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13b. Design Baseline Document? ☐ Yes ☒ No USQ screening not required. Categorical Exclusion B1 per NS 4-001 is applicable.					
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Single Use Letter Report for the Verification and Validation of the RADNUC- 2A and ORIGEN2 S.2 Computer Codes

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Project Hanford Management Contractor for the
U.S. Department of Energy under Contract DE-AC06-96RL13200

Fluor Hanford

P.O. Box 1000

Richland, Washington

Single Use Letter Report for the Verification and Validation of the RADNUC-2A and ORIGEN2 S.2 Computer Codes

M. J. Packer
Fluor Hanford

Date Published
June 2000

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SNF-4503, rev 1

**SINGLE USE LETTER REPORT FOR THE VERIFICATION AND VALIDATION OF
THE RADNUC-2A AND ORIGEN2 S.2 COMPUTER CODES**

Prepared by

FLUOR DANIEL NORTHWEST, INC.

APRIL 1999

Prepared for

DE&S HANFORD, INC.

Task Order 99-006B, Rev. 2

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RADNUC-2A AND ORIGEN2 S.2 SINGLE-USE V&V REPORT

1.0 Summary

This report documents the verification and validation (V&V) activities undertaken to support the use of the RADNUC2-A and ORIGEN2 S.2 computer codes for the specific application of calculating isotopic inventories and decay heat loadings for Spent Nuclear Fuel Project (SNFP) activities as described herein. Two recent applications include the reports HNF-SD-SNF-TI-009, *105-K Basin Material Design Basis Feed Description for Spent Nuclear Fuel Project Facilities, Volume 1, Fuel* (Praga, 1998), and HNF-3035, Rev. 0B, *MCO Gas Composition for Low Reactive Surface Areas* (Packer, 1998). Representative calculations documented in these two reports were repeated using RADNUC2-A, and the results were identical to the documented results. This serves as verification that version 2A of Radnuc was used for the applications noted above; the same version was tested herein, and perfect agreement was shown. Comprehensive V&V is demonstrated for RADNUC2-A in Appendix A.

This single use V&V report was performed according to HNF-PRO-309, "Computer Software Quality Assurance Requirements, Rev. 0." This version of HNF-PRO-309 was effective from 9/2/98 to 4/10/00; this V&V effort was performed and completed during fiscal year 1999. The applicable section of HNF-PRO-309 is Section 2.5.4:

Single-use software for a specific application (e.g., preparation of an analysis report) may be documented exclusively in that report. The minimum required information shall include a copy of the source listing and the test documentation.

The single-use V&V was intended for applications where there is no need or intention of subsequent use of the software by the organization preparing the report. Consistent with the requirements of HNF-PRO-309, the source listings for ORIGEN2 and RADNUC-2A are included in this report as well as test documentation.

Because RADNUC2-A has embedded data tables created from ORIGEN2 S.2 calculations, this single-use V&V report also contains the results of the most recent V&V activities performed for this code. Appendix C and D are a self-contained report covering the most recent V&V results for ORIGEN2 S.2. Source code listings for both RADNUC2-A and ORIGEN2 S.2 may be found in Appendices B and F, respectively.

The ORIGEN2 code was acquired originally from the RSICC (Radiation Safety Information Computational Center) as a versatile point depletion and isotope decay computer code for use in simulating nuclear fuel irradiation or material activation.

The ORIGEN2 code, which has cross section libraries for many reactor types, has been adapted for application to N Reactor with cross section libraries. ORIGEN2 was first implemented on the Hanford Cray and then converted to the Sun UNIX System as Version S.1. Version S.2 of ORIGEN2 incorporates code corrections for spontaneous fission calculations when multiple cross section libraries are used. In addition, improved N Reactor cross section libraries generated by the WIMS-E computer code and code modifications enabling the code to operate on both the Sun UNIX and Microsoft Windows95/NT Intel architectures have been implemented.

This report describes the identification of the S.2 version of ORIGEN2, the correct N Reactor data libraries, and the test results.

2.0 Test Cases and Approach

The computer modeling or simulation of physical systems or processes can be a challenging endeavor. Unlike the creation of operating systems, mathematical function libraries, or financial software (which have specific verification and validation criteria to certify acceptance), the modeling of physical systems is different. These systems are relatively straightforward to verify (that the models have been correctly implemented). However, their validation is based on how well they reproduce physical measureables (i.e., measured data).

As modeling sophistication improves, the degree of agreement with these measureables should also improve. Older versions of Radnuc were based on older versions of ORIGEN2, which used older nuclear cross section data libraries. It was shown (Appendix D) that WIMS-E reproduced measured data extremely well, and so WIMS-E was used to generate new and improved cross section libraries for ORIGEN2, so that ORIGEN2 would better match WIMS-E. These new ORIGEN2 libraries were used to create the data tables contained within the RADNUC2-A program. However, even though agreement was significantly improved (between ORIGEN2 S.2 and WIMS-E), some discrepancies still remain, and are probably attributable to the fact that the (n,2n) cross sections from WIMS-E are still not, as of yet, incorporated into the ORIGEN2 S.2 cross section libraries. Therefore, the current version of Radnuc (version 2A) does represent the best-available method for the prediction of activities and decay heat loadings that are attainable within the framework of the Radnuc code. This process may be summarized as follows:

1. The comparison of WIMS-E to measured data showed that WIMS-E reproduced measured transuranic buildup in N Reactor Mark IV fuel extremely well. However, an older version of ORIGEN2 performed not as well, and for ^{244}Cm , the comparison was terrible (high by an order of magnitude, or factor of 10).
2. WIMS-E was used to generate new cross sections for ORIGEN2, which allows ORIGEN2 version S.2 to come much closer to WIMS-E predictions than before.
3. The comparison of ORIGEN2 S.2 values to WIMS-E values (see Table D.1 in Appendix D) shows much improved agreement between ORIGEN2 S.2 and WIMS-E (and therefore with measured data).

2.1 RADNUC2-A V&V

RADNUC2-A incorporates new activity data tables, produced using the latest ORIGEN2 S.2 results, and the cross section libraries created using WIMS-E. Appendix A documents the verification that both the logarithmic interpolation and decay chain calculations were both derived and implemented in Fortran coding correctly. Validation is demonstrated against ORIGEN2 S.2 results, which constitute the baseline (i.e., ORIGEN2 S.2 is assumed to provide the "correct" results). The maximum deviation of RADNUC2-A from ORIGEN2 S.2 for a 10-year decay from the exposure basepoints is approximately 2%. For the same 10-year decay from

interpolated exposure points, the maximum deviation is approximately 10%. These deviations match the degree of agreement shown in previous Radnuc certification reports, are within the expected accuracy of the algorithms used, and are acceptable for the application of calculating decay heat loadings for SNFP.

2.2 ORIGEN2 V&V

The ORIGEN2 Version S.2 code incorporated the new N Reactor cross sections, the spontaneous fission calculation fix, and for the Windows95/NT platform, the code changes needed to migrate the code from the Sun UNIX platform. For code verification, the code was tested to 1) determine if all changes had been implemented and 2) the base test case results for ORIGEN2 were reproducible on each target platform. The validation of ORIGEN2 Version S.2 consisted of verifying that the cross section libraries had been implemented and the N Reactor test cases using these cross sections produce results that were consistent with results produced by WIMS-E 6a as published in the document, *Modification to ORIGEN2 for Generating N Reactor Source Terms* (Schwarz, 1997). At the time these WIMS-E results were generated and used, WIMS-E was certified and under configuration control as an approved code (Attachment 1). The "diff" function, which does a byte-by-byte comparison of computer files, was utilized to compare resulting output for each test case.

2.3 Single-Use Application

A selected subset of RADNUC2-A results previously documented (Praga, 1998 and Packer, 1998) were reproduced, which establishes that the calculations performed for these specific applications are supported by the V&V activities documented in Appendix A.

3.0 Hardware Description

3.1 Sun UNIX Workstation

3.1.1 RADNUC2-A

RADNUC2-A has not been installed on the UNIX computers.

3.1.2 ORIGEN2 S.2

The ORIGEN2 Version S.2 code has been installed to operate on a Sun UNIX SPARC 10 workstation with 32 megabytes of memory and 9 gigabytes of disk space. ORIGEN2 Version S.2 requires 2.0 megabytes of memory to accommodate the code and its required cross sections. The disk space requirements vary, but average 4.0 megabytes to provide storage of the executable file, cross section libraries, and the output file. For multiple calculations, the user should set aside between 50-100 megabytes of disk space to operate this code.

3.2 Windows95/NT Workstation

3.2.1 RADNUC2-A

RADNUC2-A has been installed on a Windows95/NT 4.0 Intel based workstation with 256 megabytes of memory and 9 gigabytes of disk space; this is the configuration where all test cases were performed. However, RADNUC2-A has also been executed on an 80386 PC with only 4 megabytes of memory, and still ran correctly (RADNUC2-A should therefore run on virtually any Intel-based personal computer).

3.2.2 ORIGEN2 S.2

The ORIGEN2 Version S.2 code has been installed to operate on a Windows95/NT 4.0 Intel based workstation with a minimum of 64 megabytes of memory and 4 gigabytes of disk space. The same memory and disk storage requirements as apply to the Sun UNIX workstation (See Section 3.1.2) apply to the Windows95/NT 4.0 Intel based workstation.

3.2.3 System Hardware Identification

The two systems used in the Single-Use V&V of ORIGEN2 and RADNUC 2A are:

SUN Unix System:	SUN SPARCstation 10 "frs5"
Operating System:	Sun Solaris 2.6
Property Number:	WC42360
Serial Number:	312F1902
INTEL Pentium System:	Intergraph TDZ 2000 (450 MHz)
Operating System:	MS Windows 95/NT 4.0
Property Number:	30032280
Serial Number:	H28AFF

4.0 Acceptance Test Criteria

4.1 RADNUC2-A

For the V&V activities documented in Appendix A, the mathematical expression for logarithmic interpolation was independently derived. It was verified by direct inspection of the RADNUC2-A source code that this expression was incorporated correctly. Next, the differential equations for the three decay chain models built into RADNUC2-A were solved analytically, with the proper initial conditions, and again, it was verified by direct inspection of the RADNUC2-A source code that these expressions were properly incorporated. Finally, hand calculations were performed for a subset of isotopes (selected to test each of the decay functions in RADNUC2-A).

Because no iterative (and convergence logic) methods are involved, agreement between these selected hand calculations and RADNUC2-A must agree exactly (to within the numerical precision of the RADNUC2-A output). Otherwise, something must not be implemented as intended.

For the validation section of Appendix A, it must be shown that current agreement between RADNUC2-A and ORIGEN2 S.2 is comparable to previous documented agreement.

Previous documented agreement between Radnuc and ORIGEN2 results was approximately 2% for a 10-year decay from activities on the exposure basepoints (6, 9, 12, and 16 wt% ^{240}Pu), and approximately 10% for the same 10-year decay, but from starting points that are logarithmically interpolated between the exposure basepoints (i.e., 7.5 and 14 wt% ^{240}Pu).

The acceptance test criterion for the single-use application is to show perfect agreement (to within the numerical precision output by RADNUC2-A) between several representative example problems previously documented, and when using the verified and validated copy of RADNUC2-A.

4.2 ORIGEN2

4.2.1 Definitions

Verification (Acceptance Testing) - Testing many of the features and capabilities of the ORIGEN2 S.2 software using a set of 3 input files to ensure that a new installation of the software will function properly. The purpose is to prove that a known input will produce the same expected results on a new computer platform as at ORNL.

Validation - A testing process which uses a set of input data to produce results which are compared to results obtained from measured results or results from accepted calculations established in the open literature.

4.2.2 Verification

The verification test on each computer platform will consist of the three sample problems. These sample problems consisted of the sample problem supplied with the original users manual (Croff, 1980) supplied by Oak Ridge National Laboratory (ORNL), and two N Reactor fuel problems representing Mark IV and Mark IA fuel at exposures close to 12% ^{240}Pu . The sample problem in the original users manual (Croff, 1980) tested for consistency with the problem run on the ORNL computer and other computers such as the Hanford Cray. The two N Reactor problems for 12 wt% ^{240}Pu in Mark IV and Mark IA fuels tested for consistency of the modified cross section data libraries and ORIGEN2 modifications developed for N Reactor fuels. The N Reactor fuel problems were tested for consistency with the original cases that were run for the Radnuc code support (Schwartz, 1997).

The output of ORIGEN2 is generally given in four significant figures. A variation in the last of the four digits is acceptable for the applications of ORIGEN2 calculations. An acceptance criteria of 0.05 % agreement between individual output data of similar test problems is required. This variation is expected when comparing between the Sun UNIX and Windows95/NT computer platforms due to the difference in floating point accuracy.

4.2.3 Validation

The acceptance test criteria for ORIGEN2 S.2 shall apply to fuel exposures out to the range of 4000 MWd/MTU for measured data of N Reactor Mark IV fuel. The isotopes ^{234}U , ^{235}U , ^{236}U , ^{237}U , ^{238}U , ^{239}Np , ^{239}Pu , ^{240}Pu , ^{241}Pu , ^{242}Pu , ^{241}Am , ^{243}Am , and ^{244}Cm , shall demonstrate at least 10% agreement. The isotopes ^{230}Th , ^{232}Th , ^{243}Cm , and ^{245}Cm , shall have at least 20% agreement. The isotopes ^{231}Pa , ^{233}U , ^{237}Np , ^{238}Np , ^{238}Pu , $^{242\text{m}}\text{Am}$, ^{242}Am , and ^{242}Cm shall demonstrate at least 60% agreement. While several of these isotopes were not included in the creation of new cross sections using WIMS-E (e.g., ^{231}Pa , ^{242}Cm , ^{245}Cm), none of the (n,2n) cross sections were incorporated into the new libraries, and so some work remains to be done. The output files for all of these cases (as reported in Sections 4.2.2 and 4.2.3) are archived on a CD-R disc, which is in the possession of the ORIGEN2 S.2 and RADNUC2-A code custodian.

Fission products contributing to the majority (over 85% as shown below) of the total decay heat load have been included in the "single use only" validation effort. For example, checking the ORIGEN2 database (Schwarz 1997) for both MK1A and MKIV fuel at 16% ^{240}Pu , results are as follows:

MK1A 16% ^{240}Pu

Total fission products heat load used in validation effort: 128.9 Watts/MTU

Total heat load from fission products, activation products, and actinides: 146.4 Watts/MTU

Therefore % heat load from fission products used in validation effort: $128.9/146.4 \times 100\% = 87.9\%$

MKIV 16% ^{240}Pu

Total fission products heat load used in validation effort: 106.1 Watts/MTU

Total heat load from fission products, activation products, and actinides: 122.7 Watts/MTU

Therefore % heat load from fission products used in validation effort: $106.1/122.7 \times 100\% = 86.5\%$

RADNUC-2A was validated by making a detailed comparison between RADNUC-2A and ORIGEN2 for fuel with a 10-year decay after discharge. The ORIGEN2 library is a database which includes calculated amounts of radionuclides (including primary fission products) at specified dates after discharge from the reactor. RADNUC-2A interpolates between these specified dates in ORIGEN2. Also used for validation was the WIMS-E lattice transport code to generate the same TRU isotopics as ORIGEN2 for comparison to measured data; however, the WIMS-E code is used only for transuranics comparisons since fission products and activation products are not predicted by this code.

As noted in Appendix A the RADNUC-2A prediction for ^{60}Co is approximately 20% higher than the ORIGEN2 prediction. This is because of the Cobalt Factor (COFAC) adjustment built into RADNUC-2A, which increases the ^{60}Co activity by 19% to improve agreement with measured data. The COFAC adjustment accounts for the higher level of ^{60}Co in the fuel as an activation product (not a fission product) in the nickel impurity in the charged fuel. The ORIGEN2 predictions of ^{60}Co , sensitive to the assumed nickel impurity of charged fuel, were based on the fabrication specification for impurities. Actual N Reactor fuel ^{60}Co values from waste tank and PUREX samples resulted in the COFAC adjustment (Willis 1995).

5.0 Results for Single-Use Test Problems

The objective of this section is to demonstrate that previously reported results, using RADNUC2-A for the Spent Nuclear Fuel Project, are reproducible using the version of the program transmitted to the Fluor Daniel Northwest Criticality and Shielding group for verification and validation. Section 5.1 below contains these results. Section 5.2 on ORIGEN2 is included for completeness.

5.1 RADNUC2-A

1. HNF-SD-SNF-TI-009

The RADNUC2-A input file for the combined KE/KW Basin found in Praga (1998) was scanned and read into a text file using optical character recognition (OCR) software. When RADNUC2-A was executed with this input file, perfect agreement was shown for both total curies and decay heat loading. According to the reference document, the total activity for this case is 5.50×10^7 Ci and the decay heat loading is 5.49×10^5 Btu/hr. When this problem was executed using the verified and validated copy of RADNUC2-A, these totals were reproduced exactly. The input file for this case is listed below:

"105-K Basins charge data"

"Key"	"Grade"	"Fuel"	"Pieces"	"% Pu-240"	"Uranium"	"Mo"	"Yr"
09621	1	4	000	5.94	0.006673	12	99
09621	1	4	000	5.94	0.076694	12	99
09621	1	4	000	6.01	0.023972	12	99
09621	1	4	000	5.94	0.0099	12	99
09621	1	4	000	5.94	0.002374	12	99
09621	1	4	000	5.94	0.072655	12	99
09621	1	4	000	5.94	0.149847	12	99
09621	1	4	000	5.94	0.009728	12	99
09621	1	4	000	5.94	0.050475	12	99
10001	3	4	000	12.4	0.04212	12	99
10001	3	4	000	12.4	0.014903	12	99
10001	3	4	000	12.4	0.006639	12	99
10001	3	4	000	12.4	0.00991	12	99
10001	3	4	000	12.4	0.029932	12	99
10001	3	4	000	12.4	0.035065	12	99
10201	2	4	000	9.09	1.075459	12	99
10201	2	4	000	9.09	0.366031	12	99
10201	2	4	000	9.09	0.343918	12	99
10201	2	4	000	9.09	0.537029	12	99
10201	2	4	000	9.09	0.172074	12	99
10201	2	4	000	9.09	0.161819	12	99
10259	3	4	000	10.41	0.050612	12	99
10259	3	4	000	10.41	1.476838	12	99
10259	3	4	000	10.41	12.34494	12	99
10259	3	4	000	10.41	0.031588	12	99
10259	3	4	000	10.41	0.718433	12	99
10259	3	4	000	10.41	5.758699	12	99
10294	2	4	000	8.94	0.032608	12	99
10294	3	4	000	10.4	0.012648	12	99
10294	3	4	000	10.4	0.812226	12	99
10294	3	4	000	10.4	24.15077	12	99
10294	3	4	000	10.4	0.762301	12	99
10294	2	4	000	8.94	0.027153	12	99
10294	3	4	000	10.4	0.006317	12	99

SNF-4503 Rev. 1

10294	3	4	000	10.4	0.381403	12	99
10294	3	4	000	10.4	11.35286	12	99
10294	3	4	000	10.4	0.344639	12	99
10350	2	4	000	9.28	0.031646	12	99
10350	2	4	000	9.28	0.238728	12	99
10350	2	4	000	9.28	0.089727	12	99
10350	2	4	000	9.28	0.014861	12	99
10350	2	4	000	9.28	0.112204	12	99
10350	2	4	000	9.28	0.042207	12	99
10385	3	4	000	10.21	0.130384	12	99
10385	3	4	000	11.21	0.141018	12	99
10385	3	4	000	11.21	23.81023	12	99
10385	3	4	000	11.21	0.298905	12	99
10385	3	4	000	10.21	0.075994	12	99
10385	3	4	000	11.21	0.059715	12	99
10385	3	4	000	11.21	11.17924	12	99
10385	3	4	000	11.21	0.154738	12	99
10456	3	4	000	11.24	0.009548	12	99
10456	3	4	000	11.24	0.031918	12	99
10456	3	4	000	11.24	0.414766	12	99
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10602	4	4	000	13.75	24.79309	12	99
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10679	4	4	000	14.09	0.309509	12	99
10679	3	4	000	11.09	0.014136	12	99
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10679	3	4	000	11.09	1.255033	12	99
10679	4	4	000	14.09	22.96605	12	99
10679	4	4	000	14.09	1.296428	12	99
10742	4	4	000	14.25	1.170103	12	99
10742	4	4	000	14.25	12.36114	12	99
10742	4	4	000	14.25	0.462965	12	99
10742	3	4	000	10.8	0.549476	12	99
10742	4	4	000	14.25	5.806125	12	99
10742	3	4	000	10.8	0.22488	12	99
10770	3	4	000	11.66	0.681667	12	99
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10982	4	4	000	14.97	0.126892	12	99
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10982	4	4	000	14.97	15.20181	12	99
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10982	4	4	000	14.97	0.08688	12	99
10982	3	4	000	11.7	0.059721	12	99
10982	3	4	000	11.7	0.331757	12	99
10982	4	4	000	14.97	7.090482	12	99
10982	3	4	000	11.7	0.498938	12	99
11036	4	4	000	14.37	0.006372	12	99
11036	4	4	000	13.31	0.326927	12	99
11036	4	4	000	14.37	7.817157	12	99

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11109	4	4	000	14.62	0.674804	12	99
11109	4	4	000	14.62	15.10859	12	99
11109	4	4	000	14.62	1.238823	12	99
11109	3	4	000	10.32	0.079566	12	99
11109	3	4	000	10.32	0.331711	12	99
11109	4	4	000	14.62	7.091013	12	99
11109	4	4	000	14.62	0.576213	12	99
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11183	4	4	000	14.49	0.189703	12	99
11183	4	4	000	14.49	32.90384	12	99
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11183	4	4	000	14.49	0.031018	12	99
11183	4	4	000	14.49	0.210257	12	99
11183	4	4	000	14.49	0.043892	12	99
11183	4	4	000	14.49	0.097674	12	99
11183	4	4	000	14.49	0.066214	12	99
11183	3	4	000	11.02	0.089084	12	99
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11372	4	4	000	15.17	0.421612	12	99
11372	4	4	000	15.17	19.91088	12	99
11372	4	4	000	15.17	0.686564	12	99
11372	4	4	000	15.17	0.059719	12	99
11372	3	4	000	12.05	0.019892	12	99
11372	3	4	000	12.05	0.178219	12	99
11372	3	4	000	12.05	9.414279	12	99
11372	4	4	000	15.17	0.309187	12	99
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11449	4	4	000	14.37	16.26954	12	99
11449	4	4	000	14.37	3.361394	12	99
11449	4	4	000	14.37	0.086193	12	99
11449	3	4	000	11.03	0.039598	12	99
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11449	3	4	000	11.03	1.616732	12	99
11540	3	4	000	11.66	0.152125	12	99
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11540	3	4	000	11.3	0.042167	12	99
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11540	3	4	000	11.3	0.59779	12	99
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11540	3	4	000	11.3	0.024759	12	99
11540	3	4	000	11.3	3.567068	12	99
11540	3	4	000	11.3	0.274249	12	99
11733	3	4	000	12.82	0.349841	12	99
11733	3	4	000	12.82	0.089642	12	99
11733	3	4	000	10.36	0.156979	12	99
11733	3	4	000	10.36	0.049213	12	99
11806	4	4	000	15.03	0.162968	12	99
11806	3	4	000	11.94	0.084643	12	99
11806	3	4	000	11.94	0.021097	12	99
11806	4	4	000	15.03	18.25962	12	99

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11806	4	4	000	15.03	0.268532	12	99
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11806	4	4	000	15.03	0.070582	12	99
11806	3	4	000	11.94	0.033183	12	99
11806	3	4	000	11.94	0.00991	12	99
11806	3	4	000	11.94	8.607779	12	99
11806	4	4	000	15.03	0.126466	12	99
11897	3	4	000	11.69	3.046193	12	99
11897	4	4	000	15.47	20.37553	12	99
11897	4	4	000	15.47	1.61182	12	99
11897	4	4	000	15.47	0.00663	12	99
11897	3	4	000	11.69	1.431082	12	99
11897	4	4	000	15.47	9.584959	12	99
11897	4	4	000	15.47	0.751884	12	99
11979	4	4	000	15.34	0.081493	12	99
11979	4	4	000	15.34	1.854741	12	99
11979	4	4	000	15.34	14.26082	12	99
11979	4	4	000	15.34	1.926291	12	99
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11979	4	4	000	15.34	9.622194	12	99
11979	4	4	000	15.34	0.461079	12	99
11979	3	4	000	11.7	0.89586	12	99
11979	4	4	000	15.34	6.693747	12	99
11979	3	4	000	11.7	0.892379	12	99
12127	4	4	000	14.73	0.146527	12	99
12127	4	4	000	14.73	0.497313	12	99
12127	4	4	000	14.73	0.340679	12	99
12127	4	4	000	14.73	26.23191	12	99
12127	4	4	000	14.73	3.336408	12	99
12201	4	4	000	13.98	0.13036	12	99
12201	3	4	000	11.38	0.01059	12	99
12201	3	4	000	11.38	0.449298	12	99
12201	4	4	000	13.98	15.9358	12	99
12201	4	4	000	13.98	5.664989	12	99
12201	3	4	000	11.38	0.007507	12	99
12240	4	4	000	14.51	0.063584	12	99
12240	3	4	000	11.22	0.029896	12	99
12285	4	4	000	14.45	0.014083	12	99
12285	4	4	000	14.45	0.031772	12	99
12285	3	4	000	12.1	0.759011	12	99
12285	4	4	000	14.45	57.7036	12	99
12285	4	4	000	14.45	6.101811	12	99
12285	3	4	000	12.1	0.004972	12	99
12480	4	4	000	14.29	0.580019	12	99
12480	3	4	000	12.38	0.24784	12	99
12480	4	4	000	14.29	49.62144	12	99
12480	4	4	000	14.29	3.732459	12	99
12565	4	4	000	14.15	0.290153	12	99
12565	4	4	000	14.15	0.139326	12	99
12565	4	4	000	14.15	34.78675	12	99
12565	4	4	000	14.15	3.646776	12	99
12639	4	4	000	13.84	0.02309	12	99
12639	4	4	000	13.84	40.3312	12	99
12639	4	4	000	13.84	5.400192	12	99
12852	3	4	000	11.43	2.525342	12	99
13015	4	4	000	13.19	0.216604	12	99
13015	4	4	000	13.19	0.654274	12	99
13016	1	4	000	5.63	0.02194	12	99
13371	1	4	000	6.58	0.021128	12	99
13649	3	4	000	11.4	0.374685	12	99
13649	4	4	000	13.25	0.588463	12	99
13649	4	4	000	13.25	3.972961	12	99
13685	4	4	000	13.34	2.617419	12	99
14065	1	4	000	5.62	0.023287	12	99

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14355	4	4	000	15.74	0.094818	12	99
14355	3	4	000	12	6.202162	12	99
14355	4	4	000	15.74	0.313212	12	99
14355	4	4	000	15.74	0.04455	12	99
14355	3	4	000	12	2.916202	12	99
14355	4	4	000	15.74	0.147505	12	99
14356	3	4	000	11.28	0.180698	12	99
14356	3	4	000	11.28	3.207757	12	99
14356	3	4	000	11.28	0.022035	12	99
14356	3	4	000	11.28	8.161901	12	99
14356	3	4	000	11.28	1.352138	12	99
14356	3	4	000	11.28	0.372588	12	99
14356	3	4	000	11.28	0.085034	12	99
14356	3	4	000	11.28	0.103665	12	99
14722	1	4	000	5.05	0.068843	12	99
15204	1	4	000	6.01	0.015919	12	99
15204	1	4	000	5.53	0.351245	12	99
15204	1	4	000	6.01	14.30584	12	99
15204	1	4	000	6.01	3.164697	12	99
15204	1	4	000	6.01	59.48539	12	99
15204	1	4	000	6.01	20.10897	12	99
15204	1	4	000	6.01	0.007492	12	99
15240	1	4	000	5.6	0.015919	12	99
15240	1	4	000	5.71	0.374804	12	99
15240	1	4	000	5.6	0.088008	12	99
15240	1	4	000	5.6	0.006644	12	99
15240	1	4	000	5.6	0.007041	12	99
15316	1	4	000	6.1	10.04697	12	99
15316	1	4	000	6.1	0.186043	12	99
15316	1	4	000	6.1	4.962912	12	99
15316	1	4	000	6.1	4.334796	12	99
15316	1	4	000	6.1	0.007492	12	99
15444	1	4	000	4.7	0.103706	12	99
15111	1	4	000	4.7	0.116956	12	99
15444	1	4	000	4.7	0.087941	12	99
15451	1	4	000	4.97	1.497135	12	99
15451	1	4	000	6.79	6.799597	12	99
15451	1	4	000	6.79	0.092684	12	99
15451	1	4	000	6.79	0.044007	12	99
15455	1	4	000	4.94	0.373161	12	99
15455	1	4	000	4.94	0.748424	12	99
15455	1	4	000	4.94	0.373987	12	99
15457	1	4	000	1.69	0.046801	12	99
15457	1	4	000	4.35	0.290374	12	99
15458	1	4	000	3.44	0.374335	12	99
15458	1	4	000	4.26	21.2791	12	99
15458	1	4	000	4.26	2.597811	12	99
15458	1	4	000	4.26	67.36977	12	99
15458	1	4	000	4.26	0.373516	12	99
15458	1	4	000	4.26	40.36723	12	99
15460	1	4	000	2.83	2.948269	12	99
15460	1	4	000	4.29	14.93406	12	99
15461	1	4	000	1.55	12.73	12	99
14356	3	4	000	11.28	0.014051	12	99
14356	3	4	000	11.28	0.010471	12	99
09621	1	1	000	6.04	0.105599	12	99
09964	1	1	000	6.18	0.01714	12	99
09964	1	1	000	6.18	0.279918	12	99
09964	1	4	000	6.26	0.041696	12	99
09964	1	1	000	6.18	0.013785	12	99
09964	1	1	000	6.18	0.003883	12	99
09964	1	1	000	6.18	0.005486	12	99
09964	1	4	000	6.26	0.033371	12	99
09993	3	1	000	10.29	0.246594	12	99

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09993	3	1	000	10.29	4.643864	12	99
09993	3	1	000	10.29	3.572316	12	99
10001	4	4	000	13.59	0.031624	12	99
10001	4	4	000	13.59	0.031755	12	99
10001	1	4	000	5.61	0.013364	12	99
10001	4	4	000	13.59	0.029833	12	99
10001	4	4	000	13.59	0.723905	12	99
10001	1	4	000	5.61	0.019654	12	99
10001	1	4	000	5.61	0.02194	12	99
10001	4	4	000	13.59	0.007474	12	99
10001	1	4	000	5.61	0.006289	12	99
10001	4	4	000	13.59	0.014039	12	99
10201	2	1	000	9.22	0.249793	12	99
10201	2	1	000	9.22	0.490728	12	99
10201	2	1	000	9.22	12.14053	12	99
10201	2	1	000	9.22	1.236388	12	99
10259	3	1	000	10.35	0.736071	12	99
10259	3	1	000	10.35	2.228769	12	99
10294	2	1	000	9.8	19.0871	12	99
10294	2	1	000	9.8	0.061858	12	99
10350	3	1	000	10.65	0.011009	12	99
10350	3	1	000	10.65	1.30869	12	99
10350	3	1	000	10.65	13.58606	12	99
10350	3	1	000	10.65	0.896723	12	99
10350	3	1	000	10.65	0.005503	12	99
10385	3	1	000	10.42	0.011227	12	99
10385	3	1	000	10.42	7.494582	12	99
10456	3	1	000	11.37	15.61247	12	99
10456	3	1	000	11.37	0.958057	12	99
10602	3	1	000	11.11	0.011238	12	99
10602	3	1	000	11.11	13.86589	12	99
10602	3	1	000	11.11	0.649808	12	99
10679	3	1	000	11.76	0.163905	12	99
10679	3	1	000	11.76	7.764973	12	99
10679	3	1	000	11.76	3.558569	12	99
10742	3	1	000	12.77	0.007962	12	99
10742	3	1	000	12.77	0.210765	12	99
10742	3	1	000	12.77	3.650096	12	99
10742	3	1	000	12.77	2.783527	12	99
10742	3	1	000	12.77	0.005285	12	99
10770	4	1	000	13.16	0.010359	12	99
10770	4	1	000	13.16	6.159879	12	99
10770	4	1	000	13.16	2.009749	12	99
10770	4	1	000	13.16	0.005106	12	99
10832	3	1	000	12.92	13.07947	12	99
10832	3	1	000	12.92	3.696517	12	99
10982	4	1	000	13.73	0.020983	12	99
10982	4	1	000	13.73	0.023391	12	99
10982	4	1	000	13.73	16.49613	12	99
10982	4	1	000	13.73	0.694274	12	99
10982	4	1	000	13.73	0.010547	12	99
11036	4	1	000	13.6	7.613446	12	99
11109	4	1	000	13.7	0.468068	12	99
11109	4	1	000	13.7	14.63286	12	99
11109	4	1	000	13.7	0.005275	12	99
11183	4	1	000	13.31	0.022094	12	99
11183	4	1	000	13.31	0.678594	12	99
11183	4	1	000	13.31	9.361327	12	99
11183	4	1	000	13.31	0.24688	12	99
11183	4	1	000	13.31	0.010881	12	99
11372	4	1	000	13.77	0.690168	12	99
11372	4	1	000	13.77	18.57126	12	99
11372	4	1	000	13.77	0.709699	12	99
11449	4	1	000	13.45	0.105257	12	99

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11449	4	1	000	13.45	18.58285	12	99
11449	4	1	000	13.45	1.298701	12	99
11540	4	1	000	13.26	12.48741	12	99
11806	4	1	000	13.86	0.210315	12	99
11806	4	1	000	13.86	19.23798	12	99
11806	4	1	000	13.86	0.54114	12	99
11897	4	1	000	14.4	0.023484	12	99
11897	4	1	000	14.4	1.986457	12	99
11897	4	1	000	14.4	17.69781	12	99
11897	4	1	000	14.4	0.003856	12	99
11979	4	1	000	14.27	0.007981	12	99
11979	4	1	000	14.27	0.011234	12	99
11979	4	1	000	14.27	0.010507	12	99
11979	4	1	000	14.27	1.952108	12	99
11979	4	1	000	14.27	14.49357	12	99
11979	4	1	000	14.27	8.884854	12	99
11979	4	1	000	14.27	0.010731	12	99
12127	4	1	000	14.22	0.982493	12	99
12127	4	1	000	14.22	13.32088	12	99
12127	4	1	000	14.22	1.483142	12	99
12201	4	1	000	13.24	0.748323	12	99
12201	4	1	000	13.24	24.37494	12	99
12285	4	1	000	13.17	0.246182	12	99
12285	4	1	000	13.17	19.5675	12	99
12480	4	1	000	13.78	0.022173	12	99
12480	4	1	000	13.78	19.43003	12	99
12565	4	1	000	13.7	0.011092	12	99
12565	4	1	000	13.7	25.24008	12	99
12639	4	1	000	13.06	0.011095	12	99
12639	4	1	000	13.06	23.608	12	99
12639	4	1	000	13.06	0.005465	12	99
12823	4	1	000	13.17	7.213609	12	99
12823	4	1	000	13.17	0.63684	12	99
12852	4	1	000	13.01	10.86065	12	99
12852	4	1	000	13.01	2.874132	12	99
12852	4	4	000	13.42	0.047668	12	99
12852	4	4	000	13.42	66.60527	12	99
12852	4	4	000	13.42	0.373472	12	99
12852	4	4	000	13.42	0.022424	12	99
12942	4	1	000	13.03	0.740693	12	99
12942	4	1	000	13.03	17.44634	12	99
12942	4	1	000	13.03	2.250894	12	99
12942	3	4	000	12.1	0.374625	12	99
12942	3	4	000	12.82	0.370306	12	99
12942	3	4	000	12.82	0.557199	12	99
12942	3	4	000	12.82	50.14236	12	99
12942	3	4	000	12.82	1.471475	12	99
13015	4	4	000	13.19	0.010524	12	99
13015	3	4	000	12.13	0.374619	12	99
13015	4	4	000	13.19	4.595128	12	99
13015	4	4	000	13.19	36.66284	12	99
13015	4	4	000	13.19	2.61431	12	99
13015	4	4	000	13.19	0.004952	12	99
13016	4	1	000	13.18	0.764476	12	99
13016	4	1	000	13.18	19.61489	12	99
13016	4	1	000	13.18	0.248292	12	99
13016	4	1	000	13.18	0.005246	12	99
13016	4	1	000	13.18	0.015362	12	99
13017	3	4	000	11.39	1.131855	12	99
13017	3	4	000	11.39	25.42655	12	99
13017	3	4	000	11.39	0.374331	12	99
13371	3	1	000	12.95	0.015909	12	99
13371	3	1	000	12.95	0.245652	12	99
13371	3	1	000	12.95	4.723547	12	99

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13371	3	1	000	12.95	0.010241	12	99
13372	4	4	000	13.02	0.01496	12	99
13372	4	4	000	13.02	3.176879	12	99
13372	4	4	000	13.02	11.79194	12	99
13372	4	4	000	13.02	4.333318	12	99
13372	4	4	000	13.02	0.004961	12	99
13524	4	4	000	13.13	4.10635	12	99
13524	4	4	000	13.13	2.929691	12	99
13524	4	4	000	13.13	25.97653	12	99
13524	4	4	000	13.13	4.639363	12	99
13525	4	1	000	13.52	1.219785	12	99
13525	4	1	000	13.52	16.37086	12	99
13648	3	1	000	11.67	0.032575	12	99
13650	4	1	000	13.41	1.438302	12	99
13650	4	1	000	13.41	12.42106	12	99
13650	4	1	000	13.41	2.724184	12	99
13686	3	1	000	12.41	0.023387	12	99
13686	3	1	000	12.41	17.62132	12	99
13686	3	1	000	12.41	0.247753	12	99
13724	1	1	000	5.99	0.015523	12	99
13858	3	4	000	12.01	0.374632	12	99
13858	3	4	000	12.04	3.127837	12	99
13858	3	4	000	12.04	48.353	12	99
13858	3	4	000	12.04	1.011267	12	99
13858	3	4	000	12.04	0.004955	12	99
13859	3	1	000	12.28	0.007927	12	99
13859	3	1	000	12.28	0.011657	12	99
13859	3	1	000	12.28	25.87721	12	99
13859	3	1	000	12.28	3.751426	12	99
13859	3	1	000	12.28	0.005246	12	99
14055	1	4	000	2.39	0.327945	12	99
14065	1	4	000	5.67	0.015902	12	99
14065	1	4	000	5.67	0.071951	12	99
14065	1	4	000	5.67	0.00446	12	99
14065	1	4	000	5.67	0.024244	12	99
14065	1	4	000	5.67	0.007021	12	99
14448	1	4	000	5.99	0.012272	12	99
14883	1	4	000	5.66	0.022262	12	99
15204	1	4	000	5.92	0.015919	12	99
15244	1	1	000	5.44	0.007949	12	99
15244	1	1	000	5.44	0.01126	12	99
15244	1	1	000	5.44	0.042169	12	99
15244	1	1	000	5.44	0.02338	12	99
15244	1	1	000	5.44	0.132474	12	99
15244	1	1	000	5.44	0.124027	12	99
15244	1	1	000	5.44	0.007481	12	99
15244	1	1	000	5.44	0.004961	12	99
15244	4	4	000	13.58	0.007019	12	99
15347	1	1	000	6.16	0.007949	12	99
15347	1	1	000	6.16	0.01169	12	99
15347	1	1	000	6.16	0.083168	12	99
15347	1	1	000	6.16	0.031137	12	99
15347	1	1	000	6.16	0.010645	12	99
15445	1	1	000	5.23	1.297919	12	99
15445	1	1	000	5.23	0.669493	12	99
15448	1	1	000	4.54	0.008002	12	99
15448	1	1	000	4.54	0.015812	12	99
15448	1	1	000	4.54	0.003766	12	99
15448	1	1	000	4.54	0.005327	12	99
15451	1	1	000	5.31	0.46584	12	99
15457	1	1	000	2.85	0.033293	12	99
15459	1	1	000	4.06	25.28046	12	99
15459	1	1	000	4.06	8.661046	12	99
15460	1	1	000	3.32	2.097296	12	99

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15555	1	1	000	4	0.008002	12	99
15555	1	1	000	4	0.01132	12	99
11540	4	4	000	16.49	0.031623	12	99
11540	4	4	000	16.49	6.873061	12	99
11540	4	4	000	16.49	0.984106	12	99
11540	4	4	000	13.73	0.009902	12	99
11540	4	4	000	16.49	3.241216	12	99
11540	4	4	000	16.49	0.456485	12	99
12565	4	4	000	16.72	6.674973	12	99
12565	4	4	000	16.72	0.175589	12	99
12852	4	4	000	16.62	4.201198	12	99

The output file is included below:

Combined KE/KW Basin ...
 Results decayed to 05/31/1998
 Total MTU 2099.1
 Total Curies 5.50D+07
 Total BTU 5.49D+05

Isotope	Curies	BTUs
H-3	3.59D+04	4.12D+00
C-14	2.35D-02	2.34D-05
Se-79	8.62D+01	9.07D-02
Kr-85	5.90D+05	3.02D+03
Sr-89	0.00D+00	0.00D+00
Sr-90	1.01D+07	4.01D+04
Y-90	1.01D+07	1.91D+05
Y-91	2.23D-14	2.73D-16
Zr-93	3.87D+02	1.52D-01
Nb-93m	2.39D+02	1.46D-01
Zr-95	1.67D-12	2.87D-14
Nb-95	3.70D-12	6.06D-14
Nb-95m	1.24D-14	5.57D-17
Tc-99	2.88D+03	4.93D+00
Ru-103	0.00D+00	0.00D+00
Rh-103m	0.00D+00	0.00D+00
Ru-106	1.82D+03	3.70D-01
Rh-106	1.82D+03	5.94D+01
Pd-107	1.63D+01	3.05D-03
Ag-110	2.84D-04	7.27D-09
Ag-110m	2.14D-02	1.21D-03
Cd-113m	3.55D+03	1.33D+01
Cd-115m	0.00D+00	0.00D+00
Sn-119m	2.76D-02	4.85D-05
Sn-121m	2.69D+01	9.64D-02
Sn-123	1.74D-05	1.85D-07
Te-123m	2.76D-11	1.36D-13
Sb-124	3.03D-18	1.37D-19
Sb-125	3.23D+04	3.47D+02
Te-125m	7.89D+03	2.27D+01
Sn-126	1.56D+02	1.63D-01
Sb-126	2.18D+01	1.35D+00
Sb-126m	1.56D+02	6.81D+00
Te-127	9.49D-07	4.37D-09
Te-127m	9.68D-07	1.64D-09
Te-129	0.00D+00	0.00D+00
Te-129m	0.00D+00	0.00D+00
I-129	6.37D+00	1.02D-02
Cs-134	1.59D+04	5.54D+02
Cs-135	7.75D+01	8.84D-02
Cs-137	1.32D+07	4.55D+04
Ba-137m	1.25D+07	1.67D+05

Ce-141	0.00D+00	0.00D+00
Pr-143	0.00D+00	0.00D+00
Ce-144	9.14D+02	2.06D+00
Pr-144	9.03D+02	2.26D+01
Pr-144m	1.10D+01	1.26D-02
Pm-147	4.62D+05	5.79D+02
Pm-148	0.00D+00	0.00D+00
Pm-148m	0.00D+00	0.00D+00
Sm-151	1.76D+05	7.02D+01
Eu-152	9.45D+02	1.46D+01
Gd-153	1.28D-04	3.94D-07
Eu-154	1.07D+05	3.29D+03
Eu-155	2.21D+04	5.45D+01
Tb-160	2.77D-15	7.55D-17
H-3	7.24D+02	8.31D-02
C-14	6.93D+02	6.91D-01
Fe-55	1.84D+03	2.09D-01
Ni-59	4.10D+01	5.55D-03
Co-60	3.96D+03	2.08D+02
Ni-63	4.49D+03	1.55D+00
Zr-93	1.32D+01	5.20D-03
Nb-93m	8.18D+00	5.00D-03
Zr-95	1.63D-14	2.81D-16
Nb-95	3.63D-14	5.94D-16
Nb-95m	1.21D-16	5.47D-19
In-113m	2.14D-07	1.69D-09
Sn-113	2.14D-07	1.21D-10
Sn-119m	2.69D-01	4.73D-04
Sn-121m	5.27D+01	1.89D-01
Sb-125	1.19D+03	1.27D+01
Te-125m	2.89D+02	8.32D-01
U-234	8.74D+02	8.44D+01
U-235	3.37D+01	3.12D+00
U-236	1.27D+02	1.16D+01
U-238	6.96D+02	5.92D+01
Np-237	5.72D+01	5.63D+00
Pu-238	1.11D+05	1.24D+04
Pu-239	2.51D+05	2.62D+04
Pu-240	1.44D+05	1.51D+04
Pu-241	6.68D+06	7.07D+02
Pu-242	5.49D+01	5.45D+00
Am-241	3.75D+05	4.19D+04
Am-242m	1.96D+02	1.02D+00
Am-242	1.95D+02	5.53D+00
Am-243	1.20D+02	1.30D+01
Cm-242	1.62D+02	2.00D+01
Cm-244	1.44D+03	1.69D+02

This calculation includes both Mark IV and Mark IA fuel types, exposures up to 16 wt% ^{240}Pu , and (because various discharge dates are decayed to one common final date) decay times of between 10-30 years. The output matches the previously reported results extremely well, which satisfies the acceptance criterion. Out of $89 \times 2 = 178$ numerical values output, there were four numbers that did not match exactly, but only differed by "1" in the second decimal place. This is considered to be extremely good agreement (and might be due to roundoff error arising from compiler differences).

2. HNF-3035

Two of the 11 cases reported in Appendix C of Packer (1998) were executed using RADNUC2-A, for keys 13016 (Mark IA fuel) and 13372 (Mark IV fuel). For both of these keys, perfect agreement was shown, for both total curies and decay heat loading. No anomalies were found. For key 13016, the reported activity level is 6.41×10^5 Ci and the decay heat loading was equal to 6.40×10^3 Btu/hr. The input file for this key is shown below:

"105-K Basins charge data"

"Key"	"Grade"	"Fuel"	"Pieces"	"Pu-240"	"Uranium"	"Mo"	"Yr"
13016	4	1	000	13.180	0.764476	12	99
13016	4	1	000	13.180	19.61489	12	99
13016	4	1	000	13.180	0.248292	12	99
13016	4	1	000	13.180	0.005246	12	99
13016	4	1	000	13.180	0.015362	12	99

When the verified and validated copy of RADNUC2-A was executed on this problem, the following output file was produced:

Testing ...

Results decayed to 11/30/2000

Total MTU 20.6

Total Curies 6.41D+05

Total BTU 6.40D+03

Isotope	Curies	BTUs
H-3	4.08D+02	4.68D-02
C-14	2.78D-04	2.77D-07
Se-79	1.02D+00	1.07D-03
Kr-85	6.88D+03	3.52D+01
Sr-89	0.00D+00	0.00D+00
Sr-90	1.22D+05	4.83D+02
Y-90	1.22D+05	2.30D+03
Y-91	0.00D+00	0.00D+00
Zr-93	4.65D+00	1.82D-03
Nb-93m	2.90D+00	1.77D-03
Zr-95	0.00D+00	0.00D+00
Nb-95	0.00D+00	0.00D+00
Nb-95m	0.00D+00	0.00D+00
Tc-99	3.41D+01	5.84D-02
Ru-103	0.00D+00	0.00D+00
Rh-103m	0.00D+00	0.00D+00
Ru-106	9.78D-01	1.99D-04
Rh-106	9.78D-01	3.19D-02
Pd-107	1.77D-01	3.32D-05
Ag-110	2.74D-08	7.01D-13
Ag-110m	2.06D-06	1.17D-07
Cd-113m	3.82D+01	1.43D-01
Cd-115m	0.00D+00	0.00D+00
Sn-119m	5.15D-07	9.06D-10
Sn-121m	3.03D-01	1.08D-03
Sn-123	6.48D-14	6.90D-16
Te-123m	2.43D-19	1.20D-21
Sb-124	0.00D+00	0.00D+00
Sb-125	2.34D+02	2.51D+00
Te-125m	5.72D+01	1.64D-01
Sn-126	1.75D+00	1.83D-03
Sb-126	2.44D-01	1.51D-02

Sb-126m	1.75D+00	7.63D-02
Te-127	1.40D-16	6.45D-19
Te-127m	1.43D-16	2.41D-19
Te-129	0.00D+00	0.00D+00
Te-129m	0.00D+00	0.00D+00
I-129	7.35D-02	1.17D-04
Cs-134	1.13D+02	3.94D+00
Cs-135	8.90D-01	1.02D-03
Cs-137	1.55D+05	5.36D+02
Ba-137m	1.47D+05	1.97D+03
Ce-141	0.00D+00	0.00D+00
Pr-143	0.00D+00	0.00D+00
Ce-144	6.01D-02	1.35D-04
Pr-144	5.94D-02	1.49D-03
Pr-144m	7.21D-04	8.27D-07
Pm-147	3.08D+03	3.86D+00
Pm-148	0.00D+00	0.00D+00
Pm-148m	0.00D+00	0.00D+00
Sm-151	1.99D+03	7.96D-01
Eu-152	1.07D+01	1.65D-01
Gd-153	1.88D-08	5.77D-11
Eu-154	1.17D+03	3.58D+01
Eu-155	2.04D+02	5.03D-01
Tb-160	0.00D+00	0.00D+00
H-3	7.39D+00	8.48D-04
C-14	7.59D+00	7.56D-03
Fe-55	1.21D+01	1.38D-03
Ni-59	4.63D-01	6.28D-05
Co-60	4.28D+01	2.25D+00
Ni-63	5.06D+01	1.75D-02
Zr-93	1.61D-01	6.32D-05
Nb-93m	1.00D-01	6.14D-05
Zr-95	0.00D+00	0.00D+00
Nb-95	0.00D+00	0.00D+00
Nb-95m	0.00D+00	0.00D+00
In-113m	8.71D-17	6.87D-19
Sn-113	8.71D-17	4.93D-20
Sn-119m	5.05D-06	8.87D-09
Sn-121m	6.26D-01	2.24D-03
Sb-125	8.95D+00	9.59D-02
Te-125m	2.18D+00	6.28D-03
U-234	9.08D+00	8.77D-01
U-235	3.61D-01	3.34D-02
U-236	1.40D+00	1.28D-01
U-238	6.83D+00	5.81D-01
Np-237	6.13D-01	6.03D-02
Pu-238	1.14D+03	1.27D+02
Pu-239	2.67D+03	2.78D+02
Pu-240	1.55D+03	1.61D+02
Pu-241	7.09D+04	7.50D+00
Pu-242	5.41D-01	5.37D-02
Am-241	3.98D+03	4.46D+02
Am-242m	1.72D+00	8.99D-03
Am-242	1.71D+00	4.86D-02
Am-243	1.01D+00	1.09D-01
Cm-242	1.42D+00	1.76D-01
Cm-244	1.01D+01	1.19D+00

For key 13372, the reported activity level is 5.38×10^5 Ci and the decay heat loading was equal to 5.35×10^3 Btu/hr. The input file for this key is shown below:

"105-K Basins charge data"

"Key"	"Grade"	"Fuel"	"Pieces"	"%Pu-240"	"Uranium"	"Mo"	"Yr"
13372	4	4	000	13.020	0.01496	12	99
13372	4	4	000	13.020	3.176879	12	99
13372	4	4	000	13.020	11.79194	12	99
13372	4	4	000	13.020	4.333318	12	99
13372	4	4	000	13.020	0.004961	12	99

When the verified and validated copy of RADNUC2-A was executed on this problem, the following output file was produced:

Testing ...

Results decayed to 11/30/2000

Total MTU 19.3

Total Curies 5.38D+05

Total BTU 5.35D+03

Isotope	Curies	BTUs
H-3	3.59D+02	4.11D-02
C-14	2.26D-04	2.25D-07
Se-79	8.30D-01	8.72D-04
Kr-85	5.79D+03	2.96D+01
Sr-89	0.00D+00	0.00D+00
Sr-90	9.80D+04	3.88D+02
Y-90	9.80D+04	1.85D+03
Y-91	0.00D+00	0.00D+00
Zr-93	3.70D+00	1.45D-03
Nb-93m	2.25D+00	1.38D-03
Zr-95	0.00D+00	0.00D+00
Nb-95	0.00D+00	0.00D+00
Nb-95m	0.00D+00	0.00D+00
Tc-99	2.77D+01	4.74D-02
Ru-103	0.00D+00	0.00D+00
Rh-103m	0.00D+00	0.00D+00
Ru-106	1.70D+00	3.46D-04
Rh-106	1.70D+00	5.55D-02
Pd-107	1.61D-01	3.02D-05
Ag-110	6.79D-08	1.74D-12
Ag-110m	5.11D-06	2.89D-07
Cd-113m	3.63D+01	1.36D-01
Cd-115m	0.00D+00	0.00D+00
Sn-119m	1.25D-06	2.20D-09
Sn-121m	2.67D-01	9.55D-04
Sn-123	3.77D-13	4.01D-15
Te-123m	1.81D-18	8.94D-21
Sb-124	0.00D+00	0.00D+00
Sb-125	2.66D+02	2.85D+00
Te-125m	6.49D+01	1.87D-01
Sn-126	1.53D+00	1.61D-03
Sb-126	2.14D-01	1.33D-02
Sb-126m	1.53D+00	6.69D-02
Te-127	1.14D-15	5.26D-18
Te-127m	1.16D-15	1.97D-18
Te-129	0.00D+00	0.00D+00
Te-129m	0.00D+00	0.00D+00
I-129	6.19D-02	9.89D-05
Cs-134	1.28D+02	4.44D+00

Cs-135	7.55D-01	8.61D-04
Cs-137	1.29D+05	4.45D+02
Ba-137m	1.22D+05	1.63D+03
Ce-141	0.00D+00	0.00D+00
Pr-143	0.00D+00	0.00D+00
Ce-144	1.13D-01	2.54D-04
Pr-144	1.11D-01	2.79D-03
Pr-144m	1.35D-03	1.55D-06
Pm-147	3.22D+03	4.04D+00
Pm-148	0.00D+00	0.00D+00
Pm-148m	0.00D+00	0.00D+00
Sm-151	1.71D+03	6.84D-01
Eu-152	9.76D+00	1.51D-01
Gd-153	4.60D-08	1.42D-10
Eu-154	1.07D+03	3.29D+01
Eu-155	2.05D+02	5.05D-01
Tb-160	0.00D+00	0.00D+00
H-3	7.49D+00	8.59D-04
C-14	6.89D+00	6.87D-03
Fe-55	1.39D+01	1.58D-03
Ni-59	4.02D-01	5.44D-05
Co-60	3.74D+01	1.97D+00
Ni-63	4.43D+01	1.53D-02
Zr-93	1.25D-01	4.92D-05
Nb-93m	7.61D-02	4.65D-05
Zr-95	0.00D+00	0.00D+00
Nb-95	0.00D+00	0.00D+00
Nb-95m	0.00D+00	0.00D+00
In-113m	5.78D-16	4.56D-18
Sn-113	5.77D-16	3.27D-19
Sn-119m	1.10D-05	1.93D-08
Sn-121m	5.09D-01	1.83D-03
Sb-125	9.16D+00	9.82D-02
Te-125m	2.24D+00	6.42D-03
U-234	7.73D+00	7.47D-01
U-235	2.81D-01	2.60D-02
U-236	1.19D+00	1.08D-01
U-238	6.41D+00	5.45D-01
Np-237	5.75D-01	5.65D-02
Pu-238	1.10D+03	1.23D+02
Pu-239	2.54D+03	2.64D+02
Pu-240	1.45D+03	1.51D+02
Pu-241	6.96D+04	7.36D+00
Pu-242	5.02D-01	4.98D-02
Am-241	3.63D+03	4.07D+02
Am-242m	1.75D+00	9.14D-03
Am-242	1.74D+00	4.94D-02
Am-243	9.75D-01	1.05D-01
Cm-242	1.44D+00	1.78D-01
Cm-244	1.06D+01	1.24D+00

These results meet the acceptance test criterion.

These test cases were executed on an Intergraph Pentium II Xeon personal computer running the Microsoft Windows NT 4.0 operating system. This system is part of the Fluor Daniel Northwest Advanced Computing Center (ACC), which is a part of the Fluor Daniel Network (FLAN).

5.2 ORIGEN2

The first objective of the verification test is to demonstrate that the test problem received from RSICC meets the test requirements when compared to the results of the calculations performed on the ORNL computer and the Hanford Cray computer. The second objective of the verification test is to demonstrate that the N Reactor Mark IV and Mark IA fuel test problems meet the test requirements when compared to the results of the calculations performed on the sun3 and Windows95/NT platforms. The following are the results of the above comparisons.

5.2.1 Sun UNIX Workstations

The test case using the input file listed in Appendix C, Attachment C and pwru.lib libraries supplied by ORNL (Croff, 1980) met the acceptance criteria of Section 4.2 when the output file was compared to the output file supplied by ORNL (Croff, 1980).

The N Reactor Mark IV test case using the input file listed in Appendix C, Attachment C and data libraries for Mark IV fuel listed in Table 1 met the acceptance criteria of Section 4.2 when the output file was compared to the output file listed in Schwartz (1997).

The N Reactor Mark IA test case using the input file listed in Appendix C, Attachment C and data libraries for Mark IA fuel listed in Table 1 met the acceptance criteria of Section 4.2 when the output file was compared to the output file listed in Schwartz (1997).

5.2.2 Windows95/NT Platforms

The test case using the input file listed in Appendix C, Attachment C and pwru.lib libraries supplied by ORNL (Croff, 1980) met the acceptance criteria of Section 4.2 when the output file was compared to the output file supplied by ORNL (Croff, 1980).

The N Reactor Mark IV test case using the input file listed in Appendix C, Attachment C and data libraries for Mark IV fuel listed in Table 1 met the acceptance criteria of Section 4.2 when the output file was compared to the output file listed in Schwartz (1997).

The N Reactor Mark IA test case using the input file listed in Appendix C, Attachment C and data libraries for Mark IA fuel listed in Table 1 met the acceptance criteria of Section 4.2 when the output file was compared to the output file listed in the Schwartz (1997).

6.0 Personnel involved

The individual who performed the RADNUC2-A tests was Kevin N. Schwinkendorf of Criticality and Shielding, Fluor Daniel Northwest. The individuals who performed the ORIGEN2 S.2 tests were Steven P. Roblyer of Criticality and Shielding, and Donald J. Hammervold of Environmental and Nuclear Initiatives, both of whom work for Fluor Daniel Northwest. The independent technical peer review was provided by David W. Wootan of Environmental and Nuclear Initiatives, Fluor Daniel Northwest.

7.0 Conclusion

The RADNUC2-A computer code is approved for use for the calculation of activities and decay heat loadings for N Reactor tube-in-tube fuel assemblies.

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APPENDIX A
VERIFICATION AND VALIDATION OF RADNUC2-A

1.0 VERIFICATION

The interpolation functions built into Radnuc are based on the assumption that the natural logarithms of the activity data will be linear with respect to exposure, based on the wt% ^{240}Pu in total plutonium. These two-point interpolation formulae were rederived and verified to be correct. The logarithmic interpolation formula is:

$$A(t) = \exp \left[\left(\frac{\ln A_2 - \ln A_1}{E_2 - E_1} \right) (E - E_1) + \ln A_1 \right] \quad (1)$$

where $A(t)$ is the activity of the radioisotope of interest at exposure E (as related to wt% ^{240}Pu). The subscripts 1 and 2 refer to the two points between which the interpolation is made. This expression has been verified to be correctly implemented in function CPT.

The decay expressions built into RADNUC2-A are based on three explicitly-defined forms of decay chains. These forms are:

- 1) $I_1 \rightarrow I_2$ (*stable*): The expression for the activity of isotope I_1 present at time t is:

$$A_1(t) = N_1(t_0) \lambda_1 e^{-\lambda_1(t-t_0)} \quad (2)$$

In this expression, N is the number density of atoms present, λ is the decay constant (defined as the natural logarithm of 2 divided by the half-life), and t_0 is a reference time (and $t > t_0$).

- 2) $I_1 \rightarrow I_2 \rightarrow I_3$ (*stable*): The expression for the activity of isotope I_2 present at time t is:

$$A_2(t) = \frac{N_1(t_0) \lambda_1 \lambda_2}{\lambda_2 - \lambda_1} \left(e^{-\lambda_1(t-t_0)} - e^{-\lambda_2(t-t_0)} \right) \quad (3)$$

This expression assumes that $N_2(t_0) = 0$.

- 3) $I_1 \rightarrow I_2 \rightarrow I_3 \rightarrow I_4$ (*stable*): The expression for the activity of isotope I_3 present at time t is:

$$A_3(t) = \frac{N_2(t_0) \lambda_2 \lambda_3}{\lambda_3 - \lambda_2} \left(e^{-\lambda_2(t-t_0)} - e^{-\lambda_3(t-t_0)} \right) + N_1(t_0) \lambda_1 \lambda_2 \lambda_3 \left[\frac{e^{-\lambda_1(t-t_0)}}{(\lambda_2 - \lambda_1)(\lambda_3 - \lambda_1)} + \frac{e^{-\lambda_2(t-t_0)}}{(\lambda_1 - \lambda_2)(\lambda_3 - \lambda_2)} + \frac{e^{-\lambda_3(t-t_0)}}{(\lambda_1 - \lambda_3)(\lambda_2 - \lambda_3)} \right] \quad (4)$$

This expression assumes that $N_3(t_0) = 0$.

Decay chains 1 through 3 above correspond to functions DK, DK2, and DK3 in RADNUC2-A. These above expressions were rederived and verified to be correct. For decay chain 1, the

differential equation governing the number of radioactive atoms present is:

$$\frac{dN_1}{dt} = -\lambda_1 N_1 \quad (5)$$

If this equation is divided by N_1 and integrated over time from some reference time, t_o , to some later time, t , the result is:

$$\begin{aligned} \int_{t_o}^t \frac{dN_1}{N_1} &= - \int_{t_o}^t \lambda_1 dt \\ \ln \left(\frac{N_1(t)}{N_1(t_o)} \right) &= -\lambda_1(t-t_o) \\ N_1(t) &= N_1(t_o)e^{-\lambda_1(t-t_o)} \end{aligned} \quad (6)$$

The activity of some quantity of radioactive material is the number of atoms of that material multiplied by its decay constant, with the result being equation (2).

For decay chain 2, the governing differential equations are:

$$\begin{aligned} \frac{dN_1}{dt} &= -\lambda_1 N_1 \\ \frac{dN_2}{dt} &= \lambda_1 N_1 - \lambda_2 N_2 \end{aligned} \quad (7)$$

The solution to the first equation is simply equation (2). For the second equation, one first adds $\lambda_2 N_2$ to both sides, then multiplies both sides by an integrating factor, $e^{-\lambda_2 t}$, and thus obtains

$$\frac{d}{dt} \left(e^{\lambda_2 t} N_2 \right) = e^{\lambda_2 t} \lambda_1 N_1 = e^{\lambda_2 t} \lambda_1 N_1(t_o) e^{-\lambda_1(t-t_o)} \quad (8)$$

One again integrates over time from t_o to t :

$$\begin{aligned} \int_{t_o}^t \frac{d}{dt} \left(e^{\lambda_2 t} N_2 \right) dt &= \lambda_1 N_1(t_o) e^{\lambda_1 t_o} \int_{t_o}^t e^{-\lambda_1 t} e^{\lambda_2 t} dt \\ &= \frac{\lambda_1 N_1(t_o) e^{\lambda_1 t_o}}{(\lambda_2 - \lambda_1)} \left[e^{(\lambda_2 - \lambda_1) t} - e^{(\lambda_2 - \lambda_1) t_o} \right] \end{aligned} \quad (9)$$

After some algebra, the result is:

$$N_2(t) = N_2(t_0)e^{-\lambda_2(t-t_0)} + \frac{\lambda_1 N_1(t_0)}{(\lambda_2 - \lambda_1)} \left[e^{-\lambda_1(t-t_0)} - e^{-\lambda_2(t-t_0)} \right] \quad (10)$$

Again, the activity of some quantity of radioactive material is the number of atoms of that material multiplied by its decay constant. When equation (10) is multiplied by λ_2 , the result will be equation (3), except that in this more general case, $N_2(t_0)$ is not equal to zero.

For decay chain 3, the governing system of differential equations is:

$$\begin{aligned} \frac{dN_1}{dt} &= -\lambda_1 N_1 \\ \frac{dN_2}{dt} &= \lambda_1 N_1 - \lambda_2 N_2 \\ \frac{dN_3}{dt} &= \lambda_2 N_2 - \lambda_3 N_3 \end{aligned} \quad (11)$$

We now just have to solve for the third equation. As before, one first adds $\lambda_3 N_3$ to both sides, then multiply both sides by the integrating factor $e^{-\lambda_3 t}$, and obtain

$$\begin{aligned} \frac{d}{dt} \left(e^{\lambda_3 t} N_3 \right) &= e^{\lambda_3 t} \lambda_2 N_2 \\ &= e^{\lambda_3 t} \lambda_2 \left[N_2(t_0) e^{-\lambda_2(t-t_0)} + \frac{\lambda_1 N_1(t_0)}{(\lambda_2 - \lambda_1)} \left[e^{-\lambda_1(t-t_0)} - e^{-\lambda_2(t-t_0)} \right] \right] \end{aligned} \quad (12)$$

One again integrates over time from t_0 to t :

$$\begin{aligned} \int_{t_0}^t \frac{d}{dt} \left(e^{\lambda_3 t} N_3 \right) dt &= \lambda_2 \int_{t_0}^t e^{\lambda_3 t} N_2(t) dt \\ &= \lambda_2 \int_{t_0}^t e^{\lambda_3 t} \left[N_2(t_0) e^{-\lambda_2(t-t_0)} + \frac{\lambda_1 N_1(t_0)}{(\lambda_2 - \lambda_1)} \left[e^{-\lambda_1(t-t_0)} - e^{-\lambda_2(t-t_0)} \right] \right] dt \\ &= \lambda_2 \left[\frac{N_2(t_0) e^{\lambda_2 t_0}}{\lambda_3 - \lambda_2} \left(e^{(\lambda_3 - \lambda_2)t} - e^{(\lambda_3 - \lambda_2)t_0} \right) + \frac{\lambda_1 N_1(t_0) e^{\lambda_1 t_0}}{(\lambda_2 - \lambda_1)(\lambda_3 - \lambda_1)} \left(e^{(\lambda_3 - \lambda_1)t} - e^{(\lambda_3 - \lambda_1)t_0} \right) - \right. \\ &\quad \left. \frac{\lambda_1 N_1(t_0) e^{\lambda_2 t_0}}{(\lambda_2 - \lambda_1)(\lambda_3 - \lambda_2)} \left(e^{(\lambda_3 - \lambda_2)t} - e^{(\lambda_3 - \lambda_2)t_0} \right) \right] \end{aligned} \quad (13)$$

After more algebra, the result can be shown to be:

$$N_3(t) = N_3(t_0)e^{-\lambda_3(t-t_0)} + \frac{\lambda_2 N_2(t_0)}{(\lambda_3 - \lambda_2)} \left[e^{-\lambda_2(t-t_0)} - e^{-\lambda_3(t-t_0)} \right] + \lambda_1 \lambda_2 N_1(t_0) \left[\frac{e^{-\lambda_1(t-t_0)}}{(\lambda_2 - \lambda_1)(\lambda_3 - \lambda_1)} + \frac{e^{-\lambda_2(t-t_0)}}{(\lambda_1 - \lambda_2)(\lambda_3 - \lambda_2)} + \frac{e^{-\lambda_3(t-t_0)}}{(\lambda_2 - \lambda_3)(\lambda_1 - \lambda_3)} \right] \quad (14)$$

Again, when equation (14) is multiplied by λ_3 , the result (activity) will be equation (4), except that in this more general case, $N_3(t_0)$ is not equal to zero.

As another check, these terms were compared against the generalized form of the Bateman series, and the above expressions were again verified to be correct. In both cases 2 and 3, it is clear that there is no initial activity arising from the first-order decay of that particular isotope. The term arising from some non-zero amount of I_2 present at $t=0$ is missing in case 2, and the corresponding term arising from some non-zero amount of I_3 present at $t=0$ is also missing in case 3. In both cases, this term is of the same form as in case 1. However, these terms are ultimately included as RADNUC2-A executes. Functions DK2 and DK3 add in the higher-order Bateman terms, as required on an isotope-by-isotope basis, after RADNUC2-A first calculates the case 1, first-order decay terms for all 89 isotopes.

The RADNUC2-A Fortran function DK, as implemented, will return the value of the fraction remaining of the activity of isotope I_j , (only the exponential in case 1 is evaluated). It was also verified that this is how RADNUC2-A uses this Fortran function. Functions DK2 and DK3 were written to return the ratios of the activities for either case 2 or case 3, respectively, ratioed to the activity A_j . If the expressions as implemented in DK2 and DK3 are multiplied by the expression for A_j , the results can be shown to be identical with the above expressions.

These decay functions form the basis for how RADNUC2-A performs its decay calculations. For all 89 isotopes, RADNUC2-A first calculates the first-order decay as described by case 1. Then, for each isotope, the higher-order decay terms described by cases 2 and 3 are added in. There are 25 ELSEIF blocks within the isotope decay DO-loop that add in these higher-order terms for specific decay chains, treating branching ratios as required. Of these 25 blocks, there are only four calls to function DK3. Not every one of these special cases were verified. As a spot-check, however, two isotope decay models, one using DK2 and the other using DK3, were verified. As a check on proper usage of DK2, ^{90}Y was chosen, and was found to be correctly implemented. As a check on DK3, ^{242}Cm was chosen, and (assuming the branching ratios documented in the comment statements are correct) a minor error was discovered (and is discussed later).

Hand calculations were performed for isotopes ^{90}Y and ^{242}Cm , for 6, 8, and 9 wt% ^{240}Pu , and compared to RADNUC2-A output for these isotopes, for Mark IA fuel. Agreement was exact, to within the numerical precision output by RADNUC2-A (i.e., 3 significant digits). Table A.1 summarizes this comparison. For 6 and 9 wt% ^{240}Pu , the activity tables in RADNUC2-A were used along with the decay expressions above to hand-calculate the activities after a 9-year decay (from the 1-year-decay tables contained in RADNUC2-A). The hand-calculation results are shown below the RADNUC2-A results, in parentheses. For the 8 wt% ^{240}Pu case, logarithmic

interpolation was used in addition to the decay models to check against the RADNUC2-A results. Hand-calculated values in Table A.2 were obtained using equations (10) and (16).

As an example, the 8 wt% ^{240}Pu value for ^{242}Cm activity will now be calculated. The decay chain leading to ^{242}Cm is: $^{242\text{m}}\text{Am} \rightarrow ^{242}\text{Am} \rightarrow ^{242}\text{Cm}$. According to comment statements contained within the RADNUC2-A source code, 99.5% of the $^{242\text{m}}\text{Am}$ decay reactions go to ^{242}Am . This value (99.5%) is known as the “branching ratio” for this radioactive decay channel. (When some radioactive decay reactions proceed, the result may be to more than one possible set of reaction products. However, it is usually well-known what percentage of the time a given decay will proceed to each possible set of daughter products. The fraction of the time which a given decay will proceed to a given set of daughter products is known as the “branching ratio” for that set of daughter products.) When ^{242}Am decays, 82.7% proceed to ^{242}Cm . These branching ratios must therefore be factored into equation (14) for application to this particular decay reaction. The modified set of governing differential equations is:

$$\begin{aligned}\frac{dN_1}{dt} &= -\lambda_1 N_1 \\ \frac{dN_2}{dt} &= r_1 \lambda_1 N_1 - \lambda_2 N_2 \\ \frac{dN_3}{dt} &= r_2 \lambda_2 N_2 - \lambda_3 N_3\end{aligned}\tag{15}$$

where $r_1 = 0.995$ and $r_2 = 0.827$. Solving this system in the same manner as before, the result is:

$$\begin{aligned}N_3(t) = & N_3(t_0)e^{-\lambda_3(t-t_0)} + \frac{r_2 \lambda_2 N_2(t_0)}{(\lambda_3 - \lambda_2)} \left[e^{-\lambda_2(t-t_0)} - e^{-\lambda_3(t-t_0)} \right] + \\ & r_1 r_2 \lambda_1 \lambda_2 N_1(t_0) \left[\frac{e^{-\lambda_1(t-t_0)}}{(\lambda_2 - \lambda_1)(\lambda_3 - \lambda_1)} + \frac{e^{-\lambda_2(t-t_0)}}{(\lambda_1 - \lambda_2)(\lambda_3 - \lambda_2)} + \frac{e^{-\lambda_3(t-t_0)}}{(\lambda_2 - \lambda_3)(\lambda_1 - \lambda_3)} \right]\end{aligned}\tag{16}$$

As implemented in RADNUC2-A, function DK3 returns the higher-order decay terms, consistent with equation (4). As explained in the comment statements, the two branching ratios are multiplied together to obtain $0.995 \times 0.827 = 0.823$, and this value (0.823) multiplies the value returned by DK3. Unfortunately, this means that the product, $r_1 r_2$, incorrectly multiplies both terms in equation (4). As shown in equation (16), the second term (involving N_2) should only be multiplied by r_2 . In practice, this bug introduces only a *very* small error. Because of the relative magnitudes of the decay constants and activities for ^{242}Am , $^{242\text{m}}\text{Am}$, and ^{242}Cm , the term in equation (16) which contains N_2 is five orders of magnitude smaller than the smaller of the other two terms. The 0.5% error in this term is therefore insignificant, and is several orders of magnitude smaller than the numerical precision output by RADNUC2-A.

However, RADNUC2-A calls function DK3 four times. This bug does not affect the ^{126}Sn decay chain calculation because $r_1 = 1$. However, ^{95}Nb is handled twice (once as a fission product and once as an activation product). In this decay chain, ^{95}Zr decays 0.993 of the time directly to ^{95}Nb ,

but 0.007 of the time through the ^{95m}Nb metastable state. Following the channel through the metastable state, $r_1 = 0.007$ and $r_2 = 1$. RADNUC2-A multiplies the DK3 contribution by 0.007, when only the third term in equation (16) (involving N_1) should be multiplied by 0.007. Again, the term involving N_2 is several orders of magnitude smaller than the other two terms, and the RADNUC2-A error incorrectly multiplies an insignificant term by 0.007, making it even smaller than it should be. However, this error does not affect the sum to within the numerical precision output by RADNUC2-A.

Using the 1-year-decay activity data in the RADNUC2-A tables, the basepoints for logarithmic interpolation are shown in Table A.2. The "8 wt% ^{240}Pu " column contains the results from using equation (1) to interpolate between the "6 wt% ^{240}Pu " and the "9 wt% ^{240}Pu " columns (note: one must remember to use $E_2 = 9.0431$ and $E_1 = 6.1224$, from Table A.12).

Table A.1. Comparison of RADNUC2-A with Hand-Calculation Results.

Exposure	6 wt% ^{240}Pu	8 wt% ^{240}Pu	9 wt% ^{240}Pu
^{90}Y	2.91 E3 Ci (2910.6 Ci)	3.95 E3 Ci (3945.7 Ci)	4.67 E3 Ci (4672.4 Ci)
^{242}Cm	1.19 E-3 Ci (1.188 E-3 Ci)	4.65 E-3 Ci (4.649 E-3 Ci)	9.92 E-3 Ci (9.919 E-3 Ci)

When values are substituted into equation (16), using $t - t_0 = 9.$, the result is $A_3(t) = \lambda_3 N_3(t) = 4.648 \times 10^{-3}$ Ci. If one assumes (as RADNUC2-A does) that the product of these two branching ratios is 0.823, which is only correct to three significant figures, then the result is 4.649×10^{-3} Ci, and this is the value shown in Table A.2 below.

Table A.2. Data for Sample Hand-Calculation of ^{242}Cm Remaining after 9-Year Decay.

Nuclide	Subscript	λ (yr $^{-1}$)	Activity (Ci) (6 wt% ^{240}Pu)	Activity (Ci) (9 wt% ^{240}Pu)	Activity (Ci) (8 wt% ^{240}Pu)
^{242m}Am	1	0.00456	1.499×10^{-3}	1.251×10^{-2}	5.864×10^{-3}
^{242}Am	2	379.312	1.491×10^{-3}	1.245×10^{-2}	5.834×10^{-3}
^{242}Cm	3	1.55133	9.548×10^{-1}	9.300×10^0	4.125×10^0

ENGINEERING DATA TRANSMITTAL

Page 1 of 20

1. EDT 109170

2. To: (Receiving Organization)

Engineering Configuration
ATTN: Jackie Perkins

3. From: (Originating Organization)

Thermal Reactor Physics

4. Related EDT No:

N/A

7. Purchase Order No:

N/A

5. Proj/Prog/Dept/Div:

22520

6. Cog/Proj Engr:

K.N. Schwinkendorf

9. Equip/Component No:

N/A

8. Originator Remarks:

Being distributed for approval and final sign-off
Comments from previous reviews by QA have been incorporated.

10. System/Bldg/Facility:

N/A

12. Major Assm Dwg No:

N/A

13. Permit/Permit Application No:

N/A

14. Required Response Date:

N/A

11. Receiver Remarks:

15. DATA TRANSMITTED

(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev No.	(E) Title or Description of Data Transmitted	(F) Impact Level	(G) Reason for Trans- mittal	(H) Origina- tor Dispo- sition	(I) Receiv- er Dispo- sition
1	SD-NR-SWD-017		0	Software Certification Package for the WIMS-E Code.	2	1		

16. KEY

Impact Level (F)	Reason for Transmittal (G)	Disposition (H) & (I)
1, 2, 3, or 4 see MRP 5.43 and EP-1.7	1. Approval 2. Release 3. Information 4. Review 5. Post-Review 6. Dist (Receipt Acknow. Required)	1. Approved 2. Approved w/comment 3. Disapproved w/comment 4. Reviewed no/comment 5. Reviewed w/comment 6. Receipt acknowledged

(G)	(H)	17. SIGNATURE/DISTRIBUTION (See Impact Level for required signatures)								(G)	(H)
Reason	Disp	(J) Name	(K) Signature	(L) Date	(M) MSIN	(J) Name	(K) Signature	(L) Date	(M) MSIN	Reason	Disp
1		Cog./Proj. Eng	<i>K.N. Schwinkendorf</i>								
1		Cog./Proj. Eng. Mgr.	<i>Harry Teller</i>	12/11/89							
1	1	QA	<i>Donna Bond</i>	12-22-89							
1		Safety	<i>Todd Samuel</i>	12/18/89							

Signature of EDT Originator	Date 12/19/89	19. Authorized Representative for Receiving Organization	Date	20. Cognizant/Project Engineer's Manager	Date	21. DOE APPROVAL (if required) Ltr No. ☐ Approved ☐ Approved w/comments ☐ Disapproved w/comments
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SUPPORTING DOCUMENT

1 Page 1 of 1Software Certification Package
for the WIMS-E Code.

WHC-SD-NR-SWD-017

0

5 Key Words

WIMS-E

6 Author

Kevin N. Schwinkendorf

Name (Type or Print)

Kevin N. Schwinkendorf

Signature

Thermal Reactor Physics (22520)

Organization

7 Abstract

The Winfrith Improved Multi-group Scheme, Version E (WIMS-E), is a completely reorganized, extended outgrowth of the earlier WIMS-D lattice physics computer code. Whereas WIMS-D is a self contained computer code, WIMS-E is a highly modularized computer code system. The separate modules perform separate functions, and the user controls how the various modules interact with each other over various "interfaces" (sets of five input/output files each), through the user input file. WIMS-E can be used to perform a wide range of lattice physics calculations, including reactivity perturbations, isotopic production, and few group cross section generation for later use in multi-dimensional diffusion theory reactor physics codes.

This package documents that the version of WIMS-E used at the Hanford Site meets all Westinghouse Hanford Company code quality assurance requirements.

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Software Certification Package for the WIMS-E Code

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the WIMS-E Code

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1.0 SCOPE

The Winfrith Improved Multi-group Scheme, Version E (WIMS-E), is a completely reorganized, extended outgrowth of the earlier WIMS-D lattice physics computer code. Whereas WIMS-D is a self-contained computer code, WIMS-E is a highly modularized computer code system. The separate modules perform separate functions, and the user controls how the various modules interact with each other over various "interfaces" (sets of five input/output files each), through the user input file. WIMS-E has been used in the past to perform a wide range of lattice physics calculations, including reactivity perturbations, isotopic production, and few group cross section generation for later use in multi-dimensional diffusion theory reactor physics codes.

Many of the modules in the WIMS-E system were originally in the older WIMS-D code, and the historical development of WIMS-D is given in the QA documentation for that code. Some modules, however, have been added, including the W-CACTUS module which was originally a self-contained two-dimensional transport theory code but was then integrated into the overall WIMS-E system. There are other computer codes in the nuclear industry which perform the same sort of calculations (some using different numerical methods), such as the Westinghouse Commercial Nuclear Fuel Division (CNFD) code, PHOENIX-P.

This package documents that the version of WIMS-E used at the Hanford Site meets all Westinghouse Hanford Company code quality assurance requirements.

2.0 PROGRAM DESCRIPTION SUMMARY

2.1 USER'S MANUAL

There is no single user's manual for WIMS-E, but rather a collection of user manuals for the various modules which make up the overall system. There are some documents which serve as summary publications, which tie the other module user manuals together. These documents are listed in Section 11.0, References.

2.2 CODE DESCRIPTION

The user must first perform integral transport theory calculations (in 69 groups) for each of the pin-types to be used in a possible W-CACTUS calculation. Several options are available for this, including integral transport theory according to Carlvik's method (module W-FLU), integral transport theory (for cylindrical geometry) according to Bonalumi's method, or (for slab geometry) Newmarch's method (module W-THES), or integral transport theory for grains in annular geometry (module W-PROC). Also available is W-PIJ, which performs integral transport theory calculations for rod cluster geometry. Once the collision probabilities are calculated, multi-group fluxes are calculated by the W-PIP module. Burnup is calculated by the W-BRNU module. In addition to these modules, there are separate modules for performing a variety of tasks, including collapsing cross sections in space and energy, merging interfaces, reading input data, as well as for many other options. User input is usually in the form of a "keyword," followed by numeric data, in free-form format. There are exceptions to this, particularly in W-CACTUS input. All keywords must currently be in upper case.

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W-CACTUS solves the two-dimensional neutron transport equations by means of a "track method," where the one-dimensional equations are solved for a network of tracks, or angles, over the two-dimensional problem space.

The cross section data library which the Hanford version of WIMS-E (version 1.4) uses is "The '1986' WIMS Nuclear Data Library" (Halsall and Taubman 1986). This library was generated by combining an older WIMS library (Halsall and Taubman 1983 and Halsall 1982), certain data files from the Joint European File (JEF-1), and a number of integral adjustments. The library contains cross sections and resonance parameters in 69 energy groups (14 fast, 13 resonance, and 42 thermal groups), for each of 129 nuclides. Materials include fissile and fissionable nuclides, fission products, moderator, and structural materials. Resonance parameters for the principal absorbers U-238, U-235, and Pu-239 were generated using the multi-level, multi-channel formulation contained in the GENEX code (Brissenden and Durston 1968). According to Halsall and Taubman (1986) both s- and p-wave neutron wave contributions are included, with a statistical treatment for resonances in the unresolved region. A total of 120,000 energy points are included. Other resonance absorbers are treated using an Intermediate Resonance approximation, which uses the Goldstein-Lambda parameter to interpolate between the Narrow Resonance (NR) and Narrow Resonance Infinite Mass (NRIM) treatments. For thermal scattering, special treatments are given for certain moderators, including the Nelkin model for hydrogen. The generalized method for generating the 42 x 42 scattering matrix has been to input the $S(\alpha, \beta)$ Scattering Law into the PIXSE code (MacDougall 1963) which supplies the 42 x 42 scattering matrix for a specified temperature. WIMS-E uses linear interpolation to obtain the elements of the scattering matrix for any desired temperature. For other nuclides, the scattering law is derived from a free-gas model.

In addition, 35 fission product nuclides are modeled explicitly (with the remainder being lumped into a "pseudo-fission product," 4902) and generalized burnup chains are allowed.

There is additional "documentation" which exists and is a good summary of the most often used input options for Hanford Site applications. This documentation is in the form of class notes (handouts) given in a training session for Hanford Site personnel, and was taught by the Hanford Site Code Custodian. These class notes were never issued, except to the people who attended the class.

Additional (academic) material discussing the theory behind these methods in reactor and lattice design may be found in Stammeler and Abbate (1983). This text is an excellent reference on the practical applications of nuclear design methodology and discusses the WIMS code and its methods explicitly.

2.3 CODE APPLICATION

The current cross section library was created by collapsing finer group data down to the 69-group set by assuming a thermal neutron spectrum characteristic of a light-water reactor system. It would therefore be inappropriate to use this library to perform lattice calculations for either a graphite or heavy water moderated system. The resonance integral tabulations

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were generated with fuel of commercial applications in mind, and thus the minimum "sigma-p" is equal to approximately 500 b. This results in extrapolations in the resonance integral tables when the enrichment exceeds about 5% U-235 for UO₂ oxide fuel.

2.4 CODE CUSTODIAN

Refer to the Thermal Reactor Physics Code Notebook

2.5 CODE IMPACT LEVEL

The WIMS-E code has been assigned and Impact Level of 2 per EP-1.7 of WHC-CM-6-1.

3.0 ORIGIN OF CODE

The WIMS-E computer code system at Hanford, version 1.4, was obtained directly from the British Atomic Energy Establishment (AEE), Winfrith Laboratory, and exists at Hanford under license agreement with the British. WIMS-E Version 1.4 currently operates on the Hanford Site CRAY XMP-18, under UNICOS 4.0.

4.0 DESCRIPTION OF VALIDATION PROCESS

A document which illustrates reactivity prediction comparisons of WIMS-E to results generated by both WIMS-D and the LEOPARD code is attached as Appendix C. A sample problem was selected from a CNFD LWR fuel design and these three codes were used to predict pincell reactivity as a function of exposure. Acceptable agreement was attained.

5.0 DESCRIPTION OF VERIFICATION PROCESS

WIMS-E is a computer code which the Hanford Site acquired from the British AEE, Winfrith, and no comprehensive verification effort was made by Hanford Site personnel regarding the correctness of the FORTRAN coding of these industry accepted methods for lattice calculations in reactor design. However, there were a number of benchmark test cases supplied to the Hanford Site when this code was imported from AEE, Winfrith. After conversion of WIMS-E to the Hanford LSSS, these test cases were executed and acceptable agreement was achieved. Two test cases supplied by AEE, Winfrith are listed in Appendix B and can be used to ensure that the code is functioning correctly on the CRAY XMP-18.

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**6.0 PROCEDURE TO FOLLOW IN CASE AN ERROR IS DISCOVERED IN THE CODE,
OR IN ASSOCIATED CROSS SECTION SETS AND/OR LIBRARIES**

If a user in the course of this code execution determines that an error exists, contact the code custodian (see section 2.4). An investigation of the error will be pursued and, if necessary, a documented alteration to the code will be implemented. All users of the code shall be promptly notified of any errors and/or changes to the code or associated cross sections sets and/or libraries.

7.0 COMPUTER CODE CONFIGURATION CONTROL PLAN**7.1 PURPOSE**

The purpose of this section is to document the plan used to establish requirements for control of the WIMS-E code that is used by the Thermal Reactor Physics group of Westinghouse Hanford Company. This documentation represents an implementation of EP-2.1 and other Engineering practices applicable to physics and applied physics activities.

7.2 SCOPE

This plan describes the responsibilities, requirements, and controls needed to maintain the WIMS-E program and its data libraries in such a way as to ensure its quality and integrity on the Hanford CRAY XMP-18.

7.3 DEFINITIONS

Computer Code - A sequence of instructions suitable for processing by a computer. This may include the use of an assembler, a compiler, and interpreter, or a translator to prepare the program for execution as well as to execute it.

Data Libraries - Data files or tables on the computer that the code uses for decision making or in its calculations.

Cognizant Manager - The manager in charge of overseeing the analysis activity.

Computer Code Developer(s) - The person(s) in charge of making the actual modifications to the computer code or data libraries.

Computer Code Custodian - The person in charge of making sure that the code and its data libraries are approved for use. This person may also be the code developer.

Computer Code User - The person who uses the code to compute results for the task at hand.

Source Code - The program statements that are readable by a person and are changed when the code is modified.

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Executable Code - The code that is ready to execute after it has been compiled and linked, assembled, or interpreted into a machine readable format.

Verification/Acceptance Testing - A set of input data used to test the various options of the code and its algorithms.

Validation - A set of input data and results which are compared to experiment or some other method of calculation (either other computer code or hand calculations) to check the applicability of the code to the task at hand.

7.4 RESPONSIBILITIES

7.4.1 Cognizant Manager

Responsible for:

7.4.1.1 Assuring that this configuration control plan is followed.

7.4.1.2 Assuring that all necessary verification and validation is completed and documented.

7.4.1.3 Determining that the code is appropriate for the analysis.

7.4.1.4 Assuring that all computer code users are capable of performing the required analysis.

7.4.1.5 Assigning appropriate Impact Level for computer code.

7.4.2 Computer Code Developer(s)

Responsible for:

7.4.2.1 Making any modifications to the code or data libraries in accordance with plan described herein.

7.4.2.2 Making sure that any modifications are made to the code or its libraries are correct.

7.4.2.3 Updating version identification in the code or its data libraries when changes are made.

7.4.3 Computer Code Custodian

Responsible for:

7.4.3.1 Maintaining the approved archived version of the code and its data libraries.

7.4.3.2 Controlling access to the code and notifying users when modifications are made to the code or its data libraries.

7.4.3.3 Ensuring that all who use the code understand the responsibility of proper use of the code and have the appropriate documentation.

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- 7.4.3.4 Verifying that any changes made to the code were properly identified with comment cards.
- 7.4.3.5 Prepare and maintain a complete set of all documentation pertaining to the control, verification, modification, archiving, etc., for the code and its data libraries.
- 7.4.3.6 Prepare and document a set of test problems to be used to verify the correct operation of the code.
- 7.4.3.7 Analyze and correct, if necessary, any errors discovered in the operation of the code. Document fully all changes to the code and notifying all users of code modifications.
- 7.4.3.8 Prepare and maintain an updated listing of all authorized users of the code. The listing shall be located in the code custodian notebook.

7.4.4 Computer Code Users

Responsible for:

- 7.4.4.1 Assuring that the version of code is approved for use.
- 7.4.4.2 Validating the code for the range of applications.
- 7.4.4.3 Requesting changes or modifications to be made to the code.
- 7.4.4.4 Reporting any problems encountered while using the code and what may have caused the problem.
- 7.4.4.5 Informing the code custodian that they need to retain access to a certain version of the code until the analysis is complete.
- 7.4.4.6 Assuring that every computer calculation is properly identified as to the code and cross section versions, the computer and compiler used, and the date of processing.

7.5 REQUIREMENTS

7.5.1 The code and its data libraries shall be controlled by the code custodian.

- 7.5.1.1 The code custodian and a backup will be the only users with write access to the directories containing the approved version of the source code, executable, and data libraries.
- 7.5.1.2 Modifications made to the code or its data libraries will be verified by the use of the established set of problems and documented.
- 7.5.1.3 Modifications to the code will require a new unique version identifier for the source and executable.

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7.5.1.4 Modifications to the data libraries will require a new unique version identifier for those data libraries that were modified.

7.5.2 There shall be a documented, established set of problems for verification/acceptance testing of the code.

7.5.3 The code custodian shall have a documented procedure on how modifications to the code are implemented, how it is compiled and linked, how it is tested for acceptance, where the approved version will be available, and where it will be archived.

7.5.4 If the computer operating system is modified or updated during the duration of an analysis, the code shall be recompiled if necessary and the set of test problems for verification/acceptance testing shall again be executed to test the code for any changes, and the results shall be documented. A case from the current analysis shall be rerun, the results shall be compared to the same case executed before the operating system changed. Results of the comparison case shall be documented in the custodian notebook and appropriate action shall be taken.

7.5.5 If an error is encountered in the code, its consequences on the analysis shall be determined and appropriate corrective action shall be taken, if necessary, and documented.

7.5.6 An updated listing of all authorized users of the code shall be available from the code custodian at all times, and shall be contained in the code custodians notebook.

7.6 References

WHC-CM-6-1, EP-2.1, EP-5.8, "Computer Software Configuration Management," March 31, 1989.

WHC-CM-6-16, Section 2.5, Section 2.6, "FFTF Core Conversion Group Work Control," October 31, 1989.

8.0 HARDWARE REQUIREMENTS

The memory requirements of WIMS-E is highly dependent upon the size of the problem being solved. However, the size of the WIMS-E executable is equal to 532 CRAY blocks (equivalent to approximately 2130 kbytes). The WIMS-E data library (in the binary form required by WIMS-E) is 482 CRAY blocks in length (equivalent to approximately 1928 kbytes).

9.0 OPERATING SYSTEM REQUIREMENTS

WIMS-E currently executes under the UNICOS 4.0 operating system on the Hanford LSSS CRAY XMP-18.

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Appendix A

WIMS-E User's Notes

This appendix contains lecture notes summarizing the various WIMS-E computational modules as given by the Hanford Site WIMS-E code custodian. WIMS-E sample input and listings of the nuclide identifier codes used to access the WIMS-E cross section library are also included in tabular form.

Each interface consists of five files:

1. Interface information
2. Microscopic cross sections
3. Number densities and macroscopic cross sections
4. Geometry
5. Flux

STARTING MODULES

W-HEAD: The starting point of most WIMS-E calculations, H-HEAD reads geometry and material specifications, gets microscopic cross sections from a nuclear data library, and corrects them for the effects of resonant absorption.

W-FORTE: Reads output files from WIMSD4 or LWRWIMS and writes the same information in the format of a WIMS-E interface.

W-INTER: Writes a new interface from codeword input, or copies, prints, or punches an interface.

SERVICE MODULES

W-MIX: Calculates macroscopic cross sections so that a partially written interface may be completed. The purpose of W-MIX is, in general, to allow modules that write a new interface to write only microscopic cross sections leaving to W-MIX the job of calculating macroscopic ones.

W-COND: Produces a new interface with the cross sections, etc., condensed over energy.

W-SMEAR: Produces a new interface with the cross sections, etc., averaged over space. These cross sections may be corrected for the effects of neutron streaming or they may be renormalized to preserve absorber worth by means of an inverse finite difference operation.

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W-MERGE: Merges several interfaces to produce a single interface. Includes a multicell calculation.

W-CRITIC: Modifies a given spatial flux solution by means of a fundamental mode critical spectrum calculation according to input buckling terms, producing a new interface.

