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FORT ST. VRAIN STARTUP TEST A-3:
PULSED-NEUTRON EXPERIMENTS

by

W. Pfeiffer, J. R. Brown
and A. C. Marshall

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ABSTRACT

Pulsed-neutron experiments were performed on the Fort St. Vrain high-temperature gas-cooled reactor to determine the reactivity of the core for various control rod configurations while the reactor was still subcritical. For the configurations near critical, the neutron generation time was also determined. The configurations pulsed were primarily those which will be encountered during normal operation or those which have safety implications. Thus these experiments provided a valuable check of the nuclear design.

Two methods were used to interpret most of the results. For all configurations the reactivity (or equivalently the multiplication constant, k_{eff}) was inferred from the inhour equation using the measured decay constant, α , of the fundamental mode and a calculated generation time, Λ . For configurations near critical, both k_{eff} and Λ were determined using the extrapolated area-ratio method. For a pair of configurations very near critical, k_{eff} and Λ were also measured using another, unnamed method.

The originally calculated (i.e., predicted) values for α , k_{eff} , and Λ agree poorly with those determined experimentally. The discrepancies observed are evidently due to a deficiency in the treatment of the reflector in the original calculational model. By adding 5 ppm of natural boron in the reflector model, the calculated values for α , k_{eff} , and Λ are brought into very good agreement with the measured and inferred values for all control rod configurations. An investigation revealed that the impurity level of the reflector was in fact measured to be higher than assumed in the original calculations and may well be consistent with the proposed adjustment in the calculational model. It is significant that the adjustment improves the agreement between the calculated and inferred k_{eff} values primarily by

changing the inferred values, not the calculated values. Consequently, the originally calculated (predicted) values for control rod worths, shutdown margin, etc. are only slightly conservative and require no major revisions.

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1. INTRODUCTION

Pulsed-neutron experiments were performed on the Fort St. Vrain high-temperature gas-cooled reactor (HTGR) to determine the reactivity of the core for various control rod configurations while the reactor was still subcritical. For the configurations near critical, the neutron generation time was also determined. The configurations pulsed were primarily those which will be encountered during normal operation or those which have safety implications. Thus these experiments provided a valuable check of the nuclear design.

The pulsed-neutron technique was chosen for this startup test because it is believed to be the most accurate technique for determining reactivity over the entire range from far subcritical to very near critical (Ref. 1, pp. 273-277). Moreover, this technique was previously used quite successfully on the Peach Bottom HTGR (Refs. 2 and 3).

Each experiment consisted of a number of steps which can be summarized as follows:

1. Setting up the experiment. The control rods, the pulsed source, and the detectors were properly positioned.
2. Taking the data. The core was pulsed and the time response of the thermal neutron flux following each pulse was measured with the detectors.
3. Analyzing the data. The measured time response was fit using least squares to determine the experimental decay constant, α , of the fundamental mode. The amplitudes of the fundamental mode and the delayed neutron background were also obtained from this fit.

4. Inferring the reactivity. The reactivity, ρ , was inferred from the inhour equation, $\rho \approx \Lambda\alpha + \beta$, using the fitted value for α , a calculated generation time, Λ , and the known value for the delayed neutron fraction, β . For configurations near critical, the reactivity was also determined using the extrapolated area-ratio method.
5. Determining the generation time. The neutron generation time was determined experimentally from the inhour equation, written as $\Lambda \approx (\rho - \beta)/\alpha$, for those near critical configurations for which an independent determination of the reactivity could be made, e.g., by the extrapolated area-ratio method.

Each aspect of the experiments related to the steps above is discussed in this report. This discussion is preceded by a summary of the theory on which the experiments are based and followed by a comparison between the calculated and inferred results.

2. THEORY OF THE EXPERIMENTS

The theory of pulsed-neutron experiments is described in some detail in Ref. 3 and Ref. 4, pp. 546-554. A summary, which is extracted from Ref. 5, is given here.

2.1 Time Response of the Neutron Flux

In general, the neutron flux, $\phi(\vec{r}, E, t)$, following each pulse can be written as a sum of kinetic modes,

$$\phi(\vec{r}, E, t) = \sum_{i=0}^{\infty} a_i \phi_i(\vec{r}, E) e^{\alpha_i t}. \quad (1)$$

This expansion results from separating the time dependence from the space and energy dependence in either the neutron transport or diffusion equation (Ref. 4, pp. 268-269, 533-534). The decay constants, α_i , and the kinetic modes, $\phi_i(\vec{r}, E)$, depend only upon the core configuration, whereas the amplitudes, a_i , depend upon the source characteristics as well — in particular, the source position, strength, and pulse rate.

For a subcritical reactor, the decay constants, α_i , are all negative and fall into two categories (Ref. 6, pp. 58-59 and Ref. 3, pp. 286-287) — those which are quite close to the negative decay constants, $-\lambda_j, j=1, \dots, 6$ (Ref. 1, pp. 89-92), of the delayed neutron precursors, and those which are quite far away from the former, $|\alpha_i| \gg \lambda_j$. Those modes with α_i in the first category are called delayed modes, while those with α_i in the latter category are called prompt modes. Thus Eq. (1) can be rewritten as

$$\phi(\vec{r}, E, t) = \sum_{i=0}^{\infty} a_i^P \phi_i^P(\vec{r}, E) e^{\alpha_i^P t} + \sum_{i=0}^{\infty} a_i^d \phi_i^d(\vec{r}, E) e^{\alpha_i^d t}, \quad (2)$$

where the superscripts p and d refer to prompt and delayed modes. If the prompt modes are ordered such that

$$|\alpha_0^P| < |\alpha_1^P| < |\alpha_2^P| < \dots ,$$

then ϕ_0^P is called the fundamental prompt mode.

With this theoretical background, it is possible to interpret the shape of the time response of the thermal neutron flux following each pulse. A schematic time response is shown on a semi-log plot in Fig. 1. This time response is characterized by three time intervals:

1. a short interval of time following the pulse during which the fast source neutrons slow down and the higher prompt modes (harmonics) die away,
2. an intermediate interval of time during which the neutron flux is decaying exponentially with the decay constant, α_0^P , characteristic of the fundamental prompt mode, and
3. a long interval of time up until the next pulse during which the neutron flux remains nearly constant (very slowly decaying), due to the presence of delayed neutrons.

2.2 Determination of the Reactivity

Two methods for obtaining the reactivity from the time response will be described here, although other variations have been devised (Ref. 3 and Ref. 4, pp. 546-554). The first method is the inhour method, which is based on the inhour equation (Eq. (12) in Ref. 3),

$$\rho = \alpha_0^P \left[\Lambda + \beta_{\text{eff}} \sum_{j=1}^6 \frac{(\beta_j / \beta)}{\alpha_0^P + \lambda_j} \right] , \quad (3)$$

Fig. 1. Schematic time response of thermal flux following pulse.

where

Λ = the neutron generation time,

β_{eff} = the effective delayed neutron fraction,

β = the total delayed neutron fraction $\left(= \sum_{j=1}^6 \beta_j \right)$,

β_j = the delayed neutron fraction due to the jth precursor,

λ_j = the decay constant of the jth precursor,

and the usual assumption of six precursors has been made (Ref. 1, pp. 89-92). Values for the constants, β_j/β and λ_j , for a thermal ^{235}U -fueled reactor (Ref. 1, p. 90) are given in Table 1.

Table 1

Delayed Neutron Constants
for Thermal Fission in ^{235}U

j	β_j/β	λ_j (sec^{-1})
1	0.033	0.0124
2	0.219	0.0305
3	0.196	0.111
4	0.395	0.301
5	0.115	1.14
6	0.042	3.01

Eq. (3) can also be written as

$$\rho = \Lambda \alpha_o^P + \beta_{\text{eff}} f(\alpha_o^P) \quad (4)$$

where

$$f(\alpha_o^P) \equiv \sum_{j=1}^6 \frac{(\beta_j/\beta) \alpha_o^P}{\alpha_o^P + \lambda_j} \quad (5)$$

Since $|\alpha_0^P| \gg \lambda_j$, $f(\alpha_0^P) \approx 1$. Thus a very good, and commonly used, approximation to Eq. (4) is

$$\rho \approx \Lambda \alpha_0^P + \beta_{\text{eff}} \quad (6)$$

For a large reactor with little leakage, such as the Fort St. Vrain HTGR, the effective delayed neutron fraction, β_{eff} , is very nearly the same as the total delayed neutron fraction, β . The latter depends only on the fissile isotope, in this case ^{235}U , so that $\beta_{\text{eff}} = \beta = 0.0065$ (Ref. 1, pp. 102-103). Thus β is a known constant independent of the control rod configuration. The generation time, Λ , however, varies significantly with the control rod configuration and must be calculated. To obtain the reactivity, ρ , the experimental data over the second interval of Fig. 1 are analyzed by least squares to obtain α_0^P . Using a calculated value for Λ , the reactivity is then obtained from Eq. (4). Note that the reactivity is only inferred, not measured, since errors in the calculated generation time produce corresponding errors in the reactivity.

The second method for determining reactivity, which is of interest here, is the extrapolated area-ratio method. The basic equation of the original area-ratio method is

$$\frac{\rho}{\beta} = - \frac{\text{prompt neutron area}}{\text{delayed neutron area}} \quad (7)$$

where the appropriate areas are shown in Fig. 1. The original area-ratio method is sensitive both to higher harmonics and to kinetic distortion.* The effect of higher harmonics can be mitigated by considering only the prompt

* Kinetic distortion is the space- and energy-dependent difference between the fundamental prompt and delayed modes.

neutron area due to the fundamental mode and extrapolating it back to the time of the pulse. This leads to the extrapolated area-ratio method with the basic equation,

$$\frac{\rho}{\beta} = - \frac{\text{extrapolated prompt neutron area}}{\text{delayed neutron area}} \times F(\vec{r}) , \quad (8)$$

where the space-dependent correction factor F accounts for the residual effect of higher harmonics as well as for the effect of kinetic distortion. An expression for F is derived in Ref. 3 (Eq. (38) there, although the notation is different). If the higher harmonics are negligible, then F is due solely to kinetic distortion and is given by

$$F(\vec{r}) = \frac{\phi_o^d(\vec{r}, E_{th})}{\phi_o^p(\vec{r}, E_{th})} , \quad (9)$$

where $\vec{r}$ is the location of the thermal neutron detector and each of the fundamental mode flux distributions is normalized for an equal fission source over the core.

To determine the areas in Eq. (8), the amplitudes of the fundamental prompt and delayed modes, as well as their decay constants, are required. These quantities are available from the same least squares fit used to obtain α_o^p . However, the correction factor, F , must be calculated for each detector location, $\vec{r}$. For a light water reactor or for an HTGR near critical, F is close to 1. For an HTGR far subcritical, however, F can be much larger, because of the small absorption in the reflector.

From the above discussion, it is clear that both the inhour method and the extrapolated area-ratio method require auxiliary calculations (for Λ and F , respectively) to determine the reactivity from the experimental measurements. Near critical, it is believed that both calculations are of comparable accuracy, so that either method can be used. However, for far subcritical configurations, the inhour method is probably less sensitive to calculational errors, and hence more accurate.

2.3 Determination of the Generation Time

By rewriting the inhour equation as

$$\Lambda = \frac{\rho - \beta f(\alpha_o^P)}{\alpha_o^P}, \quad (10)$$

it is evident that the neutron generation time can be determined experimentally from the measured decay constant, α_o^P , provided that the reactivity, ρ , is determined independent of the inhour equation. Such an independent determination is provided by the extrapolated area-ratio method. Other methods for determining the reactivity, and hence the generation time, are also available near critical. One such method requiring the pulsing of two related configurations will be described now.

Consider two configurations near critical whose reactivities are related in a simple manner. For example, suppose that the reactor is taken critical with the central control rod partially withdrawn. Then let configurations 1 and 2 correspond to this control rod inserted 10 and 20 inches from critical, respectively. If the differential rod worth were constant over the entire 20 inches, then the reactivity of configuration 2 would be related to that of configuration 1 by

$$\rho_2 = c \rho_1 \quad (11)$$

with $c = 2$. Even if the differential rod worth can not be assumed constant, the factor c can be determined from the ratio of scaler count rates for the two configurations due to a steady source in the reactor, since near critical

$$\frac{CR_1}{CR_2} = \frac{\rho_2}{\rho_1} = c \quad . \quad (12)$$

This provides one equation relating ρ_1 and ρ_2 . A second equation is obtained by pulsing both configurations, determining the associated fundamental mode decay constants (α_1 and α_2), and assuming that the generation times of the two configurations are the same. Thus

$$\Lambda_1 = \frac{\rho_1 - \beta f_1}{\alpha_1} = \frac{\rho_2 - \beta f_2}{\alpha_2} = \Lambda_2 \quad . \quad (13)$$

Solving Eqs. (11) and (13) for ρ_1 gives

$$\rho_1 = \frac{f_1 \alpha_2 - f_2 \alpha_1}{\alpha_2 - c \alpha_1} \beta \quad . \quad (14)$$

Then by using this value in Eq. (13), the generation time is obtained as

$$\Lambda = \frac{cf_1 - f_2}{\alpha_2 - c\alpha_1} \beta \quad . \quad (15)$$

A nearly equivalent alternative to the above method results from noting that if Λ is constant near critical, then α is linear with respect to ρ , except for small variations in the factor $f(\alpha)$. Thus linear extrapolation of α_1 and α_2 with respect to ρ can be used to obtain the value, α_0 , corresponding to $\rho_0 = 0$, i.e., the just critical reactor. By using

Eq. (11), this extrapolation can be done without solving for ρ_1 and ρ_2 .
Then

$$\alpha_o = \frac{c\alpha_1 - \alpha_2}{c - 1} \quad (16)$$

and

$$\Lambda = - \frac{\beta f_o}{\alpha_o} = \frac{(c-1)f_o}{\alpha_2 - c\alpha_1} \beta \quad (17)$$

Eqs. (15) and (17) are very similar and give essentially the same numerical result.

3. EXPERIMENTAL EQUIPMENT

The equipment used for the pulsed-neutron experiments consisted of the following:

1. a pulsed-neutron source,
2. three neutron detectors,
3. an external timer, and
4. the Fort St. Vrain data logger programmed as a multi-channel analyzer.

In addition, once the data were taken, it was possible to analyze them on-site by using

5. the data logger programmed to perform a least squares analysis.

The pulsed-neutron source was a Kaman Model A-801. This source produces 14 MeV neutrons by accelerating deuterium ions into a tritium target. Approximately 10^8 neutrons are produced in each 10 μ sec wide pulse. The pulse rate was varied from 2 to 0.15 pulses/sec, the lower pulse rates being used close to critical.

The detectors were boron-lined proportional counters. These are sensitive primarily to thermal neutrons, in contrast to the fast neutrons produced by the source. These detectors have a 2 μ sec dead time.

The detectors, as well as the pulsed-neutron source and an external timer, were connected to the Fort St. Vrain data logger (a CDC 1700 computer), which was programmed as a multi-channel analyzer. The external timer was required to generate interrupt signals to the computer for dividing the time

following each neutron pulse into equal width time channels. The detector counts were accumulated in the first 399 of these channels. Channel widths of 638 and 1075 μ sec were used, the wider channels being used close to critical. No counts could be registered during the first 70 μ sec of each channel. The effect of this 70 μ sec dead time was to slightly reduce the count rate in all channels.

Computer programs were available for receiving and storing the count data from the detectors, for printing and punching out the data, and for analyzing the data by least squares. The programs, which were stored on a drum, could be brought into the computer memory in response to signals from the operator console in the control room. Once an experiment was set up, it was only necessary to manipulate buttons, switches, and thumbwheels on the operator console to receive and process the data. Information display was by printed messages on a typewriter in the control room. A detailed description of the data logger program package is given in Ref. 7.

After completion of each experiment, the raw count data were punched on a paper tape in the computer room. These data were then sent via teletype to San Diego for more sophisticated analysis on a Univac 1108.

4. EXPERIMENTAL CONFIGURATIONS

4.1 Core Description and Control Rod Configurations

Fort St. Vrain is a 330 MW high-temperature gas-cooled reactor (HTGR) designed by General Atomic for the Public Service Company of Colorado and located about 35 miles north of Denver. The active core of the reactor consists of six layers of hexagonal fuel elements composed of graphite, thorium, and 93% enriched uranium. Each layer has 247 fuel elements, for a total of 1482 in the core. The active core is completely surrounded by graphite reflector elements, some hexagonal and others irregularly shaped. A plan view of the core and reflector is shown in Fig. 2.

The columns of fuel elements are grouped into 37 refueling regions, each containing seven columns, except for 6 five-column regions on the core periphery. The central fuel column in each region contains a control rod pair. Since the two rods in this pair are physically coupled, the expression "control rod" will often be used in the remainder of this report instead of the more precise expression, "control rod pair."

The control rods are banked in groups of three rod pairs. These groups with their predicted reactivity worths are listed in Table 2 in the normal withdrawal sequence. During startup, the rods groups are withdrawn in sequence until criticality is achieved. Consequently, during normal operation only one group of rods and the central regulating rod are partially inserted. All other groups are either fully withdrawn or fully inserted.

The control rod configurations which were pulsed are listed, along with relevant experimental information, in Table 3. Included are two configurations with temporary absorbers in the core (Confs. 1 and 2), eight with rods withdrawn in the normal sequence (Confs. 3, 6, 7, 8, 9, 10, 11A, and 11B), and three with high worth rods withdrawn (Confs. 4, 5, and 12). Thus, all together 13 distinct control rod configurations were

NOTES:

1. FUEL REGION BOUNDARIES

2. CONTROL ROD COLUMN
(WITH FUEL REGION
IDENTIFICATION NUMBER)

Fig. 2. Plan view of Fort St. Vrain reactor.

Table 2

Control Rod Withdrawal Sequence and Predicted Rod Worth
for the Initial Core
(As-Built with Shim)

Sequence	Group Number	Rod Pairs Comprising Group			Group Worth $\Delta\rho$ When Pulled in Sequence	Cumulative Group Worth $\Delta\rho$	Average Worth $\Delta\rho$ of Rod Pair in Group
		A	B	C			
1	3C	10	14	18	0.0389	0.0389	0.013
2	2A	2	4	6	0.0348	0.0737	0.012
3	4B	21	27	33	0.0094	0.0831	0.003
3A	1(half out)		1		0.0097	0.0928	
4	4F	25	31	37	0.0088	0.1016	0.003
5	2B	3	5	7	0.0416	0.1432	0.014
6	3A	8	12	16	0.0163	0.1595	0.005
7	4D	23	29	35	0.0026	0.1621	0.001
8	3B	9	13	17	0.0232	0.1853	0.008
9	4E	24	30	36	0.0082	0.1935	0.003
10	4A	20	26	32	0.0083	0.2018	0.003
11	3D	11	15	19	0.0206	0.2224	0.007
12	4C	22	28	34	0.0071	0.2295	0.002
13	1(last half)		1		0.0024	0.2319	

Note: The predicted rod worths were obtained using a 4-group, hexagonal geometry core model, not the seven-group, r-z geometry model discussed in Section 7.

TABLE 3

RELEVANT EXPERIMENTAL INFORMATION FOR CONFIGURATIONS PULSED

Run No.	Configuration		Source Axial Location (inches) ^a	Detector Axial Location (inches) ^a			Channel Width (μ sec)	Pulse Rate (sec^{-1})	Number of Pulses	Run Time (min.)
	No.	Description	Reg. 1	Reg. 30	Reg. 31	Reg. 16				
1	1	All temporary absorbers in, rods 2, 4, 6 in	102	39	39	125	638	2	8402	70
2	2 ^b	All temporary absorbers in, rods 2, 4, 6 out	110	31	31	94	638	0.7	2467	59
3	2A		110	31	31	94	638	0.7	2493	59
4	2B		110	39	39	51	638	0.7	2449	58
5	3	All rods in	98	39	39	51	638	0.72	8032	186
6	3A		98	27	27	39	638	0.72	4072	94
7	4	Rod 30 out	98	125	125	125	638	0.72	4095	95
8	4A		98	43	43	51	638	0.72	3846	89
9	5	Rod 31 out	98	125	125	125	638	0.70	3920	93
10	5A		98	43	43	51	638	0.74	3934	89
11	6A	Rod group 3C out	87	125	125	110	638	0.68	4810	118
12	6		87	39	39	75	638	0.70	3722	89
13	7A	Rod groups 3C, 2A out	87	125	125	110	638	0.74	1968	44
14	7		79	39	39	59	638	0.50	1352	45
15	8	Rod groups 3C, 2A, 4B out	79	39	39	59	638	0.50	883	29
16	9	Rod groups 3C, 2A, 4B out; rod 1 out 115 inches	79	39	39	59	1075	0.154	767	83
17	10	Rod groups 3C, 2A, 4B, 4F out	79	39	39	59	1075	0.154	430	47
18	11A	Rod groups 3C, 2A, 4B, 4F out; rod 1 out 112 inches	79	39	39	59	1075	0.153	410	45
19	11B	Rod groups 3C, 2A, 4B, 4F out; rod 1 out 122 inches	79	39	39	59	1075	0.153	406	44
20	12	Rods 30, 31 out	79	39	39	59	1075	0.153	812	88

a The axial location entries are in inches below the top core-reflector interface to the source target or the center of the active detector length.

b. For this run, rods 2, 4, 6 were 6 inches less than full out.

pulsed. In addition, several configurations were pulsed with different source or detector locations, so that 20 separate runs of data were taken.

4.2 Source and Detector Locations

When these experiments were planned, it was realized that they might be more difficult to interpret than those done on the 40 MW Peach Bottom HTGR. This is because the decay constants of the higher harmonics are considerably closer to that of the fundamental mode for the much larger 330 MW Fort St. Vrain HTGR. Moreover, the core loading is not symmetric azimuthally. Consequently, the source and detector locations were carefully chosen in order to minimize the contribution of the higher harmonics to the time response. The axial location of the source and detectors was unrestricted, but because of their size, they were restricted radially to a single location in each region, namely the reserve shutdown hole of the control rod column (see Fig. 3). With this restriction, the locations given in Table 3 were chosen based on a series of computer simulations of the experiments, which are described in detail in Refs. 5 and 8. In addition, relatively low pulse rates were used in order to observe the fundamental mode before the delayed neutron background was reached. Had these precautions not been taken, the first and last intervals of the time response in Fig. 1 might have merged together, so that determination of the decay constant of the fundamental mode would have been difficult. Even still, the contamination from higher harmonics was substantial for the far subcritical configurations, particularly in the time response from the detector in region 16. Although this was anticipated, region 16 was chosen because it is a desirable detector location for configurations near critical. Fortunately, it has been possible to subtract out most of the contamination by using the methods of analysis described in the next section.

Fig. 3. Detail of region showing location of control rod holes and reserve shutdown hole.

5. PROCEDURE FOR ANALYZING THE DATA

Representative raw count data from the three detectors are shown in Fig. 4 for configuration 5. These data clearly show the three time intervals following the pulse (i.e., slowing down and harmonic decay, fundamental decay, and delayed background). To analyze these data by the inhour method, it is necessary to determine the decay constant, α_o^P , of the fundamental mode. For the extrapolated area-ratio method, the amplitudes of the fundamental mode and of the delayed neutron background are also required. All of these quantities can be obtained by performing a weighted least squares analysis of the data.

An approximate analysis was performed within minutes following each experiment using the ALCALC code (Ref. 7) programmed on the Fort St. Vrain data logger (a CDC 1700 computer). This rapid analysis capability proved extremely valuable for determining when sufficient data had been taken. Subsequently, a more sophisticated analysis was done in San Diego on the Univac 1108 using the FRNTIC code.* Both analyses generally agreed to within 5% on α_o^P , but only the final FRNTIC analysis will be discussed here.

5.1 Summary of the FRNTIC Code

Prior to fitting the data, they must be corrected for dead time losses. This correction is done automatically within FRNTIC. If C_i is the number of raw counts in channel i , then the number of counts in channel i corrected for the detector dead time is

$$C'_i = \frac{C_i}{1 - \frac{C_i \tau_d}{N(\Delta - \tau_a)}} \quad , \quad (18)$$

* FRNTIC (Ref. 9) is a version of the FRANTIC code (Ref. 10) which has been especially modified for the analysis of pulsed-neutron experiments.

RAW COUNT DATA FOR RUN 9 , CONFIGURATION 5

Fig. 4. Raw count data for Run 9, Configuration 5.

where

Δ = channel width,
 τ_a = analyzer dead time (70 μ sec),
 τ_d = detector dead time (2 μ sec),
 N = number of pulses.

This is the same as Eq. (2-4) in Ref. 11, once it is noted that the count rate in channel i is $C_i/[N(\Delta-\tau_a)]$. Eq. (18) can also be written as

$$C'_i = F_i C_i \quad (19)$$

where

$$F_i \equiv \frac{1}{1 - \frac{C_i \tau_d}{N(\Delta - \tau_a)}} \quad (20)$$

These equations will be used shortly in the derivation of the statistical weights.

The FRNTIC code performs a weighted least squares fit of a sum of exponentials to the dead-time-corrected count rate data. In particular, FRNTIC minimizes the following sum of squares:

$$S = \sum_{i=n_1}^{n_2} w'_i (C'_i - f_i)^2 \quad (21)$$

The quantity, w'_i , is the statistical weight for channel i , while f_i is the expected number of counts in channel i . If the true count rate is

$$CR = \sum_{j=1}^m \frac{A_j}{\Delta - \tau_a} e^{\alpha_j t}, \quad (22)$$

then the expected number of counts in channel i is

$$f_i = \int_{t_{i-1} + \tau_a}^{t_i} CR \, dt$$

$$= \sum_{j=1}^m A_j e^{\alpha_j (t_{i-1} + \tau_a)} \left[\frac{1 - e^{\alpha_j (\Delta - \tau_a)}}{-\alpha_j (\Delta - \tau_a)} \right] . \quad (23)$$

To perform the integral above, use has been made of the relation,

$$t_i = t_o + (i-1) \Delta . \quad (24)$$

The initial time of the first channel, t_o , is input to the code. For these experiments,

$$t_o = \frac{\Delta}{2} . \quad (25)$$

The effective channel width, $\Delta - \tau_a$, which appears in the denominator of Eq. (22), is simply a scale factor that makes the amplitude, A_j , approximately equal to the number of counts due to the j th component in the first channel.

The first and last channels to be fit, n_1 and n_2 , are arbitrary, as is the number, m , of exponential components to be fit. The amplitudes, A_j , and the decay constants, α_j , may be either variable or fixed. If variable, then they are determined by minimizing S . FRNTIC is thus a versatile code providing numerous options for fitting the data.

The motivation for using a weighted least squares fit is based upon the maximum likelihood principle (Ref. 12, pp. 135-138). Specifically, the use of this fitting procedure with the proper statistical weights provides the most likely estimates for the amplitudes, A_j , and the decay constants, α_j . The proper statistical weight for channel i is

$$w_i' = \frac{1}{(\sigma_i')^2} , \quad (26)$$

where $(\sigma_i')^2$ is the variance of C_i' . To obtain $(\sigma_i')^2$, one first notes that the variance of the raw counts is approximately (Ref. 11, pp. 60-61)

$$\sigma_i^2 = C_i . \quad (27)$$

Next, the propagation of errors formula (Ref. 12, pp. 111-115 or Ref. 13, pp. 26-29) implies that

$$(\sigma_i')^2 = \left(\frac{\partial C_i'}{\partial C_i} \right)^2 \sigma_i^2 . \quad (28)$$

Finally, upon substitution of Eqs. (19) and (20) into Eq. (28), one obtains, after some algebra (see Ref. 9),

$$(\sigma_i')^2 = \left(1 + \frac{C_i' \tau_d}{N(\Delta - \tau_a)} \right) F_i C_i' . \quad (29)$$

The procedure for fitting the count data using FRNTIC is not automatic. In particular, it is necessary to choose

1. the functional form for the fitted count rate, i.e., the number of components, m , in Eq. (22) and which parameters, A_j and α_j , will be held fixed, and
2. the starting channel, n_1 , in Eq. (21) for the fit.*

Depending upon the choices made, significantly different results can be obtained. A plausible and reasonably objective procedure for making these choices will now be described.

5.2 Choosing the Functional Form

The "best" functional form and the "best" starting channel for the fit are closely related. Noting that the count rate is proportional to the time response of the thermal neutron flux, and recalling Eq. (2), then the general expression for the count rate can be written as

$$CR = \sum_j A_j^P e^{\alpha_j^P t} + \sum_j A_j^D e^{\alpha_j^D t} . \quad (30)$$

This form is the same as that which FRNTIC can fit, i.e., Eq. (22), with the contributions from the prompt and the delayed modes written separately and with the factor $1/(\Delta - \tau_a)$ omitted.

Consider the prompt modes first. Although several prompt modes may be present in the count rate data, it is only the fundamental prompt mode which is of interest for determining the reactivity. The standard procedure for isolating the fundamental mode from the higher harmonics is to choose the starting channel for the fit late enough so that the higher harmonics have died away. In some cases this results in large uncertainties in the fitted

* The last channel for the fit, n_2 , should always be the last measured channel (399 for these experiments) in order to obtain the best statistics possible for determining the background.

decay constant, since the counting statistics are poor for the data which remain. If this is a problem, then FRNTIC can be used to fit a higher harmonic as well as the fundamental mode to the data. This allows an earlier starting channel and can dramatically improve the fit, as will be demonstrated shortly. In principle, additional higher modes could also be fit to the data using FRNTIC. In practice, though, this is very difficult to do, as shown numerically in Ref. 14, pp. 272-280 and theoretically in Ref. 15.

Now consider the delayed modes. There is no problem with higher delayed harmonics, since as noted in Ref. 16, these have negligible amplitudes compared to the fundamental delayed mode. For six groups of delayed neutrons, though, there are six exponential components having essentially the same fundamental delayed mode spatial distribution.* The standard procedure is to fit a single constant to the delayed neutron background. This is an approximation which results from the observation that $|\alpha_j^d| \ll 1$ for most j and t in Eq. (30). As criticality is approached in a graphite-moderated reactor, this approximation is no longer valid. Analytic and numerical treatments of the slowing decaying delayed background based upon a point kinetics model have been used by several authors (Refs. 17-21). All these treatments, though, assume that the modal distributions of the fundamental prompt mode and the delayed sub-modes are the same, i.e., kinetic distortion is neglected. Although this is a rather good approximation near critical, it can be avoided. With FRNTIC it is possible to fit all six exponential components to the delayed neutron background, assuming the count rate model given by

$$\begin{aligned} CR &= CR^P + CR^d \\ &= \sum_{j=1}^{m-1} \frac{A_j}{\Delta - \tau_a} e^{\alpha_j t} + \frac{A^d}{\Delta - \tau_a} \sum_{k=1}^6 n_k^d e^{\alpha_k^d t}, \end{aligned} \quad (31)$$

* To be more precise, there are six fundamental delayed sub-modes, which are nearly degenerate (Ref. 6, p. 59).

or, upon integration

$$f_i = \sum_{j=1}^{m-1} A_j e^{\alpha_j(t_{i-1} + \tau_a)} \left[\frac{1 - e^{\alpha_j(\Delta - \tau_a)}}{-\alpha_j(\Delta - \tau_a)} \right] + A^d \sum_{k=1}^6 n_k^d e^{\alpha_k^d(t_{i-1} + \tau_a)} \left[\frac{1 - e^{\alpha_k^d(\Delta - \tau_a)}}{-\alpha_k^d(\Delta - \tau_a)} \right]. \quad (32)$$

Here the delayed background is treated as a single, special component with an overall amplitude, A^d , which is variable. The time-dependent shape of the background is fixed by the relative amplitudes, n_k^d , and decay constants, α_k^d , which are determined from the known pulse rate and an estimate of the reactivity as described in the FRNTIC report (Ref. 9). By allowing A^d to vary, any kinetic distortion in the data can be automatically accounted for.

A summary of the possible forms for fitting the prompt and delayed modes discussed above is given in Table 4. Each of the forms listed in this table has been used to fit some of the data, if only for comparative purposes. In general, the use of a higher prompt harmonic is only required for the far subcritical configurations, whereas careful treatment of the delayed background using six groups is required only for the near critical configurations. However, since FRNTIC can fit the six-group delayed background with little more effort than the simpler constant background, all of the results reported in Section 6 have been obtained using six delayed groups.

5.3 Choosing the Starting Channel — Use of Tornado Plots

To determine what the starting channel for the fit should be and whether or not a higher harmonic should be fit to the data, the use of "tornado plots" is invaluable. These plots and their use will now be described.

Table 4

Possible Functional Forms for Fitting the Count Rate^a

	Possible Functional Forms	
	Prompt Modes	Delayed Modes
Standard Form	Single Exponential (Fundamental Only) $A_o^P e^{\alpha_o^P t}$	Single Constant A^d
Better Form	Two Exponentials (Fundamental + Higher Harmonic) $A_o^P e^{\alpha_o^P t} + A_1^P e^{\alpha_1^P t}$	Six Exponentials (Six Delayed Neutron Groups) $A^d \sum_{k=1}^6 n_k^d e^{\alpha_k^d t}$

a. The factor $1/(\Delta - \tau_a)$ has been omitted from each expression in the table.

At the same time that FRNTIC determines the best estimate of the decay constant, α , of the fundamental mode,* it also determines an estimate of the uncertainty, σ_α , in the decay constant due to the statistical errors in the fit. Consequently, $\alpha \pm 2\sigma_\alpha$ provides an apparent confidence estimate for the decay constant. By fitting the data with various starting channels and then plotting $\alpha \pm 2\sigma_\alpha$ versus the starting channel, a so-called tornado plot is generated. Typical examples resulting from fitting one prompt mode are shown in Fig. 5, from which the motivation for the name of the plot is apparent. It should be noted that the confidence interval on α is quite narrow for early starting channels, even though substantially different α 's are obtained by using later starting channels.

* When no subscripts or superscripts appear on α , it should be understood to be α_o^P .

Fig. 5. Tornado plots for one-mode fits of data

This is an indication of the presence of a higher mode for the early channels. If the initial trend is downward, then the higher mode has a positive amplitude; if the initial trend is upward, then the amplitude of the higher mode is negative. That the apparent confidence interval is so narrow is due to the fact that a single exponential plus a background can still be fit reasonably well to the data, even when a higher mode is present. Thus one must be careful not to use the confidence intervals as true estimates of the uncertainty in α . Nevertheless, it is possible to use the confidence intervals to devise a plausible rule for determining the "best" starting channel for the fit. This rule can be stated as follows:

The "best" starting channel is the first one for which the mean value for α is no longer trending either upward or downward. Specifically, the "best" channel is taken to be the first one for which the upper confidence limit opens upward and the lower confidence limit opens downward, provided that there are later starting channels which have mean α values both above and below that of the chosen channel.

This rule is based upon the observation that once all the higher modes have died away, the fitted value for α will fluctuate randomly as the starting channel is increased. The "best" starting channel for each plot in Fig. 5 is indicated by an arrow.

All of the plots in Fig. 5 show the presence of a higher mode in the early channels. A higher mode is also evident in Fig. 4 in the raw count data for the detector in region 16. By waiting long enough to start the fit, a reasonable estimate of the decay constant of the fundamental mode can be obtained. However, for the plot corresponding to the detector in region 16, the resulting estimate is quite uncertain because of poor counting statistics. In this situation it is worthwhile to fit a higher mode to the data. Fig. 6 shows the original tornado plot for the detector in region 16 plus two additional ones in which higher modes were utilized. The improvement is particularly striking in the case where the higher mode decay constant was fixed to $\alpha_1^P = -310 \text{ sec}^{-1}$. In the

Fig. 6. Tornado plots comparing one- and two-mode fits of data for Run 9, Configuration 5, Detector Region 16.

case where α_1^P was variable, the plot shows more variation because this is a more difficult fitting problem for FRNTIC. Consequently use of a fixed decay constant for the higher mode is preferable.

