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AN AUTOMATED CROSS SECTION ANALYSIS PROGRAM (ACSAP)

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ABSTRACT

The Automated Cross Section Analysis Program (ACSAP) has been developed to assist in the evaluation of neutron cross section data in the resonance region. Experimental data may be compared by means of a wide selection of representations. Single level or multilevel resonance parameters may be fitted to the data by an iterative adjustment routine. Total, fission, capture, or scattering data may be fitted. The fitted curves can be printed or plotted for comparison with the data using Doppler and resolution broadening appropriate to the particular experiment. ACSAP allows each user to "program" his problem to suit his particular needs. This programmability gives ACSAP a versatility that makes it a powerful tool in cross section evaluation.

ACSAP is written almost entirely in FORTRAN; however it does contain some subroutines written in IBM 360 assembly language. These are discussed in the text. ACSAP was developed using the FORTRAN H compiler with optimization level 2. This was done on an IBM 360/75 computer using 240K bytes of core and IBM 2314 disc storage.

ACSAP is available through the Argonne Code Center.

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I. INTRODUCTION

The development of nuclear power requires great amounts of neutron cross section data for reactor design applications. A variety of experimental apparatus has been employed in obtaining the needed data. Where once the measurement of cross sections was the province of crystal spectrometers and fast choppers, the field has lately been dominated by linear accelerators. The new machines allow the collection of data over wider energy regions, and their greatly improved resolutions have allowed resonances to be resolved at much higher energies. At the same time high neutron fluxes and improved means of collecting data have made it possible to collect much more data in much shorter times than did the older equipment. The result has been an avalanche of data in the resolved resonance region.

As an example, Shore and Sailor⁽¹⁾ in 1958 published the results of an experiment in which the total and fission cross sections of ^{235}U were measured on the Brookhaven crystal spectrometer at a resolution of 0.17 $\mu\text{sec}/\text{meter}$. The SCISRS listing of the fission cross section shows 278 points obtained between 0.1 and 10 eV. The fission data of Cao⁽²⁾, measured ten years later on the Linac at Geel with a resolution near 0.002 $\mu\text{sec}/\text{meter}$ covers the energy region from 6 eV to 3 keV with almost 10,000 points. Below 100 eV there are some 6700 points.

In addition to sheer size of the data sets produced, the new machines offer challenges with respect to their resolution functions. Since a moderator of some type is normally used to enhance the flux at the lower energies, the resolution function often has some degree of asymmetry. It is therefore advantageous to be able to modify the resolution function in shape as well as in width to account properly for resolution widths in a variety of experiments.

II. STRUCTURE OF ACSAP

1. USER'S VIEW OF ACSAP

The Automated Cross Sections Analysis Program (ACSAP) was developed to deal with the problems of handling and analyzing large data sets. It was developed originally with an eye to the analysis of total cross section data obtained from the fast chopper at the Materials Testing Reactor. Succeeding development has increased its flexibility and applicability to many types of data. Early accounts of ACSAP have been given previously.⁽³⁻⁵⁾

A primitive version of ACSAP has been incorporated into the SCORE package.⁽⁶⁾ The version herein described is designed for batch-mode operation. It has been completely restructured to increase the control of the analyst over the actions to be performed and their order of execution. With this one program the analyst has the options of plotting data for comparison on the same or different axes, using a choice of plotting symbols and scales. The variables labeling the axes can be selected by the analyst, and need not be the same as the input form of the data. For example, a set of data may be plotted as transmission vs time delay, even though the input data may be listed as cross section vs energy. Theoretical curves may be calculated and plotted along with the data or separately. When more than one curve is plotted, various forms of dashed lines may be used to distinguish them. Each curve is calculated with Doppler and resolution broadening appropriate to a particular experiment. If desired, a smooth background may be added in also. The curves may be calculated with either the Breit-Wigner single level formula⁽⁷⁾ or the Reich-Moore multilevel formula.⁽⁸⁾ Parameters may be automatically adjusted to improve the fit of the curves to the data. Calculated data may be listed, punched in cards, or plotted, as may the differences between the theoretical curve and the individual experimental points. ACSAP is completely programmable, and many more combinations of operations are available than have been indicated here. It all depends upon the choice of function cards and the order in which they are assembled.

The programmability of ACSAP is achieved by punching an alphanumeric keyword in each card of the input data. ACSAP input cards (called function cards) are of two types; information cards and action cards. Information

cards are used to enter data into ACSAP. Action cards also contain information, but they result in an action being performed as well. It should be noted that ACSAP will complete a stipulated action before it processes the next function card.

The function cards are essentially independent of each other. Because of this, function cards may be entered in any order and as frequently as desired. There are some exceptions. For example, isotope information, resonance parameter information, and experimental conditions information must be entered before an action card which would cause cross sections to be calculated. Instructions to draw a plot axis must precede any instructions to plot data, and points to be fitted must be entered prior to the ADJUST card.

ACSAP will acknowledge each function card read. All input cards are printed just as they are read in. An accompanying comment tells whether ACSAP has recognized and accepted the card. Any misspelled keywords (often only the first four columns are checked) will be flagged by ACSAP as unrecognizable, and will result in that particular card being skipped.

Table 1 lists keywords currently recognized by ACSAP. A detailed discussion of the function cards (in alphabetical order) is contained in Appendix A.

2. PROGRAMMER'S VIEW OF ACSAP

Information on the structure of ACSAP from a programmer's point of view is given in Appendix B. This should be of value to anyone adapting ACSAP to his own use.

Appendix B contains a brief discussion of the major functions of each of the ACSAP routines. ACSAP uses several "local system" subroutines such as date, timing and plotting routines, which may be used or replaced by anyone implementing ACSAP at his own installation. These are also discussed in Appendix B. This appendix describes the internal management of data utilized by ACSAP. It also contains tables showing the distribution of common blocks in the various ACSAP routines, and another indicating how ACSAP routines activate each other. Both calling routines and the subroutines called may be determined.

TABLE 1

KEYWORDS AND FUNCTIONS

Keyword	Brief statement of function
ADJUST	Causes fitting of designated input data. Sets iterative fitting routine into action.
AXIS	Draws plot axis.
BIAS 1/V	Adds 1/V bias to computed cross sections.
BIAS SIGMA	Adds linear bias to computed cross sections.
BIAS TRANS	Allows background adjustment of transmission data.
CLEAR	Re-initializes ACSAP for new problem.
CLEAR FIT	Clears previously entered FIT card data.
CLEAR VALLEY	Clears previously entered VALLEY card data.
COMMENTS	Allows user to enter comments.
CONDITIONS	Describes experimental conditions.
DATA	Enters experimental data from cards.
DATADISC	Enters experimental data from disc.
DIFFER IN	Inputs difference tables.
DIFF OUT	Produces difference tables.
FIT	Enters resonance points to be fitted.
ISOTOPE	Inputs isotope information.
LIST	Prints theoretical cross section data, both broadened and unbroadened.
MODERATOR	Allows compensation for neutron slowing down time in the moderator.
PARAMETER	Enters resonance parameter information.
PLOT	Produces plot of theoretical data.
PLOTDATA	Produces plot of experimental data.
PUNCH	Punches updated function cards.
PUNCHTHE	Punches DATA cards containing theoretical cross sections.
RESOLUTION	Enters new resolution tables.
TIME	Causes elapsed central processor time to be printed.
TITLE	Enters titling information.
VALLEY	Inputs valley points to be fitted.

3. COMPUTER ENVIRONMENT

ACSAP was developed on an IBM 360/75 computer with just over one million bytes of core. The computer configuration also includes three model 2314 disc storage units and two Calcomp plotters (models 564 and 565). Details of the IBM 360/75 system are presented in Appendix C. The disc and plotter were mentioned explicitly because they are used by ACSAP.

ACSAP will run in 240K bytes of core. It requires three data sets, for temporary storage, on some external device (2314 discs were used here). At this installation output plots may be directed either to the Calcomp plotters or to the FR-80 microfilm unit as designated by the Job Control Language (JCL).

III. ADJUSTMENT OF PARAMETERS

The actual fitting of data is accomplished in the subroutine ADJUST. A single action card, keyworded ADJUST, sets in motion an iterative fitting procedure that is similar to traditional trial and error methods. The objective of the fitting procedure is to determine for each resonance the parameters E_0 , Γ_n^0 , Γ_γ , and Γ_f . These represent, respectively, the resonance energy, the reduced neutron width, the capture width, and the fission width of the resonance. ACSAP offers the analyst the choice of using the Breit-Wigner single level equation or the Reich-Moore multilevel equation. The program will allow up to 25 different isotopes and a total of 250 resonances to be used at any one time. It has the capability of adjusting parameters for up to 100 resonances simultaneously.

For a shape fit to a resonance, ACSAP requires three representative points through which the derived curve will pass. One of these points should be near the peak of the resonance, and one on each side of it. As it is not always possible to supply all three representative data points, ACSAP is coded to handle three different cases. Briefly these are as follows:

- Shape fit: Requires the peak point and one or both side points. Γ_n^0 and Γ_x (Γ_x represents either Γ_γ or Γ_f) are determined. When both side points are present, E_0 may also be determined.
- Peak fit: Requires only the peak point. This option returns values for Γ_n^0 or Γ_x .
- Wing fit: Requires one or both side points. Either Γ_n^0 or Γ_x may be determined. A value of E_0 is also found when both side points are present.

Each of these options has advantages in particular situations. The shape fit, of course, yields the most information, and is to be preferred where it is possible to select the required three points and where resolution is good enough to allow shape fitting. The peak fit option comes in handy where (1) the resonance has already been shape fit in one cross section (for example, the total cross section), and it is desired to adjust one partial width to match a partial cross section (for example, fission) or (2) the resolution is not adequate for a shape fit. The wing

fit is handy for gaining some information from resonances that become blacked out because of sample thicknesses or for adjusting parameters of negative energy resonances.

The algorithms used in adjusting resonance parameters are quite simple. To understand how they work, let us follow the steps involved in fitting a single resonance. Suppose that we have a group of cross section points as shown in Figure 1. We select three points to characterize the desired fit: a point (E_p, σ_p) near the peak of the resonance and two side points, (E_L, σ_L) and (E_R, σ_R) one on each side of the resonance. The latter points are normally placed fairly far down the sides of the resonance, but high enough so their cross section values are dominated by the resonance. The chosen points need not coincide with experimental points. They may represent averages, but should represent the way the curve should pass through the data, in the judgement of the evaluator. Of course, σ_p must be greater than σ_L or σ_R , and E_p lies between E_L and E_R .

The fitting sequence follows the flow charted sequence shown in Figure 2. A trial set of parameters is selected. These need not be very close to the true values, but the better the initial guess, the more rapid the convergence. ACSAP calculates the cross section at the peak of the resonance, using the trial parameters, with Doppler and resolution broadening appropriate to the experimental data. The trial resonance might look like the dotted curve in Figure 1. However, at this point only the cross section at E_p has been calculated, not the whole curve. The trial parameters produce a cross section σ_0 at the peak fit point energy, E_p .

The resonance cross section is dominated by the term

$$\frac{\Gamma_n^0 \Gamma_x}{(E-E_0)^2 + \frac{\Gamma^2}{4}}$$

where Γ_x represents the partial width corresponding to the cross section being calculated. This relationship is, however, slightly modified where Doppler and resolution broadening are present. The broadened resonance term is approximately

$$\sigma_x = A \frac{\Gamma_n^0 \Gamma_x}{4(E-E_0)^2 + \Gamma_B^2} \cdot \frac{\Gamma_B}{\Gamma},$$

Fig. 1 Progress of ACSAP fit. The crosses represent experimental data, and the squares are the points through which the fitted curve is required to pass. The trial parameters produced the dashed curve. A fit to the peak produced the dash-dot curve. The solid curve represents the shape fit.

AUTOMATIC CROSS SECTION ANALYSIS PROGRAM

Fig. 2 Flow chart of ACSAP iterative procedure. Appropriately broadened cross sections, calculated from initial parameters, are compared with the input data. Adjustments are made to the parameters to improve the fit. The program reiterates a specified number of times before producing an output listing and plot of the results.

where A is a constant and Γ_B is the broadened total width. $\Gamma_B^2 = \Gamma^2 + R^2$, where R represents the convoluted widths of the resolution and Doppler broadening functions. On resonance the cross section becomes

$$\sigma_{xo} = A \frac{\Gamma_n^o \Gamma_x}{\Gamma_B \Gamma} .$$

Suppose we are fitting capture, and $\Gamma_\gamma \gg \Gamma_n$. The peak cross section is then proportional to $\frac{\Gamma_n^o}{\Gamma}$, which under these circumstances varies linearly with Γ_n^o . An initial estimate, Γ_n^o , produced a cross section of σ_o barns at E_p , where we wanted σ_p . ACSAP calculates a "next guess" reduced width:

$$\Gamma_n^{o'} = \frac{\sigma_p}{\sigma_o} \Gamma_n^o .$$

Furthermore, it calculates the ratio $R_G = \frac{\Gamma_n^{o'} \Gamma_x}{\Gamma \Gamma_B}$. This ratio will be held constant through this iteration.

With the new value of Γ_n^o , the cross section may look something like the dash-dot curve in Figure 1. The peak has been reached, but the resonance is far too narrow to fit the data. ACSAP now searches for energies E_1 and E_2 , at which the theoretical curve gives cross section values of σ_L and σ_R , respectively. If $|E_2 - E_1| \neq |E_R - E_L|$, the resonance width is adjusted in the direction to correct this inequality. Following the width adjustment, Γ_n^o is revised to preserve the peak cross section attained earlier in the iteration, using the relation

$$\sigma_n^{o''} = R_G \frac{\Gamma' \Gamma_B'}{\Gamma_x'}$$

The resonance energy is now shifted by an amount $\Delta E = 0.5[(E_L - E_1) + (E_R - E_2)]$. This completes the iteration. The sequence next begins another iteration. When all the requested iterations have been completed, ACSAP prints out a summary of the iteration history and then proceeds to whatever next action has been call for.

IV. SOME PRACTICAL CONSIDERATIONS

The foregoing is a brief description of a rather idealized situation. Such idealized situations are hardly ever encountered in practice. In the following paragraphs a few characteristics of ACSAP are discussed. It is hoped that these considerations, together with the information contained in the User's Manual (Appendix A) will give the user enough insight into the operation of ACSAP to deal with most problems that might be encountered.

While the ACSAP fitting procedure has been discussed in terms of fitting cross sections vs energy, other combinations are also possible. The abscissa may be either energy or time delay, and the ordinate may be cross section, cross section times the square root of energy, or transmission. Total cross section measurements are best analyzed by fitting transmission vs delay. Regardless of which variable is specified for the abscissa, "left point" and "right point" in the fit-point terminology refer to their appearance to the analyst on a plot in which the abscissa runs in increasing value of the independent variable from left to right.

A failure of ACSAP to locate the side points will cause a change in the course of the fitting procedures. By location of side points is meant the determination of the energy at which the trial parameters give the cross section of the side FIT point, as specified on the FIT card. The search for this energy is made in the subroutine ZEROIN. A calculation is made of the trial curve in an energy interval one-and-one-half times as wide as the difference between the current resonance energy and the energy of the FIT point. If both right and left FIT points are present, the calculation extends on each side of the resonance for one-and-one-half times the energy distance from the resonance energy to the farther FIT point. If no point can be found in this interval to have the same cross section as the FIT point, ACSAP sets a switch to cause that side point to be ignored. The current values of the side point switches are printed out. Thus, the message "** F T" indicates that the right point was found, but the left point was not. ACSAP then prints out the footnote: "** UNABLE TO DETERMINE ENERGIES OF THEORETICAL CURVE AT ONE OR BOTH SIDE POINTS". If one side point is lost in this manner, ACSAP will continue to adjust Γ_n^0 and the one width requested but will not shift the resonance energy. If both side points are lost, only Γ_n^0 will be adjusted. Corrective action for the loss of side points will depend upon the cause. This may be evident from an

examination of the output of the run. If the original estimates are too far off, either for the troubled resonance or a neighbor, the resulting theoretical curve may not come within the range of the search by ZEROIN. Beginning with narrower initial values of the resonance width may help. It is also helpful to choose the side points in such a way as to help ZEROIN to find them.

In order to reduce the likelihood of oscillations in the iterated parameter values, a restriction has been placed on the allowed changes in Γ_n^0 and E_0 per iteration. Moreover, the calculated peak cross section is required to be greater than the cross sections of the side FIT points before a shape adjustment is made. ACSAP stays in the peak fit mode until this requirement is met. No energy adjustment will be made if the input resonance energy does not fall between the two side FIT points. For these reasons, a good deal of time will be saved by making reasonably close initial estimates whenever possible.

The number of iterations required will depend upon how close the initial parameters are to the true values. Isolated resonances will be fitted more quickly than resonances that are closely spaced or dominated by interference effects. There is no limit to the number of iterations allowed by ACSAP. In practice it is usually best to use three to five iterations per run. This will often prove adequate, and in any event represents an appropriate stage to check the progress of the fit.

Multilevel fitting, at present, uses the same algorithms as single-level fitting. These work well as far as they go. However, it is up to the analyst to decide upon the alignment of interfering resonances and the signs of the interference terms. ACSAP does not adjust these.

The resonance formulas in ACSAP, both single level and multilevel, at present, are limited to $l=0$ cases. The single-level calculation gives only single-level scattering. If multilevel scattering is desired, the Reich-Moore formula must be used.

Parameters may be added between calculations, if desired. Since each PARAMETER card carries its own isotopic identification, the added cards will automatically be sorted into the appropriate isotope file. If a PARAMETER card shows a resonance energy within 0.0005 eV of a resonance already present in the parameter file for the same isotope, the values on the card replace the old parameters for that resonance.

Each resonance rides on a background produced by all other resonances present. When making adjustments, ACSAP works on the net cross section due to the resonance being fitted. Sometimes it may appear that this net cross section is negative. This situation might result if the trial parameters for neighboring resonances generate a cross section greater than the measured data at the peak of a small resonance. In such cases the printout includes the message: "UNABLE TO ADJUST, BACKGROUND FROM OTHER LEVEL IS _____".

A peak fit is normally accomplished in the manner previously described for the adjustment of Γ_n^0 in a shape fit. The analyst also has the option of adjusting either Γ_γ or Γ_f in a peak fit. In this latter event he should be cognizant of the behavior of the cross section as one of these partial widths is varied. If the partial width is a small part of the total width, increasing it will cause the cross section to increase. If the width being varied is a major part of the total width, it must be decreased to cause the cross section to increase. In between these extremes the cross section has a peak, which falls approximately at

$$\Gamma_x = \frac{\Gamma \Gamma_B^2}{\Gamma_B^2 + \Gamma^2}.$$

ACSAP restricts Γ_x to the same side of this peak from which it began. If this limitation is reached before a fit is attained, the analyst must intervene, either by modifying the partial width not fitted in the previous trial or by specifying a different partial width as the parameter to be varied.

Sometimes it is not possible to specify a cross section near the peak of a resonance. If the resonance occurs at negative energy, or if the total cross section (or transmission) is being fitted for a black or near black resonance, the cross section will be unreliable for the peak point. In this case ACSAP performs what is termed a "wing fit". On the FIT card, the resonance energy is entered as the peak point energy, and the corresponding cross section is left blank. If both a left and a right point are present, ACSAP will adjust E_0 in addition to one partial width. The reduced neutron width is adjusted unless either FISS or CAPT is entered as IDB (col. 5-8) of the FIT card. In the latter case, the partial width entered is the one adjusted.

Some cross section measurements contain contributions from contaminants in the samples used in the measurements. When such a contaminant is suspected, as many as 20 VALLEY points may be specified. These are points chosen in the valleys between resonances. At the end of each iteration, ACSAP computes all the differences between the VALLEY points and the points at the same energies, calculated from the current parameter values. These differences are averaged, and the average value is added to the calculated curve. A net nonzero value for this average valley bias suggests the presence in the experiment of a contaminant having a constant cross section. A net negative value could be interpreted as an indication that the data had previously been overcorrected for a contaminant during preparation for fitting. The valley bias is added only to the cross section being fitted, as specified by the ADJUST card. If no cross section is being adjusted, the valley bias is applied to the total cross section only.

Another way of handling contaminant backgrounds is afforded by the BIAS feature. A linear background may be added in either cross section or transmission, or a $1/V$ background may be added to the cross section.

A DIFF OUT card causes ACSAP to calculate, point by point, the difference between the theoretical curve, appropriately broadened, and a corresponding set of experimental data. The difference will be printed, plotted, or punched, as specified on the function card.

This feature has many applications. The output may be examined for evidence of missed resonances. It may be used directly, or appropriately averaged, in difference files such as these employed by ENDF/B. At the end of the printed difference tables are printed the value of chi-squared, and a comparison of the area covered by the theoretical and experimental data. The chi-squared value gives a goodness-of-fit parameter with which to compare different fits to the data. The integrals of the experimental data can be used to compare and perhaps normalize different sets of experimental data.

The difference calculation is a comparison between calculated and measured cross sections values, so ACSAP must have access to both types of data before it can proceed. If a table of theoretical data already exists, as it would if the DIFF OUT card is preceded by a LIST card, ACSAP uses that table for the difference calculation. If no such table exists, ACSAP calculates one. In this calculation the minimum point spacing is 0.01 eV.

Whether the LIST option is used or not the ISOTOPE, PARAMETER, and CONDITIONS cards must have been read in sometime before the DIFF OUT card. In comparing the theoretical and experimental data, ACSAP takes energies from the experimental data table. This energy probably does not exactly coincide with a point from the table of theoretical data, so ACSAP interpolates the latter table, using a four-point Lagrangian interpolation routine. Here is where some attention to detail is required of the user. If the theoretical data have been calculated on too wide a mesh, the four-point interpolation routine may generate some rather wild, unrealistic swings in the cross section. To avoid such difficulties, be sure the theoretical points have a sufficiently narrow spacing (eg $\sim \Gamma/5$).

V. CONCLUSIONS

In its years of development, ACSAP has grown to be a very versatile tool for evaluating neutron cross sections in the resonance region. Its variety of plot options makes it possible to examine and compare experimental data in various ways. The easy modification of resolution functions enables the evaluator to compare sets of resonance parameters to experimental data of diverse origins. The automated adjustment features greatly speed the process of obtaining fits of resonance parameters to data. The user can quickly review the sequence of his proposed computer run by scanning the key words as he thumbs through his card deck. The programmability of ACSAP thus not only increases its versatility, but also makes it easy to use and minimizes errors in preparing computer runs.

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APPENDIX A

USER'S MANUAL FOR ACSAP

This section contains complete instructions for filling out control cards to perform any of the ACSAP functions. The order in which the cards are assembled is at the discretion of the user. He can perform operations in any order he desires, provided that all pertinent information is entered before an action is called for. For example, ISOTOPE, PARAMETER, and CONDITIONS cards must precede a call for cross section calculation. LIST, ADJUST, PLOT, DIFF OUT, and PUNCHTHE all may call for such calculations, although all but ADJUST will use data previously calculated by LIST, provided the conditions have not changed. An ADJUST card must be preceded by the appropriate FIT cards. An AXIS card must precede a call to plot by PLOT, PLOTDATA, or DIFF OUT. The plot will bear the title punched on the most recent TITLE card. DATA or DATADISC cards must precede a call for PLOTDATA or DIFF OUT.

Keyword: ADJUST

Purpose: Results in iterations to modify resonance parameters.

Format:

Card Col		Mnemonics	FORTRAN format	Description
from	to			
1	10	IDA, IDB	2A4, 2X	Keyword ADJUST must be punched
11	20	ITMAX	I10	Number of iterations desired.
21	30	DUM1	A4, 6X	If first four columns of DUM1 are non-blank, a detailed printout of each iteration results. Otherwise only a summary listing is made.
31	40	XSEC	A4, 6X	Stipulates type of cross section to be fitted. May be: TOTAL, ABSORPTION, CAPTURE, FISSION, or SCATTERING. If left blank, the default is TOTAL.
41	50	FORM	A4, 6X	BREIT or REICH signifying the Breit-Wigner or Reich-Moore formula, respectively. If left blank, default is the Breit-Wigner formula for total cross sections, and the Reich-Moore formula for the partials.
51	60	XCODE	A4, 6X	Designates form of the abscissas of FIT and VALLEY points previously entered. Allowable codes are ENERGY and DELAY. Default is ENERGY.
61	70	YCODE	A4, 6X	Designates the form of the ordinates of FIT and VALLEY points previously entered. Default is SIGMA. Allowable codes are: SIGMA for cross sections TRANS for transmission SIGRE for cross section times the square root of energy
71	80	Not used		

Note: The ADJUST card must follow the FIT cards which designate the points to be fit. Since it will result in cross sections calculations, it must also be preceded by ISOTOPE, PARAMETER, and CONDITIONS cards.

Any number of iterations can be specified. Usually ITMAX is five or less.

Keyword: AXIS

Purpose: Creates a plot axis.

Format:

Card Col		Mnemonics	FORTRAN format	Description
from	to			
1	10	IDA,IDB	2A4,2X	Keyword AXIS must be punched
11	12	LNK	A2	If these columns contain LN a log axis will be drawn in the x direction. Otherwise it will be linear.
13	20	LABELX	A4,4X	Identifies x axis type. Any of the following codes may be used: DELAY for delay in μ sec TRANS for transmission SIGMA for cross sections (in barns) ENERGY for neutron energy (eV) SIGRE for cross sections times the square root of energy ALPHA for alpha ETA for eta Note: If a linear axis is desired, LNK need not be used and LABELX may start in Col. 11 if desired.
21	22	LNK	A2	If LN, y axis will be logarithmic, otherwise it will be linear.
23	30	LABELY	A4,4X	Identifies y axis type. Uses same codes as LABELX above. If a linear axis is desired, LABELY may begin in column 21.
31	40	XMIN	F10.0	Value of left end of x-axis
41	50	XMAX	F10.0	Value of right end of x-axis
51	60	YMIN	F10.0	Value at bottom of y-axis
61	70	YMAX	F10.0	Value at top of y-axis
71	75	XL	F5.0	Length of x-axis in inches
76	80	YL	F5.0	Length of y-axis in inches

Note: An axis card causes a plot axis to be drawn. Any number of plots may be put on the same axis. A subsequent AXIS card causes the plot to be advanced and a new axis drawn.

Keyword: BIAS 1/V

Purpose: Allows addition of a bias as a function of the reciprocal square root of the energy ($\text{bias}/\sqrt{E}$).

Format:

Card Col		Mnemonics	FORTRAN format	Description
from	to			
1	10	IDA,IDB	2A4,2X	Keyword BIAS 1/V
11	20	KOD(1)	A4,6X	Stipulates cross section type to which bias is to be added. Allowable codes are: TOTAL, ABSORPTION, CAPTURE, FISSION, or SCATTERING.
21	30	SLOP(1)	F10.0	Value of bias to be added (at 1 eV).
31	40	KOD(2)	A4,6X	(optional) Identifies cross section type of second bias value.
41	50	SLOP(2)	F10.0	(optional) Gives second bias value if KOD(2) is used.
51	60	KOD(3)	A4,6X	(optional) Identifies cross section type of third bias value.
61	70	SLOP(3)	F10.0	(optional) Gives third bias value if KOD(3) is used.
71	80	Not used		

Note: As many BIAS 1/V cards may be used as desired. If a subsequent card designates the same cross section type as a previous one, the latest bias entered will replace the earlier one.

Any bias read in for absorption cross section will be used. However, if none is entered, but biases for fission and/or capture are submitted, a bias for absorption will be computed. The computed bias will be the sum of the fission and capture bias.

Biases designated for the partial cross section data will not affect total cross section data.

Keyword: BIAS SIGMA

Purpose: Allows addition of a linear bias to theoretical cross sections. The bias is in the form: $\text{bias} = mE + b$, where m represents slope of the bias line, E is energy, and b is the y-intercept.

Format:

Card Col from to	Mnemonics	FORTTRAN format	Description
1 10	IDA, IDB	2A4, 2X	Keyword BIAS SIGMA
11 20	KOD(1)	A4, 6X	Stipulates type of cross section to which bias is to be added. Allowable codes are: TOTAL, ABSORPTION, CAPTURE, FISSION, and SCATTERING.
21 30	SLOP(1)	F10.0	Slope m , of bias line.
31 40	YINT(1)	F10.0	y-intercept b , of bias line.
41 50	KOD(2)	A4, 6X	(optional) Identifies cross section type for second bias line.
51 60	SLOP(2)	F10.0	(optional) Slope of second bias line.
61 70	YINT(2)	F10.0	(optional) y-intercept of second bias line.
71 80	Not used		

Note: As many BIAS SIGMA cards may be used as desired. If a subsequent card designates the same cross section type as a previous one, the latest bias entered will replace the earlier one.

Any bias read in for absorption cross section will be used. However, if none is entered, but biases for fission and/or capture are submitted, a bias for absorption will be computed. The computed slope and intercept will be the sum of the fission and capture slopes and intercepts, respectively.

Biases designated for partial cross sections data will not affect total cross section data.

Keyword: BIAS TRANS

Purpose: Allows background adjustment of transmission data. Data are entered as linear function; ie., bias = $md+b$, where m is the slope, d is time-of-flight (μsec), and b is the y-intercept.

Format:

Card Col		Mnemonics	FORTRAN format	Description
from	to			
1	10	IDA,IDB	2A4,2X	Keyword: BIAS TRANS
11	20	SLOPE	F10.0	Slope m of linear bias
21	30	YINTR	F10.0	y-intercept b , of linear bias
31	80	Not used		

Note: Transmission bias b_t is applied to total cross section data as follows:

$$T = e^{-n\sigma}(1. - b_t) + b_t$$

where: T is the adjusted transmission

n is sample thickness (atoms/barn)

σ is cross section (barns/atom)

b_t is the computed transmission bias.

This bias does not affect the partial cross section calculations.

Keyword: CLEAR

Purpose: To re-initialize ACSAP for a new problem, or to delete either VALLEY points or FIT points.

Format: This card has three forms.

Card Col		Mnemonics	FORTRAN format	Description
from	to			
1	10	IDA, IDB	2A4, 2X	Keyword: CLEAR This re-initializes ACSAP for an entire new problem.
11	80	Not used		

or:

Card Col		Mnemonics	FORTRAN format	Description
from	to			
1	10	IDA, IDB	2A4, 2X	Keyword: CLEAR FIT This option clears all previously entered FIT card data.
11	80	Not used		

or:

Card Col		Mnemonics	FORTRAN format	Description
from	to			
1	12	IDA, IDB	2A4, 4X	Keyword: CLEAR VALLEY This option re-initializes ACSAP pointers so that a new set of valley bias points may be entered.
13	80	Not used		

Keyword: COMMENTS

Purpose: To allow user to enter comments into input stream. These cards will be printed with input data.

Format:

Card Cols		Mnemonics	FORTRAN format	Description
from	to			
1	8	IDA,IDB	2A4	Keyword: COMMENTS (or blanks)
9	80	BUFFER	18A4	Any alphanumeric text.

Note: Comment cards cannot be used to enter information into ACSAP.

Function cards whose first four columns are blank will be treated as comment cards.

Keyword: CONDITIONS

Purpose: To describe experimental conditions which ACSAP will use to broaden the theoretical cross section curves.

Format:

Card Cols		Mnemonics	FORTRAN format	Description
from	to			
1	10	IDA, IDB	2A4, 2X	Keyword: CONDITIONS
11	20	TKEL	F10.0	Sample temperature in degrees Kelvin. This is used in Doppler broadening.
21	30	FP	F10.0	Flight path in meters.
31	40	BW	F10.0	Burst width in μ sec.
41	50	CW	F10.0	Channel width in μ sec.
51	60	DT	F10.0	Flight path uncertainty in centimeters.
61	70	XJIT	F10.0	Instrument jitter in μ sec.
71	80	RNOUT	F10.0	Reciprocal sample thickness (1/n) in barns/atom. This value will be used in the conversion of the broadened transmission to cross sections. If omitted, the default value assigned will be the 1/n value from the first ISOTOPE card entered. If no previous ISOTOPE cards have been read, default value is 5000.

Note: This card must be present before theoretical cross sections can be computed.

DT includes uncertainties due to detector thickness and moderator thickness.

RNOUT will often be the 1/n value of the major isotope. It is used to calculate composite cross sections from weighted individual values. For example, for j isotopes, the composite cross section will be given by:

$$\sigma = \frac{1}{n} \sum_{i=1}^j n_i \sigma_i$$

where: $\frac{1}{n}$ is RNOUT

n_i are the reciprocals of the ISOTOPE RNN values

σ_i are the cross sections of each isotope computed at the appropriate energy.

If FP, BW, CW, and DT are all left blank, resolution broadening will be skipped.

Keyword: DATA

Purpose: To enter experimental data (from cards).

Format:

Card Col		Mnemonics	FORTRAN format	Description
from	to			
1	8	IDA, IDB	2A4	Keyword: DATA
9	10	KS	A2	Any two character alphanumeric key. This allows ACSAP to recall any selected data set.
11	20	W(I)	F10.0	Ith energy value, where I depends upon how many DATA cards precede this one.
21	30	Z(I)	F10.0	Ith experimental cross section value.
31	40	W(I+1)	F10.0	Next energy value.
41	50	Z(I+1)	F10.0	Next cross section value.
51	60	W(I+2)	F10.0	Next energy.
61	70	Z(I+2)	F10.0	Next cross section.
71	80	Not used		

Note: ACSAP allows any number of DATA cards to be read. The data are collected in core, then written to disc in blocks of 150 points. These may later be recalled from disc for plotting or difference calculations.

Keyword: DATADISC

Purpose: To allow experimental data to be entered from a direct access device.

Format:

Card Col from to		Mnemonics	FORTTRAN format	Description
1	8	IDA, IDB	2A4	Keyword: DATADISC
9	10	KS	A2	Any two character alphanumeric key. This allows ACEAP to recall any selected data.
11	17	ISY	A5,2X	Atomic number and atomic weight for isotope. eg, ISY is 92235 for ²³⁵ U.
18	22	DAT	A3,2X	Data type. eg, DAT would be TOT or NF for total cross section or fission cross section, respectively.
23	26	MET	A2,2X	Experimental method. eg, TF for time-of-flight experiments.
27	31	INS	A3,2X	Reporting institution, eg, SAC for Saclay.
32	47	REF1, REF2	2A8	SCISRS format data reference.
48	49	ND	1X,11	Should be 1, 2, 3, or 4 to identify the direct access unit the experimental data resides on. The DISC subroutine will add 50 to ND to compute the logical unit number.
50	60	Not used		
61	70	E1	F10.0	Starting energy of data to be read from disc.
71	80	E2	F10.0	Final energy of data to be extracted from disc.

Note: Columns 11 through 47, inclusive, constitute an identifying title by which ACSAP will select the input data to be read. This title is arbitrary. In the above example it is similar to a SCISRS 1 format. ACSAP requires only that the identification in columns 11-47 match exactly the corresponding identification in the table of contents of the disc on which the data are stored.

Keyword: DIFFER IN

Purpose: To read in difference tables. Values interpolated (linearly) from these tables will be added to computed cross section data.

Format:

Card Col		Mnemonics	FORTRAN format	Description										
from	to													
1	9	IDA,IDB	2A4,1X	Keyword: DIFFER IN										
10	10	NDCOD	A1	Indicates the type of cross section to which difference table values are to be added. Table values are always added to total cross sections. In addition, the following codes in column 10 result in the indicated action. <table><thead><tr><th>Code</th><th>Action</th></tr></thead><tbody><tr><td>A</td><td>difference values added to absorption cross section</td></tr><tr><td>C</td><td>difference values added to capture and absorption cross sections</td></tr><tr><td>F</td><td>difference values added to fission and absorption cross sections</td></tr><tr><td>S</td><td>difference values added to scattering cross sections</td></tr></tbody></table>	Code	Action	A	difference values added to absorption cross section	C	difference values added to capture and absorption cross sections	F	difference values added to fission and absorption cross sections	S	difference values added to scattering cross sections
Code	Action													
A	difference values added to absorption cross section													
C	difference values added to capture and absorption cross sections													
F	difference values added to fission and absorption cross sections													
S	difference values added to scattering cross sections													
11	20	W(I)	F10.0	Ith energy value of difference table.										
21	30	Z(I)	F10.0	Ith difference value.										
31	40	W(I+1)	F10.0	(I+1)st energy value.										
41	50	Z(I+1)	F10.0	(I+1)st difference value.										
51	60	W(I+2)	F10.0	(I+2)nd energy value.										
61	70	Z(I+2)	F10.0	(I+2)nd difference value.										
71	80	Not used												

Note: ACSAP currently allows only one difference table at a time.

Keyword: DIFF OUT

Purpose: To produce tables of the differences between a set of experimental data and theoretical data. Differences are punched with the same abscissas as the experimental data.

Format:

Card Col		Mnemonics	FORTRAN format	Description
from	to			
1	8	IDA,IDB	2A4	Keyword DIFF OUT
9	10	KS	A2	Any two character alphanumeric key. This allows ACSAP to recall selectively any experimental data for computing difference tables.
11	20	EI	F10.0	Starting energy of difference tables.
21	30	EM	F10.0	Final energy value of tables.
31	40	XSEC	A4,6X	Alphanumeric code indicating type of cross sections to be subtracted from the experimental data. Allowable codes are TOTAL, ABSORPTION, CAPTURE, FISSION, and SCATTERING.
41	50	FORM	A4,6X	Alphanumeric code; either BREIT designating the Breit-Wigner formula, or REICH for the Reich-Moore formula.
51	60	PCH	A4,6X	If this word is nonblank, the tables will be directed to logical unit 7. (card punch unit).
61	70	PRNT	A4,6X	If this word is nonblank, the computed tables will be printed.
71	80	PLT	A4,6X	If this word is nonblank, the tables will be plotted. Note: If this option is used, the DIFF OUT card must be preceded by an appropriate AXIS card.

Note: This card must be preceded by function cards which input experimental cross section data, as well as those necessary to allow computation of theoretical data.

A DIFF OUT function card will cause ACSAP to punch difference tables in the format of the DIFFER IN function cards. Thus they may be used as input difference tables on subsequent runs.

Keyword: FIT

Purpose: Enters experimental data points to be fit by ACSAP.

Format:

Card Col		Mnemonics	FORTRAN format	Description
from	to			
1	4	IDA	A4	Keyword FIT must be punched starting in column 1.
5	10	IDB	A4,2X	One of the following may be used to cause ACSAP to override the defaults: CAPT, FISS. See note below.
11	20	ID	2A4,A2	Isotope identification. Must be identical to the identification of one of the ISOTOPE cards.
21	30	EP	F10.0	Abscissa of the peak of the resonance. This value must always be present.
31	40	SP	F10.0	Ordinate of the peak point of the resonance. SP is left blank (or zero) for wing fit.
41	50	EL	F10.0	Abscissa of the fit point on the left side of the resonance. EL should be zero (or blank) if no left fit point is used.
51	60	SL	F10.0	Ordinate of the left fit point. SL should be present if EL is.
61	70	ER	F10.0	Abscissa of the fit point on the right side of the resonance. ER should be zero (or blank) if no right fit point is used.
71	80	SR	F10.0	Ordinate of the right fit point. SR should be present if ER is.

Note: One FIT card must be included for each resonance to be fit.

The abscissas of the fit points may be expressed in either energy or delay. The ordinates may be in transmission, cross sections, or cross sections times the square root of the energy. All FIT and VALLEY cards must utilize the same units. If the chosen units are other than energy and cross section, they must be indicated on the ADJUST card.

When SHAPE fitting ACSAP will adjust the peak energy, the reduced neutron width, and the capture width by default. If FISS is specified for IDB, ACSAP will adjust the fission width instead of the capture width.

For PEAK or WING fitting, ACSAP will usually adjust the reduced neutron width. This may be overridden by coding IDB with one of the indicated options. This will cause ACSAP to adjust the capture width or the fission widths instead.

For WING fit, enter the resonance energy as EP, but leave SP blank or zero.

Keyword: ISOTOPE

Purpose: To enter information for each isotope or spin state.

Format:

Card Col		Mnemonics	FORTRAN format	Description
from	to			
1	10	IDA, IDB	2A4, 2X	Keyword ISOTOPE must be punched.
11	20	ID	2A4, A2	Alphanumeric identification. May also be used to identify different spin states. See note below.
21	30	ATWTN	F10.0	Atomic weight of isotope.
31	40	SPOT	F10.0	Potential scattering of isotope. If this entry is zero or blank, ACSAP will compute the potential scattering contribution.
41	50	GV	F10.0	The statistical weight factor associated with this isotope.
51	60	RNN	F10.0	The reciprocal sample thickness for isotope in barns per atom. This value is used to convert total cross sections to transmission. See the note on the CONDITIONS card write-up for the relationship between this variable and the RNOUT which is input on the CONDITIONS card.
61	80	Not used		

Note: ACSAP allows up to 25 "different" isotope cards per run. "Different" means that the ID information is different. If an isotope card is read with the same ID as a previous one it will replace the former one.

The last two digits of the ID (col. 19, 20) can be used to designate different spin states. If an ISOTOPE card contains a blank in col. 19 and a 1 in col. 20, and a second isotope card has an identical ID except for a 2 in col. 20, it is considered that these cards represent two spin states of the same isotope. Both should contain the same value for SPOT (potential scattering), which will be divided between them according to the ratio of their respective GV values.

If an ISOTOPE card has an ID with a blank in col. 19 and a 3 in col. 20, the potential scattering contribution will be zero. This allows some resonances to remain unassigned (GV should be .5), while others are assigned to spin states.

ACSAP computes potential scattering (σ_p) using the relationships:

$$\sigma_p = 4\pi R^2$$
$$\text{where } R = 1.45 \times 10^{-13} A^{1/3}$$

A = atomic weight of isotope.

ACSAP computes σ_p only if SPOT is blank or zero.

Keyword: LIST

Purpose: Causes cross section values to be printed.