W-INTER in its copying mode could also be regarded as a service module.

COLLISION PROBABILITY MODULES

W-FLU: Calculates collision probabilities in annular geometry using Carlvik's method.

W-THES: Calculates collision probabilities in slab geometry using Newmarch's method or in annular geometry using Bonalumi's method.

W-PROC: Calculates collision probabilities for grains in annular geometry.

W-PIJ: Calculates collision probabilities in rod cluster geometry.

W-PIP: Calculates fluxes from given collision probability and scatter cross section matrices.

W-MERGE in its multicell mode could also be regarded as a Collision Probability Module.

EDIT MODULES

W-WIRE: Prints reaction rates by mesh and material over specified energy ranges.

W-WED: Prints a neutron balance edit.

W-INTER in its printing mode could also be regarded as an Edit Module.

BURNUP MODULE

W-BURNUP: Estimates the effect of irradiation on fuel materials by solving the number density depletion equations within the material regions of a lattice cell.

SUBGROUP MODULES

W-PRES: Prepares subgroup cross sections for a collision probability calculation prior to W-RES.

W-RES: Calculates group averaged resonance cross sections by the subgroup method.

W-CACTUS: Calculates multi-group fluxes by solving the 2D Boltzmann transport equation using a "track method." May be used to evaluate pin power distributions within a PWR fuel assembly where rectangular boundary distributions are required. Generalized geometry input is supported.

DATA FORMAT CONVENTIONS

1. Generally free format
2. Col 1.- 72
3. Input stream consists of a sequence of codewords which may or may not be followed by items of numeric or literal data.
4. Codeword consists of a string of alphabetic characters of any length terminated by any non-alphabetic character or by col. 73. Only first four characters of a codeword are used for identification.

Examples:

```
PARTITIONS -
PARTS      -
PART       -    Legal
PAR        -    not legal
```

5. Numeric item - a string of digits with or without a sign, a decimal point, and an exponent. The exponent has the form En where n is a positive or negative number. No embedded blanks. Numeric items are terminated by any alphabetic or special character not allowed in the number or col. 73.

Examples:

```
1.0 2.0E-4      -    legal
-2.0 8.99E-16   -    legal

2.0-4           -    not legal
2.0E4           -    not legal
```

6. Comment can be included anywhere on the line by preceding it with *. Any character between * and col. 73 is treated as a comment.
7. Continuation sign \$ is not needed. Will be ignored. *

W-HEAD - Used as a starting point. Reads geometry and material specifications, gets microscopic cross sections from the library and corrects them for resonance absorption effects.

WHEAD m or WHEAD 1 m

m = interface number to write to

1 = interface number to read from (usually from BRNUP module)

```
NREG j    - number of annuli
NMAT k    - number of materials
NMESH n   - number of mesh intervals. If omitted, assume n = j.
```

```
BURN [KB][KC]
ENDP
```

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MAIN DATA

General

Apart from CENT and MILL, the Main Data Codewords may be in any order provided BEGIN is last. One of CENT or MILL must be included in W-HEAD and whichever it is must precede any codeword specifying length, i.e., SLAB, ANNU, or POLY.

MILL - Lengths are in millimeters (approved SI units).

CENT - Lengths are in centimeters.

PRINT LP - A general method of controlling printed output has been devised to cover all modules in the Integrated WIMS-E Program (2). Every print statement is allocated to one of ten print levels, numbered 0-9. Prints at level 0 always appear. Such prints generally include the input data and error diagnostics. The prints at other levels are controlled by the input data as follows:

PRIN LP - Specifies that only levels 0 to LP inclusive are to be printed.

PRIN 0 List - specifies that all levels in the list are to be printed. The two forms may be combined; thus:

PRIN 2 6 - causes levels 0, 1, 2, and 6 to be printed. The default specification is LP=2.

The print control may be set either in the Main Data of W-HEAD, where it operates only within W-HEAD, or in the control Routine Data where it operates on all the modules. If used in both, that used in W-HEAD will apply throughout the execution of W-HEAD, but on return to the control routine, that previously specified to it will be remembered.

The print control options for W-HEAD are given in Table 2.

TEST - this has the same effect as PRIN 6 (i.e., all prints are produced).

BEGIN - this terminates the Main Data for W-HEAD. It must be the last codeword presented to W-HEAD.

Material Compositions

MATERIAL m, d, T, i, (NI(n), F_n, N=1, MX) - This is used to describe the composition of each material.

m = material number

T = temperature in k

i = resonance region number (no "-1" allowed)

The resonance calculation is carried out in a simplified geometry in which all the materials of Resonance Region 1 are in the center, surrounded by Regions 2, 3, etc., in order. Average values of cross sections are used in

Table 2. Print Levels in W-HEAD

<u>Level</u>	<u>Output</u>
0 all	Error diagnostics, warning messages, short heading, unused storage, input data, library name, number of nuclides, and energy groups on the library, message on completion.
1	Full heading, summary of recent changes to the coding, general information messages, temperatures, number of nuclides and their identifiers, number of materials, number of slabs or annuli and their contents and volumes.
2	Microscopic cross sections for each resonance group.
5	Temperatures, number densities, can correction factor beta, the probability R of crossing the moderator, $Q = 1-R$, resonance escape probability p, correction factor f to the scatter out cross section, flux depression factor x, extent of the pseudo-homogeneous region.
6	Absorption cross sections before interaction correction and after interaction but before flux depression correction.

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each region. It is essential to put all material containing resonant absorbers into Resonance Region 1. The resonances will be calculated on a homogeneous basis if only Resonance Region 1 is used.

The pairs of numbers (NI(n), F_n) - there may be any number of pairs - indicate how the material is made up of nuclides with identifiers NI(n). The definition of F_n depends on the value of d.

(i) d = -1. F_n = number density in atoms per barn cm.

(ii) d = density (specific gravity). F_n = proportion of the mass of the material that is nuclide NI(n). These need not sum to unity as W-HEAD will renormalize them. W-HEAD will use these values to convert to number densities using the formula

$$N_n = \frac{A d F_n}{w S_q F_q} \quad \text{--} \times 10^{-24}$$

A = Avogadro's Number = 0.602306×10^{24} molecules/mol

w is the atomic weight, which W-HEAD reads from its nuclear data library. Both A and w are in the C12 scale. The factor 10^{-24} converts from atoms/cc to atoms/barn cm.

Voids need not be specified; they may be referred to as Material 0. Any material used in two resonance regions requires two MATE codewords.

TRACE (NI(K), K=1, ND) - This may be used to insert traces of the nuclides identified by (NI(K), K=1, ND) into every material so that they become available to a reaction rate edit. Traces have a number density of 10^{-20} atoms per barn cm and do not include transport or scatter cross sections.

DETECTOR NQ NI m - This means that detector NQ is to consist of a trace of the nuclide with identifier NI in material m only, in order to retain the hyperfine structure. NQ will be used as the nuclide identifier and therefore must be different from any other nuclide identifier used. W-HEAD checks that it is different from any library nuclide identifier. Thus, if NI is 3238, then it would be appropriate to use 4238 for NQ. In this case:

REAC 4238 would be used in W-WIRE.

It is quite reasonable to have another detector with different values of NQ and m and the same value of NI.

TEMP (T(m), m = 1, M) - This resets all material temperatures to T(m) in K (not delta-T's).

ALTER NI (m(K), N_n(K), K=1, MA) - This resets the number densities for the nuclide with identifier NI to N_n(K) in atoms per barn cm in material m(K). For example:

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ALTER 1012 1 9.88E-2 2 6.79E-2

resets the number density for nuclide 1012 to 9.88E-2 atoms per barn cm in Material 1 and 6.79E-2 atoms per barn cm in Material 1.

Geometry Specification

SLAB j r m - This codeword should be used when the lattice cell is divided into slabs. W-HEAD assumes that a cell in slab geometry is symmetrical about its center and consequently that data are supplied for only half a cell, from the center to the outer boundary. A reflective boundary condition is always assumed for both boundaries.

j = slab number counting outward from the center
r = distance from the center to the outer edge of this slab
m = material number

ANNULUS j r m - This codeword should be used when the lattice cell is divided into annuli.

j = annulus number, counting outward from the center
r = outer radius
m = material number

Thus, the definitions of the SLAB and ANNU codewords are identical, and indeed they may be used interchangeably for slab, annular, or spherical geometry. It is the Prelude Data codeword MPLA that tells W-HEAD which geometry to use.

POLYGON j s m r - This is another alternative to ANNU in which j and m have the same definition. s is the number of sides of a regular polygon and r the radius of the inscribed circle. The effect is that W-HEAD interprets this as

$$\text{ANNU } j, r \sqrt{\frac{\tan(\pi/s)}{\pi/s}}, m$$

i.e., preserving volume. This is cylindricized.

BEHRENS V - This instructs W-HEAD to store V until all the data have been read and then subtract it from the volume of the last slab or annulus, giving the radius of the last annulus as $\sqrt{r^2 - V/\pi}$ or the distance from the center to the outer edge in slab geometry as $r - V$. For spherical geometry, W-HEAD at present incorrectly uses the same formula as for slab geometry.

MESH (MM(j), j = 1, NA) - This gives for each slab or annulus the number of mesh intervals into which it should be divided. The volume of the slab or annulus is divided equally between the meshes in it. If this codeword is omitted, it is assumed that each slab or annulus is one mesh interval.

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Resonance Calculation

The resonance treatment in W-HEAD, as described in Section 3.0 calculates the microscopic cross sections of the resonant absorbers, allowing for self-shielding and the interaction effects of overlapping resonances. This treatment includes calculation of the Dancoff effect between adjacent pin cells and the effect of the absorption resonances on the scatter out cross section. The process is fully automatic and normally requires no special codeword input. It may, however, be modified by the following:

BELL a - Alter the Bell factor from its default value of 1.16 to a.

DANCOFF - Alter the Dancoff factor from the calculated value $(1-\beta R)$ to γ . γ may be one number to apply to all resonance groups or there may be a different number for each resonance group, following one appearance of the codeword DANC.

RESX NI,NR, $((\sigma_r(IK), IK = 1,12), r=1,NR)$ - Alter the cross section in the resonance groups $IK=1,12$ for the nuclide with identifier NI from their calculated values to $\sigma_r(IK)$ barns. 12 is the number of resonance groups and NR signifies whether fission resonances are to be included. Thus, for NI = 3238, NR = 1 and only σ_a is given; for NI = 235, NR = 2 and NI = 3238, NR = 2 and both σ_a and σ_f (not σ_{sf}) are given.

NORESONSNC - This deletes the resonance shielding calculation. W-HEAD then produces infinitely dilute resonance integrals per unit lethargy width instead of cross sections for resonant absorbers in the resonance energy range. The scatter out cross sections are not corrected for the effects of the absorption resonances, not even if the latter have been provided via the codeword RESX.

NOFP - This instructs W-HEAD not to correct the scatter out cross sections for the effects of the absorption resonances. However, this input is for test purposes only, and will not normally be required.

SAMPLE CASE #1

```
WHEAD 1
BURN
NREGION 3
NMAT 3
NMEAH 11
ENDP
MESH 5 1 5
CENT
MATE 1 10.0 942.0 1 2235 8.82 8238 79.37 6016 11.80 6 1.0E-4
MATE 2 -1 623.0 2 91 3.963E-2
MATE 3 .693 587.0 3 3001 11.2 6016 88.8
ANNU 1 0.277 1
ANNU 2 0.342 2
ANNU 3 0.6779 3
PRINT 2
BEGIN
STOP
```

W-THES - Used to calculate collision probabilities for slab or annular geometry.

WTHES n - where n is the interface number

Main Data

SLAB if needed
PRINT list
BEGIN

W-PIP - Used to calculate fluxes.

WPIP n - where n is the interface number

Main Data

OMEGA w - over-relaxation factor (RV=1.25)
TOLERANCE e - convergence criterion (RV=1.0E-5)
PRINT list
BEGIN

*

* SAMPLE CASE #2

*

WHEAD 1
BURN
NREGION 3
NMAT 3
NMESH 11
ENDP
MESH 5 1 5
CENT
MATE 1 10.0 942.0 1 2235 8.82 8238 79.37 6016 11.80 6 1.0e-4
MATE 2 -1 623.0 2 91 3.963e-2
MATE 3 .693 587.0 3 3001 11.2 6016 88.8
ANNU 1 0.277 1
ANNU 2 0.342 2
ANNU 3 0.6779 3
PRINT 2
BEGIN
*
* PERSEUS TYPE CALCULATION
*
WTHES 1
BEGIN
WPIP 1
TOLER 1.0E-5
OMEGA 1.25
BEGIN
STOP

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W-SMEAR - Used to perform spatial collapse of the cross section data and flux distributions.

WSMEAR m n
 m = interface to read from
 n = interface to write to

MATERIALS i
 i = number of new materials

MESHES j
 j = number of new meshes

ENDP

NEWMAT x, K₁, K₂, . . . , K_n - form a new material X by smearing the N old meshes K_i.

MCODE list - new material code for each new mesh.

BEGIN

Examples

```
MATE 3
MESH 4
ENDP
NEWM 1 1 2
MEWM 2 3 4 5 6
NEWM 3 7
MCODE 1 2 3 3
BEGIN
```

W-COND - Used to perform energy collapse of cross section data and flux distributions.

WCOND m n
 m = interface to read from
 n = interface to write to

GROUPS i = number of new energy groups
 ENDP

PARTITIONS list (=i)

BEGIN

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```

*
* SAMPLE CASE #3
*
WHEAD 1
BURN
NREGION 3
NMAT 3
NMESH 11
ENDP
MESH 5 1 5
CENT
MATE 1 10.0 942.0 1 2235 8.82 8238 79.37 6016 11.80 6 1.0E-4
MATE 2 -1 623.0 2 91 3.963E-2
MATE 3 .693 587.0 3 3001 11.2 6016 88.8
ANNU 1 0.277 1
ANNU 2 0.342 2
ANNU 3 0.6779 3
PRINT 2
BEGIN
*
* PERSEUS TYPE CALCULATION
*
WTHES 1
BEGIN
WPIP 1
TOLER 1.0E-5
OMEGA 1.25
BEGIN
*
* SMEAR THE CELL INTO ONE REGION
*
SMEAR 1 2
MATE 1
MESH 1
ENDP
NEWMAT 1 1 2 3 4 5 6 7 8 9 10 11
MCODE 1
BEGIN
*
* COLLAPSE TO 2 GROUPS
*
WCOND 2 3
GROUP 2
ENDP
PART 27 69
BEGIN
STOP

```

W-INTER - Used to write an interface from input information, to copy an interface, and to print or punch contests of an interface.

WINTER m [n]
 m = interface to read from
 n = interface to write or copy to

COPY

PRINT

FILE list (1-5)

MATRIX - to print scatter matrix, instead of scatter spectrum (value from 0 to 1)

SNAP - to punch cross section data from file 3 to unit 7 in SNAP-SCRAMBLE format.

BEGIN

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*SAMPLE CASE #4

*

WHEAD 1

BURN

NREGION 3

NMAT 3

NMESH 11

ENDP

MESH 5 1 5

CENT

MATE 1 10.0 942.0 1 2235 8.82 8238 79.37 6016 11.80 6 1.0E-4

MATE 2 -1 623.0 2 91 3.963E-2

MATE 3 .693 587.0 3 3001 11.2 6016 88.8

ANNU 1 0.227 1

ANNU 2 0.342 2

ANNU 3 0.6779 3

PRINT 2

BEGIN

*

* PERSEUS TYPE CALCULATION

*

WTHES 1

BEGIN

WPIP 1

TOLER 1.0E-5

OMEGA 1.25

BEGIN

*

* SMEAR THE CELL INTO ONE REGION

*

WSMEAR 1 2

MATE 1

MESH 1

ENDP

NEWMAT 1 1 2 3 4 5 6 7 8 9 10 11

MCODE 1

BEGIN

*

* COLLAPSE TO 2 GROUPS

*

WCOND 2 3

GROUP 2

ENDP

PART 27 69

BEGIN

*

* PRINT THE 2 GROUP CROSS SECTIONS AND SAVE IT ON UNIT 7 (FROM SNAP)

*

WINTER 3

PRINT

FILE 3

MATRIX

SNAP

BEGIN

SNAP OUTPUT FROM UNIT 7 -- 2 GROUP DATA

```

I  1 D
  1.8029E+00    4.3296E-01
  3.0638E-02    2.8396E-02
  2.2565E-03    4.4798E-02
  5.3452E-01    2.8062E-02
  4.7565E-05    1.4199E+00
W 1
  8.9549E-04    1.8428E-02
SP
  1.0000E+00    0.0000E+00

```

W-BRNUP - Used to perform burnup calculations

WBRNUP m n
 m = interface to read from
 n = interface to write to

RATING iq, rq, ig
 iq = power specification trigger
 = 1 - rating in MW/MT heavy elements (A.W.> 231)
 = 2 - in fissions/ml/sec averaged over cell
 = 3 - in fissions/ml/sec averaged over the burnable region
 = 4 - as total flux averaged over specified materials of cell (n/cm²-sec). Use with TRIGGER card.
 = 5 - as flux in group ig is averaged over specified materials. Use with TRIGGER card.

rq = rating
 ig = group indicator required if iq = 5

STEPS ib,rtau
 ib = number of substeps within this burnup time step.
 rtau = length in days of each substep

BEGIN

NOTE: In WIMS-D, xenon and samarium are assumed to reach equilibrium concentrations immediately. Not so in WIMS-E. To get data for BOL with xenon, use:

STEPS 2 1.0
 for the first burnup step.

WHC-SD-NR-SWD-017

```
*
* SAMPLE CASE #5
*
* INPUT DECK FOR SAMPLE CASE #4
* ...
* ...
* ...
*
* COLLAPSING TO 18 GROUPS FOR BURNUP
*
WCOND 1 4
GROUP 18
ENDP
PART 2 5 10 14 23 24 26 27 36 39 45 48 53 56 60 63 66 69
BEGIN
*
* DO THE BURN
*
WBRNUP 4 5
RATING 1 81.6
STEPS 2 1.0
BEGIN
STOP
```

10 CONTINUE

WHC-SD-NR-SWD-017

```
*
* SAMPLE CASE #6
*
NCYCLE 1 3
QQUAL 1 1
WHEAD 1
MISS 1 1
WHEAD 5 1
BURN 1
NREGION 3
NMAT 3
NMESH 11
ENDP
...
...
...
*
* DO THE BURN
*
WBRNUP 4 5
RATING 1 81.6
QUAL 1 1
STEPS 2 1.0
MISS 1 1
STEPS 1 30.0
BEGIN
FINISH
STOP
```


WHC-SD-NR-SWD-017

W-WED and W-WIRE

W-WED - gives region and cell edits

WWED m

OPTION x where x = 0, 1, 2, 3, or 4 edit option

REGION ij

BEGIN

W-WIRE - gives reaction rate edits

WWIRE m

REACTION i, NIPC, list

i = nuclide identification number

NIPC = 4 digit integer to control output

non-zero value of N = suppress print of cross section

non-zero value of I = suppress print of reaction rates by mesh

non-zero value of P = suppress print of reaction rates by material

non-zero value of C = suppress print of reactions by material

list = specifies combination of energy groups in the edit

BEGIN

Example

```
WWIRE 2
REAC 2235 0 14 27 69
REAC 8238 1110 14 27 69
BEGIN
```

PIJ - Used to calculate collision probabilities, mainly for rod cluster geometry.

WPIJ (interface #)

CELLD NR, NAN, NS, MNCS, MNSS, NCSYM

NR = number of regions in the system

NAN = number of annuli

NS = number of surfaces

MNCS = maximum number of sections

MNSS = number of surface sectors

NCSYM = cell and surface symmetry number

RODDIM NRODS, NTYPES, MRAN, MNREC

NRODS = total number of rods

NTYPES = number of rod types

MRAN = maximum number of annuli per rod

MNRSEC = maximum number of different angles per rod

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CONTROL NSYM, NLINES, NANGLES, NCLUST, NREST, NBOPT

NSYM = symmetry number for angular integration mesh
 NLINES = total number of lines. Used with LINE card.
 NANGLES = number of discrete angles. Should be an odd number
 NCLUST = 0 for unrodded system
 1 for rodded system
 NREST = restart number (= 0 for no restart)
 NBOPT = boundary condition option
 = 1 block (free) boundary
 = 2 "matrix" boundary condition
 = 3 "vector" boundary condition

MILL - length in millimeters - 1 is required

CENT - length in centimeters - 1 is required

ADEG - angles in degrees - 1 is required

ARAD - angles in radians - 1 is required

ANNULUS J R M_1 θ_1 M_2 θ_2 . . . M_n θ_n
 J = annulus number
 R = outer radius
 M_n = material code of sector n
 θ_n = leading angle of sector n

SURFACE θ_1 θ_2 . . . θ_n
 one surface = SURFACE 0.0

ARRAY

RODSUB

LINES N_1 N_2 . . . N_{NAN}

BMAT . . . if NBOPT = 2

BVECT NG α_1 α_2 . . . α_{NS} if NBOPT = 3
 same α for all group => BVECT 0 1.0

BEGIN

ARRAY - Rod centers are positioned by means of ARRAY cards, each type of rod being described by one card or set of cards. These take the form:

ARRAY ITYPE m_1 n_1 p_1 ϕ_1 m_2 n_2 p_2 ϕ_2 . . . m_n n_n p_n ϕ_n

Up to twelve sets of (m n p ϕ) data are allowed. The first number of each set, m, specifies the option on the coordinates chosen to describe the array. All angles are measured from the fixed reference direction. All rings, squares, and hexagons of rods are based on the cell center. The options are:

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- $m = 1$ A ring, radius p , of n equally spaced rods one of which has angular coordinate ϕ . ϕ should be the smallest coordinate in the range $0 \leq \phi < 2\pi$.
- $m = 3$ A ring of n equally spaced rods with separation p , the first of which has angular coordinate ϕ . (As $m = 1$ except p is separation instead of radius.)
- $m = 4$ A hollow square of n equally spaced rods with separation p . ϕ is the angular coordinate of the first corner rod in the range $0 \leq \phi < 2\pi$.

Rods may be specified singly by using $m = 1$ and $n = 1$. Note that rods are allocated the same region numbers if:

- they are the same type and
- their outer annuli at the point furthest from the cell center lies in the same cell annulus.

If $m = 1$ or 3 , then all rods specified by one set of four numbers will automatically be at the same distance from the cell center and hence have the same set of region numbers. With Options 4 and 6, this is not true and care must be taken to ensure the correct assignments.

RODSUB - The subdivision of each type of rod is specified by RODSUB cards. These cards are similar in format to the ANNULUS cards apart from the first number which specifies the type number of the rod. The angles are measured in an anticlockwise sense in the range $0 \leq \theta < 2\pi$ relative to the outward going line from cell center through the rod center. Thus:

ROBDUB ITYPE J R M_1 θ_1 M_2 θ_2 . . . M_N θ_N

where

ITYPE = rod type number
 J = annulus number within the rod
 R = outer radius of the annulus
 M_N = material code in sector N
 θ_N = leading angle of sector N

Example

Rods of Type 1 have two annuli with outer radii 1.0 and 2.0 cms. The first annulus is not divided into sectors and is void but the second is divided into two with the division along the line joining cell center to rod center. The first half contains Material 1 and the second half material 2. Thus we would have:

CENT
 ADEG

RODSUB 1 1 1.0 0
 RODSUB 1 2 2.0 1 0 2 180

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Note that if a rod annulus is not divided into sectors, a card of the form below suffices.

RODSUB ITYPE J R M

and Material M fills the whole of Annulus J.

MULTICELL CALCULATIONS

1. Flux substitution in WCOND

```
FFACE N
WCOND i j
GROUPS . . .
ENDP
SUBF
PART . . .
BEGIN
```

2. WMERGE - Used to merge more than one interfaces into one interface (referenced only in AEEW-R1920, "The Collision Probability Modules of WIMS-E.")

```
WMERGE 1 2 3
NOIF 2
ENDP
BEGIN
```

3. Burnup consequences

In WHEAD, BURN KB KC => get the number densities for cell type KC. Must read File 1 of the interface written by WMERGE. Done by using MFACE card appearing before the WHEAD card.

Example

```
MFACE 5
WHEAD 6 1
BURN 1 1
.
.
WHEAD 6 2
BURN 1 2
.
.
WMERGE 1 2 5
.
.
WPIJ 5
.
.
WBRNUP 5 6
.
.
```

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```
*
* SAMPLE CASE #7
*
PRINT 0
WHEAD 1
NREG 3
NMAT 2
NMESH 4
ENDP
* PINCELL FOR PIJ CLUSTER
CENT
ANNULUS 1 0.5 1
ANNULUS 2 1.0 2
ANNULUS 3 1.30 0
MATERIAL 1 -1 1089 1 2235 2.908E-4 8238 2.2672E-3
MATERIAL 2 -1 1005 3 2012 8.873E-2
MESH 1 2 1
BEGIN
WTHES 1
BEGIN
WPIP 1
TOLER 1.0E-5
OMEGA 1.25
BEGIN
WCOND 1 2
GROUP 3
ENDP
PART 9 27 69
BEGIN
WPIJ 2
CELLD 4 3 1 1 1 1
RODD 6 1 3 1
CONT -12 30 5 1 0 3
ENDP
CENT
ADEG
PRINT 5
ANNULUS 1 5.0 0
ANNULUS 2 10.0 2
ANNULUS 3 15.0 2
SURF 0.0
ARRAY 1 1 6 7.5 0
RODSUB 1 1 0.5 1
RODSUB 1 2 1.0 2
RODSUB 1 3 1.3 0
LINES 10 10 10
BVECT 0 1.0
BEGIN
WPIP 2
BEGIN
STOP
```

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```

*
* SAMPLE CASE #8
*
* PINCELL TYPE #1 FOR FUEL PINS
*
WHEAD 1
BURN
NMESH 8
NREGION 4
NMATERIAL 4
ENDP
PRINT 0
CENT
MESH 1 1 1 5
MATERIAL 1 . . . .
MATERIAL 2 . . . .
MATERIAL 3 . . . .
MATERIAL 4 . . . .
ANNULUS 1 0.135 1 * UO2
ANNULUS 2 0.277 2 * UO2
ANNULUS 3 0.342 3 * ZR CLAD WITH SMEARED GAP
ANNULUS 4 0.6363 4 * WATER COOLANT
BEGIN
*
* PERSEUS CALCULATIONS
*
WTHES 1
PRINT 0
BEGIN
WPIP 1
PRINT 0
TOLER 1.0E-5
OMEGA 1.25
BEGIN
WCOND 1 2
GROUP 18
ENDP
PART 2 5 10 14 23 24 26 27 36 39 45 48 53 56 60 63 66 69
PRINT 0
BEGIN
*
* PINCELL TYPE #2 FOR TARGET PINS
*
WHEAD 4
BURN
NMESH 8
NREGION 4
NMATERIAL 4
ENDP
PRINT 0
CENT
MESH 1 1 1 5
MATERIAL 1 . . . .
MATERIAL 2 . . . .

```

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```

MATERIAL 3 . . . .
MATERIAL 4 . . . .
ANNULUS 1 0.167 1 * LIALO2
ANNULUS 2 0.335 2 * LIALO2
ANNULUS 3 0.457 3 * STAINLESS STEEL CLAD
ANNULUS 4 0.6363 4 * WATER COOLANT
BEGIN
FFACE 1
WCOND 4 3
SUBF
GROUP 18
ENDP
PART 2 5 10 14 23 24 26 27 36 39 45 48 53 56 60 66 69
PRINT 0
BEGIN
*
* MERGE FOR MULTICELL CALCULATIONS
*
WMERGE 2 3 5
NOIF 2
ENDP
BEGIN
*
* PIJ MODEL FOR 25 PINS
*
WPIJ 5
CELLD 20 5 1 1 1 1
RODD 25 3 3 1
CONT 4 50 75 1 0 3
ENDP
CENT
ADEG
PRINT 5
ANNULUS 1 0.135 1 * UO2
ANNULUS 2 0.277 2 * UO2
ANNULUS 3 0.342 3 * ZR CLAD WITH SMEARED GAP
ANNULUS 4 0.6779 4 * COOLANT
ANNULUS 5 3.3200 4 * COOLANT
SURF 0
ARRAY 1 1 4 1.141 0.0 * INNER FUEL SQUARE
*
ARRAY 2 1 4 1.6136 45.0 * INNER TARGET SQUARE
*
ARRAY 3 1 4 2.282 0.0 $ * OUTER FUEL RING
        1 4 2.551 26.56 $ * OUTER FUEL RING
        1 4 2.978 45.00 $ * OUTER FUEL RING
        1 4 2.551 63.43 * OUTER FUEL RING
*
RODSUB 1 1 .135 1 * UO2
RODSUB 1 2 .277 2 * UO2
RODSUB 1 3 .342 3 * CLAD + GAP
*
RODSUB 2 1 .167 5 * LIALO2
RODSUB 2 2 .335 6 * LIALO2

```

RODSUB 2 3 .457 7 * CLAD
*
RODSUB 3 1 .135 1 * UO2
RODSUB 3 2 .277 2 * UO2
RODWUB 3 3 .342 3 * CLAD + GAP
*
LINES 10 10 10 10 10
BVECT 0 1.0
BEGIN
WPIP 5
BEGIN
STOP

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W-CACTUS - Solves two-dimensional transport equations with the aid of lines or tracks as used in collision probability calculations.

- o general geometry features
- o limited to geometries with rectangular outer boundary with reflecting or periodic boundary conditions.

Geometry

User defines the problem in terms of "nodes," edges," "elements," and "inserts."

1. Node = any point on an x-y map of the problem
2. Edge = connection of two nodes by either a straight line or a circular arc
3. Element = discrete zone defined by edges
4. Insert = special provision to simplify the definition of cylindrical fuel pins

No "islands" are permitted in the problem except for those defined by "inserts."

Input

WCACTUS m

PRELUDE MNODE, MEDGE, MELEM, MIN, MJ, MK, NNN5, MSIDE, MGRP, MMAT

MNODE = maximum number of nodes
 MEDGE = maximum number of edges
 MELEM = maximum number of elements
 MIN = maximum number of inserts
 MJ = maximum number of azimuthal angles
 MK = maximum number of polar angles
 NNN5 = maximum number of annuli specified in any one insert (5 if zero or blank)
 MSIDE = maximum number of edges of any one element (8 if zero or blank)
 MGRP = maximum number of groups (usually blank)
 MMAT = maximum number of materials (usually blank)

GEOMETRY

DIMENSION XMAX, YMAX

NODES

$V_1 V_2 V_3 V_4$ - general form. By default, V_1 and V_2 are the x- and y-coordinates relative to an origin at the bottom left hand corner of the problem. For this case, V_3 and V_4 are omitted. See Roth and Halsall (1983) for details for RTHETA coordinates.

EDGE - One line for each edge. For a straight line, 2 data items are required - the node numbers at the ends of the edge. For an arc, 4 numbers are needed - 2 node numbers and the x- and y-coordinates of the center of curvature of the arc.

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Node numbers are given in counter-clockwise direction.

ELEMENTS - One line for each element containing a list of edge numbers defining the element. Normally listed in counter-clockwise order.

For a simple x-y mesh, with or without inserts, the DIMENSION, NODES, EDGES, and ELEMENTS data can be replaced by the much simpler XYCOORDINATES or XYINTERVALS.

See reference for details on BOX option.

INSERTS

IN, XC, YC, (RAD(L), L=1,N)

IN = element number to be inserted
 XC, YC = x- and y-coordinates of the insert center
 RAD(L) = list of radii of N concentric insert annuli

MATERIAL - material identification numbers of each region in turn; that is, first for each element and then for each annulus of each insert in the order they were specified.

ENDGEOMETRY

PICTURE - Produces a graphics file which will draw a picture on a TEK graphics terminal of the CATCUS geometry.

The user must supply information which tells the code how to "draw" its tracks for solving the problem. Two keywords must be used:

AZIMUTHAL NJ,SEPMAX,KH,KV,ISYM,PROP,IAZM

where NJ is the number of azimuthal angles (i.e. in the x-y plane) (7,5,3,2 respectively may be sufficient for the 4 values of ISYM given below)

SEPMAX is the maximum separation between tracks (this should be of the same order of magnitude as the geometric detail)

KH = 1 or 2 indicates translation or reflection at the horizontal boundaries ($y = 0$, $y = y_{\max}$) of the problem.

KV = 1 or 2 indicates translation or reflection at the vertical boundaries ($x = 0$, $x = x_{\max}$) of the problem

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ISYM denotes an angle $2\pi/\text{ISYM}$ which may be divided between the NJ tracks. Values may be

- 1 for cases with all translational boundaries and ny symmetry
- 2 for cases with translational boundaries at $x = 0$, $x = x_{\text{max}}$, i.e. with $\text{KH} = 2$ and $\text{KV} = 1$
- 4 for general cases with reflecting boundaries
- 8 for reflecting boundary cases with symmetry about the $x=y$ diagonal. In the limit of many angles and close lines there may be a detectable lack of symmetry in the flux solution when the angles are restricted to 45° . The eigenvalue will be correct in such a situation and a best estimate of fluxes could be obtained by smearing symmetrically placed regions.

PROP is normally zero or blank. This parameter is used in the definition of a track starting point, and default values are 0.249 if the vertical boundaries are reflecting ($\text{KV} = 2$) and 0.499 if these are translational ($\text{KV} = 1$). These default values will be supplied if PROP and IAZM are blank.

IAZM is normally zero or blank. If a value 2 is input, the AZIMUTHAL card must be followed by NJ further cards each with a value of angle (in degrees), SEPMAX, and PROP. (No default values.)

For continuation cases, it is necessary only to specify values on this line up to the last one that is required to be changed.

POLAR NK POW

where NK is the number of polar angles (3 may be sufficient)
 POW may have values of 0 or 1 and is the power of $\cos \phi$ in the polar angle subdivision algorithm. The recommended value is zero, or blank.

The following data apart from the terminating keywords are optional and can be input in any order.

If CACTUS is run normally in a sequence of WIMS-E modules, the nuclear data will be read from the interface indicated in the control data used to call CACTUS. If the user wishes to run CACTUS as an independent program that does not interact with any WIMS-E interface, he can specify MGRP and MMAT in the PRELUDE data and CACTUS will then expect to read cross sections from lines of data following the keyword:

NUCLEAR

The lines of data that follow are:

- a Number of energy groups, number of materials (unformatted)
- b Fission spectrum (unformatted with \$ to indicate continuation to the next line if necessary)
- c For each material:
 - i a title line (unformatted)
 - ii for each energy group J, (in standard DSN format)

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$M, N, \Sigma_t, \nu\Sigma_f, \Sigma_f$ (2I6, 3E12.4)

$\Sigma_a, \Sigma_s(L = LL, LLL)$ (6E12.4)

where $LL = J - M + 2$ (M is the position on the second line of the self scatter cross section)

$LLL = J - M + N$ (N is the number of items on the second and subsequent lines if necessary)

Σ_t = transport corrected total cross section

$\nu\Sigma_f$ = fission yield cross section

Σ_f = fission cross section

Σ_a = absorption cross section (including fission)

Σ_s = scattering cross section from group J to other groups L

CACTUS normally writes WIMS-E File 4 (geometry) and File 5 (fluxes) to the interface from which the cross section data were read. If these data were not read from a WIMS-E interface, but under control of the keyword NUCLEAR, then the geometry and fluxes will not be written to a WIMS-E interface. It is also possible to suppress the writing of Files 4 and 5 by inserting the line:

LINK L

where a negative value of L will suppress the output and a zero or positive value will cause it to be written. This option is most likely to be useful if several CACTUS cases are run consecutively within a sequence of WIMS-E modules, and output is required only from the last.

A few optional keywords are available to control convergence criteria and amount of printout:

TOLERANCE $\epsilon_k \epsilon_\phi \epsilon_a i_o i_i i_g$

where ϵ_k is the required convergence accuracy of k_∞ (default 10^{-5})

ϵ_ϕ is the required convergence accuracy of scalar flux (default 10^{-4})

ϵ_a is the required convergence accuracy of boundary angular flux (default 10^{-4})

i_o is an upper limit to the number of outer iterations (default 50)

i_i is an upper limit to the number of inner iterations (default ∞)

i_g is an upper limit to the number of inner iterations per energy group (default 2)

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EDITS E_i , $i = 1$ to 4

where zero values give no edit output and values of unity produce output as follows (default values are 0, 0, 1, 1)

- $i = 1$ absorptions and fissions for every region in the problem
- $i = 2$ scatters for every region
- $i = 3$ a sum over the whole problem of absorptions, fissions, and scatters
- $i = 4$ a print of the iteration count, fluxes and k_∞ at every E_4 th outer iteration

W-CACTUS (cont.)

BEGIN

{

ENDC

Example

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WHEAD 1
NREGION 3
NMATERIAL 3
ENDP
*
* LWR PINCELL
*
CENT
ANNULUS 1 0.40957 1
ANNULUS 2 0.47498 2
ANNULUS 3 0.71079
MATERIAL 1 -1 923 1 234 5.00828E-6 2235 5.885412E-4 236 2.191123E-6
8238 2.176266E-2 6016 4.471680E-2
MATERIAL 2 -1 613 2 91 3.33805E-2
MATERIAL 3 -1 583 3 3001 4.689344E-2 6016 2.344672E-2 9058 4.936743E-4
1010 9.19298E-6 * 1189 PPM
BEGIN
WTHES 1
BEGIN
WPIP 1
BEGIN
WCOND 1 2
GROUPS 18
ENDP
PARTITION 2 5 10 14 23 24 26 27 36 39 45 48 53 65 60 63 66 69
BEGIN
WCACTUS 2
PRELUDE 4 4 1 1 3 3
GEOMETRY
XYINTERVALS
1 1.26
1 1.26
INSERTS
1 0.63 0.63 0.40957 0.47498
MATERIALS
3 1 2
*PICTURE
ENDGEOMETRY
AZIMUTHAL 3 0.05 2 2 8
POLAR 3
BEGIN
ENDC
WWIRE 2
REACTION 2235 1 6
REACTION 8238 1 6
BEGIN
STOP

W-CACTUS (cont.)

1.

Did work

2.

Did work!

3.

Did Work

5x5 burnup (5 steps) - 3 min. CRAY
19x19 burnup (5 steps) - 30 min CRAY

WIMS-E 1986 CROSS SECTION LIBRARY

<u>Nuclide ID</u>	<u>Nuclide</u>
✓ 3001	hydrogen
3002	deuterium
3	helium-3
4	helium-4
6	lithium-6 (burnable)
7	lithium-7
9	beryllium-9
10	boron-10 (burnable)
1010	boron-10 (unburnable)
1011	natural boron (unburnable, purely $1/v < 100$ keV)
✓ 2012	carbon
2212	graphite damage
✓ 14	nitrogen
✓ 6016	oxygen
✓ 19	fluorine
✓ 23	sodium
✓ 24	magnesium-24
27	aluminum
29	silicon
48	<i>Titanium?</i>
51	vanadium (n, γ) reaction
✓ 52	chromium
1054	Fe-54 (n,p) Mn-54 reaction
55	manganese
2056	iron
9056	stainless steel
✓ 58	nickel
1058	Ni-58 (n,p) Co-58
3058	Fe-58 (n, γ) Fe-59
8058	Inconel 750
9058	Inconel 718
1059	Co-59 (n, γ) Co-60
✓ 3063	copper
84	krypton-84
✓ 91	zirconium
1091	zircaloy damage
93	niobium
96	<i>Molybdenum?</i>
2103	Rh-103 (n,n ¹) Rh-103m
✓ 3109	silver
2113	natural cadmium
2115	indium
121	antimony-121
123	antimony-123
2154	gadolinium-154
2155	gadolinium-155
2156	gadolinium-156
2157	gadolinium-157
2158	gadolinium-158

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164	dysprosium-164
167	erbium
176	lutetium-176
2176	hafnium-176
2177	hafnium-177
2178	hafnium-178
2179	hafnium-179
2180	hafnium-180
178	natural hafnium
181	tantalum
197	gold
251	pseudo fission products
252	pseudo fission products
253	pseudo fission products
254	pseudo fission products
105	rhodium-105
135	xenon-135
500	samarium pseudo fission products
4083	krypton-83
4095	molybdenum-95
4099	technetium-99
4101	ruthenium-101
5103	ruthenium-103 (?)
4103	rhodium-103 (?)
4105	rhodium-105
5105	palladium-105
4108	palladium-108
4109	silver-109
4113	cadmium-113
4115	indium-115
4127	iodine-127
4131	xenon-131
4133	cesium-133
4134	cesium-134
6135	iodine-135
4135	xenon-135
5135	cesium-135
4143	neodymium-143
4145	neodymium-145
4147	promethium-147
5147	promethium-147
6147	samarium-147
4148	promethium-148m
5148	promethium-148
5149	promethium-149
4149	samarium-149
4150	samarium-150
4151	samarium-151
4152	samarium-152
4153	europium-153
4154	europium-154
4155	europium-155
4157	gadolinium-157
4902	pseudo

WHC-SD-NR-SWD-017

✓ 207	lead
2232	thorium-232
9233	uranium-233
1233	protactinium-233
234	uranium-234
2235	uranium-235
236	uranium-236
927	uranium-237
✓ 8238	uranium-238
937	neptunium-237
1939	neptunium-239
948	plutonium-238
6239	plutonium-239
1240	plutonium-240
1241	plutonium-241
1242	plutonium-242
✓ 951	americium-241
952	americium-242
953	americium-243
1000	+ 1/v absorber
1003	U-235 fission detector (from 2235 nuclide)
1999	resonance part of 1/v
2000	- 1/v absorber
3000	pure absorber
4000	inverse lethargy intervals
3003	tritium

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Appendix B

WIMS-E Test Problems

This appendix contains complete listings of the input and corresponding output for two WIMS-E Test Problems. The WIMS-E Test Case #1 and #3, supplied to the Hanford Site by AEE, Winfrith (code developer), were selected.

WHC-SD-NR-SWD-017

UU	UU	UUUUUUUUUU	MM	MM	SSSSSSSSSS	EEEEEEEEEEEE
UU	UU	UUUUUUUUUU	MM	MM	SSSSSSSSSS	EEEEEEEEEEEE
UU	UU	UUUUUUUUUU	MM	MM	SS	EE
UU	UU	UUUUUUUUUU	MM	MM	SS	EE
UU	UU	UUUUUUUUUU	MM	MM	SS	EE
UU	UU	UUUUUUUUUU	MM	MM	SSSSSSSSSS	EEEEEEEEEEEE
UU	UU	UUUUUUUUUU	MM	MM	SSSSSSSSSS	EEEEEEEEEEEE
UU	UU	UUUUUUUUUU	MM	MM	SS	EE
UU	UU	UUUUUUUUUU	MM	MM	SS	EE
UU	UU	UUUUUUUUUU	MM	MM	SSSSSSSSSS	EEEEEEEEEEEE
UU	UU	UUUUUUUUUU	MM	MM	SSSSSSSSSS	EEEEEEEEEEEE

11	2222222222		11	44	8888888888	9999999999
1111	2222222222		1111	444	8888888888	9999999999
11	22		11	4444	88	99
11	22		11	44 44	88	99
11	22		11	44 44	88	99
11	22		11	44 44	8888888888	9999999999
11	22		11	4444444444	8888888888	9999999999
11	22		11	4444444444	88	99
11	22		11	44	88	99
11111111	2222222222		11111111	44	8888888888	9999999999
11111111	2222222222		11111111	44	8888888888	9999999999

11	3333333333		11	3333333333	2222222222	5555555555
1111	3333333333		1111	3333333333	2222222222	5555555555
11	33		11	33	22	55
11	33		11	33	22	55
11	333		11	333	22	55
11	333		11	333	22	55
11	33		11	33	22	55
11	33		11	33	22	55
11111111	3333333333		11111111	3333333333	2222222222	5555555555
11111111	3333333333		11111111	3333333333	2222222222	5555555555

PROGRAM VERIFICATION INFORMATION

```

#####      PPOGRAM:    /p/wimse/wimse.x
#####      VEPSION:    1.4
#####
#####      OPERATING SYSTEM:  CFAY UNICOS 4.0
#####
#####      CREATION DATE:    May 9 1989
#####
#####      LIBRARY:         /p/wimse/wimselib.bin
#####
#####      RELEASED DATE:    05/01/89
#####
#####      VALIDATION DATE:
#####
#####      CODE CUSTODIAN:    G.H. MERIWETHER
#####
#####
#####      JOBNAM:          1802
#####
#####      DATE OF EXECUTION: 12/14/89
#####
#####      TIME OF EXECUTION: 13.12.25
#####

```

MESSAGE BOX
~~~~~

REPORTED PROBLEMS

1. WHEN USING CACTUS IN BURNUP CALCULATIONS, THE EXPOSURE VALUE IS NOT INTEGRATED PROPERLY. (4-18-89)
2. THE CODE CRASHES WHEN USING WCRIT MODULE RIGHT AFTER THE CACTUS MODULE. TRY USING WSMEAR IN BETWEEN. (4-18-89)
3. TWO MODULES, WPRES AND WRES, ARE NOT OPERABLE. (4-18-89)

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*****
 OVERLAY WIMSE, VERSION 130, CREATED 01/20/89, CONSISTS OF:

MODULE	VERSION	MODULE	VERSION	MODULE	VERSION	MODULE	VERSION	MODULE	VERSION
WBPNUF	1988/11	WCOND	1988/11	WCPITIC	1988/11	WFLUPIG	1988/11	WCACTUS	1988/11
WCHART	1988/11	WFOFTE	1988/11	WHEAD	1989/01	WINTER	1988/11	WLINK	ABSENT
WCHARGE	1988/11	WMIK	1988/11	WPERSEUS	DELETED	WPIJ	1988/11	WPIP	1988/11
WUPNE	1988/11	WPRES	1988/11	WPPCOL	1988/11	WPES	1988/11	WSHEAR	1988/11
WSNAP	ABSENT	WTHESEUS	1988/11	WJED	1988/11	WJIRE	1988/11		

SUMMARY OF RECENT CHANGES

VERSION	CREATED	MODULES CHANGED
112	19/06/81	WHEAD, WINTER, WPRES, WPES, WPIJ, WPPCOL, CONTROL (CYCLIC CALCULATIONS)
113	18/10/84	WCACTUS(ADDED), WCHART(ADDED), WLINK, WMIK, WPIJ, WUPNE, WSHEAR, WJIRE
114	01/03/87	THE FOLLOWING CHANGES HAVE BEEN MADE FOR WIMS-E VERSION 114 : 1. ALL MODULES CONVERTED TO FORTRAN 77. 2. EPPOP CORRECTIONS TO W-BPNUP, W-INTER, W-FOFTE, W-THESE, W-HEAD, W-PIP AND W-CACTUS. 3. THE CONTROLLER HAS BEEN REWRITTEN TO MAKE IT PORTABLE. 4. ALL ASSEMBLER CODING HAS BEEN REMOVED. 5. W-PERSEUS HAS BEEN REMOVED: W-THESE FOLLOWED BY W-PIP SHOULD NOW BE USED INSTEAD. 6. NEW VERSION SUPPORTS USE OF THE 1986 WIMS NUCLEAR DATA LIBRARIES. 7. ALL MODULES NOW USE THE NEW INPUT PACKAGE READDATA.
120	08/11/88	THE FOLLOWING CHANGES HAVE BEEN MADE FOR WIMS-E VERSION 120 : 1. ALL MODULES CONVERTED ONTO THE HANFORD CRAY EXCEPT WPRES AND WPES MODULES. 2. PRINT TABLES GIVING GRAMS/CMFOR ALL ISOTOPIES WERE ADDED IN BRNUP MODULE. 3. \$ CHARACTER TO SIGNAL DATA CONTINUATION ON NEXT CARD MADE OPERABLE IN CACTUS MODULE. 4. PIN OPTION ADDED IN CACTUS MODULE TO CALCULATE NORMALIZED LOCAL PIN POWER DISTRIBUTION.
130	19/01/89	THE FOLLOWING CHANGES HAVE BEEN MADE FOR WIMS-E VERSION 130 : 1. ALT ARRAY IN MAIN02 ROUTINE WAS DECLARED REAL INSTEAD OF IMPLICIT INTEGER.
140	01/05/89	THE FOLLOWING CHANGES HAVE BEEN MADE FOR WIMS-E VERSION 140 : 1. SNAP OPTION WAS ADDED IN BRNUP MODULE TO SAVE THE ISOTOPIES ONTO UNIT 7. 2. DYNAMIC MEMORY ALLOCATION FEATURE WAS ADDED TO THE CODE. 3. QA INFORMATION PAGE WAS ADDED. THIS REQUIRES A UNICOS SHELLSCRIPT (WIMSE.EXE) TO BE EXECUTED TO COLLECT APPROPRIATE QA INFORMATION BEFORE THE ACTUAL EXECUTION. 4. THE MESSAGE BOX WAS CHANGED TO LIST ANY REPORTED PROBLEMS. THIS ELIMINATES THE NEED FOR THE WIMSE.TXT FILE.

NOTE PRINTS OF INPUT DATA (BEING READ FOR EXECUTION) ARE FLAGGED BY ONE OF THE FOLLOWING SYMBOLS TO DISTINGUISH THEM FROM OTHER PRINTS. THESE SYMBOLS SHOULD NOT BE TYPED.

-C- CONTROL ROUTINE DATA
 -P- PRELUDE DATA FOR MODULE
 -M- MAIN DATA FOR MODULE

THE FOLLOWING INPUT DATA WERE READ FROM UNIT 5

