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See Attached Errata Sheet

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# Fission Product Yields from Fast (~1 MeV) Neutron Fission of Pu-239



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October 31, 1966

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IN REPLY TO: Copyholders of LA-3383

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Subject: Errata and Addendum to LA-3383

Please attach this sheet to LA-3383 and make the indicated corrections to the Table.

Delete the following lines from Table III, pages 21 and 22 of LA-3383.

✓ 35	82	0.001	0.260
✓ 36	82	0.000	0.260
<del>ب</del> 38	87	0.000	1.150
- 41	96	0.008	5.250
<del>ب</del> 42	96	0.000	5.250
<u>س</u> 50	115	0.000	0.095
6 53	130	0.009	2.350
۵ 54	130	0.000	2.350
- 61	150	0.014	1.150
62	150	0.000	1.150

The entry for Z = 35, A = 82 was definitely an error. The other deletions are made in view of the possible practical application of the calculations. In the report, the cumulative yields were given for infinite time, but since the half-lives shown below (Ref: Sullivan, W. H., "Trilinear Chart of Nuclides") are so long, it would be practical to consider these nuclides as pseudo-stable.

<u>Z</u>	<u>A</u>	<u>Half-life (years)</u>
37	87	$4.7 \times 10^{10}$
40	96	$> 2 \times 10^{16}$
49	115	$6 \times 10^{15}$
52	130	> 10 <sup>21</sup>
60	150	> 10 <sup>16</sup>



REFER TO:

LA-3383 UC-34, PHYSICS TID-4500 (46th Ed.)

## LOS ALAMOS SCIENTIFIC LABORATORY of the University of California

LOS ALAMOS • NEW MEXICO

Report written: July 1965 Report distributed: December 30, 1965

## Fission Product Yields from Fast (~1 MeV) Neutron Fission of Pu-239

by

Carl A. Anderson, Jr.



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#### ABSTRACT

The sixteen measured yields of fission products from fast fission of Pu-239 published through June, 1965 are given. Information is presented which indicates the restricted range of mass numbers within which mirroring, or reflection, of data is applicable. Use of this information enables generation of fairly reliable guesses for six reflected data points. A curve fit to these data provides interpolated estimates of unmeasured mass chain yields. A modified equal-charge-displacement hypothesis is used to estimate independent and cumulative fission yields of nuclides.

It is hoped that future measurements of fission product yields from fast fission of Pu-239 will make the speculative portions of this report unnecessary.

#### ACKNOWLEDGMENTS

The author appreciates the helpful information provided by James Terrell on the subject of neutron yield versus mass number. Kurt Wolfsberg, Rolf Peterson, and Morris Battat very kindly reviewed the manuscript and offered valuable suggestions. The staff of the Los Alamos Scientific Laboratory Technical Library assisted in the literature search.

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#### INT RODUCTION

In the shield design and safety analysis of a plutonium fueled fast reactor, it is necessary to determine the radiation which results from fission product decay. To do so, it is first necessary to have good information concerning the fission product nuclide yields.

For lack of sufficient information on plutonium fission, some fast plutonium reactor designers (e.g., Ref. 1) still rely on inappropriate treatments based on thermal fission of U-235 (e.g., Ref. 2). Two extensive compilations of fission product yields, those of Katcoff, <sup>3,4</sup> contain too few measured values of mass chain yields for Pu-239 fast fission\* to enable determination of nonmeasured yields by interpolation. Indeed, only one report<sup>5</sup> contains a curve of yield versus mass number for fast fission of Pu-239 on the basis of Katcoff's compilation; this curve agrees better with the experimental data than does the widely used Pu-239 fast fission product yields by Zysin<sup>7</sup> raises the possibility of improving the situation, since it tabulates fast Pu-239 fission yields for 16 mass numbers, as opposed to yields for 8 mass numbers in Katcoff's compilations. Unfortunately, checking a few of the references given by Zysin indicates a number of errors in his compilation (but these are really rather minor errors in so impressive a collection of data as Zysin's). Consequently, the literature was

<sup>\*</sup>Fast fission is rather loosely defined as fission induced by neutrons with energies of the order of 1 or 2 MeV.

searched for original data. This search, while not uncovering data for additional mass numbers, revealed 8 errors in the 29 values given by Zysin, as well as 7 omissions. Virtually all of the errors are due to Zysin's consideration of values listed by Katcoff as original measurements. Thus, for example, the measured yield of  $Cs-137^8$  was corrected by Katcoff for the 1958 value of its half-life<sup>3</sup> and recorrected for the 1960 value of its half-life.<sup>4</sup> Zysin lists all three values as independent determinations. In another error, Brightsen, et al.<sup>9</sup> erroneously list the Pu-239 thermal fission yield of Zr-95 as a fast fission yield, and Zysin copies the error.

#### MASS CHAIN YIELD DATA

The results of the literature search are given in Table I. Most of the plus-minus deviations given in column 2 are known to be standard deviations of the means, or standard errors, but some of the deviations can only be assumed to be so because the authors are not specific. The plus-minus deviations in column 7 are the standard deviations of the means based on the preceding assumption, using equal weighting of the data. Inclusion of the standard errors is of importance, since they indicate the liberties which may be taken in plotting a curve through the points. The compilations of Katcoff and Zysin are included for comparison.

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#### TABLE I

#### MEASURED PU-239 FAST FISSION YIELDS

			Earl	ier Compila	tions		
Nuclide	Original D	ata	Katcoff (Ref. T1)	Katcoff (Ref. T2)	Zysin (Ref. T3)	Chain Yield Based on Original Data	Notes
	Yield	Ref.	Yleid	Yleid	Yield		<u> </u>
38 <sup>Sr<sup>89</sup></sup>	1.8±0.2	T6			1.8±0.2	1.8±0.2	
38Sr <sup>89</sup>	$2.12 \pm 0.09$	т7	2. 2	2.2	2.2	$2.12 \pm 0.09$	
40Zr <sup>85</sup>	5.3 ± 0.5	T6			5.3 ± 0.5 5.6	5.3 ± 0.5	1
40Zr <sup>97</sup>	5.01 5.41	T8 T8	5.2	5.2	5.2	5.2 ± 0.2	
40 <sup>M0<sup>99</sup></sup>	6.04 5.70 6.07 5.5 $\pm$ 0.4 5.9 $\pm$ 0.6	T8 T8 T8 T6 T9	5.9	6.0	5.9 6.0 5.5 $\pm$ 0.4 5.9 $\pm$ 0.6	5.78 ± 0.24	2
44Ru <sup>103</sup>	$6.0 \pm 0.7$ $5.7 \pm 1.0$	T9 T10			$6.0 \pm 0.7$ 5.7 ± 1.0	5.85 ± 0.61	<u>,,</u>
44 Ru 106	$4.8 \pm 0.6$ $4.6 \pm 0.8$	T9 T10			$4.8 \pm 0.6$ $4.6 \pm 0.8$	4.7 ± 0.5	
46 Pd <sup>109</sup>	1.67 1.48 1.60	T8 T5 T5	1.9	2.0	1.9 2.0	1.64 ± 0.06	3
47 <sup>Ag<sup>111</sup></sup>	$0.55 \pm 0.06$ $0.45 \pm 0.03$ 0.237	T9 T6 T5			$0.55 \pm 0.06$ $0.45 \pm 0.03$	0.50 ± 0.03	4
48Pd <sup>112</sup>	0.127 0.177	T5 T5	0.14	0.14	0.14	0.152 ± 0.025	
53 hr <sub>48</sub> Cd <sup>115</sup>	$\begin{array}{c} 0.045 \\ 0.075 \\ 0.09 \pm 0.01 \\ 0.098 \pm 0.008 \end{array}$	T5 T5 T9 T6	0.069	0,067	0.069 0.067 0.09 $\pm$ 0.01 0.098 $\pm$ 0.008		
Total 48Cd <sup>115</sup>	0.095 ± 0.010	Т9			$0.095 \pm 0.010$	$0.095 \pm 0.010$	
33.5 day 52Te <sup>128</sup>	$0.45 \pm 0.09$	Т9			$0.45 \pm 0.09$		
Total 52 Te129	1.17	Т9			1.17	1. 17	·
52Te <sup>132</sup>	3.5 ± 1.0	Т9			$3.5 \pm 1.0$	3. 75 ± 1. 0	5
55Cs <sup>137</sup>	7.45 ± 0.20	T4	6.6	6.8	6.6 6.8 7.45 ± 0.20	6, 85 ± 0, 20	3
56 <sup>Ba<sup>140</sup></sup>	5. $4 \pm 0.5$ 5. 14 4. 91 5. 06 4. 9 $\pm$ 0. 4	T9 T8 T8 T8 T6	5.0	5.0	5.4 $\pm$ 0.5 5.0 4.9 $\pm$ 0.4	5.11 ± 0.21	6
<sub>62</sub> Sm <sup>153</sup>	0.50 0.45	T8 T8	0,48	0.48	0.48	0.475 ± 0.025	

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Notes: 1. Zysin reproduces error of Ref. T8 App. B
2. Ref. T8 mean = 5.94 ± 0.12
3. Half-life correction applied to original data
4. 0.237 rejected
5. Chain yield/Te-132 yield = 1.07
6. Ref. T8 mean = 5.04 ± 0.07

#### **REFERENCES FOR TABLE I**

- T1. Katcoff, S., "Fission-Product Yields from U, Th and Pu," Nucleonics 16, No. 4, 78 (1958).
- T2. Katcoff, S., "Fission-Product Yields from Neutron-Induced Fission," Nucleonics 18, No. 11, 201 (1960).
- T3. Zysin, Yu. A., A. A. Lbov, and L. I. Sel'chenkov, <u>Fission Product</u> <u>Yields and Their Mass Distribution</u> (Consultants Bureau, New York, 1964), Russian publication in 1963.
- T4. Kafalas, P. and C. E. Crouthamel, "The Absolute Yield of Cs-137 in Fast-Neutron Fission of U-235 and Pu-239," J. Inorg. Nucl. Chem. 4, 239 (1957).
- T5. Ford, G. P. and J. S. Gilmore, "Mass Yields from Fission by Neutrons Between Thermal and 14.7 Mev," Los Alamos Scientific Laboratory Report LA-1997 (1956).
- T6. Petrzhak, K. A. et al., "Yields of a Number of Fission Products in the Fission of Uranium-235, Uranium-238, and Plutonium-239 by Neutrons," AEC-TR-4696 (1961) Russian publication in 1960.
- T7. Bayhurst, B. P., "Fission Yields of Sr<sup>90</sup>," TID-5787 (1956).
- Steinberg, E. P. and M. S. Freedman, "Summary of Results of Fission-Yield Experiments," in <u>Radiochemical Studies: The Fission Products</u>, C. D. Coryell and N. Sugarman, Eds., (McGraw-Hill Book Company, Inc., New York, 1951), Book 3, pp. 1378-1390; and Engelkemeir, D. W. et al., "Determination of Absolute Fast-Neutron Fission Yields in Pu-239," pp. 1331-1333.
- T9. Bonyushkin, E. K. et al., "Fragment Yield in the Fission of U-233 and Pu-239 by Fast Neutrons," At. Energ. USSR <u>10</u>, 13 (1961).
- T10. Bak, M. A. et al., "Yields of Ru-103 and Ru-106 on Fission of U-235 and Pu-239 by Fast Neutrons," At. Energ. USSR <u>6</u>, 577 (1959).

#### MIRRORING

To supplement, and to make the most efficient use of, the small amount of data available, the technique of mirroring, or reflection, is used. The relation

$$Pu^{239} + n^{1} \rightarrow M_{light} + M_{heavy} + \nu n^{1} , \qquad (1)$$

where

M = fission product,

 $\nu$  = a constant,

 $n^1 = neutron,$ 

has been widely used, but is <u>not</u> generally applicable. Petrzhak, <sup>10</sup> for example, incorrectly assumed the applicability of the above relation for all of his data, using  $\nu = 3.0$ . The following discussion indicates the limited extent to which mirroring may be used. Terrell<sup>11,12</sup> has derived the relation (assuming a continuous mass distribution):

$$\int_{0}^{M_{i} - \nu(M_{i})} Y(M) \, dM = \int_{0}^{M_{i}} y(M) \, dM + \frac{1}{2} \frac{dy}{dM} \langle \sigma^{2}(\nu; M) \rangle + \dots, \quad (2)$$

where

 $M_i$  = initial fission fragment mass,

y = initial mass yield,

Y = final mass yield,

 $\nu(M_i)$  = average number of neutrons emitted by fragment of mass  $M_i$ ,  $\sigma^2(x) = \overline{x^2} - \overline{x}^2$ , the conditional variance.

Differentiating Eq. 2 with respect to  $M_i$  (and noting that, since the correction term involving  $\sigma^2$  is both small and fairly independent of  $M_i$ , the differential of the correction term may be neglected) one writes

$$Y[M_{i} - \nu(M_{i})] \left[1 - \frac{d \nu(M_{i})}{d M_{i}}\right] = y(M_{i}) .$$
(3a)

This relation applies equally for the light and for the heavy fission fragment which occur in a given fission, whence

$$Y[M_{\underline{L}\underline{i}} - \nu(M_{\underline{L}\underline{i}})] \left[1 - \frac{d \nu(M_{\underline{L}\underline{i}})}{d M_{\underline{L}\underline{i}}}\right] = y(M_{\underline{L}\underline{i}})$$
(3b)

and

$$Y[M_{Hi} - \nu(M_{Hi})] \left[1 - \frac{d\nu(M_{Hi})}{dM_{Hi}}\right] = y(M_{Hi}) . \qquad (3c)$$

Since, by definition,

$$y(M_{Li}) \equiv y(M_{Hi}), \qquad (4)$$

and if

$$\frac{d\nu(M_{Li})}{dM_{Li}} = \frac{d\nu(M_{Hi})}{dM_{Hi}}, \qquad (5)$$

(the validity of Eq. 5 will be discussed later) then

$$Y[M_{Li} - \nu(M_{Li})] = Y[M_{Hi} - \nu(M_{Hi})].$$
(6)

Let

$$M_{Lf} = M_{Li} - \nu(M_{Li}) , \qquad (7)$$

where

 $M_{f}$  = final fission product mass.

It is also known that

$$M_{\rm Hi} + M_{\rm Li} = A_{\rm f} , \qquad (8)$$

where

 $A_f$  = mass of fissionable (compound) nucleus.

From Eqs. 6, 7, and 8:

$$Y(M_{Lf}) = Y[A_{f} - M_{Lf} - \nu(M_{Hi}) - \nu(M_{Li})], \qquad (9)$$

and defining the total neutron yield associated with the light fission fragment of mass  $\ensuremath{M_{\text{Li}}}$  as

$$\nu = \nu(M_{\rm Hi}) + \nu(M_{\rm Li})$$
, (10)

there results

$$Y(M_{Lf}) = Y(A_f - M_{Lf} - \nu)$$
, (11a)

.

and, similarly,

$$Y(M_{Hf}) = Y(A_f - M_{Hf} - \nu)$$
 (11b)

This can be a very useful result. It states that, if one knows the total number of neutrons associated with the fission product mass chain  $M_{Lf}$  and if one knows the fission yield for that mass chain, then one knows the fission yield of the mirror imaged mass chain  $A_f - M_{Lf} - \nu$ . The restriction is that Eq. 5 must be valid.

Just as there is not much data on fission product yields from fast fission of Pu-239, so there is not much on neutron yields for fast fission of Pu-239. However, the available data<sup>11</sup> on neutron yield versus mass number for thermal neutron induced fission of U-233, U-235 and Pu-239, and for spontaneous fission of Cf-252 show a striking similarity (Fig. 1). Terrell draws the conclusion<sup>12</sup> "It is remarkable that the results for these different types of fission look so much alike when shown as functions of fragment mass. It is suggested that the excitation of the fragments depends more on the properties of the fragments than on the mass ratio, and leads to the idea of a universal neutron yield curve. " Thus, it does not appear unreasonable to assume that the curve of neutron yield versus mass number for Pu-239 fast fission will follow the same pattern.