The choice of the higher mode decay constant is not arbitrary. The "best" choice is that which gives the flattest tornado plot for the fundamental mode. Use of too small or too large a value will cause the plot to slope either upward or downward. Examples are shown in Fig. 7. The best plot corresponds to $\alpha_1^P = -310 \text{ sec}^{-1}$ and the best starting channel is chosen following the same rule started previously. The chosen higher mode decay constant most likely does not correspond to any single dominant higher mode. Instead, it probably represents an effective decay constant due to the combination of several modes. This is immaterial as long as there is little effect on the apparent decay constant of the fundamental mode. Fig. 7 indicates that the best value for α_0^P is not particularly sensitive to the value chosen for α_1^P .

In some cases the use of an appropriate higher mode decay constant allows one to extract the fundamental mode from otherwise unusable data. A dramatic example of this is shown in Fig. 8, where the tornado plots for the fundamental mode decay constant resulting from a single mode fit and a two-mode fit of the same data are compared.

The ability to separate out a higher mode from the data is needed only to analyze configurations that are far subcritical. As criticality is approached the importance of the higher modes diminishes, while the importance of the delayed neutron background increases. For the near critical configurations, it is important to use the six delayed group background described previously. This is demonstrated in Fig. 9 where the tornado plots of the fundamental mode decay constant are compared for various treatments of the delayed background. The six delayed group fit with a good estimate for the reactivity ($k_{\text{eff}}^{\text{est}} = 0.990$) is the best.

Fig. 7. Tornado plots comparing various two-mode fits of data for Run 9, Configuration 5, Detector Region 16.

Fig. 8. Tornado plots comparing one- and two-mode fits of data from Run 1, Configuration 1, Detector Region 16.

Fig. 9. Tornado plots comparing various treatments of background for data from Run 16, Configuration 9, Detector Region 16.

5.4 Summary of the Fitting Procedure

In summary, the recommended procedure, and that which has been used to fit the data in the next section, can be stated as follows:

1. Perform a series of least squares fits using the FRNTIC code, successively increasing the starting channel of the fit. Assume a functional form for the count rate consisting of one prompt exponential component and six delayed exponentials. Make a reasonable estimate for the reactivity in order to obtain the proper delayed exponentials and their relative amplitudes.
2. Make a tornado plot, i.e. a plot of the apparent $\alpha \pm 2\sigma_\alpha$ versus the starting channel. Choose the "best" starting channel to be the first for which the mean value for α shows no significant trend either upward or downward.
3. If the best starting channel is late resulting in poor counting statistics, then perform another series of FRNTIC fits. This time assume a functional form consisting of two prompt exponential components and six delayed exponentials. Make several series of fits with different assumed values for the higher mode decay constant.
4. Make tornado plots for each series of fits corresponding to a particular higher mode decay constant. Choose the "best" value for the higher mode decay constant, as that which gives the flattest tornado plot for the fundamental mode. Using this tornado plot, choose the "best" starting channel the same as in step 2.

6. ANALYSIS OF THE DATA

The raw count data for all 20 runs and for each detector are given in Appendix A. In Appendix B, these data are plotted, after subtracting the background determined by the best FRNTIC fit. For the later runs in particular, these plots clearly show the decay of the fundamental prompt mode with very good counting statistics.

There were no significant problems with external noise such as were experienced in the pulsing of the Peach Bottom HTGR (Ref. 2, p. 9). Only five obviously bad data counts were recorded, and all of these were in background channels. The one bad count in the data for Run 15, Configuration 8, and Detector Region 30 appeared to have an acceptable absolute value, but was negative. After changing the sign, this count was used in the fit. The four bad counts in the data for Run 12, Configuration 6, and Detector Region 16 were in the last four channels and were simply deleted from the fit.

All the data were fit using the procedure described in the previous section. The resulting tornado plots are shown for each run and detector in Appendix C and the fitted values for the amplitudes and decay constants corresponding to the best starting channel are given in Appendix D. Two-mode fits were used to separate out an effective higher harmonic for most of the data from the far subcritical configurations (1, 2, and 3). For the moderately subcritical configurations (4, 5, and 6), two-mode fits were used only for the data from Detector Region 16.

The best values for the decay constant (α) of the fundamental mode given in Appendix D are summarized in Table 5 for each run and detector. Also shown in Table 5 for each distinct control rod configuration are

TABLE 5

SUMMARY OF FITTED DECAY CONSTANTS

Run No.	Configuration		Apparent λ (sec ⁻¹) from Least Squares Fit			Average λ (sec ⁻¹)	Std. Dev., s_{λ} (sec ⁻¹)	95% Confidence Error		f(λ)
	No.	Description	Det. Reg. 30	Det. Reg. 31	Det. Reg. 16			c_{λ} (sec ⁻¹)	100 c_{λ}/λ (%)	
1	1	All temporary absorbers in, rods 2, 4, 6 in	-193.0	-196.0	-201.6	-196.9	4.4	10.8	5.5	1.002
2	2 ^a	All temporary absorbers in, rods 2, 4, 6 out	-174.1 ^b	-185.1 ^b	-188.7 ^b	-185.1	11.6	12.2	6.6	1.002
3	2A		-177.6	-184.0	-185.4					
4	2B		-171.9	-185.7	-206.2					
5	3	All rods in	-163.5	-167.7	-161.3	-164.6	4.7	4.9	3.0	1.002
6	3A		-165.0	-158.6	-171.7					
7	4	Rod 30 out	-116.9	-118.5	-121.1	-118.3	3.0	3.2	2.7	1.003
8	4A		-116.0	-114.9	-122.6					
9	5	Rod 31 out	-117.7	-117.7	-117.7	-117.6	1.7	1.8	1.6	1.003
10	5A		-116.0	-115.7	-120.6					
11	6A	Rod group 3C out	-138.7	-134.1	-141.5	-137.3	3.7	3.9	2.8	1.003
12	6		-135.2	-133.0	-141.2					
13	7A	Rod groups 3C, 2A out	- 79.09	- 78.05	- 78.25	- 78.19	0.50	0.52	0.7	1.005
14	7		- 77.56	- 78.15	- 78.01					
15	8	Rod groups 3C, 2A, 4B out	- 57.49	- 57.10	- 58.46	- 57.68	0.70	1.74	3.0	1.007
16	9	Rod groups 3C, 2A, 4B out; rod 1 out 115 inches	- 41.54	- 41.97	- 41.41	- 41.64	0.29	0.73	1.7	1.010
17	10	Rod groups 3C, 2A, 4B, 4F out	- 33.49	- 34.41	- 34.30	- 34.07	0.50	1.25	3.7	1.012
18	11A	Rod groups 3C, 2A, 4B, 4F out; rod 1 out 112 inches	- 22.74	- 22.30	- 22.51	- 22.52	0.22	0.55	2.4	1.019
19	11B	Rod groups 3C, 2A, 4B, 4F out; rod 1 out 122 inches	- 19.64	- 19.66	- 19.49	- 19.60	0.09	0.22	1.1	1.022
20	12	Rods 30, 31 out	- 49.31	- 49.52	- 49.32	- 49.38	0.12	0.29	0.6	1.008

a. For this run, rods 2, 4, and 6 were 6 inches less than full out.

b. This apparent λ value has not been included in the average λ .

the average decay constant ($\bar{\alpha}$) of the various detector α values, the corresponding standard deviation (s_{α}), a 95% confidence error (c_{α}) on $\bar{\alpha}$, and the factor ($f(\bar{\alpha})$) defined by Eq. (5). Each detector α value (α_k) for a distinct configuration has been assigned equal weight, so that

$$\bar{\alpha} = \frac{1}{n} \sum_{k=1}^n \alpha_k \quad (33)$$

and

$$s_{\alpha} = \sqrt{\frac{1}{n-1} \sum_{k=1}^n (\alpha_k - \bar{\alpha})^2} = \sqrt{\frac{1}{n-1} \left[\sum_{k=1}^n \alpha_k^2 - \frac{1}{n} \left(\sum_{k=1}^n \alpha_k \right)^2 \right]} \quad (34)$$

where n is the number of detector α values. For these data, $n=3$ or $n=6$. The 95% confidence error, c_{α} , is that error such that there is a 95% confidence that the true value for the fundamental mode decay constant is in the interval $\bar{\alpha} \pm c_{\alpha}$. The expression for this error is

$$c_{\alpha} = \frac{t_{0.975}(n-1)}{\sqrt{n}} s_{\alpha} \quad , \quad (35)$$

where $t_{0.975}(n-1)$ is the value of Student's t for a two-sided 95% confidence interval given $n-1$ degrees of freedom. The appropriate values for $t_{0.975}(n-1)/\sqrt{n}$ are 2.48 and 1.05 for $n=3$ and $n=6$, respectively (Ref. 22, pp. 80-81, 464). As an example, for Configuration 3 + 3A, the assigned experimental value for $\bar{\alpha}$ with its 95% confidence interval is $\bar{\alpha} \pm c_{\alpha} = -164.6 \pm 4.9 \text{ sec}^{-1}$.

The weighting procedure described above, which gives equal weight to each detector α value, is different from that used in the Peach Bottom experiments. There the values were combined statistically assuming that the $\alpha \pm 2\sigma_{\alpha}$ value obtained from the least squares fit gives a true estimate of the uncertainty in α (Ref. 2, pp. 10-12). Thus those detectors with smaller σ_{α} values carried a larger weight. This procedure has not been

used here, because the variation in the α values from detector to detector is generally not consistent with the σ_α values assigned by the least squares fit.* This indicates that the α values for at least some of the detectors contain an error component in addition to the fitting error, σ_α . The fitting error is due primarily to counting statistics and hence is random. The most likely source of additional error is the residual presence of higher modes in the data. This error varies depending upon the detector location and thus may also be considered random. The equal weighting procedure used here presupposes no particular uncertainty in the individual detector α values, but rather allows the variation from detector to detector, as measured by s_α , to determine the uncertainty. This procedure is more conservative than that used for the Peach Bottom data, in that wider confidence intervals on $\bar{\alpha}$ result. Even still, for all but the two configurations containing temporary absorbers, the resulting error in $\bar{\alpha}$ is less than 4% with 95% confidence (see Table 5). For the two temporary absorber configurations, the error in $\bar{\alpha}$ is less than 7% with 95% confidence.

The data from all runs except Run 2 have been used in the determination of the $\bar{\alpha}$ values. For Run 2, control rods 2, 4, and 6 were 6 inches less than the intended full out positions of Runs 3 and 4. Of course, the difference in reactivity due to 6 inches of rod motion at the top of the core is very small. On the other hand, if the reactivity difference were truly negligible, then Runs 2 and 3 would merely be repeat measurements, since the source and detectors were not moved. In this case, the variation in the α values for a particular detector between the two runs would not include the error component due to higher modes alluded to above. This would result in a narrower than warranted confidence interval. For this reason, the α values from Run 2 have been neglected in the determination of the average $\bar{\alpha}$ for Configuration 2.

* For that matter, the variation in the α values from detector to detector was not consistent with the assigned σ_α values in the Peach Bottom experiments either.

For most of the far subcritical and moderately subcritical control rod configurations, two separate runs of data were taken with different detector locations. For one configuration (7 + 7A), different source locations were used as well. In this manner, the errors associated with the presence of higher harmonics were randomized and, simultaneously, the confidence interval on $\bar{\alpha}$ was narrowed due to a larger value for n.

Prior to the experiments, computer simulations were performed to determine the optimum source and detector locations for each configuration (Refs. 5 and 8). For the six distinct control rod configurations for which two runs of data were taken, those designated by 2A, 3, 4, 5, 6, and 7 were predicted to be optimum, while 2B, 3A, 4A, 5A, 6A, and 7A were reasonable alternates. In all but one of these configurations (6 + 6A), there was less scatter in the three α values for the optimum detector locations than in the three α values for the alternate detector locations. This lends credence to the simulation model that was used.

7. CALCULATIONAL PROCEDURE

Once the measured α value is obtained by fitting the data, the reactivity, ρ , can be inferred from the inhour equation (see Section 2.2),

$$\rho = \Lambda\alpha + \beta f(\alpha) \quad , \quad (4)$$

using the known value for the delayed neutron fraction, β , and a calculated value for the generation time, Λ . Clearly the accuracy of the reactivity inferred in this manner is, to a large extent, dependent upon the accuracy of the calculated generation time. In the discussion that follows, the procedure used to calculate the generation time is described. As part of this procedure, calculated values for α and ρ are also obtained, which can be compared with the measured and inferred values.

7.1 General Description of Procedure

Two procedures for obtaining calculated results were actually used at various times. Before the experiments were performed, calculated (predicted) results were obtained for most of the configurations using a two-group, r-z geometry core model in the GAMBLE diffusion code (Ref. 23). The results obtained by this procedure (Ref. 5) are quite approximate because of the two-group model. Also, the design fuel loadings were assumed. No further discussion of this procedure will be given here.

Subsequently, but still prior to the experiments, a better procedure (Ref. 8) was used to calculate (predict) results for five of the configurations with a seven-group, r-z geometry GAMBLE model. In addition, the

"as-built" fuel loadings* were assumed. After the experiments, essentially the same procedure was used to calculate results for all configurations, except 5 and 11A. In the latter calculations, though, the "as-assembled" fuel loadings* were assumed and an adjustment to the boron content in the reflector was made as discussed in Section 8.2.

Some steps of the calculational procedure were performed for each configuration, while others were performed only once. Those steps performed for each configuration are:

1. BUGTRI flux calculations. Seven-group k_{eff} (and flux) calculations were performed for the top and bottom halves of the core in hexagonal geometry using the BUGTRI diffusion code (Ref. 24).
2. SLMAC flux-weighting of cross sections. The SLMAC code (Ref. 25), together with the BUGTRI fluxes, was used to generate flux- and volume-weighted macroscopic cross sections in r-z geometry.
3. GAMBLE k_{eff} calculation. The GAMBLE code (Ref. 23), together with the SLMAC cross sections, was used to perform a seven-group k_{eff} calculation in r-z geometry. The reactivity is obtained from k_{eff} through the definition,

$$\rho \equiv \frac{k_{\text{eff}} - 1}{k_{\text{eff}}} \quad (36)$$

* The loadings of the fuel elements as fabricated are slightly different from the nominal design loadings. This was known prior to loading the fuel into the core. It was not known, however, exactly where each block would be loaded in the core, since the loading procedure allowed some flexibility in this regard. One of the many acceptable possibilities was chosen and designated the "as-built" loading. After the fuel was actually loaded, the location of each block was known and the associated fuel distribution was designated the "as-assembled" loading.

4. GAMBLE α calculation. A $1/v$ poison search (Ref. 3, p. 286) was performed to obtain α using the same GAMBLE model as in the previous step.
5. Λ calculation. The calculated generation time is then obtained from the calculated values of ρ and α by rewriting Eq. (4) as

$$\Lambda = \frac{\rho - \beta f(\alpha)}{\alpha} . \quad (10)$$

Those calculational steps which were performed only once are

- A. Generation of Cross Sections for BUGTRI. The basic seven-group microscopic cross sections were obtained using the GGC-5 spectrum code (Ref. 26) as described in Ref. 27. Cross sections appropriate for the "as-built" or "as-assembled" core were then obtained using the INTERP interpolation code (Ref. 28).
- B. Generation of $\overline{1/v}$ values for GAMBLE. Spectrum-averaged, seven-group inverse velocities ($\overline{1/v}$) for the post-experiment α calculations were obtained for the core and reflector using the MICROX spectrum code (Ref. 29). The values for the inverse velocities used in the pre-experiment α calculations were nearly the same, although they were obtained in a somewhat different manner.

Details related to the above steps are given in the next three sections (7.2-7.4).

7.2 BUGTRI Model

The BUGTRI hexagonal geometry model is shown in Fig. 10, where each hex corresponds to a single column of fuel or reflector elements. The spatial mesh interval used was half the side length of a fuel element. This relatively fine mesh permitted explicit modeling of the buffer region at the core-reflector interface, although the resulting "thin" buffer model was used only for the post-experiment calculations. The pre-experiment calculations used the same fine mesh, but a "thick" buffer model in which the atom densities were homogenized over each fuel element. Another difference between the pre- and post-experiment calculations was in the fuel loadings used. For the pre-experiment calculations, "as-built" fuel loadings were used to generate the appropriate atom densities for each BUGTRI burnup region in the top and bottom halves of the core; for the post-experiment calculations, the "as-assembled" fuel loadings were used. In both sets of BUGTRI calculations, the control rods were homogenized over the control rod element using self-shielding factors obtained from separate transport theory calculations.

The basic seven-group microscopic cross sections at 300°K were obtained using the GGC-5 spectrum code (Ref. 26) as described in Ref. 27. These basic cross section sets are parameterized as a function of the thorium atom density in the fast energy range and as a function of the C/U ratio in the thermal energy range. Specific cross sections appropriate to the various burnup regions in the "as-built" and the "as-assembled" core models were then obtained by interpolating among the basic cross section sets using the INTERP code (Ref. 28). The structure of the seven energy groups is given in Table 6.

Fig. 10. BUGTRI hexagonal geometry model.

Note: Encircled numbers designate both refueling regions as well as burnup regions for control fuel element columns. All other numbers designate burnup regions for standard fuel element columns or buffer regions.

Table 6
Energy Group Structure

Group	Lower Energy Boundary (eV)
1	1.83×10^5
2	17.6
3	2.38
4	0.414
5	0.10
6	0.04
7	0.0

Transverse (i.e., axial) neutron leakage was ignored in the BUGTRI calculations, since a previous study had shown that this simplification has a negligible effect on the calculated flux distribution.

7.3 GAMBLE Model

The GAMBLE r-z geometry model is shown in Fig. 11. Flux- and volume-weighted macroscopic cross sections were obtained using the SLMAC code (Ref. 25) together with the BUGTRI fluxes. These cross sections correspond to annular rings of refueling regions,* except that the outermost ring of regions was subdivided into two annuli to model the buffer region. Control rod densities in the top reflector were adjusted consistent with the number of control rods inserted in the core.

For the configurations with control rod 1 partially inserted (Configurations 9 and 11B**), the top core half of the GAMBLE model was subdivided into two slices — one slice containing rod 1 and the other not. Separate BUGTRI calculations were then performed for each slice to generate separate flux- and volume-weighted macroscopic cross sections.

* A refueling region contains one control fuel element surrounded by from 4 to 6 standard fuel elements.

** Configuration 11A also contained control rod 1 partially inserted, but no calculations were done for this configuration.

Fig. 11. GAMBLE r-z geometry model.

The GAMBLE model, rather than the BUGTRI model, was chosen to calculate ρ and α , because no assumption regarding transverse leakage is required in GAMBLE. On the other hand, the values for ρ and α calculated by BUGTRI are quite sensitive to the transverse leakage, even though the flux is not.

7.4 Inverse Velocities

Spectrum-averaged, seven-group inverse velocities ($\overline{1/v}$) for the post-experiment α calculations were obtained for the core and reflector at 300°K using the MICROX spectrum code (Ref. 29). Calculations were made for the top and bottom core halves, both with all control rods inserted and with all control rods withdrawn. Self-shielding factors were applied to the control rods and burnable poison as appropriate. Inverse velocities were also calculated for the reflector by assuming a pure graphite spectrum.* The resulting inverse velocities are given in Table 7.

Table 7
Seven-Group Inverse Velocities
 $\overline{1/v}$ (sec/cm)

Group	Top Core Half		Bottom Core Half		Reflector
	All Rods Out	All Rods In	All Rods Out	All Rods In	
1	8.802-10	8.800-10	8.799-10	8.798-10	8.768-10
2	3.324- 8	3.222- 8	3.356- 8	3.254- 8	3.635- 8
3	2.950- 7	2.942- 7	2.953- 7	2.945- 7	2.963- 7
4	7.566- 7	7.546- 7	7.574- 7	7.554- 7	7.605- 7
5	1.730- 6	1.722- 6	1.746- 6	1.737- 6	2.013- 6
6	2.837- 6	2.834- 6	2.850- 6	2.846- 6	2.951- 6
7	4.898- 6	4.900- 6	4.936- 6	4.937- 6	5.399- 6

* After the reflector model was adjusted by adding 5 ppm natural boron as described in Section 8.2, the inverse velocities were re-calculated. These inverse velocities differ negligibly from those for a pure graphite spectrum.

Table 7 shows that there is very little difference in the inverse velocities for the unrodded and fully rodded cases. Since all configurations had two-thirds or more of the control rods inserted, the rods-in inverse velocities were always used.

The values for the inverse velocities used in the pre-experiment α calculations were nearly the same as those in Table 7, although they were obtained in a somewhat different manner (Ref. 8).

8. COMPARISON OF CALCULATED AND INFERRED RESULTS

8.1 Comparison of Initial Results

After each configuration was pulsed and the data were analyzed, the predicted and measured values of α were compared. Next, the reactivity was inferred from the inhour equation,

$$\rho = \Lambda\alpha + \beta f(\alpha) \quad , \quad (4)$$

using previously calculated values for the generation time, Λ , and $\beta = 0.0065$. From Eq. (36), the multiplication constant was also inferred as

$$k_{\text{eff}} = \frac{1}{1-\rho} \quad . \quad (37)$$

A summary of the initial results is given in Table 8. The predicted results for α and k_{eff} have been taken from Ref. 8 and the measured values for α are from Table 5. Values for k_{eff} instead of ρ are listed in Table 8, because k_{eff} is more frequently used in design calculations.

From Table 8 it is apparent that the agreement of the initial results is quite poor. The predicted α values are consistently smaller (in absolute value) than the measured values and lie well outside the measured 95% confidence intervals. A significant discrepancy between the predicted (C) and inferred (I) values for k_{eff} also exists, with $k_{\text{eff},I}$ being always smaller than $k_{\text{eff},C}$. Furthermore, this discrepancy is strongly a function of reactivity, being quite large for the far subcritical configurations, but relatively small near critical. This is shown in the last column of Table 8 and also in Fig. 12. This behavior suggests that the predicted reactivity

TABLE 8

COMPARISON OF PREDICTED RESULTS
WITH THOSE MEASURED AND INFERRED BY THE INHOUR METHOD

Configuration		Predicted Results ^a			Measured $\alpha(\text{sec}^{-1})^b$	Inferred k_{eff}	$k_{\text{eff},I}$ $-k_{\text{eff},C}$
No.	Description	$\alpha(\text{sec}^{-1})$	k_{eff}	$\Lambda(\text{msec})$			
1	All temporary absorbers in, rods 2, 4, 6, in	-136	0.879	1.06	-196.9 ± 10.8	0.832	-0.047
2A,2B	All temporary absorbers in, rods 2, 4, 6, out	(-134)	(0.937)	(0.55)	-185.1 ± 12.2	0.913	-0.024
3,3A	All rods in	-131.5	0.909	0.81	-164.6 ± 4.9	0.887	-0.022
4,4A	Rod 30 out	-72.5	0.957	0.71	-118.3 ± 3.2	0.928	-0.029
5,5A	Rod 31 out	(-72.5)	(0.957)	(0.71)	-117.6 ± 1.8	0.929	-0.028
6A,6	Rod group 3C out	(-107)	(0.943)	(0.62)	-137.3 ± 3.9	0.927	-0.016
7A,7	Rod groups 3C, 2A out	-66	0.977	0.46	-78.2 ± 0.5	0.971	-0.006
8	Rod groups 3C, 2A, 4B out	(-46)	(0.986)	(0.45)	-57.7 ± 1.7	0.981	-0.005
10	Rod groups 3C, 2A, 4B, 4F out	-19	0.998	0.48	-34.1 ± 1.3	0.990	-0.008

a. The predicted α and k_{eff} values are taken from Ref. 8. Only 5 configurations were actually calculated with a 7-group GAMBLE model. For the other configurations, the k_{eff} values were obtained by a more approximate model and the α values were obtained by interpolation between the GAMBLE results. These more approximate results are enclosed in parentheses.

b. The measured α values with 95% confidence intervals are taken from Table 5.

Fig. 12. Discrepancy between the predicted (C) and inferred (I) values of k_{eff} .

(or $k_{\text{eff},C}$) may be nearly correct, but that the predicted α and Λ (and hence $k_{\text{eff},I}$) are in error. No confidence intervals have been assigned to $k_{\text{eff},I}$ in Table 8, because of the possible systematic error in Λ .

Further evidence that the predicted generation time, Λ , is in error is provided by comparing the predicted value of Λ near critical with that measured for Configurations 11A and 11B using the method described in Section 2.3. The first criticality of the reactor was attained with rod groups 3C, 2A, 4B, and 4F completely withdrawn and rod 1 withdrawn 132 inches. Configurations 11B and 11A were then obtained by inserting rod 1 10 and 20 inches, respectively, from critical. If the subscripts 1 and 2 designate Configurations 11B and 11A, respectively, then the discussion of Section 2.2 applies and the generation time is given by

$$\Lambda = \frac{cf_1 - f_2}{\alpha_2 - c\alpha_1} \beta \quad (15)$$

with

$$c = \frac{\rho_2}{\rho_1} \quad (12a)$$

Since the differential worth of rod 1 is nearly constant between 112 and 132 inches withdrawn, $c \approx 2$. Using this value for c , using $\beta = 0.0065$, and using values for α_1 and α_2 from Table 5, a measured value of $\Lambda = 0.399$ msec is obtained. This is more than 10% smaller than the predicted value of $\Lambda = 0.45$ msec (see Table 9). If all of the predicted values of Λ could be shown to be 10% too large, then much of the k_{eff} discrepancy in Table 8 and Fig. 12 would be eliminated.

TABLE 9

COMPARISON OF PREDICTED AND MEASURED
GENERATION TIME NEAR CRITICAL

Configuration	Predicted Results ^a			Configuration		Measured Results ^b			
	α (sec ⁻¹)	f(α)	Λ (msec)	No.	Subscript	α (sec ⁻¹)	f(α)	Λ (msec)	k _{eff}
Rods withdrawn in normal sequence to 15¢ subcritical	(-17)	1.026	(0.45)	11B	1	-19.60±0.22	1.022	0.399±0.043	0.9988±0.0004
				11A	2	-22.52±0.55	1.019		0.9976±0.0008

a. The predicted values for α and Λ are taken from Ref. 8. They are enclosed in parentheses, because they were obtained in a somewhat approximate manner.

b. $c = 2.0 \pm 0.2$ and $\beta = 0.0065 \pm 0.0006$. All errors are 95% confidence values.

Table 9 also contains a 95% confidence interval on the measured Λ . This confidence interval was obtained using the propagation of errors formula (Ref. 12, pp. 111-115 or Ref. 13, pp. 26-29) applied to Eq. (15), i.e.,

$$(c_{\Lambda})^2 = \left(\frac{\partial \Lambda}{\partial c}\right)^2 (c_c)^2 + \left(\frac{\partial \Lambda}{\partial \beta}\right)^2 (c_{\beta})^2 + \left(\frac{\partial \Lambda}{\partial \alpha_1}\right)^2 (c_{\alpha_1})^2 + \left(\frac{\partial \Lambda}{\partial \alpha_2}\right)^2 (c_{\alpha_2})^2 \quad (38)$$

The quantities, c_{Λ} , c_c , c_{β} , c_{α_1} , and c_{α_2} , are 95% confidence errors for the subscripted parameters. Values for c_{α_1} and c_{α_2} are given in Table 5 and repeated in Table 9. To obtain c_{β} , Ref. 1, p. 102 and Ref. 30, p. 1047 were consulted, which indicate that the probable error for β is 0.0002. Thus $\beta = 0.0065 \pm 0.002$ with 50% confidence. Converting to a 95% confidence interval gives $\beta = 0.0065 \pm 0.0006$. Finally, a value for c_c is required. By taking scaler counts for Configurations 11A and 11B, an accurate value for c could have been obtained from

$$c = \frac{CR_1}{CR_2} \quad (12b)$$

and the error, c_c , could have been obtained from the counting statistics. In fact, however, scaler counts were not taken until after the pulsed source had been removed from the core. This changed the critical position of rod 1 from 132 inches out to 127.8 inches out. Nevertheless, these counts indicated a broad peak in the differential rod worth near 120 inches out, so that indeed $c \approx 2$. For the calculation in Table 9, a value of $c = 2.0 \pm 0.2$ with 95% confidence was assumed.

Substituting the above values for the parameters and their errors in Eqs. (15) and (38) gives a measured value of $\Lambda = 0.399 \pm 0.043$ msec with 95% confidence. Note that the predicted value of Λ (0.45 msec) does not lie within this interval. Again, this suggests that the predicted Λ is too large. It should also be noted that the uncertainty in Λ (c_{Λ}) is

primarily due to the uncertainty in β (c_β), and not due to the uncertainties in the other parameters (c_c , c_{α_1} , c_{α_2}). Thus, more accurate values for c , α_1 , and α_2 would have little effect on the measured value for Λ .

Table 9 also contains measured values for k_{eff} obtained using Eqs. (14), (11), and (37). The associated confidence intervals were obtained using the propagation of errors formula in a manner analogous to that described above for Λ .

One last piece of evidence regarding the cause of the k_{eff} discrepancy in the initial results is provided by the extrapolated area-ratio method. To apply this method, Eq. (31) is combined with Eq. (8) to obtain

$$\begin{aligned}
 \frac{\rho}{\beta} &= - \frac{\text{extrapolated prompt neutron area}}{\text{delayed neutron area}} \times F \\
 &= - \frac{\int_0^{1/R} A_o^P e^{\alpha_o^P t} dt}{\int_0^{1/R} A^d \sum_{k=1}^6 n_k^d e^{\alpha_k^d t} dt} F \\
 &= - \frac{\frac{A_o^P}{(-\alpha_o^P)} \left(1 - e^{\alpha_o^P / R}\right)}{A^d \sum_{k=1}^6 \frac{n_k^d}{(-\alpha_k^d)} \left(1 - e^{\alpha_k^d / R}\right)} F \\
 &\approx - \frac{A_o^P / (-\alpha_o^P)}{A^d \sum_{k=1}^6 \frac{n_k^d}{(-\alpha_k^d)} \left(1 - e^{\alpha_k^d / R}\right)} F .
 \end{aligned} \tag{39}$$

All of the unknown quantities in this expression, except F , were determined by the FRNTIC code and are listed in Appendix D for each configuration and detector. Near critical, the correction factor, F , is close to 1. With this approximation, "measured" values for ρ/β can be obtained by evaluating Eq. (39). This has been done for each of the detectors in several near critical configurations (7, 8, 10, 11A, and 11B) with the results given in Table 10. Also given there are average values, $\overline{\rho/\beta}$ and $\overline{\alpha}$, for each of the five configurations and the resulting k_{eff} and Λ values obtained using Eqs. (37) and (10). The last two columns give the predicted k_{eff} and Λ values for comparison. These results indicate again that the predicted Λ is too large.

Confidence intervals for the measured results are not listed in Table 10 because the correction factor, F , has been neglected. Values for F will be given in Section 8.3, at which time confidence intervals will be assigned to the corrected results.

8.2 Adjustment of Computational Model

As discussed in the previous section, the predicted results (i.e., the pre-experiment calculated results) agree poorly with the measured and inferred results. After the experiments, the first calculations performed were for Configurations 3 and 11B. These calculations examined the effect of minor improvements in the calculational model, namely the use of "as-assembled" loadings and a "thin" buffer vs. "as-built" loadings and a "thick" buffer as mentioned in Section 7. For Configuration 3, which had been calculated previously, the post-experiment results give even poorer agreement with the measured and inferred data than obtained before (see Table 11). Because the exact critical rod position was not known before the experiments, predicted results were not available precisely for Configuration 11B. Results were, however, predicted for a similar near critical configuration and, again, the post-experiment calculations are in poorer agreement with the measured and inferred results (see Table 11).

TABLE 10

COMPARISON OF PREDICTED RESULTS WITH THOSE MEASURED
BY THE EXTRAPOLATED AREA-RATIO METHOD

Configuration		Detector Region	Measured Results					Predicted Results ^a	
No.	Description		ρ/β	$\overline{\rho/\beta}$	$\bar{\alpha}(\text{sec}^{-1})$	k_{eff}	$\lambda(\text{msec})$	k_{eff}	$\lambda(\text{msec})$
7A,7	Rod groups 3C, 2A out	30 ^b	-4.63	-4.10	-78.2	0.974	0.424	0.977	0.46
		31 ^b	-4.24						
		16 ^b	-3.74						
		30	-4.19						
		31	-4.22						
		16	-3.59						
8	Rod groups 3C, 2A, 4B out	30	-2.72	-2.64	-57.7	0.983	0.411	(0.986)	(0.45)
		31	-2.67						
		16	-2.52						
10	Rod groups 3C, 2A, 4B, 4F out	30	-1.12	-1.14	-34.1	0.993	0.411	0.998	0.48
		31	-1.21						
		16	-1.10						
11A	Rod groups 3C, 2A, 4B, 4F out; rod 1 out 112 inches	30	-0.401	-0.384	-22.5	0.9975	0.405	-	(0.45)
		31	-0.379						
		16	-0.372						
11B	Rod groups 3C, 2A, 4B, 4F out; rod 1 out 122 inches	30	-0.203	-0.200	-19.6	0.9987	0.405	-	(0.45)
		31	-0.200						
		16	-0.196						

a. The predicted results are taken from Ref. 8. Most of them are enclosed in parentheses, because they were obtained in a somewhat approximate manner.

b. This detector was in the "A" configuration.

TABLE 11

COMPARISON OF VARIOUS CALCULATED, MEASURED,
AND INFERRED RESULTS FOR CONFIGURATIONS 3 AND 11B

Configuration	Calculational Model	Calculated Results				Measured Results		Inferred k_{eff}	Measured Results	
		$\alpha(\text{sec}^{-1})$	$f(\alpha)$	k_{eff}	$\Lambda(\text{msec})$	$\alpha(\text{sec}^{-1})$	$f(\alpha)$		k_{eff}	$\Lambda(\text{msec})$
3	Pre-experiment	-131.5	1.003	0.909	0.811	-164.6	1.002	0.887	-	-
3	Post-experiment, no adjustment	-121.5	1.003	0.910	0.868			0.880		
3	Post-experiment, 5 ppm natB added to reflector	-168.8	1.002	0.902	0.682			0.904		
3	Post-experiment, 1.5 ppm natB added to replaceable reflector and 4.5 ppm natB added to permanent reflector	-148.0	1.003	0.904	0.762			0.894		
15c subcritical	Pre-experiment	(-17)	1.026	0.999	(0.45)	-19.60	1.022	0.9978	0.9988	0.399
11B	Post-experiment, no adjustment	-8.5	1.059	1.0025	0.516			0.9965		
11B	Post-experiment, 5 ppm natB added to reflector	-21.3	1.020	0.9975	0.429			0.9982		
11B	Post-experiment, 1.5 ppm natB added to replaceable reflector and 4.5 ppm natB added to permanent reflector	-19.6	1.022	0.9983	0.426			0.9983		

As a result of the above, various adjustments to the calculational model were considered which might improve the agreement between the calculated and measured results. The criteria governing acceptable adjustments were as follows:

1. The adjustment must be simple.
2. The adjustment must be credible.
3. The adjustment must be effective over the entire range of reactivities.

Configurations 3 and 11B were chosen for preliminary investigation of the effect of various adjustments, because they span the entire range of reactivities, except for Configuration 1 which contained temporary absorbers. Thus the adjusted results for these configurations should be indicative of how well criterion 3 will be met. Furthermore, for Configuration 11B, k_{eff} and Λ were measured in addition to α .

