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FAST NEUTRON CAPTURE CROSS SECTIONS FOR FISSION PRODUCT ISOTOPES

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F. Schmittroth
and
R. E. Schenter

August 1973

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FOR FISSION PRODUCT ISOTOPES

F. Schmittroth and R. E. Schenter

ABSTRACT

Calculated average capture cross sections are given from 10 eV to 15 MeV to be used as a basis for revising and extending the ENDF/B-IV data files. Thirty-nine fission product isotopes, plus Au^{197}, are included. The results were obtained by statistical model calculations that were adjusted as seemed necessary by the available capture data. For those isotopes studied earlier, the major revision is the use of new estimates for the neutron resonance spacings. Integral cross sections are computed and compared with values from the Coupled Fast Reactivity Measurement Facility (CFRMF).

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I. INTRODUCTION

In this study, we present fast neutron capture cross sections in the energy range 10 eV to 15 MeV to be used as a basis for revising and extending ENDF/B evaluations. In particular, as shown in Table 1, 39 fission product isotopes important in fast reactor studies were considered, 19 of which are in ENDF/B version III[1] and 20 additional nuclei which will be included in ENDF/B version IV. Although it is not a fission product, Au^{197} was also included, since it is sometimes used as a standard, and a wealth of data exists for its capture cross section.

Little or no data exist for most of these isotopes[1] so that statistical model calculations were used to obtain most of the needed cross sections. Nevertheless, our general philosophy was to utilize the data to the maximum extent possible. The statistical formalism is reviewed in Reference 2, along with several important corrections, such as width fluctuation effects and direct and collective capture. Detailed studies documented in Reference 2 indicate the general validity of the theoretical approach.

In the following sections, we describe the input data for the calculations as well as neutron capture data. A comparison with integral values from the Coupled Fast Reactivity Measurement Facility (CFRMF) is also included. For the purpose of comparison, the work of other evaluations[3,4] is presented in the Appendix.

II. ISOTOPES WITH NO CAPTURE DATA

The uncertainties in the theoretical cross sections are governed more by the necessary input parameters than by the calculation itself[2]. The most crucial parameter is the ratio of the radiative width, Γ_γ, to the observed s-wave neutron resonance spacing, D_{obs}. The calculations for which no capture data exist thus fall into two categories - those where the ratio Γ_γ/D_{obs} is well known and those for which a systematic or theoretical value must be used. For both these cases, we relied strongly on a recent study[5] of observed resonance spacings. The values for D_{obs} can range over several orders of magnitude, and, for most isotopes, the uncertainties in the ratio, Γ_γ/D_{obs}, are mainly due to the uncertainties in D_{obs}. Measured values for Γ_γ are fairly accurate by comparison. Even when experimental values of Γ_γ are unavailable, the mass systematics of Γ_γ are reliable enough to provide useful values through simple interpolation.

Reference 5 was used both as a source of evaluated values of D_{obs} and to provide theoretical values when experimental values were unavailable. Also, the evaluation procedures described in Reference 5 were used to process new resonance data for a few cases. In these procedures, special care was given to the problems of missed resonances and the identification of p-wave resonances. An outstanding example is provided by Mo^{98}. An earlier value of D_{obs} (1) was low by a factor of 4 because several p-wave resonances were misidentified. The result was a theoretical cross section that overpredicted the experimental values by a factor of 2 or 3. The newer evaluation of D_{obs} (5) removes the discrepancy.

The main distinction between the revised calculations in this report as compared to the earlier evaluations in Reference 1 is the use of theoretical values for D_{obs} based on Reference 5. As in the earlier evaluations, values for Γ_γ were obtained from resolved resonance parameters and interpolation procedures. Moldauer's optical potential(6) was used to calculate the neutron transmission coefficients, while Axel's estimate(7) was used to obtain the energy dependence of the radiation width. As described in Reference 1, Gilbert and Cameron's level density formulation was used. The results of similar calculations are now discussed in the next section for those nuclei that have some capture data available.

III. ISOTOPES WITH CAPTURE DATA

Table 1 indicates that 18 of the nuclei in this report have some neutron capture data. The primary data source was the SCISRS(8) data file obtained from Brookhaven National Laboratory and augmented in a few cases by values obtained via the CINDA index(9). The experimental data are depicted in Figures 1 through 40, and compared with calculated values. The theoretical results for those nuclei with no capture data are also included in the same set of figures. Laboratory codes and dates appropriate to the SCISRS file and the CINDA index are used to identify the data.

The calculated curves were used to supplement the data in various ways according to the circumstances. As can be noted from the graphs, both the quality and the quantity of the data vary considerably, all the way from a single measured point (as for Ce^{140}) to a large amount of relatively consistent data (as for I^{127}). In cases where very limited data exist (as for Ce^{140} or for Zr^{96}), the data are used solely to normalize the calculated values, while the energy dependence of the cross sections is given by the theory. Renormalization of the theory was accomplished by an adjustment of the ratio Γ_γ/D_{obs}. Usually D_{obs} was modified, since it is generally more uncertain than Γ_γ (as in the examples of Ru^{104} and Pd^{108}). Nevertheless, in some cases, Γ_γ was altered. An example is Mo^{98}, where non-statistical[(10)] and ℓ-dependent[(2)] effects contribute to cause difficulty in obtaining a precise number for Γ_γ. (The uncertainty here in Γ_γ is small compared to the discrepancy alluded to above where an incorrect value of D_{obs} for Mo^{98} gave computed cross sections that were a factor of 3 high.)

For Mo^{95} and Mo^{97}, the data were used to provide detailed structure in the capture cross section, especially for the lower energies where resonance structure may be observed. Here, and for a few other isotopes, the computed cross sections were used only to extend the range of energies covered by the experimental values. The cross sections that were fitted to the experimental points are shown as dashed lines in the graphs to distinguish them from the calculated values given by solid curves. In actual evaluations, of course, resolved resonance parameters may be used in some instances to describe the cross sections for the lower energies.

The theoretical results were also useful to connect experimental values given over separated energy ranges (Rb^{85} for example), and to effect an evaluation where different data sets are somewhat inconsistent (as in Mo^{100}). Finally, for at least one case (La^{139}), the data appear both complete enough and consistent enough to allow one to dispense with the theoretical values.

The dashed curves displayed in the graphs, which represent an evaluation of the data, were obtained in the following manner. First, the data were plotted with computer graphics. Then, an evaluated curve was drawn through the data by eye. Least-squares and similar curve-fitting procedures were not used because of the difficulty in applying them to inconsistent data sets. Numerical values for the evaluated curves were then obtained by the use of a pen-type digitizer that converts pen locations into desired x-y coordinates. The dashed curves represent computer plots of the digitized curves.

Although one can always adjust the theory to experiment for an evaluation, it is worthwhile to remark that, for I^{127} and Au^{197}, no such adjustment was made. Not only does a relatively large amount of capture data exist for both these isotopes, but Γ_γ and D_{obs} are well known also. Because the experimental uncertainties in Γ_γ and D_{obs} are small, these two cases provide a good test of the ability of the statistical theory to predict capture cross sections on an absolute basis. The overall agreement is good for energies up to 1 MeV (See Figures 28 and 40). Above 1 MeV, a number of uncertainties(2) can lead to poorer results.

For La^{139}, the agreement between theory and experiment is poorer. The data are not as extensive here as for iodine and gold. Nevertheless, especially for energies in the range 10 keV to 1 MeV, a clear-cut discrepancy seems to exist. For lower energies, one would not expect the statistical results to reproduce the resonance structure that begins to appear in the data. Because La^{139} is magic in neutrons (N = 82), the poorer theoretical results are perhaps not too surprising. Magic and near magic nuclei behave somewhat like light nuclei. The radiation width may fluctuate, D_{obs} is relatively large, and non-statistical effects become more important.

IV. INTEGRAL RESULTS

Just as in other areas of reactor studies, integral results can also play an important role in the evaluation of fission product cross sections. Perhaps more so, since, for fission products, theory defines the shape of the capture cross section better than the magnitude. The coupled fast reactivity measurement facility(11) (CFRMF) at ANC has a program to obtain integral cross sections for fission products important to fast reactors, and it is desirable to compare our results with theirs.

Integral cross sections were computed from

$$\bar{\sigma}_c = \frac{1}{\phi_T} \int \phi(E)\ \sigma(E)\ dE \qquad (1)$$

where

$$\phi_T = \int \phi(E)\ dE. \qquad (2)$$

The flux, ϕ, was obtained[12] from a reactor physics calculation and normalized by dosimetry foils. The differential cross sections used are those shown in Figures 1 through 40. Where a choice existed, the fitted cross sections were used in preference to the theoretical values. When the computed cross sections were used in Equation (1), the lower energy limit was 10 eV, and when the fitted cross sections were used, the lower limit was determined by the data. Typical contributions to the integrals from the range of 10 eV to 100 eV were about 5% of the total. Contributions from below 10 eV were neglected.

The results are shown in Table 43. Unadjusted experimental data from CFRMF[12] are also given for comparison. Specifically, no self-shielding corrections were made. Although there is general agreement for most isotopes, the integral cross section for I^{127} is 34% lower than the calculated value, even though the calculated differential cross section is in good agreement with the differential data. Nevertheless, there is no clear discrepancy. The differential data are likely to be uncertain by 10 to 20%, enough to bring the computed integral cross section within the limits of the rather large experimental uncertainty for the integral result. The integral result for Ru^{102} indicates a slight downward adjustment of the differential data. Finally, for Xe^{134}, the integral value from CFRMF implies an upward adjustment of the differential cross section. This result is not unexpected, since a theoretical resonance spacing, D_{obs}, was used to compute the differential cross section. A reliable estimate for D_{obs} is particularly difficult here, since Xe^{134} is at the edge of a deformed region of nuclei.

A further point must be considered, however, in the calculation of the integral cross section, $\overline{\sigma}_c$, as given by Equation (1). Except as they appeared in the fitted cross sections, resonance effects were neglected, and only the energy-averaged cross sections as obtained from the statistical calculations were used to compute $\overline{\sigma}_c$ from Equation (1). Large errors can occur if the resonance spacing, D_{obs}, is so big that only a few resonances contribute an appreciable fraction to the total integral value. The detailed location of the isolated resonances then becomes important. Calculations based on the formalism in Reference 13 and using the CFRMF flux spectrum were made in order to estimate the uncertainties in computed integral values due to the sole use of average cross sections. The results may be summarized as follows:

$$\frac{\sigma_f}{\langle f \rangle} \simeq \sqrt{\frac{D_{obs}, \text{eV}}{100}} \,, \qquad (3)$$

where $\sigma_f/\langle f \rangle$ is the fractional uncertainty in the computed integral value at the one-sigma level (f represents the integral value). As an example, the average resonance spacing, D_{obs}, for I^{127} is 14.7 eV, so that we find

$$\frac{\sigma_f}{\langle f \rangle} \simeq 0.04. \qquad (4)$$

Less than a 4% uncertainty occurs due to the use of an average cross section throughout the resolved resonance region. But for Xe^{134}, with an estimated D_{obs} of 14 keV, the fractional uncertainty is

$$\frac{\sigma_f}{\langle f \rangle} \simeq 1. \qquad (5)$$

In order to reduce this large uncertainty, detailed data on resolved resonances must be utilized. Even if D_{obs} were only half as large (a likely possibility), the fractional uncertainty would still be as large as $1/\sqrt{2} \simeq 0.7$.

V. SUMMARY

Calculated average capture cross sections are given from 10 eV to 15 MeV to be used as a basis for revising and extending the ENDF/B-IV data files. Thirty-nine fission product isotopes and Au^{197} were studied. About half of these cases represent revisions of earlier work, and about half are new studies. The calculations were based on the statistical model and include width fluctuation corrections, as well as several other corrections. For example, direct and collective capture were estimated. Where available, experimental capture data were used to modify the computed cross sections as seemed necessary.

The primary revision of those isotopes for which no capture data exist was the use of new sets of neutron resonance spacings. For some, the revised spacing, D_{obs}, was obtained from a new evaluation of resolved resonances. For the rest, a new procedure for estimating D_{obs} was used.

Finally, a preliminary comparison of computed integral cross sections was made with experimental values obtained from the CFRMF. The results indicate that some adjustment of the differential values is in order and that additional integral measurements would be useful.

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Table 1

List of Isotopes

	Isotope	New or Revised	Capture Data
1	36 Kr 83		
2	37 Rb 85	New	Yes
3	38 Sr 89	New	
4	39 Y 91	New	
5	40 Zr 92	New	Yes
6	40 Zr 93	New	
7	40 Zr 94	New	Yes
8	40 Zr 95		
9	40 Zr 96	New	Yes
10	41 Nb 95		
11	42 Mo 95		Yes
12	42 Mo 97		Yes
13	42 Mo 98		Yes
14	42 Mo 100		Yes
15	44 Ru 101		
16	44 Ru 102		Yes
17	44 Ru 103		
18	44 Ru 104		Yes
19	44 Ru 106		
20	46 Pd 105		
21	46 Pd 106		
22	46 Pd 107		
23	46 Pd 108	New	Yes
24	46 Pd 110	New	Yes
25	48 Cd 111	New	
26	51 Sb 121	New	Yes
27	51 Sb 125	New	
28	53 I 127	New	Yes
29	53 I 129	New	
30	54 Xe 131		
31	54 Xe 132	New	
32	54 Xe 134	New	
33	54 Xe 136	New	Yes
34	55 Cs 135		
35	55 Cs 137		
36	57 La 139		Yes
37	58 Ce 140	New	Yes
38	58 Ce 142	New	Yes
39	58 Ce 144	New	
40	79 Au 197		

TABLE 2. INPUT PARAMETERS

GG = RADIATION WIDTH (MV)
DOBS = S-WAVE LEVEL SPACING (EV)
BN = NEUTRON BINDING ENERGY (MEV)
A = LEVEL DENSITY PARAMETER
P = PAIRING ENERGY

TARGET NUCLEUS	GG	DOBS	BN	TARGET NUCLEUS A	TARGET NUCLEUS P	COMPOUND NUCLEUS A	COMPOUND NUCLEUS P
36 KR 83	220.	.179+03	10.5193	11.20	1.17	10.19	2.63
37 RB 85	215.	.308+03	8.6374	10.18	1.46	8.81	.00
38 SR 89	146.	.990+03	7.7884	8.00	1.24	10.64	1.96
39 Y 91	88.	.643+03	6.5524	10.78	.72	11.45	.00
40 ZR 92	210.	.570+04	6.7497	10.34	1.92	11.42	1.20
40 ZR 93	194.	.379+03	8.1984	11.42	1.20	12.10	2.32
40 ZR 94	100.	.376+04	6.4675	12.10	2.32	11.95	1.20
40 ZR 95	200.	.177+03	7.8381	11.95	1.20	14.52	2.49
40 ZR 96	220.	.350+04	5.5756	14.52	2.49	14.19	1.20
41 NB 95	200.	.534+02	6.9313	12.30	1.12	13.24	.00
42 MO 95	350.	.114+03	9.1567	11.90	1.28	12.49	2.40
42 MO 97	220.	.775+02	8.6422	13.27	1.28	14.39	2.57
42 MO 98	150.	.101+04	5.9187	14.39	2.57	16.05	1.23
42 MO 100	150.	.134+04	5.3901	16.81	2.22	17.22	1.23
44 RU 101	192.	.183+02	9.2161	14.95	1.28	14.93	2.22
44 RU 102	290.	.611+03	6.2475	14.98	2.22	16.21	1.28
44 RU 103	170.	.160+02	8.8873	16.21	1.28	16.56	2.52
44 RU 104	160.	.570+03	5.9765	16.56	2.52	17.22	1.28
44 RU 106	145.	.123+04	5.4534	17.09	2.53	17.32	1.28
46 PD 105	153.	.101+02	9.5474	15.81	1.35	16.08	2.59
46 PD 106	145.	.419+03	6.5323	16.08	2.59	16.44	1.35
46 PD 107	140.	.109+02	9.2275	16.44	1.35	16.69	2.60
46 PD 108	98.	.290+03	6.1494	16.69	2.60	18.42	1.35
46 PD 110	150.	.900+03	5.7434	17.13	2.49	17.34	1.35
48 CD 111	120.	.524+02	9.3996	15.85	1.36	15.86	2.50
51 SB 121	95.	.136+02	6.7982	16.41	1.24	16.54	.00
51 SB 125	131.	.498+02	6.1264	15.71	1.09	15.18	.00
53 I 127	120.	.147+02	6.7971	18.04	1.09	16.06	.00
53 I 129	117.	.260+02	6.4984	16.78	1.20	15.52	.00
54 XE 131	110.	.592+02	8.9323	16.98	1.12	15.02	2.16
54 XE 132	105.	.121+04	6.5315	15.02	2.16	14.24	1.12
54 XE 134	100.	.139+05	6.5609	12.34	1.82	10.06	1.12
54 XE 136	197.	.973+05	4.4594	8.78	1.97	10.70	1.12
55 CS 135	105.	.303+03	6.6114	13.80	.70	11.52	.00
55 CS 137	95.	.291+04	4.3114	10.24	.95	12.16	.00
57 LA 139	75.	.512+03	5.0004	12.48	.85	14.68	.00
58 CE 140	85.	.582+04	5.4384	13.17	2.02	15.09	1.17
58 CE 142	79.	.152+04	5.1054	16.40	1.93	18.44	1.17
58 CE 144	73.	.158+04	4.6434	17.79	2.09	20.26	1.17
79 AU 197	126.	.158+02	6.4974	19.95	.79	17.87	.00

TABLE 3. CAPTURE CALCULATION RESULTS, KR 83

GG(MV) = 220.
DOBS(EV) = .179+03

TARGET NUCLEUS LEVELS

LEVEL	SPIN(PRT)		ENERGY
0	9/2	+	.0000
1	7/2	+	.0093
2	1/2	-	.0416
3	5/2	-	.5620
4	3/2	-	.5710

ENERGY(MEV)	X-SECTION(BARNS)
.10-04	.544+02
.30-04	.250+02
.60-04	.150+02
.10-03	.101+02
.30-03	.419+01
.60-03	.239+01
.10-02	.160+01
.20-02	.975-00
.30-02	.750-00
.50-02	.548-00
.70-02	.449-00
.10-01	.347-00
.20-01	.203-00
.24-01	.175-00
.30-01	.143-00
.50-01	.938-01
.70-01	.708-01
.10+00	.544-01
.13-00	.455-01
.16-00	.400-01
.20-00	.352-01
.24-00	.322-01
.30-00	.292-01
.37-00	.269-01
.45-00	.254-01
.55-00	.243-01
.70-00	.197-01
.85-00	.154-01
.10+01	.129-01
.13+01	.980-02
.16+01	.823-02
.20+01	.668-02
.24+01	.545-02
.30+01	.422-02
.50+01	.134-02
.70+01	.199-02
.10+02	.184-02
.12+02	.195-02
.15+02	.223-02

36 KR 83

TABLE 4. CAPTURE CALCULATION RESULTS, RB 85

GG(MV) = 215.
DOBS(EV) = .308+03

TARGET NUCLEUS LEVELS

LEVEL	SPIN(PRT)		ENERGY
0	5/2	-	.0000
1	3/2	-	.1495
2	7/2	-	.5140
3	3/2	+	.8800

ENERGY(MEV)	X-SECTION(BARNS)
.10-04	.618+02
.30-04	.294+02
.60-04	.181+02
.10-03	.127+02
.30-03	.568+01
.60-03	.337+01
.10-02	.230+01
.20-02	.141+01
.30-02	.109+01
.50-02	.807-00
.70-02	.667-00
.10-01	.547-00
.20-01	.370-00
.24-01	.331-00
.30-01	.286-00
.50-01	.200-00
.70-01	.157-00
.10+00	.123+00
.13-00	.105+00
.16-00	.893-01
.20-00	.763-01
.24-00	.675-01
.30-00	.610-01
.37-00	.552-01
.45-00	.527-01
.55-00	.460-01
.70-00	.392-01
.85-00	.368-01
.10+01	.338-01
.13+01	.267-01
.16+01	.227-01
.20+01	.202-01
.24+01	.173-01
.30+01	.141-01
.50+01	.731-02
.70+01	.367-02
.10+02	.208-02
.12+02	.193-02
.15+02	.206-02

37 RB 85

TABLE 5. CAPTURE CALCULATION RESULTS, SR 89

GG(MV) = 146.
DOBS(EV) = .990+03

TARGET NUCLEUS LEVELS

LEVEL	SPIN(PRT)		ENERGY
0	5/2	+	.0000
1	1/2	+	1.0500
2	3/2	+	2.0000

ENERGY(MEV)	X-SECTION(BARNS)
.10-04	.151+02
.30-04	.587+01
.60-04	.324+01
.10-03	.206+01
.30-03	.859-00
.60-03	.527-00
.10-02	.378-00
.20-02	.244-00
.30-02	.187-00
.50-02	.129-00
.70-02	.989-01
.10-01	.737-01
.20-01	.410-01
.24-01	.351-01
.30-01	.291-01
.50-01	.193-01
.70-01	.151-01
.10+00	.121-01
.13-00	.105-01
.16-00	.947-02
.20-00	.857-02
.24-00	.797-02
.30-00	.736-02
.37-00	.686-02
.45-00	.649-02
.55-00	.624-02
.70-00	.613-02
.85-00	.625-02
.10+01	.653-02
.13+01	.717-02
.16+01	.833-02
.20+01	.101-01
.24+01	.645-02
.30+01	.398-02
.50+01	.262-02
.70+01	.200-02
.10+02	.173-02
.12+02	.174-02
.15+02	.191-02

38 SR 89

TABLE 6. CAPTURE CALCULATION RESULTS, Y 91

GG(MV) = 88.
DOBS(EV) = .643+03

TARGET NUCLEUS LEVELS

LEVEL	SPIN(PRT)		ENERGY
0	1/2	-	.0000
1	9/2	+	.5510
2	3/2	-	.6530
3	5/2	-	.9260
4	7/2	-	1.1860
5	5/2	-	1.3050
6	3/2	-	1.474
7	5/2	-	1.5460
8	7/2	+	1.5830
9	3/2	-	1.9601
10	5/2	+	2.0600
11	1/2	-	2.1600
12	5/2	-	2.2000

ENERGY(MEV)	X-SECTION(BARNS)
.10-04	.154+02
.30-04	.612+01
.60-04	.340+01
.10-03	.221+01
.30-03	.926-00
.60-03	.587-00
.10-02	.435-00
.20-02	.296-00
.30-02	.238-00
.50-02	.174-00
.70-02	.138-00
.10-01	.105+00
.20-01	.613-01
.24-01	.529-01
.30-01	.442-01
.50-01	.300-01
.70-01	.240-01
.10+00	.198-01
.13-00	.179-01
.16-00	.170-01
.20-00	.165-01
.24-00	.163-01
.30-00	.163-01
.37-00	.164-01
.45-00	.165-01
.55-00	.165-01
.70-00	.104-01
.85-00	.827-02
.10+01	.744-02
.13+01	.549-02
.16+01	.408-02
.20+01	.363-02
.24+01	.302-02
.30+01	.170-02
.50+01	.142-02
.70+01	.121-02
.10+02	.129-02
.12+02	.144-02
.15+02	.174-02

39 Y 91

TABLE 7. CAPTURE CALCULATION RESULTS, ZR 92

GN(MV) = 210.
DOBS(EV) = .370+04

TARGET NUCLEUS LEVELS

LEVEL	SPIN(PRT)		ENERGY
0	0	+	.0000
1	2	+	.9300
2	0	+	1.3800
3	4	+	1.5000
4	2	+	1.8400
5	2	+	2.0700
6	0	+	2.1500
7	3	-	2.3400
8	2	+	2.4800
9	4	+	2.7500
10	0	+	2.8500
11	2	+	3.0400

ENERGY(MEV)	X-SECTION(BARNS)
.10-04	.118+02
.30-04	.455+01
.60-04	.252+01
.10-03	.164+01
.30-03	.711-00
.60-03	.469-00
.10-02	.357-00
.20-02	.257-00
.30-02	.209-00
.50-02	.153-00
.70-02	.121+00
.10-01	.935-01
.20-01	.549-01
.24-01	.474-01
.30-01	.399-01
.50-01	.272-01
.70-01	.221-01
.10+00	.186-01
.13-00	.172-01
.16-00	.168-01
.20-00	.167-01
.24-00	.168-01
.30-00	.172-01
.37-00	.177-01
.45-00	.180-01
.55-00	.183-01
.70-00	.190-01
.85-00	.202-01
.10+01	.127-01
.13+01	.107-01
.16+01	.111-01
.20+01	.996-02
.24+01	.884-02
.30+01	.818-02
.50+01	.330-02
.70+01	.203-02
.10+02	.154-02
.12+02	.160-02
.15+02	.185-02

40 ZR 92

TABLE 8. CAPTURE CALCULATION RESULTS, ZR 93

GN(MV) = 194.
DOBS(EV) = .379+03

TARGET NUCLEUS LEVELS

LEVEL	SPIN(PRT)		ENERGY
0	5/2	+	.0000
1	3/2	+	.2700
2	1/2	+	.9500
3	7/2	+	1.1700
4	3/2	+	1.4500

ENERGY(MEV)	X-SECTION(BARNS)
.10-04	.261+02
.30-04	.118+02
.60-04	.703+01
.10-03	.473+01
.30-03	.200+01
.60-03	.122+01
.10-02	.878-00
.20-02	.582-00
.30-02	.461-00
.50-02	.343-00
.70-02	.276-00
.10-01	.214-00
.20-01	.125-00
.24-01	.108+00
.30-01	.901-01
.50-01	.594-01
.70-01	.457-01
.10+00	.355-01
.13-00	.302-01
.16-00	.270-01
.20-00	.245-01
.24-00	.230-01
.30-00	.207-01
.37-00	.193-01
.45-00	.182-01
.55-00	.172-01
.70-00	.170-01
.85-00	.172-01
.10+01	.179-01
.13+01	.167-01
.16+01	.125-01
.20+01	.606-02
.24+01	.403-02
.30+01	.274-02
.50+01	.207-02
.70+01	.158-02
.10+02	.157-02
.12+02	.174-02
.15+02	.205-02

40 ZR 93

TABLE 9. CAPTURE CALCULATION RESULTS, ZR 94

GG(MV) = 100.
DOBS(EV) = .376+04

TARGET NUCLEUS LEVELS

LEVEL	SPIN(PRT)		ENERGY
0	0	+	.0000
1	2	+	.9200
2	0	+	1.3000
3	4	+	1.4700
4	2	+	1.6700
5	2	+	1.8500
6	3	+	2.0600

ENERGY(MEV)	X-SECTION(BARNS)
.10-04	.651+01
.30-04	.245+01
.60-04	.136+01
.10-03	.894-00
.30-03	.427-00
.60-03	.292-00
.10-02	.227-00
.20-02	.159-00
.30-02	.122+00
.50-02	.849-01
.70-02	.658-01
.10-01	.496-01
.20-01	.281-01
.24-01	.241-01
.30-01	.201-01
.50-01	.140-01
.70-01	.117-01
.10+00	.103-01
.13-00	.987-02
.16-00	.980-02
.20-00	.983-02
.24-00	.993-02
.30-00	.100-01
.37-00	.999-02
.45-00	.996-02
.55-00	.101-01
.70-00	.105-01
.85-00	.111-01
.10+01	.665-02
.13+01	.590-02
.16+01	.579-02
.20+01	.474-02
.24+01	.304-02
.30+01	.195-02
.50+01	.182-02
.70+01	.133-02
.10+02	.129-02
.12+02	.145-02
.15+02	.176-02

40 ZR 94

TABLE 10. CAPTURE CALCULATION RESULTS, ZR 95

GG(MV) = 200.
DOBS(EV) = .177+03

TARGET NUCLEUS LEVELS

LEVEL	SPIN(PRT)		ENERGY
0	5/2	+	.0000
1	1/2	+	.9500
2	1/2	+	1.0200
3	5/2	+	1.1400
4	3/2	+	1.1730
5	3/2	+	1.3300

ENERGY(MEV)	X-SECTION(BARNS)
.10-04	.320+02
.30-04	.152+02
.60-04	.947+01
.10-03	.664+01
.30-03	.308+01
.60-03	.192+01
.10-02	.139+01
.20-02	.940-00
.30-02	.756-00
.50-02	.577-00
.70-02	.481-00
.10-01	.390-00
.20-01	.242-00
.24-01	.211-00
.30-01	.178-00
.50-01	.120+00
.70-01	.925-01
.10+00	.714-01
.13-00	.602-01
.16-00	.535-01
.20-00	.482-01
.24-00	.450-01
.30-00	.424-01
.37-00	.410-01
.45-00	.407-01
.55-00	.413-01
.70-00	.431-01
.85-00	.457-01
.10+01	.489-01
.13+01	.486-01
.16+01	.243-01
.20+01	.121-01
.24+01	.822-02
.30+01	.552-02
.50+01	.285-02
.70+01	.173-02
.10+02	.151-02
.12+02	.165-02
.15+02	.195-02

40 ZR 95

TABLE 11. CAPTURE CALCULATION RESULTS, ZR 96

GN(MV) = 220.
DOBS(EV) = .350+04

TARGET NUCLEUS LEVELS

LEVEL	SPIN(PRT)		ENERGY
0	0	+	.0000
1	2	+	1.7300
2	3	-	1.8700
3	2	+	2.0500
4	3	-	2.2100

ENERGY(MEV)	X-SECTION(BARNS)
.10-04	.115+02
.30-04	.457+01
.60-04	.255+01
.10-03	.167+01
.30-03	.755-00
.60-03	.509-00
.10-02	.393-00
.20-02	.286-00
.30-02	.233-00
.50-02	.170-00
.70-02	.135-00
.10-01	.104+00
.20-01	.609-01
.24-01	.526-01
.30-01	.440-01
.50-01	.297-01
.70-01	.239-01
.10+00	.200-01
.13-00	.185-01
.16-00	.181-01
.20-00	.182-01
.24-00	.186-01
.30-00	.194-01
.37-00	.203-01
.45-00	.211-01
.55-00	.219-01
.70-00	.234-01
.85-00	.255-01
.10+01	.281-01
.13+01	.348-01
.16+01	.434-01
.20+01	.249-01
.24+01	.165-01
.30+01	.951-02
.50+01	.257-02
.70+01	.132-02
.10+02	.114-02
.12+02	.130-02
.15+02	.160-02

40 ZR 96

TABLE 12. CAPTURE CALCULATION RESULTS, NB 95

GN(MV) = 200.
DOBS(EV) = .534+02

TARGET NUCLEUS LEVELS

LEVEL	SPIN(PRT)		ENERGY
0	9/2	+	.0000
1	1/2	-	.2350

ENERGY(MEV)	X-SECTION(BARNS)
.10-04	.424+02
.30-04	.222+02
.60-04	.144+02
.10-03	.103+02
.30-03	.504+01
.60-03	.326+01
.10-02	.241+01
.20-02	.168+01
.30-02	.139+01
.50-02	.111+01
.70-02	.953-00
.10-01	.807-00
.20-01	.568-00
.24-01	.510-00
.30-01	.443-00
.50-01	.311-00
.70-01	.244-00
.10+00	.190-00
.13-00	.159-00
.16-00	.140-00
.20-00	.123+00
.24-00	.113+00
.30-00	.987-01
.37-00	.827-01
.45-00	.685-01
.55-00	.581-01
.70-00	.448-01
.85-00	.391-01
.10+01	.358-01
.13+01	.295-01
.16+01	.258-01
.20+01	.208-01
.24+01	.176-01
.30+01	.132-01
.50+01	.590-02
.70+01	.279-02
.10+02	.165-02
.12+02	.167-02
.15+02	.193-02