Format:

Card Col		Mnemonics	FORTRAN format	Description
from	to			
1	10	IDA,IDB	2A4,2X	Keyword LIST
11	20	EI	F10.0	Starting energy of printout
21	30	EM	F10.0	Final energy of printout
31	40	DS	F10.0	Minimum energy increment of output. This spacing will be used over peaks of resonances. ACSAP will also use this value as maximum spacing allowed for sampling the resonances, ie, cross section values will be computed internal to ACSAP with a spacing which will not exceed DS.
41	50	DM	F10.0	Maximum energy increment of output. This value will be used in the valleys between resonances.
51	55	XCOD(1)	A4,1X	The XCOD values are used to designate the types of cross sections desired. ACSAP will always print total cross sections and whatever partials are stipulated here. Allowable codes are: TOTA, ABSO, CAPT, FISS, SCAT, ALPH, and ETA. Note: If ETA is desired; enter ETA into XCOD(1) and punch the value of nu bar into col. 61 through 70 (F10.0 format). This will cause total, cap- ture, and fission cross sections to be printed as well as alpha and eta.
56	60	XCOD(2)	A4,1X	
61	65	XCOD(3)	A4,1X	
66	70	XCOD(4)	A4,1X	
71	80	FORM	A4,6X	Designates cross section formula to be used. Allowable codes are BREIT (for Breit-Wigner formula) and REICH (for Reich-Moore formula)

Note: ACSAP prints neutron energy and both broadened and unbroadened cross section data. Total cross sections are always printed and the partial cross sections are printed as stipulated in XCOD. If room permits ACSAP will print cross sections times the square root of energy and transmission and delay as well. If ALPHA or ETA are designated in XCOD, ACSAP will print capture and fission cross section data also.

Keyword: MODERATOR

Purpose: Modifies resolution width to compensate for the effect of neutron slowing down time in the moderator.

Format:

Card Col		Mnemonics	FORTRAN format	Description
from	to			
1	10	IDA, IDB	2A4, 2X	Keyword MODERATOR
11	20	EH1	F10.0	EH1 and EH2 are the energy limits within which the holdup function will be applied.
21	30	EH2	F10.0	
31	40	AH	F10.0	AH parameter used to describe moderator holdup effect (μ sec).
41	80	Not used		

Note: The moderator slow down function is given by:

$$\text{HOLDUP} = \text{AH}/\text{SQRT}(E)$$

where E is the neutron energy. This function is defined by arithmetic function statements in the subroutines ADJUST, COMBCO, and READY. It may easily be modified as desired.

The value computed by the above expression is combined with the resolution width to compensate for moderation effects.

Keyword: PARAMETER

Purpose: To enter parameter values in ACSAP

Format:

Card Col		Mnemonics	FORTRAN format	Description
from	to			
1	10	IDA, IDB	2A4, 2X	Keyword PARAMETER
11	20	ID	2A4, A2	Alphanumeric identification. This must be identical to the ID on an ISOTOPE card.
21	30	EON	F10.0	Energy at peak of resonance in eV.
31	40	GM	3PF10.0	Γ_n^0 , reduced neutron width in meV.
41	50	GA	3PF10.0	Γ_γ , gamma width of resonance in meV.
51	60	GF1	3PF10.0	Γ_{f1} , fission width first channel (in meV).
61	70	GF2	3PF10.0	Γ_{f2} , fission width in second channel (in meV).
71	80	GF3	3PF10.0	Γ_{f3} , fission width in third channel (in meV). GF3 allows use of noninterfering fission widths.

Note: A current PARAMETER card will replace a preceding one if both the following two conditions are met:

1. The two ID values are identical.
2. The EON values differ by .0005 eV or less.

If the single level Breit-Wigner formula is used to compute cross sections, the fission width is taken as $|\Gamma_{f1}| + |\Gamma_{f2}| + |\Gamma_{f3}|$. For the Reich-Moore multilevel formula, the signs of the fission widths are retained. They are significant in establishing the pattern of interference between levels.

Keyword: PLOT

Purpose: Produces plot of theoretical data.

Format:

Card Col		Mnemonics	FORTRAN format	Description
from	to			
1	10	IDA, IDB	24A, 2X	Keyword PLOT
11	20	E1	F10.0	Starting energy of data to be plotted.
21	30	E2	F10.0	Final energy of data to be plotted.
31	35	DIV	F5.0	For solid lines DIV is the minimum spacing between points (in eV). For dashed lines DIV is a basic length along the cross section curve (in inches). DIV should be small enough to sample the data adequately.
36	38	LDASH	I3	Not used for solid line plotting. For dashed lines the length of the dash is determined by LDASH times DIV. If LPOINT is not used, the length of the space between dashes is the same as the length of the dashes.
39	40	LPOINT	I2	Not used for solid line plotting, optional for dashed lines. If used LPOINT is the number of points which will be plotted in the spaces between dashes. In this case the spacing between points and between dashes and points will be 0.1 inches.
41	50	XCOD(1)	A4, 6X	Designates the type of data to be plotted. Allowable codes are: TOTAL, ABSORPTION, CAPTURE, FISSION, SCATTERING, ALPHA, ETA. The default is TOTAL.
51	60	FORM	A4, 6X	Designates formula to be used. BREIT stipulates Breit-Wigner, and REICH the Reich-Moore formula.
61	70	LABX	A4, 6X	(optional) Designates the form in which the abscissa is to be plotted. Acceptable codes are the same as for LABELX in the AXIS card, ie, DELAY, TRANS, SIGMA, ENERGY, SIGRE, ALPHA, or ETA.
71	80	LABY	A4, 6X	(optional) Designates the form in which the ordinate is to be plotted. Acceptable codes are the same as for LABX, but should be compatible with XCOD designation.

Keyword: PLOT (Continued from previous page.)

Note: PLOT cards may be stacked, one behind another, and will result in multiple plots on the same axis. An AXIS card is necessary to advance the plotter to start a new plot.

If LABX or LABY are left blank they will default to the values of LABELX and LABELY, respectively, from the AXIS card.

Keyword: PLOTDATA

Purpose: To plot experimental data.

Format:

Card Col		Mnemonics	FORTRAN format	Description
from	to			
1	8	IDA,IDB	2A4	Keyword PLOTDATA
9	10	KS	A2	Alphanumeric key which should correspond to key on DATA or DATADISC card. This allows selective plotting of data. If KS is left blank, all existing sets of experimental data will be plotted.
11	20	E1	F10.0	Starting energy (delay) above which data will be plotted.
21	30	E2	F10.0	Final energy (delay) below which data will be plotted.
31	40	LABX	A4,6X	Designates the form in which the abscissa will be plotted. See note.
41	50	LABY	A4,6X	Designates the form in which the ordinate is to be plotted. See note.
51	60	IS	A4,6X	Designates the plotting symbol to be used. See note.
61	70	INX	A4,6X	(optional) Stipulates the form of the input data abscissas. Acceptable codes are the same as for LABX. ACSAP will convert the data, if necessary, from whatever form is identified here to that which is desired for output.
71	80	INY	A4,6X	(optional) Stipulates the form of the input data ordinates. Acceptable codes are the same as for LABX.

Note: PLOTDATA cards may be intermixed with PLOT cards so that theoretical and experimental data may be plotted on the same axis.

If LABX or LABY are left blank they will default to the values of LABELX and LABELY, respectively, from the AXIS card. Acceptable codes for LABX or LABY are the same as are detailed for LABELX on the AXIS card, ie, DELAY, TRANS, SIGMA, ENERGY, SIGRE, ALPHA, and ETA.

Acceptable codes for IS and their plotting symbols are:

<u>Code</u>	<u>Symbol</u>	<u>Code</u>	<u>Symbol</u>	<u>Code</u>	<u>Symbol</u>
X	X	TRIANGLE	Δ	DASH	-
Y	Y	SQUARE	□	LINE	(See next page)
Z	Z	ARROW	↑		
Diamond	◇	STAR	*		

Keyword: PLOTDATA (Continued from previous page.)

The default value for IS is X. If any of the above symbol codes are preceded by a L, a line will be drawn between symbols, eg, LSTAR will cause data to be presented by asterisks, but the pen will not be lifted between symbols.

If LINE is selected for IS, a continuous line will be drawn between data points, but no special symbol will appear at the points themselves.

Keyword: PUNCH

Purpose: To punch sets of updated PARAMETER cards, which may then be used in subsequent runs.

Format:

Card Col		Mnemonics	FORTRAN format	Description
from	to			
1	10	IDA, IDB	2A4, 2X	Keyword PUNCH
11	80	Not used		

Note: This card will cause a set of cards suitable for input into subsequent runs to be punched. The cards will be punched as follows:

A TITLE card identical to last TITLE card entered except that columns 73 through 80 will be replaced with the current date.

ISOTOPE cards.

PARAMETER cards.

CONDITIONS card.

These cards will have a sequence number punched in columns 8, 9, and 10. There will also be a listing produced of all cards punched. The sequence number and the listing allow easy identification of the cards in the event it is not convenient to interpret them.

Keyword: PUNCHTHE

Purpose: To produce card image of the theoretical data in a format which may be read back into ACSAP.

Format:

Card Col		Mnemonics	FORTRAN format	Description
from	to			
1	8	IDA, IDB	2A4, 2X	Keyword PUNCHTHE
9	10	KS	2A	Alphanumeric key which will be punched on the output data cards. This may then be used in subsequence runs to identify particular data sets.
11	20	EI	F10.0	Starting energy of output cards.
21	30	EM	F10.0	Final energy of output cards.
31	40	DS	F10.0	Minimum energy spacing between points. Used over peaks of resonance.
41	50	DM	F10.0	Maximum energy spacing between points. Used in valleys between resonances.
51	55	XCOD(1)	A4, 1X	Alphanumeric code indicating which type of data is to be punched. Allowable codes are: TOTA, ABSO, CAPT, FISS, SCAT, ALPH, and ETA.
56	60	FORM	A4, 1X	Alphanumeric code designating formula to be used. BREIT designates the single level Breit-Wigner formula, and REICH designates the multilevel Reich-Moore formula.
61	70	BNU	F10.0	This word should be left blank unless ETA is specified for XCOD(1). In that event BNU contains the value of $\bar{v}$ used to compute eta from alpha.
71	80	FACTOR	F10.0	Multiplication factor used to control simulated experimental error in cross sections of data punched. See note below.

Note: One of the purposes of this card is to simulate experimental data. For this reason, ACSAP punches cards (three energy-cross section pairs per card) which may be read back in as experimental data.

In order to simulate experimental error, the values output are computed by:

$$\sigma_0 = \sigma_t + rf \sqrt{\sigma_t}$$

where σ_0 is cross section punched
 σ_t is cross section computed
 r is a random number between -1 and 1
 f is FACTOR, entered as input.

If FACTOR = 0, then $\sigma_0 = \sigma_t$.

Keyword: RESOLUTION

Purpose: Allows user to change resolution functions.

Format:

Card Col.		Mnemonics	FORTRAN format	Description
from	to			
1	10	IDA,IDB	2A4,2X	Keyword RESOLUTION
11	20	RLT(I)	F10.0	Ith value of resolution table.
21	30	RLT(I+1)	F10.0	(I+1)th value of resolution table.
		.		
		.		
61	70	RLT(I+5)	F10.0	(I+5)th value of resolution table.
71	80	Not used		(One may use these columns for a sequence number.)

Note: ACSAP will read a 29 point resolution table representing a new resolution function. The points should be equally spaced across the resolution function (thus abscissas need not be entered). They should be punched six values per card for a total of five cards.

ACSAP will normalize the resolution function to unit area for use in convoluting it with the theoretical data.

If new resolution tables are not entered, ACSAP uses a Gaussian shape.

Keyword: TIME

Purpose: Prints elapsed CPU time since start of program and since last call to TIME.

Format:

Card Col		Mnemonics	FORTRAN format	Description
from	to			
1	10	IDA,IDB	2A4,2X	Keyword TIME
11	80	Not used		

Keyword: TITLE

Purpose: Enters titling information for all printed and plotted output.

Format:

Card Col		Mnemonics	FORTRAN format	Description
from	to			
1	8	IDA,IDB	2A4	Keyword TITLE Up to 72 columns of alphanumeric data. This will appear on all printed and plotted output.
9	80	TITLE	18A4	

Keyword: VALLEY

Purpose: Enters points to be fit in valleys between resonances.

Format:

Card Col		Mnemonics	FORMAT format	Description
from	to			
1	10	IDA, IDB	2A4, 2X	Keyword VALLEY
11	20	EV(I)	F10.0	Abscissa of the Ith valley point.
21	30	SV(I)	F10.0	Ordinate of the Ith valley point.
31	40	EV(I+1)	F10.0	Abscissa of the (I+1)th valley point.
41	50	SV(I+1)	F10.0	Ordinate of the (I+1)th valley point.
51	60	EV(I+2)	F10.0	Abscissa of the (I+2)th valley point.
61	70	SV(I+2)	F10.0	Ordinate of the (I+2)th valley point.
71	80	Not used		

Note: Up to 20 valley points may be entered. ACSAP will accept from one to three data pairs (energy and cross section or delay and transmission) per card.

The theoretical cross sections data will be adjusted to fit the average of the valley points entered.

The abscissas of the fit points may be expressed in either energy or delay. The ordinates may be in transmission, cross sections, or cross sections times the square root of the energy. All FIT and VALLEY cards must utilize the same units. If the chosen units are other than energy and cross section, they must be indicated on the ADJUST card.

APPENDIX B

PROGRAMMER'S KEY TO ACSAP SUBROUTINES

This appendix outlines the structure of ACSAP from a programmer's viewpoint. It should be useful to anyone adapting ACSAP to his own computer.

Section 1 contains a brief description of each of the subroutines in ACSAP. This is intended to convey a general idea of the main function of the various subroutines and entry points of ACSAP.

Table B-1 shows a cross reference of the distribution of common blocks throughout the various ACSAP routines. The common blocks are associated with the columns of the table, and the routine names with the rows. If a common block occurs in a given subroutine, an "X" will occur in the table at the intersection of that common block's column and the subroutine's row.

Table B-2 depicts the interaction between the various ACSAP routines. The ACSAP routines are associated with the various rows of the table, and the subroutines they call (which includes most ACSAP routines) are associated with its various columns. An "X" in a given table position indicates that the corresponding row routine "calls" the column subroutine. For example, an examination of the table column corresponding to the READY subroutine indicates that it is "called" both by MAIN and by PLTSET.

Section 2 outlines briefly the internal management of both experimental and theoretical data by ACSAP. This includes the required format of experimental data if it is to be read into ACSAP from some external direct access device.

Certain "local system" subroutines are used by ACSAP. Anyone implementing ACSAP on his own computer may choose to replace or delete these subroutines. Examples of such routines are date, time, and plotting routines. Subroutines which the authors consider to be candidates for replacement are discussed in Section 3.

Section 4 contains write-ups on the subroutines constituting the Calcomp plotting package.

[illegible]

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SUBROUTINES CALLED

CALLING ROUTINES	I	E	T	P	F	I	R	P	P	P	A	P	D	D	F	C	A	P	D	T	T	C	H	Z	V	S	L	B	C	P	P	S	D	R	D	L	P	A	L	P				
	IR	IR	IS	IE	IT	IR	IR	IR	IR	IR	IR	IR	IR	IR	IR	IR	IR	IR	IR	IR	IR	IR	IR	IR	IR	IR	IR	IR	IR	IR	IR	IR	IR	IR	IR	IR	IR	IR	IR	IR	IR	IR		
	RM	SE	EG	IL	IT	AF	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI	AI		
	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	SS	
	EE	EE	EE	EE	EE	EE	EE	EE	EE	EE	EE	EE	EE	EE	EE	EE	EE	EE	EE	EE	EE	EE	EE	EE	EE	EE	EE	EE	EE	EE	EE	EE	EE	EE	EE	EE	EE	EE	EE	EE	EE	EE	EE	
	TT	TT	TT	TT	TT	TT	TT	TT	TT	TT	TT	TT	TT	TT	TT	TT	TT	TT	TT	TT	TT	TT	TT	TT	TT	TT	TT	TT	TT	TT	TT	TT	TT	TT	TT	TT	TT	TT	TT	TT	TT	TT	TT	TT
MAIN	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
ADJUST																																												
BADCRD																																												
BIAS																																												
COMBCO																																												
CONVRT																																												
CONVRT																																												
DIFTBL																																												
DISC																																												
DLINE																																												
FITPTS																																												
HOLDUP																																												
LAIN																																												
PAGEIT																																												
PCHDA																																												
PLOTIT																																												
PLTFIT																																												
PLTSET																																												
PRINT1																																												
PRINT2																																												
READY																																												
SIGMAS																																												
TABLES																																												

Table B-2 The interaction between various ACSAP routines. An "X" in a given position indicates that the corresponding row routine "calls" the column subroutine.

1. MAIN FUNCTION OF ACSAP SUBROUTINES

MAIN	The main routine in ACSAP analyzes the input function cards to determine which action should be performed. Some actions are completed by MAIN while others may be accomplished by calls to the appropriate subroutines. MAIN also calls routines for error checking as well as time and date routines.
ADJUST	This subroutine will adjust the neutron resonance parameters so that the computed cross section curve will fit the designated experimental data points.
AXISDR	This is an entry point in the subroutine PLOTIT. Its purpose is to determine scale factors for plotting and to draw the plot axis.
BADCRD	This routine is called by the IBM error handling routines when a read error number 215 is encountered (a mispunched card can cause a 215 error). This routine sets a flag which can be interrogated by FLAGIT.
BIAS	Computes various bias values used in calculating cross section values.
COMBCO	This routine computes Doppler and resolution broadened cross section from input parameters. These values are written onto logical unit 10. They are then available for any of the functions ACSAP may perform, eg, printing or plotting.
CONVIT	This routine transforms data from one form to another; eg, it is used to convert from cross section to transmission (or visa versa).
CONVRT	If the coordinates of the FIT and VALLEY points are not already in energy vs cross sections, this routine will convert them. Since ACSAP works internally with energy and cross sections, this subroutine allows the user to enter his points in the most convenient units.
DATSET	This is an entry point in PLTSET which reads experimental data from logical unit 11 for plotting purposes. Once the desired data have been selected, DATSET calls the appropriate plotting routine (PLOTUT).
DIFTBL	This subroutine produces difference tables between experimental and theoretical data. The theoretical data are interpolated at the energies of the experimental data. The difference tables may be printed and/or plotted and/or punched.
DISC	This subroutine reads experimental data from logical units 51, 52, 53, and/or 54 as designated by the input. The data are blocked and rewritten onto logical unit 11 in a format compatible with the other ACSAP subroutines.

DLINE	This subroutine is called by the plotting routines to plot dashed line shapes.
ERRSET	One of IBM's subroutines for error handling. It modifies the entries in the option table so that 215 errors may be handled by ACSAP. For further information see p. 123 IBM System/360 Operating System FORTRAN IV (G and H) Programmers Guide GC28-6817-2.
FITPTS	This subroutine does housekeeping associated with FIT points, such as identification of resonances, counting and replacement of previously entered points.
FLAGIT	An entry point in BADCRD which interrogates flag set by BADCRD when a read error 215 occurs. This entry writes an appropriate message giving the status of the read operation.
HOLDUP	This subroutine computes the resolution effect due to deceleration of neutrons in the moderator.
LAIN	This subroutine performs a 4-point Lagrangian interpolation.
PAGEIT	This subroutine handles the pagination for ACSAP.
PCHDA	This subroutine punches theoretical data computed from input resonance parameters.
PCHPAR	This is an entry point in PCHDA. It punches ISOTOPE, PARAMETER and CONDITION cards with current values. These cards may be used in subsequent runs.
PLOTIT	This subroutine does the necessary housekeeping associated with plotting theoretical data.
PLOTUT	An entry point in PLOTIT. This entry performs the scaling and plotting of theoretical data.
PLTFIT	This subroutine plots data entered on FIT and VALLEY cards.
PLTSET	This subroutine interprets the PLOT card information and obtains the theoretical values to be plotted.
PRINT1	This subroutine prints current running conditions, isotope and parameter information.
PRINT2	This subroutine prints broadened and unbroadened theoretical cross section values.
READY	This is an initialization subroutine which sets up print headings and sets logical switches properly.
SIGMAS	This subroutine computes unbroadened cross section values using either Breit-Wigner single-level formula or the Reich-Moore multilevel formula.

TABLES	This subroutine analyzes and normalizes input resolution tables.
VALE	This is an entry point in the READY subroutine. When called it computes a valley bias used in adjusting the theoretical cross section curve through the VALLEY points.
ZEROIN	This subroutine is called by ADJUST to determine the energies at which the computed cross section on the sides of resonance are equal to those of the entered FIT points.

2. INTERNAL MANAGEMENT OF DATA

ACSAP uses external storage devices for intermediate storage in three instances: 1) to store calculated theoretical data, 2) to store experimental data which have been read in, and 3) to store difference tables which are read into ACSAP. In each of these cases the I/O instructions are sequential, and although ACSAP uses disc locally, presumably any external storage device, including magnetic tape, could be used.

Theoretical cross section data are stored on logical unit 10. Any function card which requires theoretical data will cause ACSAP to determine if the data have previously been computed under the desired circumstances. If so, it will be currently residing on logical unit 10, and will be read into memory as needed. If it is not available, the subroutine COMBCO will compute this broadened theoretical data and store it on unit 10. It is then available for printing, plotting, computing difference tables, etc. COMBCO will output the data in logical records of 150 data points per record (last record may be less). The storing and retrieval of these data are sequential, and should be compatible with most conventional storage devices.

Theoretical data will be stored on disc using the FORTRAN unformatted WRITE as follows: Each logical record will contain up to 150 points each of total, absorption, capture, fission, and scattering cross section data. The first item written on unit 10 will be N, the number of energy points which follow ($N \leq 150$). Next will be N values of energy in ascending order, followed by N values of total cross section data. This is followed by N values of absorption data, N values of capture data, N values of fission data, and N values of scattering cross section data. Actually the foregoing arrays will contain valid data only if it has been requested by the input to ACSAP; however all the above arrays are always written.

Both the experimental data and the difference tables are stored sequentially, with up to 150 data pairs per logical record. They are written as follows: 1) the first value is N, the number of points which follow, 2) N values of energy (in eV) are next, 3) finally N values of experimental cross sections or differences, whichever applies, is written. Experimental data are stored on logical unit 11, and the difference tables on logical unit 12.

ACSAP has the capability of selectively reading experimental data which are stored on some direct access device(s). Up to four data sets may be accessed during any one ACSAP run. These are assigned the logical unit numbers 51, 52, 53, and 54, which are selected by the input DATADISC card. The DISC subroutine will search the designated unit for the specified data. When the desired data are located, DISC will read and store the data between the desired energy limits. These data are written on logical unit 11, as has been previously discussed for theoretical cross section data.

Each direct access data disc contains 1950 logical binary records of 480 bytes each, described by a define file statement: DEFINE FILE 51(1950,480,L,I). The first 5 records contain the disc index, consisting of space for 50 experimental data set identifiers, which are blocked 10 per logical record. Each experimental data set identifier contains 48 bytes of information describing the data to which it refers, as follows:

MNEMONIC	TYPE	DESCRIPTION
ISO	R*8	Isotope name
DAT	R*4	Data type
MET	R*4	Experimental method
INS	R*4	Reporting institution
REF1	R*8	} SCISRS reference
REF2	R*8	
NUM	I*4	Number of points in data set
EI	R*4	Initial energy of data (eV)
EF	R*4	Final energy of data (eV)

The rest of the disc contains cross section vs energy data points. Each "data point" consists of 6 single precision words as follows:

MNEMONIC	TYPE	DESCRIPTION
EN	R*4	Energy
ENR	R*4	Energy error
SIG	R*4	Sigma (cross section)
SIGR	R*4	Sigma error
N1	I*4	Sequence number within experimental data set
N2	I*4	Sequence number on disc

20 such "data points" are blocked per logical record. The disc can contain 38900 data points.

3. AUXILIARY SUBROUTINES USED BY ACSAP

The following subroutines may or may not be available to anyone implementing ACSAP. It may be desirable to replace or, in some cases, delete them. These subroutines will be included as a separate file on the ACSAP transmittal tape.

INFILQ is the most important assembly language subroutine used by ACSAP. It enables ACSAP to re-read an input card, ie, ACSAP first reads the keyword from a function card. After the keyword has been identified, the remainder of the card is re-read using the appropriate format. INFILQ modifies IBCOM (standard IBM FORTRAN I/O routines) such that the next read instruction will cause the desired information to be transferred from a designated core buffer area. Any installation converting ACSAP may desire to replace INFILQ with its own re-read capabilities (eg, DECODE). If no such capabilities exist, the data from any input card may be written on some external device and immediately re-read under the appropriate format. The last alternative is crude and slow, but will accomplish re-read capabilities.

The DATE is an assembly language subroutine which returns the current date in a double precision word. It is called by PAGEIT and PCHDA, and may be replaced by a local subroutine, or omitted from ACSAP.

The TIMSET is an assembly language subroutine which is used for timing various functions of ACSAP. The entry point TIMSET initializes the timing routine, and a call to the entry point TIMER returns elapsed time (in seconds) since the previous call to either TIMSET or TIMER. This subroutine is called from the main program of ACSAP. Calls to it may be replaced by local routines or omitted entirely.

RANDR is an assembly language subroutine which computes random numbers uniformly distributed on the unit interval. This subroutine is called by PCHDA if a PUNCHTHE function card is encountered by ACSAP.

The remaining subroutines used by ACSAP constitute a Calcomp plotting package. The local write-ups on these subroutines are included in this report as an aid to anyone implementing ACSAP. This package consists of the following FORTRAN subroutines: PLOTL, PLOTS, PLTSEP, PLOT, PLTMRK, DXDY, SCALE, LINE, NUMBER, NORMAL, AXIS, LDXDY, LSCALE, LAXIS, and the following assembly language subroutines: WRTPLT, PLTJOB, SYMBL4, BCDBYT, SYMBL5, HOLOCT.

4. CALCOMP PLOTTING PACKAGE

PLOTL and PLOTS

These subroutines are used to plot the job information and/or a plot sequence number. The pen can be moved to the specified location to perform these tasks in either a raised or lowered position. It should be noted that a call to PLOTL or PLOTS must be the first plotting routine called in order to establish the step increment size for future plotting and to initialize the output data properly.

The calling sequence is:

CALL PLOTL (X,Y,IC) for plotting on 200 increments/inch plotter
or CALL PLOTS (X,Y,IC) for plotting on 100 increments/inch plotter

where

1. X and Y are the floating point coordinates (in inches) of the point to which the pen is to be moved before the job information and/or sequence number is plotted.
2. IC is a fixed point number or variable name which specifies the pen position during the pen movement.

IC=0,1,2 for pen lowered

IC ≥ 3 for pen raised

The first call to either PLOTL or PLOTS will plot the job information and a sequence number after moving to the specified X,Y coordinates. All subsequent calls to PLOTL or PLOTS will plot just the sequence number. A new origin (X=0, Y=0) will be assigned to the point at which the bottom edge of the plotting paper and the right edge of the sequence number intersect.

Normally, a call to PLOTL or PLOTS should be made at the beginning of each plot. This will make it possible, in the event of operations problems (such as running out of paper or ink, mechanical failures, etc.), to restart the plotting at a given plot by referring to its associated sequence number.

The job information which will precede the first plot will contain the job name, the date, and time of day. The time of day will reflect the time when the first PLOTL or PLOTS routine was called.

PLOT

This subroutine is called to move the pen from its present location to a new location. The pen can be moved either in a raised or lowered position. The new location may also be established as a new origin for future pen movements.

The calling sequence is:

CALL PLOT (X,Y,IC)

where

1. X and Y are the floating point coordinates (in inches) of the point to which the pen is to be moved.

2. IC is a fixed point number or variable name which specifies the pen position during the pen movement.

IC=0,1,2 for pen lowered

IC $\geq$ 3 for pen raised

3. The sign of IC specifies the setting of a new origin. If IC is negative, a new origin (X=0 and Y=0) is assigned to the new pen location after the pen has been moved to X,Y.

PLTMRK

This subroutine places a plus sign (+) with a corresponding mark number at the X,Y location specified so that a restart may be made at that point in case of an operational failure.

The calling sequence is:

CALL PLTMRK (X,Y)

where

1. X and Y are the floating point coordinates (in inches) where the plus sign and mark number are to be plotted. The pen is always raised during the movement to and from the X,Y coordinates.

It is suggested that this subroutine be called occasionally during extremely long plots to facilitate a restart within the plot.

DXDY

This subroutine is a scale adjuster routine which determines a scale factor (DX for the X array and DY for the Y array) for use in the SCALE routine.

The calling sequence is:

CALL DXDY (XMAX,XMIN,DX,S)

where

1. XMAX is the floating point maximum value of the set of data.
2. XMIN is the floating point minimum value of the set of data on the entry to the routine.
3. DX is the floating point units per inch scale factor.
4. S is the floating point length of the axis in inches.

DX will be returned with one of the following values:

1×10^N
 2×10^N
 2.5×10^N
 4×10^N
 5×10^N
 8×10^N

This routine is normally not called by the user.

SCALE

This subroutine searches an array of data to determine the maximum and minimum values for use in the DXDY routine. After a scaling factor has been determined by DXDY, the SCALE routine converts an array of data to appropriate units to fit the graph the user has specified. (The original data in the array has now been destroyed.)

The calling sequence is:

CALL SCALE (X,N,S,XMIN,DX,K) for the X array
 or CALL SCALE (Y,N,S,YMIN,DY,K) for the Y array

where

1. X and Y are the locations of the floating point data arrays.
2. N is the fixed point number of points in the X or Y arrays.
3. S is the floating point length of the axis in inches.
4. XMIN and DX (YMIN and DY) are the locations of the floating point minimum array value and the scale factor, respectively, returned by DXDY.
5. K is a fixed point stepping increment used in selecting data from the array, i.e., if K=1 each data point will be used, if K=2 every second, if K=3 every third, etc. If K is negative 0.0 is forced for a minimum value and stepping occurs by K. If the data is double-precision, then K must be a multiple of 2, i.e., if K=2 each data point will be used, if K=4 every second, etc.

The formula for converting the data is

$$X(I) = \frac{[X(I) - XMIN]}{DX}$$

An example would be

CALL SCALE (X,6,8,0,XMIN,DX,1)

where X contains the following numbers (in floating point form):

X	20.0
X + 1	60.0
X + 2	90.0
X + 3	180.0
X + 4	120.0
X + 5	100.0

This call would result in the following scaled results in the original locations:

X	0.0
X + 1	2.0
X + 2	3.5
X + 3	8.0
X + 4	5.0
X + 5	4.0

and XMIN=20.0 and DX=20.0

This data along with Y data similarly scaled would be ready for plotting and would fit on the graph in an optimum manner. The XMIN and DX values are usually used in the call to AXIS.

LINE

This subroutine is used to draw a continuous line or curve through a series of scaled data points.

The calling sequence is:

```
CALL LINE (X,Y,N,K)
```

where

1. X and Y are floating point data arrays containing the X and Y coordinates (in inches).
2. N is the fixed point number of data points in each of the arrays.
3. K is a fixed point stepping increment used in selecting data from the array, i.e., if K=1 each data point will be plotted, if K=2 every second, if K=3 every third, etc. If K is negative, the pen will be moved to X(1), Y(1) in a lowered position. If K is positive, the pen will be moved to X(1), Y(1) in a raised position. If the data is double-precision, then K must be a multiple of 2, i.e., if K=2 each data point will be plotted, if K=4 every second, etc.

This routine assumes that the data points have been scaled.

SYMBL4

This subroutine is used to draw alphameric characters and special symbols on a plot..

The calling sequence is:

CALL SYMBL4 (X,Y,HT,BCD,THETA,N)

where

1. X and Y are the floating point coordinates (in inches) for the lower left-hand corner of the first character.
2. HT is the floating point character height, where $.07 \text{ inches} < HT < \text{graph size}$.
3. BCD is the starting location of a string of BCD characters or it may be the actual characters expressed in standard Hollerith FORTRAN notation.
4. THETA is the floating point angle in degrees at which the characters are to be plotted.
5. N is the fixed point number of characters to be plotted or the location where it may be found. If N is a negative value, the pen will not be raised between symbols.

Table B-3 shows the plotter characters available for use with the IBM 360/75. A (✓) check indicates centered symbol. When no symbol is listed the symbol plotted will be the space unless a special character is inserted in the table by using SYMBL5.

NUMBER

This subroutine converts a floating point number (positive or negative) to BCD and draws the resulting alphameric characters on the plot.

The calling sequence is:

CALL NUMBER (X,Y,HT,DIGIT,THETA,N)

where

1. X and Y are the floating point coordinates (in inches) which locate the lower left corner of the first character in the number.
2. HT is the floating point character height where $.07 \text{ inches} < HT < \text{graph size}$.
3. DIGIT is the floating point number or location of the number which is to be plotted.
4. THETA is the floating point angle in degrees at which the number is to be plotted.

TABLE B-3
PLOTTER SYMBOL TABLE

SYMBOL	HEX CODE	DECIMAL CODE	PUNCHED CARD CODE	SYMBOL	HEX CODE	DECIMAL CODE	PUNCHED CARD CODE
	00	0	12-0-1-8-9		24	36	0-4-9
	01	1	12-1-9		25	37	0-5-9
	02	2	12-2-9		26	38	0-6-9
	03	3	12-3-9		27	39	0-7-9
	04	4	12-4-9		28	40	0-8-9
	05	5	12-5-9		29	41	0-1-8-9
	06	6	12-6-9	√□	2A	42	0-2-8-9
	07	7	12-7-9		2B	43	0-3-8-9
	08	8	12-8-9	√*	2C	44	0-4-8-9
	09	9	12-1-8-9	√Y	2D	45	0-5-8-9
√X	0A	10	12-2-8-9	√K	2E	46	0-6-8-9
	0B	11	12-3-8-9	√Z	2F	47	0-7-8-9
√-	0C	12	12-4-8-9		30	48	12-11-0-1-8-9
√+	0D	13	12-5-8-9		31	49	1-9
√→	0E	14	12-6-8-9		32	50	2-9
√↑	0F	15	12-7-8-9		33	51	3-9
	10	16	12-11-1-8-9		34	52	4-9
	11	17	11-1-9		35	53	5-9
	12	18	11-2-9		36	54	6-9
	13	19	11-3-9		37	55	7-9
	14	20	11-4-9		38	56	8-9
	15	21	11-5-9		39	57	1-8-9
	16	22	11-6-9		3A	58	2-8-9
	17	23	11-7-9		3B	59	3-8-9
	18	24	11-8-9		3C	60	4-8-9
	19	25	11-1-8-9	√◇	3D	61	5-8-9
√←	1A	26	11-2-8-9	√△	3E	62	6-8-9
	1B	27	11-3-8-9		3F	63	7-8-9
	1C	28	11-4-8-9	SPACE	40	64	no punches
√X	1D	29	11-5-8-9		41	65	12-0-1-9
√X	1E	30	11-6-8-9		42	66	12-0-2-9
√X	1F	31	11-7-8-9		43	67	12-0-3-9
	20	32	11-0-1-8-9		44	68	12-0-4-9
	21	33	0-1-9		45	69	12-0-5-9
	22	34	0-2-9		46	70	12-0-6-9
	23	35	0-3-9		47	71	12-0-7-9

SYMBOL	HEX CODE	DECIMAL CODE	PUNCHED CARD CODE	SYMBOL	HEX CODE	DECIMAL CODE	PUNCHED CARD CODE
	48	72	12-0-8-9	—	6D	109	0-5-8
	49	73	12-1-8	>	6E	110	0-6-8
¢	4A	74	12-2-8	?	6F	111	0-7-9
•	4B	75	12-3-8		70	112	12-11-0
<	4C	76	12-4-8		71	113	12-11-0-1-9
(	4D	77	12-5-8		72	114	12-11-0-2-9
+	4E	78	12-6-8		73	115	12-11-0-3-9
	4F	79	12-7-8		74	116	12-11-0-4-9
&	50	80	12		75	117	12-11-0-5-9
	51	81	12-11-1-9		76	118	12-11-0-6-9
	52	82	12-11-2-9		77	119	12-11-0-7-9
	53	83	12-11-3-9		78	120	12-11-0-8-9
	54	84	12-11-4-9		79	121	1-8
	55	85	12-11-5-9	:	7A	122	2-8
	56	86	12-11-6-9	#	7B	123	3-8
	57	87	12-11-7-9	@	7C	124	4-8
	58	88	12-11-8-9	'	7D	125	5-8
	59	89	11-1-8	=	7E	126	6-8
!	5A	90	11-2-8	"	7F	127	7-8
\$	5B	91	11-3-8		80	128	12-0-1-8
*	5C	92	11-4-8		81	129	12-0-1
)	5D	93	11-5-8		82	130	12-0-2
;	5E	94	11-6-8		83	131	12-0-3
→	5F	95	11-7-8		84	132	12-0-4
-	60	96	11		85	133	12-0-5
/	61	97	0-1		86	134	12-0-6
	62	98	11-0-2-9		87	135	12-0-7
	63	99	11-0-3-9		88	136	12-0-8
	64	100	11-0-4-9		89	137	12-0-9
	65	101	11-0-5-9		8A	138	12-0-2-8
	66	102	11-0-6-9		8B	139	12-0-3-8
	67	103	11-0-7-9		8C	140	12-0-4-8
	68	104	11-0-8-9		8D	141	12-0-5-8
	69	105	0-1-8		8E	142	12-0-6-8
	6A	106	12-11		8F	143	12-0-7-8
,	6B	107	0-3-8		90	144	12-11-1-8
%	6C	108	0-4-8		91	145	12-11-1

SYMBOL	HEX CODE	DECIMAL CODE	PUNCHED CARD CODE	SYMBOL	HEX CODE	DECIMAL CODE	PUNCHED CARD CODE
	92	146	12-11-2		B7	183	12-11-0-7
	93	147	12-11-3		B8	184	12-11-0-8
	94	148	12-11-4		B9	185	12-11-0-9
	95	149	12-11-5		BA	186	12-11-0-2-8
	96	150	12-11-6		BB	187	12-11-0-3-8
	97	151	12-11-7		BC	188	12-11-0-4-8
	98	152	12-11-8		BD	189	12-11-0-5-8
	99	153	12-11-9		BE	190	12-11-0-6-8
	9A	154	12-11-2-8		BF	191	12-11-0-7-9
	9B	155	12-11-3-8		C0	192	12-0
	9C	156	12-11-4-8	A	C1	193	12-1
	9D	157	12-11-5-8	B	C2	194	12-2
	9E	158	12-11-6-8	C	C3	195	12-3
	9F	159	12-11-7-8	D	C4	196	12-4
	A0	160	11-0-1-8	E	C5	197	12-5
	A1	161	11-0-1	F	C6	198	12-6
	A2	162	11-0-2	G	C7	199	12-7
	A3	163	11-0-3	H	C8	200	12-8
	A4	164	11-0-4	I	C9	201	12-9
	A5	165	11-0-5		CA	202	12-0-2-8-9
	A6	166	11-0-6		CB	203	12-0-3-8-9
	A7	167	11-0-7		CC	204	12-0-4-8-9
	A8	168	11-0-8		CD	205	12-0-5-8-9
	A9	169	11-0-9		CE	206	12-0-6-8-9
	AA	170	11-0-2-8		CF	207	12-0-7-8-9
	AB	171	11-0-3-8		D0	208	11-0
	AC	172	11-0-4-8	J	D1	209	11-1
	AD	173	11-0-5-8	K	D2	210	11-2
	AE	174	11-0-6-8	L	D3	211	11-3
	AF	175	11-0-7-8	M	D4	212	11-4
	B0	176	12-11-0-1-8	N	D5	213	11-5
	B1	177	12-11-0-1	O	D6	214	11-6
	B2	178	12-11-0-2	P	D7	215	11-7
	B3	179	12-11-0-3	Q	D8	216	11-8
	B4	180	12-11-0-4	R	D9	217	11-9
	B5	181	12-11-0-5		DA	218	12-11-2-8-9
	B6	182	12-11-0-6		DB	219	12-11-3-8-9

SYMBOL	HEX CODE	DECIMAL CODE	PUNCHED CARD CODE	SYMBOL	HEX CODE	DECIMAL CODE	PUNCHED CARD CODE
	DC	220	12-11-4-8-9				
	DD	221	12-11-5-8-9				
	DE	222	12-11-6-8-9				
	DF	223	12-11-7-8-9				
	E0	224	0-2-8				
	E1	225	11-0-1-9				
S	E2	226	0-2				
T	E3	227	0-3				
U	E4	228	0-4				
V	E5	229	0-5				
W	E6	230	0-6				
X	E7	231	0-7				
Y	E8	232	0-8				
Z	E9	233	0-9				
	EA	234	11-0-2-8-9				
	EB	235	11-0-3-8-9				
	EC	236	11-0-4-8-9				
	ED	237	11-0-5-8-9				
	EE	238	11-0-6-8-9				
	EF	239	11-0-7-8-9				
0	F0	240	0				
1	F1	241	1				
2	F2	242	2				
3	F3	243	3				
4	F4	244	4				
5	F5	245	5				
6	F6	246	6				
7	F7	247	7				
8	F8	248	8				
9	F9	249	9				
	FA	250	12-11-0-2-8-9				
	FB	251	12-11-0-3-8-9				
	FC	252	12-11-0-4-8-9				
	FD	253	12-11-0-5-8-9				
	FE	254	12-11-0-6-8-9				
	FF	255	12-11-0-7-8-9				

5. N is a fixed point integer representing the number of decimal places to be printed.

N	Number Plotted
-6	+X.XXXXX+EE
-5	+X.XXXX+EE
-4	+X.XX+EE
-3	+X.XX+EE
-2	+X.X+EE
-1	+XXXXXX
0	+XXXXXX.
1	+XXXXX.X
2	+XXXX.XX
3	+XXX.XXX
4	+XX.XXXX
5	+X.XXXXX
6	+XXXXXX
7	+X.XXXXX+EE

For

N=-2, -3, ..., -6, an exponential will be plotted with the number of significant digits represented by the absolute value of N with a maximum of six digits.