Because the inferred k_{eff} is always smaller than that predicted (see Table 8), adjustments to the control rod density (and hence, reactivity worth) were investigated first. It quickly became clear, however, that these adjustments would not meet criterion 3. Near critical (i.e., for Configuration 11B) a relatively small increase (6%) in the rod density was required to obtain agreement between the calculated and measured values for α , while for subcritical (i.e., for Configuration 3) an enormous increase (100%) in the rod density was required to obtain similar agreement for α . Moreover, the latter adjustment gave unreasonably low values for k_{eff} . Combined adjustments of the rod density and the fission fraction (excess reactivity) were also investigated. Besides being more complicated, they were not much more effective in improving the agreement between the calculated and measured α .

What kind of adjustment is indicated then? First, recall that the discrepancy between the predicted and inferred k_{eff} increases with increasing subcriticality as shown in Fig. 12. Then note that the generation time also

increases with increasing subcriticality (see Table 8), because as more control rods are inserted, a larger fraction of the neutrons spend their life in the reflector where the probability of absorption is small. This implies that the reflector becomes more important relative to the core for the far subcritical configurations. Hence, an error in the reflector model (e.g., in the impurity level) may have only a small effect near critical, but a large effect far subcritical. Also, the effect will be larger for the α calculation than for the k_{eff} calculation, since the flux is more peaked in the reflector for the α calculation.

Thus, suppose that the reflector impurity level had been underestimated in the calculational model. Then k_{eff} would be calculated slightly too high, while α would be calculated significantly low (in absolute value), because k_{eff} would be too high in the α search. Furthermore, the equations,

$$\rho = \frac{k_{\text{eff}}^{-1}}{k_{\text{eff}}} \quad (36)$$

and

$$\Lambda = \frac{\rho - \beta f(\alpha)}{\alpha} \quad , \quad (10)$$

imply that Λ would be calculated significantly high. Consequently, the inferred k_{eff} would be significantly low, while the calculated k_{eff} would be only slightly high as noted above. Moreover, the discrepancy in k_{eff} would be greater, the further subcritical the reactor is. This is precisely the behavior displayed in Fig. 12.

The adjustment suggested by the above discussion is an increase in the reflector impurity level. Accordingly, natural boron was added to the reflector in the GAMBLE model until the calculated and measured α values were in reasonable agreement for at least one of the configurations. In fact, it was found that a 5 ppm increase in the natural boron content of the reflector (in addition to the 0.5 ppm originally assumed) gives very

good agreement between the calculated and measured α values for both Configurations 3 and 11B. Furthermore, the calculated and inferred k_{eff} values for Configuration 3, as well as all the k_{eff} and Λ values for Configuration 11B, are in very good agreement once the adjustment is made. These results are shown in Table 11.

Now, how well does the proposed adjustment meet the criteria given above? Certainly it is simple enough (criterion 1). Moreover, since very good agreement is obtained for the two extreme configurations (with regard to reactivity), it is reasonable to assume that the adjustment will be effective for all configurations (criterion 3). (Indeed, this is demonstrated in the next section.) Finally, the adjustment is credible (criterion 2) as discussed below.

Prior to loading, nuclear measurements were performed on three reflector samples and indicated an impurity level of only 1 ppm boron equivalent, which is nearly the same as the 0.5 ppm boron equivalent assumed in the original calculations. However, after the poor agreement between the predicted and measured results was obtained and traced to the reflector model, an investigation disclosed that chemical analyses had also been performed prior to loading on a much larger number of reflector samples and indicated higher impurity levels. In particular, levels of roughly 2 ppm boron equivalent in the replaceable reflector (see Fig. 2) and 5 ppm boron equivalent in the permanent reflector were indicated. The latter value is very nearly the same as the 5.5 ppm boron equivalent in the proposed adjustment. In any case, it is apparent that the impurity measurements are only approximate and may well be consistent with the proposed adjustment.

For completeness some additional calculations were performed for Configurations 3 and 11B in which the reflector impurities were adjusted consistent with the levels indicated by the chemical analyses. The results obtained are given in Table 11. The agreement between these calculated results and those measured are excellent for Configuration 11B. For Configuration 3, these calculations agree better with the measurements

than the original calculations do, but not as well as the calculations with the proposed reflector adjustment do. When both configurations are considered, the proposed adjustment is still preferred.

One further point worth noting is that the change in the inferred k_{eff} is much larger than the change in the calculated k_{eff} when the proposed model adjustment is made. Excluding Configuration 1, the maximum change should occur for Configuration 3, for which the calculated k_{eff} decreases by $0.008 \Delta k$, while the inferred k_{eff} increases by $0.024 \Delta k$ (see Table 11). The implication here is that the originally calculated (i.e., predicted) values for control rod worths, shutdown margin, etc. are only slightly conservative and require no major revisions.

8.3 Comparison of Adjusted Results

From the above study and in light of the uncertainty in the measured impurity level of the reflector, a 5 ppm increase in the natural boron content of the reflector appears to be a reasonable adjustment to the calculational model. Consequently all configurations (except 5 and 11A) were recalculated with the adjusted model. The calculated results so obtained for α and k_{eff} are compared in Table 12 with the measured α and the k_{eff} inferred by the inhour method. The improved agreement, compared to the predicted results of Table 8, is evident over the entire range of reactivities. The maximum deviation between the adjusted and measured α is less than 10%, while the maximum deviation between the adjusted and inferred k_{eff} is $0.005 \Delta k$. The comparison of the adjusted k_{eff} discrepancy is also shown graphically in Fig. 13. The systematic variation of the discrepancy between the originally predicted and inferred results of Fig. 12 has been nearly eliminated. Moreover, the error bars in Fig. 13 show that all of the adjusted k_{eff} values lie within the 95% confidence interval for the inferred k_{eff} .

TABLE 12

COMPARISON OF ADJUSTED RESULTS
WITH THOSE MEASURED AND INFERRED BY THE INHOUR METHOD

Configuration		Adjusted Results ^a			Measured $\alpha(\text{sec}^{-1})^b$	Inferred k_{eff}^c	$k_{\text{eff},I}$ $-k_{\text{eff},C}$
No.	Description	$\alpha(\text{sec}^{-1})$	k_{eff}	$\Lambda(\text{msec})$			
1	All temporary absorbers in, rods 2, 4, 6 in	-204.3	0.833	1.013	-196.9±10.8	0.838±0.019	0.005
2A,2B	All temporary absorbers in, rods 2, 4, 6 out	-190.9	0.910	0.552	-185.1±12.2	0.913±0.011	0.003
3,3A	All rods in	-168.8	0.902	0.682	-164.6± 4.9	0.904±0.011	0.002
4,4A	Rod 30 out	-110.4	0.944	0.596	-118.3± 3.2	0.940±0.007	-0.004
5,5A	Rod 31 out	(-110.4)	(0.944)	(0.596)	-117.6± 1.8	0.940±0.007	-0.004
6A,6	Rod group 3C out	-138.4	0.938	0.525	-137.3± 3.9	0.938±0.007	0.000
7A,7	Rod groups 3C, 2A out	-82.7	0.973	0.415	-78.2± 0.5	0.975±0.003	0.002
8	Rod groups 3C, 2A, 4B out	-61.5	0.981	0.421	-57.7± 1.7	0.983±0.003	0.002
9	Rod groups 3C, 2A, 4B out; rod 1 out 115 inches	-45.2	0.988	0.414	-41.6± 0.7	0.989±0.002	0.001
10	Rod groups 3C, 2A, 4B, 4F out	-37.3	0.991	0.420	-34.1± 1.3	0.992±0.002	0.001
11A	Rod groups 3C, 2A, 4B, 4F out; rod 1 out 112 inches	-	-	(0.430)	-22.5± 0.6	0.9970±0.0012	-
11B	Rod groups 3C, 2A, 4B, 4F out; rod 1 out 122 inches	-21.3	0.9975	0.430	-19.6± 0.2	0.9982±0.0010	0.0007
12	Rods 30, 31 out	-44.9	0.983	0.531	-49.4± 0.3	0.981±0.003	-0.002

- a. The adjusted results for Configurations 5 and 11A were not calculated, but rather are assumed to be the same as for Configurations 4 and 11B, respectively. To signify this, the assumed results are enclosed in parentheses.
- b. Listed errors for the measured α values are 95% confidence values taken from Table 5.
- c. Listed errors for the inferred k_{eff} values are 95% confidence values obtained by propagation of errors, assuming that the 95% confidence error on the adjusted Λ is 10%.

Fig. 13. Discrepancy between the adjusted (C) and inferred (I) values of k_{eff} .
Note: error bars represent 95% confidence intervals.

The confidence intervals on k_{eff} shown in Table 12 and Fig. 13 were obtained by propagation of errors in Eqs. (4) and (37) in a manner similar to that discussed in Section 8.1 for Eq. (15). In this case, the uncertainty assigned to the calculated (adjusted) Λ is a key assumption in the error analysis. It has been assumed here that the 95% confidence error on the adjusted Λ is 10%, i.e.,

$$\frac{c_{\Lambda}}{\Lambda} = 0.1 \quad .$$

This assumption is believed to be reasonable, particularly in light of the resulting errors in k_{eff} shown in Fig. 13. It should be noted, though, that the adjusted Λ values differ by more than 10% (roughly 15%) from those originally predicted. The assumed uncertainty in Λ is important in the error analysis, because the error in k_{eff} is determined almost completely by the error in Λ . The error in α is only a factor for the temporary absorber configurations (1 and 2). For all the other configurations, α was measured quite accurately.

Further examination of Fig. 13 shows that for all the configurations except 4, 5, and 12, the inferred k_{eff} is slightly higher than the adjusted k_{eff} . Configurations 4, 5, and 12 had asymmetric control rod patterns, which are difficult to model with GAMBLE in r-z geometry. Thus, it is not surprising that these configurations exhibit k_{eff} discrepancies different from the other configurations. These observations suggest that even better agreement between the adjusted and inferred results could be obtained for most of the configurations by adding a slightly smaller amount than 5 ppm boron to the reflector. For Configurations 4, 5, and 12, an improved calculational model would be required in order to obtain better agreement between the adjusted and inferred results. This is considered unnecessary, though, since the maximum discrepancy for these configurations is only $0.004 \Delta k$.

The GAMBLE calculations used to obtain the adjusted values for α and k_{eff} also provide the fluxes required to evaluate the correction factor,

$$F(\vec{r}) = \frac{\phi_o^d(\vec{r}, E_{\text{th}})}{\phi_o^p(\vec{r}, E_{\text{th}})} . \quad (9)$$

The delayed mode thermal flux is obtained from the α calculation and the prompt mode thermal flux comes from the k_{eff} calculation. The factor F can then be used to correct the ρ/β values measured by the extrapolated area-ratio method. This has been done for each detector for Configurations 7-12 with the results given in Table 13. The values prior to multiplication by F are designated by $(\rho/\beta)_{\text{meas}}$, while those after multiplication are designated by $(\rho/\beta)_{\text{corr}}$. For each configuration the values of $(\rho/\beta)_{\text{corr}}$ from the three detectors are averaged and a 95% confidence interval is calculated in a manner similar to that described in Section 6 to obtain $\bar{\alpha} \pm c_{\alpha}^-$. Thus the $(\rho/\beta)_{\text{corr}}$ value from each detector is assigned equal weight. The resulting mean values and confidence intervals for $(\bar{\rho}/\bar{\beta})_{\text{corr}}$, as well as for $k_{\text{eff,corr}}$ and Λ_{corr} , are given in Table 13. The confidence intervals for the latter were obtained by propagation of errors.

Also listed in Table 13 are the adjusted results for k_{eff} and Λ . Comparison with the corrected results shows that the k_{eff} agreement is very good (within $0.003 \Delta k$), even though the adjusted k_{eff} values lie slightly outside the corrected k_{eff} confidence intervals. This should not be of concern, since the difference is small and since no confidence intervals have been assigned to the adjusted results. However, the narrow confidence intervals on k_{eff} do indicate that the extrapolated area-ratio method can provide very accurate results for k_{eff} . Unfortunately, the method is only applicable near critical, for reasons discussed below.

TABLE 13

COMPARISON OF ADJUSTED RESULTS WITH THOSE MEASURED
(AND THEN CORRECTED) BY THE EXTRAPOLATED AREA-RATIO METHOD

Configuration		Detector Region	Measured and Corrected Results ^a							Adjusted Results ^b	
No.	Description		$F(\bar{r})$	$(\rho/\beta)_{\text{meas}}$	$(\rho/\beta)_{\text{corr}}$	$(\bar{L}/\bar{\beta})_{\text{corr}}$	$\alpha(\text{sec}^{-1})$	$k_{\text{eff,corr}}$	$\lambda_{\text{corr}}(\text{msec})$	k_{eff}	$\lambda(\text{msec})$
7A,7	Rod groups 3C, 2A out	30 ^c	0.816	-4.63	-3.78	-3.73 ± 0.21	-78.2 ± 0.5	0.976 ± 0.003	0.394 ± 0.040	0.973	0.415
		31 ^c	0.857	-4.24	-3.63						
		16 ^c	1.034	-3.74	-3.87						
		30	0.805	-4.19	-3.37						
		31	0.908	-4.22	-3.83						
		16	1.079	-3.59	-3.87						
8	Rod groups 3C, 2A, 4B out	30	0.915	-2.72	-2.49	-2.56 ± 0.23	-57.7 ± 1.7	0.984 ± 0.002	0.402 ± 0.047	0.981	0.421
		31	0.943	-2.67	-2.52						
		16	1.057	-2.52	-2.66						
9	Rod groups 3C, 2A, 4B out; rod 1 out 115 inches	30	0.950	-1.64	-1.56	-1.58 ± 0.05	-41.6 ± 0.7	0.990 ± 0.001	0.405 ± 0.039	0.988	0.414
		31	0.970	-1.65	-1.60						
		16	1.047	-1.50	-1.57						
10	Rod groups 3C, 2A, 4B, 4F out	30	0.946	-1.12	-1.06	-1.12 ± 0.14	-34.1 ± 1.3	0.993 ± 0.001	0.406 ± 0.049	0.991	0.420
		31	0.964	-1.21	-1.17						
		16	1.037	-1.10	-1.14						
11A	Rod groups 3C, 2A, 4B, 4F out; rod 1 out 112 inches	30	0.967	-0.401	-0.388	-0.379 ± 0.022	-22.5 ± 0.6	0.9975 ± 0.0003	0.404 ± 0.039	-	(0.430)
		31	0.976	-0.379	-0.370						
		16	1.015	-0.372	-0.378						
11B	Rod groups 3C, 2A, 4B, 4F out; rod 1 out 122 inches	30	0.967	-0.203	-0.196	-0.197 ± 0.005	-19.6 ± 0.2	0.9987 ± 0.0001	0.404 ± 0.038	0.9975	0.430
		31	0.976	-0.200	-0.195						
		16	1.015	-0.196	-0.199						
12	Rods 30, 31 out	30	0.962	-2.41	-2.32	-2.23 ± 0.45	-49.4 ± 0.3	0.986 ± 0.003	0.426 ± 0.071	0.983	0.531
		31	0.983	-2.39	-2.35						
		16	1.062	-1.90	-2.02						

a. Listed errors are 95% confidence values.

b. The adjusted λ value for Configuration 11A (in parentheses) is assumed to be the same as for Configuration 11B.

c. This detector was in the "A" configuration.

The Λ agreement is also very good (within 7%), except for Configuration 12. The 25% discrepancy for the latter configuration is no doubt due to the difficulty in calculating Λ for an asymmetric control rod pattern using an r-z geometry model. It should be noted that the confidence intervals for Λ are much wider than those for k_{eff} . For both quantities, k_{eff} and Λ , the confidence intervals are determined almost completely by the error in β , except for Configuration 12.

The error analysis described above neglects any errors in the calculated correction factor, F . Near critical, this is a good assumption, because F is primarily due to kinetic distortion so that the approximate expression given by Eq. (9) is valid. Moreover, the magnitude of F is nearly 1 in most cases so that the correction is small. However, for the more subcritical configurations (1-6), the effect of higher harmonics leads to considerable error in the calculation of F by Eq. (9). Consequently, poor agreement is obtained between the adjusted and corrected results for k_{eff} and Λ . The results for these configurations are not shown in Table 13.

A summary comparison of the calculated (adjusted) results with those measured (inferred, corrected) by the various methods can be obtained by extracting selected results from Tables 12, 13, and 9. This summary comparison is given in Table 14. The same results, displayed in a relative manner to highlight differences, are given in Table 15.

TABLE 14

SUMMARY COMPARISON OF RESULTS

Configuration		$\alpha(\text{sec}^{-1})$		k_{eff}				(msec)		
No.	Description	Adjusted ^a	Measured ^b	Adjusted ^a	Inferred ^c	Corrected ^d	Measured ^e	Adjusted ^a	Corrected ^d	Measured ^e
1	All temporary absorbers in, rods 2, 4, 6 in	-204.3	-196.9±10.8	0.833	0.838±0.019	-	-	1.013	-	-
2A, 2B	All temporary absorbers in, rods 2, 4, 6 out	-190.9	-185.1±12.2	0.910	0.913±0.011	-	-	0.552	-	-
3, 3A	All rods in	-168.8	-164.6± 4.9	0.902	0.904±0.011	-	-	0.682	-	-
4, 4A	Rod 30 out	-110.4	-118.3± 3.2	0.944	0.940±0.007	-	-	0.596	-	-
5, 5A	Rod 31 out	(-110.4)	-117.6± 1.8	(0.944)	0.940±0.007	-	-	(0.596)	-	-
6A, 6	Rod group 3C out	-138.4	-137.3± 3.9	0.938	0.938±0.007	-	-	0.525	-	-
7A, 7	Rod groups 3C, 2A out	- 82.7	- 78.2± 0.5	0.973	0.975±0.003	0.976±0.003	-	0.415	0.394±0.040	-
8	Rod groups 3C, 2A, 4B out	- 61.5	- 57.7± 1.7	0.981	0.983±0.003	0.984±0.002	-	0.421	0.402±0.047	-
9	Rod groups 3C, 2A, 4B out; rod 1 out 115 inches	- 45.2	- 41.6± 0.7	0.988	0.989±0.002	0.990±0.001	-	0.414	0.405±0.039	-
10	Rod groups 3C, 2A, 4B, 4F out	- 37.3	- 34.1 ± 1.3	0.991	0.992±0.002	0.993±0.001	-	0.420	0.406±0.049	-
11A	Rod groups 3C, 2A, 4B, 4F out; rod 1 out 112 inches	-	- 22.5± 0.6	-	0.9970±0.0012	0.9975±0.0003	0.9976±0.0008	(0.430)	0.404±0.040	0.399±0.043
11B	Rod groups 3C, 2A, 4B, 4F out; rod 1 out 122 inches	- 21.3	- 19.6± 0.2	0.9975	0.9982±0.0010	0.9987±0.0001	0.9988±0.0004	0.430	0.404±0.038	0.399±0.043
12	Rods 30, 31 out	- 44.9	- 49.4± 0.3	0.983	0.981±0.003	0.986±0.003	-	0.531	0.426±0.071	-

a The adjusted results were obtained by adding 5 ppm natural boron to the reflector in the calculational model. The results for Configurations 5 and 11A (in parentheses) are assumed to be the same as for Configurations 4 and 11B, respectively.

b. The measured α values are taken from Table 5. The listed errors are 95% confidence values.

c The inferred results were obtained by the inhour method. The listed errors are 95% confidence values.

d The corrected results were obtained by the extrapolated area-ratio method. The listed errors are 95% confidence values.

e The measured k_{eff} and λ values were obtained by the unnamed method described in Section 2.3. The listed errors are 95% confidence values.

TABLE 15

SUMMARY OF RELATIVE RESULTS

Configuration		$\frac{\alpha_C}{\alpha_M}$	$k_{\text{eff},I}$ $-k_{\text{eff},C}$	$k_{\text{eff},EA}$ $-k_{\text{eff},C}$	$\frac{\Lambda_C}{\Lambda_{EA}}$
No.	Description				
1	All temporary absorbers in, rods 2, 4, 6 in	1.038	0.005	-	-
2A,2B	All temporary absorbers in, rods 2, 4, 6 out	1.031	0.003	-	-
3,3A	All rods in	1.026	0.002	-	-
4,4A	Rod 30 out	0.933	-0.004	-	-
5,5A	Rod 31 out	0.939	-0.004	-	-
6A,6	Rod group 3C out	1.008	0.000	-	-
7A,7	Rod groups 3C, 2A out	1.058	0.002	0.003	1.058
8	Rod groups 3C, 2A, 4B out	1.066	0.002	0.003	1.047
9	Rod groups 3C, 2A, 4B out; rod 1 out 115 inches	1.087	0.001	0.002	1.022
10	Rod groups 3C, 2A, 4B, 4F out	1.094	0.001	0.002	1.034
11A	Rod groups 3C, 2A, 4B, 4F out; rod 1 out 112 inches	-	-	-	1.064
11B	Rod groups 3C, 2A, 4B 4F out; rod 1 out 122 inches	1.087	0.0007	0.0012	1.064
12	Rods 30, 31 out	0.909	-0.002	0.003	1.246

Note: The subscripts on the quantities at the head of the columns correspond to the results in Table 14 as follows:

C — adjusted (i.e., calculated),

M — measured,

I — inferred (i.e., obtained by inhour method),

EA — corrected (i.e., obtained by extrapolated area-ratio method).

9. CONCLUSIONS

1. The originally calculated (i.e., predicted) values for the decay constant, α , agree poorly with the measured values for all control rod configurations. Likewise the predicted values for the generation time, Λ , agree poorly with the experimental values, which were obtained only near critical. For the multiplication constant, k_{eff} , a significant discrepancy also exists between the predicted and experimental values, but this discrepancy is strongly a function of reactivity. For the far subcritical configurations the k_{eff} discrepancy is large, but for the near critical configurations it is relatively small.
2. The measurements of α were done relatively accurately. The uncertainty in k_{eff} inferred by the inhour method is limited by the uncertainty in the calculated Λ . The uncertainties in k_{eff} and Λ determined by the extrapolated area-ratio method are limited by the uncertainties in the correction factor, F , and the delayed neutron fraction, β . Thus more accurate measurements would not significantly change the results.
3. No single adjustment to the control rod worth in the calculational model can be used to give agreement with the measured α values for all control rod configurations. Reasonable combinations of rod worth change and excess reactivity change in the calculational model also fail to give agreement with the measured α values for all configurations.
4. However, by adding 5 ppm of natural boron to the reflector in the calculational model, the calculated values for α , k_{eff} , and Λ are brought into very good agreement with the measured and inferred values for all control rod configurations. The calculated (adjusted) α values are within 10% of the measured values, while the adjusted

k_{eff} values are within $\pm 0.005 \Delta k$ of the inferred values for all configurations. The adjusted Λ values are within 7% of the experimental values for all but one of the seven near critical configurations where Λ could be determined.

5. The adjustment in the impurity level of the reflector was suggested by an analysis of the systematic nature of the k_{eff} discrepancy between the predicted and inferred results. Subsequently, an investigation revealed that the impurity level of the reflector was measured to be higher than assumed in the original calculations, although not quite as high as proposed by the above adjustment. The impurity measurements are only approximate, though, and may well be consistent with the proposed adjustment. Accordingly, the adjusted results should be considered the final results of this report.
6. Adding 5 ppm of natural boron to the reflector changes the inferred values for k_{eff} much more than the calculated values and brings them into very good agreement. Consequently, the originally calculated (i.e., predicted) values for control rod worths, shutdown margin, etc. are only slightly conservative and require no major revisions.

APPENDIX A
RAW COUNT DATA

The raw count data for all 20 runs and for each detector are listed in this appendix. For each configuration there are three blocks of data. The first block corresponds to Detector Region 30; the second block corresponds to Detector Region 31; and the third block corresponds to Detector Region 16. Each block contains 399 data counts, except for that corresponding to Run 12, Configuration 6, and Detector Region 16, which has only 395 data counts. For each run the 400th data entry in the block corresponding to Detector Region 16 contains the number of pulses for that run.

FSV PULSED-NEUTRON DATA RUN 1 CONFIGURATION 1

0	80	895	3329	6617	9611	11806	12875	12614	11713	10700	9482	BLK1	1
8190	6895	5946	4846	4099	3583	2938	2479	2049	1706	1506	1352	BLK1	2
1117	1010	904	705	615	570	470	419	369	333	307	288	BLK1	3
245	208	192	179	148	148	119	123	112	92	85	85	BLK1	4
81	62	70	68	45	39	57	71	49	45	33	47	BLK1	5
25	31	35	34	35	25	30	32	36	30	32	28	BLK1	6
36	27	33	30	29	35	21	40	22	33	34	23	BLK1	7
37	24	24	31	33	22	27	20	30	27	17	27	BLK1	8
24	31	29	29	31	23	22	21	30	31	25	39	BLK1	9
27	29	29	16	19	29	22	26	23	26	33	25	BLK1	10
32	22	17	25	30	32	25	32	30	29	25	19	BLK1	11
26	26	30	25	22	16	24	41	27	34	28	34	BLK1	12
26	29	30	28	29	28	32	25	20	24	23	32	BLK1	13
21	24	28	22	38	24	19	34	17	18	30	25	BLK1	14
13	18	24	26	19	30	26	28	23	22	20	29	BLK1	15
29	23	29	20	23	21	20	16	28	24	28	18	BLK1	16
19	32	21	30	24	23	19	22	24	21	32	20	BLK1	17
34	27	26	24	30	25	24	28	28	28	34	28	BLK1	18
25	20	24	34	29	28	28	28	17	33	28	30	BLK1	19
34	21	27	27	34	26	19	27	33	24	23	30	BLK1	20
18	26	33	25	27	28	28	24	22	32	24	37	BLK1	21
25	16	24	37	27	31	25	24	39	23	20	24	BLK1	22
23	25	31	30	28	22	23	24	36	21	30	25	BLK1	23
24	28	33	28	32	15	35	29	26	29	25	30	BLK1	24
27	26	22	21	23	29	18	18	23	19	18	23	BLK1	25
17	25	24	15	27	26	24	27	27	22	30	27	BLK1	26
26	42	30	21	18	27	23	22	26	35	32	21	BLK1	27
21	29	25	24	33	30	30	22	25	25	31	23	BLK1	28
33	22	20	24	31	25	22	18	20	19	19	26	BLK1	29
22	27	13	31	23	25	14	26	25	29	27	23	BLK1	30
25	21	26	26	19	34	18	21	12	25	32	26	BLK1	31
26	24	32	20	22	15	26	17	28	26	20	27	BLK1	32
27	22	23	13	17	21	26	24	31	25	19	28	BLK1	33
29	23	33	0									BLK1	34
0	115	1847	6329	12422	17491	20488	21435	20904	19162	17434	14956	BLK2	1
12694	10637	8784	7528	16251	5083	4297	3570	2982	2601	2090	1787	BLK2	2
1571	1293	1200	1035	849	769	713	629	512	437	419	353	BLK2	3
345	303	256	224	227	191	187	146	147	135	147	102	BLK2	4
108	91	87	86	81	72	74	63	59	52	53	54	BLK2	5
55	50	50	42	47	43	54	47	47	53	35	53	BLK2	6
45	40	40	31	38	30	36	44	46	40	48	22	BLK2	7
40	46	33	35	45	47	48	45	47	44	34	30	BLK2	8
41	37	48	44	39	38	43	46	45	38	43	41	BLK2	9
43	46	42	46	35	37	48	46	34	42	35	46	BLK2	10
49	41	41	33	32	29	51	35	47	42	44	52	BLK2	11
48	36	38	61	28	40	43	41	52	47	49	48	BLK2	12
40	32	43	44	40	34	34	47	42	40	41	47	BLK2	13
41	40	37	40	36	43	41	39	33	28	47	40	BLK2	14
46	41	42	45	41	40	39	49	56	44	47	30	BLK2	15
25	39	53	38	50	37	39	45	37	42	42	44	BLK2	16

38	45	40	30	41	38	30	29	42	50	37	40	BLK2	17
47	51	42	39	42	55	42	40	42	45	51	45	BLK2	18
20	38	49	50	45	43	32	45	52	37	46	41	BLK2	19
50	41	34	42	42	40	42	40	44	40	43	27	BLK2	20
47	33	42	32	39	26	42	46	47	37	35	39	BLK2	21
43	38	44	40	42	45	43	35	38	32	44	54	BLK2	22
35	34	42	40	44	39	42	41	39	36	34	46	BLK2	23
47	45	35	40	46	39	49	45	35	33	34	45	BLK2	24
30	29	34	38	44	40	40	53	34	51	37	42	BLK2	25
39	30	33	39	38	39	29	36	44	36	45	38	BLK2	26
39	31	35	44	44	35	41	50	42	55	44	38	BLK2	27
31	29	34	40	29	33	36	32	32	42	34	41	BLK2	28
35	38	45	40	43	43	33	30	30	37	42	53	BLK2	29
35	39	39	39	54	32	36	46	45	29	43	50	BLK2	30
60	44	51	42	39	45	39	36	45	38	44	53	BLK2	31
43	37	45	26	41	38	28	29	34	39	36	40	BLK2	32
36	37	31	43	45	45	43	39	32	35	40	34	BLK2	33
37	43	40	0									BLK2	34

0	21649	59561	72354	982621	558901	945711	1628571	313811	103833	80788	62139	BLK3	1
47758	35975	27113	20856	15893	12424	9092	7186	5513	4359	3451	2619	BLK3	2
2185	1741	1363	1142	933	812	724	611	543	496	426	390	BLK3	3
349	319	272	284	257	264	261	221	219	211	183	223	BLK3	4
185	185	161	216	177	184	165	176	169	158	183	169	BLK3	5
142	180	164	171	201	173	158	168	167	181	157	156	BLK3	6
174	162	171	133	165	164	156	154	151	174	178	165	BLK3	7
161	173	135	162	162	168	159	168	149	134	163	167	BLK3	8
151	143	177	189	173	157	182	167	156	162	153	173	BLK3	9
165	160	178	157	170	193	185	156	155	158	150	170	BLK3	10
163	158	144	179	164	186	159	156	174	187	144	166	BLK3	11
157	157	158	155	154	145	157	161	155	146	148	171	BLK3	12
164	159	163	133	156	151	167	161	139	165	161	137	BLK3	13
175	169	159	137	174	173	146	142	170	163	175	163	BLK3	14
133	172	168	152	159	155	160	165	169	156	158	159	BLK3	15
161	147	164	154	166	164	151	154	182	148	162	155	BLK3	16
127	151	153	159	138	171	169	159	181	167	150	175	BLK3	17
163	177	164	138	172	149	152	154	180	154	151	153	BLK3	18
150	137	154	141	146	185	152	152	151	170	166	163	BLK3	19
148	160	151	172	158	169	168	149	158	160	166	158	BLK3	20
133	134	183	151	194	139	171	154	155	142	149	162	BLK3	21
178	158	157	175	136	148	153	130	151	174	142	169	BLK3	22
142	142	174	155	152	159	148	144	151	164	163	143	BLK3	23
164	148	156	155	166	139	172	144	162	135	170	163	BLK3	24
136	155	161	170	148	157	140	141	159	162	170	156	BLK3	25
151	150	170	148	181	145	164	154	161	158	162	174	BLK3	26
170	160	143	165	162	150	134	161	165	147	135	119	BLK3	27
155	165	144	159	156	150	145	160	160	156	145	164	BLK3	28
152	158	158	181	162	137	160	161	149	159	150	159	BLK3	29
157	172	160	170	154	124	146	144	174	151	130	161	BLK3	30
155	143	152	146	163	148	133	167	160	144	152	149	BLK3	31
146	175	169	140	158	156	130	146	134	159	153	178	BLK3	32
154	167	152	168	136	174	143	149	156	144	133	166	BLK3	33
160	140	159	8402									BLK3	34

FLV PULSED-NEUTRON DATA RUN 2 CONFIGURATION 2

0	3	27	161	443	762	1130	1318	1579	1654	1705	1762	BLK1	1
1563	1559	1412	1354	1276	1228	1092	908	863	816	726	651	BLK1	2
588	496	460	442	364	366	313	304	239	222	170	178	BLK1	3
164	145	147	116	96	106	94	77	75	47	71	51	BLK1	4
57	39	45	48	23	16	29	23	26	19	16	12	BLK1	5
13	15	15	10	11	7	11	8	7	12	2	9	BLK1	6
10	8	12	10	6	8	3	4	3	5	7	4	BLK1	7
6	4	3	1	2	5	4	2	7	3	7	8	BLK1	8
7	5	2	6	5	5	2	0	1	4	1	2	BLK1	9
2	2	3	5	5	4	0	7	4	3	1	5	BLK1	10
3	4	2	1	3	3	3	8	3	4	5	3	BLK1	11
4	6	2	6	8	5	2	3	8	2	3	3	BLK1	12
3	5	3	4	5	8	4	3	8	1	1	4	BLK1	13
6	4	6	3	5	6	4	4	3	3	6	3	BLK1	14
3	1	4	4	6	2	6	5	2	3	5	5	BLK1	15
4	10	4	3	3	4	5	0	5	3	5	5	BLK1	16
4	1	5	6	3	2	4	3	5	5	9	4	BLK1	17
9	4	5	8	4	5	3	4	5	1	4	9	BLK1	18
5	6	3	4	3	4	3	4	5	2	4	3	BLK1	19
4	5	3	5	3	5	5	3	4	4	3	5	BLK1	20
5	5	0	3	1	3	6	2	3	4	4	1	BLK1	21
4	3	7	3	1	4	3	5	3	2	7	2	BLK1	22
3	3	7	4	5	4	3	2	5	5	4	2	BLK1	23
5	4	5	2	3	5	4	1	5	6	5	5	BLK1	24
3	3	3	0	1	4	7	2	7	4	4	5	BLK1	25
2	3	5	3	3	2	3	3	4	3	6	0	BLK1	26
1	2	5	2	3	3	3	5	3	2	5	6	BLK1	27
7	6	2	4	4	5	3	4	6	1	6	2	BLK1	28
4	4	3	4	0	4	4	6	7	2	3	4	BLK1	29
1	2	6	4	6	8	1	4	4	2	3	5	BLK1	30
6	4	4	9	3	1	4	2	1	0	5	2	BLK1	31
3	2	4	3	3	3	2	1	3	2	2	5	BLK1	32
1	1	2	3	4	2	5	7	4	4	3	4	BLK1	33
2	1	3	0									BLK1	34
0	8	99	414	960	1733	2338	2867	3218	3320	3283	3312	BLK2	1
3183	3031	2816	2564	2464	2044	2043	1780	1587	1402	1313	1169	BLK2	2
1060	921	802	704	669	604	530	474	408	378	328	287	BLK2	3
298	224	205	192	155	152	151	129	109	128	82	88	BLK2	4
63	65	44	51	51	42	46	37	25	29	30	24	BLK2	5
21	22	27	23	19	4	14	9	18	16	11	10	BLK2	6
10	8	12	8	14	12	5	2	6	6	7	7	BLK2	7
12	8	13	7	7	10	10	7	6	6	4	4	BLK2	8
4	5	8	7	9	8	7	12	8	5	12	6	BLK2	9
9	8	10	5	8	3	7	11	8	3	11	3	BLK2	10
6	10	7	3	8	7	12	10	9	10	4	8	BLK2	11
9	7	11	3	6	3	2	9	8	9	5	7	BLK2	12
3	7	9	6	4	8	5	9	7	5	6	4	BLK2	13
6	4	9	5	7	8	7	9	7	10	6	6	BLK2	14
6	10	6	2	6	8	12	4	7	3	9	5	BLK2	15
6	6	6	5	9	5	9	13	8	5	2	3	BLK2	16