```
*****
*
* WIMSE TEST CASE #1
*
*****
WHEAD 1
NREGION 3
NMAT 3
ENDP
CENT
MATE 1 -1 866 1 2235 0.00046787 8238 0.0215361 6016 0.044008
MATE 2 -1 570 2 91 0.04326
MATE 3 0.5 558 3 3001 11.19 6016 88.81
ANNU 1 0.633 1
ANNU 2 0.714 2
ANNU 3 1.057 3
BELL .67
TEST
BEGIN
WFLU 1
PRINT 9
LINES 2
BEGIN
WPIP 1
TOLERANCE .00001
OMEGA 1.25
BEGIN
WINTER 1
PRINT FILE 3 4 5
BEGIN
WCPITIC 1 2
CENT
PRINT 1
BUCK 69 .343E-4 .343E-4 .343E-4 .343E-4
BEGIN
WCOND 2 3
GROUPS 3
ENDP
PART 14 27 69
PRINT 5
BEGIN
STOP
-C- *****
-C- *
-C- * WIMSE TEST CASE #1
-C- *
-C- *****
-C- WHEAD 1
```

WRITES INTERFACE 1

FORTRAN DATA SETS 11-15

OSNAMES:

WHC-SD-NR-SWD-017

READ LIBRARY, DO RESONANCE CALCULATION, WRITE MICRO X-SECTIONS

LIBRARY
NUCLIDES 130 GROUPS 69-P- NREGION 3
-P- NWRT 3
-P- ENDPMAXIMUM SIZE OF NUMBER DENSITY DATA BLOCK 68814
STORAGE USED NOW GIVEN AT END OF HEAD CALCULATION-M- CENT
-M- MATE 1 -1 866 1 2235 0.0004678/ 8238 0.0215361 6016 0.044009
-M- MATE 2 -1 570 2 91 0.04328
-M- MATE 3 0.5 558 3 3001 11.19 6016 88.81
-M- ANNU 1 0.633 1
-M- ANNU 2 0.714 2
-M- ANNU 3 1.057 3
-M- BELL .67
-M- TEST
-M- BEGIN

MATERIAL TEMPERATURES AND ISOTOPE NUMBER DENSITIES

TEMP 1 2 3
866.0000 570.0000 558.0000

3001	0.0000E+00	0.0000E+00	-3.3699E-02
3002	0.0000E+00	0.0000E+00	0.0000E+00
3	0.0000E+00	0.0000E+00	0.0000E+00
4	0.0000E+00	0.0000E+00	0.0000E+00
5	0.0000E+00	0.0000E+00	0.0000E+00
6	0.0000E+00	0.0000E+00	0.0000E+00
7	0.0000E+00	0.0000E+00	0.0000E+00
8	0.0000E+00	0.0000E+00	0.0000E+00
9	0.0000E+00	0.0000E+00	0.0000E+00
10	0.0000E+00	0.0000E+00	0.0000E+00
1010	0.0000E+00	0.0000E+00	0.0000E+00
1011	0.0000E+00	0.0000E+00	0.0000E+00
2012	0.0000E+00	0.0000E+00	0.0000E+00
2212	0.0000E+00	0.0000E+00	0.0000E+00
14	0.0000E+00	0.0000E+00	0.0000E+00
6016	4.4008E-02	0.0000E+00	-2.6745E-01
19	0.0000E+00	0.0000E+00	0.0000E+00
23	0.0000E+00	0.0000E+00	0.0000E+00
24	0.0000E+00	0.0000E+00	0.0000E+00
27	0.0000E+00	0.0000E+00	0.0000E+00
29	0.0000E+00	0.0000E+00	0.0000E+00
48	0.0000E+00	0.0000E+00	0.0000E+00
51	0.0000E+00	0.0000E+00	0.0000E+00
52	0.0000E+00	0.0000E+00	0.0000E+00
1054	0.0000E+00	0.0000E+00	0.0000E+00
55	0.0000E+00	0.0000E+00	0.0000E+00
2056	0.0000E+00	0.0000E+00	0.0000E+00
9056	0.0000E+00	0.0000E+00	0.0000E+00
58	0.0000E+00	0.0000E+00	0.0000E+00
1058	0.0000E+00	0.0000E+00	0.0000E+00
3058	0.0000E+00	0.0000E+00	0.0000E+00
8058	0.0000E+00	0.0000E+00	0.0000E+00
9058	0.0000E+00	0.0000E+00	0.0000E+00
1059	0.0000E+00	0.0000E+00	0.0000E+00
3083	0.0000E+00	0.0000E+00	0.0000E+00
84	0.0000E+00	0.0000E+00	0.0000E+00
91	0.0000E+00	4.3280E-02	0.0000E+00
1091	0.0000E+00	0.0000E+00	0.0000E+00
93	0.0000E+00	0.0000E+00	0.0000E+00
96	0.0000E+00	0.0000E+00	0.0000E+00
2103	0.0000E+00	0.0000E+00	0.0000E+00
3109	0.0000E+00	0.0000E+00	0.0000E+00
2113	0.0000E+00	0.0000E+00	0.0000E+00
2115	0.0000E+00	0.0000E+00	0.0000E+00
121	0.0000E+00	0.0000E+00	0.0000E+00
123	0.0000E+00	0.0000E+00	0.0000E+00
2154	0.0000E+00	0.0000E+00	0.0000E+00
2155	0.0000E+00	0.0000E+00	0.0000E+00
2156	0.0000E+00	0.0000E+00	0.0000E+00
2157	0.0000E+00	0.0000E+00	0.0000E+00
2158	0.0000E+00	0.0000E+00	0.0000E+00
164	0.0000E+00	0.0000E+00	0.0000E+00
167	0.0000E+00	0.0000E+00	0.0000E+00
176	0.0000E+00	0.0000E+00	0.0000E+00
2176	0.0000E+00	0.0000E+00	0.0000E+00
2177	0.0000E+00	0.0000E+00	0.0000E+00
2178	0.0000E+00	0.0000E+00	0.0000E+00
2179	0.0000E+00	0.0000E+00	0.0000E+00
2180	0.0000E+00	0.0000E+00	0.0000E+00
178	0.0000E+00	0.0000E+00	0.0000E+00
181	0.0000E+00	0.0000E+00	0.0000E+00
183	0.0000E+00	0.0000E+00	0.0000E+00
197	0.0000E+00	0.0000E+00	0.0000E+00
251	0.0000E+00	0.0000E+00	0.0000E+00
252	0.0000E+00	0.0000E+00	0.0000E+00
253	0.0000E+00	0.0000E+00	0.0000E+00
254	0.0000E+00	0.0000E+00	0.0000E+00
105	0.0000E+00	0.0000E+00	0.0000E+00
135	0.0000E+00	0.0000E+00	0.0000E+00
500	0.0000E+00	0.0000E+00	0.0000E+00
4083	0.0000E+00	0.0000E+00	0.0000E+00
4096	0.0000E+00	0.0000E+00	0.0000E+00
4099	0.0000E+00	0.0000E+00	0.0000E+00
4101	0.0000E+00	0.0000E+00	0.0000E+00
5103	0.0000E+00	0.0000E+00	0.0000E+00
4103	0.0000E+00	0.0000E+00	0.0000E+00
4105	0.0000E+00	0.0000E+00	0.0000E+00
5105	0.0000E+00	0.0000E+00	0.0000E+00
4106	0.0000E+00	0.0000E+00	0.0000E+00
4109	0.0000E+00	0.0000E+00	0.0000E+00
4113	0.0000E+00	0.0000E+00	0.0000E+00
4115	0.0000E+00	0.0000E+00	0.0000E+00
4127	0.0000E+00	0.0000E+00	0.0000E+00
4131	0.0000E+00	0.0000E+00	0.0000E+00
4133	0.0000E+00	0.0000E+00	0.0000E+00
4134	0.0000E+00	0.0000E+00	0.0000E+00
6135	0.0000E+00	0.0000E+00	0.0000E+00
4135	0.0000E+00	0.0000E+00	0.0000E+00
5135	0.0000E+00	0.0000E+00	0.0000E+00
4143	0.0000E+00	0.0000E+00	0.0000E+00
4145	0.0000E+00	0.0000E+00	0.0000E+00
4147	0.0000E+00	0.0000E+00	0.0000E+00
5147	0.0000E+00	0.0000E+00	0.0000E+00
6147	0.0000E+00	0.0000E+00	0.0000E+00
4148	0.0000E+00	0.0000E+00	0.0000E+00
5148	0.0000E+00	0.0000E+00	0.0000E+00
5149	0.0000E+00	0.0000E+00	0.0000E+00

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4151 0.0000E+00 0.0000E+00 0.0000E+00
4152 0.0000E+00 0.0000E+00 0.0000E+00
4153 0.0000E+00 0.0000E+00 0.0000E+00
4154 0.0000E+00 0.0000E+00 0.0000E+00
4155 0.0000E+00 0.0000E+00 0.0000E+00
4157 0.0000E+00 0.0000E+00 0.0000E+00
4902 0.0000E+00 0.0000E+00 0.0000E+00
207 0.0000E+00 0.0000E+00 0.0000E+00
2232 0.0000E+00 0.0000E+00 0.0000E+00
9233 0.0000E+00 0.0000E+00 0.0000E+00
1233 0.0000E+00 0.0000E+00 0.0000E+00
234 0.0000E+00 0.0000E+00 0.0000E+00
2235 4.6787E-04 0.0000E+00 0.0000E+00
236 0.0000E+00 0.0000E+00 0.0000E+00
927 0.0000E+00 0.0000E+00 0.0000E+00
8238 2.1536E-02 0.0000E+00 0.0000E+00
937 0.0000E+00 0.0000E+00 0.0000E+00
1939 0.0000E+00 0.0000E+00 0.0000E+00
948 0.0000E+00 0.0000E+00 0.0000E+00
8279 0.0000E+00 0.0000E+00 0.0000E+00
1240 0.0000E+00 0.0000E+00 0.0000E+00
1241 0.0000E+00 0.0000E+00 0.0000E+00
1242 0.0000E+00 0.0000E+00 0.0000E+00
951 0.0000E+00 0.0000E+00 0.0000E+00
952 0.0000E+00 0.0000E+00 0.0000E+00
953 0.0000E+00 0.0000E+00 0.0000E+00
1000 0.0000E+00 0.0000E+00 0.0000E+00
1003 0.0000E+00 0.0000E+00 0.0000E+00
1999 0.0000E+00 0.0000E+00 0.0000E+00
2000 0.0000E+00 0.0000E+00 0.0000E+00
3000 0.0000E+00 0.0000E+00 0.0000E+00
4000 0.0000E+00 0.0000E+00 0.0000E+00
3003 0.0000E+00 0.0000E+00 0.0000E+00

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NEGATIVE VALUES IN THE ABOVE TABLE ARE REPLACED BY -N/(ATOMIC WEIGHT)

RESONANCE GROUP 15

BETA R Q
1.04475E+00 3.25792E-01 6.74208E-01

NUCLIDE ARRAY AND CLUSTER RESINT
CROSS-SECTION -----INPUT----- OUTPUT-----

MICROSCOPIC ABSORPTION CROSS-SECTIONS BEFORE INTERACTION CORRECTION
2.23500E+03 4.86788E+00 1.57357E+03 1.29692E+03 4.87250E+00 4.86808E+00
8.23800E+03 8.03625E-01 3.41856E+01 2.81755E+01 8.20722E-01 8.04357E-01
MACROSCOPIC 1.95845E-02

MICROSCOPIC CROSS-SECTIONS AFTER INTERACTION BUT BEFORE FLUX DEPRESSION CORRECTION
2.23500E+03 4.72965E+00 1.61977E+03 1.33500E+03 4.87319E+00 4.86871E+00
2.23500E+03 3.43417E+00 1.61977E+03 1.33500E+03 3.53842E+00 3.53514E+00
8.23800E+03 8.00976E-01 3.43144E+01 2.82816E+01 8.20971E-01 8.04721E-01

MICROSCOPIC CROSS-SECTIONS
ARRAY
2235.OABS 4.86838E+00
2235.OFIS 3.54797E+00
8238.OABS 8.27519E-01

P = 0.96997E+00 FOR EACH REGION UP TO THE VOLUME FRACTION 0.29633E+00 OF REGION 3

FLUX DEPRESSION FACTOR = 0.96793E+00

FUEL CAN COOLANT MODERATOR
F(P) 1.01829E+00 1.01739E+00 9.99671E-01 1.00000E+00

RESONANCE GROUP 16

BETA R Q
1.04533E+00 3.21945E-01 8.78055E-01

NUCLIDE ARRAY AND CLUSTER RESINT
CROSS-SECTION -----INPUT----- OUTPUT-----

MICROSCOPIC ABSORPTION CROSS-SECTIONS BEFORE INTERACTION CORRECTION
2.23500E+03 5.73689E+00 1.57757E+03 1.30458E+03 5.74366E+00 5.73719E+00
8.23800E+03 9.82576E-01 3.42726E+01 2.83418E+01 1.00853E+00 9.83702E-01
MACROSCOPIC 2.38450E-02

MICROSCOPIC CROSS-SECTIONS AFTER INTERACTION BUT BEFORE FLUX DEPRESSION CORRECTION
2.23500E+03 5.53911E+00 1.63423E+03 1.35143E+03 5.74493E+00 5.73834E+00
2.23500E+03 3.96195E+00 1.63423E+03 1.35143E+03 4.10915E+00 4.10445E+00
8.23800E+03 9.79916E-01 3.44239E+01 2.84670E+01 1.00900E+00 9.84357E-01

MICROSCOPIC CROSS-SECTIONS
ARRAY
2235.OABS 5.78282E+00
2235.OFIS 4.12182E+00
8238.OABS 1.01842E+00

P = 0.96718E+00 FOR EACH REGION UP TO THE VOLUME FRACTION 0.29419E+00 OF REGION 3

FLUX DEPRESSION FACTOR = 0.96121E+00

FUEL CAN COOLANT MODERATOR
F(P) 1.01048E+00 1.02299E+00 9.99622E-01 1.00000E+00

RESONANCE GROUP 17

BETA R Q
1.04555E+00 3.20464E-01 6.79536E-01

NUCLIDE ARRAY AND CLUSTER RESINT
CROSS-SECTION -----INPUT----- OUTPUT-----

MICROSCOPIC ABSORPTION CROSS-SECTIONS BEFORE INTERACTION CORRECTION
2.23500E+03 7.31224E+00 1.57774E+03 1.30615E+03 7.32444E+00 7.31277E+00
8.23800E+03 5.65690E-01 3.42764E+01 2.83761E+01 5.92464E-01 5.68901E-01
MACROSCOPIC 1.58039E-02

MICROSCOPIC CROSS-SECTIONS AFTER INTERACTION BUT BEFORE FLUX DEPRESSION CORRECTION
2.23500E+03 7.16763E+00 1.60984E+03 1.32272E+03 7.32575E+00 7.31394E+00
2.23500E+03 5.13471E+00 1.60984E+03 1.32272E+03 5.24806E+00 5.23954E+00
8.23800E+03 5.63371E-01 3.44893E+01 2.85359E+01 5.94173E-01 5.67747E-01

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8238.0ABS 5.78019E-01

P = 0.97848E+00 FOR EACH REGION UP TO THE VOLUME FRACTION 0.29361E+00 OF REGION 3
FLUX DEPRESSION FACTOR = 0.97466E+00

FUEL CAN COOLANT MODERATOR
F(P) 1.00678E+00 1.01484E+00 9.99758E-01 1.00000E+00

RESONANCE GROUP 18

BETA R Q
1.04575E+00 3.19380E-01 6.80620E-01

NUCLIDE ARRAY AND CLUSTER CROSS-SECTION -----INPUT----- RESINT -----OUTPUT-----

MICROSCOPIC ABSORPTION CROSS-SECTIONS BEFORE INTERACTION CORRECTION
2.23500E+03 8.95878E+00 1.58129E+03 1.31073E+03 8.97697E+00 8.95956E+00
8.23800E+03 8.70128E+01 3.43535E+01 2.84755E+01 9.28405E-01 8.72678E-01
MACROSCOPIC 2.29307E-02

MICROSCOPIC CROSS-SECTIONS AFTER INTERACTION BUT BEFORE FLUX DEPRESSION CORRECTION
2.23500E+03 8.68788E+00 1.63114E+03 1.35205E+03 8.98002E+00 8.96232E+00
2.23500E+03 8.25937E+00 1.63114E+03 1.35205E+03 6.47007E+00 6.45725E+00
8.23800E+03 8.66298E-01 3.45899E+01 2.86715E+01 9.30326E-01 8.74601E-01

MICROSCOPIC CROSS-SECTIONS

ARRAY
2235.0ABS 9.02195E+00
2235.0FIS 6.50020E+00
8238.0ABS 8.99630E-01

P = 0.96863E+00 FOR EACH REGION UP TO THE VOLUME FRACTION 0.29290E+00 OF REGION 3
FLUX DEPRESSION FACTOR = 0.96295E+00

FUEL CAN COOLANT MODERATOR
F(P) 1.00999E+00 1.02193E+00 9.99641E-01 1.00000E+00

RESONANCE GROUP 19

BETA R Q
1.04578E+00 3.19531E-01 6.80469E-01

NUCLIDE ARRAY AND CLUSTER CROSS-SECTION -----INPUT----- RESINT -----OUTPUT-----

MICROSCOPIC ABSORPTION CROSS-SECTIONS BEFORE INTERACTION CORRECTION
2.23500E+03 1.12795E+01 1.57709E+03 1.30638E+03 1.13125E+01 1.12810E+01
8.23800E+03 8.95379E-01 3.42621E+01 2.83810E+01 9.61780E-01 8.98286E-01
MACROSCOPIC 2.45603E-02

MICROSCOPIC CROSS-SECTIONS AFTER INTERACTION BUT BEFORE FLUX DEPRESSION CORRECTION
2.23500E+03 1.02886E+01 1.62846E+03 1.34894E+03 1.13181E+01 1.12881E+01
2.23500E+03 7.94563E+00 1.62846E+03 1.34894E+03 8.22847E+00 8.20552E+00
8.23800E+03 8.90594E-01 3.45605E+01 2.86282E+01 9.64630E-01 9.01252E-01

MICROSCOPIC CROSS-SECTIONS

ARRAY
2235.0ABS 1.13810E+01
2235.0FIS 8.27450E+00
8238.0ABS 9.27456E-01

P = 0.96663E+00 FOR EACH REGION UP TO THE VOLUME FRACTION 0.29305E+00 OF REGION 3
FLUX DEPRESSION FACTOR = 0.96025E+00

FUEL CAN COOLANT MODERATOR
F(P) 1.01088E+00 1.02372E+00 9.99618E-01 1.00000E+00

RESONANCE GROUP 20

BETA R Q
1.04611E+00 3.17286E-01 6.82714E-01

NUCLIDE ARRAY AND CLUSTER CROSS-SECTION -----INPUT----- RESINT -----OUTPUT-----

MICROSCOPIC ABSORPTION CROSS-SECTIONS BEFORE INTERACTION CORRECTION
2.23500E+03 1.57166E+01 1.58009E+03 1.31151E+03 1.57874E+01 1.57198E+01
8.23800E+03 1.06443E+00 3.43274E+01 2.84925E+01 1.14942E+00 1.06818E+00
MACROSCOPIC 3.02771E-02

MICROSCOPIC CROSS-SECTIONS AFTER INTERACTION BUT BEFORE FLUX DEPRESSION CORRECTION
2.23500E+03 1.51423E+01 1.64141E+03 1.36241E+03 1.58021E+01 1.57331E+01
2.23500E+03 1.13229E+01 1.64141E+03 1.36241E+03 1.18266E+01 1.17750E+01
8.23800E+03 1.05684E+00 3.47437E+01 2.88381E+01 1.15470E+00 1.07341E+00

MICROSCOPIC CROSS-SECTIONS

ARRAY
2235.0ABS 1.59164E+01
2235.0FIS 1.19122E+01
8238.0ABS 1.11087E+00

P = 0.92006E+00 FOR EACH REGION UP TO THE VOLUME FRACTION 0.29179E+00 OF REGION 3
FLUX DEPRESSION FACTOR = 0.95136E+00

FUEL CAN COOLANT MODERATOR
F(P) 1.00736E+00 1.00736E+00 9.97741E-01 1.00000E+00

RESONANCE GROUP 21

BETA P Q
1.04623E+00 3.16882E-01 6.83118E-01

NUCLIDE ARRAY AND CLUSTER CROSS-SECTION -----INPUT----- RESINT -----OUTPUT-----

MICROSCOPIC ABSORPTION CROSS-SECTIONS BEFORE INTERACTION CORRECTION
2.23500E+03 2.21679E+01 1.57373E+03 1.30553E+03 2.22932E+01 2.21710E+01
8.23800E+03 1.12244E+00 3.41941E+01 2.83625E+01 1.14434E+00 1.13532E+00

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MICROSCOPIC CROSS-SECTIONS AFTER INTERACTION BUT BEFORE FLUX DEPRESSION CORRECTION
 2.23500E+03 2.12370E+01 1.64507E+03 1.36471E+03 2.23677E+01 2.22071E+01
 2.23500E+03 1.34855E+01 1.64507E+03 1.36471E+03 1.42003E+01 1.41014E+01
 8.23800E+03 1.21874E+00 3.47795E+01 2.88523E+01 1.36053E+00 1.24512E+00

MICROSCOPIC CROSS-SECTIONS

ARRAY
 2235.0ABS 2.25742E+01
 2235.0FIS 1.43346E+01
 8238.0ABS 1.29548E+00

P = 0.90609E+00 FOR EACH REGION UP TO THE VOLUME FRACTION 0.29737E+00 OF REGION 3

FLUX DEPRESSION FACTOR = 0.94076E+00

FUEL CAN COOLANT MODERATOR
 F(P) 1.01060E+00 1.01060E+00 9.97271E-01 1.00000E+00

RESONANCE GROUP 22

BETA R Q
 1.04607E+00 3.19354E-01 8.80646E-01

NUCLIDE ARRAY AND CLUSTER CROSS-SECTION -----INPUT----- RESINT -----OUTPUT-----

MICROSCOPIC ABSORPTION CROSS-SECTIONS BEFORE INTERACTION CORRECTION
 2.23500E+03 3.48191E+01 1.57243E+03 1.30195E+03 3.51327E+01 3.46418E+01
 8.23800E+03 1.92309E+00 3.41622E+01 2.82848E+01 2.11443E+00 1.93152E+00
 MACROSCOPIC 5.76131E-02

MICROSCOPIC CROSS-SECTIONS AFTER INTERACTION BUT BEFORE FLUX DEPRESSION CORRECTION
 2.23500E+03 3.24302E+01 1.88720E+03 1.39693E+03 3.53280E+01 3.48194E+01
 2.23500E+03 2.04366E+01 1.88720E+03 1.39693E+03 2.22404E+01 2.19413E+01
 8.23800E+03 1.89613E+00 3.50954E+01 2.90575E+01 2.14212E+00 1.95647E+00

MICROSCOPIC CROSS-SECTIONS

ARRAY
 2235.0ABS 3.57140E+01
 2235.0FIS 2.25059E+01
 8238.0ABS 2.08612E+00

P = 0.89304E+00 FOR EACH REGION UP TO THE VOLUME FRACTION 0.29957E+00 OF REGION 3

FLUX DEPRESSION FACTOR = 0.90805E+00

FUEL CAN COOLANT MODERATOR
 F(P) 1.03903E+00 1.03903E+00 9.97755E-01 1.00000E+00

RESONANCE GROUP 23

BETA R Q
 1.04583E+00 3.22190E-01 8.77810E-01

NUCLIDE ARRAY AND CLUSTER CROSS-SECTION -----INPUT----- RESINT -----OUTPUT-----

MICROSCOPIC ABSORPTION CROSS-SECTIONS BEFORE INTERACTION CORRECTION
 2.23500E+03 3.85965E+01 1.57255E+03 1.30533E+03 3.93511E+01 3.86296E+01
 8.23800E+03 1.59022E+00 3.42940E+01 2.83581E+01 1.77822E+00 1.59837E+00
 MACROSCOPIC 5.23054E-02

MICROSCOPIC CROSS-SECTIONS AFTER INTERACTION BUT BEFORE FLUX DEPRESSION CORRECTION
 2.23500E+03 3.66313E+01 1.67233E+03 1.38287E+03 3.95841E+01 3.88415E+01
 2.23500E+03 2.44901E+01 1.67233E+03 1.38287E+03 2.83991E+01 2.59649E+01
 8.23800E+03 1.58842E+00 3.53389E+01 2.92222E+01 1.80890E+00 1.62457E+00

MICROSCOPIC CROSS-SECTIONS

ARRAY
 2235.0ABS 3.99630E+01
 2235.0FIS 2.67175E+01
 8238.0ABS 1.71108E+00

P = 0.93531E+00 FOR EACH REGION UP TO THE VOLUME FRACTION 0.30714E+00 OF REGION 3

FLUX DEPRESSION FACTOR = 0.91663E+00

FUEL CAN COOLANT MODERATOR
 F(P) 1.02618E+00 1.05449E+00 9.99217E-01 1.00000E+00

RESONANCE GROUP 24

BETA R Q
 1.04498E+00 3.31096E-01 8.68904E-01

NUCLIDE ARRAY AND CLUSTER CROSS-SECTION -----INPUT----- RESINT -----OUTPUT-----

MICROSCOPIC ABSORPTION CROSS-SECTIONS BEFORE INTERACTION CORRECTION
 2.23500E+03 6.12808E+01 1.58833E+03 1.30683E+03 6.33042E+01 6.13679E+01
 8.23800E+03 3.27416E+00 3.45064E+01 2.83864E+01 3.65633E+00 3.29061E+00
 MACROSCOPIC 9.91840E-02

MICROSCOPIC CROSS-SECTIONS AFTER INTERACTION BUT BEFORE FLUX DEPRESSION CORRECTION
 2.23500E+03 5.52706E+01 1.79542E+03 1.47699E+03 6.44372E+01 6.25612E+01
 2.23500E+03 3.15892E+01 1.79542E+03 1.47699E+03 3.67659E+01 3.57534E+01
 8.23800E+03 3.20280E+00 3.82044E+01 2.97833E+01 3.75197E+00 3.37726E+00

MICROSCOPIC CROSS-SECTIONS

ARRAY
 2235.0ABS 6.54190E+01
 2235.0FIS 3.73894E+01
 8238.0ABS 3.79087E+00

P = 0.86686E+00 FOR EACH REGION UP TO THE VOLUME FRACTION 0.32749E+00 OF REGION 3

FLUX DEPRESSION FACTOR = 0.84487E+00

FUEL CAN COOLANT MODERATOR
 F(P) 1.09920E+00 1.09920E+00 9.97866E-01 1.00000E+00

RESONANCE GROUP 25

BETA R Q
 1.04511E+00 3.20677E-01 8.69617E-01

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NUCLIDE   ARRAY AND CLUSTER CROSS-SECTION   RESINT   OUTPUT
MICROSCOPIC ABSORPTION CROSS-SECTIONS BEFORE INTERACTION CORRECTION
2.23500E+03  7.36780E+01  1.59499E+03  1.31398E+03  7.61437E+01  7.37844E+01
8.23800E+03  3.96704E+00  3.46509E+01  2.85461E+01  4.47817E+00  3.98910E+00
MACROSCOPIC  1.19906E-01
MICROSCOPIC CROSS-SECTIONS AFTER INTERACTION BUT BEFORE FLUX DEPRESSION CORRECTION
2.23500E+03  6.49965E+01  1.85242E+03  1.52606E+03  7.77741E+01  7.55856E+01
2.23500E+03  3.54387E+01  1.85242E+03  1.52606E+03  4.23553E+01  4.12101E+01
8.23800E+03  3.87233E+00  3.67093E+01  3.02419E+01  4.63766E+00  4.12547E+00
MICROSCOPIC CROSS-SECTIONS
ARRAY
2235.OABS  7.97617E+01
2235.OFIS  4.34993E+01
8238.OABS  4.75200E+00
P = 0.84257E+00 FOR EACH REGION UP TO THE VOLUME FRACTION 0.32732E+00 OF REGION 3
FLUX DEPRESSION FACTOR = 0.81488E+00
F(P)  FUEL  CAN  COOLANT  MODERATOR
      1.12232E+00  1.12232E+00  9.97340E-01  1.00000E+00
RESONANCE GROUP 26
BETA  R  Q
1.04782E+00  3.10044E-01  6.89956E-01
NUCLIDE   ARRAY AND CLUSTER CROSS-SECTION   RESINT   OUTPUT
MICROSCOPIC ABSORPTION CROSS-SECTIONS BEFORE INTERACTION CORRECTION
2.23500E+03  7.00922E+01  1.74822E+03  1.48647E+03  7.22888E+01  7.01924E+01
8.23800E+03  3.01851E-01  3.79799E+01  3.22934E+01  3.02840E-01  3.01896E-01
MACROSCOPIC  3.92947E-02
MICROSCOPIC CROSS-SECTIONS AFTER INTERACTION BUT BEFORE FLUX DEPRESSION CORRECTION
2.23500E+03  6.95000E+01  1.76471E+03  1.50043E+03  7.23943E+01  7.03153E+01
2.23500E+03  3.89870E+01  1.76471E+03  1.50043E+03  3.82760E+01  3.73789E+01
8.23800E+03  2.87877E-01  3.98594E+01  3.38915E+01  3.03136E-01  3.02169E-01
MICROSCOPIC CROSS-SECTIONS
ARRAY
2235.OABS  7.36638E+01
2235.OFIS  3.91692E+01
8238.OABS  3.04861E-01
P = 0.94635E+00 FOR EACH REGION UP TO THE VOLUME FRACTION 0.29958E+00 OF REGION 3
FLUX DEPRESSION FACTOR = 0.94429E+00
F(P)  FUEL  CAN  COOLANT  MODERATOR
      1.02069E+00  1.02991E+00  9.99313E-01  1.00000E+00
RESONANCE GROUP 27
BETA  R  Q
1.04430E+00  3.37799E-01  6.62201E-01
NUCLIDE   ARRAY AND CLUSTER CROSS-SECTION   RESINT   OUTPUT
MICROSCOPIC ABSORPTION CROSS-SECTIONS BEFORE INTERACTION CORRECTION
2.23500E+03  6.20577E+01  1.54804E+03  1.25992E+03  6.44654E+01  6.21599E+01
8.23800E+03  5.05157E+00  3.36310E+01  2.73718E+01  5.73590E+00  5.08060E+00
MACROSCOPIC  1.37828E-01
MICROSCOPIC CROSS-SECTIONS AFTER INTERACTION BUT BEFORE FLUX DEPRESSION CORRECTION
2.23500E+03  5.24715E+01  1.89840E+03  1.54507E+03  6.66003E+01  6.44427E+01
2.23500E+03  3.47526E+01  1.89840E+03  1.54507E+03  4.41442E+01  4.26827E+01
8.23800E+03  4.94616E+00  3.53734E+01  2.87896E+01  5.91299E+00  5.23255E+00
MICROSCOPIC CROSS-SECTIONS
ARRAY
2235.OABS  6.74746E+01
2235.OFIS  4.46893E+01
8238.OABS  6.36040E+00
P = 0.73391E+00 FOR EACH REGION UP TO THE VOLUME FRACTION 0.34113E+00 OF REGION 3
FLUX DEPRESSION FACTOR = 0.77765E+00
F(P)  FUEL  CAN  COOLANT  MODERATOR
      1.08859E+00  1.08859E+00  9.89038E-01  1.00000E+00
FILE 2
NUCLIDES  6
NUCLIDE IDENTIFICATIONS
3001 8016 6016 91 2235 8238
FILE 3
MATERIALS  3
NUMBER DENSITIES PRINTED IN U-MIX
FILE 4
ANNULI  3
MATERIAL  1  2  3
VOLUMES  1.2588E+00  3.4277E-01  1.9084E+00
UNUSED STORAGE, CHAIN 1  280592
UNUSED STORAGE, CHAIN 2  275584
HEAD COMPLETED
TIME FROM START  1.5 SECONDS.  TIME IN THIS MODULE  1.5 SECONDS.  UNUSED REGION THIS MODULE 1076 K BYTES.

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***** WIMS-E MODULE W-MIX *****
 READS FILES 2 & 3, FORMS MACROSCOPIC X-SECTIONS AND WRITES THESE TO FILE 3.
 FLUXES ETC READ FROM FILE 1 AND WRITTEN TO FILE 5.

LN 1 LT 0

CROSS-SECTIONS 6

GROUPS 69

MATERIALS 3

NO. OF MATERIALS TO BE PROCESSED AT A TIME 3

UNUSED STORAGE 230802 (IF MATERIALS PROCESSED SINGLY 270291)

MATERIAL	1	NUCLIDE	IDENTIFIER	NUMBER DENSITY
		235	6016	4.4008E-02
		238	2235	4.6737E-04
		6	8238	2.1536E-02

NUMBER OF REACTIONS 4

MATERIAL	2	NUCLIDE	IDENTIFIER	NUMBER DENSITY
		4	91	4.3260E-02

NUMBER OF REACTIONS 3

MATERIAL	3	NUCLIDE	IDENTIFIER	NUMBER DENSITY
		1	3001	3.3438E-02
		3	6016	1.6721E-02

NUMBER OF REACTIONS 3

READING FILE 1

RTIME 0.00000E+00 RIRRAD 0.00000E+00

WRITING FILE 5

NMESH 1 NGRP 1 NORDER 1

FLUX
1.00000E+00

AK BX BY BZ TC U
1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 1.0000E+00

RTIME 0.00000E+00 RIRRAD 0.00000E+00

SPARE ITEMS

0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00

MIX COMPLETED

TIME FROM START 1.6 SECONDS. TIME IN THIS MODULE 0.1 SECONDS. UNUSED REGION THIS MODULE 1054 K BYTES.

WHC-SD-NR-SWD-017

-C- WFLU 1

READS INTERFACE 1

FORTRAN DATA SETS 11-15

DSNAMES:

***** WIMS-E MODULE W-FLU *****
 UNUSED STORAGE 299761

-M- PRINT 9
 -M- LINES 2
 -M- BEGIN

NR OF MESHES = 3 NR OF MATERIALS = 3 NR OF GROUPS = 69
 REGION 1 2 3
 MATERIAL 1 2 3
 VOLUMES.

1.258802E+00 3.427697E-01 1.908370E+00

TRANSPORT X-SEC. GROUP BY MATERIAL.
 GROUP 1 0.985964E-01 0.100402E+00 0.462351E-01
 GROUP 2 0.128462E+00 0.117364E+00 0.624338E-01
 GROUP 3 0.123168E+00 0.138576E+00 0.882154E-01
 GROUP 4 0.177354E+00 0.157237E+00 0.823707E-01
 GROUP 5 0.269836E+00 0.212350E+00 0.109042E+00
 GROUP 6 0.245881E+00 0.293530E+00 0.114662E+00
 GROUP 7 0.405453E+00 0.298555E+00 0.146637E+00
 GROUP 8 0.355870E+00 0.275821E+00 0.156370E+00
 GROUP 9 0.387537E+00 0.283863E+00 0.161243E+00
 GROUP 10 0.388430E+00 0.281476E+00 0.167358E+00
 GROUP 11 0.397639E+00 0.343735E+00 0.183876E+00
 GROUP 12 0.393988E+00 0.353447E+00 0.204004E+00
 GROUP 13 0.393136E+00 0.372750E+00 0.218054E+00
 GROUP 14 0.388760E+00 0.321612E+00 0.230191E+00
 GROUP 15 0.411230E+00 0.406583E+00 0.241569E+00
 GROUP 16 0.416538E+00 0.627919E+00 0.249651E+00
 GROUP 17 0.407524E+00 0.352776E+00 0.252328E+00
 GROUP 18 0.415242E+00 0.341776E+00 0.256914E+00
 GROUP 19 0.417847E+00 0.230377E+00 0.264780E+00
 GROUP 20 0.422892E+00 0.266845E+00 0.272583E+00
 GROUP 21 0.429416E+00 0.360217E+00 0.279309E+00
 GROUP 22 0.451856E+00 0.245397E+00 0.282435E+00
 GROUP 23 0.445805E+00 0.246340E+00 0.284712E+00
 GROUP 24 0.447131E+00 0.246733E+00 0.284951E+00
 GROUP 25 0.529984E+00 0.246980E+00 0.285040E+00
 GROUP 26 0.431379E+00 0.247144E+00 0.284809E+00
 GROUP 27 0.558374E+00 0.247300E+00 0.286232E+00
 GROUP 28 0.375245E+00 0.296927E+00 0.322412E+00
 GROUP 29 0.385712E+00 0.297024E+00 0.328722E+00
 GROUP 30 0.357109E+00 0.297131E+00 0.336692E+00
 GROUP 31 0.382349E+00 0.297270E+00 0.349688E+00
 GROUP 32 0.381479E+00 0.297410E+00 0.363430E+00
 GROUP 33 0.383393E+00 0.297494E+00 0.372248E+00
 GROUP 34 0.416186E+00 0.297542E+00 0.377436E+00
 GROUP 35 0.414525E+00 0.297559E+00 0.379179E+00
 GROUP 36 0.406545E+00 0.297572E+00 0.380927E+00
 GROUP 37 0.398393E+00 0.297589E+00 0.382735E+00
 GROUP 38 0.392398E+00 0.297607E+00 0.384603E+00
 GROUP 39 0.388194E+00 0.297624E+00 0.386499E+00
 GROUP 40 0.385381E+00 0.297641E+00 0.388452E+00
 GROUP 41 0.383406E+00 0.297658E+00 0.390323E+00
 GROUP 42 0.381710E+00 0.297684E+00 0.392940E+00
 GROUP 43 0.380164E+00 0.297723E+00 0.397776E+00
 GROUP 44 0.379607E+00 0.297783E+00 0.405242E+00
 GROUP 45 0.382703E+00 0.297916E+00 0.421276E+00
 GROUP 46 0.390767E+00 0.298123E+00 0.449237E+00
 GROUP 47 0.407200E+00 0.298355E+00 0.483741E+00
 GROUP 48 0.429146E+00 0.298565E+00 0.515053E+00
 GROUP 49 0.449788E+00 0.298710E+00 0.536081E+00
 GROUP 50 0.463596E+00 0.298813E+00 0.551048E+00
 GROUP 51 0.470960E+00 0.298908E+00 0.564373E+00
 GROUP 52 0.470135E+00 0.299045E+00 0.583210E+00
 GROUP 53 0.464847E+00 0.299233E+00 0.608963E+00
 GROUP 54 0.462873E+00 0.299520E+00 0.646610E+00
 GROUP 55 0.471289E+00 0.299964E+00 0.703931E+00
 GROUP 56 0.493667E+00 0.300843E+00 0.784572E+00
 GROUP 57 0.522814E+00 0.301414E+00 0.872457E+00
 GROUP 58 0.545920E+00 0.302044E+00 0.936468E+00
 GROUP 59 0.568654E+00 0.302823E+00 0.987150E+00
 GROUP 60 0.590286E+00 0.303205E+00 0.104061E+01
 GROUP 61 0.616044E+00 0.303918E+00 0.111595E+01
 GROUP 62 0.647245E+00 0.304800E+00 0.122233E+01
 GROUP 63 0.679491E+00 0.305745E+00 0.134320E+01
 GROUP 64 0.714471E+00 0.306803E+00 0.147585E+01
 GROUP 65 0.760599E+00 0.308256E+00 0.164557E+01
 GROUP 66 0.825533E+00 0.310401E+00 0.186791E+01
 GROUP 67 0.925094E+00 0.313989E+00 0.217867E+01
 GROUP 68 0.111253E+01 0.321579E+00 0.269214E+01
 GROUP 69 0.167069E+01 0.352199E+00 0.404584E+01
 FLU COMPLETED

TIME FROM START 1.7 SECONDS. TIME IN THIS MODULE 0.1 SECONDS. UNUSED REGION THIS MODULE 170 K BYTES.

WHC-SD-NR-SWD-017

-C- WPIP 1

READS INTERFACE 1

FORTRAN DATA SETS 11-15

DSNAMES:

***** WIMS-E MODULE W-PIP *****

ALL COLLISION PROBABILITIES WILL BE HELD IN FAST STORE.
 UNUSED STORAGE 281542

-M- TOLERANCE .00001

-M- OMEGA 1.25

-M- BEGIN

REGION	1	2	3
MATERIAL	1	2	3
VOLUMES	1.2588E+00	3.4277E-01	1.9084E+00

CALCULATION CONVERGED IN 78 ITERATIONS.

K-INFINITY = 1.207084

FLUX.

REGION 1	1.28078E-01	4.82374E-01	1.11536E+00	1.16922E+00	1.24139E+00	1.48657E+00	9.67921E-01	8.35618E-01	6.54802E-01
	5.24201E-01	4.56790E-01	4.00565E-01	3.71991E-01	3.50056E-01	3.35683E-01	2.94444E-01	2.93249E-01	2.86562E-01
	2.82142E-01	5.45362E-01	5.16755E-01	3.82279E-01	2.36358E-01	2.56737E-01	2.34393E-01	2.23988E-01	3.33936E-01
	8.03945E-02	1.02586E-01	9.46468E-02	1.50302E-01	5.47183E-02	5.42810E-02	1.01818E-02	1.00453E-02	1.03682E-02
	1.07286E-02	1.06537E-02	1.05459E-02	1.08626E-02	1.02440E-02	1.93595E-02	3.09551E-02	3.94417E-02	1.03747E-01
	1.07502E-01	1.11430E-01	7.01703E-02	4.94326E-02	3.72661E-02	4.19537E-02	7.49970E-02	9.51056E-02	1.72016E-01
	2.46701E-01	3.46506E-01	2.12687E-01	1.48801E-01	1.04945E-01	9.24666E-02	8.93563E-02	7.34348E-02	4.64046E-02
	4.39161E-02	3.83616E-02	3.16108E-02	2.35931E-02	1.42956E-02	4.22318E-03			
TOTAL	1.74881E+01								
REGION 2	1.21030E-01	4.81304E-01	1.07296E+00	1.12839E+00	1.19895E+00	1.43806E+00	9.43655E-01	8.16200E-01	6.44840E-01
	5.21602E-01	4.54084E-01	4.01055E-01	3.72807E-01	3.51492E-01	3.38036E-01	2.98865E-01	2.94828E-01	2.88888E-01
	2.84743E-01	5.51353E-01	5.23086E-01	3.70548E-01	2.41162E-01	2.67599E-01	2.46757E-01	2.27433E-01	3.55181E-01
	8.12682E-02	1.03722E-01	9.52830E-02	1.51495E-01	6.52161E-02	5.50830E-02	1.04351E-02	1.02952E-02	1.06027E-02
	1.09429E-02	1.08486E-02	1.07243E-02	1.10373E-02	1.04025E-02	1.96482E-02	3.13983E-02	3.99946E-02	1.05255E-01
	1.09311E-01	1.13850E-01	7.21823E-02	5.11697E-02	3.87389E-02	4.37019E-02	7.81260E-02	9.89768E-02	1.79106E-01
	2.57886E-01	3.65931E-01	2.27234E-01	1.60145E-01	1.13856E-01	1.01087E-01	9.85416E-02	8.17938E-02	5.44619E-02
	4.99561E-02	4.42578E-02	3.71943E-02	2.85980E-02	1.82921E-02	6.27207E-03			
TOTAL	1.74752E+01								
REGION 3	1.20367E-01	4.56429E-01	1.05807E+00	1.10447E+00	1.16578E+00	1.39138E+00	9.27006E-01	7.99790E-01	6.36140E-01
	5.19255E-01	4.52641E-01	4.00919E-01	3.72855E-01	3.52703E-01	3.39822E-01	2.98919E-01	2.96351E-01	2.90793E-01
	2.86484E-01	5.55977E-01	5.29800E-01	3.76025E-01	2.44359E-01	2.74676E-01	2.54756E-01	2.29725E-01	3.68760E-01
	8.19091E-02	1.04540E-01	9.57548E-02	1.52352E-01	6.55853E-02	5.56421E-02	1.06020E-02	1.04628E-02	1.07640E-02
	1.10954E-02	1.09879E-02	1.08539E-02	1.11636E-02	1.05169E-02	1.98565E-02	3.17193E-02	4.03945E-02	1.06349E-01
	1.10617E-01	1.15558E-01	7.35940E-02	5.23863E-02	3.97858E-02	4.49208E-02	8.03320E-02	1.01761E-01	1.84313E-01
	2.66383E-01	3.80287E-01	2.37640E-01	1.88410E-01	1.20416E-01	1.07480E-01	1.05403E-01	8.80992E-02	5.90876E-02
	5.48317E-02	4.88962E-02	4.16678E-02	3.26887E-02	2.16367E-02	8.02325E-03			
TOTAL	1.74836E+01								

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FOR EACH GROUP, POINT INTERVALS ARE UNIFORMED. THE POINTS ARE NOT NECESSARILY EQUIDISTANT.

GROUP 1	1.58707539E-01	4.14854029E-02	2.29704363E-01	4.29897305E-01
GROUP 2	6.07213519E-01	1.58120955E-01	8.71036141E-01	1.63637061E+00
GROUP 3	1.40402166E+00	3.87777971E-01	2.01919326E+00	3.79099289E+00
GROUP 4	1.47181240E+00	3.86779057E-01	2.10774180E+00	3.96633325E+00
GROUP 5	1.56266853E+00	4.10962920E-01	2.22473802E+00	4.19836947E+00
GROUP 6	1.87129527E+00	4.92236910E-01	2.65526481E+00	5.01879699E+00
GROUP 7	1.21842112E+00	3.23456541E-01	1.75952791E+00	3.30140558E+00
GROUP 8	1.05187688E+00	2.79762793E-01	1.52629494E+00	2.85794062E+00
GROUP 9	8.24265285E-01	2.21031725E-01	1.21399113E+00	2.25928813E+00
GROUP 10	6.59864512E-01	1.78789425E-01	9.90930151E-01	1.82958409E+00
GROUP 11	5.75007427E-01	1.55846400E-01	8.63806526E-01	1.59446035E+00
GROUP 12	5.04232229E-01	1.37469541E-01	7.65102819E-01	1.40680439E+00
GROUP 13	4.88263053E-01	1.27786981E-01	7.11544950E-01	1.30759498E+00
GROUP 14	4.40651327E-01	1.20430834E-01	6.73087708E-01	1.23421987E+00
GROUP 15	4.22558726E-01	1.15868413E-01	6.48124144E-01	1.18655128E+00
GROUP 16	3.70846227E-01	1.01756271E-01	5.70447729E-01	1.04285023E+00
GROUP 17	3.89142892E-01	1.01058278E-01	5.65546470E-01	1.03574764E+00
GROUP 18	3.80724248E-01	9.90151218E-02	5.54920687E-01	1.01466006E+00
GROUP 19	3.55160938E-01	9.76012878E-02	5.48717264E-01	9.99479488E-01
GROUP 20	6.86502536E-01	1.88987261E-01	1.06100890E+00	1.93649970E+00
GROUP 21	6.50492199E-01	1.79298016E-01	1.01105350E+00	1.84084372E+00
GROUP 22	4.58037711E-01	1.27012815E-01	7.17594228E-01	1.30064475E+00
GROUP 23	2.97527725E-01	8.26630551E-02	4.66326710E-01	8.46517490E-01
GROUP 24	3.23180967E-01	9.17247054E-02	5.24182963E-01	9.39088636E-01
GROUP 25	2.95054629E-01	8.45808733E-02	4.86167760E-01	8.65803263E-01
GROUP 26	2.81956036E-01	7.79571852E-02	4.38401074E-01	7.98314275E-01
GROUP 27	4.20358834E-01	1.21745216E-01	7.03729757E-01	1.24583381E+00
GROUP 28	1.01200722E-01	2.78562789E-02	1.56312770E-01	2.85369771E-01
GROUP 29	1.29135607E-01	3.55527409E-02	1.99501523E-01	3.84189870E-01
GROUP 30	1.19141504E-01	3.26601391E-02	1.82735546E-01	3.34537190E-01
GROUP 31	1.89200003E-01	5.19278710E-02	2.90744038E-01	5.31871913E-01
GROUP 32	8.14674843E-02	2.23540929E-02	1.25160938E-01	2.28982514E-01
GROUP 33	6.83290381E-02	1.88807752E-02	1.06185758E-01	1.93395570E-01
GROUP 34	1.28169151E-02	3.57883950E-03	2.02325819E-02	3.66263366E-02
GROUP 35	1.26450419E-02	3.52888903E-03	1.99668101E-02	3.61407410E-02
GROUP 36	1.30514936E-02	3.83429568E-03	2.05417390E-02	3.72275283E-02
GROUP 37	1.35026228E-02	3.75088603E-03	2.11740437E-02	3.84275526E-02
GROUP 38	1.34109274E-02	3.71855609E-03	2.09689809E-02	3.80984644E-02
GROUP 39	1.32752350E-02	3.67617145E-03	2.07132229E-02	3.76646293E-02
GROUP 40	1.36738094E-02	3.78328641E-03	2.13042922E-02	3.87613680E-02
GROUP 41	1.28952218E-02	3.56564880E-03	2.00701868E-02	3.65310574E-02
GROUP 42	2.43898244E-02	6.73481197E-03	3.78938408E-02	6.89982772E-02
GROUP 43	3.89863435E-02	1.07627383E-02	8.05322315E-02	1.10281311E-01
GROUP 44	4.96492783E-02	1.37089438E-02	7.70875894E-02	1.40445811E-01
GROUP 45	1.30597409E-01	3.60781055E-02	2.02952653E-01	3.89628168E-01
GROUP 46	1.35323634E-01	3.74683726E-02	2.11097648E-01	3.83889652E-01
GROUP 47	1.40268479E-01	3.90242176E-02	2.20527091E-01	3.99819788E-01
GROUP 48	8.83305229E-02	2.47419134E-02	1.40444553E-01	2.53516989E-01
GROUP 49	6.22258038E-02	1.75394139E-02	9.99724932E-02	1.79737711E-01
GROUP 50	4.69105999E-02	1.32785341E-02	7.58878419E-02	1.36076976E-01
GROUP 51	5.28114016E-02	1.49796959E-02	8.57255896E-02	1.53516687E-01
GROUP 52	9.44062841E-02	2.67792245E-02	1.53303258E-01	2.74488766E-01
GROUP 53	1.19719093E-01	3.39262651E-02	1.94198541E-01	3.47843899E-01
GROUP 54	2.16533957E-01	6.13921949E-02	3.51738044E-01	6.29684195E-01
GROUP 55	3.10547561E-01	8.83955584E-02	5.08318263E-01	9.07261381E-01
GROUP 56	4.36182685E-01	1.25430150E-01	7.25728941E-01	1.28734178E+00
GROUP 57	2.67731007E-01	7.78889749E-02	4.53505363E-01	7.99125344E-01
GROUP 58	1.87311352E-01	5.48929724E-02	3.21389438E-01	5.63593763E-01
GROUP 59	1.32104423E-01	3.90284737E-02	2.29797534E-01	4.00928430E-01
GROUP 60	1.16397072E-01	3.46494307E-02	2.05112538E-01	3.56159041E-01
GROUP 61	1.12481864E-01	3.37770895E-02	2.01148814E-01	3.47407767E-01
GROUP 62	9.24399054E-02	2.80364291E-02	1.68125773E-01	2.88802107E-01
GROUP 63	6.09318059E-02	1.86679075E-02	1.12761099E-01	1.92360799E-01

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GROUP 65	4.62836492E-02	1.51702800E-02	9.09120708E-02	1.56477194E-01
GROUP 66	3.97917018E-02	1.27490771E-02	7.95175471E-02	1.32058326E-01
GROUP 67	2.98990089E-02	9.80185705E-03	6.23820590E-02	1.01882925E-01
GROUP 68	1.79953485E-02	6.26996808E-03	4.12908747E-02	6.55561913E-02
GROUP 69	5.31614438E-03	2.14987446E-03	1.53113231E-02	2.27773419E-02
	2.20140038E+01	5.98997223E+00	3.33651183E+01	

PIP COMPLETED

TIME FROM START 1.9 SECONDS. TIME IN THIS MODULE 0.2 SECONDS. UNUSED REGION THIS MODULE 1098 K BYTES.

-C- WINTER 1

READS INTERFACE 1

FORTRAN DATA SETS 11-15

OSNAMES:

***** WIMS-E MODULE W-INTER *****

-M- PRINT FILE 3 4 5
-M- BEGIN

WHC-SD-NR-SWD-017

FILE 3

NUMBER DENSITIES			NO. OF MATERIALS			GROUPS			NO. OF MATERIALS			GROUPS		
NUCL	MATL	NO.DENSITY	NUCL	MATL	NO.DENSITY	NUCL	MATL	NO.DENSITY	NUCL	MATL	NO.DENSITY	NUCL	MATL	NO.DENSITY
1	3	3.3438E-02	2	1	4.4009E-02	3	3	1.6721E-02	4	2	4.3260E-02	5	1	4.6787E-04
6	1	2.1536E-02												

FOR EACH MATERIAL
*****

MATERIAL 1 NO. OF REACTIONS
4

FILE 3
*****

ABSORPTION
*****

REACTION NAME	NUMBER OF SECONDARY NEUTRONS	NUMBER OF P-N ORDERS	NUMBER OF ENERGY RANGES FOR PRIMARY DATA
1	0	1	1

FIRST + LAST PRIMARY GROUPS
1 69

MOMENT 0

PRIMARY SIGMA

1.54581E-02	1.55186E-02	1.35942E-02	1.11160E-02	3.92852E-03	3.63478E-03
3.45720E-03	4.27018E-03	5.81508E-03	7.35498E-03	9.27924E-03	1.18605E-02
1.37732E-02	1.58366E-02	2.01077E-02	2.46289E-02	1.58890E-02	2.35956E-02
2.52886E-02	3.13707E-02	3.84614E-02	5.16795E-02	5.25474E-02	1.12248E-01
1.39858E-01	4.10306E-02	1.68547E-01	3.47602E-02	2.59956E-02	1.71483E-02
2.27444E-02	2.18321E-02	4.39746E-02	7.68399E-02	7.52084E-02	6.72237E-02
5.30631E-02	5.30596E-02	4.88453E-02	4.60184E-02	4.40341E-02	4.23295E-02
4.07636E-02	4.01966E-02	4.25818E-02	5.06592E-02	6.70608E-02	8.91592E-02
1.09614E-01	1.23338E-01	1.30298E-01	1.30018E-01	1.26198E-01	1.25536E-01
1.32761E-01	1.53856E-01	1.81922E-01	2.04839E-01	2.25754E-01	2.45882E-01
2.70519E-01	2.99644E-01	3.29143E-01	3.61148E-01	4.03085E-01	4.61970E-01
5.50980E-01	7.15653E-01	1.19060E+00			

TRANSPORT
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REACTION NAME	NUMBER OF SECONDARY NEUTRONS	NUMBER OF P-N ORDERS	NUMBER OF ENERGY RANGES FOR PRIMARY DATA
2	0	1	1

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.....

FIRST * LAST PRIMARY GROUPS
1 69

RADIAL

PRIMARY SIGMA

9.86964E-02 1.28462E-01 1.23168E-01 1.77354E-01 2.69886E-01 2.46881E-01
 4.05453E-01 3.55870E-01 3.87537E-01 3.88430E-01 3.97639E-01 3.93986E-01
 3.93139E-01 3.86760E-01 4.11230E-01 4.16538E-01 4.07524E-01 4.15242E-01
 4.17847E-01 4.22892E-01 4.29416E-01 4.51956E-01 4.45805E-01 5.03473E-01
 5.23984E-01 4.31379E-01 5.58374E-01 3.75245E-01 3.65712E-01 3.57109E-01
 3.62349E-01 3.61479E-01 3.83393E-01 4.16196E-01 4.14525E-01 4.06545E-01
 3.98393E-01 3.92398E-01 3.88194E-01 3.85381E-01 3.83406E-01 3.81710E-01
 3.80164E-01 3.79607E-01 3.82703E-01 3.90767E-01 4.07200E-01 4.29146E-01
 4.49788E-01 4.67595E-01 4.70960E-01 4.70135E-01 4.64847E-01 4.62973E-01
 4.71289E-01 4.93667E-01 5.22814E-01 5.46920E-01 5.68654E-01 5.90286E-01
 6.16044E-01 6.47245E-01 6.79491E-01 7.14471E-01 7.60599E-01 8.25533E-01
 9.25094E-01 1.11263E+00 1.67069E+00

SCATTER
*****

REACTION NUMBER OF NUMBER OF NUMBER OF
NAME SECONDARY P-N ENERGY RANGES FOR
3 1 1 1
ORDERS PRIMARY DATA

FIRST * LAST PRIMARY GROUPS
1 69

MOMENT 0

PRIMARY SIGMA

1.76549E-01 2.30183E-01 1.33023E-01 1.86478E-01 2.93625E-01 2.58237E-01
 4.51180E-01 3.45310E-01 3.79251E-01 4.08486E-01 4.28586E-01 4.48768E-01
 4.69054E-01 4.77020E-01 3.98114E-01 3.98898E-01 3.98457E-01 3.98477E-01
 3.99369E-01 3.98351E-01 3.97731E-01 3.97007E-01 3.97109E-01 3.98091E-01
 3.97286E-01 3.97220E-01 3.96972E-01 3.47177E-01 3.47081E-01 3.47295E-01
 3.46376E-01 3.47031E-01 3.46754E-01 3.46687E-01 3.46651E-01 3.46659E-01
 3.46668E-01 3.46676E-01 3.46685E-01 3.46697E-01 3.46708E-01 3.46717E-01
 3.46739E-01 3.46746E-01 3.47459E-01 3.47447E-01 3.47474E-01 3.47322E-01
 3.47510E-01 3.47595E-01 3.47684E-01 3.47826E-01 3.48021E-01 3.48260E-01
 3.48803E-01 3.49731E-01 3.50824E-01 3.51833E-01 3.52800E-01 3.53829E-01
 3.55139E-01 3.56659E-01 3.58793E-01 3.61046E-01 3.64293E-01 3.69372E-01
 3.78417E-01 3.98786E-01 4.76014E-01

NO. OF ENERGY RANGES FOR SECONDARY DATA

FIRST * LAST PRIMARY GROUPS
1 69

FOR EACH PRIMARY GROUP

GROUP NO 1 JFST 1 JLST 20 MOMENT 0

SCATTER SPECTRUM

5.8851E-01 5.0687E-02 2.0254E-02 5.2948E-02 7.9489E-02 7.7783E-02 5.6396E-02 3.5911E-02 2.4212E-02 8.6119E-03
 3.3150E-03 1.2080E-03 4.3300E-04 1.5567E-04 5.7847E-05 2.0287E-05 8.2661E-06 3.3599E-06 1.4071E-06 3.1935E-08

GROUP NO 2 JFST 2 JLST 18 MOMENT 0

SCATTER SPECTRUM

6.4732E-01 1.1967E-01 3.4217E-02 8.0414E-02 5.9054E-02 4.0657E-02 2.1705E-02 9.9510E-03 4.2163E-03 1.6874E-03
 6.5001E-04 2.4780E-04 9.3165E-05 3.4694E-05 1.2113E-05 4.9631E-06 2.0554E-06

GROUP NO 3 JFST 3 JLST 18 MOMENT 0

SCATTER SPECTRUM

5.3952E-01 8.5251E-02 9.0864E-02 1.1125E-01 8.6787E-02 4.9227E-02 3.6973E-02 9.2924E-05 3.6868E-05 1.4207E-05
 5.3809E-06 2.0192E-06 7.5289E-07 2.6261E-07 1.0759E-07 4.5170E-08

GROUP NO 4 JFST 4 JLST 18 MOMENT 0

SCATTER SPECTRUM

6.4084E-01 2.2140E-01 1.0104E-01 2.5109E-02 3.7161E-03 7.7363E-03 9.8947E-05 4.0113E-05 1.5642E-05 5.9626E-06
 2.2499E-06 8.3978E-07 2.9437E-07 1.2089E-07 5.0882E-08

GROUP NO 5 JFST 5 JLST 18 MOMENT 0

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SCATTER SPECTRUM
 7.8803E-01 2.0388E-01 2.0416E-02 6.8221E-03 7.3714E-04 6.7756E-05 2.8227E-05 1.1183E-05 4.3069E-06 1.6297E-06
 6.1193E-07 2.1426E-07 8.7658E-08 3.5940E-08

GROUP NO 6 JFST 6 JLST 18 MOMENT 0

SCATTER SPECTRUM
 8.5867E-01 1.4286E-01 2.5245E-04 1.1865E-04 4.9862E-05 2.8800E-05 8.4360E-06 3.2815E-06 1.2477E-06 4.7095E-07
 1.6520E-07 6.7646E-08 2.7645E-08

GROUP NO 7 JFST 7 JLST 15 MOMENT 0

SCATTER SPECTRUM
 8.5598E-01 1.4383E-01 1.1094E-04 3.7858E-05 2.3146E-05 1.0584E-05 4.9947E-06 1.7504E-06 4.6292E-07

GROUP NO 8 JFST 8 JLST 21 MOMENT 0

SCATTER SPECTRUM
 8.4911E-01 1.5075E-01 9.7148E-05 2.2639E-05 1.2759E-05 5.8353E-06 2.9708E-06 1.5154E-06 9.6147E-07 5.6190E-07
 3.4098E-07 2.1217E-07 1.5935E-07 2.1982E-08

GROUP NO 9 JFST 9 JLST 16 MOMENT 0

SCATTER SPECTRUM
 8.6646E-01 1.2212E-01 1.1396E-02 2.0470E-05 1.5941E-06 4.9944E-07 1.3760E-07 2.0704E-08

GROUP NO 10 JFST 10 JLST 19 MOMENT 0

SCATTER SPECTRUM
 8.7822E-01 1.1594E-01 3.4722E-03 2.3664E-03 2.0786E-06 4.8353E-07 1.8390E-07 8.8843E-08 4.4881E-08 1.5822E-08

GROUP NO 11 JFST 11 JLST 19 MOMENT 0

SCATTER SPECTRUM
 8.9749E-01 9.7195E-02 3.8282E-03 1.4816E-03 4.9852E-06 6.4681E-07 1.7199E-07 6.2228E-08 2.7543E-08

FILE 3
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GROUP NO 12 JFST 12 JLST 14 MOMENT 0

SCATTER SPECTRUM
 9.0282E-01 9.7182E-02 2.0393E-06

GROUP NO 13 JFST 13 JLST 15 MOMENT 0

SCATTER SPECTRUM
 9.0820E-01 9.1795E-02 3.7276E-07

GROUP NO 14 JFST 14 JLST 15 MOMENT 0

SCATTER SPECTRUM
 9.0911E-01 9.0897E-02

GROUP NO 15 JFST 15 JLST 16 MOMENT 0

SCATTER SPECTRUM
 8.8928E-01 1.1072E-01

GROUP NO 16 JFST 16 JLST 17 MOMENT 0

SCATTER SPECTRUM
 8.7835E-01 1.2165E-01

GROUP NO 17 JFST 17 JLST 18 MOMENT 0

SCATTER SPECTRUM
 8.7874E-01 1.2126E-01

GROUP NO 18 JFST 18 JLST 19 MOMENT 0

SCATTER SPECTRUM
 8.7838E-01 1.2164E-01

GROUP NO 19 JFST 19 JLST 20 MOMENT 0

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SCATTER SPECTRUM
8.7848E-01 1.2153E-01
GROUP NO 20 JFST 20 JLST 21 MOMENT 0

SCATTER SPECTRUM
9.3932E-01 6.0881E-02
GROUP NO 21 JFST 21 JLST 22 MOMENT 0

SCATTER SPECTRUM
9.3905E-01 6.0944E-02
GROUP NO 22 JFST 22 JLST 23 MOMENT 0

SCATTER SPECTRUM
9.1631E-01 8.3688E-02
GROUP NO 23 JFST 23 JLST 24 MOMENT 0

SCATTER SPECTRUM
8.7602E-01 1.2398E-01
GROUP NO 24 JFST 24 JLST 25 MOMENT 0

SCATTER SPECTRUM
8.9129E-01 1.0871E-01
GROUP NO 25 JFST 25 JLST 26 MOMENT 0

SCATTER SPECTRUM
8.8881E-01 1.1119E-01
GROUP NO 26 JFST 26 JLST 27 MOMENT 0

SCATTER SPECTRUM
8.8403E-01 1.1597E-01

FILE 3
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GROUP NO 27 JFST 27 JLST 31 MOMENT 0

SCATTER SPECTRUM
9.3423E-01 8.0261E-02 5.5015E-03 2.8739E-06 8.9254E-12

GROUP NO 28 JFST 27 JLST 69 MOMENT 0

SCATTER SPECTRUM
7.3746E-03 7.1601E-01 2.5495E-01 2.1229E-02 4.3488E-04 4.4594E-08 3.8386E-10 2.8888E-12 1.2060E-12 5.1813E-13
2.1656E-13 8.5865E-14 3.4251E-14 1.4143E-14 5.3952E-15 3.1065E-15 6.8015E-16 4.9950E-17 1.7884E-18 3.4457E-20
6.9672E-21 2.1006E-20 1.1740E-20 4.0820E-20 4.1488E-20 7.1479E-21 1.2786E-20 1.7975E-20 3.2784E-20 2.7688E-20
0.0000E+00 5.0577E-21 0.0000E+00 0.0000E+00 8.1103E-21 0.0000E+00 7.4812E-21 5.1698E-21 1.4627E-20 8.6287E-21
0.0000E+00 2.5593E-04 4.7245E-07

GROUP NO 29 JFST 27 JLST 68 MOMENT 0

SCATTER SPECTRUM
3.3841E-07 8.0698E-03 7.5490E-01 2.0842E-01 2.8520E-02 9.3202E-05 3.5384E-06 7.7578E-08 4.1277E-08 2.2865E-08
1.2050E-08 6.1074E-09 3.0963E-09 1.8211E-09 7.7959E-10 5.9800E-10 2.0799E-10 2.9482E-11 2.3698E-12 2.4685E-15
2.2445E-18 2.7508E-20 4.0986E-20 2.5037E-20 3.7731E-20 7.6280E-21 2.7599E-20 1.5646E-20 5.8495E-21 9.5762E-21
7.2050E-21 6.8354E-21 2.0518E-20 1.6836E-20 1.5286E-20 1.0618E-20 7.6843E-21 1.0259E-20 0.0000E+00 0.0000E+00
0.0000E+00 6.2910E-21

GROUP NO 30 JFST 27 JLST 69 MOMENT 0

SCATTER SPECTRUM
3.0319E-12 3.7522E-07 1.2971E-02 7.3386E-01 2.4557E-01 6.7679E-03 7.4642E-04 3.3787E-05 2.1439E-05 1.3968E-05
8.9188E-06 5.4084E-06 3.2685E-06 2.0381E-06 1.1642E-06 1.1100E-06 5.5107E-07 1.2904E-07 1.9732E-08 8.6075E-11
2.9164E-13 9.1575E-16 2.8332E-17 2.6674E-18 5.5221E-19 1.2144E-19 1.0105E-20 1.1468E-20 7.8996E-21 2.7309E-20
3.2704E-20 8.9320E-21 3.0080E-20 3.9266E-20 1.0241E-20 3.8083E-20 3.3752E-20 8.2407E-21 1.0049E-20 9.5803E-21
6.9899E-21 2.2301E-20 2.7584E-20

GROUP NO 31 JFST 28 JLST 69 MOMENT 0

SCATTER SPECTRUM
3.1014E-11 5.1464E-06 1.1334E-02 8.0978E-01 1.2515E-01 3.7274E-02 3.7106E-03 2.9205E-03 2.3617E-03 1.8810E-03
1.4242E-03 1.0705E-03 8.2982E-04 5.8705E-04 7.3958E-04 5.8036E-04 2.5697E-04 9.3874E-05 2.4297E-06 4.4471E-08
6.3843E-10 4.5037E-11 7.0963E-12 2.1595E-12 7.1220E-13 8.8322E-14 9.0581E-15 2.5440E-16 3.5589E-18 2.4564E-20
8.0695E-21 1.4773E-20 9.5058E-21 1.5709E-20 2.0656E-20 2.6427E-20 7.7132E-21 1.3481E-20 1.9041E-20 1.9726E-20
2.1586E-20 2.7214E-20

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GROUP NO 32 JFST 28 JLST 69 MOMENT 0

SCATTER SPECTRUM

1.8592E-17	1.1853E-10	1.8826E-06	4.0803E-02	6.5212E-01	1.8765E-01	1.9502E-02	1.8765E-02	1.4803E-02	1.2902E-02
1.0702E-02	8.8000E-03	7.4614E-03	5.7614E-03	8.1479E-03	7.7168E-03	4.4108E-03	2.3277E-03	1.1723E-04	3.9378E-06
9.8730E-08	9.1816E-09	1.7415E-09	6.1289E-10	2.3989E-10	3.7739E-11	5.0454E-12	2.0418E-13	4.2963E-15	3.2664E-17
1.5886E-18	1.7021E-19	3.0300E-20	7.7083E-21	1.1234E-20	1.5896E-20	3.8077E-20	1.5447E-20	1.3190E-20	2.5364E-20
1.7376E-20	4.4558E-20								

GROUP NO 33 JFST 28 JLST 69 MOMENT 0

SCATTER SPECTRUM

2.6295E-20	7.4850E-13	3.6637E-08	1.8372E-03	5.3347E-02	6.1852E-01	7.3937E-02	4.0930E-02	3.0279E-02	2.6507E-02
2.3235E-02	2.0283E-02	1.8237E-02	1.4908E-02	2.2806E-02	2.4743E-02	1.7157E-02	1.2180E-02	1.0321E-03	5.6217E-05
2.0955E-06	2.4934E-07	5.4833E-08	2.1625E-08	9.6955E-09	1.8390E-09	3.0733E-10	1.6390E-11	4.7593E-13	5.1799E-15
3.0890E-16	3.6027E-17	7.2877E-18	1.5998E-18	2.8314E-19	4.9167E-20	1.8154E-20	3.9789E-20	7.1995E-21	9.8633E-21
1.7101E-20	2.9075E-20								

GROUP NO 34 JFST 28 JLST 69 MOMENT 0

SCATTER SPECTRUM

2.3048E-20	2.4049E-14	2.8723E-09	3.2718E-04	8.5783E-03	1.5898E-01	2.7643E-01	1.9086E-01	8.3587E-02	4.3016E-02
3.1593E-02	2.7620E-02	2.5698E-02	2.1728E-02	3.4549E-02	3.9705E-02	2.9985E-02	2.4546E-02	2.6161E-02	1.7480E-04
7.6868E-06	9.9727E-07	2.3149E-07	9.5186E-08	4.4831E-08	9.0868E-09	1.6140E-09	9.6060E-11	3.0994E-12	3.7755E-14
2.3963E-15	2.9193E-16	6.1083E-17	1.3859E-17	2.5223E-18	4.3418E-19	1.2699E-19	3.0294E-20	7.6996E-21	1.0770E-20
9.6293E-21	3.3950E-20								

GROUP NO 35 JFST 28 JLST 69 MOMENT 0

SCATTER SPECTRUM

1.1202E-20	9.9292E-15	1.3239E-09	2.0164E-04	5.8440E-03	6.3013E-02	1.0275E-01	2.7193E-01	1.9387E-01	8.3939E-02
4.1763E-02	3.0825E-02	2.8029E-02	2.3934E-02	3.8773E-02	4.5602E-02	3.5386E-02	3.0514E-02	2.5565E-03	2.5899E-04
1.2270E-05	1.6580E-06	3.9501E-07	1.6579E-07	8.0040E-08	1.6781E-08	3.0977E-09	1.9433E-10	6.6526E-12	8.6523E-14
5.7025E-15	7.1348E-16	1.5247E-16	3.5318E-17	6.5689E-18	1.1546E-18	3.2685E-19	8.4006E-20	2.2677E-20	3.2161E-20
2.9263E-20	1.0583E-20								

FILE 3
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GROUP NO 36 JFST 28 JLST 69 MOMENT 0

SCATTER SPECTRUM

2.3172E-20	4.0832E-15	6.5276E-10	1.2372E-04	3.6963E-03	3.7273E-02	2.9958E-02	1.0158E-01	2.7479E-01	1.9427E-01
8.1055E-02	4.0932E-02	3.1368E-02	2.6117E-02	4.2915E-02	5.1869E-02	4.1361E-02	3.7499E-02	4.7736E-03	3.7846E-04
1.9304E-05	2.7160E-06	6.6399E-07	2.8442E-07	1.4072E-07	3.0509E-08	5.8517E-09	3.8684E-10	1.4045E-11	1.9502E-13
1.3341E-14	1.7144E-15	3.7411E-16	8.8473E-17	1.6816E-17	2.9921E-18	8.6874E-19	2.1709E-19	4.6805E-20	9.4907E-21
8.7808E-21	3.2536E-20								

GROUP NO 37 JFST 28 JLST 69 MOMENT 0

SCATTER SPECTRUM

9.7212E-21	1.6404E-15	3.1551E-10	7.4799E-05	2.3923E-03	2.4812E-02	1.4848E-02	2.9356E-02	1.0222E-01	2.7773E-01
1.8984E-01	8.0750E-02	4.2289E-02	2.9424E-02	4.7084E-02	5.8453E-02	4.8052E-02	4.5743E-02	6.3613E-03	5.4924E-04
3.0178E-05	4.4222E-06	1.1098E-06	4.8512E-07	2.4605E-07	5.5177E-08	1.1001E-08	7.8658E-10	2.9538E-11	4.3804E-13
3.1120E-14	4.1078E-15	9.1570E-16	2.2115E-16	4.2964E-17	7.7986E-18	2.2865E-18	5.8681E-19	1.3014E-19	2.8165E-20
2.6462E-20	1.0044E-20								

GROUP NO 38 JFST 28 JLST 69 MOMENT 0

SCATTER SPECTRUM

2.8352E-20	6.5329E-16	1.5133E-10	4.4948E-05	1.5431E-03	1.8882E-02	9.6334E-03	1.4679E-02	2.9879E-02	1.0504E-01
2.7295E-01	1.8788E-01	8.8632E-02	4.0239E-02	5.2649E-02	6.5009E-02	5.5312E-02	5.5191E-02	8.3679E-03	7.8558E-04
4.6440E-05	7.0840E-06	1.8238E-06	8.1387E-07	4.2286E-07	9.8039E-08	2.0305E-08	1.4903E-09	6.0891E-11	9.6345E-13
7.1039E-14	9.6294E-15	2.1919E-15	5.4042E-16	1.0730E-16	1.9862E-17	5.9216E-18	1.5373E-18	3.3345E-19	5.7353E-20
7.8301E-21	3.0358E-20								

GROUP NO 39 JFST 28 JLST 69 MOMENT 0

SCATTER SPECTRUM

8.5083E-21	2.6354E-16	7.3255E-11	2.7148E-05	1.0016E-03	1.1574E-02	6.8839E-03	9.6642E-03	1.5244E-02	3.1592E-02
1.0603E-01	2.6786E-01	1.9101E-01	7.9513E-02	6.7723E-02	7.1535E-02	6.2863E-02	6.5633E-02	1.0815E-02	1.1007E-03
6.9939E-05	1.1077E-05	2.9233E-06	1.3300E-06	7.0782E-07	1.6948E-07	3.6422E-08	2.8112E-09	1.2156E-10	2.0481E-12
1.5656E-13	2.1775E-14	5.0585E-15	1.2726E-15	2.5804E-16	4.8685E-17	1.4752E-17	3.8993E-18	8.6333E-19	1.5302E-19
2.2312E-20	8.8295E-21								

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GROUP NO 40 JFST 28 JLST 69 MOMENT 0
 SCATTER SPECTRUM
 2.5789E-20 1.0613E-18 3.5359E-11 1.8340E-05 8.4873E-04 7.8964E-03 4.6836E-03 6.7448E-03 1.0081E-02 1.6026E-02
 3.2147E-02 1.0462E-01 2.7070E-01 1.8077E-01 1.2161E-01 8.0511E-02 7.0641E-02 7.7445E-02 1.3815E-02 1.5224E-03
 1.0359E-04 1.7075E-05 4.6190E-06 2.1429E-06 1.1876E-06 2.8884E-07 6.4350E-08 5.2207E-09 2.3893E-10 4.2825E-12
 3.3935E-13 4.8418E-14 1.1479E-14 2.9462E-15 6.1009E-16 1.1732E-16 3.6130E-17 9.7174E-18 2.1789E-18 3.7809E-19
 4.4279E-20 2.5351E-20

GROUP NO 41 JFST 28 JLST 69 MOMENT 0
 SCATTER SPECTRUM
 7.9693E-21 4.3189E-17 1.7210E-11 9.8895E-06 4.2242E-04 5.4016E-03 3.2900E-03 4.7876E-03 7.1203E-03 1.0876E-02
 1.6307E-02 2.2397E-02 1.1006E-01 2.5671E-01 2.6177E-01 1.0299E-01 7.8230E-02 9.0168E-02 1.7549E-02 2.0634E-03
 1.5009E-04 2.5676E-05 7.1126E-06 3.1619E-06 1.8739E-06 4.7765E-07 1.1030E-07 9.3868E-09 4.5320E-10 8.6255E-12
 7.0733E-13 1.0344E-13 2.5002E-14 6.5415E-15 1.3821E-15 2.7066E-16 8.4662E-17 2.3159E-17 5.2915E-18 9.3904E-19
 1.1362E-19 8.9500E-21

GROUP NO 42 JFST 28 JLST 69 MOMENT 0
 SCATTER SPECTRUM
 1.9004E-20 1.3387E-17 6.6404E-12 5.0251E-06 2.3604E-04 3.2203E-03 2.0185E-03 2.9899E-03 4.5085E-03 6.7357E-03
 9.6371E-03 1.4261E-02 2.7538E-02 7.4132E-02 3.8581E-01 2.4161E-01 9.0545E-02 1.0987E-01 2.3459E-02 3.1074E-03
 2.4855E-04 4.4857E-05 1.2860E-05 6.2466E-06 3.5993E-06 9.5956E-07 2.3335E-07 2.1309E-08 1.1148E-09 2.3193E-11
 2.0028E-12 3.0396E-13 7.5675E-14 2.0388E-14 4.4420E-15 8.9453E-16 2.8655E-16 8.0453E-17 1.8923E-17 3.4460E-18
 4.1626E-19 3.0321E-20

GROUP NO 43 JFST 28 JLST 69 MOMENT 0
 SCATTER SPECTRUM
 1.5467E-20 1.9077E-18 1.3499E-12 1.8064E-06 8.8278E-05 1.3490E-03 8.8032E-04 1.3320E-03 2.0613E-03 3.1594E-03
 4.5649E-03 6.4309E-03 9.4252E-03 1.3153E-02 7.4116E-02 4.8251E-01 2.1000E-01 1.4718E-01 3.7167E-02 5.8675E-03
 5.4734E-04 1.0784E-04 3.2751E-05 1.6627E-05 1.0121E-05 2.9058E-06 7.6979E-07 7.8943E-08 4.7127E-09 1.1350E-10
 1.0677E-11 1.7223E-12 4.5021E-13 1.2734E-13 2.9193E-14 6.1563E-15 2.0516E-15 6.0145E-16 1.4844E-16 2.8560E-17
 3.6603E-18 2.0129E-19

FILE 3
 GROUP NO 44 JFST 28 JLST 69 MOMENT 0
 SCATTER SPECTRUM
 6.7978E-21 1.2126E-19 1.4069E-13 3.1840E-07 2.1849E-05 3.9548E-04 2.7391E-04 4.2476E-04 6.7424E-04 1.0839E-03
 1.5889E-03 2.3110E-03 3.4417E-03 4.5740E-03 1.3844E-02 7.8832E-02 5.2539E-01 2.8843E-01 6.4139E-02 1.2842E-02
 1.4343E-03 3.1615E-04 1.0320E-04 5.5800E-05 3.6357E-05 1.1486E-05 3.3993E-06 4.0450E-07 2.8585E-08 8.2863E-10
 8.6827E-11 1.5144E-11 4.2150E-12 1.2675E-12 3.1003E-13 6.9329E-14 2.4296E-14 7.5252E-15 1.9743E-15 4.0738E-16
 5.6759E-17 3.4542E-18

GROUP NO 45 JFST 28 JLST 69 MOMENT 0
 SCATTER SPECTRUM
 3.9040E-20 2.1049E-20 4.1965E-15 2.1901E-08 2.0450E-06 4.7160E-05 3.5870E-05 5.8031E-05 9.5902E-05 1.5733E-04
 2.4397E-04 3.6847E-04 5.7144E-04 7.9236E-04 2.5293E-03 9.1226E-03 4.4965E-02 7.0282E-01 1.8255E-01 4.4337E-02
 7.4151E-03 2.0580E-03 7.8261E-04 4.7752E-04 3.6497E-04 1.4226E-04 5.3949E-05 8.9579E-06 9.2558E-07 4.0655E-08
 5.4465E-09 1.1352E-09 3.6446E-10 1.2657E-10 3.5982E-11 9.2212E-12 3.6353E-12 1.2809E-12 3.8801E-13 9.4410E-14
 1.6029E-14 1.2588E-15

GROUP NO 46 JFST 28 JLST 69 MOMENT 0
 SCATTER SPECTRUM
 1.6849E-20 6.1508E-21 4.7578E-18 1.5932E-10 2.8647E-08 1.0876E-06 9.9006E-07 1.7486E-06 3.1509E-06 5.6365E-06
 9.5071E-06 1.5554E-05 2.6062E-05 3.8857E-05 1.3757E-04 5.8883E-04 2.4998E-03 6.9737E-02 6.9039E-01 1.7614E-01
 3.4028E-02 1.1821E-02 5.2297E-03 3.6125E-03 3.2284E-03 1.5448E-03 7.4814E-04 1.7168E-04 2.5536E-05 1.8466E-06
 2.7846E-07 6.7837E-08 2.4847E-08 9.8452E-09 3.2124E-09 9.3215E-10 4.0932E-10 1.8230E-10 5.6083E-11 1.5867E-11
 3.2280E-12 3.2026E-13

GROUP NO 47 JFST 28 JLST 69 MOMENT 0
 SCATTER SPECTRUM
 7.4137E-21 2.5160E-20 1.5318E-20 1.1298E-12 3.7628E-10 2.3028E-08 2.4708E-08 4.7533E-08 9.3180E-08 1.8134E-07
 3.3214E-07 5.8920E-07 1.0657E-06 1.7119E-06 5.7573E-06 3.4517E-05 1.8229E-04 6.1248E-03 8.3100E-02 6.7446E-01
 1.3195E-01 3.8784E-02 1.9451E-02 1.4883E-02 5.1682E-02 8.6757E-03 5.2201E-03 1.5913E-03 3.2687E-04 2.9445E-05
 6.0258E-06 1.7060E-06 7.0167E-07 3.1230E-07 1.1501E-07 3.7208E-08 1.7968E-08 7.9044E-09 3.0675E-09 9.9149E-10
 2.3673E-10 2.8904E-11

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GROUP NO 48 JFST 28 JLST 69 MOMENT 0
 SCATTER SPECTRUM
 1.2938E-20 1.9556E-20 2.2370E-20 1.3911E-14 8.0973E-12 7.5652E-10 9.3201E-10 1.9349E-09 4.0908E-09 8.5886E-09
 1.6946E-08 3.2242E-08 8.2697E-08 1.0772E-07 4.6212E-07 2.8086E-06 1.8092E-05 9.2209E-04 1.3999E-02 1.3132E-01
 5.5388E-01 1.4134E-01 4.1539E-02 3.2874E-02 3.6719E-02 2.3483E-02 1.6221E-02 5.9504E-03 1.5027E-03 1.6657E-04
 3.8516E-05 1.1917E-05 5.2633E-06 2.5153E-06 9.9694E-07 3.4436E-07 1.7605E-07 8.2435E-08 3.4282E-08 1.1993E-08
 3.1480E-09 4.3434E-10

GROUP NO 49 JFST 28 JLST 69 MOMENT 0
 SCATTER SPECTRUM
 1.0312E-20 2.2362E-20 6.3451E-21 1.0917E-15 8.6303E-13 1.0159E-10 1.3457E-10 2.9121E-10 6.4150E-10 1.4038E-09
 2.8847E-09 5.7087E-09 1.1542E-08 2.0584E-08 9.4717E-08 6.2047E-07 4.4730E-06 2.9030E-04 5.4492E-03 4.3915E-02
 1.4418E-01 4.5495E-01 1.5152E-01 5.7679E-02 5.7098E-02 3.3256E-02 2.9475E-02 1.2075E-02 2.4773E-03 4.3941E-04
 1.0998E-04 3.8005E-05 1.6657E-05 8.3393E-06 3.4682E-06 1.2504E-06 6.6372E-07 3.2380E-07 1.4094E-07 5.1948E-08
 1.4519E-08 2.1727E-09

GROUP NO 50 JFST 29 JLST 69 MOMENT 0
 SCATTER SPECTRUM
 2.1909E-20 1.4570E-20 2.0249E-16 1.9451E-13 2.6543E-11 3.6796E-11 8.1769E-11 1.8494E-10 4.1556E-10 8.7644E-10
 1.7786E-09 3.8869E-09 6.7340E-09 3.2110E-08 2.2299E-07 1.7303E-06 1.3168E-04 2.8549E-03 2.5954E-02 5.4317E-02
 1.5087E-01 3.7188E-01 1.8710E-01 8.5652E-02 5.3182E-02 4.2505E-02 1.8712E-02 5.8803E-03 8.1195E-04 2.1438E-04
 7.2974E-05 3.4854E-05 1.8018E-05 7.7465E-06 2.8769E-06 1.5673E-06 7.8668E-07 3.5347E-07 1.3511E-07 3.6452E-08
 6.2491E-09

GROUP NO 51 JFST 29 JLST 69 MOMENT 0
 SCATTER SPECTRUM
 2.5290E-20 1.0615E-20 5.1396E-17 5.7375E-14 8.7840E-12 1.2612E-11 2.8616E-11 6.6073E-11 1.5158E-10 3.2631E-10
 6.7544E-10 1.4279E-09 2.6575E-09 1.3033E-08 9.4794E-08 7.8007E-07 6.7546E-05 1.6478E-03 1.6490E-02 3.6132E-02
 5.1942E-02 1.2881E-01 3.7982E-01 2.2216E-01 6.8943E-02 5.6542E-02 2.6520E-02 8.9530E-03 1.3350E-03 3.8909E-04
 1.2994E-04 6.3804E-05 3.3917E-05 1.5011E-05 5.7213E-06 3.1889E-06 1.6412E-06 7.5829E-07 2.9932E-07 9.0856E-08
 1.5137E-08

FILE 3
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GROUP NO 52 JFST 29 JLST 69 MOMENT 0
 SCATTER SPECTRUM
 1.8956E-20 1.9486E-20 9.1131E-18 1.2135E-14 2.1300E-12 3.1878E-12 7.4158E-12 1.7554E-11 4.1294E-11 9.1110E-11
 1.9315E-10 4.1816E-10 7.9612E-10 4.0403E-09 3.1092E-08 2.7497E-07 2.7980E-05 7.9160E-04 8.9600E-03 2.1372E-02
 2.9207E-02 3.4894E-02 1.0056E-01 4.8388E-01 1.7972E-01 8.0592E-02 4.0964E-02 1.5228E-02 2.5080E-03 7.3805E-04
 2.7199E-04 1.3869E-04 7.6596E-05 3.5275E-05 1.3931E-05 8.0137E-06 4.2693E-06 2.0505E-06 8.4629E-07 2.7115E-07
 4.8477E-08

GROUP NO 53 JFST 29 JLST 69 MOMENT 0
 SCATTER SPECTRUM
 1.0097E-20 7.9884E-21 8.8895E-19 1.5069E-15 3.1926E-13 5.0529E-13 1.2164E-12 2.9787E-12 7.2505E-12 1.6544E-11
 3.6230E-11 8.0998E-11 1.5902E-10 8.4524E-10 7.0186E-09 6.8352E-08 8.6395E-06 2.9729E-04 3.9757E-03 1.0491E-02
 1.5400E-02 1.7642E-02 2.7342E-02 1.2161E-01 4.9845E-01 2.0214E-01 6.6648E-02 2.7871E-02 5.1511E-03 1.6313E-03
 6.3446E-04 3.3816E-04 1.9532E-04 9.4234E-05 3.8795E-05 2.3151E-05 1.2842E-05 6.4518E-06 2.8045E-06 9.5671E-07
 1.8559E-07

GROUP NO 54 JFST 29 JLST 69 MOMENT 0
 SCATTER SPECTRUM
 9.0359E-21 2.0081E-20 6.2313E-20 1.1648E-16 3.0510E-14 5.1401E-14 1.2965E-13 3.2752E-13 8.2911E-13 1.9661E-12
 4.4695E-12 1.0370E-11 2.1098E-11 1.1831E-10 1.0733E-09 1.1697E-08 1.9131E-08 8.3322E-05 1.3689E-03 4.0920E-03
 6.4977E-03 7.9072E-03 1.2716E-02 3.4221E-02 1.0266E-01 5.8049E-01 1.7368E-01 5.6160E-02 1.2004E-02 4.1686E-03
 1.7380E-03 9.8153E-04 6.0127E-04 3.0837E-04 1.3408E-04 8.4004E-05 4.9156E-05 2.6223E-05 1.2216E-05 4.5327E-06
 9.8116E-07

GROUP NO 55 JFST 29 JLST 69 MOMENT 0
 SCATTER SPECTRUM
 3.6622E-20 1.4647E-20 1.2340E-20 3.6542E-18 1.2793E-15 2.3421E-15 6.1826E-15 1.6596E-14 4.4317E-14 1.1075E-13
 2.6491E-13 6.4648E-13 1.3801E-12 8.3272E-12 8.5187E-11 1.0804E-09 2.4932E-07 1.4912E-05 3.2149E-04 1.1376E-03
 2.0047E-03 2.6118E-03 4.4659E-03 1.3055E-02 2.7687E-02 1.1953E-01 6.0802E-01 1.6885E-01 2.9940E-02 1.1549E-02
 5.2021E-03 3.1370E-03 2.0960E-03 1.1315E-03 5.2396E-04 3.4727E-04 2.1619E-04 1.2361E-04 6.2381E-05 2.5506E-05
 6.2633E-06

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GROUP NO 56 JFST 28 JLST 69 MOMENT 0
SCATTER SPECTRUM
1.3097E-20 6.7473E-21 7.1632E-21 1.8353E-20 8.4813E-20 3.0734E-17 6.1609E-17 1.7264E-16 4.9180E-16 1.3945E-15
3.6973E-15 9.3651E-15 2.4195E-14 5.4537E-14 3.5763E-13 4.1949E-12 8.3208E-11 2.1718E-08 1.8557E-06 5.4620E-05
2.1395E-04 4.6671E-04 6.6095E-04 1.2122E-03 3.8862E-03 9.2374E-03 3.3130E-02 1.2301E-01 6.3772E-01 1.1622E-01
3.1692E-02 1.5501E-02 1.0043E-02 7.0742E-03 4.1977E-03 2.0806E-03 1.4663E-03 9.7700E-04 6.0300E-04 3.3250E-04
1.5142E-04 4.2740E-05

GROUP NO 57 JFST 28 JLST 69 MOMENT 0
SCATTER SPECTRUM
3.8398E-04 0.0000E+00 1.5638E-20 1.3355E-20 1.7015E-20 6.2659E-19 1.3860E-18 4.1342E-18 1.2577E-17 3.8109E-17
1.0785E-16 2.9100E-16 8.0058E-16 1.9160E-15 1.3777E-14 1.8799E-13 3.4225E-12 1.8102E-09 2.2650E-07 9.2380E-06
4.8021E-05 1.0853E-04 1.6731E-04 3.3018E-04 1.1672E-03 3.1021E-03 1.2817E-02 4.2723E-02 1.8051E-01 5.1736E-01
1.3878E-01 3.5659E-02 2.3043E-02 1.7137E-02 1.0757E-02 5.5963E-03 4.1192E-03 2.8783E-03 1.8750E-03 1.1005E-03
5.4044E-04 1.6797E-04

GROUP NO 58 JFST 28 JLST 69 MOMENT 0
SCATTER SPECTRUM
1.6970E-06 0.0000E+00 7.1716E-21 1.2785E-20 1.0377E-20 6.7997E-20 1.3756E-19 4.1853E-19 1.3229E-18 4.1496E-18
1.2190E-17 3.4108E-17 9.7282E-17 2.4098E-16 1.8279E-15 2.7233E-14 5.5380E-13 3.7761E-10 5.9213E-08 2.9353E-06
1.7131E-05 4.1751E-05 8.7762E-05 1.3985E-04 5.2537E-04 1.4997E-03 6.7779E-03 2.5035E-02 8.5962E-02 1.7276E-01
4.4207E-01 1.4130E-01 4.4654E-02 2.9254E-02 1.8885E-02 1.0159E-02 7.6961E-03 5.5492E-03 3.7435E-03 2.2864E-03
1.1812E-03 3.9114E-04

GROUP NO 59 JFST 28 JLST 69 MOMENT 0
SCATTER SPECTRUM
3.4970E-20 0.0000E+00 3.1624E-20 1.3292E-20 1.3879E-20 1.1260E-20 2.8396E-20 7.8858E-20 2.5712E-19 8.1234E-19
2.4524E-18 7.0150E-18 2.0532E-17 5.2127E-17 4.1081E-16 6.5194E-15 1.4346E-13 1.1762E-10 2.1722E-08 1.2407E-06
7.8747E-06 2.0276E-05 3.4172E-05 7.2879E-05 2.8629E-04 8.6136E-04 4.1660E-03 1.6533E-02 6.1929E-02 7.7296E-02
1.7648E-01 3.7524E-01 1.5815E-01 5.1745E-02 2.8278E-02 1.5411E-02 1.1931E-02 8.8074E-03 6.0948E-03 3.8365E-03
2.0524E-03 7.1121E-04

FILE 3
GROUP NO 60 JFST 28 JLST 69 MOMENT 0
SCATTER SPECTRUM
2.3953E-20 0.0000E+00 2.1712E-20 2.7368E-20 2.5988E-20 1.3755E-20 2.2463E-20 6.5176E-20 2.1634E-19
6.5189E-19 1.9114E-18 5.6896E-18 1.4729E-17 1.1966E-16 1.9968E-15 4.6808E-14 4.4491E-11 9.3793E-09 6.0113E-07
4.0842E-06 1.0999E-05 1.9119E-05 4.1894E-05 1.7077E-04 5.3658E-04 2.7460E-03 1.1661E-02 4.8694E-02 5.9482E-02
7.1947E-02 1.6037E-01 3.6437E-01 1.6470E-01 4.6215E-02 2.1871E-02 1.7042E-02 1.2823E-02 9.0692E-03 5.8502E-03
3.2238E-03 1.1596E-03

GROUP NO 61 JFST 28 JLST 69 MOMENT 0
SCATTER SPECTRUM
1.6872E-20 0.0000E+00 5.0136E-21 3.5854E-20 1.3592E-20 9.6227E-21 1.5643E-20 1.0699E-20 1.8519E-20 6.4567E-20
1.7388E-19 5.0904E-19 1.5524E-18 4.0834E-18 3.4191E-17 5.9968E-16 1.4969E-14 1.6493E-11 3.9697E-09 2.8568E-07
2.0781E-06 5.8549E-06 1.0500E-05 2.3648E-05 1.0007E-04 3.2858E-04 1.7811E-03 8.0797E-03 3.4724E-02 4.8704E-02
5.2425E-02 5.9658E-02 1.5286E-01 3.8188E-01 1.5123E-01 3.7682E-02 2.4827E-02 1.8619E-02 1.3442E-02 8.8978E-03
5.0426E-03 1.8920E-03

GROUP NO 62 JFST 28 JLST 69 MOMENT 0
SCATTER SPECTRUM
1.0598E-20 0.0000E+00 5.7112E-21 1.4880E-20 1.0013E-20 1.8751E-20 3.4431E-20 2.1199E-20 4.2119E-20 1.4912E-20
4.3440E-20 1.3034E-19 3.9779E-19 1.0716E-18 9.2334E-18 1.7063E-16 4.5482E-15 5.8490E-12 1.6171E-09 1.3131E-07
1.0253E-06 3.0272E-06 5.6073E-06 1.2993E-05 5.7188E-05 1.9656E-04 1.1313E-03 5.4988E-03 2.5442E-02 3.6170E-02
4.1874E-02 4.2572E-02 5.7137E-02 1.6560E-01 3.7005E-01 1.3361E-01 4.8523E-02 2.7889E-02 1.9883E-02 1.3450E-02
7.8538E-03 3.0362E-03

GROUP NO 63 JFST 30 JLST 69 MOMENT 0
SCATTER SPECTRUM
8.0430E-21 1.0514E-20 2.2180E-20 3.2076E-20 1.3208E-20 3.1195E-20 1.9614E-20 4.0216E-20 1.3520E-20 4.3328E-20
1.1933E-19 3.2873E-19 2.8579E-18 5.5190E-17 1.5613E-15 2.3088E-12 7.2327E-10 6.5472E-08 5.4459E-07 1.6768E-06
3.1973E-06 7.6005E-06 3.4647E-05 1.2407E-04 7.5346E-04 3.8957E-03 1.9257E-02 2.8728E-02 3.4377E-02 3.5510E-02
4.3203E-02 8.7138E-02 1.8417E-01 3.1288E-01 1.5579E-01 5.0783E-02 2.8370E-02 1.9165E-02 1.1455E-02 4.5585E-03

GROUP NO 64 JFST 30 JLST 69 MOMENT 0

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FILE 1
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SCATTER SPECTRUM

1.4470E-20 2.4846E-20 1.0217E-20 1.2342E-20 2.6975E-20 1.4360E-20 3.5009E-20 2.2402E-20 8.3678E-21 1.4069E-20
 4.6700E-20 1.1294E-19 1.0105E-18 2.0332E-17 6.0525E-16 1.0097E-12 3.5255E-10 3.5095E-08 3.0854E-07 9.8555E-07
 1.9278E-06 4.6876E-06 2.2045E-05 8.1872E-05 6.2155E-04 2.8499E-03 1.4970E-02 2.2922E-02 2.8682E-02 3.0272E-02
 3.7174E-02 5.1022E-02 7.6015E-02 1.5715E-01 3.2890E-01 1.5271E-01 4.7042E-02 2.6606E-02 1.6102E-02 6.5715E-03

GROUP NO 65 JFST 30 JLST 69

MOMENT 0

SCATTER SPECTRUM

2.1622E-20 9.1601E-21 2.2069E-20 3.1201E-20 9.5979E-21 2.6601E-20 1.4585E-20 3.6318E-20 2.1894E-20 4.1199E-20
 1.3850E-20 4.0307E-20 3.2981E-19 6.7989E-18 2.1391E-16 4.0711E-13 1.6008E-10 1.7684E-08 1.6517E-07 5.4926E-07
 1.0449E-06 2.7539E-06 1.3403E-05 5.1808E-05 3.4794E-04 2.0205E-03 1.1347E-02 1.8505E-02 2.3500E-02 2.5385E-02
 3.1773E-02 4.3728E-02 5.2648E-02 5.9797E-02 1.5940E-01 3.4806E-01 1.4740E-01 4.2869E-02 2.3377E-02 9.7721E-03

GROUP NO 66 JFST 28 JLST 69

MOMENT 0

SCATTER SPECTRUM

7.0245E-04 0.0000E+00 5.4765E-21 1.4188E-20 2.8893E-20 1.6779E-20 2.1258E-20 8.2414E-21 3.2907E-20 1.3194E-20
 3.1578E-20 1.8050E-20 3.5952E-20 1.0605E-20 9.2019E-20 2.0076E-18 6.7032E-17 1.4775E-13 6.6314E-11 8.2288E-09
 8.2217E-08 2.8595E-07 5.9345E-07 1.5209E-06 7.6926E-06 3.1099E-05 2.2152E-04 1.3780E-03 8.3436E-03 1.4350E-02
 1.8863E-02 2.0896E-02 2.6724E-02 3.7546E-02 4.5028E-02 4.1899E-02 6.0775E-02 1.6176E-01 3.7104E-01 1.3836E-01
 3.7550E-02 1.5217E-02

GROUP NO 67 JFST 28 JLST 69

MOMENT 0

SCATTER SPECTRUM

4.3209E-05 1.8439E-20 0.0000E+00 1.7408E-20 6.0985E-21 1.2178E-20 3.8603E-20 1.5131E-20 6.0823E-21 2.4676E-20
 9.4079E-21 2.2326E-20 1.2868E-20 2.3260E-20 2.4009E-20 5.0671E-13 1.7903E-17 4.8418E-14 2.4244E-11 3.4382E-09
 3.7109E-08 1.3588E-07 2.9229E-07 7.7340E-07 4.0898E-06 1.7412E-05 1.3291E-04 8.9446E-04 5.3100E-03 1.0811E-02
 1.4794E-02 1.6870E-02 2.2104E-02 3.1825E-02 3.9053E-02 3.6475E-02 4.5909E-02 6.3542E-02 1.6469E-01 3.9872E-01
 1.2238E-01 2.5864E-02

GROUP NO 68 JFST 28 JLST 69

MOMENT 0

SCATTER SPECTRUM

7.8609E-07 0.0000E+00 0.0000E+00 1.4974E-20 1.7337E-20 1.5977E-20 1.0551E-20 2.0647E-20 8.4172E-21 3.4595E-20
 1.3333E-20 3.5630E-20 1.8585E-20 3.8772E-20 4.1312E-20 9.6054E-20 3.7061E-18 1.1780E-14 7.3794E-12 1.2288E-09
 1.4550E-08 5.6678E-08 1.2702E-07 3.5017E-07 1.9545E-06 8.8604E-06 7.3534E-05 5.4490E-04 4.0053E-03 7.8950E-03
 1.1349E-02 1.3409E-02 1.8091E-02 2.6817E-02 3.3858E-02 3.2369E-02 4.1329E-02 5.2920E-02 7.0542E-02 1.7038E-01
 4.2967E-01 8.6837E-02

FILE 3
*****

GROUP NO 69 JFST 31 JLST 69

MOMENT 0

SCATTER SPECTRUM

7.8609E-07 0.0000E+00 0.0000E+00 1.4974E-20 1.7337E-20 1.5977E-20 1.0551E-20 2.0647E-20 8.4172E-21 3.4595E-20
 1.3333E-20 3.5630E-20 1.8585E-20 3.8772E-20 4.1312E-20 9.6054E-20 3.7061E-18 1.1780E-14 7.3794E-12 1.2288E-09
 1.4550E-08 5.6678E-08 1.2702E-07 3.5017E-07 1.9545E-06 8.8604E-06 7.3534E-05 5.4490E-04 4.0053E-03 7.8950E-03
 1.1349E-02 1.3409E-02 1.8091E-02 2.6817E-02 3.3858E-02 3.2369E-02 4.1329E-02 5.2920E-02 7.0542E-02 1.7038E-01
 4.2967E-01 8.6837E-02

FISSION
*****

REACTION NUMBER OF NUMBER OF NUMBER OF
 NAME SECONDARY P-N ENERGY RANGES FOR
 4 NEUTRONS ORDERS PRIMARY DATA
 1 FIRST + LAST PRIMARY GROUPS
 1 69

MOMENT 0

PRIMARY SIGMA

2.02680E-02 1.29564E-02 1.31168E-02 9.87100E-03 1.09848E-03 5.78100E-04
 6.36350E-04 8.88740E-04 7.52850E-04 8.46611E-04 9.82246E-04 1.11180E-03
 1.24570E-03 1.47028E-03 1.65999E-03 1.92847E-03 2.46484E-03 3.04125E-03
 3.87139E-03 5.57338E-03 6.70675E-03 1.05299E-02 1.25003E-02 1.74934E-02
 2.03473E-02 1.83261E-02 2.09088E-02 1.32894E-02 1.01944E-02 5.01979E-03
 7.69880E-03 9.72093E-03 2.35428E-02 4.74654E-02 4.84386E-02 4.41894E-02
 3.87803E-02 3.45597E-02 3.15700E-02 2.95352E-02 2.81120E-02 2.68922E-02
 2.58100E-02 2.54569E-02 2.72385E-02 3.32234E-02 4.54671E-02 6.17214E-02
 7.63704E-02 8.56249E-02 9.01211E-02 8.93398E-02 8.63173E-02 8.63220E-02
 9.29237E-02 1.09790E-01 1.30994E-01 1.47940E-01 1.62964E-01 1.77355E-01
 1.95247E-01 2.16521E-01 2.37903E-01 2.61067E-01 2.91427E-01 3.34092E-01
 3.98405E-01 5.17277E-01 6.61583E-01

NO. OF ENERGY RANGES FOR SECONDARY DATA
 1

WHC-SD-NR-SWD-017

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FIRST * LAST PRIMARY GROUPS
1 69

MOMENT 0

NU
 3.42838E+00 3.01543E+00 2.74497E+00 2.60875E+00 2.53020E+00 2.50680E+00
 2.48130E+00 2.46640E+00 2.45090E+00 2.44020E+00 2.43960E+00 2.43920E+00
 2.43890E+00 2.43660E+00 2.43800E+00 2.43750E+00 2.43710E+00 2.43790E+00
 2.43640E+00 2.43630E+00 2.43580E+00 2.43610E+00 2.43500E+00 2.43470E+00
 2.43440E+00 2.43390E+00 2.43380E+00 2.43330E+00 2.43320E+00 2.43300E+00
 2.43280E+00 2.43260E+00 2.43250E+00 2.43250E+00 2.43250E+00 2.43250E+00
 2.43250E+00 2.43250E+00 2.43240E+00 2.43240E+00 2.43240E+00 2.43240E+00
 2.43230E+00 2.43230E+00 2.43220E+00 2.43200E+00 2.43190E+00 2.43180E+00
 2.43170E+00 2.43160E+00 2.43160E+00 2.43160E+00 2.43150E+00 2.43130E+00
 2.43120E+00 2.43100E+00 2.43080E+00 2.43070E+00 2.43060E+00 2.43050E+00
 2.43040E+00 2.43030E+00 2.43020E+00 2.43000E+00 2.43000E+00 2.43000E+00
 2.43000E+00 2.43000E+00 2.43000E+00

FISSION YIELD
 6.94863E-02 3.90691E-02 3.60051E-02 2.57510E-02 2.77936E-03 1.44918E-03
 1.57898E-03 1.69377E-03 1.84516E-03 2.06590E-03 2.39629E-03 2.71190E-03
 3.03815E-03 3.58543E-03 4.04706E-03 4.70066E-03 6.00706E-03 7.41426E-03
 9.43228E-03 1.35784E-02 1.63383E-02 2.56518E-02 3.04383E-02 4.25911E-02
 4.95335E-02 4.46038E-02 5.09878E-02 3.23370E-02 2.48091E-02 1.22131E-02
 1.87296E-02 2.36471E-02 5.72877E-02 1.15460E-01 1.17827E-01 1.07491E-01
 9.43332E-02 8.40664E-02 7.87909E-02 7.18415E-02 6.83796E-02 6.54127E-02
 6.27778E-02 6.19186E-02 6.62494E-02 8.07994E-02 1.10572E-01 1.50094E-01
 1.85710E-01 2.08205E-01 2.19139E-01 2.17239E-01 2.09881E-01 2.09875E-01
 2.25916E-01 2.66900E-01 3.18421E-01 3.59599E-01 3.98100E-01 4.31052E-01
 4.74528E-01 5.28211E-01 5.78151E-01 6.34392E-01 7.08167E-01 8.11843E-01
 9.68125E-01 1.25698E+00 2.09365E+00

FOR EACH PRIMARY GROUP

GROUP NO 1 JFST 1 JLST 16

MOMENT 0

FILE 3
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FISSION SPECTRUM
 2.7100E-02 1.1600E-01 2.1480E-01 2.2930E-01 1.7580E-01 1.1070E-01 6.2100E-02 3.2500E-02 1.6300E-02 8.0000E-03
 3.9000E-03 1.9000E-03 9.0000E-04 4.0000E-04 2.0000E-04 1.0000E-04

GROUP NO 2 JFST 1 JLST 16

MOMENT 0

FISSION SPECTRUM
 2.7100E-02 1.1600E-01 2.1480E-01 2.2930E-01 1.7580E-01 1.1070E-01 6.2100E-02 3.2500E-02 1.6300E-02 8.0000E-03
 3.9000E-03 1.9000E-03 9.0000E-04 4.0000E-04 2.0000E-04 1.0000E-04

GROUP NO 3 JFST 1 JLST 16

MOMENT 0

FISSION SPECTRUM
 2.7100E-02 1.1600E-01 2.1480E-01 2.2930E-01 1.7580E-01 1.1070E-01 6.2100E-02 3.2500E-02 1.6300E-02 8.0000E-03
 3.9000E-03 1.9000E-03 9.0000E-04 4.0000E-04 2.0000E-04 1.0000E-04

GROUP NO 4 JFST 1 JLST 16

MOMENT 0

FISSION SPECTRUM
 2.7100E-02 1.1600E-01 2.1480E-01 2.2930E-01 1.7580E-01 1.1070E-01 6.2100E-02 3.2500E-02 1.6300E-02 8.0000E-03
 3.9000E-03 1.9000E-03 9.0000E-04 4.0000E-04 2.0000E-04 1.0000E-04

GROUP NO 5 JFST 1 JLST 16

MOMENT 0

FISSION SPECTRUM
 2.7100E-02 1.1600E-01 2.1480E-01 2.2930E-01 1.7580E-01 1.1070E-01 6.2100E-02 3.2500E-02 1.6300E-02 8.0000E-03
 3.9000E-03 1.9000E-03 9.0000E-04 4.0000E-04 2.0000E-04 1.0000E-04

GROUP NO 6 JFST 1 JLST 16

MOMENT 0

FISSION SPECTRUM
 2.7100E-02 1.1600E-01 2.1480E-01 2.2930E-01 1.7580E-01 1.1070E-01 6.2100E-02 3.2500E-02 1.6300E-02 8.0000E-03
 3.9000E-03 1.9000E-03 9.0000E-04 4.0000E-04 2.0000E-04 1.0000E-04

GROUP NO 7 JFST 1 JLST 16

MOMENT 0

WHC-SD-NR-SWD-017

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FISSION SPECTRUM
2.7100E-02 1.1600E-01 2.1480E-01 2.2930E-01 1.7580E-01 1.1070E-01 6.2100E-02 3.2500E-02 1.6300E-02 8.0000E-03
3.9000E-03 1.9000E-03 9.0000E-04 4.0000E-04 2.0000E-04 1.0000E-04
GROUP NO 8 JFST 1 JLST 16 MOMENT 0
FISSION SPECTRUM
2.7100E-02 1.1600E-01 2.1480E-01 2.2930E-01 1.7580E-01 1.1070E-01 6.2100E-02 3.2500E-02 1.6300E-02 8.0000E-03
3.9000E-03 1.9000E-03 9.0000E-04 4.0000E-04 2.0000E-04 1.0000E-04
GROUP NO 9 JFST 1 JLST 16 MOMENT 0
FISSION SPECTRUM
2.7100E-02 1.1600E-01 2.1480E-01 2.2930E-01 1.7580E-01 1.1070E-01 6.2100E-02 3.2500E-02 1.6300E-02 8.0000E-03
3.9000E-03 1.9000E-03 9.0000E-04 4.0000E-04 2.0000E-04 1.0000E-04
GROUP NO 10 JFST 1 JLST 16 MOMENT 0
FISSION SPECTRUM
2.7100E-02 1.1600E-01 2.1480E-01 2.2930E-01 1.7580E-01 1.1070E-01 6.2100E-02 3.2500E-02 1.6300E-02 8.0000E-03
3.9000E-03 1.9000E-03 9.0000E-04 4.0000E-04 2.0000E-04 1.0000E-04
GROUP NO 11 JFST 1 JLST 16 MOMENT 0
FISSION SPECTRUM
2.7100E-02 1.1600E-01 2.1480E-01 2.2930E-01 1.7580E-01 1.1070E-01 6.2100E-02 3.2500E-02 1.6300E-02 8.0000E-03
3.9000E-03 1.9000E-03 9.0000E-04 4.0000E-04 2.0000E-04 1.0000E-04
GROUP NO 12 JFST 1 JLST 16 MOMENT 0
FISSION SPECTRUM
2.7100E-02 1.1600E-01 2.1480E-01 2.2930E-01 1.7580E-01 1.1070E-01 6.2100E-02 3.2500E-02 1.6300E-02 8.0000E-03
3.9000E-03 1.9000E-03 9.0000E-04 4.0000E-04 2.0000E-04 1.0000E-04
GROUP NO 13 JFST 1 JLST 16 MOMENT 0

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FILE 3
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FISSION SPECTRUM
2.7100E-02 1.1600E-01 2.1480E-01 2.2930E-01 1.7580E-01 1.1070E-01 6.2100E-02 3.2500E-02 1.6300E-02 8.0000E-03
3.9000E-03 1.9000E-03 9.0000E-04 4.0000E-04 2.0000E-04 1.0000E-04
GROUP NO 14 JFST 1 JLST 16 MOMENT 0
FISSION SPECTRUM
2.7100E-02 1.1600E-01 2.1480E-01 2.2930E-01 1.7580E-01 1.1070E-01 6.2100E-02 3.2500E-02 1.6300E-02 8.0000E-03
3.9000E-03 1.9000E-03 9.0000E-04 4.0000E-04 2.0000E-04 1.0000E-04
GROUP NO 15 JFST 1 JLST 16 MOMENT 0
FISSION SPECTRUM
2.7100E-02 1.1600E-01 2.1480E-01 2.2930E-01 1.7580E-01 1.1070E-01 6.2100E-02 3.2500E-02 1.6300E-02 8.0000E-03
3.9000E-03 1.9000E-03 9.0000E-04 4.0000E-04 2.0000E-04 1.0000E-04
GROUP NO 16 JFST 1 JLST 16 MOMENT 0
FISSION SPECTRUM
2.7100E-02 1.1600E-01 2.1480E-01 2.2930E-01 1.7580E-01 1.1070E-01 6.2100E-02 3.2500E-02 1.6300E-02 8.0000E-03
3.9000E-03 1.9000E-03 9.0000E-04 4.0000E-04 2.0000E-04 1.0000E-04
GROUP NO 17 JFST 1 JLST 16 MOMENT 0
FISSION SPECTRUM
2.7100E-02 1.1600E-01 2.1480E-01 2.2930E-01 1.7580E-01 1.1070E-01 6.2100E-02 3.2500E-02 1.6300E-02 8.0000E-03
3.9000E-03 1.9000E-03 9.0000E-04 4.0000E-04 2.0000E-04 1.0000E-04
GROUP NO 18 JFST 1 JLST 16 MOMENT 0
FISSION SPECTRUM
2.7100E-02 1.1600E-01 2.1480E-01 2.2930E-01 1.7580E-01 1.1070E-01 6.2100E-02 3.2500E-02 1.6300E-02 8.0000E-03
3.9000E-03 1.9000E-03 9.0000E-04 4.0000E-04 2.0000E-04 1.0000E-04
GROUP NO 19 JFST 1 JLST 16 MOMENT 0

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FILE 3
XXXXXXXXXX

B-26
Attachment 1
1-77

FILE

B-27
Attachment 1
1-78

FILE 3
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B-28
Attachment 1
1-79

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FILE 3
京京軍西內海軍

WHC-SD-NR-SWD-017

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FISSION SPECTRUM

2.7100E-02 1.1600E-01 2.1480E-01 2.2930E-01 1.7580E-01 1.1070E-01 6.2100E-02 3.2500E-02 1.6300E-02 8.0000E-03
 3.9000E-03 1.9000E-03 9.0000E-04 4.0000E-04 2.0000E-04 1.0000E-04

GROUP NO 68 JFST 1 J1ST 16

MOMENT 0

FISSION SPECTRUM

2.7100E-02 1.1600E-01 2.1480E-01 2.2930E-01 1.7580E-01 1.1070E-01 6.2100E-02 3.2500E-02 1.6300E-02 8.0000E-03
 3.9000E-03 1.9000E-03 9.0000E-04 4.0000E-04 2.0000E-04 1.0000E-04

GROUP NO 69 JFST 1 J1ST 16

MOMENT 0

FISSION SPECTRUM

2.7100E-02 1.1600E-01 2.1480E-01 2.2930E-01 1.7580E-01 1.1070E-01 6.2100E-02 3.2500E-02 1.6300E-02 8.0000E-03
 3.9000E-03 1.9000E-03 9.0000E-04 4.0000E-04 2.0000E-04 1.0000E-04

FILE 3

MATERIAL 2 NO.OF REACTIONS
3

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ABSORPTION

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REACTION NAME	NUMBER OF SECONDARY NEUTRONS	NUMBER OF ORDERS	NUMBER OF P-N ENERGY RANGES FOR PRIMARY DATA
1	0	1	1

FIRST + LAST PRIMARY GROUPS
1 69

MOMENT 0

PRIMARY SIGMA
 3.55891E-03 1.47646E-03 4.71664E-04 6.79269E-05 2.99792E-04 5.50657E-04
 5.71119E-04 6.19570E-04 3.45531E-04 2.09210E-04 1.78422E-04 1.73044E-04
 1.73049E-04 1.73044E-04 5.20877E-04 5.45465E-03 7.13983E-03 5.92496E-03
 2.72534E-04 5.30843E-03 2.28318E-02 8.48372E-05 9.46096E-05 1.15753E-04
 1.48598E-04 1.89423E-04 2.88668E-04 6.64474E-04 7.39054E-04 8.26872E-04
 9.48778E-04 1.06796E-03 1.14090E-03 1.18303E-03 1.19700E-03 1.21119E-03
 1.22590E-03 1.24087E-03 1.25579E-03 1.27098E-03 1.28608E-03 1.30740E-03
 1.34426E-03 1.39704E-03 1.50917E-03 1.68836E-03 1.88505E-03 2.05991E-03
 2.17771E-03 2.26306E-03 2.33980E-03 2.44908E-03 2.60131E-03 2.82453E-03
 3.16300E-03 3.66533E-03 4.22620E-03 4.86033E-03 5.04671E-03 5.42826E-03
 5.88293E-03 6.42887E-03 6.99158E-03 7.60165E-03 8.40542E-03 9.53234E-03
 1.12800E-02 1.45492E-02 2.39985E-02

TRANSPORT

*****

REACTION NAME	NUMBER OF SECONDARY NEUTRONS	NUMBER OF ORDERS	NUMBER OF P-N ENERGY RANGES FOR PRIMARY DATA
2	0	1	1

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FIRST + LAST PRIMARY GROUPS
1 69

RADIAL

PRIMARY SIGMA

1.00402E-01	1.17364E-01	1.36576E-01	1.57237E-01	2.12350E-01	2.83530E-01
2.98555E-01	2.75821E-01	2.83863E-01	2.81476E-01	3.43735E-01	3.53447E-01
3.72750E-01	3.21612E-01	4.06583E-01	6.27919E-01	5.52776E-01	3.41776E-01
2.30377E-01	2.66845E-01	3.60217E-01	2.45337E-01	2.46340E-01	2.46733E-01
2.46380E-01	2.47144E-01	2.47300E-01	2.96927E-01	2.97024E-01	2.97131E-01
2.97270E-01	2.97410E-01	2.97494E-01	2.97542E-01	2.97559E-01	2.97572E-01
2.97589E-01	2.97607E-01	2.97624E-01	2.97641E-01	2.97658E-01	2.97684E-01
2.97723E-01	2.97783E-01	2.97916E-01	2.98123E-01	2.98355E-01	2.98565E-01
2.98710E-01	2.98813E-01	2.98908E-01	2.99045E-01	2.99233E-01	2.99520E-01
2.99864E-01	3.00643E-01	3.01414E-01	3.02044E-01	3.02623E-01	3.03205E-01
3.03919E-01	3.04800E-01	3.05745E-01	3.06803E-01	3.08256E-01	3.10401E-01
3.13989E-01	3.21579E-01	3.52199E-01			

SCATTER
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REACTION NAME	NUMBER OF SECONDARY NEUTRONS	NUMBER OF P-N ORDERS	NUMBER OF ENERGY RANGES FOR PRIMARY DATA
3	1	1	1

FIRST + LAST PRIMARY GROUPS
1 69

MOMENT 0

PRIMARY SIGMA

1.81125E-01	1.74359E-01	1.89609E-01	2.24822E-01	2.94393E-01	3.57976E-01
3.79334E-01	3.48935E-01	3.58180E-01	3.56609E-01	3.94890E-01	3.54689E-01
3.73407E-01	3.24922E-01	2.98494E-01	2.98494E-01	2.98494E-01	2.98494E-01
2.98494E-01	2.98494E-01	2.98494E-01	2.98494E-01	2.98494E-01	2.98494E-01
2.98494E-01	2.98494E-01	2.98494E-01	2.98494E-01	2.98494E-01	2.98494E-01
2.98525E-01	2.98539E-01	2.98554E-01	2.98558E-01	2.98562E-01	2.98563E-01
2.98567E-01	2.98567E-01	2.98571E-01	2.98571E-01	2.98575E-01	2.98575E-01
2.98584E-01	2.98588E-01	2.98609E-01	2.98638E-01	2.98671E-01	2.98708E-01
2.98732E-01	2.98753E-01	2.98769E-01	2.98798E-01	2.98835E-01	2.98901E-01
2.99004E-01	2.99184E-01	2.99398E-01	2.99595E-01	2.99784E-01	2.99986E-01
3.00245E-01	3.00590E-01	3.00972E-01	3.01424E-01	3.02078E-01	3.03101E-01
3.04958E-01	3.09308E-01	3.30834E-01			

NO. OF ENERGY RANGES FOR SECONDARY DATA
1FIRST + LAST PRIMARY GROUPS
1 69

FOR EACH PRIMARY GROUP

GROUP NO 1 JFST 1 JLST 17

MOMENT 0

SCATTER SPECTRUM

8.0408E-01	3.8108E-02	7.3813E-02	1.0147E-01	8.5026E-02	5.1743E-02	2.6383E-02	1.1687E-02	4.8109E-03	1.9107E-03
7.3860E-04	2.8021E-04	1.0664E-04	4.0617E-05	1.5698E-05	5.8740E-06	2.5663E-06			

GROUP NO 2 JFST 2 JLST 17

MOMENT 0

SCATTER SPECTRUM

5.7816E-01	7.2152E-02	1.0130E-01	1.0438E-01	7.2359E-02	4.0016E-02	1.8642E-02	7.8727E-03	3.1630E-03	1.2279E-03
4.6600E-04	1.7552E-04	6.5486E-05	2.4350E-05	8.5301E-06	3.5610E-06				

GROUP NO 3 JFST 3 JLST 17

MOMENT 0

SCATTER SPECTRUM

6.9383E-01	9.0809E-02	7.8890E-02	6.3980E-02	3.9015E-02	1.9320E-02	8.4691E-03	3.4808E-03	1.3700E-03	5.2477E-04
1.9789E-04	7.4216E-05	2.7631E-05	9.7199E-05	4.0893E-06					

GROUP NO 4 JFST 4 JLST 15

MOMENT 0

SCATTER SPECTRUM

8.1087E-01	7.8042E-02	7.9574E-02	2.6843E-02	2.6547E-03	1.1960E-03	4.9975E-04	1.9870E-04	7.6563E-05	2.8943E-05
1.0878E-05	4.0553E-06								

GROUP NO 5 JFST 5 JLST 13

MOMENT 0

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SCATTER SPECTRUM
9.1441E-01 4.5943E-02 1.7376E-02 1.4481E-02 8.8474E-03 8.6118E-04 6.7047E-05 1.1535E-05 1.8238E-06

GROUP NO 6	JFST 6	JLST 7	MOMENT 0

SCATTER SPECTRUM
9.6944E-01 3.0555E-02

GROUP NO 7	JFST 7	JLST 8	MOMENT 0

SCATTER SPECTRUM
9.5768E-01 4.2221E-02

GROUP NO 8	JFST 8	JLST 9	MOMENT 0

SCATTER SPECTRUM
9.5907E-01 4.0933E-02

GROUP NO 9	JFST 9	JLST 10	MOMENT 0

SCATTER SPECTRUM
9.6643E-01 3.3574E-02

GROUP NO 10	JFST 10	JLST 11	MOMENT 0

SCATTER SPECTRUM
9.6592E-01 3.4081E-02

GROUP NO 11	JFST 11	JLST 12	MOMENT 0

SCATTER SPECTRUM
9.5074E-01 4.9261E-02

GROUP NO 12	JFST 12	JLST 13	MOMENT 0

SCATTER SPECTRUM
9.5385E-01 4.6154E-02

FILE 3
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GROUP NO 13	JFST 13	JLST 14	MOMENT 0

SCATTER SPECTRUM
9.7172E-01 2.8279E-02

GROUP NO 14	JFST 14	JLST 15	MOMENT 0

SCATTER SPECTRUM
9.5640E-01 4.3601E-02

GROUP NO 15	JFST 15	JLST 16	MOMENT 0

SCATTER SPECTRUM
9.5534E-01 4.4683E-02

GROUP NO 16	JFST 16	JLST 17	MOMENT 0

SCATTER SPECTRUM
9.5031E-01 4.9687E-02

GROUP NO 17	JFST 17	JLST 18	MOMENT 0

SCATTER SPECTRUM
9.5071E-01 4.9292E-02

GROUP NO 18	JFST 18	JLST 19	MOMENT 0

SCATTER SPECTRUM
9.5037E-01 4.9634E-02

GROUP NO 19	JFST 19	JLST 20	MOMENT 0

SCATTER SPECTRUM
9.5028E-01 4.9724E-02

GROUP NO 20	JFST 20	JLST 21	MOMENT 0

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SCATTER SPECTRUM			
9.7553E-01	2.4484E-02		
GROUP NO 21	JFST 21	JLST 22	MOMENT 0
SCATTER SPECTRUM			
9.7545E-01	2.4542E-02		
GROUP NO 22	JFST 22	JLST 23	MOMENT 0
SCATTER SPECTRUM			
9.6636E-01	3.3644E-02		
GROUP NO 23	JFST 23	JLST 24	MOMENT 0
SCATTER SPECTRUM			
9.4877E-01	5.1229E-02		
GROUP NO 24	JFST 24	JLST 25	MOMENT 0
SCATTER SPECTRUM			
9.5620E-01	4.3805E-02		
GROUP NO 25	JFST 25	JLST 26	MOMENT 0
SCATTER SPECTRUM			
9.5528E-01	4.4728E-02		
GROUP NO 26	JFST 26	JLST 27	MOMENT 0
SCATTER SPECTRUM			
9.5294E-01	4.7061E-02		
GROUP NO 27	JFST 27	JLST 29	MOMENT 0
SCATTER SPECTRUM			
9.7356E-01	2.6437E-02	1.4889E-13	

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GROUP NO 28	JFST 27	JLST 29	MOMENT 0
SCATTER SPECTRUM			
1.0876E-02	8.6546E-01	1.2367E-01	
GROUP NO 29	JFST 27	JLST 30	MOMENT 0
SCATTER SPECTRUM			
1.5593E-14	1.1215E-02	8.8600E-01	1.0279E-01
GROUP NO 30	JFST 29	JLST 31	MOMENT 0
SCATTER SPECTRUM			
1.6646E-02	8.6501E-01	1.1834E-01	
GROUP NO 31	JFST 30	JLST 33	MOMENT 0
SCATTER SPECTRUM			
1.3413E-02	9.0704E-01	7.9202E-02	3.5084E-04
GROUP NO 32	JFST 31	JLST 39	MOMENT 0
SCATTER SPECTRUM			
4.4672E-02	7.6396E-01	1.8819E-01	2.0850E-03
7.5021E-04	2.5376E-04	7.5038E-05	1.9009E-05
4.5000E-06			
GROUP NO 33	JFST 31	JLST 43	MOMENT 0
SCATTER SPECTRUM			
1.2442E-05	5.9817E-02	7.1390E-01	1.0073E-01
6.0075E-02	3.4265E-02	1.7714E-02	8.0391E-03
3.3854E-03	1.3635E-03		
GROUP NO 34	JFST 32	JLST 44	MOMENT 0
SCATTER SPECTRUM			
4.7012E-04	2.1527E-01	2.4621E-01	2.1103E-01
1.4511E-01	9.0102E-02	4.8725E-02	2.4191E-02
1.1424E-02	4.5785E-03		
2.4970E-03	3.7995E-04	9.5229E-06	

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GROUP NO 35      JFST 32      JLST 44      MOMENT 0
SCATTER SPECTRUM
1.1257E-04 8.4974E-02 1.3458E-01 2.4143E-01 2.1394E-01 1.4605E-01 8.7191E-02 4.7750E-02 2.4872E-02 1.1000E-02
6.7830E-03 1.2789E-03 4.1680E-05
GROUP NO 36      JFST 32      JLST 45      MOMENT 0
SCATTER SPECTRUM
2.4545E-05 3.1617E-02 5.6170E-02 1.3255E-01 2.4434E-01 2.1554E-01 1.4137E-01 8.5209E-02 4.8881E-02 2.3791E-02
1.6525E-02 3.9085E-03 1.7012E-04 1.4734E-06
GROUP NO 37      JFST 32      JLST 45      MOMENT 0
SCATTER SPECTRUM
4.6643E-06 1.0739E-02 2.1670E-02 5.4954E-02 1.3370E-01 2.4734E-01 2.1019E-01 1.3399E-01 8.7747E-02 4.6985E-02
3.6754E-02 1.0293E-02 6.2694E-04 7.2571E-06
GROUP NO 38      JFST 33      JLST 45      MOMENT 0
SCATTER SPECTRUM
3.3537E-03 7.7481E-03 2.1360E-02 5.5848E-02 1.3683E-01 2.4230E-01 2.0603E-01 1.4241E-01 8.3640E-02 7.3559E-02
2.4869E-02 2.0193E-03 3.2325E-05
GROUP NO 39      JFST 33      JLST 45      MOMENT 0
SCATTER SPECTRUM
9.9595E-04 2.6123E-03 7.8876E-03 2.2367E-02 5.8835E-02 1.3663E-01 2.3696E-01 2.0900E-01 1.3375E-01 1.3177E-01
5.3416E-02 5.6553E-03 1.3055E-04
GROUP NO 40      JFST 33      JLST 45      MOMENT 0
SCATTER SPECTRUM
2.6733E-04 8.1390E-04 2.7089E-03 8.4001E-03 2.3955E-02 5.9613E-02 1.3425E-01 2.3983E-01 1.9573E-01 2.1522E-01
1.0446E-01 1.4281E-02 4.6944E-04

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GROUP NO 41      JFST 33      JLST 45      MOMENT 0
SCATTER SPECTRUM
8.7753E-05 2.3702E-04 8.7252E-04 2.9803E-03 9.2863E-03 2.4991E-02 6.0087E-02 1.3955E-01 2.2545E-01 3.1922E-01
1.8387E-01 9.1968E-02 1.4442E-03
GROUP NO 42      JFST 33      JLST 45      MOMENT 0
SCATTER SPECTRUM
1.0804E-05 4.4335E-05 1.9450E-04 7.0841E-04 2.4712E-03 7.3740E-03 1.9440E-02 4.8961E-02 1.0220E-01 3.6978E-01
3.5497E-01 8.7568E-02 6.2821E-03
GROUP NO 43      JFST 34      JLST 46      MOMENT 0
SCATTER SPECTRUM
2.1423E-08 1.1025E-05 5.1719E-05 2.1927E-04 7.8552E-04 2.4482E-03 7.1940E-03 1.7167E-02 1.0950E-01 4.9955E-01
3.1672E-01 4.6343E-02 7.0127E-06
GROUP NO 44      JFST 37      JLST 46      MOMENT 0
SCATTER SPECTRUM
4.0753E-06 1.9598E-05 8.0117E-05 3.0477E-04 9.1664E-04 8.0834E-03 1.1071E-01 5.6237E-01 3.1705E-01 4.5950E-04
GROUP NO 45      JFST 41      JLST 47      MOMENT 0
SCATTER SPECTRUM
5.3914E-06 7.7397E-05 2.1264E-03 4.9783E-02 7.9988E-01 1.4770E-01 4.1633E-04
GROUP NO 46      JFST 44      JLST 49      MOMENT 0
SCATTER SPECTRUM
8.4150E-06 8.1483E-02 7.8151E-01 1.5609E-01 8.9459E-04 1.1292E-05
GROUP NO 47      JFST 45      JLST 52      MOMENT 0
SCATTER SPECTRUM
3.5786E-05 7.3373E-02 7.6007E-01 1.5251E-01 1.2240E-02 1.4506E-03 2.8530E-04 4.4137E-05

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GROUP NO 48      JFST 46      JLST 54                      MOMENT 0
SCATTER SPECTRUM
2.2274E-04 1.4158E-01 5.9501E-01 2.0157E-01 4.3585E-02 1.3918E-02 3.8764E-03 2.5086E-04 6.6396E-06
GROUP NO 49      JFST 46      JLST 54                      MOMENT 0
SCATTER SPECTRUM
2.3239E-06 9.9623E-03 1.9621E-01 4.5355E-01 2.0805E-01 9.1157E-02 3.6785E-02 4.0918E-03 2.0743E-04
GROUP NO 50      JFST 47      JLST 55                      MOMENT 0
SCATTER SPECTRUM
1.2063E-03 4.2519E-02 2.1325E-01 3.4844E-01 2.4387E-01 1.2842E-01 2.0653E-02 1.6159E-03 1.0340E-05
GROUP NO 51      JFST 47      JLST 55                      MOMENT 0
SCATTER SPECTRUM
1.7727E-04 1.0192E-02 6.7987E-02 1.7759E-01 3.5800E-01 3.0904E-01 6.8992E-02 7.9207E-03 9.5661E-05
GROUP NO 52      JFST 47      JLST 56                      MOMENT 0
SCATTER SPECTRUM
1.3110E-05 1.3612E-03 1.2962E-02 4.2871E-02 1.4167E-01 4.9231E-01 2.5755E-01 4.9884E-02 1.3759E-03 4.3190E-06
GROUP NO 53      JFST 48      JLST 56                      MOMENT 0
SCATTER SPECTRUM
5.7225E-05 9.3971E-04 4.4666E-03 2.0090E-02 1.6829E-01 5.1221E-01 2.7631E-01 1.7462E-02 1.7015E-04
GROUP NO 54      JFST 49      JLST 57                      MOMENT 0
SCATTER SPECTRUM
2.1925E-05 1.6125E-04 1.0716E-03 1.4962E-02 1.2767E-01 6.2909E-01 2.1886E-01 8.1428E-03 2.3214E-05
GROUP NO 55      JFST 51      JLST 59                      MOMENT 0

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SCATTER SPECTRUM
7.2699E-06 2.3749E-04 4.6161E-03 1.2697E-01 6.6395E-01 2.0070E-01 3.3954E-03 1.2256E-04 6.5354E-06
GROUP NO 56      JFST 53      JLST 62                      MOMENT 0
SCATTER SPECTRUM
2.5090E-05 2.6689E-03 1.1017E-01 7.0614E-01 1.6002E-01 1.7997E-02 2.4401E-03 4.5393E-04 7.5565E-05 7.9131E-06
GROUP NO 57      JFST 54      JLST 65                      MOMENT 0
SCATTER SPECTRUM
1.2099E-05 2.9236E-03 2.0805E-01 5.4225E-01 1.9097E-01 4.1139E-02 1.1281E-02 2.8256E-03 4.7132E-04 6.1736E-05
1.1736E-05 1.5521E-08
GROUP NO 58      JFST 55      JLST 66                      MOMENT 0
SCATTER SPECTRUM
1.4846E-04 3.2088E-02 2.4315E-01 4.3881E-01 1.8909E-01 6.7991E-02 2.2473E-02 5.0854E-03 8.9818E-04 2.2395E-04
4.0986E-05 4.8622E-06
GROUP NO 59      JFST 55      JLST 67                      MOMENT 0
SCATTER SPECTRUM
1.1009E-05 6.0172E-03 7.1715E-02 2.4877E-01 3.5571E-01 2.0432E-01 8.2986E-02 2.3422E-02 5.1070E-03 1.5396E-03
3.5114E-04 5.4402E-05 4.7188E-06
GROUP NO 60      JFST 56      JLST 68                      MOMENT 0
SCATTER SPECTRUM
1.2331E-03 2.1733E-02 9.8060E-02 2.1891E-01 3.4371E-01 2.1483E-01 7.3358E-02 1.9124E-02 6.7742E-03 1.8603E-03
3.5951E-04 4.1225E-05 1.9656E-06
GROUP NO 61      JFST 56      JLST 68                      MOMENT 0
SCATTER SPECTRUM
2.0489E-04 5.4616E-03 3.2550E-02 8.8607E-02 2.0989E-01 3.6563E-01 1.9908E-01 6.1992E-02 2.5753E-02 8.4814E-03
2.0308E-03 3.0326E-04 2.0650E-05

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GROUP NO 62 JFST 56 JLST 69 MOMENT 0
 SCATTER SPECTRUM
 2.5177E-05 1.0736E-03 8.7246E-03 2.9582E-02 8.4066E-02 2.2865E-01 3.5324E-01 1.6941E-01 8.1954E-02 3.2007E-02
 9.3373E-03 1.7713E-03 1.6440E-04 3.4668E-06
 GROUP NO 63 JFST 56 JLST 69 MOMENT 0
 SCATTER SPECTRUM
 3.0205E-08 2.0761E-04 2.2833E-03 9.5816E-03 3.2470E-02 1.0463E-01 2.4459E-01 2.8879E-01 1.9332E-01 8.6823E-02
 2.9683E-02 6.8004E-03 8.0143E-04 2.3781E-05
 GROUP NO 64 JFST 57 JLST 69 MOMENT 0
 SCATTER SPECTRUM
 4.2035E-05 6.0862E-04 3.0986E-03 1.2356E-02 4.6577E-02 1.2602E-01 2.0375E-01 3.0879E-01 1.9636E-01 7.7875E-02
 2.1262E-02 3.1286E-03 1.2696E-04
 GROUP NO 65 JFST 57 JLST 69 MOMENT 0
 SCATTER SPECTRUM
 6.1188E-06 1.2290E-04 7.8188E-04 3.7626E-03 1.7023E-02 5.4467E-02 1.0075E-01 2.1381E-01 3.3393E-01 1.9766E-01
 6.4977E-02 1.2046E-02 6.7292E-04
 GROUP NO 66 JFST 58 JLST 69 MOMENT 0
 SCATTER SPECTRUM
 1.6884E-05 1.4056E-04 8.4526E-04 4.7478E-03 1.8524E-02 4.0073E-02 9.8142E-02 2.2604E-01 3.6692E-01 1.9471E-01
 4.6244E-02 3.6110E-03
 GROUP NO 67 JFST 58 JLST 69 MOMENT 0
 SCATTER SPECTRUM
 1.3398E-06 1.5328E-05 1.2209E-04 8.9450E-04 4.4446E-03 1.1629E-02 3.3879E-02 9.3464E-02 2.4169E-01 4.1303E-01
 1.8052E-01 2.0310E-02

GROUP NO 68 JFST 60 JLST 69 MOMENT 0
 SCATTER SPECTRUM
 8.6444E-06 9.0558E-05 6.1454E-04 2.0472E-03 7.4558E-03 2.5893E-02 8.5377E-02 2.6456E-01 4.8389E-01 1.3008E-01
 GROUP NO 69 JFST 61 JLST 69 MOMENT 0
 SCATTER SPECTRUM
 3.1114E-06 3.3201E-05 1.5594E-04 7.7749E-04 3.7221E-03 1.7158E-02 7.8331E-02 3.2815E-01 5.7366E-01

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***MATERIAL 3** NO.OF REACTIONS
3

FILE 3
*****

ABSORPTION
*****

REACTION NAME	NUMBER OF SECONDARY NEUTRONS	NUMBER OF P-N ENERGY RANGES FOR ORDERS	NUMBER OF PRIMARY DATA
1	0	1	1

FIRST + LAST PRIMARY GROUPS
1 69

MOMENT 0

PRIMARY SIGMA

2.91214E-03	8.58586E-04	1.49905E-06	1.14824E-06	1.15516E-05	1.21174E-06
1.42257E-06	1.82809E-06	2.83376E-06	3.80587E-06	5.41403E-06	7.69414E-06
1.06121E-05	1.47890E-05	1.96872E-05	2.54195E-05	3.23092E-05	4.09916E-05
5.19863E-05	7.36037E-05	1.15548E-04	1.71298E-04	2.20477E-04	2.80057E-04
3.83395E-04	4.99391E-04	7.10282E-04	9.21238E-04	1.02657E-03	1.14972E-03
1.32082E-03	1.48824E-03	1.59073E-03	1.65001E-03	1.66967E-03	1.68963E-03
1.71033E-03	1.73143E-03	1.75250E-03	1.77390E-03	1.79490E-03	1.82466E-03
1.87599E-03	1.94950E-03	2.10564E-03	2.35238E-03	2.62998E-03	2.87223E-03
3.03600E-03	3.15472E-03	3.26140E-03	3.41309E-03	3.62444E-03	3.93412E-03
4.40398E-03	5.12499E-03	5.82360E-03	6.54459E-03	7.08970E-03	7.61541E-03
8.24646E-03	9.01552E-03	9.80930E-03	1.06640E-02	1.17850E-02	1.33617E-02
1.58134E-02	2.04056E-02	3.36058E-02			

TRANSPORT
*****

REACTION NAME	NUMBER OF SECONDARY NEUTRONS	NUMBER OF P-N ENERGY RANGES FOR ORDERS	NUMBER OF PRIMARY DATA
2	0	1	1

FILE 3
*****

FIRST + LAST PRIMARY GROUPS
1 69

RADIAL

PRIMARY SIGMA

4.62951E-02	6.24338E-02	6.92154E-02	8.23707E-02	1.09042E-01	1.14662E-01
1.46637E-01	1.56370E-01	1.61243E-01	1.67358E-01	1.83876E-01	2.04004E-01
2.18054E-01	2.30191E-01	2.41569E-01	2.49651E-01	2.52328E-01	2.56914E-01
2.64780E-01	2.72583E-01	2.79309E-01	2.82435E-01	2.84712E-01	2.84951E-01
2.85040E-01	2.84809E-01	2.86232E-01	3.22412E-01	3.28722E-01	3.36692E-01
3.49688E-01	3.63430E-01	3.72248E-01	3.77436E-01	3.79179E-01	3.80927E-01
3.82735E-01	3.84603E-01	3.86499E-01	3.89452E-01	3.90323E-01	3.92940E-01
3.97775E-01	4.05242E-01	4.21276E-01	4.49237E-01	4.83741E-01	5.15053E-01
5.36081E-01	5.51048E-01	5.64373E-01	5.83210E-01	6.08963E-01	6.46610E-01
7.03931E-01	7.84572E-01	8.72457E-01	9.36468E-01	9.87150E-01	1.04061E+00
1.11595E+00	1.22253E+00	1.34320E+00	1.47585E+00	1.64557E+00	1.86791E+00
2.17867E+00	2.69214E+00	4.04584E+00			

SCATTER
*****

REACTION NAME	NUMBER OF SECONDARY NEUTRONS	NUMBER OF P-N ENERGY RANGES FOR ORDERS	NUMBER OF PRIMARY DATA
3	1	1	1

FIRST + LAST PRIMARY GROUPS
1 69

MOMENT 0

PRIMARY SIGMA

5.59255E-02	8.66473E-02	9.66837E-02	1.39680E-01	2.09841E-01	2.33034E-01
3.53167E-01	3.69427E-01	4.37739E-01	5.05216E-01	5.71456E-01	6.29805E-01
6.71301E-01	6.97114E-01	7.12730E-01	7.20621E-01	7.24368E-01	7.27041E-01
7.29749E-01	7.33361E-01	7.38009E-01	7.41787E-01	7.42857E-01	7.43526E-01
7.44562E-01	7.44997E-01	7.44997E-01	7.47419E-01	7.52673E-01	7.62505E-01
7.67546E-01	7.76837E-01	7.83041E-01	7.85360E-01	7.86847E-01	7.87965E-01
7.88844E-01	7.89880E-01	7.90981E-01	7.92090E-01	7.93163E-01	7.94390E-01
7.97183E-01	8.01325E-01	8.12707E-01	8.34424E-01	8.68091E-01	9.00295E-01
9.21096E-01	9.35829E-01	9.48722E-01	9.66903E-01	9.91790E-01	1.02859E+00
1.08408E+00	1.15963E+00	1.24069E+00	1.29400E+00	1.33695E+00	1.38826E+00
1.46530E+00	1.57417E+00	1.69364E+00	1.82135E+00	1.98053E+00	2.18538E+00
2.46692E+00	2.93077E+00	4.17634E+00			

NO.OF ENERGY RANGES FOR SECONDARY DATA
1

FIRST + LAST PRIMARY GROUPS
1 69

FOR EACH PRIMARY GROUP

GROUP NO 1 JFST 1 JLIST 22

MOMENT 0

SCATTER SPECTRUM

2.7468E-01	3.0048E-01	1.5255E-01	1.0436E-01	6.6008E-02	3.8921E-02	2.3021E-02	1.3621E-02	7.9921E-03	4.6827E-03
2.8090E-03	1.6949E-03	1.0252E-03	6.1798E-04	3.7506E-04	2.1016E-04	1.3374E-04	8.5108E-05	5.4157E-05	5.6433E-05
2.2953E-05	7.6561E-06								

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SCATTER SPECTRUM
 3.3465E-01 3.2873E-01 1.3248E-01 8.0269E-02 4.8433E-02 2.9799E-02 1.8031E-02 1.0863E-02 6.5875E-03 3.9958E-03
 2.4247E-03 1.4711E-03 8.9202E-04 5.4137E-04 3.0339E-04 1.9307E-04 1.2287E-04 7.8185E-05 8.1435E-05 3.2979E-05
 1.1050E-05 4.1415E-06

GROUP NO 3 JFST 3 JLST 25

MOMENT 0

SCATTER SPECTRUM
 3.0947E-01 2.8522E-01 1.5938E-01 9.6187E-02 5.9186E-02 3.5500E-02 2.1569E-02 1.3080E-02 7.9358E-03 4.9142E-03
 2.9209E-03 1.7711E-03 1.0748E-03 6.0242E-04 3.8336E-04 2.4396E-04 1.5524E-04 1.6167E-04 6.5469E-05 2.1938E-05
 8.2233E-06 8.0971E-06 3.5147E-06

GROUP NO 4 JFST 4 JLST 27

MOMENT 0

SCATTER SPECTRUM
 3.3110E-01 3.0454E-01 1.4246E-01 8.7851E-02 5.3034E-02 3.1954E-02 1.9376E-02 1.1756E-02 7.1319E-03 4.3270E-03
 2.6237E-03 1.5924E-03 8.9242E-04 5.6731E-04 3.6141E-04 2.2998E-04 2.3948E-04 9.6977E-05 3.2496E-05 1.2182E-05
 9.0320E-06 5.2066E-06 2.7032E-06 2.6080E-06

FILE 3
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GROUP NO 5 JFST 5 JLST 27

MOMENT 0

SCATTER SPECTRUM
 3.9040E-01 2.8997E-01 1.2626E-01 7.6393E-02 4.8027E-02 2.7910E-02 1.6934E-02 1.0273E-02 6.2328E-03 3.7793E-03
 2.2937E-03 1.2855E-03 8.1803E-04 5.2058E-04 3.3126E-04 3.4494E-04 1.3969E-04 4.6809E-05 1.7547E-05 1.3010E-05
 7.4999E-06 3.8937E-06 3.7567E-06

GROUP NO 6 JFST 6 JLST 27

MOMENT 0

SCATTER SPECTRUM
 3.5194E-01 2.8091E-01 1.4505E-01 8.7395E-02 5.2994E-02 3.2153E-02 1.9505E-02 1.1834E-02 7.1759E-03 4.3550E-03
 2.4409E-03 1.5533E-03 9.8850E-04 6.2902E-04 6.5488E-04 2.6520E-04 8.8872E-05 3.3320E-05 2.4702E-05 1.4240E-05
 7.3933E-06 7.1321E-06

GROUP NO 7 JFST 7 JLST 31

MOMENT 0

SCATTER SPECTRUM
 4.0687E-01 2.6822E-01 1.2784E-01 7.7520E-02 4.7033E-02 2.8533E-02 1.7311E-02 1.0497E-02 6.3708E-03 3.5703E-03
 2.2720E-03 1.4459E-03 9.2007E-04 5.8068E-04 3.8799E-04 1.3001E-04 4.8736E-05 3.6135E-05 2.0830E-05 1.0815E-05
 1.0434E-05 1.2429E-06 1.2429E-06 8.8775E-07 1.0654E-06

GROUP NO 8 JFST 8 JLST 31

MOMENT 0

SCATTER SPECTRUM
 3.0686E-01 2.3709E-01 1.5587E-01 9.4589E-02 5.7370E-02 3.4808E-02 2.1106E-02 1.2809E-02 7.1790E-03 4.5684E-03
 2.9072E-03 1.8500E-03 1.9252E-03 7.8005E-04 2.6140E-04 9.7999E-05 7.2655E-05 4.1882E-05 2.1745E-05 2.0977E-05
 2.4992E-06 2.4992E-06 1.7852E-06 2.1421E-06

GROUP NO 9 JFST 9 JLST 45

MOMENT 0

SCATTER SPECTRUM
 2.9216E-01 2.9846E-01 1.6104E-01 9.7699E-02 5.9274E-02 3.5941E-02 2.1813E-02 1.2226E-02 7.7797E-03 4.9508E-03
 3.1504E-03 3.2802E-03 1.3284E-03 4.4514E-04 1.6688E-04 1.2372E-04 7.1322E-05 3.7030E-05 3.5724E-05 4.2561E-06
 4.2560E-06 3.0400E-06 3.6479E-06 1.2160E-06 9.1199E-07 1.6418E-07 1.5810E-07 1.5810E-07 1.5810E-07 1.5202E-07
 1.4594E-07 1.4594E-07 1.3378E-07 2.4323E-07 3.6482E-07 4.2562E-07 9.4238E-07

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GROUP NO 10 JFST 10 JLST 47 MOMENT 0
 SCATTER SPECTRUM
 2.8148E-01 2.9995E-01 1.6488E-01 9.9908E-02 6.0578E-02 3.8785E-02 2.0606E-02 1.3112E-02 8.3445E-03 5.3099E-03
 5.5297E-03 2.2390E-03 7.5027E-04 2.8127E-04 2.0854E-04 1.2021E-04 6.2413E-05 6.0211E-05 7.1734E-06 7.1732E-06
 5.1238E-06 8.1483E-06 2.0496E-06 1.5372E-06 2.7672E-07 2.6647E-07 2.6647E-07 2.6647E-07 2.5622E-07 2.4597E-07
 2.4597E-07 2.2548E-07 4.0993E-07 6.1486E-07 7.1736E-07 1.5884E-06 1.2909E-06 1.0248E-06

GROUP NO 11 JFST 11 JLST 56 MOMENT 0
 SCATTER SPECTRUM
 2.7227E-01 3.0174E-01 1.6761E-01 1.0163E-01 6.1681E-02 3.4577E-02 2.1999E-02 1.3999E-02 8.9085E-03 9.2758E-03
 3.7563E-03 1.2588E-03 4.7189E-04 3.4986E-04 2.0188E-04 1.0471E-04 1.0102E-04 1.2035E-05 1.2035E-05 8.5862E-06
 1.0316E-05 3.4386E-06 2.5789E-06 4.6425E-07 4.4705E-07 4.4705E-07 4.4705E-07 4.2988E-07 4.1287E-07 4.1287E-07
 3.7828E-07 6.8776E-07 1.0316E-06 1.2036E-06 2.6648E-06 2.1491E-06 1.7193E-06 8.5964E-07 5.1561E-07 3.4387E-07
 3.4386E-07 5.1579E-07 5.1579E-07 6.8770E-07 6.8770E-07 6.8768E-07

GROUP NO 12 JFST 12 JLST 57 MOMENT 0
 SCATTER SPECTRUM
 2.6689E-01 3.0256E-01 1.6938E-01 1.0279E-01 5.7608E-02 3.6660E-02 2.3330E-02 1.4846E-02 1.5457E-02 6.2597E-03
 2.0976E-03 7.8637E-04 5.8303E-04 3.3809E-04 1.7449E-04 1.6834E-04 2.0055E-05 2.0054E-05 1.4325E-05 1.7189E-05
 5.7302E-06 4.2976E-06 7.7364E-07 7.4499E-07 7.4499E-07 7.4499E-07 7.1634E-07 6.8768E-07 6.8768E-07 6.3038E-07
 1.1481E-06 1.7191E-06 2.0056E-06 4.4407E-06 3.5813E-06 2.8650E-06 1.4325E-06 8.5955E-07 5.7305E-07 5.7303E-07
 8.5953E-07 8.5953E-07 1.1461E-06 1.1460E-06 1.1460E-06 5.7300E-07

GROUP NO 13 JFST 13 JLST 58 MOMENT 0
 SCATTER SPECTRUM
 2.6424E-01 3.0266E-01 1.7044E-01 9.5523E-02 6.0788E-02 3.8685E-02 2.4616E-02 2.5631E-02 1.0379E-02 3.4782E-03
 1.3039E-03 9.6678E-04 5.5729E-04 2.8934E-04 2.7913E-04 3.3255E-05 3.3254E-05 2.3754E-05 2.6503E-05 9.5014E-06
 7.1263E-06 1.2928E-06 1.2353E-06 1.2353E-06 1.1878E-06 1.1402E-06 1.1402E-06 1.1402E-06 1.0453E-06 1.9005E-06
 2.8505E-06 3.3257E-06 7.3638E-06 5.9384E-06 4.7508E-06 1.7555E-06 1.4253E-06 9.5023E-07 9.5014E-07 1.9252E-06
 1.4252E-06 1.9003E-06 1.9003E-06 1.9002E-06 9.5014E-07 6.1753E-07

GROUP NO 14 JFST 14 JLST 62 MOMENT 0

FILE J
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SCATTER SPECTRUM
 2.6243E-01 3.0304E-01 1.5802E-01 1.0056E-01 6.3994E-02 4.0721E-02 4.2399E-02 1.7170E-02 5.7537E-03 2.1570E-03
 1.5992E-03 9.2191E-04 4.7863E-04 4.6175E-04 5.5012E-05 5.5010E-05 3.9294E-05 4.7151E-05 1.5718E-05 1.1789E-05
 2.1221E-06 2.0435E-06 2.0435E-06 2.0435E-06 1.9649E-06 1.8863E-06 1.8863E-06 1.7291E-06 3.1438E-06 4.7155E-06
 5.5014E-06 1.2181E-06 9.8233E-06 7.8587E-06 3.9295E-06 2.3578E-06 1.5719E-06 1.5718E-06 2.3577E-06 2.3577E-06
 3.1435E-06 3.1435E-06 3.1434E-06 1.5717E-06 1.0217E-06 7.0731E-07 6.2873E-07 6.2871E-07 5.5012E-07

GROUP NO 15 JFST 15 JLST 69 MOMENT 0
 SCATTER SPECTRUM
 2.8064E-01 2.8223E-01 1.8624E-01 1.0579E-01 8.7318E-02 7.0103E-02 2.8389E-02 9.5124E-03 3.5659E-03 2.6438E-03
 1.5241E-03 7.9126E-04 7.8346E-04 8.8937E-05 9.2403E-05 8.6159E-05 7.9143E-05 2.8273E-05 1.9602E-05 3.5214E-06
 3.3899E-06 3.3879E-06 3.3857E-06 3.2555E-06 3.1240E-06 3.1216E-06 2.8599E-06 5.1937E-06 7.7795E-06 9.0823E-06
 2.0022E-06 1.8133E-06 1.2906E-06 6.4519E-06 3.8709E-06 2.5806E-06 2.5806E-06 3.8708E-06 3.8706E-06 5.1602E-06
 5.1577E-06 5.1452E-06 2.5558E-06 1.6458E-06 1.1260E-06 9.8693E-07 9.6758E-07 8.2348E-07 5.6971E-07 5.4891E-07
 5.2131E-07 4.8218E-07 4.3078E-07 3.5209E-07 2.0386E-07

GROUP NO 16 JFST 16 JLST 69 MOMENT 0
 SCATTER SPECTRUM
 2.4185E-01 2.9031E-01 1.7013E-01 1.0828E-01 1.1274E-01 4.5655E-02 1.5298E-02 5.7346E-03 4.2518E-03 2.4510E-03
 1.2725E-03 1.2278E-03 1.4288E-04 1.4863E-04 1.0641E-04 1.2729E-04 4.2257E-05 3.1526E-05 5.6637E-06 5.4508E-06
 5.4488E-06 5.4471E-06 5.2361E-06 5.0248E-06 5.0208E-06 4.5999E-06 8.3536E-06 1.2511E-05 1.4576E-05 3.2202E-05
 2.5947E-05 2.0757E-05 1.0377E-05 6.2261E-06 4.1507E-06 4.1506E-06 6.2256E-06 6.2255E-06 8.2986E-06 8.2986E-06
 8.2755E-06 4.1107E-06 2.8471E-06 1.8110E-06 1.5874E-06 1.5562E-06 1.3245E-06 9.1636E-07 8.8286E-07 8.3847E-07
 7.7714E-07 6.9286E-07 5.6631E-07 3.2789E-07

GROUP NO 17 JFST 17 JLST 69 MOMENT 0
 SCATTER SPECTRUM
 2.4151E-01 2.9037E-01 1.7023E-01 1.7727E-01 7.1788E-02 2.4055E-02 9.0171E-03 6.8856E-03 3.8540E-03 2.0009E-03
 1.9306E-03 2.2469E-04 2.3371E-04 1.6732E-04 2.0017E-04 6.6449E-05 4.9575E-05 8.9082E-06 8.5714E-06 8.5693E-06
 8.5656E-06 8.2337E-06 7.9012E-06 7.8952E-06 7.2333E-06 1.3136E-05 1.9675E-05 2.2920E-05 5.0638E-05 4.0802E-05
 3.2640E-05 1.6319E-05 9.7901E-06 6.5269E-06 6.5269E-06 9.7901E-06 9.7892E-06 1.3051E-05 1.3044E-05 1.3013E-05
 6.4642E-06 4.1629E-06 2.8478E-06 2.4982E-06 2.4471E-06 2.0827E-06 1.4410E-06 1.3883E-06 1.3185E-06 1.2221E-06
 1.0898E-06 8.9053E-07 5.1560E-07

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GROUP NO 18 JFST 18 JLST 69 MOMENT 0
 SCATTER SPECTRUM
 2.4143E-01 2.9033E-01 2.7863E-01 1.1283E-01 3.7809E-02 1.4173E-02 1.0508E-02 6.0575E-03 3.1450E-03 3.0345E-03
 3.5317E-04 3.6777E-04 2.6301E-04 3.1464E-04 1.0444E-04 7.7925E-05 1.3999E-05 1.3473E-05 1.3468E-05 1.3463E-05
 1.2942E-05 1.2419E-05 1.2410E-05 1.1370E-05 2.0647E-05 3.0927E-05 3.6028E-05 7.9598E-05 6.4135E-05 5.1306E-05
 2.5659E-05 1.5390E-05 1.0260E-05 1.0259E-05 1.5389E-05 1.5388E-05 2.0515E-05 2.0505E-05 2.0454E-05 1.0161E-05
 6.5429E-06 4.4763E-06 3.9236E-06 3.8465E-06 3.2737E-06 2.2649E-06 2.1822E-06 2.0724E-06 1.9209E-06 1.7125E-06
 1.3998E-06 8.1045E-07

GROUP NO 19 JFST 19 JLST 69 MOMENT 0
 SCATTER SPECTRUM
 2.4127E-01 4.6067E-01 1.7737E-01 5.9433E-02 2.2279E-02 1.6518E-02 9.5220E-03 4.9436E-03 4.7700E-03 5.5518E-04
 5.7748E-04 4.1345E-04 4.9460E-04 1.6419E-04 1.2249E-04 2.2006E-05 2.1179E-05 2.1171E-05 2.1165E-05 2.0345E-05
 1.9523E-05 1.9509E-05 1.7873E-05 2.2458E-05 4.8617E-05 5.6634E-05 1.2512E-04 1.0082E-04 8.0651E-05 4.0320E-05
 2.4191E-05 1.6127E-05 1.6127E-05 2.4190E-05 2.4189E-05 3.2248E-05 3.2233E-05 3.2154E-05 1.5973E-05 1.0285E-05
 7.0366E-06 6.1679E-06 6.0467E-06 5.1462E-06 3.5604E-06 3.4303E-06 3.2579E-06 3.0195E-06 2.6921E-06 2.2004E-06
 1.2740E-06

GROUP NO 20 JFST 20 JLST 69 MOMENT 0
 SCATTER SPECTRUM
 3.8738E-01 3.6910E-01 1.1991E-01 4.4948E-02 3.3325E-02 1.9211E-02 9.9734E-03 9.6235E-03 1.1201E-03 1.1651E-03
 8.3415E-04 9.9799E-04 3.3126E-04 2.4714E-04 4.4399E-05 4.2730E-05 4.2715E-05 4.2701E-05 4.1047E-05 3.9389E-05
 3.9359E-05 3.6059E-05 6.5486E-05 9.8090E-05 1.1426E-04 2.5244E-04 2.0341E-04 1.6272E-04 8.1349E-05 4.8807E-05
 3.2538E-05 3.2537E-05 4.8805E-05 4.8802E-05 6.5063E-05 6.5031E-05 6.4873E-05 3.2225E-05 2.0751E-05 1.4197E-05
 1.2444E-05 1.2200E-05 1.0383E-05 7.1832E-06 6.9209E-06 6.5729E-06 6.0922E-06 5.4315E-06 4.4395E-06 2.5704E-06

GROUP NO 21 JFST 21 JLST 69 MOMENT 0
 SCATTER SPECTRUM
 3.8738E-01 3.0731E-01 1.1100E-01 8.2301E-02 4.7443E-02 2.4632E-02 2.3766E-02 2.7662E-03 2.8774E-03 2.0600E-03
 2.4644E-03 8.1810E-04 6.1036E-04 1.0965E-04 1.0553E-04 1.0549E-04 1.0546E-04 1.0137E-04 9.7278E-05 9.7205E-05
 8.9054E-05 1.6173E-04 2.4224E-04 2.8219E-04 6.2343E-04 5.0234E-04 4.0186E-04 2.0091E-04 1.2054E-04 8.0356E-05
 8.0355E-05 1.2053E-04 1.2052E-04 1.6068E-04 1.6060E-04 1.6021E-04 7.9585E-05 5.1248E-05 3.5081E-05 3.0732E-05
 3.0128E-05 2.5642E-05 1.7740E-05 1.7092E-05 1.8233E-05 1.5045E-05 1.3414E-05 1.0964E-05 6.3479E-06

FILE 3
 GROUP NO 22 JFST 22 JLST 69 MOMENT 0
 SCATTER SPECTRUM
 3.2100E-01 2.5632E-01 1.7903E-01 1.0321E-01 5.3581E-02 5.1698E-02 6.0175E-03 6.2593E-03 4.4813E-03 5.2609E-03
 1.7796E-03 1.3277E-03 2.3852E-04 2.2956E-04 2.2948E-04 2.2940E-04 2.2051E-04 2.1161E-04 2.1145E-04 1.9372E-04
 3.5180E-04 5.2696E-04 6.1385E-04 1.3562E-03 1.0928E-03 8.7418E-04 4.3703E-04 2.6221E-04 1.7480E-04 1.7480E-04
 2.6219E-04 2.6218E-04 3.4954E-04 3.4936E-04 3.4852E-04 1.7312E-04 1.1148E-04 7.6270E-05 6.6853E-05 6.5539E-05
 5.5780E-05 3.8591E-05 3.7181E-05 3.5311E-05 3.2729E-05 2.9179E-05 2.3850E-05 1.3809E-05

GROUP NO 23 JFST 23 JLST 69 MOMENT 0
 SCATTER SPECTRUM
 2.4073E-01 3.3443E-01 1.7994E-01 9.3423E-02 9.0139E-02 1.0492E-02 1.0913E-02 7.8135E-03 9.3468E-03 3.1029E-03
 2.3149E-03 4.1588E-04 4.0025E-04 4.0010E-04 3.9998E-04 3.8448E-04 3.6895E-04 3.6867E-04 3.3777E-04 6.1340E-04
 9.1875E-04 1.0703E-03 2.3646E-03 1.9053E-03 1.5242E-03 7.6199E-04 4.5717E-04 3.0478E-04 3.0477E-04 4.5715E-04
 4.5713E-04 6.0943E-04 6.0914E-04 6.0768E-04 3.0185E-04 1.9437E-04 1.3298E-04 1.1656E-04 1.1427E-04 9.7251E-05
 6.7295E-05 6.4828E-05 6.1568E-05 5.7065E-05 5.0876E-05 4.1584E-05 2.4076E-05

GROUP NO 24 JFST 24 JLST 69 MOMENT 0
 SCATTER SPECTRUM
 2.7837E-01 3.1618E-01 1.5487E-01 1.4924E-01 1.7371E-02 1.8089E-02 1.2977E-02 1.5478E-02 5.1374E-03 3.8328E-03
 6.8857E-04 6.6268E-04 6.6244E-04 6.6223E-04 6.3858E-04 6.1086E-04 6.1041E-04 5.5923E-04 1.0156E-03 1.5212E-03
 1.7720E-03 3.9150E-03 3.1545E-03 2.3236E-03 1.2616E-03 7.5694E-04 5.0461E-04 5.0461E-04 7.5689E-04 7.5689E-04
 1.0091E-03 1.0085E-03 1.0061E-03 4.9977E-04 3.2182E-04 2.2017E-04 1.9298E-04 1.8920E-04 1.6102E-04 1.1140E-04
 1.0734E-04 1.0194E-04 9.4484E-05 8.4235E-05 6.8850E-05 3.9863E-05

GROUP NO 25 JFST 25 JLST 69 MOMENT 0
 SCATTER SPECTRUM
 2.7868E-01 2.8641E-01 2.5879E-01 3.0122E-02 3.1332E-02 2.2432E-02 2.6835E-02 8.9084E-03 6.8462E-03 1.1940E-03
 1.1491E-03 1.1487E-03 1.1483E-03 1.1039E-03 1.0592E-03 1.0585E-03 9.6970E-04 1.7611E-03 2.8378E-03 3.0729E-03
 6.7886E-03 5.4700E-03 4.3759E-03 2.1877E-03 1.3125E-03 8.7501E-04 8.7499E-04 1.3124E-03 1.3124E-03 1.7497E-03
 1.7488E-03 1.7446E-03 8.6660E-04 5.6804E-04 3.8178E-04 3.3465E-04 3.2807E-04 2.7921E-04 1.9317E-04 1.8612E-04
 1.7676E-04 1.6384E-04 1.4607E-04 1.1938E-04 6.9123E-05

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GROUP NO 26 JFST 26 JLST 69 MOMENT 0
SCATTER SPECTRUM
2.5051E-01 4.5443E-01 5.0482E-02 5.2490E-02 3.7579E-02 4.4956E-02 1.4823E-02 1.1134E-02 2.0002E-03 1.9250E-03
1.9244E-03 1.9237E-03 1.8492E-03 1.7746E-03 1.7732E-03 1.6246E-03 2.9502E-03 4.4190E-03 5.1476E-03 1.1373E-02
9.1633E-03 7.3307E-03 3.6648E-03 2.1988E-03 1.4658E-03 1.4658E-03 2.1987E-03 2.1986E-03 2.9311E-03 2.9297E-03
2.9226E-03 1.4518E-03 9.3484E-04 6.3959E-04 5.6062E-04 5.4960E-04 4.6777E-04 3.2361E-04 3.1180E-04 2.9612E-04
2.7446E-04 2.4470E-04 2.0001E-04 1.1580E-04

GROUP NO 27 JFST 27 JLST 69 MOMENT 0
SCATTER SPECTRUM
3.8806E-01 1.1275E-01 1.0792E-01 7.6538E-02 9.1561E-02 3.0395E-02 2.2676E-02 4.0738E-03 3.9206E-03 3.9193E-03
3.9180E-03 3.7662E-03 3.6141E-03 3.6114E-03 3.3087E-03 6.0086E-03 9.0000E-03 1.0484E-02 2.3162E-02 1.8663E-02
1.4930E-02 7.4642E-03 4.4783E-03 2.9855E-03 2.9854E-03 4.4720E-03 4.4778E-03 5.9693E-03 5.9669E-03 5.9525E-03
2.3566E-03 1.9040E-03 1.3027E-03 1.1418E-03 1.1194E-03 9.5270E-04 6.5909E-04 6.3503E-04 6.0310E-04 5.5899E-04
4.9637E-04 4.0734E-04 2.3584E-04

GROUP NO 28 JFST 27 JLST 69 MOMENT 0
SCATTER SPECTRUM
1.2734E-03 1.3840E-01 2.1783E-01 1.3143E-01 1.5253E-01 5.0499E-02 3.7782E-02 6.7772E-03 6.5207E-03 6.5159E-03
6.5103E-03 6.2574E-03 6.0089E-03 6.0074E-03 5.5046E-03 1.0003E-02 1.5005E-02 1.7493E-02 3.8705E-02 3.1183E-02
2.4801E-02 1.2296E-02 7.3201E-03 4.8460E-03 4.8111E-03 7.1421E-03 7.0215E-03 9.1055E-03 8.6822E-03 9.0456E-03
3.6774E-03 2.2265E-03 1.4518E-03 1.3057E-03 1.1451E-03 9.2885E-04 6.1691E-04 5.7331E-04 5.2355E-04 4.6637E-04
3.9827E-04 3.1081E-04 1.7178E-04

GROUP NO 29 JFST 27 JLST 69 MOMENT 0
SCATTER SPECTRUM
1.1331E-09 1.5313E-03 1.7039E-01 1.9055E-01 1.9284E-01 6.2330E-02 4.6669E-02 8.3940E-03 8.0823E-03 8.0830E-03
8.0830E-03 7.7723E-03 7.4619E-03 7.4625E-03 6.9400E-03 1.2437E-02 1.8658E-02 2.1750E-02 4.8071E-02 3.8596E-02
3.0677E-02 1.5212E-02 9.0674E-03 6.0092E-03 5.9769E-03 8.8809E-03 8.7307E-03 1.1332E-02 1.0828E-02 1.0061E-02
4.6161E-03 2.8013E-03 1.8276E-03 1.5350E-03 1.4385E-03 1.1737E-03 7.7674E-04 7.2154E-04 6.5396E-04 5.8692E-04
5.0088E-04 3.9082E-04 2.1606E-04

FILE 3
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GROUP NO 30 JFST 28 JLST 69 MOMENT 0
SCATTER SPECTRUM
1.5982E-09 2.6471E-03 1.7215E-01 2.7292E-01 7.8201E-02 5.7859E-02 1.0399E-02 1.0012E-02 1.0014E-02 1.0015E-02
9.6288E-03 9.2421E-03 9.2406E-03 8.4698E-03 1.5399E-02 2.3092E-02 2.6931E-02 5.9530E-02 4.7886E-02 3.8107E-02
1.8892E-02 1.1249E-02 7.4564E-03 7.4102E-03 1.1009E-02 1.0840E-02 1.4080E-02 1.3460E-02 1.2498E-02 5.7255E-03
3.4716E-03 2.2637E-03 1.9015E-03 1.7826E-03 1.4488E-03 9.6251E-04 8.9406E-04 8.1679E-04 7.2783E-04 6.2068E-04
4.8363E-04 3.5119E-04

GROUP NO 31 JFST 28 JLST 69 MOMENT 0
SCATTER SPECTRUM
5.0864E-14 7.8985E-08 2.4936E-03 2.4267E-01 1.2402E-01 8.1252E-02 1.4081E-02 1.3487E-02 1.3402E-02 1.3382E-02
1.2806E-02 1.2258E-02 1.2244E-02 1.1205E-02 2.0318E-02 3.0378E-02 3.5374E-02 7.8069E-02 6.2781E-02 4.9979E-02
2.4841E-02 1.4815E-02 9.8223E-03 9.7687E-03 1.4523E-02 1.4327E-02 1.8662E-02 1.7877E-02 1.6657E-02 7.6515E-03
4.6432E-03 3.0295E-03 2.5439E-03 2.3834E-03 1.9362E-03 1.2862E-03 1.1952E-03 1.0914E-03 9.7133E-04 8.2825E-04
6.4569E-04 3.5667E-04

GROUP NO 32 JFST 28 JLST 69 MOMENT 0
SCATTER SPECTRUM
2.3449E-18 1.5475E-12 3.5861E-08 1.0727E-02 1.5227E-01 1.3437E-01 2.1263E-02 1.9686E-02 1.8968E-02 1.8304E-02
1.7088E-02 1.5996E-02 1.5708E-02 1.4200E-02 2.5568E-02 3.8144E-02 4.4533E-02 9.8519E-02 7.8916E-02 6.2652E-02
3.1114E-02 1.8560E-02 1.2310E-02 1.2242E-02 1.8213E-02 1.7971E-02 2.3399E-02 2.2419E-02 2.0889E-02 9.5994E-03
5.8317E-03 3.8094E-03 3.2031E-03 3.0050E-03 2.4429E-03 1.6236E-03 1.5091E-03 1.3790E-03 1.2284E-03 1.0485E-03
8.1798E-04 4.5216E-04

GROUP NO 33 JFST 28 JLST 69 MOMENT 0
SCATTER SPECTRUM
1.1796E-19 4.7910E-14 8.5660E-10 2.1723E-04 1.6304E-02 1.4335E-01 3.0616E-02 2.8474E-02 2.7114E-02 2.5803E-02
2.3963E-02 2.2129E-02 2.1356E-02 1.8945E-02 3.2710E-02 4.5850E-02 5.0073E-02 1.0935E-01 8.9625E-02 7.1406E-02
3.5376E-02 2.1095E-02 1.3997E-02 1.3826E-02 2.0721E-02 2.0451E-02 2.8643E-02 2.5545E-02 2.3808E-02 1.0933E-02
6.6308E-03 4.3246E-03 3.6322E-03 3.4040E-03 2.7627E-03 1.8336E-03 1.7019E-03 1.5534E-03 1.3816E-03 1.1770E-03
9.1691E-04 5.0604E-04

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GROUP NO 34 JFST 28 JLST 69 MOMENT 0
SCATTER SPECTRUM
5.2067E-20 7.2188E-15 1.1760E-10 2.4295E-05 1.7719E-03 4.6399E-02 4.7247E-02 3.4263E-02 3.3862E-02 3.3140E-02
2.8226E-02 2.8899E-02 2.5422E-02 2.2407E-02 3.9694E-02 5.4552E-02 5.7243E-02 1.1628E-01 9.5534E-02 7.6593E-02
3.8072E-02 2.2661E-02 1.5006E-02 1.4929E-02 2.2231E-02 2.1971E-02 2.8686E-02 2.7481E-02 2.5579E-02 1.1723E-02
7.0998E-03 4.6330E-03 3.8952E-03 3.6518E-03 2.9645E-03 1.9681E-03 1.8291E-03 1.6731E-03 1.4917E-03 1.2723E-03
9.9186E-04 5.4767E-04

GROUP NO 35 JFST 28 JLST 69 MOMENT 0
SCATTER SPECTRUM
3.8516E-20 4.4389E-15 7.1198E-11 1.4029E-05 1.0206E-03 2.6313E-02 2.2409E-02 4.6989E-02 3.5140E-02 3.4600E-02
3.2771E-02 2.7687E-02 2.7520E-02 2.3965E-02 4.1423E-02 5.8054E-02 6.0715E-02 1.1936E-01 9.7187E-02 7.8274E-02
3.9026E-02 2.3233E-02 1.5383E-02 1.5297E-02 2.2746E-02 2.2430E-02 2.9303E-02 2.8196E-02 2.6219E-02 1.2017E-02
7.2753E-03 4.7388E-03 3.9796E-03 3.7310E-03 3.0295E-03 2.0105E-03 1.8673E-03 1.7066E-03 1.5207E-03 1.2966E-03
1.0099E-03 5.5737E-04

GROUP NO 36 JFST 28 JLST 69 MOMENT 0
SCATTER SPECTRUM
2.8003E-20 2.7600E-15 4.3632E-11 8.2436E-06 5.8968E-04 1.5195E-02 1.2662E-02 2.2340E-02 4.8033E-02 3.5897E-02
3.3862E-02 3.2466E-02 2.8354E-02 2.5792E-02 4.3946E-02 6.1612E-02 6.4402E-02 1.2338E-01 9.8596E-02 7.9965E-02
3.9927E-02 2.3813E-02 1.5777E-02 1.5679E-02 2.3276E-02 2.2927E-02 2.9326E-02 2.8873E-02 2.6893E-02 1.2321E-02
7.4642E-03 4.8584E-03 4.0758E-03 3.8174E-03 3.0997E-03 2.0573E-03 1.9098E-03 1.7425E-03 1.5492E-03 1.3201E-03
1.0289E-03 5.8801E-04

GROUP NO 37 JFST 28 JLST 69 MOMENT 0
SCATTER SPECTRUM
2.0343E-20 1.7187E-15 2.6801E-11 4.9138E-06 3.3958E-04 8.5059E-03 7.6871E-03 1.2545E-02 2.2834E-02 4.9132E-02
3.5430E-02 3.2852E-02 3.3574E-02 2.6693E-02 4.7308E-02 6.4813E-02 6.8629E-02 1.2880E-01 9.9736E-02 8.1651E-02
4.0819E-02 2.4386E-02 1.6183E-02 1.6070E-02 2.3851E-02 2.3492E-02 3.0627E-02 2.9439E-02 2.7571E-02 1.2651E-02
7.8662E-03 4.9910E-03 4.1834E-03 3.9162E-03 3.1777E-03 2.1090E-03 1.9567E-03 1.7829E-03 1.5837E-03 1.3492E-03
1.0514E-03 5.8084E-04

FILE 3
GROUP NO 38 JFST 28 JLST 69 MOMENT 0
SCATTER SPECTRUM
6.1623E-20 1.0811E-15 1.6643E-11 2.9482E-06 1.9833E-04 5.0212E-03 4.0768E-03 7.7319E-03 1.2899E-02 2.3663E-02
4.8822E-02 3.5123E-02 3.3178E-02 3.1976E-02 4.9548E-02 8.8934E-02 7.2935E-02 1.3543E-01 1.0116E-01 8.3212E-02
4.1676E-02 2.4924E-02 1.6552E-02 1.6474E-02 2.4465E-02 2.4102E-02 3.1373E-02 3.0097E-02 2.8195E-02 1.2969E-02
7.8667E-03 5.1316E-03 4.3021E-03 4.0220E-03 3.2615E-03 2.1630E-03 2.0056E-03 1.8290E-03 1.6254E-03 1.3836E-03
1.0779E-03 5.9463E-04

GROUP NO 39 JFST 28 JLST 69 MOMENT 0
SCATTER SPECTRUM
3.9066E-20 6.9315E-16 1.0539E-11 1.8020E-06 1.1792E-04 2.9834E-03 2.5094E-03 4.1743E-03 8.2093E-03 1.3426E-02
2.3929E-02 4.8431E-02 3.6102E-02 3.0675E-02 5.6534E-02 7.3208E-02 7.6869E-02 1.4252E-01 1.0303E-01 8.4682E-02
4.2504E-02 2.5450E-02 1.6913E-02 1.6853E-02 2.5082E-02 2.4729E-02 3.2134E-02 3.0748E-02 2.8763E-02 1.3257E-02
8.0479E-03 5.2520E-03 4.4159E-03 4.1347E-03 3.3504E-03 2.2202E-03 2.0583E-03 1.8778E-03 1.6711E-03 1.4226E-03
1.1066E-03 6.0997E-04

GROUP NO 40 JFST 28 JLST 69 MOMENT 0
SCATTER SPECTRUM
3.3826E-20 4.4910E-16 6.7503E-12 1.1182E-06 7.1189E-05 1.8080E-03 1.4938E-03 2.5983E-03 4.4583E-03 8.8245E-03
1.3430E-02 2.3828E-02 4.9523E-02 3.4275E-02 5.8908E-02 7.8404E-02 8.1088E-02 1.5061E-01 1.0531E-01 8.6106E-02
4.3382E-02 2.6018E-02 1.7288E-02 1.7225E-02 2.5897E-02 2.5365E-02 3.2830E-02 3.1476E-02 2.9355E-02 1.3516E-02
8.2140E-03 5.3636E-03 4.5102E-03 4.2307E-03 3.4338E-03 2.2783E-03 2.1151E-03 1.9308E-03 1.7179E-03 1.4629E-03
1.1372E-03 6.2628E-04

GROUP NO 41 JFST 28 JLST 69 MOMENT 0
SCATTER SPECTRUM
2.0163E-20 2.9609E-16 4.4034E-12 7.0693E-07 4.3955E-05 1.1203E-03 9.1439E-04 1.5830E-03 2.8136E-03 4.8826E-03
9.2199E-03 1.3399E-02 2.5127E-02 4.7395E-02 6.0526E-02 8.6687E-02 8.5999E-02 1.5900E-01 1.0808E-01 8.7369E-02
4.4268E-02 2.8578E-02 1.7664E-02 1.7606E-02 2.6263E-02 2.5962E-02 3.3746E-02 3.2262E-02 2.9985E-02 1.3784E-02
8.3717E-03 5.4617E-03 4.5903E-03 4.3098E-03 3.5059E-03 2.3284E-03 2.1621E-03 1.9730E-03 1.7540E-03 1.4939E-03
1.1642E-03 6.4236E-04

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GROUP NO 42 JFST 28 JLST 69 MOMENT 0

SCATTER SPECTRUM

7.9269E-20 1.7175E-18 2.5207E-12 3.8889E-07 2.3604E-05 5.9074E-04 4.9592E-04 8.3556E-04 1.4810E-03 2.6317E-03
 4.3677E-03 7.7940E-03 1.2511E-02 1.9398E-02 7.4477E-02 9.3247E-02 9.3819E-02 1.7093E-01 1.1324E-01 8.8960E-02
 4.5466E-02 2.7308E-02 1.8186E-02 1.8142E-02 2.7052E-02 2.6744E-02 3.4914E-02 3.3444E-02 3.0991E-02 1.4192E-02
 8.6099E-03 5.6171E-03 4.7154E-03 4.4173E-03 3.5889E-03 2.3850E-03 2.2159E-03 2.0228E-03 1.7989E-03 1.5328E-03
 1.1950E-03 8.6012E-04

GROUP NO 43 JFST 28 JLST 69 MOMENT 0

SCATTER SPECTRUM

3.2515E-20 7.1592E-17 1.0309E-12 1.5032E-07 8.8562E-06 2.1161E-04 1.7708E-04 3.0573E-04 5.3778E-04 9.4031E-04
 1.5904E-03 2.5929E-03 4.4706E-03 7.1371E-03 2.5706E-02 1.0251E-01 1.1136E-01 1.9439E-01 1.2512E-01 9.2490E-02
 4.7021E-02 2.8442E-02 1.8988E-02 1.8965E-02 2.8339E-02 2.8063E-02 3.6761E-02 3.5351E-02 3.2375E-02 1.5000E-02
 9.0655E-03 5.9012E-03 4.9511E-03 4.6355E-03 3.7529E-03 2.4920E-03 2.3115E-03 2.1091E-03 1.8767E-03 1.5991E-03
 1.2449E-03 6.8653E-04

GROUP NO 44 JFST 28 JLST 69 MOMENT 0

SCATTER SPECTRUM

8.4435E-20 2.2730E-17 3.1946E-13 4.3694E-08 2.5147E-08 5.5094E-05 4.5532E-05 7.8520E-05 1.3880E-04 2.4680E-04
 4.1506E-04 6.7453E-04 1.1421E-03 1.7332E-03 6.4558E-03 3.1497E-02 1.2217E-01 2.3602E-01 1.4633E-01 1.0126E-01
 4.9338E-02 2.9878E-02 2.0025E-02 2.0072E-02 3.0100E-02 2.9922E-02 3.9218E-02 3.7829E-02 3.5356E-02 1.6223E-02
 9.8184E-03 6.3842E-03 5.3462E-03 4.9936E-03 4.0426E-03 2.5777E-03 2.4809E-03 2.2591E-03 2.0054E-03 1.7054E-03
 1.3261E-03 7.3059E-04

GROUP NO 45 JFST 28 JLST 69 MOMENT 0

SCATTER SPECTRUM

2.0135E-20 3.7543E-18 5.1205E-14 6.4607E-09 3.5969E-07 7.3692E-06 5.7877E-06 9.7794E-06 1.7110E-05 3.0168E-05
 6.5308E-05 8.3250E-05 1.4158E-04 2.1474E-04 7.8378E-04 3.6978E-03 1.9349E-02 2.3599E-01 2.0506E-01 1.3237E-01
 5.9929E-02 3.4690E-02 2.2805E-02 2.2615E-02 3.3682E-02 3.3430E-02 4.4009E-02 4.2705E-02 4.0083E-02 1.8426E-02
 1.1161E-02 7.2654E-03 6.0903E-03 5.6948E-03 4.6105E-03 3.0521E-03 2.8269E-03 2.5735E-03 2.2823E-03 1.9382E-03
 1.5049E-03 8.2781E-04

FILE 3
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GROUP NO 46 JFST 28 JLST 69 MOMENT 0

SCATTER SPECTRUM

6.5308E-20 2.9519E-19 3.8486E-15 4.3317E-10 2.2970E-08 4.5720E-07 3.4899E-07 5.7333E-07 9.6700E-07 1.6272E-06
 2.6223E-06 4.1661E-06 6.8725E-06 1.0224E-05 3.6907E-05 1.7168E-04 8.6103E-04 3.4326E-02 2.4478E-01 2.0390E-01
 8.5936E-02 4.8198E-02 3.1078E-02 3.0201E-02 4.3849E-02 4.2342E-02 5.4166E-02 5.1449E-02 4.7838E-02 2.1927E-02
 1.3268E-02 8.6275E-03 7.2207E-03 6.7405E-03 5.4491E-03 3.6020E-03 3.3298E-03 3.0259E-03 2.5790E-03 2.2707E-03
 1.7582E-03 9.6462E-04

GROUP NO 47 JFST 28 JLST 69 MOMENT 0

SCATTER SPECTRUM

8.9078E-20 5.5247E-20 5.0520E-16 5.2774E-11 2.6914E-09 5.2574E-08 3.9862E-08 6.5437E-08 1.1056E-07 1.8686E-07
 3.0001E-07 4.7100E-07 7.8296E-07 1.1077E-06 3.8162E-06 1.6440E-05 7.7543E-05 2.8521E-03 4.7005E-02 2.4967E-01
 1.3087E-01 7.0635E-02 4.3202E-02 4.1775E-02 5.9588E-02 5.6677E-02 7.1750E-02 6.6645E-02 6.0500E-02 2.7228E-02
 1.6321E-02 1.0549E-02 8.7901E-03 8.1729E-03 6.5825E-03 4.3364E-03 3.9981E-03 3.6236E-03 3.1977E-03 2.7017E-03
 2.0648E-03 1.1386E-03

GROUP NO 48 JFST 28 JLST 69 MOMENT 0

SCATTER SPECTRUM

1.5271E-20 4.7876E-20 1.3023E-16 1.3035E-11 6.4856E-10 1.2402E-08 9.3767E-09 1.5395E-08 2.5982E-08 4.3826E-08
 7.0285E-08 1.1035E-07 1.7890E-07 2.6040E-07 9.0127E-07 3.7997E-06 1.6767E-05 5.6071E-04 8.5424E-03 8.1015E-02
 1.8011E-01 9.4806E-02 6.1731E-02 5.8084E-02 7.7319E-02 7.2375E-02 8.8515E-02 8.2737E-02 7.4540E-02 3.3427E-02
 1.9912E-02 1.2815E-02 1.0642E-02 9.8599E-03 7.9093E-03 5.1943E-03 4.7765E-03 4.3159E-03 3.7975E-03 3.1982E-03
 2.4606E-03 1.3407E-03

GROUP NO 49 JFST 28 JLST 69 MOMENT 0

SCATTER SPECTRUM

7.1968E-20 2.2160E-20 6.5430E-17 6.4092E-12 3.1586E-10 5.9762E-09 4.4978E-09 7.3739E-09 1.2453E-08 2.1012E-08
 3.3686E-08 5.2846E-08 8.5698E-08 1.2479E-07 4.3141E-07 1.8256E-06 8.0083E-06 2.5053E-04 3.8885E-03 3.4496E-02
 8.1064E-02 1.4066E-01 7.1719E-02 6.3647E-02 1.0186E-01 8.4105E-02 1.0439E-01 9.3033E-02 8.5201E-02 3.7895E-02
 2.2702E-02 1.4634E-02 1.2138E-02 1.1214E-02 8.9766E-03 5.8656E-03 5.4041E-03 4.8782E-03 4.2885E-03 3.6035E-03
 2.7673E-03 1.5044E-03

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GROUP NO 50 JFST 28 JLST 69 MOMENT 0
 SCATTER SPECTRUM
 4.5453E-20 1.3252E-20 4.2955E-17 4.1580E-12 2.0327E-10 3.8278E-09 2.8715E-09 4.7010E-09 7.9342E-09 1.3400E-08
 2.1483E-08 3.3695E-08 5.4620E-08 7.9418E-08 2.7495E-07 1.1647E-06 5.1137E-06 1.5471E-04 2.2456E-03 1.9488E-02
 4.9030E-02 7.1939E-02 1.1104E-01 8.1928E-02 1.0087E-01 1.0497E-01 1.1435E-01 1.0330E-01 9.2509E-02 4.1585E-02
 2.4688E-02 1.5881E-02 1.3218E-02 1.2267E-02 8.8360E-03 6.4487E-03 5.9161E-03 5.3269E-03 4.6716E-03 3.9247E-03
 3.0093E-03 1.6356E-03

GROUP NO 51 JFST 28 JLST 69 MOMENT 0
 SCATTER SPECTRUM
 3.3715E-20 7.0413E-20 3.0862E-17 2.9599E-12 1.4390E-10 2.6982E-09 2.0199E-09 3.3044E-09 5.5630E-09 9.3907E-09
 1.5074E-08 2.3660E-08 3.8322E-08 5.5718E-08 1.9284E-07 8.1703E-07 3.5934E-06 1.0650E-04 1.5127E-03 1.3118E-02
 3.2994E-02 4.2557E-02 5.9297E-02 1.1670E-01 1.1836E-01 1.1246E-01 1.2971E-01 1.1425E-01 9.8619E-02 4.5060E-02
 2.6794E-02 1.7166E-02 1.4224E-02 1.3159E-02 1.0557E-02 6.9356E-03 6.3747E-03 5.7536E-03 5.0530E-03 4.2378E-03
 3.2463E-03 1.7601E-03

GROUP NO 52 JFST 28 JLST 69 MOMENT 0
 SCATTER SPECTRUM
 2.0177E-20 4.5204E-20 2.0542E-17 1.9475E-12 9.4146E-11 1.7568E-09 1.3127E-09 2.1420E-09 3.6023E-09 6.0655E-09
 9.7322E-09 1.5297E-08 2.4804E-08 3.6062E-08 1.2459E-07 5.2812E-07 2.3267E-06 6.7729E-05 9.3534E-04 7.9493E-03
 1.8484E-02 2.9713E-02 3.0068E-02 5.2869E-02 1.8722E-01 1.2047E-01 1.5676E-01 1.2675E-01 1.1213E-01 4.8816E-02
 2.9573E-02 1.9154E-02 1.5887E-02 1.4662E-02 1.1706E-02 7.8635E-03 7.0314E-03 6.3368E-03 5.5635E-03 4.6726E-03
 3.5831E-03 1.9445E-03

GROUP NO 53 JFST 28 JLST 69 MOMENT 0
 SCATTER SPECTRUM
 1.1323E-20 3.5901E-20 1.2603E-17 1.1798E-12 5.8674E-11 1.0526E-09 7.8471E-10 1.2785E-09 2.1410E-09 3.6004E-09
 5.7735E-09 9.0724E-09 1.4723E-08 2.1408E-08 7.3878E-08 3.1321E-07 1.3809E-06 3.9699E-05 5.3200E-04 4.4183E-03
 1.0193E-02 1.4472E-02 1.8901E-02 2.8455E-02 7.4712E-02 1.8240E-01 1.7199E-01 1.8298E-01 1.2908E-01 5.7273E-02
 2.2311E-02 2.1343E-02 1.7854E-02 1.6649E-02 1.3414E-02 8.8127E-03 8.0849E-03 7.2760E-03 6.3716E-03 5.3340E-03
 4.0761E-03 2.2071E-03

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GROUP NO 54 JFST 28 JLST 69 MOMENT 0
 SCATTER SPECTRUM
 2.5704E-06 1.8488E-20 7.0665E-18 6.5623E-13 3.1299E-11 5.7808E-10 4.3105E-10 7.0070E-10 1.1732E-09 1.9890E-09
 3.1489E-09 4.9357E-09 7.9949E-09 1.1630E-08 4.0249E-08 1.7075E-07 7.5219E-07 2.1552E-05 2.7840E-04 4.4183E-03
 5.0885E-03 7.3241E-03 8.3545E-03 1.3753E-02 3.8766E-02 7.3330E-02 2.4520E-01 1.9028E-01 1.7164E-01 6.8440E-02
 4.1342E-02 2.8635E-02 2.1873E-02 1.9966E-02 1.5820E-02 1.0327E-02 9.4823E-03 8.5359E-03 7.5078E-03 6.3146E-03
 4.8435E-03 2.6269E-03

GROUP NO 55 JFST 28 JLST 69 MOMENT 0
 SCATTER SPECTRUM
 2.9502E-20 6.5185E-06 3.7592E-18 3.4550E-13 1.8236E-11 2.9666E-10 2.2044E-10 3.5909E-10 6.0162E-10 1.0062E-09
 1.6013E-09 2.4990E-09 4.0352E-09 5.8600E-09 2.0289E-08 8.6117E-08 3.7888E-07 1.0838E-05 1.3506E-04 1.0830E-03
 2.4054E-03 3.3034E-03 3.8339E-03 6.0892E-03 1.8018E-02 3.4963E-02 9.9807E-02 2.8455E-01 2.1600E-01 1.0201E-01
 5.6955E-02 3.4038E-02 2.7510E-02 2.5440E-02 2.0610E-02 1.3637E-02 1.2588E-02 1.1331E-02 9.8961E-03 8.2237E-03
 6.2263E-03 3.3370E-03

GROUP NO 56 JFST 28 JLST 69 MOMENT 0
 SCATTER SPECTRUM
 1.5025E-20 3.3482E-20 2.0462E-18 1.8720E-13 8.6823E-12 1.5764E-10 1.1672E-10 1.8988E-10 3.1816E-10 5.3284E-10
 8.4775E-10 1.3196E-09 2.1233E-09 3.0708E-09 1.0574E-08 4.4942E-08 1.9790E-07 5.6519E-06 6.8974E-05 5.3922E-04
 1.1841E-03 1.6512E-03 1.8689E-03 2.8626E-03 7.7149E-03 1.5033E-02 4.9293E-02 1.1824E-01 3.4256E-01 1.3338E-01
 7.0965E-02 4.9807E-02 4.3699E-02 4.0911E-02 3.1716E-02 1.9829E-02 1.7455E-02 1.5131E-02 1.2945E-02 1.0645E-02
 8.1106E-03 4.3904E-03

GROUP NO 57 JFST 28 JLST 69 MOMENT 0
 SCATTER SPECTRUM
 7.3377E-20 2.9434E-20 1.3287E-18 1.2097E-13 5.5577E-12 1.0056E-10 7.4083E-11 1.2038E-10 2.0167E-10 3.3817E-10
 5.3870E-10 8.3873E-10 1.3459E-09 1.9417E-09 6.8538E-09 2.8137E-09 1.2432E-07 3.5399E-06 4.2767E-05 3.2737E-04
 7.1677E-04 9.8865E-04 1.1307E-03 1.7570E-03 4.5004E-03 8.9713E-03 2.6219E-02 7.5001E-02 1.7952E-01 2.5980E-01
 1.2501E-01 5.6013E-02 4.2904E-02 4.2403E-02 3.8735E-02 2.8092E-02 2.7149E-02 2.4863E-02 2.1364E-02 1.7078E-02
 1.2242E-02 6.1768E-03

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GROUP NO 58 JFST 28 JLST 69 MOMENT 0

SCATTER SPECTRUM

5.6773E-20	2.3035E-20	1.0621E-18	9.6319E-14	4.4157E-12	7.9707E-11	5.8541E-11	9.4965E-11	1.5900E-10	2.6672E-10
4.2543E-10	6.8282E-10	1.0635E-09	1.5320E-09	5.2426E-09	2.2058E-08	9.7486E-08	2.7598E-08	3.3327E-05	2.5223E-04
5.4866E-04	7.6058E-04	8.6107E-04	1.3415E-03	3.4955E-03	6.6643E-03	2.0303E-02	5.3648E-02	1.2255E-01	1.6040E-01
2.1123E-01	1.1783E-01	6.7156E-02	4.9097E-02	3.6004E-02	2.4352E-02	2.4597E-02	2.5053E-02	2.4623E-02	2.2313E-02
1.7653E-02	9.4467E-03								

GROUP NO 59 JFST 28 JLST 69 MOMENT 0

SCATTER SPECTRUM

4.8133E-20	1.9749E-20	9.2157E-19	9.3283E-14	3.8179E-12	6.8812E-11	5.0527E-11	8.1784E-11	1.3670E-10	2.2920E-10
3.8627E-10	5.7091E-10	9.1682E-10	1.3185E-09	4.5075E-09	1.8915E-08	8.3465E-08	2.3693E-08	2.8428E-05	2.1351E-04
4.6242E-04	6.4228E-04	7.2561E-04	1.1248E-03	2.9544E-03	5.5903E-03	1.7139E-02	4.1909E-02	1.1239E-01	9.4101E-01
1.5387E-01	1.7154E-01	1.2699E-01	8.0106E-02	4.8082E-02	2.7068E-02	2.3355E-02	2.1494E-02	2.0963E-02	2.0436E-02
1.7999E-02	1.0801E-02								

GROUP NO 60 JFST 28 JLST 69 MOMENT 0

SCATTER SPECTRUM

4.2643E-20	4.9443E-05	8.2635E-19	7.4370E-14	3.4065E-12	6.1328E-11	4.5025E-11	7.2831E-11	1.2156E-10	2.0350E-10
3.2511E-10	5.0803E-10	8.1626E-10	1.1731E-09	4.0028E-09	1.6775E-08	7.3878E-08	2.0957E-08	2.5070E-05	1.8726E-04
4.0417E-04	5.6063E-04	6.3529E-04	9.8029E-04	2.5869E-03	4.9137E-03	1.4800E-02	3.5583E-02	1.0355E-01	7.5774E-02
9.2397E-02	1.3348E-01	1.6878E-01	1.3866E-01	7.5973E-02	3.8131E-02	2.9306E-02	2.3022E-02	1.8992E-02	1.6760E-02
1.4904E-02	9.5985E-03								

GROUP NO 61 JFST 28 JLST 69 MOMENT 0

SCATTER SPECTRUM

3.7634E-20	1.8451E-06	3.1309E-06	6.8516E-14	3.0422E-12	5.4693E-11	4.0103E-11	6.4884E-11	1.0822E-10	1.8097E-10
2.8864E-10	4.5152E-10	7.2644E-10	1.0455E-09	3.5575E-09	1.4886E-08	6.5388E-08	1.8535E-08	2.2110E-05	1.6427E-04
3.5332E-04	4.8863E-04	5.5801E-04	8.5508E-04	2.2512E-03	4.3189E-03	1.2723E-02	3.0986E-02	9.1276E-02	7.0516E-02
6.3882E-02	7.9368E-02	1.3065E-01	1.8323E-01	1.3176E-01	6.2628E-02	4.4627E-02	3.2015E-02	2.2664E-02	1.6108E-02
1.1728E-02	7.0261E-03								

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GROUP NO 62 JFST 28 JLST 69 MOMENT 0

SCATTER SPECTRUM

4.3025E-20	3.8873E-08	3.9502E-08	5.9480E-14	2.7195E-12	4.8764E-11	3.5739E-11	5.7775E-11	9.6390E-11	1.6108E-10
2.5863E-10	4.0112E-10	6.4586E-10	9.3145E-10	3.1658E-09	1.3211E-08	5.7893E-08	1.8381E-08	1.9493E-05	1.4415E-04
3.0879E-04	4.2598E-04	4.8554E-04	7.4687E-04	1.9581E-03	3.7876E-03	1.0958E-02	2.7294E-02	7.6929E-02	6.9993E-02
5.0803E-02	5.1846E-02	7.7887E-02	1.4332E-01	1.7532E-01	1.0781E-01	7.5523E-02	5.1322E-02	3.4234E-02	2.1425E-02
1.2177E-02	5.2845E-03								

GROUP NO 63 JFST 28 JLST 69 MOMENT 0

SCATTER SPECTRUM

3.8956E-20	8.1079E-20	6.0404E-19	5.4225E-14	2.4793E-12	4.4370E-11	3.2508E-11	5.2529E-11	8.7591E-11	1.4635E-10
2.3293E-10	3.6373E-10	5.8641E-10	8.4610E-10	2.8767E-09	1.1971E-08	5.2382E-08	1.4794E-08	1.7581E-05	1.2937E-04
2.7622E-04	3.8029E-04	4.3346E-04	6.6791E-04	1.7429E-03	3.3879E-03	9.7227E-03	2.4557E-02	6.5403E-02	6.8983E-02
4.6717E-02	3.9718E-02	5.3193E-02	9.2674E-02	1.4664E-01	1.3722E-01	1.1913E-01	8.1202E-02	5.2760E-02	3.2255E-02
1.6918E-02	5.8823E-03								

GROUP NO 64 JFST 28 JLST 69 MOMENT 0

SCATTER SPECTRUM

3.5926E-20	7.4525E-20	5.6159E-19	5.0243E-14	2.2970E-12	4.1042E-11	3.0098E-11	4.8605E-11	8.0982E-11	1.3521E-10
2.1504E-10	3.3568E-10	5.4189E-10	7.8190E-10	2.6589E-09	1.1044E-08	4.8236E-08	1.3612E-08	1.6109E-05	1.1830E-04
2.5193E-04	3.4626E-04	3.9428E-04	6.0863E-04	1.5851E-03	3.0815E-03	8.8218E-03	2.2455E-02	5.7033E-02	6.6010E-02
4.6715E-02	3.3949E-02	4.0519E-02	6.5445E-02	1.0178E-01	1.1802E-01	1.4580E-01	1.2328E-01	8.0478E-02	4.8972E-02
2.5713E-02	8.6068E-03								

GROUP NO 65 JFST 28 JLST 69 MOMENT 0

SCATTER SPECTRUM

3.3302E-20	6.8955E-20	5.2343E-19	4.6782E-14	2.1385E-12	3.8160E-11	2.8038E-11	4.5230E-11	7.5226E-11	1.2542E-10
1.9962E-10	3.1116E-10	5.0338E-10	7.2595E-10	2.4689E-09	1.0247E-08	4.4646E-08	1.2586E-08	1.4859E-05	1.0874E-04
2.3089E-04	3.1704E-04	3.6004E-04	5.5710E-04	1.4483E-03	2.8118E-03	8.0641E-03	2.0484E-02	5.0098E-02	6.1230E-02
4.8176E-02	3.1649E-02	3.2266E-02	4.7597E-02	7.0107E-02	8.1530E-02	1.2492E-01	1.5644E-01	1.2746E-01	7.8023E-02
4.1731E-02	1.4370E-02								

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GROUP NO 66      JFST 28      JLST 69      MOMENT 0
SCATTER SPECTRUM
3.1185E-20 6.4366E-20 4.9283E-19 4.4015E-14 2.0112E-12 3.5806E-11 2.6374E-11 4.2516E-11 7.0544E-11 1.1750E-10
1.8710E-10 2.9248E-10 4.7220E-10 6.8033E-10 2.3146E-09 9.6055E-09 4.1754E-08 1.1749E-06 1.3842E-05 1.0089E-04
2.1359E-04 2.9307E-04 3.3203E-04 5.1440E-04 1.3367E-03 2.5887E-03 7.4538E-03 1.8799E-02 4.5029E-02 5.5255E-02
4.9713E-02 3.2407E-02 2.7964E-02 3.5420E-02 4.9157E-02 5.5675E-02 8.5700E-02 1.3382E-01 1.7021E-01 1.3100E-01
7.1215E-02 2.5688E-02

GROUP NO 67      JFST 28      JLST 69      MOMENT 0
SCATTER SPECTRUM
2.9774E-20 6.1396E-20 4.7317E-19 4.2165E-14 1.9266E-12 3.4222E-11 2.5238E-11 4.0664E-11 6.7430E-11 1.1228E-10
1.7861E-10 2.7925E-10 4.5094E-10 6.4970E-10 2.2112E-09 9.1727E-09 3.9802E-08 1.1175E-06 1.3135E-05 9.5420E-05
2.0139E-04 2.7567E-04 3.1225E-04 4.8296E-04 1.2564E-03 2.4253E-03 7.0150E-03 1.7481E-02 4.1428E-02 4.9419E-02
5.0373E-02 3.5315E-02 2.7593E-02 2.8169E-02 3.4437E-02 3.8098E-02 5.9363E-02 9.1737E-02 1.4658E-01 1.8899E-01
1.3097E-01 4.8970E-02

GROUP NO 68      JFST 28      JLST 69      MOMENT 0
SCATTER SPECTRUM
2.9431E-20 6.0660E-20 4.6795E-19 4.1677E-14 1.9056E-12 3.3794E-11 2.4934E-11 4.0136E-11 6.6609E-11 1.1089E-10
1.7634E-10 2.7525E-10 4.4423E-10 6.4168E-10 2.1849E-09 9.0404E-09 3.9217E-08 1.0994E-06 1.2883E-05 9.3266E-05
1.9634E-04 2.6831E-04 3.0345E-04 4.8889E-04 1.2210E-03 2.3497E-03 6.8203E-03 1.6774E-02 3.9995E-02 4.4889E-02
5.0476E-02 3.9381E-02 3.1064E-02 2.5981E-02 2.4816E-02 2.5336E-02 3.8850E-02 6.2198E-02 1.0099E-01 1.6598E-01
2.1503E-01 1.0650E-01

GROUP NO 69      JFST 28      JLST 69      MOMENT 0
SCATTER SPECTRUM
3.1226E-20 6.4399E-20 4.9019E-19 4.3842E-14 2.0076E-12 3.5567E-11 2.6265E-11 4.2267E-11 7.0174E-11 1.1693E-10
1.8571E-10 2.8971E-10 4.6724E-10 6.7628E-10 2.3057E-09 9.5364E-09 4.1302E-08 1.1572E-06 1.3537E-05 9.7584E-05
2.0507E-04 2.7972E-04 3.1633E-04 4.8764E-04 1.2711E-03 2.4397E-03 7.0995E-03 1.7254E-02 4.1545E-02 4.3474E-02
5.1838E-02 4.5340E-02 3.8369E-02 2.9848E-02 2.0667E-02 1.6918E-02 2.4975E-02 4.1130E-02 6.9901E-02 1.1917E-01
2.0449E-01 2.2287E-01

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FILE 4

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NO.OF MESH INTERVALS
3
MATERIAL CODE
1      2      3
VOLUMES
1.25880E+00 3.42770E-01 1.90837E+00
FIXED SOURCE GROUPS,P-N ORDERS
0      2
NO.OF COLL.PROB GROUPS P-N ORDERS
4      69      1
P(I,J)/SIGMA-TRANSPORT FOR GROUP 1 MOMENT 0
7.57547E-01 1.30312E-01 4.83739E-01 8.89755E-01 4.78562E-01 2.96857E-01
5.76903E-01 8.96255E-01 3.19085E-01 1.03620E-01 7.09906E-01 9.25239E-01
6.74579E-01 1.85029E-01 1.06346E+00 8.65611E-01
P(I,J)/SIGMA-TRANSPORT FOR GROUP 2 MOMENT 0
7.39589E-01 1.28622E-01 4.68393E-01 9.81014E-01 4.85011E-01 2.79116E-01
5.81955E-01 9.72427E-01 3.07642E-01 1.00917E-01 6.87963E-01 9.05682E-01
6.52789E-01 1.80109E-01 1.04098E+00 8.30010E-01
P(I,J)/SIGMA-TRANSPORT FOR GROUP 3 MOMENT 0
7.42612E-01 1.26979E-01 4.65838E-01 8.58948E-01 4.68324E-01 2.66535E-01
5.58637E-01 8.87495E-01 3.07277E-01 1.00339E-01 6.82279E-01 9.01225E-01
6.51222E-01 1.78091E-01 1.03586E+00 8.23633E-01
P(I,J)/SIGMA-TRANSPORT FOR GROUP 4 MOMENT 0
7.13548E-01 1.20887E-01 4.40271E-01 8.18179E-01 4.43878E-01 2.51973E-01
5.38976E-01 8.37261E-01 2.90412E-01 9.68076E-02 6.63448E-01 8.78624E-01
6.20313E-01 1.72850E-01 1.00988E+00 7.79622E-01

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P(I,J)/SIGMA-TRANSPORT FOR GROUP 5 MOMENT 0
6.71211E-01 1.11500E-01 4.00248E-01 7.51529E-01 4.09476E-01 2.27388E-01
5.06432E-01 7.85980E-01 2.64011E-01 9.09623E-02 6.33333E-01 8.40372E-01
5.69781E-01 1.62263E-01 9.85915E-01 7.06442E-01

P(I,J)/SIGMA-TRANSPORT FOR GROUP 6 MOMENT 0
6.81095E-01 1.12779E-01 4.01797E-01 7.53803E-01 4.14175E-01 2.14020E-01
5.00431E-01 7.79686E-01 2.65034E-01 8.98844E-02 6.29420E-01 8.36912E-01
5.71506E-01 1.60964E-01 9.61939E-01 7.02970E-01

P(I,J)/SIGMA-TRANSPORT FOR GROUP 7 MOMENT 0
6.19309E-01 1.00011E-01 3.51820E-01 6.67450E-01 3.67283E-01 2.03944E-01
4.66893E-01 7.21731E-01 2.32068E-01 8.38605E-02 5.98783E-01 7.93066E-01
5.06036E-01 1.48999E-01 9.11543E-01 6.16675E-01

P(I,J)/SIGMA-TRANSPORT FOR GROUP 8 MOMENT 0
6.37179E-01 1.03860E-01 3.65057E-01 6.37516E-01 3.81420E-01 2.09726E-01
4.74807E-01 7.32171E-01 2.40799E-01 8.52819E-02 6.00090E-01 7.96948E-01
5.21249E-01 1.51154E-01 9.16004E-01 6.29575E-01

P(I,J)/SIGMA-TRANSPORT FOR GROUP 9 MOMENT 0
6.32870E-01 1.02904E-01 3.60884E-01 6.79977E-01 3.77909E-01 2.07863E-01
4.71213E-01 7.26119E-01 2.38047E-01 8.46365E-02 5.96712E-01 7.92268E-01
5.15548E-01 1.49905E-01 9.10626E-01 6.21133E-01

P(I,J)/SIGMA-TRANSPORT FOR GROUP 10 MOMENT 0
6.25316E-01 1.01388E-01 3.54906E-01 6.89174E-01 3.72341E-01 2.07328E-01
4.67327E-01 7.18803E-01 2.34104E-01 8.39335E-02 5.92573E-01 7.86268E-01
5.07343E-01 1.48394E-01 9.07730E-01 6.09917E-01

P(I,J)/SIGMA-TRANSPORT FOR GROUP 11 MOMENT 0
6.22051E-01 1.00153E-01 3.47073E-01 6.54404E-01 3.67806E-01 1.98270E-01
4.56108E-01 7.01727E-01 2.28937E-01 8.19231E-02 5.82891E-01 7.73626E-01
4.96145E-01 1.44869E-01 8.89199E-01 5.89414E-01

P(I,J)/SIGMA-TRANSPORT FOR GROUP 12 MOMENT 0
6.23341E-01 1.00325E-01 3.45250E-01 6.48514E-01 3.68437E-01 1.97288E-01
4.51973E-01 6.92906E-01 2.27754E-01 8.11807E-02 5.75468E-01 7.64177E-01
4.91679E-01 1.43048E-01 8.78338E-01 5.76541E-01

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P(I,J)/SIGMA-TRANSPORT FOR GROUP 13 MOMENT 0
6.23642E-01 1.00210E-01 3.42901E-01 6.42700E-01 3.68014E-01 1.95195E-01
4.47592E-01 6.84962E-01 2.26185E-01 8.03938E-02 5.69865E-01 7.56850E-01
4.87271E-01 1.41408E-01 8.69917E-01 5.66037E-01

P(I,J)/SIGMA-TRANSPORT FOR GROUP 14 MOMENT 0
6.25912E-01 1.01137E-01 3.46178E-01 6.45703E-01 3.71419E-01 2.01515E-01
4.51761E-01 6.87549E-01 2.28348E-01 8.11423E-02 5.68213E-01 7.54791E-01
4.89552E-01 1.41942E-01 8.67550E-01 5.65309E-01

P(I,J)/SIGMA-TRANSPORT FOR GROUP 15 MOMENT 0
6.17300E-01 9.86323E-02 3.34232E-01 6.25305E-01 3.62221E-01 1.91073E-01
4.37757E-01 6.67608E-01 2.20487E-01 7.86272E-02 5.59322E-01 7.42254E-01
4.74083E-01 1.37825E-01 8.53140E-01 5.42913E-01

P(I,J)/SIGMA-TRANSPORT FOR GROUP 16 MOMENT 0
6.15467E-01 9.63466E-02 3.20283E-01 6.03178E-01 3.53827E-01 1.75319E-01
4.14874E-01 6.38958E-01 2.11265E-01 7.45172E-02 5.48952E-01 7.28163E-01
4.57307E-01 1.31911E-01 8.36943E-01 5.17741E-01

P(I,J)/SIGMA-TRANSPORT FOR GROUP 17 MOMENT 0
6.18587E-01 9.76035E-02 3.26046E-01 6.11687E-01 3.58443E-01 1.80074E-01
4.22353E-01 6.47813E-01 2.15067E-01 7.58613E-02 5.51112E-01 7.31360E-01
4.63758E-01 1.33739E-01 8.40618E-01 5.24968E-01

P(I,J)/SIGMA-TRANSPORT FOR GROUP 18 MOMENT 0
6.15913E-01 9.89330E-02 3.35370E-01 6.24273E-01 3.63326E-01 1.97772E-01
4.41271E-01 6.68170E-01 2.21217E-01 7.92584E-02 5.56421E-01 7.38100E-01
4.73300E-01 1.37941E-01 8.48366E-01 5.38364E-01

P(I,J)/SIGMA-TRANSPORT FOR GROUP 19 MOMENT 0
6.15017E-01 9.97612E-02 3.40274E-01 6.29937E-01 3.66367E-01 2.15873E-01
4.51445E-01 6.77649E-01 2.24452E-01 8.10859E-02 5.57984E-01 7.39790E-01
4.77595E-01 1.39898E-01 8.50308E-01 5.43065E-01

P(I,J)/SIGMA-TRANSPORT FOR GROUP 20 MOMENT 0
6.13288E-01 9.90774E-02 3.36203E-01 6.22564E-01 3.63856E-01 2.08355E-01
4.45433E-01 6.69096E-01 2.21767E-01 8.00167E-02 5.53696E-01 7.33937E-01
4.72005E-01 1.38133E-01 8.43580E-01 5.33586E-01

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P(I,J)/SIGMA-TRANSPORT FOR GROUP 21 MOMENT 0
6.11069E-01 9.77943E-02 3.28834E-01 6.10524E-01 3.59144E-01 1.95066E-01
4.33879E-01 6.54326E-01 2.16906E-01 7.79306E-02 5.47678E-01 7.25814E-01
4.62877E-01 1.35083E-01 8.34244E-01 5.19562E-01
P(I,J)/SIGMA-TRANSPORT FOR GROUP 22 MOMENT 0
6.03567E-01 9.72969E-02 3.29706E-01 6.10278E-01 3.57317E-01 2.11261E-01
4.42446E-01 6.61739E-01 2.17481E-01 7.94694E-02 5.49308E-01 7.27085E-01
4.62690E-01 1.36614E-01 8.35704E-01 5.21374E-01
P(I,J)/SIGMA-TRANSPORT FOR GROUP 23 MOMENT 0
6.05570E-01 9.76849E-02 3.30811E-01 6.11782E-01 3.58779E-01 2.11309E-01
4.42710E-01 6.61956E-01 2.18210E-01 7.95169E-02 5.49006E-01 7.26824E-01
4.63830E-01 1.36658E-01 8.35405E-01 5.21708E-01
P(I,J)/SIGMA-TRANSPORT FOR GROUP 24 MOMENT 0
5.87046E-01 9.39458E-02 3.18025E-01 5.90837E-01 3.45011E-01 2.09035E-01
4.35771E-01 6.50547E-01 2.09776E-01 7.82705E-02 5.44926E-01 7.19794E-01
4.47799E-01 1.34303E-01 8.27325E-01 5.05661E-01
P(I,J)/SIGMA-TRANSPORT FOR GROUP 25 MOMENT 0
5.78931E-01 9.23118E-02 3.12445E-01 5.81317E-01 3.39009E-01 2.08042E-01
4.32782E-01 6.45588E-01 2.08095E-01 7.77336E-02 5.43175E-01 7.16748E-01
4.40733E-01 1.33279E-01 8.23823E-01 4.98679E-01
P(I,J)/SIGMA-TRANSPORT FOR GROUP 26 MOMENT 0
6.10404E-01 9.86695E-02 3.34093E-01 6.17146E-01 3.62358E-01 2.11729E-01
4.44426E-01 6.64782E-01 2.20375E-01 7.98250E-02 5.50004E-01 7.23560E-01
4.67897E-01 1.37242E-01 8.37401E-01 5.25741E-01
P(I,J)/SIGMA-TRANSPORT FOR GROUP 27 MOMENT 0
5.70499E-01 9.06138E-02 3.06563E-01 5.71290E-01 3.32795E-01 2.07009E-01
4.29525E-01 6.40039E-01 2.02215E-01 7.71487E-02 5.41041E-01 7.13146E-01
4.33131E-01 1.32134E-01 8.19684E-01 4.90855E-01
P(I,J)/SIGMA-TRANSPORT FOR GROUP 28 MOMENT 0
6.30059E-01 1.02208E-01 3.40933E-01 6.23304E-01 3.75355E-01 2.05433E-01
4.40280E-01 6.56182E-01 2.24886E-01 7.90804E-02 5.41089E-01 7.17678E-01
4.72566E-01 1.35467E-01 8.24892E-01 5.16493E-01

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P(I,J)/SIGMA-TRANSPORT FOR GROUP 29 MOMENT 0
6.33539E-01 1.02916E-01 3.42639E-01 6.25106E-01 3.77952E-01 2.05906E-01
4.40537E-01 6.55805E-01 2.28012E-01 7.91266E-02 5.39992E-01 7.16335E-01
4.73932E-01 1.35389E-01 8.23349E-01 5.15811E-01
P(I,J)/SIGMA-TRANSPORT FOR GROUP 30 MOMENT 0
6.36718E-01 1.03562E-01 3.43964E-01 6.26041E-01 3.80326E-01 2.06281E-01
4.40412E-01 6.54807E-01 2.26886E-01 7.91041E-02 5.38363E-01 7.14210E-01
4.74641E-01 1.35141E-01 8.20907E-01 5.13954E-01
P(I,J)/SIGMA-TRANSPORT FOR GROUP 31 MOMENT 0
6.34779E-01 1.03186E-01 3.41332E-01 6.19961E-01 3.78870E-01 2.06021E-01
4.37552E-01 6.48466E-01 2.25150E-01 7.85905E-02 5.34234E-01 7.08240E-01
4.70031E-01 1.33874E-01 8.14044E-01 5.05227E-01
P(I,J)/SIGMA-TRANSPORT FOR GROUP 32 MOMENT 0
6.35099E-01 1.03230E-01 3.40156E-01 6.16100E-01 3.79105E-01 2.06040E-01
4.35442E-01 6.43431E-01 2.24374E-01 7.82114E-02 5.30445E-01 7.02853E-01
4.67104E-01 1.32834E-01 8.07853E-01 4.98048E-01
P(I,J)/SIGMA-TRANSPORT FOR GROUP 33 MOMENT 0
6.27118E-01 1.01605E-01 3.33967E-01 6.05022E-01 3.73140E-01 2.05049E-01
4.31079E-01 6.35472E-01 2.20292E-01 7.74278E-02 5.26343E-01 6.96577E-01
4.58705E-01 1.31191E-01 8.00640E-01 4.87071E-01
P(I,J)/SIGMA-TRANSPORT FOR GROUP 34 MOMENT 0
6.15589E-01 9.92660E-02 3.25820E-01 5.91289E-01 3.64548E-01 2.03646E-01
4.26055E-01 6.26878E-01 2.14918E-01 7.65254E-02 5.22556E-01 6.90553E-01
4.48293E-01 1.29417E-01 7.93715E-01 4.75343E-01
P(I,J)/SIGMA-TRANSPORT FOR GROUP 35 MOMENT 0
6.16161E-01 9.93817E-02 3.28033E-01 5.91389E-01 3.64974E-01 2.03713E-01
4.25988E-01 6.26567E-01 2.15058E-01 7.65134E-02 5.22201E-01 6.90078E-01
4.48368E-01 1.29353E-01 7.93169E-01 4.74896E-01
P(I,J)/SIGMA-TRANSPORT FOR GROUP 36 MOMENT 0
6.18929E-01 9.99424E-02 3.27697E-01 5.93809E-01 3.87033E-01 2.04044E-01
4.26717E-01 6.27519E-01 2.18156E-01 7.66442E-02 5.22296E-01 6.90359E-01
4.50204E-01 1.29549E-01 7.93493E-01 4.76159E-01

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P(I,J)/SIGMA-TRANSPORT FOR GROUP 37 MOMENT 0
6.21785E-01 1.00522E-01 3.29412E-01 5.96294E-01 3.69159E-01 2.04387E-01
4.27469E-01 6.28499E-01 2.17287E-01 7.67794E-02 5.22393E-01 6.90648E-01
4.52098E-01 1.29751E-01 7.93824E-01 4.77455E-01

P(I,J)/SIGMA-TRANSPORT FOR GROUP 38 MOMENT 0
6.23904E-01 1.00951E-01 3.30632E-01 5.97975E-01 3.70738E-01 2.04641E-01
4.27947E-01 6.29031E-01 2.18092E-01 7.68652E-02 5.22325E-01 6.90658E-01
4.53363E-01 1.29861E-01 7.93836E-01 4.78142E-01

P(I,J)/SIGMA-TRANSPORT FOR GROUP 39 MOMENT 0
6.25400E-01 1.01255E-01 3.31436E-01 5.98988E-01 3.71853E-01 2.04821E-01
4.28194E-01 6.29193E-01 2.18623E-01 7.69095E-02 5.22122E-01 6.90442E-01
4.54130E-01 1.29895E-01 7.93588E-01 4.78329E-01

P(I,J)/SIGMA-TRANSPORT FOR GROUP 40 MOMENT 0
6.26406E-01 1.01459E-01 3.31911E-01 5.99466E-01 3.72603E-01 2.04940E-01
4.28253E-01 6.29052E-01 2.18935E-01 7.69202E-02 5.21805E-01 6.90036E-01
4.54493E-01 1.29866E-01 7.93121E-01 4.78104E-01

P(I,J)/SIGMA-TRANSPORT FOR GROUP 41 MOMENT 0
6.27114E-01 1.01603E-01 3.32196E-01 5.99655E-01 3.73131E-01 2.05024E-01
4.28217E-01 6.28770E-01 2.19123E-01 7.69138E-02 5.21449E-01 6.89559E-01
4.54636E-01 1.29807E-01 7.92573E-01 4.77692E-01

P(I,J)/SIGMA-TRANSPORT FOR GROUP 42 MOMENT 0
6.27723E-01 1.01726E-01 3.32343E-01 5.99513E-01 3.73584E-01 2.05095E-01
4.28028E-01 6.28156E-01 2.19220E-01 7.68798E-02 5.20874E-01 6.88763E-01
4.54533E-01 1.29681E-01 7.91658E-01 4.76822E-01

P(I,J)/SIGMA-TRANSPORT FOR GROUP 43 MOMENT 0
6.28280E-01 1.01939E-01 3.32239E-01 5.98674E-01 3.73999E-01 2.05157E-01
4.27474E-01 6.28701E-01 2.19152E-01 7.67802E-02 5.19702E-01 6.87102E-01
4.53892E-01 1.29980E-01 7.89749E-01 4.74784E-01

P(I,J)/SIGMA-TRANSPORT FOR GROUP 44 MOMENT 0
6.28481E-01 1.01880E-01 3.31647E-01 5.96689E-01 3.74147E-01 2.05172E-01
4.26382E-01 6.24097E-01 2.18782E-01 7.65842E-02 5.17771E-01 6.84329E-01
4.52367E-01 1.28841E-01 7.86561E-01 4.71157E-01

FILE 4
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P(I,J)/SIGMA-TRANSPORT FOR GROUP 45 MOMENT 0
6.27366E-01 1.01852E-01 3.29374E-01 5.90864E-01 3.73310E-01 2.05016E-01
4.23499E-01 6.17645E-01 2.17262E-01 7.60663E-02 5.13373E-01 6.77920E-01
4.47971E-01 1.27511E-01 7.79195E-01 4.62316E-01

P(I,J)/SIGMA-TRANSPORT FOR GROUP 46 MOMENT 0
6.24484E-01 1.01064E-01 3.24856E-01 5.79906E-01 3.71153E-01 2.04635E-01
4.18217E-01 6.06081E-01 2.14282E-01 7.51176E-02 5.05717E-01 6.66685E-01
4.39663E-01 1.25123E-01 7.68282E-01 4.46650E-01

P(I,J)/SIGMA-TRANSPORT FOR GROUP 47 MOMENT 0
6.18700E-01 9.98891E-02 3.17966E-01 5.64450E-01 3.66837E-01 2.03900E-01
4.11087E-01 5.90940E-01 2.09737E-01 7.38333E-02 4.96179E-01 6.52544E-01
4.27945E-01 1.21997E-01 7.50028E-01 4.26523E-01

P(I,J)/SIGMA-TRANSPORT FOR GROUP 48 MOMENT 0
6.11160E-01 9.83609E-02 3.10395E-01 5.48485E-01 3.61224E-01 2.02964E-01
4.03944E-01 5.76331E-01 2.04744E-01 7.25540E-02 4.87414E-01 6.39429E-01
4.15841E-01 1.18982E-01 7.34953E-01 4.07480E-01

P(I,J)/SIGMA-TRANSPORT FOR GROUP 49 MOMENT 0
6.04250E-01 9.89644E-02 3.04241E-01 5.36153E-01 3.56096E-01 2.02121E-01
3.98831E-01 5.85758E-01 2.00684E-01 7.15997E-02 4.81362E-01 6.30298E-01
4.06492E-01 1.16799E-01 7.24459E-01 3.93907E-01

P(I,J)/SIGMA-TRANSPORT FOR GROUP 50 MOMENT 0
5.99722E-01 9.80511E-02 3.00154E-01 5.27870E-01 3.52742E-01 2.01571E-01
3.95037E-01 5.58554E-01 1.97988E-01 7.09541E-02 4.77213E-01 6.24044E-01
4.00212E-01 1.15311E-01 7.17271E-01 3.84756E-01

P(I,J)/SIGMA-TRANSPORT FOR GROUP 51 MOMENT 0
5.97337E-01 9.55704E-02 2.97588E-01 5.22172E-01 3.50977E-01 2.01277E-01
3.92420E-01 5.53069E-01 1.96282E-01 7.04841E-02 4.73871E-01 6.19050E-01
3.95891E-01 1.14179E-01 7.11531E-01 3.77853E-01

P(I,J)/SIGMA-TRANSPORT FOR GROUP 52 MOMENT 0
5.97602E-01 9.56227E-02 2.96184E-01 5.17713E-01 3.51169E-01 2.01288E-01
3.89965E-01 5.47078E-01 1.95370E-01 7.00431E-02 4.69870E-01 6.13171E-01
3.92510E-01 1.12984E-01 7.04773E-01 3.70649E-01

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P(I,J)/SIGMA-TRANSPORT FOR GROUP 53 MOMENT 0
5.99315E-01 9.59656E-02 2.85136E-01 5.12967E-01 3.52428E-01 2.01461E-01
3.87100E-01 5.40161E-01 1.94678E-01 8.95285E-02 4.64755E-01 6.05681E-01
3.89912E-01 1.11514E-01 6.96164E-01 3.61908E-01

P(I,J)/SIGMA-TRANSPORT FOR GROUP 54 MOMENT 0
5.99957E-01 9.60924E-02 2.92498E-01 5.04382E-01 3.52893E-01 2.01495E-01
3.82393E-01 5.29044E-01 1.92938E-01 6.86831E-02 4.57185E-01 5.94502E-01
3.82404E-01 1.09219E-01 6.83315E-01 3.48444E-01

P(I,J)/SIGMA-TRANSPORT FOR GROUP 55 MOMENT 0
5.97231E-01 9.55400E-02 2.86376E-01 4.88284E-01 3.50855E-01 2.01109E-01
3.74257E-01 5.10864E-01 1.88900E-01 6.72218E-02 4.45549E-01 5.77174E-01
3.70199E-01 1.05466E-01 6.63398E-01 3.26907E-01

P(I,J)/SIGMA-TRANSPORT FOR GROUP 56 MOMENT 0
5.90110E-01 9.41042E-02 2.76189E-01 4.63717E-01 3.45592E-01 2.00180E-01
3.62276E-01 4.84978E-01 1.82167E-01 6.50698E-02 4.29663E-01 5.53406E-01
3.51573E-01 1.00122E-01 6.36080E-01 2.97289E-01

P(I,J)/SIGMA-TRANSPORT FOR GROUP 57 MOMENT 0
5.81103E-01 9.22950E-02 2.64829E-01 4.37321E-01 3.38948E-01 1.99029E-01
3.49511E-01 4.57870E-01 1.74587E-01 6.27771E-02 4.13408E-01 5.29063E-01
3.31560E-01 9.45257E-02 6.08107E-01 2.67618E-01

P(I,J)/SIGMA-TRANSPORT FOR GROUP 58 MOMENT 0
5.73870E-01 9.08473E-02 2.56520E-01 4.16477E-01 3.33631E-01 1.98114E-01
3.40436E-01 4.38884E-01 1.89206E-01 6.11470E-02 4.02216E-01 5.12327E-01
3.17273E-01 9.06060E-02 5.88864E-01 2.47658E-01

P(I,J)/SIGMA-TRANSPORT FOR GROUP 59 MOMENT 0
5.67510E-01 8.95779E-02 2.49786E-01 4.03598E-01 3.28970E-01 1.97314E-01
3.33310E-01 4.24192E-01 1.64764E-01 5.98671E-02 3.93676E-01 4.99571E-01
3.05993E-01 8.75729E-02 5.74202E-01 2.32670E-01

P(I,J)/SIGMA-TRANSPORT FOR GROUP 60 MOMENT 0
5.61323E-01 8.83468E-02 2.43152E-01 3.88644E-01 3.24448E-01 1.96539E-01
3.26171E-01 4.09473E-01 1.60388E-01 5.85848E-02 3.85112E-01 4.86809E-01
2.94807E-01 8.45343E-02 5.59534E-01 2.18089E-01

FILE 4
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P(I,J)/SIGMA-TRANSPORT FOR GROUP 61 MOMENT 0
5.54137E-01 8.69209E-02 2.34902E-01 3.70070E-01 3.19212E-01 1.95643E-01
3.18900E-01 3.90246E-01 1.54347E-01 5.69197E-02 3.73834E-01 4.70066E-01
2.80573E-01 8.05650E-02 5.40289E-01 1.99732E-01

P(I,J)/SIGMA-TRANSPORT FOR GROUP 62 MOMENT 0
5.45683E-01 8.52496E-02 2.24605E-01 3.46239E-01 3.13074E-01 1.94595E-01
3.04887E-01 3.65319E-01 1.48155E-01 5.47620E-02 3.59143E-01 4.48354E-01
2.62506E-01 7.54186E-02 5.15334E-01 1.77098E-01

P(I,J)/SIGMA-TRANSPORT FOR GROUP 63 MOMENT 0
5.37218E-01 8.35828E-02 2.14091E-01 3.21843E-01 3.06953E-01 1.93550E-01
2.92371E-01 3.39539E-01 1.41219E-01 5.25139E-02 3.43936E-01 4.26013E-01
2.44009E-01 7.00986E-02 4.89656E-01 1.55081E-01

P(I,J)/SIGMA-TRANSPORT FOR GROUP 64 MOMENT 0
5.28333E-01 8.18407E-02 2.03369E-01 2.97270E-01 3.00555E-01 1.92459E-01
2.79585E-01 3.13589E-01 1.34147E-01 5.02173E-02 3.28649E-01 4.03712E-01
2.25379E-01 6.47394E-02 4.64023E-01 1.34282E-01

P(I,J)/SIGMA-TRANSPORT FOR GROUP 65 MOMENT 0
5.17060E-01 7.98416E-02 1.90583E-01 2.86591E-01 2.92479E-01 1.91082E-01
2.64434E-01 2.83495E-01 1.25899E-01 4.74961E-02 3.10932E-01 3.78094E-01
2.03636E-01 5.85265E-02 4.34578E-01 1.11947E-01

P(I,J)/SIGMA-TRANSPORT FOR GROUP 66 MOMENT 0
5.01983E-01 7.87209E-02 1.74974E-01 2.34946E-01 2.81753E-01 1.89251E-01
2.48299E-01 2.48595E-01 1.15416E-01 4.42387E-02 2.90331E-01 3.48675E-01
1.78127E-01 5.19215E-02 4.00764E-01 8.84268E-02

P(I,J)/SIGMA-TRANSPORT FOR GROUP 67 MOMENT 0
4.80490E-01 7.25979E-02 1.55234E-01 1.94502E-01 2.66611E-01 1.86652E-01
2.23785E-01 2.07198E-01 1.02396E-01 4.01950E-02 2.65608E-01 3.13982E-01
1.47484E-01 4.27754E-02 3.60888E-01 6.38944E-02

P(I,J)/SIGMA-TRANSPORT FOR GROUP 68 MOMENT 0
4.44545E-01 6.58172E-02 1.27235E-01 1.41685E-01 2.41710E-01 1.82324E-01
1.92595E-01 1.53941E-01 8.39270E-02 3.45928E-02 2.32707E-01 2.69017E-01
1.07421E-01 3.17805E-02 3.09206E-01 3.78370E-02

WHC-SD-NR-SWD-017

P(I,J)/SIGMA-TRANSPORT FOR GROUP 69 MOMENT 0
3.62883E-01 5.09914E-02 7.75529E-02 6.20081E-02 1.87263E-01 1.72129E-01
1.36819E-01 7.29686E-02 5.11556E-02 2.45746E-02 1.75778E-01 1.94711E-01
4.70122E-02 1.50641E-02 2.23798E-01 1.06982E-02

FILE 5

FLUXES	MESHES 3	GROUPS 69	ORDERS 1
1.26078E-01	1.21030E-01	1.20367E-01	4.82374E-01
1.11536E+00	1.07296E+00	1.05807E+00	1.16922E+00
1.24139E+00	1.19895E+00	1.16578E+00	1.48657E+00
9.67921E-01	9.43655E-01	9.22006E-01	8.35618E-01
6.54802E-01	6.44840E-01	6.36140E-01	5.24201E-01
4.56790E-01	4.54084E-01	4.52841E-01	4.00565E-01
3.71991E-01	3.72807E-01	3.72855E-01	3.50056E-01
3.35883E-01	3.38036E-01	3.39622E-01	2.94444E-01
2.93249E-01	2.94828E-01	2.96351E-01	2.86582E-01
2.82142E-01	2.84743E-01	2.86484E-01	5.45362E-01
5.18755E-01	5.23086E-01	5.29800E-01	3.62279E-01
2.36358E-01	2.41162E-01	2.44359E-01	2.56737E-01
2.34333E-01	2.46757E-01	2.54756E-01	2.23988E-01
3.33336E-01	3.55121E-01	3.82760E-01	8.03945E-02
1.02588E-01	1.03722E-01	1.04540E-01	9.46468E-02
1.50302E-01	1.51495E-01	1.52352E-01	6.47183E-02
5.42810E-02	5.50830E-02	5.56421E-02	1.01818E-02
1.00453E-02	1.02952E-02	1.04628E-02	1.03682E-02
1.07286E-02	1.09429E-02	1.10954E-02	1.0637E-02
1.05459E-02	1.07249E-02	1.08539E-02	1.08486E-02
1.02440E-02	1.04025E-02	1.05189E-02	1.0626E-02
3.09551E-02	3.13993E-02	3.17193E-02	1.93595E-02
1.03747E-01	1.05255E-01	1.06349E-01	3.94417E-02
1.11430E-01	1.13850E-01	1.15558E-01	1.07502E-01
4.94328E-02	5.11697E-02	5.23863E-02	7.01703E-02
1.19537E-02	4.37019E-02	4.43208E-02	3.72661E-02
9.51056E-02	9.89768E-02	1.01761E-01	7.49970E-02
2.46701E-01	2.57836E-01	2.66363E-01	1.72016E-01
2.12687E-01	2.27234E-01	2.37640E-01	1.79106E-01
1.04945E-01	1.13858E-01	1.20416E-01	3.65931E-01
8.93563E-02	9.85416E-02	1.05403E-01	1.60145E-01
4.84046E-02	5.44619E-02	5.90876E-02	1.01087E-01
3.83616E-02	4.42579E-02	4.88962E-02	8.17938E-02
2.35931E-02	2.85960E-02	3.26887E-02	4.99561E-02
4.22318E-03	6.27207E-03	8.02325E-03	3.71943E-02
			1.82921E-02
			2.16367E-02

WHC-SD-NR-SWD-017

K BX BY BZ TC U
 1.20708E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 8.28443E-01

BUCKLINGS ARE CM**-2, NOT S.I. UNITS

BURNUP TIME IRRADIATION
 0.00000E+00 0.00000E+00

SPARE ITEMS (I/F WRITTEN IN OR AFTER MAY '72)
 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
 0.00000E+00 0.00000E+00

INTER COMPLETED

UNUSED STORAGE 297861 WORDS

TIME FROM START 2.1 SECONDS. TIME IN THIS MODULE 0.2 SECONDS. UNUSED REGION THIS MODULE 1162 K BYTES.

-C- WCRITIC 1 2

READS INTERFACE 1 FORTRAN DATA SETS 11-15 DS NAMES:
 WRITES INTERFACE 2 FORTRAN DATA SETS 16-20 DS NAMES:

-M- CENT
 -M- PRINT 1
 -M- BUCK 69 .343E-4 .343E-4 .343E-4 .343E-4
 -M- BEGIN
 BUCKLING SEARCH
 KEFF SET TO 1.000000

UNUSED STORAGE 274109
 LAMDA IS 29.434687
 FLUX NORMALISED FOR TOTAL CELL ABSORPTION OF 1.0 NOT INCLUDING BUCKLING TERMS
 TOTAL CELL FISSION SOURCE (NU*SIG.FIS*PHI) = 1.200388

CRITIC COMPLETED

TIME FROM START 2.4 SECONDS. TIME IN THIS MODULE 0.2 SECONDS. UNUSED REGION THIS MODULE 1070 K BYTES.

WHC-SD-NR-SWD-017

***** WIMS-E MODULE W-MIX *****
 READS FILES 2 & 3, FORMS MACROSCOPIC X-SECTIONS AND WRITES THESE TO FILE 3.
 FLUXES ETC READ FROM FILE 1 AND WRITTEN TO FILE 5.

LN 2 LT 1

CROSS-SECTIONS 6

GROUPS 69

MATERIALS 3

NO. OF MATERIALS TO BE PROCESSED AT A TIME 3

UNUSED STORAGE 230526 (IF MATERIALS PROCESSED SINGLY 270015)

MATERIAL	1	NUCLIDE	IDENTIFIER	NUMBER DENSITY
		2	6016	4.4008E-02
		5	2235	4.6787E-04
		6	9238	2.1536E-02
NUMBER OF REACTIONS 4				

MATERIAL	2	NUCLIDE	IDENTIFIER	NUMBER DENSITY
		4	91	4.3260E-02
NUMBER OF REACTIONS 3				

MATERIAL	3	NUCLIDE	IDENTIFIER	NUMBER DENSITY
		1	3001	3.3439E-02
		3	6016	1.6721E-02
NUMBER OF REACTIONS 3				

WRITING FILE 5

NMESH 3 NGRP 69 NORDER 1

FLUX

1.30972E-01	1.25728E-01	1.25039E-01	5.22535E-01	4.99710E-01	4.94430E-01	1.18980E-00	1.14457E+00	1.12869E+00	1.27171E+00
1.22730E-00	1.20129E+00	1.35239E+00	1.30614E+00	1.27001E+00	1.58947E+00	1.53546E+00	1.48769E+00	1.03630E+00	1.01032E+00
9.87136E-01	8.87930E-01	8.67297E-01	8.49859E-01	6.32000E-01	6.81472E-01	5.72279E-01	5.51624E-01	5.48890E-01	5.46420E-01
4.79116E-01	4.76279E-01	4.74765E-01	4.18876E-01	4.19388E-01	4.19247E-01	3.87260E-01	3.88710E-01	3.88760E-01	3.63885E-01
3.65378E-01	3.66636E-01	3.48098E-01	3.50533E-01	3.52183E-01	3.04721E-01	3.07227E-01	3.09352E-01	3.02715E-01	3.04345E-01
3.05916E-01	2.95038E-01	2.97412E-01	2.99384E-01	2.89737E-01	2.92408E-01	2.94196E-01	5.57966E-01	5.64096E-01	5.68826E-01
5.26465E-01	5.32915E-01	5.39755E-01	3.67766E-01	3.78160E-01	3.81719E-01	2.39307E-01	2.44171E-01	2.47408E-01	2.59484E-01
2.70451E-01	2.77614E-01	2.38436E-01	2.48908E-01	2.56976E-01	2.25246E-01	2.23711E-01	2.31015E-01	3.35174E-01	3.56438E-01
3.70127E-01	8.04517E-02	8.13260E-02	8.19673E-02	1.02538E-01	1.03873E-01	1.04491E-01	9.44735E-02	9.51086E-02	9.55795E-02
1.49820E-01	1.51009E-01	1.51864E-01	6.44381E-02	6.49337E-02	6.53013E-02	5.40201E-02	5.48182E-02	5.53747E-02	1.01316E-02
1.03836E-02	1.05497E-02	9.99458E-03	1.02432E-02	1.04099E-02	1.03144E-02	1.05477E-02	1.07082E-02	1.06692E-02	1.08843E-02
1.10360E-02	1.05951E-02	1.07889E-02	1.09274E-02	1.04864E-02	1.06644E-02	1.07926E-02	1.07997E-02	1.09735E-02	1.10990E-02
1.01834E-02	1.03409E-02	1.04547E-02	1.92415E-02	1.95284E-02	1.97355E-02	3.07572E-02	3.11988E-02	3.15166E-02	3.91733E-02
3.97224E-02	4.01196E-02	1.02960E-01	1.04456E-01	1.05542E-01	1.06567E-01	1.08260E-01	1.09655E-01	1.10311E-01	1.12706E-01
1.14397E-01	6.93629E-02	7.13518E-02	7.27472E-02	4.88062E-02	5.05213E-02	5.17226E-02	3.67599E-02	3.82127E-02	3.92256E-02
4.13493E-02	4.30724E-02	4.42757E-02	7.38309E-02	7.89113E-02	7.90830E-02	9.34961E-02	9.73018E-02	1.00039E-01	1.68847E-01
1.75807E-01	1.80918E-01	2.41813E-01	2.52777E-01	2.61085E-01	3.39315E-01	3.58337E-01	3.72396E-01	2.08178E-01	2.22416E-01
2.32602E-01	1.45633E-01	1.56736E-01	1.64825E-01	1.02707E-01	1.11428E-01	1.17848E-01	9.04915E-02	9.89274E-02	1.05185E-01
8.74534E-02	9.64431E-02	1.03159E-01	7.18769E-02	8.00584E-02	8.62300E-02	4.73817E-02	5.33110E-02	5.78390E-02	4.29920E-02
4.89049E-02	5.34822E-02	3.75578E-02	4.33305E-02	4.78717E-02	3.09504E-02	3.64173E-02	4.07973E-02	2.31039E-02	2.80031E-02
3.20109E-02	1.40011E-02	1.79153E-02	2.11910E-02	4.13683E-03	6.14383E-03	7.85921E-03			

AK	BX	BY	BZ	TC	U
1.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	2.9435E+01

RTIME	0.00000E+00	RIRRAD	0.00000E+00

SPARE ITEMS

0.00000E+00	6.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

MIX COMPLETED

TIME FROM START 2.5 SECONDS. TIME IN THIS MODULE 0.1 SECONDS. UNUSED REGION THIS MODULE 1054 K BYTES.

OSNAMES:

● ● ● ● ● ● ● ● ● ●

-H- PRINT
-M- BEGIN

MESH(ES)

1

22

1	2	3
1.2588E+00	3.4277E-01	1.9084E+00

RIES IN ABOVE TABLE FOR EACH OLD

1.3097E-01	1.2573E-01	1.2504E-01	5.2253E-01	4.9971E-01	4.9443E-01	1.1899E-00	1.1446E-00	1.1297E-00	1.2717E+00
1.2273E+00	1.2013E+00	1.3524E+00	1.3061E+00	1.2700E+00	1.5895E+00	1.5355E+00	1.4877E+00	1.0363E+00	1.0103E+00
9.8714E-01	8.8793E-01	8.6730E-01	8.4988E-01	6.9200E-01	6.8147E-01	6.7228E-01	5.5162E-01	5.4889E-01	5.6442E-01
1.7913E-01	4.7628E-01	4.7477E-01	4.1889E-01	4.1939E-01	4.1925E-01	3.8768E-01	3.8871E-01	3.8876E-01	3.8484E-01
3.2513E-01	3.2513E-01	2.4849E-01	2.4849E-01	2.4849E-01	2.4849E-01	2.4849E-01	2.4849E-01	2.4849E-01	2.4849E-01
3.0592E-01	2.9504E-01	2.9741E-01	2.9938E-01	2.8974E-01	2.9241E-01	2.9420E-01	5.5797E-01	5.6410E-01	5.6883E-01
5.2647E-01	5.3291E-01	5.3975E-01	3.6777E-01	3.7616E-01	3.8172E-01	2.3931E-01	2.4417E-01	2.4741E-01	2.5948E-01
2.7046E-01	2.7761E-01	2.3644E-01	2.4891E-01	2.2658E-01	2.2525E-01	2.2871E-01	2.3102E-01	3.3517E-01	3.5650E-01
3.7013E-01	8.0452E-02	8.1328E-02	8.1967E-02	1.0254E-01	1.0367E-01	1.0449E-01	9.4473E-02	9.5109E-02	9.5579E-02
1.4982E-01	1.5101E-01	1.5186E-01	6.4438E-02	6.4934E-02	6.5301E-02	5.4020E-02	5.4818E-02	5.5375E-02	1.0132E-02
1.0395E-02	1.0550E-02	9.7465E-03	1.0243E-02	1.0410E-02	1.0314E-02	1.0548E-02	1.0708E-02	1.0696E-02	1.0883E-02
1.0395E-02	1.0550E-02	1.0746E-02	1.0243E-02	1.0410E-02	1.0314E-02	1.0548E-02	1.0708E-02	1.0696E-02	1.0883E-02
1.0183E-02	1.0341E-02	1.0455E-02	1.0247E-02	1.0528E-02	1.0735E-02	1.0757E-02	3.1198E-02	3.1517E-02	3.9173E-02
3.9722E-02	4.0120E-02	1.0296E-01	1.0448E-01	1.0554E-01	1.0657E-01	1.0938E-01	1.0966E-01	1.1031E-01	1.1271E-01
1.1440E-01	6.9383E-02	7.1352E-02	7.2747E-02	4.8806E-02	5.0521E-02	5.1732E-02	3.6780E-02	3.8213E-02	3.9226E-02
1.1349E-02	4.3072E-02	4.4274E-02	7.3831E-02	7.6911E-02	7.9083E-02	9.3496E-02	9.7302E-02	1.0004E-01	1.6885E-01
1.7581E-01	1.8092E-01	2.4181E-01	2.5278E-01	2.6109E-01	3.3932E-01	3.5834E-01	3.7240E-01	2.0818E-01	2.2242E-01
2.3260E-01	1.4563E-01	1.5674E-01	1.6483E-01	1.0271E-01	1.1143E-01	1.1785E-01	9.0492E-01	9.8927E-01	1.0518E-01
1.4448E-02	1.4448E-02	1.4448E-02	8.0258E-02	8.0258E-02	8.0258E-02	8.0258E-02	8.0258E-02	8.0258E-02	8.0258E-02
4.8905E-02	5.3482E-02	5.7588E-02	4.3330E-02	4.7827E-02	3.0950E-02	3.6476E-02	4.0797E-02	2.3104E-02	2.8003E-02
3.2011E-02	1.4901E-02	1.7915E-02	2.1191E-02	4.1686E-03	6.1438E-03	7.8592E-03			

NEW GROUP NUMBER FOR EACH OLD GROUP

[illegible]

ORDERS

1.0874E+01 1.0597E+01 1.0412E+01 4.2882E+00 4.3739E+00 4.4345E+00 3.0580E+00 3.2160E+00 3.3339E+00

RTIME = 0.0000E+00 RIRRAD = 0.0000E+00

FISSILE NUCLIDES

NUCLIDE IDENTIFICATIONS
3001 6016 6016 91 2235 8238

MATERIALS	3
GROUPS	3

NUMBER DENSITIES PRINTED IN MIX

CONDENSE COMPLETED

TIME FROM START 2.6 SECONDS. TIME IN THIS MODULE 0.1 SECONDS. UNUSED REGION THIS MODULE 1128 K BYTES.

WHC-SD-NR-SWD-017

***** WIMS-E MODULE W-MIX *****
 READS FILES 2 & 3, FORMS MACROSCOPIC X-SECTIONS AND WRITES THESE TO FILE 3.
 FLUXES ETC READ FROM FILE 1 AND WRITTEN TO FILE 5.

LN 3 LT -1

CROSS-SECTIONS 6

GROUPS 3

MATERIALS 3

NO. OF MATERIALS TO BE PROCESSED AT A TIME 3

UNUSED STORAGE 299694 (IF MATERIALS PROCESSED SINGLY 299847)

MATERIAL	1	NUCLIDE	IDENTIFIER	NUMBER DENSITY
		2	6018	4.4008E-02
		5	2235	4.6787E-04
		6	8238	2.1536E-02
NUMBER OF REACTIONS	4			

MATERIAL	2	NUCLIDE	IDENTIFIER	NUMBER DENSITY
		4	91	4.3260E-02
NUMBER OF REACTIONS	3			

MATERIAL	3	NUCLIDE	IDENTIFIER	NUMBER DENSITY
		1	3001	3.3438E-02
		3	6016	1.6721E-02
NUMBER OF REACTIONS	3			

READING FILE 1

LT1 1 LI 2

NMESH 3 NGRP 3 NORDER 1

FLUX 1.08745E+01 1.05966E+01 1.04122E+01 4.28815E+00 4.37385E+00 4.43447E+00 3.05797E+00 3.21599E+00 3.33391E+00

AK BX BY BZ TC U
 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 2.9435E+01

RTIME 0.00000E+00 RIRRAD 0.00000E+00

WRITING FILE 5

NMESH 3 NGRP 3 NORDER 1

FLUX 1.08745E+01 1.05966E+01 1.04122E+01 4.28815E+00 4.37385E+00 4.43447E+00 3.05797E+00 3.21599E+00 3.33391E+00

AK BX BY BZ TC U
 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 2.9435E+01

RTIME 0.00000E+00 RIRRAD 0.00000E+00

SPARE ITEMS

0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00

MIX COMPLETED

TIME FROM START 2.6 SECONDS. TIME IN THIS MODULE 0.0 SECONDS. UNUSED REGION THIS MODULE 1170 K BYTES.

-C- STOP

UNUSED REGION FOR THIS RUN WAS 1054 K BYTES.

B-57
Attachment 1
1-108