N=-1, no decimal point will be plotted.

N=0, a decimal point will be plotted with no fractional characters.

N=1, 2, ..., 6, N fractional characters will be plotted.

N=7, an exponential will be plotted with six significant digits.

N=-7, the subroutine will calculate the format to be used.

AXIS

This subroutine is used to draw an axis with tic marks and scale values at every inch. Also, there is a provision for labeling the axis, drawing tic marks only, or drawing a dummy axis only (no scale values or label).

The calling sequence is:

```
CALL AXIS (X,Y,LABEL,NC,SIZE,THETA,VMIN,DV,N)
```

where

1. X and Y are the floating point coordinates (in inches) for the start of the axis.
2. LABEL is the character information (either Hollerith notation or location of the actual characters) for identifying the axis.

3. NC is the fixed point number of characters in LABEL.
 If NC>0, a LABEL will be drawn,
 NC=0, no LABEL,
 NC=-1, tic marks only,
 NC=-2, dummy axis.
4. SIZE is the floating point length of the axis in inches.
5. THETA is the floating point angle in degrees at which the axis will be drawn. Normally angle=0.0° or 90.0°.
6. VMIN is the floating point minimum value on the axis (usually obtained from SCALE).
7. DV is the floating point scale increment or location thereof which represents the values between tic marks (usually obtained from SCALE).
8. N is a fixed point integer representing the number of decimal places for a value on the axis. (See table in NUMBER routine.)

LDXDY

This subroutine is a scale adjuster routine which determines a scale factor (DX for the X-array and DY for the Y-array) for use in the LSCALE routine.

The calling sequence is:

```
CALL LDXDY (XMAX,XMIN,DX,S)
```

where

1. XMAX is the floating point $\log_{10}$ of the maximum value of the set of data.
2. XMIN is the floating point $\log_{10}$ of the minimum value of the set of data on entry to the routine.
3. DX is the floating point log units per inch scale factor.
4. S is the floating point length of the axis in inches.

XMIN is adjusted to the nearest lower integer and is returned in floating point form. XMAX is adjusted to the nearest upper integer and used to calculate DX in the following manner:

$$DX = \frac{I(XMAX) - I(XMIN)}{S}$$

This routine is normally not called by the user.

LSCALE

This subroutine searches an array of data to determine the maximum and minimum values for use in the LDXDY routine. After a scaling factor has been determined by LDXDY, the LSCALE routine takes an array of data and converts it to the appropriate units to fit the graph the user has specified. (Note: The original data in the array has now been destroyed.)

The calling sequence is:

CALL LSCALE (X,N,S,XMIN,DX,K) for the X-arrays
or CALL LSCALE (Y,N,S,YMIN,DY,K) for the Y-arrays

where:

1. X and Y are the locations of the floating point data arrays.
2. N is the fixed point number of points in the X and Y arrays.
3. S is the floating point length of the axis in inches.
4. XMIN and DX (YMIN and DY) are the locations of the floating point minimum array value and the scale factor, respectively, returned by LDXDY.
5. K is a fixed point stepping increment used in selecting data from the array, i.e., if K=1 each data point will be used, if K=2 every second, if K=3 every third, etc. If the data is double-precision, then K must be multiple of 2, i.e., if K=2 each data point will be used, if K=4 every second, etc.

The formula for converting the data is:

$$X(I) = \frac{\log_{10}[X(I)] - \log_{10}[XMIN]}{DX}$$

An example would be:

CALL LSCALE (X,6,5.0,XMIN,DX,1)

where X contains the following numbers in floating point form:

X	20.0
X+1	180.0
X+2	930.0
X+3	14.0
X+4	556.0
X+5	389.0

This call would result in the following scaled results in the original locations:

X	0.752575
X+1	3.138175
X+2	4.921200
X+3	0.365325
X+4	4.362675
X+5	3.974875

and XMIN=1.0 and DX=0.4.

This data along with Y data similarly scaled would be ready for plotting and would fit on the graph in an optimum manner.

XMIN and DX would be specified for input to LAXIS.

LAXIS

This subroutine is used to draw a log axis with tic marks at each integer value for each power of 10 (eq. 1×10^1 , 2×10^1 , etc.) and each power of 10 is also printed.

The calling sequence is:

```
CALL LAXIS (X,Y,LABEL,NC,SIZE,THETA,XMIN,DX,N)
```

where

1. X and Y are the floating point coordinates (in inches) for the start of the axis.
2. LABEL is the character information (either Hollerith notation, or the location of the actual characters) for identifying the axis.
3. NC is the fixed point number of characters in the LABEL to be plotted.
4. SIZE is the floating point length of the axis in inches.
5. THETA is the floating point angle in degrees at which the axis will be drawn. Only multiples of 90° are accepted (i.e., 0., 90., 180., 270.).
6. XMIN is the floating point minimum power of 10 value on the log axis (usually obtained from LSCALE).
7. DX is the floating point scale increment or location thereof which represent the values on the log axis. DX is in log units per inches and should be the number of decades divided by the total length in inches of the axis.
8. N is a fixed point control number for a dummy axis. If N equals zero, a dummy axis with tic marks is drawn and if N is not zero, a normal axis is drawn.

SYMBL5

This subroutine allows the user to define his own symbols. SYMBL4 must be used to plot the symbol.

The calling sequence is:

```
CALL SYMBL5 (NUMB,N,CODE)
```

where

1. NUMB is the hexadecimal number which will define a character in the Plotter Symbol Table for SYMBL4.
2. N is the fixed point number of coordinate pairs in CODE.
3. CODE is the hexadecimal string of coordinate pairs.

A symbol is defined by giving the coordinates for the pen movements on a 5 x 8 grid. A coordinate pair is any X and Y coordinate on the 5 x 8 grid. The pen is normally raised to move to the first point; for the exception refer to the description of SYMBL4.

* * * *	07 17 27 37 47
* * * *	06 16 26 36 46
* * * *	05 15 25 35 45
* * * *	04 14 24 34 44
* * * *	03 13 23 33 43
* * * *	02 12 22 32 42
* * * *	01 11 21 31 41
* * * *	00 10 20 30 40

For example, the greek letter β (Beta) may be defined by this string of 12 coordinate pairs: 000737464534043443423101. Suppose that the user wishes to assign the hexadecimal number B2 to the new symbol β . Since there is no symbol associated with B2 in the Plotter Symbol Table (Table B-3) the following FORTRAN coding may be used to define the new symbol and draw it on the plotter.

```
DIMENSION PAIRS (3)
DATA PAIRS/Z00073746,Z45340434,Z43423101/,BETA/1H 0/
.
.
CALL SYMBL5 (178,12,PAIRS)
.
.
CALL SYMBL4 (X,Y,HT,BETA,THETA,1)
.
.
```

Centered symbols use a 3 x 3 grid with the coordinate 11 as the center. A centered symbol should begin at the center position and end by leaving the pen at the center position.

```

* * * * *
* * * * *
* * * * *
* * * * *
* * * * *
* * * * *
* * * * *

```

For example an enclosed slash which is centered may be defined by this string of eight coordinate pairs: 1100022200202211. To distinguish this string of coordinate pairs as defining a centered symbol, a 4 is added to the first X coordinate. Therefore, the string would appear as: 5100022200202211.

If the user wishes to assign the hexadecimal number A1 to this new symbol, the following FORTRAN coding would be used to define the new symbol and to draw it on the plotter:

```

DIMENSION CODE (2)
DATA CODE/Z51000222,Z00202211/,CSLSH/1H 0/
.
.
CALL SYMBL5 (161,8,CODE)
.
.
CALL SYMBL4 (X,Y,HT,CSLSH,THETA,1)
.
.

```

In drawing some symbols it may be advantageous to be able to raise the pen to move to a new point rather than retrace some of the lines. By adding 4 to the X coordinate of the point being moved to, the pen will be raised, moved to the new point, and then lowered.

```

* * * * *
* * * * *
* * * * *
* * * * *
* * * * *
* * * * *
* * * * *

```

For example, the letter K may be defined by this string of coordinate pairs if the pen is not raised: 000704470440. However, if the pen is raised, the letter may be defined by this string of coordinate pairs (which eliminates having to retrace two lines to get to the point 47): 0007870440. (The 8 is the result of 4 being added to the X coordinate.)

NOTE: The card punch codes referred to in the DATA statements of the preceding examples are found in Plotter Symbol Table B-3 with their associated plotter symbol (if one is assigned), hex code, and decimal code.

HOLUCT

This subroutine is sometimes used before calling SYMBL4. Its purpose is to convert a symbol into its EBCDIC equivalent in order for SYMBL4 to plot it on the graph.

For example:

```
CALL HOLUCT (SQ,16H2A000000000000)
```

converts to EBCDIC the alphameric characters necessary to draw , a centered square. The characters are in the DOUBLE PRECISION location identified by SQ. The statement

```
CALL SYMBL4 (X,Y,HT,SQ,THETA,1)
```

will draw , a centered square, at X,Y.

It should be noted that this same task can be accomplished more efficiently through the use of a DATA statement in the following manner:

```
DATA SQ/Z2A000000/    or    DATA SQ/1H0289/
```

```
CALL SYMBL4 (X,Y,HT,SQ,THETA,1)
```

will draw , a centered square, at X,Y.

APPENDIX C

COMPUTER ENVIRONMENT

A description of the IBM 360/75 configuration under which ACSAP was developed is given. The entire configuration is shown in Figure C-1 and Table C-1. It should be noted that ACSAP requires only a subset of this system.

The data processing hardware which makes up the System/360 computer complex consists of three basic systems; the IBM System/360 Model 75, IBM 1130 Remote Terminals, and an Information International FR-80 Computer Output Microfilm (COM) Recorder. Each of the systems operates independently or as a unit to provide general commercial and scientific data processing services for the NRTS.

The IBM System/360 Model 75 is one of a series of solid-state commercial, scientific, communications, and control applications. Major components comprising the 360/75 are: an IBM 2075-J Processing Unit, IBM 2365 Processor Storage, IBM 2860 Selector Channels, and IBM 2870-1 Multiplexor Channel with input/output devices attached to the channel through control units.

Data input and output for the System/360 can utilize several storage media, such as punched cards, magnetic tape, and disk. Disk and drum "volumes" normally provide on-line storage for system, program library, interim (scratch), and user data files. Plots can be directed to the FR-80 microfilm recorder if film output is desired, to Calcomp incremental plotters for hard-copy plotter output, and line printers for printed hard-copy reports. Interactive graphics capability is available on IBM 2250 display units.

A block diagram of the 360/75 system is shown in Figure C-1. The diagram shows all the system devices and their respective system interfaces. The component model numbers and special feature numbers are shown for reference purposes. A list of the components and features is shown in Table C-1. Specific component data and descriptions of special features associated with each can be obtained from the IBM publication, IBM System/360 System Summary, Form A22-6810.

Table C-1
360/75 COMPONENTS AND SPECIAL FEATURES

Type	Model	Feature	Qty	Description
1052	7		1	Console Keyboard
1403	N1		2	Printer
		8640	2	Universal Character Set
1416	1		2	Interchangeable Train Cartridge for Printer
2075	J		1	Processing Unit
2150	1		1	Console Control
		5475	1	Control Panel
2250	1		1	CRT Display Unit
		1002	1	Absolute Vectors
		1245	1	Alphameric Keyboard
		1498	1	Buffer, 4096 Locations
		1880	1	Character Generator
		4485	1	Graphic Design Feature (light pen)
		5855	1	Program Function Keyboard
2301	1		2	Drum Storage
2314	1		3	Direct Access Storage
2365	3		4	Processor Storage (262,144 bytes)
2401	2		2	Magnetic Tape Unit (7-track)
		5121	2	Mode Compatibility
2401	5		5	Magnetic Tape Unit (9-track)
		3471	2	Dual Density (800/1600 bpi)
2540	1		1	Card Read/Punch
2701	1		3	Data Adapter Unit
		3815	3	Expanded Capability
		3855	3	Expansion Feature
		7697	5	Synchronous Data Adapter Type II
		8029	5	Transparency Feature
		3464	1	Dual Communications Interface
		3855	1	Expansion Feature
		7885	1	Telegraph Adapter Type II
		RPQ880701	1	1627 Plotter Attachment
2803	2		2	Magnetic Tape Control
		5320	1	9-Track Compatibility (800 bpi)
		3228	1	Data Conversion
		7127	1	7-Track Compatibility
2820	1		1	Drum Storage Control
2821	1		1	Control Unit
		3615	1	1100 LPM Adapter
		8637	1	Universal Character Set Adapter #1
2821	2		1	Control Unit
		3615	1	1100 LPM Adapter
		8637	1	Universal Character Set Adapter #1
2860	3		1	Selector Channel (3 channels)
2870	1		1	Multiplexor Channel
		6990	1	1st Selector Sub-channel
		6991	1	2nd Selector Sub-channel

Fig. C-1 System 360/75 configuration.

APPENDIX D

SAMPLE PROBLEMS

Included with the program package is a set of sample problems. These are built around a pair of resonances in a fictitious material, identified as 295-XS. The parameters and assumed experimental conditions are shown in Table D-1. Mock experimental data, covering the energy region 10-15 eV, are also included in the program packages. These data were generated and randomized by ACSAP, using the PUNCHTHE option.

Problem number 1 is simply to plot the experimental data. The total cross section is plotted as arrows, fission as diamonds, and capture as triangles, all on the same plot. The plot is done twice, once as cross section vs energy on linear-linear axes, then as $\sigma\sqrt{E}$ vs energy, with the ordinate given a logarithmic scale. The ACSAP control cards to accomplish this plotting task are shown in Figure D-1. The two plots obtained are shown in Figures D-2 and D-3.

Problem number 2 introduces a set of trial parameters for these resonances. ACSAP calculates the fission cross section from these trial parameters and plots the calculated curve as a dashed line. The experimental data are then plotted as diamonds. FIT points are introduced, and ACSAP performs eight iterations. The fitted curve is shown as a solid line on the same plot as the trial curve, with the FIT points shown as large squares. Finally, a difference calculation is called for.

The ACSAP input for this problem is shown in Figure D-4, and the resulting plot in Figure D-5. Note that the fitted curve was plotted following a LIST card, while the trial curve was plotted without listing the calculated data. When a plot is requested, ACSAP uses an existing array of calculated data, provided a suitable array exists. If such a list is not available, the necessary computation is performed. A change in the parameters, experimental conditions, or resolution function will cause ACSAP to disregard previously calculated data and to make fresh calculations when they are required.

When the LIST option is used, ACSAP provides, in addition to the listed data, values of $\int \sigma dE$ and $\int \sigma dE/E$ for the theoretical cross sections, over the region in which they were calculated. Similarly, when a listing of difference data is called for under the DIFF OUT option, ACSAP provides

a comparison of the experimental and theoretical integrals, as well as a value of chi-squared, divided by the number of experimental points.

Problem number 3 is a comparison of single-level and multilevel fits. The ACSAP input is illustrated in Figure D-6. The fission data are first fitted with the multilevel formula, as was done in Problem number 2. A difference calculation is performed, and the results printed. Next the data are fitted with single-level parameters, using the same FIT points as were used in the multilevel fit. The FIT points could have been changed, if desired, by inserting a CLEAR FIT card, followed by a new set of FIT cards. The single-level fit is plotted as a dash-dot curve on the same set of axes as the multilevel fit. Finally, a difference calculation is made for the single-level fit. This time, in addition to the listing, the difference is plotted and punched on cards. Figure D-7 shows the two fits, and Figure D-8 shows the difference between the single-level fit and the data, point by point.

These three problems can all be run in one computer submission. Figure D-9 shows the necessary ACSAP input. The output listing is shown in Figure D-10. The five plots, two fits, and two difference calculations generated by this combined problem require approximately one minute and fifty seconds on the IBM 360/75 computer.

The Job Control Language may vary somewhat from installation to installation. For the IBM 360/75 in use at the Computer Science Center at Idaho Falls, Idaho, the ACSAP procedures used are shown in Figure D-11. In practice, these procedures are catalogued under the name ACSAP. They are then called into operation by a single control card.

These few problems should be sufficient to demonstrate the operation of ACSAP. They do not by any means test all the features of the program. The user may experiment with other combinations, and in doing so may try combinations not tested by the authors. That is where difficulties are usually discovered. Users are invited to communicate to the authors their experience with ACSAP.

TABLE D-1

CONDITIONS FOR ACSAP TEST PROBLEMS

Isotope	295-XS
Atomic Weight	295.
G (Statistical Weight Factor)	0.5
Reciprocal Sample Thickness	1000 barns/atom
Potential Scattering	11.0 barns

RESONANCE PARAMETERS

E_o	Γ_n^o	Γ_γ	Γ_{F1}	Γ_{F2}
12.20	0.40	40	250	0
13.02	0.10	40	50	0

EXPERIMENTAL CONDITIONS

Flight Path	50 Meters
Sample Temperature	300° K
Burst Width	0.5 μ s
Channel Width	0.5 μ s
Detector Thickness	1.2 cm
Instrument Jitter	0.001 μ s

TITLE ACSAP SAMPLE PROBLEM #1: PLOTTING EXPERIMENTAL DATA								
DATA	TX	10.000	14.57	10.020	14.34	10.040	14.13	1
.	.	.	.	.	.	.	.	.
DATA	TX	14.960	13.26	14.980	14.11	15.000	13.67	129
.	.	.	.	.	.	.	.	.
DATA	CX	10.000	0.43	10.020	0.45	10.040	0.55	1
.	.	.	.	.	.	.	.	.
DATA	CX	14.960	0.14	14.980	0.33	15.000	0.36	129
.	.	.	.	.	.	.	.	.
DATA	FX	10.000	3.20	10.020	3.10	10.040	3.17	1
.	.	.	.	.	.	.	.	.
DATA	FX	14.960	2.18	14.980	2.18	15.000	1.62	129
TITLE 295-XS XSEC: ARROW=TOTAL, DIAMOND=FISSION, TRIANGLE=CAPTURE.								
AXIS	ENERGY	SIGMA	10.	15.	0.	500.	10.	10.
PLOTDATA TX	10.	15.	ENERGY	SIGMA	ARROW	ENERGY	SIGMA	
PLOTDATA FX	10.	15.	ENERGY	SIGMA	DIAMOND	ENERGY	SIGMA	
PLOTDATA CX	10.	15.	ENERGY	SIGMA	TRIANGLE	ENERGY	SIGMA	
AXIS	ENERGY	LNSIGRE	10.	15.	1.	10000.	10.	10.
PLOTDATA TX	10.	15.	ENERGY	SIGRE	ARROW	ENERGY	SIGMA	
PLOTDATA FX	10.	15.	ENERGY	SIGRE	DIAMOND	ENERGY	SIGMA	
PLOTDATA CX	10.	15.	ENERGY	SIGRE	TRIANGLE	ENERGY	SIGMA	

Fig. D-1 ACSAP input for Sample Problem No. 1. This run will plot total, fission, and capture cross sections for the mock nucleus 295-XS. The data are to be plotted twice: first as σ vs E on a linear scale, then as $\sigma\sqrt{E}$ vs E with the ordinate given a logarithmic scale. For brevity, the input data are represented by only two cards for each cross section. If disc storage were used, each cross section set would be called by a single DATADISC card.

Fig. D-2 ACSAP linear plot of the total, fission, and capture cross sections for the mock isotope 295-XS, between 10 and 15 eV. The total cross section is represented by arrows, the fission by diamonds, and the capture by triangles.

Fig. D-3 ACSAP semilogarithmic plot of cross sections for 295-XS between 10 and 15 eV. The total cross section is represented by arrows, the fission by diamonds, and the capture by triangles. The data are shown as $\sigma\sqrt{E}$ vs E .

TITLE ACSAP SAMPLE PROBLEM #2: MULTILEVEL FIT TO 295-XS								
DATA	TX	10.000	14.57	10.020	14.34	10.040	14.13	1
DATA	TX	14.960	13.26	14.980	14.11	15.000	13.87	129
DATA	CX	10.000	0.43	10.020	0.45	10.040	0.55	1
DATA	CX	14.960	0.14	14.980	0.33	15.000	0.36	129
DATA	FX	10.000	3.20	10.020	3.10	10.040	3.17	1
DATA	FX	14.960	2.18	14.980	2.18	15.000	1.62	129
ISOTOPE	295-XS	295.	11.	.5	1000.			
PARAMETER	295-XS	12.1	.05	40.	100.			
PARAMETER	295-XS	13.1	.05	40.	100.			
CONDITIONS	300.	50.	.5	.5	1.2	.001	1000.	
AXIS	ENERGY	LNSIGMA	10.	15.	1.	1000.	10.	10.
PLOT	10.	15.	.01	5	FISSION	REICH	ENERGY	SIGMA
PLOTDATAFX	10.	15.	ENERGY	SIGMA	DIAMOND	ENERGY	SIGMA	
FIT FISSFX295-XS		12.20	403.82	12.00	171.7	12.39	154.25	
FIT FISSFX295-XS		13.04	148.70	12.96	70.8	13.14	74.97	
ADJUST	8	DETAIL	FISSION	REICH				
LIST	10.	15.	.01	.02	TOTA CAPT	FISSION	SCAT	REICH
PLOT	10.	15.	.01	FISSION	REICH	ENERGY	SIGMA	
PUNCH PARAM								
DIFF OUTFX	10.	14.9	FISSION	REICH			LIST	

Fig. D-4 ACSAP input for Sample Problem No. 2. In this problem the two resonances of 295-XS are fitted with the Reich-Moore multilevel formula. First the fission cross section generated by the trial parameters is plotted as a dashed line. No listing of these calculated data is called for. The experimental data will also be plotted. The FIT cards list three representative points for each resonance. The fitted curve will be required to pass through these points. For both resonances the fission width will be adjusted to give the proper resonance width. The ADJUST card calls for eight iterations, with detailed information printed for each iteration. The cross sections generated by the fitted parameters are then listed. The fitted curve will be plotted as a solid line on the same axes as the trial curve. The current set of parameters are punched in ACSAP format. Finally, a difference calculation is called for.

Fig. D-5 Multilevel fit to the fission cross section of 295-XS between 10 and 15 eV. This represents the results of Sample Problem No. 2. The preliminary parameters generated the cross sections shown as a dashed line. The fitted curve is the solid line. The FIT points are represented by squares and the experimental data by diamonds.

SAMPLE PROBLEM #3: MULTILEVEL AND SINGLE LEVEL COMPARISON 295-XS							
TITLE	TX	10.000	14.57	10.020	14.34	10.040	14.13
DATA	TX	14.960	13.26	14.980	14.11	15.000	13.87
DATA	CX	10.000	0.43	10.020	0.45	10.040	0.55
DATA	CX	14.960	0.14	14.980	0.33	15.000	0.36
DATA	FX	10.000	3.20	10.020	3.10	10.040	3.17
DATA	FX	14.960	2.18	14.980	2.18	15.000	1.62

295-XS FISSION, COMPARISON OF SINGLE-LEVEL AND MULTILEVEL FITS.							
ISOTOPE	295-XS	295.	11.	.5	1000.		
PARAMETER	295-XS	12.1	.05	40.	100.		
PARAMETER	295-XS	13.1	.05	40.	100.		
CONDITIONS	300	50.	.5	.5	1.2	.001	1000.
FIT FISSFX295-XS		12.20	403.82	12.00	171.7	12.39	154.25
FIT FISSFX295-XS		13.04	148.70	12.96	70.8	13.14	74.97
ADJUST	8 DETAIL	FISSION	REICH				
LIST	10.	15.	.01	.02	TOTA CAPT	FISS SCAT	REICH
AXIS	ENERGY	LNSIGMA	10.	15.	1.	1000.	10.
PLOT	10.	15.	.01	FISSION	REICH	ENERGY	SIGMA
DIFF OUTFX	10.	14.9	FISSION	REICH	LIST		
TITLE	295-XS FISSION, FIT WITH BREIT-WIGNER PARAMETERS.						
ADJUST	6 DETAIL	FISSION	BREIT				
LIST	10.	15.	.01	.02	TOTA CAPT	FISS SCAT	BREIT
PLOT	10.	15.	.01	8 IFISSION	BREIT	ENERGY	SIGMA
PLOTDATAFX	10.	15.	ENERGY	SIGMA	DIAMOND	ENERGY	SIGMA
TITLE	DIFFERENCE PLOT FOR SINGLE-LEVEL FIT TO 295-XS.						
AXIS	ENERGY	SIGMA	10.	15.	-50.	50.	10.
DIFF OUTFX	10.	14.9	FISSION	BREIT	PUNCH	LIST	PLOT

Fig. D-6 ACSAP input to Sample Problem No. 3, a comparison of single-level and multilevel fits to 295-XS. The multilevel fitting part of this problem is identical to that of Problem No. 2, except that the curve generated by the trial parameters is not plotted. The single-level fit follows the multilevel fit and uses the same FIT points. The resulting curve is to be plotted as a dash-dot line, with dashes 8 units long separated by a single dot. Finally a difference calculation is made for the single-level fit. This time the difference is punched on cards and plotted as well as being listed. The difference plot requires separate TITLE and AXIS cards

Fig. D-7 Plotted output from Sample Problem No. 3, a comparison of single-level and multilevel fits by ACSAP to the fission cross section of 295-XS between 10 and 15 eV. The multilevel fit is shown as a solid line. The dash-dot line represents the single-level fit.

Fig. D-8 Difference plot for the single-level fit of 295-XS resulting from Sample Problem No. 3.

```

TITLE      SAMPLE PROBLEM FOR ACSAP: 295-XS DATA
DATA  TX   10.000   14.57   10.020   14.34   10.040   14.13   1
.
.
.
DATA  TX   14.960   13.26   14.980   14.11   15.000   13.87   129
.
.
.
DATA  CX   10.000   0.43   10.020   0.45   10.040   0.55   1
.
.
.
DATA  CX   14.960   0.14   14.980   0.33   15.000   0.38   129
.
.
.
DATA  FX   10.000   3.20   10.020   3.10   10.040   3.17   1
.
.
.
DATA  FX   14.960   2.18   14.980   2.18   15.000   1.62   129

TITLE      295-XS XSEC:  ARROW=TOTAL,  DIAMOND=FISSION,  TRIANGLE=CAPTURE.
AXIS      ENERGY  SIGMA  10.  15.  0.  500.  10.  10.
PLOTDATA  10.  15.  ENERGY  SIGMA  ARROW  ENERGY  SIGMA
PLOTDATA  10.  15.  ENERGY  SIGMA  DIAMOND  ENERGY  SIGMA
PLOTDATA  10.  15.  ENERGY  SIGMA  TRIANGLE  ENERGY  SIGMA
AXIS      ENERGY  LNSIGRE  10.  15.  1.  10000.  10.  10.
PLOTDATA  10.  15.  ENERGY  SIGRE  ARROW  ENERGY  SIGMA
PLOTDATA  10.  15.  ENERGY  SIGRE  DIAMOND  ENERGY  SIGMA
PLOTDATA  10.  15.  ENERGY  SIGRE  TRIANGLE  ENERGY  SIGMA
TITLE      265-XS FISSION, FIT WITH REICH-MOORE PARAMETERS.
ISOTOPE   295-XS  295.  11.  .5  1000.
PARAMETER 295-XS  12.1  .05  40.  100.
PARAMETER 295-XS  13.1  .05  40.  100.
CONDITIONS 300.  50.  .5  .5  1.2  .001  1000.
AXIS      ENERGY  LNSIGMA  10.  15.  1.  1000.  10.  10.
PLOT      10.  15.  .01  5  FISSION  REICH  ENERGY  SIGMA
PLOTDATA  10.  15.  ENERGY  SIGMA  DIAMOND  ENERGY  SIGMA
FIT FISSFX295-XS  12.20  403.82  12.00  171.7  12.39  154.25
FIT FISSFX295-XS  13.04  148.70  12.96  70.8  13.14  74.97
ADJUST    8 DETAIL  FISSION  REICH
LIST      10.  15.  .01  .02  TOTA CAPT  FISS SCAT  REICH
PLOT      10.  15.  .01  FISSION  REICH  ENERGY  SIGMA
PUNCH PARAM
DIFF OUTFX 10.  14.9  FISSION  REICH  LIST
TITLE      295-XS FISSION, COMPARISON OF SINGLE-LEVEL AND MULTILEVEL FITS.
AXIS      ENERGY  LNSIGMA  10.  15.  1.  1000.  10.  10.
PLOT      10.  15.  .01  FISSION  REICH  ENERGY  SIGMA
TITLE      295-XS FISSION, FIT WITH BREIT-WIGNER PARAMETERS.
ADJUST    6 DETAIL  FISSION  BREIT
LIST      10.  15.  .01  .02  TOTA CAPT  FISS SCAT  BREIT
PLOT      10.  15.  .01  8 FISSION  BREIT  ENERGY  SIGMA
PLOTDATA  10.  15.  ENERGY  SIGMA  DIAMOND  ENERGY  SIGMA
TITLE      DIFFERENCE PLOT FOR SINGLE-LEVEL FIT TO 295-XS.
AXIS      ENERGY  SIGMA  10.  15.  -50.  50.  10.  10.
DIFF OUTFX 10.  14.9  FISSION  BREIT  PUNCH  LIST  PLOT

```

Fig. D-9 ACSAP input to run all three sample problems as one problem.

Fig. D-10. Pages 86 through 144 contain a complete ACSAP output listing for the three sample problems run as one.

.. TITLE	SAMPLE	PROBLEM	FOR ACSAP:	295-XS DATA							
.. DATA	TX	10.000	14.57	10.020	14.34	10.040	14.13	1	CARD ACCEPTED.		
.. DATA	TX	10.060	13.24	10.080	13.74	10.100	13.79	2	CARD ACCEPTED.		
.. DATA	TX	10.120	13.54	10.140	13.62	10.160	14.71	3	CARD ACCEPTED.		
.. DATA	TX	10.180	13.27	10.200	13.87	10.220	13.67	4	CARD ACCEPTED.		
.. DATA	TX	10.240	14.87	10.260	14.65	10.280	14.22	5	CARD ACCEPTED.		
.. DATA	TX	10.300	13.81	10.320	15.59	10.340	14.87	6	CARD ACCEPTED.		
.. DATA	TX	10.360	14.00	10.380	15.54	10.400	15.68	7	CARD ACCEPTED.		
.. DATA	TX	10.420	14.46	10.440	15.97	10.460	14.93	8	CARD ACCEPTED.		
.. DATA	TX	10.480	15.00	10.500	15.38	10.520	15.42	9	CARD ACCEPTED.		
.. DATA	TX	10.540	16.64	10.560	16.00	10.580	15.55	10	CARD ACCEPTED.		
.. DATA	TX	10.600	17.01	10.620	16.36	10.640	15.71	11	CARD ACCEPTED.		
.. DATA	TX	10.660	16.23	10.679	15.66	10.697	16.12	12	CARD ACCEPTED.		
.. DATA	TX	10.715	16.46	10.733	16.89	10.750	16.96	13	CARD ACCEPTED.		
.. DATA	TX	10.767	18.13	10.784	16.81	10.800	17.66	14	CARD ACCEPTED.		
.. DATA	TX	10.816	18.46	10.831	18.30	10.846	16.99	15	CARD ACCEPTED.		
.. DATA	TX	10.861	17.53	10.876	18.33	10.890	18.88	16	CARD ACCEPTED.		
.. DATA	TX	10.904	17.67	10.917	18.92	10.931	18.61	17	CARD ACCEPTED.		
.. DATA	TX	10.944	19.09	10.956	18.78	10.969	19.89	18	CARD ACCEPTED.		
.. DATA	TX	10.981	18.93	10.993	19.21	11.005	19.22	19	CARD ACCEPTED.		
.. DATA	TX	11.016	19.64	11.028	20.41	11.039	19.71	20	CARD ACCEPTED.		
.. DATA	TX	11.050	20.50	11.060	20.92	11.071	21.50	21	CARD ACCEPTED.		
.. DATA	TX	11.081	21.90	11.091	22.06	11.100	22.42	22	CARD ACCEPTED.		
.. DATA	TX	11.110	21.66	11.120	21.28	11.130	22.06	23	CARD ACCEPTED.		
.. DATA	TX	11.140	21.43	11.150	23.27	11.160	21.73	24	CARD ACCEPTED.		
.. DATA	TX	11.170	22.91	11.180	23.18	11.190	22.20	25	CARD ACCEPTED.		
.. DATA	TX	11.200	24.43	11.210	23.36	11.220	24.38	26	CARD ACCEPTED.		
.. DATA	TX	11.230	24.08	11.240	23.90	11.250	24.00	27	CARD ACCEPTED.		
.. DATA	TX	11.260	24.85	11.270	25.00	11.280	24.45	28	CARD ACCEPTED.		
.. DATA	TX	11.290	25.92	11.300	25.61	11.310	26.99	29	CARD ACCEPTED.		
.. DATA	TX	11.320	26.45	11.330	27.59	11.340	27.55	30	CARD ACCEPTED.		
.. DATA	TX	11.350	28.90	11.360	28.16	11.370	28.91	31	CARD ACCEPTED.		
.. DATA	TX	11.380	28.31	11.390	30.23	11.400	29.83	32	CARD ACCEPTED.		
.. DATA	TX	11.410	30.83	11.420	31.18	11.430	31.54	33	CARD ACCEPTED.		
.. DATA	TX	11.440	32.44	11.450	33.63	11.460	31.80	34	CARD ACCEPTED.		
.. DATA	TX	11.470	35.11	11.480	33.19	11.490	34.71	35	CARD ACCEPTED.		
.. DATA	TX	11.500	34.22	11.510	37.71	11.520	35.57	36	CARD ACCEPTED.		
.. DATA	TX	11.530	39.04	11.540	39.29	11.550	39.77	37	CARD ACCEPTED.		
.. DATA	TX	11.560	40.31	11.570	42.35	11.580	43.38	38	CARD ACCEPTED.		
.. DATA	TX	11.590	44.00	11.600	45.15	11.610	43.54	39	CARD ACCEPTED.		
.. DATA	TX	11.620	47.37	11.630	45.27	11.640	49.69	40	CARD ACCEPTED.		
.. DATA	TX	11.650	48.04	11.660	51.44	11.670	52.78	41	CARD ACCEPTED.		
.. DATA	TX	11.680	52.76	11.690	56.81	11.700	57.39	42	CARD ACCEPTED.		
.. DATA	TX	11.710	59.74	11.720	59.70	11.730	60.08	43	CARD ACCEPTED.		
.. DATA	TX	11.740	65.93	11.750	65.12	11.760	66.88	44	CARD ACCEPTED.		
.. DATA	TX	11.770	68.59	11.780	71.49	11.790	73.80	45	CARD ACCEPTED.		
.. DATA	TX	11.800	79.61	11.810	81.42	11.820	85.81	46	CARD ACCEPTED.		
.. DATA	TX	11.830	89.19	11.840	90.96	11.850	93.61	47	CARD ACCEPTED.		
.. DATA	TX	11.860	98.08	11.870	105.98	11.880	108.00	48	CARD ACCEPTED.		
.. DATA	TX	11.890	116.83	11.900	122.44	11.910	127.30	49	CARD ACCEPTED.		
.. DATA	TX	11.920	132.40	11.930	142.06	11.940	148.97	50	CARD ACCEPTED.		
.. DATA	TX	11.950	152.30	11.960	162.99	11.970	171.54	51	CARD ACCEPTED.		
.. DATA	TX	11.980	183.85	11.990	195.44	12.000	204.27	52	CARD ACCEPTED.		
.. DATA	TX	12.010	221.66	12.020	232.19	12.030	243.83	53	CARD ACCEPTED.		

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SAMPLE PROBLEM FOR ACSAP: 295-XS DATA

05/26/72
PAGE 2

** DATA	TX	12.040	262.78	12.050	277.97	12.060	295.37	54	CARD ACCEPTED.
** DATA	TX	12.070	307.02	12.080	328.23	12.090	347.94	55	CARD ACCEPTED.
** DATA	TX	12.100	362.34	12.110	381.18	12.120	400.97	56	CARD ACCEPTED.
** DATA	TX	12.130	413.88	12.140	437.68	12.150	443.53	57	CARD ACCEPTED.
** DATA	TX	12.160	457.95	12.170	471.47	12.180	479.55	58	CARD ACCEPTED.
** DATA	TX	12.190	476.57	12.200	480.06	12.210	479.69	59	CARD ACCEPTED.
** DATA	TX	12.220	473.53	12.230	465.86	12.240	455.48	60	CARD ACCEPTED.
** DATA	TX	12.250	441.14	12.260	426.00	12.270	409.26	61	CARD ACCEPTED.
** DATA	TX	12.280	391.33	12.290	372.32	12.300	351.15	62	CARD ACCEPTED.
** DATA	TX	12.310	330.99	12.320	313.76	12.330	295.34	63	CARD ACCEPTED.
** DATA	TX	12.340	279.03	12.350	260.58	12.360	245.20	64	CARD ACCEPTED.
** DATA	TX	12.370	229.76	12.380	213.32	12.390	200.61	65	CARD ACCEPTED.
** DATA	TX	12.400	185.38	12.410	176.22	12.420	161.82	66	CARD ACCEPTED.
** DATA	TX	12.430	151.88	12.440	141.08	12.450	133.24	67	CARD ACCEPTED.
** DATA	TX	12.460	124.16	12.470	119.37	12.480	109.62	68	CARD ACCEPTED.
** DATA	TX	12.490	105.00	12.500	97.88	12.510	94.50	69	CARD ACCEPTED.
** DATA	TX	12.520	88.00	12.530	84.58	12.540	77.14	70	CARD ACCEPTED.
** DATA	TX	12.550	74.34	12.560	69.89	12.570	68.08	71	CARD ACCEPTED.
** DATA	TX	12.580	64.43	12.590	60.19	12.600	57.14	72	CARD ACCEPTED.
** DATA	TX	12.610	55.76	12.620	51.49	12.630	48.93	73	CARD ACCEPTED.
** DATA	TX	12.640	46.49	12.650	44.84	12.660	44.07	74	CARD ACCEPTED.
** DATA	TX	12.670	42.34	12.680	40.70	12.690	38.69	75	CARD ACCEPTED.
** DATA	TX	12.700	37.15	12.710	36.02	12.720	33.79	76	CARD ACCEPTED.
** DATA	TX	12.730	33.40	12.740	31.05	12.750	32.52	77	CARD ACCEPTED.
** DATA	TX	12.760	29.65	12.770	28.58	12.780	30.13	78	CARD ACCEPTED.
** DATA	TX	12.790	29.58	12.800	28.52	12.810	27.55	79	CARD ACCEPTED.
** DATA	TX	12.820	29.79	12.830	29.83	12.840	31.73	80	CARD ACCEPTED.
** DATA	TX	12.850	33.41	12.860	37.95	12.870	40.32	81	CARD ACCEPTED.
** DATA	TX	12.880	45.34	12.890	53.10	12.900	62.68	82	CARD ACCEPTED.
** DATA	TX	12.910	73.41	12.920	86.27	12.930	102.55	83	CARD ACCEPTED.
** DATA	TX	12.940	119.43	12.950	139.06	12.960	166.29	84	CARD ACCEPTED.
** DATA	TX	12.970	184.46	12.980	209.18	12.990	225.13	85	CARD ACCEPTED.
** DATA	TX	13.000	243.38	13.010	257.30	13.020	268.84	86	CARD ACCEPTED.
** DATA	TX	13.030	268.35	13.040	265.44	13.050	261.48	87	CARD ACCEPTED.
** DATA	TX	13.060	250.37	13.070	232.66	13.080	217.02	88	CARD ACCEPTED.
** DATA	TX	13.090	201.87	13.100	181.38	13.110	162.86	89	CARD ACCEPTED.
** DATA	TX	13.120	145.30	13.130	131.72	13.140	119.33	90	CARD ACCEPTED.
** DATA	TX	13.150	108.51	13.160	96.87	13.170	92.77	91	CARD ACCEPTED.
** DATA	TX	13.180	83.75	13.190	76.37	13.200	69.89	92	CARD ACCEPTED.
** DATA	TX	13.210	68.42	13.220	64.45	13.230	58.48	93	CARD ACCEPTED.
** DATA	TX	13.240	55.86	13.250	54.56	13.260	53.36	94	CARD ACCEPTED.
** DATA	TX	13.270	48.92	13.280	47.50	13.290	47.04	95	CARD ACCEPTED.
** DATA	TX	13.300	43.80	13.310	41.25	13.320	41.12	96	CARD ACCEPTED.
** DATA	TX	13.330	40.64	13.340	39.79	13.350	37.02	97	CARD ACCEPTED.
** DATA	TX	13.360	35.53	13.370	37.49	13.380	34.33	98	CARD ACCEPTED.
** DATA	TX	13.390	33.00	13.400	34.69	13.410	33.01	99	CARD ACCEPTED.
** DATA	TX	13.420	33.68	13.430	32.48	13.440	30.84	100	CARD ACCEPTED.
** DATA	TX	13.450	31.57	13.460	28.81	13.470	28.11	101	CARD ACCEPTED.
** DATA	TX	13.480	29.86	13.490	28.43	13.500	28.97	102	CARD ACCEPTED.
** DATA	TX	13.510	27.15	13.520	27.98	13.530	26.61	103	CARD ACCEPTED.
** DATA	TX	13.540	27.44	13.551	24.98	13.562	24.46	104	CARD ACCEPTED.
** DATA	TX	13.574	26.46	13.586	24.00	13.599	24.94	105	CARD ACCEPTED.
** DATA	TX	13.612	23.78	13.626	24.16	13.640	23.17	106	CARD ACCEPTED.
** DATA	TX	13.656	22.03	13.672	22.59	13.689	22.72	107	CARD ACCEPTED.
** DATA	TX	13.706	21.80	13.725	20.80	13.745	21.48	108	CARD ACCEPTED.