3	6	6	9	10	8	6	9	10	4	6	9	BLK2	17
6	4	7	7	5	6	5	11	8	8	10	7	BLK2	18
6	10	8	6	11	3	12	5	4	7	6	7	BLK2	19
5	11	3	8	7	9	7	6	11	7	5	5	BLK2	20
4	5	6	10	8	8	8	3	4	9	8	4	BLK2	21
10	8	5	12	5	11	2	10	5	10	8	5	BLK2	22
8	3	13	7	6	5	4	2	7	8	9	7	BLK2	23
9	6	3	6	1	2	7	7	4	8	2	13	BLK2	24
4	8	5	2	6	5	10	9	7	7	7	8	BLK2	25
7	3	4	8	9	6	8	8	9	2	8	6	BLK2	26
3	6	6	8	9	5	11	10	4	6	7	8	BLK2	27
6	6	4	10	7	11	10	3	7	6	12	4	BLK2	28
4	9	9	13	3	10	6	3	9	6	9	2	BLK2	29
5	9	6	3	5	6	7	6	6	7	8	6	BLK2	30
15	4	10	12	7	7	9	5	8	6	6	8	BLK2	31
2	6	5	9	10	6	8	7	6	5	3	14	BLK2	32
3	7	6	6	4	3	4	5	7	7	9	4	BLK2	33
4	4	8	0									BLK2	34

0	1936	14024	26301	33426	35726	35080	32550	29832	26159	22973	20139	3LK3	1
17367	15440	13262	11220	9919	8437	7288	6495	5319	4569	4032	3440	BLK3	2
3107	2633	2247	2036	1740	1449	1243	1090	915	854	739	633	BLK3	3
527	475	417	385	325	299	237	217	211	183	154	144	BLK3	4
135	106	95	91	73	67	69	79	57	65	72	44	BLK3	5
57	58	47	43	46	36	38	41	31	30	32	32	BLK3	6
23	38	32	36	28	25	27	35	32	34	24	26	BLK3	7
31	22	25	33	33	29	31	29	29	33	28	25	BLK3	8
25	32	27	24	25	36	30	26	28	27	34	23	BLK3	9
17	30	24	30	30	23	29	14	23	28	20	27	BLK3	10
27	16	29	28	32	27	29	24	22	24	34	35	BLK3	11
24	33	23	27	21	32	32	24	26	28	21	26	BLK3	12
25	25	26	30	31	25	31	18	29	19	28	35	BLK3	13
24	27	32	31	22	28	37	26	28	32	23	21	BLK3	14
27	26	20	28	29	27	28	28	34	33	23	34	BLK3	15
29	23	20	30	29	21	27	27	33	27	19	30	BLK3	16
23	19	28	31	36	19	24	21	32	20	25	28	BLK3	17
32	22	29	24	37	27	29	19	24	32	22	22	BLK3	18
23	24	24	25	18	26	32	29	29	33	24	24	BLK3	19
19	24	25	27	26	23	40	28	27	28	29	22	BLK3	20
34	26	28	21	30	27	26	25	17	13	31	27	BLK3	21
23	23	28	31	37	36	27	23	31	26	26	24	BLK3	22
31	27	24	29	22	27	18	20	26	40	33	22	BLK3	23
28	22	24	26	30	30	24	29	33	25	27	26	BLK3	24
24	23	25	33	29	25	26	25	31	30	17	31	BLK3	25
23	26	29	17	26	22	29	22	24	29	22	31	BLK3	26
22	28	29	29	32	27	24	30	32	24	15	24	BLK3	27
16	29	26	22	31	30	28	21	20	26	24	24	BLK3	28
26	21	25	33	37	19	28	24	28	30	35	29	BLK3	29
28	25	24	21	32	21	30	23	30	23	25	25	BLK3	30
32	20	26	34	29	25	19	24	17	32	21	19	BLK3	31
21	26	20	28	27	26	26	35	18	23	21	16	BLK3	32
30	13	16	23	15	21	31	22	29	27	15	21	BLK3	33
22	20	25	2467									BLK3	34

FSV PULSED-NEUTRON DATA RUN 3 CONFIGURATION 2A

0	4	45	163	428	772	1051	1414	1618	1734	1809	1842	BLK1	1
1668	1637	1595	1514	1371	1259	1111	1060	966	869	795	735	BLK1	2
629	579	537	446	439	394	306	325	260	245	231	171	BLK1	3
177	177	145	116	125	121	98	82	80	66	55	62	BLK1	4
39	36	42	37	30	29	21	20	25	24	15	16	BLK1	5
20	12	12	15	11	6	12	7	5	8	11	7	BLK1	6
6	7	9	8	3	4	12	6	5	8	5	10	BLK1	7
4	2	6	5	6	3	4	5	3	2	3	3	BLK1	8
3	1	6	4	4	4	3	4	3	4	5	5	BLK1	9
3	3	4	5	2	4	1	5	0	3	4	4	BLK1	10
2	6	4	5	3	5	6	3	5	3	3	6	BLK1	11
5	2	6	4	8	7	2	2	4	7	8	6	BLK1	12
4	6	3	1	3	2	3	7	5	3	7	2	BLK1	13
4	1	3	10	4	5	3	4	3	3	3	1	BLK1	14
6	0	3	2	4	3	4	3	7	4	6	4	BLK1	15
4	2	5	4	3	4	8	1	7	5	8	3	BLK1	16
1	8	6	1	5	4	7	7	4	1	4	6	BLK1	17
4	1	3	3	2	4	1	4	4	1	5	6	BLK1	18
8	7	4	3	9	3	8	5	2	4	8	4	BLK1	19
8	5	3	5	6	1	8	5	3	4	4	6	BLK1	20
5	10	6	2	2	3	7	4	2	4	5	2	BLK1	21
5	1	6	3	2	4	2	3	5	6	2	5	BLK1	22
3	3	2	5	7	7	4	5	7	5	3	7	BLK1	23
3	4	4	0	6	7	4	5	8	1	4	2	BLK1	24
4	4	3	5	2	3	2	4	4	2	3	2	BLK1	25
1	5	2	2	4	2	6	5	8	3	1	6	BLK1	26
8	1	3	2	2	4	1	3	4	6	3	1	BLK1	27
6	6	2	2	2	1	3	0	6	3	7	3	BLK1	28
10	5	5	3	3	4	5	3	5	4	7	2	BLK1	29
6	5	6	4	7	1	5	1	2	3	2	6	BLK1	30
3	2	1	4	2	5	5	7	2	1	2	3	BLK1	31
3	5	6	1	3	2	0	1	4	6	2	3	BLK1	32
6	5	1	0	2	2	5	2	4	5	2	4	BLK1	33
5	5	6	0									BLK1	34
0	6	100	479	1103	1813	2507	3080	3330	3602	3576	3597	BLK2	1
3244	3199	2938	2766	2515	2341	2120	1897	1652	1560	1420	1277	BLK2	2
1188	1017	954	778	715	636	570	550	508	404	405	359	BLK2	3
306	240	256	233	166	168	148	102	131	115	106	79	BLK2	4
78	83	65	46	63	62	36	42	44	36	25	29	BLK2	5
26	27	21	11	22	17	12	13	13	20	15	18	BLK2	6
13	18	8	9	8	9	15	7	10	8	8	12	BLK2	7
8	11	5	6	11	8	13	7	10	8	5	6	BLK2	8
6	5	7	10	9	13	3	7	5	7	14	4	BLK2	9
6	8	7	5	5	10	10	7	8	11	8	9	BLK2	10
12	3	7	5	4	7	8	13	5	10	11	11	BLK2	11
5	12	9	6	8	10	4	4	10	3	8	4	BLK2	12
3	6	5	11	3	13	5	9	6	9	13	5	BLK2	13
10	5	6	12	7	9	8	4	10	8	6	11	BLK2	14
8	6	4	4	8	5	9	6	4	6	3	9	BLK2	15
10	7	5	12	7	5	10	6	7	10	12	11	BLK2	16

7	12	6	5	6	6	6	10	10	8	5	7	BLK2	17
7	11	5	3	8	8	9	7	5	6	8	6	BLK2	18
7	10	8	12	7	5	5	8	5	8	8	5	BLK2	19
9	6	5	8	4	8	7	8	8	2	13	3	BLK2	20
13	7	10	9	4	10	9	6	10	11	8	6	BLK2	21
6	7	11	9	5	9	5	9	4	8	7	6	BLK2	22
9	4	7	5	4	5	4	6	8	9	3	11	BLK2	23
10	10	6	6	9	6	7	3	7	15	9	8	BLK2	24
11	6	5	10	9	7	7	5	6	5	9	15	BLK2	25
10	6	5	7	8	5	6	7	8	6	5	6	BLK2	26
1	3	10	7	10	6	9	11	8	5	4	5	BLK2	27
5	7	8	5	4	5	8	9	9	5	8	6	BLK2	28
10	7	5	8	5	11	9	11	9	4	4	7	BLK2	29
10	8	5	5	8	4	4	3	5	11	4	7	BLK2	30
8	11	8	7	8	5	5	10	8	5	9	8	BLK2	31
8	6	6	9	9	9	7	10	11	5	5	9	BLK2	32
7	5	5	10	2	9	6	4	12	4	12	7	BLK2	33
9	10	10	0									BLK2	34
0	1951	14760	27687	35349	37660	36790	34532	30976	27673	24250	21408	BLK3	1
18664	15957	13923	12020	10182	8966	7720	6596	5769	4995	4208	3639	BLK3	2
3224	2754	2453	2233	1939	1549	1342	1187	1051	919	794	720	BLK3	3
665	521	484	427	343	336	295	259	210	203	195	163	BLK3	4
130	144	112	95	101	84	78	73	68	61	72	63	BLK3	5
51	54	49	38	49	37	38	25	43	34	38	33	BLK3	6
39	36	41	38	41	29	28	30	35	30	42	30	BLK3	7
33	34	34	24	40	27	31	28	23	23	26	30	BLK3	8
22	13	39	26	27	31	30	32	38	28	30	24	BLK3	9
31	30	23	34	25	24	23	31	29	31	22	25	BLK3	10
26	26	30	27	34	32	30	25	36	17	26	22	BLK3	11
26	29	28	21	21	33	26	44	34	30	29	33	BLK3	12
34	26	27	26	29	26	28	30	32	27	19	32	BLK3	13
35	26	22	30	22	22	26	32	29	26	39	23	BLK3	14
22	29	35	25	22	41	29	25	25	21	42	32	BLK3	15
32	25	26	37	29	29	27	26	26	31	27	26	BLK3	16
31	26	26	30	39	29	29	24	32	24	27	18	BLK3	17
25	32	30	27	26	32	29	26	38	20	29	27	BLK3	18
28	20	27	32	27	15	39	16	30	28	31	22	BLK3	19
34	27	33	27	34	19	23	27	26	28	24	26	BLK3	20
36	33	28	30	22	31	23	40	27	29	36	24	BLK3	21
33	29	30	26	22	22	34	31	24	28	20	21	BLK3	22
31	37	23	25	30	33	30	29	34	24	26	32	BLK3	23
19	27	26	24	33	20	26	24	35	30	29	40	BLK3	24
38	17	28	25	27	28	30	34	27	27	27	37	BLK3	25
26	22	23	24	25	30	30	33	33	23	29	30	BLK3	26
23	27	28	20	26	24	24	27	18	33	42	33	BLK3	27
26	29	35	25	28	28	25	24	30	32	36	26	BLK3	28
24	32	30	34	26	29	26	30	20	23	23	30	BLK3	29
32	23	31	23	26	28	22	21	25	23	23	19	BLK3	30
28	28	27	19	25	38	18	29	17	29	24	24	BLK3	31
33	31	19	21	26	30	24	18	29	27	18	24	BLK3	32
28	22	25	20	25	30	22	26	25	33	28	29	BLK3	33
26	28	23	2493									BLK3	34

FSV PULSED-NEUTRON DATA RUN 4 CONFIGURATION 2B

0	4	57	207	496	767	1069	1378	1501	1539	1595	1476	BLK1	1
1434	1432	1246	1287	1160	981	949	844	791	681	586	576	BLK1	2
479	410	402	375	341	266	259	211	245	195	177	140	BLK1	3
142	111	102	105	101	89	77	59	55	41	60	45	BLK1	4
35	42	31	29	26	24	31	15	12	21	14	10	BLK1	5
16	16	5	13	15	6	12	8	8	6	7	5	BLK1	6
8	2	8	4	4	2	3	3	3	5	3	6	BLK1	7
4	1	4	4	8	2	3	7	2	3	1	1	BLK1	8
2	2	8	7	3	7	4	2	1	2	1	2	BLK1	9
2	3	4	4	5	3	3	2	4	2	0	7	BLK1	10
3	8	5	4	3	0	6	6	2	3	7	6	BLK1	11
4	4	3	3	6	2	4	5	5	4	7	6	BLK1	12
1	1	3	4	7	4	2	3	4	3	5	4	BLK1	13
3	2	7	3	6	5	2	2	4	4	5	3	BLK1	14
4	2	4	2	2	7	2	3	5	4	6	4	BLK1	15
2	6	5	5	4	6	1	3	6	3	1	0	BLK1	16
2	3	2	4	6	4	4	4	6	1	6	5	BLK1	17
7	2	3	4	4	8	2	5	6	4	5	4	BLK1	18
3	3	9	4	3	4	3	5	1	4	3	3	BLK1	19
4	6	1	1	3	2	0	3	1	4	3	4	BLK1	20
3	3	8	3	5	0	3	4	2	1	4	4	BLK1	21
3	3	1	3	3	3	2	1	0	5	0	2	BLK1	22
3	5	1	6	4	4	2	7	2	4	1	1	BLK1	23
1	2	2	3	3	0	2	5	4	3	3	3	BLK1	24
6	5	5	4	3	3	4	3	4	4	1	5	BLK1	25
1	0	3	4	7	4	3	3	4	4	2	2	BLK1	26
3	2	2	4	3	0	3	3	3	5	3	6	BLK1	27
3	0	4	3	4	4	5	1	3	4	4	3	BLK1	28
3	1	6	3	2	3	6	2	2	3	3	1	BLK1	29
3	3	2	5	6	4	1	7	3	6	5	2	BLK1	30
5	2	4	4	4	3	0	4	6	1	4	1	BLK1	31
2	4	6	6	3	6	4	4	6	1	3	2	BLK1	32
5	4	3	3	3	4	4	1	3	6	3	1	BLK1	33
5	3	3	0									BLK1	34
0	11	107	499	1047	1724	2349	2675	2965	3022	2970	2869	BLK2	1
2793	2639	2345	2208	2002	1830	1564	1510	1287	1197	1129	976	BLK2	2
863	827	721	613	556	463	437	408	349	319	320	256	BLK2	3
211	184	185	152	139	129	113	116	97	88	55	66	BLK2	4
47	54	62	49	31	40	27	22	16	22	16	17	BLK2	5
20	16	18	14	18	9	11	14	14	14	6	14	BLK2	6
7	14	12	7	13	9	3	13	8	10	8	7	BLK2	7
4	8	5	7	6	9	12	2	3	7	5	7	BLK2	8
4	5	5	7	6	10	9	7	4	6	7	2	BLK2	9
7	5	7	7	4	10	7	2	5	5	7	6	BLK2	10
3	9	7	4	6	7	7	4	9	5	8	6	BLK2	11
7	3	5	10	5	6	8	10	4	5	5	8	BLK2	12
7	9	3	3	9	0	7	6	5	10	7	3	BLK2	13
5	12	8	9	5	10	1	6	8	4	3	10	BLK2	14
4	6	6	8	4	5	6	4	6	7	4	5	BLK2	15
11	5	6	6	4	10	4	4	6	4	6	5	BLK2	16

4	12	6	5	7	6	8	4	5	5	2	4	BLK2	17
8	6	6	8	6	4	2	8	7	4	3	9	BLK2	18
3	10	11	6	3	6	8	4	9	6	3	6	BLK2	19
6	5	7	10	7	7	4	5	7	10	2	4	BLK2	20
6	5	6	7	4	6	10	1	6	7	7	6	BLK2	21
5	9	4	4	4	6	1	6	4	7	6	7	BLK2	22
0	2	10	6	8	5	5	7	4	6	5	2	BLK2	23
9	4	2	7	10	3	10	4	5	4	5	7	BLK2	24
12	8	7	4	10	4	6	4	5	2	3	9	BLK2	25
5	4	5	6	6	2	1	4	7	4	1	4	BLK2	26
2	8	7	7	6	3	5	5	2	7	7	7	BLK2	27
8	8	2	6	5	6	5	7	11	6	8	5	BLK2	28
6	3	4	6	3	7	3	5	6	6	3	4	BLK2	29
4	5	11	3	7	3	10	7	8	3	7	7	BLK2	30
4	3	2	4	5	5	12	3	1	5	6	9	BLK2	31
4	7	7	4	7	1	4	5	9	3	10	4	BLK2	32
7	11	4	3	6	8	5	2	7	6	6	4	BLK2	33
4	5	6	0									BLK2	34
0	135	1710	4849	7964	10210	11486	11958	11717	11155	10468	9633	BLK3	1
8645	7788	7117	6195	5507	4911	4238	3881	3318	2872	2529	2215	BLK3	2
1953	1673	1560	1371	1113	1051	939	801	702	589	545	446	BLK3	3
427	390	314	309	269	228	191	152	150	154	111	114	BLK3	4
113	85	88	74	67	77	50	58	34	48	41	36	BLK3	5
26	41	31	22	27	30	28	20	13	21	13	19	BLK3	6
21	25	9	17	15	17	18	28	13	11	17	17	BLK3	7
12	11	16	12	22	25	16	19	14	18	13	12	BLK3	8
11	9	13	13	11	18	17	11	20	15	17	11	BLK3	9
17	12	16	17	26	12	20	14	20	15	20	18	BLK3	10
20	13	13	14	19	21	17	16	23	14	13	23	BLK3	11
14	10	10	20	17	16	13	17	13	23	17	24	BLK3	12
17	13	21	16	16	12	18	19	20	14	16	16	BLK3	13
18	13	21	14	19	20	27	13	12	17	9	12	BLK3	14
12	11	17	15	19	16	18	19	21	17	20	14	BLK3	15
9	15	17	17	13	14	16	9	17	27	9	6	BLK3	16
16	12	16	18	21	13	14	16	22	13	14	13	BLK3	17
14	12	23	13	13	15	14	15	14	13	14	16	BLK3	18
15	23	18	14	16	17	12	9	13	9	15	11	BLK3	19
22	11	19	13	19	14	19	23	15	14	14	18	BLK3	20
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21	15	13	13	21	17	15	10	16	16	15	19	BLK3	22
19	16	10	19	13	16	16	17	15	16	12	12	BLK3	23
23	12	16	17	12	27	13	13	13	19	13	13	BLK3	24
18	22	16	14	14	14	20	19	17	14	15	22	BLK3	25
18	13	16	13	18	19	20	11	10	14	9	21	BLK3	26
18	11	14	26	17	17	14	12	15	12	10	17	BLK3	27
13	13	15	20	11	15	19	22	12	22	13	18	BLK3	28
16	16	21	10	12	14	16	14	14	11	12	13	BLK3	29
11	18	19	20	15	13	13	15	9	13	16	15	BLK3	30
12	16	13	11	16	8	10	12	14	16	18	18	BLK3	31
15	14	14	11	15	16	13	18	21	19	22	18	BLK3	32
16	19	13	12	15	17	11	12	16	14	15	15	BLK3	33
13	15	10	2449									BLK3	34

FSV PULSED-NEUTRON DATA RUN 5 CONFIGURATION 3

0	165	2706	9197	18149	27181	33121	36272	37235	36374	35174	31813	8LK1	1
29346	26101	23771	21136	18674	16670	14595	12901	11704	10079	8986	8156	8LK1	2
7117	6289	5579	5059	4569	4033	3587	3179	2869	2603	2278	1981	8LK1	3
1922	1658	1515	1337	1213	1077	986	995	806	643	692	604	8LK1	4
561	498	416	437	354	336	309	277	267	220	225	206	8LK1	5
193	183	174	119	139	126	141	120	107	117	85	122	8LK1	6
98	83	100	72	83	74	66	82	58	66	77	62	8LK1	7
56	68	71	56	54	58	58	49	49	63	44	56	8LK1	8
55	36	50	54	55	45	58	45	61	58	54	50	8LK1	9
56	51	56	30	49	47	40	44	62	55	51	60	8LK1	10
49	53	52	40	41	54	54	46	64	61	59	51	8LK1	11
53	47	51	42	54	49	53	52	51	50	51	59	8LK1	12
59	60	60	51	54	51	43	56	47	54	44	58	8LK1	13
56	54	49	51	53	58	52	42	41	48	42	49	8LK1	14
42	57	55	60	56	43	56	59	42	55	40	46	8LK1	15
30	44	49	58	55	53	55	52	51	56	45	49	8LK1	16
61	53	54	62	42	52	44	56	51	57	44	45	8LK1	17
59	51	49	43	49	42	55	44	50	48	37	60	8LK1	18
52	61	46	47	48	49	41	54	52	47	45	45	8LK1	19
46	59	46	45	44	46	42	43	58	60	45	64	8LK1	20
45	57	52	43	34	49	56	38	56	60	47	56	8LK1	21
55	57	39	48	66	50	52	50	48	51	52	53	8LK1	22
59	38	50	44	44	41	42	47	45	49	49	31	8LK1	23
60	48	33	48	45	50	47	36	53	49	37	51	8LK1	24
43	51	57	39	49	46	52	47	52	44	48	48	8LK1	25
37	54	42	61	53	42	42	50	55	48	50	42	8LK1	26
46	39	49	48	40	47	54	55	45	40	53	31	8LK1	27
53	43	40	50	52	30	41	52	40	35	57	45	8LK1	28
55	45	48	65	44	40	45	45	51	49	46	43	8LK1	29
49	41	41	59	42	45	44	49	44	34	36	47	8LK1	30
48	45	41	49	56	45	45	40	55	54	45	43	8LK1	31
51	42	48	46	38	50	47	40	44	54	48	51	8LK1	32
48	44	46	46	39	45	43	42	47	55	49	52	8LK1	33
44	49	33	0									8LK1	34
0	281	4127	14151	27248	39283	47621	51734	52744	51035	47692	44364	8LK2	1
40498	36329	32400	28660	25485	22331	19602	17415	15429	13613	12071	10727	8LK2	2
9412	8237	7379	6663	6078	5338	4729	4105	3808	3425	2966	2715	8LK2	3
2487	2113	1913	1675	1557	1398	1311	1194	1038	974	887	805	8LK2	4
711	625	615	548	436	464	404	360	309	303	304	241	8LK2	5
226	234	239	207	208	159	169	159	141	123	125	118	8LK2	6
100	117	108	94	90	95	83	94	102	94	88	75	8LK2	7
77	101	67	69	76	77	74	74	64	72	84	73	8LK2	8
63	71	75	94	76	87	70	87	79	85	74	86	8LK2	9
89	65	94	57	71	66	75	87	80	72	67	77	8LK2	10
66	66	49	77	74	77	85	73	62	70	79	66	8LK2	11
67	50	84	74	62	77	71	61	74	77	70	79	8LK2	12
79	51	62	64	73	67	85	76	87	53	80	69	8LK2	13
66	75	86	78	82	92	84	78	80	79	78	64	8LK2	14
71	75	57	56	91	67	69	64	83	80	74	76	8LK2	15
61	71	55	59	80	70	60	57	69	79	64	64	8LK2	16

68	67	61	71	77	69	71	73	66	89	74	64	BLK2	17
80	76	78	74	83	84	75	63	63	67	55	82	BLK2	18
75	55	56	49	74	76	76	58	68	53	74	61	BLK2	19
48	70	72	63	68	61	66	72	73	61	62	86	BLK2	20
56	62	78	64	63	68	61	58	76	63	74	51	BLK2	21
57	72	58	62	71	81	65	55	62	69	77	72	BLK2	22
73	79	75	83	64	64	71	73	57	73	75	69	BLK2	23
68	76	50	76	67	67	60	81	53	72	59	68	BLK2	24
65	65	67	80	65	57	69	63	77	71	71	70	BLK2	25
72	64	66	62	60	73	70	68	69	65	68	60	BLK2	26
72	47	73	76	59	67	68	59	55	74	68	70	BLK2	27
63	72	71	60	66	63	75	65	61	69	64	69	BLK2	28
71	68	70	56	69	63	63	65	80	66	71	70	BLK2	29
68	64	76	64	63	52	65	61	70	76	63	66	BLK2	30
77	75	57	70	52	75	62	57	51	71	55	54	BLK2	31
59	68	57	70	76	54	71	61	65	72	47	60	BLK2	32
70	60	68	57	54	61	63	68	60	51	69	69	BLK2	33
68	69	62	0									BLK2	34

0	5739	513781078421482801	659221	67955158197144579129167113264	98921	BLK3	1						
84776	73065	62123	53293	45088	38744	32821	28561	24185	20875	17763	15340	BLK3	2
13378	11623	10101	8994	7735	6876	5993	5311	4634	4198	3566	3219	BLK3	3
2884	2609	2301	2029	1802	1645	1387	1317	1287	1108	925	848	BLK3	4
773	722	725	616	578	525	460	453	429	403	363	344	BLK3	5
322	313	277	276	260	266	251	237	244	225	211	209	BLK3	6
185	190	182	173	167	181	170	157	171	160	147	166	BLK3	7
174	152	158	153	158	141	149	151	160	162	127	152	BLK3	8
106	167	159	158	135	147	156	142	154	155	166	158	BLK3	9
163	156	157	141	141	152	132	170	149	124	129	125	BLK3	10
148	143	149	133	145	136	172	147	130	156	147	167	BLK3	11
139	123	138	140	135	149	154	176	144	138	163	145	BLK3	12
126	146	138	139	157	145	143	132	135	136	138	148	BLK3	13
166	142	129	153	151	137	138	157	146	144	132	135	BLK3	14
154	139	153	143	131	139	144	151	158	134	153	144	BLK3	15
124	128	157	159	153	143	130	148	125	139	139	138	BLK3	16
140	145	122	123	132	141	161	167	153	136	149	139	BLK3	17
132	141	143	133	129	156	134	145	147	128	134	137	BLK3	18
134	139	150	147	134	114	124	129	139	135	144	148	BLK3	19
143	140	137	145	145	146	137	150	152	144	129	135	BLK3	20
149	154	142	131	120	174	111	155	152	126	139	144	BLK3	21
135	168	141	125	127	114	136	144	143	153	151	135	BLK3	22
133	128	157	132	123	137	126	130	140	127	140	142	BLK3	23
144	145	125	136	146	117	152	144	134	118	145	128	BLK3	24
121	163	125	135	136	129	140	141	141	119	129	132	BLK3	25
124	138	119	144	135	125	124	152	120	137	139	133	BLK3	26
133	145	146	123	122	159	147	133	142	130	140	169	BLK3	27
139	131	135	150	146	135	122	116	142	127	140	135	BLK3	28
137	136	136	145	130	145	154	119	134	128	160	144	BLK3	29
154	117	128	124	145	138	140	120	147	119	133	134	BLK3	30
133	121	137	117	122	124	136	129	131	159	110	133	BLK3	31
132	147	130	119	143	153	143	127	144	128	126	144	BLK3	32
129	130	149	137	141	157	135	150	124	132	131	131	BLK3	33
133	139	132	8032									BLK3	34

FSV PULSED-NEUTRON DATA RUN 6 CONFIGURATION 3A

0	45	659	2562	5325	8283	10705	12329	12926	13114	12525	11858	BLK1	1
10975	10090	9026	8136	7261	6519	5865	5155	4696	4161	3726	3365	BLK1	2
2970	2641	2358	2066	1914	1670	1530	1390	1227	1073	1065	888	BLK1	3
821	726	679	569	529	473	437	408	350	313	277	265	BLK1	4
271	201	212	172	173	155	147	131	111	99	96	90	BLK1	5
92	68	78	65	51	56	56	42	42	44	37	32	BLK1	6
39	34	34	34	33	37	30	39	30	36	19	28	BLK1	7
13	25	18	23	19	28	18	24	39	18	20	20	BLK1	8
15	20	14	22	31	26	13	24	20	26	18	22	BLK1	9
26	24	18	19	20	23	18	27	18	21	22	15	BLK1	10
21	19	16	17	16	22	22	28	32	26	19	21	BLK1	11
20	23	17	13	16	22	21	24	19	23	25	21	BLK1	12
20	15	17	19	19	14	18	19	22	25	27	27	BLK1	13
20	20	12	27	30	24	18	20	19	20	22	24	BLK1	14
19	22	24	16	15	19	29	16	24	14	17	17	BLK1	15
27	17	21	26	19	22	22	24	24	25	22	24	BLK1	16
13	17	17	25	28	21	23	18	17	16	17	19	BLK1	17
22	19	22	19	18	22	26	16	18	27	23	17	BLK1	18
14	35	11	23	23	15	16	22	20	18	27	22	BLK1	19
17	24	33	19	25	15	21	21	26	17	18	18	BLK1	20
32	19	20	32	14	26	15	24	18	26	17	11	BLK1	21
19	15	13	11	23	25	22	27	19	22	13	21	BLK1	22
26	23	21	22	21	19	21	22	24	25	20	16	BLK1	23
17	19	15	22	17	25	20	18	29	27	19	16	BLK1	24
28	9	10	21	22	25	13	14	19	20	22	14	BLK1	25
22	18	26	21	14	20	23	20	20	21	20	16	BLK1	26
22	15	17	21	17	16	28	15	23	24	23	25	BLK1	27
22	18	24	20	27	13	15	28	20	13	21	17	BLK1	28
15	26	17	29	30	21	17	20	15	16	21	18	BLK1	29
16	19	24	17	23	17	19	19	16	20	25	21	BLK1	30
17	13	26	17	18	21	16	29	18	22	9	20	BLK1	31
25	23	26	20	17	13	12	14	23	19	21	19	BLK1	32
15	23	25	21	18	16	19	20	20	22	14	18	BLK1	33
18	17	33	0									BLK1	34
0	68	1005	3692	7795	11783	14849	17029	17621	17827	16730	15622	BLK2	1
14564	13290	11913	10838	9667	8579	7775	6899	6147	5466	4842	4391	BLK2	2
3877	3315	3104	2798	2443	2252	1992	1801	1587	1356	1290	1149	BLK2	3
1048	930	798	732	622	594	531	507	457	402	358	329	BLK2	4
310	281	228	221	209	177	178	163	140	141	126	118	BLK2	5
115	115	82	80	84	63	74	66	63	58	50	52	BLK2	6
46	42	49	36	43	42	36	43	36	28	26	41	BLK2	7
38	35	40	29	40	33	33	30	28	32	24	36	BLK2	8
34	24	29	27	25	32	26	30	35	29	32	27	BLK2	9
36	25	33	29	35	36	28	21	23	23	35	25	BLK2	10
24	35	26	22	31	29	18	20	25	28	36	40	BLK2	11
28	26	32	28	29	32	24	30	25	24	20	29	BLK2	12
31	24	20	20	30	42	31	31	27	22	25	23	BLK2	13
27	25	41	33	39	36	26	31	31	32	29	34	BLK2	14
30	31	31	30	30	20	30	28	28	28	25	25	BLK2	15
23	23	35	26	28	26	29	29	21	33	28	24	BLK2	16

26	25	31	22	23	40	20	26	23	22	38	28	BLK2	17
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26	28	31	27	27	26	30	24	38	30	37	30	BLK2	19
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22	18	26	28	22	27	23	32	18	25	29	31	BLK2	27
32	27	22	30	21	25	26	36	22	33	27	22	BLK2	28
28	27	25	23	33	22	29	25	25	32	24	26	BLK2	29
27	36	22	21	34	22	23	26	15	32	25	22	BLK2	30
30	22	27	32	26	24	25	19	29	23	28	28	BLK2	31
31	16	27	29	24	20	36	24	27	25	38	19	BLK2	32
30	28	36	21	20	15	17	26	22	28	31	29	BLK2	33
28	27	30	0									BLK2	34
0	1161	12045	30303	45341	55162	58279	57309	54128	49566	44601	39306	BLK3	1
34145	23550	25345	22042	19159	16361	14269	12310	10555	9150	7980	6918	BLK3	2
6045	5337	4620	4124	3539	3046	2902	2470	2151	1860	1683	1503	BLK3	3
1307	1211	1090	952	851	703	691	613	561	474	435	436	BLK3	4
366	339	311	326	244	241	216	226	188	197	142	162	BLK3	5
124	126	117	123	95	107	115	102	75	82	91	73	BLK3	6
83	83	65	88	66	92	88	62	69	57	69	66	BLK3	7
73	54	68	63	71	76	64	56	85	52	69	64	BLK3	8
54	49	76	56	62	54	55	59	72	59	57	77	BLK3	9
62	80	58	51	54	52	51	60	67	65	51	56	BLK3	10
57	48	70	75	53	52	55	54	63	54	62	69	BLK3	11
51	65	70	54	72	65	56	54	69	59	70	70	BLK3	12
64	67	53	46	59	41	59	72	58	57	52	69	BLK3	13
48	73	57	61	51	48	67	45	49	65	53	58	BLK3	14
81	54	51	61	65	57	57	68	58	50	49	46	BLK3	15
59	70	45	59	46	57	63	49	61	41	57	57	BLK3	16
49	66	72	57	63	61	47	55	65	67	46	66	BLK3	17
59	48	57	66	56	55	55	73	52	50	54	60	BLK3	18
62	56	52	58	56	65	61	66	47	47	52	61	BLK3	19
62	61	66	65	63	65	51	50	66	56	62	52	BLK3	20
62	70	50	74	59	52	50	52	65	67	65	53	BLK3	21
52	65	70	67	61	51	47	50	64	43	53	49	BLK3	22
56	57	59	51	57	63	50	60	55	46	55	47	BLK3	23
58	51	53	56	64	64	69	53	66	60	53	50	BLK3	24
53	54	61	49	58	37	54	55	52	53	53	59	BLK3	25
48	52	52	57	57	52	57	59	56	59	62	47	BLK3	26
62	58	71	57	52	56	47	67	50	53	52	59	BLK3	27
53	59	58	50	62	54	53	53	46	58	55	47	BLK3	28
50	58	61	69	62	60	60	63	63	58	48	59	BLK3	29
48	45	56	41	48	46	52	65	47	48	56	59	BLK3	30
45	48	54	55	47	45	58	48	52	69	71	57	BLK3	31
59	55	51	54	45	48	83	61	64	43	53	49	BLK3	32
56	61	49	59	54	52	56	60	45	73	48	57	BLK3	33
60	51	55	4072									BLK3	34

