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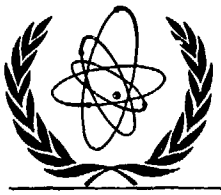

INTERNATIONAL ATOMIC ENERGY AGENCY

NUCLEAR DATA SERVICES

DOCUMENTATION SERIES OF THE IAEA NUCLEAR DATA SECTION

"ACTV-FUS/ECN"

NEUTRON ACTIVATION CROSS-SECTION LIBRARY FOR FUSION REACTOR APPLICATION

Data from the Petten REAC-ECN-5 General Activation File.

Abstract: The "ACTV-FUS/ECN" library containts ENDF-6 formatted evaluated cross-section data for 387 neutron induced reactions, most important for activation in fusion reactor technology for neutron energies up to 20 MeV. The library is available on magnetic tape from the IAEA Nuclear Data Section, free of charge, upon request.

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FOR FUSION REACTOR APPLICATION

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1. Introduction

A recent interest in low-activation materials for fusion reactor technology has accelerated the development of national activation cross-section libraries with a large number of target nuclei and reaction types. At the IAEA Specialists' Meeting on "Fusion Evaluated Nuclear Data Library (FENDL) and Benchmark Calculations" (8-10 May 1989, Vienna) the Working Group on Neutron Activation Data has initiated an intercomparison of activation cross sections, important for fusion reactor technology. It was agreed that national nuclear data centers will send to the IAEA Nuclear Data Section (NDS) their contributions, according to the list of reactions, selected by Dr. R.A. Forrest (UKAEA, Harwell, U.K.) on the basis of inventory calculations [1].

A list of the 256 nuclear reactions most important for activation in fusion reactors was distributed to all interested parties and some activation data files have been received during this time into IAEA from the participants of this activation data intercomparison to be made graphically by plotting against EXFOR data [2].

2. Source of Data

The "ACTV-FUS/ECN" file of neutron activation cross-section data for the nuclear reactions most important for activation in fusion reactor technology is a part of recent REAC-ECN-5 general activation library of the Energy Research Foundation (ECN) in Petten, Netherlands [3].

3. Content and Size of the Library

The REAC-ECN-5 data subfile was received at the IAEA from Petten in late 1989 [10]. The data were kept unchanged except that the data file format was changed to ENDF/B-6 format at IAEA Nuclear Data Section (NDS). This file was named as "ACTV-FUS/ECN" and contains pointwise cross-section data for 370 activation reactions of 151 isotopes. The list of reactions presented in the Table 2 on the next pages gives the MAT numbers (accession numbers) as well as brief description of methods, used for data evaluations.

The "ACTV-FUS/ECN" library contains 141494 records or 11 Mb of memory.

4. Availability

The "ACTV-FUS/ECN" library is available from IAEA NDS on magnetic tape, free of charge, upon request.

5. History of the REAC-ECN files [4]

In 1985 F.M. Mann [5] produced a data base for neutron activation calculations. This file, called REAC, contains more than 6000 reactions and over 300 target nuclei. The library served as a starter for a continuing activity at the ECN-Petten with the goal to extend and improve it. The revised and extended library is called REAC-ECN and from 1986, when the first version (REAC-ECN-1) was released [6], four higher levels have been prepared: REAC-ECN-2 [7], REAC-ECN-3 [8,9], REAC-ECN-4 and recently REAC-ECN-5 [3].

6. Evaluation Methods

Techniques applied in the evaluation of the REAC-ECN files have been documented in refs. [7-9]. They consist mainly of two codes to calculate excitation functions (THRESH and FISGIN), the application of cross-section systematics of R. Forrest [11], H. Vonach [12] and ECN [8,9] and the insertion of systematics of isomer ratios [7,13]. For some further improvements, used in the REAC-ECN-5 file see [4]. Self-explanatory brief comments on evaluation methods of activation data are given in Table 2 on their respective places. For instance:

1.000+00 * JENDL-2	the data from JENDL-2 taken directly, no renormalization applied
0.867+00 * THRESH	data from THRESH calculation renormalized at 14.5 MeV (either to experiment or to systematics, as indicated in the second comment line); for example, $XS(eval) = XS(THRESH) * \frac{XS(exp.)}{XS(THRESH)}/14.5\ MeV$
1.8989+00 * BOSPOR Rn-Exp. Qa81	evaluated excitation function from BOSPOR library renormalized at 14.5 MeV to experimental value, measured by Qaim in 1981
5.1156-01 * THRESH output ECN-Petten Rn-Syst. Fo86	data from THRESH calculation at ECN-Petten renormalized at 14.5 to Forrest's systematic
5.0000-01 * JEF-1 Rn-Br=0.5	evaluated data from JEF-1 renormalized at 14.5 to branching ratio $Br=\sigma^m/(\sigma^m+\sigma^g)=0.5$

7. MT Number Identification

The pointwise cross-section data of this library are in ENDF-6 format, MF = 3. But the users of the file should pay attention to the fact that new MT numbers were introduced for the representation of the isomer production data and should check whether their inventory codes handle them. In particular: The MT numbers in the left side column of Table 1 identify the activation of the ground state; this is the total cross-section in case of nuclides with no isomer, or a partial cross-section in case of nuclides with isomer(s). The assigned MT numbers do not distinguish the cases whether the formation of the isomer includes or excludes the decay from a higher isomer.

Table 1. MT numbers

MT		Reaction	MT		Reaction	
4	=	(n,n)	304	=	(n,n)*	1st isomer production
16	=	(n,2n)	316	=	(n,2n)*	1st isomer production
			616	=	(n,2n)#	2nd isomer production
17	=	(n,3n)	317	=	(n,3n)*	1st isomer production
22	=	(n,nα)	322	=	(n,nα)*	1st isomer production
			622	=	(n,nα)#	2nd isomer production
28	=	(n,np)	328	=	(n,np)*	1st isomer production
			628	=	(n,np)#	2nd isomer production
32	=	(n,nd)				
33	=	(n,nt)				
34	=	(n,nHe3)				
102	=	(n,γ)	402	=	(n,γ)*	1st isomer production
			702	=	(n,γ)#	2nd isomer production
103	=	(n,p)	403	=	(n,p)*	1st isomer production
			703	=	(n,p)#	2nd isomer production
104	=	(n,d)	404	=	(n,d)*	1st isomer production
			704	=	(n,d)#	2nd isomer production
105	=	(n,t)				
106	=	(n,He3)				
107	=	(n,α)	407	=	(n,α)*	1st isomer production
			707	=	(n,α)#	2nd isomer production
111	=	(n,2p)				

8. Plots

Plots of activation cross-section data of "ACTV-FUS/ECN" library were done at IAEA NDS using the EVALPLOT code [14]. The plots are presented in the Appendix of this document. The users of the file should pay attention to the fact that in some instances the original authors' data have obvious errors of interpolation (see the plots). We shall correct these data in a later version when a new data set, corrected and approved by authors, becomes available.

9. References

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13. J. Kopecky, H. Gruppelaar: "Systematics of neutron-induced isomeric cross-section ratios at 14.5 MeV", ECN-200 (1987).

14. D.E. Cullen, P.K. McLaughlin: The 1989 ENDF pre-processing codes. IAEA-NDS-39, Rev. 5, Dec. 1989.

10. List of Reactions

The list of reactions presented in the Table 2 on the next pages gives the MAT numbers and brief description of methods, used for data evaluations.

Table 2. Activation Cross-Sections for Fusion Reactor Technology from "ACTV-FUS/ECN" Library

NO.	REACTION	EVALUATION METHOD	MAT NUMBER
1.	B-11(n,d)	1.6855+00 * THRESH output ECN-Petten Rn-Exp. Mi 68	511
2.	C-13(n,γ)	1.0000+00 * ACTL	613
3.	C-13(n,α)	2.5209+00 * THRESH output Rn-Th-Ga64A	613
4.	C-14(n,na)	1.0000+00 * THRESH output	614
5.	N-14(n,np)	1.0000+00 * THRESH output comment. uncertain, comp. Ts77=46; reaction has been observed	714
6.	N-14(n,p)	1.9652+00 * THRESH output ENDFB corrected Rn-Exp. Qa81=77+-14	714
7.	N-14(n,d)	1.0000+00 * THRESH output ENDFB corrected	714
8.	O-16(n,α)	1.0000+00 * THRESH output ENDFB corrected	816
9.	O-17(n,na)	1.0000+00 * THRESH output ENDFB corrected	817
10.	O-17(n,α)	1.0000+00 * THRESH output ENDFB corrected	817
11.	Ne-20(n,α)	1.6778+00 * THRESH output Rn-Th-Ga64	1020
12.	Na-23(n,α)	9.2830-01 * THRESH output ENDF/B-V corrected Rn-Exp. Pe84. comment. exp. QA81=150+-30	1123
13.	Mg-24(n,na)	3.7473+01 * THRESH output comment. guessed value based upon Si-28	1224
14.	Mg-24(n,p)	6.5489-01 * ENDF/B-V Rn-Exp. Qa81, Rn-Br=0.69	1224
15.	Mg-24(n,p)*	2.9423-01 * ENDF/B-V Rn-Br=0.31 (J=1) Syst. Ko87	1224
16.	Mg-26(n,γ)	1.0000+00 * ACTL evaluation	1226
17.	Al-27(n,2n)	4.2477-01 * THRESH output ENDFB corrected Rn-Exp. Iw88 G+M1=32.0+-3.5 Mb G=(G+M1)-M1	1327