** DATA	TX	13.760	21.59	13.780	21.10	13.800	21.05	109	CARD ACCEPTED.
** DATA	TX	13.820	19.27	13.840	18.90	13.860	20.25	110	CARD ACCEPTED.
** DATA	TX	13.880	19.37	13.900	18.59	13.920	18.56	111	CARD ACCEPTED.
** DATA	TX	13.940	17.80	13.960	19.02	13.980	17.26	112	CARD ACCEPTED.
** DATA	TX	14.000	18.40	14.020	16.80	14.040	17.37	113	CARD ACCEPTED.
** DATA	TX	14.060	17.55	14.080	16.98	14.100	17.48	114	CARD ACCEPTED.
** DATA	TX	14.120	16.71	14.140	17.19	14.160	16.18	115	CARD ACCEPTED.
** DATA	TX	14.180	17.45	14.200	17.28	14.220	16.54	116	CARD ACCEPTED.
** DATA	TX	14.240	17.10	14.260	16.52	14.280	15.57	117	CARD ACCEPTED.
** DATA	TX	14.300	16.58	14.320	16.77	14.340	16.34	118	CARD ACCEPTED.
** DATA	TX	14.360	15.64	14.380	14.85	14.400	15.94	119	CARD ACCEPTED.
** DATA	TX	14.420	15.49	14.440	14.37	14.460	15.23	120	CARD ACCEPTED.
** DATA	TX	14.480	14.57	14.500	14.15	14.520	15.32	121	CARD ACCEPTED.
** DATA	TX	14.540	14.19	14.560	13.92	14.580	14.54	122	CARD ACCEPTED.
** DATA	TX	14.600	14.61	14.620	14.95	14.640	14.15	123	CARD ACCEPTED.
** DATA	TX	14.660	13.72	14.680	14.22	14.700	15.13	124	CARD ACCEPTED.
** DATA	TX	14.720	14.04	14.740	14.14	14.760	14.91	125	CARD ACCEPTED.
** DATA	TX	14.780	14.64	14.800	13.36	14.820	13.57	126	CARD ACCEPTED.
** DATA	TX	14.840	14.87	14.860	13.09	14.880	14.82	127	CARD ACCEPTED.
** DATA	TX	14.900	13.00	14.920	14.34	14.940	14.33	128	CARD ACCEPTED.
** DATA	TX	14.960	13.26	14.980	14.11	15.000	13.87	129	CARD ACCEPTED.
** DATA	CX	10.000	0.43	10.020	0.45	10.040	0.55	1	CARD ACCEPTED.
** DATA	CX	10.060	0.26	10.080	0.54	10.100	0.41	2	CARD ACCEPTED.
** DATA	CX	10.120	0.38	10.140	0.37	10.160	0.29	3	CARD ACCEPTED.
** DATA	CX	10.180	0.29	10.200	0.42	10.220	0.48	4	CARD ACCEPTED.
** DATA	CX	10.240	0.37	10.260	0.60	10.280	0.55	5	CARD ACCEPTED.
** DATA	CX	10.300	0.37	10.320	0.37	10.340	0.38	6	CARD ACCEPTED.
** DATA	CX	10.360	0.40	10.380	0.50	10.400	0.55	7	CARD ACCEPTED.
** DATA	CX	10.420	0.41	10.440	0.61	10.460	0.52	8	CARD ACCEPTED.
** DATA	CX	10.480	0.42	10.500	0.78	10.520	0.71	9	CARD ACCEPTED.
** DATA	CX	10.540	0.64	10.560	0.51	10.580	0.83	10	CARD ACCEPTED.
** DATA	CX	10.600	0.69	10.620	0.75	10.640	0.73	11	CARD ACCEPTED.
** DATA	CX	10.660	0.58	10.679	0.80	10.697	0.96	12	CARD ACCEPTED.
** DATA	CX	10.715	0.87	10.733	0.70	10.750	0.60	13	CARD ACCEPTED.
** DATA	CX	10.767	0.71	10.784	0.92	10.800	0.82	14	CARD ACCEPTED.
** DATA	CX	10.816	0.76	10.831	0.85	10.846	1.05	15	CARD ACCEPTED.
** DATA	CX	10.861	1.03	10.876	1.19	10.890	0.81	16	CARD ACCEPTED.
** DATA	CX	10.904	1.25	10.917	0.82	10.931	0.93	17	CARD ACCEPTED.
** DATA	CX	10.944	1.03	10.956	1.15	10.969	1.12	18	CARD ACCEPTED.
** DATA	CX	10.981	0.89	10.993	1.01	11.005	1.20	19	CARD ACCEPTED.
** DATA	CX	11.016	1.29	11.028	1.29	11.039	1.09	20	CARD ACCEPTED.
** DATA	CX	11.050	1.15	11.060	1.14	11.071	1.13	21	CARD ACCEPTED.
** DATA	CX	11.081	1.35	11.091	1.62	11.100	1.37	22	CARD ACCEPTED.
** DATA	CX	11.110	1.55	11.120	1.56	11.130	1.74	23	CARD ACCEPTED.
** DATA	CX	11.140	1.71	11.150	1.77	11.160	1.34	24	CARD ACCEPTED.
** DATA	CX	11.170	1.37	11.180	1.27	11.190	1.68	25	CARD ACCEPTED.
** DATA	CX	11.200	1.44	11.210	1.37	11.220	1.43	26	CARD ACCEPTED.
** DATA	CX	11.230	1.86	11.240	2.06	11.250	2.10	27	CARD ACCEPTED.
** DATA	CX	11.260	1.94	11.270	2.20	11.280	1.89	28	CARD ACCEPTED.
** DATA	CX	11.290	1.98	11.300	2.08	11.310	1.92	29	CARD ACCEPTED.
** DATA	CX	11.320	2.41	11.330	1.91	11.340	1.88	30	CARD ACCEPTED.
** DATA	CX	11.350	2.11	11.360	2.40	11.370	2.21	31	CARD ACCEPTED.
** DATA	CX	11.380	2.38	11.390	2.35	11.400	2.34	32	CARD ACCEPTED.
** DATA	CX	11.410	2.73	11.420	2.28	11.430	2.63	33	CARD ACCEPTED.
** DATA	CX	11.440	2.62	11.450	2.84	11.460	2.89	34	CARD ACCEPTED.

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** DATA	CX	11.470	3.11	11.480	3.38	11.490	3.31	35	CARD ACCEPTED.
** DATA	CX	11.500	3.35	11.510	3.70	11.520	3.02	36	CARD ACCEPTED.
** DATA	CX	11.530	3.44	11.540	3.29	11.550	3.57	37	CARD ACCEPTED.
** DATA	CX	11.560	4.14	11.570	3.48	11.580	3.58	38	CARD ACCEPTED.
** DATA	CX	11.590	3.64	11.600	4.61	11.610	4.17	39	CARD ACCEPTED.
** DATA	CX	11.620	4.55	11.630	5.00	11.640	4.85	40	CARD ACCEPTED.
** DATA	CX	11.650	4.66	11.660	5.64	11.670	4.83	41	CARD ACCEPTED.
** DATA	CX	11.680	5.36	11.690	6.25	11.700	6.25	42	CARD ACCEPTED.
** DATA	CX	11.710	6.00	11.720	6.65	11.730	6.25	43	CARD ACCEPTED.
** DATA	CX	11.740	6.40	11.750	6.80	11.760	7.55	44	CARD ACCEPTED.
** DATA	CX	11.770	8.01	11.780	7.67	11.790	8.29	45	CARD ACCEPTED.
** DATA	CX	11.800	9.31	11.810	9.53	11.820	8.96	46	CARD ACCEPTED.
** DATA	CX	11.830	9.69	11.840	10.05	11.850	10.39	47	CARD ACCEPTED.
** DATA	CX	11.860	10.95	11.870	11.60	11.880	12.31	48	CARD ACCEPTED.
** DATA	CX	11.890	12.92	11.900	14.29	11.910	15.76	49	CARD ACCEPTED.
** DATA	CX	11.920	16.60	11.930	17.03	11.940	17.32	50	CARD ACCEPTED.
** DATA	CX	11.950	18.89	11.960	21.05	11.970	21.32	51	CARD ACCEPTED.
** DATA	CX	11.980	23.39	11.990	24.43	12.000	26.46	52	CARD ACCEPTED.
** DATA	CX	12.010	27.36	12.020	27.94	12.030	29.98	53	CARD ACCEPTED.
** DATA	CX	12.040	33.16	12.050	35.29	12.060	38.36	54	CARD ACCEPTED.
** DATA	CX	12.070	39.72	12.080	41.28	12.090	44.90	55	CARD ACCEPTED.
** DATA	CX	12.100	45.75	12.110	48.26	12.120	52.53	56	CARD ACCEPTED.
** DATA	CX	12.130	54.84	12.140	58.45	12.150	58.20	57	CARD ACCEPTED.
** DATA	CX	12.160	60.49	12.170	62.85	12.180	64.64	58	CARD ACCEPTED.
** DATA	CX	12.190	65.31	12.200	63.14	12.210	64.99	59	CARD ACCEPTED.
** DATA	CX	12.220	62.38	12.230	63.66	12.240	62.42	60	CARD ACCEPTED.
** DATA	CX	12.250	61.49	12.260	59.51	12.270	54.77	61	CARD ACCEPTED.
** DATA	CX	12.280	52.67	12.290	52.09	12.300	48.30	62	CARD ACCEPTED.
** DATA	CX	12.310	46.67	12.320	43.56	12.330	43.06	63	CARD ACCEPTED.
** DATA	CX	12.340	38.20	12.350	35.52	12.360	33.77	64	CARD ACCEPTED.
** DATA	CX	12.370	31.69	12.380	31.53	12.390	29.47	65	CARD ACCEPTED.
** DATA	CX	12.400	27.00	12.410	25.24	12.420	24.02	66	CARD ACCEPTED.
** DATA	CX	12.430	23.12	12.440	20.10	12.450	20.38	67	CARD ACCEPTED.
** DATA	CX	12.460	18.38	12.470	18.99	12.480	16.52	68	CARD ACCEPTED.
** DATA	CX	12.490	15.38	12.500	15.97	12.510	14.39	69	CARD ACCEPTED.
** DATA	CX	12.520	13.95	12.530	12.83	12.540	12.81	70	CARD ACCEPTED.
** DATA	CX	12.550	12.83	12.560	12.75	12.570	11.76	71	CARD ACCEPTED.
** DATA	CX	12.580	11.37	12.590	11.01	12.600	10.66	72	CARD ACCEPTED.
** DATA	CX	12.610	10.32	12.620	10.01	12.630	10.07	73	CARD ACCEPTED.
** DATA	CX	12.640	8.93	12.650	9.93	12.660	9.86	74	CARD ACCEPTED.
** DATA	CX	12.670	9.05	12.680	8.77	12.690	9.34	75	CARD ACCEPTED.
** DATA	CX	12.700	8.85	12.710	9.75	12.720	8.76	76	CARD ACCEPTED.
** DATA	CX	12.730	10.03	12.740	9.92	12.750	10.43	77	CARD ACCEPTED.
** DATA	CX	12.760	10.40	12.770	11.03	12.780	11.29	78	CARD ACCEPTED.
** DATA	CX	12.790	11.56	12.800	12.37	12.810	13.22	79	CARD ACCEPTED.
** DATA	CX	12.820	14.89	12.830	16.28	12.840	16.10	80	CARD ACCEPTED.
** DATA	CX	12.850	18.77	12.860	20.94	12.870	24.05	81	CARD ACCEPTED.
** DATA	CX	12.880	27.96	12.890	31.90	12.900	36.27	82	CARD ACCEPTED.
** DATA	CX	12.910	40.55	12.920	47.02	12.930	54.77	83	CARD ACCEPTED.
** DATA	CX	12.940	66.01	12.950	74.97	12.960	80.44	84	CARD ACCEPTED.
** DATA	CX	12.970	89.97	12.980	99.42	12.990	106.81	85	CARD ACCEPTED.
** DATA	CX	13.000	111.79	13.010	113.03	13.020	113.81	86	CARD ACCEPTED.
** DATA	CX	13.030	111.25	13.040	104.86	13.050	100.16	87	CARD ACCEPTED.
** DATA	CX	13.060	93.87	13.070	85.26	13.080	73.79	88	CARD ACCEPTED.
** DATA	CX	13.090	67.23	13.100	56.15	13.110	49.25	89	CARD ACCEPTED.

** DATA	CX	13.120	43.18	13.130	36.18	13.140	31.48	90	CARD ACCEPTED.
** DATA	CX	13.150	25.92	13.160	23.95	13.170	20.89	91	CARD ACCEPTED.
** DATA	CX	13.180	18.14	13.190	14.72	13.200	14.38	92	CARD ACCEPTED.
** DATA	CX	13.210	11.81	13.220	10.15	13.230	10.58	93	CARD ACCEPTED.
** DATA	CX	13.240	9.62	13.250	8.48	13.260	7.50	94	CARD ACCEPTED.
** DATA	CX	13.270	6.91	13.280	6.34	13.290	5.76	95	CARD ACCEPTED.
** DATA	CX	13.300	6.30	13.310	5.63	13.320	4.75	96	CARD ACCEPTED.
** DATA	CX	13.330	4.94	13.340	4.69	13.350	4.67	97	CARD ACCEPTED.
** DATA	CX	13.360	4.58	13.370	4.32	13.380	3.68	98	CARD ACCEPTED.
** DATA	CX	13.390	3.14	13.400	3.78	13.410	3.34	99	CARD ACCEPTED.
** DATA	CX	13.420	3.55	13.430	2.77	13.440	2.67	100	CARD ACCEPTED.
** DATA	CX	13.450	3.21	13.460	2.65	13.470	2.45	101	CARD ACCEPTED.
** DATA	CX	13.480	2.44	13.490	2.20	13.500	2.00	102	CARD ACCEPTED.
** DATA	CX	13.510	2.61	13.520	2.45	13.530	1.82	103	CARD ACCEPTED.
** DATA	CX	13.540	1.99	13.551	1.82	13.562	1.90	104	CARD ACCEPTED.
** DATA	CX	13.574	1.60	13.586	1.52	13.599	1.49	105	CARD ACCEPTED.
** DATA	CX	13.612	1.73	13.626	1.93	13.640	1.38	106	CARD ACCEPTED.
** DATA	CX	13.656	1.27	13.672	1.39	13.689	1.65	107	CARD ACCEPTED.
** DATA	CX	13.706	1.40	13.725	1.50	13.745	1.18	108	CARD ACCEPTED.
** DATA	CX	13.760	1.01	13.780	1.35	13.800	1.06	109	CARD ACCEPTED.
** DATA	CX	13.820	0.93	13.840	0.89	13.860	1.15	110	CARD ACCEPTED.
** DATA	CX	13.880	0.88	13.900	0.79	13.920	1.05	111	CARD ACCEPTED.
** DATA	CX	13.940	0.87	13.960	0.62	13.980	0.62	112	CARD ACCEPTED.
** DATA	CX	14.000	0.90	14.020	0.72	14.040	0.54	113	CARD ACCEPTED.
** DATA	CX	14.060	0.52	14.080	0.68	14.100	0.85	114	CARD ACCEPTED.
** DATA	CX	14.120	0.78	14.140	0.83	14.160	0.49	115	CARD ACCEPTED.
** DATA	CX	14.180	0.72	14.200	0.66	14.220	0.60	116	CARD ACCEPTED.
** DATA	CX	14.240	0.64	14.260	0.58	14.280	0.61	117	CARD ACCEPTED.
** DATA	CX	14.300	0.46	14.320	0.42	14.340	0.64	118	CARD ACCEPTED.
** DATA	CX	14.360	0.55	14.380	0.45	14.400	0.62	119	CARD ACCEPTED.
** DATA	CX	14.420	0.38	14.440	0.44	14.460	0.58	120	CARD ACCEPTED.
** DATA	CX	14.480	0.51	14.500	0.44	14.520	0.54	121	CARD ACCEPTED.
** DATA	CX	14.540	0.52	14.560	0.36	14.580	0.23	122	CARD ACCEPTED.
** DATA	CX	14.600	0.48	14.620	0.30	14.640	0.43	123	CARD ACCEPTED.
** DATA	CX	14.660	0.27	14.680	0.27	14.700	0.45	124	CARD ACCEPTED.
** DATA	CX	14.720	0.35	14.740	0.39	14.760	0.45	125	CARD ACCEPTED.
** DATA	CX	14.780	0.32	14.800	0.19	14.820	0.24	126	CARD ACCEPTED.
** DATA	CX	14.840	0.24	14.860	0.40	14.880	0.19	127	CARD ACCEPTED.
** DATA	CX	14.900	0.21	14.920	0.34	14.940	0.37	128	CARD ACCEPTED.
** DATA	CX	14.960	0.14	14.980	0.33	15.000	0.36	129	CARD ACCEPTED.
** DATA	FX	10.000	3.20	10.020	3.10	10.040	3.17	1	CARD ACCEPTED.
** DATA	FX	10.060	2.98	10.080	3.14	10.100	3.36	2	CARD ACCEPTED.
** DATA	FX	10.120	3.55	10.140	2.78	10.160	3.03	3	CARD ACCEPTED.
** DATA	FX	10.180	3.58	10.200	2.96	10.220	3.78	4	CARD ACCEPTED.
** DATA	FX	10.240	3.35	10.260	3.91	10.280	3.83	5	CARD ACCEPTED.
** DATA	FX	10.300	3.27	10.320	3.92	10.340	4.36	6	CARD ACCEPTED.
** DATA	FX	10.360	4.30	10.380	4.23	10.400	3.69	7	CARD ACCEPTED.
** DATA	FX	10.420	4.42	10.440	3.89	10.460	4.64	8	CARD ACCEPTED.
** DATA	FX	10.480	4.96	10.500	4.60	10.520	4.20	9	CARD ACCEPTED.
** DATA	FX	10.540	4.36	10.560	5.04	10.580	4.73	10	CARD ACCEPTED.
** DATA	FX	10.600	4.85	10.620	5.48	10.640	5.24	11	CARD ACCEPTED.
** DATA	FX	10.660	5.34	10.679	5.23	10.697	5.27	12	CARD ACCEPTED.
** DATA	FX	10.715	5.86	10.733	5.86	10.750	5.97	13	CARD ACCEPTED.
** DATA	FX	10.767	5.84	10.784	5.87	10.800	6.47	14	CARD ACCEPTED.
** DATA	FX	10.816	6.52	10.831	7.07	10.846	6.57	15	CARD ACCEPTED.

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** DATA	FX	10.861	6.90	10.876	7.48	10.890	7.16	16	CARD ACCEPTED.
** DATA	FX	10.904	7.21	10.917	7.01	10.931	7.21	17	CARD ACCEPTED.
** DATA	FX	10.944	8.10	10.956	7.99	10.969	8.28	18	CARD ACCEPTED.
** DATA	FX	10.981	8.81	10.993	8.47	11.005	8.07	19	CARD ACCEPTED.
** DATA	FX	11.016	9.38	11.028	9.64	11.039	8.92	20	CARD ACCEPTED.
** DATA	FX	11.050	8.86	11.060	9.64	11.071	9.37	21	CARD ACCEPTED.
** DATA	FX	11.081	10.57	11.091	9.97	11.100	10.22	22	CARD ACCEPTED.
** DATA	FX	11.110	10.15	11.120	11.07	11.130	11.42	23	CARD ACCEPTED.
** DATA	FX	11.140	10.74	11.150	10.80	11.160	11.53	24	CARD ACCEPTED.
** DATA	FX	11.170	11.00	11.180	12.12	11.190	12.55	25	CARD ACCEPTED.
** DATA	FX	11.200	12.57	11.210	11.42	11.220	12.18	26	CARD ACCEPTED.
** DATA	FX	11.230	12.24	11.240	13.71	11.250	13.94	27	CARD ACCEPTED.
** DATA	FX	11.260	13.73	11.270	13.21	11.280	14.87	28	CARD ACCEPTED.
** DATA	FX	11.290	13.93	11.300	14.89	11.310	15.20	29	CARD ACCEPTED.
** DATA	FX	11.320	15.17	11.330	15.39	11.340	16.18	30	CARD ACCEPTED.
** DATA	FX	11.350	16.23	11.360	16.61	11.370	17.82	31	CARD ACCEPTED.
** DATA	FX	11.380	16.88	11.390	18.20	11.400	17.33	32	CARD ACCEPTED.
** DATA	FX	11.410	18.64	11.420	18.85	11.430	18.48	33	CARD ACCEPTED.
** DATA	FX	11.440	20.42	11.450	19.50	11.460	20.43	34	CARD ACCEPTED.
** DATA	FX	11.470	20.57	11.480	21.67	11.490	22.02	35	CARD ACCEPTED.
** DATA	FX	11.500	23.33	11.510	22.96	11.520	23.12	36	CARD ACCEPTED.
** DATA	FX	11.530	25.01	11.540	24.95	11.550	24.96	37	CARD ACCEPTED.
** DATA	FX	11.560	28.21	11.570	27.17	11.580	28.08	38	CARD ACCEPTED.
** DATA	FX	11.590	30.33	11.600	30.50	11.610	30.57	39	CARD ACCEPTED.
** DATA	FX	11.620	33.11	11.630	34.45	11.640	34.34	40	CARD ACCEPTED.
** DATA	FX	11.650	34.17	11.660	35.52	11.670	37.56	41	CARD ACCEPTED.
** DATA	FX	11.680	38.93	11.690	39.42	11.700	41.10	42	CARD ACCEPTED.
** DATA	FX	11.710	42.50	11.720	44.27	11.730	47.97	43	CARD ACCEPTED.
** DATA	FX	11.740	46.42	11.750	51.21	11.760	52.05	44	CARD ACCEPTED.
** DATA	FX	11.770	52.46	11.780	55.08	11.790	56.74	45	CARD ACCEPTED.
** DATA	FX	11.800	62.72	11.810	65.27	11.820	66.82	46	CARD ACCEPTED.
** DATA	FX	11.830	71.40	11.840	71.04	11.850	76.78	47	CARD ACCEPTED.
** DATA	FX	11.860	79.76	11.870	84.74	11.880	88.01	48	CARD ACCEPTED.
** DATA	FX	11.890	91.12	11.900	96.44	11.910	102.80	49	CARD ACCEPTED.
** DATA	FX	11.920	105.74	11.930	116.18	11.940	120.76	50	CARD ACCEPTED.
** DATA	FX	11.950	129.57	11.960	138.13	11.970	141.01	51	CARD ACCEPTED.
** DATA	FX	11.980	150.67	11.990	159.86	12.000	172.48	52	CARD ACCEPTED.
** DATA	FX	12.010	180.45	12.020	191.44	12.030	206.23	53	CARD ACCEPTED.
** DATA	FX	12.040	217.68	12.050	235.05	12.060	247.92	54	CARD ACCEPTED.
** DATA	FX	12.070	258.25	12.080	276.40	12.090	293.67	55	CARD ACCEPTED.
** DATA	FX	12.100	309.44	12.110	327.16	12.120	336.45	56	CARD ACCEPTED.
** DATA	FX	12.130	350.24	12.140	367.11	12.150	376.05	57	CARD ACCEPTED.
** DATA	FX	12.160	382.99	12.170	397.82	12.180	402.48	58	CARD ACCEPTED.
** DATA	FX	12.190	406.19	12.200	408.07	12.210	398.22	59	CARD ACCEPTED.
** DATA	FX	12.220	394.19	12.230	389.37	12.240	377.01	60	CARD ACCEPTED.
** DATA	FX	12.250	365.03	12.260	353.83	12.270	335.38	61	CARD ACCEPTED.
** DATA	FX	12.280	324.03	12.290	302.52	12.300	286.88	62	CARD ACCEPTED.
** DATA	FX	12.310	268.66	12.320	258.11	12.330	241.54	63	CARD ACCEPTED.
** DATA	FX	12.340	225.44	12.350	209.39	12.360	191.26	64	CARD ACCEPTED.
** DATA	FX	12.370	176.15	12.380	165.18	12.390	157.13	65	CARD ACCEPTED.
** DATA	FX	12.400	141.75	12.410	132.63	12.420	125.45	66	CARD ACCEPTED.
** DATA	FX	12.430	115.07	12.440	104.30	12.450	93.91	67	CARD ACCEPTED.
** DATA	FX	12.460	91.89	12.470	86.21	12.480	80.37	68	CARD ACCEPTED.
** DATA	FX	12.490	73.58	12.500	68.20	12.510	64.32	69	CARD ACCEPTED.
** DATA	FX	12.520	59.35	12.530	56.31	12.540	52.47	70	CARD ACCEPTED.

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** DATA	FX	12.550	47.13	12.560	43.86	12.570	42.83	71	CARD ACCEPTED.
** DATA	FX	12.580	39.30	12.590	37.35	12.600	32.83	72	CARD ACCEPTED.
** DATA	FX	12.610	32.51	12.620	28.66	12.630	26.73	73	CARD ACCEPTED.
** DATA	FX	12.640	26.35	12.650	22.73	12.660	21.29	74	CARD ACCEPTED.
** DATA	FX	12.670	19.98	12.680	17.96	12.690	17.32	75	CARD ACCEPTED.
** DATA	FX	12.700	16.38	12.710	14.74	12.720	13.26	76	CARD ACCEPTED.
** DATA	FX	12.730	11.40	12.740	9.69	12.750	8.82	77	CARD ACCEPTED.
** DATA	FX	12.760	7.62	12.770	6.80	12.780	6.83	78	CARD ACCEPTED.
** DATA	FX	12.790	5.36	12.800	5.14	12.810	3.92	79	CARD ACCEPTED.
** DATA	FX	12.820	4.06	12.830	3.59	12.840	3.94	80	CARD ACCEPTED.
** DATA	FX	12.850	3.61	12.860	4.83	12.870	6.09	81	CARD ACCEPTED.
** DATA	FX	12.980	7.40	12.890	10.99	12.900	15.94	82	CARD ACCEPTED.
** DATA	FX	12.910	20.77	12.920	27.89	12.930	37.32	83	CARD ACCEPTED.
** DATA	FX	12.940	44.54	12.950	55.92	12.960	69.09	84	CARD ACCEPTED.
** DATA	FX	12.970	82.56	12.980	101.00	12.990	114.17	85	CARD ACCEPTED.
** DATA	FX	13.000	127.20	13.010	135.06	13.020	144.70	86	CARD ACCEPTED.
** DATA	FX	13.030	148.63	13.040	145.79	13.050	149.57	87	CARD ACCEPTED.
** DATA	FX	13.060	143.64	13.070	134.52	13.080	131.05	88	CARD ACCEPTED.
** DATA	FX	13.090	121.63	13.100	109.57	13.110	98.23	89	CARD ACCEPTED.
** DATA	FX	13.120	88.97	13.130	90.55	13.140	74.49	90	CARD ACCEPTED.
** DATA	FX	13.150	68.51	13.160	62.50	13.170	57.91	91	CARD ACCEPTED.
** DATA	FX	13.180	53.06	13.190	48.85	13.200	45.91	92	CARD ACCEPTED.
** DATA	FX	13.210	41.02	13.220	38.71	13.230	35.32	93	CARD ACCEPTED.
** DATA	FX	13.240	33.12	13.250	33.46	13.260	31.79	94	CARD ACCEPTED.
** DATA	FX	13.270	28.11	13.280	27.07	13.290	27.90	95	CARD ACCEPTED.
** DATA	FX	13.300	26.05	13.310	25.49	13.320	23.50	96	CARD ACCEPTED.
** DATA	FX	13.330	21.85	13.340	20.53	13.350	21.06	97	CARD ACCEPTED.
** DATA	FX	13.360	20.89	13.370	18.99	13.380	19.22	98	CARD ACCEPTED.
** DATA	FX	13.390	17.19	13.400	17.44	13.410	17.50	99	CARD ACCEPTED.
** DATA	FX	13.420	17.50	13.430	16.91	13.440	15.27	100	CARD ACCEPTED.
** DATA	FX	13.450	14.57	13.460	15.10	13.470	15.09	101	CARD ACCEPTED.
** DATA	FX	13.480	14.33	13.490	13.94	13.500	12.97	102	CARD ACCEPTED.
** DATA	FX	13.510	12.89	13.520	12.30	13.530	11.72	103	CARD ACCEPTED.
** DATA	FX	13.540	12.23	13.551	12.23	13.562	11.83	104	CARD ACCEPTED.
** DATA	FX	13.574	11.63	13.586	11.13	13.599	10.37	105	CARD ACCEPTED.
** DATA	FX	13.612	10.69	13.626	10.16	13.640	9.35	106	CARD ACCEPTED.
** DATA	FX	13.656	9.62	13.672	9.50	13.689	8.42	107	CARD ACCEPTED.
** DATA	FX	13.706	9.20	13.725	7.73	13.745	8.13	108	CARD ACCEPTED.
** DATA	FX	13.760	8.29	13.780	7.01	13.800	6.94	109	CARD ACCEPTED.
** DATA	FX	13.826	7.31	13.840	6.54	13.860	6.79	110	CARD ACCEPTED.
** DATA	FX	13.880	6.49	13.900	6.72	13.920	6.12	111	CARD ACCEPTED.
** DATA	FX	13.940	5.87	13.960	5.30	13.980	5.72	112	CARD ACCEPTED.
** DATA	FX	14.000	5.55	14.020	4.88	14.040	5.08	113	CARD ACCEPTED.
** DATA	FX	14.060	4.91	14.080	4.89	14.100	4.65	114	CARD ACCEPTED.
** DATA	FX	14.120	5.02	14.140	4.64	14.160	3.79	115	CARD ACCEPTED.
** DATA	FX	14.180	3.73	14.200	4.24	14.220	4.45	116	CARD ACCEPTED.
** DATA	FX	14.240	3.75	14.260	4.22	14.280	4.04	117	CARD ACCEPTED.
** DATA	FX	14.300	3.33	14.320	3.11	14.340	3.00	118	CARD ACCEPTED.
** DATA	FX	14.360	3.08	14.380	3.30	14.400	3.59	119	CARD ACCEPTED.
** DATA	FX	14.420	3.13	14.440	2.87	14.460	3.34	120	CARD ACCEPTED.
** DATA	FX	14.480	2.91	14.500	2.94	14.520	3.17	121	CARD ACCEPTED.
** DATA	FX	14.540	3.15	14.560	2.53	14.580	2.84	122	CARD ACCEPTED.
** DATA	FX	14.600	2.59	14.620	2.22	14.640	2.60	123	CARD ACCEPTED.
** DATA	FX	14.660	2.17	14.680	2.54	14.700	2.33	124	CARD ACCEPTED.
** DATA	FX	14.720	2.24	14.740	2.64	14.760	2.61	125	CARD ACCEPTED.

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```
** DATA  FX  14.780    2.42   14.800    2.26   14.820    1.94    126   CARD ACCEPTED.
** DATA  FX  14.840    2.10   14.860    2.12   14.880    2.05    127   CARD ACCEPTED.
** DATA  FX  14.900    2.04   14.920    1.77   14.940    2.21    128   CARD ACCEPTED.
** DATA  FX  14.960    2.18   14.980    2.18   15.000    1.62    129   CARD ACCEPTED.
** TITLE  295-XS XSEC: ARROW=TOTAL, DIAMOND=FISSION, TRIANGLE=CAPTURE. CARD ACCEPTED.
** AXIS   ENERGY  SIGMA   10.    15.    0.    500.   10.  10.   CARD ACCEPTED.
```

A PLOT AXIS HAS BEEN DRAWN TO THE FOLLOWING SPECIFICATIONS:

ABSCISSA: ENERGY (EV)
ORDINATE: CROSS SECTION (BARNS)

LINEAR
LINEAR

MINIMUM= 10.00
MINIMUM= 0.0

MAXIMUM= 15.00
MAXIMUM= 500.0

LENGTH= 10.0
LENGTH= 10.0

```
** PLOTDATATX  10.    15.    ENERGY  SIGMA  ARROW  ENERGY  SIGMA  CARD ACCEPTED.
```

EXPERIMENTAL DATA HAVE BEEN PLOTTED AS ENERGY (EV)
FROM 10.00 EV TO 15.00 EV
FORM OF INPUT DATA WAS ENERGY (EV)

VS CROSS SECTION (BARNS)
SYMBOL USED WAS: ARROW
VS CROSS SECTION (BARNS)

```
** PLOTDATAFX  10.    15.    ENERGY  SIGMA  DIAMOND  ENERGY  SIGMA  CARD ACCEPTED.
```

EXPERIMENTAL DATA HAVE BEEN PLOTTED AS ENERGY (EV)
FROM 10.00 EV TO 15.00 EV
FORM OF INPUT DATA WAS ENERGY (EV)

VS CROSS SECTION (BARNS)
SYMBOL USED WAS: DIAMOND
VS CROSS SECTION (BARNS)

```
** PLOTDATA CX  10.    15.    ENERGY  SIGMA  TRIANGLE  ENERGY  SIGMA  CARD ACCEPTED.
```

EXPERIMENTAL DATA HAVE BEEN PLOTTED AS ENERGY (EV)
FROM 10.00 EV TO 15.00 EV
FORM OF INPUT DATA WAS ENERGY (EV)

VS CROSS SECTION (BARNS)
SYMBOL USED WAS: TRIANGLE
VS CROSS SECTION (BARNS)