FSV PULSED-NEUTRON DATA RUN 7 CONFIGURATION 4

0	459	4607	13862	26081	37272	45867	51601	54361	55129	53796	51946	BLK1	1
49490	46622	43414	40520	37224	34572	32264	29576	27440	25272	23199	21459	BLK1	2
20103	18509	16879	15549	14298	13412	12420	11400	10674	9843	9117	8608	BLK1	3
7920	7330	6766	6482	5871	5437	5091	4798	4437	4184	3930	3506	BLK1	4
3293	3154	2960	2698	2499	2295	2218	2061	1877	1796	1574	1438	BLK1	5
1428	1363	1258	1192	1066	1002	984	874	818	804	796	661	BLK1	6
625	628	543	596	554	492	464	493	463	405	417	346	BLK1	7
348	367	329	286	303	278	266	234	275	247	213	220	BLK1	8
190	189	210	191	200	183	182	176	170	168	156	142	BLK1	9
149	144	187	163	154	147	161	141	146	119	116	148	BLK1	10
142	143	127	121	112	153	115	149	133	146	147	137	BLK1	11
133	126	119	143	148	146	142	126	107	120	115	109	BLK1	12
121	145	134	126	115	113	139	134	107	128	122	121	BLK1	13
127	142	130	116	117	129	114	129	143	115	122	106	BLK1	14
120	139	128	122	118	112	147	132	112	103	118	137	BLK1	15
154	117	120	114	134	139	120	115	134	118	119	115	BLK1	16
120	109	121	120	124	120	119	112	108	113	142	143	BLK1	17
120	103	114	99	108	127	110	136	120	131	128	126	BLK1	18
126	149	107	114	120	107	137	124	115	107	104	109	BLK1	19
127	124	110	134	112	117	112	119	131	126	138	107	BLK1	20
119	106	146	118	127	114	122	108	105	157	122	141	BLK1	21
130	121	136	106	131	125	119	118	105	120	104	118	BLK1	22
122	110	123	128	119	117	108	106	112	132	126	101	BLK1	23
125	127	117	104	125	137	105	129	124	109	115	119	BLK1	24
128	106	100	99	138	103	123	96	116	106	120	113	BLK1	25
113	117	110	118	123	115	119	122	118	111	127	101	BLK1	26
117	115	136	114	103	118	125	115	105	101	109	122	BLK1	27
111	113	105	119	111	114	113	83	147	114	104	118	BLK1	28
97	101	115	111	118	119	106	112	117	127	118	116	BLK1	29
123	122	110	99	134	100	111	138	106	106	119	110	BLK1	30
123	129	111	122	111	132	110	104	116	121	119	96	BLK1	31
101	100	110	117	97	117	134	105	108	119	121	112	BLK1	32
125	128	112	111	112	133	111	118	106	101	112	106	BLK1	33
120	98	123	0									BLK1	34
0	435	4656	12970	21955	28413	31586	32783	32097	30370	28016	25369	BLK2	1
23210	20751	18840	16833	14906	13551	12246	11098	10003	9126	8144	7514	BLK2	2
6816	6241	5549	5169	4752	4360	3959	3643	3356	3099	2818	2538	BLK2	3
2438	2295	2095	1961	1783	1661	1615	1467	1387	1254	1131	1067	BLK2	4
1024	940	801	823	769	768	634	641	579	539	502	434	BLK2	5
452	418	375	364	317	310	289	257	258	220	207	244	BLK2	6
222	212	175	178	166	151	141	138	148	135	129	126	BLK2	7
121	117	119	107	84	88	83	70	77	78	77	59	BLK2	9
76	68	75	83	65	46	68	70	49	49	68	79	BLK2	9
58	67	59	67	74	46	47	57	65	56	63	37	BLK2	10
42	46	55	52	52	52	44	47	47	45	42	42	BLK2	11
54	42	45	48	50	50	39	49	53	58	46	51	BLK2	12
41	45	52	46	50	48	44	48	44	37	40	53	BLK2	13
56	51	44	28	44	54	48	44	47	48	35	37	BLK2	14
37	39	48	50	39	50	49	48	43	56	51	39	BLK2	15
46	61	54	41	55	51	60	54	47	64	48	39	BLK2	16

55	48	49	50	52	56	38	44	50	47	42	58	BLK2	17
48	62	50	42	49	48	38	54	60	50	42	53	BLK2	18
42	39	49	39	51	50	51	52	63	53	40	57	BLK2	19
45	49	37	63	39	48	58	40	48	38	44	46	BLK2	20
36	41	49	36	45	47	42	47	50	42	45	53	BLK2	21
40	56	54	37	60	43	43	53	46	41	35	49	BLK2	22
49	44	45	43	48	35	48	49	37	44	40	45	BLK2	23
51	44	40	52	44	45	45	47	50	46	36	40	BLK2	24
36	42	51	56	39	50	58	48	40	38	44	36	BLK2	25
41	44	43	46	54	31	43	49	50	38	63	42	BLK2	26
48	38	45	44	37	32	49	40	47	39	56	40	BLK2	27
47	38	52	50	37	42	45	41	50	33	44	41	BLK2	28
35	50	43	48	37	36	43	44	27	45	33	49	BLK2	29
43	37	41	57	44	43	41	47	51	35	37	46	BLK2	30
59	45	56	43	31	54	49	53	44	42	41	40	BLK2	31
38	43	42	44	35	36	38	55	50	55	41	46	BLK2	32
45	38	52	42	51	49	37	48	35	35	43	45	BLK2	33
39	51	52	0									BLK2	34
0	7039	45026	80379	98614	102137	97707	87834	77764	67509	56937	47993	BLK3	1
40462	34495	28571	24091	20572	17465	15012	12477	10842	9180	8224	7071	BLK3	2
6162	5549	4792	4255	3711	3374	2952	2653	2373	2201	1994	1806	BLK3	3
1600	1501	1442	1245	1166	974	939	888	793	812	741	631	BLK3	4
549	569	551	487	455	425	378	374	323	311	310	298	BLK3	5
261	271	239	228	214	200	211	185	204	162	167	164	BLK3	6
150	133	134	116	123	126	100	102	127	114	114	110	BLK3	7
93	98	99	86	88	72	78	86	83	86	75	78	BLK3	8
95	76	88	67	67	68	88	77	86	59	79	78	BLK3	9
73	60	73	82	68	77	56	70	66	65	71	65	BLK3	10
70	76	81	71	69	86	62	58	64	55	61	65	BLK3	11
55	67	63	58	60	68	68	56	73	82	68	66	BLK3	12
67	80	72	68	71	56	58	69	54	67	69	51	BLK3	13
60	55	64	66	82	57	64	66	70	76	76	61	BLK3	14
53	56	71	67	53	81	71	69	65	60	63	57	BLK3	15
77	68	50	67	53	63	75	60	71	75	61	72	BLK3	16
53	52	59	68	54	62	55	61	59	76	71	67	BLK3	17
72	57	67	47	76	59	62	78	60	61	61	68	BLK3	18
66	72	67	61	59	75	60	69	54	62	62	79	BLK3	19
60	58	72	67	61	74	54	55	64	64	67	69	BLK3	20
72	70	53	51	59	73	62	61	71	74	71	60	BLK3	21
71	60	62	55	77	72	64	67	57	59	64	62	BLK3	22
69	65	62	53	73	68	48	64	60	63	70	59	BLK3	23
67	63	64	46	71	67	55	56	61	57	62	70	BLK3	24
65	65	60	65	41	53	57	61	57	50	51	73	BLK3	25
59	55	53	58	43	58	55	75	82	56	68	61	BLK3	26
59	52	54	64	50	52	63	62	63	61	73	58	BLK3	27
59	54	69	55	52	54	63	65	68	66	61	65	BLK3	28
46	69	53	58	62	73	55	54	61	49	62	61	BLK3	29
75	57	55	62	64	52	67	65	60	67	53	59	BLK3	30
73	64	48	60	55	78	69	64	61	56	60	62	BLK3	31
76	69	62	67	61	62	67	56	57	72	81	61	BLK3	32
62	60	61	70	55	62	60	48	42	47	49	60	BLK3	33
59	46	74	4095									BLK3	34

FSV PULSED-NEUTRON DATA RUN 8 CONFIGURATION 4A

0	149	1629	59E5	13018	20667	27551	32429	36287	38075	38819	38730	BLK1	1
37457	36436	34835	32603	31090	29284	27726	25892	23926	22420	20870	19564	BLK1	2
18280	16983	15873	14526	13722	12745	12102	11180	10622	9744	9074	8370	BLK1	3
7781	7347	6857	6333	5948	5560	5137	4865	4489	4226	3834	3585	BLK1	4
3408	3145	3012	2717	2583	2425	2275	2207	2042	1876	1710	1593	BLK1	5
1447	1420	1285	1201	1172	1067	958	931	882	853	827	696	BLK1	6
673	615	601	594	540	552	439	445	457	427	434	367	BLK1	7
369	347	338	308	286	270	264	257	271	217	213	225	BLK1	8
233	212	235	196	193	171	181	177	170	194	181	159	BLK1	9
164	173	163	164	159	131	144	134	162	120	145	136	BLK1	10
128	138	127	152	141	134	133	123	133	134	126	131	BLK1	11
151	122	146	119	121	128	132	131	94	111	107	130	BLK1	12
137	136	122	106	131	113	125	132	126	130	114	111	BLK1	13
114	120	114	141	128	115	112	111	121	121	124	111	BLK1	14
106	135	143	139	128	113	119	128	128	117	140	129	BLK1	15
123	137	128	122	118	129	132	103	126	112	133	126	BLK1	16
125	116	99	126	129	132	119	108	119	125	129	146	BLK1	17
139	101	124	124	119	101	142	128	107	127	132	115	BLK1	18
116	142	121	131	106	117	125	114	123	125	124	101	BLK1	19
113	133	122	132	115	110	122	135	122	93	130	120	BLK1	20
110	123	122	123	123	121	110	125	123	113	117	116	BLK1	21
118	110	110	110	124	104	101	120	116	101	111	122	BLK1	22
107	112	127	125	110	92	125	120	126	127	129	110	BLK1	23
134	120	118	118	104	116	127	123	107	124	127	117	BLK1	24
130	120	123	127	100	136	123	103	123	132	110	116	BLK1	25
112	119	114	117	120	113	123	111	116	129	111	125	BLK1	26
135	89	103	113	119	107	136	112	129	121	117	117	BLK1	27
121	103	106	103	112	128	123	100	130	118	93	95	BLK1	28
122	107	108	107	111	118	113	129	129	130	131	119	BLK1	29
124	103	114	123	109	122	97	103	116	128	101	109	BLK1	30
112	109	104	115	108	107	121	102	91	109	119	125	BLK1	31
109	130	122	111	106	116	103	117	112	99	106	122	BLK1	32
114	109	109	115	102	114	111	119	101	142	104	102	BLK1	33
128	102	106	0									BLK1	34
0	102	1447	4904	9240	13552	16542	18178	18930	19017	18422	17487	BLK2	1
16471	15311	13887	12898	11825	10784	10049	9213	8586	7718	7210	6722	BLK2	2
6056	5674	5156	4842	4459	4158	3810	3545	3363	3083	2896	2596	BLK2	3
2480	2243	2066	1915	1853	1618	1596	1539	1386	1351	1227	1141	BLK2	4
999	954	906	853	820	740	718	625	598	548	515	516	BLK2	5
438	442	394	324	377	313	320	283	256	268	243	234	BLK2	6
227	221	186	172	178	140	143	159	149	133	137	148	BLK2	7
101	105	101	101	84	97	96	88	92	63	85	85	BLK2	8
77	79	79	73	69	72	74	47	66	62	65	62	BLK2	9
55	58	56	48	41	51	60	63	59	59	37	53	BLK2	10
55	40	51	48	47	46	45	50	39	45	44	49	BLK2	11
41	44	49	43	44	54	38	37	46	34	45	57	BLK2	12
50	40	35	42	43	42	40	36	38	37	43	41	BLK2	13
62	43	31	51	41	50	32	43	48	45	42	58	BLK2	14
45	43	35	48	56	56	42	55	48	45	39	54	BLK2	15
42	46	45	47	53	29	31	50	46	37	32	52	BLK2	16

50	33	54	56	52	43	41	50	38	36	44	56	BLK2	17
39	27	40	40	34	54	46	47	37	50	41	50	BLK2	18
30	50	25	47	38	44	36	46	51	34	41	41	BLK2	19
41	36	46	44	40	43	38	47	45	42	37	49	BLK2	20
47	52	35	41	49	54	40	45	43	45	46	51	BLK2	21
42	40	33	39	40	42	43	53	44	44	37	39	BLK2	22
40	43	44	44	40	51	41	50	48	47	39	33	BLK2	23
41	45	40	43	47	45	42	35	45	50	37	46	BLK2	24
50	34	38	49	42	35	45	32	40	42	52	47	BLK2	25
38	42	27	37	49	36	50	40	34	37	32	44	BLK2	26
52	29	47	33	39	53	47	34	39	34	32	32	BLK2	27
41	46	36	32	44	43	46	52	37	44	49	42	BLK2	28
42	41	36	40	46	49	47	54	36	36	42	40	BLK2	29
42	42	40	52	43	44	42	37	37	38	43	33	BLK2	30
39	35	51	38	45	42	47	41	35	32	44	47	BLK2	31
30	42	35	45	43	37	33	35	29	52	32	33	BLK2	32
35	50	43	42	48	32	39	44	44	37	38	51	BLK2	33
36	47	31	0									BLK2	34
0	1661	15235	33768	46878	54310	54407	52531	48465	43037	38334	33295	BLK3	1
23762	25211	22010	19009	16734	14259	12253	10795	9646	8512	7538	6592	BLK3	2
5805	5237	4733	4337	3772	3451	3065	2881	2592	2401	2233	1881	BLK3	3
1760	1735	1422	1338	1297	1142	1107	958	925	859	787	712	BLK3	4
711	663	611	545	546	500	421	413	370	346	327	321	BLK3	5
323	260	275	234	266	215	213	190	184	186	156	149	BLK3	6
140	153	152	125	122	141	131	116	95	88	100	92	BLK3	7
83	86	88	93	77	84	98	83	88	73	65	84	BLK3	8
89	74	71	73	59	71	69	61	67	75	79	60	BLK3	9
55	71	63	66	66	65	61	71	73	75	63	58	BLK3	10
67	60	58	43	53	59	67	62	68	58	72	64	BLK3	11
78	59	68	48	49	67	62	50	47	61	50	59	BLK3	12
50	55	64	58	59	65	59	69	75	58	71	65	BLK3	13
62	61	59	56	64	59	56	66	64	51	62	66	BLK3	14
49	54	51	42	59	61	50	59	56	53	58	52	BLK3	15
57	48	63	67	59	60	63	51	44	46	45	57	BLK3	16
73	55	59	49	40	76	50	50	58	57	56	59	BLK3	17
50	53	67	48	65	60	53	67	60	61	76	44	BLK3	18
04	63	49	61	52	52	52	64	62	58	60	49	BLK3	19
36	51	59	50	40	40	47	61	47	51	57	49	BLK3	20
56	74	52	63	47	60	55	52	53	56	51	80	BLK3	21
58	54	60	54	46	56	65	43	64	51	61	51	BLK3	22
58	58	51	52	52	40	56	56	40	59	50	61	BLK3	23
52	48	52	63	56	52	60	61	64	51	50	49	BLK3	24
46	55	00	57	70	54	65	59	55	56	53	59	BLK3	25
51	49	51	56	61	60	51	50	61	48	59	59	BLK3	26
53	48	73	52	54	51	50	57	54	53	51	66	BLK3	27
53	53	55	56	56	57	65	63	52	53	55	60	BLK3	28
66	48	56	59	50	50	39	60	44	61	64	71	BLK3	29
54	65	57	65	49	47	53	50	61	55	50	57	BLK3	30
59	58	63	70	54	63	63	50	47	35	64	56	BLK3	31
41	50	50	46	65	43	63	54	75	44	56	49	BLK3	32
46	62	61	59	54	55	56	58	64	58	42	43	BLK3	33
39	49	51	3846									BLK3	34

FSV PULSED-NEUTRON DATA RUN 9 CONFIGURATION 5

0	344	3354	9276	15632	20423	23919	25311	25131	24195	23056	21396	BLK1	1
20056	18403	16721	15142	14076	12653	11501	10346	9547	8638	8004	7102	BLK1	2
6624	5907	5693	5053	4622	4290	4031	3819	3389	3136	2990	2724	BLK1	3
2463	2317	2197	2054	1950	1720	1588	1500	1407	1272	1183	1076	BLK1	4
1029	987	935	865	752	702	681	636	590	550	528	479	BLK1	5
447	441	387	410	335	310	300	295	246	247	226	250	BLK1	6
220	190	188	170	177	165	141	122	146	129	119	119	BLK1	7
113	113	113	99	97	98	84	73	99	72	87	74	BLK1	8
77	57	80	67	61	61	70	57	73	53	47	53	BLK1	9
58	57	60	48	54	54	50	50	48	53	53	41	BLK1	10
51	41	53	47	47	52	51	36	43	37	49	44	BLK1	11
50	44	44	50	27	30	35	36	47	42	36	53	BLK1	12
49	47	47	49	48	45	44	46	48	39	41	39	BLK1	13
43	42	48	41	49	44	48	50	47	47	41	32	BLK1	14
36	37	40	44	51	42	30	45	34	46	50	44	BLK1	15
48	50	41	38	49	45	44	48	46	41	46	36	BLK1	16
44	47	44	48	45	43	41	37	42	45	43	41	BLK1	17
53	38	22	44	46	53	44	43	47	41	47	52	BLK1	18
49	45	57	37	40	46	37	37	41	38	49	50	BLK1	19
39	43	41	30	43	20	31	47	38	42	33	40	BLK1	20
38	44	35	52	46	36	29	46	45	44	40	46	BLK1	21
50	44	44	54	39	51	41	38	42	36	41	53	BLK1	22
40	45	51	49	49	44	45	50	41	40	43	34	BLK1	23
41	44	48	45	44	38	34	36	48	43	47	35	BLK1	24
48	41	43	36	35	39	37	39	42	42	44	36	BLK1	25
38	32	42	43	38	36	37	41	48	41	43	37	BLK1	26
36	40	50	37	45	39	45	50	54	46	50	52	BLK1	27
46	42	38	49	34	39	42	39	40	47	37	48	BLK1	28
48	46	42	49	39	42	52	37	35	46	46	43	BLK1	29
47	45	44	61	52	37	39	53	48	44	40	32	BLK1	30
38	44	42	49	40	43	35	54	36	45	41	38	BLK1	31
38	46	43	44	50	32	40	34	46	39	40	49	BLK1	32
45	44	25	38	43	38	42	44	39	40	36	53	BLK1	33
41	56	27	0									BLK1	34
0	632	6938	20318	36989	51985	62918	68601	71730	71752	70307	67146	BLK2	1
64031	59739	56017	51761	48008	44419	41069	37730	34391	31866	29733	27353	BLK2	2
25154	23387	21233	19766	18361	17019	15597	14756	13340	12381	11643	10775	BLK2	3
9853	9133	8489	7869	7299	6660	6332	5970	5382	5062	4728	4336	BLK2	4
4102	3803	3579	3383	3006	2833	2754	2499	2292	2136	2033	1841	BLK2	5
1777	1651	1553	1412	1424	1290	1222	1165	1026	959	920	907	BLK2	6
877	766	731	661	678	536	596	547	483	484	476	446	BLK2	7
441	397	357	342	354	341	327	324	326	312	299	271	BLK2	8
256	268	252	263	204	239	244	234	220	249	206	205	BLK2	9
225	199	188	202	182	187	192	169	180	174	182	159	BLK2	10
183	186	179	166	174	186	205	165	182	169	176	184	BLK2	11
156	173	154	161	189	200	173	176	130	160	158	156	BLK2	12
193	163	181	148	158	181	153	170	162	174	147	165	BLK2	13
147	158	178	157	173	145	165	151	149	143	166	169	BLK2	14
151	178	149	155	166	174	165	174	168	170	156	163	BLK2	15
167	153	146	156	137	157	141	159	150	176	152	144	BLK2	16

154	139	152	176	166	131	180	158	158	158	137	166	BLK2	17
178	156	161	160	165	154	149	179	149	150	169	162	BLK2	18
183	149	143	160	146	149	146	152	163	139	146	182	BLK2	19
159	156	144	176	152	142	146	168	135	178	130	114	BLK2	20
151	137	166	145	156	158	170	170	150	164	135	166	BLK2	21
163	142	146	175	137	161	144	161	152	152	169	162	BLK2	22
153	157	139	142	148	175	135	163	158	154	150	147	BLK2	23
146	153	155	158	153	139	163	152	147	149	160	147	BLK2	24
148	167	144	152	163	146	166	144	157	150	144	142	BLK2	25
133	149	161	161	145	147	145	140	151	140	141	138	BLK2	26
162	161	154	147	150	164	160	137	174	169	159	161	BLK2	27
156	164	143	173	159	139	145	163	159	162	167	140	BLK2	28
152	149	144	167	157	143	152	150	172	160	168	154	BLK2	29
158	162	152	163	135	181	144	147	137	172	143	144	BLK2	30
144	165	171	137	131	167	160	148	180	153	159	146	BLK2	31
145	131	153	136	147	151	149	159	175	141	159	160	BLK2	32
166	152	151	137	153	157	139	134	136	156	151	142	BLK2	33
129	136	161	0									BLK2	34

0	6824	43986	76520	94068	97105	91909	83817	73793	64376	55721	47387	BLK3	1
41276	35078	30178	26085	22505	19468	17033	15058	13090	11537	10084	9099	BLK3	2
7994	7249	6505	5823	5289	4865	4412	3858	3560	3295	2976	2656	BLK3	3
2515	2335	2204	1980	1824	1665	1548	1486	1341	1223	1130	1057	BLK3	4
1621	918	834	820	772	661	623	574	537	543	516	461	BLK3	5
432	410	389	385	339	343	291	314	291	253	258	230	BLK3	6
229	222	208	184	189	151	173	172	155	137	170	138	BLK3	7
134	134	140	116	138	124	121	102	119	101	112	98	BLK3	8
110	91	97	80	96	91	99	80	85	109	84	98	BLK3	9
93	80	84	88	80	91	90	77	66	82	88	79	BLK3	10
75	72	79	83	84	88	81	89	89	80	79	80	BLK3	11
67	46	70	65	60	90	79	74	78	71	69	82	BLK3	12
73	70	59	79	88	79	83	64	62	96	84	92	BLK3	13
78	79	69	92	61	70	100	75	88	75	65	60	BLK3	14
74	72	63	88	83	70	83	74	58	67	71	74	BLK3	15
75	68	81	82	76	81	67	80	73	87	66	91	BLK3	16
86	86	69	88	84	79	83	68	65	69	68	68	BLK3	17
89	74	78	100	60	79	67	73	64	66	70	80	BLK3	18
72	65	76	56	78	85	78	70	74	61	85	72	BLK3	19
64	87	79	84	80	101	67	78	76	74	67	69	BLK3	20
64	76	79	78	74	64	61	76	77	68	76	95	BLK3	21
70	96	57	74	76	71	69	73	78	78	72	74	BLK3	22
73	69	61	71	81	75	80	71	76	79	76	67	BLK3	23
67	81	76	58	72	72	82	70	76	87	70	73	BLK3	24
75	67	79	85	94	68	71	64	65	86	66	66	BLK3	25
80	70	68	75	57	72	75	74	75	81	66	67	BLK3	26
70	75	67	74	76	66	80	80	70	54	71	59	BLK3	27
70	79	64	75	75	68	72	65	67	63	61	62	BLK3	28
62	60	84	85	63	73	76	62	60	67	69	74	BLK3	29
69	76	62	63	75	69	86	63	62	66	56	75	BLK3	30
79	57	79	62	84	66	72	75	85	53	78	72	BLK3	31
87	61	72	68	68	83	66	63	85	64	73	59	BLK3	32
79	49	61	68	65	74	53	72	84	78	70	68	BLK3	33
57	74	65	3920									BLK3	34

FSV PULSED-NEUTRON DATA RUN 10 CONFIGURATION 5A

0	80	890	3283	6502	9994	12828	14604	15904	16362	16033	15642	BLK1	1
15011	14374	13336	12569	11698	10846	10039	9526	8639	7935	7562	6915	BLK1	2
6433	5938	5593	5051	4773	4448	4092	3730	3491	3297	3123	2830	BLK1	3
2671	2461	2215	2040	2029	1808	1731	1517	1541	1336	1244	1182	BLK1	4
1172	990	947	888	864	817	780	668	702	589	534	459	BLK1	5
480	433	429	412	395	383	292	306	297	294	230	254	BLK1	6
234	230	193	181	183	169	139	146	143	142	121	123	BLK1	7
124	118	109	107	118	86	94	100	82	92	76	86	BLK1	8
67	65	67	53	68	65	71	53	64	61	55	62	BLK1	9
49	63	55	58	38	52	48	55	38	44	51	36	BLK1	10
56	40	43	50	40	45	47	47	53	47	55	47	BLK1	11
50	36	45	43	49	53	46	37	45	49	38	40	BLK1	12
39	44	43	41	49	48	33	36	46	42	38	43	BLK1	13
38	39	49	43	46	48	64	45	37	39	51	39	BLK1	14
43	41	50	36	37	54	44	44	41	52	35	55	BLK1	15
37	53	45	44	33	47	33	34	46	42	46	49	BLK1	16
49	35	48	49	44	48	41	49	45	37	46	45	BLK1	17
44	48	42	43	40	36	47	54	49	46	39	46	BLK1	18
61	37	46	45	59	46	37	41	42	45	51	28	BLK1	19
45	46	44	46	43	40	29	47	49	50	36	34	BLK1	20
41	35	32	36	36	40	36	48	34	46	44	44	BLK1	21
41	41	36	45	34	44	38	44	40	35	49	36	BLK1	22
50	38	42	50	50	32	46	34	40	42	41	40	BLK1	23
34	37	38	43	43	37	42	33	42	39	32	38	BLK1	24
36	27	46	38	52	36	43	41	40	38	41	39	BLK1	25
50	32	48	36	33	57	28	44	41	31	36	45	BLK1	26
38	41	38	43	32	45	49	54	30	49	46	42	BLK1	27
38	37	44	36	54	40	30	32	37	48	39	41	BLK1	28
30	35	48	45	35	46	57	43	38	39	58	40	BLK1	29
40	36	46	51	54	38	38	45	47	37	39	55	BLK1	30
33	51	43	38	48	37	40	45	35	33	39	47	BLK1	31
31	35	48	43	43	26	37	48	29	43	34	37	BLK1	32
38	36	49	36	40	48	33	37	36	46	34	37	BLK1	33
41	40	39	0									BLK1	34
0	255	2532	9549	20065	31323	40932	48452	52880	54882	55828	55251	BLK2	1
53331	51282	49151	46289	44125	41291	38704	36047	33663	31797	29565	27327	BLK2	2
25602	23934	22502	20540	19121	18105	16654	15509	14494	13550	12789	11693	BLK2	3
10787	10187	9438	8748	8295	7706	7081	6522	6107	5857	5362	4928	BLK2	4
4519	4265	4054	3788	3600	3232	2959	2845	2691	2472	2400	2153	BLK2	5
1981	1925	1768	1698	1522	1439	1407	1283	1219	1160	1062	1043	BLK2	6
986	868	842	856	729	635	668	620	586	563	529	540	BLK2	7
465	497	432	429	460	361	379	356	350	341	328	303	BLK2	8
305	294	257	243	281	251	282	232	242	258	248	221	BLK2	9
216	247	221	200	218	217	200	232	196	199	195	227	BLK2	10
188	201	209	188	207	208	196	170	206	185	172	172	BLK2	11
182	184	181	162	186	217	167	197	161	172	173	177	BLK2	12
195	173	201	193	193	176	163	153	205	181	170	172	BLK2	13
167	188	172	184	189	170	165	190	171	179	149	194	BLK2	14
186	166	172	175	172	163	162	150	179	156	164	172	BLK2	15
169	172	169	196	167	166	161	171	182	179	165	175	BLK2	16

177	173	160	168	150	196	165	169	168	152	164	175	BLK2	17
150	138	166	173	175	161	168	155	167	160	152	190	BLK2	18
142	172	171	183	165	172	162	166	165	178	175	167	BLK2	19
177	176	177	157	156	175	158	183	181	171	169	187	BLK2	20
163	159	156	163	172	172	179	151	164	159	172	158	BLK2	21
160	187	167	173	181	169	151	156	164	177	178	157	BLK2	22
175	163	161	161	163	173	176	174	167	166	153	192	BLK2	23
155	165	160	147	171	167	177	175	162	161	153	138	BLK2	24
180	157	167	153	169	191	173	152	169	178	175	189	BLK2	25
154	184	151	150	197	167	150	169	159	169	167	168	BLK2	26
186	155	166	184	142	186	146	172	163	173	146	186	BLK2	27
160	155	151	164	144	184	149	160	164	156	165	186	BLK2	28
155	155	177	180	167	167	166	167	165	158	155	175	BLK2	29
156	156	159	162	169	156	179	155	173	145	163	170	BLK2	30
180	165	179	175	173	159	161	149	155	172	160	182	BLK2	31
158	150	176	163	161	160	164	160	174	174	176	175	BLK2	32
163	166	193	163	167	166	185	135	147	158	175	164	BLK2	33
177	174	154	0									BLK2	34

0	1494	14454	32489	46266	53732	55645	54367	50447	46334	41659	37025	BLK3	1
33114	29478	25709	22758	20438	18014	16247	14247	12941	11455	10502	9568	BLK3	2
8603	7785	7070	6386	5773	5350	4881	4360	4141	3884	3514	3319	BLK3	3
2917	2664	2475	2393	2190	1963	1870	1746	1591	1538	1306	1381	BLK3	4
1234	1079	935	947	919	873	736	760	673	641	545	558	BLK3	5
529	477	475	402	405	362	360	361	313	273	284	254	BLK3	6
257	221	234	245	190	183	198	152	169	155	140	177	BLK3	7
141	110	143	128	146	121	124	101	116	115	123	121	BLK3	8
122	113	104	95	114	95	108	90	110	97	72	86	BLK3	9
99	76	93	59	85	87	77	88	98	90	83	74	BLK3	10
85	88	78	74	75	86	85	74	76	82	75	80	BLK3	11
75	87	84	75	76	76	87	86	76	73	73	88	BLK3	12
78	61	71	71	78	70	65	74	68	77	80	87	BLK3	13
70	64	82	68	71	74	83	69	72	82	86	74	BLK3	14
77	71	70	87	69	77	67	77	71	85	86	71	BLK3	15
82	60	57	62	69	92	81	60	79	71	89	67	BLK3	16
75	80	85	72	88	79	91	73	69	90	60	53	BLK3	17
75	65	72	73	80	59	80	84	74	71	69	82	BLK3	18
58	86	72	111	85	81	84	67	68	72	80	84	BLK3	19
67	71	78	71	81	62	81	63	68	61	84	73	BLK3	20
72	83	73	82	75	65	72	67	58	71	82	79	BLK3	21
69	70	78	57	67	73	55	65	75	80	74	66	BLK3	22
71	81	65	68	79	74	70	64	66	62	71	61	BLK3	23
96	62	77	69	85	64	82	74	73	80	81	75	BLK3	24
70	84	60	72	76	70	72	60	57	55	60	55	BLK3	25
63	72	53	56	69	59	50	73	66	76	70	65	BLK3	26
89	63	61	79	66	82	59	72	73	62	82	71	BLK3	27
68	66	76	77	76	74	61	70	54	76	69	67	BLK3	28
72	77	76	65	77	78	81	76	58	59	62	67	BLK3	29
82	63	76	70	64	84	52	77	61	72	72	75	BLK3	30
73	69	65	74	69	79	68	68	60	79	78	70	BLK3	31
73	75	68	66	66	80	79	69	67	74	80	62	BLK3	32
55	74	69	65	87	65	80	64	65	76	80	64	BLK3	33
67	82	68	3934									BLK3	34

FSV PULSED-NEUTRON DATA RUN 11 CONFIGURATION 6A

0	184	1729	5090	9313	12994	15921	17545	17958	17966	17417	16400	BLK1	1
15458	14310	13221	12084	10903	9962	9151	8218	7504	6858	6151	5643	BLK1	2
5228	4785	4285	3944	3574	3206	2942	2665	2519	2189	2066	1913	BLK1	3
1745	1596	1423	1338	1196	1174	1073	940	949	833	713	654	BLK1	4
608	614	529	477	413	388	359	353	314	309	284	235	BLK1	5
250	203	216	198	197	171	144	149	134	152	124	109	BLK1	6
94	101	96	84	88	75	64	79	64	58	56	69	BLK1	7
51	39	49	49	53	36	50	61	48	39	68	41	BLK1	8
44	46	37	38	49	33	32	30	42	34	33	42	BLK1	9
54	45	36	27	30	43	27	28	34	36	26	29	BLK1	10
39	34	29	36	37	36	38	40	20	35	44	29	BLK1	11
36	21	44	34	28	38	45	24	42	31	38	27	BLK1	12
40	37	37	39	44	32	40	28	24	36	21	32	BLK1	13
31	29	35	21	36	36	31	37	32	30	36	37	BLK1	14
36	31	43	35	30	34	36	32	30	25	29	33	BLK1	15
39	36	38	32	33	32	34	35	24	28	37	22	BLK1	16
35	28	25	29	30	24	40	21	35	34	33	20	BLK1	17
34	24	32	38	37	25	38	37	31	36	33	27	BLK1	18
31	29	32	28	33	41	31	33	35	25	22	38	BLK1	19
32	30	32	33	31	31	29	25	36	32	28	32	BLK1	20
27	21	26	36	25	27	35	30	25	47	29	32	BLK1	21
31	33	31	25	31	27	29	34	29	32	38	25	BLK1	22
27	30	30	29	32	35	41	29	46	39	33	25	BLK1	23
22	32	37	27	40	36	29	23	46	25	28	31	BLK1	24
24	51	25	32	28	28	28	31	27	33	30	24	BLK1	25
35	25	32	26	24	28	31	28	32	24	40	41	BLK1	26
25	30	34	31	30	28	30	26	20	33	36	31	BLK1	27
27	39	30	25	36	27	35	35	38	29	20	33	BLK1	28
31	34	25	22	26	25	27	33	18	32	28	29	BLK1	29
29	28	29	26	34	29	32	28	25	21	28	30	BLK1	30
34	37	40	33	33	34	32	34	26	31	30	30	BLK1	31
34	21	26	40	37	38	30	19	27	24	29	21	BLK1	32
30	31	27	35	27	26	28	26	28	26	31	28	BLK1	33
31	36	31	0									BLK1	34
0	181	2183	6287	11112	14777	17173	17929	18035	17270	16367	15089	BLK2	1
13712	12762	11377	10339	9228	8396	7510	6754	6134	5582	5003	4702	BLK2	2
4123	3774	3485	3243	2928	2601	2338	2240	1976	1794	1682	1550	BLK2	3
1361	1292	1129	1046	991	841	848	722	680	626	564	527	BLK2	4
477	442	428	353	348	336	324	285	273	208	225	186	BLK2	5
198	196	156	137	151	134	127	135	103	108	103	77	BLK2	6
92	81	64	88	70	69	78	58	54	49	67	50	BLK2	7
44	37	52	43	48	46	38	48	44	30	34	27	BLK2	8
37	32	38	35	24	32	27	34	28	38	29	36	BLK2	9
34	38	31	21	29	23	26	34	36	37	24	25	BLK2	10
30	35	28	31	41	17	28	32	20	21	32	30	BLK2	11
17	22	29	26	19	34	33	28	37	23	26	29	BLK2	12
28	21	27	39	25	35	33	27	26	30	22	36	BLK2	13
29	21	33	21	23	32	22	44	23	27	24	34	BLK2	14
32	34	32	16	37	21	23	24	34	19	25	32	BLK2	15
22	32	32	21	24	23	35	22	25	31	22	30	BLK2	16