NO.	REACTION	EVALUATION METHOD	MAT NUMBER
18.	Al-27(n,2n)*	1.3168-02 * estimate used Al-27(n,2n) Rn-Exp. Qa81 M1=0.62+-0.05 Mb	1327
19.	Al-27(n,na)	1.4650+01 * THRESH output Rn-Exp. Kn81. comment. (n,GAS)-(n,α)	1327
20.	Al-27(n,α)	6.9945-01 * THRESH output ENDFB corrected Rn-Exp. Qa81, Rn-Br=0.69 Syst. Ko87	1327
21.	Al-27(n,α)*	3.1425-01 * THRESH output ENDFB corrected Rn-Exp. Qa81, Rn-Br=0.31 (J=1) Syst. Ko87	1327
22.	Si-28(n,na)	9.6085+01 * THRESH output Rn-Exp. He82. comment. (n,Xa)-(n,α) (Exp. FRM KNEFF)	1428
23.	Si-28(n,np)	1.1429+01 * THRESH output Rn-Evl. He82. comment. uncertain, steep slope	1428
24.	Si-28(n,d)	8.3846-01 * THRESH output Rn-Evl. He82. comment. partly based upon exp. data(n,do)	1428
25.	Si-30(n,γ)	1.0000+00 * ACTL	1430
26.	Si-31(n,γ)	1.0000+00 * estimate used Si29(n,γ)	1431
27.	P-31(n,γ)	1.0000+00 * ENDF/B-V	1531
28.	P-32(n,p)	5.1156-01 * THRESH output ECN-Petten Rn-Syst. Fo86	1532
29.	S-34(n,γ)	1.0000+00 * ACTL	1634
30.	S-34(n,α)	1.8989+00 * BOSPOR Rn-Exp. Qa81	1634
31.	Cl-35(n,p)	1.0127+00 * ACTL Rn-Exp. Qa81	1735
32.	Cl-35(n,α)	1.0475+00 * ACTL Rn-Exp. Qa81	1735
33.	Ar-37(n,np)	2.3459+00 * THRESH output ECN-Petten Rn-Syst. Fo86	1837
34.	Ar-37(n,d)	4.8241-02 * THRESH output ECN-Petten Rn-Syst. Fo86	1837
35.	Ar-40(n,2n)	1.5125+00 * THRESH output ACTL corrected Rn-Evl. RCN-2	1840
36.	Ar-40(n,γ)	1.0000+00 * JEF-1	1840

NO.	REACTION	EVALUATION METHOD	MAT NUMBER
37.	K-39(n,p)	9.4680-01 * THRESH output ACTL corrected Rn-Exp. Qa81	1939
38.	K-39(n,α)	1.0000+00 * THRESH output ACTL corrected	1939
39.	K-41(n,p)	7.5820-01 * BOSPOR Rn-Exp. Qa81, com. agrees with An85	1941
40.	Ca-40(n,np)	1.0000+00 * ECN-Petten, data from JENDL-2	2040
41.	Ca-40(n,γ)	1.0000+00 * ACTL evaluation	2040
42.	Ca-40(n,d)	1.0000+00 * THRESH output	2040
43.	Ca-40(n,α)	1.2000+00 * THRESH output ACTL corrected Rn-Exp. Qa81	2040
44.	Ca-40(n,2p)	1.0000+00 * THRESH output	2040
45.	Ca-42(n,2n)	1.0000+00 * THRESH output ECN-Petten	2042
46.	Ca-42(n,α)	1.3509+00 * THRESH output ECN-Petten Rn-Syst. Fo86	2042
47.	Ca-43(n,2n)	1.0000+00 * THRESH output ECN-Petten	2043
48.	Ca-43(n,na)	2.4909+00 * THRESH output ECN-Petten Rn-Syst. Fo86	2043
49.	Ca-43(n,2p)	1.0000+00 * THRESH output ECN-Petten	2043
50.	Ca-44(n,2n)	1.0000+00 * THRESH output ECN-Petten	2044
51.	Ca-44(n,na)	6.5708-01 * THRESH output ECN-Petten Rn-Syst. Fo86	2044
52.	Ca-44(n,γ)	1.0000+00 * JENDL-2	2044
53.	Ca-44(n,α)	1.1106+00 * JENDL-2 Rn-Exp. An85	2044
54.	Ca-(45n,α)	3.8757-01 * THRESH output ECN-Petten Rn-Syst. Fo86	2045
55.	Ca-46(n,na)	3.0082+00 * THRESH output ECN-Petten Rn-Syst. Fo86	2046
56.	Ca-46(n,γ)	1.0000+00 * JENDL-2	2046
57.	Ca-48(n,2n)	9.1892-01 * JENDL-2 Rn-Exp. An85	2048

NO.	REACTION	EVALUATION METHOD	MAT NUMBER
58.	Sc-45(n,γ)	6.9000-01 * ENDF/B-V Rn-Br=0.64 Exp. Mu84, above 69.9 keV Br=0.69 Syst. Ko87	2145
59.	Sc-45(n,γ)*	3.1000-01 * ENDF/B-V Rn-Br=0.36 Exp. Mu84, above 69.9 keV Br=0.31 Syst. Ko87	2145
60.	Sc-45(n,p)	9.5027-01 * ACTL Rn-Exp. Qa81	2145
61.	Sc-45(n,α)	1.0297+00 * THRESH output ACTL corrected Rn-Exp. Qa81	2145
62.	Sc-46(n,na)	8.7296-01 * THRESH output ECN-Petten Rn-Syst. Fo86	2146
63.	Ti-45(n,2n)	1.0000+00 * THRESH output ECN-Petten	2245
64.	Ti-46(n,2n)	1.0385+00 * THRESH output ACTL corrected Rn-Exp. Qa81	2246
65.	Ti-46(n,np)	1.5019+01 * THRESH output ACTL corrected Rn-Exp. Qa82, Ri83 com. (n,xp)-(n,p), Rn-Br=0.56 Syst. Ko87	2246
66.	Ti-46(n,np)*	1.1800+01 * THRESH output ACTL corrected Rn-Br=0.44 (J=1.5) Syst. Ko87	2246
67.	Ti-46(n,d)	5.6434-02 * THRESH output Rn-Exp. Qa82, com.: LLL data, Rn-Br=0.61 Syst. Ko87	2246
68.	Ti-46(n,d)*	3.6081-02 * THRESH output Rn-Exp. Qa82, com.: LLL data, Rn-Br=0.39 (J=1.5) Syst. Ko87	2246
69.	Ti-46(n,α)	1.0000+00 * THRESH output ACTL corrected	2246
70.	Ti-47(n,2n)	1.0000+00 * THRESH output ACTL corrected	2247
71.	Ti-47(n,α)	1.0000+00 * THRESH output ACTL corrected	2247
72.	Ti-48(n,α)	1.3778+00 * THRESH output ENDF/B-V corrected Rn-Exp. Qa81	2248
73.	Ti-49(n,α)	1.0000+00 * THRESH output ACTL corrected	2249
74.	V-51(n,na)	1.0000+00 * THRESH output ENDF corrected	2351
75.	V-51(n,α)	8.4574-01 * THRESH output ENDF corrected Rn-Exp. eV85 (evaluated value)	2351
76.	Cr-50(n,na)	1.0000+00 * THRESH output A. Prince corrected	2450

NO.	REACTION	EVALUATION METHOD	MAT NUMBER
77.	Cr-50(n,np)	1.6940+00 * THRESH output ACTL corrected Rn-Exp. Qa82. comment. Difference: (n,np+n,d)-(n,d)	2450
78.	Cr-50(n,γ)	1.0000+00 * JEF-1	2450
79.	Cr-50(n,d)	8.2192-02 * THRESH output Rn-Exp. Qa82. comment. LLL data	2450
80.	Cr-50(n,α)	1.0000+00 * THRESH output A. Prince corrected comment. agreement with Ha80 (n,na + n,α)	2450
81.	Cr-52(n,α)	4.6959-01 * THRESH output A.Prince corrected Rn-Exp. Ha80. comment. exp. value=(n,α+n,na); (n,na) is small	2452
82.	Cr-54(n,γ)	1.0000+00 * JENDL-2	2454
83.	Mn-54(n,2n)	1.0000+00 * THRESH output ACTL corrected	2554
84.	Mn-55(n,2n)	1.0774+00 * THRESH output ENDF/B-V corrected Rn-Evl. eV85. comment. many data	2555
85.	Mn-55(n,γ)	1.0000+00 * JEF-1	2555
86.	Fe-54(n,np)	1.0000+00 * ENDF/B-6 comment. evaluation agrees with exp. data (Gr79, Ba85)	2654
87.	Fe-54(n,d)	5.9520-02 * THRESH output Rn-Syst. Fo86	2654
88.	Fe-56(n,2n)	1.0000+00 * LANL special evaluation comment. exp. Qa81=440+-40	2656
89.	Fe-56(n,γ)	1.0000+00 * estimated used Fe54(n,γ)	2656
90.	Fe-57(n,γ)	1.0000+00 * estimated used Fe55(n,γ)	2657
91.	Fe-58(n,γ)	1.0000+00 * ENDF/B-V	2658
92.	Fe-59(n,γ)	1.0000+00 * estimated used Fe55(n,γ)	2659
93.	Co-58(n,γ)	1.0000+00 * JEF-1	2758
94.	Co-59(n,γ)	5.3000-01 * ECN-Petten data from JEF-1 Rn-Br=0.451, exp. Mu81, above 85 keV Rn-Br=0.53, Syst. Ko87	2759
95.	Co-59(n,γ)*	4.7000-01 * ECN-Petten data from JEF-1 Rn-Br=0.549, exp. Mu81, above 85 keV Rn-Br=0.47, Syst. Ko87	2759
96.	Co-60(n,γ)	1.0000+00 * ACTL evaluation	2760