41 NB 95

TABLE 13. CAPTURE CALCULATION RESULTS, MO 95

GG(MV) = 350.
DOBS(EV) = .114+03

TARGET NUCLEUS LEVELS

LEVEL	SPIN(PRT)		ENERGY
0	5/2	+	.0000
1	3/2	+	.2040
2	7/2	+	.7660
3	1/2	+	.7860
4	5/2	+	.8210
5	7/2	+	.9480
6	3/2	+	1.0390

ENERGY(MEV)	X-SECTION(BARNS)
.10-04	.412+02
.30-04	.212+02
.60-04	.136+02
.10-03	.972+01
.30-03	.472+01
.60-03	.304+01
.10-02	.225+01
.20-02	.156+01
.30-02	.129+01
.50-02	.102+01
.70-02	.869-00
.10-01	.733-00
.20-01	.508-00
.24-01	.454-00
.30-01	.392-00
.50-01	.274-00
.70-01	.214-00
.10+00	.166-00
.13-00	.139-00
.16-00	.122+00
.20-00	.108+00
.24-00	.943-01
.30-00	.824-01
.37-00	.769-01
.45-00	.718-01
.55-00	.713-01
.70-00	.724-01
.85-00	.659-01
.10+01	.552-01
.13+01	.337-01
.16+01	.233-01
.20+01	.187-01
.24+01	.162-01
.30+01	.133-01
.50+01	.698-02
.70+01	.351-02
.10+02	.216-02
.12+02	.215-02
.15+02	.241-02

42 MO 95

TABLE 14. CAPTURE CALCULATION RESULTS, MO 97

GG(MV) = 220.
DOBS(EV) = .775+02

TARGET NUCLEUS LEVELS

LEVEL	SPIN(PRT)		ENERGY
0	5/2	+	.0000
1	7/2	+	.6560
2	1/2	+	.6830
3	3/2	+	.7270

ENERGY(MEV)	X-SECTION(BARNS)
.10-04	.363+02
.30-04	.188+02
.60-04	.121+02
.10-03	.865+01
.30-03	.424+01
.60-03	.276+01
.10-02	.206+01
.20-02	.146+01
.30-02	.122+01
.50-02	.970-00
.70-02	.831-00
.10-01	.702-00
.20-01	.484-00
.24-01	.431-00
.30-01	.371-00
.50-01	.258-00
.70-01	.202-00
.10+00	.156-00
.13-00	.131-00
.16-00	.115+00
.20-00	.102+00
.24-00	.946-01
.30-00	.880-01
.37-00	.844-01
.45-00	.832-01
.55-00	.841-01
.70-00	.808-01
.85-00	.580-01
.10+01	.410-01
.13+01	.286-01
.16+01	.241-01
.20+01	.191-01
.24+01	.162-01
.30+01	.123-01
.50+01	.585-02
.70+01	.281-02
.10+02	.188-02
.12+02	.195-02
.15+02	.225-02

42 MO 97

TABLE 15. CAPTURE CALCULATION RESULTS, MO 98

GG(MV) = 150.
DOBS(EV) = .101+04

TARGET NUCLEUS LEVELS

LEVEL	SPIN(PRT)		ENERGY
0	0	+	.0000
1	0	+	.7360
2	2	+	.7870
3	2	+	1.4320
4	4	+	1.5090

ENERGY(MEV)	X-SECTION(BARNS)
.10-04	.169+02
.30-04	.753+01
.60-04	.441+01
.10-03	.298+01
.30-03	.131+01
.60-03	.847-00
.10-02	.653-00
.20-02	.477-00
.30-02	.402-00
.50-02	.317-00
.70-02	.262-00
.10-01	.208-00
.20-01	.127-00
.24-01	.111+00
.30-01	.940-01
.50-01	.639-01
.70-01	.503-01
.10+00	.405-01
.13-00	.362-01
.16-00	.342-01
.20-00	.335-01
.24-00	.338-01
.30-00	.352-01
.37-00	.375-01
.45-00	.405-01
.55-00	.438-01
.70-00	.484-01
.85-00	.305-01
.10+01	.256-01
.13+01	.307-01
.16+01	.287-01
.20+01	.214-01
.24+01	.190-01
.30+01	.169-01
.50+01	.778-02
.70+01	.298-02
.10+02	.144-02
.12+02	.149-02
.15+02	.179-02

42 MO 98

TABLE 16. CAPTURE CALCULATION RESULTS, MO 100

GG(MV) = 150.
DOBS(EV) = .134+04

TARGET NUCLEUS LEVELS

LEVEL	SPIN(PRT)		ENERGY
0	0	+	.0000
1	2	+	.5400
2	0	+	.7000
3	2	+	1.0800

ENERGY(MEV)	X-SECTION(BARNS)
.10-04	.139+02
.30-04	.608+01
.60-04	.353+01
.10-03	.238+01
.30-03	.107+01
.60-03	.712-00
.10-02	.554-00
.20-02	.408-00
.30-02	.343-00
.50-02	.264-00
.70-02	.214-00
.10-01	.168-00
.20-01	.101+00
.24-01	.880-01
.30-01	.739-01
.50-01	.500-01
.70-01	.396-01
.10+00	.324-01
.13-00	.294-01
.16-00	.282-01
.20-00	.280-01
.24-00	.286-01
.30-00	.301-01
.37-00	.324-01
.45-00	.348-01
.55-00	.314-01
.70-00	.172-01
.85-00	.169-01
.10+01	.186-01
.13+01	.139-01
.16+01	.112-01
.20+01	.999-02
.24+01	.844-02
.30+01	.703-02
.50+01	.254-02
.70+01	.124-02
.10+02	.116-02
.12+02	.134-02
.15+02	.167-02

42 MO 100

TABLE 17. CAPTURE CALCULATION RESULTS, RU 101

GG(MV) = 192.
DOBS(EV) = .183+02

TARGET NUCLEUS LEVELS

LEVEL	SPIN(PRT)		ENERGY
0	5/2	+	.0000
1	3/2	+	.1270
2	7/2	+	.3070
3	5/2	+	.3110
4	1/2	+	.3250
5	3/2	+	.4220
6	11/2	-	.5240
7	7/2	+	.5450

ENERGY(MEV)	X-SECTION(BARNS)
.10-04	.319+02
.30-04	.179+02
.60-04	.124+02
.10-03	.946+01
.30-03	.518+01
.60-03	.356+01
.10-02	.274+01
.20-02	.201+01
.30-02	.174+01
.50-02	.150+01
.70-02	.138+01
.10-01	.125+01
.20-01	.996-00
.24-01	.930-00
.30-01	.850-00
.50-01	.663-00
.70-01	.545-00
.10+00	.436-00
.13-00	.368-00
.16-00	.313-00
.20-00	.262-00
.24-00	.235-00
.30-00	.203-00
.37-00	.153-00
.45-00	.123+00
.55-00	.106+00
.70-00	.799-01
.85-00	.671-01
.10+01	.581-01
.13+01	.496-01
.16+01	.452-01
.20+01	.408-01
.24+01	.367-01
.30+01	.286-01
.50+01	.121-01
.70+01	.433-02
.10+02	.218-02
.12+02	.218-02
.15+02	.249-02

44 Ru 101

TABLE 18. CAPTURE CALCULATION RESULTS, RU 102

GG(MV) = 290.
DOBS(EV) = .611+03

TARGET NUCLEUS LEVELS

LEVEL	SPIN(PRT)		ENERGY
0	0	+	.0000
1	2	+	.4750
2	0	+	.9440
3	2	+	1.1030
4	4	+	1.1050

ENERGY(MEV)	X-SECTION(BARNS)
.10-04	.221+02
.30-04	.106+02
.60-04	.671+01
.10-03	.475+01
.30-03	.231+01
.60-03	.153+01
.10-02	.117+01
.20-02	.873-00
.30-02	.749-00
.50-02	.620-00
.70-02	.547-00
.10-01	.471-00
.20-01	.318-00
.24-01	.283-00
.30-01	.244-00
.50-01	.171-00
.70-01	.136-00
.10+00	.108+00
.13-00	.930-01
.16-00	.849-01
.20-00	.796-01
.24-00	.778-01
.30-00	.787-01
.37-00	.821-01
.45-00	.878-01
.55-00	.577-01
.70-00	.518-01
.85-00	.556-01
.10+01	.621-01
.13+01	.512-01
.16+01	.421-01
.20+01	.397-01
.24+01	.382-01
.30+01	.333-01
.50+01	.145-01
.70+01	.481-02
.10+02	.174-02
.12+02	.167-02
.15+02	.195-02

44 Ru 102

TABLE 19. CAPTURE CALCULATION RESULTS, RU 103

GG(MV) = 170.
DOBS(EV) = .160+02

TARGET NUCLEUS LEVELS

LEVEL	SPIN(PRT)		ENERGY
0	5/2	+	.0000
1	3/2	+	.1330
2	1/2	+	.1710
3	7/2	+	.2100
4	11/2	-	.2350
5	7/2	+	.2400

ENERGY(MEV)	X-SECTION(BARNS)
.10-04	.285+02
.30-04	.161+02
.60-04	.112+02
.10-03	.853+01
.30-03	.475+01
.60-03	.329+01
.10-02	.256+01
.20-02	.191+01
.30-02	.166+01
.50-02	.145+01
.70-02	.134+01
.10-01	.123+01
.20-01	.985-00
.24-01	.922-00
.30-01	.844-00
.50-01	.662-00
.70-01	.546-00
.10+00	.439-00
.13-00	.374-00
.16-00	.320-00
.20-00	.267-00
.24-00	.213-00
.30-00	.149-00
.37-00	.111+00
.45-00	.898-01
.55-00	.755-01
.70-00	.646-01
.85-00	.576-01
.10+01	.554-01
.13+01	.500-01
.16+01	.464-01
.20+01	.432-01
.24+01	.379-01
.30+01	.286-01
.50+01	.115-01
.70+01	.377-02
.10+02	.199-02
.12+02	.205-02
.15+02	.237-02

44 RU 103

TABLE 20. CAPTURE CALCULATION RESULTS, RU 104

GG(MV) = 160.
DOBS(EV) = .570+03

TARGET NUCLEUS LEVELS

LEVEL	SPIN(PRT)		ENERGY
0	0	+	.0000
1	2	+	.3590
2	4	+	.8890
3	2	+	.8930
4	0	+	.9830

ENERGY(MEV)	X-SECTION(BARNS)
.10-04	.174+02
.30-04	.819+01
.60-04	.513+01
.10-03	.359+01
.30-03	.172+01
.60-03	.114+01
.10-02	.886-00
.20-02	.663-00
.30-02	.566-00
.50-02	.465-00
.70-02	.402-00
.10-01	.333-00
.20-01	.213-00
.24-01	.188-00
.30-01	.160-00
.50-01	.111+00
.70-01	.877-01
.10+00	.702-01
.13-00	.617-01
.16-00	.575-01
.20-00	.554-01
.24-00	.554-01
.30-00	.572-01
.37-00	.506-01
.45-00	.336-01
.55-00	.312-01
.70-00	.330-01
.85-00	.370-01
.10+01	.318-01
.13+01	.280-01
.16+01	.273-01
.20+01	.278-01
.24+01	.293-01
.30+01	.264-01
.50+01	.111-01
.70+01	.340-02
.10+02	.146-02
.12+02	.154-02
.15+02	.185-02

44 RU 104

TABLE 21. CAPTURE CALCULATION RESULTS, RU 106

GG(MV) = 145.
DOBS(EV) = .123+04

TARGET NUCLEUS LEVELS

LEVEL	SPIN(PRT)		ENERGY
0	0	+	.0000
1	2	+	.2700
2	4	+	.7110
3	2	+	.7910
4	0	+	.9890

ENERGY(MEV)	X-SECTION(BARNS)
.10-04	.119+02
.30-04	.539+01
.60-04	.326+01
.10-03	.221+01
.30-03	.103+01
.60-03	.700-00
.10-02	.551-00
.20-02	.411-00
.30-02	.348-00
.50-02	.271-00
.70-02	.220-00
.10-01	.173-00
.20-01	.105+00
.24-01	.914-01
.30-01	.771-01
.50-01	.526-01
.70-01	.420-01
.10+00	.348-01
.13-00	.319-01
.16-00	.308-01
.20-00	.309-01
.24-00	.316-01
.30-00	.192-01
.37-00	.150-01
.45-00	.140-01
.55-00	.142-01
.70-00	.156-01
.85-00	.129-01
.10+01	.128-01
.13+01	.117-01
.16+01	.115-01
.20+01	.118-01
.24+01	.121-01
.30+01	.116-01
.50+01	.454-02
.70+01	.166-02
.10+02	.123-02
.12+02	.140-02
.15+02	.174-02

44 RU 106

TABLE 22. CAPTURE CALCULATION RESULTS, PD 105

GG(MV) = 153.
DOBS(EV) = .101+02

TARGET NUCLEUS LEVELS

LEVEL	SPIN(PRT)		ENERGY
0	5/2	+	.0000
1	3/2	+	.2810
2	7/2	+	.3060
3	5/2	+	.3190
4	1/2	+	.3440
5	3/2	+	.4200
6	7/2	+	.4400

ENERGY(MEV)	X-SECTION(BARNS)
.10-04	.262+02
.30-04	.149+02
.60-04	.105+02
.10-03	.803+01
.30-03	.458+01
.60-03	.325+01
.10-02	.257+01
.20-02	.195+01
.30-02	.172+01
.50-02	.153+01
.70-02	.144+01
.10-01	.134+01
.20-01	.112+01
.24-01	.106+01
.30-01	.984-00
.50-01	.801-00
.70-01	.678-00
.10+00	.555-00
.13-00	.477-00
.16-00	.424-00
.20-00	.376-00
.24-00	.345-00
.30-00	.312-00
.37-00	.227-00
.45-00	.177-00
.55-00	.135-00
.70-00	.106+00
.85-00	.908-01
.10+01	.825-01
.13+01	.751-01
.16+01	.705-01
.20+01	.658-01
.24+01	.593-01
.30+01	.465-01
.50+01	.194-01
.70+01	.592-02
.10+02	.246-02
.12+02	.238-02
.15+02	.268-02

46 PD 105

TABLE 23. CAPTURE CALCULATION RESULTS, PD 106

GG(MV) = 145.
DOBS(EV) = .419+03

TARGET NUCLEUS LEVELS

LEVEL	SPIN(PRT)		ENERGY
0	0	+	.0000
1	2	+	.5120
2	2	+	1.1280
3	0	+	1.1340
4	4	+	1.2290
5	3	+	1.5580
6	2	+	1.5620
7	0	+	1.7060

ENERGY(MEV)	X-SECTION(BARNS)
.10-04	.176+02
.30-04	.841+01
.60-04	.530+01
.10-03	.374+01
.30-03	.184+01
.60-03	.123+01
.10-02	.959-00
.20-02	.725-00
.30-02	.622-00
.50-02	.515-00
.70-02	.451-00
.10-01	.380-00
.20-01	.249-00
.24-01	.220-00
.30-01	.189-00
.50-01	.132-00
.70-01	.104+00
.10+00	.836-01
.13-00	.733-01
.16-00	.680-01
.20-00	.651-01
.24-00	.647-01
.30-00	.665-01
.37-00	.701-01
.45-00	.756-01
.55-00	.572-01
.70-00	.458-01
.85-00	.482-01
.10+01	.541-01
.13+01	.516-01
.16+01	.529-01
.20+01	.471-01
.24+01	.392-01
.30+01	.357-01
.50+01	.160-01
.70+01	.478-02
.10+02	.175-02
.12+02	.176-02
.15+02	.209-02

46 PD 106

TABLE 24. CAPTURE CALCULATION RESULTS, PD 107

GG(MV) = 140.
DOBS(EV) = .109+02

TARGET NUCLEUS LEVELS

LEVEL	SPIN(PRT)		ENERGY
0	5/2	+	.0000
1	1/2	+	.1150
2	11/2	-	.2140
3	5/2	+	.3020
4	7/2	+	.3110

ENERGY(MEV)	X-SECTION(BARNS)
.10-04	.244+02
.30-04	.139+02
.60-04	.975+01
.10-03	.747+01
.30-03	.425+01
.60-03	.301+01
.10-02	.238+01
.20-02	.181+01
.30-02	.161+01
.50-02	.143+01
.70-02	.134+01
.10-01	.124+01
.20-01	.103+01
.24-01	.968-00
.30-01	.894-00
.50-01	.720-00
.70-01	.604-00
.10+00	.491-00
.13-00	.418-00
.16-00	.367-00
.20-00	.323-00
.24-00	.287-00
.30-00	.258-00
.37-00	.192-00
.45-00	.149-00
.55-00	.124+00
.70-00	.103+00
.85-00	.909-01
.10+01	.876-01
.13+01	.805-01
.16+01	.703-01
.20+01	.623-01
.24+01	.541-01
.30+01	.408-01
.50+01	.163-01
.70+01	.479-02
.10+02	.222-02
.12+02	.224-02
.15+02	.256-02

46 PD 107

TABLE 25. CAPTURE CALCULATION RESULTS, PD 108

GG(MV) = 98.
DOBS(EV) = .290+03

TARGET NUCLEUS LEVELS

LEVEL	SPIN(PRT)		ENERGY
0	0	+	.0000
1	2	+	.4340
2	2	+	.9350
3	4	+	1.0480
4	0	+	1.0530

ENERGY(MEV)	X-SECTION(BARNS)
.10-04	.169+02
.30-04	.808+01
.60-04	.510+01
.10-03	.360+01
.30-03	.177+01
.60-03	.119+01
.10-02	.930-00
.20-02	.704-00
.30-02	.605-00
.50-02	.502-00
.70-02	.439-00
.10-01	.371-00
.20-01	.243-00
.24-01	.215-00
.30-01	.185-00
.50-01	.129-00
.70-01	.103+00
.10+00	.833-01
.13-00	.737-01
.16-00	.688-01
.20-00	.663-01
.24-00	.662-01
.30-00	.684-01
.37-00	.726-01
.45-00	.641-01
.55-00	.458-01
.70-00	.456-01
.85-00	.502-01
.10+01	.525-01
.13+01	.433-01
.16+01	.431-01
.20+01	.444-01
.24+01	.482-01
.30+01	.458-01
.50+01	.210-01
.70+01	.597-02
.10+02	.177-02
.12+02	.169-02
.15+02	.199-02

46 PD 108

TABLE 26. CAPTURE CALCULATION RESULTS, PD 110

GG(MV) = 150.
DOBS(EV) = .900+03

TARGET NUCLEUS LEVELS

LEVEL	SPIN(PRT)		ENERGY
0	0	+	.0000
1	2	+	.3730
2	2	+	.8130
3	4	+	.9210
4	0	+	.9460
5	2	+	1.1680
6	2	+	1.2120

ENERGY(MEV)	X-SECTION(BARNS)
.10-04	.132+02
.30-04	.611+01
.60-04	.378+01
.10-03	.261+01
.30-03	.123+01
.60-03	.822-00
.10-02	.646-00
.20-02	.482-00
.30-02	.411-00
.50-02	.331-00
.70-02	.278-00
.10-01	.223-00
.20-01	.139-00
.24-01	.121+00
.30-01	.103+00
.50-01	.713-01
.70-01	.573-01
.10+00	.475-01
.13-00	.432-01
.16-00	.414-01
.20-00	.411-01
.24-00	.419-01
.30-00	.438-01
.37-00	.465-01
.45-00	.254-01
.55-00	.232-01
.70-00	.241-01
.85-00	.241-01
.10+01	.210-01
.13+01	.187-01
.16+01	.169-01
.20+01	.162-01
.24+01	.162-01
.30+01	.171-01
.50+01	.763-02
.70+01	.238-02
.10+02	.138-02
.12+02	.153-02
.15+02	.187-02

46 PD 110

TABLE 27. CAPTURE CALCULATION RESULTS, CD 111

G_n(MV) = 120.
DOBS(EV) = .324+02

TARGET NUCLEUS LEVELS

LEVEL	SPIN(PRT)		ENERGY
0	1/2	+	.0000
1	5/2	+	.2460
2	3/2	+	.3420
3	11/2	-	.4000
4	7/2	+	.4200
5	1/2	+	.4350
6	1/2	+	.5330
7	3/2	+	.5450
8	5/2	+	.6200
9	1/2	+	.6600
10	5/2	+	.7000
11	3/2	+	.7300

ENERGY(MEV)	X-SECTION(BARNS)
.10-04	.229+02
.30-04	.126+02
.60-04	.856+01
.10-03	.638+01
.30-03	.339+01
.60-03	.231+01
.10-02	.179+01
.20-02	.135+01
.30-02	.119+01
.50-02	.105+01
.70-02	.964-00
.10-01	.870-00
.20-01	.688-00
.24-01	.641-00
.30-01	.582-00
.50-01	.445-00
.70-01	.364-00
.10+00	.293-00
.13-00	.252-00
.16-00	.227-00
.20-00	.207-00
.24-00	.196-00
.30-00	.158-00
.37-00	.132-00
.45-00	.106+00
.55-00	.865-01
.70-00	.661-01
.85-00	.545-01
.10+01	.467-01
.13+01	.394-01
.16+01	.381-01
.20+01	.380-01
.24+01	.365-01
.30+01	.312-01
.50+01	.142-01
.70+01	.440-02
.10+02	.231-02
.12+02	.238-02
.15+02	.272-02

48 CD 111

TABLE 28. CAPTURE CALCULATION RESULTS, SB 121

G_n(MV) = 95.
DOBS(EV) = .106+02

TARGET NUCLEUS LEVELS

LEVEL	SPIN(PRT)		ENERGY
0	5/2	+	.0000
1	7/2	+	.0372
2	3/2	+	.5073
3	1/2	+	.5731
4	7/2	+	.9473
5	9/2	+	1.0240
6	7/2	+	1.0353
7	9/2	+	1.1393
8	11/2	+	1.1410
9	1/2	+	1.3820
10	3/2	+	1.4230
11	5/2	+	1.4460

ENERGY(MEV)	X-SECTION(BARNS)
.10-04	.448+02
.30-04	.248+02
.60-04	.168+02
.10-03	.126+02
.30-03	.652+01
.60-03	.426+01
.10-02	.314+01
.20-02	.214+01
.30-02	.176+01
.50-02	.143+01
.70-02	.126+01
.10-01	.112+01
.20-01	.856-00
.24-01	.794-00
.30-01	.721-00
.50-01	.525-00
.70-01	.399-00
.10+00	.300-00
.13-00	.251-00
.16-00	.222-00
.20-00	.194-00
.24-00	.181-00
.30-00	.169-00
.37-00	.162-00
.45-00	.159-00
.55-00	.152-00
.70-00	.150-00
.85-00	.154-00
.10+01	.161-00
.13+01	.139-00
.16+01	.133-00
.20+01	.907-01
.24+01	.688-01
.30+01	.484-01
.50+01	.163-01
.70+01	.401-02
.10+02	.187-02
.12+02	.194-02
.15+02	.229-02

51 SB 121

TABLE 29. CAPTURE CALCULATION RESULTS, SB 125

GG(MV) = 131.
DOBS(EV) = .498+02

TARGET NUCLEUS LEVELS

LEVEL	SPIN(PRT)		ENERGY
0	7/2	+	.0000
1	5/2	+	.3320
2	3/2	+	.6430
3	1/2	+	.9210
4	9/2	+	1.0670
5	11/2	+	1.0900
6	7/2	+	1.3490
7	9/2	+	1.4200
8	3/2	+	1.4800

ENERGY(MEV)	X-SECTION(BARNS)
.10-04	.524+02
.30-04	.257+02
.60-04	.161+02
.10-03	.114+02
.30-03	.533+01
.60-03	.329+01
.10-02	.232+01
.20-02	.148+01
.30-02	.117+01
.50-02	.885-00
.70-02	.740-00
.10-01	.612-00
.20-01	.422-00
.24-01	.379-00
.30-01	.329-00
.50-01	.235-00
.70-01	.189-00
.10+00	.153-00
.13-00	.133-00
.16-00	.120+00
.20-00	.110+00
.24-00	.104+00
.30-00	.982-01
.37-00	.906-01
.45-00	.837-01
.55-00	.804-01
.70-00	.805-01
.85-00	.804-01
.10+01	.858-01
.13+01	.706-01
.16+01	.621-01
.20+01	.314-01
.24+01	.205-01
.30+01	.129-01
.50+01	.441-02
.70+01	.174-02
.10+02	.151-02
.12+02	.171-02
.15+02	.210-02

51 Sb 125

TABLE 30. CAPTURE CALCULATION RESULTS, I 127

GG(MV) = 120.
DOBS(EV) = .147+02

TARGET NUCLEUS LEVELS

LEVEL	SPIN(PRT)		ENERGY
0	5/2	+	.0000
1	7/2	+	.0570
2	3/2	+	.2030
3	1/2	+	.3750
4	5/2	+	.4180
5	3/2	+	.6190
6	7/2	+	.6290
7	9/2	+	.6510
8	11/2	+	.7160

ENERGY(MEV)	X-SECTION(BARNS)
.10-04	.752+02
.30-04	.400+02
.60-04	.263+02
.10-03	.190+02
.30-03	.926+01
.60-03	.585+01
.10-02	.419+01
.20-02	.271+01
.30-02	.213+01
.50-02	.162+01
.70-02	.137+01
.10-01	.116+01
.20-01	.839-00
.24-01	.768-00
.30-01	.690-00
.50-01	.535-00
.70-01	.417-00
.10+00	.308-00
.13-00	.256-00
.16-00	.222-00
.20-00	.197-00
.24-00	.172-00
.30-00	.154-00
.37-00	.143-00
.45-00	.130-00
.55-00	.120+00
.70-00	.104+00
.85-00	.841-01
.10+01	.710-01
.13+01	.499-01
.16+01	.414-01
.20+01	.324-01
.24+01	.252-01
.30+01	.180-01
.50+01	.551-02
.70+01	.192-02
.10+02	.171-02
.12+02	.194-02
.15+02	.235-02

53 I 127

TABLE 31. CAPTURE CALCULATION RESULTS, I 129

GG(MV) = 117.
DOBS(EV) = .260+02

TARGET NUCLEUS LEVELS

LEVEL	SPIN(PRT)		ENERGY
0	7/2	+	.0000
1	5/2	+	.0270
2	5/2	+	.2780
3	5/2	+	.4670
4	1/2	+	.5600
5	11/2	+	.6960
6	9/2	+	.7300
7	7/2	+	.7690
8	3/2	+	.8300
9	7/2	+	.8450
10	9/2	+	1.0500
11	5/2	+	1.1110
12	3/2	+	1.2040
13	3/2	+	1.2610
14	5/2	+	1.2820
15	1/2	+	1.2920

ENERGY(MEV)	X-SECTION(BARNS)
.10-04	.797+02
.30-04	.396+02
.60-04	.249+02
.10-03	.176+02
.30-03	.825+01
.60-03	.508+01
.10-02	.355+01
.20-02	.220+01
.30-02	.169+01
.50-02	.124+01
.70-02	.103+01
.10-01	.851-00
.20-01	.589-00
.24-01	.535-00
.30-01	.459-00
.50-01	.316-00
.70-01	.244-00
.10+00	.194-00
.13-00	.165-00
.16-00	.149-00
.20-00	.135-00
.24-00	.126-00
.30-00	.116+00
.37-00	.108+00
.45-00	.104+00
.55-00	.968-01
.70-00	.953-01
.85-00	.696-01
.10+01	.617-01
.13+01	.555-01
.16+01	.408-01
.20+01	.280-01
.24+01	.208-01
.30+01	.143-01
.50+01	.468-02
.70+01	.180-02
.10+02	.164-02
.12+02	.186-02
.15+02	.226-02

53 I 129

TABLE 32. CAPTURE CALCULATION RESULTS, XE 131

GG(MV) = 110.
DOBS(EV) = .392+02

TARGET NUCLEUS LEVELS

LEVEL	SPIN(PRT)		ENERGY
0	3/2	+	.0000
1	1/2	+	.0802
2	11/2	-	.1640

ENERGY(MEV)	X-SECTION(BARNS)
.10-04	.803+02
.30-04	.382+02
.60-04	.237+02
.10-03	.165+02
.30-03	.739+01
.60-03	.437+01
.10-02	.296+01
.20-02	.177+01
.30-02	.135+01
.50-02	.983-00
.70-02	.811-00
.10-01	.665-00
.20-01	.456-00
.24-01	.413-00
.30-01	.364-00
.50-01	.270-00
.70-01	.221-00
.10+00	.176-00
.13-00	.151-00
.16-00	.137-00
.20-00	.117+00
.24-00	.103+00
.30-00	.870-01
.37-00	.735-01
.45-00	.619-01
.55-00	.538-01
.70-00	.449-01
.85-00	.391-01
.10+01	.345-01
.13+01	.267-01
.16+01	.217-01
.20+01	.174-01
.24+01	.137-01
.30+01	.985-02
.50+01	.407-02
.70+01	.215-02
.10+02	.215-02
.12+02	.239-02
.15+02	.281-02

54 XE 131

TABLE 33. CAPTURE CALCULATION RESULTS, XE 132

G0(MV) = 105.
DOBS(EV) = .121+04

TARGET NUCLEUS LEVELS

LEVEL	SPIN(PRT)		ENERGY
0	0	+	.0000
1	2	+	.6680
2	2	+	1.2980
3	4	+	1.4400
4	3	+	1.8040
5	3	+	1.9600
6	2	+	1.9800

ENERGY(MEV)	X-SECTION(BARNS)
.10-04	.199+02
.30-04	.755+01
.60-04	.408+01
.10-03	.257+01
.30-03	.100+01
.60-03	.590-00
.10-02	.423-00
.20-02	.286-00
.30-02	.232-00
.50-02	.181-00
.70-02	.151-00
.10-01	.121+00
.20-01	.770-01
.24-01	.687-01
.30-01	.603-01
.50-01	.467-01
.70-01	.409-01
.10+00	.368-01
.13-00	.340-01
.16-00	.319-01
.20-00	.300-01
.24-00	.289-01
.30-00	.282-01
.37-00	.281-01
.45-00	.288-01
.55-00	.303-01
.70-00	.235-01
.85-00	.186-01
.10+01	.184-01
.13+01	.196-01
.16+01	.158-01
.20+01	.150-01
.24+01	.124-01
.30+01	.633-02
.50+01	.351-02
.70+01	.173-02
.10+02	.166-02
.12+02	.189-02
.15+02	.230-02