```
*****
*****
***** PROGRAM VERIFICATION INFORMATION *****
*****
*****
***** PROGRAM: /p/wimse/wimse.x *****
***** VERSION: 1.4 *****
***** OPERATING SYSTEM: CRAY UNICOS 4.0 *****
***** CREATION DATE: May 9 1989 *****
***** LIBRARY: /p/wimse/wimselib.bin *****
*****
***** RELEASED DATE: 05/01/89 *****
***** VALIDATION DATE: *****
***** CODE CUSTODIAN: G.H. MEPIWETHER *****
*****
***** JOBNAME: 2182 *****
***** DATE OF EXECUTION: 12/14/89 *****
***** TIME OF EXECUTION: 13.15.14 *****
*****
*****
*****
```

MESSAGE BOX
*****

REPORTED PROBLEMS

1. WHEN USING CACTUS IN BURNUP CALCULATIONS, THE EXPOSURE VALUE IS NOT INTEGRATED PROPERLY. (4-18-89)
2. THE CODE CRASHES WHEN USING WCPIT MODULE RIGHT AFTER THE CACTUS MODULE. TRY USING WSHARP IN BETWEEN. (4-18-89)
3. TWO MODULES, WPRES AND WRES, ARE NOT OPERABLE. (4-18-89)

WHC-SD-NR-SWD-017

OVERLAY WIMSE, VERSION 130, CREATED 01/20/89, CONSISTS OF:

MODULE	VERSION	MODULE	VERSION	MODULE	VERSION	MODULE	VERSION	MODULE	VERSION
WBPNUF	1988/11	WCOND	1988/11	WCRTIC	1988/11	WFLURIG	1988/11	WCACTUS	1988/11
WCHART	1988/11	WFORTE	1988/11	WHEAD	1989/01	WINTER	1988/11	WLINK	ABSENT
WPERGE	1988/11	WMIX	1988/11	WPERSEUS	DELETED	WPIJ	1988/11	WPIP	1988/11
WPONE	1988/11	WPRES	1988/11	WPROCOL	1988/11	WRES	1988/11	WSHEAR	1988/11
WSNAP	ABSENT	WTHESEUS	1988/11	WJED	1988/11	WJIRE	1988/11		

SUMMARY OF RECENT CHANGES

VERSION	CREATED	MODULES CHANGED
112	19/06/81	WHEAD, WINTER, WPRES, WRES, WPIJ, WPROC, CONTROL (CYCLIC CALCULATIONS)
113	18/10/84	WCACTUS (ADDED), WCHART (ADDED), WLINK, WMIX, WPIP, WPONE, WSHEAR, WJIRE
114	01/03/87	THE FOLLOWING CHANGES HAVE BEEN MADE FOR WIMS-E VERSION 114 : 1. ALL MODULES CONVERTED TO FORTRAN 77. 2. ERROR CORRECTIONS TO W-BRNUF, W-INTER, W-FORTE, W-THES, W-HEAD, W-PIP AND W-CACTUS. 3. THE CONTROLLER HAS BEEN REWRITTEN TO MAKE IT PORTABLE. 4. ALL ASSEMBLER CODING HAS BEEN REMOVED. 5. W-PERSEUS HAS BEEN REMOVED; W-THES FOLLOWED BY W-PIP SHOULD NOW BE USED INSTEAD. 6. NEW VERSION SUPPORTS USE OF THE 1986 WIMS NUCLEAR DATA LIBRARIES. 7. ALL MODULES NOW USE THE NEW INPUT PACKAGE READDATA.
120	08/11/88	THE FOLLOWING CHANGES HAVE BEEN MADE FOR WIMS-E VERSION 120 : 1. ALL MODULES CONVERTED ONTO THE HANFORD CRAY EXCEPT WPRES AND WRES MODULES. 2. PRINT TABLES GIVING GRAMS/CMFOR ALL ISOTOPICS WERE ADDED IN BRNUF MODULE. 3. \$ CHARACTER TO SIGNAL DATA CONTINUATION ON NEXT CARD MADE OPERABLE IN CACTUS MODULE. 4. PIN OPTION ADDED IN CACTUS MODULE TO CALCULATE NORMALIZED LOCAL PIN POWER DISTRIBUTION.
130	19/01/89	THE FOLLOWING CHANGES HAVE BEEN MADE FOR WIMS-E VERSION 130 : 1. ALT ARRAY IN MAIN02 ROUTINE WAS DECLARED REAL INSTEAD OF IMPLICIT INTEGER.
140	01/05/89	THE FOLLOWING CHANGES HAVE BEEN MADE FOR WIMS-E VERSION 140 : 1. SNAP OPTION WAS ADDED IN BRNUF MODULE TO SAVE THE ISOTOPICS ONTO UNIT 7. 2. DYNAMIC MEMORY ALLOCATION FEATURE WAS ADDED TO THE CODE. 3. QA INFORMATION PAGE WAS ADDED. THIS REQUIRES A UNICOS SHELLSCRIPT (WIMSE.EXE) TO BE EXECUTED TO COLLECT APPROPRIATE QA INFORMATION BEFORE THE ACTUAL EXECUTION. 4. THE MESSAGE BOX WAS CHANGED TO LIST ANY REPORTED PROBLEMS. THIS ELIMINATES THE NEED FOR THE WIMSE.TXT FILE.

NOTE PRINTS OF INPUT DATA (BEING READ FOR EXECUTION) ARE FLAGGED BY ONE OF THE FOLLOWING SYMBOLS TO DISTINGUISH THEM FROM OTHER PRINTS. THESE SYMBOLS SHOULD NOT BE TYPED.

-C- CONTROL ROUTINE DATA
 -P- PRELUDE DATA FOR MODULE
 -M- MAIN DATA FOR MODULE

THE FOLLOWING INPUT DATA WERE READ FROM UNIT 5