NO.	REACTION	EVALUATION METHOD	MAT NUMBER
97.	Co-60(n,p)	1.0000+00 * THRESH output ACTL corrected comment. theoretical value Ga67A=27.6	2760
98.	Ni-58(n,2n)	1.0000+00 * EFF-2 comment. evaluation agrees with exp. data (Ik88)	2858
99.	Ni-58(n,np)	1.0000+00 * EFF-2 comment. evaluation agrees with exp. data (Ba85)	2858
100.	Ni-58(n,γ)	1.0000+00 * ENDF/B-V	2858
101.	Ni-58(n,p)	4.8684-01 * THRESH output ACTL corrected Rn-Exp. Qa81	2858
102.	Ni-58(n,p)*	1.2969+00 * THRESH output ACTL corrected Rn-Exp. Qa81	2858
103.	Ni-58(n,d)	1.0000+00 * ENDF/B-6	2858
104.	Ni-60(n,2n)	1.0000+00 * THRESH output ENDF/B-V corrected	2860
105.	Ni-60(n,np)	3.8296+00 * THRESH output Rn-Syst. Fo86, com. agreement with Qa82: (n,xp)-(n,p)=213	2860
106.	Ni-60(n,p)	5.2334-01 * ECN-Petten data from ENDF/B-V Rn-Exp. G+M1=127.1+-13.8 Mb, aver. exp. values. Rn-Br=0.52	2860
107.	Ni-60(n,p)*	4.7666-01 * ECN-Petten data from ENDF/B-V Rn-Exp. G+M=127.1+-13.8, Rn-Br=0.47(J=2), (Ko87)	2860
108.	Ni-60(n,d)	1.4635-01 * THRESH output Rn-Syst. Fo86	2860
109.	Ni-61(n,γ)	1.0000+00 * JENDL-2	2861
110.	Ni-62(n,γ)	1.0000+00 * JEF-1	2862
111.	Ni-62(n,α)	5.9701-01 * ENDF/B-V Rn-Exp. Qa82	2862
112.	Ni-63(n,α)	1.0000+00 * THRESH output ACTL corrected	2863
113.	Ni-64(n,2n)	1.0000+00 * THRESH output ACTL corrected	2864
114.	Cu-63(n,γ)	1.0000+00 * ENDF/B-V	2963
115.	Cu-63(n,p)	1.9284+00 * THRESH output ENDF corrected Rn-Exp. Gr87A	2963

NO.	REACTION	EVALUATION METHOD	MAT NUMBER
116.	Cu-63(n,α)	4.1192-01 * ECN-Petten data from ENDF/B-V Rn-Exp. G+M1=42.3+-4.7Mb, aver. exp. values. G=(G+M1)-M1	2963
117.	Cu-63(n,α)*	6.1908-01 * ECN-Petten data from ENDF/B-V Rn-Exp. M1=25.4+-3.3Mb, (Ka62)	2963
118.	Zn-64(n,2n)	6.6127-01 * THRESH output Rn-Exp. Qa81 comment. eV85=162.2+-3.9	3064
119.	Zn-64(n,na)	9.2455-01 * THRESH output Rn-Evl. RCN-2	3064
120.	Zn-64(n,np)	3.4198+00 * THRESH output Rn-Evl. RCN-2	3064
121.	Zn-64(n,γ)	1.0000+00 * JEF-1	3064
122.	Zn-64(n,p)	1.0000+00 * Yamamuro	3064
123.	Zn-64(n,d)	1.0479-01 * THRESH output Rn-Syst. Fo86	3064
124.	Zn-64(n,2p)	1.0000+00 * THRESH output	3064
125.	Zn-66(n,2n)	1.0000+00 * LANL evaluation	3066
126.	Zn-66(n,α)	1.4347+00 * THRESH output Rn-Syst. Fo86	3066
127.	Zr-92(n,γ)	1.0000+00 * JEF-1	4092
128.	Zr-93(n,α)	1.0000+00 * THRESH output ACTL corrected	4093
129.	Zr-94(n,2n)	1.0000+00 * THRESH output ENDF corrected	4094
130.	Zr-94(n,na)	1.0000+00 * THRESH output ACTL corrected	4094
131.	Zr-94(n,γ)	9.9998-01 * JEF-1 Rn-Exp. data Mu84 below 42.45 keV	4094
132.	Zr-96(n,2n)	1.0574+00 * THRESH output ENDF corrected Rn-Exp. Qa81 comment. exp. value in Pe84: 1420+-81	4096
133.	Nb-92(n,2n)	1.0000+00 * THRESH output	4192
134.	Nb-92(n,2n)*	1.0000+00 * THRESH output ACTL corrected	4192
135.	Nb-93(n,2n)	9.8085-01 * THRESH output ACTL corrected com. sum of ACTL values for G- and M-State min. exp. val. for M-State	4193

NO.	REACTION	EVALUATION METHOD	MAT NUMBER
136.	Nb-93(n,2n)*	1.0286+00 * THRESH output ACTL corrected Rn-Exp. Qa82, comment. exp. value in Pe84: 462+-12	4193
137.	Nb-93(n,γ)	3.1000-01 * ECN-Petten, data from ENDF/B-V Rn-Br=0.31 Syst. Ko87	4193
138.	Nb-93(n,γ)*	6.9000-01 * ECN-Petten, data from ENDF/B-V Rn-Br=0.69 Syst. Ko87(J=3)	4193
139.	Nb-93(n,p)	1.0000+00 * THRESH output ACTL corrected	4193
140.	Nb-95(n,2n)	2.0000-01 * THRESH output ECN-Petten Rn-Br=0.2 Syst. Ko87	4195
141.	Nb-95(n,2n)*	8.0000-01 * THRESH output ECN-Petten Rn-Br=0.8 Syst. Ko87 (J=3)	4195
142.	Mo-92(n,2n)	9.3324-01 * THRESH output ACTL corrected Rn-Exp. Qa81	4292
143.	Mo-92(n,2n)*	7.5910-02 * estimate used Mo92(n,2n) Rn-Exp. Qa81	4292
144.	Mo-92(n,np)	9.9376+00 * THRESH output Rn-Exp. H81. com. (n,np)=(x,xp)-(n,p) min. value (n,np) for M.St.	4292
145.	Mo-92(n,np)*	4.3947+00 * THRESH output ACTL corrected Rn-Exp. Qa81, comment. value given is assumed to be (n,np) only	4292
146.	Mo-92(n,γ)	5.0000-01 * JEF-1 Rn-Br=0.5	4292
147.	Mo-92(n,γ)*	5.0000-01 * JEF-1 Rn-Br=0.5	4292
148.	Mo-92(n,d)	4.4308-02 * THRESH output ACTL corrected Rn-Exp. Ha81, Rn-Br=0.53 Syst. Ko87	4292
149.	Mo-92(n,d)*	4.4012-01 * THRESH output ACTL corrected Rn-Exp. Ha81, Rn-Br=0.47 Syst. Ko87 (J=2)	4292
150.	Mo-94(n,2n)*	5.8003-03 * ECN-Petten data from JENDL-2 Rn-Exp. M1=4.92+-0.7 Mb, average exp. values.	4294
151.	Mo-94(n,p)	8.8412-01 * ECN-Petten data from JENDL-2 Rn-Exp. G+M1=56.0+-17.0 Mb (Gr86), G=(G+M1)-M1.	4294
152.	Mo-94(n,p)*	1.0808-01 * ECN-Petten data from JENDL-2 Rn-Exp. M1=6.1+-1.5 Mb(Br63).	4294

NO.	REACTION	EVALUATION METHOD	MAT NUMBER
153.	Mo-95(n,np)*	1.9962+00 * THRESH output com. (n,np)=(n,xp) Ha81-(n,p) Qa81, Br=0.81 Syst. Ko87 (J=3)	4295
154.	Mo-95(n,d)	1.9195-01 * THRESH output Rn-Exp. Ha81, Rn-Br=0.31 Syst. Ko87 (JG=6]])	4295
155.	Mo-95(n,d)*	4.2725-01 * THRESH output Rn-Exp. Ha81, Rn-Br=0.69 Syst. Ko87 (J=3)	4295
156.	Mo-98(n,γ)	1.0000+00 * JEF-1 Rn-Exp. data Mu84 below 5.265 keV	4298
157.	Mo-100(n,2n)	1.0562+00 * THRESH output ACTL corrected Rn-Exp. Qa81	4200
158.	Rh-103(n,na)	4.1072-02 * THRESH output Rn-Syst. Fo86, Rn-Br=0.8 Syst. Ko87	4503
159.	Rh-103(n,na)*	1.0268-02 * THRESH output Rn-Syst. Fo86, Rn-Br=0.2 Syst. Ko87 (J=0.5)	4503
160.	Rh-103(n,γ)	5.0000-01 * JEF-1 Rn-Br=0.5	4503
161.	Rh-103(n,γ)*	5.0000-01 * JEF-1 Rn-Br=0.5	4503
162.	Pd-104(n,γ)	5.0000-01 * JEF-1 Rn-Br=0.5	4604
163.	Pd-104(n,γ)*	5.0000-01 * JEF-1 Rn-Br=0.5	4604
164.	Pd-105(n,γ)	1.0000+00 * JEF-1	4605
165.	Pd-106(n,γ)	5.0000-01 * JEF-1 Rn-Br=0.5	4606
166.	Pd-106(n,γ)*	5.0000-01 * JEF-1 Rn-Br=0.5	4606
167.	Pd-107(n,γ)	1.0000+00 * JEF-1	4607
168.	Pd-108(n,γ)	5.0000-01 * JEF-1 Rn-Br=0.5	4608
169.	Pd-108(n,γ)*	5.0000-01 * JEF-1 Rn-Br=0.5	4608
170.	Ag-107(n,2n)	9.2800-01 * THRESH output ACTL corrected Rn-Exp. Qa81	4707