54 XE 132

TABLE 34. CAPTURE CALCULATION RESULTS, XE 134

G0(MV) = 100.
DOBS(EV) = .139+05

TARGET NUCLEUS LEVELS

LEVEL	SPIN(PRT)		ENERGY
0	0	+	.0000
1	2	+	.8470
2	2	+	1.6130
3	4	+	1.7310
4	3	+	1.9200
5	7	-	1.9630

ENERGY(MEV)	X-SECTION(BARNS)
.10-04	.255+01
.30-04	.882-00
.60-04	.480-00
.10-03	.292-00
.30-03	.144-00
.60-03	.995-01
.10-02	.763-01
.20-02	.498-01
.30-02	.373-01
.50-02	.253-01
.70-02	.201-01
.10-01	.155-01
.20-01	.104-01
.24-01	.954-02
.30-01	.868-02
.50-01	.685-02
.70-01	.574-02
.10+00	.481-02
.13-00	.431-02
.16-00	.402-02
.20-00	.379-02
.24-00	.370-02
.30-00	.360-02
.37-00	.357-02
.45-00	.361-02
.55-00	.375-02
.70-00	.397-02
.85-00	.418-02
.10+01	.204-02
.13+01	.169-02
.16+01	.170-02
.20+01	.115-02
.24+01	.849-03
.30+01	.499-03
.50+01	.125-02
.70+01	.131-02
.10+02	.161-02
.12+02	.186-02
.15+02	.227-02

54 XE 134

TABLE 55. CAPTURE CALCULATION RESULTS, XE 136

GG(MV) = 197.
DOBS(EV) = .973+05

TARGET NUCLEUS LEVELS

LEVEL	SPIN(PRT)		ENERGY
0	0	+	.0000
1	2	+	1.3100
2	4	+	1.6950
3	6	+	1.8920

ENERGY(MEV)	X-SECTION(BARNS)
.10-04	.776-00
.30-04	.263-00
.60-04	.133-00
.10-03	.993-01
.30-03	.581-01
.60-03	.403-01
.10-02	.288-01
.20-02	.172-01
.30-02	.124-01
.50-02	.808-02
.70-02	.673-02
.10-01	.549-02
.20-01	.391-02
.24-01	.359-02
.30-01	.316-02
.50-01	.233-02
.70-01	.192-02
.10+00	.163-02
.13-00	.147-02
.16-00	.140-02
.20-00	.135-02
.24-00	.131-02
.30-00	.129-02
.37-00	.131-02
.45-00	.134-02
.55-00	.137-02
.70-00	.144-02
.85-00	.153-02
.10+01	.164-02
.13+01	.193-02
.16+01	.104-02
.20+01	.699-03
.24+01	.119-02
.30+01	.112-02
.50+01	.101-02
.70+01	.103-02
.10+02	.127-02
.12+02	.149-02
.15+02	.188-02

54 XE 136

TABLE 56. CAPTURE CALCULATION RESULTS, CS 135

GG(MV) = 165.
DOBS(EV) = .303+03

TARGET NUCLEUS LEVELS

LEVEL	SPIN(PRT)		ENERGY
0	7/2	+	.0000
1	5/2	+	.2500
2	3/2	+	.6040

ENERGY(MEV)	X-SECTION(BARNS)
.10-04	.354+02
.30-04	.137+02
.60-04	.743+01
.10-03	.473+01
.30-03	.180+01
.60-03	.101+01
.10-02	.684-00
.20-02	.420-00
.30-02	.321-00
.50-02	.231-00
.70-02	.186-00
.10-01	.145-00
.20-01	.865-01
.24-01	.756-01
.30-01	.644-01
.50-01	.455-01
.70-01	.368-01
.10+00	.298-01
.13-00	.254-01
.16-00	.225-01
.20-00	.199-01
.24-00	.183-01
.30-00	.153-01
.37-00	.137-01
.45-00	.127-01
.55-00	.122-01
.70-00	.819-02
.85-00	.584-02
.10+01	.438-02
.13+01	.286-02
.16+01	.189-02
.20+01	.134-02
.24+01	.101-02
.30+01	.712-03
.50+01	.134-02
.70+01	.136-02
.10+02	.167-02
.12+02	.192-02
.15+02	.235-02

55 CS 135

TABLE 37. CAPTURE CALCULATION RESULTS, CS 137

GG(MV) = 95.
DOBS(EV) = .291+04

TARGET NUCLEUS LEVELS

LEVEL	SPIN(PRT)		ENERGY
0	7/2	+	.0000
1	5/2	+	.4550
2	1/2	+	.8490
3	3/2	+	.9820

ENERGY(MEV)	X-SECTION(BARNS)
.10-04	.549+01
.30-04	.193+01
.60-04	.990-00
.10-03	.625-00
.30-03	.253-00
.60-03	.155-00
.10-02	.110+00
.20-02	.678-01
.30-02	.494-01
.50-02	.323-01
.70-02	.247-01
.10-01	.186-01
.20-01	.110-01
.24-01	.968-02
.30-01	.828-02
.50-01	.573-02
.70-01	.447-02
.10+00	.349-02
.13-00	.296-02
.16-00	.263-02
.20-00	.235-02
.24-00	.217-02
.30-00	.201-02
.37-00	.190-02
.45-00	.184-02
.55-00	.169-02
.70-00	.162-02
.85-00	.161-02
.10+01	.164-02
.13+01	.967-03
.16+01	.760-03
.20+01	.585-03
.24+01	.103-02
.30+01	.950-03
.50+01	.884-03
.70+01	.966-03
.10+02	.126-02
.12+02	.150-02
.15+02	.191-02

55 CS 137

TABLE 38. CAPTURE CALCULATION RESULTS, LA 139

GG(MV) = 75.
DOBS(EV) = .312+03

TARGET NUCLEUS LEVELS

LEVEL	SPIN(PRT)		ENERGY
0	7/2	+	.0000
1	5/2	-	.1650
2	3/2	-	.5700
3	3/2	-	.8000
4	9/2	-	1.0700
5	3/2	-	1.4300

ENERGY(MEV)	X-SECTION(BARNS)
.10-04	.295+02
.30-04	.111+02
.60-04	.591+01
.10-03	.372+01
.30-03	.139+01
.60-03	.769-00
.10-02	.516-00
.20-02	.314-00
.30-02	.239-00
.50-02	.171-00
.70-02	.136-00
.10-01	.106+00
.20-01	.635-01
.24-01	.557-01
.30-01	.478-01
.50-01	.342-01
.70-01	.279-01
.10+00	.224-01
.13-00	.191-01
.16-00	.169-01
.20-00	.136-01
.24-00	.122-01
.30-00	.110-01
.37-00	.103-01
.45-00	.966-02
.55-00	.940-02
.70-00	.934-02
.85-00	.966-02
.10+01	.102-01
.13+01	.104-01
.16+01	.775-02
.20+01	.470-02
.24+01	.290-02
.30+01	.263-02
.50+01	.142-02
.70+01	.121-02
.10+02	.146-02
.12+02	.171-02
.15+02	.214-02

57 LA 139

TABLE 39. CAPTURE CALCULATION RESULTS, CE 140

GG(MV) = 85.
DOBS(EV) = .382+04

TARGET NUCLEUS LEVELS

LEVEL	SPIN(PRT)		ENERGY
0	0	+	.0000
1	2	+	1.6000
2	4	+	2.0800
3	3	+	2.4100
4	2	+	2.5200

ENERGY(MEV)	X-SECTION(BARNS)
.10-04	.742+01
.30-04	.261+01
.60-04	.134+01
.10-03	.842-00
.30-03	.328-00
.60-03	.206-00
.10-02	.151-00
.20-02	.105+00
.30-02	.850-01
.50-02	.617-01
.70-02	.500-01
.10-01	.395-01
.20-01	.266-01
.24-01	.243-01
.30-01	.221-01
.50-01	.183-01
.70-01	.157-01
.10+00	.132-01
.13-00	.117-01
.16-00	.108-01
.20-00	.100-01
.24-00	.961-02
.30-00	.939-02
.37-00	.955-02
.45-00	.999-02
.55-00	.107-01
.70-00	.122-01
.85-00	.138-01
.10+01	.156-01
.13+01	.196-01
.16+01	.246-01
.20+01	.173-01
.24+01	.134-01
.30+01	.743-02
.50+01	.201-02
.70+01	.141-02
.10+02	.158-02
.12+02	.184-02
.15+02	.229-02

58 CE 140

TABLE 40. CAPTURE CALCULATION RESULTS, CE 142

GG(MV) = 79.
DOBS(EV) = .152+04

TARGET NUCLEUS LEVELS

LEVEL	SPIN(PRT)		ENERGY
0	0	+	.0000
1	2	+	.6450
2	2	+	1.5400
3	3	-	1.6600

ENERGY(MEV)	X-SECTION(BARNS)
.10-04	.159+02
.30-04	.574+01
.60-04	.298+01
.10-03	.186+01
.30-03	.683-00
.60-03	.394-00
.10-02	.276-00
.20-02	.183-00
.30-02	.148-00
.50-02	.115+00
.70-02	.953-01
.10-01	.768-01
.20-01	.517-01
.24-01	.473-01
.30-01	.428-01
.50-01	.354-01
.70-01	.319-01
.10+00	.279-01
.13-00	.249-01
.16-00	.230-01
.20-00	.214-01
.24-00	.204-01
.30-00	.198-01
.37-00	.198-01
.45-00	.205-01
.55-00	.222-01
.70-00	.160-01
.85-00	.137-01
.10+01	.140-01
.13+01	.155-01
.16+01	.192-01
.20+01	.136-01
.24+01	.928-02
.30+01	.610-02
.50+01	.211-02
.70+01	.130-02
.10+02	.149-02
.12+02	.175-02
.15+02	.219-02

58 CE 142

TABLE 41. CAPTURE CALCULATION RESULTS, CE 144

GG(MV) = 73.
DOBS(EV) = .158+04

TARGET NUCLEUS LEVELS

LEVEL	SPIN(PRT)		ENERGY
0	0	+	.0000

ENERGY(MEV)	X-SECTION(BARNS)
.10-04	.137+02
.30-04	.490+01
.60-04	.253+01
.10-03	.158+01
.30-03	.581-00
.60-03	.332-00
.10-02	.235-00
.20-02	.156-00
.30-02	.126-00
.50-02	.974-01
.70-02	.804-01
.10-01	.648-01
.20-01	.432-01
.24-01	.392-01
.30-01	.347-01
.50-01	.262-01
.70-01	.218-01
.10+00	.178-01
.13-00	.155-01
.16-00	.141-01
.20-00	.128-01
.24-00	.120-01
.30-00	.111-01
.37-00	.104-01
.45-00	.994-02
.55-00	.959-02
.70-00	.935-02
.85-00	.925-02
.10+01	.925-02
.13+01	.905-02
.16+01	.849-02
.20+01	.721-02
.24+01	.629-02
.30+01	.417-02
.50+01	.161-02
.70+01	.115-02
.10+02	.138-02
.12+02	.164-02
.15+02	.207-02

58 CE 144

TABLE 42. CAPTURE CALCULATION RESULTS, AU 197

GG(MV) = 126.
DOBS(EV) = .158+02

TARGET NUCLEUS LEVELS

LEVEL	SPIN(PRT)		ENERGY
0	3/2	+	.0000
1	1/2	+	.0773
2	3/2	+	.2686
3	5/2	+	.2793
4	11/2	-	.4095
5	7/2	+	.5480

ENERGY(MEV)	X-SECTION(BARNS)
.10-04	.215+03
.30-04	.103+03
.60-04	.635+02
.10-03	.443+02
.30-03	.198+02
.60-03	.116+02
.10-02	.769+01
.20-02	.434+01
.30-02	.309+01
.50-02	.203+01
.70-02	.154+01
.10-01	.117+01
.20-01	.723-00
.24-01	.647-00
.30-01	.570-00
.50-01	.447-00
.70-01	.397-00
.10+00	.346-00
.13-00	.324-00
.16-00	.310-00
.20-00	.295-00
.24-00	.286-00
.30-00	.239-00
.37-00	.212-00
.45-00	.187-00
.55-00	.172-00
.70-00	.134-00
.85-00	.104+00
.10+01	.836-01
.13+01	.588-01
.16+01	.475-01
.20+01	.386-01
.24+01	.316-01
.30+01	.219-01
.50+01	.480-02
.70+01	.222-02
.10+02	.235-02
.12+02	.270-02
.15+02	.330-02

79 AU 197

Table 43

Integral Results

	Isotope	$\bar{\sigma}_c$, mbrns Calculated	Experimental[12]
1	36 Kr 83	95.0	
2	37 Rb 85	113	
3	38 Sr 89	22.5	
4	39 Y 91	30.8	
5	40 Zr 92	30.0	
6	40 Zr 93	56.7	
7	40 Zr 94	11.5	
8	40 Zr 95	102	
9	40 Zr 96	36.1	
10	41 Nb 95	196	
11	42 Mo 95	162	
12	42 Mo 97	175	
13	42 Mo 98	57.1	
14	42 Mo 100	48.4	
15	44 Ru 101	322	
16	44 Ru 102	125	97 ± 11
17	44 Ru 103	302	
18	44 Ru 104	84.4	93.2 ± 9.3
19	44 Ru 106	43.3	
20	46 Pd 105	386	
21	46 Pd 106	104	
22	46 Pd 107	346	
23	46 Pd 108	102	
24	46 Pd 110	59.9	
25	48 Cd 111	231	
26	51 Sb 121	318	309 ± 28
27	51 Sb 125	188	
28	53 I 127	327	216 ± 80
29	53 I 129	251	
30	54 Xe 131	203	
31	54 Xe 132	44.1	40.1 ± 4.0
32	54 Xe 134	6.09	15.2 ± 1.6
33	54 Xe 136	2.33	
34	55 Cs 135	43.7	
35	55 Cs 137	6.24	
36	57 La 139	21.9	
37	58 Ce 140	17.9	
38	58 Ce 142	31.4	
39	58 Ce 144	21.9	
40	79 Au 197	478	

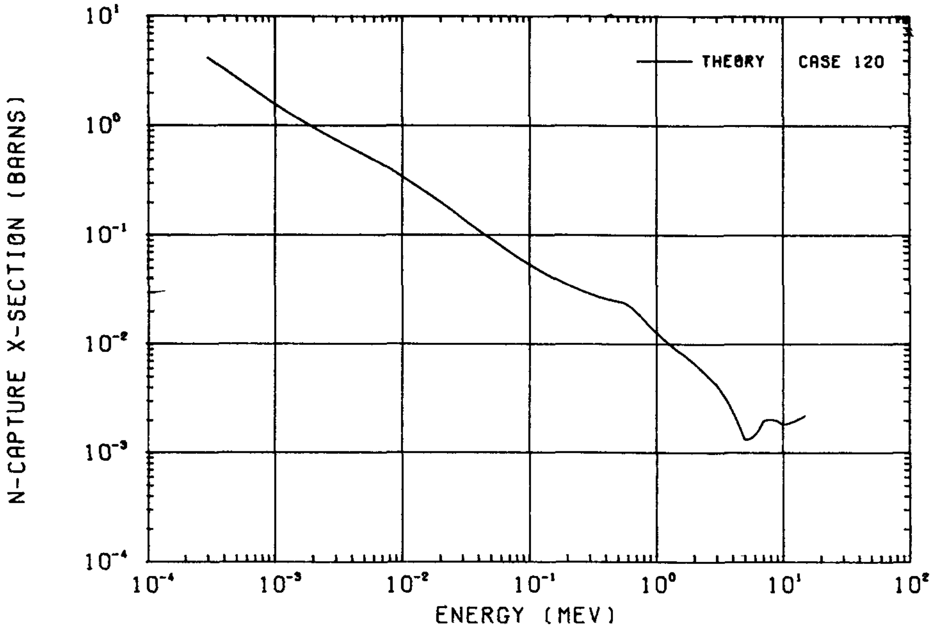


Figure 1.

KR 83

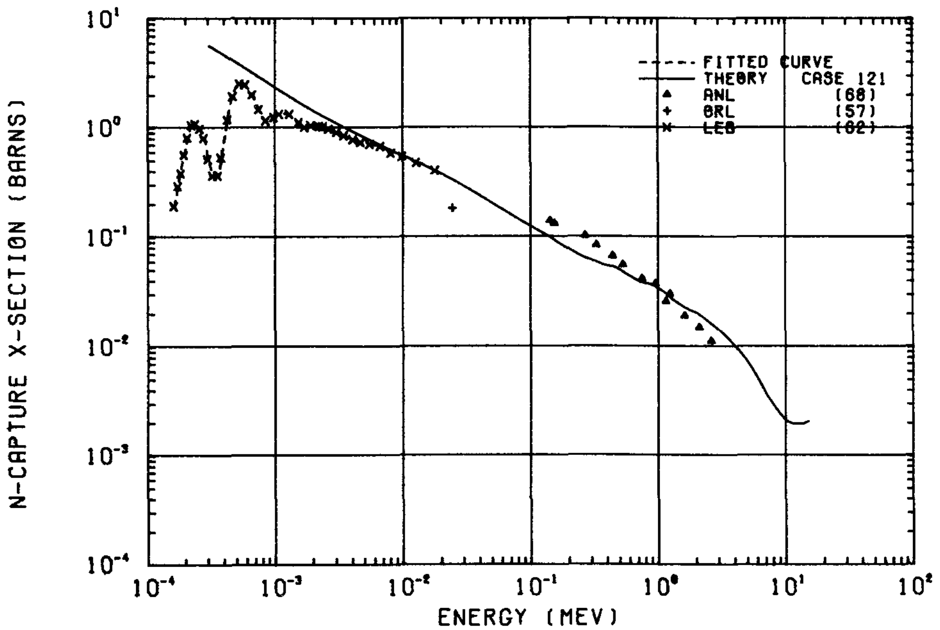


Figure 2.

RB 85

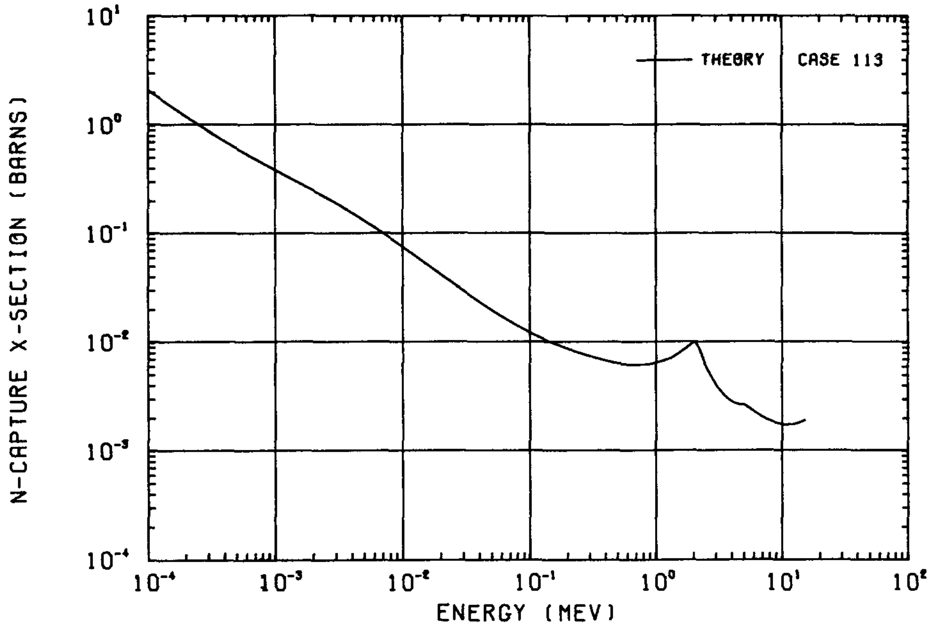


Figure 3. SR 89

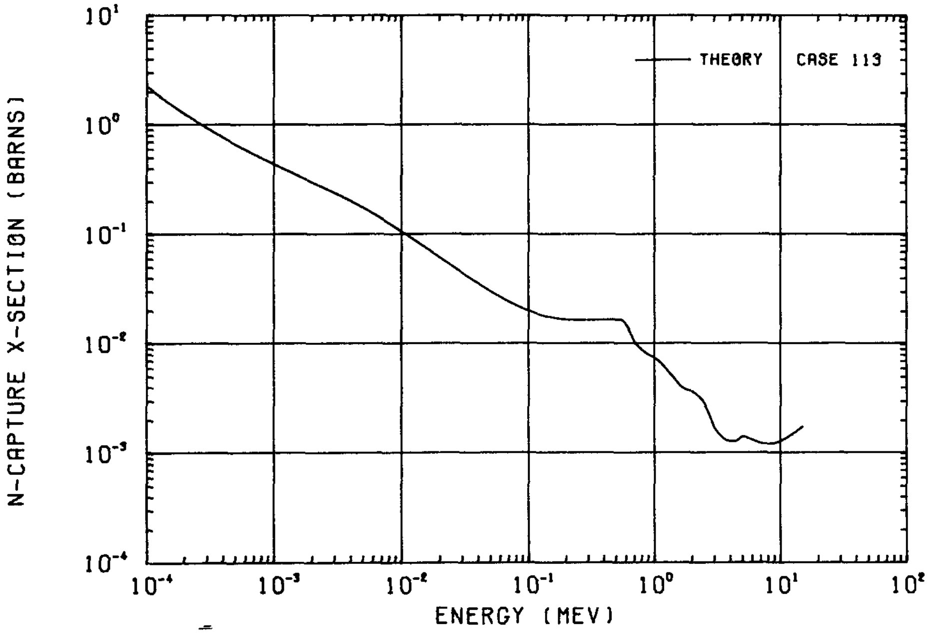


Figure 4. Y 91

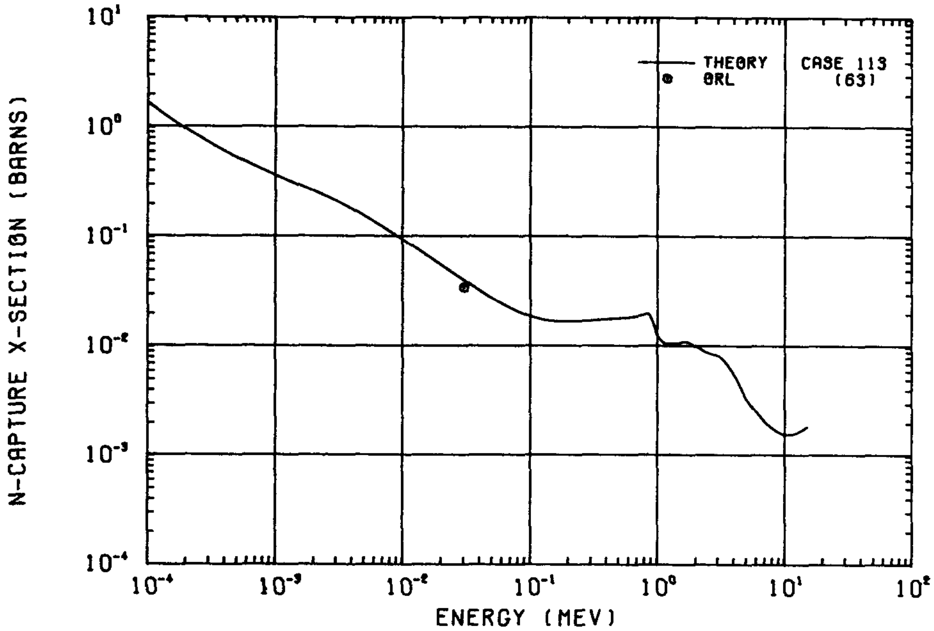


Figure 5. ZR 92

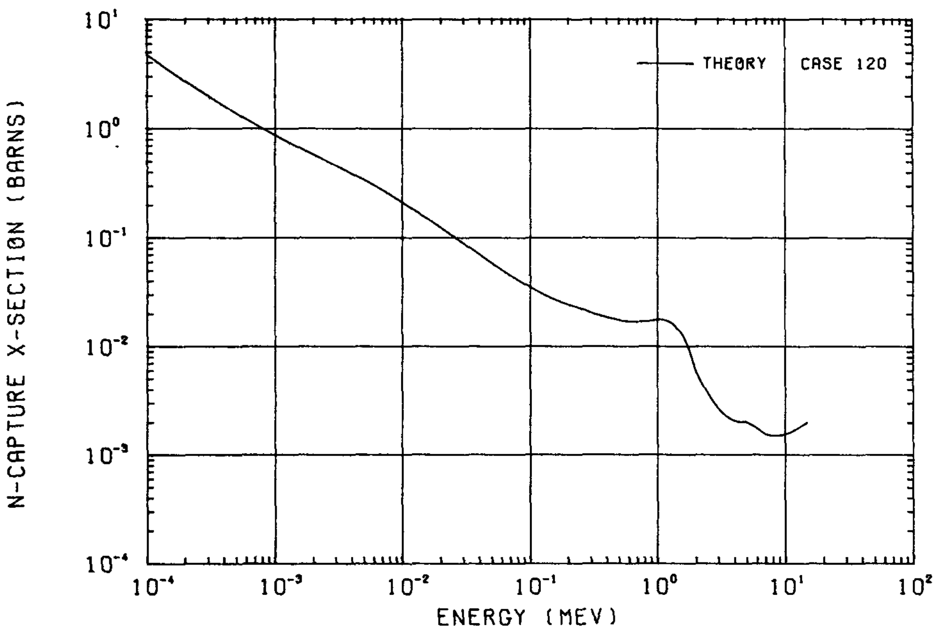


Figure 6. ZR 93

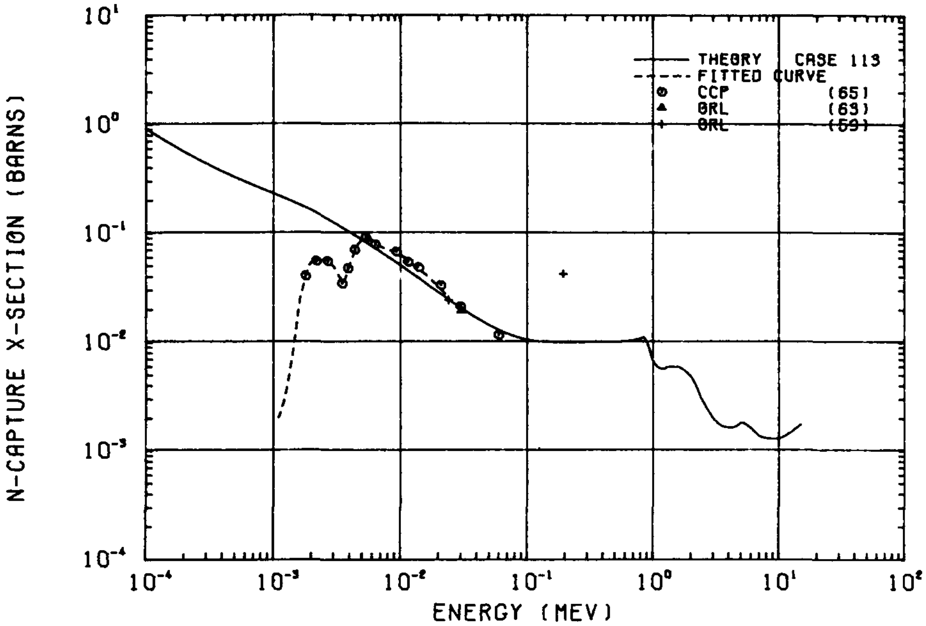


Figure 7. ZR 94

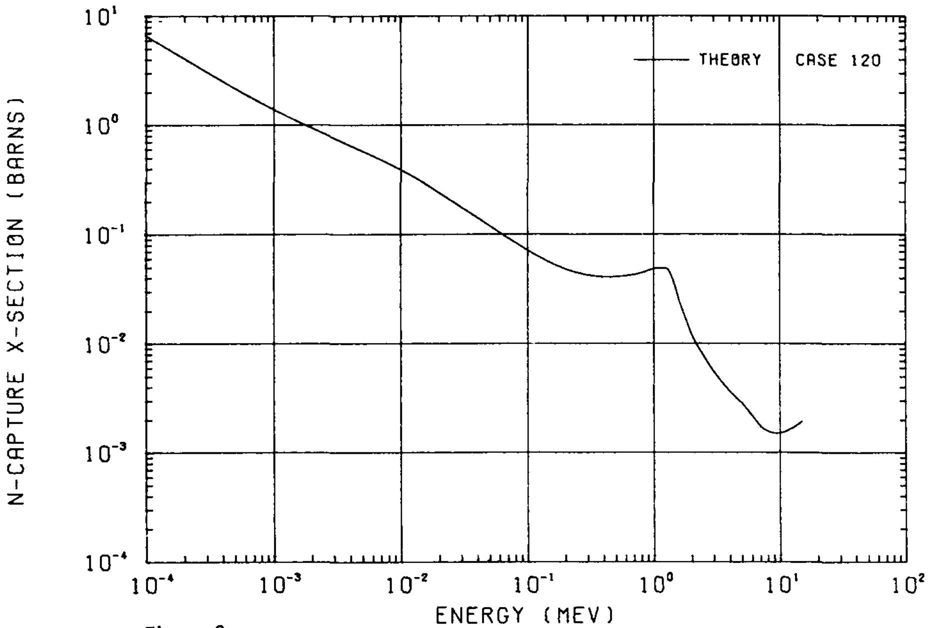


Figure 8. ZR 95

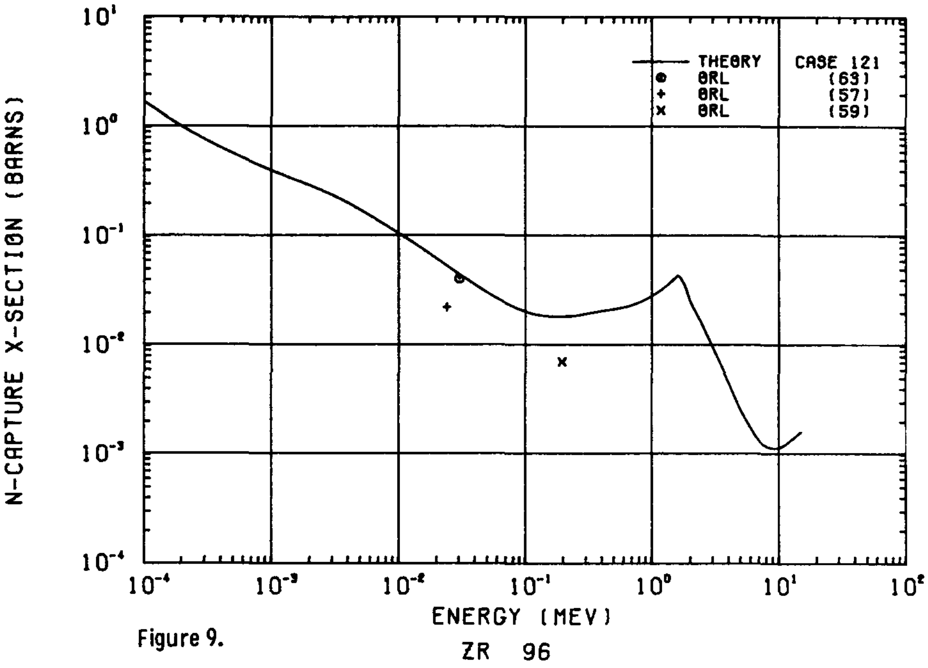


Figure 9.