Equations 5 and 10 indicate that Eq. 11 is valid only when

$$\frac{\mathrm{d}\nu}{\mathrm{d}\,\mathrm{M}_{\mathrm{Hi}}} = 0 \,, \tag{12}$$

where  $\nu$  is now plotted against  $M_{Hi}$ . The data referred to above show Eq. 12 to be true only for fissions in which the heavy fragment falls on the high mass side of the heavy mass peak (and, concomitantly, the light fragment falls on the low mass side of the light mass peak). For thermal fission of Pu-239, Eq. 12 is valid in the mass number range 137 to 153, in which range  $\nu \approx 3.15 (\pm 0.2 \text{ for}$  $139 < M_{H} < 149, \pm 0.6 \text{ for } M_{H} = 153)$ . A further restriction on the use of



Fig. 1. Neutron Yield versus Initial Fragment Mass Number (from Ref. 11).  $\nu_L$ ,  $\nu_H$  = neutron yields associated with light and heavy fission fragments, respectively.

Eq. 11 is that  $\nu$  must be known; because of the difficulty of associating a measured neutron yield with a particular mass chain,  $\nu$  is known only at mass numbers far from those at which Eq. 12 is invalid. Thus, one may only apply mirroring for Pu-239 fast fission within the range  $137 < M_{\rm H} < 153$ .

Since  $\overline{\nu}$ , the average number of neutrons per fission, is 2.89 ± 0.03 for thermal neutron induced fission of Pu-239 and 3.12 ± 0.15 for fission of Pu-239 by 2.1 MeV neutrons, <sup>13</sup> a value of  $\nu = 3.40$  will be used. The spread in neutron yield data (Fig. 1) indicates a possible error of ± 0.5 mass unit in the extrapolation to Pu-239 fast fission. Combining all these errors indicates that mirroring may be used for Pu-239 fast fission data with  $\nu = 3.40 \pm 0.55$  for  $139 < M_{\rm H} < 149$ , the probable error increasing to ± 0.75 at  $M_{\rm H} = 153$ .

It should be mentioned that sharp peaks and valleys in the fission product mass chain yield curve will not be made apparent by the mirroring technique.

#### MASS CHAIN YIELD CURVES

The data in Table I are plotted as open circles in Fig. 2. Careful use of the technique of mirroring, discussed above, enables generation of additional pseudo-data points (shown as closed circles in Fig. 2) at mass numbers 83.6, 96.6, 139.6, 141.6, 146.6, and 147.6 (reflections of the mass chain yields at mass numbers 153, 140, 97, 95, 90, and 89). A best fit curve is drawn subject to the constraint that the sum of the yields under each peak must be 100%. Figure 2 also shows the curves of Burris and Dillon<sup>6</sup> and of Weaver, et al.<sup>5</sup> for comparison.



Fig. 2. Fission Product Mass Chain Yields for Pu-239 Fast Fission. Data and Three Fitted Curves.

It should be noted that the mass chain yields most open to question are those in the valley, partly because there are no data from mass number 115 to mass number 129, and partly because the valley yields are most sensitive to changes in the energy of neutrons inducing fission.

Figure 3 reproduces the Pu-239 fast fission yield data and compares them with curves based on experimental fission product yields<sup>3,4,7</sup> for thermal fission of Pu-239 and U-235 (these yields were not checked). Two conclusions from this comparison should be emphasized. The first conclusion is that the U-235 thermal fission yield curve is a bad approximation to the Pu-239 fast fission yield data and should not be used as such. The second conclusion is that Pu-239 fission product mass chain yields are not strongly dependent on energy, except in the valley. This is important because of the wide variation in 'fast' neutron spectra which were used for measurement of the fast fission yields under discussion. Thus, in the work of Ford,<sup>14</sup> data are given for fast fission of Pd-109, Pd-112, and Cd-115 from two different 'fast' spectra; one a degraded fission spectrum from a fast reactor and the other spectrum from a thick U-235 converter capsule in a reactor thermal column. Several experimenters (e.g., Ref. 10) used a U-235 plate in a reactor thermal column as the source of fast neutrons. The fission energy neutrons passed through about 1 cm of  $B_{4}C$  (a thermal neutron shield) to reach the sample. Inasmuch as the  $B_4C$  scattered about 10% of the fission energy neutrons directed from the U-235 plate to the sample, the spectrum at the sample was probably degraded somewhat.

Table II lists the fission product mass chain yields obtained, by interpolation and extrapolation, from Fig. 2. Three significant figures are used merely for consistency, and do not, of course, imply that the numbers are that well known. These yields will now be used to derive the fission product nuclide yields.

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Fig. 3. Comparison of Experimental Data.

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#### TABLE II

#### MASS CHAIN YIELDS

<u>A</u>	Mass Chain Yield	A	Mass Chain Yield
76	0.00	120	0.089
77	0.019	121	0.092
78	0.039	122	0.097
79	0.070	123	0.110
80	0.110	124	0.129
81	0.178	125	0.167
82	0.26	126	0.28
83	0.38	127	0.43
84	0.52	128	0.71
85	0.69	129	1.20
86	0.90	130	2,35
87	1.15	131	3.40
88	1.43	132	4.55
89	1.80	133	5.70
90	2.12	134	6.45
91	2,60	135	6.85
92	3, 15	136	6.95
93	3, 80	137	6,85
94	4,60	138	6,10
95	5.30	139	5,30
96	5, 25	140	5,10
97	5, 20	141	5, 35
98	5, 50	142	5,40
99	5, 80	143	4,90
100	6,00	144	4,30
101	6,00	145	3, 55
102	6,00	146	2,85
103	5, 85	147	2, 25
104	5, 60	148	1.75
105	5, 30	149	1,43
106	4,70	150	1, 15
107	3, 70	151	0.89
108	2,70	152	0.70
109	1.67	153	0.48
110	0.82	154	0.36
111	0.50	155	0.26
112	0.15	156	0.180
113	0.11	157	0.120
114	0,099	158	0.072
115	0,095	159	0.045
116	0.089	160	0.026
117	0.087	161	0.014
118	0.086	Sum	= 98.981
119	0.086	_	
Sum	= 100,508	Grand Sum	1 = 199.489
		•	

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#### FISSION PRODUCT NUCLIDE YIELDS

The equal charge displacement hypothesis<sup>15</sup> has usually been used to determine the independent yields of members of a mass chain. More recent studies by Wolfsberg and others<sup>16,17</sup> indicate that adjustment of the most probable charge by reference to U-235 thermal neutron fission data results in better agreement with experiment for other fission processes. Assuming that Wolfsberg's is the best available treatment of the yield of a nuclide for which the mass chain yield is known, we write:<sup>17</sup>

$$Y_{c}(Z, A) = Y_{c}(A) \{0.5 + 0.5 \text{ Erf} [(Z - Zp(A) + 0.5)/\sigma/2]\},$$
 (13)

where

$$Z = \text{atomic number of fission product,}$$

$$A = \text{mass number of fission product,}$$

$$Zp(A) = \text{most probable charge,}$$

$$T = \text{a characteristic of the Gaussian distribution assumed}$$
for  $Y_c(Z, A)$ ,
$$Y_c(A) = \text{mass chain yield,}$$

$$Y_c(Z, A) = \text{cumulative yield of nuclide (Z, A),}$$

$$Erf(x) = \frac{2}{\sqrt{\pi}} \int_{0}^{x} e^{-t^2} dt$$
, the error function. (14)

Zp(A), the most probable charge, is given by (for  $82 \le A \le 100$ )

$$Zp(A) = 0.4237A - 2.19 + 0.5(Z_F - 92) - (0.21(A_F - 236) + 0.19(\nu - 2.43)$$
  
(15a)

(for  $A \ge 135$ )

$$Zp(A) = 0.4331A - 6.06 + 0.5(Z_F - 92) - 0.21(A_F - 236) + 0.19(\nu - 2.43),$$
(15b)

where

 $Z_{F}$  = atomic number of fissionable nucleus,

 $A_F = mass number of compound nucleus,$ 

 $\nu$  = average number of neutrons emitted per fission.

Although not enough measurements have been made for low yield mass numbers, <sup>17</sup> linear interpolation is assumed to be satisfactory for  $101 \le A \le 134$ , whence (for  $101 \le A \le 134$ )

$$Zp(A) = 0.349A + 5.24 + 0.5(Z_F - 92) - 0.21(A_F - 236) + 0.19(\nu - 2.43).$$
(15c)

The Appendix contains the computer program used for the calculations, which were performed on the IBM 7094 computer. Table III gives the resultant values of independent and cumulative fission product yields versus Z and A for Pu-239 fast fission. The mass chain yields given above were used, along with  $\sigma = 0.59$  (from Ref. 17) and E = 1.0 MeV, where E is the energy of neutrons causing fission. The choice of  $\sigma$  is open to question. <sup>16,17</sup> The value of  $Y_c(Z, A)$  is not very dependent on E, since it can be affected only by the dependence of  $Y_c(A)$  on E (which Fig. 3 shows to be slight) and the dependence of  $\nu$  on E (which Fig. 15 shows to have little effect).

For a given A, the computer terminates the fission product decay chain calculation at the first value of Z corresponding to a stable nuclide. This means that a few shielded nuclides, such as Sb-122, are not included in the results--but this is an inconsiderable omission since the yields of such nuclides are extremely small.

Sce Attached Errata Sheet

## TABLE III

## INDEPENDENT AND CUMULATIVE FISSION PRODUCT YIELDS VERSUS Z AND A FOR PU-239 FAST FISSION

	DEBLENT VI	F1 0	37 91	1 346	2 417	42165	3-065	3.707
			37 42	1.894	2.440	42106	2.037	2.220
7 🔺	INDEPENDENT C	UMULATIVE	37 43	1.770	1.954	42107	0.906	0.940
30 77	0.007	0.007	37 94	1 000	1 1 20	42168	0.279	0.283
20 70	0.006	0.004	37 95	0 422	0 4 28	42109	0.054	0.054
20 70	0.003	0.003	37 96	0.9422	0.420	42110	0.006	0.006
21 77	0.010	0 017	37 47	0.012	0.012	43 09	0,000	5.800
21 70	0.023	0 029	37 08	0.001	0.0012	63101	0 011	6.000
21 70	0.025	0.027	36	- 0.000	1 160	43102	0 964	6.000
31 80	0.073	0.023	30 07	0.000		43103	0.255	5.848
21 00	0.011	0.012	30 00	0.000	1.430	43104	0 728	5.586
31 82	0.003	0.003	30 07	0.003	2 120	43105	1.523	5,230
12 77	0 002	0.019	30 01	0.390	2.120	43106	2.236	4.455
32 78	0.016	0.039	30 71	0.407	2.370	43107	2.202	3,142
32 70	0.034	0.066	30 72	1 4 3 7	3 441	43108	1 527	1.810
32 80	0.054	0.090	30 73	2 744	1 004	43109	0 680	0.745
32 11	0.000	0 102	30 74	2.140	3 244	43110	0 181	0.167
32 87	0.073	0.077	30 94	1 676	1 766	43111	0.045	0.045
32 43	0.049	0.040	30 97	0 667	0 659	43112	0.004	0.044
32 84	0.012	0.013	30 77	0.172	0.173	44 99	0.	5.800
32 85	0.022	0.002	30 70	0.029	0.029	44101	0.006	6.000
33 77	0.000	0.019	34100	0.003	0.003	44102	0.000	6.000
33 78	0.000	0.039	30 60	0.000	1.800	44103	0.002	5.850
33 79	0.004	0.070	39 90	0.000	2.120	44104	0.014	5.600
33 80	0.020	0.109	39.91	0.002	2.600	44105	0.070	5.300
33 81	0.071	0.173	39 92	0.022	3,150	44106	0.242	4.698
33 82	4.151	0.228	19 91	0.157	3.799	441ú7	0.546	3.688
33 83	0.215	0.254	39 94	0.700	4.584	44108	0.840	2.656
33 84	0.196	0.203	39 95	1.912	5.176	44109	0.833	1.568
33 85	0.107	0.110	39 96	2.952	4.716	44110	0.493	0.680
33 86	0.038	0.039	39 97	3.033	3.692	44111	0.275	0.320
33 87	0.009	0.009	39 98	2.217	2.390	44112	0.057	0.051
33 88	0.001	0.001	39 99	1.065	1.094	44113	0.022	0.023
34 77	0.000	0.019	39160	0.325	0.328	44114	u.008	0.008
34 78	0.000	0.039	39101	0.084	0.085	44115	0.002	0.002
34 79	0.000	0.070	39102	0.016	0.016	45103	0.000	5.850
34 80	0.001	0.110	39103	0.002	0.002	45105	0.000	5.300
34 81	0.005	0.178	40 90	0.000	2.120	45106	0.002	4.700
34 62	0.032	0.239	40 91	0.000	2.600	45107	0.012	3.700
34 03	0.117	0 479	40 92	0.000	3.150	45108	0.044	2.700
34 96	0.413	0.522	40 93	0.001	5.800	45109	0.101	1.007
34 95	0.413	0.442	40 94	0.016	4.000 6.200	45110	0.137	0.617
34 87	0.256	0.264	40 95	0.125	5 24 2	40111	0.170	0 1 4 9 0
34 88	0.102	0.103	40 90	1 444	5.136	45113		0.039
34 89	0.026	0.027	40 98	2.764	5.154	45114	0.053	0.060
34 90	0.004	0.004	40 99	3.498	4.591	45115	0.034	0.036
35 79	0.000	0.070	40100	2.896	3.224	45116	0.016	0.016
35 81	0.000	0.178	40101	1.770	1.854	45117	0.006	0.006
35_82m		.0.260	40102	0.810	0.826	45118	0.002	0.002
35 83	0.006	0.380	40103	0.268	0.270	46105	0.000	5.300
35 84	0.040	0.520	40104	0.064	0.064	46106	0.000	4.700
35 85	0.162	0.684	40105	0.011	0.011	46107	0.000	3.700
35 86	0.415	0.858	40106	0.001	0.001	461ú8	3 0.000	2.700
35 87	0.691	0.955	41 93	0.000	3.800	46109	0.001	1.670
35 88	0.145	0.647	41 95	0.001	5.300	46110	0.033	0.820
35 89	0.541	0.367	-41.46			46111	1 0.010	0.500
36 01	0.071	0.072	41 97	0.004	5 407	46112	2 JJL	J. 1. 4
35 91	0.011	0.012	41 98	0.343	5 745	40113	5 0.021	0.107
35 03	1 0 002	0.002	41 77	2 666	5 779	46115	5 0.051	0.057
-14		0.260	41105	2.555	5 306	46116	5 0.054	0.076
36 83	0.000	0.380	41102	3 537	4 363	46112	7 (), )44	0.050
36 84	0.000	0.520	41103	2.683	2,953	46114	4 0.026	0.030
36 85	0.006	0.690	41104	1.509	1.573	46119	9 0.014	0.614
36 86	0.042	0.900	41105	0.628	0.639	46120	0.005	0.005
36 87	0.191	1.145	41106	0.181	0.182	46121	L 0.001	0.001
36 88	0.543	1.392	41107	0.034	0.034	47107	7 0.	3.700
36 89	1.030	1.598	41108	0.004	0.004	47109	0.000	1.670
36 90	1.218	1.463	42 95	0.000	5.300	47111	ເ 0.000	0.500
36 91	0.999	1.071	<del>42-96-</del>		<b>5.2</b> 50	47112	0.000	0.150
36 92	0.533	0.546	42 97	0.000	5.200	47113	3 0.001	0.110
36 93	0.183	0.184	42 98	0.003	5.500	47114	0.002	0.099
36 94	0.040	0.040	42 99	0.035	5.800	47115	0.008	0.095
36 95	0.005	0.005	42100	0.219	5.999	47116	5 0.019	0.088
37 85	0.000	0.090	42101	0.683	2.464	47117	r U+U34	0.084
31 87	0.005	1 430	42102	1.512	5,530	47110	0 U+U48 3 0 061	0.078
37 68	0.038	1.797	42103	2.046	4.854	4713	, 0.021 0 0.023	0.005
37 07	0.627	2.090	72104	3.203	7.030	47121	1 1.124	0.074
JI 70	1							

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### TABLE III (CONTINUED)