NO.	REACTION	EVALUATION METHOD	MAT NUMBER
171.	Ag-107(n,2n)*	1.2414+00 * THRESH output ACTL corrected Rn-Exp. Qa81	4707
172.	Ag-107(n,γ)	6.1975-01 * ECN-Petten, data from ENDF/B-V Rn-Br=0.948 exp. Mu81, above 1000 eV Rn-Br=0.62 Syst. Ko87	4707
173.	Ag-107(n,γ)*	3.7985-01 * ECN-Petten, data from ENDF/B-V Rn-Br=0.05 Exp. Mu81, above 1000 eV Rn-Br=0.38 Syst. Ko87	4707
174.	Ag-107(n,p)	1.4564+00 * THRESH output ACTL corrected Rn-Syst. Fo86, Rn-Br=0.56 Syst. Ko87	4707
175.	Ag-107(n,p)*	2.3318-01 * THRESH output Rn-Syst. Fo86, Rn-Br=0.44 Syst. Ko87 (J=5.5)	4707
176.	Ag-109(n,2n)	1.3156+00 * ECN-Petten data from ACTL Rn-Exp. G+M1=1440+-170 Mb (Bo73), G=786+-92 Mb mean value exp.	4709
177.	Ag-109(n,2n)*	1.6380+00 * ECN-Petten data from ACTL Rn-Exp. M1=(G+M1)-G=653+-193 Mb	4709
178.	Ag-109(n,γ)	6.2000-01 * JEF-1 Rn-Br=0.95 exp. Mu84, above 976.1 eV Br=0.62 Syst. Ko87	4709
179.	Ag-109(n,γ)*	3.8001-01 * JEF-1 Rn-Br=0.05 exp. Mu84, above 976.1 eV Br=0.38 Syst. Ko87	4709
180.	Cd-110(n,γ)	5.0000-01 * JEF-1 Rn-Br=0.5	4810
181.	Cd-110(n,γ)*	5.0000-01 * JEF-1 Rn-Br=0.5	4810
182.	Cd-111(n,γ)	1.0000+00 * JEF-1	4811
183.	Cd-112(n,γ)	5.0000-01 * JEF-1 Rn-Br=0.5	4812
184.	Cd-112(n,γ)*	5.0000-01 * JEF-1 Rn-Br=0.5	4812
185.	Sn-112(n,α)	1.7395+00 * THRESH output Rn-Syst. Fo86	5012
186.	Sn-116(n,α)	7.2758-01 * THRESH output Rn-Syst. Fo86, Rn-Br=0.56 Syst. Ko87	5016
187.	Sn-116(n,α)*	5.7167-01 * THRESH output Rn-Syst. Fo86, Rn-Br=0.44 Syst. Ko87 (J=5.5)	5016

NO.	REACTION	EVALUATION METHOD	MAT NUMBER
188.	Sn-117(n,n)*	1.0000+00 * Yamamuro comment. Syst. Vo86 gives 218 Mb (J1=1.5,Jh=5.5)	5017
189.	Sn-117(n,n)	2.4000-01 * THRESH output ECN-Petten Rn-Superel. 400Mb * Br=Syst. Ko87 (J=0.5)	5067
190.	Sn-119(n,n)*	1.0000+00 * Yamamuro comment. Syst. Vo86 gives 218 Mb (J1=1.5, JH=5.5)	5019
191.	Sn-119(n,n)	2.4000-01 * THRESH output ECN-Petten Rn-Superel. 400 Mb * Br=Syst. Ko87 (J=0.5)	5069
192.	Sn-120(n,γ)	5.6000-01 * JEF-1 Rn-Br=0.99 Exp. Mu84, above 14.271 keV Br=0.56 Syst. Ko87	5020
193.	Sn-120(n,γ)*	4.4000-01 * JEF-1 Rn-Br=0.01 exp. Mu84, above 14.271 keV Br=0.44 Syst. Ko87	5020
194.	Sn-122(n,γ)	5.0000-01 * JEF-1 Rn-Br=0.5	5022
195.	Sn-122(n,γ)*	5.0000-01 * JEF-1 Rn-Br=0.5	5022
196.	Sn-124(n,γ)	5.0000-01 * JEF-1 Rn-Br=0.5	5024
197.	Sn-124(n,γ)*	5.0000-01 * JEF-1 Rn-Br=0.5	5024
198.	Sn-125(n,γ)	1.0000+00 * JEF-1	5025
199.	Sb-121(n,2n)	6.9217-01 * THRESH output Rn-Exp. Qa81	5121
200.	Sb-121(n,2n)*	2.7367-01 * THRESH output Rn-Exp. Qa81	5121
201.	Sb-121(n,γ)	5.0000-01 * JEF-1 Rn-Br=0.5	5121
202.	Sb-121(n,γ)*	5.0000-01 * JEF-1 Rn-Br=0.5	5121
203.	Sb-121(n,p)	1.0000+00 * Yamamuro	5121
204.	Sb-121(n,p)*	1.0000+00 * Yamamuro	5121

NO.	REACTION	EVALUATION METHOD	MAT NUMBER
205.	Sb-123(n,2n)	4.9062-01 * THRESH output Rn-Exp. Qa81	5123
206.	Sb-123(n,2n)*	4.4223-01 * THRESH output Rn-Exp. Qa81	5123
207.	Sb-123(n,γ)	5.0000-01 * JEF-1 Rn-Br=0.5	5123
208.	Sb-123(n,γ)*	5.0000-01 * JEF-1 Rn-Br=0.5	5123
209.	Sb-124(n,γ)	1.0000+00 * JEF-1	5124
210.	Sb-125(n,p)	9.3933-02 * THRESH output ECN-Petten Rn-Br=0.61 Syst. Ko87, Rn-Syst. Fo86	5125
211.	Sb-125(n,p)*	6.0056-02 * THRESH output ECN-Petten Rn-Br=0.39 Syst. Ko87 (J=1.5), Rn-Syst. Fo86	5125
212.	Sb-126(n,p)	7.1984-02 * THRESH output ECN-Petten Rn-Syst. Fo86	5126
213.	Te-122(n,γ)	5.0000-01 * JEF-1 Rn-Br=0.5	5222
214.	Te-122(n,γ)*	5.0000-01 * JEF-1 Rn-Br=0.5	5222
215.	Cs-136(n,γ)	1.0000+00 * JEF-1	5536
216.	Ba-137(n,p)	1.1577-01 * THRESH output Rn-Syst. Fo86	5637
217.	La-139(n,h)	1.8172+00 * THRESH output Rn-Syst. Fo86	5739
218.	La-139(n,α)	4.7249-01 * THRESH output Rn-Exp. Qa84, Rn-Br=0.5	5739
219.	La-139(n,α)*	4.7249-01 * THRESH output Rn-Exp. Qa84, Rn-Br=0.5 (J=?)	5739
220.	Ce-140(n,2n)	5.2065-01 * THRESH output Rn-Exp. Qa81	5840
221.	Ce-140(n,2n)*	5.1493-01 * THRESH output Rn-Exp. Qa81	5840
222.	Ce-140(n,α)	1.3719+00 * THRESH output Rn-value (n,α) from (n,α) value of Met.St. Br=0.56 Syst. Ko87	5840

NO.	REACTION	EVALUATION METHOD	MAT NUMBER
223.	Ce-140(n,α)*	1.0779+00 * THRESH output Rn-Exp. Qa84, Br=0.44 Syst. Ko87 (J=5.5)	5840
224.	Nd-148(n,γ)	1.0000+00 * JEF-1	6048
225.	Nd-150(n,2n)	1.7429+00 * THRESH output Rn-Exp. Qa81	6050
226.	Nd-150(n,γ)	1.0000+00 * JEF-1	6050
227.	Sm-150(n,γ)	1.0000+00 * JEF-1	6250
228.	Sm-151(n,γ)	1.0000+00 * JEF-1	6251
229.	Sm-152(n,2n)	9.7992-01 * THRESH output Rn-Exp. Fr80	6252
230.	Sm-152(n,γ)	1.0000+00 * JEF-1	6252
231.	Eu-151(n,2n)	2.9663-01 * ECN-Petten data from TAT (India) Rn-Exp. G=514+-29.4 Mb, average several measurements	6351
232.	Eu-151(n,2n)*	7.0337-01 * ECN-Petten data from TAT (India) Rn-Exp. M1=1219.7+-82.7 Mb, average several measurements.	6351
233.	Eu-151(n,γ)	6.8030-01 * ECN-Petten, data from ENDF/B-V Rn-Br=0.64 exp. Mu84, above 98 eV Rn-Br=0.68 Syst. Ko87	6351
234.	Eu-151(n,γ)*	1.9008-01 * ECN-Petten, data from ENDF/B-V Rn-Br=0.36 exp. Mu84, above 98 eV Rn-Br=0.19 Syst. Ko87	6351
235.	Eu-151(n,γ)#	1.3006-01 * ECN-Petten, data from ENDF/B-V Rn-Br=0.0004 exp. Mu84, above 98 eV Rn-Br=0.13 Syst. Ko87	6351
236.	Eu-152(n,γ)	1.0000+00 * JEF-1	6352
237.	Eu-153(n,2n)	7.6537-01 * ECN-Petten THRESH output Rn-Exp. G=1546+-138 Mb, average of measurements	6353
238.	Eu-153(n,2n)*	2.0099-01 * ECN-Petten THRESH output Rn-Exp. M1=406+-39 Mb, average of measurements.	6353
239.	Eu-153(n,2n)#	3.3663-02 * ECN-Petten THRESH output Rn-Exp. M2=68+-6 Mb, average of measurements.	6353