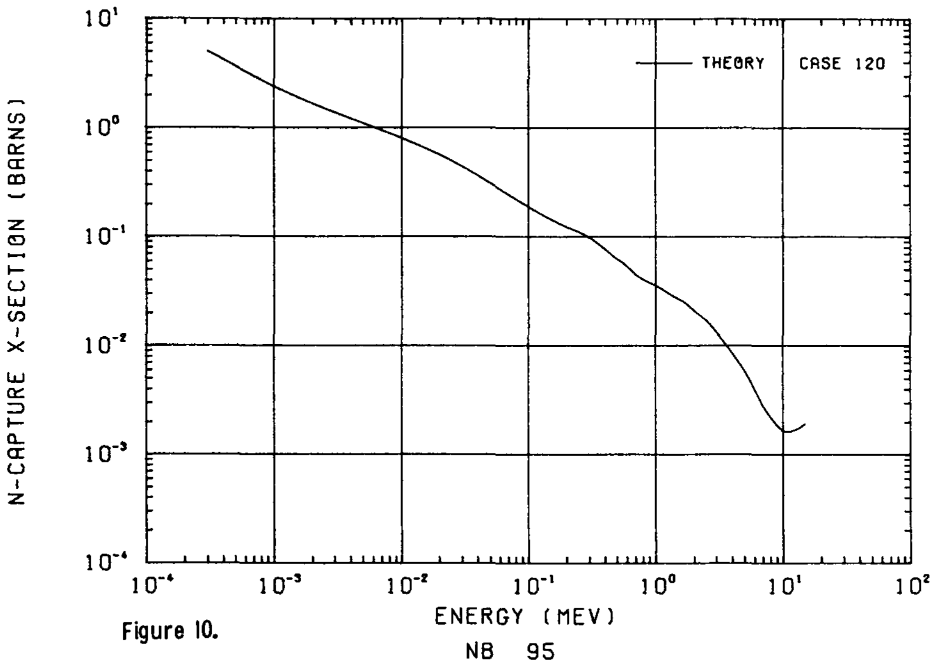


Figure 10.

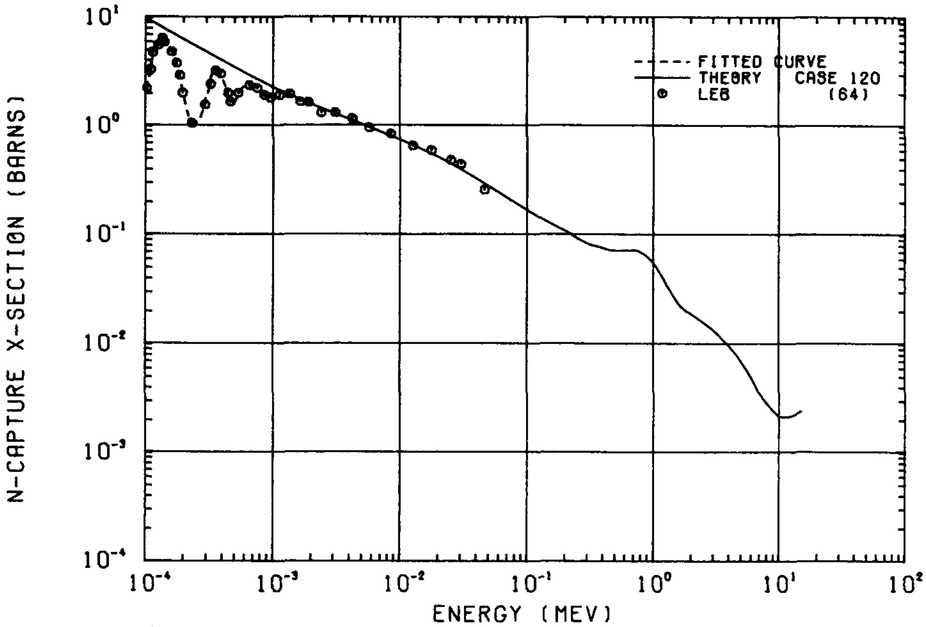


Figure 11. MO 95

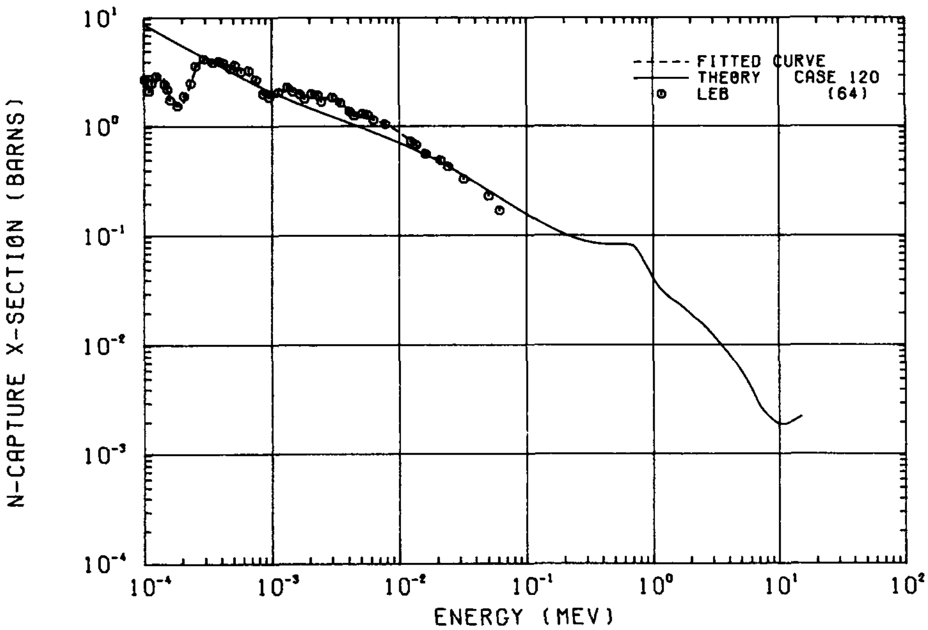


Figure 12. MO 97

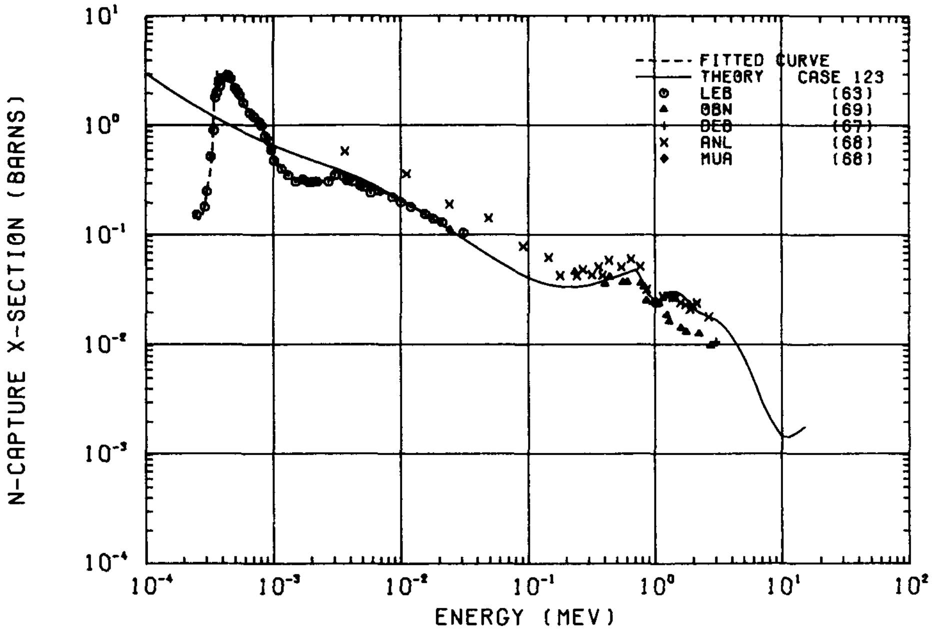


Figure 13. MO 98

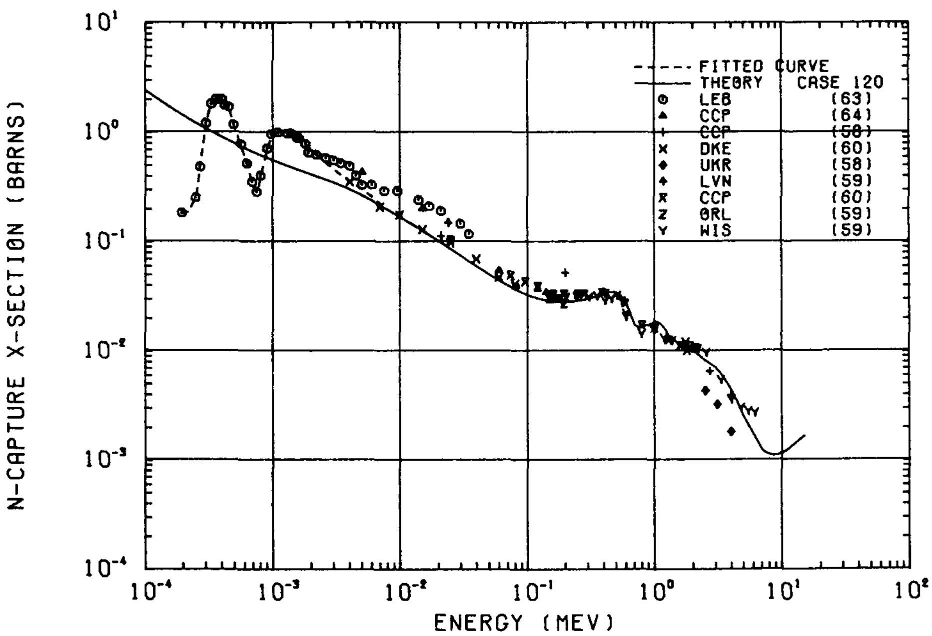


Figure 14. MO 100

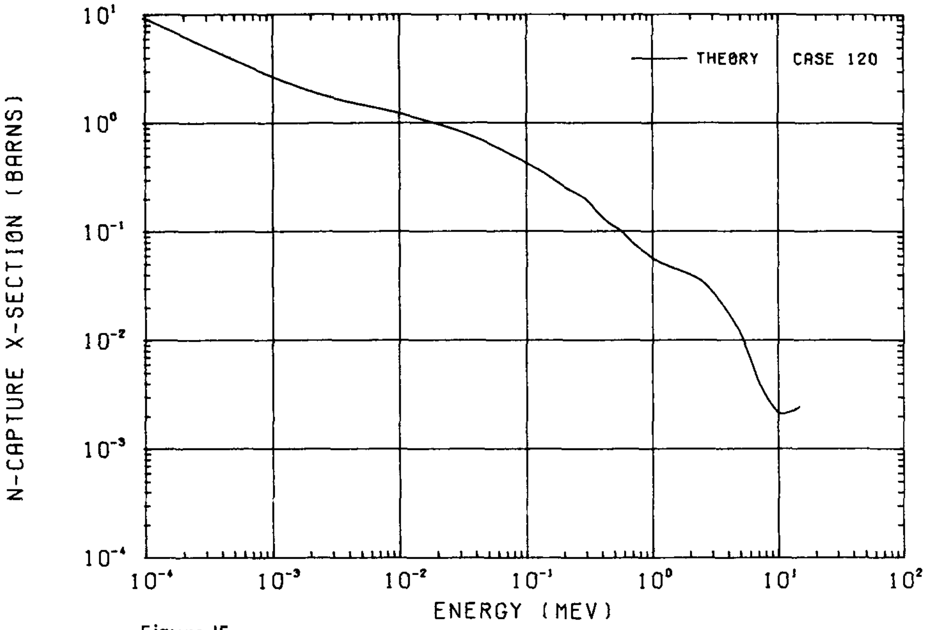


Figure 15. RU 101

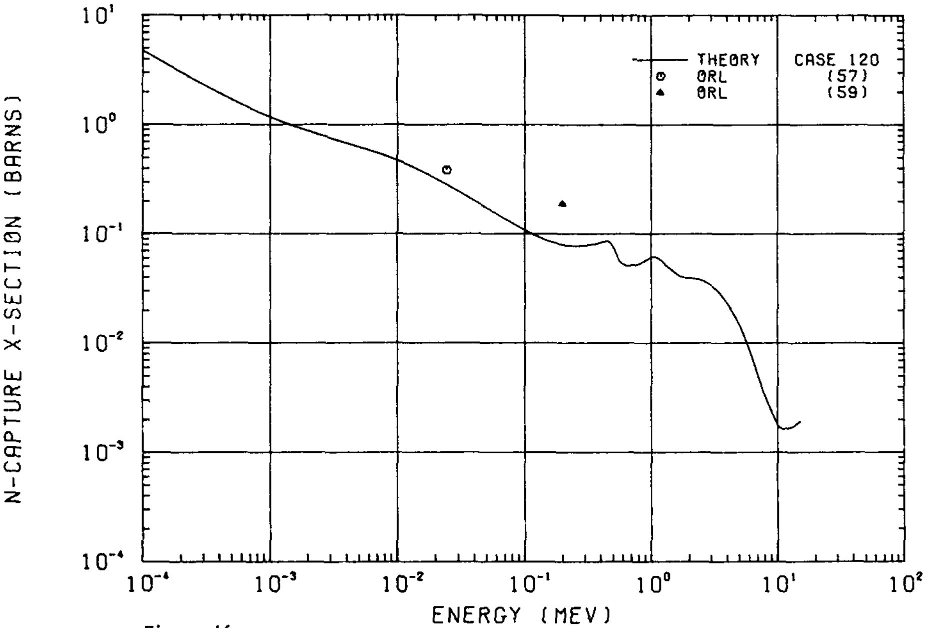


Figure 16. RU 102

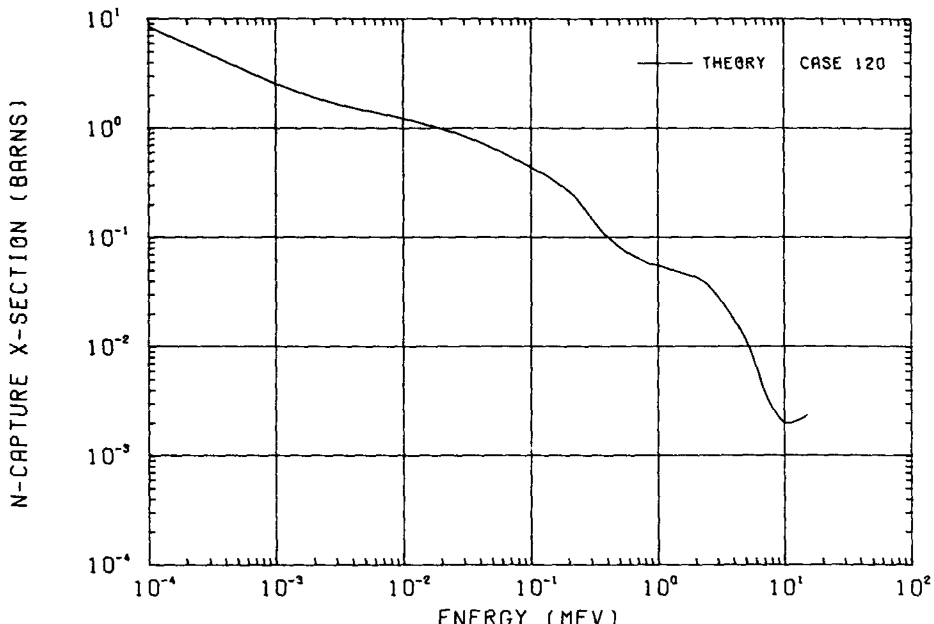


Figure 17.
RU 103

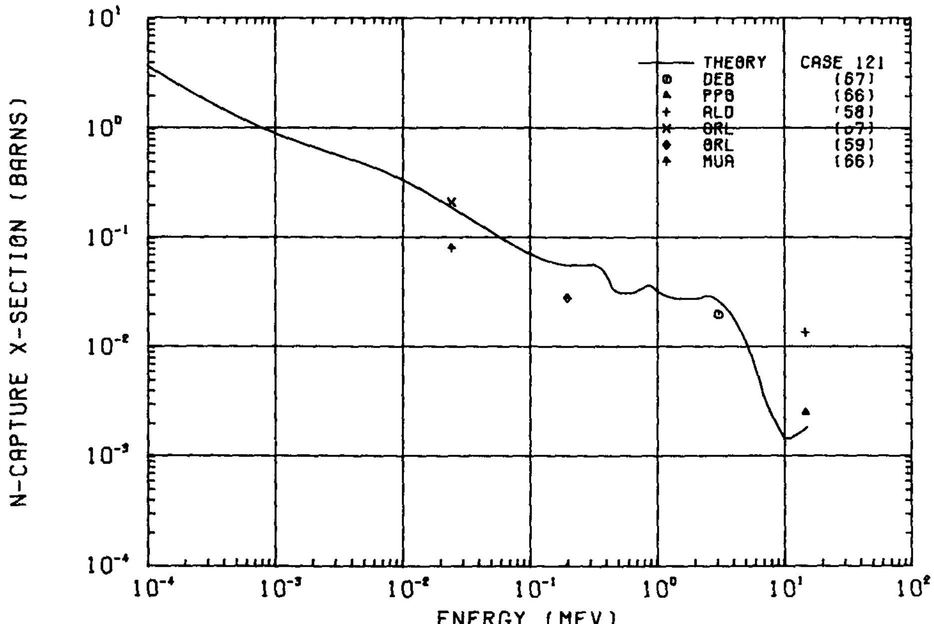


Figure 18.
RU 104

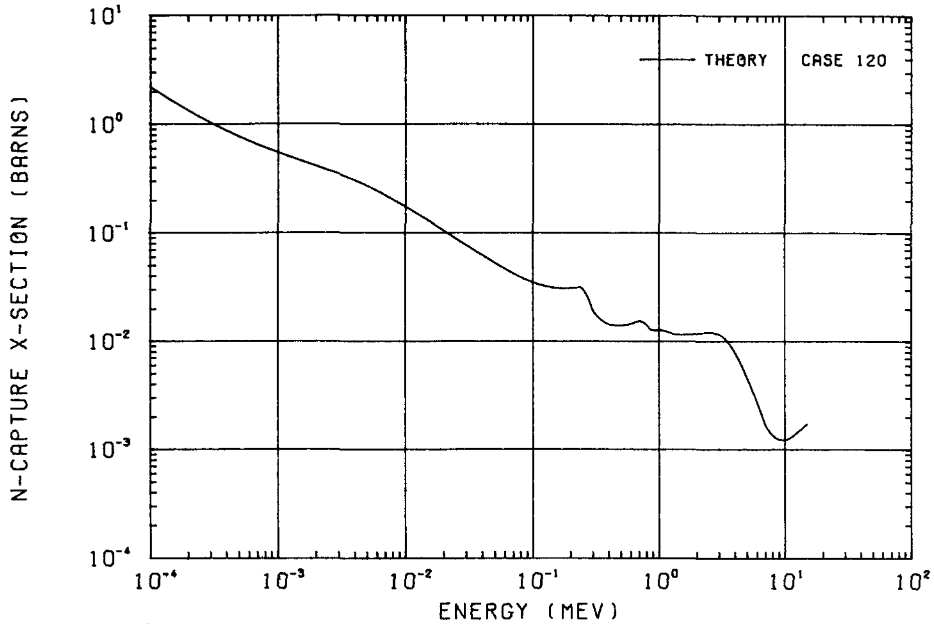


Figure 19.
RU 106

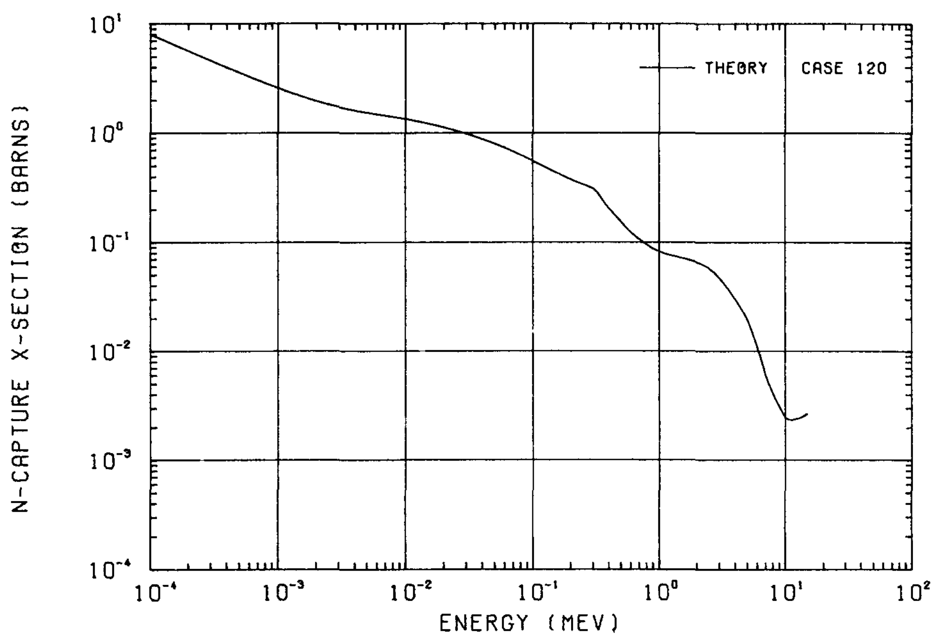


Figure 20.
PD 105

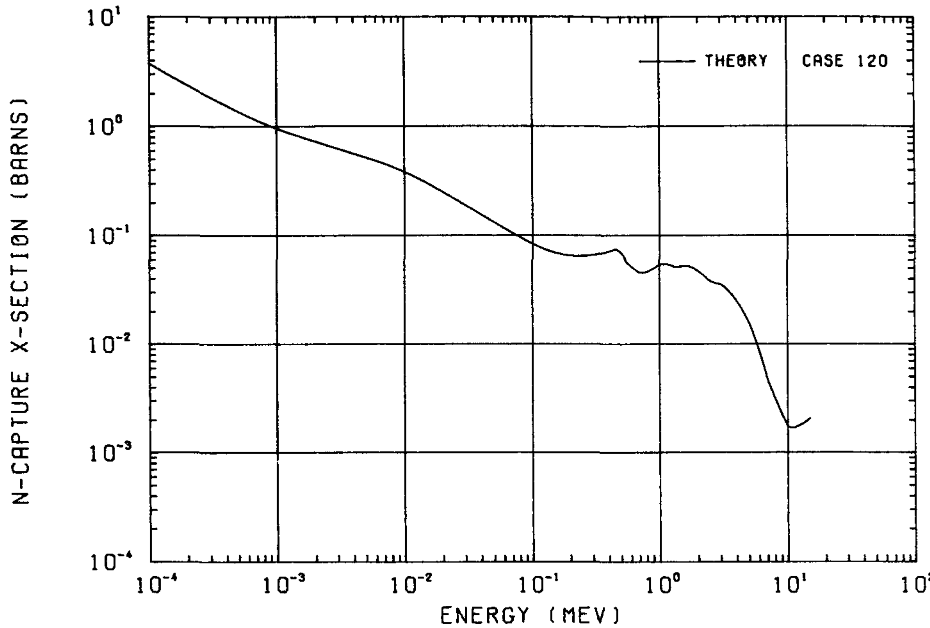
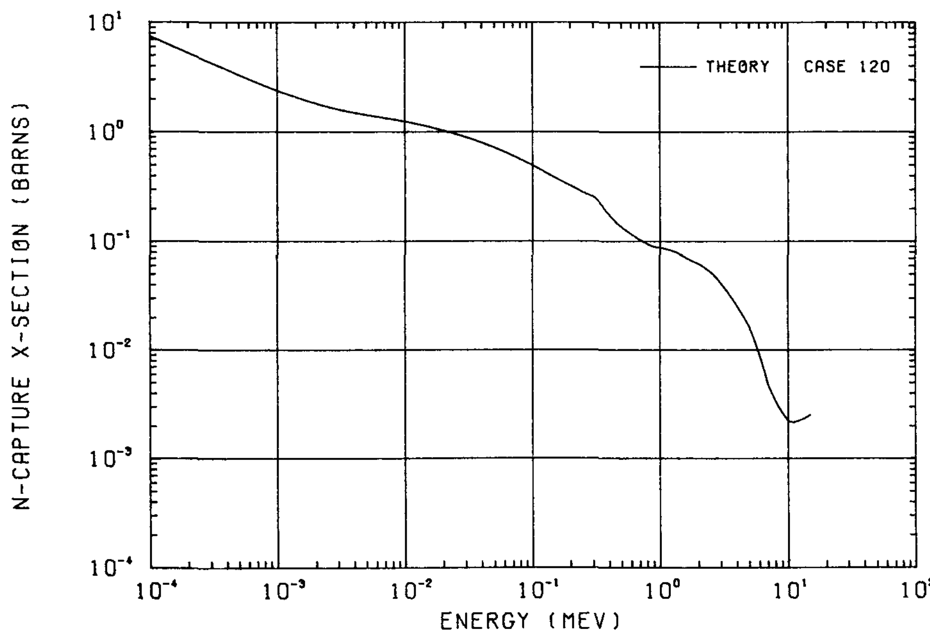


Figure 21. PD 106



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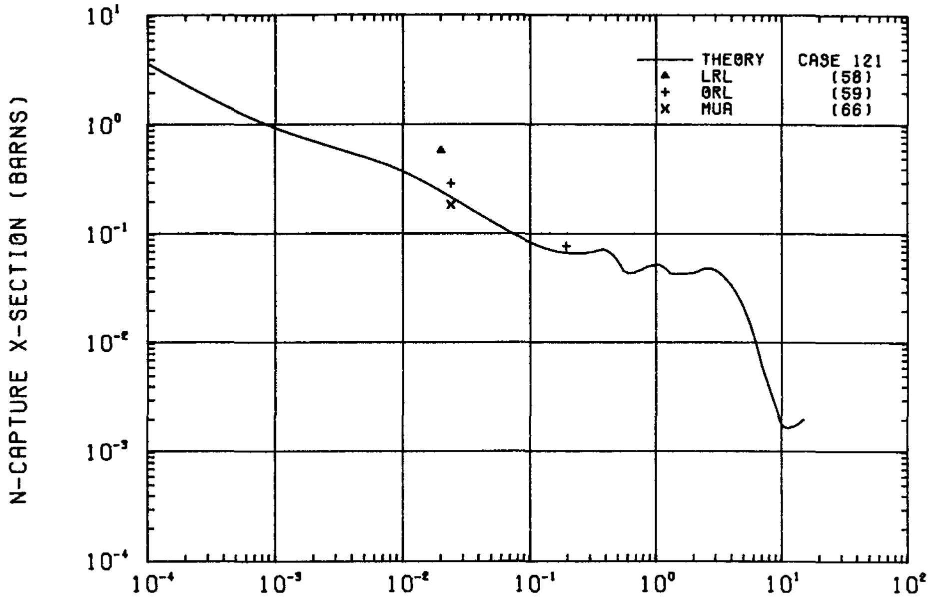
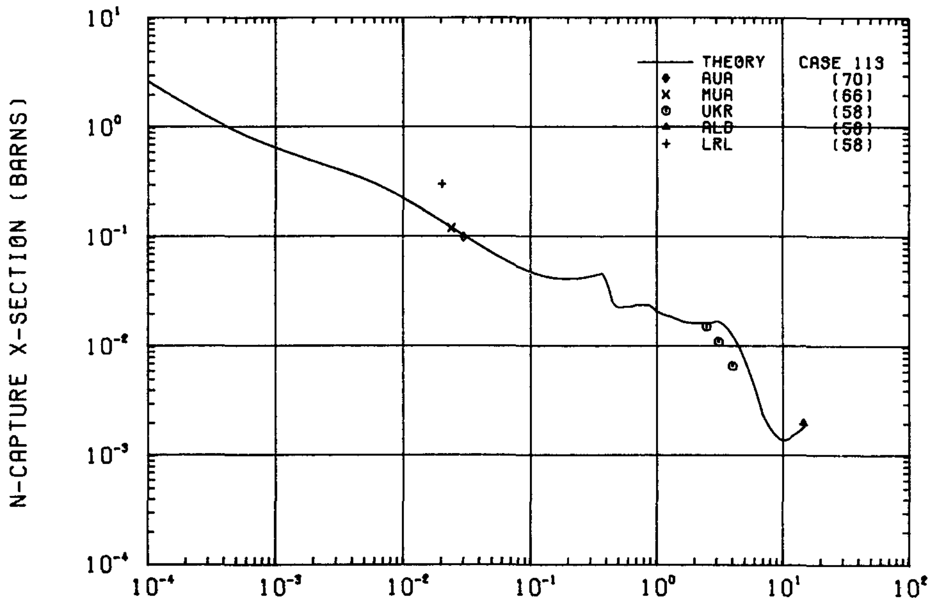


Figure 23.