26	32	23	22	25	23	24	22	27	18	22	30	BLK2	17
22	18	31	30	25	25	26	31	20	26	27	31	BLK2	18
34	26	21	28	28	22	25	26	29	30	21	26	BLK2	19
25	34	36	33	20	31	32	28	21	31	30	29	BLK2	20
29	23	19	23	30	27	27	27	32	27	19	25	BLK2	21
24	30	43	33	33	29	34	21	34	29	27	21	BLK2	22
24	36	26	21	21	29	29	26	24	32	22	24	BLK2	23
34	26	30	21	25	34	28	23	30	16	25	29	BLK2	24
26	28	31	35	29	32	25	22	28	23	21	22	BLK2	25
22	35	23	19	31	29	15	25	23	23	22	22	BLK2	26
30	23	16	27	28	20	25	25	24	31	33	28	BLK2	27
26	34	30	29	33	20	18	20	33	20	23	19	BLK2	28
25	18	31	21	27	30	29	19	28	23	25	16	BLK2	29
22	20	25	24	23	32	25	18	25	25	32	22	BLK2	30
21	24	23	28	18	24	29	30	26	35	25	36	BLK2	31
27	20	16	18	32	25	38	35	26	28	27	36	BLK2	32
25	29	27	14	24	33	22	26	24	24	27	22	BLK2	33
20	21	23	0									BLK2	34
0	4929	31682	56445	68103	71269	661355	661493	53134	46593	40659	34761	BLK3	1
30461	26206	22608	19603	17155	15189	13099	11879	10315	9078	8274	7380	BLK3	2
6449	5789	5375	4686	4278	3777	3492	3072	2891	2497	2395	2129	BLK3	3
1982	1735	1502	1413	1244	1169	1074	977	946	817	799	706	BLK3	4
595	600	569	489	447	444	403	362	313	331	313	270	BLK3	5
254	268	197	193	210	190	170	156	142	148	125	150	BLK3	6
131	118	104	104	106	95	92	97	91	83	93	90	BLK3	7
87	76	109	77	71	73	61	64	75	68	59	74	BLK3	8
75	55	60	67	79	71	58	53	64	54	72	60	BLK3	9
66	55	47	56	73	56	65	55	55	70	61	58	BLK3	10
59	71	68	58	68	60	56	62	62	55	63	67	BLK3	11
48	53	59	54	62	40	64	54	59	60	67	68	BLK3	12
44	60	47	61	47	67	46	67	68	49	71	43	BLK3	13
64	46	57	55	55	53	71	62	51	50	58	45	BLK3	14
63	53	67	50	46	51	56	66	52	51	52	52	BLK3	15
54	57	47	69	60	60	71	47	55	55	53	58	BLK3	16
49	52	56	56	47	53	50	62	41	41	53	72	BLK3	17
56	57	50	48	68	68	51	59	37	64	47	58	BLK3	18
50	58	59	62	55	59	69	55	56	43	51	52	BLK3	19
42	58	50	56	79	61	56	52	59	52	50	51	BLK3	20
54	57	59	63	42	49	55	55	55	54	55	58	BLK3	21
53	37	64	43	47	62	62	52	50	58	47	68	BLK3	22
49	65	56	59	47	49	52	60	49	70	56	53	BLK3	23
40	67	49	50	56	51	64	57	50	59	52	54	BLK3	24
58	58	57	57	58	43	47	52	54	55	50	55	BLK3	25
64	40	52	48	62	57	56	57	58	51	54	43	BLK3	26
58	56	60	56	49	49	43	50	50	59	66	57	BLK3	27
44	61	70	62	41	41	54	49	51	70	47	55	BLK3	28
47	48	62	64	53	47	57	44	47	43	51	49	BLK3	29
47	56	50	52	45	54	52	51	39	53	49	51	BLK3	30
55	46	51	49	55	49	49	55	50	50	65	61	BLK3	31
47	48	51	52	51	46	49	63	53	47	47	54	BLK3	32
47	64	59	51	58	60	50	45	60	49	55	57	BLK3	33
57	44	65	4810									BLK3	34

FSV PULSED-NEUTRON DATA RUN 12 CONFIGURATION 6

0	88	1044	3200	6671	9703	11983	14033	14166	14733	14728	14179	BLK1	1
13548	12578	11757	10998	10256	9390	9006	7997	7377	6820	6232	5720	BLK1	2
5142	4948	4545	4080	3811	3442	3255	2948	2717	2434	2300	2082	BLK1	3
2009	1759	1627	1519	1401	1225	1094	1114	976	900	861	769	BLK1	4
727	647	602	563	509	483	413	403	383	340	328	314	BLK1	5
271	238	235	217	199	196	198	180	159	153	149	145	BLK1	6
127	111	96	90	104	85	99	80	78	69	73	69	BLK1	7
59	69	65	55	58	45	48	52	46	52	60	51	BLK1	8
43	48	32	47	36	50	41	50	43	34	39	37	BLK1	9
39	43	34	42	46	33	36	37	41	30	31	36	BLK1	10
37	35	39	31	42	40	38	39	40	35	42	37	BLK1	11
36	42	43	28	40	29	50	31	34	28	39	44	BLK1	12
24	45	37	34	42	26	34	35	39	42	41	35	BLK1	13
36	40	34	38	36	36	26	37	39	42	39	35	BLK1	14
38	42	46	37	30	35	29	34	37	45	55	23	BLK1	15
29	31	30	34	44	32	31	31	39	26	37	37	BLK1	16
29	37	44	31	26	30	40	30	35	33	42	29	BLK1	17
36	33	37	44	33	29	32	34	42	41	32	24	BLK1	18
39	40	31	26	38	32	35	38	38	22	34	29	BLK1	19
40	43	39	27	34	38	33	34	28	37	29	36	BLK1	20
28	36	30	43	33	44	29	29	53	30	26	33	BLK1	21
37	29	39	42	29	29	39	44	39	35	28	33	BLK1	22
40	32	33	30	43	34	31	33	37	44	43	32	BLK1	23
38	35	37	29	32	33	27	38	41	31	33	34	BLK1	24
40	36	30	39	22	30	34	31	45	32	38	27	BLK1	25
25	28	32	31	35	37	37	38	36	47	43	49	BLK1	26
39	26	31	28	38	38	40	26	29	36	36	43	BLK1	27
31	42	35	43	32	41	33	34	33	21	31	37	BLK1	28
28	25	29	40	42	33	36	25	33	32	34	39	BLK1	29
32	37	29	29	38	38	38	33	42	44	38	29	BLK1	30
40	36	28	24	30	34	31	32	40	36	38	23	BLK1	31
35	25	43	28	27	46	34	35	29	29	28	40	BLK1	32
29	37	32	39	44	38	31	31	42	30	42	26	BLK1	33
25	31	30	0									BLK1	34
0	130	1432	4683	9532	11834	14065	15244	15638	15242	14582	13718	BLK2	1
12715	11815	10782	9994	9211	8333	7726	6982	6567	5971	5483	5005	BLK2	2
4590	4195	3932	3605	3263	3056	2769	2486	2307	2127	1937	1764	BLK2	3
1636	1547	1387	1234	1203	1134	1026	906	843	766	732	654	BLK2	4
625	522	517	451	485	403	371	342	312	302	283	258	BLK2	5
262	237	215	205	175	185	126	152	133	137	131	120	BLK2	6
101	104	111	91	93	87	72	83	67	73	69	61	BLK2	7
60	58	43	48	51	44	54	52	50	49	35	50	BLK2	8
46	37	44	39	43	33	36	45	43	40	33	33	BLK2	9
37	29	32	44	43	39	34	29	44	53	33	36	BLK2	10
36	42	27	26	23	40	25	39	28	35	35	29	BLK2	11
24	27	32	30	40	49	39	46	23	24	30	31	BLK2	12
31	35	33	42	39	28	36	33	31	35	37	36	BLK2	13
41	22	22	36	29	37	28	28	32	35	39	33	BLK2	14
38	22	27	29	36	35	26	30	38	29	16	38	BLK2	15
36	29	30	35	33	39	29	32	31	36	28	31	BLK2	16

40	38	39	35	33	30	26	31	31	31	36	38	BLK2	17
35	44	23	22	37	26	35	41	29	35	32	34	BLK2	18
32	41	23	31	28	37	44	19	26	30	30	37	BLK2	19
31	44	28	20	29	28	27	33	37	36	32	20	BLK2	20
31	22	26	19	22	30	32	33	34	29	30	37	BLK2	21
32	26	38	28	36	32	31	26	32	30	29	29	BLK2	22
30	26	28	36	39	38	30	25	33	31	36	34	BLK2	23
24	28	36	25	29	35	27	25	19	35	26	32	BLK2	24
23	36	25	33	24	21	35	29	29	21	36	30	BLK2	25
37	32	36	35	29	33	32	17	32	25	29	25	BLK2	26
37	29	41	29	40	35	26	35	29	30	32	29	BLK2	27
28	32	30	38	31	30	34	32	22	31	25	45	BLK2	28
42	25	23	25	34	34	28	22	42	26	29	27	BLK2	29
28	34	27	21	35	39	22	37	20	34	27	25	BLK2	30
26	38	31	32	30	31	34	34	31	26	32	32	BLK2	31
33	27	26	21	23	32	32	41	26	18	34	26	BLK2	32
29	29	30	33	30	33	39	31	23	36	24	31	BLK2	33
32	22	33	0									BLK2	34

0	5140	33498	57125	67079	68149	63541	57527	50770	44431	38405	33488	BLK3	1
29041	25261	22317	19546	17244	15172	13352	11916	10447	9364	8301	7563	BLK3	2
6822	6042	5312	4865	4206	4064	3613	3337	2941	2767	2396	2247	BLK3	3
2035	1976	1731	1618	1390	1281	1221	1059	983	904	876	793	BLK3	4
729	663	619	543	479	469	438	404	351	340	319	286	BLK3	5
271	290	249	249	221	192	186	173	175	162	155	167	BLK3	6
126	119	129	111	112	117	114	104	93	86	96	79	BLK3	7
99	70	82	72	81	75	81	82	82	69	89	71	BLK3	8
82	48	56	66	101	69	68	78	68	62	71	47	BLK3	9
53	61	57	68	69	61	65	65	68	72	65	56	BLK3	10
75	73	50	63	70	79	73	67	64	55	62	74	BLK3	11
60	71	61	51	53	57	56	72	63	64	60	74	BLK3	12
60	65	69	69	62	63	60	54	73	58	45	63	BLK3	13
77	79	53	60	72	71	68	70	65	58	56	63	BLK3	14
56	73	61	49	49	64	56	61	61	56	50	63	BLK3	15
78	57	68	60	68	59	68	69	69	56	56	72	BLK3	16
64	50	68	61	71	60	71	60	64	63	64	63	BLK3	17
59	72	55	46	64	70	61	59	47	52	57	52	BLK3	18
66	58	77	49	65	67	73	60	42	56	71	61	BLK3	19
63	51	79	73	74	58	70	68	55	70	71	59	BLK3	20
47	56	66	53	80	55	54	56	76	58	52	57	BLK3	21
61	51	49	53	56	65	51	55	56	73	92	60	BLK3	22
61	64	75	55	52	47	53	59	63	52	55	59	BLK3	23
67	59	57	66	68	48	62	58	59	58	60	53	BLK3	24
81	61	58	62	55	71	65	59	50	75	61	56	BLK3	25
66	68	53	61	67	57	57	63	65	69	40	55	BLK3	26
57	57	59	52	66	77	72	49	57	51	60	56	BLK3	27
63	59	72	62	69	39	83	59	57	58	58	54	BLK3	28
53	64	55	49	53	51	66	55	49	60	56	63	BLK3	29
76	54	57	60	47	65	47	54	55	47	55	56	BLK3	30
66	55	52	58	65	50	51	72	48	59	56	56	BLK3	31
40	42	55	64	53	59	59	45	61	60	56	69	BLK3	32
69	63	64	61	67	59	59	52	56	69	48	0	BLK3	33

FSV PULSED-NEUTRON DATA RUN 13 CONFIGURATION 7A

0	162	1133	3585	7072	10412	13084	15192	16597	17550	18213	18321	BLK1	1
17996	17909	17935	17117	16486	16193	15575	14841	14547	13788	13324	12725	BLK1	2
12192	11653	11127	10686	10079	9788	9397	8878	8600	8229	7870	7514	BLK1	3
7074	6900	6427	6186	5782	5668	5299	5095	4858	4772	4381	4311	BLK1	4
4145	3837	3699	3540	3216	3151	3083	3021	2734	2582	2525	2379	BLK1	5
2277	2213	2106	2011	1947	1908	1769	1709	1585	1472	1516	1431	BLK1	6
1368	1263	1246	1240	1102	1106	1032	970	961	911	804	883	BLK1	7
811	718	726	668	664	657	575	582	561	568	522	507	BLK1	8
479	503	454	445	427	413	396	375	341	373	304	322	BLK1	9
337	325	330	306	282	278	278	250	263	280	241	241	BLK1	10
237	231	227	263	210	221	196	205	189	215	186	202	BLK1	11
170	171	182	163	178	166	161	146	130	138	137	145	BLK1	12
148	160	138	139	157	124	146	156	160	160	158	129	BLK1	13
131	131	121	136	134	123	138	134	135	128	150	118	BLK1	14
139	134	136	127	134	147	151	117	124	126	113	124	BLK1	15
127	98	141	139	107	109	125	134	134	135	136	122	BLK1	16
114	135	121	107	127	105	126	144	113	122	138	124	BLK1	17
131	125	104	128	148	106	113	136	123	126	133	134	BLK1	18
134	140	108	112	116	120	92	117	136	115	123	131	BLK1	19
122	95	115	122	101	116	117	108	112	116	124	119	BLK1	20
120	133	124	97	105	106	106	101	129	123	134	132	BLK1	21
125	122	124	118	115	115	133	128	113	118	102	104	BLK1	22
133	102	111	126	94	127	104	115	120	126	123	129	BLK1	23
110	94	112	134	115	106	116	112	109	112	105	120	BLK1	24
120	125	112	129	123	136	105	111	113	107	126	109	BLK1	25
105	110	123	115	104	115	109	124	143	115	104	125	BLK1	26
114	115	131	118	110	133	111	133	121	126	123	116	BLK1	27
112	120	111	109	105	110	115	126	130	115	99	101	BLK1	28
138	104	130	131	118	120	123	117	121	110	110	127	BLK1	29
139	106	117	105	114	114	131	115	102	113	122	100	BLK1	30
114	101	125	107	132	106	116	97	123	115	104	104	BLK1	31
119	125	114	108	101	125	126	124	119	94	116	109	BLK1	32
99	112	125	123	123	101	110	98	104	121	101	122	BLK1	33
109	106	135	0									BLK1	34
0	190	1652	5226	9670	13603	16784	18866	19755	20238	20302	20130	BLK2	1
19361	18789	18540	17412	16881	16150	15410	14683	14091	13590	12788	12233	BLK2	2
11737	11222	10596	10174	9935	8991	8954	8455	8166	7687	7239	6974	BLK2	3
6729	6285	5884	5843	5533	5171	5044	4761	4498	4332	4157	3878	BLK2	4
3719	3596	3353	3266	3104	2953	2803	2628	2576	2541	2374	2263	BLK2	5
2063	1999	1933	1865	1741	1650	1690	1539	1464	1462	1407	1313	BLK2	6
1267	1134	1090	1129	1006	976	952	918	827	784	747	760	BLK2	7
719	667	620	661	641	568	536	534	548	519	530	465	BLK2	8
461	430	426	425	377	389	361	346	333	308	326	333	BLK2	9
308	284	269	295	270	256	255	240	234	228	218	225	BLK2	10
215	204	215	240	182	208	190	198	170	176	185	183	BLK2	11
192	163	193	160	176	161	138	163	158	166	171	157	BLK2	12
149	142	139	137	147	121	131	130	130	140	119	129	BLK2	13
138	98	118	129	114	124	116	146	118	114	121	126	BLK2	14
140	119	121	118	122	114	113	131	120	128	121	99	BLK2	15
93	123	119	122	130	116	109	111	114	112	127	108	BLK2	16

125	124	124	122	116	126	112	116	116	121	136	120	BLK2	17
113	94	103	119	110	101	115	117	128	135	104	97	BLK2	18
111	132	103	130	124	121	105	112	107	118	94	120	BLK2	19
116	121	121	132	125	135	123	109	98	113	98	122	BLK2	20
102	104	106	123	115	116	123	109	131	106	114	112	BLK2	21
110	116	120	127	110	112	107	118	113	118	113	112	BLK2	22
115	115	129	118	116	117	148	118	120	121	113	108	BLK2	23
110	88	116	116	116	115	106	97	103	98	122	98	BLK2	24
108	117	110	118	114	112	122	116	115	141	110	116	BLK2	25
134	114	119	125	102	105	102	122	104	95	111	118	BLK2	26
109	99	97	125	131	95	100	115	96	97	115	136	BLK2	27
90	100	110	107	110	101	110	108	112	94	100	103	BLK2	28
124	116	95	109	131	101	109	107	110	109	108	110	BLK2	29
106	115	113	104	111	102	85	122	93	120	118	110	BLK2	30
96	106	96	111	108	120	110	108	91	109	106	94	BLK2	31
112	87	107	112	100	119	100	113	112	123	105	103	BLK2	32
113	109	115	123	105	83	107	109	130	102	111	96	BLK2	33
114	117	91	0									BLK2	34
0	3530	24363	45558	59227	65169	67195	66149	63643	60439	57714	54274	BLK3	1
51204	48479	45964	42936	40687	38483	36611	34582	32626	30925	29359	28079	BLK3	2
26277	24762	23665	22451	21273	20280	19509	18489	17418	16703	15695	14987	BLK3	3
14346	13698	12721	12584	11652	11132	10915	10192	9680	9411	8965	8245	BLK3	4
8051	7506	7142	6985	6639	6305	5849	5703	5403	5133	4876	4670	BLK3	5
4547	4416	4201	3826	3714	3599	3492	3243	3080	2969	2930	2719	BLK3	6
2616	2486	2375	2338	2173	2127	2030	1981	1766	1840	1697	1667	BLK3	7
1541	1483	1392	1364	1271	1304	1237	1217	1119	1122	1081	1018	BLK3	8
1026	955	939	844	841	810	777	792	750	707	686	678	BLK3	9
630	684	632	650	626	588	606	583	553	523	526	506	BLK3	10
514	486	427	441	442	450	449	433	415	450	415	409	BLK3	11
393	395	380	371	377	388	361	369	374	340	391	320	BLK3	12
313	335	324	329	316	343	349	327	306	309	318	328	BLK3	13
321	310	323	300	318	268	297	327	314	288	269	286	BLK3	14
309	281	283	303	278	278	284	293	239	259	288	292	BLK3	15
284	244	288	282	294	275	279	271	275	281	260	280	BLK3	16
290	281	286	273	263	285	265	273	261	289	273	295	BLK3	17
264	266	297	275	254	270	295	279	270	279	253	247	BLK3	18
269	296	263	325	246	310	299	240	297	297	268	257	BLK3	19
296	253	256	227	242	293	291	282	258	282	281	282	BLK3	20
283	277	268	274	290	266	244	295	282	256	286	268	BLK3	21
277	281	275	291	287	271	287	239	251	298	270	262	BLK3	22
274	268	260	285	298	278	242	260	254	278	262	279	BLK3	23
266	246	261	299	269	265	255	292	300	268	276	237	BLK3	24
246	261	271	291	261	238	265	267	260	266	281	273	BLK3	25
252	283	282	233	263	271	281	292	252	249	282	265	BLK3	26
308	286	263	291	268	258	263	255	265	256	253	260	BLK3	27
260	289	249	256	271	244	261	271	273	256	267	242	BLK3	28
258	254	283	244	267	264	236	265	252	289	259	248	BLK3	29
259	261	291	284	245	256	237	251	267	275	260	271	BLK3	30
258	263	275	265	241	250	282	268	254	238	267	251	BLK3	31
268	295	275	250	249	292	277	247	300	268	256	221	BLK3	32
251	279	258	251	271	258	237	260	235	262	230	253	BLK3	33
258	263	246	1968									BLK3	34

FSV PULSED-NEUTRON DATA RUN 14 CONFIGURATION 7

0	90	717	2444	4931	7462	9840	11720	13121	13792	14591	14972	8LK1	1
14938	14914	14933	14436	14399	13750	13484	13049	12583	12147	11814	11481	8LK1	2
11163	10687	10212	9789	9548	9223	8764	8384	8069	7576	7279	6999	8LK1	3
6812	6517	6087	5955	5690	5374	5239	4966	4671	4503	4304	4078	8LK1	4
3991	3774	3519	3436	3194	3164	2930	2847	2705	2636	2420	2461	8LK1	5
2173	2227	2024	1932	1807	1794	1747	1615	1470	1486	1433	1309	8LK1	6
1284	1207	1151	1096	1016	987	1005	947	827	857	822	746	8LK1	7
773	685	686	657	586	610	588	570	583	482	468	461	8LK1	8
458	439	439	418	397	386	383	367	337	323	315	300	8LK1	9
307	267	318	272	263	264	238	256	206	223	248	197	8LK1	10
194	193	196	184	198	184	191	164	173	168	179	172	8LK1	11
155	152	149	136	140	146	149	123	157	131	117	111	8LK1	12
116	127	121	134	121	133	123	128	102	110	119	100	8LK1	13
110	110	113	114	94	106	119	88	98	104	96	105	8LK1	14
111	105	105	87	100	104	100	109	99	128	107	82	8LK1	15
91	98	88	98	84	84	92	67	91	106	96	90	8LK1	16
92	89	82	96	100	84	101	82	96	75	90	90	8LK1	17
103	96	102	98	91	98	90	112	81	97	95	95	8LK1	18
107	91	86	104	82	93	103	71	96	95	98	83	8LK1	19
85	88	93	102	97	86	90	94	107	96	98	90	8LK1	20
81	107	100	94	90	99	83	97	98	75	94	89	8LK1	21
71	89	76	79	95	100	75	82	82	103	111	90	8LK1	22
93	75	82	86	98	91	86	91	89	86	84	96	8LK1	23
102	86	91	70	80	92	73	89	92	98	88	105	8LK1	24
88	74	94	100	83	91	92	91	84	74	100	96	8LK1	25
76	91	79	93	102	88	82	96	82	92	90	97	8LK1	26
98	82	81	82	76	94	86	102	95	77	81	84	8LK1	27
83	85	78	94	94	85	89	93	74	102	83	90	8LK1	28
95	77	87	76	82	108	84	96	96	93	89	83	8LK1	29
92	94	89	79	78	81	79	81	83	92	90	93	8LK1	30
92	101	90	96	95	101	90	67	77	90	100	86	8LK1	31
75	86	71	89	87	90	75	96	95	77	69	79	8LK1	32
100	86	114	67	83	87	97	100	89	82	93	94	8LK1	33
94	82	75	0									8LK1	34
0	114	1231	4076	17718	11029	13660	15236	16162	16844	17227	17123	8LK2	1
16940	16551	16274	15916	15217	14805	14404	13893	13239	12990	12445	11768	8LK2	2
11348	10938	10504	10049	9646	9198	8754	8498	8157	7672	7460	7300	8LK2	3
6776	6622	6269	5848	5655	5467	5059	4915	4797	4517	4265	4019	8LK2	4
3911	3731	3568	3440	3292	3157	3041	2804	2594	2500	2407	2337	8LK2	5
2233	2183	2027	1966	1890	1791	1657	1609	1462	1482	1441	1327	8LK2	6
1319	1204	1157	1101	1120	1064	960	930	945	836	782	782	8LK2	7
778	705	655	662	634	639	587	553	481	518	508	493	8LK2	8
477	448	429	410	364	395	351	347	329	298	317	295	8LK2	9
292	279	259	279	289	241	221	236	239	214	217	230	8LK2	10
210	235	199	191	180	190	181	177	169	165	179	166	8LK2	11
136	141	151	134	138	157	143	122	117	146	126	134	8LK2	12
120	116	135	140	146	121	107	102	112	121	102	92	8LK2	13
116	121	107	117	110	99	104	114	93	107	113	88	8LK2	14
96	106	86	104	97	111	107	108	103	91	106	87	8LK2	15
90	104	100	96	101	98	106	88	100	90	121	102	8LK2	16

99	97	107	86	100	104	90	98	104	89	97	105	BLK2	17
93	107	78	99	105	110	82	105	88	86	102	93	BLK2	18
101	106	92	97	100	90	85	95	108	91	93	77	BLK2	19
108	76	93	84	78	92	103	78	84	93	85	100	BLK2	20
101	85	100	90	82	84	87	105	97	76	80	114	BLK2	21
108	80	85	89	84	95	97	89	86	100	84	84	BLK2	22
82	95	86	106	98	111	96	80	73	86	86	98	BLK2	23
92	99	89	97	87	89	84	87	98	95	81	97	BLK2	24
81	94	92	96	89	101	95	96	86	105	96	89	BLK2	25
81	81	107	87	103	82	95	79	95	110	108	109	BLK2	26
98	71	88	78	99	79	95	81	100	89	100	81	BLK2	27
98	81	101	105	83	89	100	85	87	83	90	90	BLK2	28
94	83	104	88	77	90	79	85	90	87	100	83	BLK2	29
101	104	87	75	81	85	97	99	90	86	99	95	BLK2	30
84	80	88	76	95	90	78	78	85	79	79	77	BLK2	31
91	86	78	78	109	90	76	97	73	75	86	77	BLK2	32
80	80	82	90	88	72	83	100	79	78	90	93	BLK2	33
83	87	113	0									BLK2	34

0	2648	19306	37024	48124	53026	55084	54182	53061	51059	49037	46271	BLK3	1
44106	42323	40328	38143	38542	34917	33312	31648	30044	28997	27644	26208	BLK3	2
24995	23721	22661	21341	20527	19703	18688	17975	17380	16313	15514	14927	BLK3	3
14046	13344	12767	12333	11741	11144	10549	10011	9399	9248	8737	8257	BLK3	4
7781	7583	7269	6943	6606	6270	5959	5619	5385	5221	4976	4694	BLK3	5
4549	4283	4069	4001	3758	3509	3495	3225	3013	3024	2761	2667	BLK3	6
2612	2518	2365	2324	2146	2145	2048	1942	1835	1797	1701	1600	BLK3	7
1590	1475	1413	1344	1280	1211	1172	1134	1091	1087	983	1021	BLK3	8
933	951	852	797	847	748	724	748	719	667	633	619	BLK3	9
658	615	558	578	559	526	542	531	505	487	448	435	BLK3	10
440	430	430	404	412	381	380	396	404	378	359	386	BLK3	11
364	339	336	317	338	296	293	323	296	308	313	310	BLK3	12
296	269	288	277	279	271	260	257	242	282	269	268	BLK3	13
216	266	239	269	226	240	263	230	233	241	227	215	BLK3	14
212	250	250	219	228	242	257	208	226	222	248	212	BLK3	15
232	234	261	188	241	204	214	227	216	252	208	229	BLK3	16
216	236	218	204	217	218	263	203	221	220	250	234	BLK3	17
253	208	193	209	216	219	216	201	199	213	194	211	BLK3	18
205	224	215	236	217	234	207	199	205	213	213	186	BLK3	19
228	233	202	232	188	243	217	192	214	220	198	207	BLK3	20
232	195	196	267	212	228	210	186	190	223	241	238	BLK3	21
211	224	213	213	221	200	206	217	225	220	228	234	BLK3	22
196	215	228	208	204	224	225	218	213	222	224	196	BLK3	23
193	205	238	220	215	230	204	201	202	187	227	226	BLK3	24
234	201	186	219	217	211	220	227	217	203	193	214	BLK3	25
229	213	208	185	213	204	198	202	196	228	214	185	BLK3	26
208	194	186	203	187	231	211	204	247	219	187	232	BLK3	27
188	184	212	217	205	234	196	191	203	208	215	190	BLK3	28
213	203	238	206	202	225	193	216	177	206	211	211	BLK3	29
202	209	189	224	225	212	213	191	229	200	200	200	BLK3	30
172	211	181	215	191	208	228	205	211	207	213	200	BLK3	31
199	205	199	204	209	220	206	198	216	216	184	235	BLK3	32
226	197	189	171	189	208	210	183	233	186	233	222	BLK3	33
206	185	211	1352									BLK3	34

FSV PULSED-NEUTRON DATA RUN 15 CONFIGURATION 8

0	74	521	1588	3197	4947	6345	7570	8347	9050	9581	9569	BLK1	1
9734	9745	9844	9506	9606	9388	9232	8898	8802	8646	8355	8119	BLK1	2
7920	7651	7624	7252	7062	6941	6690	6544	6380	6097	5895	5650	BLK1	3
5500	5208	5179	5136	4732	4652	4556	4412	4243	4015	4030	3839	BLK1	4
3769	3566	3431	3313	3300	3237	3110	2916	2801	2719	2647	2656	BLK1	5
2434	2412	2318	2190	2222	2106	2084	1895	1904	1807	1755	1713	BLK1	6
1707	1599	1517	1466	1506	1378	1346	1227	1310	1234	1183	1079	BLK1	7
1045	1016	1043	1018	966	921	937	919	821	829	805	735	BLK1	8
714	752	688	656	717	623	608	598	613	550	546	521	BLK1	9
501	497	496	453	478	474	451	427	429	396	428	385	BLK1	10
367	322	355	341	341	299	312	305	298	304	272	274	BLK1	11
275	263	270	262	260	246	210	205	223	209	202	233	BLK1	12
229	213	211	205	213	178	177	178	185	170	142	170	BLK1	13
174	182	162	154	153	165	160	166	184	145	162	149	BLK1	14
129	122	131	139	112	141	133	128	140	134	120	131	BLK1	15
152	105	127	132	117	122	116	109	110	130	104	134	BLK1	16
122	97	119	111	98	116	107	109	119	103	96	114	BLK1	17
94	97	101	91	110	106	109	109	101	100	94	114	BLK1	18
109	103	116	81	101	103	101	98	100	109	85	95	BLK1	19
108	102	85	114	99	79	100	100	96	89	114	98	BLK1	20
93	85	100	124	95	92	96	108	102	77	92	85	BLK1	21
95	116	84	94	97	101	75	102	101	90	97	104	BLK1	22
107	98	91	99	87	109	97	83	102	85	93	93	BLK1	23
87	84	94	74	96	99	91	96	95	98	101	92	BLK1	24
96	86	88	100	112	83	104	101	101	97	89	92	BLK1	25
77	111	102	95	87	99	88	112	104	93	101	89	BLK1	26
86	106	90	103	100	91	93	96	97	109	98	91	BLK1	27
106	95	85	69	127	98	98	87	84	90	87	79	BLK1	28
85	95	76	84	97	86	91	86	79	86	85	99	BLK1	29
89	99	105	81	94	108	85	91	94	106	100	89	BLK1	30
81	77	86	87	95	105	97	85	95	89	105	113	BLK1	31
109	80	90	87	92	94	86	94	87	94	99	105	BLK1	32
104	75	90	88	82	93	73	97	99	87	84	86	BLK1	33
99	93	82	0									BLK1	34
0	113	855	2608	4842	7082	8798	10034	10588	11264	11519	11631	BLK2	1
11534	11650	11207	11331	10933	10704	10491	10270	10023	9576	9264	8984	BLK2	2
8803	8432	8389	8022	7747	7757	7427	7109	6848	6643	6403	6374	BLK2	3
6096	6016	5611	5400	5316	5103	4962	4844	4581	4540	4280	4181	BLK2	4
4011	3856	3728	3686	3615	3443	3259	3065	3115	2898	2842	2790	BLK2	5
2633	2602	2505	2409	2318	2258	2221	2123	2031	1979	1842	1772	BLK2	6
1762	1650	1620	1603	1551	1461	1376	1442	1315	1377	1242	1206	BLK2	7
1152	1147	1091	1077	1066	962	954	979	874	919	881	804	BLK2	8
792	765	743	760	709	683	659	649	627	622	624	552	BLK2	9
551	541	497	488	479	468	515	464	450	429	411	406	BLK2	10
392	413	354	370	378	350	350	309	343	288	284	308	BLK2	11
270	271	284	297	286	264	247	258	262	245	257	230	BLK2	12
240	205	226	212	211	184	204	194	197	219	196	181	BLK2	13
173	182	161	180	157	159	162	169	172	167	153	149	BLK2	14
158	161	161	156	154	156	152	170	145	135	151	116	BLK2	15
152	133	135	138	114	140	122	139	116	130	116	127	BLK2	16

125	130	118	110	125	137	119	125	122	121	113	114	BLK2	17
114	119	118	111	128	113	108	128	100	143	108	114	BLK2	18
126	99	103	120	105	112	107	105	105	121	129	104	BLK2	19
92	102	104	112	95	89	102	95	121	108	117	118	BLK2	20
101	119	89	104	107	88	115	102	112	111	108	99	BLK2	21
96	104	103	110	114	112	83	117	98	89	111	82	BLK2	22
109	107	97	77	89	103	109	104	110	96	92	117	BLK2	23
108	92	107	103	108	96	89	99	105	97	91	113	BLK2	24
100	109	109	102	120	112	104	114	88	105	94	97	BLK2	25
101	102	104	85	104	95	109	117	111	115	115	91	BLK2	26
95	104	109	104	107	85	111	112	103	101	97	88	BLK2	27
98	100	85	109	101	96	88	107	98	120	91	92	BLK2	28
93	101	95	94	104	96	98	89	93	110	104	93	BLK2	29
111	101	91	112	102	94	112	98	111	88	93	117	BLK2	30
100	97	89	86	106	92	94	89	81	97	99	88	BLK2	31
87	121	100	112	92	89	94	100	90	104	85	95	BLK2	32
113	106	99	96	96	91	99	109	105	90	88	103	BLK2	33
94	96	97	0									BLK2	34
0	1764	12525	23931	30947	34805	35963	36304	36018	35069	33631	33050	BLK3	1
31703	30601	29417	28549	27558	26388	25623	25127	23791	23398	22322	21311	BLK3	2
20697	20253	19392	18801	18168	17747	16736	16318	15845	15376	14789	14283	BLK3	3
13684	13482	12889	12484	11889	11664	11251	10960	10598	10149	9843	9570	BLK3	4
9181	8864	8447	8357	8026	7798	7621	7190	6899	6553	6428	6204	BLK3	5
5960	5844	5710	5454	5346	5116	4880	4797	4698	4480	4239	4178	BLK3	6
3919	3858	3734	3617	3406	3333	3211	3265	3039	2948	2834	2774	BLK3	7
2729	2587	2499	2386	2265	2252	2239	2167	2037	2019	1939	1836	BLK3	8
1817	1698	1675	1647	1586	1524	1494	1446	1444	1302	1346	1312	BLK3	9
1243	1192	1169	1110	1128	1048	1057	1061	1021	1012	954	915	BLK3	10
871	878	833	833	814	801	738	747	683	681	684	687	BLK3	11
637	687	655	639	607	657	601	613	606	552	531	500	BLK3	12
500	507	496	472	483	429	490	480	478	436	409	443	BLK3	13
406	413	424	416	413	396	416	383	389	367	338	361	BLK3	14
385	362	362	350	312	360	360	341	355	352	335	316	BLK3	15
357	353	293	327	308	277	331	291	297	285	306	344	BLK3	16
276	331	308	284	276	313	304	336	289	292	292	287	BLK3	17
278	260	265	275	292	292	286	265	294	263	296	269	BLK3	18
278	289	298	280	260	266	239	270	270	279	297	261	BLK3	19
252	263	226	273	249	293	246	268	273	277	243	257	BLK3	20
254	266	275	270	268	268	236	252	264	273	249	261	BLK3	21
246	233	262	263	270	274	211	264	260	242	242	233	BLK3	22
248	276	266	244	247	260	243	248	272	281	258	235	BLK3	23
268	264	234	259	282	264	220	241	242	271	268	244	BLK3	24
248	284	257	255	273	250	249	247	254	278	253	245	BLK3	25
222	250	251	214	245	235	282	242	265	243	267	278	BLK3	26
236	253	258	228	244	223	234	262	282	282	249	243	BLK3	27
243	256	244	217	265	245	234	275	246	222	251	265	BLK3	28
236	243	243	228	239	226	220	234	244	266	250	242	BLK3	29
231	249	249	233	264	238	223	245	240	233	239	246	BLK3	30
259	238	223	241	247	250	234	275	214	230	213	252	BLK3	31
261	227	242	270	225	250	237	268	237	247	227	265	BLK3	32
229	259	255	264	247	257	231	229	249	233	244	253	BLK3	33
239	228	255	883									BLK3	34