NO.	REACTION	EVALUATION METHOD	MAT NUMBER
240.	Eu-153(n,γ)	5.0000-01 * JEF-1 Rn-Br=0.5	6353
241.	Eu-153(n,γ)*	5.0000-01 * JEF-1 Rn-Br=0.5	6353
242.	Eu-154(n,γ)	1.0000+00 * JEF-1	6354
243.	Gd-158(n,γ)	1.0000+00 * ECN-Petten, data from ENDF/B-4	6458
244.	Gd-160(n,2n)	1.0000+00 * ECN-Petten data from CEN (France) Rn-Exp. G=1805+-172 Mb, average several measurements.	6460
245.	Tb-159(n,2n)	7.4138-01 * ECN-Petten THRESH output Rn-Exp. G+M1=1856+-126 Mb, aver. meas., G=(G+M1)-M1	6559
246.	Tb-159(n,2n)*	2.5862-01 * ECN-Petten THRESH output Rn-Exp. M1=480+-70 Mb, average measurements.	6559
247.	Dy-158(n,p)	8.2828-01 * THRESH output Rn-Syst. Fo86, Rn-Br=0.81 Syst. Ko87	6658
248.	Dy-158(n,p)*	1.9429-01 * THRESH output Rn-Syst. Fo86, Rn-Br=0.19 Syst. Ko87 (J=0)	6658
249.	Ho-165(n,2n)	9.2363-01 * THRESH output ACTL corrected Rn-Exp. Qa81	6765
250.	Ho-165(n,2n)*	1.1538+00 * THRESH output ACTL corrected Rn-Exp. Qa81	6765
251.	Ho-165(n,γ)	6.4000-01 * ECN-Petten, data from ENDF/B-V Rn-Br=0.94 exp. Mu84, above 151 eV Rn-Br=0.64 Syst. Ko87	6765
252.	Ho-165(n,γ)*	3.6001-01 * ECN-Petten, data from ENDF/B-V Rn-Br=0.05 exp. Mu84, above 151 eV Rn-Br=0.36 Syst. Ko87	6765
253.	Ho-166(n,n)*	2.2000-01 * THRESH output ECN-Petten Rn-Syst. Vo86 (J1=0, Jh=7)	6766
254.	Ho-166(n,n)	1.9000-01 * THRESH output ECN-Petten Rn-Superel. 400 Mb * Br=Syst. Ko87 (J=0)	6816
255.	Hf-177(n,γ)	8.6899-01 * ECN-Petten, data from JENDL-2 Rn-Br=0.99 exp. Mu84, above 1000 eV Rn-Br=0.87 Syst. Ko87	7277

NO.	REACTION	EVALUATION METHOD	MAT NUMBER
256.	Hf-177(n,γ)*	1.2999-01 * ECN-Petten, data from JENDL-2 Rn-Br=2E-3 exp. Mu84, above 1000 eV Rn-Br=0.13 Syst. Ko87	7277
257.	Hf-177(n,γ)#	9.9996-04 * ECN-Petten, data from JENDL-2 Rn-Br=5E-10 exp. Mu84, above 1000 eV Rn-Br=0.001 Syst. Ko87	7277
258.	Hf-178(n,n)*	5.2660-02 * ECN-Petten data from JENDL-2 Rn-Syst. SIGM1= 19 Mb, systematics Vonach (Vo86)	7278
259.	Hf-178(n,n)#	2.4943-04 * ECN-Petten data from JENDL-2 Rn-Syst. SIGM2=0.09 Mb, systematics Vonach (Vo86)	7278
260.	Hf-178(n,2n)	9.5200-01 * THRESH output Rn-Br=0.952 Syst. Ko87	7278
261.	Hf-178(n,2n)*	4.8000-02 * THRESH output Rn-Br=0.048 Syst. Ko87 (J=11.5)	7278
262.	Hf-178(n,2n)#	1.0000-03 * THRESH output Rn-Br=0.001 Syst. Ko87 (J=18.5)	7278
263.	Hf-178(n,γ)	7.5800-01 * JEF-1 Rn-Br=0.27 exp. Mu84, above 1.5 keV Br=0.758 Syst. Ko87	7278
264.	Hf-178(n,γ)*	2.4000-01 * JEF-1 Rn-Br=0.62 exp. Mu84, above 1.5 keV Br=0.24 Syst. Ko87	7278
265.	Hf-178(n,γ)#	2.0000-03 * JEF-1 Rn-Br=0.01 exp. Mu84, above 1.5 keV Br=0.002 Syst. Ko87	7278
266.	Hf-178(n,n)	1.0000+00 * THRESH output ECN-Petten Rn-Superel.(2.Met.St.) 400Mb * Br=Syst. Ko87 (J=0)	7348
267.	Hf-179(n,n)*	2.4000-01 * THRESH output ECN-Petten Rn-400 Mb * Br=Syst. Ko87 (J=0.5)	7279
268.	Hf-179(n,n)#	1.1000-01 * THRESH output ECN-Petten	279
269.	Hf-179(n,2n)	2.8584-01 * ECN-Petten data from ACTL Rn-Syst. G+M1+M2=2106+-160 Mb(BO73). G=(G+M1+M2)-M1-M2.	7279
270.	Hf-179(n,2n)*	7.0795-01 * ECN-Petten data from ACTL Rn-Exp., M1=1491+-116 Mb, experimental value (Sa75).	7279

NO.	REACTION	EVALUATION METHOD	MAT NUMBER
271.	Hf-179(n,2n)#	6.0220-03 * ECN-Petten data from ACTL Rn-Syst. G+M1+M2=2106+-160 Mb(BO73), Rn-Br=6.22E-3 (Ko87).	7279
272.	Hf-179(n,n)	6.0000-01 * THRESH output ECN-Petten Rn-Superel. 400Mb * Br=Syst. Ko87 (J=4.5)	7349
273.	Hf-180(n,2n)	5.5514-01 * JENDL-2 Rn-G+M1+M2=1975+-140 Mb Syst. Bo73 Rn-Br=0.65 Syst. Ko87	7280
274.	Hf-180(n,2n)*	2.8184-01 * JENDL-2 Rn-Br=0.33 from exp. data (Ru70, So77)	7280
275.	Hf-180(n,2n)#	1.7081-02 * JENDL-2 Rn-Br=0.02 Syst. Ko87	7280
276.	Hf-180(n,3n)	8.0001-01 * THRESH output ACTL corrected Rn-Br=0.66 Syst. Ko87	7280
277.	Hf-180(n,3n)*	8.0001-01 * THRESH output Rn-Br=0.34 Syst. Ko87 (J=8)	7280
278.	Hf-180(n,3n)#	2. -03 * THRESH output Rn-Br=0.001 Syst. Ko87 (J=16)	7280
279.	Hf-180(n,γ)	1.0000+00 * JEF-1	7280
280.	Ta-179(n,2n)	5.0000-01 * THRESH output ECN-Petten Rn-Br=0.5	7379
281.	Ta-179(n,2n)*	5.0000-01 * THRESH output ECN-Petten Rn-Br=0.5 (J=?,EG=EM)	7379
282.	Ta-181(n,2n)	5.2295+00 * THRESH output ACTL corrected comment. total ACTL minus exp. value for metastable state	7381
283.	Ta-181(n,2n)*	5.7760-01 * THRESH output ACTL corrected Rn-Exp. Qa81	7381
284.	Ta-181(n,na)	9.5196-01 * THRESH output ACTL corrected Rn-Br=0.952 Syst. Ko87	7381
285.	Ta-181(n,na)*	4.7998-02 * estimate used Ta181(n,na) Rn-Br=0.048 Syst. Ko87 (J=11.5)	7381
286.	Ta-181(n,nd)	1.7693-02 * THRESH output	7381
287.	Ta-181(n,nd)*	4.5600-03 * THRESH output	7381
288.	Ta-181(n,nd)#	5.4720-04 * THRESH output	7381