```
** AXIS        ENERGY  LNSIGRE  10.    15.    1.    10000.  10.  10.   CARD ACCEPTED.
```

A PLOT AXIS HAS BEEN DRAWN TO THE FOLLOWING SPECIFICATIONS:

ABSCISSA: ENERGY (EV)
ORDINATE: CROSS SECTION ROOT E (EV**1/2)

LINEAR
LOGARITHMIC

MINIMUM= 10.00
MINIMUM= 1.000

MAXIMUM= 15.00
MAXIMUM= 10000.

LENGTH= 10.0
LENGTH= 10.0

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295-XS XSEC: ARROW=TOTAL, DIAMOND=FISSION, TRIANGLE=CAPTURE.

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** PLOTDATATX 10. 15. ENERGY SIGRE ARROW ENERGY SIGMA CARD ACCEPTED.

EXPERIMENTAL DATA HAVE BEEN PLOTTED AS ENERGY (EV) VS CROSS SECTION ROOT E (EV**1/2)
FROM 10.00 EV TO 15.00 EV SYMBOL USED WAS: ARROW
FORM OF INPUT DATA WAS ENERGY (EV) VS CROSS SECTION (BARNs)

** PLOTDATAFX 10. 15. ENERGY SIGRE DIAMOND ENERGY SIGMA CARD ACCEPTED.

EXPERIMENTAL DATA HAVE BEEN PLOTTED AS ENERGY (EV) VS CROSS SECTION ROOT E (EV**1/2)
FROM 10.00 EV TO 15.00 EV SYMBOL USED WAS: DIAMOND
FORM OF INPUT DATA WAS ENERGY (EV) VS CROSS SECTION (BARNs)

** PLOTDATA CX 10. 15. ENERGY SIGRE TRIANGLE ENERGY SIGMA CARD ACCEPTED.

EXPERIMENTAL DATA HAVE BEEN PLOTTED AS ENERGY (EV) VS CROSS SECTION ROOT E (EV**1/2)
FROM 10.00 EV TO 15.00 EV SYMBOL USED WAS: TRIANGLE
FORM OF INPUT DATA WAS ENERGY (EV) VS CROSS SECTION (BARNs)

** TITLE 295-XS FISSION, FIT WITH REICH-MOORE PARAMETERS. CARD ACCEPTED.
** ISOTOPE 295-XS 295. 11. .5 1000. CARD ACCEPTED.
** PARAMETER 295-XS 12.1 .05 40. 100. CARD ACCEPTED.
** PARAMETER 295-XS 13.1 .05 40. 100. CARD ACCEPTED.
** CONDITIONS 300. 50. .5 .5 1.2 .001 1000. CARD ACCEPTED.
** AXIS ENERGY LNSIGMA 10. 15. 1. 1000. 10. 10. CARD ACCEPTED.

A PLOT AXIS HAS BEEN DRAWN TO THE FOLLOWING SPECIFICATIONS:

ABSCISSA: ENERGY (EV)	LINEAR	MINIMUM= 10.00	MAXIMUM= 15.00	LENGTH= 10.0
ORDINATE: CROSS SECTION (BARNs)	LOGARITHMIC	MINIMUM= 1.000	MAXIMUM= 1000.	LENGTH= 10.0

** PLOT 10. 15. .01 5 FISSION REICH ENERGY SIGMA CARD ACCEPTED.

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295-XS FISSION, FIT WITH REICH-MOORE PARAMETERS.

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ISOTOPE INFORMATION

295-XS

ATOMIC WEIGHT OF ISOTOPE	295.0	POTENTIAL SCATTERING CROSS SECTION.	11.00
G - STATISTICAL WEIGHTING FACTOR	0.5000	POTENTIAL SCATTERING CONTRIBUTION	11.00
1/N - RECIPICAL SAMPLE THICKNESS	1000.0		

RESONANCE PARAMETERS

RESONANCE ENERGY	GAMMA N- NOUGHT (MV)	GAMMA-GAMMA (MV)	GAMMA F1 (MV)	GAMMA F2 (MV)	GAMMA F3 (MV)
12.100	0.0500	40.000	100.000	0.0	0.0
13.100	0.0500	40.000	100.000	0.0	0.0

THIS RUN WAS MADE UNDER THE FOLLOWING CONDITIONS:

FLIGHT PATH	50.000	METERS
SAMPLE TEMPERATURE	300.00	DEGREES KELVIN
1/N - RECIPICAL SAMPLE THICKNESS (OUTPUT)	1000.0	BARNS/ATOM
BURST WIDTH	0.50000	MICROSECONDS
CHANNEL WIDTH	0.50000	MICROSECONDS
DETECTOR THICKNESS	1.2000	CENTIMETERS
INSTRUMENT JITTER	0.10000E-02	MICROSECONDS

CROSS SECTIONS WILL BE COMPUTED FROM 10.000 EV TO 15.00 EV MINIMUM SPACING IS 0.005 MAXIMUM SPACING IS 0.100

CROSS SECTIONS COMPUTED USING THE REICH-MOORE FORMULA ARE: TOTAL FISSION

. THEORETICAL DATA HAVE BEEN CALCULATED USING THE REICH-MOORE FORMULA

FISSION CROSS SECTION HAS BEEN PLOTTED AS:
ENERGY (EV) VS CROSS SECTION (BARNS)
FROM 10.00 EV TO 15.00 EV

** PLOTDATAFX 10. 15. ENERGY SIGMA DIAMOND ENERGY SIGMA CARD ACCEPTED.

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295-XS: FISSION, FIT WITH REICH-MOORE PARAMETERS.

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EXPERIMENTAL DATA HAVE BEEN PLOTTED AS ENERGY (EV)
FROM 10.00 EV TO 15.00 EV
FORM OF INPUT DATA WAS ENERGY (EV)

VS CROSS SECTION (BARNs)
SYMBOL USED WAS: DIAMOND
VS CROSS SECTION (BARNs)

•• FIT FISSFX295-XS	12.20	403.82	12.00	171.7	12.39	154.25	CARD ACCEPTED.
•• FIT FISSFX295-XS	13.04	148.70	12.96	70.8	13.14	74.97	CARD ACCEPTED.
•• ADJUST	8 DETAIL	FISSION	REICH				CARD ACCEPTED.

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295-XS FISSION, FIT WITH REICH-MOORE PARAMETERS.

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ITERATION NO. 1

	PREVIOUS VALUES	PRESENT VALUES	PERCENT CHANGE		ENERGY	PREVIOUS	CROSS SECTIONS CURRENT	DESIRED	PERCENT DEVIATION
295-XS	12.113	EV RESONANCE (	1038.62 USEC.)	SHAPE FIT					
PEAK ENERGY	12.1000	12.1131	6.09	LEFT POINT	12.000	41.66	61.05	171.70	-6.20
GAMMA-N-NOUGHT	0.0500	0.2212	342.37	PEAK POINT	12.200	32.29	89.63	403.82	-53.04
GAMMA F	100.000	144.448	44.45	RIGHT POINT	12.390	2.21	27.96	154.25	-81.88
295-XS	13.077	EV RESONANCE (	999.60 USEC.)	SHAPE FIT					
PEAK ENERGY	13.1000	13.0774	-15.19	LEFT POINT	12.960	17.74	57.17	70.80	-19.25
GAMMA-N-NOUGHT	0.0500	0.1801	260.27	PEAK POINT	13.040	50.62	207.92	148.70	39.82
GAMMA F	100.000	54.836	-45.16	RIGHT POINT	13.140	64.40	191.27	74.97	155.13

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295-XS FISSION, FIT WITH REICH-MOORE PARAMETERS.

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ITERATION NO. 2

	PREVIOUS VALUES	PRESENT VALUES	PERCENT CHANGE		ENERGY	PREVIOUS	CROSS SECTIONS CURRENT	DESIRED	PERCENT DEVIATION
295-XS	12.140	EV RESONANCE (	1037.47 USEC.)	SHAPE FIT					
PEAK ENERGY	12.1131	12.1400	13.98	LEFT POINT	12.000	161.05	249.05	171.70	45.05
GAMMA-N-NOUGHT	0.2212	0.4665	110.91	PEAK POINT	12.200	189.63	499.06	403.82	23.58
GAMMA F	144.448	116.479	-19.36	RIGHT POINT	12.390	27.96	59.65	154.25	-61.33
295-XS	13.059	EV RESONANCE (	1000.31 USEC.)	SHAPE FIT					
PEAK ENERGY	13.0774	13.0588	-14.53	LEFT POINT	12.960	57.17	38.77	70.80	-45.25
GAMMA-N-NOUGHT	0.1801	0.2124	17.89	PEAK POINT	13.040	207.92	180.65	148.70	21.48
GAMMA F	54.836	17.687	-67.75	RIGHT POINT	13.140	191.27	113.86	74.97	51.88

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295-XS FISSION, FIT WITH REICH-MOORE PARAMETERS.

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ITERATION NO. 3

	PREVIOUS VALUES	PRESENT VALUES	PERCENT CHANGE		ENERGY	- - - - CROSS SECTIONS - - - -		PERCENT DEVIATION	
						PREVIOUS	CURRENT	DESIRED	
295-XS	12.152	EV RESONANCE (	1036.96 USEC.)	SHAPE FIT					
PEAK ENERGY	12.1400	12.1521	5.80	LEFT POINT	12.000	249.05	194.49	171.70	13.27
GAMMA-N-NOUGHT	0.4665	0.3902	-16.36	PEAK POINT	12.200	499.06	448.01	403.82	10.94
GAMMA F	116.479	136.269	16.99	RIGHT POINT	12.390	59.65	69.98	154.25	-54.63
295-XS	13.050	EV RESONANCE (	1000.64 USEC.)	SHAPE FIT					
PEAK ENERGY	13.0588	13.0502	-6.16	LEFT POINT	12.960	38.77	44.45	70.80	-37.22
GAMMA-N-NOUGHT	0.2124	0.1155	-45.59	PEAK POINT	13.040	180.65	149.28	148.70	0.39
GAMMA F	17.687	40.176	127.14	RIGHT POINT	13.140	113.86	92.41	74.97	23.26

ITERATION NO. 4

				CROSS SECTIONS				
				ENERGY	PREVIOUS	CURRENT	DESIRED	PERCENT DEVIATION
PREVIOUS VALUES	PRESENT VALUES	PERCENT CHANGE						
295-XS 12.171 EV RESONANCE (1036.15 USEC.)								
			SHAPE FIT					
PEAK ENERGY	12.1521	12.1709	7.52	12.000	194.49	188.42	171.70	9.74
GAMMA-N-NOUGHT	0.3902	0.3958	1.43	12.200	448.01	448.90	403.82	11.15
GAMMA F	136.269	184.326	35.27	12.390	69.98	104.34	154.25	-32.35
295-XS 13.041 EV RESONANCE (1000.98 USEC.)								
			SHAPE FIT					
PEAK ENERGY	13.0502	13.0413	-6.17	12.960	44.45	53.19	70.80	-24.87
GAMMA-N-NOUGHT	0.1155	0.1092	-5.45	13.040	149.28	153.26	148.70	3.07
GAMMA F	40.176	48.628	21.04	13.140	92.41	90.83	74.97	21.16

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ITERATION NO. 5

	PREVIOUS VALUES	PRESENT VALUES	PERCENT CHANGE		ENERGY	PREVIOUS	CROSS SECTIONS CURRENT	DESIRED	PERCENT DEVIATION
295-XS	12.182	EV RESONANCE (	1035.67 USEC.)	SHAPE FIT					
PEAK ENERGY	12.1709	12.1823	3.78	LEFT POINT	12.000	188.42	193.29	171.70	12.57
GAMMA-N-NOUGHT	0.3958	0.4081	3.11	PEAK POINT	12.200	448.90	417.43	403.82	3.37
GAMMA F	184.326	238.340	29.30	RIGHT POINT	12.390	104.34	135.43	154.25	-12.20
295-XS	13.026	EV RESONANCE (	1001.55 USEC.)	SHAPE FIT					
PEAK ENERGY	13.0413	13.0265	-9.88	LEFT POINT	12.960	53.19	67.82	70.80	-4.21
GAMMA-N-NOUGHT	0.1092	0.1017	-6.86	PEAK POINT	13.040	153.26	152.65	148.70	2.65
GAMMA F	48.628	58.025	19.32	RIGHT POINT	13.140	90.83	83.71	74.97	11.66

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ITERATION NO. 6

	PREVIOUS VALUES	PRESENT VALUES	PERCENT CHANGE		ENERGY	PREVIOUS	CROSS SECTIONS CURRENT	DESIRED	PERCENT DEVIATION
295-XS	12.193	EV RESONANCE (	1035.21 USEC.)	SHAPE FIT					
PEAK ENERGY	12.1823	12.1932	3.56	LEFT POINT	12.000	193.29	178.93	171.70	4.21
GAMMA-N-NOUGHT	0.4081	0.4011	-1.72	PEAK POINT	12.200	417.43	408.65	403.82	1.20
GAMMA F	238.340	245.014	2.80	RIGHT POINT	12.390	135.43	145.17	154.25	-5.89
295-XS	13.023	EV RESONANCE (	1001.68 USEC.)	SHAPE FIT					
PEAK ENERGY	13.0265	13.0231	-2.29	LEFT POINT	12.960	67.82	69.28	70.80	-2.15
GAMMA-N-NOUGHT	0.1017	0.0994	-2.29	PEAK POINT	13.040	152.65	149.58	148.70	0.59
GAMMA F	58.025	56.063	-3.38	RIGHT POINT	13.140	83.71	79.32	74.97	5.80

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ITERATION NO. 7

	PREVIOUS VALUES	PRESENT VALUES	PERCENT CHANGE		ENERGY	----- PREVIOUS	CROSS SECTIONS CURRENT	----- DESIRED	PERCENT DEVIATION
295-XS	12.197	EV RESONANCE (	1035.06 USEC.)	SHAPE FIT					
PEAK ENERGY	12.1932	12.1966	1.09	LEFT POINT	12.000	178.93	175.90	171.70	2.45
GAMMA-N-NOUGHT	0.4011	0.4010	-0.01	PEAK POINT	12.200	408.65	404.65	403.82	0.20
GAMMA F	245.014	249.921	2.00	RIGHT POINT	12.390	145.17	150.33	154.25	-2.54
295-XS	13.021	EV RESONANCE (	1001.76 USEC.)	SHAPE FIT					
PEAK ENERGY	13.0231	13.0209	-1.45	LEFT POINT	12.960	69.28	70.84	70.80	0.05
GAMMA-N-NOUGHT	0.0994	0.0996	0.17	PEAK POINT	13.040	149.58	149.45	148.70	0.50
GAMMA F	56.063	53.417	-4.72	RIGHT POINT	13.140	79.32	77.06	74.97	2.78

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ITERATION NO. 8

	PREVIOUS VALUES	PRESENT VALUES	PERCENT CHANGE		ENERGY	- - - - PREVIOUS	CROSS SECTIONS CURRENT	- - - - DESIRED	PERCENT DEVIATION
295-XS	12.199	EV RESONANCE (	1034.98 USEC.)	SHAPE FIT					
PEAK ENERGY	12.1966	12.1986	0.65	LEFT POINT	12.000	175.90	173.28	171.70	0.92
GAMMA-N-NOUGHT	0.4010	0.4001	-0.22	PEAK POINT	12.200	404.65	404.12	403.82	0.07
GAMMA F	249.921	249.849	-0.03	RIGHT POINT	12.390	150.33	152.39	154.25	-1.21
295-XS	13.020	EV RESONANCE (	1001.79 USEC.)	SHAPE FIT					
PEAK ENERGY	13.0209	13.0203	-0.41	LEFT POINT	12.960	70.84	70.81	70.80	0.02
GAMMA-N-NOUGHT	0.0996	0.1002	0.56	PEAK POINT	13.040	149.45	149.34	148.70	0.43
GAMMA F	53.417	50.677	-5.13	RIGHT POINT	13.140	77.06	75.52	74.97	0.74

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PARAMETER HISTORIES

CROSS SECTION
FIT POINTS

	ORIGINAL	1ST	2ND	3RD	4TH	5TH	6TH	7TH	8TH
DELAY	1039.19								
E-ZEROS	12.100	12.113	12.140	12.152	12.171	12.182	12.193	12.197	12.199
GAMMA NO	0.0500	0.2212	0.4665	0.3902	0.3958	0.4081	0.4011	0.4010	0.4001
GAMMA C	40.00								
GAMMA F	100.00	144.45	116.48	136.27	184.33	238.34	245.01	249.92	249.85
GAMMA T	291.25								
SIG LEFT	41.7	161.0	249.1	194.5	188.4	193.3	178.9	175.9	173.3
SIG PEAK	32.3	189.6	499.1	448.0	448.9	417.4	408.7	404.6	404.1
SIG RGHT	2.2	28.0	59.6	70.0	104.3	135.4	145.2	150.3	152.4
DELAY	998.74								
E-ZEROS	13.100	13.077	13.059	13.050	13.041	13.026	13.023	13.021	13.020
GAMMA NO	0.0500	0.1801	0.2124	0.1155	0.1092	0.1017	0.0994	0.0996	0.1002
GAMMA C	40.00								
GAMMA F	100.00	54.84	17.69	40.18	48.63	58.02	56.06	53.42	50.68
GAMMA T	91.04								
SIG LEFT	17.7	57.2	38.8	44.4	53.2	67.8	69.3	70.8	70.8
SIG PEAK	50.6	207.9	180.6	149.3	153.3	152.6	149.6	149.5	149.3
SIG RGHT	64.4	191.3	113.9	92.4	90.8	83.7	79.3	77.1	75.5

171.7
403.8
154.3

70.8
148.7
75.0

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** LIST 10. 15. .01 .02 TOTA CAPT FISS SCAT REICH CARD ACCEPTED.

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ISOTOPE INFORMATION

295-XS
ATOMIC WEIGHT OF ISOTOPE 295.0
G - STATISTICAL WEIGHTING FACTOR 0.5000
1/N - RECIPROCAL SAMPLE THICKNESS 1000.0
POTENTIAL SCATTERING CROSS SECTION. 11.00
POTENTIAL SCATTERING CONTRIBUTION 11.00

RESONANCE PARAMETERS

RESONANCE ENERGY	GAMMA N- NOUGHT (MV)	GAMMA-GAMMA (MV)	GAMMA F1 (MV)	GAMMA F2 (MV)	GAMMA F3 (MV)
12.199	0.4001	40.000	249.849	0.0	0.0
13.020	0.1002	40.000	50.677	0.0	0.0

THIS RUN WAS MADE UNDER THE FOLLOWING CONDITIONS:

FLIGHT PATH	50.000	METERS
SAMPLE TEMPERATURE	300.00	DEGREES KELVIN
1/N - RECIPICAL SAMPLE THICKNESS (OUTPUT)	1000.0	BARN/ATOM
BURST WIDTH	0.50000	MICROSECONDS
CHANNEL WIDTH	0.50000	MICROSECONDS
DETECTOR THICKNESS	1.2000	CENTIMETERS
INSTRUMENT JITTER	0.10000E-02	MICROSECONDS

CROSS SECTIONS WILL BE COMPUTED FROM 10.000 EV TO 15.00 EV MINIMUM SPACING IS 0.010 MAXIMUM SPACING IS 0.020

CROSS SECTIONS COMPUTED USING THE REICH-MOORE FORMULA ARE: TOTAL CAPTURE FISSION SCATTERING

THEORETICAL DATA HAVE BEEN CALCULATED USING THE REICH-MOORE FORMULA

ENERGY	SIG. T	UNBROADENED DATA			SIG. T	BROADENED DATA		
		SIG. C	SIG. F	SIG. S		SIG. C	SIG. F	SIG. S
10.000	13.694	0.384	2.868	10.442	13.698	0.384	2.871	10.442
10.020	13.744	0.390	2.916	10.437	13.747	0.391	2.919	10.437
10.040	13.794	0.397	2.965	10.433	13.798	0.397	2.968	10.432
10.060	13.846	0.404	3.015	10.428	13.850	0.404	3.018	10.427
10.080	13.900	0.411	3.067	10.423	13.904	0.411	3.070	10.422
10.100	13.955	0.418	3.120	10.418	13.959	0.418	3.123	10.417
10.120	14.012	0.425	3.174	10.412	14.016	0.426	3.178	10.412
10.140	14.070	0.433	3.230	10.407	14.074	0.433	3.234	10.407
10.160	14.130	0.440	3.287	10.402	14.135	0.441	3.291	10.402
10.180	14.192	0.448	3.347	10.396	14.196	0.449	3.351	10.396
10.200	14.255	0.457	3.407	10.391	14.260	0.457	3.412	10.391
10.220	14.320	0.465	3.470	10.385	14.325	0.466	3.474	10.385
10.240	14.388	0.474	3.534	10.380	14.393	0.474	3.539	10.379
10.260	14.457	0.483	3.601	10.374	14.463	0.483	3.606	10.373
10.280	14.529	0.492	3.669	10.368	14.534	0.493	3.674	10.367
10.300	14.602	0.501	3.739	10.362	14.609	0.502	3.744	10.361
10.320	14.679	0.511	3.812	10.356	14.684	0.512	3.817	10.355
10.340	14.757	0.521	3.886	10.349	14.764	0.522	3.892	10.349
10.360	14.838	0.532	3.963	10.343	14.844	0.533	3.969	10.342
10.380	14.922	0.543	4.043	10.336	14.928	0.543	4.049	10.336
10.400	15.008	0.554	4.125	10.329	15.015	0.555	4.131	10.329
10.420	15.097	0.565	4.209	10.323	15.105	0.566	4.216	10.322
10.440	15.189	0.577	4.296	10.316	15.197	0.578	4.303	10.315
10.460	15.284	0.589	4.387	10.309	15.292	0.590	4.394	10.308
10.480	15.383	0.602	4.480	10.301	15.391	0.603	4.487	10.301
10.500	15.485	0.615	4.576	10.294	15.493	0.616	4.584	10.293
10.520	15.590	0.628	4.675	10.286	15.600	0.630	4.684	10.286
10.540	15.699	0.642	4.778	10.279	15.709	0.644	4.787	10.278
10.560	15.812	0.657	4.885	10.271	15.822	0.658	4.894	10.270
10.580	15.929	0.672	4.995	10.262	15.940	0.673	5.005	10.262
10.600	16.051	0.687	5.109	10.254	16.062	0.689	5.119	10.254
10.620	16.176	0.703	5.227	10.246	16.188	0.705	5.238	10.245
10.640	16.307	0.720	5.350	10.237	16.319	0.722	5.361	10.236
10.660	16.439	0.737	5.474	10.228	16.453	0.739	5.486	10.228
10.679	16.573	0.754	5.599	10.220	16.587	0.756	5.612	10.219
10.697	16.709	0.772	5.726	10.211	16.723	0.773	5.739	10.210
10.715	16.846	0.789	5.854	10.202	16.861	0.791	5.868	10.202
10.733	16.984	0.807	5.984	10.194	17.000	0.809	5.998	10.193
10.750	17.124	0.824	6.114	10.185	17.141	0.827	6.129	10.185
10.767	17.265	0.843	6.246	10.177	17.283	0.845	6.262	10.176
10.784	17.408	0.861	6.379	10.168	17.426	0.863	6.396	10.168
10.800	17.553	0.879	6.514	10.160	17.572	0.882	6.531	10.159
10.816	17.699	0.898	6.650	10.151	17.719	0.900	6.668	10.151
10.831	17.846	0.916	6.787	10.143	17.867	0.919	6.805	10.142
10.846	17.995	0.935	6.925	10.134	18.017	0.938	6.945	10.134
10.861	18.145	0.955	7.065	10.126	18.168	0.957	7.085	10.125
10.875	18.297	0.974	7.206	10.118	18.321	0.977	7.227	10.117
10.890	18.450	0.993	7.348	10.109	18.475	0.996	7.370	10.108
10.903	18.605	1.013	7.491	10.101	18.631	1.016	7.514	10.100
10.917	18.761	1.033	7.636	10.093	18.788	1.036	7.660	10.092

ENERGY	SIG. T	UNBROADENED DATA			SIG. T	BROADENED DATA		
		SIG. C	SIG. F	SIG. S		SIG. C	SIG. F	SIG. S
10.930	18.919	1.053	7.782	10.084	18.947	1.056	7.807	10.083
10.943	19.078	1.073	7.929	10.076	19.107	1.077	7.955	10.075
10.956	19.238	1.094	8.077	10.068	19.268	1.097	8.104	10.067
10.969	19.400	1.114	8.227	10.059	19.432	1.118	8.255	10.058
10.981	19.564	1.135	8.377	10.051	19.596	1.139	8.407	10.050
10.993	19.726	1.156	8.527	10.043	19.760	1.160	8.558	10.042
11.004	19.892	1.177	8.681	10.035	19.927	1.181	8.712	10.034
11.016	20.060	1.198	8.835	10.027	20.097	1.203	8.868	10.026
11.027	20.229	1.219	8.991	10.019	20.266	1.224	9.025	10.017
11.038	20.399	1.241	9.148	10.010	20.439	1.246	9.183	10.009
11.049	20.571	1.263	9.306	10.002	20.612	1.268	9.342	10.001
11.060	20.745	1.285	9.465	9.994	20.787	1.290	9.503	9.993
11.071	20.919	1.307	9.626	9.986	20.963	1.313	9.665	9.985
11.081	21.095	1.329	9.788	9.978	21.140	1.335	9.828	9.977
11.091	21.273	1.352	9.950	9.970	21.319	1.358	9.992	9.969
11.100	21.435	1.373	10.100	9.963	21.484	1.379	10.143	9.961
11.110	21.619	1.396	10.268	9.955	21.670	1.402	10.313	9.953
11.120	21.808	1.420	10.442	9.946	21.860	1.427	10.488	9.945
11.130	22.002	1.445	10.619	9.938	22.056	1.451	10.668	9.937
11.140	22.201	1.470	10.802	9.929	22.257	1.477	10.852	9.928
11.150	22.406	1.496	10.989	9.921	22.463	1.503	11.041	9.919
11.160	22.616	1.523	11.182	9.912	22.676	1.530	11.235	9.910
11.170	22.832	1.550	11.379	9.903	22.894	1.558	11.435	9.901
11.180	23.054	1.578	11.582	9.894	23.119	1.586	11.640	9.892
11.190	23.283	1.607	11.791	9.885	23.350	1.616	11.851	9.883
11.200	23.517	1.637	12.005	9.875	23.587	1.646	12.068	9.873
11.210	23.759	1.668	12.226	9.866	23.831	1.677	12.290	9.864
11.220	24.008	1.699	12.453	9.856	24.083	1.709	12.520	9.854
11.230	24.264	1.732	12.686	9.846	24.342	1.742	12.756	9.844
11.240	24.527	1.765	12.926	9.836	24.608	1.776	12.999	9.834
11.250	24.798	1.800	13.173	9.826	24.883	1.810	13.249	9.824
11.260	25.078	1.835	13.428	9.815	25.166	1.846	13.508	9.813
11.270	25.366	1.872	13.690	9.804	25.458	1.883	13.772	9.802
11.280	25.663	1.910	13.960	9.794	25.758	1.922	14.045	9.792
11.290	25.969	1.948	14.238	9.783	26.069	1.961	14.327	9.780
11.300	26.285	1.989	14.525	9.771	26.388	2.002	14.617	9.769
11.310	26.611	2.030	14.821	9.760	26.719	2.044	14.917	9.758
11.320	26.947	2.073	15.126	9.748	27.060	2.087	15.227	9.746
11.330	27.294	2.117	15.441	9.737	27.412	2.132	15.546	9.734
11.340	27.652	2.162	15.766	9.725	27.776	2.178	15.876	9.722
11.350	28.023	2.209	16.101	9.712	28.152	2.226	16.216	9.710
11.360	28.406	2.258	16.448	9.700	28.541	2.275	16.568	9.697
11.370	28.801	2.308	16.806	9.687	28.943	2.327	16.931	9.684
11.380	29.211	2.361	17.176	9.674	29.359	2.379	17.308	9.671
11.390	29.634	2.414	17.559	9.661	29.789	2.434	17.697	9.658
11.400	30.073	2.470	17.955	9.647	30.235	2.491	18.099	9.644
11.410	30.527	2.528	18.365	9.633	30.697	2.550	18.516	9.631
11.420	30.997	2.588	18.789	9.619	31.175	2.611	18.947	9.618
11.430	31.484	2.650	19.229	9.605	31.671	2.674	19.395	9.602
11.440	31.989	2.714	19.684	9.590	32.186	2.739	19.859	9.587

ENERGY	SIG. T	UNBROADENED DATA			SIG. S	SIG. T	BROADENED DATA			SIG. S
		SIG. C	SIG. F	SIG. S			SIG. C	SIG. F	SIG. S	
11.450	32.513	2.781	20.156	9.576	32.719	2.807	20.339	9.572		
11.460	33.056	2.850	20.646	9.560	33.274	2.878	20.838	9.557		
11.470	33.621	2.922	21.153	9.545	33.849	2.951	21.356	9.541		
11.480	34.206	2.997	21.681	9.529	34.447	3.028	21.893	9.525		
11.490	34.815	3.075	22.228	9.513	35.068	3.107	22.452	9.509		
11.500	35.448	3.155	22.797	9.496	35.715	3.190	23.033	9.493		
11.510	36.107	3.239	23.388	9.480	36.388	3.276	23.636	9.476		
11.520	36.791	3.327	24.002	9.462	37.089	3.365	24.265	9.458		
11.530	37.505	3.418	24.642	9.445	37.818	3.458	24.919	9.441		
11.540	38.247	3.513	25.308	9.427	38.578	3.556	25.600	9.423		
11.550	39.021	3.612	26.001	9.408	39.371	3.657	26.310	9.404		
11.560	39.829	3.715	26.724	9.390	40.200	3.763	27.051	9.385		
11.570	40.671	3.823	27.477	9.370	41.063	3.874	27.823	9.366		
11.580	41.550	3.935	28.264	9.351	41.966	3.989	28.630	9.346		
11.590	42.468	4.053	29.085	9.331	42.910	4.110	29.473	9.326		
11.600	43.429	4.176	29.942	9.310	43.897	4.237	30.354	9.306		
11.610	44.433	4.305	30.838	9.290	44.930	4.369	31.276	9.285		
11.620	45.483	4.439	31.776	9.268	46.013	4.508	32.241	9.263		
11.630	46.584	4.581	32.757	9.246	47.147	4.654	33.252	9.241		
11.640	47.737	4.729	33.784	9.224	48.336	4.807	34.311	9.219		
11.650	48.946	4.884	34.861	9.201	49.586	4.967	35.422	9.196		
11.660	50.216	5.047	35.990	9.178	50.897	5.136	36.588	9.172		
11.670	51.548	5.219	37.176	9.154	52.276	5.314	37.814	9.148		
11.680	52.949	5.399	38.420	9.130	53.727	5.500	39.102	9.124		
11.690	54.422	5.589	39.729	9.105	55.254	5.698	40.458	9.099		
11.700	55.973	5.789	41.105	9.079	56.865	5.905	41.886	9.073		
11.710	57.607	5.999	42.554	9.053	58.562	6.124	43.390	9.047		
11.720	59.329	6.222	44.080	9.027	60.353	6.356	44.977	9.021		
11.730	61.146	6.456	45.690	9.000	62.248	6.601	46.653	8.994		
11.740	63.066	6.705	47.389	8.972	64.250	6.860	48.424	8.966		
11.750	65.095	6.967	49.184	8.944	66.369	7.135	50.297	8.938		
11.760	67.242	7.245	51.081	8.915	68.615	7.426	52.280	8.909		
11.770	69.515	7.540	53.089	8.886	70.995	7.735	54.381	8.880		
11.780	71.925	7.852	55.216	8.856	73.523	8.063	56.610	8.851		
11.790	74.482	8.184	57.472	8.826	76.211	8.413	58.978	8.821		
11.800	77.198	8.537	59.866	8.795	79.068	8.785	61.494	8.791		
11.810	80.085	8.913	62.409	8.764	82.111	9.181	64.171	8.760		
11.820	83.159	9.313	65.113	8.732	85.356	9.605	67.024	8.729		
11.830	86.433	9.740	67.993	8.700	88.817	10.057	70.064	8.698		
11.840	89.926	10.196	71.062	8.668	92.516	10.541	73.311	8.667		
11.850	93.655	10.683	74.336	8.636	96.471	11.059	76.779	8.636		
11.860	97.641	11.205	77.833	8.603	100.706	11.614	80.490	8.605		
11.870	101.906	11.763	81.572	8.571	105.243	12.210	84.461	8.575		
11.880	106.475	12.362	85.574	8.539	110.111	12.850	88.720	8.545		
11.890	111.376	13.006	89.863	8.507	115.338	13.538	93.288	8.516		
11.900	116.637	13.698	94.463	8.476	120.957	14.279	98.184	8.489		
11.910	122.292	14.442	99.404	8.446	127.002	15.077	103.468	8.463		
11.920	128.376	15.244	104.715	8.417	133.506	15.938	109.137	8.439		
11.930	134.929	16.110	110.429	8.390	140.520	16.867	115.243	8.418		
11.940	141.992	17.044	116.583	8.365	148.073	17.870	121.813	8.400		

ENERGY	SIG. T	UNBROADENED DATA			SIG. S	SIG. T	BROADENED DATA			SIG. S
		SIG. C	SIG. F	SIG. S			SIG. C	SIG. F	SIG. S	
11.950	149.613	18.054	123.216	8.343	156.218	18.953	128.890	8.386		
11.960	157.842	19.146	130.372	8.324	164.994	20.123	136.507	8.377		
11.970	166.734	20.328	138.096	8.310	174.456	21.386	144.711	8.374		
11.980	176.344	21.608	146.435	8.301	184.644	22.750	153.534	8.378		
11.990	186.734	22.995	155.442	8.298	195.608	24.221	163.018	8.391		
12.000	197.969	24.497	165.169	8.303	207.393	25.805	173.199	8.413		
12.010	210.112	26.125	175.670	8.316	220.012	27.507	184.086	8.448		
12.020	223.223	27.886	186.995	8.342	233.516	29.332	195.721	8.496		
12.030	237.367	29.792	199.195	8.380	247.895	31.281	208.091	8.560		
12.040	252.592	31.847	212.310	8.434	263.134	33.353	221.181	8.642		
12.050	268.938	34.061	226.370	8.507	279.213	35.547	234.970	8.744		
12.060	286.421	36.436	241.384	8.601	296.044	37.852	249.375	8.869		
12.070	305.034	38.974	257.341	8.720	313.535	40.256	264.315	9.019		
12.080	324.722	41.667	274.188	8.867	331.547	42.743	279.666	9.196		
12.090	345.383	44.507	291.829	9.047	349.871	45.285	295.244	9.402		
12.100	366.837	47.468	310.105	9.263	368.273	47.852	310.843	9.638		
12.110	388.828	50.521	328.788	9.519	386.473	50.407	326.219	9.904		
12.120	410.997	53.617	347.563	9.817	404.139	52.906	341.086	10.200		
12.130	432.877	56.697	366.021	10.159	420.900	55.299	355.123	10.524		
12.140	453.894	59.684	383.665	10.545	436.373	57.534	368.001	10.875		
12.150	473.382	62.489	399.922	10.972	450.154	59.557	379.378	11.248		
12.160	490.605	65.013	414.158	11.435	461.884	61.317	388.948	11.639		
12.170	504.812	67.152	425.733	11.927	471.189	62.762	396.396	12.041		
12.180	515.300	68.808	434.058	12.437	477.790	63.852	401.492	12.449		
12.190	521.493	69.895	438.646	12.951	481.458	64.554	404.047	12.858		
12.200	523.002	70.361	439.185	13.456	482.052	64.846	403.951	13.253		
12.210	519.684	70.174	435.573	13.937	479.529	64.718	401.177	13.634		
12.220	511.666	69.349	427.935	14.381	473.945	64.175	395.785	13.993		
12.230	499.321	67.928	416.617	14.776	465.464	63.235	387.923	14.322		
12.240	483.232	65.985	402.130	15.116	454.311	61.927	377.793	14.618		
12.250	464.114	63.612	385.105	15.396	440.794	60.288	365.867	14.877		
12.260	442.747	60.914	366.217	15.615	425.298	58.369	351.882	15.097		
12.270	419.898	57.992	346.131	15.776	408.187	56.217	338.751	15.277		
12.280	396.267	54.940	325.444	15.882	389.896	53.890	320.653	15.416		
12.290	372.459	51.843	304.677	15.940	370.786	51.437	303.900	15.518		
12.300	348.967	48.768	284.243	15.956	351.269	48.913	286.845	15.583		
12.310	326.166	45.768	264.461	15.937	331.654	46.381	269.749	15.618		
12.320	304.319	42.882	245.548	15.889	312.228	43.821	252.859	15.619		
12.330	283.603	40.136	227.649	15.818	293.248	41.328	236.391	15.596		
12.340	264.121	37.545	210.847	15.729	274.903	38.910	220.503	15.551		
12.350	245.916	35.119	195.171	15.626	257.324	36.585	205.306	15.488		
12.360	228.986	32.858	180.614	15.514	240.624	34.371	190.893	15.410		
12.370	213.298	30.759	167.144	15.395	224.852	32.278	177.301	15.320		
12.380	198.802	28.819	154.712	15.272	210.051	30.308	164.562	15.221		
12.390	185.433	27.027	143.260	15.146	196.213	28.462	152.689	15.115		
12.400	173.117	25.376	132.721	15.020	183.328	26.744	141.608	15.005		
12.410	161.780	23.857	123.030	14.894	171.365	25.149	131.349	14.892		
12.420	151.347	22.459	114.118	14.769	160.275	23.670	121.849	14.777		
12.430	141.746	21.175	105.924	14.646	150.016	22.304	113.089	14.662		
12.440	132.906	19.995	98.384	14.526	140.535	21.042	104.960	14.548		

ENERGY	SIG. T	UNBROADENED DATA			SIG. T	BROADENED DATA		
		SIG. C	SIG. F	SIG. S		SIG. C	SIG. F	SIG. S
12.450	124.762	18.911	91.442	14.409	131.779	19.880	97.477	14.434
12.460	117.255	17.915	85.045	14.295	123.691	18.810	90.569	14.323
12.470	110.328	16.999	79.145	14.184	116.223	17.825	84.194	14.214
12.480	103.930	16.158	73.696	14.076	109.319	16.919	78.302	14.107
12.490	98.014	15.384	68.658	13.972	102.941	16.087	72.859	14.002
12.500	92.538	14.674	63.994	13.870	97.043	15.323	67.826	13.900
12.510	87.463	14.021	59.670	13.772	91.580	14.621	63.163	13.801
12.520	82.755	13.422	55.657	13.676	86.521	13.978	58.843	13.705
12.530	78.380	12.872	51.924	13.584	81.825	13.388	54.830	13.611
12.540	74.311	12.367	48.450	13.494	77.465	12.848	51.101	13.520
12.550	70.521	11.905	45.209	13.406	73.411	12.354	47.629	13.431
12.560	66.988	11.483	42.183	13.321	69.641	11.904	44.394	13.344
12.570	63.689	11.098	39.352	13.238	66.128	11.495	41.376	13.260
12.580	60.606	10.748	36.701	13.158	62.851	11.124	38.552	13.178
12.590	57.722	10.431	34.213	13.079	59.791	10.788	35.907	13.097
12.600	55.022	10.145	31.875	13.002	56.933	10.488	33.428	13.018
12.610	52.490	9.889	29.674	12.927	54.260	10.220	31.099	12.941
12.620	50.115	9.663	27.600	12.853	51.758	9.985	28.909	12.866
12.630	47.885	9.464	25.641	12.780	49.414	9.780	26.844	12.791
12.640	45.790	9.293	23.789	12.708	47.220	9.606	24.897	12.718
12.650	43.821	9.148	22.035	12.638	45.163	9.461	23.057	12.645
12.660	41.970	9.031	20.371	12.568	43.237	9.348	21.316	12.573
12.670	40.230	8.941	18.791	12.499	41.431	9.264	19.665	12.502
12.680	38.596	8.878	17.288	12.430	39.742	9.212	18.100	12.431
12.690	37.061	8.843	15.856	12.361	38.166	9.193	16.613	12.360
12.700	35.622	8.838	14.491	12.293	36.698	9.208	15.201	12.289
12.710	34.275	8.863	13.188	12.224	35.336	9.260	13.858	12.218
12.720	33.019	8.920	11.943	12.155	34.078	9.351	12.582	12.146
12.730	31.851	9.013	10.753	12.085	32.928	9.486	11.368	12.073
12.740	30.773	9.143	9.615	12.015	31.886	9.669	10.217	11.999
12.750	29.785	9.315	8.527	11.943	30.959	9.907	9.129	11.924
12.760	28.891	9.532	7.489	11.870	30.156	10.206	8.103	11.847
12.770	28.095	9.801	6.498	11.795	29.489	10.576	7.146	11.767
12.780	27.404	10.128	5.558	11.718	28.978	11.031	6.262	11.686
12.790	26.828	10.522	4.668	11.639	28.646	11.585	5.461	11.601
12.800	26.381	10.991	3.834	11.556	28.529	12.258	4.758	11.512
12.810	26.080	11.550	3.060	11.470	28.673	13.077	4.176	11.419
12.820	25.949	12.214	2.355	11.380	29.141	14.075	3.745	11.322
12.830	26.019	13.002	1.731	11.286	30.019	15.292	3.507	11.220
12.840	26.330	13.939	1.205	11.185	31.415	16.781	3.522	11.112
12.850	26.937	15.057	0.801	11.079	33.473	18.607	3.866	11.000
12.860	27.912	16.397	0.550	10.965	36.370	20.848	4.643	10.882
12.870	29.351	18.010	0.498	10.843	40.332	23.592	5.983	10.761
12.880	31.387	19.967	0.708	10.712	45.624	26.946	8.047	10.639
12.890	34.198	22.358	1.271	10.569	52.536	31.008	11.021	10.519
12.900	38.034	25.306	2.314	10.415	61.381	35.881	15.115	10.406
12.910	43.245	28.977	4.021	10.247	72.434	41.630	20.528	10.309
12.920	50.324	33.597	6.660	10.066	85.905	48.278	27.440	10.234
12.930	59.974	39.475	10.626	9.872	101.892	55.787	35.976	10.184
12.940	73.204	47.033	16.500	9.670	120.291	64.020	46.156	10.188

ENERGY	UNBROADENED DATA				BROADENED DATA			
	SIG. T	SIG. C	SIG. F	SIG. S	SIG. T	SIG. C	SIG. F	SIG. S
12.950	91.439	56.832	25.137	9.470	140.785	72.747	57.880	10.258
12.960	116.631	69.577	37.761	9.293	162.748	81.613	70.862	10.383
12.970	151.217	86.023	56.012	9.182	185.331	90.191	84.675	10.577
12.980	197.578	106.625	81.739	9.213	207.421	97.975	98.706	10.841
12.990	256.152	130.626	116.021	9.506	227.791	104.456	112.245	11.171
13.000	321.574	154.535	156.847	10.192	245.222	109.175	124.547	11.554
13.010	379.032	171.352	196.367	11.314	258.604	111.769	134.888	11.974
13.020	408.862	173.729	222.451	12.682	267.088	112.032	142.655	12.410
13.030	401.779	160.433	227.416	13.931	270.243	109.942	147.461	12.840
13.040	366.679	137.649	214.240	14.791	268.035	105.660	149.136	13.244
13.050	320.073	113.053	191.788	15.232	260.866	99.517	147.768	13.601
13.060	274.059	91.187	167.506	15.367	249.468	91.943	143.664	13.900
13.070	233.970	73.436	145.211	15.323	234.842	83.453	137.314	14.131
13.080	200.904	59.578	126.138	15.189	218.059	74.540	129.294	14.295
13.090	174.198	48.890	110.291	15.016	200.216	65.670	120.227	14.393
13.100	152.710	40.634	97.242	14.834	182.212	57.189	110.662	14.433
13.110	135.346	34.204	86.486	14.656	164.836	49.374	101.100	14.426
13.120	121.198	29.142	77.568	14.488	148.628	42.386	91.916	14.381
13.130	109.553	25.107	70.114	14.332	133.915	36.286	83.363	14.310
13.140	99.869	21.852	63.827	14.190	120.829	31.063	75.580	14.221
13.150	91.730	19.195	58.476	14.059	109.390	26.662	66.632	14.121
13.160	84.824	17.003	53.881	13.940	99.499	22.992	62.507	14.018
13.170	78.908	15.175	49.902	13.831	91.011	19.955	57.154	13.915
13.180	73.798	13.637	46.430	13.731	83.742	17.444	52.493	13.815
13.190	69.348	12.330	43.379	13.639	77.522	15.370	48.441	13.719
13.200	65.444	11.211	40.678	13.555	72.186	13.649	44.913	13.629
13.210	61.997	10.247	38.274	13.476	67.580	12.212	41.826	13.545
13.220	58.934	9.409	36.121	13.404	63.588	11.007	39.118	13.468
13.230	56.196	8.676	34.183	13.337	60.102	9.986	36.725	13.393
13.240	53.736	8.032	32.430	13.274	57.039	9.115	34.601	13.325
13.250	51.516	7.463	30.837	13.216	54.329	8.366	32.704	13.262
13.260	49.502	6.957	29.383	13.161	51.917	7.716	31.000	13.202
13.270	47.668	6.506	28.052	13.110	49.754	7.148	29.459	13.147
13.280	45.991	6.101	26.829	13.061	47.803	6.648	28.060	13.095