PD 108



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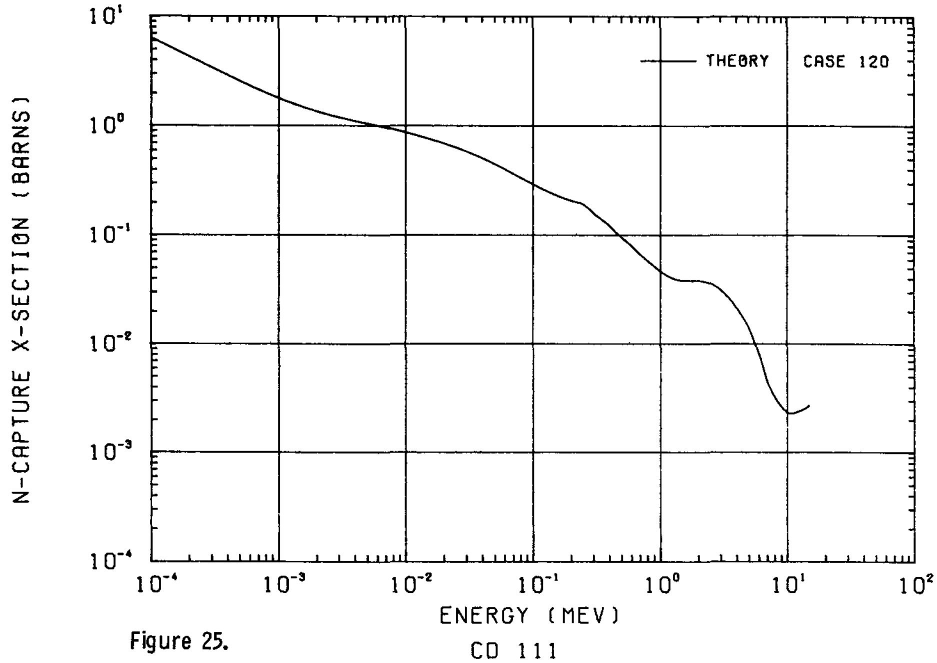
PD 110



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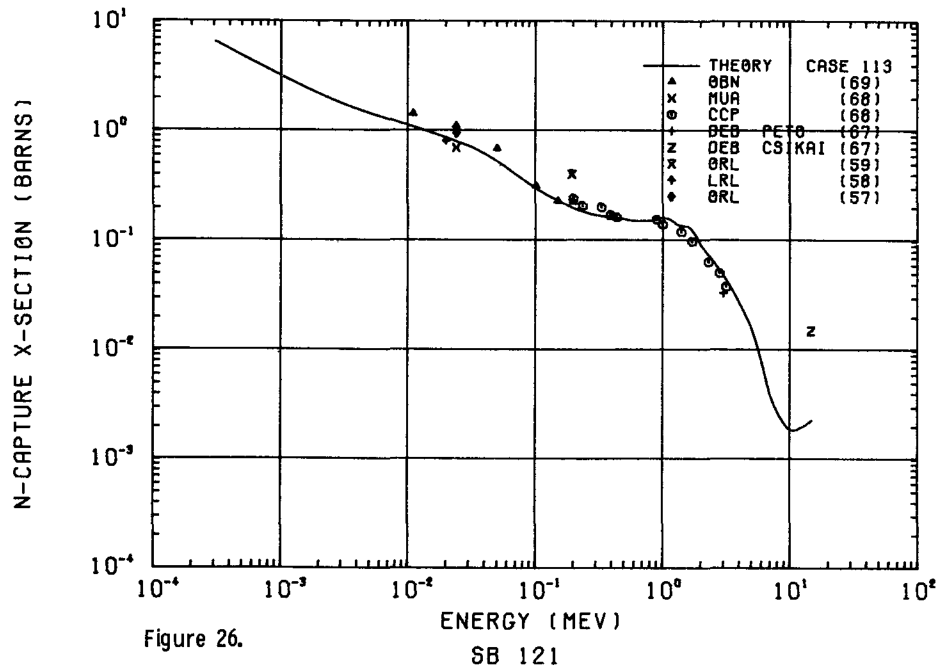

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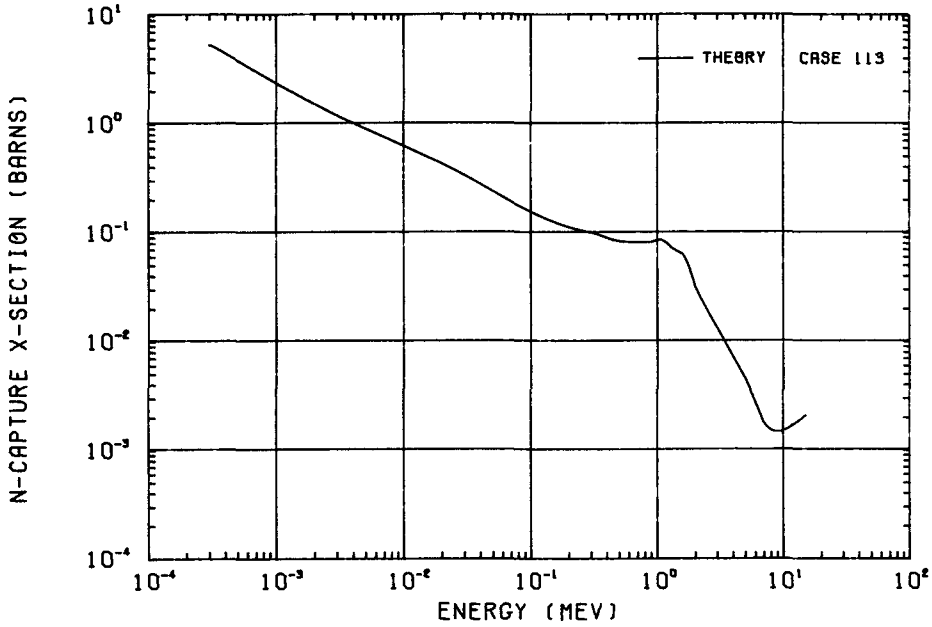


Figure 27. SB 125

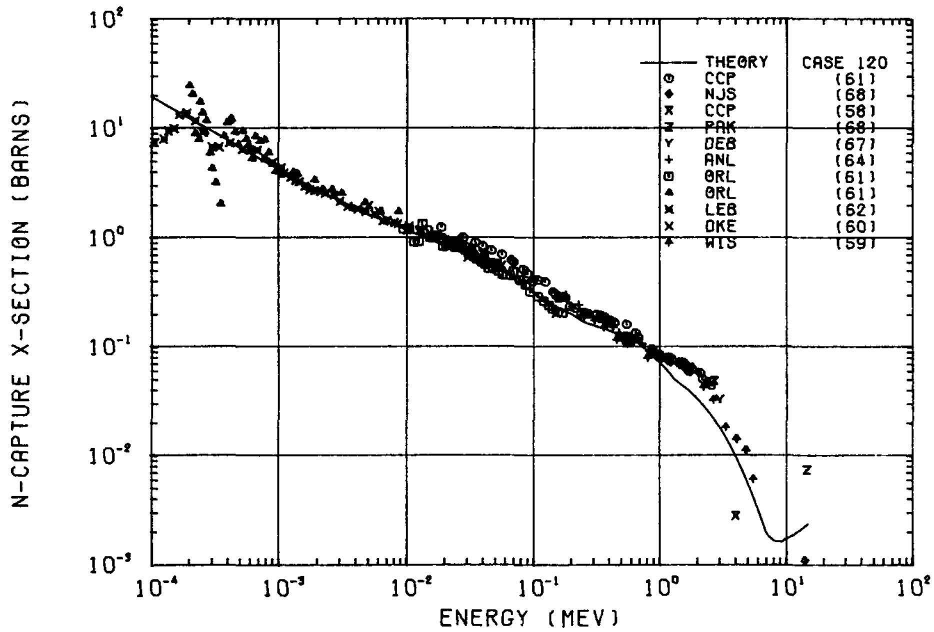


Figure 28. I 127

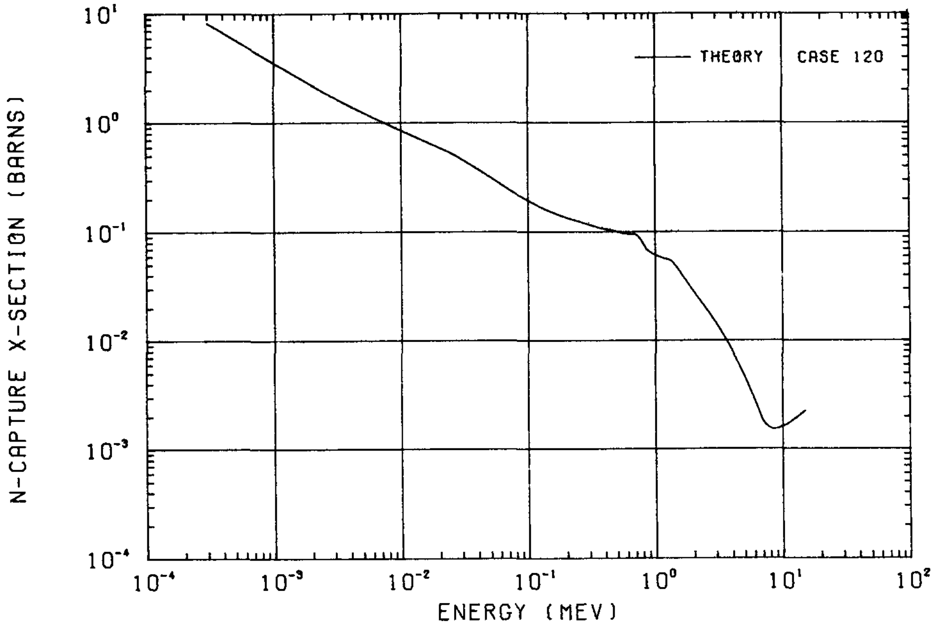


Figure 29.
I 129

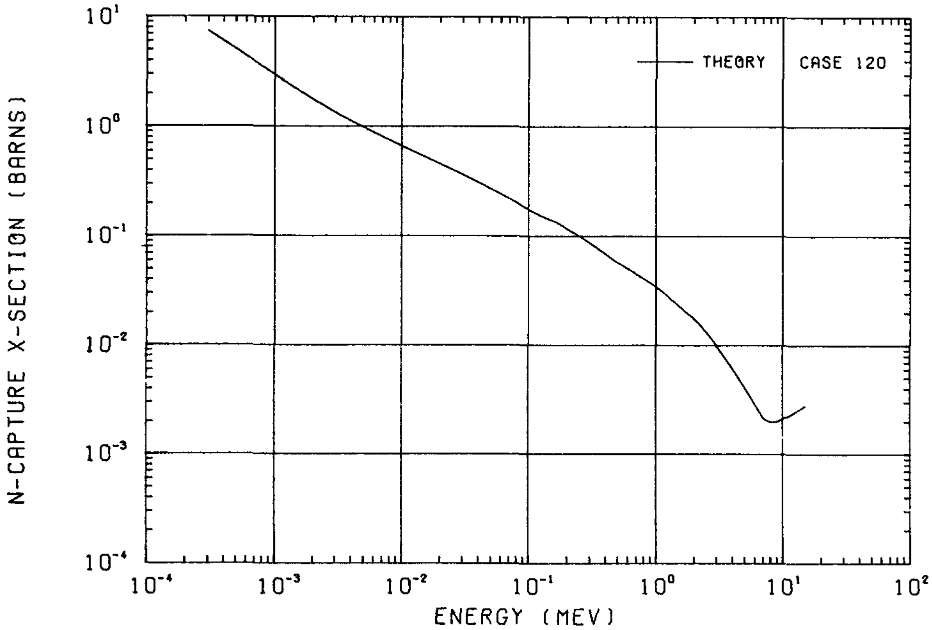
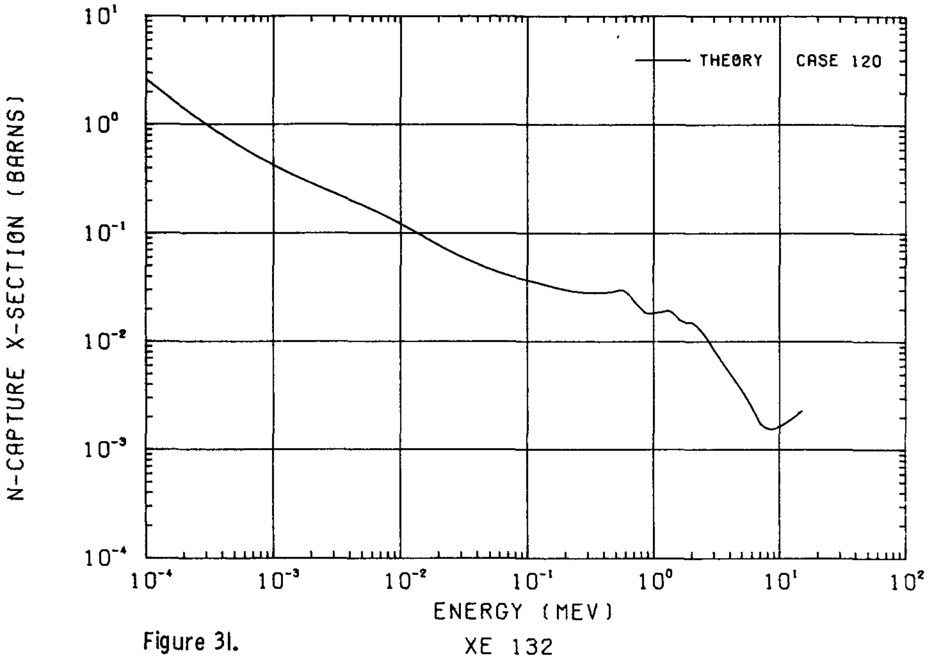


Figure 30.
XE 131



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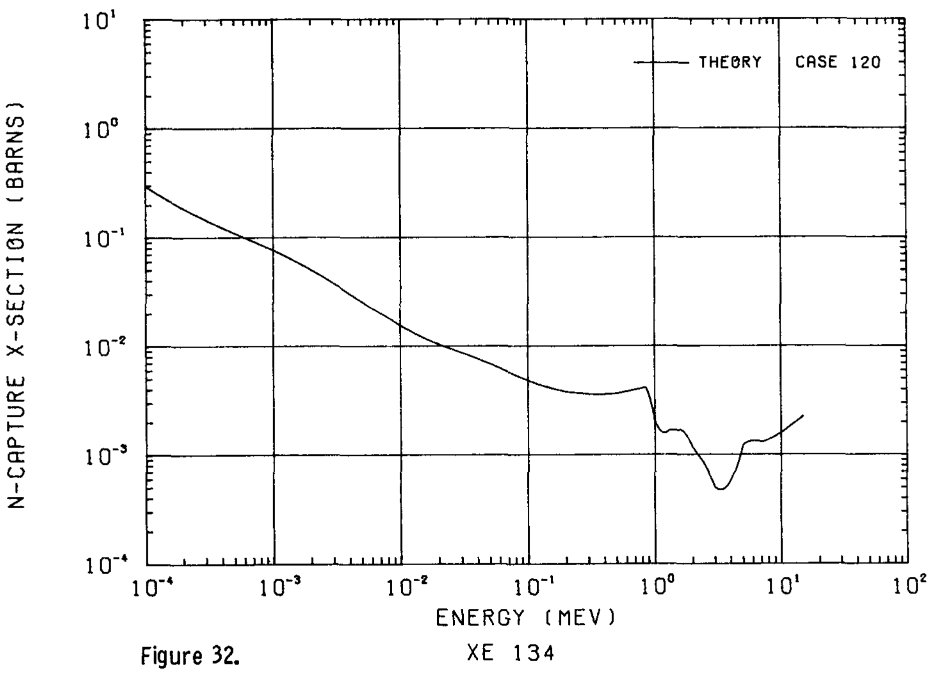

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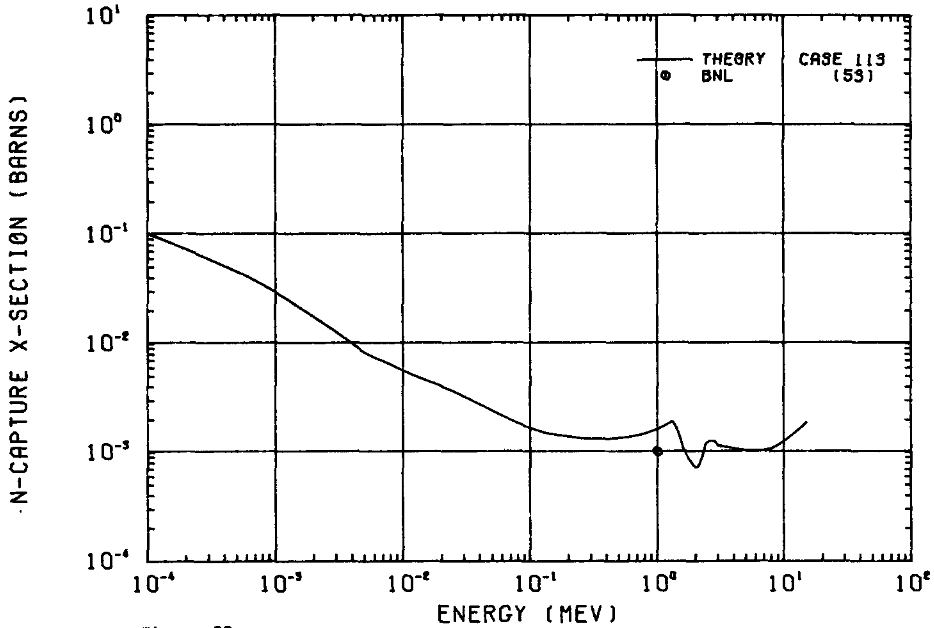

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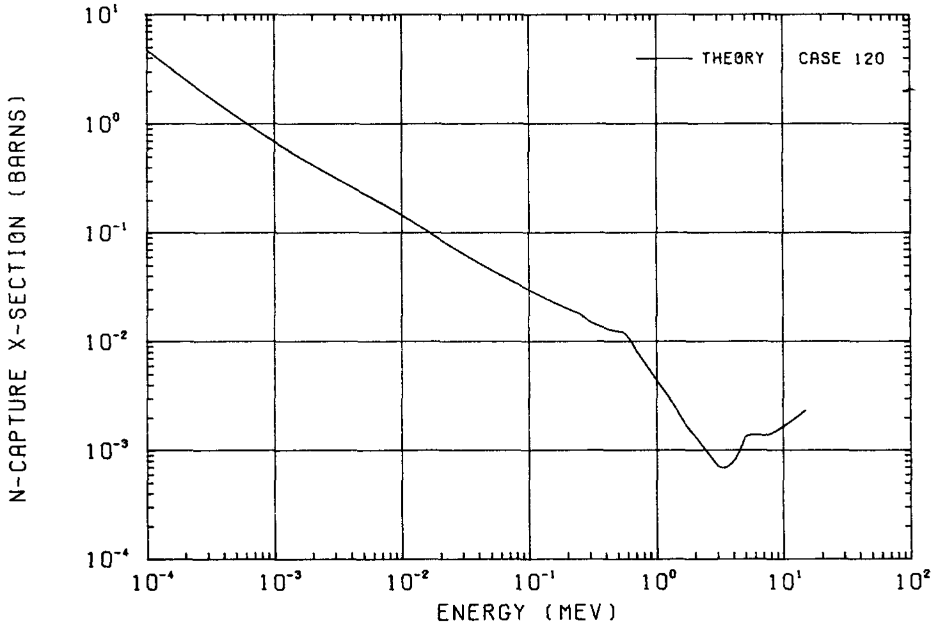

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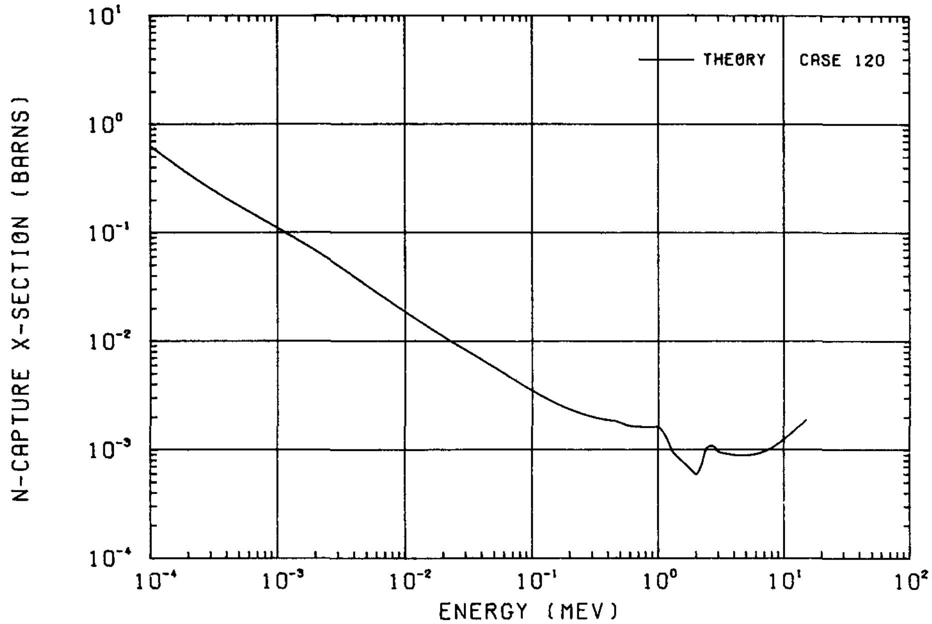

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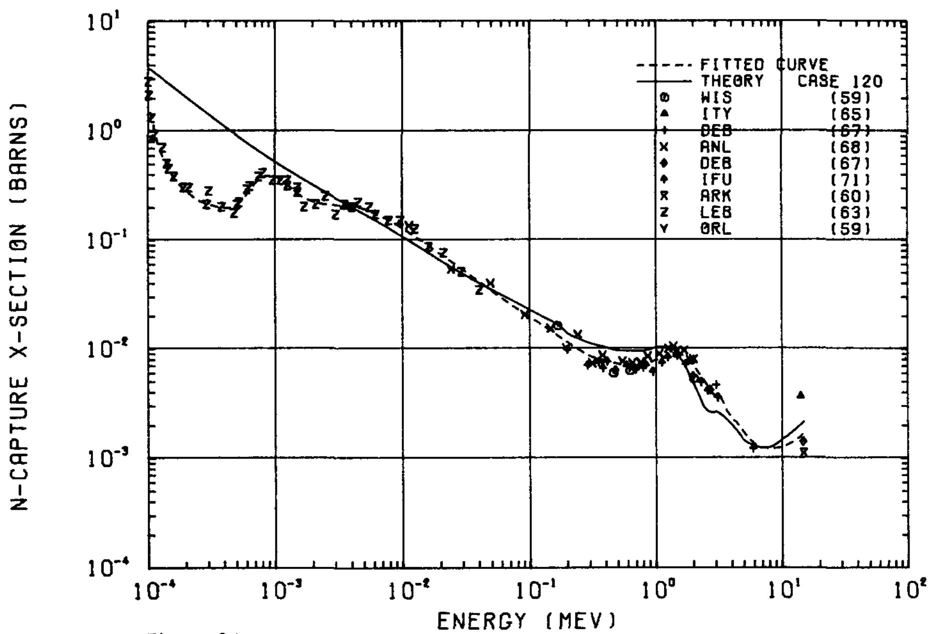
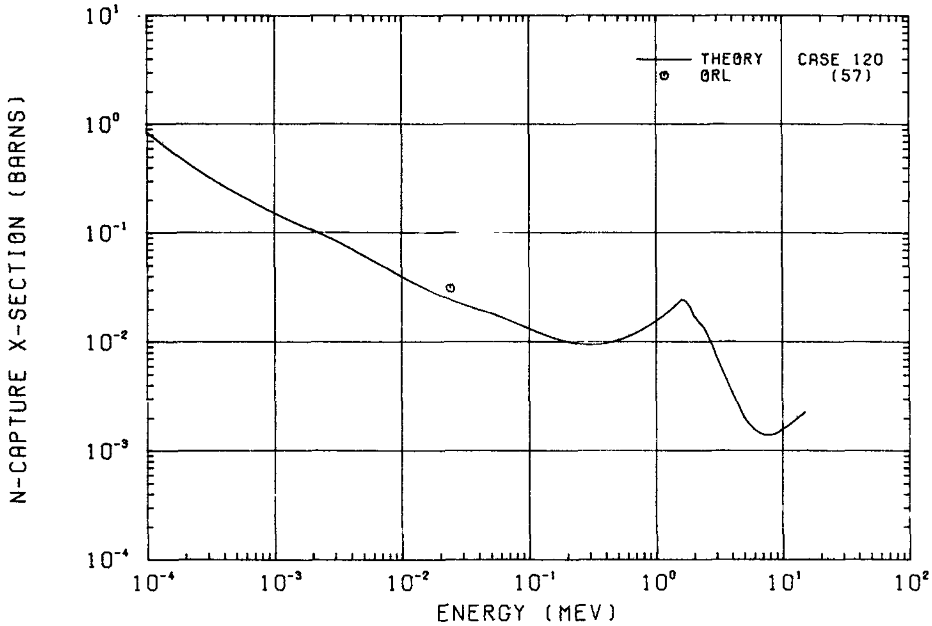


Figure 36. LA 139



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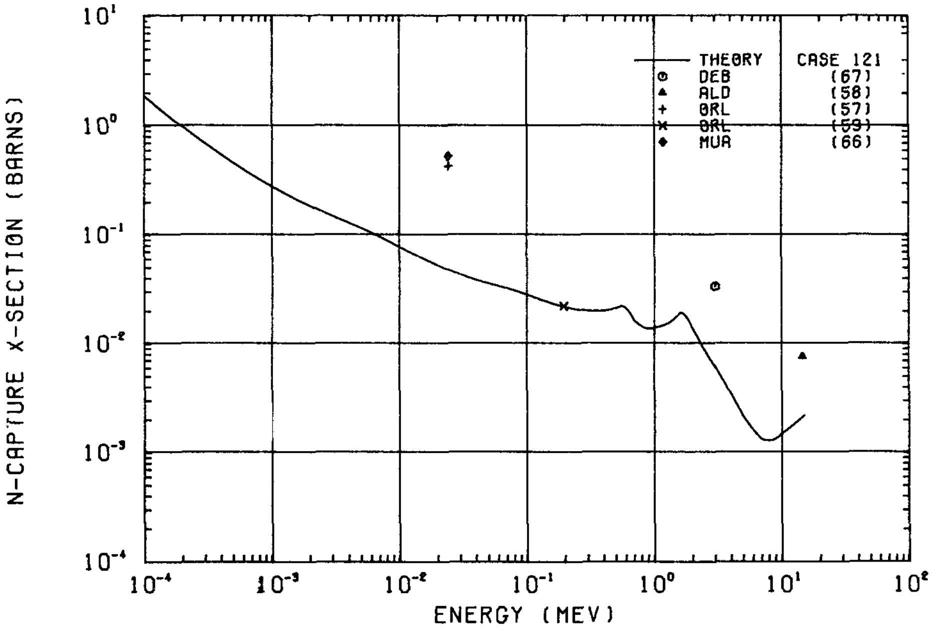


Figure 38. CE 142

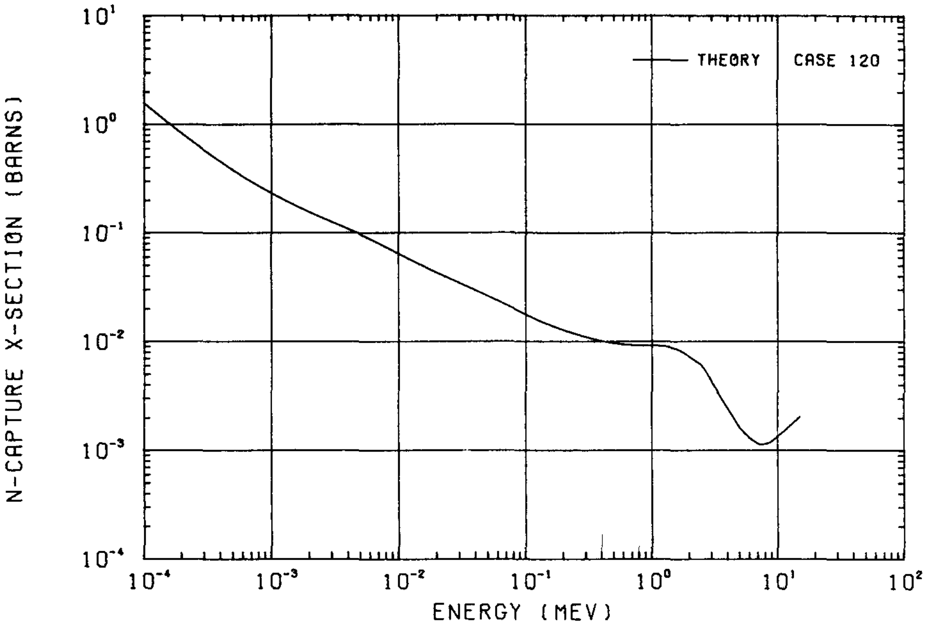


Figure 39.
CE 144

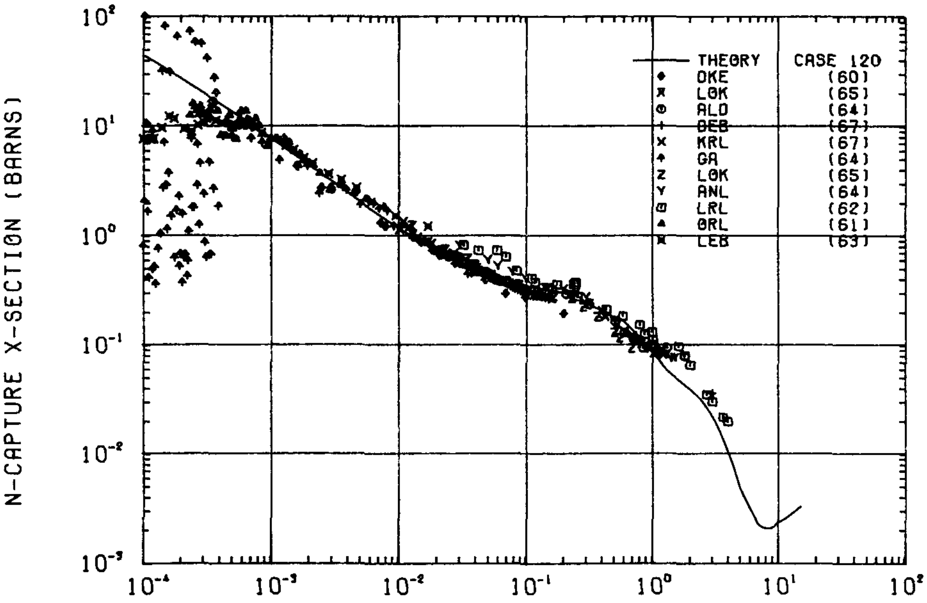


Figure 40.
AU 197

APPENDIX

CAPTURE CROSS SECTION COMPARISONS
WITH COOK AND BENZI

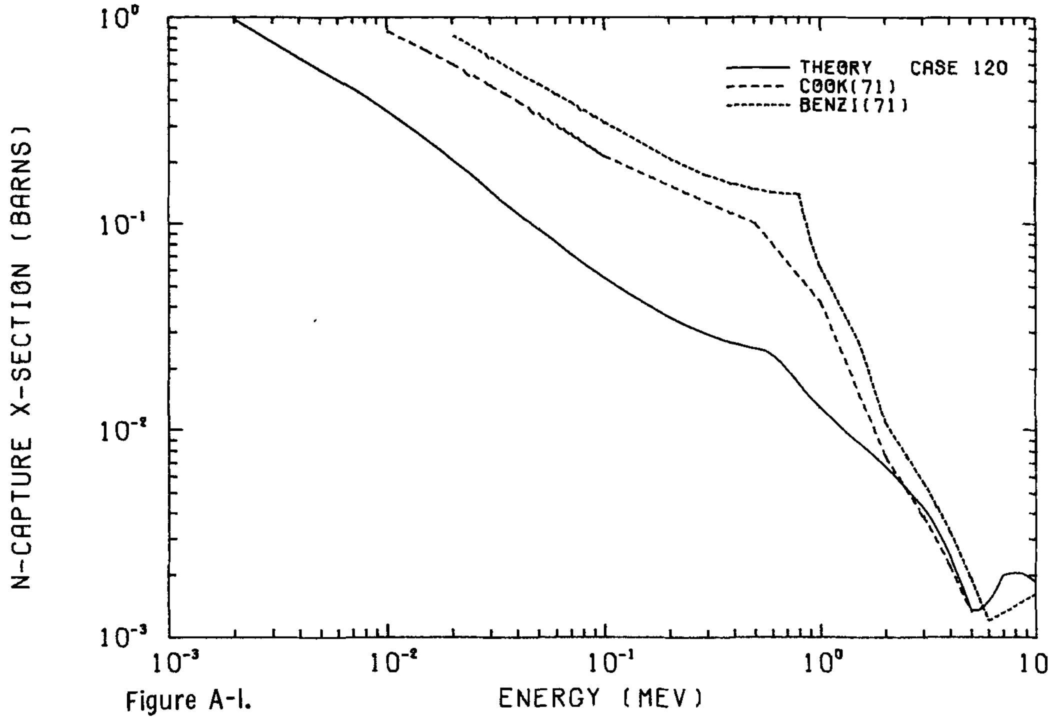


Figure A-1.