NO.	REACTION	EVALUATION METHOD	MAT NUMBER
289.	Ta-181(n,γ)	4.7800-01 * JEF-1 Rn-Br=0.99 exp. Mu84, above 330 eV Br=0.478 Syst. Ko87	7381
290.	Ta-181(n,γ)*	5.0000-01 * JEF-1 Rn-Br=0.005 exp. Mu84, above 330 eV Br=0.50 Syst. Ko87	7381
291.	Ta-181(n,γ)#	2.2000-02 * JEF-1 Rn-Br=0.005 exp. Mu84, above 330 eV Br=0.022 Syst. Ko87	7381
292.	Ta-181(n,t)	9.1990-01 * ECN-Petten THRESH output Rn-Syst. R. Forrest, Rn-Br=0.92, Syst. Qa85	7381
293.	Ta-181(n,t)*	8.0000-02 * ECN-Petten THRESH output Rn-Syst. R. Forrest, Rn-Br=0.08, Syst. Qa85(J=0.5)	7381
294.	Ta-181(n,t)#	1.0000-03 * ECN-Petten THRESH output Rn-Syst. R. Forrest, Rn-Br=0.001, Syst. Qa85(J=12.5)	7381
295.	Ta-182(n,γ)	1.0000+00 * JEF-1	7382
296.	Ta-182(n,p)	4.0560-01 * THRESH output ECN-Petten Rn-Syst. Fo86, Rn-Br=0.87 Syst. Ko87	7382
297.	Ta-182(n,p)*	6.0608-02 * THRESH output ECN-Petten Rn-Syst. Fo86, Rn-Br=0.13 Syst. Ko87 (J=8)	7382
298.	W-180(n,2n)	6.5524-01 * THRESH output ACTL corrected Rn-Exp. Qa81	7480
299.	W-180(n,2n)*	2.3333-01 * estimate used W180 (n,2n) Rn-Exp. Qa81	7480
300.	W-182(n,na)	4.0964-02 * THRESH output Rn-Syst. Fo86, Rn-Br=0.719 Syst. Ko87	7482
301.	W-182(n,na)*	1.5953-02 * THRESH output Rn-Syst. Fo86, Rn-Br=0.28 Syst. Ko87 (J=8)	7482
302.	W-182(n,na)#	5.6973-05 * THRESH output Rn-Syst. Fo86, Br=0.001 Syst. Ko87 (J=16)	7482
303.	W-182(n,γ)	1.0000+00 * JEF-1 Rn-Br=0.5	7482
304.	W-182(n,γ)*	1.0000+00 * JEF-1 Rn-Br=0.5	7482

NO.	REACTION	EVALUATION METHOD	MAT NUMBER
305.	W-182(n,α)	7.7639-01 * THRESH output ACTL corrected Rn-Syst. Fo86, minus exp. and Syst. value of met. states	7482
306.	W-182(n,α)*	1.7236+00 * THRESH output ACTL corrected Rn-Exp. Qa81	7482
307.	W-182(n,α)#	3.0163-03 * THRESH output ACTL corrected Rn-Syst. Fo86 * Br=0.002 Syst. Ko87 (J=12.5)	7482
308.	W-183(n,γ)	1.0000+00 * JEF-1	7483
309.	W-184(n,γ)	5.5999-01 * ECN-Petten, data from ENDF/B-4 Rn-Br=0.999 exp. Mu84, above 2650 eV Rn-Br=0.56 Syst. Ko87	7484
310.	W-184(n,γ)*	4.4000-01 * ECN-Petten, data from ENDF/B-4 Rn-Br=1E-3 exp. Mu84, above 2650 eV Rn-Br=0.44 Syst. Ko87	7484
311.	W-186(n,na)	6.0131-02 * THRESH output Rn-Syst. Fo86, Rn-Br=0.72 Syst. Ko87	7486
312.	W-186(n,na)*	2.3384-02 * THRESH output Rn-Syst. Fo86, Rn-Br=0.28 Syst. Ko87 (J=8)	7486
313.	W-186(n,γ)	1.0000+00 * ECN-Petten, data from ENDF/B-4	7486
314.	Re-185(n,γ)	6.7000-01 * ECN-Petten, data from ENDF/B-4 Rn-Br=0.67 Syst. Ko87	7585
315.	Re-185(n,γ)*	3.3000-01 * ECN-Petten, data from ENDF/B-4 Rn-Br=0.33 Syst. Ko87	7585
316.	Re-187(n,2n)	7.1191-01 * ECN-Petten data from ACTL Rn-Exp. G=1495+-164 Mb, average measurements	7587
317.	Re-187(n,2n)*	2.8809-01 * ECN-Petten data from ACTL Rn-Syst. M1=605+-258 Mb = Syst. value YAO (Ya85) minus value G.	7587
318.	Re-187(n,γ)	6.2000-01 * JEF-1 Rn-Br= 0.96 exp. Mu84, above 91.8 eV Br=0.62 Syst. Ko87	7587
319.	Re-187(n,γ)*	3.8000-01 * JEF-1 Rn-Br=0.04 exp. Mu84, above 91.8 eV Br=0.38 Syst. Ko87	7587
320.	Os-188(n,γ)	1.0000+00 * ECN evaluation	7688

NO.	REACTION	EVALUATION METHOD	MAT NUMBER
321.	Os-188(n,p)	2.7261+00 * THRESH output Rn-Exp. Qa81, Rn-Br=0.62 Syst. Ko87	7688
322.	Os-188(n,p)*	1.6709+00 * THRESH output Rn-Exp. Qa81, Rn-Br=0.38 Syst. Ko87 (J=6)	7688
323.	Os-189(n,γ)	9.7800-01 * ECN evaluation Rn-Br=0.978 Syst. Ko87	7689
324.	Os-189(n,γ)*	2.2000-02 * ECN evaluation Rn-Br=0.022 Syst. Ko87 (J=10)	7689
325.	Os-190(n,γ)	6.1000-01 * ECN-Petten data from FISPRO-ECN Rn-Br=0.298 exp. Mu84, above 30 eV Rn-Br=0.61 Syst. Ko87	7690
326.	Os-190(n,γ)*	3.9000-01 * ECN-Petten data from FISPRO-ECN Rn-Br=0.702, exp. Mu84, above 30 eV Rn-Br=0.39 Syst. Ko87	7690
327.	Os-190(n,α)	2.2351+00 * THRESH output Rn-Syst. Fo86	7690
328.	Os-192(n,2n)	6.0605-01 * ECN-Petten data from IBJ (Poland) Rn-Exp. G+M1=2216+-112 Mb, aver. val. meas. G=(G+M1)-M1	7692
329.	Os-192(n,2n)*	3.9395-01 * ECN-Petten data from IBJ (Poland) Rn-Exp. M1=873+-121, average value measurements	7692
330.	Os-192(n,γ)	1.0000+00 * ECN-Petten data from FISPRO-ECN	7692
331.	Ir-191(n,2n)	7.8532-01 * THRESH output Rn-Exp. Qa81	7791
332.	Ir-191(n,2n)*	1.0068-01 * THRESH output Rn-Exp. Qa81	7791
333.	Ir-191(n,na)	7.0017-02 * THRESH output Rn-Syst. Fo86	7791
334.	Ir-191(n,γ)	4.2006-01 * ECN-Petten data from FISPRO-ECN Rn-Br=0.324, exp. Mu84, above 10 keV Rn-Br=0.42 Syst. Ko87	7791
335.	Ir-191(n,γ)*	3.1005-01 * ECN-Petten data from FISPRO-ECN Rn-Br=0.676 exp. Mu84, above 10 keV Rn-Br=0.31 Syst. Ko87	7791
336.	Ir-191(n,γ)#	2.7005-01 * ECN-Petten data from FISPRO-ECN Rn-Br=1.677E-4 exp. Mu84, above 10 keV Rn-Br=0.27 Syst. Ko87	7791