```

*****
* WIMSE TEST CASE #3
*****
MFACE 11
NCYC 1 2
WHEAD 13 12
NREGION 4
NMAT 2
QUAL 1 1
BURN
MISS 1 1
BURN 1 1
ENDP
CENT
MATE 1 -1 1138 1 2012 7.994E-2 6016 2.838E-3 29 2.052E-3 1000
4.183E-5 2232 1.30317E-3 2235 1.077863E-4 8238 8.11294E-6 6239
1E-20 9233 1E-20 937 1E-20
MATE 2 -1 968 3 2012 0.0877555 1000 5.49E-5
ANNU 1 .825 1
ANNU 2 .8325 0
ANNU 3 1.6302 2
ANNU 4 1.9364 0
DANC 1 BELL .602
BEGIN
WHEAD 13 14
NREGION 6
NMATE 6
NMESH 8
QUAL 1 1
BURN
MISS 1 1
BURN 1 2
ENDP
* POISON PIN
CENT
MATE 1 -1 968 1 2155 1.302E-4 2157 1.3859E-4
MATE 2 -1 968 1 2155 1.302E-4 2157 1.3859E-4
MATE 3 -1 968 1 2155 1.302E-4 2157 1.3859E-4
MATE 4 -1 968 1 2155 1.302E-4 2157 1.3859E-4
MATE 5 -1 968 1 2155 1.302E-4 2157 1.3859E-4
MATE 6 -1 968 3 2012 0.0877555 1000 5.49E-5
ANNU 1 .1 1
ANNU 2 .2 2
ANNU 3 .3 3
ANNU 4 .4 4
ANNU 5 .5 5
ANNU 6 1.4892 6
MESH 1 1 1 1 1 3
BEGIN
WTHES 12
PPINT 9
BEGIN
WPIJ 12
TOLEPA 1E-5
OMEGA 1.25
BEGIN
WCOND 12 8

```

WHC-SD-NR-SWD-017

```

*****
FFACE 12
WCOND 14 7
SUBF
GROUPS 9
ENDP
PART 14 27 45 47 49 52 54 57 69
CONO 1 1 1
CONO 2 2 1
CONO 3 3 1
CONO 4 4 1
CONO 5 5 1
CONO 6 6 3
BEGIN
WTHES 8
BEGIN
WTHES 7
BEGIN
WPERGE 8 7 11
NOIF 2
MULTICELL
ENDP
CELL 1 .060042
PCELL 9 .951532 .048468 .7 .3
PRINT 8
BEGIN
WPIP 11
BEGIN
WJED 11
OPTION 4
REGION 1 1
BEGIN
*
WJED 11
OPTION 4
BEGIN
*
GOTO 1 2
WBRN 11 13
RATING 1 88.425 CENT BUCK 9 3.43E-5 3.95E-5 3.43E-5 3.95E-5
STEP 2 1
POISON 2 5 5 15
PRAD .5
BEGIN
POINT 1
FINISH
WJIRE 11
REACT 2012 1100 1 2 9 REACT6016 1100 1 2 9 REACT 29 1100 1 2 9
BEGIN
WCOND 11 8
GROUPS 2
ENDP
PART 2 9
BEGIN
WSHEAR 6 1
MATE 1
MESH 1
ENDP
PCODE 1
NEWMAT 1 1 2 3 4 5 6 7 8 9 10 11 12
BEGIN
* NEW TEST FOR INTER
WINTER 1
PRINT 1
MATERIALS 1
PAGE 44
FILE 3
BEGIN
*
WINTER 1 14
COPY
MATRIX
FILE 3
PRINT
BEGIN
*
WINTER 1
PRINT
FILE 1 3
BEGIN
*
WINTER 1
PRINT
FILE 3 5
SNAP
BEGINC
STOP
-C- *****
-C- *
-C- * WIMSE TEST CASE #3
-C- *
-C- *****
-C- MFACE 11

FILE 1 OF INTERFACE 11 USES FOPTAN DATA SET 81 AND HAS A DSNAME
-C- NCYC 1 2
ALL CARD DATA TO CODE-WORD 'FINISH' WILL BE READ AND LISTED. THIS DATA IS COPIED TO AN ALTERNATIVE
INPUT FILE AND REREAD FROM THERE FOR EACH CYCLE.

LISTING OF CARD DATA FOR CYCLIC CALCULATION. THE DATA IS NOT USED AT THIS STAGE.

WHEAD 13 12
NREGION 4
NMAT 2
QUAL 1 1
BURN
MISS 1 1
BURN 1 1
ENDP
CENT
MATE 1 -1 1138 1 2012 7.994E-2 6016 2.838E-3 29 2.052E-3 1000
4.183E-5 2232 1.30317E-3 2235 1.077863E-4 8238 8.11294E-6 8239
1E-20 9233 1E-20 937 1E-20
MATE 2 -1 968 3 2012 0.0877555 1000 5.49E-5
ANNU 1 .825 1
ANNU 2 .8325 0
ANNU 3 1.8302 2
ANNU 4 1.9364 0
DANC 1 BELL .602
BEGIN
WHEAD 13 14
NREGION 6
NMATE 6
NMESH 8
DUAL 1 1
BURN
MISS 1 1
BURN 1 2
ENDP
* POISON FIN

```

WHC-SD-NR-SWD-017

```

MATE 2 -1 968 1 2155 1.302E-4 2157 1.3859E-4
MATE 3 -1 968 1 2155 1.302E-4 2157 1.3859E-4
MATE 4 -1 968 1 2155 1.302E-4 2157 1.3859E-4
MATE 5 -1 968 1 2155 1.302E-4 2157 1.3859E-4
MATE 6 -1 968 3 2012 0.0877555 1000 5.49E-5
ANNU 1 .1 1
ANNU 2 .2 2
ANNU 3 .3 3
ANNU 4 .4 4
ANNU 5 .5 5
ANNU 6 1.4882 6
MESH 1 1 1 1 1 3
BEGIN
WTHES 12
PRINT 9
BEGIN
WPIP 12
TOLERA 1E-5
OMEGA 1.25
BEGIN
WCONO 12 8
GROUPS 9
ENDP
PART 14 27 45 47 49 52 54 57 69
BEGIN
FFACE 12
WCONO 14 7
SUBF
GROUPS 9
ENDP
PART 14 27 45 47 49 52 54 57 69
COND 1 1 1
COND 2 2 1
COND 3 3 1
COND 4 4 1
COND 5 5 1
COND 6 6 3
BEGIN
WTHES 8
BEGIN
WTHES 7
BEGIN
WMERGE 8 7 11
NOIF 2
MULTICELL
ENDP
CELL 1 .060042
PCELL 9 .951532 .048468 .7 .3
PRINT 8
BEGIN
WPIP 11
BEGIN
WJED 11
OPTION 4
REGION 1 1
BEGIN
*
WJED 11
OPTION 4
BEGIN
*
GOTO 1 2
WBRN 11 13
RATING 1 88.425 CENT BUCK 9 3.43E-5 3.95E-5 3.43E-5 3.95E-5
STEP 2 1
POISON 2 5 5 15
PRAD .5
BEGIN
POINT 1
FINISH

```

CYCLE 1
-C- WHEAD 13 12

CYCLE 1

READS INTERFACE 13
WRITES INTERFACE 12

FORTRAN DATA SETS 71-75
FORTRAN DATA SETS 66-70

DSNAMES:
DSNAMES:

ALSO READS :

WHC-SD-NR-SWD-017

READ LIBRARY, DO RESONANCE CALCULATION, WRITE MICRO X-SECTIONS

LIBRARY
NUCLIDES 130 GROUPS 69-P- MREGION 4
-P- NMT 2
-P- BURN
-P- ENDPMAXIMUM SIZE OF NUMBER DENSITY DATA BLOCK 68977
STORAGE USED NOW GIVEN AT END OF HEAD CALCULATION-M- CENT
-M- RATE 1 -1 1138 1 2012 7.994E-2 6016 2.838E-3 29 2.052E-3 1000
-M- 4 183E-5 2232 1 30317E-3 2235 1.077863E-4 8238 8.11294E-6 6239
-M- 1E-20 9235 1E-20 937 1E-20
-M- RATE 2 -1 968 3 2012 0.0877555 1000 5.49E-5
-M- ANNU 1 .825 1
-M- ANNU 2 .8325 0
-M- ANNU 3 1.6302 2
-M- ANNU 4 1.9364 0
-M- DANC 1 BELL .602
-M- BEGIN

MATERIAL TEMPERATURES

TEMP 1 1138.0000 2 968.0000 3 0.0000

RESONANCE GROUP 15

MICROSCOPIC CROSS-SECTIONS

ARRAY
2232.OABS 8.37682E-01
234.OABS 8.77478E-01
2235.OABS 4.89030E+00
2235.OFIS 3.55080E+00
236.OABS 3.49999E-01
8238.OABS 9.56395E-01
6239.OABS 4.95379E+00
6239.OFIS 3.13229E+00

RESONANCE GROUP 16

MICROSCOPIC CROSS-SECTIONS

ARRAY
2232.OABS 1.11085E+00
234.OABS 1.36120E+00
2235.OABS 5.76977E+00
2235.OFIS 4.12692E+00
236.OABS 5.29998E-01
8238.OABS 1.23346E+00
6239.OABS 6.09562E+00
6239.OFIS 3.87138E+00

RESONANCE GROUP 17

MICROSCOPIC CROSS-SECTIONS

ARRAY
2232.OABS 1.37205E+00
234.OABS 2.01719E+00
2235.OABS 7.37097E+00
2235.OFIS 5.28068E+00
236.OABS 7.89998E-01
8238.OABS 9.30696E-01
6239.OABS 7.79288E+00
6239.OFIS 5.02427E+00

RESONANCE GROUP 18

MICROSCOPIC CROSS-SECTIONS

ARRAY
2232.OABS 1.83976E+00
234.OABS 3.00998E+00
2235.OABS 9.04679E+00
2235.OFIS 6.51853E+00
236.OABS 1.16999E+00
8238.OABS 1.85293E+00
6239.OABS 9.26130E+00
6239.OFIS 5.73306E+00

RESONANCE GROUP 19

MICROSCOPIC CROSS-SECTIONS

ARRAY
2232.OABS 2.07071E+00
234.OABS 3.40636E+00
2235.OABS 1.14386E+01
2235.OFIS 8.31438E+00
236.OABS 1.70998E+00
8238.OABS 2.33601E+00
6239.OABS 1.18597E+01
6239.OFIS 6.87784E+00

RESONANCE GROUP 20

MICROSCOPIC CROSS-SECTIONS

ARRAY
2232.OABS 3.08512E+00
234.OABS 6.29985E+00
2235.OABS 1.80585E+01
2235.OFIS 1.20162E+01
236.OABS 2.9709E+00
8238.OABS 3.1404E+00
6239.OABS 1.9600E+01

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RESONANCE GROUP 21

MICROSCOPIC CROSS-SECTIONS

2232.OABS	7.75480E+00
234.OABS	1.30990E+01
2235.OABS	2.29658E+01
2235.OFIS	1.45728E+01
236.OABS	7.04944E+00
8238.OABS	8.08717E+00
6239.OABS	2.43724E+01
6239.OFIS	1.53041E+01

RESONANCE GROUP 22

MICROSCOPIC CROSS-SECTIONS

2232.OABS	6.44803E+00
234.OABS	2.77971E+01
2235.OABS	3.71811E+01
2235.OFIS	2.33330E+01
236.OABS	3.00966E+01
8238.OABS	1.68017E+01
6239.OABS	5.07359E+01
6239.OFIS	3.81078E+01

RESONANCE GROUP 23

MICROSCOPIC CROSS-SECTIONS

2232.OABS	1.63276E+01
234.OABS	3.06416E+01
2235.OABS	4.24302E+01
2235.OFIS	2.80706E+01
236.OABS	2.90920E+01
8238.OABS	2.42255E+01
6239.OABS	1.18427E+02
6239.OFIS	4.40108E+01

RESONANCE GROUP 24

MICROSCOPIC CROSS-SECTIONS

2232.OABS	8.28185E-02
234.OABS	4.76891E+01
2235.OABS	7.22619E+01
2235.OFIS	4.10243E+01
236.OABS	6.25288E+01
8238.OABS	7.61836E+01
6239.OABS	4.56956E+01
6239.OFIS	1.19048E+01

RESONANCE GROUP 25

MICROSCOPIC CROSS-SECTIONS

2232.OABS	3.43390E+01
234.OABS	4.01513E+00
2235.OABS	8.75347E+01
2235.OFIS	4.74896E+01
236.OABS	1.26846E+01
8239.OABS	1.08934E+02
6239.OABS	8.86562E+01
6239.OFIS	5.13413E+01

RESONANCE GROUP 26

MICROSCOPIC CROSS-SECTIONS

2232.OABS	1.11545E-01
234.OABS	5.01998E+00
2235.OABS	8.34740E+01
2235.OFIS	4.21246E+01
236.OABS	3.14999E-01
8238.OABS	3.13212E-01
6239.OABS	2.73725E+02
6239.OFIS	1.66549E+02

RESONANCE GROUP 27

MICROSCOPIC CROSS-SECTIONS

2232.OABS	1.57274E-01
234.OABS	6.94776E+02
2235.OABS	7.57008E+01
2235.OFIS	5.04263E+01
236.OABS	2.52920E+02
8238.OABS	1.40282E+02
6239.OABS	6.81771E+01
6239.OFIS	3.84647E+01

FILE 2

NUCLIDES 60

2012	2012	6018	29	4083	4095	4099	4101	5103	4103	4105	5105	4108	4109	4113	4115
4127	4131	4133	4134	6135	4135	5135	4143	4145	4147	5147	6147	4148	5149	5149	4149
4150	4151	4152	4153	4154	4155	4157	4902	2232	9233	1233	234	2235	236	927	8238
937	1939	948	6239	1240	1241	1242	951	952	953	1000	1000				

VOIDS BECOME MATERIAL 3

VOIDS BECOME MATERIAL 3

WHC-SD-NR-SWD-017

FILE 3

MATERIALS 3

NUMBER DENSITIES PRINTED IN W-MIX

FILE 4

ANNULI 4

MATERIAL 1 3 2 3

VOLUMES 2.1382E+00 3.9054E-02 6.1716E+00 3.4309E+00

UNUSED STORAGE, CHAIN 1 280931

UNUSED STORAGE, CHAIN 2 276452

HEAD COMPLETED

TIME FROM START 2.3 SECONDS.

TIME IN THIS MODULE

2.2 SECONDS.

UNUSED REGION THIS MODULE 1078 K BYTES.

***** WIMS-E MODULE W-MIX *****
 READS FILES 2 & 3, FORMS MACROSCOPIC X-SECTIONS AND WRITES THESE TO FILE 3.
 FLUXES ETC READ FROM FILE 1 AND WRITTEN TO FILE 5.

LN 1 LT 0

CROSS-SECTIONS 60

GROUPS 69

MATERIALS 3

NO. OF MATERIALS TO BE PROCESSED AT A TIME 3

UNUSED STORAGE 230640 (IF MATERIALS PROCESSED SINGLY 270129)

MATERIAL 1	NUCLIDE	IDENTIFIER	NUMBER DENSITY
	1	2012	7.9940E-02
	3	6016	2.8380E-03
	4	23	2.0520E-03
	5	4083	1.0000E-19
	6	4095	1.0000E-19
	7	4099	1.0000E-19
	8	4101	1.0000E-19
	9	5103	1.0000E-19
	10	4103	1.0000E-19
	11	4105	1.0000E-19
	12	5105	1.0000E-19
	13	4108	1.0000E-19
	14	4109	1.0000E-19
	15	4113	1.0000E-19
	16	4115	1.0000E-19
	17	4127	1.0000E-19
	18	4131	1.0000E-19
	19	4133	1.0000E-19
	20	4134	1.0000E-19
	21	6135	1.0000E-19
	22	4135	1.0000E-19
	23	5135	1.0000E-19
	24	4142	1.0000E-19
	25	4145	1.0000E-19
	26	4147	1.0000E-19
	27	5147	1.0000E-19
	28	6147	1.0000E-19
	29	4148	1.0000E-19
	30	5148	1.0000E-19
	31	5149	1.0000E-19
	32	4149	1.0000E-19
	33	4150	1.0000E-19
	34	4151	1.0000E-19

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38	4155	1.0000E-19
39	4157	1.0000E-19
40	4902	1.0000E-19
41	2232	1.3032E-03
42	9233	1.0000E-20
43	1233	1.0000E-19
44	234	1.0000E-19
45	2235	1.0779E-04
46	236	1.0000E-19
47	927	1.0000E-19
48	8238	8.1129E-06
49	937	1.0000E-20
50	1939	1.0000E-19
51	948	1.0000E-19
52	8239	1.0000E-20
53	1240	1.0000E-19
54	1241	1.0000E-19
55	1242	1.0000E-19
56	951	1.0000E-19
57	952	1.0000E-19
58	953	1.0000E-19
59	1000	4.1830E-05

NUMBER OF REACTIONS 4

MATERIAL	2	NUCLIDE	IDENTIFIER	NUMBER DENSITY
		2	2012	8.7755E-02
		60	1000	5.4900E-05

NUMBER OF REACTIONS 3

MATERIAL 3 VOID

NUMBER OF REACTIONS 0

WRITING FILE 5

NMESH 1 NGPP 1 NORDEP 1

FLUX
1.00000E+00

AK	BX	BY	BZ	TC	U
1.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.0000E+00

RTIME 0.00000E+00 RIRRAD 0.00000E+00

SPARE ITEMS

0.00000E+00	6.00000E+01	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

MIX COMPLETED

TIME FROM START 2.7 SECONDS. TIME IN THIS MODULE 0.4 SECONDS. UNUSED REGION THIS MODULE 1054 K BYTES.

-C- WHEAD 13 14

CYCLE 1

READS INTERFACE 13

FORTRAN DATA SETS 71-75

DSNAMES:

WRITES INTERFACE 14

FORTRAN DATA SETS 76-80

DSNAMES:

ALSO READS :

WHC-SD-NR-SWD-017

***** WRITE MODULE TO HEAD *****
 READ LIBRARY, DO RESONANCE CALCULATION, WRITE MICRO X-SECTIONS

LIBRARY
 NUCLIDES 130 GROUPS 69

-P- NREGION 6
 -P- NMATE 6
 -P- NMESH 8
 -P- BUPN
 -P- ENDP
 -P- POISON PIN

MAXIMUM SIZE OF NUMBER DENSITY DATA BLOCK 68321
 STORAGE USED NOW GIVEN AT END OF HEAD CALCULATION

-M- CENT
 -M- MATE 1 -1 968 1 2155 1.302E-4 2157 1.3859E-4
 -M- MATE 2 -1 968 1 2155 1.302E-4 2157 1.3859E-4
 -M- MATE 3 -1 968 1 2155 1.302E-4 2157 1.3859E-4
 -M- MATE 4 -1 968 1 2155 1.302E-4 2157 1.3859E-4
 -M- MATE 5 -1 968 1 2155 1.302E-4 2157 1.3859E-4
 -M- MATE 6 -1 968 3 2012 0.0877555 1000 5.49E-5
 -M- ANNU 1 1 1
 -M- ANNU 2 2 2
 -M- ANNU 3 3 3
 -M- ANNU 4 4 4
 -M- ANNU 5 5 5
 -M- ANNU 6 1.4882 6
 -M- MESH 1 1 1 1 1 3
 -M- BEGIN

MATERIAL TEMPERATURES

TEMP	1	2	3	4	5	6
	968.0000	968.0000	968.0000	968.0000	968.0000	968.0000

FILE 2

NUCLIDES 6

NUCLIDE IDENTIFICATIONS

2012 2155 2156 2157 2158 1000

FILE 3

MATERIALS 8

NUMBER DENSITIES PRINTED IN W-MIX

FILE 4

ANNULI 8

MATERIAL	1	2	3	4	5	6	6	6
VOLUMES	3.1416E-02	9.4248E-02	1.5708E-01	2.1991E-01	2.8274E-01	2.0575E+00	2.0575E+00	2.0575E+00

UNUSED STORAGE, CHAIN 1 280197
 UNUSED STORAGE, CHAIN 2 273674

HEAD COMPLETED

TIME FROM START 3.9 SECONDS. TIME IN THIS MODULE 1.2 SECONDS. UNUSED REGION THIS MODULE 1068 K BYTES.

WHC-SD-NR-SWD-017

***** WIMS-E MODULE W-MIX *****
 READS FILES 2 & 3, FORMS MACROSCOPIC X-SECTIONS AND WRITES THESE TO FILE 3.
 FLUXES ETC READ FROM FILE 1 AND WRITTEN TO FILE 5.

LN 1 LT 0

CROSS-SECTIONS 6

GROUPS 69

MATERIALS 6

NO. OF MATERIALS TO BE PROCESSED AT A TIME 6

UNUSED STORAGE 171519 (IF MATERIALS PROCESSED SINGLY 270252)

MATERIAL	1	NUCLIDE	IDENTIFIER	NUMBER DENSITY
		2	2155	1.3020E-04
		3	2156	1.0000E-19
		4	2157	1.3859E-04
		5	2158	1.0000E-19

NUMBER OF REACTIONS 3

MATERIAL	2	NUCLIDE	IDENTIFIER	NUMBER DENSITY
		2	2155	1.3020E-04
		3	2156	1.0000E-19
		4	2157	1.3859E-04
		5	2158	1.0000E-19

NUMBER OF REACTIONS 3

MATERIAL	3	NUCLIDE	IDENTIFIER	NUMBER DENSITY
		2	2155	1.3020E-04
		3	2156	1.0000E-19
		4	2157	1.3859E-04
		5	2158	1.0000E-19

NUMBER OF REACTIONS 3

MATERIAL	4	NUCLIDE	IDENTIFIER	NUMBER DENSITY
		2	2155	1.3020E-04
		3	2156	1.0000E-19
		4	2157	1.3859E-04
		5	2158	1.0000E-19

NUMBER OF REACTIONS 3

MATERIAL	5	NUCLIDE	IDENTIFIER	NUMBER DENSITY
		2	2155	1.3020E-04
		3	2156	1.0000E-19
		4	2157	1.3859E-04
		5	2158	1.0000E-19

NUMBER OF REACTIONS 3

MATERIAL	6	NUCLIDE	IDENTIFIER	NUMBER DENSITY
		1	2012	8.7755E-02
		6	1000	5.4900E-05

NUMBER OF REACTIONS 3

WRITING FILE 5

MMESH 1 NGRP 1 NORDER 1

FLUX

1.00000E+00

AK BX BY BZ TC U
 1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 1.0000E+00

RTIME 0.00000E+00 RIRRAD 0.00000E+00

SPARE ITEMS

0.00000E+00 2.20000E+01 0.00000E+00 0.00000E+00 0.00000E+00
 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00

MIX COMPLETED

TIME FROM START 4.1 SECONDS. TIME IN THIS MODULE 0.1 SECONDS. UNUSED REGION THIS MODULE 1054 K BYTES.

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-C- WTHES 12

READS INTERFACE 12

FORTRAN DATA SETS 66-70

DSNAMES:

CYCLE 1

***** WIMS-E MODULE W-THES *****

NR OF MESHES = 4 NR OF MATERIALS = 3 NR OF GROUPS = 69

REGION	1	2	3	4
MATERIAL	1	3	2	3

VOLUMES 2.1382E+00 3.9054E-02 6.1716E+00 3.4309E+00
 UNUSED STORAGE 299193

-M- PRINT 9

-M- BEGIN

RADIOI 8.2500E-01 8.3250E-01 1.8302E+00 1.9384E+00

COLLISION PROBABILITIES

GROUP 1

P(I TO J)/SIGMA(J)
 1.005287 0.013282 1.025591 0.349380 0.727193 0.030932 1.301730 0.366252 0.355676 0.008237
 1.391256 0.476824 0.217744 0.004169 0.857728 0.783895
 P(I TO SURFACE)
 0.872123 0.873321 0.891917 0.933465
 P(SURFACE TO J)/SIGMA(J)
 0.613085 0.011213 1.809717 1.052913
 P(SURFACE TO SURFACE)
 0.849663

GROUP 2

P(I TO J)/SIGMA(J)
 0.994089 0.013148 1.010578 0.342037 0.719864 0.030834 1.285721 0.358805 0.350128 0.008136
 1.370422 0.469638 0.213168 0.004084 0.844802 0.779733
 P(I TO SURFACE)
 0.855035 0.856427 0.878252 0.925148
 P(SURFACE TO J)/SIGMA(J)
 0.801072 0.010996 1.781989 1.043532
 P(SURFACE TO SURFACE)
 0.830755

GROUP 3

P(I TO J)/SIGMA(J)
 0.932604 0.012363 0.909027 0.294418 0.676881 0.030262 1.178493 0.308507 0.314944 0.007457
 1.232810 0.419717 0.183490 0.003512 0.755002 0.751862
 P(I TO SURFACE)
 0.743771 0.741888 0.784739 0.869459
 P(SURFACE TO J)/SIGMA(J)
 0.522856 0.009526 1.592249 0.980716
 P(SURFACE TO SURFACE)
 0.705783

GROUP 4

P(I TO J)/SIGMA(J)
 0.917967 0.012166 0.886276 0.284394 0.666092 0.030120 1.155259 0.298171 0.307062 0.007310
 1.206366 0.409928 0.177243 0.003394 0.737393 0.746503
 P(I TO SURFACE)
 0.719897 0.717915 0.766242 0.858750
 P(SURFACE TO J)/SIGMA(J)
 0.506073 0.009218 1.554719 0.988638
 P(SURFACE TO SURFACE)
 0.681471

GROUP 5

P(I TO J)/SIGMA(J)
 0.884043 0.011697 0.831290 0.260166 0.640437 0.029783 1.097948 0.272804 0.288011 0.006948
 1.142194 0.385670 0.162143 0.003105 0.693757 0.733574
 P(I TO SURFACE)
 0.661960 0.658873 0.720709 0.832918
 P(SURFACE TO J)/SIGMA(J)
 0.465344 0.008460 1.462332 0.939500
 P(SURFACE TO SURFACE)
 0.623123

GROUP 6

P(I TO J)/SIGMA(J)
 0.854859 0.011283 0.779704 0.237146 0.617747 0.029488 1.041681 0.247922 0.270138 0.006592
 1.078860 0.361295 0.147796 0.002822 0.649911 0.721166
 P(I TO SURFACE)
 0.606670 0.600762 0.675517 0.808126
 P(SURFACE TO J)/SIGMA(J)
 0.426477 0.007714 1.370636 0.911535
 P(SURFACE TO SURFACE)
 0.587703

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GROUP 7
P(I TO J)/SIGMA(J)
0.821428 0.010798 0.726454 0.214907 0.591185 0.029147 0.986056 0.224609 0.251689 0.006240
1.021807 0.339375 0.133936 0.002557 0.610479 0.710317
P(I TO SURFACE)
0.552465 0.545557 0.634525 0.796448
P(SURFACE TO J)/SIGMA(J)
0.388372 0.007005 1.287463 0.887084
P(SURFACE TO SURFACE)
0.518692

GROUP 8
P(I TO J)/SIGMA(J)
0.800192 0.010485 0.691095 0.200103 0.574052 0.028930 0.947922 0.208737 0.239439 0.005998
0.982501 0.324157 0.124710 0.002376 0.583106 0.703114
P(I TO SURFACE)
0.516234 0.507865 0.606330 0.772056
P(SURFACE TO J)/SIGMA(J)
0.362902 0.006521 1.230256 0.870850
P(SURFACE TO SURFACE)
0.486404

GROUP 9
P(I TO J)/SIGMA(J)
0.791033 0.010349 0.672301 0.191691 0.566610 0.028837 0.925511 0.199122 0.232927 0.005857
0.957671 0.314388 0.119468 0.002287 0.565533 0.698705
P(I TO SURFACE)
0.495736 0.485142 0.588568 0.763245
P(SURFACE TO J)/SIGMA(J)
0.348492 0.008229 1.194215 0.860912
P(SURFACE TO SURFACE)
0.467022

GROUP 10
P(I TO J)/SIGMA(J)
0.781625 0.010209 0.656776 0.185334 0.558935 0.028742 0.908625 0.192277 0.227548 0.005750
0.940733 0.307825 0.115508 0.002189 0.553727 0.695742
P(I TO SURFACE)
0.480055 0.468779 0.576441 0.757325
P(SURFACE TO J)/SIGMA(J)
0.337469 0.006019 1.169609 0.854233
P(SURFACE TO SURFACE)
0.453746

GROUP 11
P(I TO J)/SIGMA(J)
0.774892 0.010108 0.646072 0.181044 0.553425 0.028673 0.897171 0.187711 0.223840 0.005677
0.929522 0.303498 0.112832 0.002137 0.545942 0.693807
P(I TO SURFACE)
0.469437 0.457826 0.568423 0.753458
P(SURFACE TO J)/SIGMA(J)
0.330004 0.005878 1.153340 0.849872
P(SURFACE TO SURFACE)
0.445043

GROUP 12
P(I TO J)/SIGMA(J)
0.770891 0.010048 0.639617 0.178448 0.550145 0.028633 0.890186 0.184927 0.221604 0.005633
0.922647 0.300840 0.111214 0.002105 0.541161 0.692632
P(I TO SURFACE)
0.463007 0.451147 0.563511 0.751111
P(SURFACE TO J)/SIGMA(J)
0.325485 0.005793 1.143374 0.847224
P(SURFACE TO SURFACE)
0.439773

GROUP 13
P(I TO J)/SIGMA(J)
0.768383 0.010010 0.635697 0.176897 0.548088 0.028607 0.888012 0.183282 0.220245 0.005607
0.918616 0.299287 0.110243 0.002086 0.538368 0.691947
P(I TO SURFACE)
0.459157 0.447192 0.560632 0.749741
P(SURFACE TO J)/SIGMA(J)
0.322778 0.005742 1.137533 0.845680
P(SURFACE TO SURFACE)
0.438687

GROUP 14
P(I TO J)/SIGMA(J)
0.766743 0.009986 0.633206 0.175926 0.546739 0.028591 0.882402 0.182264 0.219382 0.005590
0.916140 0.298326 0.109643 0.002075 0.536658 0.691527
P(I TO SURFACE)
0.456742 0.444730 0.558665 0.748902

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P(SURFACE TO SURFACE)
0.434790

GROUP 15

P(I TO J)/SIGMA(J)
0.764438 0.009951 0.630407 0.174968 0.544844 0.028568 0.880908 0.181381 0.218413 0.005574
0.914207 0.297628 0.109045 0.002085 0.535385 0.691196

P(I TO SURFACE)
0.454322 0.442570 0.557484 0.748242

P(SURFACE TO J)/SIGMA(J)
0.319379 0.005682 1.131146 0.843989

P(SURFACE TO SURFACE)
0.433222

GROUP 16

P(I TO J)/SIGMA(J)
0.763747 0.009941 0.629481 0.174631 0.544276 0.028561 0.880016 0.181049 0.218092 0.005569
0.913438 0.297339 0.108835 0.002061 0.534864 0.691066

P(I TO SURFACE)
0.453477 0.441763 0.556935 0.747982

P(SURFACE TO J)/SIGMA(J)
0.318785 0.005672 1.130031 0.843695

P(SURFACE TO SURFACE)
0.432618

GROUP 17

P(I TO J)/SIGMA(J)
0.763182 0.009932 0.628721 0.174353 0.543811 0.028555 0.879279 0.180774 0.217828 0.005564
0.912798 0.297098 0.108682 0.002058 0.534431 0.690957

P(I TO SURFACE)
0.452780 0.441095 0.556478 0.747765

P(SURFACE TO J)/SIGMA(J)
0.318295 0.005663 1.129105 0.843451

P(SURFACE TO SURFACE)
0.432118

GROUP 18

P(I TO J)/SIGMA(J)
0.763153 0.009932 0.628512 0.174241 0.543787 0.028555 0.878957 0.180628 0.217756 0.005562
0.912392 0.296934 0.108592 0.002056 0.534138 0.690890

P(I TO SURFACE)
0.452511 0.440752 0.556189 0.747630

P(SURFACE TO J)/SIGMA(J)
0.318106 0.005659 1.128518 0.843298

P(SURFACE TO SURFACE)
0.431831

GROUP 19

P(I TO J)/SIGMA(J)
0.762783 0.009926 0.628068 0.174090 0.543483 0.028551 0.878564 0.180490 0.217602 0.005560
0.912091 0.296825 0.108498 0.002055 0.533939 0.690839

P(I TO SURFACE)
0.452129 0.440413 0.555975 0.747527

P(SURFACE TO J)/SIGMA(J)
0.317837 0.005655 1.128083 0.843183

P(SURFACE TO SURFACE)
0.431587

GROUP 20

P(I TO J)/SIGMA(J)
0.761363 0.009905 0.626652 0.173678 0.542314 0.028537 0.877548 0.180188 0.217112 0.005553
0.911583 0.296666 0.108241 0.002051 0.533653 0.690749

P(I TO SURFACE)
0.451066 0.439641 0.555611 0.747349

P(SURFACE TO J)/SIGMA(J)
0.317090 0.005645 1.127345 0.842982

P(SURFACE TO SURFACE)
0.431104

GROUP 21

P(I TO J)/SIGMA(J)
0.765970 0.009974 0.630980 0.174863 0.546103 0.028583 0.880406 0.180964 0.218611 0.005571
0.912655 0.296947 0.108980 0.002060 0.534159 0.690943

P(I TO SURFACE)
0.454149 0.441688 0.556379 0.747735

P(SURFACE TO J)/SIGMA(J)
0.319258 0.005671 1.128903 0.843417

P(SURFACE TO SURFACE)
0.432265

GROUP 22

P(I TO J)/SIGMA(J)
0.762259 0.009919 0.627426 0.173967 0.543060 0.028546 0.877980 0.180280 0.217380 0.005556
0.911623 0.296652 0.108359 0.002052 0.533628 0.690759

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P(SURFACE TO J)/SIGMA(J)
0.317442 0.005648 1.127405 0.843003

P(SURFACE TO SURFACE)
0.431212

GROUP 23

P(I TO J)/SIGMA(J)
0.754457 0.009801 0.819981 0.171801 0.536624 0.028467 0.872988 0.178894 0.214901 0.005524
0.909604 0.296092 0.107071 0.002036 0.532621 0.690398

P(I TO SURFACE)
0.446202 0.436301 0.554195 0.746647

P(SURFACE TO J)/SIGMA(J)
0.313671 0.005602 1.124472 0.842189

P(SURFACE TO SURFACE)
0.429102

GROUP 24

P(I TO J)/SIGMA(J)
0.754654 0.009804 0.820156 0.171846 0.536786 0.028469 0.873092 0.178919 0.214861 0.005525
0.909626 0.296095 0.107099 0.002037 0.532626 0.690402

P(I TO SURFACE)
0.446320 0.436368 0.554211 0.746655

P(SURFACE TO J)/SIGMA(J)
0.313754 0.005603 1.124505 0.842199

P(SURFACE TO SURFACE)
0.429136

GROUP 25

P(I TO J)/SIGMA(J)
0.689808 0.008820 0.557896 0.154592 0.482901 0.027830 0.832634 0.167706 0.193290 0.005269
0.893367 0.291608 0.096346 0.001909 0.524554 0.687492

P(I TO SURFACE)
0.401508 0.407247 0.542572 0.740840

P(SURFACE TO J)/SIGMA(J)
0.282252 0.005229 1.100888 0.835639

P(SURFACE TO SURFACE)
0.412094

GROUP 26

P(I TO J)/SIGMA(J)
0.761128 0.009902 0.826288 0.173535 0.542120 0.028534 0.877162 0.180037 0.216986 0.005551
0.911213 0.296523 0.108152 0.002049 0.533397 0.690687

P(I TO SURFACE)
0.450712 0.439278 0.555347 0.747225

P(SURFACE TO J)/SIGMA(J)
0.316841 0.005640 1.126810 0.842841

P(SURFACE TO SURFACE)
0.430823

GROUP 27

P(I TO J)/SIGMA(J)
0.760328 0.009890 0.825302 0.173195 0.541462 0.028528 0.876271 0.179719 0.216644 0.005545
0.910508 0.296264 0.107940 0.002046 0.532930 0.690567

P(I TO SURFACE)
0.449852 0.438498 0.554844 0.746986

P(SURFACE TO J)/SIGMA(J)
0.316237 0.005630 1.125790 0.842571

P(SURFACE TO SURFACE)
0.430258

GROUP 28

P(I TO J)/SIGMA(J)
0.764234 0.009948 0.830517 0.175089 0.544677 0.028566 0.881289 0.181582 0.218451 0.005577
0.914827 0.297887 0.109121 0.002067 0.535850 0.691299

P(I TO SURFACE)
0.454603 0.443030 0.557926 0.748448

P(SURFACE TO J)/SIGMA(J)
0.319577 0.005688 1.132041 0.844221

P(SURFACE TO SURFACE)
0.433639

GROUP 29

P(I TO J)/SIGMA(J)
0.765517 0.009967 0.832061 0.175615 0.545731 0.028578 0.882653 0.182063 0.218996 0.005585
0.915872 0.298268 0.109448 0.002072 0.536536 0.691478

P(I TO SURFACE)
0.455931 0.444212 0.558872 0.748805

P(SURFACE TO J)/SIGMA(J)
0.320510 0.005703 1.133556 0.844623

P(SURFACE TO SURFACE)
0.434491

GROUP 30

P(I TO J)/SIGMA(J)
0.766800 0.009986 0.833517 0.176143 0.546805 0.028590 0.884019 0.182579 0.219517 0.005593
0.916927 0.298650 0.109775 0.002083 0.537219 0.691660

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0.914854	0.297642	0.109730	0.000087	0.01539789	0.891139				
P(I TO SURFACE)									
0.455493	0.443487	0.557947	0.748488						
P(SURFACE TO J)/SIGMA(J)									
0.320202	0.005694	1.132084	0.844243						
P(SURFACE TO SURFACE)									
0.433808									
GROUP 31									
P(I TO J)/SIGMA(J)									
0.764084	0.009946	0.829427	0.174503	0.544553	0.028564	0.879601	0.180816	0.218073	0.005566
0.912696	0.297027	0.108756	0.002058	0.534303	0.690944				
P(I TO SURFACE)									
0.453189	0.441234	0.556407	0.747737						
P(SURFACE TO J)/SIGMA(J)									
0.318583	0.005665	1.128960	0.843419						
P(SURFACE TO SURFACE)									
0.432127									
GROUP 32									
P(I TO J)/SIGMA(J)									
0.763163	0.009932	0.827737	0.173791	0.543795	0.028555	0.877642	0.180017	0.217487	0.005554
0.910661	0.296232	0.108312	0.002049	0.532872	0.690602				
P(I TO SURFACE)									
0.451431	0.439326	0.554956	0.747055						
P(SURFACE TO J)/SIGMA(J)									
0.317347	0.005641	1.126015	0.842650						
P(SURFACE TO SURFACE)									
0.430617									
GROUP 33									
P(I TO J)/SIGMA(J)									
0.759557	0.009878	0.823735	0.172511	0.540827	0.028518	0.874373	0.178931	0.216101	0.005533
0.908464	0.295460	0.107514	0.002037	0.531484	0.690226				
P(I TO SURFACE)									
0.448171	0.436822	0.553388	0.746303						
P(SURFACE TO J)/SIGMA(J)									
0.315055	0.005606	1.122834	0.841802						
P(SURFACE TO SURFACE)									
0.428760									
GROUP 34									
P(I TO J)/SIGMA(J)									
0.755631	0.009819	0.820024	0.171491	0.537591	0.028479	0.871913	0.178258	0.214815	0.005517
0.907511	0.295204	0.106879	0.002029	0.531023	0.690055				
P(I TO SURFACE)									
0.445519	0.434867	0.552706	0.745962						
P(SURFACE TO J)/SIGMA(J)									
0.313191	0.005584	1.121451	0.841417						
P(SURFACE TO SURFACE)									
0.427747									
GROUP 35									
P(I TO J)/SIGMA(J)									
0.755702	0.009820	0.820027	0.171473	0.537650	0.028480	0.871849	0.178220	0.214817	0.005517
0.907386	0.295150	0.106867	0.002029	0.530927	0.690035				
P(I TO SURFACE)									
0.445479	0.434782	0.552617	0.745921						
P(SURFACE TO J)/SIGMA(J)									
0.313162	0.005582	1.121271	0.841371						
P(SURFACE TO SURFACE)									
0.427666									
GROUP 36									
P(I TO J)/SIGMA(J)									
0.756628	0.009834	0.820869	0.171694	0.538414	0.028489	0.872372	0.178352	0.215108	0.005520
0.907536	0.295181	0.107005	0.002030	0.530982	0.690063				
P(I TO SURFACE)									
0.446058	0.435134	0.552725	0.745977						
P(SURFACE TO J)/SIGMA(J)									
0.313570	0.005587	1.121490	0.841434						
P(SURFACE TO SURFACE)									
0.427853									
GROUP 37									
P(I TO J)/SIGMA(J)									
0.757595	0.009848	0.821844	0.171980	0.539210	0.028499	0.873090	0.178566	0.215446	0.005525
0.907906	0.295299	0.107183	0.002033	0.531194	0.690127				
P(I TO SURFACE)									
0.446795	0.435677	0.552989	0.746106						
P(SURFACE TO J)/SIGMA(J)									
0.314088	0.005594	1.122025	0.841579						
P(SURFACE TO SURFACE)									
0.425197									

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P(I TO J)/SIGMA(J)	0.758247	0.009858	0.622439	0.172138	0.539748	0.028505	0.873453	0.178661	0.215652	0.005527
0.908018	0.295322	0.107281	0.002034	0.531236	0.690148					
P(I TO SURFACE)	0.447206	0.435930	0.553069	0.746147						
P(SURFACE TO J)/SIGMA(J)	0.314377	0.005597	1.122187	0.841625						
P(SURFACE TO SURFACE)	0.428332									
GROUP 39										
P(I TO J)/SIGMA(J)	0.758660	0.009864	0.622778	0.172216	0.540088	0.028509	0.873626	0.178692	0.215769	0.005528
0.908005	0.295303	0.107330	0.002034	0.531202	0.690147					
P(I TO SURFACE)	0.447414	0.436021	0.553060	0.746145						
P(SURFACE TO J)/SIGMA(J)	0.314523	0.005598	1.122169	0.841624						
P(SURFACE TO SURFACE)	0.428360									
GROUP 40										
P(I TO J)/SIGMA(J)	0.758841	0.009867	0.622948	0.172262	0.540237	0.028511	0.873739	0.178723	0.215829	0.005529
0.908048	0.295315	0.107359	0.002034	0.531223	0.690155					
P(I TO SURFACE)	0.447536	0.436102	0.553091	0.746161						
P(SURFACE TO J)/SIGMA(J)	0.314609	0.005599	1.122231	0.841641						
P(SURFACE TO SURFACE)	0.428406									
GROUP 41										
P(I TO J)/SIGMA(J)	0.759149	0.009872	0.623277	0.172364	0.540491	0.028514	0.873994	0.178804	0.215942	0.005531
0.908204	0.295388	0.107422	0.002035	0.531318	0.690182					
P(I TO SURFACE)	0.447795	0.436307	0.553202	0.746215						
P(SURFACE TO J)/SIGMA(J)	0.314791	0.005602	1.122458	0.841702						
P(SURFACE TO SURFACE)	0.428542									
GROUP 42										
P(I TO J)/SIGMA(J)	0.759190	0.009872	0.623282	0.172355	0.540525	0.028515	0.873964	0.178786	0.215944	0.005530
0.908142	0.295341	0.107417	0.002035	0.531271	0.690171					
P(I TO SURFACE)	0.447777	0.436265	0.553158	0.746194						
P(SURFACE TO J)/SIGMA(J)	0.314778	0.005601	1.122368	0.841679						
P(SURFACE TO SURFACE)	0.428503									
GROUP 43										
P(I TO J)/SIGMA(J)	0.759326	0.009874	0.623395	0.172382	0.540637	0.028516	0.874023	0.178797	0.215983	0.005531
0.908140	0.295336	0.107433	0.002035	0.531261	0.690172					
P(I TO SURFACE)	0.447847	0.436297	0.553157	0.746195						
P(SURFACE TO J)/SIGMA(J)	0.314828	0.005602	1.122365	0.841679						
P(SURFACE TO SURFACE)	0.428513									
GROUP 44										
P(I TO J)/SIGMA(J)	0.759302	0.009874	0.623336	0.172354	0.540617	0.028516	0.873947	0.178764	0.215963	0.005530
0.908054	0.295302	0.107416	0.002035	0.531199	0.690157					
P(I TO SURFACE)	0.447781	0.436220	0.553095	0.746186						
P(SURFACE TO J)/SIGMA(J)	0.314781	0.005601	1.122241	0.841647						
P(SURFACE TO SURFACE)	0.428451									
GROUP 45										
P(I TO J)/SIGMA(J)	0.759812	0.009867	0.622792	0.172181	0.540214	0.028511	0.873502	0.178617	0.215774	0.005527
0.907755	0.295197	0.107308	0.002033	0.531010	0.690106					
P(I TO SURFACE)	0.447338	0.435853	0.552882	0.746064						
P(SURFACE TO J)/SIGMA(J)	0.314470	0.005596	1.121808	0.841512						

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GROUP 46

P(I TO J)/SIGMA(J)
 0.757882 0.009853 0.622171 0.172087 0.539447 0.028502 0.873355 0.178659 0.215559 0.005527
 0.908099 0.295368 0.107250 0.002034 0.531318 0.690160

P(I TO SURFACE)
 0.447066 0.435908 0.553127 0.746172

P(SURFACE TO J)/SIGMA(J)
 0.314278 0.005597 1.122305 0.841653

P(SURFACE TO SURFACE)
 0.428357

GROUP 47

P(I TO J)/SIGMA(J)
 0.755536 0.009817 0.620070 0.171545 0.537513 0.028478 0.872084 0.178348 0.214831 0.005519
 0.907791 0.295320 0.106912 0.002030 0.531233 0.690101

P(I TO SURFACE)
 0.445643 0.435075 0.552906 0.746054

P(SURFACE TO J)/SIGMA(J)
 0.313278 0.005586 1.121956 0.841521

P(SURFACE TO SURFACE)
 0.427934

GROUP 48

P(I TO J)/SIGMA(J)
 0.754505 0.009802 0.619592 0.171563 0.536683 0.028468 0.872282 0.178561 0.214666 0.005520
 0.908647 0.295702 0.106923 0.002033 0.531920 0.690240

P(I TO SURFACE)
 0.445634 0.435526 0.553514 0.746330

P(SURFACE TO J)/SIGMA(J)
 0.313271 0.005592 1.123081 0.841832

P(SURFACE TO SURFACE)
 0.428440

GROUP 49

P(I TO J)/SIGMA(J)
 0.752499 0.009772 0.618335 0.171410 0.535008 0.028447 0.872118 0.178723 0.214230 0.005519
 0.909597 0.296154 0.106828 0.002034 0.532733 0.690390

P(I TO SURFACE)
 0.445163 0.435810 0.554188 0.746631

P(SURFACE TO J)/SIGMA(J)
 0.312941 0.005596 1.124457 0.842171

P(SURFACE TO SURFACE)
 0.428922

GROUP 50

P(I TO J)/SIGMA(J)
 0.751202 0.009752 0.617338 0.171206 0.533937 0.028434 0.871704 0.178684 0.213885 0.005516
 0.909805 0.296282 0.106701 0.002034 0.532962 0.690420

P(I TO SURFACE)
 0.444806 0.435660 0.554334 0.746691

P(SURFACE TO J)/SIGMA(J)
 0.312549 0.005594 1.124754 0.842239

P(SURFACE TO SURFACE)
 0.428950

GROUP 51

P(I TO J)/SIGMA(J)
 0.750820 0.009743 0.616984 0.171168 0.533457 0.028429 0.871676 0.178740 0.213762 0.005516
 0.910107 0.296424 0.106677 0.002035 0.533218 0.690468

P(I TO SURFACE)
 0.444484 0.435764 0.554548 0.746787

P(SURFACE TO J)/SIGMA(J)
 0.312463 0.005595 1.125189 0.842347

P(SURFACE TO SURFACE)
 0.429108

GROUP 52

P(I TO J)/SIGMA(J)
 0.751096 0.009750 0.617700 0.171445 0.533849 0.028433 0.872425 0.179031 0.214010 0.005521
 0.910818 0.296696 0.106850 0.002038 0.533708 0.690587

P(I TO SURFACE)
 0.445174 0.436465 0.555054 0.747025

P(SURFACE TO J)/SIGMA(J)
 0.312948 0.005604 1.126215 0.842818

P(SURFACE TO SURFACE)
 0.429646

GROUP 53

P(I TO J)/SIGMA(J)
 0.752159 0.009767 0.618979 0.171879 0.534727 0.028444 0.873548 0.179426 0.214453 0.005528
 0.911880 0.297011 0.107120 0.002042 0.534274 0.690734

P(I TO SURFACE)

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P(SURFACE TO SURFACE)
0.313719 0.005616 1.127463 0.842947

P(SURFACE TO SURFACE)
0.430344

GROUP 54

P(I TO J)/SIGMA(J)
0.752846 0.009777 0.619870 0.172197 0.535294 0.028451 0.874385 0.179733 0.214762 0.005533

0.912383 0.297274 0.107318 0.002046 0.534746 0.690853

P(I TO SURFACE)
0.447069 0.438185 0.556170 0.747557

P(SURFACE TO J)/SIGMA(J)
0.314281 0.005626 1.128480 0.843216

P(SURFACE TO SURFACE)
0.430898

GROUP 55

P(I TO J)/SIGMA(J)
0.748218 0.009707 0.612537 0.169293 0.531472 0.028404 0.866481 0.176820 0.212222 0.005463

0.904666 0.294295 0.105508 0.002010 0.529388 0.689561

P(I TO SURFACE)
0.439955 0.430701 0.550676 0.744974

P(SURFACE TO J)/SIGMA(J)
0.309209 0.005530 1.117332 0.840303

P(SURFACE TO SURFACE)
0.425112

GROUP 56

P(I TO J)/SIGMA(J)
0.745083 0.009660 0.608859 0.168070 0.528881 0.028373 0.863318 0.175527 0.210947 0.005463

0.902319 0.293446 0.104746 0.001998 0.527862 0.689164

P(I TO SURFACE)
0.436754 0.428004 0.549006 0.744182

P(SURFACE TO J)/SIGMA(J)
0.307030 0.005495 1.113943 0.839409

P(SURFACE TO SURFACE)
0.423211

GROUP 57

P(I TO J)/SIGMA(J)
0.746636 0.009693 0.614142 0.170689 0.530164 0.028389 0.870798 0.178804 0.212777 0.005510

0.911272 0.297028 0.106366 0.002035 0.534305 0.690847

P(I TO SURFACE)
0.443079 0.435729 0.555370 0.747144

P(SURFACE TO J)/SIGMA(J)
0.311475 0.005595 1.126856 0.842750

P(SURFACE TO SURFACE)
0.429557

GROUP 58

P(I TO J)/SIGMA(J)
0.735675 0.009517 0.597301 0.164108 0.521090 0.028279 0.852932 0.171841 0.206943 0.005397

0.894094 0.290419 0.102277 0.001956 0.522417 0.687788

P(I TO SURFACE)
0.426747 0.418981 0.543159 0.741432

P(SURFACE TO J)/SIGMA(J)
0.299994 0.005379 1.102080 0.836307

P(SURFACE TO SURFACE)
0.416736

GROUP 59

P(I TO J)/SIGMA(J)
0.724660 0.009350 0.580164 0.157433 0.511947 0.028170 0.834483 0.164685 0.201005 0.005281

0.876276 0.283555 0.098117 0.001875 0.510069 0.684886

P(I TO SURFACE)
0.410104 0.401711 0.530524 0.735633

P(SURFACE TO J)/SIGMA(J)
0.288295 0.005158 1.076442 0.829766

P(SURFACE TO SURFACE)
0.403785

GROUP 60

P(I TO J)/SIGMA(J)
0.723999 0.009340 0.581857 0.158467 0.511398 0.028163 0.837760 0.166243 0.201523 0.005301

0.880887 0.285446 0.098761 0.001892 0.513470 0.685619

P(I TO SURFACE)
0.412568 0.405337 0.533794 0.737098

P(SURFACE TO J)/SIGMA(J)
0.290027 0.005204 1.083077 0.831419

P(SURFACE TO SURFACE)
0.406795

GROUP 61

P(I TO J)/SIGMA(J)
0.718060 0.009220 0.576413 0.154303 0.504735 0.028085 0.826746 0.161960 0.197629 0.005229

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P(I TO SURFACE)
 0.402126 0.394949 0.526433 0.733744
 P(SURFACE TO J)/SIGMA(J)
 0.282688 0.005071 1.068143 0.827636
 P(SURFACE TO SURFACE)
 0.399203

GROUP 62

P(I TO J)/SIGMA(J)
 0.718080 0.009251 0.577439 0.157728 0.506476 0.028105 0.836544 0.166351 0.200061 0.005294
 0.882599 0.286333 0.098301 0.001894 0.515066 0.685873
 P(I TO SURFACE)
 0.410495 0.405331 0.535010 0.737606
 P(SURFACE TO J)/SIGMA(J)
 0.288570 0.005204 1.085545 0.831991
 P(SURFACE TO SURFACE)
 0.407438

GROUP 63

P(I TO J)/SIGMA(J)
 0.696868 0.008928 0.543434 0.144401 0.489797 0.027898 0.798952 0.151745 0.188280 0.005055
 0.845513 0.271995 0.089995 0.001727 0.489274 0.680003
 P(I TO SURFACE)
 0.377229 0.370135 0.508820 0.725877
 P(SURFACE TO J)/SIGMA(J)
 0.265184 0.004752 1.032405 0.818762
 P(SURFACE TO SURFACE)
 0.381433

GROUP 64

P(I TO J)/SIGMA(J)
 0.693011 0.008869 0.540016 0.143540 0.485578 0.027860 0.796873 0.151270 0.187096 0.005043
 0.845006 0.271913 0.089458 0.001722 0.489126 0.679914
 P(I TO SURFACE)
 0.374964 0.368861 0.508476 0.725700
 P(SURFACE TO J)/SIGMA(J)
 0.263592 0.004736 1.031706 0.818562
 P(SURFACE TO SURFACE)
 0.380813

GROUP 65

P(I TO J)/SIGMA(J)
 0.661454 0.008387 0.490179 0.124456 0.459193 0.027560 0.740708 0.130137 0.169829 0.004687
 0.790408 0.250869 0.077565 0.001481 0.451273 0.671825
 P(I TO SURFACE)
 0.327009 0.317692 0.470209 0.709535
 P(SURFACE TO J)/SIGMA(J)
 0.229880 0.004079 0.954062 0.800329
 P(SURFACE TO SURFACE)
 0.345100

GROUP 66

P(I TO J)/SIGMA(J)
 0.676857 0.008622 0.521088 0.137366 0.472077 0.027706 0.780314 0.145638 0.180538 0.004938
 0.832284 0.267278 0.085610 0.001658 0.480789 0.677944
 P(I TO SURFACE)
 0.359227 0.354949 0.499567 0.721763
 P(SURFACE TO J)/SIGMA(J)
 0.252529 0.004557 1.013630 0.814121
 P(SURFACE TO SURFACE)
 0.371563

GROUP 67

P(I TO J)/SIGMA(J)
 0.706835 0.003079 0.582143 0.163676 0.497110 0.027995 0.857027 0.177061 0.201691 0.005423
 0.916289 0.300359 0.102008 0.002015 0.540297 0.691310
 P(I TO SURFACE)
 0.424191 0.429809 0.558778 0.748470
 P(SURFACE TO J)/SIGMA(J)
 0.298197 0.005519 1.133771 0.844246
 P(SURFACE TO SURFACE)
 0.429220

GROUP 68

P(I TO J)/SIGMA(J)
 0.659331 0.008354 0.512240 0.137202 0.457417 0.027541 0.783995 0.149000 0.177472 0.004961
 0.845981 0.273381 0.085508 0.001696 0.491732 0.679951
 P(I TO SURFACE)
 0.358041 0.362171 0.509246 0.725773
 P(SURFACE TO J)/SIGMA(J)
 0.251695 0.004650 1.033269 0.818644
 P(SURFACE TO SURFACE)
 0.378774

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P(I TO J)/SIGMA(J)
 0.573453 0.007046 0.399730 0.098095 0.385786 0.026783 0.670294 0.108436 0.138492 0.004242
 0.742665 0.234225 0.061136 0.001234 0.421333 0.665193
 P(I TO SURFACE)
 0.258777 0.263228 0.437642 0.686285
 P(SURFACE TO J)/SIGMA(J)
 0.181915 0.003380 0.887984 0.785383
 P(SURFACE TO SURFACE)
 0.313255

COLLISION PROBABILITIES WRITTEN TO FILE 4 (DATA-SET 69)

THESEUS COMPLETED

TIME FROM START 4.1 SECONDS. TIME IN THIS MODULE 0.1 SECONDS. UNUSED REGION THIS MODULE 1168 K BYTES.

-C- WPIP 12

CYCLE 1

READS INTERFACE 12

FORTRAN DATA SETS 88-70

DSNAMES:

***** WIMS-E MODULE W-PIP *****

 ALL COLLISION PROBABILITIES WILL BE HELD IN FAST STORE.
 UNUSED STORAGE 280499

 -M- TOLERA 1E-5
 -M- OMEGA 1.25
 -M- BEGIN

REGION	1	2	3	4
MATERIAL	1	3	2	3

VOLUMES 2.1382E+00 3.9054E-02 6.1716E+00 3.4309E+00

CALCULATION CONVERGED IN 171 ITERATIONS.

K-INFINITY = 1.382314

WHC-SD-NR-SWD-017

REGION	1	5.82757E-02	3.14766E-01	6.73407E-01	1.21310E+00	1.32419E+00	1.27244E+00	1.17400E+00	1.08149E+00	1.02592E+00
		9.83210E-01	9.56908E-01	9.38225E-01	9.26728E-01	9.17175E-01	9.10584E-01	8.18253E-01	8.13316E-01	8.07563E-01
		8.01311E-01	1.57427E+00	1.51193E+00	1.08930E+00	6.93957E-01	8.28641E-01	7.50364E-01	6.30023E-01	1.16801E+00
		2.75325E-01	3.25267E-01	2.96757E-01	4.78153E-01	2.08839E-01	1.83698E-01	3.58951E-02	3.56239E-02	3.67759E-02
		3.80111E-02	3.77931E-02	3.74980E-02	3.87581E-02	3.87114E-02	6.99183E-02	1.13748E-01	1.49400E-01	4.30178E-01
		5.35993E-01	8.89226E-01	4.96180E-01	3.65508E-01	2.77282E-01	3.07869E-01	5.27131E-01	6.14740E-01	9.67419E-01
		1.12838E+00	1.23244E+00	6.12063E-01	3.78744E-01	2.43471E-01	2.00279E-01	1.81293E-01	1.40065E-01	8.77929E-02
		7.64255E-02	6.39859E-02	5.06737E-02	3.65732E-02	2.18454E-02	6.98699E-03			
TOTAL		3.73326E+01								
REGION	2	5.47858E-02	2.99889E-01	6.46110E-01	1.18402E+00	1.30141E+00	1.25629E+00	1.16575E+00	1.08275E+00	1.02299E+00
		9.82168E-01	9.56344E-01	9.38039E-01	9.26808E-01	9.17461E-01	9.10938E-01	8.18707E-01	8.13887E-01	8.08299E-01
		8.02180E-01	1.57665E+00	1.51693E+00	1.09342E+00	6.98812E-01	8.31140E-01	7.61046E-01	6.33275E-01	1.17105E+00
		2.75851E-01	3.23784E-01	2.96985E-01	4.78564E-01	2.08952E-01	1.84032E-01	3.60128E-02	3.57478E-02	3.68874E-02
		3.81094E-02	3.73778E-02	3.75724E-02	3.88274E-02	3.87715E-02	7.00221E-02	1.13945E-01	1.49358E-01	4.30468E-01
		5.36308E-01	6.90137E-01	4.97682E-01	3.67237E-01	2.78917E-01	3.09910E-01	5.30374E-01	6.19349E-01	9.75409E-01
		1.13980E+00	1.24679E+00	6.20430E-01	3.82475E-01	2.47535E-01	2.03898E-01	1.84865E-01	1.43085E-01	8.98629E-02
		7.83883E-02	6.58225E-02	5.23162E-02	3.79627E-02	2.29278E-02	7.57661E-03			
TOTAL		3.73327E+01								
REGION	3	5.10089E-02	2.83742E-01	6.15998E-01	1.15184E+00	1.27600E+00	1.23809E+00	1.15638E+00	1.07733E+00	1.01963E+00
		9.80967E-01	9.55631E-01	9.37932E-01	9.26900E-01	9.17793E-01	9.11371E-01	8.19233E-01	8.14546E-01	8.09151E-01
		8.03185E-01	1.57940E+00	1.52272E+00	1.09818E+00	7.04401E-01	8.34018E-01	7.72800E-01	6.37035E-01	1.17455E+00
		2.78459E-01	3.26340E-01	2.97250E-01	4.79040E-01	2.09082E-01	1.84418E-01	3.61602E-02	3.58908E-02	3.70162E-02
		3.82230E-02	3.79758E-02	3.76585E-02	3.89076E-02	3.88411E-02	7.01422E-02	1.14062E-01	1.49741E-01	4.30803E-01
		5.36671E-01	6.91187E-01	4.99412E-01	3.69226E-01	2.80793E-01	3.12252E-01	5.35170E-01	6.24640E-01	9.84581E-01
		1.15223E+00	1.26327E+00	6.29994E-01	3.89037E-01	2.52198E-01	2.08038E-01	1.88947E-01	1.46517E-01	9.22266E-02
		8.06222E-02	6.79297E-02	5.41729E-02	3.94949E-02	2.41189E-02	8.21268E-03			
TOTAL		3.73363E+01								
REGION	4	5.14112E-02	2.85377E-01	6.18011E-01	1.15380E+00	1.27716E+00	1.23865E+00	1.15655E+00	1.07738E+00	1.01964E+00
		9.80966E-01	9.55689E-01	9.37932E-01	9.26901E-01	9.17795E-01	9.11374E-01	8.19237E-01	8.14553E-01	8.09157E-01
		8.03192E-01	1.57942E+00	1.52277E+00	1.09821E+00	7.04445E-01	8.34041E-01	7.72892E-01	6.37055E-01	1.17458E+00
		2.78463E-01	3.26343E-01	2.97251E-01	4.79044E-01	2.09084E-01	1.84422E-01	3.61614E-02	3.58920E-02	3.70173E-02
		3.82239E-02	3.79766E-02	3.76592E-02	3.89082E-02	3.88417E-02	7.01432E-02	1.14064E-01	1.49742E-01	4.30806E-01
		5.36674E-01	6.91196E-01	4.99426E-01	3.69241E-01	2.80807E-01	3.12269E-01	5.35201E-01	6.24677E-01	9.84544E-01
		1.15234E+00	1.26342E+00	6.30058E-01	3.89107E-01	2.52268E-01	2.08092E-01	1.89013E-01	1.46580E-01	9.22779E-02
		8.06706E-02	6.80035E-02	5.42177E-02	3.94988E-02	2.41418E-02	8.24065E-03			
TOTAL		3.73463E+01								

FOR EACH GROUP, FLOW INTEGRALS OVER MATERIALS 1 TO 3, WITH ROW AND COLUMN TOTALS.

GROUP	1	1.24607755E-01	3.14809065E-01	1.78527327E-01	6.17944146E-01
GROUP	2	6.73047576E-01	1.75115286E+00	9.90813722E-01	3.41501416E+00
GROUP	3	1.43990938E+00	3.80172030E+00	2.14557252E+00	7.38720220E+00
GROUP	4	2.59389814E+00	7.10874795E+00	4.00481225E+00	1.37074583E+01
GROUP	5	2.83144716E+00	7.87499514E+00	4.43265854E+00	1.51391018E+01
GROUP	6	2.72079342E+00	7.64104832E+00	4.29877215E+00	1.46608139E+01
GROUP	7	2.51030747E+00	7.13678354E+00	4.01355357E+00	1.36606446E+01
GROUP	8	2.32531341E+00	6.64891386E+00	3.73868343E+00	1.27129107E+01
GROUP	9	2.19387383E+00	6.29278360E+00	3.53823828E+00	1.20246957E+01
GROUP	10	2.10234522E+00	6.05418083E+00	3.40386362E+00	1.15604897E+01
GROUP	11	2.04610570E+00	5.89818834E+00	3.31823279E+00	1.12605268E+01
GROUP	12	2.00615570E+00	5.78858643E+00	3.25459595E+00	1.10493381E+01
GROUP	13	1.98157355E+00	5.72049966E+00	3.21630974E+00	1.09183829E+01
GROUP	14	1.98114575E+00	5.66429278E+00	3.18470422E+00	1.08101428E+01
GROUP	15	1.94701054E+00	5.62466000E+00	3.18241992E+00	1.07340905E+01
GROUP	16	1.74962590E+00	5.05601395E+00	2.84270157E+00	9.64834142E+00
GROUP	17	1.73906942E+00	5.02710430E+00	2.82844574E+00	9.59261945E+00
GROUP	18	1.72676858E+00	4.99379208E+00	2.80771393E+00	9.52827459E+00
GROUP	19	1.71339984E+00	4.95897149E+00	2.78701000E+00	9.45738132E+00
GROUP	20	3.36617078E+00	9.74748117E+00	5.48041887E+00	1.85940708E+01
GROUP	21	3.23288531E+00	9.39771388E+00	5.28372641E+00	1.79143256E+01
GROUP	22	2.32920155E+00	6.77755500E+00	3.81057372E+00	1.29173303E+01
GROUP	23	1.48385025E+00	4.34731498E+00	2.44417792E+00	8.27534315E+00
GROUP	24	1.77183888E+00	5.14726570E+00	2.89397864E+00	9.81308322E+00
GROUP	25	1.80446362E+00	4.76944595E+00	2.68144425E+00	9.05535382E+00
GROUP	26	1.34714357E+00	3.93155869E+00	2.21044494E+00	7.48914719E+00
GROUP	27	2.49749566E+00	7.24892623E+00	4.07561669E+00	1.38220386E+01
GROUP	28	5.88713305E-01	1.70620692E+00	9.59293862E-01	3.25421409E+00
GROUP	29	6.95500890E-01	2.01405194E+00	1.13237770E+00	3.84193053E+00
GROUP	30	6.74538995E-01	1.83451869E+00	1.03144155E+00	3.50043923E+00

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GROUP 33	3.92791693E-01	1.13816435E+00	6.39921089E-01	2.17087713E+00
GROUP 34	7.67311795E-02	2.23167899E-01	1.25473098E-01	4.25372177E-01
GROUP 35	7.61726987E-02	2.21505085E-01	1.24538257E-01	4.22216041E-01
GROUP 36	7.86359873E-02	2.28450974E-01	1.28443688E-01	4.35530649E-01
GROUP 37	8.12771287E-02	2.35898601E-01	1.32631204E-01	4.49806933E-01
GROUP 38	8.08108739E-02	2.34373028E-01	1.31773624E-01	4.46957527E-01
GROUP 39	8.01799040E-02	2.32414632E-01	1.30672660E-01	4.43287196E-01
GROUP 40	8.28743264E-02	2.40123720E-01	1.35007100E-01	4.58005146E-01
GROUP 41	7.84980627E-02	2.27370047E-01	1.27836536E-01	4.33704645E-01
GROUP 42	1.49502632E-01	4.32892803E-01	2.43389784E-01	8.25785219E-01
GROUP 43	2.43222131E-01	7.03952595E-01	3.95790800E-01	1.34296553E+00
GROUP 44	3.19454291E-01	9.24145478E-01	5.19592598E-01	1.76319237E+00
GROUP 45	9.19827651E-01	2.65876558E+00	1.49486930E+00	5.07346253E+00
GROUP 46	1.14608573E+00	3.31214587E+00	1.86222738E+00	6.32045898E+00
GROUP 47	1.47373562E+00	4.26576329E+00	2.39838484E+00	8.13788373E+00
GROUP 48	1.06095431E+00	3.08219605E+00	1.73292336E+00	5.87607373E+00
GROUP 49	7.81545216E-01	2.27873052E+00	1.28117471E+00	4.34145045E+00
GROUP 50	5.92897386E-01	1.73295757E+00	9.74318141E-01	3.30017310E+00
GROUP 51	6.58300760E-01	1.92711062E+00	1.08347209E+00	3.68888347E+00
GROUP 52	1.12713630E+00	3.30287802E+00	1.85695827E+00	8.28697259E+00
GROUP 53	1.31446628E+00	3.85505582E+00	2.16739907E+00	7.33692117E+00
GROUP 54	2.06858130E+00	6.07648438E+00	3.41631906E+00	1.15613847E+01
GROUP 55	2.41403322E+00	7.11115749E+00	3.99808339E+00	1.35232741E+01
GROUP 56	2.83526807E+00	7.79644544E+00	4.38336860E+00	1.48150801E+01
GROUP 57	1.30874215E+00	3.88809889E+00	2.18590424E+00	7.38274528E+00
GROUP 58	8.05571041E-01	2.40099787E+00	1.34992983E+00	4.55649874E+00
GROUP 59	5.20600383E-01	1.55647797E+00	8.75175743E-01	2.95225410E+00
GROUP 60	4.28245964E-01	1.28392400E+00	7.21908987E-01	2.43407895E+00
GROUP 61	3.87649319E-01	1.16611651E+00	6.55705243E-01	2.20947107E+00
GROUP 62	2.99494240E-01	9.04249107E-01	5.08423774E-01	1.71216712E+00
GROUP 63	1.87722901E-01	5.89190082E-01	3.20106851E-01	1.07701973E+00
GROUP 64	1.63416485E-01	4.97572471E-01	2.79834988E-01	9.40823924E-01
GROUP 65	1.38817700E-01	4.19237934E-01	2.35884453E-01	7.91940088E-01
GROUP 66	1.08352897E-01	3.34335797E-01	1.88059412E-01	6.30748106E-01
GROUP 67	7.82025198E-02	2.43748789E-01	1.36999617E-01	4.58950926E-01
GROUP 68	4.67109271E-02	1.48853027E-01	8.37236288E-02	2.79287583E-01
GROUP 69	1.49399071E-02	5.06857739E-02	2.85688365E-02	9.41945175E-02
	7.98264063E-01	2.30429772E+02	1.29589773E+02	

PIP COMPLETED

TIME FROM START 4.7 SECONDS.

TIME IN THIS MODULE 0.5 SECONDS.

UNUSED REGION THIS MODULE 1094 K BYTES.

WHC-SD-NR-SWD-017

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-C- WCOND 12 8                                CYCLE 1
      READS  INTERFACE 12                      FORTRAN DATA SETS 66-70      DSNAMES:
      WRITES INTERFACE 8                      FORTRAN DATA SETS 46-50      DSNAMES:

*****      WIMS-E MODULE W-CONDENSE      *****

-P- GROUPS 9
-P- ENDP

SPACE AVAILABLE ALLOWS UP TO 99706 NUCLIDE TABULATIONS ON NEW INTERFACE

-M- PART 14 27 45 47 49 52 54 57 69
-M- BEGIN

DETAILS OF CONDENSATION
NEW CONDENSED FROM OLD MATERIAL USING FLUXES INTEGRATED OVER MESH(ES)
MATERIAL              1      2      3
1
2
3

NEW FILE 4
MESHES      4
MATERIAL CODE AND VOLUMES
1      2      3
2.1382E+00 3.9054E-02 6.1718E+00 3.4309E+00

NEW FILE 2
NUCLIDE TABULATIONS      60
GROUPS      9
FISSILE NUCLIDES      11

NUCLIDE IDENTIFICATIONS
2012 2012 6016 29 4083 4095 4099 4101 5103 4103 4105 5105 4108 4109 4113 4115 4127 4131 4133 4134
8135 4135 5135 4143 4145 4147 5147 6147 4148 5148 5149 4149 4150 4151 4152 4153 4154 4155 4157 4902
2232 9233 1233 234 2235 236 927 8238 937 1939 948 6239 1240 1241 1242 951 952 953 1000 1000

NEW FILE 3
MATERIALS      3
GROUPS      9

NUMBER DENSITIES PRINTED IN MIX

UNUSED STORAGE 288620

CONDENSE COMPLETED
TIME FROM START      5.0 SECONDS.      TIME IN THIS MODULE      0.3 SECONDS.      UNUSED REGION THIS MODULE 1126 K BYTES.

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WHC-SD-NR-SWD-017

***** WIMS-E MODULE W-MIX *****
 READS FILES 2 & 3, FORMS MACROSCOPIC X-SECTIONS AND WRITES THESE TO FILE 3.
 FLUXES ETC READ FROM FILE 1 AND WRITTEN TO FILE 5.

LN 2 LT -1

CROSS-SECTIONS 60

GROUPS 9

MATERIALS 3

NO. OF MATERIALS TO BE PROCESSED AT A TIME 3

UNUSED STORAGE 298266 (IF MATERIALS PROCESSED SINGLY 299115)

MATERIAL	1	NUCLIDE	IDENTIFIER	NUMBER DENSITY
		1	2012	7.9940E-02
		3	6016	2.8380E-03
		4	29	2.0520E-03
		5	4083	1.0000E-19
		6	4095	1.0000E-19
		7	4099	1.0000E-19
		8	4101	1.0000E-19
		9	5103	1.0000E-19
		10	4103	1.0000E-19
		11	4105	1.0000E-19
		12	5105	1.0000E-19
		13	4108	1.0000E-19
		14	4109	1.0000E-19
		15	4113	1.0000E-19
		16	4115	1.0000E-19
		17	4127	1.0000E-19
		18	4131	1.0000E-19
		19	4133	1.0000E-19
		20	4134	1.0000E-19
		21	8135	1.0000E-19
		22	4135	1.0000E-19
		23	5135	1.0000E-19
		24	4143	1.0000E-19
		25	4145	1.0000E-19
		26	4147	1.0000E-19
		27	5147	1.0000E-19
		28	6147	1.0000E-19
		29	4148	1.0000E-19
		30	5148	1.0000E-19
		31	5149	1.0000E-19
		32	4149	1.0000E-19
		33	4150	1.0000E-19
		34	4151	1.0000E-19
		35	4152	1.0000E-19
		36	4153	1.0000E-19
		37	4154	1.0000E-19
		38	4155	1.0000E-19
		39	4157	1.0000E-19
		40	4902	1.0000E-19
		41	2232	1.3032E-03
		42	9233	1.0000E-20
		43	1233	1.0000E-19
		44	234	1.0000E-19
		45	2235	1.0779E-04
		46	236	1.0000E-19
		47	927	1.0000E-19
		48	8238	8.1129E-06
		49	937	1.0000E-20
		50	1939	1.0000E-19
		51	948	1.0000E-19
		52	6239	1.0000E-20
		53	1240	1.0000E-19
		54	1241	1.0000E-19
		55	1242	1.0000E-19
		56	951	1.0000E-19
		57	952	1.0000E-19
		58	953	1.0000E-19
		59	1000	4.1830E-05

NUMBER OF REACTIONS 4

MATERIAL	2	NUCLIDE	IDENTIFIER	NUMBER DENSITY
		2	2012	8.7755E-02
		60	1000	5.4900E-05

NUMBER OF REACTIONS 3

MATERIAL 3 VOID

NUMBER OF REACTIONS 0

WRITING FILE 5

WMESH 4 NGRP 9 NORDER 1

FLUX
 1.28658E+01 1.27349E+01 1.25893E+01 1.25973E+01 1.23975E+01 1.24363E+01 1.24806E+01 1.24809E+01 2.82834E+00 2.83190E+00
 2.83601E+00 2.83604E+00 1.22522E+00 1.22644E+00 1.22786E+00 1.22787E+00 8.61687E-01 8.64919E-01 8.68638E-01 8.68667E-01
 1.11228E+00 1.11970E+00 1.12822E+00 1.12828E+00 1.58216E+00 1.59476E+00 1.60922E+00 1.60932E+00 2.97348E+00 3.00702E+00
 3.04549E+00 3.04561E+00 1.48614E+00 1.51672E+00 1.55151E+00 1.55209E+00

AK BX BY BZ TC U
 1.3823E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 7.2342E-01

RTIME 0.00000E+00 RIRRAD 0.00000E+00

SPARE ITEMS
 0.00000E+00 6.00000E+01 0.00000E+00 0.00000E+00 0.00000E+00
 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00

1. *Phragmites* spp. (Poaceae)

NEW FILE 4

MESSES 8

MATERIAL CODE AND VOLUMES

1	2	3	4	5	6	7	8
-3.1416E-02	9.4248E-02	1.5708E-01	2.1991E-01	2.8274E-01	2.0575E+00	2.0575E+00	2.0575E+00

MESH VOLUMES FOR SUBSTITUTE FLUX INTERFACE

WARNING: WHEN SUBSTITUTE FLUX USED, NUMBER OF MESHES AND MESH VOLUMES ON THE TWO INTERFACES SHOULD MATCH.

WHC-SD-NR-SWD-017

NEW FILE 2

NUCLIDE TABULATIONS 22
 GROUPS 9
 FISSIONABLE NUCLIDES 0

NUCLIDE IDENTIFICATIONS

2012 2155 2155 2155 2155 2155 2156 2156 2156 2156 2157 2157 2157 2157 2157 2158 2158 2158 2158
 2158 1000

NEW FILE 3

MATERIALS 6
 GROUPS 9

NUMBER DENSITIES PRINTED IN MIX

UNUSED STORAGE 288126

CONDENSE COMPLETED

TIME FROM START 5.2 SECONDS. TIME IN THIS MODULE 0.1 SECONDS. UNUSED REGION THIS MODULE 1124 K BYTES.

***** WIMS-E MODULE W-MIX *****
 READS FILES 2 & 3, FORMS MACROSCOPIC X-SECTIONS AND WRITES THESE TO FILE 3.
 FLUXES ETC READ FROM FILE 1 AND WRITTEN TO FILE 5.

LN 2 LT -1

CROSS-SECTIONS 22

GROUPS 9

MATERIALS 8

NO. OF MATERIALS TO BE PROCESSED AT A TIME 6

UNUSED STORAGE 297024 (IF MATERIALS PROCESSED SINGLY 299157)

MATERIAL	1	NUCLIDE	IDENTIFIER	NUMBER DENSITY
		2	2155	1.3020E-04
		7	2156	1.0000E-19
		12	2157	1.3859E-04
		17	2158	1.0000E-19

NUMBER OF REACTIONS 3

MATERIAL	2	NUCLIDE	IDENTIFIER	NUMBER DENSITY
		3	2155	1.3020E-04
		8	2156	1.0000E-19
		13	2157	1.3859E-04
		18	2158	1.0000E-19

NUMBER OF REACTIONS 3

MATERIAL	3	NUCLIDE	IDENTIFIER	NUMBER DENSITY
		4	2155	1.3020E-04
		9	2156	1.0000E-19
		14	2157	1.3859E-04
		19	2158	1.0000E-19

NUMBER OF REACTIONS 3

MATERIAL	4	NUCLIDE	IDENTIFIER	NUMBER DENSITY
		5	2155	1.3020E-04
		10	2156	1.0000E-19
		15	2157	1.3859E-04
			2158	1.0000E-19

WHC-SD-NR-SWD-017

MATERIAL	5	NUCLIDE	IDENTIFIER	NUMBER DENSITY
		8	2155	1.3020E-04
		11	2156	1.0000E-19
		16	2157	1.3859E-04
		21	2158	1.0000E-19

NUMBER OF REACTIONS 3

MATERIAL	6	NUCLIDE	IDENTIFIER	NUMBER DENSITY
		1	2012	8.7755E-02
		22	1000	5.4900E-05

NUMBER OF REACTIONS 3

WRITING FILE 5

NMESH 8 NGRP 9 NORDER 1

FLUX

1.28658E+01	1.28658E+01	1.28658E+01	1.28658E+01	1.28658E+01	1.25893E+01	1.25893E+01	1.25893E+01	1.25893E+01	1.23975E+01	1.23975E+01
1.23975E+01	1.23975E+01	1.23975E+01	1.24806E+01	1.24806E+01	1.24806E+01	2.82834E+00	2.82834E+00	2.82834E+00	2.82834E+00	2.82834E+00
2.82834E+00	2.83601E+00	2.83601E+00	2.83601E+00	1.22522E+00	1.22522E+00	1.22522E+00	1.22522E+00	1.22522E+00	1.22522E+00	1.22786E+00
1.22786E+00	1.22786E+00	8.61687E-01	8.61687E-01	8.61687E-01	8.61687E-01	8.61687E-01	8.61687E-01	8.61687E-01	8.61687E-01	8.61687E-01
1.11228E+00	1.11228E+00	1.11228E+00	1.11228E+00	1.11228E+00	1.12822E+00	1.12822E+00	1.12822E+00	1.12822E+00	1.58216E+00	1.58216E+00
1.58216E+00	1.58216E+00	1.58216E+00	1.60922E+00	1.60922E+00	1.60922E+00	2.97348E+00	2.97348E+00	2.97348E+00	2.97348E+00	2.97348E+00
2.97348E+00	3.04549E+00	3.04549E+00	3.04549E+00	1.48614E+00	1.48614E+00	1.48614E+00	1.48614E+00	1.48614E+00	1.48614E+00	1.55151E+00
1.55151E+00	1.55151E+00									

AK	BX	BY	BZ	TC	U
1.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	1.0000E+00

RTIME 0.00000E+00 RIRRAD 0.00000E+00

SPARE ITEMS

0.00000E+00	2.20000E+01	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

MIX COMPLETED

TIME FROM START 5.3 SECONDS. TIME IN THIS MODULE 0.0 SECONDS. UNUSED REGION THIS MODULE 1168 K BYTES.

-C- WTHES 8

CYCLE 1

→ READS INTERFACE 8 FORTRAN DATA SETS 46-50 DSNNAMES:

***** WIMS-E MODULE W-THES *****

NR OF MESHES = 4 NR OF MATERIALS = 3 NR OF GROUPS = 9

REGION	1	2	3	4
MATERIAL	1	3	2	3

VOLUMES 2.1382E+00 3.9054E-02 6.1716E+00 3.4309E+00
 UNUSED STORAGE 299853

-M- BEGIN
 COLLISION PROBABILITIES WRITTEN TO FILE 4 (DATA-SET 49)

THESEUS COMPLETED

TIME FROM START 5.3 SECONDS. TIME IN THIS MODULE 0.0 SECONDS. UNUSED REGION THIS MODULE 1170 K BYTES.

WHC-SD-NR-SWD-017

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-C- WTHES 7                                CYCLE 1
      READS  INTERFACE 7                    FORTRAN DATA SETS 41-45      DSNAMES:

*****      WIMS-E MODULE W-TNES      *****

NR OF MESHES = 8 NR OF MATERIALS = 6 NR OF GROUPS = 9
      REGION      1      2      3      4      5      6      7      8
MATERIAL      1      2      3      4      5      6      6      6
VOLUMES 3.1416E-02 9.4248E-02 1.5708E-01 2.1991E-01 2.8274E-01 2.0575E+00 2.0575E+00 2.0575E+00
UNUSED STORAGE 299642

-M- BEGIN
COLLISION PROBABILITIES WRITTEN TO FILE 4 (DATA-SET 44)
THESEUS COMPLETED
      TIME FROM START 5.3 SECONDS.      TIME IN THIS MODULE 0.0 SECONDS.      UNUSED REGION THIS MODULE 1170 K BYTES.

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-C- WMERGE 8 7 11                            CYCLE 1
      READS  INTERFACE 8                    FORTRAN DATA SETS 46-50      DSNAMES:
      READS  INTERFACE 7                    FORTRAN DATA SETS 41-45      DSNAMES:
      WRITES INTERFACE 11                   FORTRAN DATA SETS 61-65      DSNAMES:

*****      WIMS-E MODULE W-MERGE      *****

-P- NOIF 2
-P- MULTICELL
-P- ENDP
UNUSED STORAGE 299299

-M- CELL 1 .060042
-M- PCELL 9 .951532 .048468 .7 .3
-M- PRINT 8
-M- BEGIN

INTERFACE 1 OF 2      IDENTIFICATIONS
2012      2012      8016      29      4083      4095      4099      4101      5103      4103
4105      5105      4108      4109      4113      4115      4127      4131      4133      4134
6135      4135      5135      4143      4145      4147      5147      6147      4148      5148
5149      4149      4150      4151      4152      4153      4154      4155      4157      4902
2232      9233      1233      234      2235      236      927      8238      937      1939
948      6239      1240      1241      1242      951      952      953      1000      1000

INTERFACE 2 OF 2      IDENTIFICATIONS
2012      2155      2155      2155      2155      2155      2158      2156      2156      2156
2158      2157      2157      2157      2157      2157      2158      2158      2158      2158
2158      1000
1      2      61      3      4      5      6      7      8      10
9      11      12      13      14      15      16      17      18      19
20      22      23      24      25      26      27      28      29      29
30      32      33      34      35      36      37      38      39      40
64      65      66      67      68      69      70      71      72      72
73      74      75      76      77      78      79      80      81      81
41      43      42      44      45      46      48      52      53      54
55      40      47      49      50      51      56      57      58      59
80      82
2012      2012      8016      29      4083      4095      4099      4101      4103
5103      4105      4108      4109      4113      4115      4127      4131      4133
4134      4135      5135      4143      4145      4147      5147      6147      4148
5148      4149      5149      4150      4151      4152      4153      4154      2155
2155      2155      2155      4155      2156      2156      2156      2156      2156
2157      2157      2157      4157      2158      2158      2158      2158      2158
2232      1233      9233      234      2235      236      8238      6239      1240
1240      4902      927      937      1939      948      951      952      953      1000
1000      1000