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0	202	2090	6459	11026	14740	17015	13460	19110	19606	19554	19310	BLK1	1
19081	18929	18289	17955	17239	16595	16228	15872	15378	14605	14057	13697	BLK1	2
13332	12674	12195	11662	11299	10890	10332	9856	9571	9260	8985	8612	BLK1	3
8260	8013	7540	7070	6825	6592	6501	6167	5836	5752	5420	5165	BLK1	4
4818	4814	4702	4283	4161	4152	3901	3566	3636	3477	3299	3133	BLK1	5
2972	2864	2739	2752	2540	2441	2360	2209	2233	2113	1977	1910	BLK1	6
1809	1905	1725	1642	1552	1567	1452	1458	1362	1311	1270	1234	BLK1	7
1140	1110	1036	1070	966	955	929	920	871	856	813	815	BLK1	8
773	767	706	690	641	658	652	589	566	586	548	592	BLK1	9
535	528	523	477	503	476	434	437	433	408	422	390	BLK1	10
372	376	389	356	338	321	340	353	343	355	309	348	BLK1	11
313	333	280	304	293	259	291	275	329	290	253	258	BLK1	12
271	247	264	259	265	252	230	250	244	249	249	204	BLK1	13
251	243	223	218	227	217	221	231	240	235	206	246	BLK1	14
184	239	242	231	211	212	224	235	224	209	202	234	BLK1	15
210	216	222	200	204	189	202	213	222	200	213	169	BLK1	16
204	207	184	218	200	184	208	195	178	215	170	201	BLK1	17
186	203	181	178	188	180	183	217	159	193	195	181	BLK1	18
175	177	201	190	212	176	197	184	176	183	182	193	BLK1	19
167	193	203	170	200	170	181	194	174	194	211	196	BLK1	20
172	162	156	197	177	194	165	179	192	208	190	201	BLK1	21
176	181	171	188	170	174	181	178	186	192	171	193	BLK1	22
182	176	172	182	178	186	179	163	181	185	152	197	BLK1	23
191	158	191	171	162	177	190	176	195	173	153	168	BLK1	24
179	211	198	163	170	171	175	192	171	162	178	165	BLK1	25
176	177	184	184	176	183	175	183	165	155	175	148	BLK1	26
164	170	164	185	175	168	166	164	177	168	177	161	BLK1	27
158	162	182	157	190	200	176	171	163	152	161	184	BLK1	28
177	189	156	166	173	202	163	151	177	170	156	171	BLK1	29
150	168	163	158	172	170	151	156	142	165	163	173	BLK1	30
160	179	176	178	172	168	189	154	170	179	150	151	BLK1	31
168	171	173	168	181	170	165	163	158	198	181	143	BLK1	32
171	167	169	177	143	173	176	164	191	138	166	159	BLK1	33
168	188	154	0									BLK1	34
0	272	3357	9697	15352	18929	21259	21854	22470	22133	22201	21734	BLK2	1
21382	20571	20373	19742	19369	18435	17998	17218	16716	16101	15460	15087	BLK2	2
14199	13655	13217	12707	12170	11785	11367	10854	10670	10079	9540	9241	BLK2	3
8916	8526	8252	7788	7490	7222	6857	6581	6354	6113	5906	5691	BLK2	4
5375	5128	4811	4669	4529	4227	4235	3978	3875	3718	3552	3393	BLK2	5
3194	3186	2993	3008	2764	2653	2541	2423	2350	2284	2186	2124	BLK2	6
2012	1916	1853	1721	1708	1672	1645	1504	1500	1455	1370	1268	BLK2	7
1229	1211	1175	1117	1072	1090	1058	963	962	930	918	847	BLK2	8
792	867	731	780	751	667	643	693	649	618	623	577	BLK2	9
556	554	565	538	488	477	512	443	446	445	457	392	BLK2	10
408	418	441	426	406	425	370	384	375	367	374	321	BLK2	11
308	345	320	293	297	311	290	297	292	315	294	284	BLK2	12
300	301	305	271	273	254	288	305	279	251	238	268	BLK2	13
267	257	265	244	235	247	224	238	268	242	237	243	BLK2	14
247	244	257	232	245	239	227	242	224	230	239	227	BLK2	15
225	231	225	233	213	227	230	203	228	219	217	211	BLK2	16

197	233	205	218	218	216	214	246	232	220	220	184	BLK2	17
190	214	215	187	197	198	225	212	199	224	234	230	BLK2	18
236	205	207	207	225	216	208	195	205	185	232	220	BLK2	19
210	190	191	213	199	199	194	213	175	234	221	219	BLK2	20
194	202	225	187	198	201	221	206	219	176	204	202	BLK2	21
194	202	224	185	193	196	190	204	190	194	199	198	BLK2	22
195	194	192	187	199	211	200	171	198	170	197	184	BLK2	23
217	196	198	174	182	181	188	190	200	184	212	208	BLK2	24
187	196	194	191	183	181	190	179	193	172	219	197	BLK2	25
188	189	176	190	175	220	190	196	182	190	194	190	BLK2	26
169	201	193	191	202	184	200	220	170	176	168	171	BLK2	27
168	192	176	176	196	198	190	172	185	195	192	179	BLK2	28
199	178	194	204	202	210	190	181	206	200	192	186	BLK2	29
183	175	156	188	185	170	219	169	199	184	195	192	BLK2	30
182	174	167	184	200	190	197	171	197	187	204	198	BLK2	31
175	179	182	166	185	199	198	205	189	192	174	170	BLK2	32
190	190	172	165	201	182	189	171	157	214	216	161	BLK2	33
185	167	199	0									BLK2	34
0	4867	32985	54761	63343	64942	64344	62810	61045	58888	56768	54596	BLK3	1
53221	50982	48977	47263	45594	43763	42120	40895	39105	37623	36486	35131	BLK3	2
33395	32478	31434	29889	28740	27554	26488	25305	24428	23533	22658	22016	BLK3	3
20935	19947	19266	18373	17738	17017	16303	15758	14940	14436	13831	13478	BLK3	4
12969	12192	11730	11416	10928	10259	9992	9653	9167	8767	8659	8173	BLK3	5
7753	7414	7060	7116	6484	6521	6123	5808	5705	5517	5248	4841	BLK3	6
4906	4562	4536	4256	4202	3933	3821	3645	3574	3318	3324	3264	BLK3	7
3105	2996	2941	2750	2760	2602	2457	2456	2340	2182	2123	2151	BLK3	8
2034	1929	1927	1866	1773	1733	1700	1711	1567	1543	1525	1481	BLK3	9
1549	1406	1390	1357	1311	1258	1185	1216	1232	1111	1094	1062	BLK3	10
1097	1041	1018	1032	956	904	994	918	951	952	885	910	BLK3	11
844	779	786	807	813	789	765	793	770	747	722	698	BLK3	12
731	692	779	703	696	695	661	718	701	664	704	667	BLK3	13
645	608	607	648	617	603	662	582	602	635	627	603	BLK3	14
638	614	572	593	604	582	559	579	597	606	584	557	BLK3	15
596	547	583	556	556	555	556	511	581	530	537	577	BLK3	16
548	542	559	543	574	541	561	563	543	546	519	549	BLK3	17
550	569	534	530	543	537	534	529	525	585	534	483	BLK3	18
558	513	558	504	553	546	505	499	505	480	515	565	BLK3	19
493	530	527	504	490	533	578	496	499	558	537	482	BLK3	20
503	517	494	548	522	489	528	508	492	482	547	474	BLK3	21
531	515	522	567	511	520	511	499	510	525	511	493	BLK3	22
507	508	540	494	507	492	467	500	532	492	521	484	BLK3	23
513	509	484	492	510	507	530	499	436	497	522	476	BLK3	24
541	491	491	484	475	506	484	494	507	530	476	514	BLK3	25
533	521	472	467	523	517	486	500	489	470	505	490	BLK3	26
512	485	486	488	494	502	486	504	481	521	460	498	BLK3	27
502	483	512	481	500	493	510	491	456	467	449	499	BLK3	28
470	481	485	489	473	495	486	455	474	513	488	506	BLK3	29
465	483	511	461	497	457	517	503	489	440	450	474	BLK3	30
468	447	470	443	469	467	476	441	464	465	487	447	BLK3	31
493	472	459	469	447	457	497	472	448	466	457	439	BLK3	32
500	455	445	464	461	442	457	469	445	452	468	500	BLK3	33
470	453	475	767									BLK3	34

FSV PULSED-NEUTRON DATA RUN 17 CONFIGURATION 10

0	120	1153	3410	5703	7570	8905	9612	10056	10587	10650	10513	BLK1	1
10522	10491	10262	10202	10050	9877	9589	9403	9175	8895	8777	8523	BLK1	2
8293	8142	7856	7592	7382	7069	6930	6735	6599	6380	6247	5854	BLK1	3
5813	5596	5296	5329	5039	4877	4784	4647	4472	4168	3968	4132	BLK1	4
3855	3901	3706	3519	3433	3372	3124	2999	2944	2909	2906	2725	BLK1	5
2631	2594	2409	2312	2332	2277	2160	2026	2055	2020	1902	1791	BLK1	6
1815	1669	1708	1582	1572	1503	1483	1446	1407	1361	1334	1248	BLK1	7
1178	1240	1149	1095	1052	1066	1033	1026	946	954	895	874	BLK1	8
862	834	833	815	825	750	704	675	647	663	679	601	BLK1	9
624	616	615	565	564	501	532	529	482	470	472	474	BLK1	10
497	414	442	397	438	379	417	394	403	382	354	339	BLK1	11
352	323	304	348	328	347	339	334	313	312	295	299	BLK1	12
279	281	297	281	284	275	250	246	243	274	308	255	BLK1	13
241	255	245	216	228	212	238	225	223	233	251	194	BLK1	14
205	219	241	240	223	184	216	226	199	180	198	185	BLK1	15
181	196	185	185	191	190	188	211	219	215	206	184	BLK1	16
182	181	203	213	174	197	189	175	177	188	191	181	BLK1	17
179	174	186	189	177	185	170	182	169	175	179	168	BLK1	18
183	164	188	162	168	172	177	159	158	175	166	185	BLK1	19
182	166	168	180	168	183	176	159	161	157	161	180	BLK1	20
176	154	147	153	199	178	140	139	166	155	152	181	BLK1	21
133	168	181	172	163	175	164	147	152	150	142	166	BLK1	22
167	141	146	174	171	149	154	173	156	144	184	183	BLK1	23
164	153	154	169	126	153	162	142	143	181	146	152	BLK1	24
144	146	139	141	155	137	167	160	154	143	132	160	BLK1	25
152	158	148	165	162	154	139	162	153	159	146	160	BLK1	26
130	154	141	160	160	156	152	152	167	160	160	141	BLK1	27
169	148	167	134	151	157	161	153	157	153	152	135	BLK1	28
150	150	142	165	146	157	154	156	144	142	124	145	BLK1	29
146	183	153	157	135	150	155	148	146	150	147	136	BLK1	30
157	170	148	185	144	120	176	171	160	147	151	146	BLK1	31
166	141	148	174	138	174	160	150	147	173	134	142	BLK1	32
131	151	178	123	143	176	138	144	150	163	129	142	BLK1	33
150	134	136	0									BLK1	34
0	372	3307	9713	16566	21500	24588	26457	27997	28530	29025	29028	BLK2	1
29207	28870	28426	28377	27878	27227	26828	26306	25901	25512	24746	24326	BLK2	2
23626	23191	22681	22173	21490	20844	20198	19765	18997	18715	18167	17546	BLK2	3
17157	16579	16102	15738	15258	14919	14209	13937	13563	12817	12558	12216	BLK2	4
11908	11582	11216	10874	10426	10017	9779	9669	9296	9202	8959	8658	BLK2	5
8238	7886	7563	7473	7212	7043	6823	6514	6256	6252	5852	5783	BLK2	6
5610	5217	5318	5071	5006	4894	4681	4582	4401	4274	4207	4000	BLK2	7
3848	3732	3643	3608	3439	3399	3408	3201	3092	3041	2911	2825	BLK2	8
2745	2674	2621	2537	2457	2351	2249	2272	2206	2099	2103	1986	BLK2	9
1990	1987	1863	1844	1796	1761	1649	1646	1640	1633	1552	1517	BLK2	10
1464	1417	1378	1342	1382	1310	1297	1218	1245	1243	1220	1202	BLK2	11
1162	1063	1162	1081	1049	1023	1038	1036	1002	963	932	980	BLK2	12
930	949	890	890	872	875	880	793	863	828	810	795	BLK2	13
806	764	793	776	701	755	704	725	739	735	709	722	BLK2	14
642	684	708	676	667	687	686	657	637	637	676	588	BLK2	15
699	609	589	638	647	640	623	603	592	625	577	606	BLK2	16

569	614	610	541	618	619	579	621	554	601	586	514	BLK2	17
549	560	552	572	611	540	597	577	535	586	573	565	BLK2	18
557	545	582	603	535	552	569	550	532	522	556	553	BLK2	19
535	502	553	555	546	514	493	535	557	527	530	518	BLK2	20
550	520	532	564	544	549	500	539	501	545	540	571	BLK2	21
498	511	526	521	489	510	535	483	538	522	527	511	BLK2	22
488	519	532	534	545	511	491	522	560	487	522	494	BLK2	23
496	529	525	542	524	513	457	514	468	517	487	511	BLK2	24
511	474	486	489	527	518	482	509	489	522	511	499	BLK2	25
490	508	478	478	503	502	466	502	498	559	475	471	BLK2	26
500	483	505	495	500	496	504	497	476	487	486	505	BLK2	27
533	482	477	500	493	452	482	497	457	487	481	478	BLK2	28
482	492	492	488	500	417	498	540	498	495	486	474	BLK2	29
498	538	498	503	483	510	436	520	481	487	468	503	BLK2	30
473	499	460	473	481	493	488	464	466	496	480	476	BLK2	31
489	482	495	459	474	487	494	475	483	456	482	464	BLK2	32
485	484	458	488	458	478	519	483	476	469	494	517	BLK2	33
474	455	424	0									BLK2	34
0	2729	16496	26617	29710	29591	29058	28122	26964	26180	24916	24075	BLK3	1
23223	22624	21565	20943	20157	19559	18950	18559	17782	16969	16770	16170	BLK3	2
15562	15070	14714	14319	13984	13445	12950	12561	12417	11779	11513	11067	BLK3	3
10800	10567	10092	9727	9519	8960	8642	8397	8432	8022	7810	7539	BLK3	4
7312	6991	6831	6543	6304	6133	5950	5830	5608	5353	5090	5157	BLK3	5
4955	4738	4505	4403	4416	4140	4051	3973	3786	3782	3440	3509	BLK3	6
3354	3327	3127	3179	2881	2867	2827	2689	2540	2458	2432	2397	BLK3	7
2310	2209	2217	2137	2077	1930	1912	1845	1892	1774	1720	1681	BLK3	8
1702	1499	1501	1476	1396	1390	1339	1389	1355	1250	1223	1198	BLK3	9
1140	1151	1115	1007	1015	1004	972	988	943	913	925	822	BLK3	10
902	896	818	781	789	798	789	746	704	724	690	660	BLK3	11
680	660	670	662	611	626	587	629	589	570	554	545	BLK3	12
568	586	561	514	572	521	516	499	479	467	488	458	BLK3	13
490	468	473	505	502	447	442	448	472	449	454	421	BLK3	14
473	424	466	382	401	411	405	407	409	408	402	411	BLK3	15
386	411	424	372	400	385	382	396	374	372	370	368	BLK3	16
402	331	364	349	364	348	366	347	351	384	352	331	BLK3	17
377	382	326	375	343	362	345	344	334	369	382	367	BLK3	18
368	371	366	364	311	337	351	341	331	351	294	336	BLK3	19
331	322	356	337	313	324	315	305	333	363	326	347	BLK3	20
319	311	331	349	320	361	320	370	317	317	319	318	BLK3	21
287	324	315	316	339	297	330	323	337	309	346	285	BLK3	22
303	330	339	330	327	308	331	317	367	333	312	292	BLK3	23
285	338	332	341	301	330	315	313	290	320	306	314	BLK3	24
314	282	297	350	304	299	339	306	311	325	318	292	BLK3	25
318	297	297	274	302	305	289	315	308	304	313	302	BLK3	26
316	301	309	315	281	295	336	309	324	287	342	322	BLK3	27
313	297	295	321	287	316	296	285	303	326	305	322	BLK3	28
311	279	266	309	279	343	301	281	314	286	321	288	BLK3	29
307	280	335	259	286	294	287	301	299	311	303	305	BLK3	30
306	322	289	312	328	288	317	310	284	319	307	320	BLK3	31
289	275	269	292	286	277	315	284	279	301	311	345	BLK3	32
313	246	305	305	288	329	290	292	283	316	267	274	BLK3	33
290	279	288	430									BLK3	34

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0	378	1203	3444	5769	7854	9372	10696	11350	11953	12146	12596	BLK1	1
12569	12784	12629	12693	12702	12522	12508	12413	12323	12020	11716	11759	BLK1	2
11534	11275	11061	11088	10923	10586	10523	10247	10151	9902	9702	9506	BLK1	3
9448	9252	8860	8796	8770	8576	8259	8111	7879	7891	7580	7390	BLK1	4
7351	7063	7080	6913	6714	6681	6513	6462	6305	6034	5950	5877	BLK1	5
5830	5501	5549	5486	5306	5213	5116	4976	4852	4791	4626	4732	BLK1	6
4468	4462	4391	4225	4050	3955	4035	4005	3825	3795	3778	3652	BLK1	7
3442	3569	3276	3465	3349	3216	3191	3099	3104	2921	2913	2840	BLK1	8
2924	2726	2665	2627	2659	2576	2575	2435	2413	2363	2329	2310	BLK1	9
2231	2171	2156	2117	2047	2081	2037	2017	1931	2023	1963	1952	BLK1	10
1823	1744	1847	1745	1731	1714	1569	1665	1634	1652	1601	1494	BLK1	11
1525	1506	1439	1421	1452	1432	1384	1390	1339	1281	1334	1330	BLK1	12
1325	1267	1217	1219	1180	1250	1205	1114	1147	1174	1167	1182	BLK1	13
1113	1130	1088	1034	1035	1031	1058	990	981	982	978	998	BLK1	14
955	1010	1031	961	927	941	884	958	917	868	962	901	BLK1	15
876	867	835	823	816	804	820	828	871	814	788	829	BLK1	16
796	800	834	781	786	753	755	765	774	794	749	708	BLK1	17
735	692	688	703	714	706	682	658	690	665	677	719	BLK1	18
706	729	703	670	649	719	675	673	650	652	614	629	BLK1	19
653	653	674	655	630	676	661	643	644	621	647	614	BLK1	20
629	632	673	627	609	666	627	653	629	646	627	588	BLK1	21
617	619	600	608	620	615	632	609	608	634	622	577	BLK1	22
591	630	597	555	631	630	593	615	575	611	603	636	BLK1	23
577	590	536	559	585	621	582	587	551	557	600	624	BLK1	24
593	569	586	563	568	611	577	569	582	585	561	587	BLK1	25
576	553	549	570	565	543	558	563	586	605	557	605	BLK1	26
588	568	540	563	571	514	554	541	564	598	593	560	BLK1	27
524	617	546	584	537	564	568	566	539	554	536	536	BLK1	28
556	545	573	561	539	534	565	562	547	551	565	513	BLK1	29
566	530	546	545	552	502	547	550	545	535	516	533	BLK1	30
533	510	549	520	577	548	515	595	506	514	520	550	BLK1	31
534	520	551	564	564	593	526	522	515	535	532	539	BLK1	32
529	547	567	577	536	523	566	553	548	521	537	524	BLK1	33
541	513	506	0									BLK1	34
0	1201	3743	9834	16276	21761	25313	28017	29914	31166	32151	32767	BLK2	1
33180	33380	33445	33423	33499	33157	33152	33016	32976	31930	31945	31735	BLK2	2
31109	30434	30536	29858	29529	29227	28846	28333	27674	27470	27056	26606	BLK2	3
26459	25730	25274	24780	24434	24020	23473	22972	22970	22326	21668	21691	BLK2	4
21110	20916	20363	20003	19710	19396	18777	18719	18080	17799	17547	17294	BLK2	5
16724	16718	16259	16106	15727	15406	15222	14782	14443	14319	13994	13652	BLK2	6
13357	13233	12751	12680	12683	12337	12003	11961	11603	11196	11089	11149	BLK2	7
10850	10659	10401	10027	9998	9654	9488	9354	9216	9077	8903	8804	BLK2	8
8700	8460	8519	8134	8042	8024	7781	7688	7392	7365	7247	7054	BLK2	9
7111	6897	6865	6640	6502	6425	6359	6355	6129	6028	6076	5799	BLK2	10
5872	5567	5571	5542	5403	5340	5180	5200	5093	5083	4891	4840	BLK2	11
4730	4786	4698	4627	4570	4465	4376	4243	4336	4238	4158	4044	BLK2	12
4017	4008	3898	3881	3865	3956	3701	3743	3764	3557	3587	3607	BLK2	13
3501	3422	3382	3472	3381	3240	3371	3292	3252	3240	3175	3190	BLK2	14
3167	3010	3043	3055	2991	2931	2915	2919	2826	2882	2803	2777	BLK2	15
2807	2746	2701	2592	2677	2656	2644	2632	2673	2517	2626	2543	BLK2	16

2520	2488	2534	2483	2483	2441	2517	2428	2421	2434	2384	2396	BLK2	17
2435	2361	2379	2375	2367	2316	2339	2287	2277	2239	2301	2250	BLK2	18
2299	2170	2249	2139	2188	2185	2195	2146	2175	2157	2223	2106	BLK2	19
2143	2118	2117	2098	2080	1935	2058	2033	2093	1964	2029	2017	BLK2	20
1943	2066	2008	2070	2068	1965	2078	1994	2066	1977	1996	1959	BLK2	21
1983	1935	1976	1982	1979	1879	1951	1905	1978	1907	1956	1918	BLK2	22
1819	2004	1919	1901	1984	1908	1914	1917	1931	1940	1911	1904	BLK2	23
1952	1878	1877	1950	1852	1896	1896	1907	1853	1881	1975	1921	BLK2	24
1855	1887	1874	1876	1881	1838	1880	1850	1818	1805	1758	1898	BLK2	25
1796	1832	1850	1923	1805	1842	1786	1799	1821	1895	1797	1849	BLK2	26
1807	1883	1859	1803	1810	1879	1787	1805	1740	1738	1816	1862	BLK2	27
1768	1731	1787	1738	1846	1770	1812	1772	1748	1751	1748	1750	BLK2	28
1722	1833	1758	1737	1777	1782	1729	1820	1822	1778	1714	1729	BLK2	29
1740	1743	1774	1794	1733	1792	1739	1814	1703	1773	1715	1768	BLK2	30
1780	1775	1733	1699	1717	1670	1715	1722	1783	1653	1704	1744	BLK2	31
1795	1718	1706	1832	1709	1761	1732	1682	1690	1690	1782	1736	BLK2	32
1773	1727	1698	1770	1654	1742	1633	1751	1750	1762	1629	1728	BLK2	33
1832	1690	1629	0									BLK2	34

0	2717	15427	25844	30193	30862	31226	30979	30219	29816	29241	28567	BLK3	1
28028	27420	27047	26635	26171	25886	25159	24724	24317	23967	23609	22657	BLK3	2
22811	22213	21785	21463	21164	20708	20200	19965	19288	19124	18653	18398	BLK3	3
17961	17641	17504	16994	16802	16112	15953	15570	15313	15096	14963	14461	BLK3	4
14138	13969	13643	13548	12950	12758	12387	12481	12032	11954	11410	11500	BLK3	5
10895	11041	10687	10401	10214	10027	10037	9717	9596	9352	9296	9040	BLK3	6
8661	8674	8531	8245	8126	7923	7779	7645	7442	7374	7255	7016	BLK3	7
6795	6793	6748	6657	6364	6278	6152	6166	5774	5883	5798	5643	BLK3	8
5541	5446	5387	5115	5182	4999	4974	4777	4834	4729	4627	4650	BLK3	9
4415	4431	4244	4237	4274	4110	4035	3974	3894	3829	3828	3731	BLK3	10
3725	3530	3599	3425	3404	3353	3238	3344	3315	3213	3186	3042	BLK3	11
3057	3022	3014	2942	2888	2752	2734	2720	2695	2750	2715	2599	BLK3	12
2594	2568	2559	2488	2468	2446	2422	2415	2366	2311	2304	2241	BLK3	13
2221	2199	2212	2140	2138	2021	2113	2063	2022	2017	2061	1989	BLK3	14
1946	1878	1976	1875	1905	1975	1923	1791	1787	1764	1827	1783	BLK3	15
1723	1823	1786	1754	1833	1671	1740	1671	1739	1671	1661	1677	BLK3	16
1651	1578	1690	1546	1658	1598	1572	1568	1561	1597	1490	1509	BLK3	17
1537	1511	1527	1482	1480	1492	1474	1492	1477	1439	1406	1497	BLK3	18
1451	1455	1439	1421	1389	1375	1352	1353	1334	1357	1358	1298	BLK3	19
1365	1362	1366	1343	1336	1265	1369	1330	1375	1360	1350	1276	BLK3	20
1264	1357	1328	1307	1301	1243	1390	1271	1285	1235	1202	1320	BLK3	21
1261	1250	1304	1309	1290	1277	1282	1251	1229	1266	1207	1248	BLK3	22
1251	1156	1252	1273	1252	1181	1281	1228	1152	1198	1262	1213	BLK3	23
1223	1215	1221	1224	1189	1241	1230	1200	1193	1169	1259	1146	BLK3	24
1259	1145	1159	1173	1205	1141	1178	1189	1204	1178	1161	1156	BLK3	25
1199	1164	1112	1199	1151	1207	1204	1125	1183	1179	1172	1240	BLK3	26
1168	1186	1146	1228	1154	1102	1193	1188	1208	1165	1105	1187	BLK3	27
1188	1173	1197	1207	1145	1165	1089	1145	1149	1183	1154	1215	BLK3	28
1184	1137	1152	1098	1181	1118	1111	1173	1123	1175	1198	1135	BLK3	29
1155	1154	1180	1102	1070	1186	1146	1121	1133	1107	1133	1103	BLK3	30
1139	1158	1220	1104	1159	1090	1106	1073	1103	1154	1167	1163	BLK3	31
1117	1101	1154	1110	1090	1058	1167	1131	1144	1117	1041	1127	BLK3	32
1126	1143	1133	1109	1125	1138	1084	1148	1118	1110	1091	1105	BLK3	33
1077	1142	1126	410									BLK3	34

FSV PULSED-NEUTRON DATA RUN 19 CONFIGURATION 119

0	893	1866	4288	7156	9457	11349	12675	13734	14407	14502	14862	BLK1	1
15287	15407	15371	15337	15490	15487	15145	15232	15339	14839	14834	14797	BLK1	2
14556	14117	14483	14053	14057	13760	13377	13332	13042	12724	12814	12671	BLK1	3
12237	12104	11896	11735	11538	11303	11033	10762	10804	10631	10471	10263	BLK1	4
10008	9896	9735	9544	9354	9172	8928	9021	8782	8651	8455	8095	BLK1	5
8527	8053	7847	7884	7563	7611	7371	7173	7110	6919	7019	6916	BLK1	6
6743	6470	6592	6488	6444	6204	6122	6100	5873	5764	5766	5635	BLK1	7
5443	5437	5362	5093	5050	5072	5199	4905	4832	4910	4812	4744	BLK1	8
4564	4567	4453	4409	4374	4228	4209	4050	4044	3953	4100	3871	BLK1	9
4022	3774	3732	3600	3744	3639	3524	3477	3493	3421	3435	3257	BLK1	10
3328	3306	3226	3087	3136	3049	3010	3032	2957	2876	2945	2963	BLK1	11
2937	2832	2789	2680	2698	2640	2651	2565	2578	2660	2462	2534	BLK1	12
2531	2463	2529	2480	2382	2334	2351	2349	2251	2183	2213	2252	BLK1	13
2210	2133	2157	2163	2161	2169	2112	2098	2079	2107	2051	2143	BLK1	14
2019	2036	1916	1891	1883	1907	1997	1862	1856	1828	1815	1776	BLK1	15
1797	1759	1845	1774	1834	1788	1765	1713	1702	1766	1781	1717	BLK1	16
1700	1711	1822	1689	1721	1720	1600	1686	1684	1632	1641	1576	BLK1	17
1572	1564	1574	1560	1608	1602	1544	1530	1505	1520	1444	1536	BLK1	18
1601	1552	1569	1467	1463	1475	1480	1527	1436	1413	1475	1498	BLK1	19
1443	1482	1484	1483	1405	1411	1388	1404	1412	1409	1478	1458	BLK1	20
1434	1405	1459	1328	1401	1335	1369	1440	1324	1369	1345	1348	BLK1	21
1393	1363	1401	1330	1328	1344	1409	1379	1315	1365	1361	1356	BLK1	22
1296	1387	1327	1299	1213	1330	1287	1404	1277	1265	1309	1300	BLK1	23
1291	1321	1328	1304	1332	1282	1278	1326	1285	1264	1292	1378	BLK1	24
1315	1344	1350	1290	1289	1294	1207	1232	1242	1294	1270	1349	BLK1	25
1274	1219	1218	1251	1293	1356	1246	1289	1273	1231	1245	1295	BLK1	26
1227	1346	1333	1239	1257	1274	1250	1189	1289	1231	1208	1242	BLK1	27
1197	1195	1235	1326	1275	1301	1196	1218	1260	1159	1216	1218	BLK1	28
1262	1236	1232	1211	1220	1202	1211	1237	1192	1245	1303	1222	BLK1	29
1206	1262	1250	1229	1227	1192	1243	1202	1253	1226	1188	1228	BLK1	30
1242	1209	1272	1258	1289	1222	1185	1192	1214	1223	1226	1263	BLK1	31
1224	1180	1258	1210	1237	1203	1233	1191	1225	1183	1168	1223	BLK1	32
1171	1172	1172	1173	1235	1174	1156	1283	1192	1215	1150	1199	BLK1	33
1231	1196	1230	0									BLK1	34
0	2939	5610	12155	19556	25767	29827	32897	34824	36388	37556	38101	BLK2	1
38982	39234	39077	39634	39357	39377	39118	38854	38730	38646	38166	37941	BLK2	2
37313	37379	36640	36526	35990	35861	35208	34986	34414	33925	33550	33389	BLK2	3
32956	32563	31935	31563	31036	30452	30117	29592	29403	28930	28316	28119	BLK2	4
27649	27493	26794	26531	26208	25746	25610	24815	24831	24213	24165	23570	BLK2	5
23313	23029	22434	22353	21994	21515	21180	20923	20570	20090	19878	19568	BLK2	6
19393	19062	18913	18583	18336	17898	17654	17427	17159	17044	16451	16592	BLK2	7
16467	16167	15799	15623	15363	15189	15191	14364	14413	14256	14109	13896	BLK2	8
13643	13428	13289	13272	12833	13085	12524	12469	12172	12140	11950	11669	BLK2	9
11684	11700	11268	11092	11064	11053	10850	10778	10781	10406	10429	10139	BLK2	10
9979	9859	9761	9770	9502	9489	9216	9127	9180	9145	8924	8722	BLK2	11
8599	8632	8632	8458	8494	8336	8268	8212	8035	7902	7856	7733	BLK2	12
7676	7614	7615	7430	7375	7318	7264	7285	7071	7019	6956	7011	BLK2	13
6904	6729	6641	6695	6737	6600	6564	6471	6707	6342	6434	6248	BLK2	14
6246	6235	6195	6156	6043	5956	5879	5966	5967	5795	5665	5705	BLK2	15
5802	5654	5581	5629	5607	5508	5469	5607	5597	5371	5447	5387	BLK2	16

5383	5265	5258	5231	5223	5172	5045	5077	5114	5112	5107	5118	BLK2	17
4999	4981	5044	4903	4910	4945	4951	4992	4757	4769	4746	4821	BLK2	18
4875	4723	4838	4785	4745	4791	4666	4569	4676	4647	4617	4490	BLK2	19
4636	4462	4451	4609	4329	4504	4500	4334	4530	4445	4432	4486	BLK2	20
4342	4353	4325	4447	4274	4325	4350	4422	4296	4367	4268	4301	BLK2	21
4374	4449	4308	4235	4300	4114	4232	4277	4170	4218	4189	4188	BLK2	22
4224	4170	4184	4266	4145	4176	4266	4110	4239	4093	4099	4274	BLK2	23
4022	4191	4101	4162	4210	4065	4069	4124	4171	4117	4046	4091	BLK2	24
4107	4133	4118	4076	4053	4035	4014	3974	3950	3946	4072	3933	BLK2	25
4025	4030	3929	4052	3908	4107	4055	3904	3998	3969	3924	3890	BLK2	26
3910	3897	4003	3984	4035	3977	3974	4058	3991	3930	4066	4063	BLK2	27
3958	4014	3993	3851	3923	3979	3875	4009	3985	3865	3882	3831	BLK2	28
4006	3993	3872	3950	3928	3863	3901	3895	3726	3823	3937	3916	BLK2	29
3938	3909	3980	3832	3905	3803	3844	3888	3849	3849	3877	3833	BLK2	30
3791	3876	3849	3826	3781	3824	3913	3860	3834	3840	3738	3755	BLK2	31
3828	3852	3717	3685	3745	3857	3773	3799	3842	3793	3691	3787	BLK2	32
3805	3748	3786	3901	3748	3736	3832	3808	3853	3905	3905	3717	BLK2	33
3773	3872	3841	0									BLK2	34
0	3894	17934	29361	34210	35795	35950	35889	35471	35241	34663	34032	BLK3	1
33498	33235	32592	32131	31531	30979	30740	30455	29903	29711	29199	28408	BLK3	2
28072	27720	27162	26924	26493	26103	25968	25145	24821	24783	24220	23828	BLK3	3
23623	23163	22559	22186	21952	21356	21059	20713	20444	20132	20050	19678	BLK3	4
19329	18952	18702	18293	18017	17712	17455	17297	16821	16632	16494	16146	BLK3	5
15704	15815	15287	15174	14913	14450	14334	14213	14062	14024	13648	13233	BLK3	6
13265	12641	12648	12607	12229	12140	11932	11814	11898	11506	11273	11104	BLK3	7
10982	10810	10502	10496	10292	10123	9989	9825	9645	9650	9493	9281	BLK3	8
9084	8929	8834	8786	8585	8472	8312	8296	8155	8042	8157	7785	BLK3	9
7758	7786	7488	7465	7272	7397	6996	7040	7145	6863	6793	6682	BLK3	10
6587	6743	6437	6498	6094	6222	6242	6025	6003	5891	5922	5842	BLK3	11
5834	5673	5566	5545	5452	5367	5359	5356	5167	5322	5230	5073	BLK3	12
5062	5017	5004	4851	4861	4754	4713	4706	4747	4712	4529	4438	BLK3	13
4498	4590	4488	4422	4474	4199	4333	4322	4341	4285	4211	4119	BLK3	14
4095	4036	4022	3960	3941	3953	3918	3823	3760	3892	3761	3796	BLK3	15
3714	3728	3703	3704	3770	3640	3530	3532	3591	3511	3609	3548	BLK3	16
3520	3437	3330	3509	3411	3426	3364	3455	3427	3398	3338	3338	BLK3	17
3322	3237	3324	3422	3248	3189	3197	3145	3190	3164	3084	3076	BLK3	18
3091	3172	3174	3139	3042	3107	2913	2965	3133	2996	3033	3038	BLK3	19
2948	2888	3015	3079	3012	2952	2907	2978	2833	2875	2868	2852	BLK3	20
2889	2827	2877	2807	2908	2845	2852	2859	2885	2802	2797	2786	BLK3	21
2820	2760	2915	2705	2822	2747	2673	2846	2842	2734	2754	2732	BLK3	22
2791	2656	2712	2743	2731	2693	2771	2699	2720	2731	2648	2741	BLK3	23
2748	2681	2802	2740	2771	2681	2675	2759	2638	2746	2589	2704	BLK3	24
2638	2676	2550	2627	2629	2645	2666	2563	2581	2693	2619	2606	BLK3	25
2702	2601	2660	2613	2670	2559	2596	2564	2585	2567	2562	2543	BLK3	26
2602	2673	2510	2618	2557	2489	2629	2588	2595	2587	2573	2572	BLK3	27
2559	2517	2532	2534	2524	2610	2622	2582	2557	2497	2460	2502	BLK3	28
2564	2510	2512	2654	2585	2502	2536	2586	2547	2500	2564	2511	BLK3	29
2585	2429	2575	2466	2468	2465	2490	2479	2452	2551	2504	2534	BLK3	30
2532	2550	2495	2563	2499	2484	2542	2601	2590	2516	2587	2493	BLK3	31
2434	2488	2490	2522	2549	2519	2549	2490	2437	2444	2468	2470	BLK3	32
2534	2536	2511	2506	2453	2478	2580	2561	2462	2522	2470	2439	BLK3	33
2533	2464	2501	406									BLK3	34