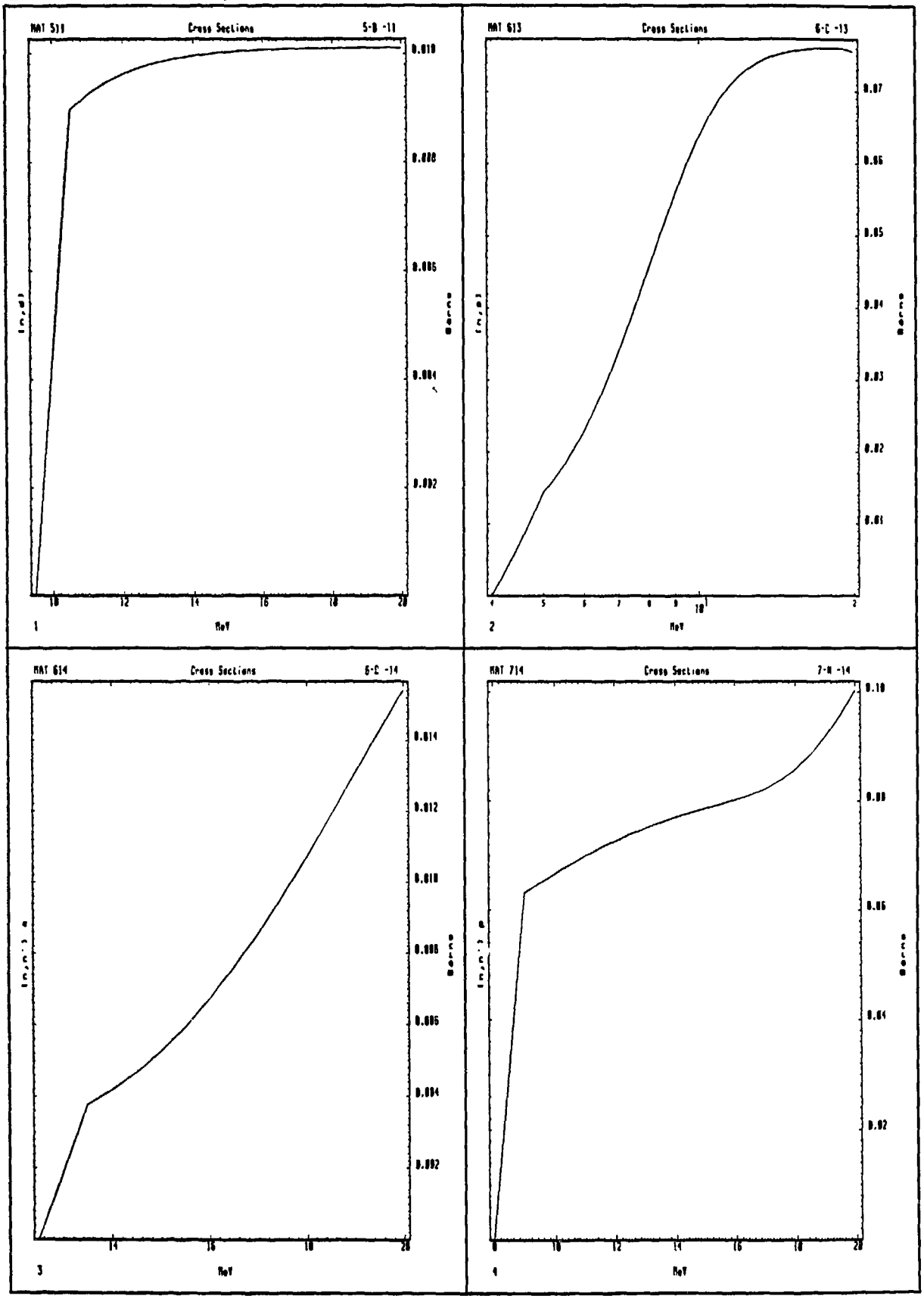
NO.	REACTION	EVALUATION METHOD	MAT NUMBER
337.	Ir-192(n,n)*	3.1000-01 * THRESH output ECN-Petten Rn-400 Mb * Br=Syst. Ko87 (J=1), JM2=9 ignored	7792
338.	Ir-192(n,n)	3.1000-01 * THRESH output ECN-Petten Rn-Superel.(2.met.st.) 400 Mb * Br=Syst. Ko87 (J=1)	7862
339.	Ir-193(n,2n)	5.9297-01 * ECN-Petten data from IBJ (Poland) Rn-Exp. G+M1=1928+-147 Mb, aver. val. meas. G=(G+M1)-M1	7793
340.	Ir-193(n,2n)*	3.1007-01 * ECN-Petten data from IBJ (Poland) Rn-Syst. G+M1+M2=2135+-160 Syst. BOEDY (Bo73), Rn-Br=0.31 (Ko87)	7793
341.	Ir-193(n,2n)#	9.6955-02 * ECN-Petten data from IBJ (Poland) Rn-Syst. M2=(G+M1+M2)-(G+M1)=207+-217 Mb	7793
342.	Pt-192(n,γ)	6.7000-01 * ECN evaluation Rn-Br=0.67 Syst. Ko87	7892
343.	Pt-192(n,γ)*	3.3000-01 * ECN evaluation Rn-Br=0.33 Syst. Ko87 (J=6.5)	7892
344.	Pt-194(n,2n)	5.0916-01 * THRESH output Rn-G+M1=2010+-150 Mb Syst. Bo73 Rn-Br=0.56 Syst. Ko87	7894
345.	Pt-194(n,2n)*	4.0005-01 * THRESH output Rn-Br=0.44 Syst. Ko87 (J=6.5)	7894
346.	Au197(n,2n)	8.4793-01 * THRESH output ACTL corrected Rn-Exp. Qa81	7997
347.	Au197(n,2n)*	1.0714+00 * THRESH output ACTL corrected Rn-Exp. Qa81	7997
348.	Au197(n,2n)#	3.8239-02 * THRESH output ACTL corrected Rn-Br=0.033 Syst. Ko87 (J=12)	7997
349.	Au197(n,α)	8.7500-01 * THRESH output ACTL corrected Rn-Exp. Qa81	7997
350.	Au197(n,α)*	4.8307+00 * THRESH output comment. (n,α)=OLD Syst. value minus value for ground state	7997
351.	Hg-195(n,2n)	1.0000+00 * THRESH output ECN-Petten	8095
352.	Hg-196(n,2n)	1.6845-01 * THRESH output Rn-Exp. Qa81	8096

NO.	REACTION	EVALUATION METHOD	MAT NUMBER
353.	Hg-196(n,2n)*	7.5038-01 * THRESH output Rn-Exp. Qa81	8096
354.	Tl-203(n,2n)	8.1092-01 * Bospor Rn-Exp. Qa81	8103
355.	Pb-204(n,n)	1.1512-01 * JENDL-2 Rn-Exp. V086	8204
356.	Pb-204(n,2n)	3.6850-01 * JENDL-2 Rn-Br=0.40 from exp. data (Ba86)	8204
357.	Pb-204(n,2n)*	5.4354-01 * JENDL-2 Rn-Br=0.59 Syst. Ko87	8204
358.	Pb-204(n,2n)#	9.2125-03 * JENDL-2 Rn-Br=0.01 Syst. Ko87	8204
359.	Pb-204(n,p)	1.2219+01 * JENDL-2 Rn-Syst. Fo86, com. eval. JENDL-2 too low	8204
360.	Pb-204(n,t)	6.7090-01 * THRESH output Rn-Exp. Bo85	8204
361.	Pb-206(n,2n)	1.0000+00 * ECN-Petten data from CEN (France) Rn-Exp. G=1960+-160 Mb(Fr80)	8206
362.	Pb-206(n,α)	1.0000+00 * JENDL-2 comment. evaluation agrees with exp. data (Qa81)	8206
363.	Pb-208(n,γ)	1.0000+00 * ECN-Petten, data from JENDL-2	8208
364.	Bi-208(n,2n)	9.1500-01 * THRESH output Rn-Br=0.915 Syst. Ko87	8308
365.	Bi-208(n,2n)*	8.5000-02 * THRESH output Rn-Br=0.085 Syst. Ko87 (J=10.5)	8308
366.	Bi-209(n,2n)	1.0000+00 * ECN-Petten data from CEN (France) Rn-Exp. G=2336+-255 Mb, average several measurements	8309
367.	Bi-209(n,γ)	7.3000-01 * ECN-Petten, data from CEN (France) Rn-Br=0.71 exp. Mu84, above 2.7E5 eV Rn-Br=0.73 Syst. Ko87	8309
368.	Bi-209(n,γ)*	2.6999-01 * ECN-Petten, data from CEN (France) Rn-Br=0.28 exp. Mu84, above 2.7E5 eV Rn-Br=0.27 Syst. Ko87	8309
369.	Po-210(n,2n)	1.0000+00 * THRESH output ECN-Petten	8410