KR 83

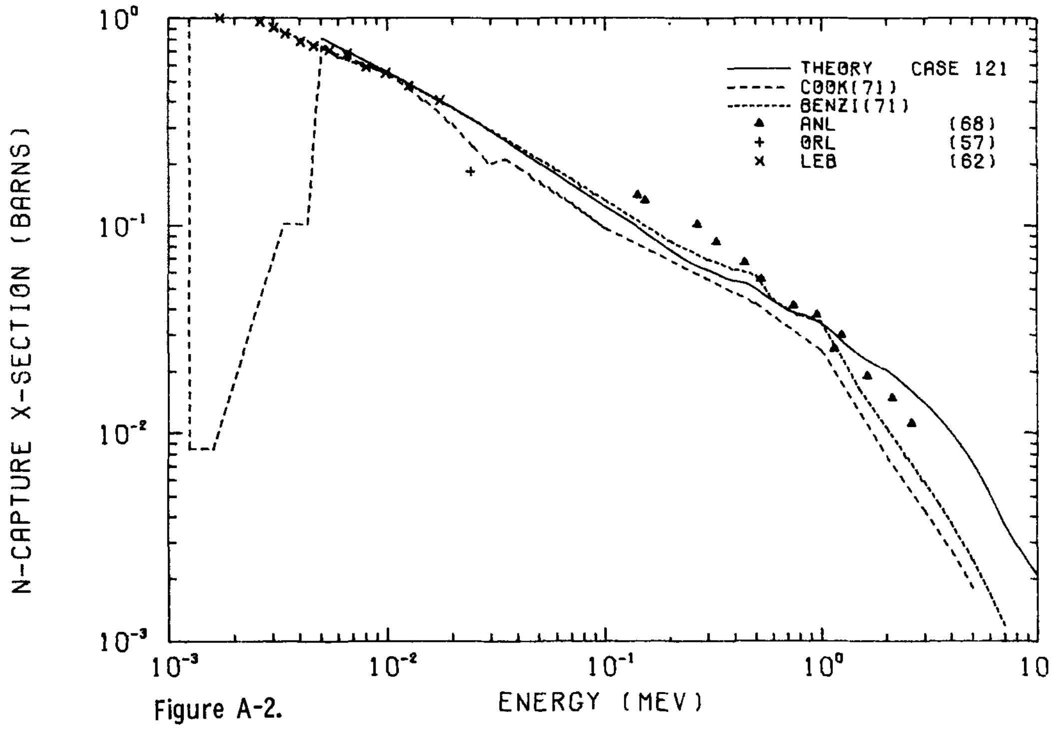
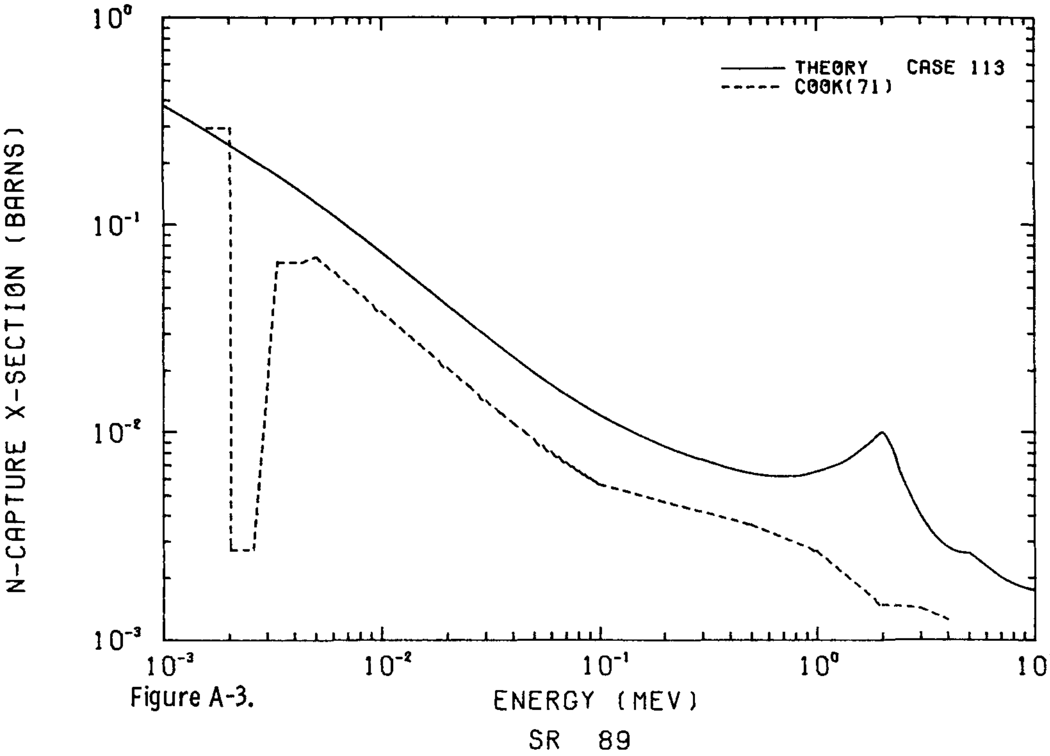


Figure A-2.

RB 85



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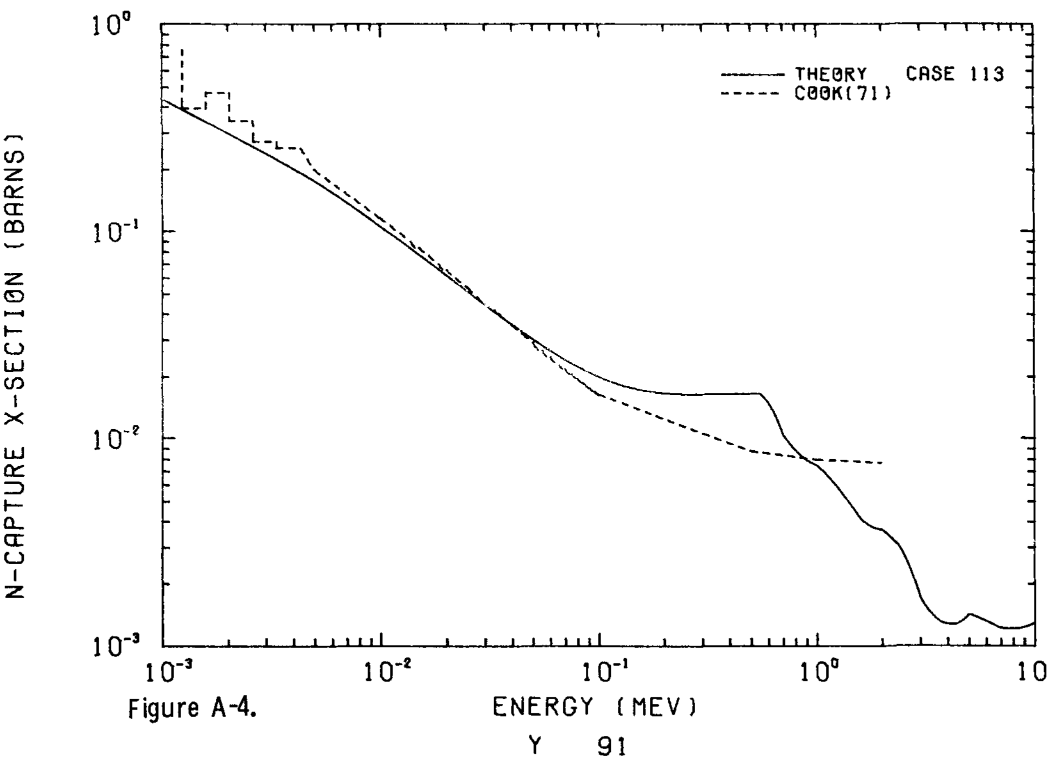

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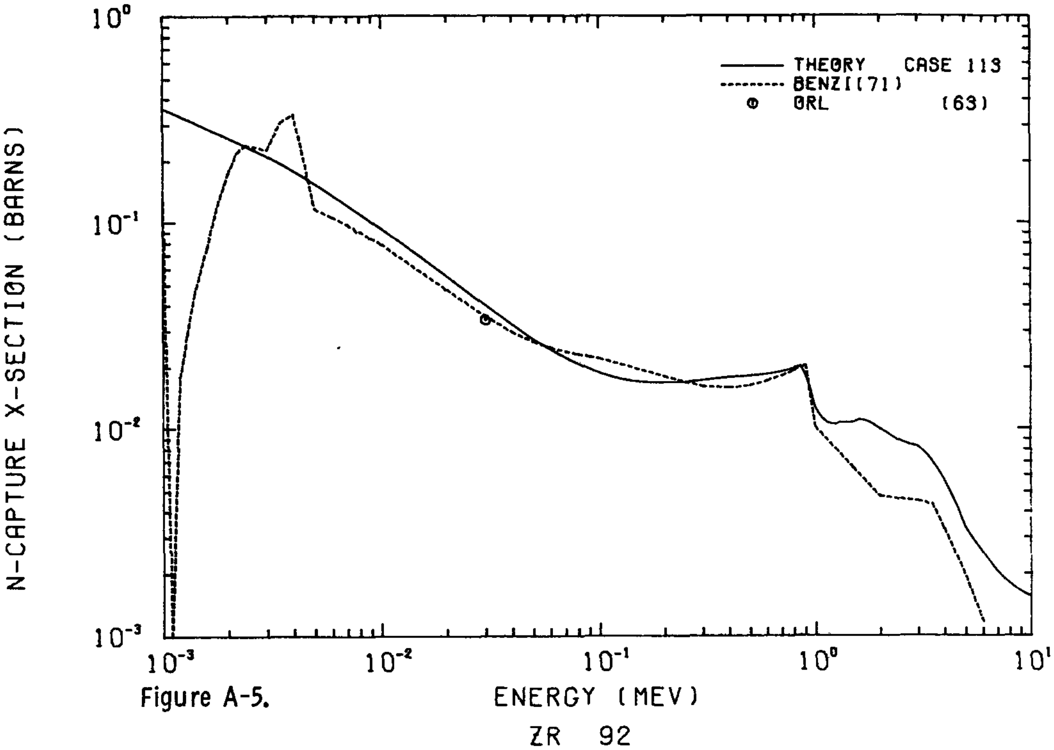

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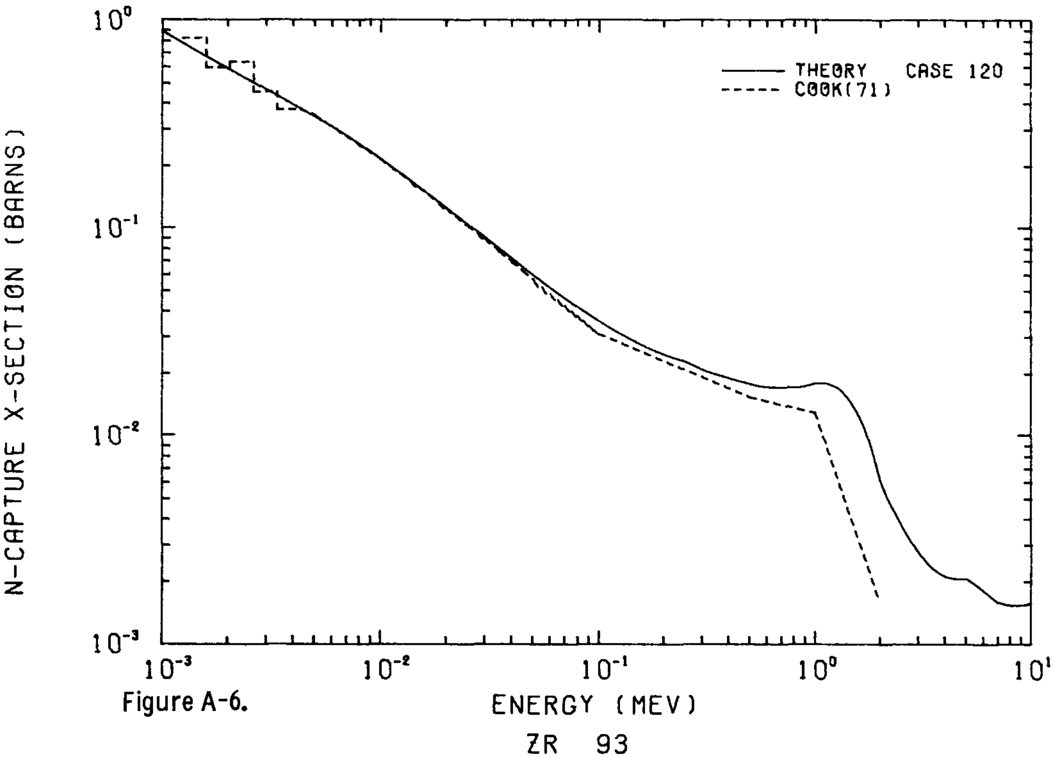

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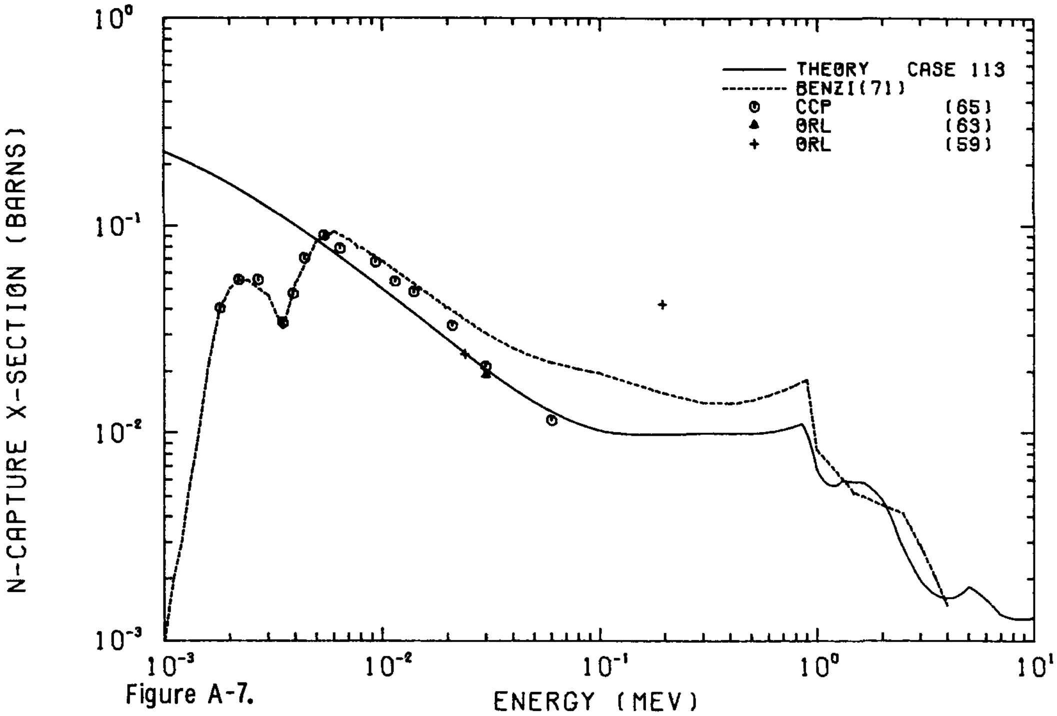
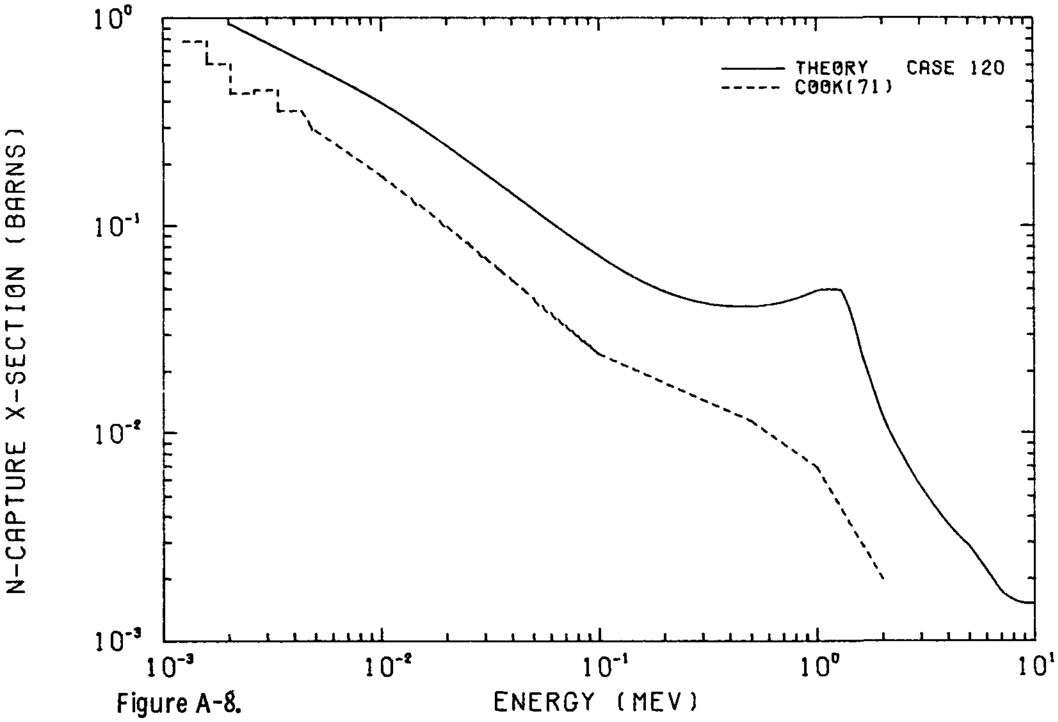


Figure A-7.

ZR 94



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ZR 95

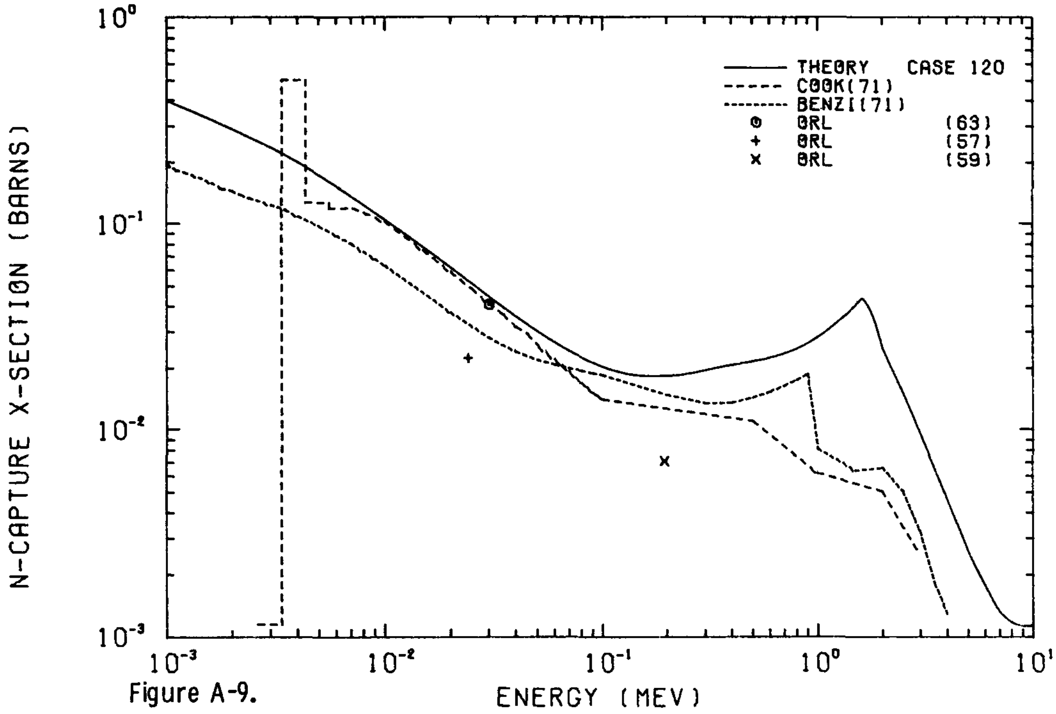


Figure A-9.

ZR 96

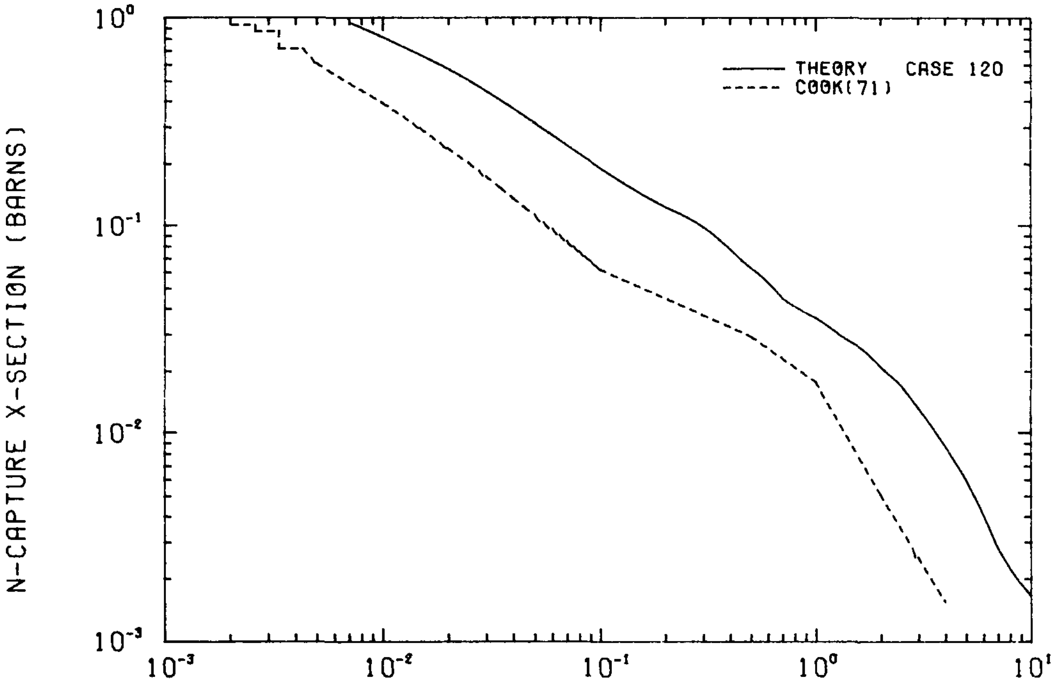


Figure A-10.

NB 95

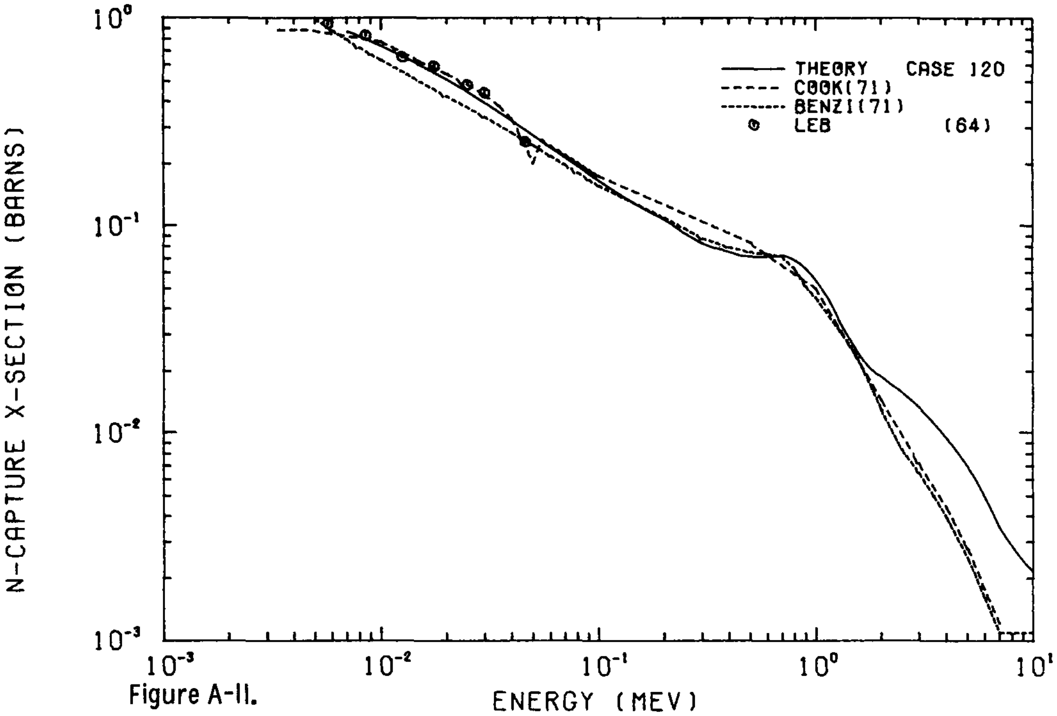


Figure A-11.

M0 95

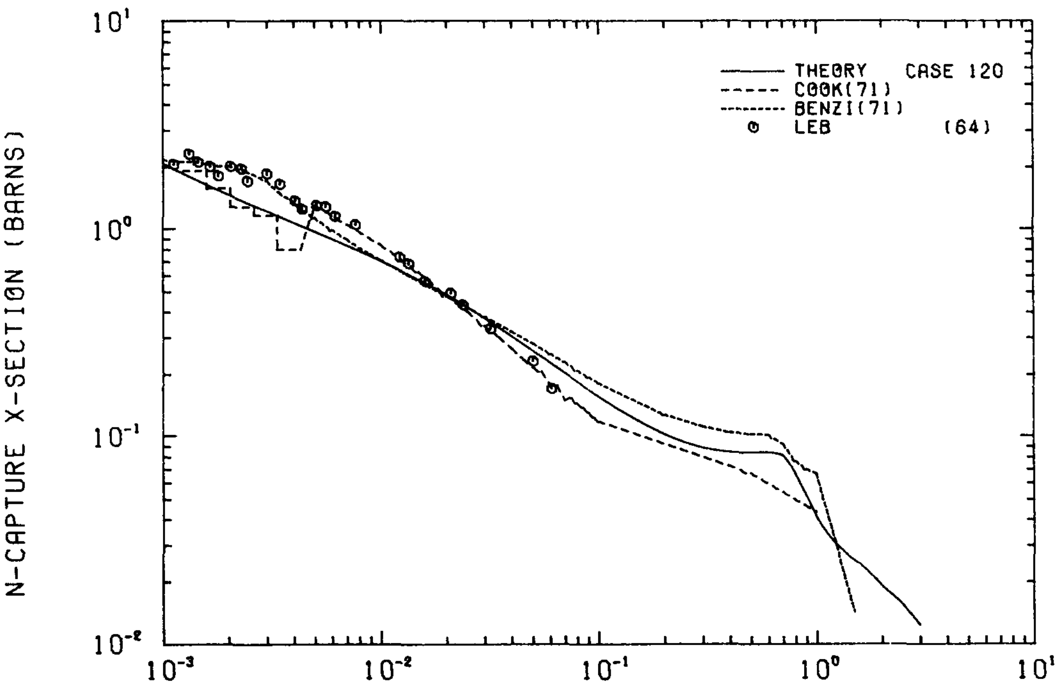


Figure A-12.

M0 97

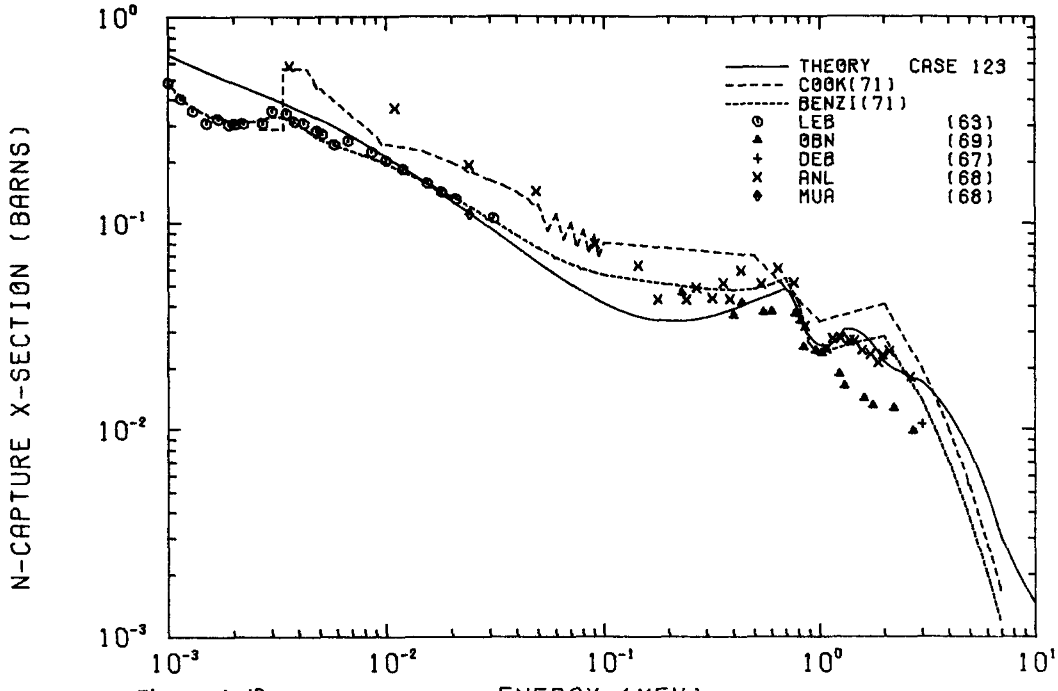


Figure A-13. MO 98

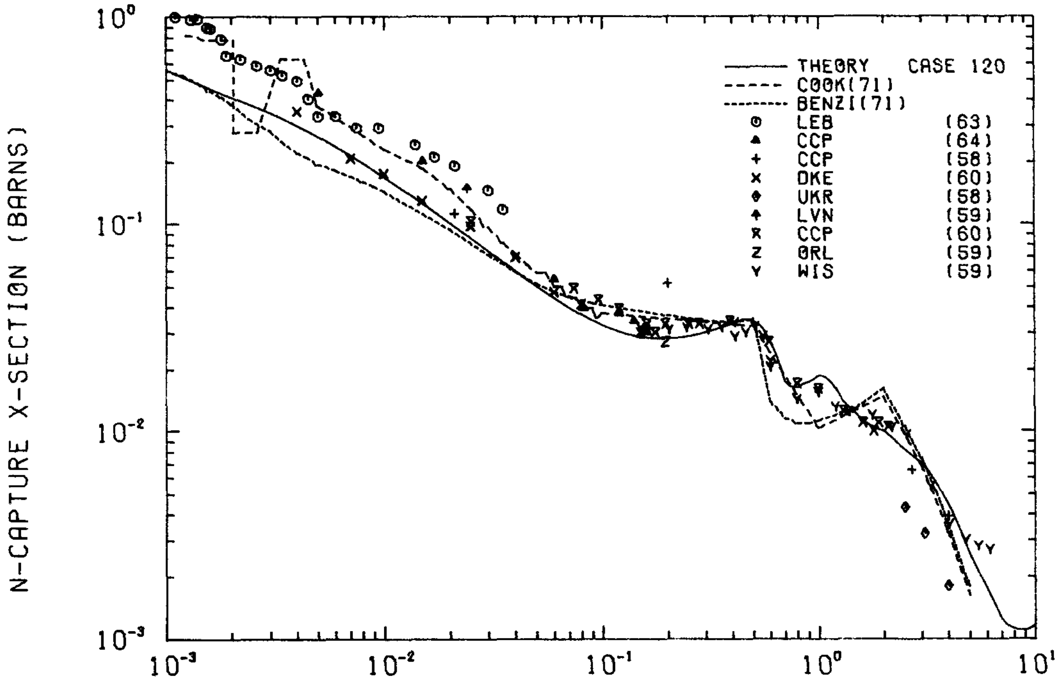


Figure A-14. MO 100

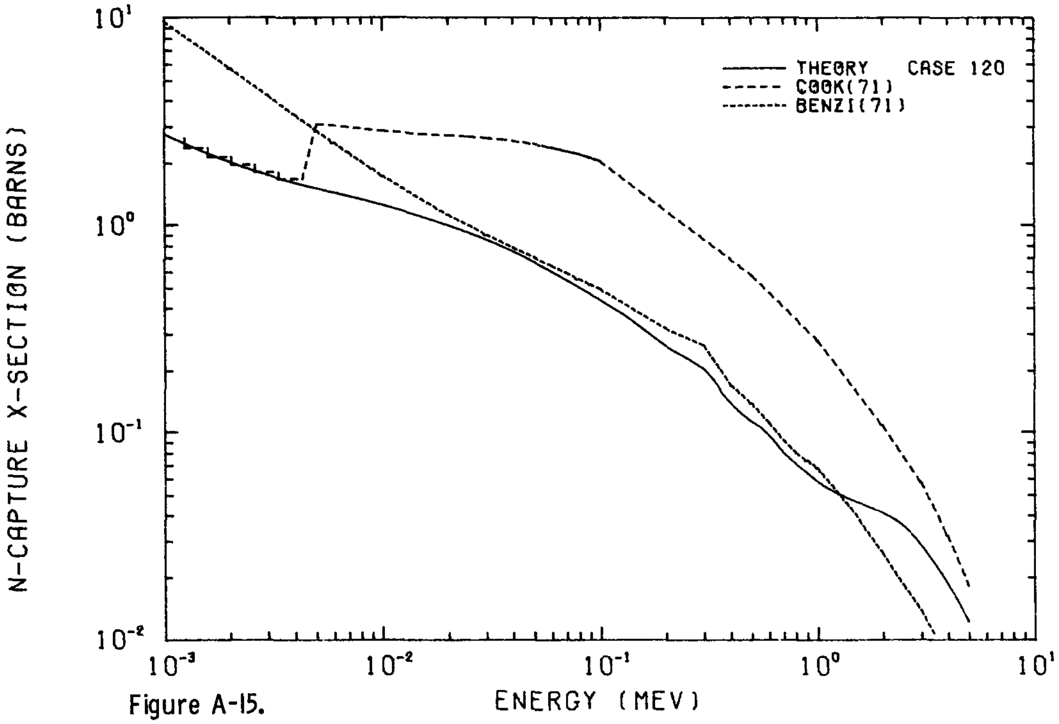


Figure A-15.