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47122	U.014	0.014	52132	2.344	4.236	58144	0.246	4.298
47123	0.005	0.005	52133	3.437	4.636	58145	0.691	3.530
47124	0.002	0.002	52134	3.457	3.980	58146	1.202	2.748
48111	0.000	0.500	52135	2.474	2.634	58147	1.332	1.928
48112	0.000	0.150	52136	1.034	1.057	58148	0.952	1.103
48113	0.000	0 110	52137	0.266	0.267	58149	0.444	0.492
40115	0,000	0 000	52118	0 018	0 038	58150	0 145	0 147
40114	0.000	0.097	52130	0.033	0.038	58150	0.149	0.147
48115	0.000	0.045	22139	0.003	0.003	50151	0.027	0.027
48116	0.001	0.089	53127	0.000	0.430	58152	0.003	0.003
48117	0.003	0.087	53129	0.001	1.200	59141	0.000	5.350
48118	0.008	0.086		- 0:009		59143	0.000	4.900
48119	0.020	0.085	53131	0.064	3.400	59144	0.002	4.300
48120	0.037	0.086	53132	0.311	4.547	59145	0.020	3.550
48121	0.053	0.082	53133	1.036	5.672	59146	0.101	2.849
48122	0.057	0.071	53134	2.321	6.361	59147	0.315	2.244
48122	0 051	0 056	53135	3.664	6 298	59149	0 609	1 712
40123	0.071	0.000	63134	6 160	6 107	501/0	0.007	1.200
48124	0.036	0.037	53130	3 076	2.177	37147	0.198	1.290
48125	0.020	0.021	22137	2.913	3.243	59150	0.012	0.814
48126	0.011	0.011	53138	1.252	1.291	59151	0.356	0.383
48127	0.004	0.004	53139	0.327	0.331	59152	0.124	0.127
48128	0.001	0.001	53140	0.059	0.059	59153	0.024	0.024
49113	0.	0.110	53141	0.007	0.007	59154	0.003	0.003
49115	0.000	0.095	54129	0.000	1.200	60143	0.	4.900
49117	0.000	0.087		0.000		60144	0.000	4.300
49118	0.000	0.086	541 11	0.000	3.400	60145	0.000	3.550
40110	0.001	0.086	541 12	0.003	4.550	60144	0.001	2 860
47117	0.001	0.000	54133	0.000	5 700	60140	0.001	2.030
47120	0.003	0.007	24133	0.140	9.100	40147	0.000	2.230
49121	0.010	0.092	24134	0.148	0.449	60148	0.037	1.750
49122	0.025	0.096	54135	0.945	6.843	60149	0.138	1.428
49123	0.049	0.105	54136	1.690	6.887	60150	0.317	1.136
49124	0.075	0.112	54137	3.253	6.496	60151	0.449	0.833
49125	0.997	0.118	54138	3.677	4.968	60152	0.422	0.549
49126	0.123	0.134	54139	2.656	2.987	60153	0.226	0.250
49127	0.108	0.112	54140	1.384	1-443	60154	0.086	0.089
49128	0.076	0.077	54141	0.503	0.510	60155	0.020	0.020
40120	0.010	0 041	54142	0 110	0 111	60156	0 003	0 003
47127	0.01	0.014	5/1/7	0.013	0.613	611/7	0.000	2 260
49130	0.018	0.010	56133	0.013	0.013	61147	0.000	2.290
49131	0.004	0.004	22122	0.000	5.700	DITeA	0.002	1.430
				~ ~ ~ ~				
50115-		0.095	55135	0.007	6.850	61150	-0.014	
50115- 50117	0.0UU	0.095	55135 55137	0.007	6.850 6.847	<del>6</del> 1150	0.014	0.889
50115~ 50117 50118	0.000 0.000	0.095 0.087 0.086	55135 55137 55138	0.007 0.351 1.103	6.850 6.847 6.071	61150 61151 61152	0.014 0.057 0.146	0.889 0.695
50115- 50117 50118 50119	0.300 0.300	0.095 0.087 0.086 0.086	55135 55137 55138 55139	0.007 0.351 1.103 2.145	6.850 6.847 6.071 5.132	<del>6</del> 1150 61151 61152 61153	0.057 0.146 0.211	0.889 0.695 0.461
50115- 50117 50118 50119 50120	0.900 ).000 0.900 	0.095 0.087 0.086 0.086 0.086 0.359	55135 55137 55138 55139 55140	0.007 0.351 1.103 2.145 2.988	6.850 6.847 6.071 5.132 4.431	61150 61151 61152 61153 61154	0.014 0.057 0.146 0.211 0.215	0.695 0.461 0.304
50115- 50117 50118 50119 50120 50121	0.900 J.J04 0.900 J.J04 J.J04 J.J04	0.095 0.087 0.086 0.086 0.086 0.089 0.092	55135 55137 55138 55139 55140 55141	0.007 0.351 1.103 2.145 2.988 2.970	6.850 6.847 6.071 5.132 4.431 3.481	61150 61151 61152 61153 61153 61154 61155	0.014 0.057 0.146 0.211 0.215 0.138	1.150 0.889 0.695 0.461 0.304 0.159
50117 50118 50119 50120 50121 50122	0.900 0.900 0.900 0.900 0.900 0.900 0.001	0.095 0.087 0.086 0.086 0.086 0.089 0.092 0.097	55135 55137 55138 55139 55140 55141 55142	0.007 0.351 1.103 2.145 2.988 2.970 1.856	6.850 6.847 6.071 5.132 4.431 3.481 1.967	61150 61151 61152 61153 61154 61155 61156	0.014 0.057 0.146 0.211 0.215 0.138 0.056	0.889 0.695 0.461 0.304 0.159 0.058
50117 50118 50118 50119 50120 50121 50122 50123	0.900 0.900 0.900 0.900 0.900 0.001 0.001 0.005	0.095 0.087 0.086 0.086 0.086 0.089 0.092 0.097 0.097	55135 55137 55138 55139 55140 55140 55142 55143	0.007 0.351 1.103 2.145 2.988 2.970 1.856 0.671	6.850 6.847 5.132 4.431 3.481 1.967 0.685	61150 61151 61152 61153 61154 61155 61156 61156	0.014 0.057 0.146 0.211 0.215 0.138 0.056 0.014	0.889 0.695 0.461 0.304 0.159 0.058 0.014
50117 50118 50119 50120 50121 50122 50122 50123 50124	0.900 0.900 0.900 0.900 0.900 0.900 0.001 0.001 0.005	0.095 0.087 0.086 0.086 0.089 0.092 0.097 0.110 0.124	55135 55137 55138 55139 55140 55140 55141 55142 55143 55143	0.007 0.351 1.103 2.145 2.988 2.970 1.856 0.671 0.148	6.850 6.847 6.071 5.132 4.431 3.481 1.967 0.685 0.149	61150 61151 61152 61153 61154 61155 61155 61156 61158	0.014 0.057 0.146 0.211 0.215 0.138 0.056 0.014 0.002	1.150 0.889 0.695 0.461 0.304 0.159 0.058 0.014
50115 50117 50118 50119 50120 50121 50122 50122 50123 50124 50125	0.700 1.300 0.700 1.300 1.300 0.700 0.001 0.001 0.015 0.07	0.095 0.087 0.086 0.086 0.086 0.086 0.086 0.092 0.097 0.110 0.129 0.155	55135 55137 55138 55140 55140 55140 55142 55142 55143 55144	0.007 0.351 1.103 2.145 2.988 2.970 1.856 0.671 0.148	6.850 6.847 6.071 5.132 4.431 1.967 0.685 0.149 0.019	61150 61151 61152 61153 61154 61155 61155 61156 61157 61158 62147	0:014 0.057 0.146 0.211 0.215 0.138 0.056 0.014 0.002	1.150 0.889 0.695 0.461 0.304 0.159 0.058 0.014 0.002 2.250
50115- 50117 50118 50119 50120 50121 50122 50123 50124 50125	0.300 0.300 0.300 0.300 0.001 0.001 0.005 0.016 0.047 0.122	0.095 0.087 0.086 0.086 0.086 0.089 0.092 0.097 0.110 0.129 0.165	55135 55137 55138 55139 55140 55140 55140 55141 55143 55143 55145 55145	0.007 0.351 1.103 2.145 2.988 2.970 1.856 0.671 0.148 0.019	6.850 6.847 6.071 5.132 4.431 3.481 1.967 0.685 0.149 0.019	61150 61151 61152 61153 61154 61155 61156 61157 61158 62147 62147	0:014 0.057 0.146 0.211 0.215 0.138 0.056 0.014 0.002 0.	0.695 0.695 0.461 0.304 0.159 0.058 0.014 0.002 2.250
50115- 50117 50118 50119 50120 50121 50122 50121 50122 50124 50125 50126	0.200 0.200 0.200 0.200 0.200 0.200 0.001 0.001 0.005 0.016 0.047 0.132	0.095 0.087 0.086 0.086 0.092 0.092 0.097 0.110 0.129 0.165 0.266	55135 55137 55138 55140 55140 55140 55142 55142 55143 55145 55145 55145	0.007 0.351 1.103 2.145 2.988 2.970 1.856 0.671 0.148 0.019 0.001	6.850 6.847 6.071 5.132 4.431 3.481 1.967 0.685 0.149 0.019 0.001	61150 61151 61152 61153 61155 61155 61156 61157 61158 62147 62149	0:014 0.057 0.146 0.211 0.215 0.138 0.056 0.014 0.002 0. 0.000	1.150 0.889 0.695 0.461 0.304 0.159 0.058 0.014 0.002 2.250 1.430
50115 50117 50118 50119 50120 50121 50122 50123 50123 50124 50125 50126 50127	0.700 0.700 0.700 0.700 0.700 0.700 0.700 0.001 0.001 0.016 0.017 0.132 0.255	0,005 0,007 0,086 0,086 0,086 0,086 0,097 0,097 0,110 0,129 0,165 0,266 0,367	55135 55137 55138 55139 55140 55141 55142 55143 55144 55145 55146 55146	0.007 0.351 1.103 2.145 2.988 2.970 1.856 0.671 0.148 0.019 0.001 0.000	6.850 6.847 6.071 5.132 4.431 3.481 1.967 0.685 0.149 0.019 0.001 6.850	61150 61151 61152 61153 61154 61155 61156 61157 61158 62147 62149 62149	0;0144 0.057 0.146 0.211 0.215 0.138 0.056 0.014 0.002 0.000 0.000	1.150 0.889 0.695 0.461 0.304 0.159 0.058 0.014 0.002 2.250 1.430 1.159
50115 50117 50118 50119 50120 50121 50122 50123 50124 50125 50126 50127 50128	0.700 0.7000 0.70000 0.70000 0.7000 0.7000 0.700	0.005 0.087 0.086 0.086 0.086 0.089 0.097 0.129 0.129 0.165 0.266 0.367 0.481	55135 55137 55138 55139 55140 55140 55140 55140 55143 55143 55144 55145 55146 56135 56137	0.007 0.351 1.103 2.145 2.988 2.970 1.856 0.671 0.148 0.019 0.001 0.000 0.003	6.850 6.847 6.071 5.132 4.431 3.481 1.967 0.685 0.149 0.019 0.001 6.850 6.850	61150 61151 61152 61153 61155 61155 61156 61157 61158 62147 62149 62150	0.014 0.057 0.146 0.211 0.215 0.138 0.056 0.014 0.002 0. 0.000 0.000 0.000	1.150 0.889 0.695 0.461 0.304 0.159 0.058 0.014 0.002 2.250 1.430 0.890
50115 50117 50118 50119 50121 50122 50123 50124 50125 50126 50126 50127 50128 50129	0.000 0.700 0.700 0.700 0.700 0.700 0.001 0.015 0.016 0.0147 0.132 0.255 0.404 0.497	0.005 0.007 0.066 0.086 0.089 0.097 0.110 0.129 0.165 0.266 0.367 0.481 0.537	55135 55137 55138 55140 55140 55142 55142 55143 55144 55145 55145 55145 56137 56138	0.007 0.351 1.103 2.145 2.988 2.970 1.856 0.671 0.148 0.019 0.001 0.000 0.003 0.029	6.850 6.847 6.071 5.132 4.431 3.481 1.967 0.685 0.149 0.019 0.001 6.850 6.850 6.850 6.100	61150 61151 61152 61153 61154 61155 61156 61157 61158 62147 62149 62150 62152	0:014 0.057 0.146 0.211 0.215 0.138 0.056 0.014 0.002 0. 0.000 0.000 0.001 0.001	1.150 0.889 0.695 0.461 0.304 0.159 0.058 0.014 0.002 2.250 1.430 0.890 0.700
50117 50117 50117 50120 50121 50122 50121 50122 50125 50126 50126 50128 50129 50130	0.700 0.7000 0	0,005 0,087 0,086 0,086 0,092 0,092 0,097 0,110 0,129 0,165 0,266 0,367 0,481 0,537 0,552	55135 55137 55138 55140 55140 55141 55142 55143 55143 55145 55145 55145 55145 55145 55137 56137 56138	0.007 0.351 1.103 2.145 2.988 2.970 1.856 0.671 0.148 0.019 0.001 0.000 0.003 0.029 0.167	6.850 6.847 6.071 5.132 4.431 1.967 0.685 0.149 0.019 0.001 6.850 6.850 6.850 6.850 6.100 5.299	61150 61151 61152 61153 61154 61155 61156 61157 61158 62147 62149 42150 62151 62152 62153	0:014 0.057 0.146 0.211 0.215 0.138 0.056 0.014 0.002 0. 0.000 0.000 0.001 0.001 0.005 0.019	1.150 0.889 0.695 0.461 0.304 0.159 0.058 0.014 0.002 2.250 1.430 1.150 0.890 0.700 0.480
50117 50117 50118 50119 50120 50121 50122 50123 50124 50125 50126 50127 50128 50127 50128 50127 50128 50129	0.700 0.700 0.700 0.700 0.700 0.700 0.700 0.700 0.712 0.725 0.604 0.647 0.132 0.644 0.697 0.533 0.316	0.005 0.007 0.086 0.086 0.089 0.097 0.110 0.129 0.165 0.266 0.367 0.461 0.552 0.320	55135 55137 55138 55140 55140 55142 55142 55143 55144 55145 55145 55145 56137 56138 56139 56139	0.007 0.351 1.103 2.145 2.988 2.970 1.856 0.671 0.148 0.019 0.001 0.000 0.003 0.029 0.167 0.656	6.850 6.847 6.071 5.132 4.431 3.481 1.967 0.685 0.149 0.019 0.001 6.850 6.850 6.100 5.299 5.088	61150 61151 61152 61153 61155 61156 61156 61157 61158 62147 62149 62149 62151 62152 62153 62154	0:014 0.146 0.211 0.215 0.138 0.056 0.014 0.002 0.000 0.000 0.001 0.001 0.005 0.019 0.055	1.150 0.889 0.695 0.461 0.304 0.159 0.058 0.014 0.002 2.250 1.430 1.430 0.890 0.700 0.480 0.359
50117 50117 50117 50120 50121 50122 50123 50124 50125 50125 50128 50127 50128 50129 50130 50131	0.300 0.300 0.300 0.300 0.300 0.300 0.001 0.001 0.015 0.0407 0.533 0.316 0.128	0.005 0.007 0.086 0.086 0.086 0.092 0.097 0.110 0.129 0.165 0.266 0.367 0.481 0.537 0.552 0.320 0.128	55135 55137 55138 55140 55140 55141 55142 55143 55144 55145 55146 55145 55146 56137 56137 56138 56137 56138 56140 56140	0.007 0.351 1.103 2.145 2.988 2.970 1.856 0.671 0.148 0.019 0.001 0.003 0.003 0.029 0.167 0.656 1.770	6.850 6.847 6.071 5.132 4.431 3.481 1.967 0.685 0.149 0.019 0.001 6.850 6.850 6.850 6.850 6.100 5.299 5.088 5.250	61150 61151 61153 61153 61154 61155 61156 61157 61158 62149 42150 62151 62152 62153 62154 62155	~ 0; 014;     ~ 0, 144;     ~ 0, 146;     0, 146;     0, 211;     0, 215;     0, 138;     0, 014;     0, 002;     0, 000;     0,00;     0,000;     0,000;     0,000;     0,000;	1.150 0.889 0.695 0.461 0.304 0.159 0.058 0.014 0.002 2.250 1.430 1.150 0.890 0.700 0.480 0.359 0.254
50119- 50117 50118 50119 50122 50123 50124 50125 50126 50126 50127 50128 50129 50130 50131 50133	0.00 0.00	0.005 0.007 0.086 0.086 0.086 0.089 0.092 0.097 0.110 0.129 0.165 0.266 0.367 0.481 0.537 0.552 0.320 0.128 0.035	55135 55137 55138 55140 55140 55142 55142 55143 55144 55145 55145 55146 55145 55145 56135 56137 56139 56140 56141 56142	0.007 0.351 1.103 2.145 2.988 2.970 1.856 0.671 0.148 0.019 0.001 0.003 0.003 0.003 0.029 0.167 0.656 1.770 2.954	6.850 6.847 6.071 5.132 4.431 3.481 1.967 0.685 0.149 0.019 0.001 6.850 6.850 6.100 5.299 5.088 5.250 4.920	61150 61151 61152 61153 61155 61155 61156 61157 61158 62147 62149 62150 62151 62152 62153 62154 62155 62156	○ ± 014 ↔ ○ ± 0 ± 0 ↔ 0 ⋅ 14 ↔ 0 ⋅ 211 0 ⋅ 215 0 ⋅ 058 0 ⋅ 018 0 ⋅ 002 0 ⋅ 000 0 ⋅ 000 0 ⋅ 000 0 ⋅ 000 0 ⋅ 001 0 ⋅ 001 0 ⋅ 005 0 ⋅ 005 0 ⋅ 005 0 ⋅ 005	1.150 0.889 0.695 0.461 0.304 0.159 0.058 0.014 0.002 2.250 1.430 0.890 0.700 0.480 0.359 0.254 0.161
501:15- 501:17 501:18 501:19 501:22 501:22 501:22 501:25 501:26 501:25 501:26 501:28 501:29 501:28 501:29 501:31 501:32 501:34	0.700 0.700 0.700 0.700 0.700 0.700 0.700 0.700 0.700 0.700 0.712 0.255 0.404 0.497 0.533 0.316 0.128 0.035 0.006	0.005 0.007 0.066 0.086 0.089 0.097 0.110 0.129 0.165 0.266 0.367 0.461 0.537 0.552 0.355 0.026	55135 55137 55138 55140 55140 55142 55142 55143 55144 55145 55145 55145 56137 56138 56139 56139 56140 56140 56142 56142	0.007 0.351 1.103 2.988 2.970 1.856 0.671 0.148 0.019 0.001 0.000 0.003 0.029 0.167 0.656 1.770 2.954 2.894	6.850 6.847 6.071 5.132 4.431 3.481 1.967 0.685 0.149 0.019 0.001 6.850 6.850 6.850 6.100 5.299 5.088 5.250 4.920 3.578	61150 61151 61152 61153 61155 61156 61156 61157 61158 62147 62149 62151 62152 62151 62152 62153 62154 62155 62155 62155 62155	○:014÷ 0.057 0.14÷ 0.211 0.215 0.138 0.056 0.014 0.002 0.000 0.001 0.005 0.005 0.005 0.005 0.005 0.005 0.102 0.065	1.150 0.889 0.695 0.461 0.304 0.159 0.058 0.014 0.002 2.250 1.430 0.890 0.700 0.480 0.359 0.254 0.161 0.083