```

***** UNUSABLE FOR MESHED INTERFACE *****

WHC-SD-NR-SWD-017

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INTERFACE 1 OF 2
VOLUMES
2.1382E+00 3.9054E-02 6.1716E+00 3.4309E+00
RD-SUM OF INDIV.VOLS
1.1780E+01

INTERFACE 2 OF 2
VOLUMES
3.1416E-02 9.4248E-02 1.5708E-01 2.1991E-01 2.8274E-01 2.0575E+00 2.0575E+00 2.0575E+00
RD-SUM OF INDIV.VOLS
6.9578E+00

MESH VOLUMES ON MERGED INTERFACE
2.1382E+00 3.9054E-02 6.1716E+00 3.4309E+00 1.8863E-03 5.6588E-03 9.4314E-03 1.3204E-02 1.6976E-02 1.2353E-01
1.2353E-01 1.2353E-01

INTERFACE 1 OF 2
KBC= 5 NGRP= 9 NORDER= 1

INTERFACE 2 OF 2
KBC= 9 NGRP= 9 NORDER= 1

NCPCT= 12 NGRP= 9 NORDER= 1

GROUP 1 REGION TO REGION PROBABILITIES
FROM REGION 1 1.39963 0.02114 2.53914 1.41240 0.00077 0.00229 0.00379 0.00525 0.00660 0.04549 0.04677 0.05043
FROM REGION 2 1.15754 0.03928 2.78270 1.41100 0.00076 0.00227 0.00375 0.00520 0.00653 0.04503 0.04629 0.04992
FROM REGION 3 0.87972 0.01761 3.04248 1.67330 0.00085 0.00256 0.00423 0.00588 0.00736 0.05078 0.05220 0.05630
FROM REGION 4 0.88025 0.01606 3.00999 2.29787 0.00103 0.00307 0.00508 0.00704 0.00884 0.06096 0.06266 0.06758
FROM REGION 5 0.57839 0.01046 1.86342 1.24350 0.13631 0.15273 0.14631 0.15012 0.15472 0.71298 0.49377 0.42706
FROM REGION 6 0.57873 0.01043 1.85809 1.23994 0.05091 0.20628 0.17323 0.15890 0.15945 0.71977 0.49428 0.42668
FROM REGION 7 0.57316 0.01036 1.84858 1.23228 0.02926 0.10394 0.23877 0.19359 0.17185 0.73496 0.49517 0.42577
FROM REGION 8 0.56679 0.01025 1.82605 1.21856 0.02145 0.06810 0.13828 0.26145 0.21179 0.76345 0.49594 0.42371
FROM REGION 9 0.55371 0.01001 1.78392 1.19045 0.01719 0.05315 0.09547 0.16472 0.27880 0.82777 0.49362 0.41766
FROM REGION 10 0.52480 0.00949 1.69078 1.12829 0.01089 0.03297 0.05611 0.08160 0.11375 0.89559 0.54747 0.42082
FROM REGION 11 0.53949 0.00975 1.73810 1.15987 0.00754 0.02264 0.03780 0.05301 0.06783 0.54747 0.73224 0.52283
FROM REGION 12 0.58178 0.01052 1.87435 1.25080 0.00652 0.01955 0.03251 0.04529 0.05740 0.42062 0.52283 0.68076

GROUP 2 REGION TO REGION PROBABILITIES
FROM REGION 1 0.99185 0.01403 1.45933 0.79836 0.00035 0.00104 0.00172 0.00237 0.00293 0.01987 0.02104 0.02407
FROM REGION 2 0.76793 0.03258 1.69172 0.79046 0.00034 0.00102 0.00168 0.00231 0.00286 0.01940 0.02055 0.02350
FROM REGION 3 0.50561 0.01071 1.94517 1.07044 0.00043 0.00129 0.00213 0.00293 0.00383 0.02458 0.02603 0.02978
FROM REGION 4 0.49756 0.00900 1.92554 1.73235 0.00058 0.00174 0.00286 0.00394 0.00488 0.03308 0.03504 0.04008
FROM REGION 5 0.26374 0.00470 0.94176 0.70467 0.13476 0.14890 0.13994 0.14121 0.14331 0.61052 0.38361 0.31873
FROM REGION 6 0.26250 0.00488 0.93733 0.70136 0.04863 0.20193 0.18684 0.14999 0.14804 0.61672 0.38362 0.31798
FROM REGION 7 0.25992 0.00464 0.92812 0.69446 0.02799 0.10010 0.23173 0.18464 0.16045 0.63063 0.38354 0.31635
FROM REGION 8 0.25538 0.00455 0.91192 0.68234 0.02017 0.06428 0.13189 0.25178 0.20030 0.65666 0.38267 0.31313
FROM REGION 9 0.24619 0.00439 0.87908 0.65776 0.01592 0.04935 0.08914 0.15579 0.26659 0.71514 0.37728 0.30504
FROM REGION 10 0.22918 0.00409 0.81834 0.61232 0.00932 0.02825 0.04815 0.07019 0.09828 0.75666 0.42353 0.30492
FROM REGION 11 0.24274 0.00433 0.86578 0.64857 0.00586 0.01757 0.02928 0.04090 0.05185 0.42353 0.60061 0.40171
FROM REGION 12 0.27766 0.00495 0.99145 0.74185 0.00487 0.01457 0.02415 0.03347 0.04192 0.30492 0.40171 0.55932

GROUP 3 REGION TO REGION PROBABILITIES
FROM REGION 1 0.99905 0.01413 1.46906 0.80350 0.00034 0.00100 0.00165 0.00228 0.00284 0.01962 0.02097 0.02406
FROM REGION 2 0.77375 0.03265 1.69781 0.79361 0.00033 0.00098 0.00161 0.00222 0.00277 0.01912 0.02043 0.02343
FROM REGION 3 0.50898 0.01074 1.94762 1.07166 0.00041 0.00123 0.00204 0.00281 0.00350 0.02416 0.02581 0.02961
FROM REGION 4 0.50076 0.00903 1.92774 1.73361 0.00056 0.00166 0.00274 0.00377 0.00470 0.03250 0.03472 0.03984
FROM REGION 5 0.25380 0.00452 0.90166 0.67440 0.13268 0.14640 0.13593 0.13573 0.13847 0.58076 0.36569 0.30409
FROM REGION 6 0.25234 0.00449 0.89647 0.67052 0.04880 0.19713 0.16269 0.14450 0.14120 0.58696 0.36563 0.30323
FROM REGION 7 0.24991 0.00445 0.88783 0.66406 0.02719 0.09762 0.22478 0.17882 0.15357 0.60141 0.36599 0.30192
FROM REGION 8 0.24601 0.00438 0.87397 0.65369 0.01939 0.06193 0.12773 0.24288 0.19283 0.62856 0.36620 0.29959
FROM REGION 9 0.23848 0.00424 0.84724 0.63369 0.01516 0.04707 0.08531 0.14998 0.25603 0.68937 0.36343 0.29368
FROM REGION 10 0.22638 0.00403 0.80424 0.60154 0.00887 0.02689 0.04591 0.06718 0.09473 0.74554 0.41704 0.29957
FROM REGION 11 0.24188 0.00430 0.85930 0.64272 0.00558 0.01675 0.02794 0.03914 0.04994 0.41704 0.59636 0.39841
FROM REGION 12 0.27749 0.00494 0.98580 0.73733 0.00464 0.01389 0.02305 0.03202 0.04036 0.29957 0.39841 0.55640

GROUP 4 REGION TO REGION PROBABILITIES
FROM REGION 1 0.98714 0.01394 1.44569 0.79034 0.00032 0.00094 0.00155 0.00214 0.00269 0.01892 0.02039 0.02347
FROM REGION 2 0.76334 0.03250 1.67734 0.78204 0.00031 0.00092 0.00151 0.00209 0.00262 0.01846 0.01989 0.02290
FROM REGION 3 0.50088 0.01061 1.92989 1.06185 0.00039 0.00116 0.00192 0.00266 0.00333 0.02344 0.02526 0.02908
FROM REGION 4 0.49256 0.00890 1.91009 1.72429 0.00053 0.00157 0.00260 0.00358 0.00449 0.03163 0.03408 0.03924
FROM REGION 5 0.23832 0.00425 0.85238 0.63932 0.13093 0.14398 0.13211 0.13054 0.13007 0.55221 0.34795 0.28941
FROM REGION 6 0.23672 0.00422 0.84668 0.63504 0.04799 0.19311 0.15872 0.13927 0.13476 0.55938 0.34785 0.28846
FROM REGION 7 0.23453 0.00418 0.83883 0.62915 0.02642 0.09523 0.21888 0.17328 0.14707 0.57331 0.34865 0.28750
FROM REGION 8 0.23135 0.00412 0.82746 0.62063 0.01865 0.05969 0.12377 0.23531 0.18581 0.60157 0.34994 0.28606
FROM REGION 9 0.22558 0.00402 0.80681 0.60514 0.01445 0.04492 0.08170 0.14452 0.24705 0.66470 0.34966 0.28222
FROM REGION 10 0.21821 0.00389 0.78045 0.58537 0.00843 0.02558 0.04377 0.06430 0.09134 0.73408 0.40994 0.29360
FROM REGION 11 0.23516 0.00419 0.84108 0.63084 0.00531 0.01593 0.02662 0.02740 0.04005 0.40994 0.59123 0.39424
FROM REGION 12 0.27072 0.00482 0.96827 0.72624 0.00442 0.01321 0.02195 0.03058 0.03878 0.29360 0.39424 0.55255

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FROM REGION 2	0.76060	0.03247	1.67832	0.78265	0.00028	0.00082	0.00136	0.00189	0.00242	0.01786	0.01360	0.02164
FROM REGION 3	0.50004	0.01062	1.93379	1.08374	0.00035	0.00105	0.00173	0.00241	0.00307	0.02271	0.02492	0.02882
FROM REGION 4	0.49179	0.00891	1.91349	1.72528	0.00047	0.00141	0.00233	0.00325	0.00414	0.03060	0.03359	0.03885
FROM REGION 5	0.21373	0.00382	0.76697	0.57469	0.12710	0.13821	0.12313	0.11861	0.11560	0.48935	0.31042	0.25892
FROM REGION 6	0.21192	0.00379	0.76046	0.56982	0.04607	0.18432	0.14937	0.12719	0.12012	0.49538	0.31032	0.25791
FROM REGION 7	0.21039	0.00376	0.75497	0.56571	0.02463	0.08962	0.20605	0.16047	0.13223	0.51154	0.31235	0.25794
FROM REGION 8	0.20904	0.00373	0.75012	0.56207	0.01694	0.05451	0.11462	0.21896	0.16978	0.54282	0.31652	0.25890
FROM REGION 9	0.20745	0.00371	0.74442	0.55780	0.01284	0.04004	0.07346	0.13205	0.22786	0.61248	0.32267	0.26038
FROM REGION 10	0.21067	0.00376	0.75597	0.56646	0.00747	0.02269	0.03905	0.05802	0.08417	0.71389	0.39896	0.28475
FROM REGION 11	0.23121	0.00413	0.82970	0.62170	0.00474	0.01422	0.02385	0.03383	0.04434	0.39896	0.58501	0.38976
FROM REGION 12	0.26740	0.00478	0.95958	0.71902	0.00395	0.01181	0.01969	0.02767	0.03578	0.28475	0.38976	0.54880
GROUP 6 REGION TO REGION PROBABILITIES												
FROM REGION 1	0.98002	0.01385	1.44177	0.78831	0.00024	0.00071	0.00118	0.00167	0.00220	0.01747	0.01963	0.02284
FROM REGION 2	0.75828	0.03245	1.68014	0.78370	0.00023	0.00070	0.00116	0.00164	0.00216	0.01713	0.01925	0.02239
FROM REGION 3	0.49952	0.01083	1.93837	1.06594	0.00030	0.00089	0.00148	0.00208	0.00274	0.02179	0.02448	0.02849
FROM REGION 4	0.49130	0.00992	1.91745	1.72644	0.00040	0.00119	0.00199	0.00281	0.00370	0.02934	0.03297	0.03835
FROM REGION 5	0.18098	0.00324	0.65140	0.48755	0.12213	0.13008	0.11089	0.10282	0.09695	0.40762	0.26068	0.21822
FROM REGION 6	0.17917	0.00321	0.64488	0.48267	0.04336	0.17304	0.13656	0.11111	0.10115	0.41341	0.26077	0.21735
FROM REGION 7	0.17886	0.00320	0.64378	0.48185	0.02218	0.08193	0.18986	0.14338	0.11292	0.43122	0.26468	0.21900
FROM REGION 8	0.18034	0.00323	0.64912	0.48584	0.01469	0.04762	0.10242	0.19872	0.14900	0.46688	0.27309	0.22356
FROM REGION 9	0.18475	0.00331	0.66497	0.49771	0.01077	0.03372	0.06274	0.11589	0.20458	0.54639	0.28842	0.23264
FROM REGION 10	0.20156	0.00361	0.72547	0.54299	0.00622	0.01894	0.03292	0.04990	0.07509	0.68915	0.38536	0.27375
FROM REGION 11	0.22649	0.00406	0.81522	0.61016	0.00398	0.01195	0.02021	0.02919	0.03964	0.38536	0.57717	0.38407
FROM REGION 12	0.26351	0.00472	0.94846	0.70989	0.00333	0.00996	0.01672	0.02390	0.03197	0.27375	0.38407	0.54399
GROUP 7 REGION TO REGION PROBABILITIES												
FROM REGION 1	0.98361	0.01391	1.44938	0.79230	0.00018	0.00048	0.00081	0.00121	0.00175	0.01631	0.01907	0.02243
FROM REGION 2	0.76153	0.03250	1.68745	0.78753	0.00016	0.00047	0.00080	0.00119	0.00172	0.01599	0.01870	0.02198
FROM REGION 3	0.50216	0.01068	1.94484	1.06902	0.00020	0.00059	0.00101	0.00151	0.00218	0.02030	0.02374	0.02791
FROM REGION 4	0.49378	0.00896	1.92298	1.72849	0.00027	0.00080	0.00136	0.00202	0.00294	0.02729	0.03191	0.03752
FROM REGION 5	0.12120	0.00217	0.43532	0.32535	0.11239	0.11313	0.08693	0.07364	0.06411	0.26341	0.17058	0.14365
FROM REGION 6	0.12019	0.00215	0.43172	0.32266	0.03771	0.15164	0.11134	0.08122	0.06767	0.26901	0.17155	0.14370
FROM REGION 7	0.12298	0.00220	0.44172	0.33013	0.01739	0.06681	0.18046	0.11152	0.07867	0.28973	0.17936	0.14891
FROM REGION 8	0.13062	0.00234	0.46918	0.35066	0.01052	0.03481	0.07966	0.16363	0.11208	0.33360	0.19622	0.18085
FROM REGION 9	0.14727	0.00264	0.52999	0.39536	0.00712	0.02256	0.04371	0.08718	0.16587	0.43351	0.22985	0.18518
FROM REGION 10	0.18814	0.00337	0.67577	0.50506	0.00402	0.01232	0.02212	0.03566	0.05957	0.65003	0.36335	0.25582
FROM REGION 11	0.22003	0.00394	0.79032	0.59067	0.00260	0.00786	0.01369	0.02097	0.03159	0.36335	0.56383	0.37413
FROM REGION 12	0.25870	0.00463	0.92922	0.69448	0.00219	0.00658	0.01137	0.01719	0.02545	0.25582	0.37413	0.53541
GROUP 8 REGION TO REGION PROBABILITIES												
FROM REGION 1	0.96738	0.01384	1.41064	0.76998	0.00001	0.00005	0.00012	0.00030	0.00087	0.01427	0.01762	0.02108
FROM REGION 2	0.74658	0.03226	1.64969	0.76573	0.00001	0.00005	0.00012	0.00030	0.00085	0.01399	0.01727	0.02064
FROM REGION 3	0.48874	0.01044	1.90762	1.04821	0.00002	0.00006	0.00015	0.00038	0.00109	0.01790	0.02210	0.02641
FROM REGION 4	0.47986	0.00872	1.88556	1.70887	0.00002	0.00008	0.00020	0.00051	0.00147	0.02420	0.02988	0.03572
FROM REGION 5	0.01068	0.00019	0.03865	0.02905	0.07832	0.05543	0.02397	0.01220	0.00659	0.02215	0.01467	0.01252
FROM REGION 6	0.01236	0.00022	0.04474	0.03364	0.01848	0.08875	0.04286	0.01685	0.00832	0.02654	0.01730	0.01467
FROM REGION 7	0.01820	0.00033	0.06590	0.04954	0.00479	0.02571	0.08757	0.03847	0.01445	0.04138	0.02619	0.02199
FROM REGION 8	0.03251	0.00058	0.11769	0.08848	0.00174	0.00722	0.02748	0.08694	0.03691	0.08052	0.04865	0.04027
FROM REGION 9	0.07295	0.00131	0.26412	0.19856	0.00073	0.00277	0.00803	0.02870	0.08779	0.21220	0.11635	0.09393
FROM REGION 10	0.16459	0.00295	0.59586	0.44796	0.00034	0.00122	0.00316	0.00861	0.02916	0.60111	0.33423	0.23166
FROM REGION 11	0.20321	0.00364	0.73571	0.55309	0.00022	0.00079	0.00200	0.00520	0.01599	0.33423	0.54380	0.35841
FROM REGION 12	0.24291	0.00435	0.87942	0.68114	0.00019	0.00067	0.00168	0.00430	0.01291	0.23166	0.35841	0.52116
GROUP 9 REGION TO REGION PROBABILITIES												
FROM REGION 1	0.89542	0.01244	1.24862	0.67819	0.00000	0.00000	0.00000	0.00000	0.00023	0.01177	0.01481	0.01800
FROM REGION 2	0.68119	0.03125	1.49431	0.67752	0.00000	0.00000	0.00000	0.00000	0.00022	0.01158	0.01457	0.01770
FROM REGION 3	0.43260	0.00946	1.75885	0.96710	0.00000	0.00000	0.00000	0.00000	0.00030	0.01540	0.01938	0.02355
FROM REGION 4	0.42267	0.00771	1.73965	1.63606	0.00000	0.00000	0.00000	0.00001	0.00041	0.02142	0.02695	0.03274
FROM REGION 5	0.00000	0.00000	0.00000	0.00000	0.02926	0.00592	0.00016	0.00001	0.00000	0.00000	0.00000	0.00000
FROM REGION 6	0.00000	0.00000	0.00000	0.00000	0.00197	0.02930	0.00398	0.00009	0.00000	0.00000	0.00000	0.00000
FROM REGION 7	0.00002	0.00000	0.00006	0.00005	0.00003	0.00239	0.02926	0.00359	0.00007	0.00004	0.00002	0.00002
FROM REGION 8	0.00037	0.00001	0.00141	0.00109	0.00000	0.00004	0.00256	0.02926	0.00342	0.00094	0.00059	0.00049
FROM REGION 9	0.01908	0.00034	0.07205	0.05569	0.00000	0.00000	0.00004	0.00266	0.02938	0.06024	0.03355	0.02712
FROM REGION 10	0.13582	0.00244	0.51290	0.39642	0.00000	0.00000	0.00000	0.00010	0.00828	0.57847	0.31623	0.21559
FROM REGION 11	0.17088	0.00307	0.64532	0.49877	0.00000	0.00000	0.00000	0.00006	0.00461	0.31623	0.52490	0.34120
FROM REGION 12	0.20760	0.00373	0.78398	0.60594	0.00000	0.00000	0.00000	0.00005	0.00373	0.21559	0.34120	0.50394

MEPGE OPERATION COMPLETE

WHC-SD-NR-SWD-017

***** WIMS-E MODULE U-MIX *****
 READS FILES 2 & 3, FORMS MACROSCOPIC X-SECTIONS AND WRITES THESE TO FILE 3.
 FLUXES ETC READ FROM FILE 1 AND WRITTEN TO FILE 5.

LN 3 LT 2

CROSS-SECTIONS 82

GROUPS 9

MATERIALS 9

NO. OF MATERIALS TO BE PROCESSED AT A TIME 9

UNUSED STORAGE 295488 (IF MATERIALS PROCESSED SINGLY 298905)

MATERIAL	1	NUCLIDE	IDENTIFIER	NUMBER DENSITY
		1	2012	7.9940E-02
		4	6016	2.8380E-03
		5	29	2.0520E-03
		6	4083	1.0000E-19
		7	4095	1.0000E-19
		8	4099	1.0000E-19
		9	4101	1.0000E-19
		10	4103	1.0000E-19
		11	5103	1.0000E-19
		12	4105	1.0000E-19
		13	5105	1.0000E-19
		14	4108	1.0000E-19
		15	4109	1.0000E-19
		16	4113	1.0000E-19
		17	4115	1.0000E-19
		18	4127	1.0000E-19
		19	4131	1.0000E-19
		20	4133	1.0000E-19
		21	4134	1.0000E-19
		22	4135	1.0000E-19
		23	5135	1.0000E-19
		24	6135	1.0000E-19
		25	4143	1.0000E-19
		26	4145	1.0000E-19
		27	4147	1.0000E-19
		28	5147	1.0000E-19
		29	6147	1.0000E-19
		30	4148	1.0000E-19
		31	5148	1.0000E-19
		32	4149	1.0000E-19
		33	5149	1.0000E-19
		34	4150	1.0000E-19
		35	4151	1.0000E-19
		36	4152	1.0000E-19
		37	4153	1.0000E-19
		38	4154	1.0000E-19
		44	4155	1.0000E-19
		55	4157	1.0000E-19
		61	2232	1.3032E-02
		62	1233	1.0000E-19
		63	9233	1.0000E-20
		64	224	1.0000E-19
		65	2235	1.0779E-04
		66	236	1.0000E-19
		67	8238	6.1125E-06
		68	8239	1.0000E-20
		69	1240	1.0000E-19
		70	1241	1.0000E-19
		71	1242	1.0000E-19
		72	4902	1.0000E-19
		73	927	1.0000E-19
		74	937	1.0000E-20
		75	1939	1.0000E-19
		76	943	1.0000E-19
		77	951	1.0000E-19
		78	952	1.0000E-19
		79	953	1.0000E-19
		80	1000	4.1830E-05

NUMBER OF REACTIONS 4

MATERIAL	2	NUCLIDE	IDENTIFIER	NUMBER DENSITY
		2	2012	8.7755E-02
		81	1000	5.4900E-05

NUMBER OF REACTIONS 3

MATERIAL 3 VOID

NUMBER OF REACTIONS 0

MATERIAL	4	NUCLIDE	IDENTIFIER	NUMBER DENSITY
		39	2155	1.3020E-04
		45	2156	1.0000E-19
		50	2157	1.3859E-04
		56	2158	1.0000E-19

NUMBER OF REACTIONS 3

MATERIAL	5	NUCLIDE	IDENTIFIER	NUMBER DENSITY
		40	2155	1.3020E-04
		46	2156	1.0000E-19
		51	2157	1.3859E-04
		57	2158	1.0000E-19

NUMBER OF REACTIONS 3

MATERIAL	6	NUCLIDE	IDENTIFIER	NUMBER DENSITY
		41	2155	1.3020E-04
			2156	1.0000E-19

WHC-SD-NR-SWD-017

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NUMBER OF REACTIONS 3

MATERIAL 7          NUCLIDE      IDENTIFIER      NUMBER DENSITY
                   42           2155           1.3020E-04
                   48           2156           1.0000E-19
                   53           2157           1.3859E-04
                   59           2158           1.0000E-19

NUMBER OF REACTIONS 3

MATERIAL 8          NUCLIDE      IDENTIFIER      NUMBER DENSITY
                   43           2155           1.3020E-04
                   49           2156           1.0000E-19
                   54           2157           1.3859E-04
                   60           2158           1.0000E-19

NUMBER OF REACTIONS 3

MATERIAL 9          NUCLIDE      IDENTIFIER      NUMBER DENSITY
                   3            2012           8.7755E-02
                   82           1000           5.4900E-05

NUMBER OF REACTIONS 3

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READING FILE 1

LT1 2 LI 2

NMESH 4 NGRP 9 NORDER 1

FLUX
1.28658E+01 1.27349E+01 1.25893E+01 1.25973E+01 1.23975E+01 1.24363E+01 1.24806E+01 1.24809E+01 2.82834E+00 2.83190E+00
2.83601E+00 2.83604E+00 1.22522E+00 1.22644E+00 1.22786E+00 1.22787E+00 8.61687E-01 8.64919E-01 8.68638E-01 8.68667E-01
1.11228E+00 1.11970E+00 1.12822E+00 1.12828E+00 1.58216E+00 1.59476E+00 1.60922E+00 1.60932E+00 2.97348E+00 3.00702E+00
3.04549E+00 3.04581E+00 1.48614E+00 1.51672E+00 1.55151E+00 1.55209E+00

NMESH 8 NGRP 9 NORDER 1

FLUX
1.28658E+01 1.28658E+01 1.28658E+01 1.28658E+01 1.28658E+01 1.25893E+01 1.25893E+01 1.25893E+01 1.23975E+01 1.23975E+01
1.23975E+01 1.23975E+01 1.23975E+01 1.24806E+01 1.24806E+01 1.24806E+01 1.24806E+01 1.23975E+01 1.23975E+01 1.23975E+01
2.82834E+00 2.83601E+00 2.83601E+00 2.83601E+00 2.83601E+00 2.83601E+00 2.83601E+00 2.83601E+00 2.82834E+00 2.82834E+00
1.22786E+00 1.22786E+00 8.61687E-01 8.61687E-01 8.61687E-01 8.61687E-01 8.61687E-01 8.61687E-01 8.68638E-01 8.68638E-01
1.11228E+00 1.11228E+00 1.11228E+00 1.11228E+00 1.11228E+00 1.12822E+00 1.12822E+00 1.12822E+00 1.58216E+00 1.58216E+00
1.58216E+00 1.58216E+00 1.58216E+00 1.60922E+00 1.60922E+00 1.60922E+00 1.60922E+00 2.97348E+00 2.97348E+00 2.97348E+00
2.97348E+00 3.04549E+00 3.04549E+00 3.04549E+00 1.48614E+00 1.48614E+00 1.48614E+00 1.48614E+00 1.48614E+00 1.55151E+00
1.55151E+00 1.55151E+00

AK BX BY BZ TC U
0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00

RTIME 0.00000E+00 RIRRAD 0.00000E+00

WRITING FILE 5

NMESH 12 NGRP 9 NORDER 1

FLUX
1.28658E+01 1.27349E+01 1.25893E+01 1.25973E+01 1.28658E+01 1.28658E+01 1.28658E+01 1.28658E+01 1.28658E+01 1.25893E+01
1.25893E+01 1.25893E+01 1.23975E+01 1.24363E+01 1.24806E+01 1.24806E+01 1.23975E+01 1.23975E+01 1.23975E+01 1.23975E+01
1.23975E+01 1.24806E+01 1.24806E+01 1.24806E+01 2.82834E+00 2.83190E+00 2.83601E+00 2.83601E+00 2.82834E+00 2.82834E+00
2.82834E+00 2.82834E+00 2.82834E+00 2.83601E+00 2.83601E+00 2.83601E+00 2.83601E+00 2.83601E+00 2.22522E+00 1.22644E+00
1.22522E+00 1.22522E+00 1.22522E+00 1.22522E+00 1.22522E+00 1.22786E+00 1.22786E+00 1.22786E+00 1.22786E+00 1.22786E+00
8.68638E-01 8.68667E-01 8.61687E-01 8.61687E-01 8.61687E-01 8.61687E-01 8.61687E-01 8.61687E-01 8.68638E-01 8.68638E-01
1.11228E+00 1.11970E+00 1.12822E+00 1.12828E+00 1.11228E+00 1.11228E+00 1.11228E+00 1.11228E+00 1.11228E+00 1.12822E+00
1.12822E+00 1.12822E+00 1.58216E+00 1.59476E+00 1.60922E+00 1.60922E+00 1.60922E+00 1.60922E+00 1.58216E+00 1.58216E+00
1.58216E+00 1.60922E+00 1.60922E+00 1.60922E+00 1.60922E+00 1.60932E+00 1.58216E+00 1.58216E+00 1.58216E+00 1.58216E+00
2.97348E+00 2.97348E+00 2.97348E+00 3.04549E+00 3.04549E+00 3.04549E+00 3.04549E+00 3.04549E+00 1.48614E+00 1.48614E+00
1.48614E+00 1.48614E+00 1.48614E+00 1.48614E+00 1.48614E+00 1.55151E+00 1.55151E+00 1.55151E+00 1.55151E+00 1.55209E+00

AK BX BY BZ TC U
0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00

RTIME 0.00000E+00 RIRRAD 0.00000E+00

SPARE ITEMS

0.00000E+00 8.20000E+01 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00

MIX COMPLETED

TIME FROM START 5.8 SECONDS. TIME IN THIS MODULE 0.1 SECONDS. UNUSED REGION THIS MODULE 116 K BYTES.

WHC-SD-NR-SWD-017

-C- WPIP 11

CYCLE 1

READS INTERFACE 11

FORTRAN DATA SETS 61-65

DSNAMES:

ALSO READS :

***** WIMS-E MODULE W-PIP *****

ALL COLLISION PROBABILITIES WILL BE HELD IN FAST STORE.
UNUSED STORAGE 296365

-M- BEGIN

REGION	1	2	3	4	5	6	7	8	9	10
MATERIAL	11	12	2	3	4	5	6	7	8	9
VOLUMES	2.1382E+00	3.9054E-02	8.1716E+00	3.4309E+00	1.8863E-03	5.6588E-03	9.4314E-03	1.3204E-02	1.6978E-02	1.2353E-01
	1.2353E-01	1.2353E-01								

CALCULATION CONVERGED IN 54 ITERATIONS.

K-INFINITY = 0.936086

FLUX.

REGION 1	1.20939E+01	1.17664E+01	2.53299E+00	9.80893E-01	8.29438E-01	7.62565E-01	1.02111E+00	1.80056E+00	8.57691E-01
TOTAL REGION 2	3.24455E+01	1.19643E+01	1.18027E+01	2.53649E+00	9.82490E-01	6.32160E-01	7.67979E-01	1.02952E+00	1.82108E+00
TOTAL REGION 3	3.24119E+01	1.18142E+01	1.18453E+01	2.53984E+00	9.83724E-01	6.34568E-01	7.72863E-01	1.03652E+00	1.83825E+00
TOTAL REGION 4	3.23572E+01	1.18123E+01	1.18465E+01	2.53883E+00	9.82835E-01	6.33512E-01	7.70924E-01	1.03263E+00	1.82896E+00
TOTAL REGION 5	3.23340E+01	1.73310E+01	1.77331E+01	3.58873E+00	1.30896E+00	7.39742E-01	7.43460E-01	6.39879E-01	9.80709E-02
TOTAL REGION 6	4.21830E+01	1.73289E+01	1.77321E+01	3.58651E+00	1.30747E+00	7.38223E-01	7.41516E-01	6.40246E-01	1.14696E-01
TOTAL REGION 7	4.21895E+01	1.73244E+01	1.77348E+01	3.58960E+00	1.30965E+00	7.41700E-01	7.50048E-01	6.65037E-01	1.71716E-01
TOTAL REGION 8	4.22870E+01	1.73164E+01	1.77424E+01	3.59941E+00	1.31648E+00	7.51638E-01	7.72359E-01	7.23176E-01	3.14530E-01
TOTAL REGION 9	4.25384E+01	1.72999E+01	1.77609E+01	3.62368E+00	1.33315E+00	7.74896E-01	8.22543E-01	8.49332E-01	7.40341E-01
TOTAL REGION 10	4.33128E+01	1.72644E+01	1.78216E+01	3.70946E+00	1.39117E+00	8.49722E-01	9.70515E-01	1.17788E+00	1.84968E+00
TOTAL REGION 11	4.59095E+01	1.72860E+01	1.78377E+01	3.74506E+00	1.41708E+00	8.81961E-01	1.03141E+00	1.30110E+00	2.14959E+00
TOTAL REGION 12	4.66800E+01	1.73413E+01	1.78311E+01	3.75755E+00	1.42776E+00	8.94760E-01	1.05488E+00	1.34757E+00	2.26189E+00
TOTAL	4.70058E+01								

WHC-SD-NR-SWD-017

FOR EACH REGION, FOUR INTEGRATED OVER MATERIALS (1 TO 9), WITH AVERAGE FLUXES, TOTAL EVENTS

GROUP 1	2.58597263E+01 2.28644231E-01	7.29129916E+01 2.93691791E-01	4.09942737E+01 6.41041427E+00	3.26910669E+02 1.46993887E+02	9.80612186E-02	1.63392883E-01
GROUP 2	2.51594162E+01 2.34269735E-01	7.31047289E+01 3.01517009E-01	4.11051099E+01 6.60791808E+00	3.34495240E+02 1.46814016E+02	1.00342617E-01	1.67263673E-01
GROUP 3	5.41514823E+00 4.75262999E-02	1.56749848E+01 6.15173754E-02	8.80955888E+00 1.38507748E+00	6.78933957E+03 3.14557326E+01	2.02954531E-02	3.38548790E-02
GROUP 4	2.09739118E+00 1.73826630E-02	6.07119789E+00 2.26321733E-02	3.41039125E+00 5.23293171E-01	2.46905206E+03 1.21645079E+01	7.39876533E-03	1.23517848E-02
GROUP 5	1.34588996E+00 9.92454740E-03	3.91632942E+00 1.31550075E-02	2.19821093E+00 3.24456638E-01	1.39535640E+03 7.82053459E+00	4.17747481E-03	8.99524980E-03
GROUP 6	1.63055197E+00 1.01981767E-02	4.78983593E+00 1.39638769E-02	2.67496439E+00 3.77620866E-01	1.40237032E+03 9.48980768E+00	4.19611080E-03	7.07398830E-03
GROUP 7	2.18339322E+00 9.54876378E-03	6.39703527E+00 1.44186709E-02	3.58307496E+00 4.72711767E-01	1.20688744E+03 1.26712849E+01	3.62303990E-03	6.27221788E-03
GROUP 8	3.85005110E+00 4.15303237E-03	1.13450185E+01 1.25683836E-02	6.34611912E+00 7.73469435E-01	1.84988779E+04 2.23338331E+01	6.49046647E-04	1.61951607E-03
GROUP 9	1.83395548E+00 2.60002295E-05	5.50507399E+00 1.83060791E-03	3.07904278E+00 3.69897601E-01	1.11977174E+09 1.07899273E+01	2.90857171E-08	7.60859430E-07
	6.93765238E+01 5.61673449E-01	1.99697196E+02 7.35294895E-01	1.12200746E+02 1.72448593E+01	7.95886885E+02 2.38742755E-01	3.98824953E-01	

PIP COMPLETED

TIME FROM START 5.9 SECONDS. TIME IN THIS MODULE 0.1 SECONDS. UNUSED REGION THIS MODULE 1158 K BYTES.

-C- WJED 11

CYCLE 1

READS INTERFACE 11

FORTRAN DATA SETS 81-85

DSNAMES:

***** WIMS-E MODULE W-JED *****

EDITED RESULTS FROM A MAIN TRANSPORT CALCULATION

DIMENSION NUMBERS
 MESHES GROUPS ORDERS MATRIS XSECTS
 12 9 1 9 82

UNUSED STORAGE 298532

I= 10, NREGION= 12

-M- OPTION 4
 -M- REGION 1 1
 -M- BEGIN
 -M- *

ZONE	VOLUME	MATERIAL
1	0.21382E+01	1
2	0.39054E-01	3
3	0.61716E-01	2
4	0.34309E-01	3
5	0.18863E-02	4
6	0.58588E-02	5
7	0.94314E-02	6
8	0.13204E-01	7
9	0.16976E-01	8
10	0.12353E+00	9
11	0.12353E+00	9
12	0.12353E+00	9

FLUX SCALE FACTOR 1.000000E+00

FEW-GROUP REGIONAL AND CELL EDIT, INTEGRATED AND AVERAGED FLUXES, TOTAL EVENTS

REGION 1 MATERIAL 1 VOLUME 2.138246E+00

GROUP	REACTIONS		TRANSPORTS		FLUXES	
	ABSORPTION	SCATTER	FISSION	NU*FISSION	RADIAL	AXIAL
1	1.57355E-02	8.08176E+00	5.58531E-02	1.36190E-02	6.33588E+00	6.33588E+00
2	2.77054E-01	1.04880E+01	2.72295E-01	1.40813E-01	1.01324E+01	1.01324E+01
3	2.32964E-02	2.21217E+00	2.20716E-02	5.28918E-02	2.14706E+00	2.14706E+00
4	2.62412E-02	5.57762E-01	1.93612E-02	4.71338E-02	2.57552E-01	2.57552E-01
					FLUX*VOL	FLUX
					2.58597E-01	1.20939E+01
					2.51594E-01	1.17664E+01
					5.41514E-02	3.38548E-02
					2.09739E-02	3.38548E-02

WHC-SD-NR-SWD-017

7	8.01319E-02	8.22172E-01	4.14193E-02	1.05163E-01	9.05506E-01	9.07506E-01	2.18172E+00	1.02111E+00
8	1.28085E-01	1.59427E+00	9.55710E-02	2.32335E-01	1.64219E+00	1.64219E+00	3.85005E+00	1.80056E+00
9	1.15336E-01	7.86755E-01	8.66994E-02	2.10710E-01	8.98624E-01	8.98624E-01	1.83396E+00	8.57691E-01
TOTAL	7.30463E-01	2.61058E+01	3.84895E-01	9.36049E-01			6.93765E+01	3.24455E+01

CELL VOLUME 2.138246E+00

GROUP	ABSORPTION	SCATTER	REACTIONS		TRANSPORTS		FLUXES	
			FISSION	NU*FISSION	RADIAL	AXIAL	FLUX*VOL	FLUX
1	1.57355E-02	8.06176E+00	5.56531E-03	1.38190E-02	6.33588E+00	6.33588E+00	2.58597E+01	1.20939E+01
2	2.77054E-01	1.04880E+01	5.78295E-02	1.40813E-01	1.01834E+01	1.01834E+01	2.51594E+01	1.17664E+01
3	3.32944E-02	2.21217E+00	2.20723E-02	5.38914E-02	2.14706E+00	2.14706E+00	5.41615E+00	2.53299E+00
4	2.62412E-02	8.56762E-01	1.93812E-02	4.71338E-02	8.53558E-01	8.53558E-01	2.09739E+00	9.80893E-01
5	2.85615E-02	5.49820E-01	2.10641E-02	5.12226E-02	5.55343E-01	5.55343E-01	1.34538E+00	6.29436E-01
6	4.80209E-02	6.66153E-01	3.32930E-02	8.09554E-02	6.81319E-01	6.81319E-01	1.63055E+00	7.62565E-01
7	6.01319E-02	8.92105E-01	4.34193E-02	1.05589E-01	9.05506E-01	9.05506E-01	2.18339E+00	1.02111E+00
8	1.28085E-01	1.59427E+00	9.55710E-02	2.32335E-01	1.64219E+00	1.64219E+00	3.85005E+00	1.80056E+00
9	1.15336E-01	7.86755E-01	8.66994E-02	2.10710E-01	8.98624E-01	8.98624E-01	1.83396E+00	8.57691E-01
TOTAL	7.30463E-01	2.61058E+01	3.84895E-01	9.36049E-01			6.93765E+01	3.24455E+01

SCATTERING MATRIX

1	7.8357E+00	2.2605E-01	4.0201E-26	2.5141E-27	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2	0.0000E+00	1.0329E-01	1.5920E-01	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3	0.0000E+00	2.3571E-03	2.0059E-00	1.7698E-01	1.7203E-02	6.4199E-03	2.4468E-03	8.4973E-04	6.9575E-05
4	0.0000E+00	0.0000E+00	5.8343E-02	5.5292E-01	1.3715E-01	6.4733E-02	3.0277E-02	1.2133E-02	1.2125E-03
5	0.0000E+00	0.0000E+00	3.1780E-03	9.0143E-02	2.6804E-01	1.0522E-01	5.4090E-02	2.6488E-02	2.6850E-03
6	0.0000E+00	0.0000E+00	1.0107E-03	3.5549E-02	8.5596E-02	3.4568E-01	1.2543E-01	6.4440E-02	8.2837E-03
7	0.0000E+00	0.0000E+00	3.4925E-04	1.4726E-02	3.8993E-02	1.0845E-01	5.2679E-01	1.7840E-01	2.4398E-02
8	0.0000E+00	0.0000E+00	1.1280E-04	5.3007E-03	1.7073E-02	5.0167E-02	1.5652E-01	1.2340E-01	1.2914E-01
9	0.0000E+00	0.0000E+00	8.4014E-06	4.8479E-04	1.4868E-03	5.6472E-03	1.8501E-02	1.1079E-01	6.4986E-01

GROUP	REMOVALS	SPECTRUM	P	ETA.F
1	2.280535E-01	9.997000E-01	2.261214E-01	8.654990E-01
2	1.568429E-01	3.000000E-04	6.929113E-01	5.082506E-01
3	1.409659E-01	0.000000E+00	8.987713E-01	1.612528E+00
4	1.216503E-01	0.000000E+00	8.629770E-01	1.796176E+00
5	1.059342E-01	0.000000E+00	8.708140E-01	1.793413E+00
6	8.576763E-02	0.000000E+00	8.096263E-01	1.759101E+00
7	6.376124E-02	0.000000E+00	7.434185E-01	1.755618E+00
8	2.896936E-02	0.000000E+00	4.543412E-01	1.813906E+00
9	0.000000E+00	0.000000E+00	0.000000E+00	1.826923E+00

WED COMPLETED

TIME FROM START 5.9 SECONDS. TIME IN THIS MODULE 0.0 SECONDS. UNUSED REGION THIS MODULE 1166 K BYTES.

-C- WED 11

CYCLE 1

READS INTERFACE 11

FORTRAN DATA SETS 61-65

DSNAMES:

***** WIMS-E MODULE W-WED *****

EDITED RESULTS FROM A MAIN TRANSPORT CALCULATION

DIMENSION NUMBERS
 MESHES GROUPS ORDERS MATPLS XSECTS
 12 9 1 9 82

UNUSED STORAGE 298532

I= 10, NREGIN= 12

-M- OPTION 4
 -H- BEGIN
 -R- *

ZONE	VOLUME	MATERIAL
1	0.21382E+01	1
2	0.39054E-01	2
3	0.61718E+01	3
4	0.34309E-01	4
5	0.18863E-02	5
6	0.56588E-02	6
7	0.94314E-02	7
8	0.13204E-01	8
9	0.16976E-01	9
10	0.12353E+00	10
11	0.12353E+00	11
12	0.12353E+00	12

FLUX SCALE FACTOR 1.000000E+00

FEW-GROUP REGIONAL AND CELL EDIT, INTEGRATED AND AVERAGED FLUXES, TOTAL EVENTS

REGION 1 MATERIAL 1 VOLUME 2.138246E+00

GROUP	ABSORPTION	SCATTER	REACTIONS		TRANSPORTS		FLUXES	
			FISSION	NU*FISSION	RADIAL	AXIAL	FLUX*VOL	FLUX
1	1.57355E-02	8.06176E+00	5.56531E-03	1.38190E-02	6.33588E+00	6.33588E+00	2.58597E+01	1.20939E+01
2	2.77054E-01	1.04880E+01	5.78295E-02	1.40813E-01	1.01834E+01	1.01834E+01	2.51594E+01	1.17664E+01
3	3.32944E-02	2.21217E+00	2.20723E-02	5.38914E-02	2.14706E+00	2.14706E+00	5.41615E+00	2.53299E+00
4	2.62412E-02	8.56762E-01	1.93812E-02	4.71338E-02	8.53558E-01	8.53558E-01	2.09739E+00	9.80893E-01
5	2.85615E-02	5.49820E-01	2.10641E-02	5.12226E-02	5.55343E-01	5.55343E-01	1.34538E+00	6.29436E-01
6	4.80209E-02	6.66153E-01	3.32930E-02	8.09554E-02	6.81319E-01	6.81319E-01	1.63055E+00	7.62565E-01
7	6.01319E-02	8.92105E-01	4.34193E-02	1.05589E-01	9.05506E-01	9.05506E-01	2.18339E+00	1.02111E+00
8	1.28085E-01	1.59427E+00	9.55710E-02	2.32335E-01	1.64219E+00	1.64219E+00	3.85005E+00	1.80056E+00
9	1.15336E-01	7.86755E-01	8.66994E-02	2.10710E-01	8.98624E-01	8.98624E-01	1.83396E+00	8.57691E-01

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9	1.15336E-01	7.86755E-01	8.66994E-02	2.10710E-01	8.98624E-01	8.98624E-01	1.83396E+00	8.57691E-01
TOTAL	7.30483E-01	2.61058E+01	3.84895E-01	9.36049E-01			6.93765E+01	3.24455E+01

REGION 2 MATERIAL 3 VOLUME 3.905392E-02

GROUP	ABSORPTION	SCATTER	REACTIONS		TRANSPORTS		FLUXES	
			FISSION	NU*FISSION	RADIAL	AXIAL	FLUX*VOL	FLUX
1	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	4.67252E-01	1.19643E+01
2	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	4.60943E-01	1.18027E+01
3	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	9.90598E-02	2.53649E+00
4	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	3.83701E-02	9.82490E-01
5	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	2.46883E-02	6.32150E-01
6	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	2.99926E-02	7.67579E-01
7	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	4.02068E-02	1.02952E+00
8	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	7.11201E-02	1.82108E+00
9	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	3.41811E-02	8.75227E-01
TOTAL	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00			1.26581E+00	3.24119E+01

REGION 3 MATERIAL 2 VOLUME 6.171646E-00

GROUP	ABSORPTION	SCATTER	REACTIONS		TRANSPORTS		FLUXES	
			FISSION	NU*FISSION	RADIAL	AXIAL	FLUX*VOL	FLUX
1	5.64969E-04	2.29818E+01	0.00000E+00	0.00000E+00	1.78634E+01	1.78634E+01	7.29130E+01	1.18142E+01
2	4.41909E-04	3.04068E+01	0.00000E+00	0.00000E+00	2.87009E+01	2.87009E+01	7.31047E+01	1.18453E+01
3	7.46380E-04	6.46516E+00	0.00000E+00	0.00000E+00	6.16629E+00	6.16629E+00	1.56750E+01	2.53984E+00
4	4.88808E-04	2.50407E+00	0.00000E+00	0.00000E+00	2.40354E+00	2.40354E+00	6.07120E+00	9.83724E+01
5	3.68648E-04	1.81529E+00	0.00000E+00	0.00000E+00	1.54102E+00	1.54102E+00	3.91832E+00	6.34569E+01
6	5.04928E-04	1.96732E+00	0.00000E+00	0.00000E+00	1.86463E+00	1.86463E+00	4.76984E+00	7.7283E+01
7	7.81482E-04	2.63846E+00	0.00000E+00	0.00000E+00	2.48982E+00	2.48982E+00	6.39704E+00	1.03652E+00
8	1.81966E-03	4.73802E+00	0.00000E+00	0.00000E+00	4.49595E+00	4.49595E+00	1.13450E+01	1.83825E+00
9	1.52128E-03	2.36604E+00	0.00000E+00	0.00000E+00	2.36140E+00	2.36140E+00	5.50507E+00	8.91995E+01
TOTAL	7.23616E-03	7.56830E+01	0.00000E+00	0.00000E+00			1.99697E+02	3.23572E+01

REGION 4 MATERIAL 3 VOLUME 3.430911E-00

GROUP	ABSORPTION	SCATTER	REACTIONS		TRANSPORTS		FLUXES	
			FISSION	NU*FISSION	RADIAL	AXIAL	FLUX*VOL	FLUX
1	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	4.05270E+01	1.18123E+01
2	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	4.06442E+01	1.18465E+01
3	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	8.71050E+00	2.53883E+00
4	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	3.37202E+00	9.82835E+01
5	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	2.17325E+00	1.33512E+01
6	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	2.64437E+00	7.70924E+01
7	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	3.54287E+00	1.03263E+00
8	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	6.27500E+00	1.82896E+00
9	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	3.04486E+00	8.87479E-01
TOTAL	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00			1.10935E+02	3.23340E+01

REGION 5 MATERIAL 4 VOLUME 1.886275E-03

GROUP	ABSORPTION	SCATTER	REACTIONS		TRANSPORTS		FLUXES	
			FISSION	NU*FISSION	RADIAL	AXIAL	FLUX*VOL	FLUX
1	6.78951E-06	5.92896E-05	0.00000E+00	0.00000E+00	6.54138E-05	6.54138E-05	3.26911E-02	1.73310E+01
2	3.19075E-04	6.29363E-05	0.00000E+00	0.00000E+00	3.82011E-04	3.82011E-04	3.34495E-02	1.77331E+01
3	5.06847E-04	1.27387E-05	0.00000E+00	0.00000E+00	5.19584E-04	5.19584E-04	6.76934E-03	3.58873E+00
4	3.45267E-04	4.84560E-06	0.00000E+00	0.00000E+00	3.48907E-04	3.48907E-04	2.46805E-03	1.30886E+00
5	4.30887E-04	2.82549E-06	0.00000E+00	0.00000E+00	4.33492E-04	4.33492E-04	1.98535E-03	1.30742E+00
6	8.02544E-04	2.83880E-06	0.00000E+00	0.00000E+00	8.05183E-04	8.05183E-04	1.40237E-03	7.43460E-01
7	1.48699E-03	2.27099E-06	0.00000E+00	0.00000E+00	1.48926E-03	1.48926E-03	1.20699E-03	6.39879E-01
8	1.00642E-03	3.48062E-07	0.00000E+00	0.00000E+00	1.00677E-03	1.00677E-03	1.84989E-04	9.80709E-02
9	3.16841E-08	2.10688E-12	0.00000E+00	0.00000E+00	3.16859E-08	3.16859E-08	1.11977E-09	5.93642E-07
TOTAL	4.90483E-03	1.47491E-04	0.00000E+00	0.00000E+00			7.95687E-02	4.21830E+01

REGION 6 MATERIAL 5 VOLUME 5.658825E-03

GROUP	ABSORPTION	SCATTER	REACTIONS		TRANSPORTS		FLUXES	
			FISSION	NU*FISSION	RADIAL	AXIAL	FLUX*VOL	FLUX
1	2.03660E-05	1.77847E-04	0.00000E+00	0.00000E+00	1.96217E-04	1.96217E-04	9.80612E-02	1.73289E+01
2	9.57187E-04	1.88798E-04	0.00000E+00	0.00000E+00	1.14596E-03	1.14596E-03	1.00343E-01	1.77321E+01
3	1.51360E-03	3.81865E-05	0.00000E+00	0.00000E+00	1.55779E-03	1.55779E-03	2.02955E-02	3.58651E+00
4	1.03463E-03	1.39210E-05	0.00000E+00	0.00000E+00	1.04853E-03	1.04853E-03	7.98877E-03	1.30747E+00
5	1.28935E-03	7.86004E-06	0.00000E+00	0.00000E+00	1.29781E-03	1.29781E-03	4.17747E-03	7.38223E-01
6	2.40134E-03	7.89511E-06	0.00000E+00	0.00000E+00	2.40923E-03	2.40923E-03	4.19611E-03	7.41516E-01
7	4.46352E-03	6.81688E-06	0.00000E+00	0.00000E+00	4.47034E-03	4.47034E-03	3.62304E-03	6.40246E-01
8	3.53111E-03	1.22120E-06	0.00000E+00	0.00000E+00	3.53234E-03	3.53234E-03	6.49047E-04	1.14696E-01
9	8.22985E-07	5.47256E-11	0.00000E+00	0.00000E+00	8.23031E-07	8.23031E-07	2.90857E-08	5.13989E-06
TOTAL	1.52185E-02	4.42546E-04	0.00000E+00	0.00000E+00			2.38744E-01	4.21896E+01

REGION 7 MATERIAL 6 VOLUME 9.431375E-03

GROUP	ABSORPTION	SCATTER	REACTIONS		TRANSPORTS		FLUXES	
			FISSION	NU*FISSION	RADIAL	AXIAL	FLUX*VOL	FLUX
1	3.39346E-05	2.98335E-04	0.00000E+00	0.00000E+00	3.26944E-04	3.26944E-04	1.63333E-01	1.73244E+01
2	1.59553E-03	3.14712E-04	0.00000E+00	0.00000E+00	1.91024E-03	1.91024E-03	1.67264E-01	1.77348E+01
3	2.53485E-03	6.36990E-05	0.00000E+00	0.00000E+00	2.59855E-03	2.59855E-03	3.38549E-02	3.58960E+00
4	1.72725E-03	2.32403E-05	0.00000E+00	0.00000E+00	1.75046E-03	1.75046E-03	1.23518E-02	1.30965E+00
5	2.16004E-03	1.31818E-05	0.00000E+00	0.00000E+00	2.17320E-03	2.17320E-03	6.89525E-03	7.41700E+01
6	4.04828E-03	1.33099E-05	0.00000E+00	0.00000E+00	4.06159E-03	4.06159E-03	7.07399E-03	7.50048E+01
7	7.72727E-03	1.18014E-05	0.00000E+00	0.00000E+00	7.73907E-03	7.73907E-03	6.27222E-03	6.65037E+01
8	8.81092E-03	3.04717E-06	0.00000E+00	0.00000E+00	8.81396E-03	8.81396E-03	1.61952E-03	1.71716E+01
9	2.15286E-05	1.43158E-09	0.00000E+00	0.00000E+00	2.15299E-05	2.15299E-05	7.60859E-07	8.06732E-05
TOTAL	2.86596E-02	7.39307E-04	0.00000E+00	0.00000E+00			3.98825E-01	4.22870E+01

REGION 8 MATERIAL 7 VOLUME 1.320393E-02

GROUP	ABSORPTION	SCATTER	REACTIONS		TRANSPORTS		FLUXES	
			FISSION	NU*FISSION	RADIAL	AXIAL	FLUX*VOL	FLUX

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1	4.74864E-05	4.14677E-04	0.00000E+00	0.00000E+00	4.57510E-04	4.57510E-04	2.28644E-01	1.73154E-01
2	2.23470E-03	4.40786E-04	0.00000E+00	0.00000E+00	2.67548E-03	2.67548E-03	2.34270E-01	1.77424E-01
3	3.55848E-03	8.94222E-05	0.00000E+00	0.00000E+00	3.64791E-03	3.64791E-03	4.75263E-02	3.59941E+00
4	2.43078E-03	3.27080E-05	0.00000E+00	0.00000E+00	2.46342E-03	2.46342E-03	1.73827E-02	1.31848E+00
5	3.06456E-03	1.86733E-05	0.00000E+00	0.00000E+00	3.08324E-03	3.08324E-03	9.32455E-03	7.51638E-01
6	5.83618E-03	1.91892E-05	0.00000E+00	0.00000E+00	5.85537E-03	5.85537E-03	1.01982E-02	7.72359E-01
7	1.17639E-02	1.79663E-05	0.00000E+00	0.00000E+00	1.17819E-02	1.17819E-02	9.54876E-03	7.23176E-01
8	2.25944E-02	7.81405E-06	0.00000E+00	0.00000E+00	2.26022E-02	2.26022E-02	4.15303E-03	3.14530E-01
9	7.35681E-04	4.89202E-08	0.00000E+00	0.00000E+00	7.35722E-04	7.35722E-04	2.60002E-05	1.96913E-03
TOTAL	5.22662E-02	1.04128E-03	0.00000E+00	0.00000E+00			5.61673E-01	4.25384E+01

REGION 9 MATERIAL 8 VOLUME 1.697648E-02

REACTIONS					TRANSPORTS		FLUXES	
GROUP	ABSORPTION	SCATTER	FISSION	NU*FISSION	RADIAL	AXIAL	FLUX*VOL	FLUX
1	6.09960E-05	5.32649E-04	0.00000E+00	0.00000E+00	5.87668E-04	5.87668E-04	2.93692E-01	1.72999E+01
2	2.87617E-03	5.67313E-04	0.00000E+00	0.00000E+00	3.44348E-03	3.44348E-03	3.01517E-01	1.77609E+01
3	4.60505E-03	1.15747E-04	0.00000E+00	0.00000E+00	4.72180E-03	4.72180E-03	6.15174E-02	3.62368E+00
4	3.16484E-03	4.25831E-05	0.00000E+00	0.00000E+00	3.20737E-03	3.20737E-03	2.26322E-02	1.33315E+00
5	4.06209E-03	2.47515E-05	0.00000E+00	0.00000E+00	4.08684E-03	4.08684E-03	1.31550E-02	7.74896E-01
6	7.99121E-03	2.62735E-05	0.00000E+00	0.00000E+00	8.01748E-03	8.01748E-03	1.39639E-02	8.25433E-01
7	1.77636E-02	2.71292E-05	0.00000E+00	0.00000E+00	1.77907E-02	1.77907E-02	1.44187E-02	8.49332E-01
8	6.83778E-02	2.36478E-05	0.00000E+00	0.00000E+00	6.84015E-02	6.84015E-02	1.25684E-02	7.40341E-01
9	5.17974E-02	3.44434E-06	0.00000E+00	0.00000E+00	5.18003E-02	5.18003E-02	1.83061E-03	1.07832E-01
TOTAL	1.80700E-01	1.36354E-03	0.00000E+00	0.00000E+00			7.35295E-01	4.33126E+01

REGION 10 MATERIAL 9 VOLUME 3.706039E-01

REACTIONS					TRANSPORTS		FLUXES	
GROUP	ABSORPTION	SCATTER	FISSION	NU*FISSION	RADIAL	AXIAL	FLUX*VOL	FLUX
1	4.96713E-05	2.02053E+00	0.00000E+00	0.00000E+00	1.57053E+00	1.57053E+00	6.41041E+00	1.72972E+01
2	3.99441E-05	2.74847E+00	0.00000E+00	0.00000E+00	2.59427E+00	2.59427E+00	6.60792E+00	1.78301E+01
3	6.59519E-05	5.71276E-01	0.00000E+00	0.00000E+00	5.44867E-01	5.44867E-01	1.38508E+00	3.73735E+00
4	4.19678E-05	2.15833E-01	0.00000E+00	0.00000E+00	2.07167E-01	2.07167E-01	5.23293E-01	1.41200E+00
5	3.05414E-05	1.01872E-01	0.00000E+00	0.00000E+00	1.27689E-01	1.27689E-01	3.24457E-01	8.75491E-01
6	3.99744E-05	1.55750E-01	0.00000E+00	0.00000E+00	1.47620E-01	1.47620E-01	3.77621E-01	1.01893E+00
7	5.77480E-05	1.94970E-01	0.00000E+00	0.00000E+00	1.83987E-01	1.83987E-01	4.72712E-01	1.27552E+00
8	1.24059E-04	3.23024E-01	0.00000E+00	0.00000E+00	3.06520E-01	3.06520E-01	7.73469E-01	2.08705E+00
9	1.02218E-04	1.58979E-01	0.00000E+00	0.00000E+00	1.58668E-01	1.58668E-01	3.69898E-01	9.98094E-01
TOTAL	5.52076E-04	6.52265E+00	0.00000E+00	0.00000E+00			1.72449E+01	4.65318E+01

CELL VOLUME 1.219762E-01

REACTIONS					TRANSPORTS		FLUXES	
GROUP	ABSORPTION	SCATTER	FISSION	NU*FISSION	RADIAL	AXIAL	FLUX*VOL	FLUX
1	1.65197E-02	3.30655E+01	5.56531E-03	1.38190E-02	2.57715E+01	2.57715E+01	1.46994E+02	1.20510E+01
2	2.85518E-01	4.38448E+01	5.78295E-02	1.40813E-01	4.14882E+01	4.14882E+01	1.46881E+02	1.20363E+01
3	4.69348E-02	9.24893E+00	2.20722E-02	5.36914E-02	8.87126E+00	8.87126E+00	3.14557E+01	2.57884E+00
4	3.54728E-02	3.57678E+00	1.93812E-02	4.71338E-02	3.47308E+00	3.47308E+00	1.21645E+01	9.97286E-01
5	3.93632E-02	2.29900E+00	2.10641E-02	5.12226E-02	2.23510E+00	2.23510E+00	7.82053E+00	6.41153E-01
6	6.76453E-02	2.78930E+00	3.32930E-02	8.05554E-02	2.71472E+00	2.71472E+00	9.43991E+00	7.78005E-01
7	1.04176E-01	3.72560E+00	4.34193E-02	1.05569E-01	3.62259E+00	3.62259E+00	1.26713E+01	1.03883E+00
8	2.34350E-01	6.65334E+00	9.55710E-02	2.32335E-01	6.54902E+00	6.54902E+00	2.23338E+01	1.83100E+00
9	1.69515E-01	3.31178E+00	8.66994E-02	2.10710E-01	3.47125E+00	3.47125E+00	1.07898E+01	8.84585E-01
TOTAL	1.00000E+00	1.08315E+02	3.84895E-01	9.38049E-01			4.00533E+02	3.28370E+01

SCATTERING MATRIX

1	2	3	4	5	6	7	8	9
1	3.2082E-01	9.8320E-01	4.0201E-26	2.5141E-27	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2	0.0000E+00	4.2939E-01	7.0586E-01	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3	0.0000E+00	7.9516E-03	8.3625E+00	7.6665E-01	7.2242E-02	2.6294E-02	9.7635E-03	3.2822E-03
4	0.0000E+00	0.0000E+00	2.1444E-01	2.3129E+00	5.8979E-01	2.7790E-01	1.2737E-01	4.9640E-02
5	0.0000E+00	0.0000E+00	9.1839E-03	3.4540E-01	1.1387E+00	4.5056E-01	2.3394E-01	1.1232E-01
6	0.0000E+00	0.0000E+00	2.6801E-03	1.2420E-01	3.3970E-01	1.4785E+00	5.3230E-01	2.7574E-01
7	0.0000E+00	0.0000E+00	8.5456E-04	4.8726E-02	1.4092E-01	4.2731E-01	2.2571E+00	7.5014E-01
8	0.0000E+00	0.0000E+00	2.5430E-04	1.5184E-02	5.5326E-02	1.7826E-01	6.0404E-01	5.2735E+00
9	0.0000E+00	0.0000E+00	1.7482E-05	1.2060E-03	4.3275E-03	1.8098E-02	6.4271E-02	4.2305E-01

MODIFIED

GROUP	REMOVALS	SPECTRUM	P	ETA.F
1	9.832024E-01	9.997000E-01	9.834975E-01	8.244126E-01
2	6.979130E-01	3.000000E-04	7.096200E-01	4.931330E-01
3	6.510631E-01	0.000000E+00	9.328714E-01	1.146405E+00
4	6.156027E-01	0.000000E+00	9.455347E-01	1.328730E+00
5	5.756411E-01	0.000000E+00	9.350853E-01	1.281584E+00
6	5.080027E-01	0.000000E+00	8.824890E-01	1.196762E+00
7	4.038393E-01	0.000000E+00	7.949551E-01	1.013365E+00
8	1.695040E-01	0.000000E+00	4.197313E-01	9.914014E-01
9	0.000000E+00	0.000000E+00	0.000000E+00	1.243018E+00

WED COMPLETED

TIME FROM START 6.0 SECONDS. TIME IN THIS MODULE 0.0 SECONDS. UNUSED REGION THIS MODULE 1166 K BYTES.

WHC-SD-NR-SWD-017

-C- WBRN 11 13

READS INTERFACE 11
WRITES INTERFACE 13FORTRAN DATA SETS 61-65
FORTRAN DATA SETS 71-75OSNAMES:
OSNAMES:

CYCLE 1

***** WIMS-E MODULE W-BURNUP *****
FUEL BURNUP CALCULATION.

MORE FISSILE NUCLIDE TABULATIONS ON INTERFACE THAN STATED 14 11

-M- RATING 1 88.425 CENT BUCK 9 3.43E-5 3.95E-5 3.43E-5 3.95E-5
-M- STEP 2 1
-M- POISON 2 5 5 15
-M- PPAD .5
-M- BEGINPOISON CELL VOLUME WEIGHTING IS 0.060043
CHECK AGREEMENT WITH CORRESPONDING FACTOR ON 'CELL' DATA CARD FOR MULTICELL MERGE.

UNUSED STORAGE 289432

INTERFACE MATERIAL NUMBERS FOR EACH BURNABLE MATERIAL

1 4 5 6 7 8
SUBSTEP 1
I LAMBDA K-EFF
1 1.00000E+00 8.58012E-01
I LAMBDA K-EFF
2-2.86234E+00 1.01764E+00
I LAMBDA K-EFF
3-2.48194E+00 1.00021E+00
LAMBDA IS -2.477385

POISON EDIT AT START OF SUBSTEP 1 0.00 DAYS 0.00 MW/TE

POISON NUMBER DENSITIES

MATERIAL/NUCLIDE	2155	2156	2157	2158
4	1.3020E-04	1.0000E-19	1.3859E-04	1.0000E-19
5	1.3020E-04	1.0000E-19	1.3859E-04	1.0000E-19
6	1.3020E-04	1.0000E-19	1.3859E-04	1.0000E-19
7	1.3020E-04	1.0000E-19	1.3859E-04	1.0000E-19
8	1.3020E-04	1.0000E-19	1.3859E-04	1.0000E-19

EQUIVALENT UNIFORM FLUX AT POISON PIN SURFACE BY GROUP

1.39358E+14 1.46636E+14 3.12042E+13 1.19212E+13 7.52054E+12 8.90857E+12 1.14220E+13 1.93147E+13 9.38575E+12

ADJUSTED FLUX IN POISON REGIONS BY MATERIAL AND GROUP

MATERIAL/GROUP	1	2	3	4	5	6	7	8	9
4	1.3917E+14	1.4543E+14	2.9503E+13	1.0756E+13	6.0280E+12	5.9795E+12	5.0381E+12	7.8316E+11	5.6652E+06
5	1.3899E+14	1.4526E+14	2.9499E+13	1.0767E+13	6.0537E+12	6.0398E+12	5.1802E+12	9.9021E+11	5.9507E+07
6	1.3900E+14	1.4532E+14	2.9577E+13	1.0821E+13	6.1255E+12	6.1854E+12	5.5020E+12	1.5220E+12	1.0153E+09
7	1.3901E+14	1.4540E+14	2.9701E+13	1.0909E+13	6.2448E+12	6.4310E+12	6.0627E+12	2.7439E+12	2.2290E+10
8	1.3901E+14	1.4552E+14	2.9913E+13	1.1050E+13	6.4496E+12	6.8599E+12	7.0955E+12	6.1953E+12	9.0344E+11

ABSORPTIONS BY GROUP AND NUCLIDE WITH TOTALS

GROUP/NUCLIDE	2155	2156	2157	2158
1	8.61364E+08	2.16157E-07	5.00090E+08	1.03632E-07
2	4.49344E+10	8.63754E-06	2.04764E+10	4.90053E-06
3	7.76963E+10	3.08050E-08	2.72415E+10	5.05937E-08
4	1.44135E+10	1.83529E-08	5.76144E+10	3.00090E-08
5	1.72728E+10	1.23018E-08	7.39265E+10	2.00443E-08
6	2.22307E+10	1.42435E-08	1.42408E+11	2.32444E-08
7	6.46738E+10	1.57137E-08	2.94100E+11	2.56942E-08
8	1.54370E+11	1.15648E-08	7.31555E+11	1.88673E-08
9	7.87482E+10	1.88090E-09	3.63829E+11	3.07182E-09

TOTALS 4.85201E+11 8.95856E-06 1.71165E+12 5.17589E-06 2.19685E+12

POISON RESIDUES

NUCLIDE	MEAN NUMBER DENSITIES
2155	1.3020E-04
2156	1.0000E-19
2157	1.3859E-04
2158	1.0000E-19

TIME (DAYS)	IRRADIATION (MW/TE)	POWER (MW/TE)	TOT. FISS/SEC/CM LENGTH	TOTAL FLUX
1.000	88.425	88.425	3.203392E+12	2.682503E+14
INITIAL FISSILE ATOMS	2.30474E+20	CURRENT FISSILE ATOMS	2.30302E+20	TOTAL FISSIONS TO DATE
			2.76773E+17	FIFA (FISSIONS/INIT. FISS. ATOM)
				1.20089E-03

SUBSTEP 2
I LAMBDA K-EFF
1-2.47738E+00 9.81493E-01
I LAMBDA K-EFF
2-2.89580E+00 1.00024E+00
LAMBDA IS -2.890498
AA 31

BURNABLE MATERIAL 1 (INTERFACE MATERIAL 1)

NUCLIDE IDENTIFIER	NUMBER DENSITIES
2232	1232
1.3030E-03	1.5513E-07
5.9497E-13	3.1445E-09
953	4083
1.0881E-19	1.4195E-09
4109	4113
1.0330E-10	2.8392E-11
4143	4145
1.4840E-08	9.8100E-09
4151	4152
1.0249E-09	6.7780E-10
9233	9233
3.9431E-09	1.4814E-10
4.1272E-16	1.2243E-18
4095	4099
1.6911E-08	1.6136E-08
4115	4127
2.8327E-11	6.4551E-10
2.8252E-09	2.9087E-09
4153	4154
3.8832E-10	7.8309E-13
234	234
1.0746E-04	6.4622E-08
0.0000E+00	0.0000E+00
4101	4103
1.2911E-08	1.2848E-10
4131	4133
7.4829E-09	1.7037E-08
5147	5147
3.9711E-12	6.5692E-12
4155	4157
7.3001E-11	1.5901E-11
236	236
6.4622E-08	8.1083E-06
0.0000E+00	0.0000E+00
4103	5103
1.2848E-10	7.3601E-09
4133	4135
1.7037E-08	6.0213E-12
5147	5148
6.5692E-12	8.8746E-12
4157	4902
1.5901E-11	7.8498E-08
8238	8238
8.1083E-06	1.0090E-09
0.0000E+00	0.0000E+00
5103	4105
7.3601E-09	1.3632E-09
4135	5135
6.0213E-12	1.4613E-09
8.8746E-12	3.9570E-09
4902	927
7.8498E-08	1.9583E-11
6239	6239
1.0090E-09	3.6819E-12
0.0000E+00	0.0000E+00
4105	5105
1.3632E-09	7.5849E-10
5135	6135
1.4613E-09	3.9570E-09
3.9570E-09	3.0832E-09
1.242	1242
1.1798E-17	9.6009E-20
5105	4108
7.5849E-10	2.3251E-10
6135	6135
3.9570E-09	3.0832E-09
4149	4150
2.0858E-09	4.9365E-11

BURNABLE MATERIAL 2 (INTERFACE MATERIAL 4)

[illegible]

BURNABLE MATERIAL 3 (INTERFACE MATERIAL 5)

[illegible]

BURNABLE MATERIAL 4 (INTERFACE MATERIAL 6)

[illegible]

BURNABLE MATERIAL 5 (INTERFACE MATERIAL 7)

[illegible]

BURNABLE MATERIAL 6 (INTERFACE MATERIAL 8)

[illegible]

WHC-SD-NR-SWD-017

	1	2	3	4	5	6	TOTAL
2232	1.07343E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.07343E+00
1233	1.28346E-04	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.28346E-04
9233	3.28218E-06	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	3.28218E-06
224	1.23127E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.23127E-07
2235	8.96716E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	8.96716E-02
236	5.41894E-05	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	5.41894E-05
8238	6.95283E-03	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	6.95283E-03
8239	8.56616E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	8.56616E-07
1240	3.14415E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	3.14415E-09
1241	1.60308E-11	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.60308E-11
937	5.00697E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	5.00697E-10
1939	2.66863E-06	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	2.66863E-06
948	3.49029E-13	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	3.49029E-13
951	1.04727E-15	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.04727E-15
2155	0.00000E+00	6.27048E-05	1.89055E-04	3.13168E-04	4.37585E-04	5.56531E-04	1.55809E-03
2156	0.00000E+00	4.98397E-20	1.46519E-19	2.44199E-19	3.41878E-19	4.39557E-19	1.22095E-18
2157	0.00000E+00	6.68511E-05	2.00269E-04	3.32577E-04	4.61614E-04	5.65627E-04	1.62694E-03
2158	0.00000E+00	4.94493E-20	1.48348E-19	2.47247E-19	3.46145E-19	4.45043E-19	1.26232E-18
1242	1.01384E-14	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.01384E-14
952	8.25055E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	8.25055E-17
953	9.38919E-17	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	9.38919E-17
4093	4.18275E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	4.18275E-07
4095	5.70380E-06	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	5.70380E-06
4099	5.67127E-06	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	5.67127E-06
4101	4.62938E-06	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	4.62938E-06
4103	4.69804E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	4.69804E-08
5103	2.69134E-06	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	2.69134E-06
4105	5.08163E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	5.08163E-07
5105	2.82739E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	2.82739E-07
4108	8.91458E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	8.91458E-08
4109	3.99721E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	3.99721E-08
4113	1.13797E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.13797E-08
4115	1.15648E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.15648E-08
4127	2.91039E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	2.91039E-07
4131	3.48008E-06	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	3.48008E-06
4133	8.04438E-06	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	8.04438E-06
4134	2.86442E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	2.86442E-09
4135	7.00336E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	7.00336E-07
5135	1.89649E-06	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.89649E-06
6135	1.47759E-06	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.47759E-06
4143	7.53379E-06	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	7.53379E-06
4145	5.04991E-06	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	5.04991E-06
4147	1.36999E-06	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.36999E-06
5147	1.51774E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.51774E-08
6147	2.07242E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	2.07242E-09
4148	3.45161E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	3.45161E-09
5148	3.61204E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	3.61204E-09
4149	3.42752E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	3.42752E-07
5149	1.10330E-06	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.10330E-06
4150	2.62881E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	2.62881E-08
4151	5.49433E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	5.49433E-07
4152	3.65757E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	3.65757E-07
4153	2.10923E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	2.10923E-07
4154	4.28132E-10	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	4.28132E-10
4155	4.01701E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	4.01701E-08
4157	8.86299E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	8.86299E-09
4902	3.03761E-05	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	3.03761E-05
927	1.64802E-08	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.64802E-08
2012	3.40872E-00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	3.40872E+00
6016	1.61154E-01	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.61154E-01
29	2.04632E-01	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	2.04632E-01
1000	1.48502E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	1.48502E-02

TIME (DAYS)	IRRADIATION (MD/TE)	POWER (MW/TE)	TOT.FISS/SEC/CM LENGTH	TOTAL FLUX
2.000	178.850	88.425	3.20340E+12	2.709353E+14
INITIAL FISSION ATOMS	CURRENT FISSION ATOMS	TOTAL FISSIONS TO DATE	FIFA (FISSIONS/INIT.FISSION ATOM)	
2.30474E+20	2.30132E+20	5.53547E+17	2.40178E-03	

NOTES. POWER AND IRRADIATION ARE IN TERMS OF INITIAL HEAVY ATOM CONCENTRATIONS
TOTAL FISSIONS AND FIFA ARE CALCULATED ASSUMING FISSION RATES REMAIN CONSTANT FOR EACH SUBSTEP

BURNUP COMPLETED

TIME FROM START 6.3 SECONDS. TIME IN THIS MODULE 0.3 SECONDS. UNUSED REGION THIS MODULE 1130 K BYTES.

WHC-SD-NR-SWD-017

-C- FINISH

END OF CYCLE 1

CYCLE 2

-C- WHEAD 13 12

CYCLE 2

READS INTERFACE 13

FORTRAN DATA SETS 71-75

DSNAMES:

WRITES INTERFACE 12

FORTRAN DATA SETS 66-70

DSNAMES:

ALSO READS :

***** DIMS-E MODULE W-HEAD1 *****
 READ LIBRARY, DO RESONANCE CALCULATION, WRITE MICRO X-SECTIONS

LIBRARY
 NUCLIDES 130 GROUPS 69

-P- NREGION 4
 -P- NRIAT 2
 -P- BURN 1 1
 -P- ENDP

MAXIMUM SIZE OF NUMBER DENSITY DATA BLOCK 68977
 STORAGE USED NOW GIVEN AT END OF HEAD CALCULATION

-M- CENT
 -M- RATE 1 -1 1138 1 2012 7.994E-2 6016 2.838E-3 29 2.052E-3 1000
 -M- 4.183E-5 2232 1.30317E-3 2235 1.077863E-4 8238 8.11294E-6 6239
 -M- 1E-20 9233 1E-20 937 1E-20
 -M- RATE 2 -1 988 3 2012 0.0877555 1000 5.49E-5
 -M- ANNU 1 .825 1
 -M- ANNU 2 .8325 0
 -M- ANNU 3 1.6302 2
 -M- ANNU 4 1.9364 0
 -M- DANC 1 BELL .602
 -M- BEGIN

MATERIAL TEMPERATURES

TEMP 1 1138.0000 2 968.0000 3 0.0000

RESONANCE GROUP 15

MICROSCOPIC CROSS-SECTIONS

	ARRAY
2232.OABS	8.37683E-01
2234.OABS	8.77479E-01
2235.OABS	4.89031E+00
2235.OFIS	3.55081E+00
2236.OABS	3.49999E-01
8238.OABS	9.56395E-01
6239.OABS	4.95379E+00
6239.OFIS	3.13229E+00

RESONANCE GROUP 16

MICROSCOPIC CROSS-SECTIONS

	ARRAY
2232.OABS	1.11085E+00
2234.OABS	1.36120E+00
2235.OABS	5.76978E+00
2235.OFIS	4.12692E+00
2236.OABS	5.20948E-01

WHC-SD-NR-SWD-017

6239.OFIS

RESONANCE GROUP 17

MICROSCOPIC CROSS-SECTIONS

	ARRAY
2232.OABS	1.37205E+00
234.OABS	2.01719E+00
2235.OABS	7.37099E+00
2235.OFIS	5.28069E+00
236.OABS	7.89996E-01
8238.OABS	9.30697E-01
6239.OABS	7.78288E+00
6239.OFIS	5.02427E+00

RESONANCE GROUP 18

MICROSCOPIC CROSS-SECTIONS

	ARRAY
2232.OABS	1.83977E+00
234.OABS	3.00998E+00
2235.OABS	9.04682E+00
2235.OFIS	6.51855E+00
236.OABS	1.16999E+00
8238.OABS	1.85293E+00
6239.OABS	9.26130E+00
6239.OFIS	5.73308E+00

RESONANCE GROUP 19

MICROSCOPIC CROSS-SECTIONS

	ARRAY
2232.OABS	2.07073E+00
234.OABS	3.40836E+00
2235.OABS	1.14387E+01
2235.OFIS	8.31442E+00
236.OABS	1.70998E+00
8238.OABS	2.33602E+00
6239.OABS	1.16597E+01
6239.OFIS	6.87784E+00

RESONANCE GROUP 20

MICROSCOPIC CROSS-SECTIONS

	ARRAY
2232.OABS	3.08518E+00
234.OABS	6.29988E+00
2235.OABS	1.60586E+01
2235.OFIS	1.20163E+01
236.OABS	2.97993E+00
8238.OABS	3.14248E+00
6239.OABS	1.96593E+01
6239.OFIS	1.08472E+01

RESONANCE GROUP 21

MICROSCOPIC CROSS-SECTIONS

	ARRAY
2232.OABS	7.75503E+00
234.OABS	1.30990E+01
2235.OABS	2.29682E+01
2235.OFIS	1.45731E+01
236.OABS	7.04861E+00
8238.OABS	8.08719E+00
6239.OABS	2.43724E+01
6239.OFIS	1.53041E+01

RESONANCE GROUP 22

MICROSCOPIC CROSS-SECTIONS

	ARRAY
2232.OABS	5.44824E+00
234.OABS	2.77971E+01
2235.OABS	3.71826E+01
2235.OFIS	2.33339E+01
236.OABS	3.00902E+01
8238.OABS	1.68017E+01
6239.OABS	5.07359E+01
6239.OFIS	3.81078E+01

RESONANCE GROUP 23

MICROSCOPIC CROSS-SECTIONS

	ARRAY
2232.OABS	1.63283E+01
234.OABS	3.06416E+01
2235.OABS	4.24328E+01
2235.OFIS	2.80721E+01
236.OABS	2.90879E+01
8238.OABS	2.42256E+01
6239.OABS	1.18427E+02
6239.OFIS	4.40108E+01

RESONANCE GROUP 24

MICROSCOPIC CROSS-SECTIONS

	ARRAY
2232.OABS	8.28195E-02
234.OABS	4.76830E-01
2235.OABS	7.22705E+01
2235.OFIS	4.10229E+01
236.OABS	6.25147E+01
8238.OABS	7.61845E+01
6239.OABS	4.56955E+01
6239.OFIS	1.19048E+01

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RESONANCE GROUP 25

MICROSCOPIC CROSS-SECTIONS

ARRAY	
2232.OABS	3.43404E+01
234.OABS	4.01515E+00
2235.OABS	8.75454E+01
2235.OFIS	4.74951E-01
236.OABS	1.26926E-01
8238.OABS	1.08935E+02
6239.OABS	8.86564E+01
6239.OFIS	5.13415E+01

RESONANCE GROUP 26

MICROSCOPIC CROSS-SECTIONS

ARRAY	
2232.OABS	1.11545E-01
234.OABS	5.01998E+00
2235.OABS	8.34869E+01
2235.OFIS	4.31298E+01
236.OABS	3.15167E-01
8238.OABS	3.13212E-01
6239.OABS	2.73725E-02
6239.OFIS	1.66549E+02

RESONANCE GROUP 27

MICROSCOPIC CROSS-SECTIONS

ARRAY	
2232.OABS	1.57274E-01
234.OABS	5.94775E+02
2235.OABS	7.57125E+01
2235.OFIS	5.04346E-01
236.OABS	2.52779E+02
8238.OABS	1.40284E+02
6239.OABS	6.81771E+01
6239.OFIS	3.84646E+01

FILE 2

NUCLIDES 60

NUCLIDE IDENTIFICATIONS

2012	2012	6016	29	4083	4095	4099	4101	5103	4103	4105	5105	4108	4109	4113	4115
4127	4131	4133	4134	6135	4135	5135	4143	4145	4147	5147	6147	4148	5148	5149	4149
4150	4151	4152	4153	4154	4155	4157	4902	2232	9233	1233	234	2235	236	927	8238
937	1939	948	6239	1240	1241	1242	951	952	953	1000	1000				

VOIDS BECOME MATERIAL 3

VOIDS BECOME MATERIAL 3

FILE 3

MATERIALS 3

NUMBER DENSITIES PRINTED IN W-MIX

FILE 4

ANNULI 4

MATERIAL 1 3 2 3

VOLUMES 2.1382E+00 3.9054E-02 6.1716E+00 3.4309E+00

UNUSED STORAGE, CHAIN 1 280931

UNUSED STORAGE, CHAIN 2 276452

HEAD COMPLETED

TIME FROM START 8.6 SECONDS.