13.290	44.452	5.736	25.700	13.016	46.038	6.208	26.786	13.046
13.300	43.035	5.406	24.656	12.973	44.430	5.812	25.617	13.001
13.310	41.726	5.107	23.687	12.932	42.959	5.460	24.542	12.957
13.320	40.514	4.835	22.787	12.893	41.608	5.142	23.549	12.916
13.330	39.389	4.586	21.946	12.857	40.365	4.856	22.631	12.878
13.340	38.340	4.358	21.161	12.821	39.214	4.596	21.777	12.841
13.350	37.362	4.149	20.425	12.788	38.147	4.359	20.982	12.806
13.360	36.446	3.956	19.734	12.756	37.156	4.143	20.239	12.773
13.370	35.588	3.778	19.085	12.726	36.230	3.945	19.544	12.741
13.380	34.782	3.613	18.472	12.697	35.365	3.762	18.892	12.711
13.390	34.023	3.460	17.894	12.669	34.554	3.594	18.278	12.682
13.400	33.308	3.318	17.348	12.642	33.794	3.439	17.700	12.654
13.410	32.632	3.185	16.831	12.616	33.076	3.294	17.154	12.628
13.420	31.993	3.061	16.340	12.591	32.401	3.160	16.638	12.602
13.430	31.387	2.945	15.874	12.568	31.763	3.035	16.150	12.578
13.440	30.813	2.837	15.431	12.545	31.160	2.919	15.688	12.554

ENERGY	UNBROADENED DATA				BROADENED DATA			
	SIG. T	SIG. C	SIG. F	SIG. S	SIG. T	SIG. C	SIG. F	SIG. S
13.450	30.267	2.735	15.009	12.523	30.588	2.810	15.246	12.531
13.460	29.748	2.639	14.607	12.501	30.045	2.708	14.827	12.510
13.470	29.253	2.549	14.223	12.480	29.529	2.612	14.429	12.488
13.480	28.782	2.464	13.857	12.461	29.039	2.522	14.049	12.468
13.490	28.332	2.384	13.506	12.441	28.571	2.437	13.685	12.448
13.500	27.901	2.308	13.171	12.422	28.125	2.357	13.339	12.429
13.510	27.490	2.236	12.850	12.404	27.699	2.282	13.007	12.411
13.520	27.096	2.168	12.541	12.387	27.292	2.210	12.689	12.393
13.530	26.719	2.103	12.246	12.370	26.902	2.142	12.384	12.375
13.540	26.350	2.041	11.956	12.353	26.522	2.077	12.087	12.358
13.551	25.982	1.979	11.667	12.336	26.144	2.012	11.790	12.341
13.562	25.615	1.918	11.378	12.318	25.765	1.949	11.493	12.323
13.573	25.248	1.857	11.090	12.301	25.389	1.886	11.198	12.306
13.585	24.883	1.798	10.802	12.283	25.014	1.824	10.902	12.288
13.598	24.518	1.739	10.513	12.265	24.641	1.763	10.608	12.270
13.611	24.154	1.681	10.226	12.247	24.268	1.703	10.313	12.251
13.625	23.790	1.623	9.938	12.229	23.897	1.644	10.020	12.233
13.639	23.427	1.566	9.651	12.211	23.526	1.585	9.727	12.214
13.654	23.066	1.510	9.364	12.192	23.157	1.527	9.434	12.195
13.670	22.704	1.455	9.077	12.173	22.789	1.470	9.142	12.176
13.687	22.344	1.400	8.790	12.154	22.423	1.414	8.851	12.157
13.705	21.984	1.346	8.504	12.134	22.056	1.359	8.560	12.137
13.723	21.626	1.293	8.219	12.115	21.692	1.304	8.270	12.117
13.743	21.268	1.240	7.933	12.095	21.329	1.251	7.981	12.097
13.760	20.915	1.197	7.700	12.078	21.032	1.207	7.744	12.080
13.780	20.648	1.150	7.439	12.059	20.700	1.159	7.480	12.061
13.800	20.338	1.106	7.191	12.041	20.386	1.114	7.229	12.043
13.820	20.045	1.065	6.957	12.023	20.089	1.072	6.992	12.025
13.840	19.766	1.026	6.734	12.006	19.808	1.032	6.767	12.008
13.860	19.502	0.989	6.523	11.990	19.541	0.995	6.553	11.992
13.880	19.251	0.954	6.322	11.974	19.286	0.960	6.350	11.976
13.900	19.011	0.922	6.130	11.959	19.044	0.927	6.157	11.961
13.920	18.783	0.891	5.948	11.945	18.815	0.896	5.973	11.946
13.940	18.566	0.862	5.774	11.930	18.595	0.866	5.797	11.932
13.960	18.358	0.834	5.608	11.917	18.386	0.838	5.629	11.918
13.980	18.160	0.808	5.449	11.903	18.186	0.812	5.469	11.905
14.000	17.970	0.783	5.297	11.891	17.994	0.786	5.316	11.892
14.020	17.789	0.759	5.152	11.878	17.811	0.762	5.170	11.879
14.040	17.615	0.736	5.012	11.866	17.636	0.739	5.029	11.867
14.060	17.448	0.715	4.879	11.854	17.469	0.718	4.895	11.855
14.080	17.288	0.694	4.751	11.843	17.307	0.697	4.766	11.844
14.100	17.134	0.675	4.628	11.832	17.152	0.677	4.642	11.833
14.120	16.987	0.656	4.510	11.821	17.003	0.658	4.523	11.822
14.140	16.845	0.638	4.396	11.810	16.861	0.640	4.409	11.811
14.160	16.708	0.621	4.287	11.800	16.723	0.623	4.299	11.801
14.180	16.577	0.604	4.182	11.790	16.592	0.606	4.194	11.791
14.200	16.450	0.588	4.081	11.781	16.463	0.590	4.092	11.781
14.220	16.328	0.573	3.984	11.771	16.341	0.575	3.994	11.772
14.240	16.210	0.559	3.890	11.762	16.223	0.560	3.900	11.763
14.260	16.097	0.545	3.799	11.753	16.108	0.546	3.809	11.754

ENERGY	UNBROADENED DATA				BROADENED DATA			
	SIG. T	SIG. C	SIG. F	SIG. S	SIG. T	SIG. C	SIG. F	SIG. S
14.280	15.987	0.531	3.712	11.744	15.999	0.533	3.721	11.745
14.300	15.881	0.518	3.627	11.736	15.892	0.520	3.636	11.736
14.320	15.779	0.506	3.546	11.727	15.789	0.507	3.554	11.728
14.340	15.680	0.494	3.467	11.719	15.690	0.495	3.475	11.720
14.360	15.585	0.482	3.391	11.711	15.594	0.484	3.399	11.712
14.380	15.492	0.471	3.318	11.704	15.501	0.472	3.325	11.704
14.400	15.403	0.460	3.246	11.696	15.411	0.462	3.253	11.696
14.420	15.316	0.450	3.177	11.688	15.324	0.451	3.184	11.689
14.440	15.232	0.440	3.111	11.681	15.240	0.441	3.117	11.682
14.460	15.151	0.430	3.046	11.674	15.158	0.431	3.052	11.674
14.480	15.072	0.421	2.984	11.667	15.079	0.422	2.989	11.668
14.500	14.995	0.412	2.923	11.660	15.002	0.413	2.928	11.661
14.520	14.921	0.403	2.864	11.654	14.928	0.404	2.869	11.654
14.540	14.849	0.395	2.807	11.647	14.855	0.396	2.812	11.647
14.560	14.779	0.387	2.752	11.641	14.785	0.387	2.756	11.641
14.580	14.711	0.379	2.698	11.635	14.717	0.379	2.702	11.635
14.600	14.645	0.371	2.646	11.628	14.651	0.372	2.650	11.629
14.620	14.581	0.363	2.595	11.622	14.587	0.364	2.599	11.623
14.640	14.518	0.356	2.546	11.616	14.524	0.357	2.550	11.617
14.660	14.458	0.349	2.498	11.611	14.463	0.350	2.502	11.611
14.680	14.399	0.342	2.451	11.605	14.403	0.343	2.455	11.605
14.700	14.341	0.336	2.406	11.599	14.346	0.336	2.410	11.600
14.720	14.286	0.329	2.362	11.594	14.290	0.330	2.366	11.594
14.740	14.231	0.323	2.319	11.589	14.236	0.324	2.323	11.589
14.760	14.178	0.317	2.278	11.583	14.183	0.318	2.281	11.584
14.780	14.127	0.311	2.237	11.578	14.131	0.312	2.240	11.578
14.800	14.076	0.306	2.198	11.573	14.080	0.306	2.201	11.573
14.820	14.027	0.300	2.159	11.568	14.031	0.300	2.162	11.568
14.840	13.980	0.295	2.122	11.563	13.984	0.295	2.125	11.563
14.860	13.933	0.289	2.085	11.558	13.937	0.290	2.088	11.559
14.880	13.888	0.284	2.050	11.554	13.891	0.285	2.052	11.554
14.900	13.843	0.279	2.015	11.549	13.847	0.280	2.018	11.549
14.920	13.800	0.274	1.981	11.545	13.804	0.275	1.984	11.545
14.940	13.758	0.270	1.948	11.540	13.761	0.270	1.951	11.540
14.960	13.717	0.265	1.916	11.536	13.720	0.265	1.918	11.538
14.980	13.677	0.261	1.885	11.531	13.680	0.261	1.887	11.531
15.000	13.637	0.256	1.854	11.527	13.640	0.257	1.856	11.527

(ACSAP/001 - - JUNE, 1972 - - AEROJET NUCLEAR CORP.)
295-XS FISSION, FIT WITH REICH-MOORE PARAMETERS.

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	INTEGRAL UNDER _CROSS_SECTION_CURVE	RESONANCE INTEGRAL -----[XSEC/E]-----
TOTAL	333.35	27.00
CAPTURE	55.00	4.39
FISSION	222.00	18.08
SCATTERING	56.40	4.54

(ACSAP/001 - - JUNE, 1972 - - AEROJET NUCLEAR CORP.)

295-XS FISSION, FIT WITH REICH-MOORE PARAMETERS.

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•• PLOT 10. 15. .01 FISSION REICH ENERGY SIGMA CARD ACCEPTED.

FIT AND VALLEY POINTS HAVE BEEN PLOTTED

FISSION CROSS SECTION HAS BEEN PLOTTED AS:
ENERGY (EV) VS CROSS SECTION (BARNs)
FROM 10.00 EV TO 15.00 EV

•• PUNCH PARAM

A TITLE CARD, ISOTOPE CARDS, PARAMETER CARDS, AND A CONDITIONS CARD HAVE BEEN PUNCHED AS FOLLOWS:
(NOTE CARD SEQUENCE NUMBER IN COL. 8 THRU 10)

TITLE	1	295-XS FISSION, FIT WITH REICH-MOORE PARAMETERS.					06/29/72	
ISOTOPE	2295-XS	295.000	11.000	0.50000	1000.00			
PARAMET	3295-XS	12.199	0.4001	40.000	249.849	0.0	0.0	
PARAMET	4295-XS	13.020	0.1002	40.000	50.677	0.0	0.0	
CONDITI	5	300.00	50.000	0.5000	0.5000	1.2000	0.0018 1000.00	

•• DIFF OUTFX 10. 14.9 FISSION REICH LIST CARD ACCEPTED.

ENERGY	THEO. DATA	EXPER. DATA	DIFFER (E-T)	ENERGY	THEO. DATA	EXPER. DATA	DIFFER (E-T)	ENERGY	THEO. DATA	EXPER. DATA	DIFFER (E-T)
10.000	2.87	3.20	0.33	10.020	2.92	3.10	0.18	10.040	2.97	3.17	0.20
10.060	3.02	2.98	-0.04	10.080	3.07	3.14	0.07	10.100	3.12	3.36	0.24
10.120	3.18	3.55	0.37	10.140	3.23	2.78	-0.45	10.160	3.29	3.03	-0.26
10.180	3.35	3.58	0.23	10.200	3.41	2.96	-0.45	10.220	3.47	3.78	0.31
10.240	3.54	3.35	-0.19	10.260	3.61	3.91	0.30	10.280	3.67	3.83	0.16
10.300	3.74	3.27	-0.47	10.320	3.82	3.92	0.10	10.340	3.89	4.36	0.47
10.360	3.97	4.30	0.33	10.380	4.05	4.23	0.18	10.400	4.13	3.69	-0.44
10.420	4.22	4.42	0.20	10.440	4.30	3.89	-0.41	10.460	4.39	4.64	0.25
10.480	4.49	4.96	0.47	10.500	4.58	4.60	0.02	10.520	4.68	4.20	-0.48
10.540	4.79	4.36	-0.43	10.560	4.89	5.04	0.15	10.580	5.00	4.73	-0.27
10.600	5.12	4.85	-0.27	10.620	5.24	5.48	0.24	10.640	5.36	5.24	-0.12
10.660	5.49	5.34	-0.15	10.679	5.61	5.23	-0.38	10.697	5.74	5.27	-0.47
10.715	5.87	5.86	-0.01	10.733	6.00	5.86	-0.14	10.750	6.13	5.97	-0.16
10.767	6.26	5.84	-0.42	10.784	6.40	5.87	-0.53	10.800	6.53	6.47	-0.06
10.816	6.67	6.52	-0.15	10.831	6.80	7.07	0.27	10.846	6.94	6.57	-0.37
10.861	7.08	6.90	-0.18	10.876	7.23	7.48	0.25	10.890	7.37	7.16	-0.21
10.904	7.52	7.21	-0.31	10.917	7.66	7.01	-0.65	10.931	7.81	7.21	-0.60
10.944	7.96	8.10	0.14	10.956	8.10	7.99	-0.11	10.969	8.26	8.28	0.02
10.981	8.41	8.81	0.40	10.993	8.56	8.47	-0.09	11.005	8.72	8.07	-0.65
11.016	8.87	9.38	0.51	11.028	9.03	9.64	0.61	11.039	9.19	8.92	-0.27
11.050	9.35	8.86	-0.49	11.060	9.50	9.64	0.14	11.071	9.67	9.37	-0.30
11.081	9.83	10.57	0.74	11.091	9.99	9.97	-0.02	11.100	10.14	10.22	0.08
11.110	10.31	10.15	-0.16	11.120	10.49	11.07	0.58	11.130	10.67	11.42	0.75
11.140	10.85	10.74	-0.11	11.150	11.04	10.80	-0.24	11.160	11.24	11.53	0.29
11.170	11.43	11.00	-0.43	11.180	11.64	12.12	0.48	11.190	11.85	12.55	0.70
11.200	12.07	12.57	0.50	11.210	12.29	11.42	-0.87	11.220	12.52	12.18	-0.34
11.230	12.76	12.24	-0.52	11.240	13.00	13.71	0.71	11.250	13.25	13.94	0.69
11.260	13.51	13.73	0.22	11.270	13.77	13.21	-0.56	11.280	14.05	14.87	0.82
11.290	14.33	13.93	-0.40	11.300	14.62	14.89	0.27	11.310	14.92	15.20	0.28
11.320	15.23	15.17	-0.06	11.330	15.55	15.39	-0.16	11.340	15.38	16.18	0.80
11.350	16.22	16.23	0.01	11.360	16.57	16.61	0.04	11.370	16.33	17.82	0.89
11.380	17.31	16.88	-0.43	11.390	17.70	18.20	0.50	11.400	18.10	17.33	-0.77
11.410	18.52	18.64	0.12	11.420	18.95	18.85	-0.10	11.430	19.39	18.48	-0.91
11.440	19.86	20.42	0.56	11.450	20.34	19.50	-0.84	11.460	20.84	20.43	-0.41
11.470	21.36	20.57	-0.79	11.480	21.89	21.67	-0.22	11.490	22.45	22.02	-0.43
11.500	23.03	23.33	0.30	11.510	23.64	22.96	-0.68	11.520	24.26	23.12	-1.14
11.530	24.92	25.01	0.09	11.540	25.60	24.95	-0.65	11.550	26.31	24.96	-1.35
11.560	27.05	28.21	1.16	11.570	27.82	27.17	-0.65	11.580	28.63	28.08	-0.55
11.590	29.47	30.33	0.86	11.600	30.35	30.50	0.15	11.610	31.28	30.57	-0.71
11.620	32.24	33.11	0.87	11.630	33.25	34.45	1.20	11.640	34.31	34.34	0.03
11.650	35.42	34.17	-1.25	11.660	36.59	35.52	-1.07	11.670	37.81	37.56	-0.25
11.680	39.10	38.93	-0.17	11.690	40.46	39.42	-1.04	11.700	41.89	41.10	-0.79
11.710	43.39	42.50	-0.89	11.720	44.98	44.27	-0.71	11.730	46.65	47.87	1.32
11.740	48.42	46.42	-2.00	11.750	50.30	51.21	0.91	11.760	52.28	52.05	-0.23
11.770	54.38	52.46	-1.92	11.780	56.61	55.08	-1.53	11.790	58.98	58.74	-0.24
11.800	61.49	62.72	1.23	11.810	64.17	65.27	1.10	11.820	67.02	66.82	-0.20
11.830	70.06	71.40	1.34	11.840	73.31	71.04	-2.27	11.850	76.78	78.78	0.00
11.860	80.49	79.76	-0.73	11.870	84.46	84.74	0.28	11.880	88.72	88.01	-0.71
11.890	93.29	91.12	-2.17	11.900	98.20	96.44	-1.76	11.910	103.47	102.80	-0.67
11.920	109.14	105.74	-3.40	11.930	115.24	116.18	0.94	11.940	121.81	120.76	-1.05

ENERGY	THEO. DATA	EXPER. DATA	DIFFER (E-T)	ENERGY	THEO. DATA	EXPER. DATA	DIFFER (E-T)	ENERGY	THEO. DATA	EXPER. DATA	DIFFER (E-T)
11.950	128.89	129.57	0.68	11.960	136.51	138.13	1.62	11.970	144.71	141.01	-3.70
11.980	153.54	150.67	-2.87	11.990	163.02	159.86	-3.16	12.000	173.20	172.48	-0.72
12.010	184.09	180.45	-3.64	12.020	195.72	191.44	-4.28	12.030	208.09	206.23	-1.86
12.040	221.18	217.68	-3.50	12.050	234.97	235.05	0.08	12.060	249.38	247.92	-1.46
12.070	264.32	258.25	-6.07	12.080	279.67	276.40	-3.27	12.090	295.25	293.67	-1.58
12.100	310.85	309.44	-1.41	12.110	326.22	327.16	0.94	12.120	341.09	336.45	-4.64
12.130	355.12	350.24	-4.88	12.140	368.00	367.11	-0.89	12.150	379.38	376.05	-3.33
12.160	388.95	382.99	-5.96	12.170	396.40	397.82	1.42	12.180	401.49	402.48	0.99
12.190	404.05	406.19	2.14	12.200	403.95	408.07	4.12	12.210	401.18	398.22	-2.96
12.220	395.78	394.19	-1.59	12.230	387.92	389.37	1.45	12.240	377.79	377.01	-0.78
12.250	365.66	365.03	-0.63	12.260	351.88	353.83	1.95	12.270	336.75	335.38	-1.37
12.280	320.65	324.03	3.38	12.290	303.89	302.52	-1.37	12.300	286.84	286.88	0.04
12.310	269.74	268.66	-1.08	12.320	252.85	258.11	5.26	12.330	236.39	241.54	5.15
12.340	220.50	225.44	4.94	12.350	205.30	209.39	4.09	12.360	190.89	191.26	0.37
12.370	177.30	176.15	-1.15	12.380	164.56	165.18	0.62	12.390	152.67	157.13	4.46
12.400	141.60	141.75	0.15	12.410	131.35	132.63	1.28	12.420	121.85	125.45	3.60
12.430	113.07	115.07	2.00	12.440	104.96	104.30	-0.66	12.450	97.48	98.91	1.43
12.460	90.57	91.89	1.32	12.470	84.19	86.21	2.02	12.480	78.30	80.37	2.07
12.490	72.86	73.58	0.72	12.500	67.82	68.20	0.38	12.510	63.16	64.32	1.16
12.520	58.84	59.35	0.51	12.530	54.83	56.31	1.48	12.540	51.10	52.47	1.37
12.550	47.63	47.13	-0.50	12.560	44.39	43.86	-0.53	12.570	41.37	42.83	1.46
12.580	38.55	39.30	0.75	12.590	35.91	37.35	1.44	12.600	33.43	32.83	-0.60
12.610	31.10	32.51	1.41	12.620	28.91	28.66	-0.25	12.630	26.84	26.73	-0.11
12.640	24.90	26.35	1.45	12.650	23.06	22.73	-0.33	12.660	21.32	21.29	-0.03
12.670	19.66	19.98	0.32	12.680	18.10	17.96	-0.14	12.690	16.61	17.32	0.71
12.700	15.20	16.38	1.18	12.710	13.86	14.74	0.88	12.720	12.58	13.26	0.68
12.730	11.37	11.40	0.03	12.740	10.22	9.69	-0.53	12.750	9.13	8.82	-0.31
12.760	8.10	7.62	-0.48	12.770	7.15	6.80	-0.35	12.780	6.26	6.83	0.57
12.790	5.46	5.36	-0.10	12.800	4.76	5.14	0.38	12.810	4.18	3.92	-0.26
12.820	3.74	4.06	0.32	12.830	3.51	3.59	0.08	12.840	3.52	3.84	0.42
12.850	3.87	3.61	-0.26	12.860	4.64	4.83	0.19	12.870	5.98	6.09	0.11
12.880	8.05	7.40	-0.65	12.890	11.02	10.99	-0.03	12.900	15.12	15.94	0.82
12.910	20.53	20.77	0.24	12.920	27.44	27.89	0.45	12.930	35.84	37.32	1.34
12.940	46.16	44.54	-1.62	12.950	57.88	55.92	-1.96	12.960	70.86	68.09	-1.77
12.970	84.68	82.56	-2.12	12.980	98.71	101.00	2.29	12.990	112.25	114.17	1.92
13.000	124.55	127.20	2.65	13.010	134.89	135.06	0.17	13.020	142.66	144.70	2.04
13.030	147.46	148.63	1.17	13.040	149.14	145.79	-3.35	13.050	147.77	148.57	0.80
13.060	143.66	143.64	-0.02	13.070	137.31	134.52	-2.79	13.080	129.29	131.05	1.76
13.090	120.22	121.63	1.41	13.100	110.66	109.57	-1.09	13.110	101.10	98.23	-2.87
13.120	91.91	88.97	-2.94	13.130	83.36	80.55	-2.81	13.140	75.58	74.49	-1.09
13.150	68.63	68.51	-0.12	13.160	62.51	62.50	-0.01	13.170	57.15	57.91	0.76
13.180	52.49	53.06	0.57	13.190	48.44	48.85	0.41	13.200	44.81	45.91	1.00
13.210	41.83	41.02	-0.81	13.220	39.12	38.71	-0.41	13.230	36.72	35.32	-1.40
13.240	34.60	33.12	-1.48	13.250	32.70	33.46	0.76	13.260	31.00	31.79	0.79
13.270	29.46	28.11	-1.35	13.280	28.06	27.07	-0.99	13.290	26.79	27.90	1.11
13.300	25.62	26.05	0.43	13.310	24.54	25.49	0.95	13.320	23.55	23.50	-0.05
13.330	22.63	21.85	-0.78	13.340	21.78	20.53	-1.25	13.350	20.98	21.06	0.08
13.360	20.24	20.89	0.65	13.370	19.54	18.99	-0.55	13.380	18.89	19.22	0.33
13.390	18.28	17.19	-1.09	13.400	17.70	17.44	-0.26	13.410	17.15	17.50	0.35
13.420	16.64	17.50	0.86	13.430	16.15	16.91	0.76	13.440	15.68	15.27	-0.42

ENERGY	THEO. DATA	EXPER. DATA	DIFFER (E-T)	ENERGY	THEO. DATA	EXPER. DATA	DIFFER (E-T)	ENERGY	THEO. DATA	EXPER. DATA	DIFFER (E-T)
13.450	15.25	14.57	-0.68	13.460	14.83	15.10	0.27	13.470	14.43	15.09	0.66
13.480	14.05	14.33	0.28	13.490	13.69	13.94	0.25	13.500	13.34	12.97	-0.37
13.510	13.01	12.89	-0.12	13.520	12.69	12.30	-0.39	13.530	12.38	11.72	-0.66
13.540	12.09	12.23	0.14	13.551	11.78	12.23	0.45	13.562	11.49	11.83	0.34
13.574	11.18	11.63	0.45	13.586	10.89	11.13	0.24	13.599	10.58	10.37	-0.21
13.612	10.29	10.69	0.40	13.626	10.00	10.16	0.16	13.640	9.71	9.35	-0.36
13.656	9.41	9.62	0.21	13.672	9.11	9.50	0.39	13.689	8.82	8.42	-0.40
13.706	8.54	9.20	0.66	13.725	8.25	7.73	-0.52	13.745	7.95	8.13	0.18
13.760	7.74	8.29	0.55	13.780	7.48	7.01	-0.47	13.800	7.23	6.94	-0.29
13.820	6.99	7.31	0.32	13.840	6.77	6.54	-0.23	13.860	6.55	6.79	0.24
13.880	6.35	6.49	0.14	13.900	6.16	6.72	0.56	13.920	5.97	6.12	0.15
13.940	5.80	5.87	0.07	13.960	5.63	5.30	-0.33	13.980	5.47	5.72	0.25
14.000	5.32	5.55	0.23	14.020	5.17	4.88	-0.29	14.040	5.03	5.08	0.05
14.060	4.89	4.91	0.02	14.080	4.77	4.89	0.12	14.100	4.64	4.65	0.01
14.120	4.52	5.02	0.50	14.140	4.41	4.64	0.23	14.160	4.30	3.79	-0.51
14.180	4.19	3.73	-0.46	14.200	4.09	4.24	0.15	14.220	3.99	4.45	0.46
14.240	3.90	3.75	-0.15	14.260	3.81	4.22	0.41	14.280	3.72	4.04	0.32
14.300	3.64	3.33	-0.31	14.320	3.55	3.11	-0.44	14.340	3.48	3.00	-0.48
14.360	3.40	3.08	-0.32	14.380	3.32	3.30	-0.02	14.400	3.25	3.59	0.34
14.420	3.18	3.13	-0.05	14.440	3.12	2.87	-0.25	14.460	3.05	3.34	0.29
14.480	2.99	2.91	-0.08	14.500	2.93	2.94	0.01	14.520	2.87	3.17	0.30
14.540	2.81	3.15	0.34	14.560	2.76	2.53	-0.23	14.580	2.70	2.84	0.14
14.600	2.65	2.59	-0.06	14.620	2.60	2.22	-0.38	14.640	2.55	2.80	0.25
14.660	2.50	2.17	-0.33	14.680	2.46	2.54	0.08	14.700	2.41	2.33	-0.08
14.720	2.37	2.24	-0.13	14.740	2.32	2.64	0.32	14.760	2.28	2.61	0.33
14.780	2.24	2.42	0.18	14.800	2.20	2.26	0.06	14.820	2.16	1.94	-0.22
14.840	2.12	2.10	-0.02	14.860	2.09	2.12	0.03	14.880	2.05	2.05	-0.00
14.900	2.02	2.04	0.02								

DIFFERENCE VALUES HAVE BEEN COMPUTED FOR N = 382 POINTS,

MEAN SQUARE DEVIATION = 1.738

CHI-SQUARED/N = 0.025

CROSS SECTION INTEGRALS
EXPERIMENTAL DIFFERENCE

221.53 -0.28

RESONANCE INTEGRALS (XSEC/E)
EXPERIMENTAL DIFFERENCE

18.04 -0.03

** TITLE 295-XS FISSION, COMPARISON OF SINGLE-LEVEL AND MULTILEVEL FITS.
 ** AXIS ENERGY LNSIGMA 10. 15. 1. 1000. 10. 10.

CARD ACCEPTED.
 CARD ACCEPTED.

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295-XS FISSION, COMPARISON OF SINGLE-LEVEL AND MULTILEVEL FITS.

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A PLOT AXIS HAS BEEN DRAWN TO THE FOLLOWING SPECIFICATIONS:

ABSCISSA: ENERGY (EV)

ORDINATE: CROSS SECTION (BARNS)

LINEAR

LOGARITHMIC

MINIMUM= 10.00

MINIMUM= 1.000

MAXIMUM= 15.00

MAXIMUM= 1000.

LENGTH= 10.0

LENGTH= 10.0

** PLOT 10. 15. .01 FISSION REICH ENERGY SIGMA CARD ACCEPTED.

FIT AND VALLEY POINTS HAVE BEEN PLOTTED

FISSION CROSS SECTION HAS BEEN PLOTTED AS:

ENERGY (EV)

VS

CROSS SECTION (BARNS)

FROM 10.00

EV TO

15.00

EV

** TITLE 295-XS FISSION, FIT WITH BREIT-WIGNER PARAMETERS.
** ADJUST 6 DETAIL FISSION BREIT

CARD ACCEPTED.
CARD ACCEPTED.

(ACSAP/001 - - JUNE, 1972 - - AEROJET NUCLEAR CORP.)

295-XS FISSION, FIT WITH BREIT-WIGNER PARAMETERS.

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ITERATION NO. 1

	PREVIOUS VALUES	PRESENT VALUES	PERCENT CHANGE		ENERGY	- - - - PREVIOUS	CROSS SECTIONS CURRENT	- - - - DESIRED	PERCENT DEVIATION
295-XS	12.194	EV RESONANCE (	1035.17 USEC.)	SHAPE FIT					
PEAK ENERGY	12.1986	12.1942	-1.46	LEFT POINT	12.000	163.72	164.56	171.70	-4.16
GAMMA-N-NOUGHT	0.4001	0.3933	-1.70	PEAK POINT	12.200	405.04	403.31	403.82	-0.13
GAMMA F	249.849	244.276	-2.23	RIGHT POINT	12.390	169.86	161.11	154.25	4.45
295-XS	13.037	EV RESONANCE (	1001.13 USEC.)	SHAPE FIT					
PEAK ENERGY	13.0203	13.0373	13.15	LEFT POINT	12.960	112.98	86.01	70.80	21.48
GAMMA-N-NOUGHT	0.1002	0.1454	45.21	PEAK POINT	13.040	148.17	162.13	148.70	9.03
GAMMA F	50.677	21.016	-58.53	RIGHT POINT	13.140	50.53	53.38	74.97	-28.80

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295-XS FISSION, FIT WITH BREIT-WIGNER PARAMETERS.

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ITERATION NO. 2

	PREVIOUS VALUES	PRESENT VALUES	PERCENT CHANGE		ENERGY	PREVIOUS	CROSS SECTIONS CURRENT	DESIRED	PERCENT DEVIATION
295-XS	12.190	EV RESONANCE (	1035.33 USEC.)	SHAPE FIT					
PEAK ENERGY	12.1942	12.1902	-1.28	LEFT POINT	12.000	164.56	169.06	171.70	-1.54
GAMMA-N-NOUGHT	0.3933	0.3942	0.21	PEAK POINT	12.200	403.31	402.98	403.82	-0.21
GAMMA F	244.276	244.312	0.01	RIGHT POINT	12.390	161.11	156.83	154.25	1.67
295-XS	13.045	EV RESONANCE (	1000.84 USEC.)	SHAPE FIT					
PEAK ENERGY	13.0373	13.0450	5.62	LEFT POINT	12.960	86.01	74.91	70.80	5.81
GAMMA-N-NOUGHT	0.1454	0.1032	-29.04	PEAK POINT	13.040	162.13	144.46	148.70	-2.85
GAMMA F	21.016	34.998	66.53	RIGHT POINT	13.140	53.38	60.23	74.97	-19.66

ITERATION NO. 3

	PREVIOUS VALUES	PRESENT VALUES	PERCENT CHANGE		ENERGY	- - - - CROSS SECTIONS - - - -	PERCENT DEVIATION
						PREVIOUS CURRENT DESIRED	
295-XS	12.189	EV RESONANCE (	1035.38 USEC.)	SHAPE FIT			
PEAK ENERGY	12.1902	12.1890	-0.40	LEFT POINT	12.000	169.06 170.55 171.70	-0.67
GAMMA-N-NOUGHT	0.3942	0.3945	0.09	PEAK POINT	12.200	402.98 403.47 403.82	-0.09
GAMMA F	244.312	243.907	-0.17	RIGHT POINT	12.390	156.83 155.75 154.25	0.97
295-XS	13.050	EV RESONANCE (	1000.64 USEC.)	SHAPE FIT			
PEAK ENERGY	13.0450	13.0502	3.65	LEFT POINT	12.960	74.91 75.83 70.80	5.97
GAMMA-N-NOUGHT	0.1032	0.0965	-6.53	PEAK POINT	13.040	144.46 144.86 148.70	-2.59
GAMMA F	34.998	47.423	35.50	RIGHT POINT	13.140	60.23 70.26 74.97	-6.28

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 295-XS FISSION, FIT WITH BREIT-WIGNER PARAMETERS.

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ITERATION NO. 4

	PREVIOUS VALUES	PRESENT VALUES	PERCENT CHANGE		ENERGY	PREVIOUS	CROSS SECTIONS CURRENT	DESIRED	PERCENT DEVIATION
295-XS	12.188	EV RESONANCE (	1035.42 USEC.)	SHAPE FIT					
PEAK ENERGY	12.1890	12.1883	-0.24	LEFT POINT	12.000	170.55	171.07	171.70	-0.37
GAMMA-N-NOUGHT	0.3945	0.3940	-0.15	PEAK POINT	12.200	403.47	403.57	403.82	-0.06
GAMMA F	243.907	243.080	-0.34	RIGHT POINT	12.390	155.75	154.78	154.25	0.35
295-XS	13.053	EV RESONANCE (	1000.54 USEC.)	SHAPE FIT					
PEAK ENERGY	13.0502	13.0528	1.83	LEFT POINT	12.960	75.03	73.17	70.80	3.35
GAMMA-N-NOUGHT	0.0965	0.1015	5.24	PEAK POINT	13.040	144.86	148.94	148.70	-0.17
GAMMA F	47.423	43.821	-7.60	RIGHT POINT	13.140	70.26	73.55	74.97	-1.89

ITERATION NO. 5

	PREVIOUS VALUES	PRESENT VALUES	PERCENT CHANGE		ENERGY	PREVIOUS	CROSS SECTIONS CURRENT	DESIRED	PERCENT DEVIATION
295-XS	12.188	EV RESONANCE (	1035.43 USEC.)	SHAPE FIT					
PEAK ENERGY	12.1883	12.1880	-0.09	LEFT POINT	12.000	171.07	171.30	171.70	-0.23
GAMMA-N-NOUGHT	0.3940	0.3939	-0.01	PEAK POINT	12.200	403.57	403.72	403.82	-0.02
GAMMA F	243.080	242.781	-0.12	RIGHT POINT	12.390	154.78	154.40	154.25	0.10
295-XS	13.054	EV RESONANCE (	1000.50 USEC.)	SHAPE FIT					
PEAK ENERGY	13.0528	13.0538	0.72	LEFT POINT	12.960	73.17	71.65	70.80	1.20
GAMMA-N-NOUGHT	0.1015	0.1033	1.80	PEAK POINT	13.040	148.44	148.70	148.70	-0.00
GAMMA F	43.821	41.625	-5.01	RIGHT POINT	13.140	73.55	74.09	74.97	-1.18

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295-XS FISSION, FIT WITH BREIT-WIGNER PARAMETERS.

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ITERATION NO. 6

	PREVIOUS VALUES	PRESENT VALUES	PERCENT CHANGE		ENERGY	PREVIOUS	CROSS SECTIONS CURRENT	DESIRED	PERCENT DEVIATION
295-XS	12.188	EV RESONANCE (	1035.43 USEC.)	SHAPE FIT					
PEAK ENERGY	12.1880	12.1879	-0.04	LEFT POINT	12.000	171.30	171.44	171.70	-0.15
GAMMA-N-NOUGHT	0.3939	0.3940	0.02	PEAK POINT	12.200	403.72	403.78	403.82	-0.01
GAMMA F	242.781	242.727	-0.02	RIGHT POINT	12.390	154.40	154.25	154.25	-0.00
295-XS	13.054	EV RESONANCE (	1000.48 USEC.)	SHAPE FIT					
PEAK ENERGY	13.0538	13.0543	0.33	LEFT POINT	12.960	71.65	71.18	70.80	0.54
GAMMA-N-NOUGHT	0.1033	0.1034	0.07	PEAK POINT	13.040	148.70	148.51	148.70	-0.13
GAMMA F	41.625	41.536	-0.21	RIGHT POINT	13.140	74.09	74.54	74.97	-0.57

PARAMETER HISTORIES

CROSS SECTION
 FIT POINTS

	ORIGINAL	1ST	2ND	3RD	4TH	5TH	6TH	
DELAY	1034.98							
E-ZEROS	12.199	12.194	12.190	12.189	12.188	12.188	12.188	
GAMMA NO	0.4001	0.3933	0.3942	0.3945	0.3940	0.3939	0.3940	
GAMMA C	40.00							
GAMMA F	249.85	244.28	244.31	243.91	243.08	242.78	242.73	
GAMMA T	284.10							
SIG LEFT	163.7	164.6	169.1	170.5	171.1	171.3	171.4	171.7
SIG PEAK	405.0	403.3	403.0	403.5	403.6	403.7	403.8	403.8
SIG RIGHT	169.9	161.1	156.8	155.8	154.8	154.4	154.2	154.3
DELAY	1001.79							
E-ZEROS	13.020	13.037	13.045	13.050	13.053	13.054	13.054	
GAMMA NO	0.1002	0.1454	0.1032	0.0965	0.1015	0.1033	0.1034	
GAMMA C	40.00							
GAMMA F	50.68	21.02	35.00	47.42	43.82	41.63	41.54	
GAMMA T	81.91							
SIG LEFT	113.0	86.0	74.9	75.0	73.2	71.7	71.2	70.8
SIG PEAK	148.2	162.1	144.5	144.9	148.4	148.7	148.5	148.7
SIG RIGHT	50.5	53.4	80.2	70.3	73.6	74.1	74.5	75.0

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295-XS FISSION, FIT WITH BREIT-HIGNER PARAMETERS.

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** LIST

10.

15.

.01

.02 TOTA CAPT FISSION SCAT BREIT

CARD ACCEPTED.

ISOTOPE INFORMATION

295-XS

ATOMIC WEIGHT OF ISOTOPE	295.0	POTENTIAL SCATTERING CROSS SECTION. . . .	11.00
G - STATISTICAL WEIGHTING FACTOR	0.5000	POTENTIAL SCATTERING CONTRIBUTION	11.00
1/N - RECIPICAL SAMPLE THICKNESS	1000.0		

RESONANCE PARAMETERS

RESONANCE ENERGY	GAMMA N- NOUGHT (MV)	GAMMA-GAMMA (MV)	GAMMA F1 (MV)	GAMMA F2 (MV)	GAMMA F3 (MV)
12.188	0.3940	40.000	242.727	0.0	0.0
13.054	0.1034	40.000	41.536	0.0	0.0

THIS RUN WAS MADE UNDER THE FOLLOWING CONDITIONS:

FLIGHT PATH	50.000	METERS
SAMPLE TEMPERATURE	300.00	DEGREES KELVIN
1/N - RECIPICAL SAMPLE THICKNESS (OUTPUT)	1000.0	BARNS/ATOM
BURST WIDTH	0.50000	MICROSECONDS
CHANNEL WIDTH	0.50000	MICROSECONDS
DETECTOR THICKNESS	1.2000	CENTIMETERS
INSTRUMENT JITTER	0.10000E-02	MICROSECONDS

CROSS SECTIONS WILL BE COMPUTED FROM 10.000 EV TO 15.00 EV MINIMUM SPACING IS 0.010 MAXIMUM SPACING IS 0.020

CROSS SECTIONS COMPUTED USING THE BREIT-WIGNER FORMULA ARE: TOTAL CAPTURE FISSION SCATTERING

. THEORETICAL DATA HAVE BEEN CALCULATED USING THE BREIT-WIGNER FORMULA

ENERGY	SIG. T	UNBROADENED DATA			SIG. S	SIG. T	BROADENED DATA			SIG. S
		SIG. C	SIG. F				SIG. C	SIG. F		
10.000	13.488	0.383	2.095		11.010	13.492	0.383	2.097		11.010
10.020	13.531	0.390	2.131		11.010	13.535	0.390	2.134		11.010
10.040	13.575	0.396	2.169		11.011	13.579	0.397	2.171		11.011
10.060	13.621	0.403	2.207		11.011	13.624	0.403	2.210		11.011
10.080	13.667	0.410	2.246		11.011	13.671	0.410	2.249		11.011
10.100	13.715	0.417	2.287		11.011	13.719	0.418	2.290		11.011
10.120	13.764	0.424	2.328		11.011	13.768	0.425	2.331		11.011
10.140	13.815	0.432	2.371		11.012	13.819	0.433	2.374		11.012
10.160	13.867	0.440	2.415		11.012	13.871	0.440	2.419		11.012
10.180	13.921	0.448	2.461		11.012	13.925	0.448	2.464		11.012
10.200	13.976	0.456	2.508		11.012	13.980	0.457	2.511		11.012
10.220	14.033	0.465	2.556		11.013	14.037	0.465	2.559		11.013
10.240	14.091	0.473	2.605		11.013	14.096	0.474	2.609		11.013
10.260	14.152	0.482	2.656		11.013	14.157	0.483	2.660		11.013
10.280	14.214	0.492	2.709		11.013	14.219	0.492	2.713		11.013
10.300	14.278	0.501	2.763		11.014	14.283	0.502	2.767		11.014
10.320	14.344	0.511	2.819		11.014	14.350	0.512	2.824		11.014
10.340	14.413	0.521	2.877		11.014	14.418	0.522	2.882		11.014
10.360	14.483	0.532	2.937		11.015	14.489	0.533	2.942		11.014
10.380	14.556	0.543	2.998		11.015	14.562	0.543	3.003		11.015
10.400	14.631	0.554	3.062		11.015	14.638	0.555	3.067		11.015
10.420	14.709	0.565	3.128		11.016	14.715	0.566	3.133		11.015
10.440	14.789	0.577	3.196		11.016	14.796	0.578	3.202		11.016
10.460	14.872	0.589	3.266		11.016	14.879	0.591	3.272		11.016
10.480	14.958	0.602	3.339		11.017	14.965	0.603	3.345		11.017
10.500	15.047	0.615	3.414		11.017	15.054	0.617	3.421		11.017
10.520	15.138	0.629	3.492		11.017	15.147	0.630	3.499		11.017
10.540	15.234	0.643	3.573		11.018	15.242	0.644	3.580		11.018
10.560	15.332	0.658	3.656		11.018	15.341	0.659	3.664		11.018
10.580	15.435	0.673	3.743		11.019	15.444	0.674	3.751		11.019
10.600	15.541	0.689	3.833		11.019	15.551	0.690	3.841		11.019
10.620	15.651	0.705	3.926		11.020	15.661	0.706	3.935		11.020
10.640	15.765	0.722	4.023		11.020	15.776	0.723	4.032		11.020
10.660	15.883	0.739	4.124		11.021	15.895	0.741	4.133		11.021
10.680	16.004	0.757	4.226		11.021	16.016	0.759	4.236		11.021
10.699	16.126	0.775	4.330		11.022	16.139	0.777	4.340		11.022
10.717	16.250	0.793	4.434		11.022	16.263	0.795	4.446		11.022
10.736	16.375	0.812	4.540		11.023	16.389	0.814	4.552		11.023
10.753	16.501	0.830	4.648		11.023	16.517	0.832	4.660		11.023
10.771	16.629	0.849	4.756		11.024	16.645	0.851	4.769		11.024
10.787	16.759	0.868	4.866		11.024	16.775	0.870	4.880		11.024
10.804	16.889	0.887	4.977		11.025	16.907	0.890	4.992		11.025
10.820	17.022	0.907	5.089		11.026	17.040	0.909	5.104		11.026
10.836	17.155	0.926	5.203		11.026	17.174	0.929	5.219		11.026
10.851	17.290	0.946	5.317		11.027	17.310	0.949	5.334		11.027
10.866	17.427	0.966	5.433		11.027	17.447	0.969	5.451		11.027
10.881	17.565	0.986	5.550		11.028	17.586	0.989	5.569		11.028
10.895	17.704	1.007	5.669		11.028	17.727	1.010	5.688		11.029
10.910	17.845	1.027	5.788		11.029	17.868	1.031	5.808		11.029
10.923	17.987	1.048	5.909		11.030	18.012	1.052	5.930		11.030

ENERGY	UNBROADENED DATA				BROADENED DATA			
	SIG. T	SIG. C	SIG. F	SIG. S	SIG. T	SIG. C	SIG. F	SIG. S
10.937	18.131	1.089	6.031	11.030	18.156	1.073	6.053	11.031
10.950	18.276	1.090	6.154	11.031	18.303	1.094	6.177	11.031
10.963	18.422	1.112	6.279	11.032	18.450	1.116	6.302	11.032
10.976	18.570	1.133	6.404	11.032	18.599	1.137	6.429	11.032
10.988	18.719	1.155	6.531	11.033	18.750	1.159	6.557	11.033
11.000	18.868	1.177	6.657	11.034	18.899	1.181	6.684	11.034
11.012	19.020	1.199	6.787	11.034	19.053	1.204	6.814	11.034
11.024	19.173	1.221	6.917	11.035	19.207	1.226	6.946	11.035
11.035	19.328	1.244	7.049	11.036	19.364	1.249	7.078	11.036
11.046	19.484	1.267	7.181	11.036	19.521	1.272	7.212	11.037
11.057	19.642	1.290	7.315	11.037	19.680	1.295	7.348	11.037
11.068	19.801	1.313	7.450	11.038	19.840	1.318	7.484	11.038
11.079	19.961	1.336	7.587	11.039	20.003	1.342	7.622	11.039
11.089	20.123	1.360	7.724	11.039	20.166	1.366	7.760	11.039
11.099	20.288	1.383	7.863	11.040	20.331	1.390	7.901	11.040
11.109	20.451	1.407	8.003	11.041	20.496	1.414	8.042	11.041
11.120	20.630	1.433	8.155	11.041	20.677	1.440	8.195	11.042
11.130	20.803	1.458	8.302	11.042	20.852	1.466	8.344	11.042
11.140	20.981	1.484	8.454	11.043	21.033	1.492	8.497	11.043
11.150	21.165	1.511	8.610	11.044	21.218	1.519	8.655	11.044
11.160	21.353	1.538	8.770	11.045	21.408	1.546	8.817	11.045
11.170	21.547	1.566	8.935	11.045	21.604	1.575	8.984	11.046
11.180	21.746	1.595	9.105	11.046	21.806	1.604	9.155	11.047
11.190	21.951	1.625	9.279	11.047	22.014	1.634	9.332	11.047
11.200	22.163	1.656	9.459	11.048	22.227	1.665	9.514	11.048
11.210	22.380	1.687	9.644	11.049	22.447	1.697	9.701	11.049
11.220	22.604	1.720	9.834	11.050	22.674	1.730	9.894	11.050
11.230	22.835	1.753	10.031	11.051	22.908	1.763	10.092	11.051
11.240	23.072	1.787	10.233	11.052	23.148	1.798	10.297	11.052
11.250	23.318	1.823	10.441	11.053	23.396	1.834	10.509	11.054
11.260	23.570	1.859	10.657	11.054	23.653	1.871	10.726	11.055
11.270	23.831	1.897	10.878	11.056	23.917	1.909	10.951	11.056
11.280	24.100	1.936	11.107	11.057	24.190	1.949	11.183	11.057
11.290	24.378	1.976	11.344	11.058	24.471	1.989	11.423	11.058
11.300	24.664	2.017	11.588	11.059	24.762	2.031	11.671	11.060
11.310	24.960	2.060	11.840	11.061	25.062	2.075	11.926	11.061
11.320	25.266	2.104	12.100	11.062	25.373	2.119	12.191	11.062
11.330	25.582	2.150	12.369	11.063	25.694	2.166	12.464	11.064