RU 101

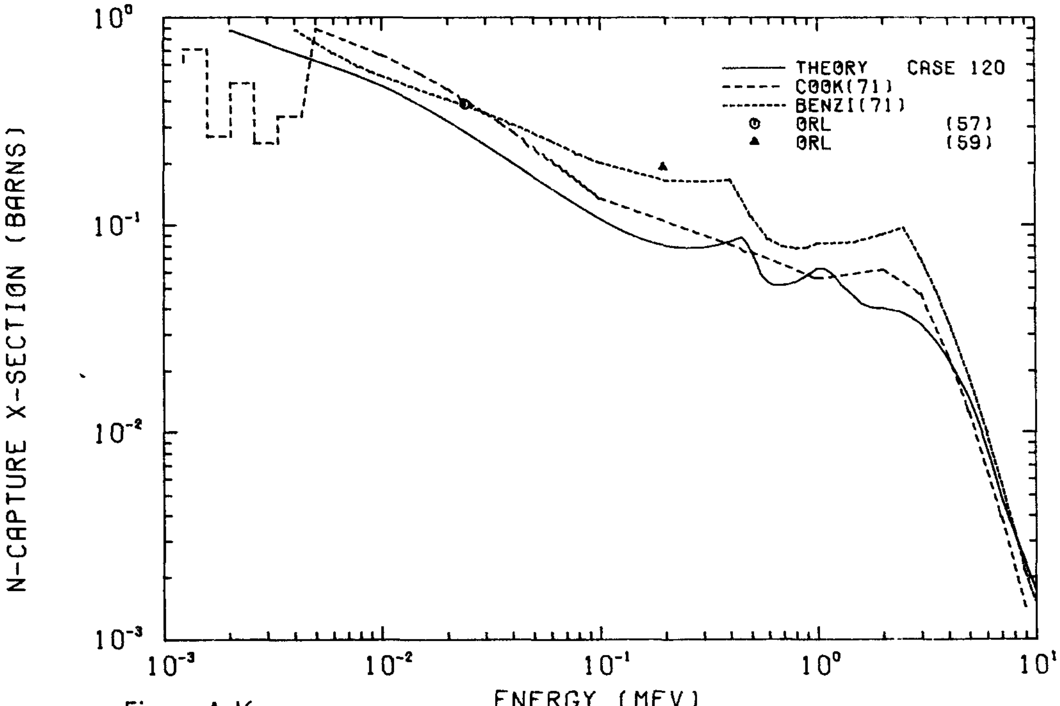
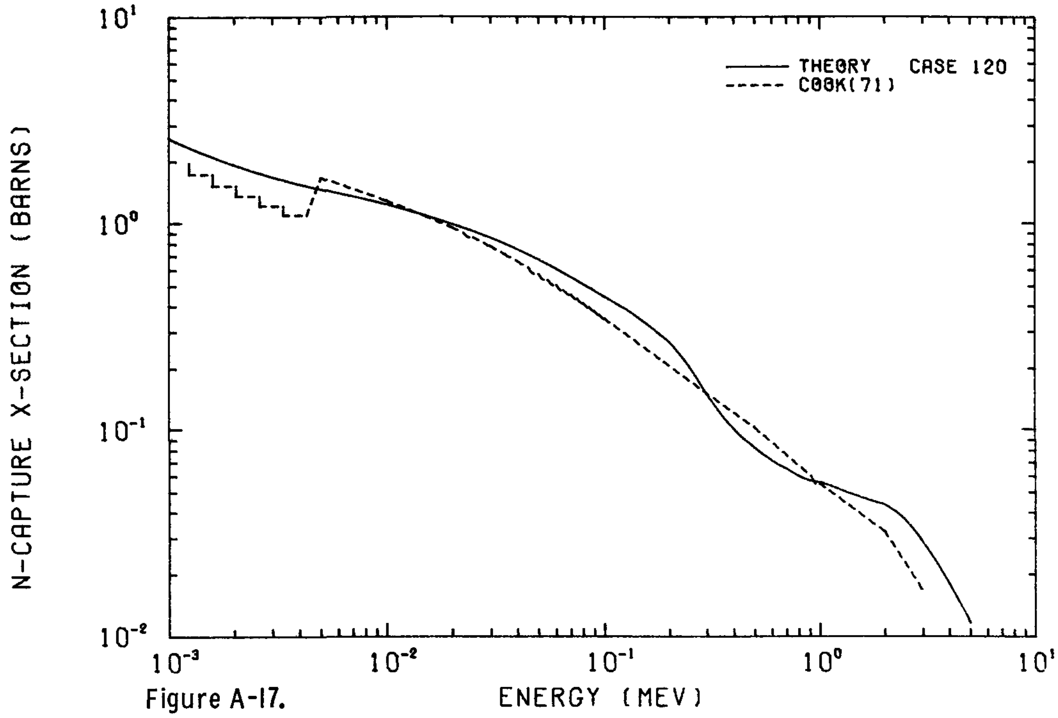


Figure A-16.

RU 102



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RU 103

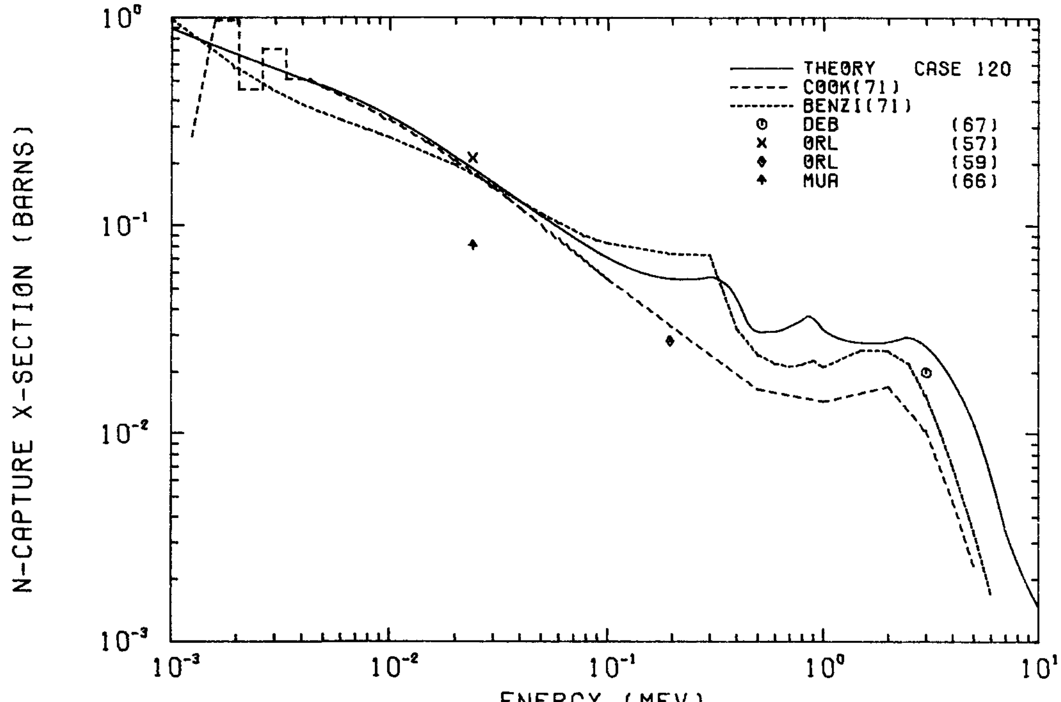

Figure A-18.

RU 104

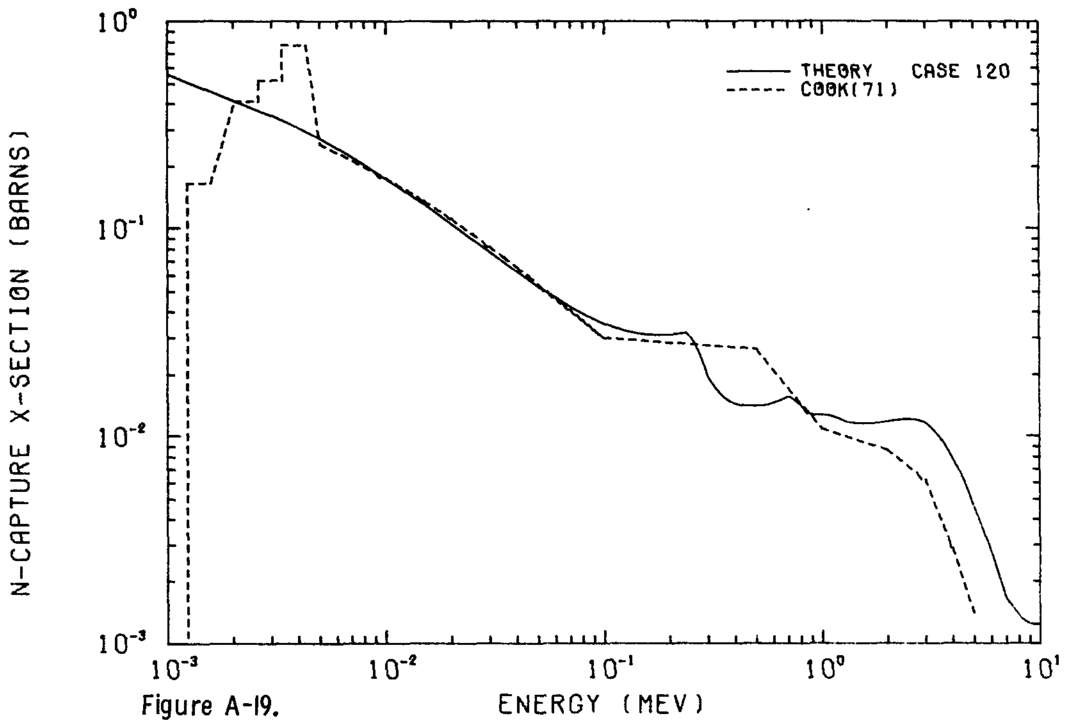

Figure A-19.

RU 106

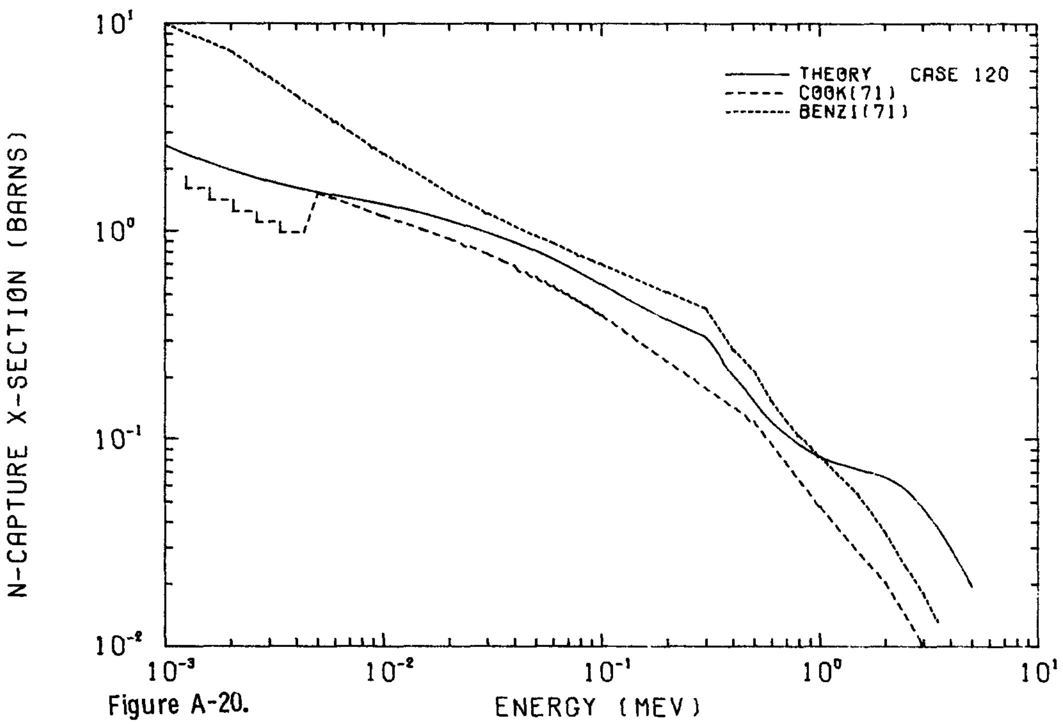

Figure A-20.

PD 105

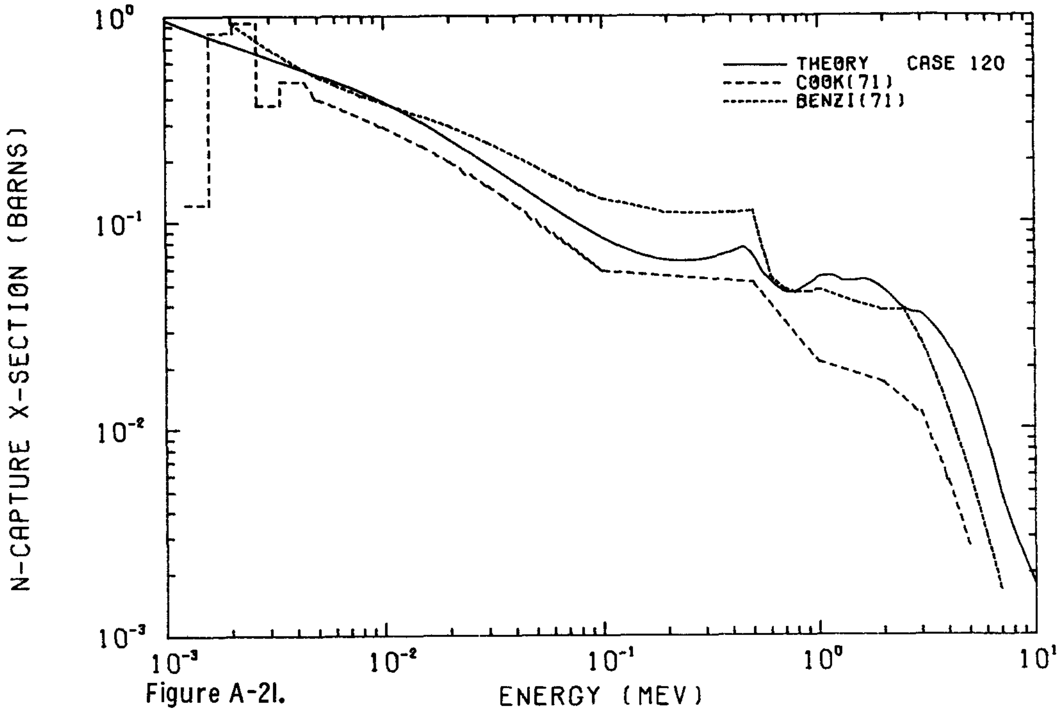

Figure A-21.

PD 106

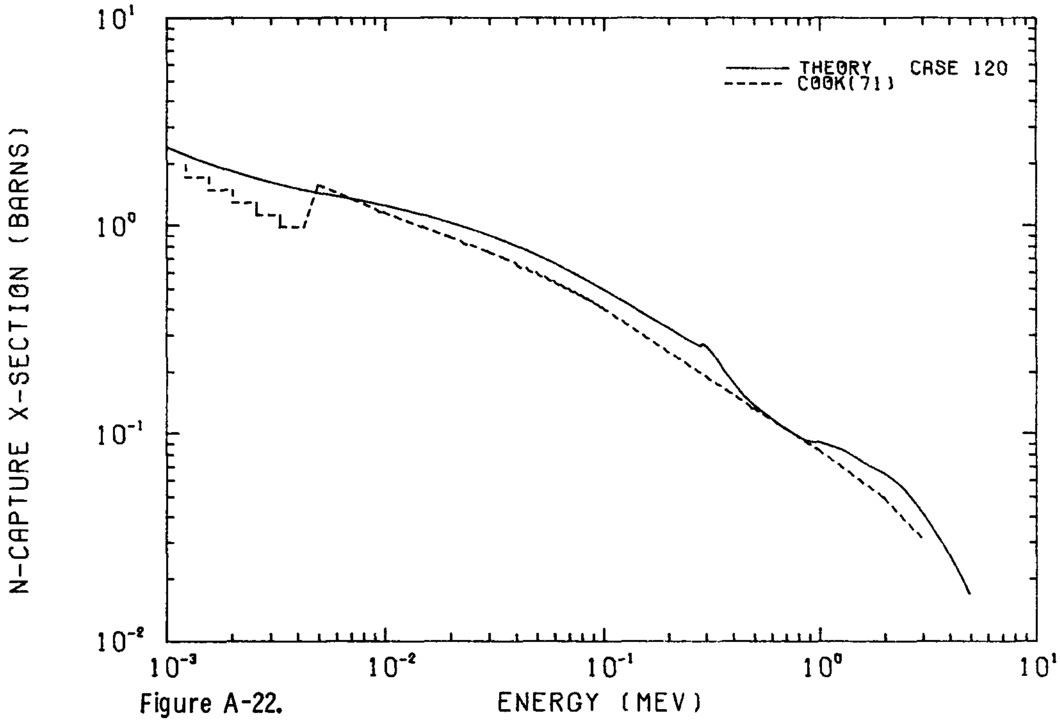

Figure A-22.

PD 107

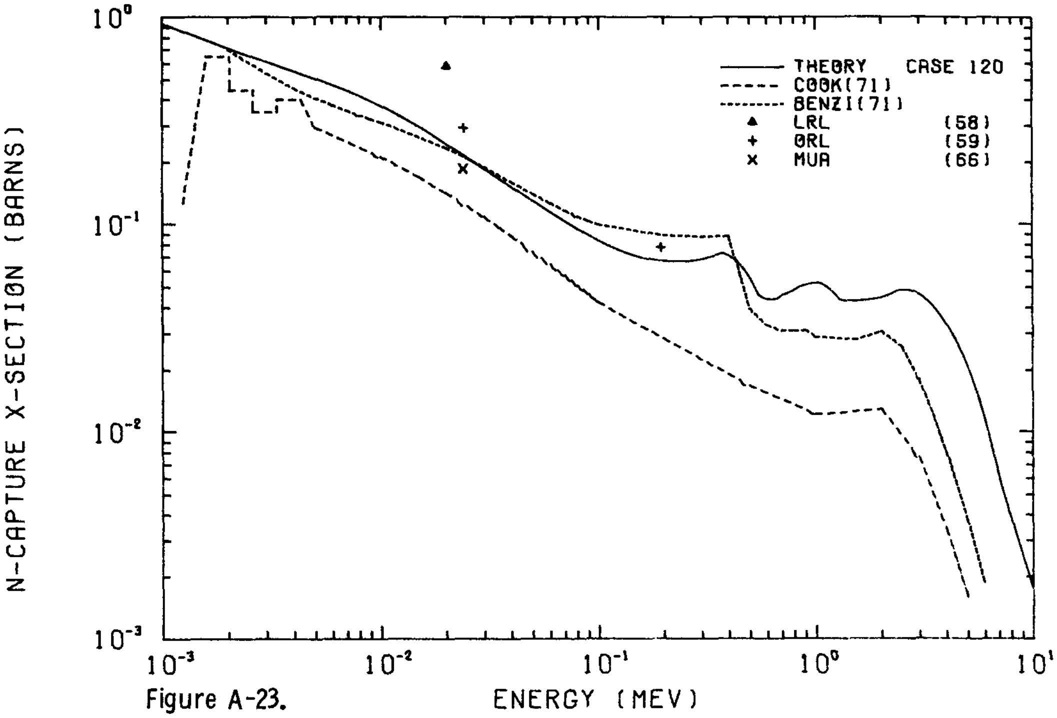

Figure A-23.

PD 108

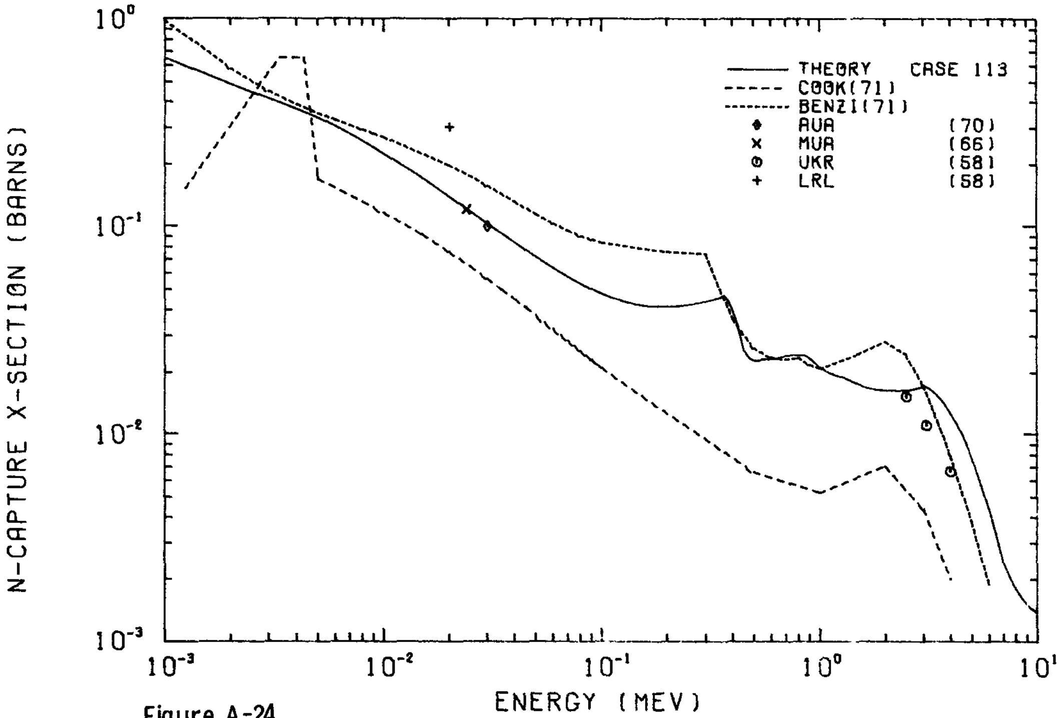

Figure A-24.

PD 110

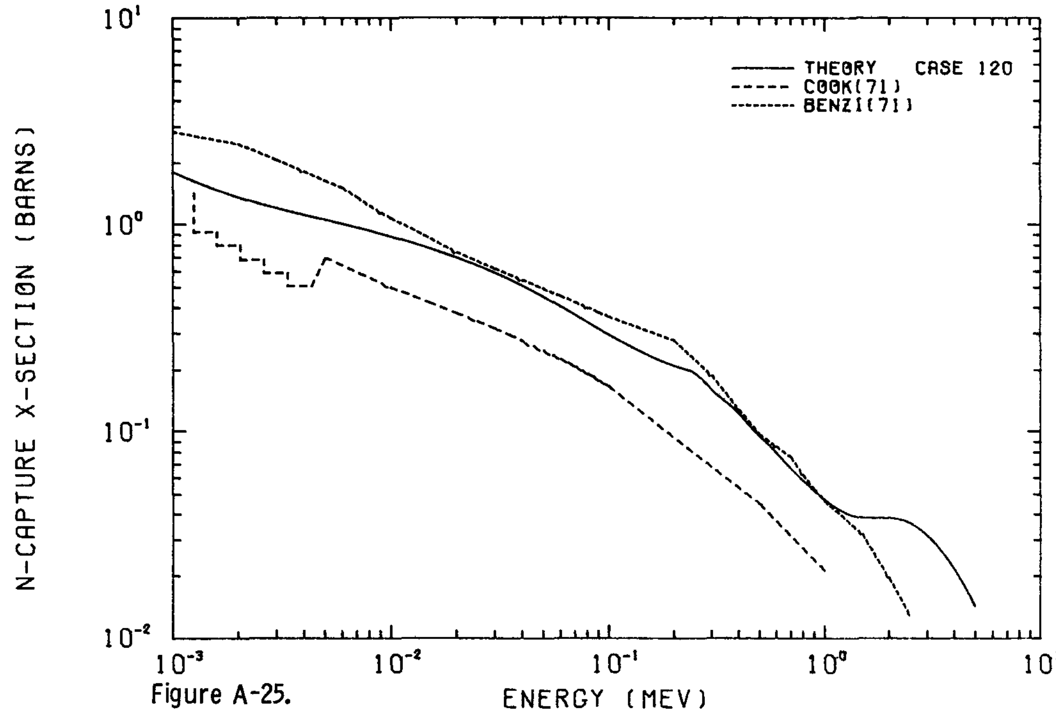

Figure A-25.

CD 111

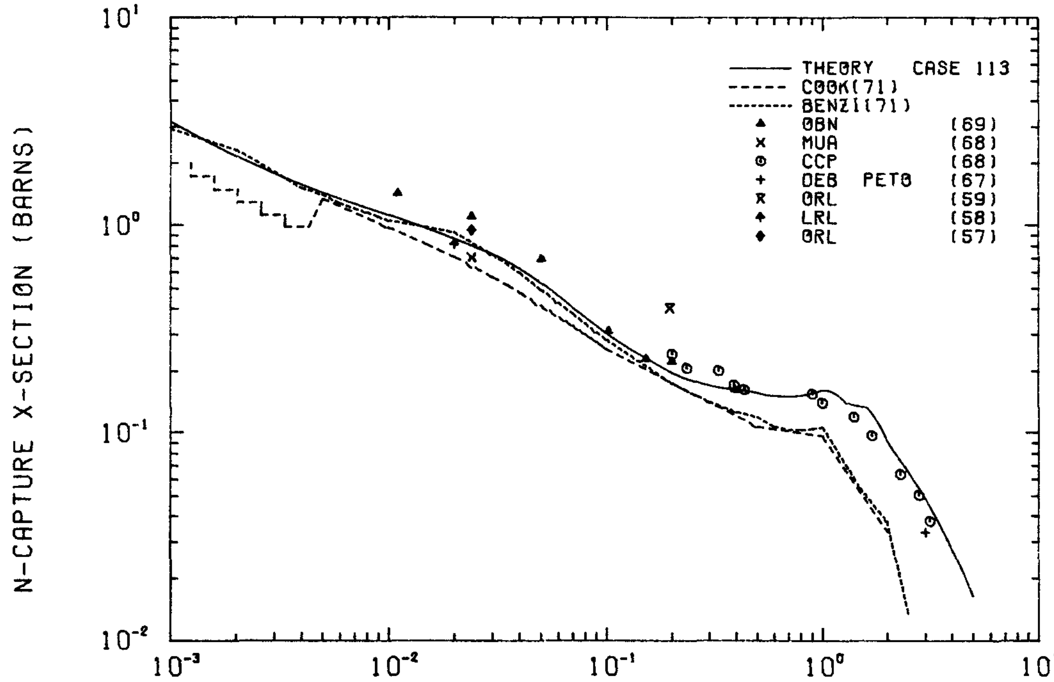

Figure A-26.