TIME IN THIS MODULE

2.2 SECONDS.

UNUSED REGION THIS MODULE 1078 K BYTES.

WHC-SD-NR-SWD-017

***** WIMS-E MODULE U-MIX *****
 READS FILES 2 & 3, FORMS MACROSCOPIC X-SECTIONS AND WRITES THESE TO FILE 3.
 FLUXES ETC READ FROM FILE 1 AND WRITTEN TO FILE 5.

LN 1 LT 0

CROSS-SECTIONS 60

GROUPS 69

MATERIALS 3

NO. OF MATERIALS TO BE PROCESSED AT A TIME 3

UNUSED STORAGE 230640 (IF MATERIALS PROCESSED SINGLY 270129)

MATERIAL 1	NUCLIDE	IDENTIFIER	NUMBER DENSITY
	1	2012	7.9940E-02
	3	6016	2.8380E-03
	4	29	2.0520E-03
	5	4083	1.4195E-09
	6	4095	1.6912E-08
	7	4099	1.6136E-08
	8	4101	1.2911E-08
	9	5103	7.3601E-09
	10	4103	1.2848E-10
	11	4105	1.3632E-09
	12	5105	7.5849E-10
	13	4108	2.3251E-10
	14	4109	1.0330E-10
	15	4113	2.8392E-11
	16	4115	2.8327E-11
	17	4127	6.4551E-10
	18	4131	7.4829E-09
	19	4133	1.7037E-08
	20	4134	6.0213E-12
	21	6135	3.0832E-09
	22	4135	1.4613E-09
	23	5135	3.9570E-09
	24	4143	1.4840E-08
	25	4145	9.8100E-09
	26	4147	2.6252E-09
	27	5147	2.9083E-09
	28	6147	3.9711E-12
	29	4148	6.5692E-12
	30	5148	6.8746E-12
	31	5149	2.0858E-09
	32	4149	6.4796E-10
	33	4150	4.9385E-11
	34	4151	1.0249E-09
	35	4152	6.7780E-10
	36	4153	3.8832E-10
	37	4154	7.8309E-13
	38	4155	7.3001E-11
	39	4157	1.5901E-11
	40	4902	7.8498E-08
	41	2232	1.3030E-03
	42	9233	3.9431E-09
	43	1233	1.5513E-07
	44	234	1.4814E-10
	45	235	1.0746E-04
	46	238	6.4622E-08
	47	927	1.9583E-11
	48	8238	8.1088E-06
	49	937	5.9497E-13
	50	1939	3.1445E-09
	51	949	4.1272E-16
	52	8239	1.0090E-09
	53	1240	3.8819E-12
	54	1241	1.8732E-14
	55	1242	1.1798E-17
	56	951	1.2243E-18
	57	952	9.6009E-20
	58	953	1.0881E-19
	59	1000	4.1830E-05

NUMBER OF REACTIONS 4

MATERIAL 2	NUCLIDE	IDENTIFIER	NUMBER DENSITY
	2	2012	8.7755E-02
	60	1000	5.4900E-05

NUMBER OF REACTIONS 3

MATERIAL 3 VOID

NUMBER OF REACTIONS 0

WRITING FILE 5

NMESH 1 NGRP 1 NORDEP 1

FLUX
1.00000E+00

AK BX BY BZ TC U
1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 1.0000E+00

RTIME 0.20000E+01 RIRRAD 0.17685E+03

SRAPE ITEMS

7.04908E-01 6.00000E+01 0.00000E+00 2.30474E+20 5.53547E+17
 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00

MIX COMPLETED

TIME FROM START 9.0 SECONDS. TIME IN THIS MODULE 0.4 SECONDS. UNUSED REGION THIS MODULE 1054 1 BYTES.

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CYCLE 2

-C- WHEAD 13 14

READS INTERFACE 13
WRITES INTERFACE 14

FORTRAN DATA SETS 71-75
FORTRAN DATA SETS 76-80

DSNAMES:
DSNAMES:

ALSO READS :

***** WIMS-E MODULE W-HEAD1 *****
READ LIBRARY, DO RESONANCE CALCULATION, WRITE MICRO X-SECTIONS

LIBRARY
NUCLIDES 130 GROUPS 69

-P- NREGION 6
-P- NMATE 6
-P- NMESH 8
-P- BURN 1 2
-P- ENDP
-P- * POISON PIN

MAXIMUM SIZE OF NUMBER DENSITY DATA BLOCK 68321
STORAGE USED NOW GIVEN AT END OF HEAD CALCULATION

-M- CENT
-M- MATE 1 -1 968 1 2155 1.302E-4 2157 1.3859E-4
-M- MATE 2 -1 968 1 2155 1.302E-4 2157 1.3859E-4
-M- MATE 3 -1 968 1 2155 1.302E-4 2157 1.3859E-4
-M- MATE 4 -1 968 1 2155 1.302E-4 2157 1.3859E-4
-M- MATE 5 -1 968 1 2155 1.302E-4 2157 1.3859E-4
-M- MATE 6 -1 968 3 2012 0.0877555 1000 5.49E-5
-M- ANNU 1 .1 1
-M- ANNU 2 .2 2
-M- ANNU 3 .3 3
-M- ANNU 4 .4 4
-M- ANNU 5 .5 5
-M- ANNU 6 1.4882 6
-M- MESH 1 1 1 1 1 3
-M- BEGIN

MATERIAL TEMPERATURES

TEMP	1	2	3	4	5	6
	968.0000	968.0000	968.0000	968.0000	968.0000	968.0000

FILE 2

NUCLIDES 6

NUCLIDE IDENTIFICATIONS
2012 2155 2156 2157 2158 1000

FILE 3

MATERIALS 6

NUMBER DENSITIES PRINTED IN W-MIX

FILE 4

ANNULI 8

MATERIAL	1	2	3	4	5	6	7	8

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UNUSED STORAGE, CHAIN 1 280197
 UNUSED STORAGE, CHAIN 2 273674

HEAD COMPLETED

TIME FROM START 10.2 SECONDS.

TIME IN THIS MODULE 1.2 SECONDS.

UNUSED REGION THIS MODULE 1068 K BYTES.

***** WIMS-E MODULE W-MIX *****
 READS FILES 2 & 3, FORMS MACROSCOPIC X-SECTIONS AND WRITES THESE TO FILE 3.
 FLUXES ETC READ FROM FILE 1 AND WRITTEN TO FILE 5.

LN 1 LT 0

CROSS-SECTIONS 6

GROUPS 69

MATERIALS 6

NO. OF MATERIALS TO BE PROCESSED AT A TIME 6

UNUSED STORAGE 171519 (IF MATERIALS PROCESSED SINGLY 270252)

MATERIAL	1	NUCLIDE	IDENTIFIER	NUMBER DENSITY
		2	2155	1.2920E-04
		3	2156	9.9967E-20
		4	2157	1.3596E-04
		5	2158	9.9981E-20

NUMBER OF REACTIONS 3

MATERIAL	2	NUCLIDE	IDENTIFIER	NUMBER DENSITY
		2	2155	1.2916E-04
		3	2156	9.9967E-20
		4	2157	1.3577E-04
		5	2158	9.9981E-20

NUMBER OF REACTIONS 3

MATERIAL	3	NUCLIDE	IDENTIFIER	NUMBER DENSITY
		2	2155	1.2905E-04
		3	2156	9.9967E-20
		4	2157	1.3528E-04
		5	2158	9.9981E-20

NUMBER OF REACTIONS 3

MATERIAL	4	NUCLIDE	IDENTIFIER	NUMBER DENSITY
		2	2155	1.2930E-04
		3	2156	9.9967E-20
		4	2157	1.3411E-04

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MATERIAL	5	NUCLIDE	IDENTIFIER	NUMBER DENSITY
		2	2155	1.2742E-04
		3	2156	9.9967E-20
		4	2157	1.2782E-04
		5	2158	9.9981E-20

NUMBER OF REACTIONS 3

MATERIAL	6	NUCLIDE	IDENTIFIER	NUMBER DENSITY
		1	2012	8.7755E-02
		6	1000	5.4900E-05

NUMBER OF REACTIONS 3

WRITING FILE 5

NMESH 1 NGRP 1 NORDER 1

FLUX
1.00000E+00AK BX SY BZ TC U
1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 1.0000E+00

RTIME 0.20000E+01 RIRRAD 0.17685E+03

SPARE ITEMS

7.04908E-01	2.20000E+01	0.00000E+00	2.30474E+20	5.53547E-17
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

MIX COMPLETED

TIME FROM START 10.3 SECONDS. TIME IN THIS MODULE 0.1 SECONDS. UNUSED REGION THIS MODULE 1054 K BYTES.

-C- WTHES 12

CYCLE 2

READS INTERFACE 12

FORTRAN DATA SETS 66-70

DSNAMES:

***** WIMS-E MODULE W-THES *****

NR OF MESHES = 4 NR OF MATERIALS = 3 NR OF GROUPS = 69

REGION	1	2	3	4

MATERIAL	1	3	2	3

VOLUMES	2.1382E+00	3.9054E-02	6.1716E+00	3.4309E+00
UNUSED STORAGE	299193			

-M- PRINT 9

-M- BEGIN

RADII 8.2500E-01 8.3250E-01 1.6302E+00 1.9364E+00

COLLISION PROBABILITIES

GROUP 1

P(I TO J)/SIGMA(J)

1.005287	0.013282	1.026591	0.349380	0.727193	0.030932	1.301730	0.366252	0.355676	0.008237

1.391258	0.476824	0.217744	0.004169	0.857727	0.783895				

P(I TO SURFACE)

0.872123	0.873321	0.891917	0.933485

P(SURFACE TO J)/SIGMA(J)

0.613085	0.011213	1.809716	1.052913

P(SURFACE TO SURFACE)

0.849663

GROUP 2

P(I TO J)/SIGMA(J)

0.994098	0.013148	1.010577	0.342037	0.719864	0.030834	1.285720	0.359804	0.350127	0.008136

1.370421	0.469638	0.213168	0.004034	0.844802	0.779733				

P(I TO SURFACE)

0.855034	0.856406	0.878252	0.925148

P(SURFACE TO J)/SIGMA(J)

0.601072	0.010996	1.781939	1.043532

P(SURFACE TO SURFACE)

0.930755

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P(I TO J)/SIGMA(J)	0.932603	0.012363	0.908027	0.294418	0.676881	0.030262	1.178493	0.308507	0.314944	0.007457
1.232810	0.419717	0.183490	0.003512	0.755002	0.751862					
P(I TO SURFACE)	0.743770	0.741888	0.784739	0.869459						
P(SURFACE TO J)/SIGMA(J)	0.522855	0.009526	1.592249	0.980716						
P(SURFACE TO SURFACE)	0.705783									
GROUP	4									
P(I TO J)/SIGMA(J)	0.917967	0.012166	0.886276	0.284394	0.666092	0.030120	1.155259	0.298171	0.307062	0.007310
1.206385	0.409928	0.177243	0.003394	0.737393	0.746503					
P(I TO SURFACE)	0.719897	0.717914	0.766242	0.858750						
P(SURFACE TO J)/SIGMA(J)	0.506073	0.009218	1.554719	0.988638						
P(SURFACE TO SURFACE)	0.681470									
GROUP	5									
P(I TO J)/SIGMA(J)	0.884043	0.011697	0.831290	0.260166	0.640436	0.029783	1.097948	0.272804	0.288011	0.006948
1.142194	0.385670	0.162143	0.003105	0.693757	0.733574					
P(I TO SURFACE)	0.661960	0.658873	0.720709	0.832918						
P(SURFACE TO J)/SIGMA(J)	0.465344	0.008460	1.462332	0.939500						
P(SURFACE TO SURFACE)	0.623123									
GROUP	6									
P(I TO J)/SIGMA(J)	0.854858	0.011283	0.779704	0.237146	0.617748	0.029488	1.041681	0.247922	0.270138	0.006592
1.078880	0.361295	0.147796	0.002822	0.649911	0.721166					
P(I TO SURFACE)	0.606670	0.600782	0.675517	0.808126						
P(SURFACE TO J)/SIGMA(J)	0.426477	0.007714	1.370836	0.911535						
P(SURFACE TO SURFACE)	0.567709									
GROUP	7									
P(I TO J)/SIGMA(J)	0.821428	0.010798	0.726454	0.214907	0.591185	0.029147	0.986056	0.224609	0.251689	0.006240
1.021807	0.339375	0.133936	0.002557	0.610479	0.710317					
P(I TO SURFACE)	0.552465	0.545557	0.634525	0.786448						
P(SURFACE TO J)/SIGMA(J)	0.388372	0.007005	1.287463	0.887084						
P(SURFACE TO SURFACE)	0.518692									
GROUP	8									
P(I TO J)/SIGMA(J)	0.800192	0.010485	0.691095	0.200103	0.574053	0.028930	0.947922	0.208737	0.239439	0.005998
0.982501	0.324158	0.124710	0.002376	0.583106	0.703114					
P(I TO SURFACE)	0.516234	0.507866	0.606330	0.772056						
P(SURFACE TO J)/SIGMA(J)	0.362902	0.006521	1.230256	0.870850						
P(SURFACE TO SURFACE)	0.486404									
GROUP	9									
P(I TO J)/SIGMA(J)	0.791034	0.010349	0.672301	0.191891	0.566811	0.028837	0.925511	0.199122	0.232927	0.005857
0.957672	0.314389	0.119468	0.002267	0.565533	0.698705					
P(I TO SURFACE)	0.495736	0.485143	0.588568	0.763245						
P(SURFACE TO J)/SIGMA(J)	0.348492	0.006229	1.194215	0.860912						
P(SURFACE TO SURFACE)	0.467022									
GROUP	10									
P(I TO J)/SIGMA(J)	0.781626	0.010209	0.658777	0.185334	0.558936	0.028742	0.908626	0.192277	0.227549	0.005750
0.940733	0.307825	0.115506	0.002189	0.553727	0.695742					
P(I TO SURFACE)	0.490056	0.468780	0.576441	0.757325						
P(SURFACE TO J)/SIGMA(J)	0.227470	0.006019	1.189609	0.854234						

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GROUP 11
P(I TO J)/SIGMA(J)
0.774893 0.010108 0.646073 0.181045 0.553426 0.028673 0.897172 0.187711 0.223841 0.005677
0.929522 0.303498 0.112832 0.002137 0.545943 0.693807
P(I TO SURFACE)
0.469437 0.457826 0.568423 0.753458
P(SURFACE TO J)/SIGMA(J)
0.330005 0.005878 1.153341 0.849872
P(SURFACE TO SURFACE)
0.445044

GROUP 12
P(I TO J)/SIGMA(J)
0.770892 0.010048 0.639618 0.178449 0.550146 0.028633 0.890187 0.184927 0.221604 0.005633
0.922647 0.300840 0.111215 0.002105 0.541161 0.692632
P(I TO SURFACE)
0.463008 0.451147 0.563511 0.751111
P(SURFACE TO J)/SIGMA(J)
0.325485 0.005793 1.143374 0.847224
P(SURFACE TO SURFACE)
0.439773

GROUP 13
P(I TO J)/SIGMA(J)
0.768384 0.010011 0.635698 0.176898 0.548087 0.028607 0.886013 0.183282 0.220246 0.005607
0.918617 0.299297 0.110248 0.002086 0.538368 0.691947
P(I TO SURFACE)
0.459158 0.447192 0.580633 0.749741
P(SURFACE TO J)/SIGMA(J)
0.322779 0.005742 1.137534 0.845680
P(SURFACE TO SURFACE)
0.436687

GROUP 14
P(I TO J)/SIGMA(J)
0.768744 0.009986 0.633207 0.175927 0.546740 0.028591 0.883403 0.182264 0.219383 0.005590
0.916140 0.298336 0.109643 0.002075 0.536858 0.691527
P(I TO SURFACE)
0.456743 0.444739 0.558865 0.748902
P(SURFACE TO J)/SIGMA(J)
0.321081 0.005710 1.133947 0.844734
P(SURFACE TO SURFACE)
0.434790

GROUP 15
P(I TO J)/SIGMA(J)
0.764438 0.009951 0.630407 0.174968 0.544844 0.028568 0.880909 0.181381 0.218413 0.005574
0.914207 0.297629 0.109045 0.002065 0.535385 0.691196
P(I TO SURFACE)
0.454322 0.442570 0.557484 0.748242
P(SURFACE TO J)/SIGMA(J)
0.319379 0.005682 1.131146 0.843989
P(SURFACE TO SURFACE)
0.433222

GROUP 16
P(I TO J)/SIGMA(J)
0.763747 0.009941 0.629482 0.174631 0.544276 0.028561 0.880016 0.181049 0.218092 0.005569
0.913438 0.297339 0.108835 0.002061 0.534884 0.691066
P(I TO SURFACE)
0.453477 0.441763 0.556935 0.747982
P(SURFACE TO J)/SIGMA(J)
0.318785 0.005672 1.130031 0.843695
P(SURFACE TO SURFACE)
0.432618

GROUP 17
P(I TO J)/SIGMA(J)
0.763183 0.009932 0.628721 0.174353 0.543812 0.028555 0.879279 0.180774 0.217829 0.005564
0.912798 0.297098 0.108662 0.002058 0.534431 0.690958
P(I TO SURFACE)
0.452781 0.441095 0.556478 0.747765
P(SURFACE TO J)/SIGMA(J)
0.318296 0.005663 1.129105 0.843451
P(SURFACE TO SURFACE)
0.432118

GROUP 18
P(I TO J)/SIGMA(J)
0.763153 0.009932 0.628513 0.174241 0.543787 0.028555 0.878957 0.180629 0.217756 0.005562
0.912392 0.296934 0.108592 0.002056 0.534136 0.690890
P(I TO SURFACE)
0.452511 0.440750 0.556199 0.747490

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0.318108 0.005853 1.128518 0.843298
P(SURFACE TO SURFACE)
0.431831

GROUP 19
P(I TO J)/SIGMA(J)
0.762784 0.009926 0.628069 0.174090 0.543484 0.028551 0.878565 0.180490 0.217603 0.005580
0.912092 0.296825 0.108498 0.002055 0.533939 0.690939
P(I TO SURFACE)
0.452130 0.440413 0.555975 0.747528
P(SURFACE TO J)/SIGMA(J)
0.317838 0.005655 1.128083 0.843183
P(SURFACE TO SURFACE)
0.431587

GROUP 20
P(I TO J)/SIGMA(J)
0.761364 0.009905 0.626653 0.173678 0.542315 0.028537 0.877549 0.180188 0.217112 0.005553
0.911583 0.296666 0.108242 0.002051 0.533653 0.690749
P(I TO SURFACE)
0.451087 0.439642 0.555611 0.747349
P(SURFACE TO J)/SIGMA(J)
0.317091 0.005645 1.127346 0.842982
P(SURFACE TO SURFACE)
0.431104

GROUP 21
P(I TO J)/SIGMA(J)
0.765970 0.009974 0.630981 0.174863 0.546104 0.028583 0.880406 0.180964 0.218612 0.005571
0.912655 0.296947 0.108980 0.002060 0.534159 0.690943
P(I TO SURFACE)
0.454149 0.441668 0.556379 0.747736
P(SURFACE TO J)/SIGMA(J)
0.319258 0.005671 1.128903 0.843417
P(SURFACE TO SURFACE)
0.432266

GROUP 22
P(I TO J)/SIGMA(J)
0.762270 0.009919 0.627427 0.173867 0.543061 0.028546 0.877980 0.180281 0.217380 0.005556
0.911623 0.296652 0.108359 0.002052 0.533628 0.690759
P(I TO SURFACE)
0.451567 0.439899 0.555641 0.747369
P(SURFACE TO J)/SIGMA(J)
0.317442 0.005648 1.127405 0.843003
P(SURFACE TO SURFACE)
0.431213

GROUP 23
P(I TO J)/SIGMA(J)
0.754459 0.009801 0.619983 0.171801 0.536825 0.028467 0.872989 0.178894 0.214801 0.005524
0.909604 0.296092 0.107072 0.002038 0.532621 0.690398
P(I TO SURFACE)
0.446203 0.436301 0.554195 0.746647
P(SURFACE TO J)/SIGMA(J)
0.313672 0.005602 1.124472 0.842189
P(SURFACE TO SURFACE)
0.429103

GROUP 24
P(I TO J)/SIGMA(J)
0.754656 0.009804 0.620159 0.171846 0.536788 0.028469 0.873094 0.178920 0.214862 0.005525
0.909827 0.296095 0.107100 0.002037 0.532626 0.690402
P(I TO SURFACE)
0.446321 0.436369 0.554212 0.746656
P(SURFACE TO J)/SIGMA(J)
0.313755 0.005603 1.124506 0.842199
P(SURFACE TO SURFACE)
0.429136

GROUP 25
P(I TO J)/SIGMA(J)
0.689920 0.008820 0.557908 0.154595 0.482911 0.027830 0.832641 0.167708 0.193295 0.005269
0.893370 0.291609 0.096348 0.001909 0.524556 0.687492
P(I TO SURFACE)
0.401516 0.407252 0.542574 0.740841
P(SURFACE TO J)/SIGMA(J)
0.282258 0.005229 1.100892 0.835640
P(SURFACE TO SURFACE)
0.412097

GROUP 26
P(I TO J)/SIGMA(J)
0.761128 0.009902 0.626249 0.173536 0.542121 0.028534 0.877163 0.180037 0.216986 0.005551

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P(I TO SURFACE)
0.450712 0.439278 0.555347 0.747225

P(SURFACE TO J)/SIGMA(J)
0.316842 0.005640 1.128810 0.842841

P(SURFACE TO SURFACE)
0.430823

GROUP 27

P(I TO J)/SIGMA(J)
0.760307 0.009889 0.625282 0.173189 0.541445 0.028526 0.876258 0.179716 0.216637 0.005545
0.910503 0.296262 0.107937 0.002046 0.532927 0.890566

P(I TO SURFACE)
0.449838 0.438489 0.554841 0.746984

P(SURFACE TO J)/SIGMA(J)
0.316227 0.005630 1.125782 0.842569

P(SURFACE TO SURFACE)
0.430253

GROUP 28

P(I TO J)/SIGMA(J)
0.764212 0.009948 0.630495 0.175083 0.544658 0.029585 0.881274 0.181578 0.218443 0.005577
0.914821 0.297885 0.109117 0.002067 0.535847 0.891298

P(I TO SURFACE)
0.454587 0.443020 0.557921 0.748445

P(SURFACE TO J)/SIGMA(J)
0.319565 0.005698 1.132033 0.844218

P(SURFACE TO SURFACE)
0.433633

GROUP 29

P(I TO J)/SIGMA(J)
0.765501 0.009967 0.632046 0.175611 0.545718 0.028578 0.882643 0.182060 0.218980 0.005585
0.915868 0.298267 0.109446 0.002072 0.536534 0.891477

P(I TO SURFACE)
0.455920 0.444204 0.558669 0.748803

P(SURFACE TO J)/SIGMA(J)
0.320502 0.005703 1.133550 0.844622

P(SURFACE TO SURFACE)
0.434486

GROUP 30

P(I TO J)/SIGMA(J)
0.765897 0.009973 0.631917 0.175423 0.546043 0.028582 0.882047 0.181736 0.218936 0.005582
0.914853 0.297642 0.109329 0.002069 0.535769 0.891309

P(I TO SURFACE)
0.455491 0.443486 0.557946 0.748467

P(SURFACE TO J)/SIGMA(J)
0.320201 0.005694 1.132083 0.844243

P(SURFACE TO SURFACE)
0.433807

GROUP 31

P(I TO J)/SIGMA(J)
0.764008 0.009945 0.629355 0.174484 0.544491 0.028563 0.879553 0.180803 0.218048 0.005566
0.912677 0.297022 0.108743 0.002058 0.534293 0.890940

P(I TO SURFACE)
0.453137 0.441200 0.556393 0.747730

P(SURFACE TO J)/SIGMA(J)
0.318546 0.005665 1.128932 0.843411

P(SURFACE TO SURFACE)
0.432107

GROUP 32

P(I TO J)/SIGMA(J)
0.763085 0.009931 0.627662 0.173771 0.543731 0.028554 0.877593 0.180004 0.217462 0.005553
0.910641 0.296226 0.108299 0.002049 0.532862 0.890599

P(I TO SURFACE)
0.451378 0.439290 0.554941 0.747048

P(SURFACE TO J)/SIGMA(J)
0.317310 0.005640 1.125986 0.842642

P(SURFACE TO SURFACE)
0.430596

GROUP 33

P(I TO J)/SIGMA(J)
0.759547 0.009878 0.623725 0.172509 0.540819 0.028518 0.874366 0.178930 0.216098 0.005533
0.908462 0.295459 0.107513 0.002037 0.531433 0.890225

P(I TO SURFACE)
0.448164 0.436617 0.553386 0.746302

P(SURFACE TO J)/SIGMA(J)
0.315050 0.005606 1.122831 0.841801

P(SURFACE TO SURFACE)
0.428758

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0.755714	0.295205	0.106881	0.002029	0.531024	0.690056				
P(I TO SURFACE)									
0.445528	0.434874	0.552709	0.745963						
P(SURFACE TO J)/SIGMA(J)									
0.313197	0.005584	1.121456	0.841419						
P(SURFACE TO SURFACE)									
0.427751									
GROUP 35									
P(I TO J)/SIGMA(J)									
0.755714	0.009820	0.620038	0.171476	0.537660	0.028480	0.871856	0.178202	0.214820	0.005517
0.907389	0.295151	0.106869	0.002029	0.530928	0.690035				
P(I TO SURFACE)									
0.445486	0.434787	0.552619	0.745922						
P(SURFACE TO J)/SIGMA(J)									
0.313168	0.005582	1.121275	0.841372						
P(SURFACE TO SURFACE)									
0.427670									
GROUP 36									
P(I TO J)/SIGMA(J)									
0.756637	0.009834	0.620878	0.171697	0.538421	0.028489	0.872378	0.178354	0.215111	0.005520
0.907539	0.295181	0.107007	0.002030	0.530983	0.690063				
P(I TO SURFACE)									
0.446064	0.435139	0.552727	0.745978						
P(SURFACE TO J)/SIGMA(J)									
0.313574	0.005587	1.121493	0.841435						
P(SURFACE TO SURFACE)									
0.427856									
GROUP 37									
P(I TO J)/SIGMA(J)									
0.757603	0.009849	0.621852	0.171983	0.539217	0.028499	0.873086	0.178567	0.215449	0.005525
0.907908	0.295299	0.107185	0.002033	0.531195	0.690128				
P(I TO SURFACE)									
0.446801	0.435681	0.552991	0.746107						
P(SURFACE TO J)/SIGMA(J)									
0.314092	0.005594	1.122028	0.841580						
P(SURFACE TO SURFACE)									
0.428199									
GROUP 38									
P(I TO J)/SIGMA(J)									
0.758254	0.009858	0.622446	0.172140	0.539754	0.028505	0.873458	0.178662	0.215654	0.005527
0.908019	0.295323	0.107283	0.002034	0.531237	0.690148				
P(I TO SURFACE)									
0.447211	0.435933	0.553070	0.746148						
P(SURFACE TO J)/SIGMA(J)									
0.314380	0.005597	1.122190	0.841626						
P(SURFACE TO SURFACE)									
0.428334									
GROUP 39									
P(I TO J)/SIGMA(J)									
0.758666	0.009865	0.622784	0.172217	0.540094	0.028509	0.873630	0.178693	0.215772	0.005528
0.908006	0.295304	0.107331	0.002034	0.531203	0.690147				
P(I TO SURFACE)									
0.447419	0.436024	0.553061	0.746146						
P(SURFACE TO J)/SIGMA(J)									
0.314526	0.005598	1.122171	0.841624						
P(SURFACE TO SURFACE)									
0.428362									
GROUP 40									
P(I TO J)/SIGMA(J)									
0.758846	0.009867	0.622954	0.172264	0.540242	0.028511	0.873742	0.178724	0.215830	0.005529
0.908049	0.295315	0.107360	0.002034	0.531223	0.690155				
P(I TO SURFACE)									
0.447540	0.436104	0.553092	0.746161						
P(SURFACE TO J)/SIGMA(J)									
0.314611	0.005599	1.122234	0.841642						
P(SURFACE TO SURFACE)									
0.428407									
GROUP 41									
P(I TO J)/SIGMA(J)									
0.759154	0.009872	0.623281	0.172365	0.540495	0.028514	0.873997	0.178805	0.215944	0.005531
0.908205	0.295368	0.107423	0.002035	0.531319	0.690182				
P(I TO SURFACE)									
0.447798	0.436309	0.553203	0.746215						
P(SURFACE TO J)/SIGMA(J)									
0.314793	0.005602	1.122460	0.841702						
P(SURFACE TO SURFACE)									

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GROUP 42									
P(I TO J)/SIGMA(J)									
0.759193	0.009872	0.623285	0.172356	0.540527	0.028515	0.873966	0.178786	0.215945	0.005530
0.908143	0.295342	0.107417	0.002035	0.531271	0.690172				
P(I TO SURFACE)									
0.447779	0.436287	0.553159	0.746195						
P(SURFACE TO J)/SIGMA(J)									
0.314780	0.005601	1.122369	0.841679						
P(SURFACE TO SURFACE)									
0.428503									
GROUP 43									
P(I TO J)/SIGMA(J)									
0.759325	0.009874	0.623394	0.172381	0.540636	0.028516	0.874023	0.178797	0.215983	0.005531
0.908140	0.295336	0.107433	0.002035	0.531261	0.690171				
P(I TO SURFACE)									
0.447847	0.436297	0.553157	0.746194						
P(SURFACE TO J)/SIGMA(J)									
0.314827	0.005602	1.122365	0.841679						
P(SURFACE TO SURFACE)									
0.428513									
GROUP 44									
P(I TO J)/SIGMA(J)									
0.759302	0.009874	0.623336	0.172354	0.540617	0.028516	0.873947	0.178764	0.215963	0.005530
0.908054	0.295302	0.107418	0.002035	0.531199	0.690157				
P(I TO SURFACE)									
0.447781	0.436220	0.553095	0.746166						
P(SURFACE TO J)/SIGMA(J)									
0.314781	0.005601	1.122241	0.841647						
P(SURFACE TO SURFACE)									
0.428451									
GROUP 45									
P(I TO J)/SIGMA(J)									
0.758813	0.009867	0.622793	0.172181	0.540214	0.028511	0.873503	0.178617	0.215775	0.005527
0.907755	0.295197	0.107308	0.002033	0.531011	0.690105				
P(I TO SURFACE)									
0.447339	0.435853	0.552882	0.746064						
P(SURFACE TO J)/SIGMA(J)									
0.314470	0.005596	1.121808	0.841532						
P(SURFACE TO SURFACE)									
0.428199									
GROUP 46									
P(I TO J)/SIGMA(J)									
0.757880	0.009853	0.622169	0.172087	0.539445	0.028501	0.873353	0.178658	0.215558	0.005527
0.908099	0.295367	0.107250	0.002034	0.531317	0.690160				
P(I TO SURFACE)									
0.447065	0.435907	0.553126	0.746171						
P(SURFACE TO J)/SIGMA(J)									
0.314277	0.005597	1.122304	0.841653						
P(SURFACE TO SURFACE)									
0.428357									
GROUP 47									
P(I TO J)/SIGMA(J)									
0.755526	0.009817	0.620062	0.171543	0.537505	0.028478	0.872078	0.178347	0.214828	0.005518
0.907789	0.295320	0.106911	0.002030	0.531232	0.690101				
P(I TO SURFACE)									
0.445637	0.435070	0.552904	0.746053						
P(SURFACE TO J)/SIGMA(J)									
0.313274	0.005586	1.121852	0.841520						
P(SURFACE TO SURFACE)									
0.427932									
GROUP 48									
P(I TO J)/SIGMA(J)									
0.754489	0.009802	0.619577	0.171559	0.536650	0.028467	0.872272	0.178559	0.214661	0.005520
0.908643	0.295701	0.106921	0.002033	0.531918	0.690239				
P(I TO SURFACE)									
0.445623	0.435518	0.553511	0.746329						
P(SURFACE TO J)/SIGMA(J)									
0.313264	0.005592	1.123085	0.841831						
P(SURFACE TO SURFACE)									
0.428435									
GROUP 49									
P(I TO J)/SIGMA(J)									
0.752475	0.009771	0.618312	0.171404	0.534989	0.028447	0.872103	0.178719	0.214222	0.005519
0.909591	0.296152	0.106824	0.002034	0.532720	0.690389				
P(I TO SURFACE)									
0.445147	0.435799	0.554183	0.746629						

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P(SURFACE TO SURFACE)
0.428915

GROUP 50

P(I TO J)/SIGMA(J)
0.751170 0.009752 0.617307 0.171197 0.533910 0.028434 0.871683 0.178678 0.213874 0.005516
0.909797 0.296279 0.106695 0.002034 0.532958 0.690418

P(I TO SURFACE)
0.444593 0.435645 0.554329 0.746688

P(SURFACE TO J)/SIGMA(J)
0.312533 0.005593 1.124742 0.842236

P(SURFACE TO SURFACE)
0.428941

GROUP 51

P(I TO J)/SIGMA(J)
0.750575 0.009743 0.616941 0.171156 0.533420 0.028428 0.871647 0.178732 0.213747 0.005516
0.910096 0.296421 0.106670 0.002035 0.533212 0.690466

P(I TO SURFACE)
0.444453 0.435743 0.554540 0.746783

P(SURFACE TO J)/SIGMA(J)
0.312441 0.005595 1.125172 0.842343

P(SURFACE TO SURFACE)
0.429096

GROUP 52

P(I TO J)/SIGMA(J)
0.751025 0.009749 0.617632 0.171427 0.533791 0.028433 0.872380 0.179018 0.213987 0.005520
0.910800 0.296691 0.106838 0.002038 0.533699 0.690584

P(I TO SURFACE)
0.445125 0.436432 0.555041 0.747019

P(SURFACE TO J)/SIGMA(J)
0.312914 0.005604 1.126189 0.842609

P(SURFACE TO SURFACE)
0.429627

GROUP 53

P(I TO J)/SIGMA(J)
0.752038 0.009765 0.618864 0.171847 0.534628 0.028443 0.873472 0.179405 0.214413 0.005527
0.911649 0.297002 0.107100 0.002042 0.534259 0.690729

P(I TO SURFACE)
0.446187 0.437381 0.555647 0.747308

P(SURFACE TO J)/SIGMA(J)
0.313661 0.005616 1.127418 0.842935

P(SURFACE TO SURFACE)
0.430312

GROUP 54

P(I TO J)/SIGMA(J)
0.752617 0.009773 0.619652 0.172136 0.535105 0.028449 0.874240 0.179693 0.214686 0.005532
0.912325 0.297257 0.107280 0.002045 0.534717 0.690843

P(I TO SURFACE)
0.446912 0.438080 0.556128 0.747536

P(SURFACE TO J)/SIGMA(J)
0.314170 0.005625 1.128394 0.843192

P(SURFACE TO SURFACE)
0.430836

GROUP 55

P(I TO J)/SIGMA(J)
0.747724 0.009700 0.612067 0.169163 0.531064 0.028399 0.866169 0.176534 0.212059 0.005481
0.904541 0.294260 0.105427 0.002009 0.529326 0.689538

P(I TO SURFACE)
0.439517 0.430477 0.550587 0.744930

P(SURFACE TO J)/SIGMA(J)
0.308972 0.005527 1.117151 0.840252

P(SURFACE TO SURFACE)
0.424981

GROUP 56

P(I TO J)/SIGMA(J)
0.743947 0.009643 0.607777 0.167771 0.527941 0.028362 0.862601 0.175329 0.210572 0.005459
0.902032 0.293367 0.104560 0.001996 0.527720 0.689113

P(I TO SURFACE)
0.435978 0.427490 0.548801 0.744030

P(SURFACE TO J)/SIGMA(J)
0.306484 0.005489 1.113528 0.839294

P(SURFACE TO SURFACE)
0.422912

GROUP 57

P(I TO J)/SIGMA(J)
0.744513 0.009656 0.612397 0.170164 0.529658 0.028370 0.869642 0.178483 0.212173 0.005503
0.910907 0.296900 0.106064 0.002032 0.534074 0.690562

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0.441112 0.444124 1.111112 1.111112
P(SURFACE TO J)/SIGMA(J)
0.310590 0.005584 1.126178 0.842561
P(SURFACE TO SURFACE)
0.429067

GROUP 58
P(I TO J)/SIGMA(J)
0.733691 0.009487 0.595416 0.163590 0.519445 0.028259 0.851694 0.171501 0.206290 0.005389
0.893800 0.290284 0.101954 0.001952 0.522174 0.687701
P(I TO SURFACE)
0.425400 0.418076 0.542808 0.741258
P(SURFACE TO J)/SIGMA(J)
0.299048 0.005368 1.101368 0.836111
P(SURFACE TO SURFACE)
0.416226

GROUP 59
P(I TO J)/SIGMA(J)
0.722723 0.009321 0.578340 0.156938 0.510338 0.028151 0.833296 0.164363 0.200373 0.005273
0.875808 0.283429 0.097809 0.001971 0.509842 0.684805
P(I TO SURFACE)
0.408814 0.400872 0.530195 0.735472
P(SURFACE TO J)/SIGMA(J)
0.287388 0.005147 1.075775 0.829584
P(SURFACE TO SURFACE)
0.403291

GROUP 60
P(I TO J)/SIGMA(J)
0.722109 0.009312 0.579669 0.157990 0.509825 0.028145 0.836597 0.165928 0.200903 0.005294
0.880427 0.285321 0.098458 0.001889 0.513246 0.685539
P(I TO SURFACE)
0.411300 0.404512 0.533469 0.736939
P(SURFACE TO J)/SIGMA(J)
0.289136 0.005194 1.082419 0.831239
P(SURFACE TO SURFACE)
0.406327

GROUP 61
P(I TO J)/SIGMA(J)
0.714270 0.009193 0.569734 0.153848 0.503304 0.028067 0.825258 0.161666 0.197045 0.005222
0.870058 0.281373 0.095883 0.001840 0.506144 0.683867
P(I TO SURFACE)
0.400938 0.394182 0.526134 0.733598
P(SURFACE TO J)/SIGMA(J)
0.281852 0.005081 1.087535 0.827471
P(SURFACE TO SURFACE)
0.398773

GROUP 62
P(I TO J)/SIGMA(J)
0.716331 0.009224 0.575780 0.157275 0.505020 0.028088 0.835470 0.166058 0.199486 0.005287
0.882173 0.286217 0.098018 0.001890 0.514858 0.685799
P(I TO SURFACE)
0.409316 0.404567 0.534709 0.737457
P(SURFACE TO J)/SIGMA(J)
0.287741 0.005194 1.084935 0.831824
P(SURFACE TO SURFACE)
0.407002

GROUP 63
P(I TO J)/SIGMA(J)
0.695251 0.008903 0.541933 0.144002 0.487446 0.027882 0.797899 0.151492 0.187760 0.005049
0.845145 0.271897 0.089746 0.001724 0.489099 0.679942
P(I TO SURFACE)
0.376187 0.389473 0.508565 0.725755
P(SURFACE TO J)/SIGMA(J)
0.264452 0.004744 1.031889 0.818625
P(SURFACE TO SURFACE)
0.381073

GROUP 64
P(I TO J)/SIGMA(J)
0.691416 0.008844 0.538535 0.143146 0.484244 0.027845 0.795936 0.151021 0.186582 0.005037
0.844644 0.271817 0.089213 0.001719 0.486954 0.679854
P(I TO SURFACE)
0.373936 0.388211 0.508225 0.725580
P(SURFACE TO J)/SIGMA(J)
0.262889 0.004728 1.031199 0.818427
P(SURFACE TO SURFACE)
0.380459

GROUP 65

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WHC-SD-NR-SWD-017

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0.790108 0.250764 0.077357 0.001479 0.451137 0.671779
P(I TO SURFACE)
0.326132 0.317156 0.470011 0.709445
P(SURFACE TO J)/SIGMA(J)
0.229264 0.004072 0.953661 0.800227
P(SURFACE TO SURFACE)
0.344831

GROUP 66
P(I TO J)/SIGMA(J)
0.675256 0.008598 0.519611 0.136976 0.470738 0.027690 0.779395 0.145396 0.180026 0.004932
0.831932 0.267185 0.085358 0.001655 0.480622 0.677886
P(I TO SURFACE)
0.358208 0.354316 0.499325 0.721648
P(SURFACE TO J)/SIGMA(J)
0.251813 0.004549 1.013139 0.813991
P(SURFACE TO SURFACE)
0.371223

GROUP 67
P(I TO J)/SIGMA(J)
0.704936 0.009051 0.580290 0.163155 0.495527 0.027976 0.855839 0.176729 0.201049 0.005416
0.915805 0.300224 0.101683 0.002012 0.540053 0.691221
P(I TO SURFACE)
0.422840 0.428944 0.558428 0.748292
P(SURFACE TO J)/SIGMA(J)
0.297248 0.005507 1.133060 0.844045
P(SURFACE TO SURFACE)
0.428701

GROUP 68
P(I TO J)/SIGMA(J)
0.657377 0.008325 0.510410 0.136712 0.455782 0.027522 0.782878 0.148700 0.176838 0.004954
0.845546 0.273246 0.085203 0.001693 0.491524 0.679878
P(I TO SURFACE)
0.356761 0.361390 0.508944 0.725626
P(SURFACE TO J)/SIGMA(J)
0.250796 0.004640 1.032656 0.818479
P(SURFACE TO SURFACE)
0.378343

GROUP 69
P(I TO J)/SIGMA(J)
0.571200 0.007012 0.397795 0.097620 0.383898 0.026765 0.669243 0.108179 0.137821 0.004235
0.742287 0.234133 0.060840 0.001231 0.421167 0.665139
P(I TO SURFACE)
0.257524 0.262548 0.437399 0.596177
P(SURFACE TO J)/SIGMA(J)
0.181034 0.003371 0.887490 0.785261
P(SURFACE TO SURFACE)
0.312934

COLLISION PROBABILITIES WRITTEN TO FILE 4 (DATA-SET 69)
THESEUS COMPLETED

TIME FROM START 10.4 SECONDS. TIME IN THIS MODULE 0.1 SECONDS. UNUSED REGION THIS MODULE 1168 K BYTES.

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WHC-SD-NR-SWD-017

-C- WPIP 12

READS INTERFACE 12

FORTRAN DATA SETS 66-70

OSNAMES:

CYCLE 2

ALSO READS :

*****

WIMS-E MODULE W-PIP

*****

ALL COLLISION PROBABILITIES WILL BE HELD IN FAST STORE.
UNUSED STORAGE 280499

-M- TOLERA 1E-5
-M- OMEGA 1.25
-M- BEGIN

REGION	1	2	3	4
MATERIAL	1	3	2	3
VOLUMES	2.1382E+00	3.9054E-02	6.1716E+00	3.4309E+00

CALCULATION CONVERGED IN 204 ITERATIONS.

K-INFINITY = 1.329766

FLUX.

REGION	1	5.82745E-02	3.14757E-01	6.73371E-01	1.21300E+00	1.32405E+00	1.27227E+00	1.17384E+00	1.08734E+00	1.02582E+00
		9.83162E-01	9.56942E-01	9.38369E-01	9.27018E-01	9.17541E-01	9.11237E-01	8.19058E-01	8.14341E-01	8.08826E-01
		9.02827E-01	1.57932E-00	1.51879E-00	1.09328E-00	6.96584E-01	8.32069E-01	7.53603E-01	8.32772E-01	1.17284E+00
		2.78377E-01	3.26460E-01	2.97793E-01	4.79547E-01	2.09387E-01	1.84139E-01	3.59666E-02	3.57020E-02	3.68533E-02
		3.80872E-02	3.78644E-02	3.75640E-02	3.88207E-02	3.67648E-02	7.00015E-02	1.13821E-01	1.49343E-01	4.28744E-01
		5.31066E-01	6.78155E-01	4.85620E-01	3.56601E-01	2.69964E-01	2.99232E-01	5.11224E-01	5.94601E-01	9.32630E-01
		1.08363E+00	1.17600E+00	5.80815E-01	3.56520E-01	2.30088E-01	1.89126E-01	1.71103E-01	1.32136E-01	8.27969E-02
		7.20585E-02	6.03148E-02	4.77534E-02	3.44548E-02	2.05720E-02	6.57509E-03			
		3.70345E+01								
TOTAL										
REGION	2	5.47847E-02	2.99879E-01	6.46075E-01	1.18392E+00	1.30127E+00	1.25613E+00	1.18559E+00	1.08280E+00	1.02289E+00
		9.82121E-01	9.56377E-01	9.38233E-01	9.27095E-01	9.17927E-01	9.11612E-01	8.19513E-01	8.14913E-01	8.09563E-01
		8.03697E-01	1.58071E+00	1.52180E+00	1.09740E+00	7.01537E-01	8.34578E-01	7.64326E-01	6.36038E-01	1.17571E+00
		2.76909E-01	3.26962E-01	2.88023E-01	4.79979E-01	2.09489E-01	1.84476E-01	3.60947E-02	3.58263E-02	3.69653E-02
		3.81860E-02	3.79497E-02	3.78390E-02	3.88906E-02	3.68255E-02	7.01066E-02	1.13969E-01	1.49506E-01	4.29054E-01
		5.31416E-01	6.79107E-01	4.87129E-01	3.58318E-01	2.71579E-01	3.01243E-01	5.14906E-01	5.99133E-01	9.40497E-01
		1.09438E+00	1.19047E+00	5.89353E-01	3.82359E-01	2.34202E-01	1.92765E-01	1.74870E-01	1.35134E-01	8.48416E-02
		7.39900E-02	6.21157E-02	4.93587E-02	3.58088E-02	2.16241E-02	7.14712E-03			
		3.70347E+01								
TOTAL										
REGION	3	5.10079E-02	2.83733E-01	6.15963E-01	1.15174E+00	1.27585E+00	1.23792E+00	1.15622E+00	1.07719E+00	1.01952E+00
		9.80919E-01	9.55725E-01	9.38076E-01	9.27187E-01	9.18258E-01	9.12045E-01	8.20039E-01	8.15574E-01	8.10416E-01
		8.04703E-01	1.58346E+00	1.52761E+00	1.10218E+00	7.07148E-01	8.37487E-01	7.76127E-01	6.39815E-01	1.17924E+00
		2.77523E-01	3.27544E-01	2.98290E-01	4.80479E-01	2.09630E-01	1.84866E-01	3.62426E-02	3.59698E-02	3.70945E-02
		3.83002E-02	3.80492E-02	3.77256E-02	3.89715E-02	3.68959E-02	7.02283E-02	1.14141E-01	1.49694E-01	4.29413E-01
		5.31820E-01	6.80205E-01	4.88888E-01	3.60292E-01	2.73432E-01	3.03550E-01	5.19131E-01	6.04334E-01	9.49527E-01
		1.10668E+00	1.20707E+00	5.99102E-01	3.69035E-01	2.38915E-01	1.96920E-01	1.78742E-01	1.38535E-01	8.71734E-02
		7.61856E-02	6.41794E-02	5.11708E-02	3.72999E-02	2.27788E-02	7.76230E-03			
		3.70389E+01								
TOTAL										
REGION	4	5.14103E-02	2.85368E-01	6.17976E-01	1.15370E+00	1.27702E+00	1.23848E+00	1.15639E+00	1.07734E+00	1.01953E+00
		9.80918E-01	9.55722E-01	9.38075E-01	9.27187E-01	9.18261E-01	9.12048E-01	8.20043E-01	8.15572E-01	8.10422E-01
		8.04711E-01	1.58348E+00	1.52766E+00	1.10221E+00	7.07191E-01	8.37490E-01	7.76219E-01	6.39844E-01	1.17927E+00
		2.77527E-01	3.27547E-01	2.98292E-01	4.80481E-01	2.09632E-01	1.84870E-01	3.62438E-02	3.59710E-02	3.70957E-02
		3.83011E-02	3.80491E-02	3.77254E-02	3.89722E-02	3.68964E-02	7.02293E-02	1.14142E-01	1.49695E-01	4.29416E-01
		5.31823E-01	6.80214E-01	4.88882E-01	3.60307E-01	2.73446E-01	3.03567E-01	5.19162E-01	6.04371E-01	9.49589E-01
		1.10679E+00	1.20723E+00	5.99168E-01	3.69107E-01	2.38985E-01	1.96976E-01	1.78807E-01	1.38578E-01	8.72240E-02
		7.62330E-02	6.42516E-02	5.12147E-02	3.73037E-02	2.28020E-02	7.78935E-03			
		3.70484E+01								
TOTAL										

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FOR EACH GROUP, FLUX INTEGRATED OVER MATERIAL 1 TO 5, WITH FLOW AND COLUMN ENTRIES.

GROUP 1	1.24605234E-01	3.14802700E-01	1.78523717E-01	6.17931650E-01
GROUP 2	6.73028357E-01	1.75110115E+00	9.90784525E-01	3.41491403E+00
GROUP 3	1.43983278E+00	3.80150607E+00	2.14545191E+00	7.38679076E+00
GROUP 4	2.59368776E+00	7.10814729E+00	4.00447439E+00	1.37063094E+01
GROUP 5	2.83113911E+00	7.87411323E+00	4.43216357E+00	1.51374159E+01
GROUP 6	2.72043629E+00	7.64002551E+00	4.29819699E+00	1.46586588E+01
GROUP 7	2.50995299E+00	7.13576226E+00	4.01297934E+00	1.36586945E+01
GROUP 8	2.32500411E+00	6.54802206E+00	3.73818202E+00	1.27112082E+01
GROUP 9	2.19344782E+00	6.29213098E+00	3.53787136E+00	1.20234502E+01
GROUP 10	2.10224355E+00	6.05388455E+00	3.40379705E+00	1.15599252E+01
GROUP 11	2.04617826E+00	5.89839365E+00	3.31634823E+00	1.12609201E+01
GROUP 12	2.00646367E+00	5.78947012E+00	3.25509281E+00	1.10510266E+01
GROUP 13	1.98218875E+00	5.72226903E+00	3.21730456E+00	1.09217623E+01
GROUP 14	1.96214334E+00	5.66716553E+00	3.18631941E+00	1.08156283E+01
GROUP 15	1.94845035E+00	5.62882053E+00	3.16475914E+00	1.07420300E+01
GROUP 16	1.75134752E+00	5.06098865E+00	2.84549855E+00	9.65783471E+00
GROUP 17	1.74126081E+00	5.03343660E+00	2.83000602E+00	9.60470344E+00
GROUP 18	1.72946952E+00	5.00159933E+00	2.81210349E+00	9.54317233E+00
GROUP 19	1.71664133E+00	4.96634361E+00	2.79227939E+00	9.47526432E+00
GROUP 20	3.37483911E+00	9.77256646E+00	5.49452282E+00	1.86419284E+01
GROUP 21	3.24326613E+00	9.42787900E+00	5.30068632E+00	1.79718315E+01
GROUP 22	2.33769389E+00	6.80224938E+00	3.82445777E+00	1.29644010E+01
GROUP 23	1.48963935E+00	4.36426479E+00	2.45370757E+00	8.30761171E+00
GROUP 24	1.77916933E+00	5.16855239E+00	2.90594680E+00	9.85366852E+00
GROUP 25	1.61138810E+00	4.78997925E+00	2.69298839E+00	9.09435575E+00
GROUP 26	1.35302201E+00	3.94870917E+00	2.22008747E+00	7.52181865E+00
GROUP 27	2.50740374E+00	7.27786675E+00	4.09188795E+00	1.38771584E+01
GROUP 28	5.90962923E-01	1.71277310E+00	9.62985558E-01	3.26672158E+00
GROUP 29	6.98051393E-01	2.02148257E+00	1.13655542E+00	3.85608938E+00
GROUP 30	6.36754342E-01	1.84094142E+00	1.03505265E+00	3.51274841E+00
GROUP 31	1.02539050E+00	2.96533756E+00	1.66723398E+00	5.65796204E+00
GROUP 32	4.47677366E-01	1.29376459E+00	7.27409577E-01	2.46885054E+00
GROUP 33	3.93734380E-01	1.14092963E+00	6.41475808E-01	2.17613982E+00
GROUP 34	7.69053810E-02	2.23678333E-01	1.25758956E-01	4.26340670E-01
GROUP 35	7.63396803E-02	2.21993034E-01	1.24812597E-01	4.23145311E-01
GROUP 36	7.88013804E-02	2.28934658E-01	1.28715631E-01	4.36451689E-01
GROUP 37	8.14398948E-02	2.36374969E-01	1.32899033E-01	4.50713897E-01
GROUP 38	8.09634744E-02	2.34820274E-01	1.32025080E-01	4.47808828E-01
GROUP 39	8.03210838E-02	2.32829280E-01	1.30905786E-01	4.44056150E-01
GROUP 40	8.30082063E-02	2.40518119E-01	1.35228841E-01	4.58755166E-01
GROUP 41	7.88121569E-02	2.27707595E-01	1.28026313E-01	4.34346065E-01
GROUP 42	1.49680394E-01	4.33423946E-01	2.43688400E-01	8.26792740E-01
GROUP 43	2.43376432E-01	7.04435599E-01	3.96062333E-01	1.34387436E+00
GROUP 44	3.19332395E-01	9.23855536E-01	5.19429527E-01	1.76261748E+00
GROUP 45	9.16761409E-01	2.65018235E+00	1.49004322E+00	5.05698698E+00
GROUP 46	1.13555013E+00	3.28220324E+00	1.84539192E+00	6.26314528E+00
GROUP 47	1.45006335E+00	4.19798365E+00	2.38027571E+00	8.00832270E+00
GROUP 48	1.03837472E+00	3.01712297E+00	1.69633638E+00	5.75183406E+00
GROUP 49	7.62500711E-01	2.22359218E+00	1.25017375E+00	4.23626664E+00
GROUP 50	5.77249977E-01	1.68752838E+00	9.48776201E-01	3.21355456E+00
GROUP 51	6.39831390E-01	1.87340363E+00	1.05327819E+00	3.56851121E+00
GROUP 52	1.09312232E+00	3.20389527E+00	1.80130692E+00	6.09832450E+00
GROUP 53	1.27140244E+00	3.72973628E+00	2.09694036E+00	7.09807908E+00
GROUP 54	1.99419204E+00	5.86014563E+00	3.29468630E+00	1.11490240E+01
GROUP 55	2.31707279E+00	6.83006406E+00	3.84004159E+00	1.29871784E+01
GROUP 56	2.51457946E+00	7.44963889E+00	4.18837809E+00	1.41525964E+01
GROUP 57	1.24192551E+00	3.69744452E+00	2.07870726E+00	7.01807729E+00
GROUP 58	7.62327403E-01	2.27755259E+00	1.28052338E+00	4.32040336E+00
GROUP 59	4.91984299E-01	1.47449882E+00	8.29084179E-01	2.79556730E+00
GROUP 60	4.04297910E-01	1.21531743E+00	6.83335572E-01	2.30305091E+00
GROUP 61	3.65860488E-01	1.10312965E+00	6.20291172E-01	2.08928131E+00
GROUP 62	2.82540146E-01	8.54986017E-01	4.80725922E-01	1.61825199E+00
GROUP 63	1.77040104E-01	5.38003105E-01	3.02571072E-01	1.01761408E+00

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GROUP 66 1.02108543E-01 3.15808755E-01 1.77640770E-01 5.95558069E-01
 GROUP 67 7.36729491E-02 2.30201676E-01 1.29384107E-01 4.33258732E-01
 GROUP 68 4.39880068E-02 1.40588972E-01 7.90762784E-02 2.63653257E-01
 GROUP 69 1.40591611E-02 4.79061440E-02 2.70036973E-02 8.89690023E-02
 7.91889465E-01 2.28591065E-02 1.28555962E-02

PIP COMPLETED

TIME FROM START 11.0 SECONDS. TIME IN THIS MODULE 0.6 SECONDS. UNUSED REGION THIS MODULE 1094 K BYTES.

-C- WCOND 12 8 CYCLE 2
 READS INTERFACE 12 FORTRAN DATA SETS 66-70 OSNAMES:
 WRITES INTERFACE 8 FORTRAN DATA SETS 46-50 OSNAMES:

ALSO READS :

***** WIMS-E MODULE W-CONDENSE *****

-P- GROUPS 9
 -P- ENDP

SPACE AVAILABLE ALLOWS UP TO 99706 NUCLIDE TABULATIONS ON NEW INTERFACE

-M- PART 14 27 45 47 49 52 54 57 69
 -M- BEGIN

DETAILS OF CONDENSATION
 NEW CONDENSED FROM OLD USING FLUXES INTEGRATED OVER MESH(ES)
 MATERIAL MATERIAL

1	1	1
2	2	2
3	3	4

NEW FILE 4

MESHES 4

MATERIAL CODE AND VOLUMES

1	2	3
2.1382E+00	3.9054E-02	6.1716E+00 3.4309E+00

NEW FILE 2

NUCLIDE TABULATIONS 60

GROUPS 9

FISSILE NUCLIDES 11

NUCLIDE IDENTIFICATIONS

2012	2012	6016	29	4083	4095	4099	4101	5103	4103	4105	5105	4108	4109	4113	4115	4127	4131	4133	4134
5135	4135	5135	4143	4145	4147	5147	6147	4148	5148	5149	4149	4150	4151	4152	4153	4154	4155	4157	4902
2232	9233	1233	234	2235	236	927	8238	937	1939	948	6239	1240	1241	1242	951	952	953	1000	1000

NEW FILE 3

MATERIALS 3
 GROUPS 9

NUMBER DENSITIES PRINTED IN MIX

WHC-SD-NR-SWD-017

CONDENSE COMPLETED

TIME FROM START 11.4 SECONDS.

TIME IN THIS MODULE 0.3 SECONDS.

UNUSED REGION THIS MODULE 1126 K BYTES.

***** WIMS-E MODULE W-MIX *****
 READS FILES 2 & 3, FORMS MACROSCOPIC X-SECTIONS AND WRITES THESE TO FILE 3.
 FLUXES ETC READ FROM FILE 1 AND WRITTEN TO FILE 5.

LN 2 LT -1

CROSS-SECTIONS 60

GROUPS 9

MATERIALS 3

NO. OF MATERIALS TO BE PROCESSED AT A TIME 3

UNUSED STORAGE 298266 (IF MATERIALS PROCESSED SINGLY 299115)

MATERIAL	1	NUCLIDE	IDENTIFIER	NUMBER DENSITY
		1	2012	7.9940E-02
		2	6015	2.8380E-03
		3	29	2.0520E-03
		4	4083	1.4195E-09
		5	4095	1.6912E-08
		6	4099	1.6136E-08
		7	4101	1.2911E-08
		8	5103	7.3601E-09
		9	4103	1.2848E-10
		10	4105	1.3632E-09
		11	5105	7.5849E-10
		12	4108	2.3251E-10
		13	4109	1.0330E-10
		14	4113	1.8392E-11
		15	4115	2.8327E-11
		16	4127	6.4551E-10
		17	4131	7.4829E-09
		18	4133	1.7037E-08
		19	4134	6.0213E-12
		20	6135	3.0832E-09
		21	4135	1.4613E-09
		22	5135	3.9570E-09
		23	4143	1.4840E-08
		24	4145	9.8100E-09
		25	4147	2.6252E-09
		26	5147	2.9083E-09
		27	6147	3.9711E-12
		28	4148	6.5692E-12
		29	5148	6.8746E-12
		30	5149	2.0853E-09
		31	4149	6.4796E-10
		32	4150	4.9365E-11
		33	4151	1.0144E-09

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38	4155	7.3001E-11
39	4157	1.5901E-11
40	4902	7.8498E-08
41	2232	1.3030E-03
42	9233	3.9431E-09
43	1233	1.5513E-07
44	234	1.4814E-10
45	2235	1.0746E-04
46	236	6.4622E-08
47	927	1.9583E-11
48	8238	8.1088E-05
49	937	5.9497E-13
50	1939	3.1445E-09
51	948	4.1272E-16
52	6239	1.0090E-09
53	1240	3.6819E-12
54	1241	1.8732E-14
55	1242	1.1793E-17
56	951	1.2243E-18
57	952	9.6003E-20
58	953	1.0831E-19
59	1000	4.1830E-05

NUMBER OF REACTIONS 4

MATERIAL	2	NUCLIDE	IDENTIFIER	NUMBER DENSITY
		2	2012	8.7755E-02
		60	1000	5.4900E-05

NUMBER OF REACTIONS 3

MATERIAL 3 VOID

NUMBER OF REACTIONS 0

WRITING FILE 5

NMESH 4 NGRP 9 NORDER 1

FLUX
 1.28658E+01 1.27349E+01 1.25893E+01 1.25973E+01 1.24324E+01 1.24714E+01 1.25158E+01 1.25162E+01 2.83322E+00 2.83685E+00
 2.84105E+00 2.84109E+00 1.20922E+00 1.21052E+00 1.21202E+00 1.21204E+00 8.42221E-01 8.45447E-01 8.49160E-01 8.49189E-01
 1.08042E+00 1.08773E+00 1.09611E+00 1.09618E+00 1.52723E+00 1.53963E+00 1.55386E+00 1.55396E+00 2.84045E+00 2.87419E+00
 2.91286E+00 2.91318E+00 1.40350E+00 1.43402E+00 1.46870E+00 1.46927E+00

AK	BX	BY	BZ	TC	U
1.3298E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	7.5201E-01

RTIME 0.20000E+01 RIRRAD 0.17685E+03

SPARE ITEMS
 7.04908E-01 6.00000E+01 0.00000E+00 2.30474E+20 5.53547E+17
 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00

MIX COMPLETED

TIME FROM START 11.5 SECONDS. TIME IN THIS MODULE 0.1 SECONDS. UNUSED REGION THIS MODULE 1168 K BYTES.

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-C- FFACE 12
    FLUX  INTERFACE 66      FORTRAN DATA SETS 66-70      DS NAMES:

-C- WCOND 14 7
    READS  INTERFACE 14     FORTRAN DATA SETS 76-80      DS NAMES:
    WRITES INTERFACE 7      FORTRAN DATA SETS 41-45      OS NAMES:

    ALSO READS :
*****      WIMS-E MODULE W-CONDENSE      *****

-P- SUBF
-P- GROUPS 9
-P- ENDP

SPACE AVAILABLE ALLOWS UP TO 99519 NUCLIDE TABULATIONS ON NEW INTERFACE

-M- PART 14 27 45 47 49 52 54 57 69
-M- COND 1 1 1
-M- COND 2 2 1
-M- COND 3 3 1
-M- COND 4 4 1
-M- COND 5 5 1
-M- COND 6 6 3
-M- BEGIN

DETAILS OF CONDENSATION
NEW      OLD      USING FLUXES INTEGRATED OVER      MESH(ES)
MATERIAL CONDENSED FROM MATERIAL

    1          1          1
    2          2          1
    3          3          1
    4          4          1
    5          5          1
    6          6          3

NEW FILE 4
MESHERS      8

MATERIAL CODE AND VOLUMES
    1          2          3          4          5          6          6          6
    3.1416E-02  9.4248E-02  1.5708E-01  2.1991E-01  2.8274E-01  2.0575E+00  2.0575E+00  2.0575E+00

MESH VOLUMES FOR SUBSTITUTE FLUX INTERFACE
2.1382E+00  3.9054E-02  6.1716E+00  3.4309E+00

WARNING. WHEN SUBSTITUTE FLUX USED, NUMBER OF MESHERS AND MESH VOLUMES ON THE TWO INTERFACES SHOULD MATCH,
UNLESS CONDENSING SPECTRA REDEFINED WITH 'COND' CARDS.

NEW FILE 2
NUCLIDE TABULATIONS      22
GROUPS                    9
FISSILE NUCLIDES         0

NUCLIDE IDENTIFICATIONS
2012 2155 2155 2155 2155 2156 2156 2156 2156 2156 2157 2157 2157 2157 2157 2158 2158 2158 2158
2158 1000

NEW FILE 3
MATERIALS      6
GROUPS         9

NUMBER DENSITIES PRINTED IN MIX

UNUSED STORAGE 288126

CONDENSE COMPLETED

    TIME FROM START  11.6 SECONDS.      TIME IN THIS MODULE  0.1 SECONDS.      UNUSED REGION THIS MODULE 1124 K BYTES.

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SNF-4503, Rev. 1
WHC-SD-NR-SWD-017

***** WIMS-E MODULE W-MIX *****
READS FILES 2 & 3, FORMS MACROSCOPIC X-SECTIONS AND WRITES THESE TO FILE 3.
FLUXES ETC READ FROM FILE 1 AND WRITTEN TO FILE 5.

LN 2 LT -1
CROSS-SECTIONS 22
GROUPS 9
MATERIALS 6
NO. OF MATERIALS TO BE PROCESSED AT A TIME 6
UNUSED STORAGE 297024 (IF MATERIALS PROCESSED SINGLY 299157)

MATERIAL	1	NUCLIDE	IDENTIFIER	NUMBER DENSITY
		2	2155	1.2920E-04
		7	2156	9.9967E-20
		12	2157	1.3596E-04
		17	2158	9.9981E-20

NUMBER OF REACTIONS 3

MATERIAL	2	NUCLIDE	IDENTIFIER	NUMBER DENSITY
		3	2155	1.2916E-04
		8	2156	9.9967E-20
		13	2157	1.3577E-04
		18	2158	9.9981E-20

NUMBER OF REACTIONS 3

MATERIAL	3	NUCLIDE	IDENTIFIER	NUMBER DENSITY
		4	2155	1.2905E-04
		9	2156	9.9967E-20
		14	2157	1.3528E-04
		19	2158	9.9981E-20

NUMBER OF REACTIONS 3

MATERIAL	4	NUCLIDE	IDENTIFIER	NUMBER DENSITY
		5	2155	1.2880E-04
		10	2156	9.9967E-20
		15	2157	1.3412E-04
		20	2158	9.9981E-20

NUMBER OF REACTIONS 3

MATERIAL	5	NUCLIDE	IDENTIFIER	NUMBER DENSITY
		6	2155	1.2742E-04
		11	2156	9.9967E-20
		16	2157	1.2782E-04
		21	2158	9.9981E-20

NUMBER OF REACTIONS 3

MATERIAL	6	NUCLIDE	IDENTIFIER	NUMBER DENSITY
		1	2012	8.7755E-02
		22	1000	5.4900E-05

NUMBER OF REACTIONS 3

WRITING FILE 5

NMESH 8 NGRP 9 NORDER 1

FLUX
1.28658E+01 1.28658E+01 1.28658E+01 1.28658E+01 1.28658E+01 1.25893E+01 1.25893E+01 1.25893E+01 1.24324E+01 1.24324E+01
1.24324E+01 1.24324E+01 1.24324E+01 1.25158E+01 1.25158E+01 1.25158E+01 2.83322E+00 2.83322E+00 2.83322E+00 2.83322E+00
2.83322E+00 2.84105E+00 2.84105E+00 2.84105E+00 1.20922E+00 1.20922E+00 1.20922E+00 1.20922E+00 1.20922E+00 1.21202E+00
1.21202E+00 1.21202E+00 8.42221E-01 8.42221E-01 8.42221E-01 8.42221E-01 8.42221E-01 8.42221E-01 8.42221E-01 8.42221E-01
1.08042E+00 1.08042E+00 1.08042E+00 1.08042E+00 1.08042E+00 1.09611E+00 1.09611E+00 1.09611E+00 1.09611E+00 1.09611E+00
1.52723E+00 1.52723E+00 1.52723E+00 1.52723E+00 1.52723E+00 1.52723E+00 1.52723E+00 1.52723E+00 1.52723E+00 1.52723E+00
1.52723E+00 1.52723E+00 1.52723E+00 1.52723E+00 1.52723E+00 1.52723E+00 1.52723E+00 1.52723E+00 1.52723E+00 1.52723E+00
2.84045E+00 2.84045E+00 2.84045E+00 2.84045E+00 2.84045E+00 2.84045E+00 2.84045E+00 2.84045E+00 2.84045E+00 2.84045E+00
1.46870E+00 1.46870E+00

AK BX BY BZ TC U
1.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 1.0000E+00

RTIME 0.20000E+01 RIRRAD 0.17685E+03

SPARE ITEMS
7.04908E-01 2.20000E+01 0.00000E+00 2.30474E+20 5.53547E+17
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00

MIX COMPLETED

TIME FROM START 11.6 SECONDS. TIME IN THIS MODULE 0.0 SECONDS. UNUSED REGION THIS MODULE 1168 K BYTES.

WHC-SD-NR-SWD-017

-C- WTHES 8
 READS INTERFACE 8 FORTRAN DATA SETS 46-50 DSNAMES:
 CYCLE 2

***** WIMS-E MODULE W-THES *****

NR OF MESHES = 4 NR OF MATERIALS = 3 NR OF GROUPS = 9

REGION	1	2	3	4
MATERIAL	1	3	2	3

VOLUMES 2.1382E+00 3.9054E-02 6.1718E+00 3.4309E+00
 UNUSED STORAGE 299853

-M- BEGIN
 COLLISION PROBABILITIES WRITTEN TO FILE 4 (DATA-SET 49)
 THESEUS COMPLETED

TIME FROM START 11.6 SECONDS. TIME IN THIS MODULE 0.0 SECONDS. UNUSED REGION THIS MODULE 1170 K BYTES.

-C- WTHES 7
 READS INTERFACE 7 FORTRAN DATA SETS 41-45 DSNAMES:
 CYCLE 2

***** WIMS-E MODULE W-THES *****

NR OF MESHES = 8 NR OF MATERIALS = 6 NR OF GROUPS = 9

REGION	1	2	3	4	5	6	7	8
MATERIAL	1	2	3	4	5	6	6	6

VOLUMES 3.1416E-02 9.4248E-02 1.5708E-01 2.1991E-01 2.8274E-01 2.0575E+00 2.0575E+00 2.0575E+00
 UNUSED STORAGE 299842

-M- BEGIN
 COLLISION PROBABILITIES WRITTEN TO FILE 4 (DATA-SET 44)
 THESEUS COMPLETED

TIME FROM START 11.6 SECONDS. TIME IN THIS MODULE 0.0 SECONDS. UNUSED REGION THIS MODULE 1170 K BYTES.

WHC-SD-NR-SWD-017

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-C- WMERGE 8 7 11
READS INTERFACE 8          FORTRAN DATA SETS 46-50          DSNAMES:
READS INTERFACE 7          FORTRAN DATA SETS 41-45          DSNAMES:
WRITES INTERFACE 11        FORTRAN DATA SETS 61-65          DSNAMES:

***** WIMS-E MODULE W-MERGE *****

-P- NOIF 2
-P- MULTICELL
-P- ENDP
UNUSED STORAGE 299299

-M- CELL 1 .060042
-M- PCELL 9 .951532 .048468 .7 .3
-M- PRINT 8
-M- BEGIN

INTERFACE 1 OF 2          IDENTIFICATIONS
2012 6016 29 4083 4095 4099 4101 5103 4103
4105 5105 4108 4109 4113 4115 4127 4131 4133 4134
6135 4135 5135 4143 4145 4147 5147 6147 4148 5148
5149 4149 4150 4151 4152 4153 4154 4155 4157 4902
2232 9233 1233 234 2235 236 827 8238 937 1939
948 6239 1240 1241 1242 951 952 953 1000 1000

INTERFACE 2 OF 2          IDENTIFICATIONS
2012 2155 2155 2155 2155 2155 2156 2156 2156 2156
2156 2157 2157 2157 2157 2158 2158 2158 2158
2158 1000
1 61 3 4 5 6 7 8 10
9 11 12 13 14 15 16 17 18 19
20 22 23 24 25 26 27 28 29
30 32 31 33 34 35 36 37 62 63
64 65 66 67 68 69 70 71 72
73 74 75 76 77 78 79 80 81
81 43 42 44 45 46 48 52 53 54
55 40 47 49 50 51 56 57 58 59
60 82
2012 2012 2012 8016 29 4083 4095 4099 4101 4103
5103 4105 4108 4109 4113 4115 4127 4131 4133 4134
4134 4135 5135 6135 4143 4145 4147 5147 6147 4148
5149 4149 4150 4151 4152 4153 4154 4155 2155 2155
2155 2156 4155 2156 2156 2156 2158 2158 2158 2158
2157 2157 2157 2157 2157 2158 2158 2158 2158
2232 1233 9233 234 2235 236 8238 6239 1240 1241
1242 4902 927 937 1939 948 951 952 953 1000
1000 1000

MATERIAL CODE FOR MERGED INTERFACE
1 3 2 3 4 5 6 7 8 9
9 9

INTERFACE 1 OF 2
VOLUMES
2.1382E+00 3.9054E-02 6.1716E+00 3.4309E+00
RD=SUM OF INDIV.VOLS
1.1780E+01

INTERFACE 2 OF 2
VOLUMES
3.1416E-02 9.4248E-02 1.5708E-01 2.1991E-01 2.8274E-01 2.0575E+00 2.0575E+00 2.0575E+00
RD=SUM OF INDIV.VOLS
6.9578E+00

MESH VOLUMES ON MERGED INTERFACE
2.1382E+00 3.9054E-02 6.1716E+00 3.4309E+00 1.8863E-03 5.6588E-03 9.4314E-03 1.3204E-02 1.6976E-02 1.2353E-01
1.2353E-01 1.2353E-01

INTERFACE 1 OF 2
KBC= 5 NGRP= 9 NORDER= 1

INTERFACE 2 OF 2
KBC= 9 NGRP= 9 NORDER= 1

NCPCT= 12 NGRP= 9 NORDER= 1

GROUP 1 REGION TO REGION PROBABILITIES
FROM REGION 1 1.39960 0.02114 2.53906 1.41235 0.00077 0.00229 0.00379 0.00525 0.00660 0.04549 0.04677 0.05043
FROM REGION 2 1.15751 0.03926 2.78261 1.41095 0.00076 0.00227 0.00375 0.00520 0.00653 0.04503 0.04629 0.04992
FROM REGION 3 0.87969 0.01761 3.04239 1.67325 0.00085 0.00256 0.00423 0.00586 0.00736 0.05078 0.05220 0.05629
FROM REGION 4 0.88022 0.01806 3.00991 2.29763 0.00103 0.00307 0.00508 0.00704 0.00884 0.06096 0.06266 0.06758
FROM REGION 5 0.57938 0.01046 1.86341 1.24350 0.13631 0.15274 0.14631 0.15012 0.15473 0.71300 0.49378 0.42706
FROM REGION 6 0.57673 0.01043 1.85807 1.23994 0.05091 0.20628 0.17323 0.15890 0.15946 0.71979 0.49429 0.42669
FROM REGION 7 0.57316 0.01036 1.84657 1.23226 0.02926 0.10394 0.23877 0.19360 0.17186 0.73498 0.49518 0.42578
FROM REGION 8 0.56679 0.01025 1.82605 1.21857 0.02145 0.06810 0.13828 0.26145 0.21179 0.76347 0.49595 0.42371
FROM REGION 9 0.55371 0.01001 1.78392 1.19046 0.01719 0.05315 0.09548 0.16473 0.27882 0.82779 0.49363 0.41767
FROM REGION 10 0.52479 0.00949 1.69073 1.12827 0.01089 0.03297 0.05611 0.08160 0.11376 0.89560 0.54747 0.42062
FROM REGION 11 0.53947 0.00975 1.73804 1.15994 0.00754 0.02264 0.03781 0.05301 0.06784 0.54747 0.73223 0.52283
FROM REGION 12 0.58176 0.01052 1.87430 1.25077 0.00652 0.01955 0.03251 0.04529 0.05740 0.42062 0.52283 0.68076

GROUP 2 REGION TO REGION PROBABILITIES
FROM REGION 1 0.99184 0.01403 1.45931 0.79835 0.00035 0.00104 0.00172 0.00237 0.00293 0.01987 0.02104 0.02407
FROM REGION 2 0.76792 0.03258 1.69170 0.79045 0.00034 0.00102 0.00168 0.00231 0.00286 0.01940 0.02055 0.02350
FROM REGION 3 0.50560 0.01071 1.94516 1.07043 0.00043 0.00129 0.00213 0.00293 0.00363 0.02458 0.02603 0.02978
FROM REGION 4 0.49755 0.00900 1.92553 1.73235 0.00058 0.00174 0.00286 0.00394 0.00488 0.03308 0.03504 0.04008
FROM REGION 5 0.26377 0.00470 0.94189 0.70476 0.13477 0.14390 0.13995 0.14122 0.14320 0.61062 0.38366 0.31878
FROM REGION 6 0.26377 0.00470 0.94189 0.70476 0.13477 0.14390 0.13995 0.14122 0.14320 0.61062 0.38366 0.31878
FROM REGION 7 0.26377 0.00470 0.94189 0.70476 0.13477 0.14390 0.13995 0.14122 0.14320 0.61062 0.38366 0.31878
FROM REGION 8 0.26377 0.00470 0.94189 0.70476 0.13477 0.14390 0.13995 0.14122 0.14320 0.61062 0.38366 0.31878
FROM REGION 9 0.26377 0.00470 0.94189 0.70476 0.13477 0.14390 0.13995 0.14122 0.14320 0.61062 0.38366 0.31878
FROM REGION 10 0.26377 0.00470 0.94189 0.70476 0.13477 0.14390 0.13995 0.14122 0.14320 0.61062 0.38366 0.31878
FROM REGION 11 0.26377 0.00470 0.94189 0.70476 0.13477 0.14390 0.13995 0.14122 0.14320 0.61062 0.38366 0.31878
FROM REGION 12 0.26377 0.00470 0.94189 0.70476 0.13477 0.14390 0.13995 0.14122 0.14320 0.61062 0.38366 0.31878

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FROM REGION 8	0.25542	0.00456	0.91207	0.68245	0.02017	0.06429	0.13190	0.25181	0.20033	0.65678	0.38273	0.31318
FROM REGION 9	0.24622	0.00439	0.87922	0.85787	0.01593	0.04935	0.08915	0.15581	0.26666	0.71527	0.37734	0.30509
FROM REGION 10	0.22919	0.00409	0.81840	0.61237	0.00932	0.02825	0.04815	0.07020	0.09829	0.75671	0.42355	0.30494
FROM REGION 11	0.24275	0.00433	0.86681	0.64859	0.00586	0.01758	0.02929	0.04091	0.05186	0.42355	0.60063	0.40172
FROM REGION 12	0.27766	0.00495	0.99147	0.74186	0.00487	0.01457	0.02416	0.03347	0.04193	0.30494	0.40172	0.55933
GROUP 3 REGION TO REGION PROBABILITIES												
FROM REGION 1	0.99902	0.01413	1.46904	0.80349	0.00034	0.00100	0.00166	0.00228	0.00284	0.01963	0.02097	0.02406
FROM REGION 2	0.77373	0.03265	1.69781	0.79361	0.00033	0.00098	0.00161	0.00222	0.00277	0.01913	0.02043	0.02344
FROM REGION 3	0.50897	0.01074	1.94764	1.07167	0.00041	0.00123	0.00204	0.00281	0.00350	0.02417	0.02581	0.02961
FROM REGION 4	0.50076	0.00903	1.92776	1.73382	0.00056	0.00166	0.00274	0.00378	0.00471	0.03251	0.03473	0.03984
FROM REGION 5	0.25402	0.00452	0.90245	0.67499	0.13270	0.14643	0.13599	0.13581	0.13659	0.58134	0.36603	0.30437
FROM REGION 6	0.25257	0.00449	0.89728	0.67113	0.04881	0.19719	0.16275	0.14458	0.14133	0.58755	0.36598	0.30351
FROM REGION 7	0.25014	0.00445	0.88868	0.66469	0.02720	0.09765	0.22487	0.17891	0.15370	0.60202	0.36635	0.30221
FROM REGION 8	0.24626	0.00438	0.87487	0.65436	0.01940	0.06196	0.12779	0.24302	0.19300	0.62923	0.36658	0.29990
FROM REGION 9	0.23672	0.00425	0.84810	0.63434	0.01518	0.04711	0.08539	0.15011	0.25635	0.69009	0.36379	0.29397
FROM REGION 10	0.22648	0.00403	0.80461	0.60181	0.00888	0.02691	0.04596	0.08725	0.09483	0.74581	0.41719	0.29970
FROM REGION 11	0.24193	0.00430	0.85950	0.64286	0.00559	0.01676	0.02797	0.03918	0.04989	0.41719	0.59545	0.39849
FROM REGION 12	0.27753	0.00494	0.98596	0.73745	0.00485	0.01390	0.02307	0.03206	0.04040	0.29970	0.39849	0.55646
GROUP 4 REGION TO REGION PROBABILITIES												
FROM REGION 1	0.98715	0.01394	1.44572	0.79036	0.00032	0.00094	0.00156	0.00215	0.00270	0.01894	0.02040	0.02348
FROM REGION 2	0.76335	0.03250	1.67737	0.78206	0.00031	0.00092	0.00152	0.00210	0.00263	0.01848	0.01991	0.02291
FROM REGION 3	0.50089	0.01061	1.92992	1.06188	0.00039	0.00117	0.00193	0.00267	0.00334	0.02347	0.02528	0.02910
FROM REGION 4	0.49258	0.00890	1.91014	1.72433	0.00053	0.00158	0.00260	0.00360	0.00451	0.03167	0.03411	0.03926
FROM REGION 5	0.23901	0.00426	0.85486	0.64117	0.13100	0.14409	0.13228	0.13079	0.13045	0.55402	0.34803	0.29029
FROM REGION 6	0.23744	0.00423	0.84923	0.63695	0.04803	0.19328	0.15890	0.13953	0.13516	0.56024	0.34896	0.28936
FROM REGION 7	0.23527	0.00419	0.84148	0.63114	0.02845	0.09534	0.21915	0.17357	0.14749	0.57526	0.34979	0.28842
FROM REGION 8	0.23213	0.00414	0.83027	0.62273	0.01868	0.05980	0.12398	0.23574	0.18632	0.60369	0.35114	0.28704
FROM REGION 9	0.22633	0.00403	0.80951	0.60716	0.01449	0.04505	0.08194	0.14492	0.24801	0.66599	0.35080	0.28314
FROM REGION 10	0.21852	0.00389	0.78157	0.58621	0.00846	0.02566	0.04392	0.06452	0.09166	0.73492	0.41042	0.29398
FROM REGION 11	0.23532	0.00419	0.84167	0.63128	0.00533	0.01598	0.02570	0.03753	0.04821	0.41042	0.59151	0.39445
FROM REGION 12	0.27085	0.00483	0.96875	0.72660	0.00443	0.01325	0.02202	0.03068	0.03891	0.29398	0.39445	0.55274
GROUP 5 REGION TO REGION PROBABILITIES												
FROM REGION 1	0.98332	0.01389	1.44329	0.78911	0.00028	0.00085	0.00140	0.00195	0.00249	0.01831	0.02007	0.02320
FROM REGION 2	0.76059	0.03247	1.67834	0.78268	0.00028	0.00083	0.00137	0.00191	0.00243	0.01791	0.01963	0.02269
FROM REGION 3	0.50005	0.01062	1.93384	1.06378	0.00035	0.00105	0.00174	0.00243	0.00309	0.02277	0.02495	0.02885
FROM REGION 4	0.49180	0.00891	1.91356	1.72533	0.00048	0.00142	0.00235	0.00327	0.00417	0.03069	0.03363	0.03988
FROM REGION 5	0.21504	0.00384	0.77169	0.57824	0.12722	0.13841	0.12345	0.11908	0.11630	0.49271	0.31245	0.26058
FROM REGION 6	0.21326	0.00381	0.76531	0.57346	0.04614	0.18461	0.14971	0.12768	0.12085	0.49885	0.31241	0.25961
FROM REGION 7	0.21178	0.00378	0.75999	0.56947	0.02469	0.08983	0.20653	0.16100	0.13302	0.51521	0.31451	0.25970
FROM REGION 8	0.21051	0.00378	0.75543	0.56605	0.01701	0.05472	0.11500	0.21970	0.17076	0.54684	0.31880	0.26076
FROM REGION 9	0.20884	0.00373	0.74944	0.56158	0.01292	0.04028	0.07390	0.13281	0.22951	0.61675	0.32480	0.26210
FROM REGION 10	0.21122	0.00377	0.75799	0.56797	0.00752	0.02285	0.03933	0.05845	0.08476	0.71541	0.39981	0.28544
FROM REGION 11	0.23150	0.00414	0.83076	0.62250	0.00477	0.01431	0.02401	0.03407	0.04463	0.39981	0.58552	0.39015
FROM REGION 12	0.26764	0.00478	0.96044	0.71967	0.00398	0.01189	0.01983	0.02787	0.03602	0.28544	0.39015	0.54914
GROUP 6 REGION TO REGION PROBABILITIES												
FROM REGION 1	0.97995	0.01385	1.44170	0.78829	0.00024	0.00072	0.00120	0.00169	0.00223	0.01754	0.01967	0.02287
FROM REGION 2	0.75822	0.03245	1.68011	0.78370	0.00024	0.00071	0.00117	0.00166	0.00218	0.01719	0.01928	0.02242
FROM REGION 3	0.49949	0.01063	1.93840	1.06598	0.00030	0.00090	0.00149	0.00211	0.00278	0.02187	0.02453	0.02852
FROM REGION 4	0.49129	0.00892	1.91753	1.72651	0.00041	0.00121	0.00201	0.00284	0.00374	0.02945	0.03303	0.03840
FROM REGION 5	0.18299	0.00328	0.65869	0.49301	0.12231	0.13040	0.11139	0.10352	0.09797	0.41263	0.26377	0.22075
FROM REGION 6	0.18122	0.00324	0.65231	0.48824	0.04347	0.17347	0.13710	0.11185	0.10223	0.41861	0.26393	0.21994
FROM REGION 7	0.18098	0.00324	0.65146	0.48760	0.02228	0.08226	0.19055	0.14421	0.11411	0.43676	0.26796	0.22168
FROM REGION 8	0.18258	0.00327	0.65721	0.49190	0.01479	0.04793	0.10301	0.19979	0.15048	0.47300	0.27858	0.22639
FROM REGION 9	0.18680	0.00334	0.67241	0.50328	0.01089	0.03408	0.06340	0.11704	0.20693	0.55277	0.29158	0.23520
FROM REGION 10	0.20233	0.00362	0.72831	0.54512	0.00830	0.01918	0.03334	0.05056	0.07596	0.69127	0.38657	0.27474
FROM REGION 11	0.22689	0.00406	0.81670	0.61128	0.00403	0.01209	0.02046	0.02956	0.04007	0.38657	0.57789	0.38461
FROM REGION 12	0.26383	0.00472	0.94966	0.71080	0.00337	0.01009	0.01692	0.02420	0.03232	0.27474	0.38461	0.54447
GROUP 7 REGION TO REGION PROBABILITIES												
FROM REGION 1	0.98330	0.01390	1.44894	0.79208	0.00016	0.00049	0.00083	0.00124	0.00179	0.01638	0.01911	0.02245
FROM REGION 2	0.76127	0.03250	1.68715	0.78739	0.00016	0.00048	0.00082	0.00121	0.00175	0.01606	0.01873	0.02201
FROM REGION 3	0.50201	0.01068	1.94470	1.06897	0.00020	0.00061	0.00104	0.00154	0.00222	0.02039	0.02379	0.02795
FROM REGION 4	0.49365	0.00896	1.92299	1.72847	0.00027	0.00082	0.00139	0.00207	0.00299	0.02742	0.03196	0.03757
FROM REGION 5	0.12398	0.00222	0.44542	0.33291	0.11267	0.11365	0.08768	0.07461	0.06545	0.26999	0.17473	0.14710
FROM REGION 6	0.12301	0.00220	0.44195	0.33032	0.03788	0.15229	0.11216	0.08225	0.06909	0.27586	0.17580	0.14721
FROM REGION 7	0.12590	0.00225	0.45231	0.33606	0.01754	0.06730	0.16144	0.11270	0.08026	0.29718	0.12384	0.15259

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FROM REGION 9	0.14999	0.00289	0.53882	0.40276	0.00727	0.02303	0.04460	0.08879	0.16897	0.44226	0.23414	0.19863
FROM REGION 10	0.18897	0.00338	0.67892	0.50744	0.00412	0.01264	0.02269	0.03857	0.06078	0.65242	0.36471	0.25694
FROM REGION 11	0.22042	0.00395	0.79192	0.59189	0.00267	0.00805	0.01404	0.02149	0.03218	0.36471	0.56464	0.37474
FROM REGION 12	0.25899	0.00484	0.93048	0.69545	0.00225	0.00674	0.01165	0.01761	0.02592	0.25694	0.37474	0.53594

GROUP 8 REGION TO REGION PROBABILITIES

FROM REGION 1	0.96554	0.01361	1.40775	0.76838	0.00002	0.00005	0.00013	0.00032	0.00090	0.01426	0.01759	0.02102
FROM REGION 2	0.74505	0.03224	1.64757	0.76457	0.00002	0.00005	0.00013	0.00032	0.00088	0.01399	0.01725	0.02062
FROM REGION 3	0.48773	0.01043	1.90623	1.04746	0.00002	0.00007	0.00016	0.00041	0.00113	0.01791	0.02209	0.02640
FROM REGION 4	0.47888	0.00870	1.88420	1.70813	0.00003	0.00009	0.00022	0.00055	0.00153	0.02422	0.02988	0.03571
FROM REGION 5	0.01175	0.00021	0.04259	0.03202	0.07889	0.05632	0.02474	0.01280	0.00713	0.02447	0.01620	0.01392
FROM REGION 6	0.01355	0.00024	0.04913	0.03894	0.01877	0.08969	0.04379	0.01757	0.00896	0.02923	0.01904	0.01614
FROM REGION 7	0.01981	0.00035	0.07179	0.05399	0.00495	0.02627	0.00866	0.03953	0.01542	0.04524	0.02861	0.02401
FROM REGION 8	0.03498	0.00063	0.12679	0.09534	0.00183	0.00753	0.02824	0.00835	0.03873	0.08719	0.05259	0.04349
FROM REGION 9	0.07545	0.00135	0.27350	0.20566	0.00079	0.00299	0.00857	0.03013	0.09102	0.22085	0.12074	0.09741
FROM REGION 10	0.16447	0.00295	0.59619	0.44830	0.00037	0.00134	0.00345	0.00932	0.03035	0.60171	0.33457	0.23193
FROM REGION 11	0.20291	0.00364	0.73554	0.55309	0.00025	0.00087	0.00218	0.00562	0.01659	0.33457	0.54410	0.35856
FROM REGION 12	0.24250	0.00434	0.87906	0.66101	0.00021	0.00074	0.00183	0.00465	0.01339	0.23193	0.35856	0.52129

GROUP 9 REGION TO REGION PROBABILITIES

FROM REGION 1	0.89243	0.01240	1.24409	0.67573	0.00000	0.00000	0.00000	0.00000	0.00024	0.01174	0.01476	0.01793
FROM REGION 2	0.67871	0.03122	1.49113	0.67580	0.00000	0.00000	0.00000	0.00000	0.00024	0.01156	0.01454	0.01766
FROM REGION 3	0.43103	0.00944	1.75687	0.96603	0.00000	0.00000	0.00000	0.00001	0.00032	0.01539	0.01936	0.02352
FROM REGION 4	0.42114	0.00769	1.73772	1.63439	0.00000	0.00000	0.00000	0.00001	0.00044	0.02141	0.02693	0.03271
FROM REGION 5	0.00000	0.00000	0.00000	0.00000	0.02968	0.00612	0.00017	0.00001	0.00000	0.00000	0.00000	0.00000
FROM REGION 6	0.00000	0.00000	0.00001	0.00000	0.00204	0.02975	0.00413	0.00010	0.00000	0.00000	0.00000	0.00000
FROM REGION 7	0.00002	0.00000	0.00008	0.00006	0.00003	0.00248	0.02979	0.00376	0.00008	0.00005	0.00003	0.00003
FROM REGION 8	0.00050	0.00001	0.00188	0.00145	0.00000	0.00004	0.00269	0.02996	0.00376	0.00126	0.00079	0.00066
FROM REGION 9	0.02028	0.00036	0.07678	0.05937	0.00000	0.00000	0.00005	0.00292	0.03111	0.06434	0.03561	0.02894
FROM REGION 10	0.13539	0.00243	0.51250	0.39625	0.00000	0.00000	0.00000	0.00014	0.00884	0.57863	0.31633	0.21567
FROM REGION 11	0.17030	0.00306	0.64468	0.49945	0.00000	0.00000	0.00000	0.00008	0.00492	0.31633	0.52496	0.34124
FROM REGION 12	0.20688	0.00372	0.78314	0.60551	0.00000	0.00000	0.00000	0.00007	0.00398	0.21567	0.34124	0.50398

MERGE OPERATION COMPLETE

TIME FROM START 12.1 SECONDS.

TIME IN THIS MODULE

0.4 SECONDS.

UNUSED REGION THIS MODULE: 168 K BYTES.