FSV PULSED-NEUTRON DATA RUN 20 CONFIGURATION 12

0	189	2880	8939	14733	18580	20550	21062	21167	20593	19796	19154	9LK1	1
18238	17406	16722	15968	15098	14331	13552	12898	12259	11727	11021	10484	8LK1	2
10040	9523	9050	8466	8144	7803	7306	7081	6720	6371	5936	5678	8LK1	3
5324	5113	5052	4746	4430	4230	3952	3906	3504	3453	3204	3090	8LK1	4
2897	2777	2565	2586	2408	2233	2063	2109	1909	1877	1796	1687	8LK1	5
1658	1561	1474	1388	1401	1292	1178	1114	1124	1060	1053	932	8LK1	6
888	880	834	752	708	739	682	626	654	615	607	592	8LK1	7
587	499	519	478	446	408	420	421	375	398	345	331	8LK1	8
315	284	317	311	268	291	300	284	276	239	240	256	8LK1	9
228	248	187	220	220	187	196	192	184	172	160	174	8LK1	10
190	165	185	149	154	176	178	168	170	166	155	139	8LK1	11
142	137	139	139	160	127	130	126	139	118	150	127	8LK1	12
131	128	142	114	129	120	141	134	129	103	117	117	9LK1	13
118	123	108	117	118	108	107	104	109	111	120	106	8LK1	14
110	125	110	113	98	117	95	127	126	106	127	116	8LK1	15
97	99	87	111	114	115	113	101	111	98	91	100	8LK1	16
91	83	109	95	111	107	99	112	104	113	109	110	8LK1	17
83	111	98	105	110	105	112	112	104	102	94	103	8LK1	18
115	93	103	102	89	113	100	87	74	109	91	106	8LK1	19
93	99	88	98	112	112	91	115	98	106	97	98	8LK1	20
117	87	91	102	117	75	90	110	106	86	121	91	9LK1	21
97	105	90	94	109	121	113	100	110	91	103	94	8LK1	22
110	89	106	106	106	90	111	89	86	102	107	93	8LK1	23
88	116	88	98	94	94	88	89	98	87	70	91	8LK1	24
97	91	89	101	95	104	82	81	95	101	89	103	8LK1	25
112	96	96	94	101	87	84	99	69	111	82	78	8LK1	26
81	83	96	112	85	94	94	81	92	91	104	100	8LK1	27
110	105	100	94	122	82	113	98	92	96	100	108	8LK1	28
94	93	91	92	92	92	99	94	101	83	93	79	8LK1	29
79	89	92	110	84	93	104	99	74	94	82	84	8LK1	30
90	97	89	81	107	93	94	85	95	91	100	101	8LK1	31
83	98	90	93	107	92	87	94	88	119	88	76	8LK1	32
103	99	94	73	94	80	84	85	99	80	109	92	9LK1	33
91	108	96	G									8LK1	34
0	311	4475	12724	19759	24683	26385	26452	26010	25318	23851	23224	8LK2	1
21775	20858	19748	18770	17700	16751	16128	15269	14549	13877	13038	12330	8LK2	2
11874	11229	10634	10224	9781	9198	8644	8270	8144	7572	7168	6774	8LK2	3
6455	6082	5838	5465	5220	5062	4898	4490	4284	3996	3897	3628	8LK2	4
3662	3203	3174	3059	2915	2729	2620	2497	2344	2250	2116	2062	8LK2	5
1994	1834	1740	1689	1666	1523	1406	1358	1308	1205	1163	1102	8LK2	6
1045	992	977	883	934	855	819	815	754	682	642	658	8LK2	7
625	653	584	617	534	544	485	492	488	427	446	440	9LK2	8
391	388	356	363	320	330	337	335	299	293	279	279	8LK2	9
274	251	269	256	259	242	230	226	255	231	205	233	8LK2	10
223	228	173	182	185	187	178	200	179	183	172	186	8LK2	11
171	188	176	160	173	153	157	186	142	161	133	160	9LK2	12
131	149	141	141	157	152	145	142	136	134	150	141	8LK2	13
124	139	155	148	142	132	116	142	130	119	131	139	9LK2	14
118	151	131	127	144	119	113	127	136	125	118	128	8LK2	15
147	133	110	119	143	140	148	129	123	121	118	124	8LK2	16

128	125	114	142	120	130	121	133	139	116	110	112	8LK2	17
135	126	124	117	132	129	134	122	110	124	133	117	8LK2	18
112	121	113	110	106	135	129	132	118	131	129	141	8LK2	19
111	119	134	122	136	115	147	106	123	112	119	134	8LK2	20
135	134	109	139	132	162	115	140	109	123	128	105	8LK2	21
132	117	110	130	122	130	145	109	105	114	131	106	8LK2	22
129	120	101	104	137	126	114	120	131	111	106	117	8LK2	23
127	115	116	120	137	96	133	114	130	116	118	113	8LK2	24
107	111	127	131	122	122	109	98	111	115	122	113	8LK2	25
116	135	124	105	110	113	128	118	114	136	123	101	8LK2	26
119	114	114	121	139	102	107	102	111	108	103	144	8LK2	27
118	102	108	103	124	104	117	142	97	116	118	133	8LK2	28
117	132	103	98	132	109	115	122	105	100	112	115	8LK2	29
119	115	125	105	112	124	111	120	128	133	118	90	8LK2	30
102	121	95	108	104	116	115	124	103	116	90	106	8LK2	31
100	102	97	111	113	113	109	103	117	102	123	107	8LK2	32
126	121	110	116	121	125	99	99	100	98	104	110	8LK2	33
127	109	89	0									8LK2	34
0	3759	22645	31688	30502	25718	20941	16960	13810	11434	9469	8448	8LK3	1
7102	6347	5788	5157	4725	4391	4119	3750	3599	3382	3092	3035	8LK3	2
2767	2585	2514	2263	2255	2074	1961	1859	1719	1709	1635	1503	8LK3	3
1441	1360	1300	1159	1189	1079	1002	998	960	909	837	843	8LK3	4
750	718	662	670	636	605	557	531	469	490	476	447	8LK3	5
387	408	370	382	352	321	330	302	270	264	257	254	8LK3	6
260	222	223	232	225	207	183	191	153	187	169	160	8LK3	7
145	127	126	134	117	130	104	113	118	99	118	92	8LK3	8
102	98	75	80	90	81	84	72	70	68	73	78	8LK3	9
66	59	68	64	64	56	48	52	47	51	53	59	8LK3	10
45	44	60	58	60	47	39	36	40	40	52	43	8LK3	11
51	39	53	50	36	33	43	51	35	33	47	33	8LK3	12
35	38	37	36	46	39	37	36	40	35	35	43	8LK3	13
45	36	42	40	30	36	39	33	35	30	30	34	8LK3	14
39	29	29	42	32	31	35	40	31	41	37	40	8LK3	15
34	43	42	40	32	33	40	43	50	45	46	34	8LK3	16
34	38	34	24	30	25	36	26	44	28	24	35	8LK3	17
32	38	38	27	26	37	34	26	37	40	30	47	8LK3	18
45	39	38	30	37	29	26	22	38	34	36	33	8LK3	19
31	25	42	29	33	26	26	37	32	36	36	26	8LK3	20
36	31	24	25	26	33	30	30	44	35	29	34	8LK3	21
37	35	39	25	34	33	35	25	39	35	46	45	8LK3	22
37	30	16	31	22	36	32	28	32	30	27	36	8LK3	23
37	25	31	31	31	28	21	30	28	37	44	37	8LK3	24
45	34	29	38	37	35	27	35	26	34	32	26	8LK3	25
37	37	29	39	40	30	40	33	31	24	34	24	8LK3	26
25	37	34	30	32	39	29	32	35	28	29	32	8LK3	27
35	30	28	28	36	28	48	36	23	31	28	30	8LK3	28
27	35	29	26	29	37	23	33	40	26	33	39	8LK3	29
41	34	22	22	28	22	32	34	33	27	25	29	8LK3	30
27	46	34	35	34	31	39	31	24	33	26	27	8LK3	31
25	29	34	33	21	35	31	25	31	38	35	37	8LK3	32
40	35	29	31	34	40	21	20	40	24	32	30	8LK3	33
36	31	28	812									8LK3	34

APPENDIX B

PLOTS OF BACKGROUND-SUBTRACTED COUNT DATA

This appendix contains plots of the count data for all 20 runs and for each detector, after subtracting the background determined by the best FRNTIC fit given in Appendix D. For the later runs in particular, these plots clearly show the decay of the fundamental prompt mode with very good counting statistics.

BACKGROUND-SUBTRACTED DATA RUN 1, CONFIGURATION 1

Fig. A1. Background-Subtracted Data for Run 1, Configuration 1.

BACKGROUND-SUBTRACTED DATA RUN 2 , CONFIGURATION 2

Fig. A2. Background-Subtracted Data for Run 2, Configuration 2.

BACKGROUND-SUBTRACTED DATA RUN 3 , CONFIGURATION 2A

Fig. A3. Background-Subtracted Data for Run 3, Configuration 2A.

BACKGROUND-SUBTRACTED DATA RUN 4 , CONFIGURATION 2B

Fig. A4. Background-Subtracted Data for Run 4, Configuration 2B.

BACKGROUND-SUBTRACTED DATA RUN 5 , CONFIGURATION 3

Fig. A5. Background-Subtracted Data for Run 5, Configuration 3.

BACKGROUND-SUBTRACTED DATA RUN 6 , CONFIGURATION 3A

Fig. A6. Background-Subtracted Data for Run 6, Configuration 3A.

BACKGROUND-SUBTRACTED DATA RUN 7 , CONFIGURATION 4

Fig. A7. Background-Subtracted Data for Run 7, Configuration 4.

BACKGROUND-SUBTRACTED DATA RUN 8 , CONFIGURATION 4A

Fig. A8. Background-Subtracted Data for Run 8, Configuration 4A.

BACKGROUND-SUBTRACTED DATA RUN 9 , CONFIGURATION 5

Fig. A9. Background-Subtracted Data for Run 9, Configuration 5.

BACKGROUND-SUBTRACTED DATA RUN 10 , CONFIGURATION 5A

Fig. A10. Background-Subtracted Data for Run 10, Configuration 5A.

BACKGROUND-SUBTRACTED DATA RUN 11 , CONFIGURATION 6A

Fig. A11. Background-Subtracted Data for Run 11, Configuration 6A.

BACKGROUND-SUBTRACTED DATA RUN 12 , CONFIGURATION 6

Fig. A12. Background-Subtracted Data for Run 12, Configuration 6.

BACKGROUND-SUBTRACTED DATA RUN 13 , CONFIGURATION 7A

Fig. A13. Background-Subtracted Data for Run 13, Configuration 7A.

BACKGROUND-SUBTRACTED DATA RUN 14 , CONFIGURATION 7

Fig. A14. Background-Subtracted Data for Run 14, Configuration 7.

BACKGROUND-SUBTRACTED DATA RUN 15 , CONFIGURATION 8

Fig. A15. Background-Subtracted Data for Run 15, Configuration 8.

BACKGROUND-SUBTRACTED DATA RUN 16 , CONFIGURATION 9

Fig. A16. Background-Subtracted Data for Run 16, Configuration 9.

BACKGROUND-SUBTRACTED DATA RUN 17 , CONFIGURATION 10

Fig. A17. Background-Subtracted Data for Run 17, Configuration 10.

BACKGROUND-SUBTRACTED DATA RUN 18 , CONFIGURATION 11A

Fig. A18. Background-Subtracted Data for Run 18, Configuration 11A.

BACKGROUND-SUBTRACTED DATA RUN 19 , CONFIGURATION 11B

Fig. A19. Background-Subtracted Data for Run 19, Configuration 11B.

BACKGROUND-SUBTRACTED DATA RUN 20 , CONFIGURATION 12

Fig. A20. Background-Subtracted Data for Run 20, Configuration 12.

APPENDIX C

TORNADO PLOTS

This appendix contains tornado plots for all 20 runs and for each detector. The use of these plots to determine the "best" starting channel for the least squares fits is described in Section 5.3. The best starting channels so obtained are indicated by arrows on the plots.

RUN 1 CONFIGURATION 1

Fig. A21. Tornado Plot for Run 1, Configuration 1.

Fig. A22. Tornado Plot for Run 2, Configuration 2.

Fig. A23. Tornado Plot for Run 3,
Configuration 2A.

Fig. A24. Tornado Plot for Run 4,
Configuration 2B.

Fig. A25. Tornado Plot for Run 5,
Configuration 3.

Fig. A26. Tornado Plot for Run 6,
Configuration 3A.

Fig. A27. Tornado Plot for Run 7,
Configuration 4.

Fig. A28. Tornado Plot for Run 8,
Configuration 4A.

Fig. A29. Tornado Plot for Run 9,
Configuration 5.

RUN 10 CONFIGURATION 5A

Fig. A30. Tornado Plot for Run 10, Configuration 5A.

RUN 12 CONFIGURATION 6

Fig. A32. Tornado Plot for Run 12, Configuration 6.

Fig. A33. Tornado Plot for Run 13, Configuration 7A.

Fig. A34. Tornado Plot for Run 14, Configuration 7.

Fig. A35. Tornado Plot for Run 15, Configuration 8.

Fig. A36. Tornado Plot for Run 16, Configuration 9.

Fig. A37. Tornado Plot for Run 17, Configuration 10.

Fig. A38. Tornado Plot for Run 18,
Configuration 11A.

Fig. A39. Tornado Plot for Run 19,
Configuration 11B.

Fig. A40. Tornado Plot for Run 20, Configuration 12.

APPENDIX D

FITTED AMPLITUDES AND DECAY CONSTANTS

The "best" values for the fitted amplitudes and decay constants for all 20 runs and for each detector are listed in this appendix. Also listed are apparent error estimates of the parameters, where appropriate, and values for the variance of fit,

$$s^2 = \frac{1}{n-p} S ,$$

where

n = number of channels being fit ($n_2 - n_1 + 1$),

p = number of variable parameters in the fit ($\leq m$),

S = weighted sum of the squares defined by Eq. (21).

The variance of fit, s^2 , provides a measure of the goodness of fit, since it is approximately a normal variable with mean, 1, and variance, $2/(n-p)$. (See Ref. 9, Section 4.4.) A 95% confidence interval on s^2 is then

$$1 \pm 1.96\sqrt{2/(n-p)} .$$

Those fits having values of s^2 outside this interval are denoted by an "*" in the following tables. There are 5 such fits out of 60 sets of data. Two of these occur in the data for Run 2, which were neglected in the final analysis for the reasons discussed in Section 6. Thus, the remaining fraction (3/57) of data sets having values of s^2 outside the 95% confidence interval is almost exactly that (5/100) to be expected from statistical considerations.

TABLE A1

FITTED AMPLITUDES AND DECAY CONSTANTS

Run	Conf.	Parameter	Values for Region-Dependent Parameters			Delayed Background Parameters		
			Reg. 30	Reg. 31	Reg. 16	Comp., k	Rel. Amp., n_k	Decay Const., λ_k (sec ⁻¹)
1	1	Starting channel	18	16	12	1	0.031	-0.0124
		$A_0^P \pm 2\sigma$	20100 ± 3300	28100 ± 3600	16400 ± 3600	2	0.205	-0.0303
		$\alpha_0^P \pm 2\sigma$ (sec ⁻¹)	-193.0 ± 7.3	-196.0 ± 5.9	-201.6 ± 11.2	3	0.186	-0.110
		$A_1^P \pm 2\sigma$	262000 ± 47000	340000 ± 31000	2080000 ± 20000	4	0.376	-0.297
		α_1^P (sec ⁻¹)	-460	-440	-460	5	0.131	-1.135
		$A^d \pm 2\sigma$	26.2 ± 0.6	41.9 ± 0.8	167.5 ± 1.5	6	0.071	-3.006
		Variance of fit	1.127	1.060	1.034	$k_{\text{eff}}^{\text{est}} = 0.849, R = 2 \text{ sec}^{-1}$		
2	2	Starting channel	10	10	14	1	0.027	-0.0124
		$A_0^P \pm 2\sigma$	9800 ± 700	20700 ± 1100	24400 ± 10000	2	0.176	-0.0300
		$\alpha_0^P \pm 2\sigma$ (sec ⁻¹)	-174.1 ± 3.7	-185.1 ± 3.1	-188.7 ± 12.7	3	0.163	-0.110
		$A_1^P \pm 2\sigma$	-25800 ± 3100	-57200 ± 5300	115000 ± 15000	4	0.346	-0.293
		α_1^P (sec ⁻¹)	-440	-460	-260	5	0.161	-1.131
		$A^d \pm 2\sigma$	3.0 ± 0.2	6.1 ± 0.3	27.8 ± 0.6	6	0.127	-3.002
		Variance of fit	1.162*	1.263*	0.990	$k_{\text{eff}}^{\text{est}} = 0.917, R = 0.7 \text{ sec}^{-1}$		
3	2A	Starting channel	10	10	12	1	0.027	-0.0124
		$A_0^P \pm 2\sigma$	11700 ± 800	23900 ± 1200	27100 ± 7600	2	0.176	-0.0300
		$\alpha_0^P \pm 2\sigma$ (sec ⁻¹)	-177.6 ± 3.8	-184.0 ± 2.9	-185.4 ± 9.1	3	0.163	-0.110
		$A_1^P \pm 2\sigma$	-26000 ± 2800	-44400 ± 4100	115000 ± 11000	4	0.346	-0.293
		α_1^P (sec ⁻¹)	-400	-400	-260	5	0.161	-1.131
		$A^d \pm 2\sigma$	3.1 ± 0.2	7.0 ± 0.3	29.3 ± 0.6	6	0.127	-3.002
		Variance of fit	1.158*	1.056	0.954	$k_{\text{eff}}^{\text{est}} = 0.917, R = 0.7 \text{ sec}^{-1}$		

TABLE A1 (Continued)

Run	Conf.	Parameter	Values for Region-Dependent Parameters			Delayed Background Parameters		
			Reg. 30	Reg. 31	Reg. 16	Comp., k	Rel. Amp., n_k^d	Decay Const., $\lambda_k^d(\text{sec}^{-1})$
4	2B	Starting channel	24	14	26	1	0.027	-0.0124
		$A_o^p \pm 2\sigma$	7710 ± 920	17700 ± 1900	52900 ± 4500	2	0.176	-0.0300
		$\alpha_o^p \pm 2\sigma (\text{sec}^{-1})$	-171.9 ± 5.6	-185.7 ± 5.0	-206.2 ± 4.1	3	0.163	-0.110
		$A_1^p \pm 2\sigma$	-	-27300 ± 9600	-	4	0.346	-0.293
		$\alpha_1^p (\text{sec}^{-1})$	-	-400	-	5	0.161	-1.131
		$A^d \pm 2\sigma$	2.7 ± 0.2	4.9 ± 0.3	16.0 ± 0.5	6	0.127	-3.002
		Variance of fit	1.123	1.312*	0.965	$k_{\text{eff}}^{\text{est}} = 0.917, R = 0.7 \text{ sec}^{-1}$		
5	3	Starting channel	18	16	28	1	0.027	-0.0124
		$A_o^p \pm 2\sigma$	78200 ± 7000	116000 ± 7000	88000 ± 19000	2	0.175	-0.0301
		$\alpha_o^p \pm 2\sigma (\text{sec}^{-1})$	-163.5 ± 3.0	-167.7 ± 2.3	-161.3 ± 6.2	3	0.162	-0.110
		$A_1^p \pm 2\sigma$	120000 ± 19000	178000 ± 21000	585000 ± 89000	4	0.349	-0.295
		$\alpha_1^p (\text{sec}^{-1})$	-280	-300	-280	5	0.161	-1.133
		$A^d \pm 2\sigma$	52.5 ± 0.9	73.9 ± 1.1	152.1 ± 1.4	6	0.126	-3.003
		Variance of fit	1.000	1.117	0.960	$k_{\text{eff}}^{\text{est}} = 0.894, R = 0.72 \text{ sec}^{-1}$		
6	3A	Starting channel	18	20	18	1	0.027	-0.0124
		$A_o^p \pm 2\sigma$	37200 ± 4800	34700 ± 7300	63100 ± 6700	2	0.175	-0.0301
		$\alpha_o^p \pm 2\sigma (\text{sec}^{-1})$	-165.0 ± 4.4	-158.6 ± 6.0	-171.7 ± 3.9	3	0.162	-0.110
		$A_1^p \pm 2\sigma$	24900 ± 13000	51000 ± 15000	280000 ± 24000	4	0.349	-0.295
		$\alpha_1^p (\text{sec}^{-1})$	-280	-240	-310	5	0.161	-1.133
		$A^d \pm 2\sigma$	21.1 ± 0.5	28.4 ± 0.6	61.7 ± 0.9	6	0.126	-3.003
		Variance of fit	1.008	0.914	1.011	$k_{\text{eff}}^{\text{est}} = 0.894, R = 0.72 \text{ sec}^{-1}$		

TABLE A1 (Continued)

Run	Conf.	Parameter	Values for Region-Dependent Parameters			Delayed Background Parameters		
			Reg. 30	Reg. 31	Reg. 16	Comp., k	Rel. Amp., n_k	Decay Const., $\alpha_k(\text{sec}^{-1})$
7	4	Starting channel	35	35	20	1	0.029	-0.0124
		$A_o^p \pm 2\sigma$	124000 ± 3000	39300 ± 1900	22600 ± 1600	2	0.184	-0.0298
		$\alpha_o^p \pm 2\sigma (\text{sec}^{-1})$	-116.9 ± 0.9	-118.5 ± 1.6	-121.1 ± 2.4	3	0.168	-0.109
		$A_1^p \pm 2\sigma$	-	-	409000 ± 15000	4	0.342	-0.290
		$\alpha_1^p (\text{sec}^{-1})$	-	-	-310	5	0.155	-1.128
		$A^d \pm 2\sigma$	129.5 ± 1.5	49.2 ± 0.9	68.2 ± 1.0	6	0.122	-2.998
		Variance of fit	1.115	1.050	0.977	$k_{\text{eff}}^{\text{est}} = 0.942, R = 0.72 \text{ sec}^{-1}$		
8	4A	Starting channel	60	35	15	1	0.029	-0.0124
		$A_o^p \pm 2\sigma$	125000 ± 14000	36300 ± 1700	28200 ± 1300	2	0.184	-0.0298
		$\alpha_o^p \pm 2\sigma (\text{sec}^{-1})$	-116.0 ± 2.6	-114.9 ± 1.5	-122.6 ± 1.7	3	0.168	-0.109
		$A_1^p \pm 2\sigma$	-	-	269000 ± 8000	4	0.342	-0.290
		α_1^p	-	-	-310	5	0.155	-1.128
		$A^d \pm 2\sigma$	129.2 ± 1.4	45.5 ± 0.9	60.8 ± 1.0	6	0.122	-2.998
		Variance of fit	0.959	1.047	1.073	$k_{\text{eff}}^{\text{est}} = 0.942, R = 0.72 \text{ sec}^{-1}$		
9	5	Starting channel	50	40	10	1	0.028	-0.0124
		$A_o^p \pm 2\sigma$	39800 ± 4600	156000 ± 5000	35400 ± 1000	2	0.182	-0.0298
		$\alpha_o^p \pm 2\sigma (\text{sec}^{-1})$	-117.7 ± 3.0	-117.7 ± 0.9	-117.7 ± 1.1	3	0.167	-0.109
		$A_1^p \pm 2\sigma$	-	-	381000 ± 4000	4	0.342	-0.290
		α_1^p	-	-	-310	5	0.156	-1.128
		$A^d \pm 2\sigma$	45.9 ± 0.8	170.1 ± 1.6	79.4 ± 1.1	6	0.125	-2.998
		Variance of fit	0.945	1.002	1.044	$k_{\text{eff}}^{\text{est}} = 0.942, R = 0.70 \text{ sec}^{-1}$		

TABLE A1 (Continued)

Run	Conf.	Parameter	Values for Region-Dependent Parameters			Delayed Background Parameters		
			Reg. 30	Reg. 31	Reg. 16	Comp., k	Rel. dAmp., n_k	Decay Const., α_k (sec ⁻¹)
10	5A	Starting channel	30	35	15	1	0.029	-0.0124
		$A_o^P \pm 2\sigma$	40300 ± 1300	167000 ± 3000	47700 ± 1600	2	0.185	-0.0298
		$\alpha_o^P \pm 2\sigma$ (sec ⁻¹)	-116.0 ± 1.1	-115.7 ± 0.7	-120.6 ± 1.2	3	0.169	-0.109
		$A_1^P \pm 2\sigma$	-	-	225000 ± 9000	4	0.343	-0.290
		α_1^P (sec ⁻¹)	-	-	-310	5	0.154	-1.128
		$A^d \pm 2\sigma$	44.8 ± 0.8	184.1 ± 1.6	78.8 ± 1.1	6	0.120	-2.998
		Variance of fit	1.015	0.928	1.136	$k_{eff}^{est} = 0.942, R = 0.74 \text{ sec}^{-1}$		
11	6A	Starting channel	30	45	18	1	0.028	-0.0124
		$A_o^P \pm 2\sigma$	45400 ± 2100	30300 ± 4700	48000 ± 2900	2	0.178	-0.0299
		$\alpha_o^P \pm 2\sigma$ (sec ⁻¹)	-138.7 ± 1.8	-134.1 ± 4.4	-141.5 ± 2.2	3	0.164	-0.109
		$A_1^P \pm 2\sigma$	-	-	183000 ± 14000	4	0.342	-0.291
		α_1^P (sec ⁻¹)	-	-	-300	5	0.160	-1.129
		$A^d \pm 2\sigma$	33.4 ± 0.7	28.1 ± 0.7	59.4 ± 0.9	6	0.128	-3.000
		Variance of fit	1.026	1.050	0.981	$k_{eff}^{est} = 0.933, R = 0.68 \text{ sec}^{-1}$		
12	6	Starting channel	30	35	12	1	0.028	-0.0124
		$A_o^P \pm 2\sigma$	46400 ± 1800	37300 ± 2500	52700 ± 1900	2	0.180	-0.0299
		$\alpha_o^P \pm 2\sigma$ (sec ⁻¹)	-135.2 ± 1.5	-133.0 ± 2.3	-141.2 ± 1.5	3	0.165	-0.109
		$A_1^P \pm 2\sigma$	-	-	195000 ± 7000	4	0.343	-0.291
		α_1^P (sec ⁻¹)	-	-	-320	5	0.158	-1.129
		$A^d \pm 2\sigma$	37.3 ± 0.7	33.2 ± 0.7	65.4 ± 1.0	6	0.126	-3.000
		Variance of fit	0.901	1.059	1.093	$k_{eff}^{est} = 0.933, R = 0.70 \text{ sec}^{-1}$		

TABLE A1 (Continued)

Run	Conf.	Parameter	Values for Region-Dependent Parameters			Delayed Background Parameters		
			Reg. 30	Reg. 31	Reg. 16	Comp., k	Rel. Amp., n_k^d	Decay Const., $\alpha_k^d(\text{sec}^{-1})$
13	7A	Starting channel	70	40	50	1	0.034	-0.0123
		$A_o^p \pm 2\sigma$	48900 ± 4300	42100 ± 900	89700 ± 2200	2	0.206	-0.0290
		$\alpha_o^p \pm 2\sigma (\text{sec}^{-1})$	-79.09 ± 1.61	-78.05 ± 0.59	-78.05 ± 0.58	3	0.181	-0.106
		$A_o^d \pm 2\sigma$	127.9 ± 1.6	121.6 ± 1.4	293.2 ± 2.3	4	0.327	-0.279
		Variance of fit	1.059	0.957	0.992	5	0.141	-1.116
						6	0.111	-2.987
		$k_{\text{eff}}^{\text{est}} = 0.972, R = 0.74 \text{ sec}^{-1}$						
14	7	Starting channel	50	60	40	1	0.030	-0.0123
		$A_o^p \pm 2\sigma$	44100 ± 1400	45400 ± 2300	90600 ± 1500	2	0.184	-0.0290
		$\alpha_o^p \pm 2\sigma (\text{sec}^{-1})$	-77.56 ± 0.75	-78.15 ± 1.02	-78.01 ± 0.43	3	0.166	-0.106
		$A_o^d \pm 2\sigma$	98.9 ± 1.3	100.6 ± 1.3	235.3 ± 2.1	4	0.315	-0.279
		Variance of fit	0.963	0.911	1.090	5	0.161	-1.116
						6	0.144	-2.987
		$k_{\text{eff}}^{\text{est}} = 0.972, R = 0.50 \text{ sec}^{-1}$						
15	8	Starting channel	60	50	50	1	0.034	-0.0123
		$A_o^p \pm 2\sigma$	22700 ± 800	23900 ± 500	57800 ± 900	2	0.199	-0.0285
		$\alpha_o^p \pm 2\sigma (\text{sec}^{-1})$	-57.49 ± 0.65	-57.10 ± 0.45	-58.46 ± 0.34	3	0.174	-0.105
		$A_o^d \pm 2\sigma$	103.3 ± 1.5	111.8 ± 1.4	278.8 ± 2.4	4	0.304	-0.272
		Variance of fit	0.977	0.832*	0.980	5	0.152	-1.109
						6	0.137	-2.979
		$k_{\text{eff}}^{\text{est}} = 0.980, R = 0.50 \text{ sec}^{-1}$						

TABLE A1 (Continued)

Run	Conf.	Parameter	Values for Region-Dependent Parameters			Delayed Background Parameters		
			Reg. 30	Reg. 31	Reg. 16	Comp., k	Rel. Amp., n_k	Decay Const., $a_k^{(sec^{-1})}$
16	9	Starting channel	60	60	60	1	0.030	-0.0121
		$A_o^P \pm 2\sigma$	43000 ± 1800	48200 ± 2000	111000 ± 3000	2	0.152	-0.0266
		$a_o^P \pm 2\sigma (sec^{-1})$	-41.54 ± 0.50	-41.97 ± 0.49	-41.41 ± 0.32	3	0.137	-0.0995
		$A^d \pm 2\sigma$	225.4 ± 2.2	248.5 ± 2.3	636.2 ± 3.6	4	0.247	-0.254
		Variance of fit	0.938	0.944	0.947	5	0.212	-1.090
						6	0.222	-2.959
						$k_{eff}^{est} = 0.990, R = 0.154 sec^{-1}$		
17	10	Starting channel	50	90	70	1	0.042	-0.0120
		$A_o^P \pm 2\sigma$	22300 ± 600	80300 ± 4600	45100 ± 1800	2	0.181	-0.0252
		$a_o^P \pm 2\sigma (sec^{-1})$	-33.49 ± 0.33	-34.41 ± 0.50	-34.30 ± 0.42	3	0.148	-0.0959
		$A^d \pm 2\sigma$	194.7 ± 2.2	632.2 ± 3.9	391.9 ± 3.2	4	0.227	-0.244
		Variance of fit	1.059	0.881	1.077	5	0.194	-1.1079
						6	0.208	-2.948
						$k_{eff}^{est} = 0.993, R = 0.154 sec^{-1}$		
18	11A	Starting channel	80	80	80	1	0.168	-0.0108
		$A_o^P \pm 2\sigma$	24100 ± 700	72000 ± 1300	46100 ± 1000	2	0.256	-0.0197
		$a_o^P \pm 2\sigma (sec^{-1})$	-22.74 ± 0.26	-22.30 ± 0.16	-22.51 ± 0.20	3	0.148	-0.0837
		$A^d \pm 2\sigma$	650.5 ± 4.5	2099 ± 9	1355 ± 7	4	0.145	-0.218
		Variance of fit	0.905	0.960	0.949	5	0.132	-1.049
						6	0.151	-2.915
						$k_{eff}^{est} = 0.9975, R = 0.153 sec^{-1}$		

TABLE A1 (Continued)

Run	Conf.	Parameter	Values for Region-Dependent Parameters			Delayed Background Parameters		
			Reg. 30	Reg. 31	Reg. 16	Comp., k	Rel. Amp., n_k	Decay Const., $a_k^d(\text{sec}^{-1})$
19	11B	Starting channel	100	130	90	1	0.412	-0.0088
		$A_o^P \pm 2\sigma$	26200 ± 1200	82800 ± 4400	52200 ± 1200	2	0.180	-0.0167
		$a_o^P \pm 2\sigma (\text{sec}^{-1})$	-19.64 ± 0.34	-19.66 ± 0.34	-19.49 ± 0.19	3	0.116	-0.0773
		$A^d \pm 2\sigma$	1374 ± 8	4397 ± 16	2850 ± 11	4	0.094	-0.207
		Variance of fit	1.104	0.978	0.952	5	0.091	-1.036
						6	0.107	-2.900
						$k_{\text{eff}}^{\text{est}} = 0.9987, R = 0.153 \text{ sec}^{-1}$		
20	12	Starting channel	20	30	40	1	0.022	-0.0122
		$A_o^P \pm 2\sigma$	38200 ± 400	46100 ± 700	9760 ± 550	2	0.124	-0.0280
		$a_o^P \pm 2\sigma (\text{sec}^{-1})$	-49.31 ± 0.25	-49.52 ± 0.30	-49.32 ± 0.92	3	0.122	-0.103
		$A^d \pm 2\sigma$	125.4 ± 1.6	152.1 ± 1.7	40.6 ± 0.9	4	0.264	-0.267
		Variance of fit	1.066	1.033	0.996	5	0.231	-1.103
						6	0.237	-2.973
						$k_{\text{eff}}^{\text{est}} = 0.984, R = 0.153 \text{ sec}^{-1}$		

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