501:15- 501:17 501:18 501:19 501:20 501:22 501:23 501:25 501:25 501:26 501:25 501:28 501:29 501:30 501:32 501:33 501:34	0.300 0.300 0.300 0.300 0.300 0.001 0.001 0.005 0.016 0.047 0.533 0.316 0.128 0.035 0.000	0.095 0.097 0.087 0.086 0.086 0.086 0.089 0.097 0.110 0.129 0.165 0.266 0.367 0.481 0.537 0.552 0.320 0.128 0.035 0.006	55135 55137 55138 55140 55140 55141 55142 55143 55144 55144 55144 55146 56135 56137 56138 56137 56138 56140 56140 56142 56143	0.007 0.351 1.103 2.145 2.988 2.970 1.856 0.671 0.148 0.019 0.001 0.003 0.003 0.003 0.003 0.029 0.167 0.656 1.770 2.954 2.894 1.795	6.850 6.847 6.071 5.132 4.431 3.481 1.967 0.685 0.149 0.019 0.001 6.850 6.850 6.100 5.299 5.088 5.250 4.920 3.578 1.944	61150 61151 61152 61153 61155 61155 61156 61157 61156 62147 62149 62151 62152 62153 62153 62154 62155 62155 62156 62157 62157	0:014 0:057 0:146 0:211 0:215 0:056 0:014 0:0000 0:0000 0:0000 0:0000 0:0000 0:0000 0:0000 0:0000 0:0000	1.150 0.689 0.695 0.461 0.304 0.058 0.014 0.002 2.250 1.430 0.890 0.700 0.480 0.359 0.254 0.161 0.083 0.30
501:15- 501:17 501:18 501:19 501:20 501:22 501:22 501:25 501:25 501:26 501:25 501:26 501:25 501:28 501:29 501:31 501:32 501:31 501:32 501:34 501:34 501:34 501:21	0.700 0.700 0.700 0.700 0.700 0.700 0.700 0.700 0.700 0.712 0.255 0.404 0.497 0.533 0.316 0.128 0.035 0.006 0.000	0.005 0.007 0.086 0.086 0.089 0.097 0.110 0.129 0.165 0.266 0.367 0.461 0.552 0.320 0.128 0.320 0.128 0.035 0.006 0.092 0.110	55135 55137 55138 55140 55140 55142 55142 55143 55144 55145 55146 56137 56138 56139 56140 56140 56142 56142 56143 56144	0.007 0.351 1.103 2.145 2.988 2.970 1.856 0.671 0.148 0.001 0.000 0.003 0.029 0.1656 1.770 2.894 1.775 2.894 1.775	6.850 6.847 6.071 5.132 4.431 3.481 1.967 0.685 0.149 0.019 0.001 6.850 6.850 6.100 5.299 5.088 5.250 4.920 3.578 1.944 0.697	61150 61151 61152 61153 61155 61156 61155 61156 62147 62149 62151 62152 62151 62152 62155 62155 62155 62155 62157 62158	<pre>&gt; □ • □ • □ • □ • □ • □ • □ • □ • □ • □</pre>	1.150 0.889 0.695 0.461 0.304 0.159 0.058 0.014 0.002 2.250 1.430 0.480 0.700 0.480 0.359 0.254 0.161 0.083 0.030
90119- 50117 50118 50119 50120 50121 50122 50123 50125 50127 50128 50128 50129 50130 50130 50132 50133 50133 50133 50133	0.300 0.300 0.300 0.300 0.300 0.001 0.001 0.005 0.016 0.047 0.132 0.255 0.404 0.497 0.533 0.316 0.128 0.035 0.006 0.000 0.000 0.000	0.005 0.007 0.086 0.086 0.092 0.097 0.110 0.129 0.165 0.266 0.367 0.481 0.552 0.320 0.128 0.035 0.006 0.092 0.1147	55135 55137 55138 55140 55140 55141 55142 55143 55144 55145 55146 55146 56135 56137 56138 56137 56138 56137 56138 56140 56140 56141 56143 56143 56143	0.007 0.351 1.103 2.145 2.988 2.970 1.856 0.671 0.148 0.019 0.001 0.000 0.003 0.003 0.003 0.003 0.167 0.556 1.770 2.954 2.894 2.954 2.954	6.850 6.847 6.071 5.132 4.431 3.481 1.967 0.685 0.149 0.019 0.001 6.850 6.920 7.0000 7.00000 7.0000 7.00000 7.00000 7.00000 7.00000 7.00000000	61150 61151 61152 61153 61154 61155 61156 61157 61158 62149 42150 62151 62151 62151 62155 62155 62156 62155 62156 62157 62158 62159 62159	0.0144 0.057 0.146 0.211 0.215 0.138 0.056 0.002 0.000 0.000 0.001 0.005 0.019 0.055 0.019 0.055 0.019 0.055 0.029 0.028 0.069 0.028	1.150 0.889 0.695 0.461 0.304 0.159 0.058 0.014 0.002 2.250 1.430 1.430 0.890 0.700 0.480 0.359 0.254 0.161 0.083 0.030 0.008
90119- 50117 50118 50119 50121 50122 50123 50124 50125 50126 50127 50128 50127 50128 50127 50133 50131 50133 50134 51123 51125	0.700 0.700 1.301 0.300 0.300 0.001 0.001 0.015 0.016 0.047 0.132 0.255 0.404 0.497 0.533 0.316 0.128 0.035 0.006 0.0000 0.00000 0.0000 0.00000 0.00000 0.00000 0.00000 0.000000 0.00000 0.00000000	0.005 0.007 0.086 0.086 0.089 0.097 0.110 0.129 0.165 0.266 0.367 0.461 0.537 0.552 0.320 0.128 0.035 0.006 0.092 0.110 0.092	55135 55137 55138 55140 55140 55142 55142 55143 55144 55145 55145 55145 56137 56138 56139 56140 56140 56142 56142 56143 56144 56144 56145	0.007 0.351 1.103 2.145 2.988 2.970 1.856 0.671 0.148 0.019 0.001 0.000 0.003 0.003 0.003 0.003 0.003 0.656 1.775 2.994 1.795 2.994 1.795 2.954 0.678 0.678	6.850 6.847 6.071 5.132 4.431 3.481 1.967 0.685 0.149 0.019 0.001 6.850 6.850 6.850 6.100 5.299 5.088 5.250 4.920 3.578 1.944 0.697 0.163	61150 61151 61152 61153 61155 61155 61156 61157 61158 62147 62149 42150 62151 62152 62153 62154 62155 62155 62156 62157 62156 62157 62159 62160 63161	0.014 0.057 0.146 0.211 0.215 0.138 0.014 0.001 0.001 0.000 0.001 0.005 0.001 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.00000 0.000000	1.150 0.889 0.695 0.461 0.304 0.159 0.058 0.014 0.002 2.250 1.430 1.430 0.890 0.359 0.254 0.161 0.083 0.030 0.008 0.008
90119- 50117 50118 50119 50120 50121 50122 50123 50124 50125 50126 50127 50128 50129 50131 50132 50131 50132 50133 50134 50132 50133 50131 51125 51125 51125	0.300 0.300 0.300 0.300 0.300 0.300 0.001 0.0047 0.132 0.255 0.404 0.497 0.533 0.316 0.128 0.035 0.006 0.000 0.002 0.002 0.014	0.005 0.007 0.066 0.086 0.089 0.097 0.110 0.129 0.165 0.266 0.367 0.481 0.557 0.357 0.552 0.320 0.128 0.355 0.006 0.092 0.110 0.167 0.280	55135 55137 55138 55140 55140 55141 55142 55143 55145 55145 55145 55145 55146 56137 56138 56137 56138 56139 56140 56141 56142 56143 56145 56145	0.007 0.351 1.103 2.145 2.988 2.970 1.856 0.671 0.148 0.001 0.003 0.003 0.003 0.029 0.167 0.656 1.770 2.954 1.795 0.678 0.158 0.023	6.850 6.847 6.071 5.132 4.431 3.481 1.967 0.685 0.149 0.019 0.001 6.850 6.850 6.100 5.299 5.088 5.250 4.920 3.578 1.944 0.697 0.160 0.023	61150 61151 61152 61153 61154 61155 61156 61157 61158 62147 62149 62151 62152 62153 62154 62155 62155 62156 62157 62158 62157 62158 62157 62158 62157 62158	0.0144 0.057 0.146 0.211 0.215 0.138 0.056 0.014 0.002 0.000 0.000 0.001 0.005 0.005 0.005 0.005 0.005 0.005 0.005 0.009 0.005 0.009 0.028 0.028 0.028 0.028 0.028 0.028	1.150 0.889 0.695 0.461 0.304 0.159 0.058 0.014 0.002 2.250 1.430 0.430 0.480 0.359 0.254 0.161 0.083 0.008 0.008 0.008
90119- 50117 50118 50119 50120 50121 50122 50123 50124 50126 50127 50128 50129 50129 50130 50131 50132 50131 50132 50134 51123 51125 51125	0.200 0.300 0.300 0.300 0.300 0.001 0.001 0.010 0.016 0.047 0.132 0.255 0.404 0.497 0.533 0.316 0.128 0.035 0.005 0.0000 0.00000 0.00000 0.0000 0.00000 0.000000 0.00000 0.00000000	0.095 0.097 0.086 0.086 0.086 0.089 0.097 0.110 0.129 0.165 0.266 0.367 0.461 0.537 0.552 0.320 0.128 0.035 0.006 0.092 0.110 0.167 0.280 0.429	55135 55137 55138 55140 55140 55142 55142 55143 55145 55145 55145 55145 55145 56137 56138 56137 56139 56140 56141 56142 56143 56143 56144 56145 56146	0.007 0.351 1.103 2.148 2.948 2.948 2.948 2.948 2.970 1.856 0.671 0.671 0.001 0.001 0.000 0.003 0.003 0.003 0.003 0.003 0.167 0.656 1.776 2.954 2.954 0.678 0.678 0.523 0.002	6.850 6.857 6.071 5.132 4.431 3.481 1.967 0.685 0.149 0.019 0.001 6.850 6.850 6.850 6.100 5.299 5.088 5.250 4.920 3.578 1.944 0.697 0.160 0.023 0.002	61150 61151 61152 61153 61155 61155 61156 62147 62149 62150 62153 62153 62157 62156 62157 62158 62158 62157 62158 62158 62157 62158 62157 62158 62158 62157 62158 62157 62158 62157 62158 62157 62158 62157 62158 62157 62158 62157 62158 62157 62158 62157 62158 62157 62158 62157 62158 62157 62158 62157 62158 62157 62158 62157 62158 62158 62157 62158 62	O = 0 114 O = 017 O = 017 O = 0138 O = 0138 O = 0158 O = 0000 O = 0000 O = 0000 O = 0000 O = 0000 O = 0005 O = 0005 O = 0055 O = 005 O = 005	1.150 0.889 0.695 0.461 0.304 0.159 0.058 0.014 0.002 2.250 1.430 0.890 0.700 0.480 0.359 0.254 0.359 0.254 0.161 0.003 0.008 0.001 0.008
90119-           50117           50118           50119           50121           50123           50124           50125           50126           50127           50128           50129           50130           50132           50133           50133           50134           51125           51125           51127           51128	0.700 0.700 0.700 0.700 0.700 0.700 0.700 0.700 0.700 0.700 0.700 0.712 0.255 0.404 0.497 0.533 0.316 0.128 0.035 0.006 0.000 0.002 0.014 0.002 0.014 0.002 0.014 0.002 0.014 0.005 0.	0.095 0.097 0.086 0.086 0.086 0.089 0.097 0.110 0.129 0.165 0.266 0.367 0.461 0.552 0.357 0.552 0.357 0.128 0.035 0.006 0.092 0.110 0.167 0.289 0.469	55135 55137 55138 55140 55140 55142 55142 55143 55145 55145 55145 55145 55145 55145 55145 55145 55145 56137 56139 56140 56141 56142 56143 56145 56146 56145 56146 56148	0.007 0.351 1.103 2.145 2.988 2.970 1.856 0.671 0.149 0.001 0.003 0.029 0.1656 1.770 2.954 1.770 2.954 1.770 2.994 1.770 2.994 1.770 2.994 1.770 2.984 1.770 2.984 1.770 2.984 1.770 2.984 1.770 2.984 1.770 2.984 1.770 2.984 1.770 2.984 1.770 2.984 1.770 2.984 1.770 2.985 1.770 2.985 1.770 2.985 1.770 1.770 2.985 1.770 2.985 1.770 1.770 1.856 1.770 1.770 2.985 1.770 1.770 2.985 2.970 2.9757 2.9757 2.9757 2.9757 2.9757 2.9757 2.9757 2.97577 2.975777 2.97577777777777777777777777777777777777	6.850 6.847 6.071 5.132 4.431 3.481 1.967 0.685 0.149 0.019 0.001 6.850 6.850 6.850 6.850 6.100 5.299 5.088 5.250 4.920 3.578 1.944 0.697 0.160 0.022 5.300	61150 61151 61152 61153 61155 61156 61156 62157 62154 62151 62152 62155 62155 62155 62155 62155 62155 62157 62158 62157 62158 62157 62158 62159 62150 63151 63153 63155	0.0144 0.057 0.146 0.211 0.215 0.138 0.056 0.012 0.000 0.000 0.000 0.0019 0.005 0.0095 0.0095 0.0095 0.009 0.028 0.009 0.028 0.007 0.001 0.000 0.000 0.000 0.000 0.000	1.150 0.889 0.695 0.461 0.304 0.159 0.058 0.014 0.002 2.250 1.430 0.480 0.700 0.480 0.359 0.254 0.161 0.083 0.008 0.001 0.890 0.008 0.001 0.890 0.008 0.001 0.890 0.008 0.001 0.890 0.008 0.001 0.008 0.001 0.008 0.001 0.008 0.001 0.008 0.001 0.254 0.008 0.001 0.254 0.008 0.001 0.008 0.008 0.001 0.008 0.008 0.008 0.001 0.008 0.008 0.001 0.008 0.
501:15-           501:17           501:18           501:19           501:21           501:22           501:23           501:24           501:25           501:25           501:26           501:27           501:28           501:29           501:31           501:33           501:34           501:35           501:31           501:32           501:33           501:34           511:25           511:26           511:27           511:28           511:29           511:29	0.200 0.300 1.300 0.300 0.300 0.001 0.001 0.005 0.016 0.047 0.132 0.255 0.404 0.497 0.533 0.316 0.128 0.035 0.000 0.002 0.014 0.002 0.014 0.002 0.014 0.062 0.218 0.592	0.095 0.097 0.087 0.086 0.086 0.086 0.089 0.097 0.110 0.129 0.165 0.266 0.367 0.481 0.552 0.320 0.128 0.035 0.026 0.092 0.110 0.167 0.280 0.092 0.129	55135 55137 55138 55140 55140 55141 55142 55143 55143 55144 55145 55146 56135 56139 56139 56139 56140 56141 56142 56143 56143 56144 56145 56144 56145	0.007 0.351 1.103 2.988 2.970 1.856 0.671 0.671 0.671 0.019 0.001 0.000 0.003 0.003 0.003 0.003 0.167 0.656 1.770 0.656 1.775 0.678 0.678 0.023 0.002 0.001 0.012	6.850 6.847 6.071 5.132 4.431 3.481 1.967 0.685 0.149 0.019 0.0019 0.0019 6.850 6.850 6.100 5.299 5.088 5.250 4.920 3.578 1.944 0.697 0.160 0.023 0.002 5.300 5.300 5.100 5.200 5.200 5.200 5.200 5.250 5.200 5.300 5.300 5.300	61 150 61 151 61 152 61 153 61 155 61 155 61 156 62 147 62 149 62 150 62 153 62 153 62 155 62 155 62 155 62 155 62 155 62 155 62 155 62 155 63 155 63 156 63 156	0.014 0.057 0.146 0.211 0.215 0.138 0.014 0.002 0.001 0.005 0.001 0.055 0.055 0.055 0.055 0.055 0.022 0.669 0.021 0.001 0.000 0.001 0.000 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.005 0.055 0.	1.150 0.889 0.695 0.461 0.304 0.058 0.014 0.002 2.250 1.430 0.480 0.700 0.480 0.359 0.254 0.161 0.083 0.008 0.008 0.008 0.008 0.008 0.260 0.480
90115-           50117           50118           50119           50121           50123           50124           50123           50124           50125           50126           50127           50128           50127           50131           50132           50133           50134           51125           51126           51127           51128           51129           51130	0.700 0.700 1.301 0.000 1.301 0.001 0.001 0.016 0.047 0.132 0.259 0.404 0.497 0.533 0.316 0.128 0.035 0.006 0.000 0.002 0.014 0.002 0.014 0.002 0.014 0.002 0.002 0.014 0.002 0.002 0.004 0.002 0.005 0.	0.005 0.007 0.086 0.086 0.089 0.097 0.110 0.129 0.165 0.266 0.367 0.461 0.552 0.320 0.128 0.320 0.128 0.035 0.006 0.092 0.110 0.167 0.280 0.280 0.469 0.469 0.469 0.469 0.469 0.469	55135 55137 55138 55140 55140 55142 55142 55143 55144 55145 55145 56137 56138 56137 56138 56139 56140 56141 56142 56143 56144 56145 56145 56147 56148 57139 57140	0.007 0.351 1.103 2.145 2.980 0.671 0.145 0.019 0.001 0.001 0.001 0.000 0.003 0.029 0.165 1.770 2.894 1.795 0.676 0.158 0.022 0.001 0.012	6.850 6.851 6.071 5.132 4.431 3.481 1.967 0.685 0.149 0.019 0.001 6.850 6.100 5.299 5.088 5.250 4.920 3.578 1.944 0.697 0.160 0.023 0.002 5.300 5.350	61 150 61 151 61 152 61 153 61 154 61 155 61 156 61 157 61 158 62 147 62 149 62 151 62 152 62 153 62 155 62 156 62 157 62 159 62 159 62 159 62 159 62 159 63 155 63 155 63 155 63 157	0.014 0.057 0.146 0.211 0.215 0.138 0.056 0.001 0.000 0.000 0.000 0.001 0.005 0.019 0.005 0.019 0.028 0.009 0.028 0.009 0.028 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.005 0.000 0.005	1.150 0.889 0.695 0.461 0.304 0.159 0.058 0.014 0.002 2.250 1.430 0.890 0.480 0.359 0.254 0.161 0.083 0.030 0.008 0.008 0.001 0.890 0.008 0.001 0.890 0.008 0.001 0.890 0.008 0.001 0.890 0.0161 0.008 0.0161 0.008 0.0161 0.008 0.0161 0.008 0.0161 0.008 0.0161 0.008 0.0161 0.008 0.0161 0.008 0.0161 0.008 0.0161 0.008 0.0161 0.008 0.0161 0.008 0.008 0.001 0.008 0.001 0.008 0.008 0.001 0.008 0.001 0.008 0.001 0.008 0.008 0.001 0.008 0.008 0.001 0.008 0.008 0.001 0.008 0.008 0.008 0.001 0.008 0.1800 0.180