SB 121

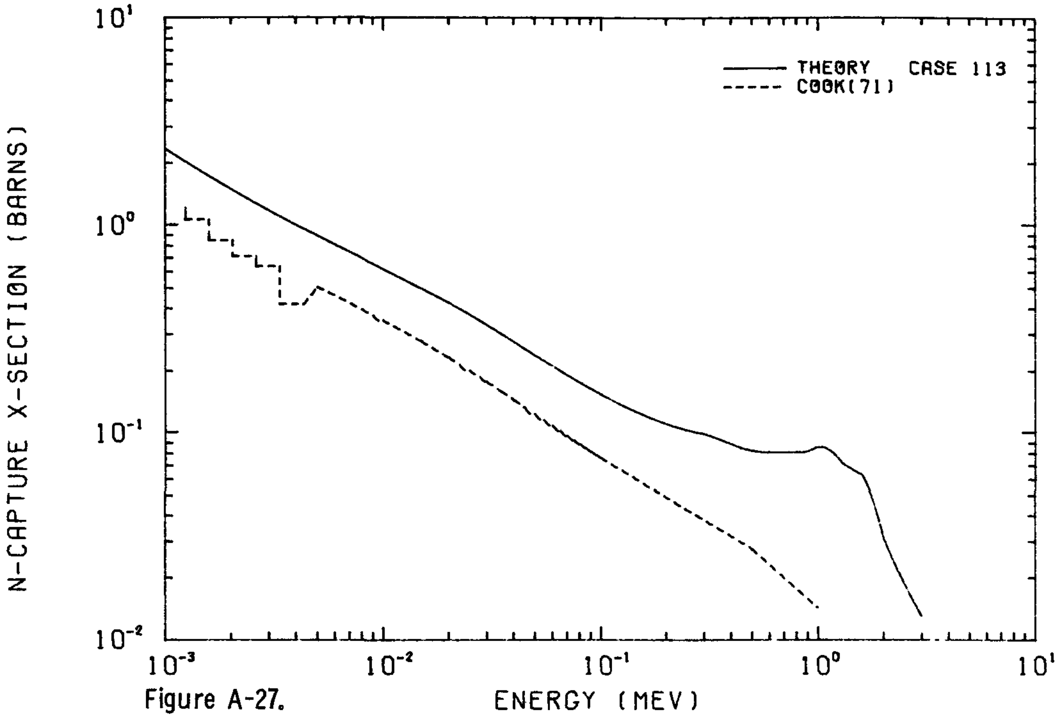

Figure A-27.

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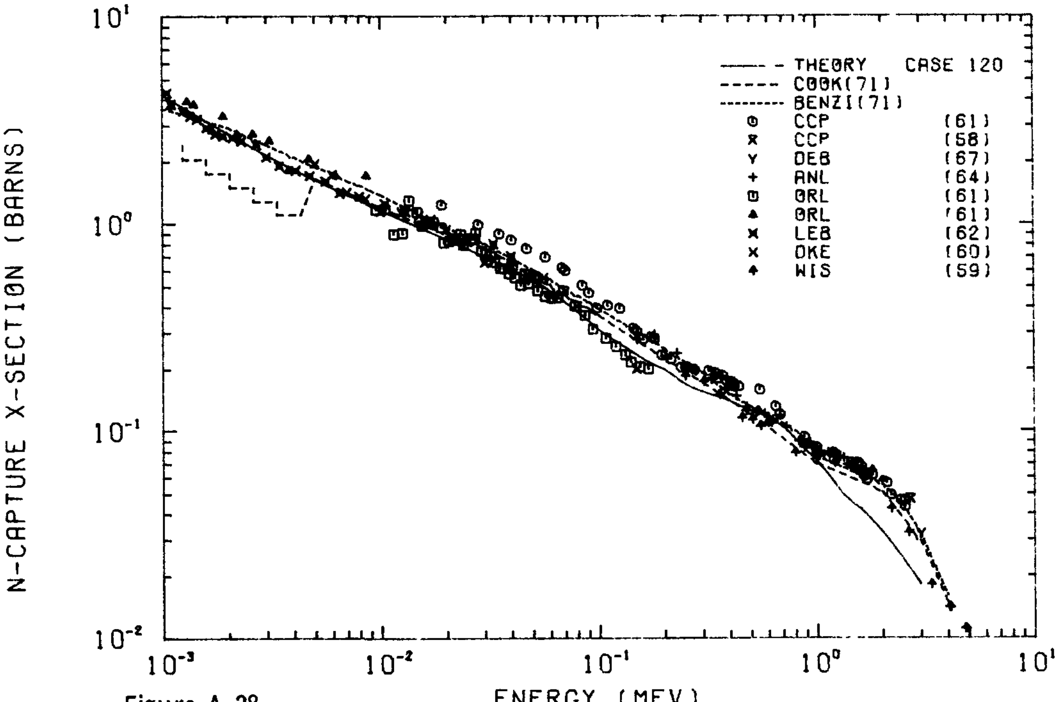

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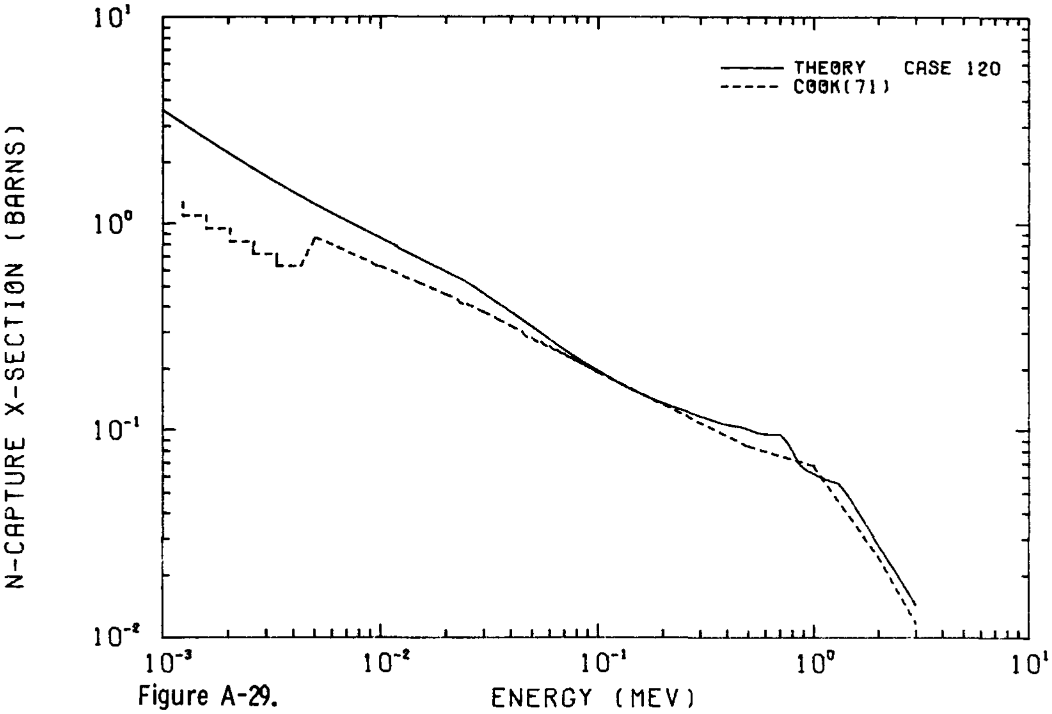
I 127



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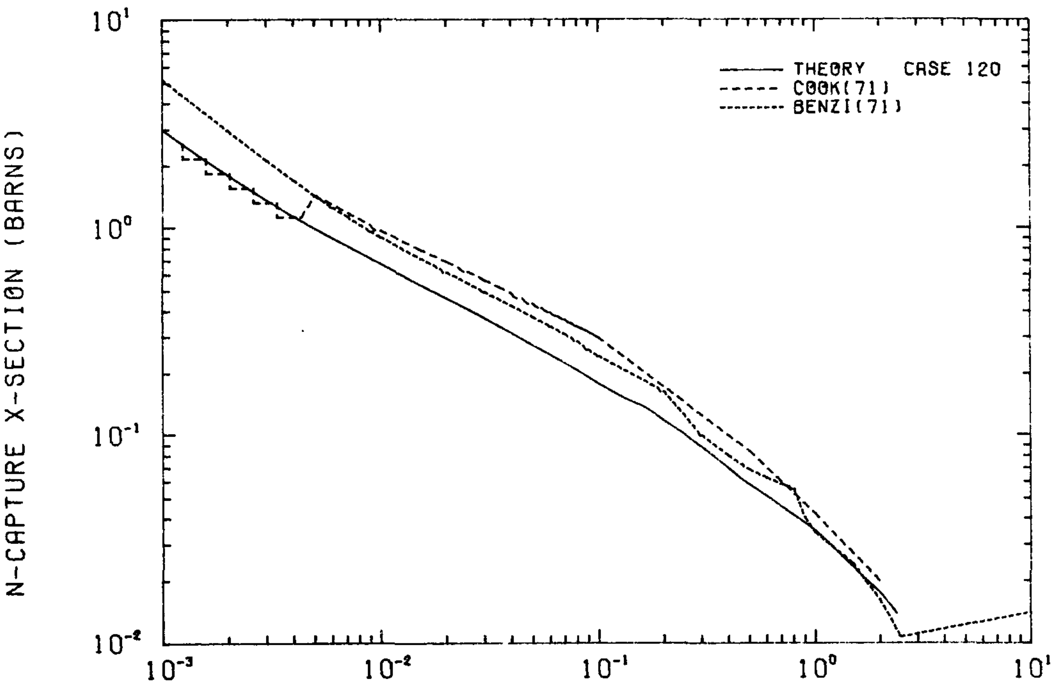
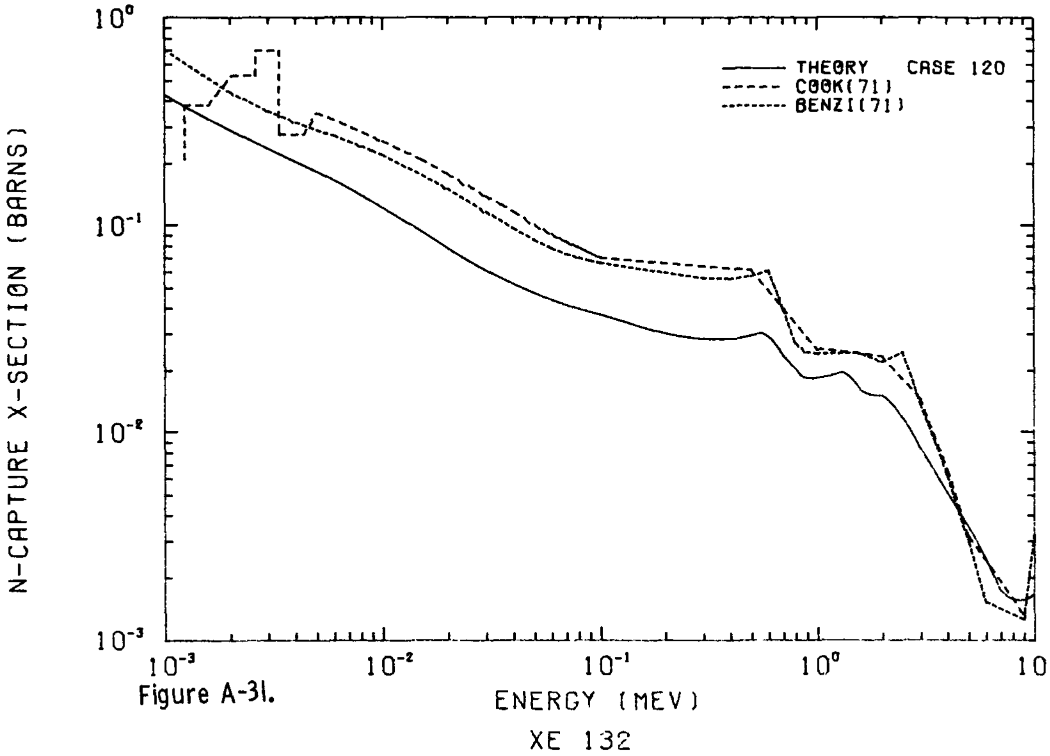


Figure A-30.

XE 131



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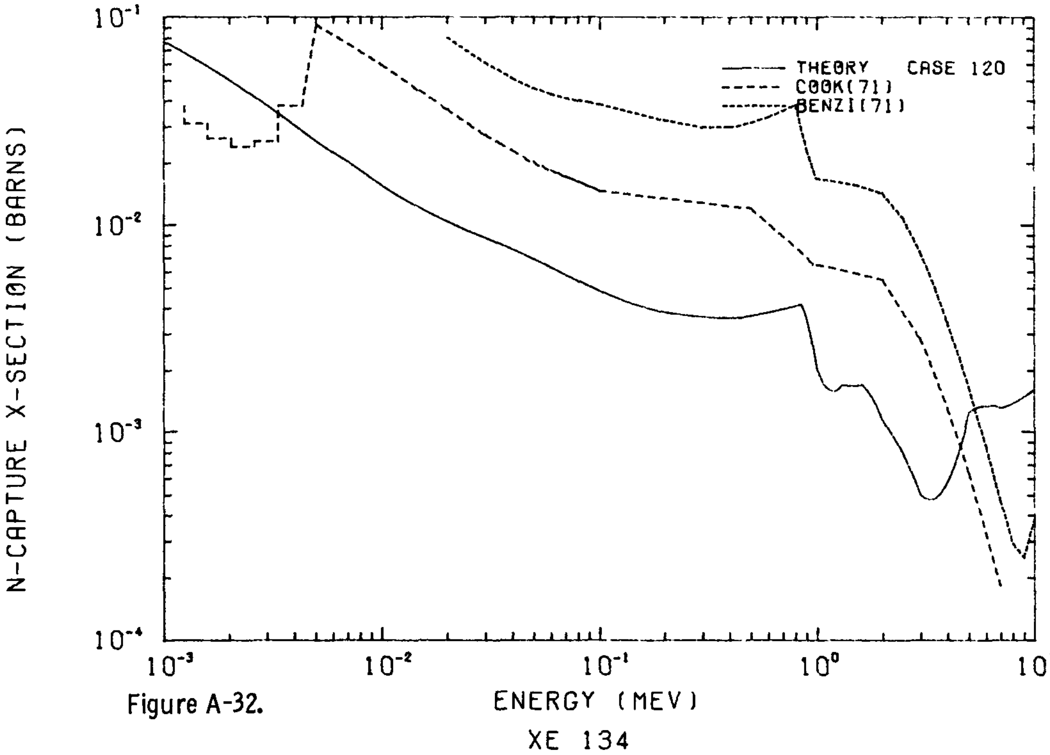

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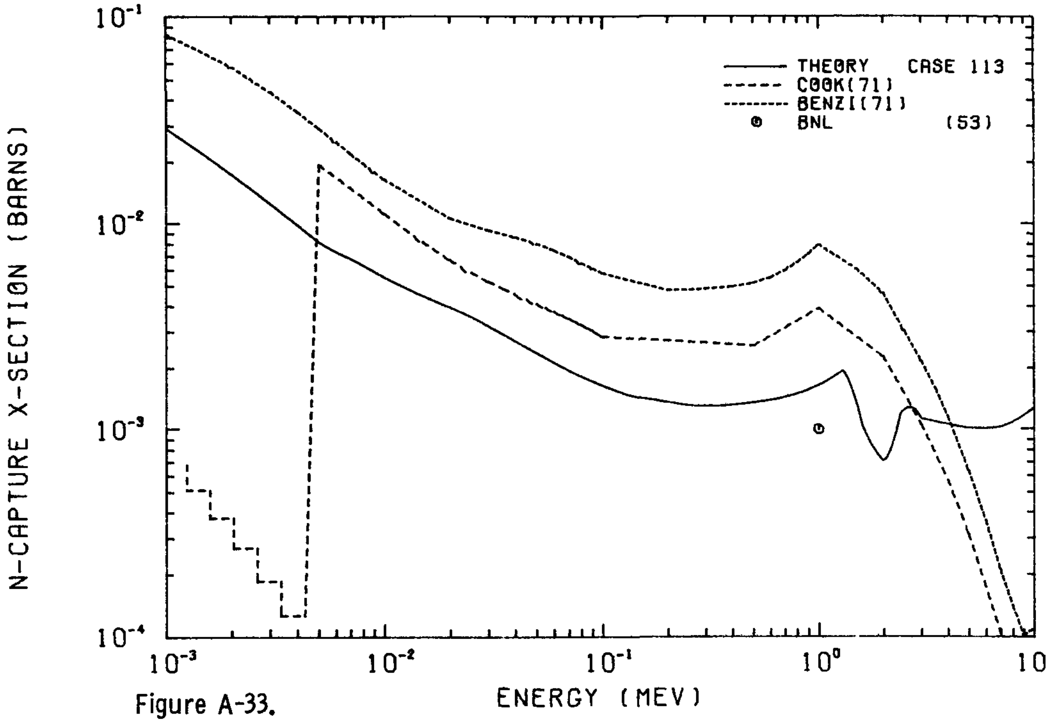


Figure A-33.

XE 136

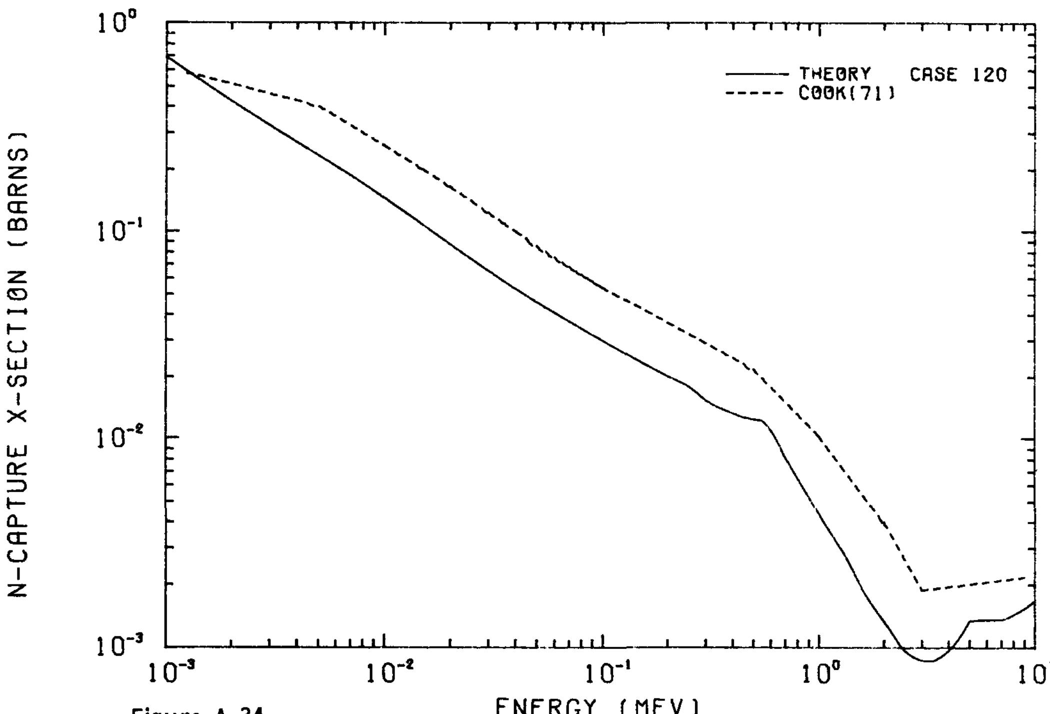
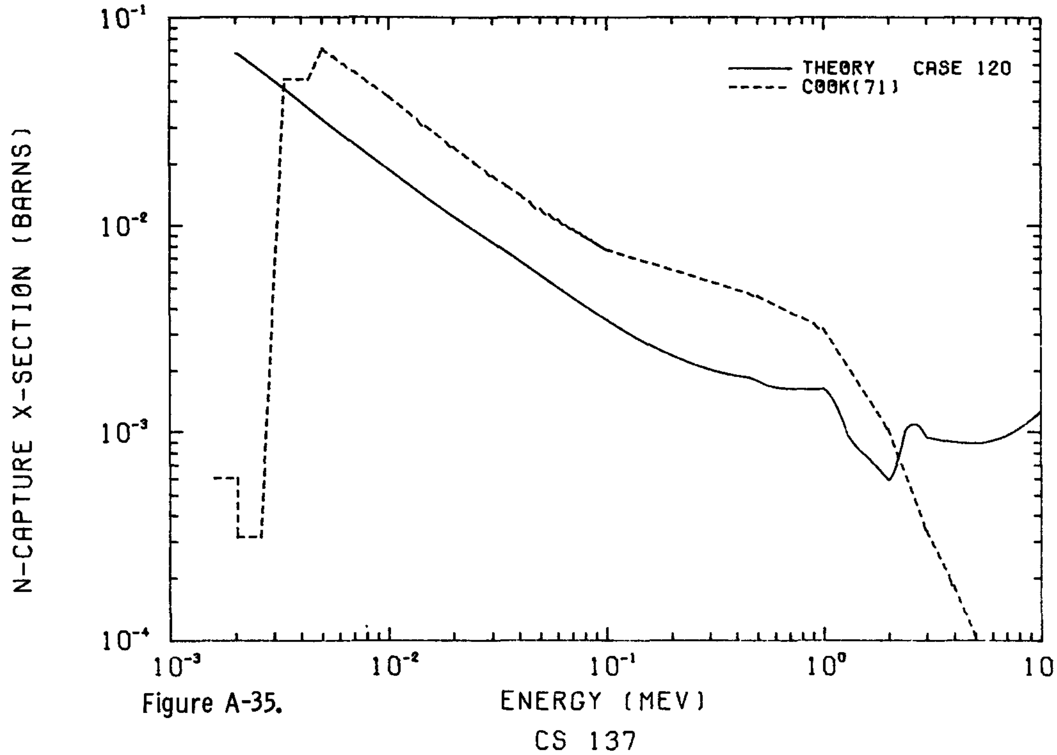


Figure A-34.

CS 135



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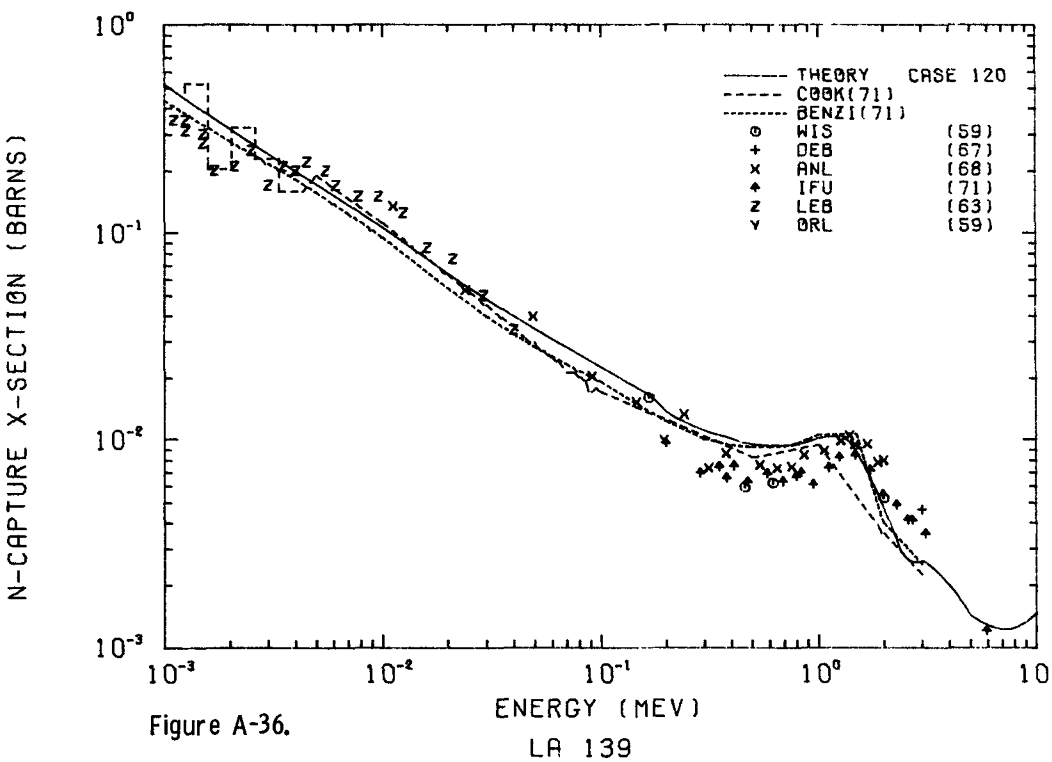

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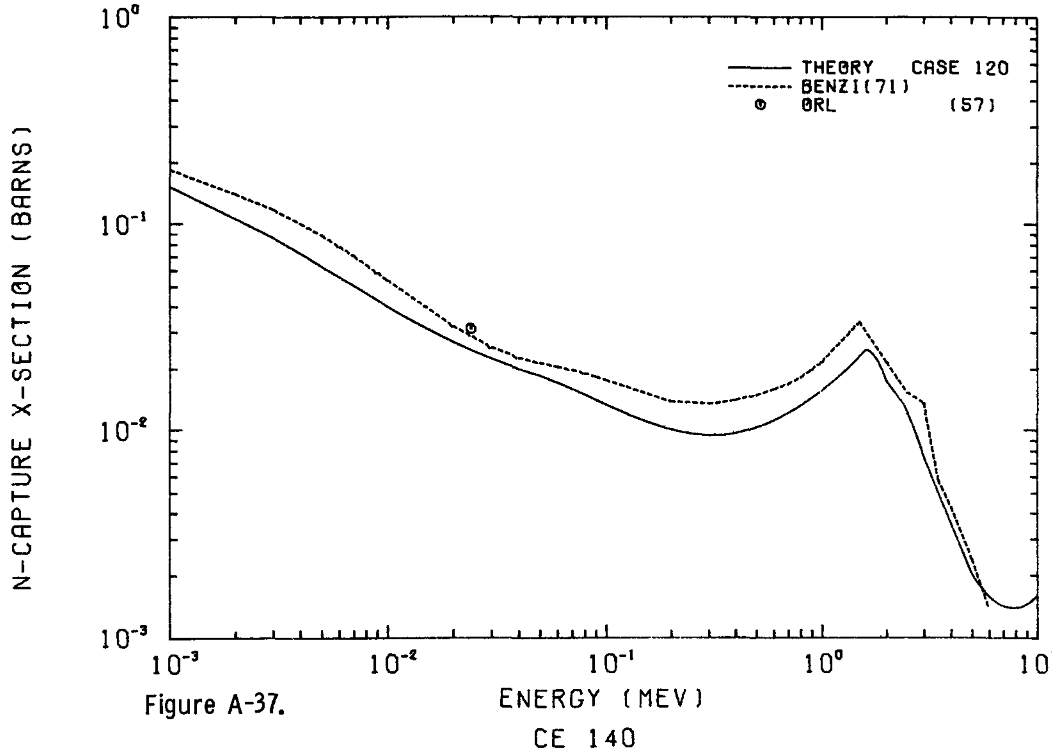

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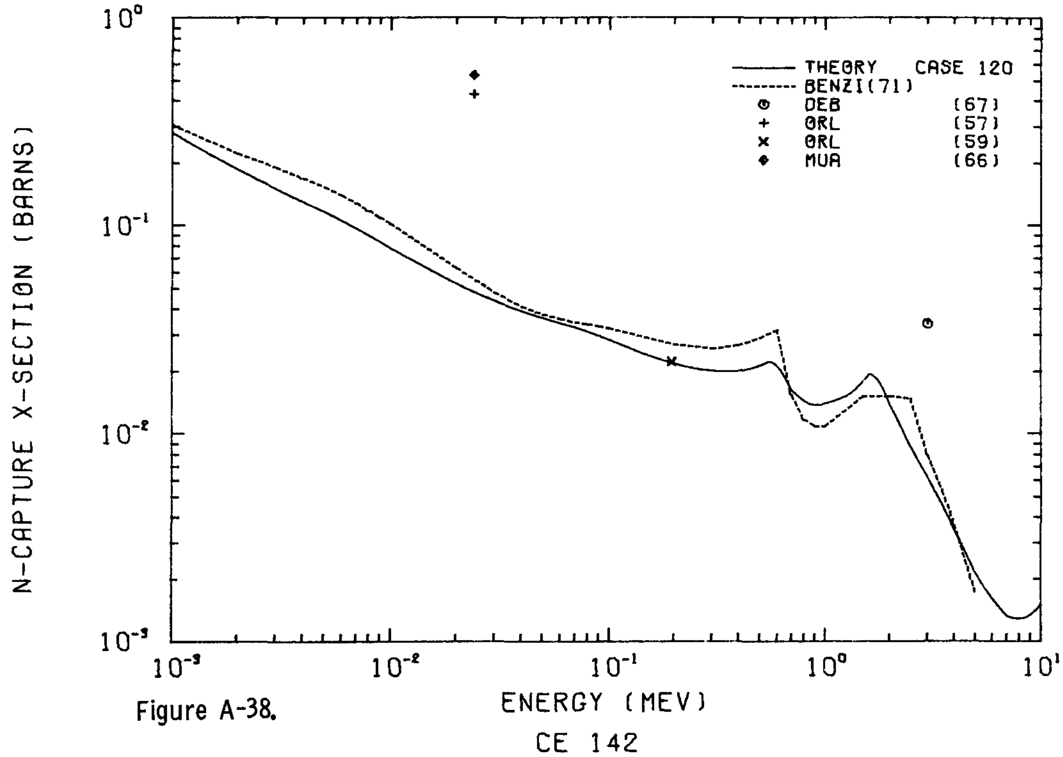

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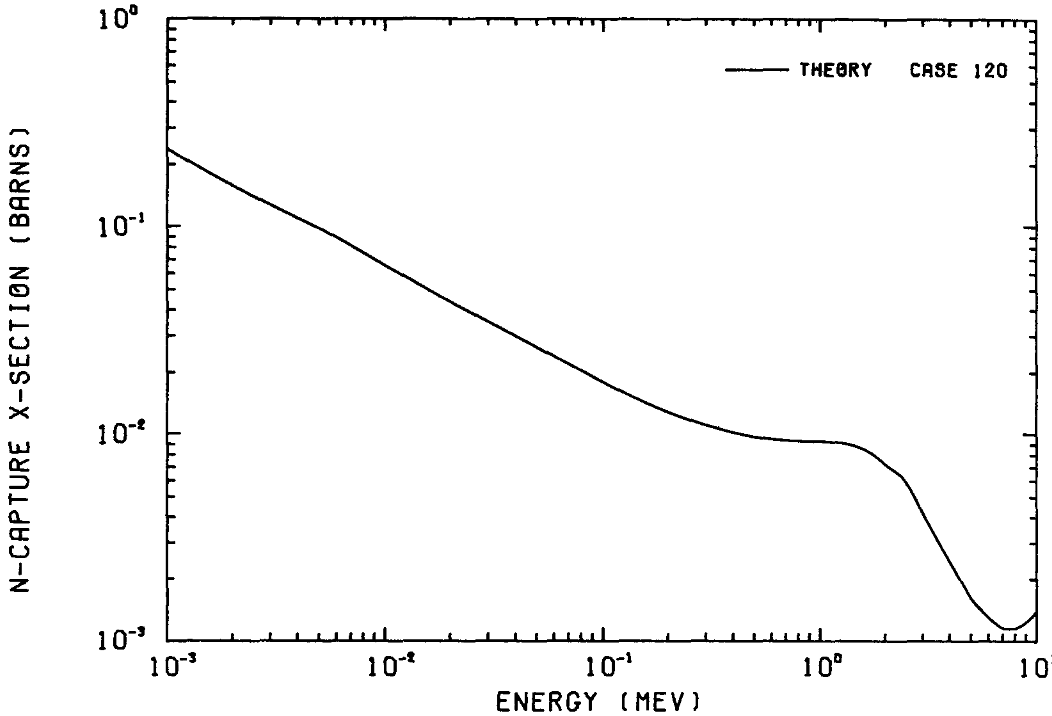

Figure A-39. CE 144