11.340	25.909	2.197	12.647	11.065	26.026	2.214	12.747	11.065
11.350	26.247	2.246	12.935	11.066	26.369	2.263	13.039	11.067
11.360	26.597	2.296	13.233	11.068	26.725	2.314	13.342	11.068
11.370	26.959	2.348	13.542	11.069	27.093	2.367	13.656	11.070
11.380	27.334	2.402	13.861	11.071	27.474	2.422	13.980	11.072
11.390	27.722	2.458	14.192	11.073	27.870	2.479	14.317	11.073
11.400	28.125	2.516	14.534	11.075	28.280	2.538	14.666	11.075
11.410	28.542	2.576	14.890	11.076	28.705	2.599	15.028	11.077
11.420	28.975	2.638	15.259	11.078	29.146	2.662	15.404	11.079
11.430	29.424	2.703	15.641	11.080	29.603	2.728	15.794	11.081
11.440	29.891	2.770	16.039	11.082	30.079	2.796	16.199	11.083
11.450	30.375	2.839	16.451	11.085	30.574	2.867	16.621	11.085

ENERGY	SIG. T	UNBROADENED DATA			SIG. T	BROADENED DATA		
		SIG. C	SIG. F	SIG. S		SIG. C	SIG. F	SIG. S
11.460	30.878	2.911	16.880	11.087	31.087	2.941	17.058	11.088
11.470	31.401	2.986	17.326	11.089	31.622	3.018	17.514	11.090
11.480	31.945	3.064	17.790	11.091	32.178	3.097	17.988	11.092
11.490	32.512	3.146	18.272	11.094	32.758	3.180	18.482	11.095
11.500	33.101	3.230	18.775	11.097	33.360	3.267	18.996	11.098
11.510	33.716	3.318	19.298	11.099	33.990	3.357	19.531	11.100
11.520	34.356	3.410	19.844	11.102	34.646	3.451	20.091	11.103
11.530	35.023	3.505	20.413	11.105	35.329	3.549	20.674	11.106
11.540	35.720	3.605	21.007	11.108	36.044	3.651	21.284	11.110
11.550	36.447	3.709	21.627	11.111	36.791	3.758	21.920	11.113
11.560	37.207	3.818	22.275	11.115	37.572	3.869	22.586	11.116
11.570	38.001	3.931	22.952	11.118	38.388	3.986	23.282	11.120
11.580	38.832	4.050	23.660	11.122	39.244	4.108	24.011	11.124
11.590	39.702	4.174	24.402	11.126	40.139	4.236	24.775	11.128
11.600	40.612	4.304	25.178	11.130	41.077	4.370	25.575	11.132
11.610	41.567	4.440	25.992	11.134	42.062	4.510	26.415	11.136
11.620	42.568	4.583	26.846	11.139	43.096	4.658	27.297	11.141
11.630	43.618	4.733	27.742	11.143	44.182	4.813	28.223	11.146
11.640	44.721	4.890	28.683	11.148	45.323	4.975	29.197	11.151
11.650	45.881	5.055	29.672	11.153	46.524	5.147	30.222	11.156
11.660	47.101	5.229	30.713	11.159	47.791	5.327	31.301	11.162
11.670	48.385	5.412	31.808	11.164	49.123	5.517	32.439	11.168
11.680	49.738	5.605	32.963	11.170	50.530	5.717	33.639	11.174
11.690	51.164	5.808	34.180	11.177	52.014	5.928	34.905	11.181
11.700	52.670	6.022	35.464	11.184	53.582	6.151	36.244	11.188
11.710	54.260	6.248	36.821	11.191	55.241	6.387	37.660	11.195
11.720	55.941	6.487	38.256	11.198	56.998	6.637	39.159	11.203
11.730	57.720	6.740	39.774	11.206	58.859	6.901	40.747	11.211
11.740	59.605	7.008	41.382	11.214	60.833	7.182	42.432	11.220
11.750	61.602	7.292	43.087	11.223	62.930	7.479	44.222	11.229
11.760	63.723	7.593	44.897	11.233	65.159	7.796	46.125	11.239
11.770	65.975	7.913	46.819	11.243	67.530	8.132	48.148	11.250
11.780	68.370	8.253	48.864	11.253	70.055	8.491	50.304	11.261
11.790	70.920	8.614	51.041	11.265	72.751	8.873	52.605	11.273
11.800	73.638	9.000	53.361	11.277	75.626	9.281	55.061	11.286
11.810	76.538	9.411	55.837	11.290	78.701	9.717	57.687	11.299
11.820	79.635	9.850	58.481	11.304	81.990	10.183	60.494	11.314
11.830	82.947	10.320	61.309	11.318	85.516	10.682	63.505	11.330
11.840	86.494	10.822	64.338	11.334	89.295	11.218	66.733	11.347
11.850	90.296	11.361	67.584	11.351	93.357	11.793	70.202	11.365
11.860	94.375	11.938	71.067	11.369	97.721	12.411	73.929	11.384
11.870	98.759	12.559	74.811	11.389	102.419	13.076	77.941	11.405
11.880	103.476	13.227	78.839	11.410	107.484	13.793	82.267	11.426
11.890	108.556	13.946	83.178	11.433	112.943	14.565	86.930	11.452
11.900	114.034	14.721	87.856	11.457	118.840	15.400	91.968	11.479
11.910	119.950	15.557	92.908	11.484	125.213	16.301	97.411	11.507
11.920	126.343	16.462	98.370	11.512	132.103	17.275	103.298	11.538
11.930	133.262	17.440	104.279	11.543	139.559	18.329	109.668	11.571
11.940	140.755	18.499	110.679	11.577	147.633	19.471	116.567	11.608
11.950	148.879	19.647	117.619	11.613	156.371	20.706	124.032	11.647

ENERGY	UNBROADENED DATA				BROADENED DATA			
	SIG. T	SIG. C	SIG. F	SIG. S	SIG. T	SIG. C	SIG. F	SIG. S
11.960	157.694	20.893	125.149	11.653	165.830	22.042	132.114	11.689
11.970	167.263	22.245	133.323	11.695	176.064	23.488	140.860	11.735
11.980	177.655	23.713	142.200	11.742	187.127	25.051	150.313	11.764
11.990	188.944	25.307	151.844	11.792	199.051	26.736	160.504	11.838
12.000	201.202	27.038	162.317	11.847	211.906	28.551	171.489	11.895
12.010	214.506	28.917	173.683	11.907	225.703	30.500	183.281	11.957
12.020	228.926	30.953	186.002	11.971	240.458	32.584	195.891	12.024
12.030	244.530	33.155	199.333	12.041	256.171	34.803	209.320	12.094
12.040	261.369	35.532	213.720	12.117	272.797	37.150	223.529	12.169
12.050	279.473	38.087	229.188	12.198	290.295	39.621	238.483	12.247
12.060	298.842	40.821	245.737	12.285	308.519	42.194	254.058	12.329
12.070	319.435	43.727	263.331	12.377	327.340	44.851	270.139	12.414
12.080	341.144	46.790	281.880	12.475	346.554	47.563	286.557	12.500
12.090	363.787	49.985	301.225	12.577	365.890	50.293	303.077	12.587
12.100	387.080	53.272	321.127	12.681	385.046	52.996	319.440	12.673
12.110	410.636	56.596	341.253	12.787	403.656	55.623	335.335	12.757
12.120	433.933	59.883	361.158	12.892	421.352	58.121	350.445	12.837
12.130	456.331	63.045	380.293	12.993	437.689	60.428	364.394	12.910
12.140	477.078	65.974	398.018	13.087	452.257	62.485	376.828	12.976
12.150	495.362	68.556	413.637	13.169	464.648	64.236	387.401	13.032
12.160	510.354	70.675	426.443	13.237	474.503	65.630	395.808	13.077
12.170	521.300	72.224	435.789	13.287	481.504	66.623	401.777	13.109
12.180	527.600	73.119	441.165	13.316	485.440	67.184	405.128	13.127
12.190	528.889	73.309	442.258	13.323	486.171	67.295	405.743	13.131
12.200	525.090	72.782	439.002	13.306	483.679	66.953	403.607	13.120
12.210	516.417	71.569	431.580	13.268	478.042	66.169	398.786	13.096
12.220	503.350	69.738	420.403	13.210	469.447	64.969	391.437	13.058
12.230	486.578	67.385	406.058	13.136	458.167	63.391	381.795	13.008
12.240	466.897	64.622	389.227	13.048	444.533	61.482	370.142	12.947
12.250	445.142	61.568	370.623	12.951	428.938	59.298	356.812	12.878
12.260	422.109	58.335	350.927	12.848	411.800	56.896	342.161	12.801
12.270	398.506	55.021	330.743	12.742	393.548	54.337	326.555	12.720
12.280	374.915	51.710	310.569	12.637	374.572	51.676	310.328	12.635
12.290	351.800	48.466	290.801	12.533	355.260	48.969	293.813	12.549
12.300	329.500	45.337	271.730	12.433	335.947	46.261	277.293	12.462
12.310	308.250	42.357	253.556	12.338	316.902	43.591	261.001	12.377
12.320	288.191	39.545	236.398	12.248	298.354	40.991	245.133	12.294
12.330	269.399	36.912	220.323	12.164	280.493	38.489	229.849	12.214
12.340	251.893	34.461	205.347	12.085	263.448	36.102	215.261	12.137
12.350	235.658	32.189	191.456	12.013	247.296	33.842	201.435	12.065
12.360	220.647	30.090	178.611	11.945	232.096	31.716	188.424	11.996
12.370	206.801	28.157	166.762	11.883	217.857	29.727	176.233	11.932
12.380	194.050	26.378	155.847	11.826	204.582	27.874	164.866	11.873
12.390	182.320	24.743	145.804	11.773	192.242	26.154	154.298	11.817
12.400	171.533	23.243	136.566	11.724	180.808	24.562	144.502	11.766
12.410	161.614	21.865	128.069	11.680	170.228	23.092	135.438	11.718
12.420	152.494	20.601	120.254	11.639	160.456	21.736	127.063	11.675
12.430	144.104	19.441	113.062	11.601	151.444	20.488	119.335	11.634
12.440	136.381	18.375	106.439	11.566	143.122	19.339	112.198	11.597
12.450	129.267	17.397	100.336	11.534	135.450	18.283	105.616	11.562

ENERGY	UNBROADENED DATA				BROADENED DATA			
	SIG. T	SIG. C	SIG. F	SIG. S	SIG. T	SIG. C	SIG. F	SIG. S
12.460	122.709	16.498	94.707	11.505	128.370	17.311	99.537	11.530
12.470	116.659	15.672	89.510	11.477	121.843	16.419	93.931	11.501
12.480	111.072	14.912	84.708	11.452	115.815	15.598	88.750	11.474
12.490	105.908	14.214	80.265	11.429	110.250	14.844	83.963	11.448
12.500	101.130	13.571	76.151	11.407	105.110	14.152	79.537	11.425
12.510	96.705	12.980	72.338	11.387	100.353	13.515	75.438	11.404
12.520	92.605	12.436	68.800	11.369	95.953	12.931	71.641	11.384
12.530	88.801	11.936	65.513	11.352	91.877	12.394	68.120	11.366
12.540	85.271	11.477	62.458	11.336	88.102	11.902	64.854	11.348
12.550	81.991	11.055	59.615	11.321	84.599	11.451	61.818	11.333
12.560	78.942	10.668	56.967	11.307	81.353	11.038	58.998	11.318
12.570	76.107	10.314	54.499	11.294	78.336	10.661	56.372	11.304
12.580	73.470	9.990	52.197	11.282	75.538	10.318	53.930	11.292
12.590	71.016	9.696	50.049	11.271	72.939	10.006	51.654	11.280
12.600	68.733	9.428	48.043	11.261	70.526	9.724	49.533	11.269
12.610	66.608	9.187	46.169	11.251	68.286	9.471	47.557	11.259
12.620	64.632	8.971	44.419	11.242	66.206	9.245	45.713	11.249
12.630	62.795	8.778	42.782	11.234	64.279	9.045	43.994	11.240
12.640	61.089	8.609	41.254	11.226	62.492	8.870	42.390	11.232
12.650	59.507	8.463	39.825	11.219	60.841	8.721	40.896	11.225
12.660	58.043	8.339	38.492	11.212	59.318	8.596	39.505	11.218
12.670	56.691	8.237	37.248	11.206	57.917	8.496	38.210	11.211
12.680	55.447	8.158	36.089	11.200	56.633	8.420	37.007	11.205
12.690	54.306	8.101	35.011	11.195	55.463	8.370	35.892	11.200
12.700	53.267	8.066	34.010	11.190	54.403	8.346	34.861	11.195
12.710	52.325	8.056	33.084	11.186	53.453	8.349	33.912	11.191
12.720	51.481	8.070	32.230	11.182	52.610	8.381	33.042	11.187
12.730	50.734	8.110	31.446	11.178	51.877	8.443	32.250	11.183
12.740	50.084	8.177	30.732	11.175	51.254	8.538	31.536	11.180
12.750	49.532	8.273	30.087	11.172	50.746	8.669	30.899	11.178
12.760	49.082	8.402	29.510	11.170	50.357	8.839	30.341	11.176
12.770	48.737	8.565	29.004	11.168	50.095	9.054	29.866	11.174
12.780	48.502	8.767	28.568	11.167	49.968	9.320	29.475	11.173
12.790	48.385	9.011	28.207	11.166	49.992	9.643	29.176	11.173
12.800	48.394	9.303	27.924	11.166	50.182	10.032	28.975	11.174
12.810	48.541	9.651	27.724	11.166	50.559	10.500	28.884	11.175
12.820	48.841	10.060	27.614	11.167	51.154	11.062	28.915	11.177
12.830	49.313	10.542	27.602	11.169	52.004	11.735	29.088	11.180
12.840	49.978	11.108	27.699	11.171	53.158	12.547	29.426	11.185
12.850	50.866	11.772	27.919	11.175	54.680	13.527	29.962	11.191
12.860	52.014	12.553	28.281	11.179	56.654	14.719	30.738	11.199
12.870	53.468	13.475	28.807	11.185	59.189	16.174	31.807	11.209
12.880	55.286	14.566	29.527	11.193	62.417	17.959	33.237	11.222
12.890	57.544	15.864	30.478	11.202	66.510	20.160	35.116	11.239
12.900	60.342	17.418	31.711	11.213	71.678	22.877	37.547	11.260
12.910	63.808	19.291	33.290	11.227	78.172	26.236	40.660	11.287
12.920	68.115	21.568	35.302	11.245	86.270	30.372	44.595	11.321
12.930	73.492	24.361	37.864	11.267	96.262	35.427	49.499	11.362
12.940	80.256	27.825	41.136	11.295	108.415	41.533	55.508	11.413
12.950	88.840	32.172	45.337	11.331	122.936	48.792	62.725	11.473

ENERGY	UNBROADENED DATA				BROADENED DATA			
	SIG. T	SIG. C	SIG. F	SIG. S	SIG. T	SIG. C	SIG. F	SIG. S
12.960	99.849	37.698	50.774	11.376	139.878	57.229	71.178	11.544
12.970	114.132	44.819	57.878	11.436	159.132	66.790	80.810	11.624
12.980	132.895	54.122	67.259	11.514	180.340	77.298	91.437	11.712
12.990	157.812	66.428	79.787	11.617	202.811	88.415	102.706	11.806
13.000	191.118	82.827	96.536	11.756	225.625	99.690	114.148	11.901
13.010	235.447	104.606	118.900	11.940	247.556	110.522	125.140	11.992
13.020	292.825	132.757	147.889	12.179	267.221	120.238	134.983	12.074
13.030	361.528	166.435	182.627	12.466	283.246	128.169	142.980	12.140
13.040	430.108	200.050	217.307	12.752	294.403	133.720	148.514	12.187
13.050	474.093	221.645	239.512	12.935	299.763	136.440	151.117	12.209
13.060	469.920	219.710	237.292	12.918	298.880	136.116	150.565	12.205
13.070	419.850	195.349	211.791	12.710	291.794	132.765	146.878	12.176
13.080	349.269	160.985	175.889	12.416	279.071	126.662	140.340	12.123
13.090	281.107	127.759	141.216	12.132	261.709	118.290	131.452	12.051
13.100	224.991	100.435	112.658	11.898	240.940	108.248	120.837	11.965
13.110	181.786	79.416	90.652	11.718	218.170	97.220	109.203	11.870
13.120	149.242	63.602	74.057	11.582	194.761	85.871	97.241	11.772
13.130	124.737	51.714	61.543	11.480	171.864	74.764	85.537	11.677
13.140	106.110	42.694	52.014	11.402	150.360	64.332	74.538	11.587
13.150	91.753	35.758	44.653	11.342	130.878	54.883	64.567	11.505
13.160	80.522	30.346	38.880	11.295	113.707	46.562	55.770	11.434
13.170	71.803	26.062	34.283	11.258	98.935	39.412	48.194	11.372
13.180	64.421	22.624	30.568	11.228	86.477	33.391	41.796	11.320
13.190	58.558	19.829	27.525	11.203	76.114	28.393	36.464	11.277
13.200	53.713	17.529	25.001	11.183	67.569	24.284	32.058	11.241
13.210	49.865	15.616	22.882	11.166	60.571	20.928	28.440	11.212
13.220	46.246	14.009	21.085	11.152	54.838	18.190	25.466	11.188
13.230	43.332	12.647	19.545	11.140	50.127	15.950	23.014	11.168
13.240	40.826	11.483	18.215	11.129	46.233	14.107	20.977	11.152
13.250	38.654	10.479	17.055	11.120	42.991	12.581	19.273	11.138
13.260	36.757	9.609	16.036	11.112	40.267	11.307	17.834	11.126
13.270	35.089	8.849	15.135	11.105	37.959	10.235	16.608	11.117
13.280	33.614	8.182	14.333	11.099	35.984	9.324	15.552	11.108
13.290	32.301	7.592	13.615	11.093	34.275	8.542	14.633	11.101
13.300	31.126	7.069	12.969	11.088	32.786	7.865	13.826	11.095
13.310	30.069	6.602	12.384	11.084	31.477	7.276	13.112	11.089
13.320	29.115	6.184	11.851	11.080	30.318	6.757	12.478	11.085
13.330	28.249	5.807	11.365	11.076	29.283	6.299	11.904	11.080
13.340	27.459	5.467	10.919	11.073	28.355	5.892	11.387	11.076
13.350	26.738	5.159	10.509	11.069	27.518	5.528	10.917	11.073
13.360	26.075	4.879	10.130	11.067	26.758	5.200	10.488	11.069
13.370	25.465	4.623	9.778	11.064	26.066	4.905	10.095	11.066
13.380	24.901	4.389	9.451	11.062	25.433	4.637	9.732	11.064
13.390	24.379	4.174	9.146	11.059	24.851	4.393	9.397	11.061
13.400	23.894	3.976	8.861	11.057	24.315	4.171	9.085	11.059
13.410	23.442	3.793	8.593	11.055	23.819	3.967	8.795	11.057
13.420	23.020	3.624	8.342	11.054	23.358	3.780	8.524	11.055
13.430	22.625	3.468	8.105	11.052	22.930	3.607	8.270	11.053
13.440	22.254	3.322	7.882	11.050	22.531	3.448	8.031	11.051
13.450	21.906	3.187	7.670	11.049	22.157	3.300	7.807	11.050

ENERGY	SIG. T	UNBROADENED DATA			SIG. S	SIG. T	BROADENED DATA			SIG. S
		SIG. C	SIG. F	SIG. C			SIG. F			
13.460	21.578	3.060	7.470	11.047	21.807	3.163	7.595	11.048		
13.470	21.268	2.942	7.280	11.046	21.477	3.036	7.395	11.047		
13.480	20.976	2.832	7.099	11.045	21.167	2.917	7.205	11.046		
13.490	20.699	2.728	6.927	11.044	20.874	2.806	7.024	11.044		
13.500	20.436	2.631	6.763	11.042	20.598	2.702	6.853	11.043		
13.510	20.187	2.539	6.606	11.041	20.335	2.604	6.689	11.042		
13.520	19.950	2.453	6.457	11.040	20.087	2.512	6.534	11.041		
13.530	19.724	2.371	6.313	11.039	19.851	2.426	6.385	11.040		
13.540	19.508	2.294	6.176	11.038	19.626	2.345	6.243	11.039		
13.550	19.303	2.221	6.044	11.038	19.413	2.268	6.106	11.038		
13.560	19.098	2.150	5.912	11.037	19.200	2.193	5.970	11.037		
13.571	18.895	2.079	5.780	11.036	18.989	2.119	5.834	11.036		
13.583	18.692	2.009	5.648	11.035	18.780	2.046	5.699	11.035		
13.594	18.490	1.940	5.516	11.034	18.571	1.974	5.563	11.034		
13.607	18.289	1.873	5.384	11.033	18.364	1.903	5.427	11.033		
13.620	18.089	1.806	5.251	11.032	18.158	1.834	5.292	11.032		
13.634	17.889	1.740	5.118	11.031	17.953	1.766	5.156	11.032		
13.648	17.691	1.675	4.985	11.030	17.749	1.698	5.020	11.031		
13.663	17.492	1.611	4.852	11.030	17.547	1.632	4.884	11.030		
13.679	17.295	1.548	4.718	11.029	17.345	1.567	4.748	11.029		
13.695	17.098	1.466	4.584	11.028	17.144	1.504	4.611	11.028		
13.713	16.902	1.425	4.449	11.027	16.943	1.441	4.475	11.027		
13.732	16.706	1.365	4.315	11.026	16.744	1.379	4.338	11.026		
13.751	16.510	1.306	4.179	11.025	16.545	1.319	4.200	11.025		
13.760	16.428	1.281	4.122	11.025	16.461	1.294	4.143	11.025		
13.780	16.246	1.227	3.995	11.024	16.277	1.238	4.014	11.024		
13.800	16.074	1.177	3.874	11.023	16.102	1.187	3.892	11.023		
13.820	15.912	1.130	3.759	11.023	15.939	1.139	3.775	11.023		
13.840	15.758	1.086	3.650	11.022	15.782	1.094	3.665	11.022		
13.860	15.612	1.045	3.546	11.021	15.634	1.052	3.560	11.021		
13.880	15.474	1.006	3.447	11.021	15.494	1.013	3.460	11.021		
13.900	15.342	0.970	3.352	11.020	15.361	0.976	3.364	11.020		
13.920	15.216	0.936	3.261	11.020	15.234	0.941	3.272	11.020		
13.940	15.097	0.903	3.174	11.019	15.113	0.909	3.185	11.019		
13.960	14.982	0.873	3.091	11.018	14.998	0.878	3.101	11.018		
13.980	14.873	0.844	3.011	11.018	14.888	0.848	3.021	11.018		
14.000	14.769	0.817	2.935	11.018	14.782	0.821	2.944	11.017		
14.020	14.669	0.791	2.861	11.017	14.682	0.794	2.870	11.017		
14.040	14.573	0.766	2.791	11.017	14.586	0.770	2.799	11.017		
14.060	14.482	0.743	2.723	11.016	14.493	0.746	2.730	11.016		
14.080	14.394	0.720	2.658	11.016	14.404	0.723	2.665	11.016		
14.100	14.309	0.699	2.595	11.015	14.319	0.702	2.602	11.015		
14.120	14.228	0.679	2.534	11.015	14.237	0.681	2.541	11.015		
14.140	14.150	0.659	2.476	11.015	14.159	0.662	2.482	11.015		
14.160	14.075	0.641	2.419	11.014	14.083	0.643	2.425	11.014		
14.180	14.002	0.623	2.365	11.014	14.011	0.626	2.370	11.014		
14.200	13.933	0.606	2.312	11.014	13.940	0.609	2.318	11.014		
14.220	13.865	0.590	2.262	11.013	13.872	0.592	2.267	11.013		
14.240	13.801	0.575	2.213	11.013	13.807	0.577	2.217	11.013		
14.260	13.738	0.560	2.165	11.013	13.745	0.562	2.170	11.013		

ENERGY	UNBROADENED DATA				BROADENED DATA			
	SIG. T	SIG. C	SIG. F	SIG. S	SIG. T	SIG. C	SIG. F	SIG. S
14.280	13.677	0.546	2.119	11.013	13.684	0.547	2.124	11.013
14.300	13.619	0.532	2.075	11.012	13.625	0.533	2.079	11.012
14.320	13.563	0.519	2.032	11.012	13.568	0.520	2.036	11.012
14.340	13.508	0.506	1.990	11.012	13.514	0.507	1.994	11.012
14.360	13.455	0.494	1.950	11.012	13.461	0.495	1.953	11.012
14.380	13.404	0.482	1.911	11.011	13.409	0.483	1.914	11.011
14.400	13.355	0.471	1.873	11.011	13.359	0.472	1.876	11.011
14.420	13.307	0.460	1.836	11.011	13.312	0.461	1.839	11.011
14.440	13.260	0.449	1.800	11.011	13.265	0.451	1.803	11.011
14.460	13.215	0.439	1.765	11.010	13.219	0.440	1.768	11.010
14.480	13.171	0.430	1.732	11.010	13.176	0.431	1.734	11.010
14.500	13.129	0.420	1.699	11.010	13.133	0.421	1.702	11.010
14.520	13.088	0.411	1.667	11.010	13.092	0.412	1.670	11.010
14.540	13.048	0.402	1.636	11.010	13.051	0.403	1.639	11.010
14.560	13.009	0.394	1.606	11.010	13.013	0.394	1.608	11.009
14.580	12.971	0.385	1.577	11.009	12.975	0.386	1.579	11.009
14.600	12.935	0.377	1.548	11.009	12.938	0.378	1.551	11.009
14.620	12.899	0.370	1.521	11.009	12.902	0.370	1.523	11.009
14.640	12.865	0.362	1.494	11.009	12.867	0.363	1.496	11.009
14.660	12.831	0.355	1.467	11.009	12.834	0.355	1.469	11.009
14.680	12.798	0.348	1.442	11.009	12.801	0.348	1.444	11.009
14.700	12.766	0.341	1.417	11.008	12.769	0.342	1.419	11.008
14.720	12.735	0.334	1.393	11.008	12.738	0.335	1.394	11.008
14.740	12.705	0.328	1.369	11.008	12.708	0.328	1.371	11.008
14.760	12.676	0.322	1.346	11.008	12.678	0.322	1.348	11.008
14.780	12.647	0.316	1.323	11.008	12.649	0.316	1.325	11.008
14.800	12.619	0.310	1.302	11.008	12.621	0.310	1.303	11.008
14.820	12.592	0.304	1.280	11.008	12.594	0.304	1.282	11.008
14.840	12.565	0.298	1.259	11.007	12.568	0.299	1.261	11.007
14.860	12.539	0.293	1.239	11.007	12.541	0.293	1.240	11.007
14.880	12.514	0.288	1.219	11.007	12.516	0.288	1.220	11.007
14.900	12.489	0.283	1.200	11.007	12.491	0.283	1.201	11.007
14.920	12.465	0.278	1.181	11.007	12.467	0.278	1.182	11.007
14.940	12.442	0.273	1.162	11.007	12.444	0.273	1.163	11.007
14.960	12.419	0.268	1.144	11.007	12.421	0.268	1.145	11.007
14.980	12.396	0.263	1.126	11.007	12.398	0.264	1.128	11.007
15.000	12.374	0.259	1.109	11.007	12.377	0.259	1.110	11.007

(ACSAP/001 - - JUNE, 1972 - - AEROJET NUCLEAR CORP.)
295-XS FISSION, FIT WITH BREIT-WIGNER PARAMETERS.

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	INTEGRAL UNDER _CROSS_SECTION_CURVE	RESONANCE INTEGRAL ----- (XSEC/E) -----
TOTAL	335.09	27.15
CAPTURE	59.58	4.74
FISSION	219.32	17.86
SCATTERING	56.24	4.56

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295-XS FISSION, FIT WITH BREIT-WIGNER PARAMETERS.

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** PLOT 10. 15. .01 8 IFISSION BREIT ENERGY SIGMA CARD ACCEPTED.
FIT AND VALLEY POINTS HAVE BEEN PLOTTED

FISSION CROSS SECTION HAS BEEN PLOTTED AS:
ENERGY (EV) VS CROSS SECTION (BARNs)
FROM 10.00 EV TO 15.00 EV

** PLOTDATAFX 10. 15. ENERGY SIGMA DIAMOND ENERGY SIGMA CARD ACCEPTED.

EXPERIMENTAL DATA HAVE BEEN PLOTTED AS ENERGY (EV) VS CROSS SECTION (BARNs)
FROM 10.00 EV TO 15.00 EV SYMBOL USED WAS: DIAMOND
FORM OF INPUT DATA WAS ENERGY (EV) VS CROSS SECTION (BARNs)

** TITLE DIFFERENCE PLOT FOR SINGLE-LEVEL FIT TO 295-XS. CARD ACCEPTED.
** AXIS ENERGY SIGMA 10. 15. -50. 50. 10. 10. CARD ACCEPTED.

A PLOT AXIS HAS BEEN DRAWN TO THE FOLLOWING SPECIFICATIONS:
ABSCISSA: ENERGY (EV) LINEAR MINIMUM= 10.00 MAXIMUM= 15.00 LENGTH= 10.0
ORDINATE: CROSS SECTION (BARNs) LINEAR MINIMUM= -50.00 MAXIMUM= 50.00 LENGTH= 10.0

** DIFF OUTFX 10. 14.9 FISSION BREIT PUNCH LIST PLOT CARD ACCEPTED.

ENERGY	THEO. DATA	EXPER. DATA	DIFFER (E-T)	ENERGY	THEO. DATA	EXPER. DATA	DIFFER (E-T)	ENERGY	THEO. DATA	EXPER. DATA	DIFFER (E-T)
10.000	2.10	3.20	1.10	10.020	2.13	3.10	0.97	10.040	2.17	3.17	1.00
10.060	2.21	2.98	0.77	10.080	2.25	3.14	0.89	10.100	2.29	3.36	1.07
10.120	2.33	3.55	1.22	10.140	2.37	2.78	0.41	10.160	2.42	3.03	0.61
10.180	2.46	3.58	1.12	10.200	2.51	2.96	0.45	10.220	2.56	3.78	1.22
10.240	2.61	3.35	0.74	10.260	2.66	3.91	1.25	10.280	2.71	3.83	1.12
10.300	2.77	3.27	0.50	10.320	2.82	3.92	1.10	10.340	2.88	4.36	1.48
10.360	2.94	4.30	1.36	10.380	3.00	4.23	1.23	10.400	3.07	3.69	0.62
10.420	3.13	4.42	1.29	10.440	3.20	3.89	0.69	10.460	3.27	4.64	1.37
10.480	3.35	4.96	1.61	10.500	3.42	4.60	1.18	10.520	3.50	4.20	0.70
10.540	3.58	4.36	0.78	10.560	3.66	5.04	1.38	10.580	3.75	4.73	0.98
10.600	3.84	4.85	1.01	10.620	3.94	5.48	1.54	10.640	4.03	5.24	1.21
10.660	4.13	5.34	1.21	10.679	4.23	5.23	1.00	10.697	4.33	5.27	0.94
10.715	4.43	5.86	1.43	10.733	4.54	5.86	1.32	10.750	4.64	5.97	1.33
10.767	4.75	5.84	1.09	10.784	4.86	5.87	1.01	10.800	4.96	6.47	1.51
10.816	5.08	6.52	1.44	10.831	5.18	7.07	1.89	10.846	5.29	6.57	1.28
10.861	5.41	6.90	1.49	10.876	5.53	7.48	1.95	10.890	5.64	7.16	1.52
10.904	5.76	7.21	1.45	10.917	5.87	7.01	1.14	10.931	6.00	7.21	1.21
10.944	6.12	8.10	1.98	10.956	6.23	7.99	1.76	10.969	6.36	8.28	1.92
10.981	6.48	8.81	2.33	10.993	6.61	8.47	1.86	11.005	6.74	8.07	1.33
11.016	6.86	9.38	2.52	11.028	7.00	9.64	2.64	11.039	7.12	8.92	1.80
11.050	7.26	8.86	1.60	11.060	7.38	9.64	2.26	11.071	7.52	9.37	1.85
11.081	7.65	10.57	2.92	11.091	7.79	9.97	2.18	11.100	7.91	10.22	2.31
11.110	8.05	10.15	2.10	11.120	8.20	11.07	2.87	11.130	8.34	11.42	3.08
11.140	8.50	10.74	2.24	11.150	8.66	10.80	2.14	11.160	8.82	11.53	2.71
11.170	8.98	11.00	2.02	11.180	9.16	12.12	2.96	11.190	9.33	12.55	3.22
11.200	9.51	12.57	3.06	11.210	9.70	11.42	1.72	11.220	9.89	12.18	2.29
11.230	10.09	12.24	2.15	11.240	10.30	13.71	3.41	11.250	10.51	13.94	3.43
11.260	10.73	13.73	3.00	11.270	10.95	13.21	2.26	11.280	11.18	14.87	3.69
11.290	11.42	13.93	2.51	11.300	11.67	14.89	3.22	11.310	11.93	15.20	3.27
11.320	12.19	15.17	2.98	11.330	12.46	15.39	2.93	11.340	12.75	16.18	3.43
11.350	13.04	16.23	3.19	11.360	13.34	16.61	3.27	11.370	13.66	17.82	4.16
11.380	13.98	16.88	2.90	11.390	14.32	18.20	3.88	11.400	14.67	17.33	2.66
11.410	15.03	18.64	3.61	11.420	15.40	18.85	3.45	11.430	15.79	18.48	2.69
11.440	16.20	20.42	4.22	11.450	16.62	19.50	2.88	11.460	17.06	20.43	3.37
11.470	17.51	20.57	3.06	11.480	17.99	21.67	3.68	11.490	18.48	22.02	3.54
11.500	19.00	23.33	4.33	11.510	19.53	22.96	3.43	11.520	20.09	23.12	3.03
11.530	20.67	25.01	4.34	11.540	21.28	24.95	3.67	11.550	21.92	24.96	3.04
11.560	22.59	28.21	5.62	11.570	23.28	27.17	3.89	11.580	24.01	28.08	4.07
11.590	24.77	30.33	5.56	11.600	25.58	30.50	4.92	11.610	26.42	30.57	4.15
11.620	27.30	33.11	5.81	11.630	28.22	34.45	6.23	11.640	29.20	34.34	5.14
11.650	30.22	34.17	3.95	11.660	31.30	35.52	4.22	11.670	32.44	37.56	5.12
11.680	33.64	38.93	5.29	11.690	34.91	39.42	4.51	11.700	36.24	41.10	4.86
11.710	37.66	42.50	4.84	11.720	39.16	44.27	5.11	11.730	40.75	47.97	7.22
11.740	42.43	46.42	3.99	11.750	44.22	51.21	6.99	11.760	46.12	52.05	5.93
11.770	48.15	52.46	4.31	11.780	50.30	55.08	4.78	11.790	52.61	56.74	4.13
11.800	55.06	62.72	7.66	11.810	57.69	65.27	7.58	11.820	60.50	66.82	6.32
11.830	63.51	71.40	7.89	11.840	66.73	71.04	4.31	11.850	70.20	76.78	6.58
11.860	73.93	79.76	5.83	11.870	77.94	84.74	6.80	11.880	82.27	88.01	5.74
11.890	86.93	91.12	4.19	11.900	91.97	96.44	4.47	11.910	97.41	102.80	5.39
11.920	103.30	105.74	2.44	11.930	109.67	116.18	6.51	11.940	116.57	120.76	4.19

ENERGY	THEO. DATA	EXPER. DATA	DIFFER (E-T)	ENERGY	THEO. DATA	EXPER. DATA	DIFFER (E-T)	ENERGY	THEO. DATA	EXPER. DATA	DIFFER (E-T)
11.950	124.03	129.57	5.54	11.960	132.12	138.13	6.01	11.970	140.86	141.01	0.15
11.980	150.32	150.67	0.35	11.990	160.51	159.86	-0.65	12.000	171.49	172.48	0.99
12.010	183.28	180.45	-2.83	12.020	195.89	191.44	-4.45	12.030	209.32	206.23	-3.09
12.040	223.53	217.68	-5.85	12.050	238.49	235.05	-3.44	12.060	254.06	247.92	-6.14
12.070	270.14	258.25	-11.89	12.080	286.56	276.40	-10.16	12.090	303.08	293.67	-9.41
12.100	319.44	309.44	-10.00	12.110	335.34	327.16	-8.18	12.120	350.45	336.45	-14.00
12.130	364.40	350.24	-14.16	12.140	376.83	367.11	-9.72	12.150	387.40	376.05	-11.35
12.160	395.81	382.99	-12.82	12.170	401.78	397.82	-3.96	12.180	405.13	402.48	-2.65
12.190	405.74	406.19	0.45	12.200	403.60	408.07	4.47	12.210	398.78	398.22	-0.56
12.220	391.43	394.19	2.76	12.230	381.79	389.37	7.58	12.240	370.14	377.01	6.87
12.250	356.81	365.03	8.22	12.260	342.16	353.83	11.67	12.270	326.55	335.38	8.83
12.280	310.32	324.03	13.71	12.290	293.81	302.52	8.71	12.300	277.29	286.88	9.59
12.310	261.00	268.66	7.66	12.320	245.13	258.11	12.98	12.330	229.84	241.54	11.70
12.340	215.26	225.44	10.18	12.350	201.43	209.39	7.96	12.360	188.42	191.26	2.84
12.370	176.23	176.15	-0.08	12.380	164.86	165.18	0.32	12.390	154.29	157.13	2.84
12.400	144.50	141.75	-2.75	12.410	135.43	132.63	-2.80	12.420	127.06	125.45	-1.61
12.430	119.33	115.07	-4.26	12.440	112.20	104.30	-7.90	12.450	105.61	98.91	-6.70
12.460	99.54	91.89	-7.65	12.470	93.93	86.21	-7.72	12.480	88.75	80.37	-8.38
12.490	83.96	73.58	-10.38	12.500	79.54	68.20	-11.34	12.510	75.44	64.32	-11.12
12.520	71.64	59.35	-12.29	12.530	68.12	56.31	-11.81	12.540	64.85	52.47	-12.38
12.550	61.82	47.13	-14.69	12.560	59.00	43.86	-15.14	12.570	56.37	42.83	-13.54
12.580	53.93	37.30	-16.63	12.590	51.65	37.35	-14.30	12.600	49.53	32.83	-16.70
12.610	47.56	32.51	-15.05	12.620	45.71	29.66	-17.05	12.630	43.99	26.73	-17.26
12.640	42.39	26.35	-16.04	12.650	40.90	22.73	-18.17	12.660	39.50	21.29	-18.21
12.670	38.21	19.98	-18.23	12.680	37.01	17.96	-19.05	12.690	35.89	17.32	-18.57
12.700	34.86	16.38	-18.48	12.710	33.91	14.74	-19.17	12.720	33.04	13.26	-19.78
12.730	32.25	11.40	-20.85	12.740	31.54	9.69	-21.85	12.750	30.90	8.82	-22.08
12.760	30.34	7.62	-22.72	12.770	29.87	6.80	-23.07	12.780	29.47	6.83	-22.64
12.790	29.18	5.36	-23.82	12.800	28.98	5.14	-23.84	12.810	28.88	3.92	-24.96
12.820	28.92	4.06	-24.86	12.830	29.09	3.59	-25.50	12.840	29.43	3.94	-25.49
12.850	29.96	3.61	-26.35	12.860	30.74	4.83	-25.91	12.870	31.81	6.09	-25.72
12.880	33.24	7.40	-25.84	12.890	35.12	10.99	-24.13	12.900	37.55	15.94	-21.61
12.910	40.66	20.77	-19.89	12.920	44.60	27.89	-16.71	12.930	49.50	37.32	-12.18
12.940	55.51	44.54	-10.97	12.950	62.73	55.92	-6.81	12.960	71.18	69.09	-2.09
12.970	80.81	82.56	1.75	12.980	91.44	101.00	9.56	12.990	102.71	114.17	11.46
13.000	114.15	127.20	13.05	13.010	125.14	135.06	9.92	13.020	134.99	144.70	9.71
13.030	142.98	148.63	5.65	13.040	148.52	145.79	-2.73	13.050	151.12	149.57	-1.55
13.060	150.56	143.64	-6.92	13.070	146.88	134.52	-12.36	13.080	140.34	131.05	-9.29
13.090	131.45	121.63	-9.82	13.100	120.83	109.57	-11.26	13.110	109.20	98.23	-10.97
13.120	97.24	88.97	-8.27	13.130	85.53	80.55	-4.98	13.140	74.54	74.49	-0.05
13.150	64.56	68.51	3.95	13.160	55.77	62.50	6.73	13.170	48.19	57.91	9.72
13.180	41.79	53.06	11.27	13.190	36.46	48.85	12.39	13.200	32.06	45.91	13.85
13.210	28.44	41.02	12.58	13.220	25.47	38.71	13.24	13.230	23.01	35.32	12.31
13.240	20.98	33.12	12.14	13.250	19.27	33.46	14.19	13.260	17.83	31.79	13.96
13.270	16.61	28.11	11.50	13.280	15.55	27.07	11.52	13.290	14.63	27.90	13.27
13.300	13.63	26.05	12.22	13.310	13.11	25.49	12.38	13.320	12.48	23.50	11.02
13.330	11.90	21.85	9.95	13.340	11.39	20.53	9.14	13.350	10.92	21.06	10.14
13.360	10.49	20.89	10.40	13.370	10.09	18.99	8.90	13.380	9.73	19.22	9.49
13.390	9.40	17.19	7.79	13.400	9.09	17.44	8.35	13.410	8.79	17.50	8.71
13.420	8.52	17.50	8.98	13.430	8.27	16.91	8.64	13.440	8.03	15.27	7.24

(ACSAP/001 - - JUNE, 1972 - - AEROJET NUCLEAR CORP.)

DIFFERENCE PLOT FOR SINGLE-LEVEL FIT TO 295-XS.

05/26/72

PAGE 58

ENERGY	THEO. DATA	EXPER. DATA	DIFFER (E-T)	ENERGY	THEO. DATA	EXPER. DATA	DIFFER (E-T)	ENERGY	THEO. DATA	EXPER. DATA	DIFFER (E-T)
13.450	7.81	14.57	6.76	13.460	7.59	15.10	7.51	13.470	7.39	15.09	7.70
13.480	7.20	14.33	7.13	13.490	7.02	13.94	6.92	13.500	6.85	12.97	6.12
13.510	6.69	12.89	6.20	13.520	6.53	12.30	5.77	13.530	6.38	11.72	5.34
13.540	6.24	12.23	5.99	13.551	6.09	12.23	6.14	13.562	5.95	11.83	5.88
13.574	5.80	11.63	5.83	13.586	5.66	11.13	5.47	13.599	5.51	10.37	4.86
13.612	5.37	10.69	5.32	13.626	5.23	10.16	4.93	13.640	5.09	9.35	4.26
13.656	4.95	9.62	4.67	13.672	4.80	9.50	4.70	13.689	4.66	8.42	3.76
13.706	4.53	9.20	4.67	13.725	4.39	7.73	3.34	13.745	4.24	8.13	3.89
13.760	4.14	8.29	4.15	13.730	4.01	7.01	3.00	13.806	3.89	6.94	3.05
13.820	3.78	7.31	3.53	13.840	3.67	6.54	2.87	13.860	3.56	6.79	3.23
13.880	3.46	6.49	3.03	13.900	3.36	6.72	3.36	13.920	3.27	6.12	2.85
13.940	3.18	5.87	2.69	13.960	3.10	5.30	2.20	13.980	3.02	5.72	2.70
14.000	2.94	5.55	2.61	14.020	2.87	4.88	2.01	14.040	2.80	5.08	2.28
14.050	2.73	4.91	2.18	14.080	2.66	4.89	2.23	14.100	2.60	4.65	2.05
14.120	2.54	5.02	2.48	14.140	2.48	4.64	2.16	14.160	2.43	3.79	1.36
14.180	2.37	3.73	1.36	14.200	2.32	4.24	1.92	14.220	2.27	4.45	2.18
14.240	2.22	3.75	1.53	14.260	2.17	4.22	2.05	14.280	2.12	4.04	1.92
14.300	2.08	3.33	1.25	14.320	2.04	3.11	1.07	14.340	1.99	3.00	1.01
14.360	1.95	3.08	1.13	14.380	1.91	3.30	1.39	14.400	1.88	3.59	1.71
14.420	1.84	3.13	1.29	14.440	1.80	2.87	1.07	14.460	1.77	3.34	1.57
14.480	1.73	2.91	1.18	14.500	1.70	2.94	1.24	14.520	1.67	3.17	1.50
14.540	1.64	3.15	1.51	14.560	1.61	2.53	0.92	14.580	1.58	2.84	1.26
14.600	1.55	2.59	1.04	14.620	1.52	2.22	0.70	14.640	1.50	2.80	1.30
14.660	1.47	2.17	0.70	14.680	1.44	2.54	1.10	14.700	1.42	2.33	0.91
14.720	1.39	2.24	0.85	14.740	1.37	2.64	1.27	14.760	1.35	2.61	1.26
14.780	1.33	2.42	1.09	14.800	1.30	2.26	0.96	14.820	1.28	1.94	0.66
14.840	1.26	2.10	0.84	14.860	1.24	2.12	0.88	14.880	1.22	2.05	0.83
14.900	1.20	2.04	0.84								

DIFFERENCE VALUES HAVE BEEN COMPUTED FOR N = 382 POINTS.

MEAN SQUARE DEVIATION = 73.567

CHI-SQUARED/N = 2.730

CROSS SECTION INTEGRALS
EXPERIMENTAL DIFFERENCE

221.53

2.32

RESONANCE INTEGRALS (XSEC/E)
EXPERIMENTAL DIFFERENCE

18.04

0.20

• • • • • IT'S BEEN A PLEASURE SERVING YOU. MAY ALL YOUR ANSWERS BE CORRECT ONES • • • • •

TIME (IN SECONDS) SINCE LAST CALL TO TIME ROUTINE 110.989

ACCUMULATIVE TIME FOR PROBLEM (IN SECONDS) 110.989