90119-           50117           50118           50119           50121           50123           50124           50125           50126           50127           50128           50129           50130           50132           50132           50133           51125           51125           51126           51128           51129           51131	0. 200 0. 200	0.095 0.097 0.087 0.086 0.086 0.086 0.089 0.092 0.097 0.110 0.129 0.165 0.266 0.367 0.481 0.537 0.481 0.537 0.552 0.320 0.128 0.035 0.026 0.128 0.035 0.092 0.110 0.167 0.280 0.092 0.129 1.129 1.961 2.203	55135 55137 55138 55140 55140 55141 55142 55143 55145 55145 55145 55146 56137 56138 56137 56138 56140 56141 56142 56142 56143 56144 56145 56145 56146 56146 56148 56148 56148 57139 57140	0.007 0.351 1.103 2.145 2.988 2.970 1.856 0.671 0.019 0.001 0.000 0.003 0.003 0.003 0.003 0.003 0.167 0.656 1.770 0.556 1.775 0.678 0.023 0.002 0.001 0.002 0.001 0.012	6.850 6.847 6.071 5.132 4.431 3.481 1.967 0.685 0.149 0.019 0.001 6.850 6.850 6.100 5.299 5.088 5.250 4.920 3.578 1.944 0.697 0.160 0.023 0.002 5.300 5.350 5.354	61150 61151 61152 61153 61155 61155 61156 61157 61156 62147 62147 62149 42150 62151 62152 62155 62155 62155 62156 62157 62158 62159 62159 62159 62159 62159 62159 63151 63153 63155 63156	0.014 0.057 0.146 0.211 0.215 0.138 0.138 0.014 0.002 0.001 0.000 0.001 0.005 0.019 0.002 0.002 0.002 0.055 0.055 0.055 0.055 0.055 0.055 0.055 0.055 0.055 0.002 0.055 0.055 0.055 0.055 0.002 0.055 0.055 0.055 0.002 0.055 0.055 0.055 0.055 0.002 0.055 0.002 0.055 0.002 0.055 0.002 0.055 0.002 0.005 0.002 0.005 0.002 0.005 0.002 0.005 0.002 0.005 0.002 0.005 0.005 0.002 0.005 0.005 0.002 0.005 0.002 0.005 0.002 0.005 0.002 0.005 0.002 0.002 0.005 0.002 0.002 0.005 0.002 0.002 0.005 0.002 0.002 0.005 0.002 0.002 0.002 0.005 0.002 0.002 0.005 0.002 0.000 0.000 0.000 0.003 0.035 0	1.150 0.889 0.695 0.461 0.304 0.159 0.058 0.014 0.002 2.250 1.430 0.890 0.700 0.480 0.359 0.254 0.161 0.083 0.030 0.254 0.161 0.089 0.254 0.161 0.089 0.254 0.161 0.089 0.254 0.161 0.089 0.254 0.161 0.089 0.254 0.161 0.089 0.254 0.161 0.058 0.001 0.890 0.254 0.161 0.002 0.254 0.161 0.002 0.254 0.161 0.002 0.254 0.161 0.002 0.254 0.161 0.003 0.000 0.254 0.161 0.003 0.000 0.254 0.161 0.002 0.254 0.161 0.002 0.254 0.161 0.002 0.254 0.161 0.002 0.254 0.161 0.002 0.254 0.161 0.002 0.254 0.161 0.002 0.254 0.161 0.002 0.254 0.161 0.002 0.254 0.161 0.002 0.254 0.161 0.002 0.002 0.254 0.161 0.002 0.000 0.000 0.002 0.002 0.002 0.002 0.002 0.002 0.002 0.002 0.002 0.002 0.002 0.002 0.002 0.002 0.002 0.002 0.002 0.000 0.002 0.0000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000 0.00000000
901:15-           50117           50118           50112           50121           50123           50124           50123           50124           50125           50126           50127           50128           50129           50131           50132           50133           50134           51125           51125           51127           51127           51128           51129           51130           51121           51123	0.700 0.700 0.700 0.700 0.700 0.700 0.700 0.700 0.700 0.712 0.753 0.716 0.763 0.763 0.763 0.763 0.763 0.763 0.763 0.7000 0.70000 0.70000 0.70000 0.70000 0.70000 0.70000000000	0.005 0.007 0.086 0.086 0.086 0.089 0.097 0.110 0.129 0.165 0.266 0.367 0.461 0.537 0.552 0.320 0.128 0.035 0.006 0.092 0.110 0.167 0.280 0.429 0.429 0.429 0.429 1.961 2.203 1.892	55135 55137 55138 55140 55140 55142 55142 55143 55143 55145 55145 55145 56137 56138 56139 56140 56140 56142 56143 56144 56144 56144 56145 56146 56148 57139 57140 57141 57142	0.007 0.351 1.103 2.145 2.988 2.970 1.856 0.671 0.148 0.019 0.001 0.000 0.003 0.029 0.167 0.456 1.770 2.954 2.994 1.795 0.678 0.158 0.022 0.001 0.002 0.002 0.001 0.012 0.099 0.477	6.850 6.847 6.071 5.132 4.431 3.481 1.967 0.685 0.149 0.019 0.001 6.850 6.850 6.100 5.299 5.088 5.299 5.089 5.299 5.089 5.299 5.089 5.299 5.299 5.088 5.299 5.394 4.849	61 150 61 151 61 152 61 153 61 155 61 155 61 156 62 157 62 159 62 153 62 154 62 155 62 155 62 155 62 155 62 156 62 157 62 156 62 157 62 156 62 157 62 156 63 151 63 155 63 155 63 156 63 157 63 158 63 157	-0.014 0.057 0.146 0.211 0.215 0.138 0.014 0.002 0.000 0.000 0.000 0.000 0.005	1.150 0.889 0.695 0.461 0.304 0.159 0.058 0.014 0.002 2.250 1.430 1.430 0.890 0.480 0.359 0.254 0.161 0.083 0.008 0.
90119-           50117           50117           50117           50117           50121           50123           50124           50125           50126           50127           50128           50129           50130           50132           50132           51125           51125           51128           51129           51128           51129           51131	0.700 0.7000 0.7000 0.7000 0.7000 0.7000 0.7000 0.7000 0.7000 0.7000 0.7000 0.7000 0.7000 0.7000 0.7000 0.70000 0.7000 0.7000 0.7000 0.70000 0.70000 0.7000 0.7000	0.005 0.007 0.066 0.086 0.087 0.097 0.097 0.110 0.129 0.165 0.266 0.367 0.461 0.557 0.552 0.355 0.006 0.092 0.110 0.167 0.280 0.167 0.280 0.167 0.280 0.167 0.280 0.429 0.699 1.129 1.961 2.203 1.892 1.199	55135 55137 55138 55140 55140 55142 55143 55144 55145 55145 55146 56135 56135 56139 56139 56140 56141 56142 56143 56144 56145 56145 56145 56145 56145 56146 56147 56145 56145 56145 56146 56147	0.007 0.351 1.103 2.145 2.988 2.988 2.970 1.856 0.671 0.148 0.001 0.003 0.029 0.167 0.656 1.770 2.954 1.795 0.023 0.001 0.012 0.001 0.012 0.001 0.012 0.023	6.850 6.871 6.071 5.132 4.431 3.481 1.967 0.685 0.149 0.001 6.850 6.850 6.850 6.850 6.100 5.299 5.088 5.250 4.920 3.578 1.944 0.697 0.160 0.022 5.300 5.394 4.849 4.052	61150 61151 61152 61153 61155 61156 61157 61158 62147 62149 62151 62152 62151 62155 62155 62155 62155 62155 62155 62156 62157 62158 62157 62158 62157 62158 62157 63158 63157 63158 63157 63158	Cull4 Cull4 Cull4 Cull6 Cull1 Cull6 Cull6 Cull4 Cull6 Cull7 C	1.150 0.889 0.695 0.461 0.304 0.159 0.058 0.014 0.002 2.250 1.430 0.480 0.700 0.480 0.359 0.254 0.161 0.083 0.008 0.001 0.890 0.008 0.001 0.890 0.480 0.008 0.001 0.890 0.480 0.008 0.001 0.695 0.118 0.005 0.013
901:15-           50117           50118           50112           50123           50124           50123           50124           50125           50126           50127           50128           50129           50131           50132           50133           50134           51125           51125           51127           51128           51127           51128           51127           51128           51127           51128           51127           51128           51127           51128           51127           51128           51130           51131           51132           51133	0.000 0.000 0.000 0.000 0.001 0.001 0.001 0.005 0.016 0.047 0.132 0.255 0.404 0.497 0.533 0.316 0.035 0.005 0.000 0.000 0.000 0.000 0.000 0.002 0.014 0.627 0.218 0.592 1.409 1.683 1.763 1.164 0.517	0.095 0.097 0.086 0.086 0.086 0.086 0.097 0.110 0.129 0.165 0.266 0.367 0.461 0.537 0.552 0.320 0.128 0.035 0.006 0.092 0.110 0.167 0.280 0.429 0.129 1.129 1.291 1.892 1.199 0.523	55135 55137 55138 55140 55140 55142 55142 55143 55145 55145 55145 55145 55145 55145 56137 56138 56139 56140 56141 56142 56143 56144 56145 56144 56145 56146 56147 56148 56146 56147 56148 56146 56147	0.007 0.351 1.103 2.148 2.948 2.948 2.948 2.948 2.948 2.948 2.948 2.948 2.948 2.948 2.948 0.671 0.671 0.001 0.000 0.003 0.003 0.003 0.003 0.003 0.003 0.003 0.003 0.676 1.770 2.954 2.944 1.795 0.678 0.678 0.678 0.678 0.623 0.002 0.002 0.001 0.012 0.002 0.012 0.012 0.012 0.012 0.012 0.012 0.012 0.012 0.012 0.012 0.012 0.012 0.023 0.023 0.023 0.023 0.023 0.023 0.023 0.023 0.023 0.023 0.023 0.023 0.023 0.001 0.001 0.035 0.035 0.001 0.003 0.005 0.003 0.005 0.003 0.005 0.003 0.005 0.003 0.005 0.003 0.007 0.005 0.002 0.00700000000	6.850 6.857 6.071 5.132 4.431 3.481 1.967 0.685 0.149 0.019 0.001 6.850 6.850 6.100 5.299 5.088 5.250 4.920 3.578 1.944 0.697 0.1697 0.160 5.350 5.394 4.849 4.052 2.839	61150 61151 61152 61153 61155 61155 61156 62147 62149 42150 62151 62152 62153 62153 62156 62157 62156 62157 62156 62157 62158 62159 63151 63151 63153 63155 63156 63157 63158 63156 63156 63157 63158 63156 63156 63156 63157 63158 63156 63166 63	0.014 0.057 0.146 0.211 0.215 0.138 0.016 0.016 0.001 0.000 0.000 0.005 0.009 0.025 0.009 0.025 0.009 0.025 0.009 0.025 0.009 0.025 0.009 0.025 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.0050	1.150 0.889 0.695 0.461 0.304 0.159 0.058 0.014 0.002 2.250 1.430 0.890 0.700 0.480 0.359 0.254 0.161 0.003 0.008 0.008 0.008 0.008 0.008 0.008 0.008 0.008 0.008 0.008 0.008 0.005 0.008 0.008 0.005 0.
90119-           50117           50117           50117           50117           50121           50123           50124           50125           50126           50127           50128           50129           50130           50132           50132           50133           51125           51126           51126           51126           51125           51126           51133           51133           51133           51133           51133           51134           51133           51134	0.700 0.700 0.700 0.700 0.700 0.700 0.700 0.700 0.700 0.700 0.700 0.700 0.700 0.713 0.753 0.404 0.497 0.533 0.316 0.128 0.035 0.006 0.002 0.014 0.002 0.014 0.002 0.014 0.002 0.001 0.002 0.014 0.002 0.001 0.002 0.001 0.002 0.001 0.005 0.	0.095 0.097 0.086 0.086 0.086 0.089 0.097 0.110 0.129 0.165 0.266 0.367 0.481 0.552 0.320 0.128 0.320 0.128 0.320 0.128 0.320 0.128 0.355 0.006 0.092 0.110 0.167 0.481 0.481 0.482 0.035 0.006	55135 55137 55138 55139 55140 55142 55142 55143 55145 55145 55145 55145 55146 56137 56139 56140 56140 56141 56142 56143 56144 56145 56145 56145 56146 56147 56148 57139 57140 57140	0.007 0.351 1.103 2.145 2.988 2.988 2.970 1.856 0.671 0.149 0.001 0.003 0.029 0.165 1.770 2.894 1.775 2.894 1.775 0.656 1.770 2.894 1.775 0.656 0.678 0.678 0.675 0.001 0.002 0.002 0.002 0.001 0.001 0.002 0.001 0.002 0.001 0.001 0.001 0.002 0.001 0.001 0.001 0.001 0.001 0.00000000	6.850 6.850 6.071 5.132 4.431 3.481 1.967 0.685 0.149 0.001 6.850 6.850 6.100 5.299 5.088 5.250 4.920 3.578 1.944 0.697 0.160 0.023 0.002 5.350 5.394 4.849 4.052 2.839 1.546	61150 61151 61152 61153 61155 61156 61156 62147 62149 42150 62151 62152 62151 62155 62155 62155 62156 62157 62158 62157 62158 62159 62160 63151 63153 63155 63156 63157 63158 63157 63158	0.0144 0.057 0.057 0.146 0.211 0.215 0.138 0.056 0.012 0.000 0.000 0.000 0.001 0.005 0.001 0.005	1.150 0.889 0.695 0.461 0.304 0.159 0.058 0.014 0.002 2.250 1.430 0.480 0.700 0.480 0.359 0.254 0.161 0.003 0.001 0.890 0.480 0.001 0.890 0.480 0.001 0.890 0.480 0.001 0.890 0.480 0.001 0.003 0.003 0.003 0.013 0.003 0.003 0.003 0.003 0.003 0.003 0.003 0.003 0.260
901:15-           50117           50118           50112           50120           50121           50122           50123           50124           50125           50126           50127           50128           50129           50131           50133           50134           51123           51125           51126           51127           51128           51129           51121           51123           51124           51125           51126           51127           51128           51129           51120           51121           51123           51124           51130           51131           51132           51133           51134           51134	0.200 0.200 0.200 0.200 0.200 0.200 0.200 0.001 0.001 0.001 0.001 0.001 0.004 0.047 0.132 0.255 0.404 0.497 0.533 0.316 0.128 0.035 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.001 0.132 0.255 0.404 0.497 0.128 0.005 0.001 0.005 0.001 0.132 0.255 0.404 0.533 0.316 0.005 0.000 0.000 0.000 0.000 0.005 0.001 0.132 0.255 0.404 0.128 0.005 0.000 0.000 0.000 0.005 0.001 0.132 0.255 0.404 0.005 0.000 0.000 0.000 0.000 0.000 0.000 0.000 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.005 0.001 0.005 0.001 0.005 0.001 0.005 0.005 0.005 0.005 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.00000 0.00000 0.00000 0.00000 0.00000000	0.095 0.097 0.087 0.086 0.086 0.086 0.086 0.092 0.097 0.110 0.129 0.165 0.266 0.266 0.367 0.481 0.537 0.481 0.552 0.320 0.128 0.035 0.092 0.110 0.167 0.280 0.092 0.1129 1.991 1.29 1.992 1.992 1.992 1.992 0.523 0.162	55135 55137 55138 55140 55140 55142 55142 55143 55143 55145 55145 55145 55145 56135 56137 56138 56137 56139 56140 56141 56142 56143 56145 56145 56145 56145 56146 56147 56146 56147 56146 56147 56148 57140 57140	0.007 0.351 1.103 2.148 2.948 2.948 2.948 2.948 2.970 1.856 0.671 0.671 0.671 0.671 0.001 0.001 0.000 0.003 0.003 0.003 0.003 0.003 0.003 0.167 0.656 1.770 2.954 2.894 0.023 0.002 0.001 0.002 0.001 0.002 0.001 0.002 0.001 0.002 0.001 0.002 0.001 0.002 0.001 0.002 0.001 0.002 0.002 0.001 0.00200000000	6.850 6.847 6.071 5.132 4.431 3.481 1.967 0.019 0.019 0.001 6.850 6.100 5.299 5.088 5.250 4.920 3.578 1.944 0.697 0.160 0.023 0.002 5.350 5.394 4.849 4.849 4.849 4.952 2.839 1.546 0.596	61150 61151 61152 61153 61155 61155 61156 61157 61156 62147 62149 62150 62151 62152 62153 62155 62155 62156 62157 62158 62159 62159 62150 63151 63153 63155 63156 63159 63160 63161 64155		1.150 0.889 0.695 0.461 0.304 0.159 0.058 0.014 0.002 2.250 1.430 0.890 0.700 0.480 0.359 0.254 0.161 0.003 0.008 0.180 0.008 0.008 0.008 0.008 0.008 0.180 0.008 0.008 0.008 0.180 0.008 0.008 0.008 0.008 0.180 0.008 0.