***** WIMS-E MODULE W-MIX *****
 READS FILES 2 & 3, FORMS MACROSCOPIC X-SECTIONS AND WRITES THESE TO FILE 3.
 FLUXES ETC READ FROM FILE 1 AND WRITTEN TO FILE 5.

LN 3 LT 2

CROSS-SECTIONS 82

GROUPS 9

MATERIALS 9

NO. OF MATERIALS TO BE PROCESSED AT A TIME 9

UNUSED STORAGE 295488 (IF MATERIALS PROCESSED SINGLY 298905)

MATERIAL	1	NUCLIDE	IDENTIFIER	NUMBER DENSITY
		1	2012	7.9940E-02
		4	6016	2.8380E-03
		5	29	2.0520E-03
		6	4083	1.4195E-09
		7	4095	1.6912E-08
		8	4099	1.6136E-08
		9	4101	1.2911E-08
		10	4103	1.2848E-10
		11	5103	7.3601E-09
		12	4105	1.3632E-09
		13	5105	7.5849E-10
		14	4108	2.3251E-10
		15	4109	1.0330E-10
		16	4113	2.8392E-11
		17	4115	2.8327E-11
		18	4127	6.4551E-10
		19	4131	7.4822E-09
		20	4133	1.7037E-08
		21	4134	6.0213E-12
		22	4135	1.4613E-09
		23	5135	3.9570E-09
		24	6135	3.0832E-09
		25	4143	1.4840E-08
		26	4145	9.8100E-09
		27	4147	2.6252E-09
		28	5147	2.9083E-09
		29	6147	3.9711E-12
		30	4148	6.5692E-12
		31	5148	6.2746E-12
		32	4149	6.4795E-10
		33	5149	2.0855E-09
		34	4150	4.3365E-11
		35	4151	1.0040E-11

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	44	4155	7.3001E-11
	55	4157	1.5901E-11
	61	2232	1.3030E-03
	62	1233	1.5513E-07
	63	9233	3.9431E-09
	64	234	1.4814E-10
	65	2235	1.0745E-04
	66	236	6.4622E-08
	67	8238	8.1088E-06
	68	6239	1.0090E-09
	69	1240	3.6819E-12
	70	1241	1.8732E-14
	71	1242	1.1798E-17
	72	4902	7.8498E-08
	73	927	1.9583E-11
	74	937	5.9497E-13
	75	1939	3.1445E-09
	76	948	4.1272E-16
	77	951	1.2243E-18
	78	952	9.6009E-20
	79	953	1.0881E-19
	80	1000	4.1830E-05
NUMBER OF REACTIONS 4			
MATERIAL 2	NUCLIDE	IDENTIFIER	NUMBER DENSITY
	2	2012	8.7755E-02
	81	1000	5.4900E-05
NUMBER OF REACTIONS 3			
MATERIAL 3	VOID		
NUMBER OF REACTIONS 0			
MATERIAL 4	NUCLIDE	IDENTIFIER	NUMBER DENSITY
	39	2155	1.2920E-04
	45	2156	9.9967E-20
	50	2157	1.3596E-04
	56	2158	9.9981E-20
NUMBER OF REACTIONS 3			
MATERIAL 5	NUCLIDE	IDENTIFIER	NUMBER DENSITY
	40	2155	1.2916E-04
	46	2156	9.9967E-20
	51	2157	1.3577E-04
	57	2158	9.9981E-20
NUMBER OF REACTIONS 3			
MATERIAL 6	NUCLIDE	IDENTIFIER	NUMBER DENSITY
	41	2155	1.2905E-04
	47	2156	9.9967E-20
	52	2157	1.3528E-04
	58	2158	9.9981E-20
NUMBER OF REACTIONS 3			
MATERIAL 7	NUCLIDE	IDENTIFIER	NUMBER DENSITY
	42	2155	1.2880E-04
	48	2156	9.9967E-20
	53	2157	1.3412E-04
	59	2158	9.9981E-20
NUMBER OF REACTIONS 3			
MATERIAL 8	NUCLIDE	IDENTIFIER	NUMBER DENSITY
	43	2155	1.2742E-04
	49	2156	9.9967E-20
	54	2157	1.2782E-04
	60	2158	9.9981E-20
NUMBER OF REACTIONS 3			
MATERIAL 9	NUCLIDE	IDENTIFIER	NUMBER DENSITY
	3	2012	8.7755E-02
	82	1000	5.4900E-05
NUMBER OF REACTIONS 3			

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READING FILE 1
LT1 2 LI 2
NMESH 4 NGRP 9 NORDER 1
FLUX
1.28658E+01 1.27349E+01 1.25893E+01 1.25973E+01 1.24324E+01 1.24714E+01 1.25158E+01 1.25162E+01 2.83322E+00 2.83685E+00
2.84105E+00 2.84109E+00 1.20922E+00 1.21052E+00 1.21202E+00 1.21204E+00 8.42221E-01 8.45447E-01 8.49160E-01 8.49189E-01
1.08042E+00 1.08773E+00 1.09611E+00 1.09616E+00 1.52723E+00 1.53963E+00 1.55386E+00 1.55396E+00 2.84045E+00 2.87419E+00
2.91286E+00 2.91318E+00 1.40350E+00 1.43402E+00 1.46870E+00 1.46927E+00
NMESH 8 NGRP 9 NORDER 1
FLUX
1.28658E+01 1.28658E+01 1.28658E+01 1.28658E+01 1.28658E+01 1.25893E+01 1.25893E+01 1.25893E+01 1.24324E+01 1.24324E+01
1.24324E+01 1.24324E+01 1.24324E+01 1.25158E+01 1.25158E+01 1.25158E+01 2.83322E+00 2.83322E+00 2.83322E+00 2.83322E+00
2.83322E+00 2.84105E+00 2.84105E+00 2.84105E+00 2.84105E+00 1.20922E+00 1.20922E+00 1.20922E+00 1.20922E+00 1.21202E+00
1.21202E+00 1.21202E+00 8.42221E-01 8.42221E-01 8.42221E-01 8.42221E-01 8.42221E-01 8.42221E-01 8.49160E-01 8.49160E-01
1.08042E+00 1.08042E+00 1.08042E+00 1.08042E+00 1.08042E+00 1.09611E+00 1.09611E+00 1.09611E+00 1.52723E+00 1.52723E+00
1.52723E+00 1.52723E+00 1.52723E+00 1.5386E+00 1.5386E+00 1.5386E+00 1.5386E+00 2.84045E+00 2.84045E+00 2.84045E+00
2.84045E+00 2.91286E+00 2.91286E+00 2.91286E+00 2.91286E+00 1.40350E+00 1.40350E+00 1.40350E+00 1.40350E+00 1.40350E+00
1.46870E+00 1.46870E+00
AK BX BY BZ TC U
0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
RTIME 0.20000E+01 RIRRAD 0.17685E+03
WRITING FILE 5
NMESH 12 NGRP 9 NORDER 1
FLUX
1.28658E+01 1.27349E+01 1.25893E+01 1.25973E+01 1.28658E+01 1.28658E+01 1.28658E+01 1.28658E+01 1.28658E+01 1.28658E+01 1.25893E+01
1.25893E+01 1.25893E+01 1.24324E+01 1.24714E+01 1.25158E+01 1.25162E+01 1.24324E+01 1.24324E+01 1.24324E+01 1.24324E+01
1.24324E+01 1.25158E+01 1.25158E+01 1.25158E+01 2.83322E+00 2.83685E+00 2.84105E+00 2.84109E+00 2.83322E+00 2.83322E+00
2.83322E+00 2.83322E+00 2.83322E+00 2.84105E+00 2.84105E+00 2.84105E+00 1.20922E+00 1.21052E+00 1.21202E+00 1.21204E+00
1.20922E+00 1.20922E+00 1.20922E+00 1.20922E+00 1.20922E+00 1.21202E+00 1.21202E+00 1.21202E+00 8.42221E-01 8.45447E-01
8.49160E-01 8.49189E-01 8.42221E-01 8.42221E-01 8.42221E-01 8.42221E-01 8.42221E-01 8.42221E-01 8.49160E-01 8.49189E-01
1.08042E+00 1.08773E+00 1.09611E+00 1.09616E+00 1.08042E+00 1.08042E+00 1.08042E+00 1.08042E+00 1.08042E+00 1.09611E+00
1.09611E+00 1.09611E+00 1.52723E+00 1.53963E+00 1.55386E+00 1.55396E+00 1.52723E+00 1.52723E+00 1.52723E+00 1.52723E+00
1.52723E+00 1.55386E+00 1.55386E+00 1.55386E+00 1.55386E+00 2.84045E+00 2.87419E+00 2.91286E+00 2.91318E+00 2.84045E+00
2.84045E+00 2.84045E+00 2.84045E+00 2.91286E+00 2.91286E+00 2.91286E+00 2.91286E+00 1.40350E+00 1.43402E+00 1.46870E+00
1.46927E+00
AK BX BY BZ TC U
0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00
RTIME 0.20000E+01 RIRRAD 0.17685E+03
SPARE ITEMS
7.04908E-01 8.20000E+01 0.00000E+00 2.30474E+20 5.53547E+17
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
MIX COMPLETED
TIME FROM START 12.2 SECONDS. TIME IN THIS MODULE 0.1 SECONDS. UNUSED REGION THIS MODULE 1166 K BYTES.

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-C- WPIP 11 CYCLE 2
READS INTERFACE 11 FORTRAN DATA SETS 61-65 DS NAMES:
ALSO READS :
***** WIMS-E MODULE W-PIP *****
ALL COLLISION PROBABILITIES WILL BE HELD IN FAST STORE.
UNUSED STORAGE 296365
-M- BEGIN
REGION 1 2 3 4 5 6 7 8 9 10
11 12
MATERIAL 1 3 2 3 4 5 6 7 8 9
9 9
VOLUMES 2.1382E+00 3.9054E-02 6.1716E+00 3.4309E+00 1.8863E-03 5.6588E-03 9.4314E-03 1.3204E-02 1.6976E-02 1.2353E-01
1.2353E-01 1.2353E-01
CALCULATION CONVERGED IN 54 ITERATIONS.
K-INFINITY = 0.917740

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SNF-4503, Rev. 1
WHC-SD-NR-SWD-017

FLUX

REGION	1	1.20882E+01	1.17558E+01	2.54220E+00	9.78010E-01	6.24762E-01	7.54353E-01	1.00590E+00	1.75797E+00	8.28718E-01
TOTAL		3.23359E+01								
REGION	2	1.19585E+01	1.17922E+01	2.54576E+00	9.79636E-01	6.27496E-01	7.59765E-01	1.01432E+00	1.77904E+00	8.46625E-01
TOTAL		3.23034E+01								
REGION	3	1.18084E+01	1.18347E+01	2.54918E+00	9.80930E-01	6.29948E-01	7.64699E-01	1.02144E+00	1.79705E+00	8.63919E-01
TOTAL		3.22503E+01								
REGION	4	1.18066E+01	1.18360E+01	2.54820E+00	9.80079E-01	6.28937E-01	7.62840E-01	1.01770E+00	1.78806E+00	8.59599E-01
TOTAL		3.22279E+01								
REGION	5	1.73225E+01	1.77202E+01	3.60609E+00	1.31037E+00	7.40164E-01	7.45523E-01	6.46958E-01	1.06001E-01	8.87003E-07
TOTAL		4.21978E+01								
REGION	6	1.73203E+01	1.77192E+01	3.60395E+00	1.30901E+00	7.38793E-01	7.43826E-01	6.47666E-01	1.23547E-01	7.39092E-06
TOTAL		4.22064E+01								
REGION	7	1.73158E+01	1.77221E+01	3.60719E+00	1.31136E+00	7.42487E-01	7.52673E-01	6.72953E-01	1.83595E-01	1.11042E-04
TOTAL		4.23083E+01								
REGION	8	1.73078E+01	1.77299E+01	3.61726E+00	1.31848E+00	7.52708E-01	7.75441E-01	7.31804E-01	3.32881E-01	2.54835E-03
TOTAL		4.25686E+01								
REGION	9	1.72914E+01	1.77483E+01	3.64166E+00	1.33514E+00	7.75748E-01	8.24771E-01	8.55000E-01	7.52656E-01	1.11722E-01
TOTAL		4.33384E+01								
REGION	10	1.72558E+01	1.78077E+01	3.72573E+00	1.39049E+00	8.47084E-01	9.65864E-01	1.16874E+00	1.81486E+00	8.50054E-01
TOTAL		4.58263E+01								
REGION	11	1.72774E+01	1.78232E+01	3.76066E+00	1.41535E+00	8.77995E-01	1.02435E+00	1.28767E+00	2.10710E+00	1.00030E-00
TOTAL		4.85740E+01								
REGION	12	1.73327E+01	1.78163E+01	3.77288E+00	1.42559E+00	8.90281E-01	1.04689E+00	1.33249E+00	2.21603E+00	1.05701E+00
TOTAL		4.68901E+01								

FOR EACH GROUP, FLUX INTEGRALS OVER MATERIALS 1 TO 9, WITH ROW AND COLUMN TOTALS.

GROUP 1	2.58474488E+01	7.28775223E+01	4.09743317E+01	3.26749138E-02	9.80127680E-02	1.63312153E-01
	2.28531257E-01	2.93546551E-01	6.40722816E+00	1.46922607E-02		
GROUP 2	2.51368349E+01	7.30397204E+01	4.10688247E+01	3.34251950E-02	1.00270012E-01	1.67143574E-01
	2.34103744E-01	3.01304425E-01	6.60256754E+00	1.46683995E-02		
GROUP 3	5.43585818E+00	1.57328421E+01	8.84205769E+00	6.80207117E-03	2.03941325E-02	3.40207441E-02
	4.77620178E-02	8.18225298E-02	1.39090994E+00	3.15722694E-01		
GROUP 4	2.09122613E+00	6.05395321E+00	3.40082275E+00	2.47171014E-03	7.40743548E-03	1.23679069E-02
	1.74090755E-02	2.26659330E-02	5.22727682E-01	1.21310518E+01		
GROUP 5	1.33589529E+00	3.88781379E+00	2.18233248E+00	1.39615251E-03	4.18089768E-03	7.00248429E-03
	9.93870536E-03	1.31694607E-02	3.23084947E-01	7.76481401E+00		
GROUP 6	1.81299363E+00	4.71945372E+00	2.64690886E+00	1.40626138E-03	4.20917963E-03	7.09873811E-03
	1.02388625E-02	1.40017124E-02	3.75187125E-01	9.39149809E+00		
GROUP 7	2.15085720E+00	6.30398425E+00	3.53123923E+00	1.22033763E-03	3.68502776E-03	6.34687012E-03
	9.86268169E-03	1.45148854E-02	4.68061577E-01	1.24895521E+01		
GROUP 8	3.75897730E+00	1.10907275E+01	6.20414511E+00	1.99947404E-04	6.99132074E-04	1.73155149E-03
	4.39269575E-03	1.27774458E-02	7.58253400E-01	2.18319041E+01		
GROUP 9	1.77200337E+00	5.33180234E+00	2.98227194E+00	1.87313107E-09	4.18239094E-08	1.04727872E-06
	3.36481645E-05	1.89664277E-03	3.59159702E-01	1.04471687E+01		
	6.91420928E+01	1.99037820E+02	1.11832734E+02	7.95965905E-02	2.38838427E-01	3.99025069E-01
	5.62072689E-01	7.35699586E-01	1.72071801E+01			

PIP COMPLETED

TIME FROM START 12.3 SECONDS. TIME IN THIS MODULE 0.1 SECONDS. UNUSED REGION THIS MODULE 1158 K BYTES.

WHC-SD-NR-SWD-017

-C- WJED 11

READS INTERFACE 11

FORTRAN DATA SETS 61-65

DSNAMES:

CYCLE 2

***** WIMS-E MODULE W-JED *****

EDITED RESULTS FROM A MAIN TRANSPORT CALCULATION

DIMENSION NUMBERS
 MESHES GROUPS ORDERS MATPLS XSECTS
 12 9 1 9 82

UNUSED STORAGE 298532

I= 10, NREGION= 12

-M- OPTION 4
 -M- REGION 1 1
 -M- BEGIN
 -M- *

ZONE	VOLUME	MATERIAL
1	0.21382E+01	1
2	0.39054E-01	3
3	0.61716E-01	2
4	0.34309E-01	3
5	0.18863E-02	4
6	0.56588E-02	5
7	0.94314E-02	6
8	0.13204E-01	7
9	0.16976E-01	8
10	0.12353E+00	9
11	0.12353E+00	9
12	0.12353E+00	9

FLUX SCALE FACTOR 1.000000E+00

FEW-GROUP REGIONAL AND CELL EDIT, INTEGRATED AND AVERAGED FLUXES, TOTAL EVENTS

REGION 1 MATERIAL 1 VOLUME 2.138246E+00

GROUP	REACTIONS				TRANSPORTS		FLUXES	
	ABSORPTION	SCATTER	FISSION	MU*FISSION	RADIAL	AXIAL	FLUX*VOL	FLUX
1	1.57170E-02	8.05812E+00	5.55052E-03	1.35827E-02	6.33305E+00	6.33305E+00	2.58474E+01	1.20882E+01
2	2.77116E-01	1.04787E+01	5.76620E-02	1.40405E-01	1.01747E+01	1.01747E+01	2.51368E+01	1.17558E+01
3	3.36418E-02	2.22020E+00	2.20720E-02	5.38912E-02	2.15506E+00	2.15506E+00	5.43586E+00	2.54220E+00
4	2.61809E-02	8.54236E-01	1.92579E-02	4.68344E-02	8.51058E-01	8.51058E-01	2.09123E+00	9.78010E-01
5	2.83987E-02	5.45732E-01	2.08443E-02	5.06890E-02	5.51266E-01	5.51266E-01	1.33590E+00	6.24762E-01
6	4.57006E-02	6.58974E-01	3.28408E-02	7.98573E-02	6.74154E-01	6.74154E-01	1.81299E+00	7.54353E-01
7	6.00743E-02	8.78802E-01	4.26482E-02	1.03695E-01	8.92802E-01	8.92802E-01	2.15086E+00	1.00590E+00
8	1.32752E-01	1.55465E+00	9.29848E-02	2.26049E-01	1.61108E+00	1.61108E+00	3.75898E+00	1.75797E+00
9	1.18510E-01	7.60143E-01	8.34856E-02	2.02900E-01	8.75284E-01	8.75284E-01	1.77200E+00	8.28718E-01
TOTAL	7.38042E-01	2.60095E+01	3.77346E-01	9.17704E-01			6.91421E+01	3.23359E+01

CELL VOLUME 2.138246E+00

GROUP	REACTIONS				TRANSPORTS		FLUXES	
	ABSORPTION	SCATTER	FISSION	MU*FISSION	RADIAL	AXIAL	FLUX*VOL	FLUX
1	1.57170E-02	8.05812E+00	5.55052E-03	1.35827E-02	6.33305E+00	6.33305E+00	2.58474E+01	1.20882E+01
2	2.77116E-01	1.04787E+01	5.76620E-02	1.40405E-01	1.01747E+01	1.01747E+01	2.51368E+01	1.17558E+01
3	3.36418E-02	2.22020E+00	2.20720E-02	5.38912E-02	2.15506E+00	2.15506E+00	5.43586E+00	2.54220E+00
4	2.61809E-02	8.54236E-01	1.92579E-02	4.68344E-02	8.51058E-01	8.51058E-01	2.09123E+00	9.78010E-01
5	2.83987E-02	5.45732E-01	2.08443E-02	5.06890E-02	5.51266E-01	5.51266E-01	1.33590E+00	6.24762E-01
6	4.57006E-02	6.58974E-01	3.28408E-02	7.98573E-02	6.74154E-01	6.74154E-01	1.81299E+00	7.54353E-01
7	6.00743E-02	8.78802E-01	4.26482E-02	1.03695E-01	8.92802E-01	8.92802E-01	2.15086E+00	1.00590E+00
8	1.32752E-01	1.55465E+00	9.29848E-02	2.26049E-01	1.61108E+00	1.61108E+00	3.75898E+00	1.75797E+00
9	1.18510E-01	7.60143E-01	8.34856E-02	2.02900E-01	8.75284E-01	8.75284E-01	1.77200E+00	8.28718E-01
TOTAL	7.38042E-01	2.60095E+01	3.77346E-01	9.17704E-01			6.91421E+01	3.23359E+01

SCATTERING MATRIX

1	2	3	4	5	6	7	8	9
1	7.8321E+00	2.2608E-01	1.6409E-16	2.8671E-17	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2	0.0000E+00	1.0319E-01	1.5924E-01	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3	0.0000E+00	2.3708E-03	2.0139E-00	1.7695E-01	1.7194E-02	6.4182E-03	2.4452E-03	8.4912E-04
4	0.0000E+00	0.0000E+00	5.8316E-02	5.5145E-01	1.3653E-01	6.4455E-02	3.0143E-02	1.2079E-02
5	0.0000E+00	0.0000E+00	3.1560E-03	8.9509E-02	2.8605E-01	1.0442E-01	5.3676E-02	2.6281E-02
6	0.0000E+00	0.0000E+00	1.0004E-03	3.5183E-02	8.4713E-02	3.4195E-01	1.2411E-01	6.3729E-02
7	0.0000E+00	0.0000E+00	3.4425E-04	1.4514E-02	3.8429E-02	1.0688E-01	5.1892E-01	1.7589E-01
8	0.0000E+00	0.0000E+00	1.1038E-04	5.1864E-03	1.6704E-02	4.9068E-02	1.5309E-01	1.2046E+00
9	0.0000E+00	0.0000E+00	8.1218E-06	4.4930E-04	1.4373E-03	5.4591E-03	1.7882E-02	1.0709E-01

GROUP	REMOVALS	SPECTRUM	P	ETA.F
1	2.260808E-01	9.997000E-01	2.241286E-01	8.642070E-01
2	1.568718E-01	3.000000E-04	8.330169E-01	5.066553E-01
3	1.409908E-01	0.000000E+00	8.987627E-01	1.595368E+00
4	1.219899E-01	0.000000E+00	8.652343E-01	1.788875E+00
5	1.066037E-01	0.000000E+00	8.738735E-01	1.784906E+00
6	8.692754E-02	0.000000E+00	8.154269E-01	1.747402E+00
7	6.547147E-02	0.000000E+00	7.531730E-01	1.727537E+00
8	2.978328E-02	0.000000E+00	4.549046E-01	1.702792E+00
9	0.000000E+00	0.000000E+00	0.000000E+00	1.712090E+00

WJED COMPLETED

TIME FROM START 12.3 SECONDS. TIME IN THIS MODULE 0.0 SECONDS. UNUSED REGION THIS MODULE 1166 K BYTES.

WHC-SD-NR-SWD-017

-C- WUED 11

READS INTERFACE 11

FORTRAN DATA SETS 61-65

DSNAMES:

C002

*****

WIMS-E MODULE W-WED

*****

EDITED RESULTS FROM A MAIN TRANSPORT CALCULATION

DIMENSION NUMBERS
 MESHES GROUPS ORDERS MATRIS XSECTS
 12 9 1 9 82

UNUSED STORAGE 298532

I= 10, NREGIN= 12

-M- OPTION 4
 -M- BEGIN
 -M- *

ZONE	VOLUME	MATERIAL
1	0.21382E+01	1
2	0.39054E-01	3
3	0.61716E+01	2
4	0.34309E+01	3
5	0.18863E-02	4
6	0.58588E-02	5
7	0.94314E-02	6
8	0.13204E-01	7
9	0.16976E-01	8
10	0.12353E+00	9
11	0.12353E+00	9
12	0.12353E+00	9

FLUX SCALE FACTOR 1.000000E+00

FEW-GROUP REGIONAL AND CELL EDIT, INTEGRATED AND AVERAGED FLUXES, TOTAL EVENTS

REGION 1 MATERIAL 1 VOLUME 2.138246E+00

GROUP	ABSORPTION	SCATTER	REACTIONS		TRANSPORTS		FLUXES	
			FISSION	NU*FISSION	RADIAL	AXIAL	FLUX*VOL	FLUX
1	1.57170E-02	8.05812E+00	5.55052E-03	1.35827E-02	6.33305E+00	8.33305E+00	2.58474E-01	1.20882E+01
2	2.77118E-01	1.04787E+01	5.76620E-02	1.40405E-01	1.01747E+01	1.01747E+01	2.51368E-01	1.17556E+01
3	3.36418E-02	2.22020E+00	2.20720E-02	5.36312E-02	2.15506E+00	2.15506E+00	5.43586E-01	2.54220E+00
4	2.61809E-02	8.54236E-01	1.92579E-02	4.68344E-02	8.51058E-01	8.51058E-01	2.09123E+00	9.78010E-01
5	2.83987E-02	5.45732E-01	2.08443E-02	5.05890E-02	5.51286E-01	5.51286E-01	1.33590E+00	6.24762E-01
6	4.57006E-02	6.58974E-01	3.28406E-02	7.98573E-02	6.74154E-01	6.74154E-01	1.61299E+00	7.54353E-01
7	6.00249E-02	8.78803E-01	4.26482E-02	1.03695E-01	8.92802E-01	8.92802E-01	2.15086E+00	1.00590E+00
8	1.32752E-01	1.55465E+00	9.29248E-02	2.25043E-01	1.61108E+00	1.61108E+00	3.75898E+00	1.75787E+00
9	1.18510E-01	7.60143E-01	8.34856E-02	2.02900E-01	8.75284E-01	8.75284E-01	1.77200E+00	6.28718E-01
TOTAL	7.38042E-01	2.60095E+01	3.77348E-01	9.17704E-01			6.91421E+01	3.23359E+01

REGION 2 MATERIAL 3 VOLUME 3.905392E-02

GROUP	ABSORPTION	SCATTER	REACTIONS		TRANSPORTS		FLUXES	
			FISSION	NU*FISSION	RADIAL	AXIAL	FLUX*VOL	FLUX
1	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	4.67027E-01	1.19585E+01
2	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	4.60531E-01	1.17922E+01
3	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	9.94218E-02	2.54576E+00
4	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	3.82586E-02	9.79636E-01
5	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	2.45062E-02	6.27496E-01
6	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	2.98718E-02	7.59765E-01
7	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	3.96133E-02	1.01432E+00
8	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	6.94788E-02	1.77904E+00
9	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	3.30640E-02	8.46625E-01
TOTAL	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00			1.28157E+00	3.23034E+01

REGION 3 MATERIAL 2 VOLUME 6.171646E+00

GROUP	ABSORPTION	SCATTER	REACTIONS		TRANSPORTS		FLUXES	
			FISSION	NU*FISSION	RADIAL	AXIAL	FLUX*VOL	FLUX
1	5.64682E-04	2.29713E+01	0.00000E+00	0.00000E+00	1.78553E+01	1.78553E+01	7.28775E+01	1.18084E+01
2	4.41991E-04	3.03798E+01	0.00000E+00	0.00000E+00	2.86755E+01	2.86755E+01	7.30397E+01	1.18347E+01
3	7.48701E-04	6.48894E+00	0.00000E+00	0.00000E+00	6.18888E+00	6.18888E+00	1.57326E+01	2.54918E+00
4	4.85433E-04	2.49696E+00	0.00000E+00	0.00000E+00	2.39671E+00	2.39671E+00	6.05395E+00	9.80930E-01
5	3.65948E-04	1.60353E+00	0.00000E+00	0.00000E+00	1.52980E+00	1.52980E+00	3.89781E+00	6.29949E-01
6	4.99589E-04	1.94654E+00	0.00000E+00	0.00000E+00	1.84494E+00	1.84494E+00	4.71945E+00	7.64695E-01
7	7.70067E-04	2.80008E+00	0.00000E+00	0.00000E+00	2.45361E+00	2.45361E+00	6.30398E+00	1.02144E+00
8	1.77815E-03	4.63201E+00	0.00000E+00	0.00000E+00	4.39529E+00	4.39529E+00	1.10907E+01	1.79705E+00
9	1.47284E-03	2.29151E+00	0.00000E+00	0.00000E+00	2.28695E+00	2.28695E+00	5.33180E+00	8.63919E-01
TOTAL	7.12738E-03	7.54107E+01	0.00000E+00	0.00000E+00			1.99038E+02	3.22503E+01

REGION 4 MATERIAL 3 VOLUME 3.430911E+00

GROUP	ABSORPTION	SCATTER	REACTIONS		TRANSPORTS		FLUXES	
			FISSION	NU*FISSION	RADIAL	AXIAL	FLUX*VOL	FLUX
1	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	4.05073E+01	1.18066E+01
2	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	4.06081E+01	1.18360E+01
3	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	8.74284E+00	2.54820E+00
4	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	3.38256E+00	9.80079E-01
5	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	2.15783E+00	6.28937E-01
6	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	2.61724E+00	7.62240E-01
7	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	3.49153E+00	1.01770E+00
8	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	6.13467E+00	1.78806E+00
9	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	2.94421E+00	8.59593E-01
TOTAL	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00			1.10571E+02	3.22279E+01

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REGION 5 MATERIAL 4				VOLUME 1.886275E-03					
REACTIONS					TRANSPORTS		FLUXES		
GROUP	ABSORPTION	SCATTER	FISSION	NU*FISSION	RADIAL	AXIAL	FLUX*VOL	FLUX	
1	6.70724E-06	5.84803E-05	0.00000E+00	0.00000E+00	6.45115E-05	6.45115E-05	3.26749E-02	1.73225E+01	
2	3.15585E-04	6.20413E-05	0.00000E+00	0.00000E+00	3.77627E-04	3.77627E-04	3.34252E-02	1.77202E+01	
3	5.04238E-04	1.26255E-05	0.00000E+00	0.00000E+00	5.16863E-04	5.16863E-04	6.80207E-03	3.60609E+00	
4	3.39554E-04	4.58780E-06	0.00000E+00	0.00000E+00	3.44136E-04	3.44136E-04	2.47171E-03	1.31037E+00	
5	4.23762E-04	2.59143E-06	0.00000E+00	0.00000E+00	4.26354E-04	4.26354E-04	1.39615E-03	7.40164E-01	
6	7.90968E-04	2.61020E-06	0.00000E+00	0.00000E+00	7.93578E-04	7.93578E-04	1.40526E-03	7.45529E-01	
7	1.47750E-03	2.26510E-06	0.00000E+00	0.00000E+00	1.47376E-03	1.47976E-03	1.22034E-03	6.46956E-01	
8	1.06695E-03	3.71127E-07	0.00000E+00	0.00000E+00	1.06732E-03	1.06732E-03	1.99947E-04	1.06001E-01	
9	4.65101E-08	3.10554E-12	0.00000E+00	0.00000E+00	4.65127E-08	4.65127E-08	1.67313E-09	8.87003E-07	
TOTAL	4.92531E-03	1.45553E-04	0.00000E+00	0.00000E+00			7.95966E-02	4.21978E+01	
REGION 6 MATERIAL 5				VOLUME 5.658825E-03					
REACTIONS					TRANSPORTS		FLUXES		
GROUP	ABSORPTION	SCATTER	FISSION	NU*FISSION	RADIAL	AXIAL	FLUX*VOL	FLUX	
1	2.01048E-05	1.75205E-04	0.00000E+00	0.00000E+00	1.93344E-04	1.93344E-04	9.80128E-02	1.73203E+01	
2	9.46079E-04	1.85950E-04	0.00000E+00	0.00000E+00	1.13203E-03	1.13203E-03	1.00270E-01	1.77192E+01	
3	1.51091E-03	3.78207E-05	0.00000E+00	0.00000E+00	1.54873E-03	1.54873E-03	2.03941E-02	3.60395E+00	
4	1.01639E-03	1.37370E-05	0.00000E+00	0.00000E+00	1.03011E-03	1.03011E-03	7.40744E-03	1.30901E+00	
5	1.26740E-03	7.75305E-06	0.00000E+00	0.00000E+00	1.27515E-03	1.27515E-03	4.18070E-03	7.38793E-01	
6	2.38463E-03	7.80587E-06	0.00000E+00	0.00000E+00	2.37244E-03	2.37244E-03	4.20918E-03	7.43826E-01	
7	4.43196E-03	6.79675E-06	0.00000E+00	0.00000E+00	4.43875E-03	4.43875E-03	3.56503E-03	6.47866E-01	
8	3.72610E-03	1.29653E-06	0.00000E+00	0.00000E+00	3.72739E-03	3.72739E-03	6.99132E-04	1.23547E-01	
9	1.16121E-06	7.75619E-11	0.00000E+00	0.00000E+00	1.16128E-06	1.16128E-06	4.18239E-08	7.39092E-06	
TOTAL	1.52847E-02	4.36364E-04	0.00000E+00	0.00000E+00			2.38838E-01	4.22064E+01	
REGION 7 MATERIAL 6				VOLUME 9.431375E-03					
REACTIONS					TRANSPORTS		FLUXES		
GROUP	ABSORPTION	SCATTER	FISSION	NU*FISSION	RADIAL	AXIAL	FLUX*VOL	FLUX	
1	3.34378E-05	2.91275E-04	0.00000E+00	0.00000E+00	3.21445E-04	3.21445E-04	1.63312E-01	1.73158E+01	
2	1.57439E-03	3.09268E-04	0.00000E+00	0.00000E+00	1.88366E-03	1.88366E-03	1.67144E-01	1.77221E+01	
3	2.51658E-03	8.29491E-05	0.00000E+00	0.00000E+00	2.57952E-03	2.57952E-03	3.40207E-02	3.60719E+00	
4	1.69186E-03	2.28845E-05	0.00000E+00	0.00000E+00	1.71471E-03	1.71471E-03	1.23679E-02	1.31136E+00	
5	2.11631E-03	1.29568E-05	0.00000E+00	0.00000E+00	2.12926E-03	2.12926E-03	7.00248E-03	1.22467E-01	
6	2.97560E-03	1.31343E-05	0.00000E+00	0.00000E+00	3.98874E-03	3.98874E-03	7.09874E-03	7.52673E-01	
7	7.65118E-03	1.17437E-05	0.00000E+00	0.00000E+00	7.66292E-03	7.66292E-03	6.34687E-03	6.72935E-01	
8	9.19369E-03	3.20392E-06	0.00000E+00	0.00000E+00	9.20290E-03	9.20290E-03	1.73155E-03	1.83595E-01	
9	2.89366E-05	1.93780E-09	0.00000E+00	0.00000E+00	2.89882E-05	2.89882E-05	1.04728E-06	1.11042E-04	
TOTAL	2.87880E-02	7.27419E-04	0.00000E+00	0.00000E+00			3.99025E-01	4.23083E+01	
REGION 8 MATERIAL 7				VOLUME 1.320393E-02					
REACTIONS					TRANSPORTS		FLUXES		
GROUP	ABSORPTION	SCATTER	FISSION	NU*FISSION	RADIAL	AXIAL	FLUX*VOL	FLUX	
1	4.65875E-05	4.05422E-04	0.00000E+00	0.00000E+00	4.47460E-04	4.47460E-04	2.28531E-01	1.73078E+01	
2	2.19631E-03	4.30854E-04	0.00000E+00	0.00000E+00	2.62717E-03	2.62717E-03	2.34104E-01	1.77299E+01	
3	3.52018E-03	8.78032E-05	0.00000E+00	0.00000E+00	3.60809E-03	3.60809E-03	4.77620E-02	3.61726E+00	
4	2.36423E-03	3.20404E-05	0.00000E+00	0.00000E+00	2.39627E-03	2.39627E-03	1.74031E-02	1.31545E+00	
5	1.88176E-03	1.89218E-05	0.00000E+00	0.00000E+00	3.00055E-03	3.00055E-03	9.93871E-03	7.52708E-01	
6	5.89214E-03	1.88440E-05	0.00000E+00	0.00000E+00	5.71098E-03	5.71098E-03	1.02389E-02	7.75441E-01	
7	1.15625E-02	1.77836E-05	0.00000E+00	0.00000E+00	1.15804E-02	1.15804E-02	9.66268E-03	7.31804E-01	
8	2.31654E-02	8.08450E-06	0.00000E+00	0.00000E+00	2.31735E-02	2.31735E-02	4.39270E-03	3.32681E-01	
9	9.24440E-04	6.19275E-08	0.00000E+00	0.00000E+00	9.24492E-04	9.24492E-04	3.36482E-05	2.54835E-03	
TOTAL	5.24537E-02	1.01929E-03	0.00000E+00	0.00000E+00			5.62073E-01	4.25866E+01	
REGION 9 MATERIAL 8				VOLUME 1.697648E-02					
REACTIONS					TRANSPORTS		FLUXES		
GROUP	ABSORPTION	SCATTER	FISSION	NU*FISSION	RADIAL	AXIAL	FLUX*VOL	FLUX	
1	5.84143E-05	5.05551E-04	0.00000E+00	0.00000E+00	5.58292E-04	5.58292E-04	2.93547E-01	1.72914E+01	
2	2.76489E-03	5.38336E-04	0.00000E+00	0.00000E+00	3.30322E-03	3.30322E-03	3.01304E-01	1.77483E+01	
3	4.46555E-03	1.10457E-04	0.00000E+00	0.00000E+00	4.57601E-03	4.57601E-03	8.18225E-02	3.61665E+00	
4	2.95623E-03	4.04669E-05	0.00000E+00	0.00000E+00	2.98674E-03	2.98674E-03	2.26659E-02	1.33514E+00	
5	3.79108E-03	2.35297E-05	0.00000E+00	0.00000E+00	3.81661E-03	3.81661E-03	1.31695E-02	7.75748E-01	
6	7.47146E-03	2.50167E-05	0.00000E+00	0.00000E+00	7.49647E-03	7.49647E-03	1.40017E-02	8.24771E-01	
7	1.66687E-02	2.59335E-05	0.00000E+00	0.00000E+00	1.66946E-02	1.66946E-02	1.45149E-02	8.55000E-01	
8	6.46521E-02	2.28293E-05	0.00000E+00	0.00000E+00	6.46749E-02	6.46749E-02	1.27774E-02	7.52856E-01	
9	5.00026E-02	3.38871E-06	0.00000E+00	0.00000E+00	5.00055E-02	5.00055E-02	1.89664E-03	1.11722E-01	
TOTAL	1.52833E-01	1.29554E-03	0.00000E+00	0.00000E+00			7.35700E-01	4.33364E+01	
REGION 10 MATERIAL 9				VOLUME 3.706039E-01					
REACTIONS					TRANSPORTS		FLUXES		
GROUP	ABSORPTION	SCATTER	FISSION	NU*FISSION	RADIAL	AXIAL	FLUX*VOL	FLUX	
1	4.96456E-05	2.01958E-00	0.00000E+00	0.00000E+00	1.56980E+00	1.56980E+00	6.40723E+00	1.72886E+01	
2	3.99547E-05	2.74625E-00	0.00000E+00	0.00000E+00	2.59217E+00	2.59217E+00	6.60257E+00	1.78157E+01	
3	6.61921E-05	5.73682E-01	0.00000E+00	0.00000E+00	5.47154E-01	5.47154E-01	1.38091E+00	3.75309E+00	
4	4.19146E-05	2.15599E-01	0.00000E+00	0.00000E+00	2.06944E-01	2.06944E-01	5.22728E-01	1.41048E+00	
5	3.04110E-05	1.33257E-01	0.00000E+00	0.00000E+00	1.27130E-01	1.27130E-01	3.23085E-01	8.71780E-01	
6	3.97147E-05	1.54748E-01	0.00000E+00	0.00000E+00	1.46669E-01	1.46669E-01	3.75187E-01	1.01237E+00	
7	5.71763E-05	1.93052E-01	0.00000E+00	0.00000E+00	1.82177E-01	1.82177E-01	4.68062E-01	1.26297E+00	
8	1.21569E-04	3.16682E-01	0.00000E+00	0.00000E+00	3.00498E-01	3.00498E-01	7.58253E-01	2.04599E+00	
9	9.92134E-05	1.54360E-01	0.00000E+00	0.00000E+00	1.54053E-01	1.54053E-01	3.59160E-01	9.69120E-01	
TOTAL	5.45791E-04	6.50721E+00	0.00000E+00	0.00000E+00			1.72072E+01	4.64301E+01	
CELL				VOLUME 1.21976CE+01					
REACTIONS					TRANSPORTS		FLUXES		
GROUP	ABSORPTION	SCATTER	FISSION	NU*FISSION	RADIAL	AXIAL	FLUX*VOL	FLUX	
1	1.64966E+02	3.30504E+01	5.55052E-03	1.35227E-02	2.57597E+01	2.57597E+01	1.46903E+02	1.2045CE+01	
2	2.85396E+01	4.38062E+01	5.76620E-02	1.40405E-01	4.14517E+01	4.14517E+01	1.46684E+02	1.2026E+01	
3	4.63742E+02	9.28714E+00	2.20720E-02	5.36912E-02	3.90192E+00	3.90192E+00	2.15721E+01	2.58240E+00	

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6	6.65347E-02	0.16033E+00	0.10840E-02	1.79377E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
7	1.02644E-01	3.67200E+00	4.26482E-02	1.03695E-01	3.57044E+00	3.57044E+00	1.24496E+01	1.02693E+00
8	2.36462E-01	6.50338E+00	9.29848E-02	2.26049E-01	6.40871E+00	6.40871E+00	2.18319E+01	1.78985E+00
9	1.71040E-01	3.20601E+00	8.34856E-02	2.02900E-01	3.36724E+00	3.36724E+00	1.04472E+01	8.56493E-01
TOTAL	1.00000E+00	1.07931E+02	3.77346E-01	9.17704E-01			3.99235E+02	3.27306E+01

SCATTERING MATRIX

	1	2	3	4	5	6	7	8	9
1	3.2057E+01	9.8322E-01	1.8409E-16	2.8671E-17	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
2	0.0000E+00	4.2900E+01	7.0606E-01	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00	0.0000E+00
3	0.0000E+00	7.9975E-03	8.3968E+00	7.6859E-01	7.2211E-02	2.6281E-02	9.7577E-03	3.2800E-03	2.5762E-04
4	0.0000E+00	0.0000E+00	2.1441E-01	2.3072E+00	5.8751E-01	2.7677E-01	1.2682E-01	4.9426E-02	4.7513E-03
5	0.0000E+00	0.0000E+00	9.1297E-03	3.4308E-01	1.1286E+00	4.4725E-01	2.3221E-01	1.1148E-01	1.0959E-02
6	0.0000E+00	0.0000E+00	2.6537E-03	1.2297E-01	3.3633E-01	1.4632E+00	5.2763E-01	2.7230E-01	3.4794E-02
7	0.0000E+00	0.0000E+00	8.4267E-04	4.6077E-02	1.3895E-01	4.2135E-01	2.2246E+00	7.3915E-01	1.0106E-01
8	0.0000E+00	0.0000E+00	2.4903E-04	1.4869E-02	5.4179E-02	1.7453E-01	5.9141E-01	5.1540E+00	5.1417E-01
9	0.0000E+00	0.0000E+00	1.6924E-05	1.1677E-03	4.1904E-03	1.7527E-02	6.2236E-02	4.0972E-01	2.7112E+00

GROUP	REMOVALS	MODIFIED	SPECTRUM	P	ETA F
1	9.832235E-01	9.897000E-01	9.835186E-01	8.233672E-01	
2	8.980665E-01	3.000000E-04	7.097608E-01	4.919672E-01	
3	8.510785E-01	0.000000E+00	9.326883E-01	1.142995E+00	
4	6.160142E-01	0.000000E+00	9.461444E-01	1.335204E+00	
5	5.766429E-01	0.000000E+00	9.360870E-01	1.297263E+00	
6	5.101143E-01	0.000000E+00	8.846277E-01	1.200236E+00	
7	4.074818E-01	0.000000E+00	7.988048E-01	1.010240E+00	
8	1.710308E-01	0.000000E+00	4.197263E-01	9.558235E-01	
9	0.000000E+00	0.000000E+00	0.000000E+00	1.186276E+00	

WED COMPLETED

TIME FROM START 12.3 SECONDS.

TIME IN THIS MODULE

0.0 SECONDS.

UNUSED REGION THIS MODULE 1166 K BYTES.

-C- FINISH

END OF CYCLE 2

-C- WIRE 11

READS INTERFACE 11

FORTRAN DATA SETS 61-65

OSNAMES:

WHC-SD-NR-SWD-017

PRINTS REACTION RATES BY MESH & MATERIAL OVER SPECIFIED ENERGY RANGES

DIMENSION NUMBERS

MESHES	GROUPS	MATRLS	XSECTS	REACTS
12	9	9	82	4

UNUSED STORAGE 298862

MATERIAL CODES

1	3	2	3	4	5	6	7	8	9
9	9								

MESH VOLUMES

2.13825E+00	3.90539E-02	6.17165E+00	3.43091E+00	1.88628E-03	5.65883E-03	9.43138E-03	1.32039E-02	1.69765E-02	1.23535E-01
1.23535E-01	1.23535E-01								

MATERIAL VOLUMES

2.13825E+00	6.17165E+00	3.46997E+00	1.88628E-03	5.65883E-03	9.43138E-03	1.32039E-02	1.69765E-02	3.70604E-01

-M- REACT 2012 1100 1 2 9 REACT6016 1100 1 2 9 REACT 29 1100 1 2 9

NO. OF GRPS.- ON I/F = 9 IN REQUESTED LIST = 3

NUCLIDE 2012 REACTION RATES BY MATERIAL

ABSORPTION

GROUP/MATL	1	2	3	4	5	6	7	8
1	1.18910E-03	1.03908E-03	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
2	6.75255E-04	6.83230E-04	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
3	9.33700E-03	9.54297E-03	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TOTAL	1.12024E-02	1.12653E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
GROUP/MATL	9							
1	1.52130E-03							
2	1.02852E-03							
3	1.18443E-02							
TOTAL	1.43946E-02							

NUCLIDE 2012 REACTIONS BY MATERIAL

ABSORPTION

GROUP/MATL	1	2	3	4	5	6	7	8
1	2.03255E-04	5.62760E-04	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
2	1.15593E-04	3.70035E-04	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
3	1.59599E-03	5.16843E-03	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TOTAL	1.91483E-03	6.10123E-03	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
GROUP/MATL	9							
1	4.94766E-05							
2	3.34500E-05							
3	3.85223E-04							
TOTAL	4.68150E-04							

NO. OF GRPS.- ON I/F = 9 IN REQUESTED LIST = 3

NUCLIDE 6016 REACTION RATES BY MATERIAL

ABSORPTION

GROUP/MATL	1	2	3	4	5	6	7	8
1	2.47079E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
2	5.78378E-07	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
3	2.23859E-04	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TOTAL	2.49323E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
GROUP/MATL	9							
1	0.00000E+00							
2	0.00000E+00							
3	0.00000E+00							
TOTAL	0.00000E+00							

NUCLIDE 6016 REACTIONS BY MATERIAL

ABSORPTION

GROUP/MATL	1	2	3	4	5	6	7	8
1	1.49936E-04	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
2	3.50980E-09	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
3	1.35845E-06	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TOTAL	1.51298E-04	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
GROUP/MATL	9							
1	0.00000E+00							
2	0.00000E+00							
3	0.00000E+00							
TOTAL	0.00000E+00							

NO. OF GRPS.- ON I/F = 9 IN REQUESTED LIST = 3

NUCLIDE 29 REACTION RATES BY MATERIAL

ABSORPTION

GROUP/MATL	1	2	3	4	5	6	7	8
1	2.29243E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
2	3.11258E-02	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
3	4.35977E-01	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TOTAL	4.94027E-01	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
GROUP/MATL	9							
1	0.00000E+00							

WHC-SD-NR-SWD-017

TOTAL 0.00000E+00

NUCLIDE 29 REACTIONS BY MATERIAL

ABSORPTION

GROUP/MATL	1	2	3	4	5	6	7	8
1	1.00587E-04	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
2	1.36569E-04	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
3	1.93048E-03	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
TOTAL	2.16763E-03	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
GROUP/MATL	9							
1	0.00000E+00							
2	0.00000E+00							
3	0.00000E+00							
TOTAL	0.00000E+00							

-M- BEGIN

WIRE COMPLETED

TIME FROM START 12.4 SECONDS. TIME IN THIS MODULE 0.0 SECONDS. UNUSED REGION THIS MODULE 1166 K BYTES.

-C- WCOND 11 6

READS INTERFACE 11

FORTRAN DATA SETS 61-65

DSNAMES:

WRITES INTERFACE 6

FORTRAN DATA SETS 36-40

DSNAMES:

ALSO READS :

***** WIMS-E MODULE W-CONDENSE *****

-P- GROUPS 2

-P- ENDP

SPACE AVAILABLE ALLOWS UP TO 99807 NUCLIDE TABULATIONS ON NEW INTERFACE

-M- PART 2 9

-M- BEGIN

DETAILS OF CONDENSATION
 NEW MATERIAL CONDENSED FROM OLD MATERIAL USING FLUXES INTEGRATED OVER MESH(ES)

1	2	3	4	5	6	7	8	9
1	1							
2	2							
3	3							
4	4							
5	5							
6	6							
7	7							
8	8							
9	9							

NEW FILE 4

MESHERS 12

MATERIAL CODE AND VOLUMES

1	2	3	4	5	6	7	8	9
2.1382E+00	3.9054E-02	6.1716E+00	3.4309E+00	1.8863E-03	5.6588E-03	9.4314E-03	1.3204E-02	1.6976E-02
1.2353E-01	1.2353E-01							1.2353E-01

NEW FILE 2

NUCLIDE TABULATIONS 82

GROUPS 2

FISSILE NUCLIDES 11

2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100																																																																								
4083	4095	4099	4101	4103	5103	4105	5105	4108	4109	4113	4115	4127	4131	4133	2155	2156	2157	2158	2159	2160	2161	2162	2163	2164	2165	2166	2167	2168	2169	2170	2171	2172	2173	2174	2175	2176	2177	2178	2179	2180	2181	2182	2183	2184	2185	2186	2187	2188	2189	2190	2191	2192	2193	2194	2195	2196	2197	2198	2199	2200	2201	2202	2203	2204	2205	2206	2207	2208	2209	2210	2211	2212	2213	2214	2215	2216	2217	2218	2219	2220	2221	2222	2223	2224	2225	2226	2227	2228	2229	2230	2231	2232	2233	2234	2235	2236	2237	2238	2239	2240	2241	2242	2243	2244	2245	2246	2247	2248	2249	2250	2251	2252	2253	2254	2255	2256	2257	2258	2259	2260	2261	2262	2263	2264	2265	2266	2267	2268	2269	2270	2271	2272	2273	2274	2275	2276	2277	2278	2279	2280	2281	2282	2283	2284	2285	2286	2287	2288	2289	2290	2291	2292	2293	2294	2295	2296	2297	2298	2299	2300

WHC-SD-NR-SWD-017

NEW FILE 3

MATERIALS 9
GROUPS 2

NUMBER DENSITIES PRINTED IN MIX

UNUSED STORAGE 299043

CONDENSE COMPLETED

TIME FROM START 12.6 SECONDS. TIME IN THIS MODULE 0.2 SECONDS. UNUSED REGION THIS MODULE 1168 K BYTES.

***** WIMS-E MODULE W-MIX *****
 READS FILES 2 & 3. FORMS MACROSCOPIC X-SECTIONS AND WRITES THESE TO FILE 3.
 FLUXES ETC READ FROM FILE 1 AND WRITTEN TO FILE 5.

LN 4 LT -1

CROSS-SECTIONS 82

GROUPS 2

MATERIALS 9

NO. OF MATERIALS TO BE PROCESSED AT A TIME 9

UNUSED STORAGE 299240 (IF MATERIALS PROCESSED SINGLY 299633)

MATERIAL 1	NUCLIDE	IDENTIFIER	NUMBER DENSITY
	1	2012	7.9940E-02
	4	6016	2.8390E-03
	5	29	2.0520E-03
	6	4083	1.4195E-09
	7	4095	1.8912E-08
	8	4099	1.6136E-08
	9	4101	1.2911E-08
	10	4103	1.2848E-10
	11	5103	7.3601E-09
	12	4105	1.3632E-09
	13	5105	7.5849E-10
	14	4108	2.3251E-10
	15	4109	1.0330E-10
	16	4113	2.8392E-11
	17	4115	2.8327E-11
	18	4127	6.4551E-10
	19	4131	7.4829E-09
	20	4133	1.7037E-09
	21	4134	6.0213E-12
	22	4135	1.4613E-09
	23	5135	3.9570E-09
	24	6135	3.0832E-09
	25	4143	1.4840E-09
	26	4145	9.8100E-09
	27	4147	2.6252E-09
	28	5147	2.9083E-09
	29	6147	3.9711E-12
	30	4148	6.5692E-12
	31	5148	6.8746E-12
	32	4149	6.4798E-10
	33	5149	2.0858E-09
	34	4150	4.9355E-11
	35	4151	1.0245E-09

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44	4155	7.3001E-11
55	4157	1.5901E-11
61	2232	1.3030E-03
62	1233	1.5513E-07
63	9233	3.9431E-09
64	234	1.4914E-10
65	2235	1.0746E-04
66	238	6.4622E-08
67	8238	8.1088E-06
68	6239	1.0090E-09
69	1240	3.6819E-12
70	1241	1.8732E-14
71	1242	1.1798E-17
72	4902	7.8498E-08
73	927	1.9583E-11
74	937	5.9437E-13
75	1939	3.1445E-09
76	949	4.1272E-16
77	951	1.2243E-18
78	952	9.6009E-20
79	953	1.0881E-19
80	1000	4.1830E-05

NUMBER OF REACTIONS 4

MATERIAL	NUCLIDE	IDENTIFIER	NUMBER DENSITY
2	2012		8.7755E-02
81	1000		5.4900E-05

NUMBER OF REACTIONS 3

MATERIAL 3 VOID

NUMBER OF REACTIONS 0

MATERIAL	NUCLIDE	IDENTIFIER	NUMBER DENSITY
4	39	2155	1.2920E-04
	45	2156	9.9967E-20
	50	2157	1.3596E-04
	56	2158	9.9981E-20

NUMBER OF REACTIONS 3

MATERIAL	NUCLIDE	IDENTIFIER	NUMBER DENSITY
5	40	2155	1.2915E-04
	46	2156	9.9967E-20
	51	2157	1.3577E-04
	57	2158	9.9981E-20

NUMBER OF REACTIONS 3

MATERIAL	NUCLIDE	IDENTIFIER	NUMBER DENSITY
6	41	2155	1.2905E-04
	47	2156	9.9967E-20
	52	2157	1.3528E-04
	58	2158	9.9981E-20

NUMBER OF REACTIONS 3

MATERIAL	NUCLIDE	IDENTIFIER	NUMBER DENSITY
7	42	2155	1.2880E-04
	48	2156	9.9967E-20
	53	2157	1.3412E-04
	59	2158	9.9981E-20

NUMBER OF REACTIONS 3

MATERIAL	NUCLIDE	IDENTIFIER	NUMBER DENSITY
8	43	2155	1.2742E-04
	49	2156	9.9967E-20
	54	2157	1.2782E-04
	60	2158	9.9981E-20

NUMBER OF REACTIONS 3

MATERIAL	NUCLIDE	IDENTIFIER	NUMBER DENSITY
9	3	2012	8.7755E-02
	82	1000	5.4300E-05

NUMBER OF REACTIONS 3

WRITING FILE 5

MMESH 12 NGRP 2 NORDER 1

FLUX

2.38440E+01 2.37507E+01 2.36432E+01 2.36425E+01 3.50427E+01 3.50396E+01 3.50379E+01 3.50377E+01 3.50397E+01 3.50635E+01
3.51005E+01 3.51490E+01 8.49192E+00 8.55265E+00 8.60717E+00 8.58541E+00 7.15510E+00 7.16680E+00 7.27034E+00 7.53092E+00
8.29669E+00 1.07628E+01 1.14734E+01 1.17411E+01

AK BX BY BZ TC U
9.1774E-01 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 1.0898E-00

RTIME 0.20000E+01 RIRPAD 0.17685E+03

SPARE ITEMS

7.04908E-01 8.20000E+01 0.00000E+00 2.30474E+20 5.53547E+17
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00

MIX COMPLETED

TIME FROM START 12.6 SECONDS. TIME IN THIS MODULE 0.1 SECONDS. UNUSED REGION THIS MODULE 1170 K BYTES.

WHC-SD-NR-SWD-017

-C- WSHEAF 6 1

READS INTERFACE 8

FORTRAN DATA SETS 36-40

DSNAMES:

WRITES INTERFACE 1

FORTRAN DATA SETS 11-15

DSNAMES:

***** WIMS-E MODULE W-SHEAR *****

-P- MATE 1

-P- MESH 1

-P- ENDP

MESHS GROUPS ORDERS MATRLS XSECTS
12 2 1 9 82

-M- MCODE 1

-M- NEUMAT 1 1 2 3 4 5 6 7 8 9 10 11 12

-M- BEGIN

-M- * NEW TEST FOR INTER

DETAILS OF SHEARING		MESHES PROVIDING		VOLUME FRACTION	
NEW MATERIAL	CONSTITUENT OLD MATERIALS	FLUXES AND VOLUMES		OF EACH MESH USED	
1	1	1		1.0000E+00	
1	2	2		1.0000E+00	
1	3	3		1.0000E+00	
1	4	4		1.0000E+00	
1	5	5		1.0000E+00	
1	6	6		1.0000E+00	
1	7	7		1.0000E+00	
1	8	8		1.0000E+00	
1	9	9		1.0000E+00	
1	10	10		1.0000E+00	
1	11	11		1.0000E+00	
1	12	12		1.0000E+00	

NEW INTERFACE
FILE 2XSECTS GROUPS NUCLIDES
82 2 82

NUCLIDE IDENTIFICATION		29	4083	4095	4099	4101	4103	5103	4105
2012	6018		4113	4115	4127	4131	4133	4134	4135
5105	4108	4109	4143	4145	5147	6147	4148	5148	4149
5135	6135	4143	4145	4147	5147	6147	4148	5148	4149
5149	4150	4151	4152	4153	4154	2155	4155	2156	2157
4157	2158	2232	1233	9233	234	2235	238	8238	8239
1240	1241	1242	4902	927	937	1939	948	951	952
953	1080								

NUMBER DENSITIES PRINTED IN MIX

FILE 4
MESHS

MATERIAL IDENTIFICATION

VOLUMES
1.21978E+01

STORAGE NOT USED =299098

SHEAR COMPLETED

TIME FROM START 12.8 SECONDS.

TIME IN THIS MODULE 0.2 SECONDS.

UNUSED REGION THIS MODULE 1168 K BYTES.

WHC-SD-NR-SWD-017

***** WIMS-E MODULE W-MIX *****
 READS FILES 2 & 3, FORMS MACROSCOPIC X-SECTIONS AND WRITES THESE TO FILE 3.
 FLUXES ETC READ FROM FILE 1 AND WRITTEN TO FILE 5.

LN 5 LT 1

CROSS-SECTIONS 62

GROUPS 2

MATERIALS 1

NO. OF MATERIALS TO BE PROCESSED AT A TIME 1

UNUSED STORAGE 299744 (IF MATERIALS PROCESSED SINGLY 299737)

MATERIAL	1	NUCLIDE	IDENTIFIER	NUMBER DENSITY
		1	2012	6.1082E-02
		2	6016	4.9750E-04
		3	29	3.5972E-04
		4	4083	2.4884E-10
		5	4095	2.9647E-09
		6	4099	2.8287E-09
		7	4101	2.2633E-09
		8	4103	2.2523E-11
		9	5103	1.2902E-09
		10	4105	2.3897E-10
		11	5105	1.3296E-10
		12	4108	4.0759E-11
		13	4109	1.8108E-11
		14	4113	4.9771E-12
		15	4115	4.9657E-12
		16	4127	1.1318E-10
		17	4131	1.3118E-09
		18	4133	2.9866E-09
		19	4134	1.0555E-12
		20	4135	2.5618E-10
		21	5135	6.8367E-10
		22	6135	5.4049E-10
		23	4143	2.6014E-09
		24	4145	1.7197E-09
		25	4147	4.6019E-10
		26	5147	5.0982E-10
		27	6147	6.9814E-13
		28	4148	1.1516E-12
		29	5148	1.2051E-12
		30	4149	1.1359E-10
		31	5149	3.6563E-10
		32	4150	8.6538E-12
		33	4151	1.7967E-10
		34	4152	1.1892E-10
		35	4153	6.8072E-11
		36	4154	1.3728E-13
		37	2155	4.9646E-07
		38	4155	1.2797E-11
		39	2156	3.8648E-22
		40	2157	5.1169E-07
		41	4157	2.7875E-12
		42	2158	3.8653E-22
		43	2232	2.2842E-04
		44	1233	2.7195E-08
		45	9233	6.9122E-10
		46	234	2.5969E-11
		47	2235	1.8838E-05
		48	236	1.3328E-08
		49	8238	1.4215E-08
		50	6239	1.7688E-10
		51	1240	6.4544E-13
		52	1241	3.2838E-15
		53	1242	2.0682E-16
		54	4902	1.3751E-08
		55	927	3.4329E-12
		56	937	1.0430E-13
		57	1939	5.5123E-10
		58	948	7.2349E-17
		59	951	2.1463E-19
		60	952	1.6830E-20
		61	953	1.9074E-20
		62	1000	3.6779E-05

NUMBER OF REACTIONS 4

WRITING FILE 5

NMESH 1 NGRP 2 NORDER 1

FLUX
 2.40708E+01 8.65974E+00

AK BX BY 8Z TC U
 9.1774E-01 0.0000E+00 0.0000E+00 0.0000E+00 0.0000E+00 1.0896E+00

RTIME 0.20000E+01 RIRRAO 0.17685E+03

SRAPE ITEMS
 7.04908E-01 6.20000E+01 0.00000E+00 2.30474E+20 5.53547E+17
 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00

MIX COMPLETED

TIME FROM START 12.9 SECONDS.

TIME IN THIS MODULE

0.1 SECONDS.

UNUSED REGION THIS MODULE 1170 K BYTES.

-C- WINTER 1

READS INTERFACE 1

FORTRAN DATA SETS 11-15

DSNAMES:

*****

WIMS-E MODULE W-INTER

*****

-M- PRINT 1
 -M- MATERIALS 1
 -M- PAGE 44
 -M- FILE 3
 -M- BEGIN
 -M- *

FILE 3

NO. OF			GROUPS		
MATERIALS			1		
2			3		
4			5		
6			7		
8			9		
10			11		
12			13		
14			15		
16			17		
18			19		
20			21		
22			23		
24			25		
26			27		
28			29		
30			31		
32			33		
34			35		
36			37		
38			39		
40			41		
42			43		
44			45		
46			47		
48			49		
50			51		
52			53		
54			55		
56			57		
58			59		
60			61		

FOR EACH MATERIAL
 *****

WHC-SD-NR-SWD-017

MATERIAL 1 NO.OF REACTIONS
4

ABSORPTION
*****

REACTION NAME	NUMBER OF SECONDARY NEUTRONS	NUMBER OF P-N ENERGY RANGES FOR ORDERS	NUMBER OF PRIMARY DATA
1	0	1	1

FIRST + LAST PRIMARY GROUPS
1 2

MOMENT 0

PRIMARY SIGMA
1.02822E-03 6.60910E-03

INTER COMPLETED

UNUSED STORAGE 297933 WORDS

TIME FROM START 12.9 SECONDS. TIME IN THIS MODULE 0.0 SECONDS. UNUSED REGION THIS MODULE 1162 K BYTES.

-C- WINTER 1 14

READS INTERFACE 1

FORTRAN DATA SETS 11-15

DSNAMES:

WRITES INTERFACE 14

FORTRAN DATA SETS 76-80

DSNAMES:

***** WIMS-E MODULE W-INTER *****

-M- COPY
-M- MATRIX
-M- FILE 3
-M- PRINT
-M- BEGIN
-M- *

WARNING. FILE 3 IS BEING COPIED WITHOUT FILE 1 AND/OR FILE 2. ALL 3 FILES NEEDED IF NUMBER DENSITIES TO BE READ.

WHC-SD-NR-SWD-017

FILE 3

			NO. OF MATERIALS			GROUPS					
			1			2					
NUMBER DENSITIES											
NUCL	MATL	NO.DENSITY	NUCL	MATL	NO.DENSITY	NUCL	MATL	NO.DENSITY	NUCL	MATL	NO.DENSITY
1	1	6.1082E-02	2	1	4.9750E-04	3	1	3.5972E-04	4	1	2.4384E-10
6	1	2.8297E-09	7	1	2.2833E-09	8	1	2.2523E-11	9	1	1.2902E-09
11	1	1.3296E-10	12	1	4.0759E-11	13	1	1.8108E-11	14	1	4.9771E-12
16	1	1.1316E-10	17	1	1.3118E-09	18	1	2.9866E-09	19	1	1.0555E-12
21	1	6.9387E-10	22	1	5.4049E-10	23	1	2.6014E-09	24	1	1.7197E-09
26	1	5.0982E-10	27	1	6.9614E-13	28	1	1.1516E-12	29	1	1.2031E-12
31	1	3.6563E-10	32	1	8.6538E-12	33	1	1.7967E-10	34	1	1.1882E-10
36	1	1.3728E-13	37	1	4.9646E-07	38	1	1.2797E-11	39	1	3.8648E-22
41	1	2.7875E-12	42	1	3.8653E-22	43	1	2.2842E-04	44	1	2.7195E-03
46	1	2.5969E-11	47	1	1.8938E-05	48	1	1.1329E-08	49	1	1.4215E-06
51	1	6.4544E-13	52	1	3.2838E-15	53	1	2.0682E-18	54	1	1.3761E-08
56	1	1.0430E-13	57	1	5.5123E-10	58	1	7.2349E-17	59	1	2.1463E-19
61	1	1.9074E-20	62	1	3.6779E-05						
									5	1	2.9647E-09
									10	1	2.3897E-10
									15	1	4.9557E-12
									20	1	2.5616E-10
									25	1	4.6019E-10
									30	1	1.1359E-10
									35	1	6.8072E-11
									40	1	5.1169E-07
									45	1	6.9122E-10
									50	1	1.7689E-10
									55	1	3.4329E-12
									60	1	1.6830E-20

FOR EACH MATERIAL
*****

FILE 3
*******MATERIAL 1** NO.OF REACTIONS
4ABSORPTION
*****

REACTION NAME 1 NUMBER OF SECONDARY NEUTRONS 0 NUMBER OF P-N ENERGY RANGES FOR ORDERS 1 NUMBER OF PRIMARY DATA 1
FIRST 1 * LAST PRIMARY GROUPS 2

MOMENT 0

PRIMARY SIGMA
1.02822E-03 6.60910E-03

TRANSPORT
*****

REACTION NAME 2 NUMBER OF SECONDARY NEUTRONS 0 NUMBER OF P-N ENERGY RANGES FOR ORDERS 1 NUMBER OF PRIMARY DATA 1
FIRST 1 * LAST PRIMARY GROUPS 2

RADIAL

PRIMARY SIGMA
2.16640E-01 2.89674E-01

SCATTER
*****

REACTION NAME 3 NUMBER OF SECONDARY NEUTRONS 1 NUMBER OF P-N ENERGY RANGES FOR ORDERS 1 NUMBER OF PRIMARY DATA 1
FIRST 1 * LAST PRIMARY GROUPS 2

MOMENT 0

PRIMARY SIGMA
2.61086E-01 2.96079E-01

NO.OF ENERGY RANGES FOR SECONDARY DATA
1

FIRST 1 * LAST PRIMARY GROUPS 2

FOR EACH PRIMARY GROUP

* GROUP NO 1 JFST 1 J1ST 2

MOMENT 0

SCATTER MATERIAL

WHC-SD-NR-SWD-017

SCATTER MATRIX
7.5714E-05 2.9600E-01

FISSION
*****

REACTION NAME	NUMBER OF SECONDARY NEUTRONS	NUMBER OF P-N ENERGY RANGES FOR ORDERS	NUMBER OF PRIMARY DATA
4	3	1	1
FIRST + LAST PRIMARY GROUPS			
1	2		

FILE 3
*****

MOMENT 0

PRIMARY SIGMA
2.15297E-04 2.97395E-03
NO. OF ENERGY RANGES FOR SECONDARY DATA
1
FIRST + LAST PRIMARY GROUPS
1 2

MOMENT 0

NU
2.43604E+00 2.43118E+00
FISSION YIELD
5.24470E-04 7.23022E-03
FOR EACH PRIMARY GROUP

GROUP NO 1 JFST 1 JLST 1

MOMENT 0

FISSION SPECTRUM
1.0000E+00

GROUP NO 2 JFST 1 JLST 1

MOMENT 0

FISSION SPECTRUM
1.0000E+00

FILE 3 COPIED

INTER COMPLETED

UNUSED STORAGE 297995 WORDS

TIME FROM START 12.9 SECONDS.

TIME IN THIS MODULE

0.0 SECONDS.

UNUSED REGION THIS MODULE 1164 K BYTES.

WHC-SD-NR-SWD-017

-C- WINTER 1
 READS INTERFACE 1   FORTRAN DATA SETS 11-15   DS NAMES:

***** WINS-E MODULE W-INTER *****

-M- PRINT 1
 -M- FILE 1 3
 -M- BEGIN
 -M- *

FILE 1

LEVEL   S   NO.OF PREVIOUS LEVELS
                  1
 PREVIOUS LEVELS
                  4

FOR EACH OLD LEVEL
 LEVEL NO. 1

OLD GROUPS/MESHES
                  12   1   1   1   1   1
                  1   1   1   1   1   1

MESHES   GROUPS   ORDERS
                  1   2   1

FLUXES
 2.40708E+01 8.65974E+00

                 K   BX   BY   BZ   TC   U
 9.17740E-01 0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00 1.08963E+00

BUCKLINGS ARE CM**-2, NOT S.I. UNITS

BURNUP TIME   IRRADIATION
 2.00000E+00 1.76850E+02

SPARE ITEMS (I/F WRITTEN IN OR AFTER MAY'72)

7.04908E-01	6.20000E+01	0.00000E+00	2.30474E+20	5.52547E+17	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00	0.00000E+00

WHC-SD-NR-SWD-017

FILE 3

NUMBER DENSITIES			NO. OF MATERIALS			GROUPS			NO. OF MATERIALS			GROUPS			NO. OF MATERIALS			GROUPS		
NUCL	MATL	NO.DENSITY	NUCL	MATL	NO.DENSITY	NUCL	MATL	NO.DENSITY	NUCL	MATL	NO.DENSITY	NUCL	MATL	NO.DENSITY	NUCL	MATL	NO.DENSITY	NUCL	MATL	NO.DENSITY
1	1	6.1082E-02	2	1	4.9750E-04	3	1	3.5972E-04	4	1	2.4884E-10	5	1	2.9647E-09	6	1	2.9647E-09	7	1	2.9647E-09
6	1	2.8287E-09	7	1	2.2633E-09	8	1	2.2523E-11	9	1	1.2902E-09	10	1	2.3897E-10	11	1	4.9657E-12	12	1	4.9657E-12
11	1	1.3296E-10	12	1	4.0759E-11	13	1	1.8108E-11	14	1	4.9771E-12	15	1	4.9657E-12	16	1	2.5616E-10	17	1	2.5616E-10
16	1	1.1316E-10	17	1	1.3118E-09	18	1	2.9866E-09	19	1	1.0555E-12	20	1	4.6019E-10	21	1	1.1353E-10	22	1	1.1353E-10
21	1	6.9387E-10	22	1	5.4049E-10	23	1	2.8014E-09	24	1	1.7197E-09	25	1	1.7197E-09	26	1	1.7197E-09	27	1	1.7197E-09
26	1	5.0932E-10	27	1	6.9614E-12	28	1	1.1516E-12	29	1	1.2051E-12	30	1	1.2051E-12	31	1	1.2051E-12	32	1	1.2051E-12
31	1	3.6563E-10	32	1	8.6538E-12	33	1	1.7967E-10	34	1	1.1822E-10	35	1	6.8072E-11	36	1	5.1169E-07	37	1	5.1169E-07
36	1	1.3728E-13	37	1	4.9646E-07	38	1	1.2797E-11	39	1	3.8648E-22	40	1	6.9122E-10	41	1	1.7688E-10	42	1	1.7688E-10
41	1	2.7875E-12	42	1	3.8653E-22	43	1	2.2842E-04	44	1	2.7195E-08	45	1	1.4215E-05	46	1	1.4215E-05	47	1	1.4215E-05
46	1	2.5969E-11	47	1	1.8838E-05	48	1	1.1328E-08	49	1	1.4215E-05	50	1	1.3761E-08	51	1	3.4329E-12	52	1	3.4329E-12
51	1	6.4544E-13	52	1	3.2838E-15	53	1	2.0682E-18	54	1	1.3761E-08	55	1	2.1463E-19	56	1	1.6830E-20	57	1	1.6830E-20
56	1	1.0430E-13	57	1	5.5123E-10	58	1	7.2349E-17	59	1	2.1463E-19	60	1	1.6830E-20	61	1	1.6830E-20	62	1	1.6830E-20
61	1	1.9074E-20	62	1	3.6779E-05															

FOR EACH MATERIAL
*****

FILE 3
*******MATERIAL 1** NO. OF REACTIONS
4ABSORPTION
*****

REACTION NAME	NUMBER OF SECONDARY NEUTRONS	NUMBER OF P-N ENERGY RANGES FOR ORDERS	NUMBER OF PRIMARY DATA
FIRST + LAST PRIMARY GROUPS	0	1	1

MOMENT 0

PRIMARY SIGMA
1.02822E-03 8.60910E-03

INTER COMPLETED

UNUSED STORAGE 297995 WORDS

TIME FROM START 12.9 SECONDS. TIME IN THIS MODULE 0.0 SECONDS. UNUSED REGION THIS MODULE 1164 K BYTES.

WHC-SD-NR-SWD-017

-C- WINTP 1

READS INTERFACE 1

FORTRAN DATA SETS 11-15

DSNAMES:

***** WIMS-E MODULE W-INTER *****

-M- PPINT
 -M- FILE 3 5
 -M- SHAP
 -M- BEGINC

FILE 3

NUMBER DENSITIES			NO. OF MATERIALS			GROUPS			NO. OF MATERIALS			GROUPS		
NUCL	MATL	NO.DENSITY	NUCL	MATL	NO.DENSITY	NUCL	MATL	NO.DENSITY	NUCL	MATL	NO.DENSITY	NUCL	MATL	NO.DENSITY
1	1	6.1082E-02	2	1	4.9750E-04	3	1	3.5972E-04	4	1	2.4884E-10	5	1	2.9847E-09
6	1	2.8287E-09	7	1	2.2833E-09	8	1	2.2523E-11	9	1	1.2802E-09	10	1	2.3897E-10
11	1	1.3296E-10	12	1	4.0759E-11	13	1	1.8108E-11	14	1	4.3771E-12	15	1	4.9657E-12
16	1	1.1318E-10	17	1	1.3118E-09	18	1	2.9866E-09	19	1	1.0555E-12	20	1	2.5616E-10
21	1	6.9387E-10	22	1	5.4049E-10	23	1	2.6014E-09	24	1	1.7197E-09	25	1	4.8019E-10
26	1	5.0982E-10	27	1	6.9814E-13	28	1	1.1518E-12	29	1	1.2051E-12	30	1	1.1359E-10
31	1	3.6563E-10	32	1	8.6538E-12	33	1	1.7967E-10	34	1	1.1882E-10	35	1	6.8072E-11
36	1	1.3728E-13	37	1	4.9646E-07	38	1	1.2797E-11	39	1	3.8648E-22	40	1	5.1169E-07
41	1	2.7875E-12	42	1	3.8653E-22	43	1	2.2842E-04	44	1	2.7195E-08	45	1	6.9122E-10
46	1	2.5969E-11	47	1	1.8839E-05	48	1	1.1328E-08	49	1	1.4215E-06	50	1	1.7689E-10
51	1	6.4544E-13	52	1	3.2838E-15	53	1	2.0682E-18	54	1	1.3761E-08	55	1	3.4329E-12
56	1	1.0430E-13	57	1	5.5123E-10	58	1	7.2349E-17	59	1	2.1463E-19	60	1	1.6830E-20
61	1	1.9074E-20	62	1	3.6779E-05									

FOR EACH MATERIAL
 *****

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MATERIAL 1 NO. OF REACTIONS
4ABSORPTION
*****

REACTION NAME	NUMBER OF SECONDARY NEUTRONS	NUMBER OF P-N ENERGY RANGES FOR ORDERS	NUMBER OF P-N ENERGY RANGES FOR PRIMARY DATA
1	0	1	1

FIRST 1 + LAST PRIMARY GROUPS
2

MOMENT 0

PRIMARY SIGMA
1.02822E-03 8.60910E-03TRANSPORT
*****

REACTION NAME	NUMBER OF SECONDARY NEUTRONS	NUMBER OF P-N ENERGY RANGES FOR ORDERS	NUMBER OF P-N ENERGY RANGES FOR PRIMARY DATA
2	0	1	1

FIRST 1 + LAST PRIMARY GROUPS
2

RADIAL

PRIMARY SIGMA
2.16640E-01 2.89674E-01SCATTER
*****

REACTION NAME	NUMBER OF SECONDARY NEUTRONS	NUMBER OF P-N ENERGY RANGES FOR ORDERS	NUMBER OF P-N ENERGY RANGES FOR PRIMARY DATA
3	1	1	1

FIRST 1 + LAST PRIMARY GROUPS
2

MOMENT 0

PRIMARY SIGMA
2.61086E-01 2.96079E-01NO. OF ENERGY RANGES FOR SECONDARY DATA
1FIRST 1 + LAST PRIMARY GROUPS
2

FOR EACH PRIMARY GROUP

GROUP NO 1

JFST 1 JLSY 2

SCATTER MATRIX
2.5868E-01 2.4048E-03

GROUP NO 2

JFST 1 JLSY 2

SCATTER MATRIX
7.5714E-05 2.9800E-01

MOMENT 0

MOMENT 0

FISSION
*****

REACTION NAME	NUMBER OF SECONDARY NEUTRONS	NUMBER OF P-N ENERGY RANGES FOR ORDERS	NUMBER OF P-N ENERGY RANGES FOR PRIMARY DATA
4	3	1	1

FIRST 1 + LAST PRIMARY GROUPS
2

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MOMENT 0

PRIMARY SIGMA
2.15297E-04 2.97395E-03
NO. OF ENERGY RANGES FOR SECONDARY DATA
1
FIRST + LAST PRIMARY GROUPS
1 2

MOMENT 0

NU
2.43604E-00 2.43113E+00
FISSION YIELD
5.24470E-04 7.23022E-03
FOR EACH PRIMARY GROUP

GROUP NO 1 JFST 1 JLST 1

FISSION SPECTRUM
1.0000E+00

MOMENT 0

GROUP NO 2 JFST 1 JLST 1

FISSION SPECTRUM
1.0000E+00

MOMENT 0

SNAP-SCRAMBLE FORMAT CARD OUTPUT

I 1 0
1.5386E+00 1.1507E+00
3.4330E-03 6.6844E-03
5.2447E-04 7.2302E-03
2.5868E-01 2.4048E-03
7.5714E-05 2.9600E-01
W 1
2.15297E-04 2.97395E-03
SP
1.00000E+00 0.00000E+00

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FILE 5

MESHES	GROUPS	ORDERS
1	2	1
FLUXES		
2.40708E+01	8.65974E+00	
K	BX	BY BZ TC U
9.17740E-01	0.00000E+00	0.00000E+00 0.00000E+00 0.00000E+00 1.08963E+00
BUCKLINGS ARE CM*-2, NOT S.I. UNITS		
BURNUP TIME IRRADIATION		
2.00000E+00	1.76850E+02	
SPACE ITEMS (I/F WRITTEN IN DR AFTER MAY'72)		
7.04908E-01	6.20000E+01	0.00000E+00 2.30474E+20 5.53547E+17 0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00
0.00000E+00	0.00000E+00	0.00000E+00 0.00000E+00 0.00000E+00 0.00000E+00

INTER COMPLETED

UNUSED STORAGE 237996 WORDS

TIME FROM START 12.9 SECONDS.

TIME IN THIS MODULE 0.0 SECONDS.

UNUSED REGION THIS MODULE 928 K BYTES.

-C- STOP

UNUSED REGION FOR THIS RUN WAS 928 K BYTES.

Appendix C

WIMS-E Validation and Benchmarking Document

This appendix contains a summary of some of the work performed to validate and benchmark the WIMS-E code for Hanford Site applications. The analysis results generated by the WIMS-E code were compared with results produced by other applicable codes.

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1.0 INTRODUCTION

The WIMS-E computer code is a state-of-the-art lattice physics neutron transport system capable of modeling nuclear systems with complex geometries, using a choice of numerical method options, and in up to 69-energy groups. WIMS-E was developed in England at the Atomic Energy Establishment Winfrith (AEEW) and was obtained by the Hanford Site under special license agreement.

When this code was received from Winfrith, a set of four test problems was included for code verification. Output from two of these test problems was included in the WIMS-E software quality assurance documentation (Appendix B). Excellent agreement was obtained between results from these sample problems executed on the Hanford CRAY X/MP-18, and with the documented British results.

Earlier versions of the WIMS code have been extensively validated against measured data (Askew 1969, Mallen et al. 1979, Robinson 1989, Schwinkendorf 1989, and others). This report serves to document the benchmarking of the WIMS-E code system against other computer codes, for both reactivity predictions and isotopic depletion calculations for Light Water Reactor (LWR) systems.

2.0 SUMMARY

This document contains the results of WIMS-E code benchmarking against reactivity predictions from both WIMS-D and the LEOPARD computer code, for a single fuel pin cell from a standard Westinghouse LWR design, for both zero exposure, and as a function of exposure.

3.0 COMPUTER CODES AND INPUT

3.1 PCODE

The PCODE computer code is a simple program written at WHC, which performs pin cell thermalhydraulics and heat transfer analysis in order to evaluate the temperature distribution within a nuclear fuel element. A one thermal group lattice physics calculation, involving diffusion theory "lattice functions", is also employed. This physics routine provides the thermal neutron diffusion length, which allows for an analytic diffusion theory estimate of the radial pin power distribution, which then feeds into the calculation of radial temperature within the fuel region.

PCODE performs a self-consistent calculation of thermally expanded dimensions, based on region averaged temperatures, and reduced densities. This code has been used by WHC for the calculation of hot operating conditions for LWR analysis by the WIMS-E code.

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3.2 WIMS-D

WIMS-D was used to perform a 69 group neutron thermalization calculation, using the SPECTROX routine, and a spatial neutron transport calculation in 18 energy groups, using the one dimensional collision probability option PERSEUS, for the benchmark problem. A set of hot operating conditions, consisting of temperatures, thermally expanded dimensions and reduced densities, was provided by the PCODE computer code.

3.3 LEOPARD

The LEOPARD code (Barry 1964) was originally developed for use on an IBM 7094 mainframe computer, and performs pin cell burnup calculations for an LWR lattice. The resonance integral calculations are performed using the MUFT scheme.

The LEOPARD code, associated cross section library, and pre-processing code, SPOTS, was acquired from Oregon State University.

3.4 WIMS-E

The WIMS-E code was employed to calculate the reactivities under green and exposed conditions, for the benchmark problem. Both the neutron thermalization and spatial transport calculations were performed in the full 69-energy groups, although the burnup equations were evaluated in the same 18 group structure as employed in the WIMS-D calculations.

3.5 BENCHMARK PROBLEM

A standard Westinghouse LWR fuel design (Duderstadt, et. al.) consists of a core operating at 3411 MWth, using 193 assemblies containing a rectangular array of 17x17 pins, of which 264 are fuel elements. The active core height is equal to 366 cm. The following is a summary table of other pertinent operating data.

This table consists of sufficient input data for PCODE, which produced hot operating conditions for a single fuel element, which were then input into the WIMS-D, LEOPARD, and WIMS-E computer codes.

4.0 RESULTS

The above three computer codes were executed on the benchmark problem. Table 4.1 contains the results of the zero exposure calculations. All of these calculations were performed on the Hanford RLVAX1 computer, a DEC VAX 11/780, except for the WIMS-E calculation, which was performed on the Hanford CRAY X/MP-18. The WIMS-D calculation used the 1235.4 and 3238.5 resonance tabulations for the uranium isotopes, which produce the highest k-infinity of any other combination, and which have been identified earlier for use in LWR reactor spectra, in conjunction with New Production Reactor (NPR) studies.

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Table 3.1. Standard Westinghouse LWR Design and Operating Data

<u>Design Parameters</u>	<u>Values</u>
Lattice Pitch	1.25 cm
Fuel pellet diameter	0.819 cm
Fuel/clad gap	0.0041 cm
Clad thickness	0.0572 cm
Enrichment (this calc)	3.1 wt%
System pressure	2250 psia
Primary flow	62e6 kg/hr
Inlet temperature	300 °C
Fuel:	95% TD 2% porosity 2.5% dishing fraction 10.133 g/cc effective density
Helium Fill gas	400 psia

Table 4.1. Zero Exposure Benchmark Results

<u>Computer Code</u>	<u>k-Infinity</u>
PCODE	1.319658
LEOPARD	1.31215
WIMS-D	1.30521
WIMS-E	1.311807

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The PCODE program does not have burnup capability, so WIMS-E exposure-dependent reactivity predictions were compared to WIMS-D and LEOPARD results. Table 4.2 contains the results of these calculations, all of which were performed on the Hanford CRAY (except for the LEOPARD calculations which were performed on the VAX 11/780). One reason why WIMS-E predicts a smaller value for xenon worth (compared to WIMS-D) is that WIMS-E builds in Xe-135 explicitly in time, and two days was assumed to build in this isotope to "nearly" its asymptotic value. WIMS-D builds in the full limiting concentration of Xe-135 instantaneously. The exposure times were all on the same basis.

Table 4.2. Exposure-Dependent Benchmark Results

<u>Exposure</u>	<u>k-Inf(WIMS-D)</u>	<u>k-Inf(WIMS-E)</u>	<u>k-Inf(LEOPARD)</u>
Green	1.30521	1.311807	1.31215
+Xenon	1.25584	1.265821	1.27008
32 days	1.23852	1.244110	1.24394
62 days	1.22361	1.228966	1.22726
92 days	1.20791	1.213257	1.21022
122 days	1.19230	1.197615	1.19331
152 days	1.17720	1.182487	1.17692
182 days	1.16283	1.168114	1.16117
212 days	1.14917	1.154498	1.14611
Xenon Worth	38.6 mk	35.7 mk	32.6 mk
Reactivity change	88.8 mk	92.1 mk	102.7 mk

5.0 CONCLUSIONS

WIMS-E has been benchmarked against other computer codes (WIMS-D and LEOPARD) for applications for which this code has been utilized for at the Hanford Site. Acceptable agreement has been shown.

APPENDIX

At present, WIMS-E at the Hanford Site has only been used for LWR calculations. N Reactor modeling has not been possible, since the 69-group cross section library was generated assuming a light water neutron spectrum, and because the resonance integral calculations were not capable of correcting for the heterogeneous effects of tube-in-tube geometry. WIMS-D also has this problem, but since there are a number of different resonance integral tabulations in the WIMS-D data library, it was possible to evaluate many combinations of these tabulations to establish (empirically) which combinations resulted in the optimum agreement with Physical Constants Test Reactor (PCTR) measurements.

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However, the complete WIMS-E system does have the capability to model these tube-in-tube systems explicitly, performing heterogeneous resonance integral calculations using first principles. The ability to execute those modules which perform these calculations depends upon the presence of one particular routine which has only recently arrived from Winfrith. Utilizing this new capability, and using 69-group cross sections which were generated assuming a graphite spectrum, should allow for the accurate modeling of N Reactor with WIMS-E. The construction of a graphite spectrum 69-group library for WIMS-E would entail executing the NJOY cross section processing code system. Once this is accomplished, meaningful benchmarking of WIMS-E against WIMS-D N Reactor models and DCODE predictions of reactivity changes during an exposure cycle would be possible.

References:

WCAP-6058, "LEOPARD - A Spectrum-Dependent Non-spatial Depletion Code for the IBM-7094," USAEC, 1964.

"Nuclear Reactor Analysis," J. J. Duderstadt and L. J. Hamilton, John Wiley & Sons, Inc., New York, Appendix H, p. 634, 1975.

REVIEW COMMENT RECORD (RCR)				1. Date	2. Review No.
				6/8/00	N/A
				3. Project No.	4. Page 1 of 2
				SNF Project	
5. Document Number(s)/Title(s)	6. Program/Project/Building Number	7. Reviewer	8. Organization/Group	9. Location/Phone	
SNF-Rev.1/ Single Use LetterReport for Verification and Validation for RADNUC-2A and ORIGIN2 S.2 Computer Codes	SNF Project / 2752E	RD Crowe	Nuc Safety	6-8028	
17. Comment Submittal Approval	10. Agreement with indicated comment disposition(s)	11. CLOSED			
Organization Manager (optional)	6/8/00 Date Reviewer/Point of Contact Author/Originator	6/8/00 Date Reviewer/Point of Contact Author/Originator			
12. Item	13. Comment(s)/Discrepancy(s) (Provide technical justification for the comment and detailed recommendation of the action required to correct/resolve the discrepancy/problem indicated).	14. Reviewer Concurrence Required	15. Disposition (Provide justification if NOT accepted).	16. Status	
1	Editorial a) Consistent reference to RADNUC-2A should be used, either as "RADNUC-2A" or "Radnuc-2a" b) "Modes" should be "Codes" on title page c) page 1, par 2, "nad" should be "and" d) appendix a. page A-5, table A-2 referenced before table A-1		Accept.		
2	Page 4, par 2, Reference to "Section 2.1" is incorrect, should probably be "Section 3.1.2"		Accept.		
3	References a) Reference to Ludwig letter to Schmittrock not found in text, should be removed from references. b) Reference to Wittekind letter to Ludwig not found in text, should be removed from references. c) Schwinkendorf, 1989, reference not a released document, could be included in this document as an attachment.		Accept.		

Attachment 2

Attachment to Review In order to SNF-4503, Rev. 1 to assess adequacy of its RADNUC-2a verification and validation for a single use application according to HNF-PRO-309 Rev. 0, the information presented in SNF-4503 was compared to procedural steps, as defined in HNF-PRO-309, Rev. 0, required for the software System/Owner Organization. Those steps applicable to a single use application were matched to corresponding section of SNF-4503. The SNF project is not the owner/system owner organization of this software. However, comparing as appropriate, these procedural steps to the information in SNF-4503, provides an assurance that the single use of these computer codes is consistent with the practice and requirements of software development and usage.	
Steps in Procedure for System Owner/System Owner Organization from Computer Software Quality Assurance Requirements, HNF-PRO-309, Rev. 0	
1 Determine need to acquire a new software product or to have it developed.	1. Addressed in Section 1.0 Summary.
2 Determine the extent and rigor of project review and acceptance testing, based on the importance of the software and justified in project planning documents.	2. Test cases and acceptance logic addressed in Section 2.0 Test Cases and Approach.
3 Initiate a procurement document in accordance with HNF-PRO-268, <i>Control of Purchased Items and Services</i> .	3. NA
4 Develop project planning document (Section 2.2).	4. NA
5 Identify required documentation (Section 2.5).	5. This document, SNF-4503, is the documentation for single use verification and validation of RADNUC-2A.
6 Review project activities throughout a software life cycle (Section 2.3).	6. NA
7 Ensure software development, user documentation, and traceability of documentation are complete.	7. Addressed in Section 1.0 Summary
8 Ensure software is ready to be formally tested against the current software requirements.	8. Addressed in Sections, 1.0 Summary Section
9 Perform software verification and document results.	9. Addressed in Appendices: App. A – V&V of RADNUC-2A App. C – V&V of Origin2-S.2.
10 Establish and maintain a software configuration management system (Section 2.6).	10. Hardware configuration in following sections: 5.1 RADNUC-2A 5.2 ORIGIN2 Software configuration as program source listing included in appendices: App. B – Source listing for RADNUC-2A App. C – Source listing for Origin2-S.2.
11 Prepare software validation (test) plan (Section 2.4.3).	11. Addressed in Section 4.0.
12 Evaluate as-built software, and verify required reviews.	12. Addressed in following sections and appendices: 5.0, Results for Single-Use Test problems App. A, Section 3 RADNUC-2A

	App. C, Section 4 ORIGENs S.2
13 Verify completion and adequacy of support documentation to satisfy the requirements (Section 2.4.3).	13. This document, SNF-4503, provides documentation for single use verification and validation of RADNUC-2A.
14 Perform software validation per approved plan and document results (Section 2.4.3).	14. Testing documented in following appendices: App. A, Section 3 RADNUC-2A App. C, Section 4 ORIGENs S.2
15 Assure that software and required documentation are received and approved prior to the distribution and operation of the software.	15. NA
16 Distribute software per the requirements of the configuration control document.	16. NA

REVIEW CHECKLIST

Document Reviewed:

SNF-4503 Rev 1., Single Use Letter Report for Verification and Validation of RADNUC-2A and ORIGINS S.2 Computer Codes, Packer, M. J.

Scope of Review:

Reviewed SNF-4503, Rev. 1 to assess adequacy of its RADNUC-2a verification and validation for a single use application according to HNF-PRO-309 Rev. 0. Validation and verification of ORIGINS S.2 for single use application to provide input to RADNUC-2A was also reviewed.

Yes   No   NA

☒	☐	☐	• Previous reviews complete and cover analysis, up to scope of this review, with no gaps.
☒	☐	☐	Problem completely defined.
☐	☐	☒	Accident scenarios developed in a clear and logical manner.
☒	☐	☐	Necessary assumptions explicitly stated and supported.
☒	☐	☐	Computer codes and data files documented.
☒	☐	☐	Data used in calculations explicitly stated in document.
☒	☐	☐	Data checked for consistency with original source information as applicable.
☐	☐	☒	Mathematical derivation checked including dimensional consistency of results.
☐	☐	☒	Models appropriate and used within range of validity or use outside range of established validity justified.
☐	☐	☒	Hand calculations checked for errors. Spreadsheet results should be treated exactly the same as hand calculations.
☒	☐	☐	Software input correct and consistent with document reviewed.
☒	☐	☐	Software output consistent with input and with results reported in document reviewed.
☐	☐	☒	Limits/criteria/guidelines applied to analysis results are appropriate and referenced. Limits/criteria/guidelines checked against references.
☐	☐	☒	Safety margins consistent with good engineering practices.
☒	☐	☐	Conclusions consistent with analytical results and applicable limits.
☒	☐	☐	Results and conclusions address all points required in the problem statement.
☐	☐	☒	Format consistent with appropriate NRC Regulatory Guide or other standards.
☒	☐	☐	* Review calculations, comments, and/or notes are attached.
☒	☐	☐	Document approved.

Ralph Crowe

Reviewer (Printed Name and Signature)

6/8/00

Date

*Any calculations, comments, or notes generated as part of this review should be signed, dated and attached to this checklist. Such material should be labeled and recorded in such a manner as to be intelligible to a technically qualified third party.