```

//ACSAP PROC PAGE=100,XTIME=5,NAME=NULLFILE,
//      PLOTS='(D,WRITER)',OUT=A,SP1=20,SP2=20,SP3=20,PLTS=80
//ST1 EXEC PGM=ACSAP,REGION=240K,TIME=&XTIME
//STEPLIB DD DSN=&NAME,DISP=SHR
//FT05F001 DD DDNAME=SYSIN
//FT06F001 DD SYSOUT=&OUT,DCB=(RECFM=FBA,LRECL=133,BLKSIZE=1596),
//      SPACE=(7980,(&PAGE,10))
//FT07F001 DD SYSOUT=B,DCB=(RECFM=FB,LRECL=80,BLKSIZE=1600)
//FT10F001 DD UNIT=DKSCRA,SPACE=(TRK,(&SP1,10)),DSN=&&COMB
//FT11F001 DD UNIT=DKSCRA,SPACE=(TRK,(&SP2,10)),DSN=&&DATA
//FT12F001 DD UNIT=DKSCRA,SPACE=(TRK,(&SP3,10)),DSN=&&DIFF
//FT51F001 DD DSN=TEMP.JWCDISC1,DISP=SHR
//FT52F001 DD DSN=TEMP.JWCDISC2,DISP=SHR
//FT53F001 DD DSN=TEMP.JWCDISC3,DISP=SHR
//FT54F001 DD DSN=TEMP.JWCDISC4,DISP=SHR
//PLOT DD SYSOUT=&PLOTS,SPACE=(TRK,(&PLTS,10)),UNIT=DKSPOL
//SYSUDUMP DD SYSOUT=A

```

Fig. D-11 Job Control Language (JCL) procedures for ACSAP.

ERRATA FOR ANCR-1042

AN AUTOMATED CROSS SECTION ANALYSIS PROGRAM (ACSAP)

These sheets replace pages 131-139 of report number ANCR-1042.

ENERGY	SIG. T	UNBROADENED DATA			SIG. S	BROADENED DATA			
		SIG. C	SIG. F	SIG. T		SIG. C	SIG. F	SIG. S	
10.000	12.918	0.383	2.095	10.440	12.920	0.383	2.097	10.439	
10.020	12.956	0.390	2.131	10.435	12.959	0.390	2.134	10.435	
10.040	12.995	0.396	2.169	10.430	12.998	0.397	2.171	10.430	
10.060	13.035	0.403	2.207	10.425	13.038	0.403	2.210	10.425	
10.080	13.076	0.410	2.246	10.420	13.080	0.410	2.249	10.420	
10.100	13.119	0.417	2.287	10.415	13.122	0.418	2.290	10.415	
10.120	13.163	0.424	2.328	10.410	13.166	0.425	2.331	10.409	
10.140	13.208	0.432	2.371	10.404	13.211	0.433	2.374	10.404	
10.160	13.254	0.440	2.415	10.399	13.258	0.440	2.419	10.399	
10.180	13.302	0.448	2.461	10.393	13.306	0.448	2.464	10.393	
10.200	13.351	0.456	2.508	10.388	13.355	0.457	2.511	10.387	
10.220	13.402	0.465	2.556	10.382	13.406	0.465	2.559	10.382	
10.240	13.455	0.473	2.605	10.376	13.459	0.474	2.609	10.376	
10.260	13.509	0.482	2.656	10.370	13.513	0.483	2.660	10.370	
10.280	13.565	0.492	2.709	10.364	13.569	0.492	2.713	10.364	
10.300	13.622	0.501	2.763	10.358	13.627	0.502	2.767	10.357	
10.320	13.682	0.511	2.819	10.352	13.687	0.512	2.824	10.351	
10.340	13.743	0.521	2.877	10.345	13.749	0.522	2.882	10.345	
10.360	13.807	0.532	2.937	10.338	13.812	0.533	2.942	10.338	
10.380	13.873	0.543	2.998	10.332	13.879	0.543	3.003	10.331	
10.400	13.941	0.554	3.062	10.325	13.947	0.555	3.067	10.324	
10.420	14.011	0.565	3.128	10.318	14.017	0.566	3.133	10.317	
10.440	14.084	0.577	3.196	10.311	14.090	0.578	3.202	10.310	
10.460	14.159	0.589	3.266	10.303	14.166	0.591	3.272	10.303	
10.480	14.237	0.602	3.339	10.296	14.244	0.603	3.345	10.296	
10.500	14.318	0.615	3.414	10.288	14.325	0.617	3.421	10.288	
10.520	14.402	0.629	3.492	10.281	14.410	0.630	3.499	10.280	
10.540	14.489	0.643	3.573	10.273	14.497	0.644	3.580	10.272	
10.560	14.579	0.658	3.656	10.265	14.587	0.659	3.664	10.264	
10.580	14.672	0.673	3.743	10.256	14.681	0.674	3.751	10.256	
10.600	14.769	0.689	3.833	10.248	14.779	0.690	3.841	10.247	
10.620	14.870	0.705	3.926	10.239	14.880	0.706	3.935	10.238	
10.640	14.975	0.722	4.023	10.230	14.986	0.723	4.032	10.229	
10.660	15.084	0.739	4.124	10.221	15.095	0.741	4.133	10.220	
10.680	15.195	0.757	4.226	10.212	15.206	0.759	4.236	10.211	
10.699	15.307	0.775	4.330	10.203	15.320	0.777	4.340	10.202	
10.717	15.421	0.793	4.434	10.194	15.434	0.795	4.446	10.193	
10.736	15.536	0.812	4.540	10.184	15.550	0.814	4.552	10.184	
10.753	15.653	0.830	4.648	10.175	15.668	0.832	4.660	10.175	
10.771	15.772	0.849	4.756	10.166	15.786	0.851	4.769	10.165	
10.787	15.891	0.868	4.866	10.157	15.907	0.870	4.880	10.156	
10.804	16.012	0.887	4.977	10.148	16.029	0.890	4.992	10.147	
10.820	16.135	0.907	5.089	10.139	16.152	0.909	5.104	10.138	
10.836	16.259	0.926	5.203	10.130	16.277	0.929	5.219	10.129	
10.851	16.385	0.946	5.317	10.121	16.403	0.949	5.334	10.120	
10.866	16.512	0.966	5.433	10.112	16.531	0.969	5.451	10.111	
10.881	16.640	0.986	5.550	10.103	16.661	0.989	5.569	10.102	
10.895	16.770	1.007	5.669	10.094	16.791	1.010	5.688	10.093	
10.910	16.901	1.027	5.788	10.086	16.924	1.031	5.808	10.085	
10.923	17.034	1.048	5.909	10.077	17.058	1.052	5.930	10.076	

ENERGY	UNBROADENED DATA				BROADENED DATA			
	SIG. T	SIG. C	SIG. F	SIG. S	SIG. T	SIG. C	SIG. F	SIG. S
10.937	17.168	1.069	6.031	10.068	17.192	1.073	6.053	10.067
10.950	17.304	1.090	6.154	10.059	17.329	1.094	6.177	10.058
10.963	17.441	1.112	6.279	10.050	17.467	1.116	6.302	10.049
10.976	17.579	1.133	6.404	10.041	17.606	1.137	6.429	10.040
10.988	17.719	1.155	6.531	10.033	17.748	1.159	6.557	10.031
11.000	17.858	1.177	6.657	10.024	17.888	1.181	6.684	10.023
11.012	18.001	1.199	6.787	10.015	18.032	1.204	6.814	10.014
11.024	18.145	1.221	6.917	10.007	18.178	1.226	6.946	10.005
11.035	18.290	1.244	7.049	9.998	18.324	1.249	7.078	9.997
11.046	18.437	1.267	7.181	9.989	18.473	1.272	7.212	9.988
11.057	18.585	1.290	7.315	9.980	18.622	1.295	7.348	9.979
11.068	18.735	1.313	7.450	9.972	18.773	1.318	7.484	9.970
11.079	18.886	1.336	7.587	9.963	18.925	1.342	7.622	9.962
11.089	19.039	1.360	7.724	9.955	19.080	1.366	7.760	9.953
11.099	19.193	1.383	7.863	9.946	19.235	1.390	7.901	9.945
11.109	19.348	1.407	8.003	9.938	19.392	1.414	8.042	9.936
11.120	19.516	1.433	8.155	9.928	19.563	1.440	8.195	9.927
11.130	19.680	1.458	8.302	9.919	19.728	1.466	8.344	9.918
11.140	19.849	1.484	8.454	9.911	19.899	1.492	8.497	9.909
11.150	20.022	1.511	8.610	9.901	20.074	1.519	8.655	9.900
11.160	20.201	1.538	8.770	9.892	20.254	1.546	8.817	9.890
11.170	20.384	1.566	8.935	9.883	20.440	1.575	8.984	9.881
11.180	20.573	1.595	9.105	9.873	20.631	1.604	9.155	9.871
11.190	20.767	1.625	9.279	9.863	20.828	1.634	9.332	9.861
11.200	20.968	1.656	9.459	9.853	21.031	1.665	9.514	9.852
11.210	21.174	1.687	9.644	9.843	21.239	1.697	9.701	9.841
11.220	21.387	1.720	9.834	9.833	21.455	1.730	9.894	9.831
11.230	21.606	1.753	10.031	9.823	21.677	1.763	10.092	9.821
11.240	21.832	1.787	10.233	9.812	21.906	1.798	10.297	9.810
11.250	22.065	1.823	10.441	9.801	22.142	1.834	10.509	9.799
11.260	22.306	1.859	10.657	9.790	22.386	1.871	10.726	9.788
11.270	22.554	1.897	10.878	9.779	22.638	1.909	10.951	9.777
11.280	22.811	1.936	11.107	9.767	22.898	1.949	11.183	9.765
11.290	23.075	1.976	11.344	9.756	23.166	1.989	11.423	9.753
11.300	23.349	2.017	11.588	9.744	23.444	2.031	11.671	9.741
11.310	23.631	2.060	11.840	9.732	23.730	2.075	11.926	9.729
11.320	23.923	2.104	12.100	9.719	24.027	2.119	12.191	9.717
11.330	24.226	2.150	12.369	9.707	24.334	2.166	12.464	9.704
11.340	24.538	2.197	12.647	9.694	24.652	2.214	12.747	9.691
11.350	24.862	2.246	12.935	9.681	24.981	2.263	13.039	9.678
11.360	25.197	2.296	13.233	9.667	25.321	2.314	13.342	9.665
11.370	25.544	2.348	13.542	9.654	25.674	2.367	13.656	9.651
11.380	25.903	2.402	13.861	9.640	26.040	2.422	13.980	9.637
11.390	26.275	2.458	14.192	9.626	26.419	2.479	14.317	9.623
11.400	26.662	2.516	14.534	9.611	26.812	2.538	14.666	9.608
11.410	27.062	2.576	14.890	9.597	27.221	2.599	15.028	9.593
11.420	27.478	2.638	15.259	9.581	27.645	2.662	15.404	9.578
11.430	27.910	2.703	15.641	9.566	28.085	2.728	15.794	9.563
11.440	28.359	2.770	16.039	9.550	28.543	2.796	16.199	9.547
11.450	28.825	2.839	16.451	9.534	29.019	2.867	16.621	9.531

ENERGY	SIG. T	UNBROADENED DATA			SIG. S	BROADENED DATA			SIG. S
		SIG. C	SIG. F	SIG. C		SIG. F			
11.460	29.309	2.911	16.880	9.518	29.514	2.941	17.058	9.514	
11.470	29.814	2.986	17.326	9.501	30.029	3.018	17.514	9.497	
11.480	30.338	3.064	17.790	9.484	30.565	3.097	17.988	9.480	
11.490	30.884	3.146	18.272	9.467	31.124	3.180	18.482	9.462	
11.500	31.453	3.230	18.775	9.449	31.707	3.267	18.996	9.444	
11.510	32.047	3.318	19.298	9.430	32.314	3.357	19.531	9.426	
11.520	32.665	3.410	19.844	9.412	32.949	3.451	20.091	9.407	
11.530	33.311	3.505	20.413	9.392	33.611	3.549	20.674	9.388	
11.540	33.985	3.605	21.007	9.373	34.303	3.651	21.284	9.368	
11.550	34.689	3.709	21.627	9.353	35.026	3.758	21.920	9.348	
11.560	35.425	3.818	22.275	9.332	35.782	3.869	22.586	9.327	
11.570	36.194	3.931	22.952	9.311	36.574	3.986	23.282	9.306	
11.580	37.000	4.050	23.660	9.290	37.404	4.108	24.011	9.284	
11.590	37.844	4.174	24.402	9.268	38.273	4.236	24.775	9.262	
11.600	38.728	4.304	25.179	9.245	39.185	4.370	25.575	9.239	
11.610	39.655	4.440	25.992	9.222	40.143	4.510	26.415	9.216	
11.620	40.628	4.583	26.846	9.199	41.148	4.658	27.297	9.192	
11.630	41.649	4.733	27.742	9.174	42.204	4.813	28.223	9.168	
11.640	42.723	4.890	28.683	9.150	43.316	4.975	29.197	9.143	
11.650	43.852	5.055	29.672	9.124	44.485	5.147	30.222	9.117	
11.660	45.040	5.229	30.713	9.098	45.720	5.327	31.301	9.091	
11.670	46.292	5.412	31.808	9.071	47.020	5.517	32.439	9.064	
11.680	47.612	5.605	32.963	9.044	48.392	5.717	33.639	9.037	
11.690	49.004	5.808	34.180	9.016	49.841	5.928	34.905	9.009	
11.700	50.474	6.022	35.464	8.987	51.375	6.151	36.244	8.980	
11.710	52.027	6.248	36.821	8.958	52.997	6.387	37.660	8.950	
11.720	53.671	6.487	38.256	8.928	54.715	6.637	39.159	8.920	
11.730	55.411	6.740	39.774	8.897	56.538	6.901	40.747	8.889	
11.740	57.255	7.008	41.382	8.865	58.470	7.182	42.432	8.857	
11.750	59.212	7.292	43.087	8.833	60.526	7.479	44.222	8.825	
11.760	61.290	7.593	44.897	8.800	62.712	7.796	46.125	8.792	
11.770	63.498	7.913	46.819	8.766	65.038	8.132	48.148	8.758	
11.780	65.848	8.253	48.864	8.731	67.518	8.491	50.304	8.724	
11.790	68.351	8.614	51.041	8.696	70.166	8.873	52.605	8.689	
11.800	71.021	9.000	53.361	8.660	72.994	9.281	55.061	8.653	
11.810	73.871	9.411	55.837	8.623	76.018	9.717	57.687	8.617	
11.820	76.917	9.850	58.481	8.586	79.256	10.183	60.494	8.580	
11.830	80.177	10.320	61.309	8.548	82.729	10.682	63.505	8.543	
11.840	83.669	10.822	64.338	8.509	86.454	11.218	66.733	8.505	
11.850	87.414	11.361	67.584	8.470	90.460	11.793	70.202	8.467	
11.860	91.436	11.938	71.067	8.431	94.766	12.411	73.929	8.430	
11.870	95.761	12.559	74.811	8.391	99.406	13.076	77.941	8.392	
11.880	100.417	13.227	78.839	8.351	104.411	13.793	82.267	8.355	
11.890	105.435	13.946	83.178	8.312	109.809	14.565	86.930	8.319	
11.900	110.850	14.721	87.856	8.273	115.646	15.400	91.968	8.283	
11.910	116.700	15.557	92.908	8.234	121.955	16.301	97.411	8.249	
11.920	123.028	16.462	98.370	8.197	128.783	17.275	103.298	8.218	
11.930	129.880	17.440	104.279	8.161	136.176	18.329	109.668	8.188	
11.940	137.305	18.499	110.679	8.127	144.189	19.471	116.567	8.163	
11.950	145.362	19.647	117.619	8.096	152.866	20.706	124.032	8.141	

ENERGY	UNBROADENED DATA				BROADENED DATA			
	SIG. T	SIG. C	SIG. F	SIG. S	SIG. T	SIG. C	SIG. F	SIG. S
11.960	154.110	20.893	125.149	8.068	162.266	22.042	132.114	8.125
11.970	163.613	22.245	133.323	8.045	172.445	23.488	140.860	8.116
11.980	173.941	23.713	142.200	8.027	183.456	25.051	150.313	8.114
11.990	185.168	25.307	151.844	8.017	195.336	26.736	160.504	8.122
12.000	197.370	27.038	162.317	8.015	208.153	28.551	171.489	8.142
12.010	210.623	28.917	173.683	8.023	221.921	30.500	183.281	8.176
12.020	224.999	30.953	186.002	8.044	236.659	32.584	195.891	8.225
12.030	240.570	33.155	199.333	8.081	252.370	34.803	209.320	8.292
12.040	257.388	35.532	213.720	8.136	269.009	37.150	223.529	8.381
12.050	275.489	38.087	229.188	8.214	286.541	39.621	238.483	8.493
12.060	294.874	40.821	245.737	8.316	304.822	42.194	254.058	8.632
12.070	315.507	43.727	263.331	8.449	323.724	44.851	270.139	8.799
12.080	337.286	46.790	281.880	8.616	343.050	47.563	286.557	8.997
12.090	360.032	49.985	301.225	8.822	362.529	50.293	303.077	9.226
12.100	383.469	53.272	321.127	9.071	381.860	52.996	319.440	9.489
12.110	407.214	56.596	341.253	9.366	400.681	55.623	335.335	9.783
12.120	430.750	59.883	361.158	9.709	418.623	58.121	350.445	10.110
12.130	453.438	63.045	380.293	10.100	435.241	60.428	364.394	10.464
12.140	474.529	65.974	398.018	10.538	450.123	62.485	376.828	10.844
12.150	493.208	68.556	413.637	11.016	462.856	64.236	387.401	11.242
12.160	508.642	70.675	426.443	11.525	473.079	65.630	395.808	11.655
12.170	520.067	72.224	435.789	12.054	480.468	66.623	401.777	12.074
12.180	526.873	73.119	441.165	12.589	484.804	67.184	405.128	12.492
12.190	528.680	73.309	442.258	13.113	485.942	67.295	405.743	12.901
12.200	525.395	72.782	439.002	13.611	483.854	66.953	403.607	13.294
12.210	517.217	71.569	431.580	14.069	478.611	66.169	398.786	13.664
12.220	504.616	69.738	420.403	14.476	470.394	64.969	391.437	14.005
12.230	488.266	67.385	406.058	14.823	459.470	63.391	381.795	14.310
12.240	468.958	64.622	389.227	15.109	446.166	61.482	370.142	14.579
12.250	447.523	61.568	370.623	15.332	430.869	59.298	356.812	14.807
12.260	424.757	58.335	350.927	15.496	413.995	56.896	342.161	14.994
12.270	401.370	55.021	330.743	15.606	395.971	54.337	326.555	15.142
12.280	377.947	51.710	310.569	15.669	377.188	51.676	310.328	15.250
12.290	354.956	48.466	290.801	15.690	358.037	48.969	293.813	15.323
12.300	332.744	45.337	271.730	15.677	338.849	46.261	277.293	15.363
12.310	311.549	42.357	253.556	15.637	319.900	43.591	261.001	15.374
12.320	291.517	39.545	236.398	15.574	301.421	40.991	245.133	15.359
12.330	272.729	36.912	220.323	15.494	283.603	38.489	229.849	15.323
12.340	255.209	34.461	205.347	15.402	266.580	36.102	215.251	15.269
12.350	238.945	32.189	191.456	15.300	250.431	33.842	201.435	15.200
12.360	223.893	30.090	178.611	15.192	235.220	31.716	188.424	15.120
12.370	209.998	28.157	166.762	15.079	220.955	29.727	176.233	15.031
12.380	197.190	26.378	155.847	14.965	207.645	27.874	164.866	14.935
12.390	185.397	24.743	145.804	14.850	195.260	26.154	154.298	14.835
12.400	174.543	23.243	136.566	14.735	183.774	24.562	144.502	14.732
12.410	164.556	21.865	128.069	14.621	173.138	23.092	135.438	14.628
12.420	155.364	20.601	120.254	14.509	163.305	21.736	127.063	14.523
12.430	146.902	19.441	113.062	14.399	154.228	20.488	119.335	14.418
12.440	139.107	18.375	106.439	14.292	145.841	19.339	112.198	14.315
12.450	131.920	17.397	100.336	14.188	138.101	18.283	105.616	14.213

ENERGY	UNBROADENED DATA				BROADENED DATA			
	SIG. T	SIG. C	SIG. F	SIG. S	SIG. T	SIG. C	SIG. F	SIG. S
12.460	125.291	16.498	94.707	14.086	130.953	17.311	99.537	14.113
12.470	119.170	15.672	89.510	13.988	124.358	16.419	93.931	14.016
12.480	113.512	14.912	84.708	13.892	118.262	15.598	88.750	13.920
12.490	108.278	14.214	80.265	13.799	112.629	14.844	83.963	13.827
12.500	103.431	13.571	76.151	13.709	107.421	14.152	79.537	13.737
12.510	98.940	12.980	72.338	13.622	102.598	13.515	75.438	13.649
12.520	94.774	12.436	68.800	13.538	98.132	12.931	71.641	13.564
12.530	90.905	11.936	65.513	13.456	93.992	12.394	68.120	13.481
12.540	87.311	11.477	62.458	13.376	90.154	11.902	64.854	13.400
12.550	83.969	11.055	59.615	13.299	86.589	11.451	61.818	13.322
12.560	80.859	10.668	56.967	13.224	83.279	11.038	58.998	13.246
12.570	77.964	10.314	54.499	13.151	80.204	10.661	56.372	13.171
12.580	75.268	9.990	52.197	13.080	77.346	10.318	53.930	13.099
12.590	72.756	9.696	50.049	13.011	74.688	10.006	51.654	13.028
12.600	70.415	9.428	48.043	12.943	72.217	9.724	49.533	12.959
12.610	68.234	9.187	46.169	12.877	69.919	9.471	47.557	12.892
12.620	66.202	8.971	44.419	12.813	67.783	9.245	45.713	12.826
12.630	64.310	8.778	42.782	12.749	65.800	9.045	43.994	12.761
12.640	62.550	8.609	41.254	12.687	63.958	8.870	42.390	12.698
12.650	60.915	8.463	39.825	12.626	62.251	8.721	40.896	12.635
12.660	59.397	8.339	38.492	12.566	60.674	8.596	39.505	12.573
12.670	57.992	8.237	37.248	12.506	59.218	8.496	38.210	12.512
12.680	56.694	8.158	36.089	12.447	57.880	8.420	37.007	12.452
12.690	55.501	8.101	35.011	12.389	56.655	8.370	35.892	12.392
12.700	54.408	8.066	34.010	12.331	55.540	8.346	34.861	12.333
12.710	53.413	8.056	33.084	12.273	54.535	8.349	33.912	12.273
12.720	52.515	8.070	32.230	12.216	53.638	8.381	33.042	12.214
12.730	51.714	8.110	31.446	12.158	52.848	8.443	32.250	12.155
12.740	51.009	8.177	30.732	12.100	52.169	8.538	31.536	12.095
12.750	50.402	8.273	30.087	12.042	51.603	8.669	30.899	12.035
12.760	49.896	8.402	29.510	11.984	51.155	8.839	30.341	11.974
12.770	49.493	8.565	29.004	11.924	50.833	9.054	29.866	11.912
12.780	49.199	8.767	28.568	11.864	50.644	9.320	29.475	11.849
12.790	49.021	9.011	28.207	11.803	50.603	9.643	29.176	11.785
12.800	48.968	9.303	27.924	11.740	50.726	10.032	28.975	11.719
12.810	49.050	9.651	27.724	11.675	51.035	10.500	28.884	11.651
12.820	49.283	10.060	27.614	11.609	51.558	11.062	28.915	11.581
12.830	49.684	10.542	27.602	11.540	52.331	11.735	29.088	11.508
12.840	50.276	11.108	27.699	11.469	53.405	12.547	29.426	11.432
12.850	51.086	11.772	27.919	11.395	54.843	13.527	29.962	11.353
12.860	52.152	12.553	28.281	11.317	56.727	14.719	30.738	11.271
12.870	53.518	13.475	28.807	11.236	59.165	16.174	31.807	11.186
12.880	55.243	14.566	29.527	11.150	62.291	17.959	33.237	11.097
12.890	57.401	15.864	30.478	11.059	66.277	20.160	35.116	11.006
12.900	60.090	17.418	31.711	10.962	71.332	22.877	37.547	10.913
12.910	63.439	19.291	33.290	10.858	77.707	26.236	40.660	10.822
12.920	67.617	21.568	35.302	10.748	85.686	30.372	44.595	10.736
12.930	72.855	24.361	37.864	10.629	95.560	35.427	49.499	10.660
12.940	79.464	27.825	41.136	10.503	107.603	41.533	55.508	10.600
12.950	87.878	32.172	45.337	10.369	122.030	48.792	62.725	10.566

ENERGY	UNBROADENED DATA				BROADENED DATA			
	SIG. T	SIG. C	SIG. F	SIG. S	SIG. T	SIG. C	SIG. F	SIG. S
12.960	98.700	37.698	50.774	10.228	138.903	57.229	71.178	10.568
12.970	112.781	44.819	57.878	10.085	158.126	66.790	80.810	10.617
12.980	131.328	54.122	67.259	9.947	179.350	77.298	91.437	10.723
12.990	156.024	66.428	79.767	9.830	201.900	88.415	102.706	10.895
13.000	189.129	82.827	96.536	9.767	224.862	99.690	114.148	11.139
13.010	233.324	104.606	118.900	9.818	247.015	110.522	125.140	11.453
13.020	290.730	132.757	147.889	10.084	266.977	120.238	134.983	11.833
13.030	359.780	166.435	182.627	10.718	283.367	128.169	142.980	12.264
13.040	429.209	200.050	217.307	11.853	294.943	133.720	148.514	12.729
13.050	474.582	221.645	239.512	13.425	300.755	136.440	151.117	13.202
13.060	472.021	219.710	237.292	15.019	300.334	136.116	150.565	13.660
13.070	423.274	195.349	211.791	16.134	293.699	132.765	146.878	14.079
13.080	353.464	160.965	175.889	16.611	281.387	126.662	140.340	14.437
13.090	285.594	127.759	141.216	16.620	264.381	118.290	131.452	14.720
13.100	229.478	100.435	112.658	16.385	243.899	108.248	120.837	14.921
13.110	186.128	79.416	90.652	16.060	221.343	97.220	109.203	15.040
13.120	153.381	63.602	74.057	15.721	198.071	85.871	97.241	15.082
13.130	128.659	51.714	61.543	15.402	175.247	74.764	85.537	15.059
13.140	109.822	42.694	52.014	15.114	153.757	64.332	74.538	14.984
13.150	95.269	35.758	44.653	14.859	134.243	54.883	64.567	14.870
13.160	83.860	30.346	38.880	14.634	117.004	46.562	55.770	14.732
13.170	74.780	26.062	34.283	14.435	102.143	39.412	48.194	14.580
13.180	67.452	22.624	30.568	14.260	89.581	33.391	41.796	14.425
13.190	61.458	19.829	27.525	14.104	79.107	28.393	36.464	14.271
13.200	56.495	17.529	25.001	13.965	70.452	24.284	32.058	14.124
13.210	52.339	15.616	22.882	13.840	63.346	20.928	28.440	13.987
13.220	48.823	14.009	21.085	13.728	57.510	18.190	25.465	13.860
13.230	45.819	12.647	19.545	13.627	52.703	15.950	23.014	13.743
13.240	43.231	11.483	18.215	13.534	48.718	14.107	20.977	13.637
13.250	40.984	10.479	17.055	13.450	45.393	12.581	19.273	13.540
13.260	39.018	9.609	16.036	13.372	42.592	11.307	17.834	13.451
13.270	37.286	8.849	15.135	13.301	40.212	10.235	16.608	13.370
13.280	35.750	8.182	14.333	13.235	38.171	9.324	15.552	13.296
13.290	34.381	7.592	13.615	13.174	36.402	8.542	14.633	13.228
13.300	33.155	7.069	12.969	13.117	34.856	7.865	13.826	13.165
13.310	32.049	6.602	12.384	13.064	33.495	7.276	13.112	13.106
13.320	31.049	6.184	11.851	13.014	32.285	6.757	12.476	13.052
13.330	30.140	5.807	11.365	12.967	31.205	6.299	11.904	13.001
13.340	29.310	5.467	10.919	12.923	30.233	5.892	11.307	12.954
13.350	28.550	5.159	10.509	12.882	29.354	5.528	10.917	12.910
13.360	27.851	4.879	10.130	12.842	28.557	5.200	10.488	12.868
13.370	27.206	4.623	9.778	12.805	27.828	4.905	10.095	12.828
13.380	26.610	4.389	9.451	12.770	27.161	4.637	9.732	12.791
13.390	26.056	4.174	9.146	12.737	26.546	4.393	9.397	12.756
13.400	25.541	3.976	8.861	12.705	25.979	4.171	9.085	12.723
13.410	25.061	3.793	8.593	12.674	25.453	3.967	8.795	12.691
13.420	24.612	3.624	8.342	12.645	24.965	3.780	8.524	12.661
13.430	24.191	3.468	8.105	12.618	24.510	3.607	8.270	12.632
13.440	23.795	3.322	7.882	12.591	24.083	3.448	8.031	12.604
13.450	23.423	3.187	7.670	12.566	23.685	3.300	7.807	12.578

ENERGY	UNBROADENED DATA				BROADENED DATA			
	SIG. T	SIG. C	SIG. F	SIG. S	SIG. T	SIG. C	SIG. F	SIG. S
13.460	23.072	3.060	7.470	12.541	23.310	3.163	7.595	12.552
13.470	22.740	2.942	7.280	12.518	22.958	3.036	7.395	12.528
13.480	22.426	2.832	7.099	12.495	22.626	2.917	7.205	12.505
13.490	22.129	2.728	6.927	12.473	22.312	2.806	7.024	12.483
13.500	21.846	2.631	6.763	12.452	22.016	2.702	6.853	12.461
13.510	21.578	2.539	6.606	12.432	21.734	2.604	6.689	12.440
13.520	21.322	2.453	6.457	12.413	21.467	2.512	6.534	12.420
13.530	21.078	2.371	6.313	12.394	21.212	2.426	6.385	12.401
13.540	20.845	2.294	6.176	12.375	20.970	2.345	6.243	12.382
13.550	20.623	2.221	6.044	12.358	20.739	2.268	6.106	12.364
13.560	20.402	2.150	5.912	12.340	20.509	2.193	5.970	12.346
13.571	20.181	2.079	5.780	12.322	20.281	2.119	5.834	12.328
13.583	19.961	2.009	5.648	12.304	20.054	2.046	5.699	12.309
13.594	19.742	1.940	5.516	12.285	19.827	1.974	5.563	12.290
13.607	19.523	1.873	5.384	12.267	19.602	1.903	5.427	12.272
13.620	19.305	1.806	5.251	12.248	19.378	1.834	5.292	12.253
13.634	19.087	1.740	5.118	12.229	19.155	1.766	5.156	12.233
13.648	18.870	1.675	4.985	12.210	18.932	1.698	5.020	12.214
13.663	18.653	1.611	4.852	12.191	18.711	1.632	4.884	12.194
13.679	18.437	1.548	4.718	12.171	18.490	1.567	4.748	12.174
13.695	18.221	1.486	4.584	12.151	18.270	1.504	4.611	12.154
13.713	18.005	1.425	4.449	12.131	18.050	1.441	4.475	12.134
13.732	17.790	1.365	4.315	12.110	17.830	1.379	4.338	12.113
13.751	17.575	1.306	4.179	12.090	17.612	1.319	4.200	12.092
13.760	17.484	1.281	4.122	12.081	17.520	1.294	4.143	12.083
13.780	17.283	1.227	3.995	12.061	17.316	1.238	4.014	12.063
13.800	17.093	1.177	3.874	12.042	17.123	1.187	3.892	12.044
13.820	16.913	1.130	3.759	12.024	16.941	1.139	3.775	12.026
13.840	16.743	1.086	3.650	12.007	16.768	1.094	3.665	12.009
13.860	16.581	1.045	3.546	11.990	16.604	1.052	3.560	11.992
13.880	16.427	1.006	3.447	11.974	16.448	1.013	3.460	11.975
13.900	16.280	0.970	3.352	11.958	16.300	0.976	3.364	11.960
13.920	16.140	0.936	3.261	11.943	16.159	0.941	3.272	11.945
13.940	16.006	0.903	3.174	11.929	16.024	0.909	3.185	11.930
13.960	15.878	0.873	3.091	11.915	15.895	0.878	3.101	11.916
13.980	15.756	0.844	3.011	11.901	15.772	0.848	3.021	11.902
14.000	15.639	0.817	2.935	11.888	15.654	0.821	2.944	11.889
14.020	15.527	0.791	2.861	11.875	15.541	0.794	2.870	11.876
14.040	15.420	0.766	2.791	11.863	15.433	0.770	2.799	11.864
14.060	15.316	0.743	2.723	11.851	15.329	0.746	2.730	11.852
14.080	15.217	0.720	2.658	11.839	15.229	0.723	2.665	11.840
14.100	15.122	0.699	2.595	11.828	15.133	0.702	2.602	11.829
14.120	15.030	0.679	2.534	11.817	15.041	0.681	2.541	11.818
14.140	14.942	0.659	2.476	11.807	14.951	0.662	2.482	11.807
14.160	14.857	0.641	2.419	11.796	14.866	0.643	2.425	11.797
14.180	14.774	0.623	2.365	11.786	14.783	0.626	2.370	11.787
14.200	14.695	0.606	2.312	11.776	14.703	0.609	2.318	11.777
14.220	14.619	0.590	2.262	11.767	14.627	0.592	2.267	11.767
14.240	14.545	0.575	2.213	11.758	14.553	0.577	2.217	11.758
14.260	14.474	0.560	2.165	11.749	14.481	0.562	2.170	11.749

ENERGY	UNBROADENED DATA				BROADENED DATA			
	SIG. T	SIG. C	SIG. F	SIG. S	SIG. T	SIG. C	SIG. F	SIG. S
14.280	14.405	0.546	2.119	11.740	14.412	0.547	2.124	11.740
14.300	14.338	0.532	2.075	11.731	14.344	0.533	2.079	11.732
14.320	14.273	0.519	2.032	11.723	14.280	0.520	2.036	11.723
14.340	14.211	0.506	1.990	11.715	14.217	0.507	1.994	11.715
14.360	14.150	0.494	1.950	11.707	14.156	0.495	1.953	11.707
14.380	14.092	0.482	1.911	11.699	14.097	0.483	1.914	11.699
14.400	14.035	0.471	1.873	11.691	14.040	0.472	1.876	11.692
14.420	13.980	0.460	1.836	11.684	13.984	0.461	1.839	11.684
14.440	13.926	0.449	1.800	11.677	13.931	0.451	1.803	11.677
14.460	13.874	0.439	1.765	11.669	13.879	0.440	1.768	11.670
14.480	13.824	0.430	1.732	11.662	13.828	0.431	1.734	11.663
14.500	13.775	0.420	1.699	11.656	13.779	0.421	1.702	11.656
14.520	13.727	0.411	1.667	11.649	13.731	0.412	1.670	11.649
14.540	13.681	0.402	1.636	11.642	13.685	0.403	1.639	11.643
14.560	13.636	0.394	1.606	11.636	13.639	0.394	1.608	11.636
14.580	13.592	0.385	1.577	11.630	13.596	0.386	1.579	11.630
14.600	13.549	0.377	1.548	11.624	13.553	0.378	1.551	11.624
14.620	13.508	0.370	1.521	11.618	13.511	0.370	1.523	11.618
14.640	13.468	0.362	1.494	11.612	13.471	0.363	1.496	11.612
14.660	13.428	0.355	1.467	11.606	13.432	0.355	1.469	11.606
14.680	13.390	0.348	1.442	11.600	13.393	0.348	1.444	11.601
14.700	13.353	0.341	1.417	11.595	13.355	0.342	1.419	11.595
14.720	13.316	0.334	1.393	11.589	13.319	0.335	1.394	11.590
14.740	13.281	0.328	1.369	11.584	13.284	0.328	1.371	11.584
14.760	13.246	0.322	1.346	11.579	13.249	0.322	1.348	11.579
14.780	13.213	0.316	1.323	11.574	13.215	0.316	1.325	11.574
14.800	13.180	0.310	1.302	11.569	13.182	0.310	1.303	11.569
14.820	13.148	0.304	1.280	11.564	13.150	0.304	1.282	11.564
14.840	13.116	0.298	1.259	11.559	13.119	0.299	1.261	11.559
14.860	13.086	0.293	1.239	11.554	13.089	0.293	1.240	11.554
14.880	13.056	0.288	1.219	11.549	13.058	0.288	1.220	11.549
14.900	13.027	0.283	1.200	11.545	13.029	0.283	1.201	11.545
14.920	12.998	0.278	1.181	11.540	13.000	0.278	1.192	11.540
14.940	12.970	0.273	1.162	11.536	12.973	0.273	1.163	11.536
14.960	12.943	0.268	1.144	11.531	12.945	0.268	1.145	11.531
14.980	12.917	0.263	1.126	11.527	12.919	0.264	1.128	11.527
15.000	12.891	0.259	1.109	11.523	12.893	0.259	1.110	11.523

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295-XS FISSION, FIT WITH BREIT-WIGNER PARAMETERS.

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	INTEGRAL UNDER _CROSS_SECTION_CURVE	RESONANCE INTEGRAL -----1XSEC/E1-----
TOTAL	335.23	27.12
CAPTURE	59.58	4.74
FISSION	219.32	17.86
SCATTERING	56.37	4.53