901:15-           50117           50118           50119           50121           50123           50124           50123           50124           50123           50124           50125           50126           50127           50128           50127           50131           50132           50133           50134           51125           51126           51127           51128           51122           51133           51125           51128           51123           51130           51131           51132           51133           51133           51134           51135           51137	0.700 0.700 1.307 0.300 3.307 0.300 0.001 0.001 0.016 0.047 0.132 0.255 0.404 0.497 0.533 0.316 0.128 0.035 0.006 0.002 0.014 0.002 0.014 0.002 0.012 1.409 1.409 1.409 1.409 1.409 1.517 0.159 0.022 0.002	0.005 0.007 0.086 0.086 0.086 0.089 0.097 0.110 0.129 0.165 0.266 0.367 0.461 0.552 0.320 0.128 0.035 0.006 0.092 0.128 0.035 0.006 0.092 0.128 0.035 0.006 0.092 0.129 1.961 2.203 1.892 1.199 1.961 2.203 1.892 1.199 0.523 0.160 0.022 0.002	55135 55137 55138 55139 55140 55140 55142 55142 55143 55145 55145 55145 56137 56138 56139 56139 56139 56140 56141 56142 56143 56144 56145 56145 56145 56146 56147 56148 57140 57141 57145 57145 57146	0.007 0.351 1.103 2.145 2.988 2.970 1.856 0.671 0.145 0.671 0.101 0.001 0.001 0.001 0.001 0.003 0.029 0.167 0.456 1.775 2.894 1.795 2.894 1.795 0.678 0.158 0.022 0.001 0.012 0.002 0.001 0.0158 0.022 0.001 2.108 2.128 0.012 0.012 0.012 0.012 0.029 0.0158 0.022 0.001 0.0158 0.022 0.012 0.022 0.012 0.022 0.001 0.0158 0.022 0.001 0.0158 0.0158 0.0158 0.0158 0.012 0.012 0.012 0.012 0.012 0.022 0.001 0.0158 0.012 0.001 0.002 0.001 0.002 0.002 0.002 0.002 0.002 0.001 0.00200000000	6.850 6.871 6.071 5.132 4.431 3.481 1.967 0.685 0.149 0.019 0.001 6.850 6.100 5.299 5.088 5.250 4.920 3.578 1.944 0.697 0.162 0.002 5.300 5.394 4.859 4.952 2.839 1.5546 0.592 0.592	61 150         61 151         61 151         61 153         61 155         61 155         61 155         61 155         61 155         61 155         61 156         62 157         62 152         62 152         62 155         62 155         62 156         62 157         62 155         62 156         62 157         62 155         62 156         63 151         63 153         63 153         63 153         63 155         63 156         63 157         63 159         63 160         63 161         64 155         64 157	- 0.014 0.057 0.146 0.211 0.215 0.138 0.014 0.002 0.001 0.000 0.000 0.005 0.019 0.05 0.019 0.028 0.005 0.001 0.000 0.000 0.005 0.001 0.000 0.005 0.001 0.000 0.005 0.001 0.005 0.001 0.005 0.001 0.005 0.001 0.005 0.001 0.005 0.001 0.005 0.001 0.005 0.001 0.005 0.001 0.005	1.150 0.889 0.695 0.461 0.304 0.159 0.058 0.014 0.002 2.250 1.430 0.890 0.480 0.359 0.254 0.161 0.083 0.035 0.008 0.
901:18           50117           50118           50118           50112           50121           50122           50123           50124           50125           50126           50127           50128           50129           50131           50133           50133           50133           50133           51125           51125           51126           51127           51128           51129           51123           51129           51129           51125           51127           51128           51129           51129           51129           51129           51129           51130           51131           51132           51133           51134           51135           51136           51137           52126	0.700 0.700 1.30' 0.700 1.30' 0.001 0.001 0.0047 0.132 0.255 0.404 0.497 0.533 0.316 0.128 0.005 0.000 0.002 0.014 0.002 0.014 0.002 0.014 0.002 0.0128 0.592 1.409 1.883 1.763 1.164 0.517 0.159 0.022 0.002 0.002 0.002	0.095 0.097 0.087 0.086 0.086 0.086 0.086 0.086 0.092 0.097 0.110 0.129 0.165 0.266 0.367 0.481 0.552 0.320 0.128 0.035 0.026 0.092 0.110 0.167 0.429 0.699 1.129 1.991 1.2203 1.1892 1.199 0.523 0.167	55135 55137 55138 55140 55140 55141 55142 55143 55143 55145 55145 55145 56135 56137 56138 56137 56139 56140 56141 56142 56143 56143 56144 56145 56144 56145 56146 56146 56146 56147 56146 56147 56146 57141 57142 57144 57145 57146	0.007 0.351 1.103 2.145 2.948 2.970 1.856 0.671 0.149 0.001 0.003 0.003 0.003 0.003 0.003 0.003 0.003 0.167 0.676 1.770 2.954 2.954 2.954 2.954 2.954 2.954 0.028 0.002 0.002 0.001 0.028 0.002 0.001 0.473 1.270 2.142 1.386 0.574 0.574 0.574 0.574	6.850 6.847 6.071 5.132 4.431 3.481 1.967 0.685 0.149 0.019 0.001 6.850 6.850 6.850 6.850 6.100 5.299 5.088 5.250 4.920 3.578 1.944 0.697 0.160 0.023 0.002 5.300 5.394 4.849 4.552 2.839 4.596 0.552 2.839 4.556 0.5596 0.152 0.026	61150 61151 61152 61153 61155 61155 61156 62157 62152 62153 62154 62155 62155 62156 62157 62156 62157 62156 62157 62158 63151 63153 63155 63156 63157 63158 63158 63157 63158 63157 63158 63157 63158 63157 63158 63157 63158 63158 63157 63158 63	0.014 0.057 0.146 0.211 0.215 0.138 0.014 0.002 0.001 0.000 0.001 0.005 0.001 0.055 0.025 0.025 0.025 0.027 0.001 0.005 0.001 0.000 0.001 0.001 0.005 0.002 0.003 0.002 0.002 0.002	1.150 0.889 0.695 0.461 0.304 0.159 0.058 0.014 0.002 2.250 1.430 0.890 0.700 0.480 0.359 0.254 0.161 0.089 0.254 0.161 0.003 0.008 0.008 0.008 0.008 0.008 0.008 0.008 0.008 0.008 0.000 0.480 0.003 0.003 0.260 0.180 0.180 0.013 0.003 0.260 0.180 0.260 0.180 0.180 0.260 0.180 0.260 0.180 0.260 0.180 0.260 0.180 0.260 0.180 0.260 0.180 0.260 0.180 0.260 0.180 0.260 0.180 0.260 0.180 0.260 0.180 0.260 0.180 0.260 0.180 0.260 0.180 0.260 0.180 0.260 0.180 0.260 0.180 0.260 0.180 0.260 0.260 0.260 0.260 0.260 0.260 0.260 0.260 0.260 0.260 0.260 0.260 0.260 0.260 0.260 0.260 0.260 0.180 0.0260 0.180 0.0260 0.180 0.0260 0.180 0.0260 0.180 0.0260 0.180 0.0260 0.180 0.0260 0.180 0.0260 0.180 0.0260 0.180 0.0260 0.180 0.0260 0.180 0.0260 0.180 0.0260 0.180 0.0260 0.180 0.0260 0.180 0.0260 0.180 0.0260 0.180 0.0260 0.027 0.02
901:15-           50117           50118           50117           50121           50121           50123           50124           50123           50124           50123           50124           50125           50126           50127           50128           50129           50131           50132           50133           50133           50134           51125           51126           51127           51128           51127           51128           51130           51132           51133           51135           51135           51135           51136           51137	0.700 0.700 1.307 0.700 1.307 0.001 0.001 0.001 0.016 0.017 0.132 0.255 0.404 0.497 0.132 0.404 0.497 0.132 0.404 0.497 0.316 0.005 0.006 0.000 0.002 0.014 0.002 0.014 0.002 0.014 0.592 1.409 1.383 1.164 0.517 0.1597 0.022 0.002 0	0.095 0.097 0.086 0.086 0.086 0.086 0.089 0.097 0.110 0.129 0.165 0.286 0.367 0.461 0.552 0.320 0.128 0.035 0.092 0.110 0.429 0.429 0.429 0.429 0.429 0.429 0.429 1.961 2.203 1.892 1.199 0.523 0.160 0.022 0.002 0.165	55135 55137 55138 55139 55140 55140 55142 55142 55143 55145 55145 55145 55145 56137 56138 56139 56140 56141 56142 56143 56144 56144 56144 56145 56148 57139 57140 57141 57145 57147 57147 57148 57149 57149	0.007 0.351 1.103 2.145 2.988 2.970 1.856 0.671 0.148 0.019 0.001 0.000 0.003 0.009 0.167 0.456 1.770 2.954 2.894 1.795 0.678 0.6770 0.675 0.678 0.6770 0.675 0.675 0.675 0.675 0.6758 0.6770 0.6770 0.6770 0.675 0.6770 0.675 0.00200000000	6.850 6.847 6.071 5.132 4.431 3.481 1.967 0.685 0.149 0.019 0.001 6.850 6.850 6.850 6.100 5.299 5.088 5.299 5.089 1.944 0.697 0.160 5.350 5.394 4.849 4.849 4.849 4.859 1.546 0.596 0.152 0.023	61150 61151 61152 61153 61155 61155 61156 62157 62152 62153 62153 62156 62157 62156 62157 62158 62157 62158 62157 62158 62157 62158 62157 62158 62157 62158 62157 63151 63153 63151 63153 63156 63157 63156 63157 63160 631616	0.014 0.057 0.057 0.146 0.211 0.215 0.138 0.014 0.001 0.001 0.000 0.000 0.005 0.005 0.005 0.005 0.005 0.005 0.005 0.005 0.005 0.005 0.005 0.005 0.000 0.000 0.000 0.000 0.000 0.001 0.000 0.001 0.000 0.000 0.001 0.000 0.001 0.000 0.005	1.150 0.889 0.695 0.461 0.304 0.159 0.058 0.014 0.002 2.250 1.430 0.460 0.480 0.359 0.254 0.161 0.083 0.008 0.
90119-           50117           50117           50117           50117           50121           50123           50124           50125           50126           50127           50128           50129           50130           50132           50133           50134           51125           51126           51128           51128           51129           51133           51133           51133           51133           51133           51133           51133           51133           51133           51134           51135           51136           51137           51138           51136           51137	0.700 0.700 0.700 0.700 0.700 0.700 0.700 0.700 0.700 0.700 0.700 0.700 0.700 0.713 0.753 0.404 0.497 0.533 0.316 0.128 0.005 0.005 0.002 0.014 0.025 0.002 0.014 0.025 0.002 0.014 0.025 0.002 0.014 0.025 0.002 0.015 0.002 0.014 0.025 0.002 0.015 0.025 0.002 0.015 0.025 0.002 0.015 0.002 0.015 0.002 0.002 0.015 0.002 0.	0.005 0.007 0.006 0.086 0.086 0.087 0.086 0.087 0.097 0.110 0.129 0.165 0.266 0.367 0.461 0.552 0.320 0.128 0.035 0.006 0.092 0.110 0.167 0.429 0.699 1.129 1.129 1.223 1.892 1.1199 0.523 0.002 0.002 0.167 0.280	55135 55137 55138 55139 55140 55140 55142 55143 55144 55145 55145 55145 55145 55145 55145 55145 55145 55145 55145 56139 56140 56141 56142 56143 56144 56145 56146 56145 56146 56145 56146 57140 57146	0.007 0.351 1.103 2.145 2.988 2.970 1.856 0.671 0.148 0.019 0.001 0.003 0.003 0.003 0.003 0.003 0.003 0.167 0.656 1.770 2.954 2.954 2.954 2.954 2.954 2.954 0.023 0.002 0.012 0.023 0.002 0.012 0.023 0.002 1.2708 2.108 2.108 2.108 2.108 2.109 0.107 0.155 0.023 0.002 0.012 0.012 0.012 0.0574 0.574 0.574 0.574 0.554 0.574 0.554 0.574 0.554 0.020 0.021 0.0574 0.0574 0.0574 0.002	6.850 6.850 6.071 5.132 4.431 3.481 1.967 0.685 0.149 0.001 6.850 6.850 6.850 6.100 5.299 5.088 5.250 4.920 3.578 1.944 0.697 0.160 0.023 5.350 5.300 5	61150 61151 61152 61153 61155 61156 61155 61156 62147 62149 62151 62152 62151 62155 62155 62155 62155 62155 62155 62155 62156 62157 62158 62159 62160 63151 63153 63155 63156 63157 63158 63159 63160 63161 64155 64159	0.014 0.057 0.146 0.215 0.138 0.215 0.138 0.014 0.002 0.001 0.000 0.001 0.005 0	1.150 0.889 0.695 0.461 0.304 0.159 0.058 0.014 0.002 2.250 1.430 0.480 0.700 0.480 0.700 0.480 0.254 0.161 0.083 0.001 0.890 0.480 0.001 0.890 0.480 0.001 0.890 0.480 0.001 0.890 0.480 0.014 0.003 0.003 0.003 0.256 0.1180 0.013 0.003 0.260 0.1180 0.003 0.003 0.003 0.260 0.1180 0.003 0.003 0.003 0.003 0.003 0.260 0.1180 0.003 0.003 0.003 0.003 0.003 0.003 0.003 0.003 0.003 0.003 0.260 0.1180 0.003 0.003 0.003 0.003 0.003 0.003 0.260 0.1180 0.003 0.0
901:15-           50117           50118           50112           50123           50124           50123           50124           50125           50128           50129           50131           50132           50133           50134           51125           51127           51128           51127           51128           51127           51128           51130           51131           51132           51133           51134           51135           51130           51131           51132           51133           51134           51135           51137           52125           52127	0.000 0.000 0.000 0.000 0.001 0.001 0.001 0.001 0.001 0.001 0.001 0.004 0.047 0.132 0.255 0.404 0.497 0.333 0.316 0.035 0.005 0.000 0.000 0.002 0.014 0.627 0.218 0.592 1.409 1.683 1.763 1.753 1.7555 1.7555 1.7555 1.7555 1.7555 1.7555 1.75555 1.755555	0.095 0.097 0.087 0.086 0.086 0.086 0.086 0.092 0.097 0.110 0.129 0.165 0.266 0.367 0.461 0.537 0.552 0.320 0.128 0.035 0.092 0.110 0.167 0.280 0.429 0.429 0.429 0.429 0.429 0.429 1.129 1.199 1.129 1.199 0.523 0.022 0.002 0.167 0.280 0.022 0.002 0.167 0.280 0.022 0.002	55135 55137 55138 55139 55140 55140 55142 55142 55143 55145 55145 55145 55145 55145 56137 56138 56139 56140 56141 56142 56143 56143 56144 56145 56144 56145 56144 56145 56146 56147 56148 57140 57140 57142 57143 57146 57148 57149 57149 57149 57149 57149	0.007 0.351 1.103 2.148 2.948 2.948 2.948 2.948 2.948 2.948 2.948 2.948 2.948 2.948 2.954 0.671 0.671 0.671 0.001 0.000 0.003 0.003 0.003 0.003 0.003 0.003 0.678 0.678 0.678 0.678 0.678 0.678 0.678 0.678 0.678 0.678 0.678 0.678 0.678 0.678 0.678 0.678 0.678 0.678 0.678 0.671 0.678 0.002 0.002 0.677 0.678 0.002 0.677 0.678 0.00200000000	6.850 6.857 6.071 5.132 4.431 3.481 1.967 0.0685 0.149 0.019 0.001 6.850 6.850 6.100 5.299 5.088 5.250 4.920 3.578 1.944 0.697 0.160 5.350 5.394 4.849 4.849 4.052 2.839 1.546 0.152 0.023 0.023 0.023 5.394 4.849 1.546 0.596 0.152 0.023 0.023 0.023 5.3596 0.152 0.023 0.023 0.002 5.3596 0.152 0.023 0.023 0.002 5.3596 0.152 0.023 0.023 0.002 5.3596 0.152 0.023 0.023 0.003 5.100 0.023 0.003 5.100 0.023 0.003 5.100 0.023 0.003 5.100 0.025 0.003 5.100 0.025 0.003 5.100 0.03 5.100 0.025 0.003 5.100 0.025 0.003 5.100 0.025 0.003 5.100 0.025 0.003 5.100 0.025 0.003 5.100 0.025 0.003 5.100 0.025 0.003 5.100 0.025 0.003 5.100 0.025 0.003 5.100 0.003 5.100 0.003 5.100 0.003 5.100 0.003 5.100 0.003 5.100 0.003 5.100 0.003 5.100 0.003 5.100 0.003 5.100 0.003 5.100 0.003 5.100 5.350 0.003 5.100 0.003 5.100 0.003 5.100 5.0000 5.0000 5.0000 5.0000 5.0000 5.00000000000000000	61150 61151 61152 61153 61155 61155 61156 62147 62149 42150 62151 62152 62153 62153 62156 62157 62156 62157 62156 62157 62158 63155 63155 63158 63158 63158 63158 64155 64155 64155 64155 64155 64155 64155 64155 64155 64155 64155 64155 64156 64157 64158 64156 64157 64158 64156 64157 64158 64156 64157 64158 64156 64157 64158 64156 64157 64158 64158 64156 64157 64158 64	0.014 0.057 0.146 0.211 0.215 0.138 0.056 0.014 0.002 0.000 0.000 0.000 0.005 0.009 0.025 0.009 0.025 0.009 0.025 0.009 0.025 0.0000 0.000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.00000 0.0000 0.0000 0.0000 0.00000 0.00000 0.00000 0.000000	1.150 0.889 0.695 0.461 0.304 0.159 0.058 0.014 0.002 2.250 1.430 0.890 0.700 0.480 0.359 0.254 0.161 0.003 0.008 0.008 0.008 0.008 0.008 0.008 0.008 0.008 0.008 0.003 0.008 0.003 0.003 0.003 0.003 0.003 0.256 0.003 0.180 0.
90115-           50117           50117           50118           50112           50123           50124           50123           50124           50123           50124           50125           50126           50127           50128           50130           50131           50132           50133           50134           51125           51126           51126           51127           51128           51129           51130           51131           51133           51134           51135           51136           51137           52126           52128           52128	0.700 0.700 0.700 0.700 0.700 0.700 0.700 0.700 0.700 0.700 0.700 0.700 0.700 0.713 0.753 0.404 0.497 0.497 0.404 0.497 0.404 0.497 0.533 0.316 0.128 0.006 0.000 0.002 0.014 0.002 0.014 0.002 0.014 0.592 1.409 1.483 1.164 0.517 0.159 0.022 0.002 0.002 0.015 0.517 0.527 0.000 0.002 0.	0.005 0.007 0.086 0.086 0.086 0.086 0.089 0.097 0.110 0.129 0.165 0.266 0.367 0.461 0.552 0.320 0.128 0.035 0.026 0.355 0.006 0.092 0.128 0.035 0.006 0.092 0.110 0.167 0.469 0.463 0.460 0.463 0.460 0.463 0.460 0.463 0.460 0.463 0.460 0.463 0.460 0.463 0.460 0.463 0.460 0.463 0.460 0.463 0.460 0.463 0.460 0.463 0.460 0.463 0.460 0.463 0.460 0.463 0.460 0.4629 0.463 0.460 0.463 0.460 0.4629 0.463 0.460 0.460 0.463 0.460 0.46	55135 55137 55138 55139 55140 55140 55142 55143 55145 55145 55146 56137 56138 56139 56139 56139 56140 56141 56142 56143 56144 56143 56144 56145 56145 56145 56146 56147 56148 57139 57140 57140 57145 57145 57146 57149 57148 57149 57140 57149 57140 57147	0.007 0.351 1.103 2.145 2.980 0.671 0.145 2.980 0.671 0.145 0.0671 0.019 0.001 0.001 0.003 0.029 0.165 1.770 2.894 1.795 2.894 1.795 2.894 1.795 2.894 1.775 2.894 1.775 2.894 1.775 2.894 1.775 2.894 1.775 2.894 1.775 2.894 1.775 2.894 1.775 2.894 1.775 2.894 1.775 2.894 1.775 2.894 1.775 2.894 1.775 2.108 2.128 2.108 2.1286 0.012 0.001 2.108 2.1286 0.574 0.026 0.003 0.026 0.003 0.026 0.003 0.026 0.003 0.026 0.003 0.026 0.001 0.002 0.002 0.001 0.002 0.002 0.002 0.002 0.001 0.002 0.002 0.002 0.002 0.001 0.002 0.002 0.002 0.001 0.002 0.002 0.002 0.001 0.002 0.002 0.002 0.001 0.002 0.002 0.001 0.002 0.0001 0.00200000000	6.850 6.857 6.071 5.132 4.431 3.481 1.967 0.685 0.149 0.019 0.001 6.850 6.100 5.299 5.088 5.250 4.920 3.578 1.944 0.667 0.160 0.023 0.002 5.350 5.354 4.859 1.546 0.592 0.525 0.023 0.022 5.354 1.546 0.592 0.525 0.023 0.022 5.350 5.354 1.546 0.592 0.023 0.023 0.525 0.023 0.022 5.350 5.354 1.546 0.592 0.023 0.023 0.022 5.300 5.354 1.546 0.595 0.023 0.025 0	61 150         61 151         61 151         61 153         61 155         61 155         61 156         61 157         61 158         62 147         62 147         62 151         62 152         62 153         62 155         62 156         62 157         62 158         62 157         62 158         62 159         62 159         62 159         63 153         63 153         63 153         63 153         63 157         63 158         63 159         63 159         63 160         63 161         64 156         64 156         64 156         64 156         64 156         64 156	0.0144 0.057 0.057 0.146 0.211 0.215 0.138 0.054 0.001 0.000 0.000 0.000 0.005	1.150 0.889 0.695 0.461 0.304 0.159 0.058 0.014 0.002 2.250 1.430 0.480 0.480 0.480 0.480 0.480 0.254 0.161 0.083 0.035 0.008 0.008 0.001 0.890 0.480 0.254 0.161 0.083 0.008 0.001 0.890 0.480 0.008 0.001 0.890 0.480 0.254 0.161 0.035 0.008 0.001 0.890 0.460 0.161 0.003 0.008 0.001 0.890 0.254 0.161 0.003 0.008 0.001 0.890 0.161 0.003 0.008 0.001 0.890 0.161 0.008 0.000 0.480 0.161 0.008 0.001 0.890 0.254 0.161 0.008 0.001 0.890 0.256 0.008 0.
901:15-           50117           50118           50117           50120           50121           501223           501245           50125           50126           50127           50128           50129           50131           50132           50133           50134           51125           51126           51127           51128           51129           51129           51120           51121           51122           51123           51124           51125           51126           51127           51128           51129           51130           51131           51132           51131           51132           51131           51132           51131           51132           51133           51134           51137           52128           52129	0.000 0.000 0.000 0.000 0.001 0.001 0.005 0.016 0.047 0.132 0.255 0.404 0.497 0.533 0.316 0.128 0.035 0.000 0.000 0.000 0.000 0.002 0.014 0.628 0.592 1.409 1.883 1.763 1.164 1.592 0.022 0.002 0.002 0.014 0.592 1.409 1.883 1.763 1.164 1.592 0.022 0.002 0.002 0.014 0.592 1.409 1.883 1.763 1.164 1.597 0.1517 0.1597 0.022 0.002 0.002 0.002 0.002 0.002 0.004 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.00000 0.0000 0.0000 0.00000 0.00000 0.00000 0.00000000	0.095 0.097 0.087 0.086 0.086 0.086 0.086 0.092 0.097 0.110 0.129 0.165 0.266 0.266 0.367 0.481 0.537 0.552 0.320 0.128 0.035 0.092 0.110 0.167 0.280 0.429 0.429 0.429 0.429 0.429 1.129 1.291 1.991 1.2203 1.892 1.199 0.523 0.002 0.167 0.2280 0.022 0.167 0.2280 0.022 0.167 0.2280 0.022	55135 55137 55138 55140 55140 55142 55142 55143 55145 55145 55145 55145 55145 56137 56138 56137 56138 56140 56141 56142 56143 56144 56145 56145 56145 56145 56145 56145 56145 56145 56145 56145 56146 56147 56145 56145 56145 56145 56146 56147 56146 56147 56148 57140 57140 57141 57146 57146 57146 57147 57148 57149 57149 57149 57149 57149 57149 57149 57149 57149 57149 57149 57149 57149 57149 57150 58141	0.007 0.351 1.103 2.148 2.948 2.948 2.948 2.948 2.948 2.948 2.948 2.948 2.954 0.671 0.149 0.001 0.003 0.003 0.003 0.003 0.003 0.003 0.003 0.003 0.003 0.003 0.678 0.678 0.678 0.028 0.002 0.001 0.002 0.001 0.002 0.001 0.002 0.002 0.001 0.00200000000	6.850 6.857 6.071 5.132 4.431 3.481 1.967 0.685 0.149 0.019 0.001 6.850 6.850 6.100 5.299 5.088 5.250 4.920 3.578 1.944 0.697 0.160 0.023 0.002 5.350 5.394 4.849 4.052 2.839 1.546 0.526 0.023 5.350 5.394 4.849 4.952 2.839 1.546 0.526 0.025 5.350 5.350 5.350 5.350 5.100 5.3596 0.526 0.023 5.002 5.3596 0.526 0.023 5.350 5.350 5.350 5.350 5.350 5.002 5.350 5.003 5.0003 5.	61150 61151 61152 61153 61155 61155 61156 61157 6155 62147 62149 62151 62152 62153 62153 62154 62155 62157 62158 62157 62158 62157 62158 62159 63151 63153 63155 63156 63157 63158 63159 63160 63161 64155 64156 64157 64158	□ • • • • • • • • • • • • • • • • • • •	1.150 0.889 0.695 0.461 0.304 0.159 0.058 0.014 0.002 2.250 1.430 0.890 0.700 0.480 0.359 0.254 0.161 0.003 0.008 0.008 0.008 0.008 0.008 0.008 0.008 0.008 0.008 0.008 0.008 0.008 0.008 0.008 0.003 0.008 0.003 0.008 0.003 0.003 0.003 0.260 0.180 0.180 0.180 0.256 0.003 0.003 0.003 0.003 0.260 0.180 0.180 0.180 0.260 0.180 0.180 0.260 0.180 0.260 0.180 0.260 0.180 0.260 0.180 0.260 0.180 0.260 0.180 0.260 0.180 0.260 0.180 0.180 0.260 0.180 0.180 0.180 0.260 0.180 0.260 0.180 0.260 0.180 0.260 0.180 0.260 0.180 0.260 0.180 0.260 0.180 0.260 0.180 0.260 0.180 0.260 0.180 0.260 0.180 0.260 0.180 0.260 0.180 0.180 0.260 0.180 0.260 0.180 0.260 0.180 0.260 0.180 0.260 0.180 0.260 0.180 0.260 0.180 0.260 0.180 0.260 0.180 0.260 0.180 0.260 0.180 0.013 0.003 0.013 0.003 0.014 0.025 0.013 0.025 0.014 0.180 0.125 0.012 0.0125 0.01
90118           50117           50118           50118           50121           50123           50124           50123           50124           50123           50124           50123           50124           50125           50126           50127           50131           50132           50133           50134           51125           51126           51127           51128           51127           51128           51127           51128           51127           51128           51130           51131           51132           51133           51134           51135           51130           51131           51132           51133           51134           51135           51136           52128           52128           52120           52120	0.700 0.700 1.307 0.300 3.307 0.300 3.307 0.300 0.001 0.016 0.047 0.132 0.404 0.497 0.404 0.497 0.533 0.404 0.497 0.533 0.404 0.497 0.533 0.316 0.128 0.005 0.005 0.005 0.002 0.002 0.014 0.0592 1.409 1.409 1.483 1.164 0.517 0.159 0.022 0.002 0.002 0.015 0.517 0.159 0.022 0.002 0.002 0.002 0.002 0.002 0.015 0.517 0.159 0.022 0.002 0.002 0.002 0.002 0.002 0.002 0.002 0.005 0.002 0.005 0	0.095 0.097 0.086 0.086 0.086 0.086 0.089 0.097 0.110 0.129 0.165 0.266 0.367 0.461 0.537 0.461 0.552 0.320 0.128 0.035 0.006 0.092 0.128 0.035 0.006 0.092 0.110 0.167 0.280 0.429 0.441 0.429 0.441 0.429 0.441 0.429 0.441 0.429 0.441 0.429 0.441 0.429 0.441 0.429 0.441 0.429 0.441 0.429 0.441 0.429 0.441 0.429 0.441 0.429 0.441 0.429 0.441 0.429 0.441 0.429 0.441 0.429 0.441 0.441 0.4429 0.4429 0.441 0.4429 0.4429 0.44300 0.44300 0.44300 0.4430000000000	55135 55137 55138 55140 55140 55142 55142 55143 55145 55145 55145 56137 56138 56137 56138 56139 56140 56141 56140 56140 56140 56143 56144 56145 56144 56145 56148 57140 57141 57145 57146	0.007 0.351 1.103 2.145 2.988 2.970 1.856 0.671 0.149 0.001 0.003 0.003 0.003 0.003 0.003 0.003 0.003 0.003 0.003 0.003 0.003 0.003 0.676 0.556 1.775 2.994 1.795 2.994 1.795 0.678 0.022 0.001 0.012 0.022 0.001 2.108 2.148 0.574 0.575 0.026 0.002 0.002 0.001 2.108 2.148 0.574 0.575 0.026 0.002 0.00000000	6.850 6.851 6.071 5.132 4.431 3.481 1.967 0.685 0.149 0.019 0.001 6.850 6.850 6.100 5.299 5.088 5.250 4.920 3.578 1.944 0.697 0.160 5.350 5.394 4.849 4.052 2.5946 0.5946 0.5946 0.5926 0.5946 0.5926 0.5946 0.5926 0.5926 0.023 0.023 0.002 5.300 5.350 5.394 4.849 4.859 1.5466 0.5926 0.023 0.025 5.300 5.100 5.350 5.394 4.849 4.859 1.5466 0.5926 0.023 5.100 5.350 5.100 5.350 5.400 0.023 5.100 5.350 5.400 0.023 5.100 5.350 5.400 0.024 0.025 5.003 5.100 5.300 5.003 5.100 5.300 5.003 5.100 5.300 5.003 5.003 5.000 5.003 5.000 5.400 4.900	61150 61151 61151 61153 61155 61156 61157 61158 62147 62149 42150 62151 62152 62153 62153 62156 62157 62156 62157 62156 62157 62156 62157 62156 63151 63153 63155 63156 63157 63158 63157 63158 63157 63158 63157 63161 63161	- 0.014 0.057 0.146 0.211 0.215 0.138 0.055 0.014 0.002 0.000 0.000 0.005	1.150 0.889 0.695 0.461 0.304 0.159 0.058 0.014 0.002 2.250 1.430 1.430 0.890 0.480 0.359 0.254 0.161 0.083 0.008 0.003 0.260 0.008 0.003 0.260 0.008 0.003 0.260 0.008 0.003 0.003 0.005 0.

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#### APPENDIX

### IBM-7094 PROGRAM FOR ESTIMATION OF FISSION PRODUCT YIELDS (FORTRAN II LANGUAGE)

Note: In addition to the information shown in Table III of this report, the computer provides:

1. Printout of selected isomer yields that are of importance for fission product heating calculations.

2. Punched card output of nuclide and isomer yields.

3. Printout of mass chain yield, most probable Z, and first stable

Z versus A.

4. Printout of fissionable nuclide, fission energy (E) and Gaussian distribution characteristic ( $\sigma$ ) used in the calculations.

Necessary inputs are:

1. Mass chain yields.

2. Identification of fissionable nucleus ( $23 \equiv U-233$ ,  $25 \equiv U-235$ ,  $28 \equiv U-238$ , and  $49 \equiv Pu-239$ ).

- 3. σ
- 4. E

#### COMMONYC.Y1

COMMONYC.YI 01HENSI DNZPI 1701. YCI 75. 1701. Y1175. 1701. F(1701. A(17:1) 1.21751. ZMAX(1701 01HENS10NAH(18) +AG(18) + 2M(18) + YIM/18) + YIG(18) + YCH118) + 14661181.4A1151.481151.41A1151.4181151.4CA1151.4CA1151.4CB1[5] 1 FORMAT(1266.3) 89 FURMATI 2.8X.215.10X.2E10.31 90 FORMATI 2.8X.2F6.1.9X.2E10.31 LOU FORMATE 24HO IOU FORMAT(24HO PERCENT YIELD) IOI FORMATI30HO Z A INCEPENDENT CUMULATIVE) 102 FORMATI 213. F4.3. F11.31 103 FORMAT(4F9.3) 104 FORMATE 34HO 105 FORMAT( 18F4-01 F 7 P ZMAXI 106 FORMAT(14.2F4.2.4115) 107 FORMATI 35H FISSION OF 2 108 FORMATI 3X. F12.0. F7.0. F6.1. F8.21 ENERGY SIGMAL ILO FURMATIZX.256.1.2510.3) ILI FURMATIZX.256.1.2510.3 ILI FURMATIZONOISOMERS Z A INCEPENDENT CUMULATIVEJ ZF=ATOMIC NUMBER с AF≃MASS NUMBER+I FIALEMASS CHAIN YIELD OF WEAVER ET AL YC=CUMULATIVE YIELD OF NUCLIDE Z.A c с YI-INDEPENDENT YIELD OF NUCLIDE Z.A c E-MEDIAN ENERGY OF NEUTRON CAUSING FISSION. MEY SIGECHARACTERISTIC UF GAUSSIAN DISTRIBUTION ZMAX=FIRST STABLE NUCLIOE C c -READINPUTTAPEID.106.10PT.SIG.E.SPARE1.SPARE2. ISPARE 3. SPARE4 13 READ(NPUTTAPE IO.1. (F(1A).1A=76.161) IF|10PT-23142.41.42 41 ZF=92.0 AF=234.0 C1=0.115 GNUT=2.50 42 CUNT (NUE IF|10PT-25144.43.44 43 ZF=92.0 AF=236.0 CI≈0.135 GNUT=2.43 44 CUNTINUE IF(10PT-28146.45,46 45 ZF=92.0 AF=239.0 C1=0.138 GNUT=2.41 46 CONTINUE IF(IUPT-49113.47.13 47 2F=94.0 AF=240.0 C1=0.111 GNUT=2.87 UELZ=0.5•12F-92.01-0.21•1AF-236.01+0.19•(GNUT+C1+E-2.43) 2 ALIAI+FLUATFLIAI

- 111 314=76.100

3 ZPIIA1=0.4237+A1IA1-2.19+UELZ 111414=101-134 4 ZP(1A)=0.3494.A()A)+5.24+DELZ IIIJ51A=135.(61 > 2P11A=0.4331\*A11A1-6.06+DELZ 101112=30.76 UU1114.76.161 20021=FLOATFI121 (F121121-241141+0.5110.6.6 111 YC112-1A1=F11A1+(G-5-0-5+ERR16911ZP11A1-211Z1-0-51 GUTUII 6 YC(12,1A)=F]1A] +(U+5+0+5+EKR169(12(121-2P)1A)+0+5) 11 CONTINUE 00712=30.70 YC(12.751=0.0 NU71A=76.101 YC129.1A1=0.0 7 YI112.1A)=YC(12.1A)-YC(12-1.1A) READINPUTTAPL9. 105.12MAX(1A).1A=76.1611 10401A=76.161 IZM=ZMAXIIAI 12M1=(ZM+1 0U40(2=12M1.70 40 YC112.1A1.0.0 AFI=AF-1.0 WAITEOUTPUITAPE9,107 WRITEOUTPUTTAPE9,108.2F.AFI.E.SIG WRITEOUTPUTTAPE 9.104 WRITEOUTPUTTAPE9.103. (A(IA).F(IA).ZP(IA).Z MAX(IA/.IA=76.161) WR ITEOUTPUTTAPE 9. 101 DO1212=30.70 D01212=30.70 D0121A=76-161 IF (YC 112.1A1-0.001112.8.8 8 WR ITEOUTPUTTAPE9-102.12.1A.YI112.1A1.YC112.1A1 WRITEOUTPUTTAPE11.89.10PT.12.1A.YI112.1A1.YC112.1A1 CONTINUE 12 CONTINUE YIM(K)=0.0 YCHIK1=0.0 AG (K 1=0.0 ZM(K)=0.( YIG(K)=0.0 YCG(K1=0.0 56 AM(K)=0.0 0057K=1.15 44(K)=0.0 A8 (K1+0.0 YIA(K)=0.0 YIU(K)=0.0 YCAIK]=C.O 57 YC6(K1=0.0 ZM111=34.0 ZM(2)=36.0 ZM(31=36.0 ZM141=39.0 ZM151=41.0 ZM161=41.0

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ZM181=43.0 ZM(9)=45.0 ZM1101=45.0 ZM1111=52.0 ZM1121=52.0 ZM(13)=52.0 ZM1141=52.0 ZM1151=53.0 ZM1161=54.0 ZH(17)=54.0 ZM(18)=56.0 AH(11=83.0 AH(21=83.0 AM131=85.0 AH141=91.0 AM151=95.0 AN161=97.0 AH(71=99.0 AM181=102.0 AM(91=103.0 AM(10)=105.0 AM1111=127.0 AH1121=129.0 AM1131=131.0 AM1141=133.0 AH(15)=131.0 AM1161=133.1 AM1171=135.0 AM(18)=137.0 D051K=1.18 51 AG(K)=AM(K)+0.1 D052K=11.15 AA(K)=AM)K1+0.1 52 AB(K]=AMJK1+0.2 YIM111=0.5+Y1(34:83) Y(M(21=0.5+Y1136-831 YIM(31=0.5+Y1136-851 YIM(4)=0.5+Y1(39.91) Y1M 51=0.5+Y1(41.95) YIMI61=0.5+Y((41.97) YIM(71=0.5+YI(43-99) YIM(81=0.5+Y1143.102) Y1M191=0.5+Y1(45.103) YIM(101=0.5+Y1(45.105) YIM1111=0.5+Y1(52.1271 YIM(12)=0.5+YI(52-1291 YIM(131=0.5+Y1(52.131) Y1H(14)=0.5+Y1(52-133) YIM(16)=0.5+Y1(54+133) YIM(171=0.5+Y1(54.135) YIMI181=0.5+Y1(56+137) 0053K=1.18 53 YIG(K)=YIMIKI 0054K=11.15 YIA(K)=YIM(K) 54 YIN(K)=0.0 YCM(11=0.56+)YC(34.83)-Y1[34.83))+Y1M111 YCG(1)=0.44+(YC(34.83)-Y1(34.83))+Y1#111

YCH(21=YC(36.831-Y1H121 YCG(2)=YC(36.83)

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ZM(7)=43.0

YCH(3)=YC)36.851-YIM13/ YCG131=0.19+YCM131+Y1M(3) YCH(41=0.6+1YC139.911-Y1(39.91)1+Y1H(41 YCG141=YC139.911 YCM151+0.03+1YC(41.951-Y1(41.951)+Y1M(5) YC6151=YC(41.951 YCH(61=0.98+1YC141.971-YI141.9711+Y1M(61 YCG161=YC141.971 YCM(71=0.76+1YC(43.991-Y1(43.991)+Y1M(7) YCG(71=YC(43.991 YCH(81=0.5+YC(43.102) YCG(81=YCM181 YCM(91=YC(45.103)-YIM(9) YCG(91+YC145+103) YCM(10)=YC(45.105)~YIM)10) YCG(101=YC145-1051 YCH(111=0.22+1YC152+1271-Y1(52+12711+Y1H111) YCA(111=0.78+1YC(52.1271-Y1(52.12711+Y1M111) YC8(11)=0.98+YCM(11) YCM1121=0.36+1YC(52.1291-Y1(52.12911+Y1M(121 YCA1121=0.04+(YC(52.124)-Y)(52.129))+YIM(12) YC5(12)=YCM1121 YCH(13]=0.15+1YC(52+131)-Y|152+131)1+Y1H1131 YCA1131=0.85+1YC(52-1311-Y1(52-13111+Y1H1131 YCA(13)=0.2.YCM1131 YCH(14)=0.72+1YC(52-1331-Y1(52-1331)+Y1H(14) YCA(14)=0.28+(YC)52.133)-Y1(52.133))+Y1H(14) YCH(14)=0.13+YCH(14) YCA(15)=YCA1131+YC6(13) YCB(151=0.8+YCM(13) YCM(16)=0.024+)YC154.1331-Y1154.13311+Y1M(16) YCG(16)=YC(54.133) YCM1171=0, 3+1YC154.1351-Y1(54.1351)+Y1M(17) YCG(17)=YC(54.135) YCM(18)=0.92+(YC(56.1371-Y1(56.13711+Y1M118) YCG1181=YC(56,1371 WR (TEOUTPUTTAPE9.111 DU62K=1.18 IF1YCHIK1-0.001160.61.61 61 WRITEOUTPUTTAPE9.110.12M(K),AM)KI.YIM(KI.YCH)K)) WR (TEOUTPUTTAPE 11.90. (IOPT. ZHIKI. AHIKI. YIHIKI. YCH(KI) 60 CONTINUE IF (YCG) K1-6.001162.63.63 63 WRITEOUTPUTTAPE9.110.(ZMIK1.AGIK1.YIG(K1.YCGIK1) WRITEUUTPUTTAPEI1.90.(1UPT.ZM(K).AG(K),YIG(K).YCG(K)) 62 CUNTINUE 11166K=1.15 IFIYCA1K1-0.001164.65.65 65 WRITEDUTPUTTAPE4.110.(ZM(K).AA(K).YIA(K).YCA)K)) WR (TEDUTPUTTAPE 11.90. ) 10PT. ZNIKI. AA (KI. YIA (KI. YCA (KI) CONTINUE IF (YC81K1-0.001166.67.67 WRITEOUTPUTTAPE9.110.12M[K].AB(K].YIB(K1.YCB)K)] WKITEDUTPUTTAPEI1.90.110PT.ZMIKI.ABIKI,YIB(KI.YCB(KI)

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66 CONTINUE

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ENUI1.0.0.0.0.0.0.0.0.1.0.0.0.0.01

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