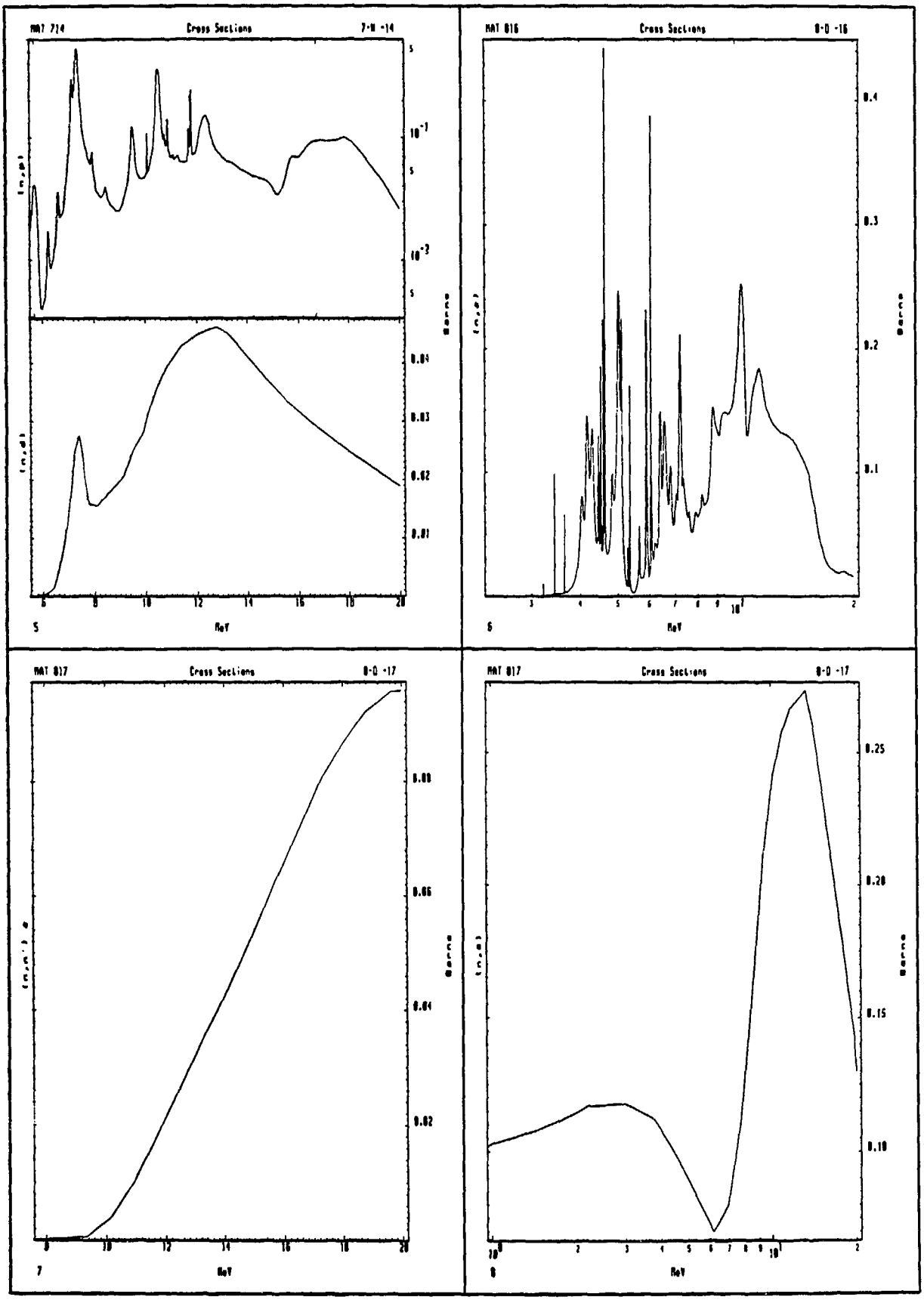
APPENDIX

Plots of Activation Cross-Section Data for the "ACTV-FUS/ECN" Library

PART 1. Plots of Reaction Cross-Sections and Ground State Production Cross-Sections



Part 1: Plots of reaction cross-sections and ground state production cross-sections



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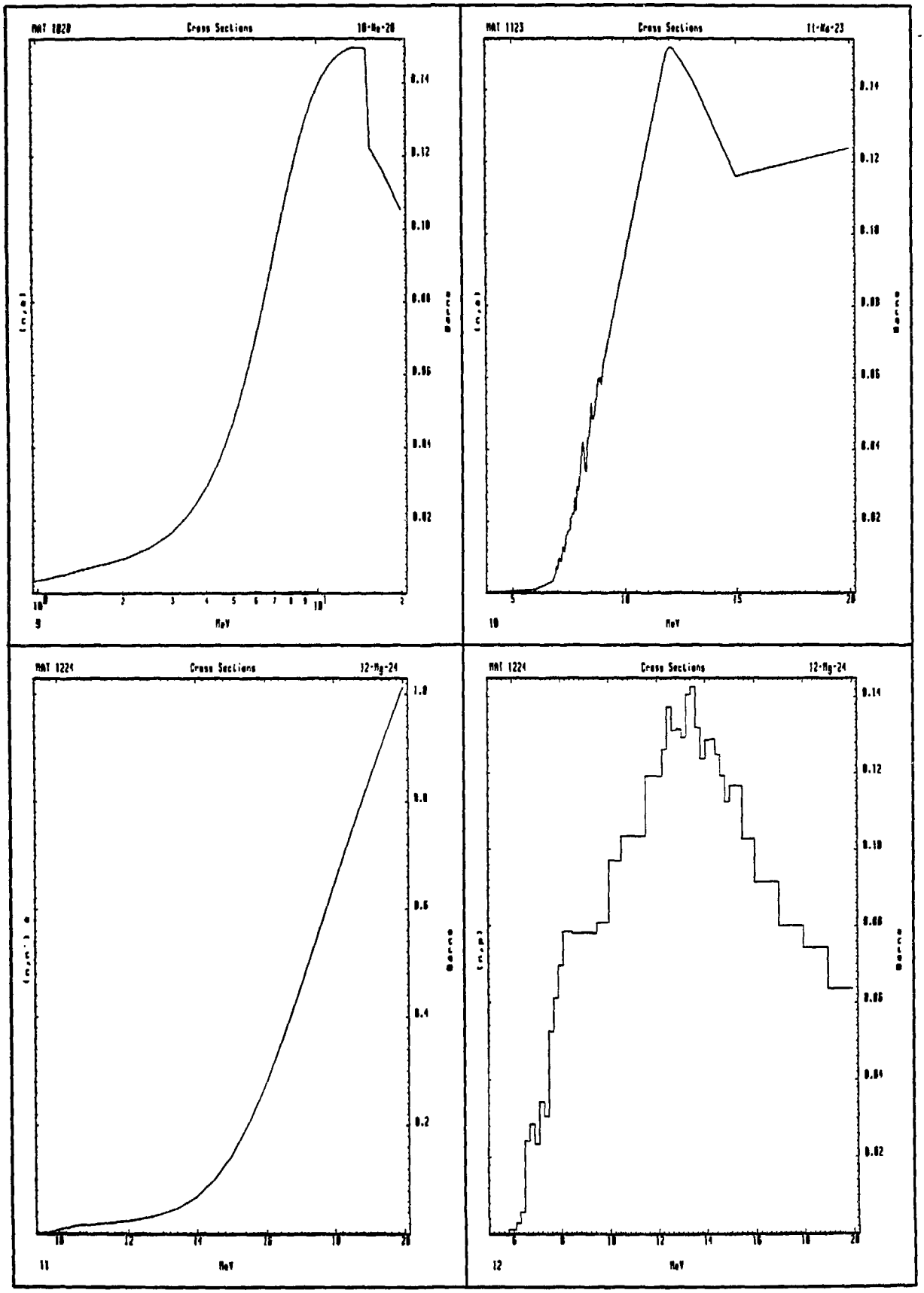

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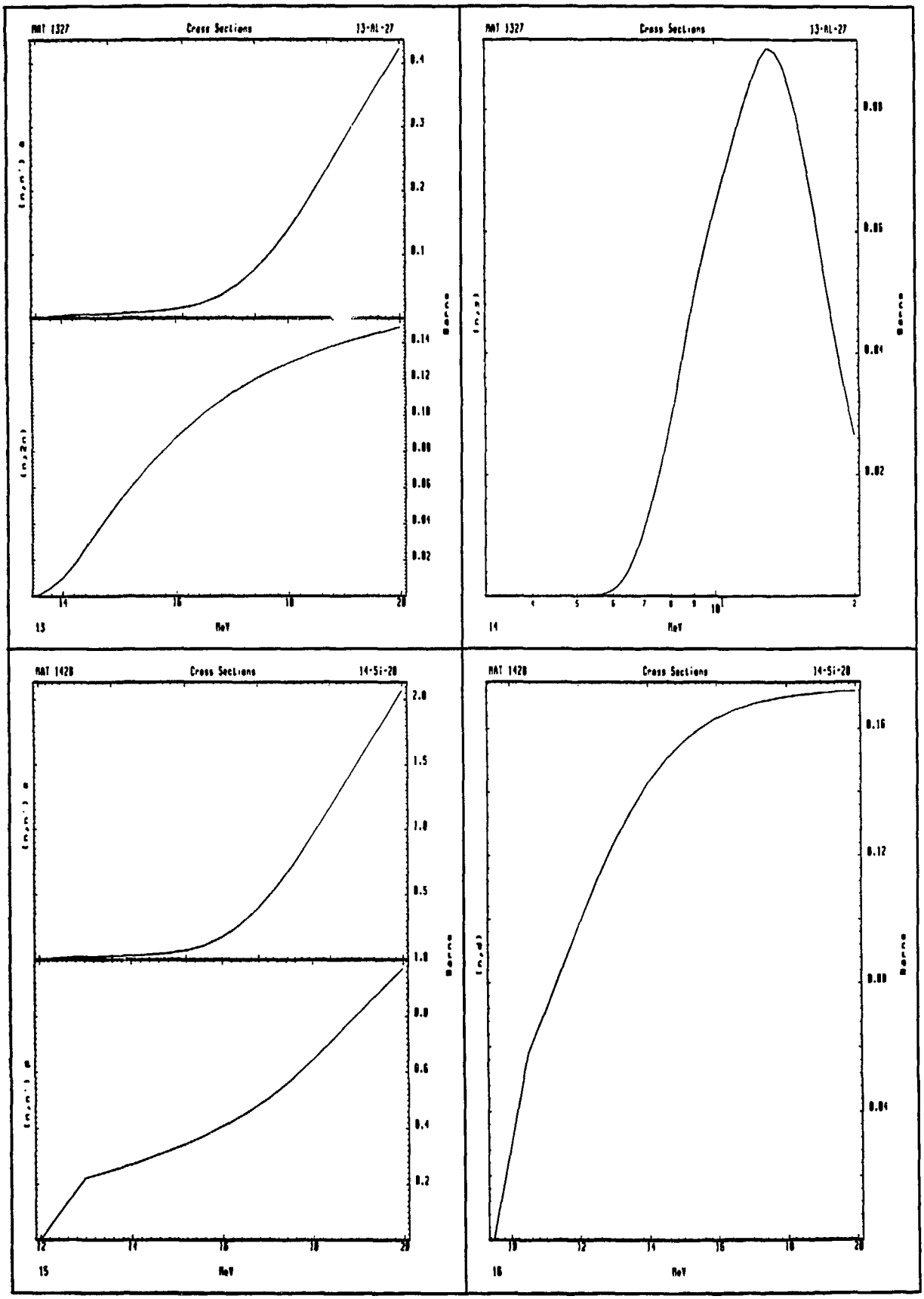

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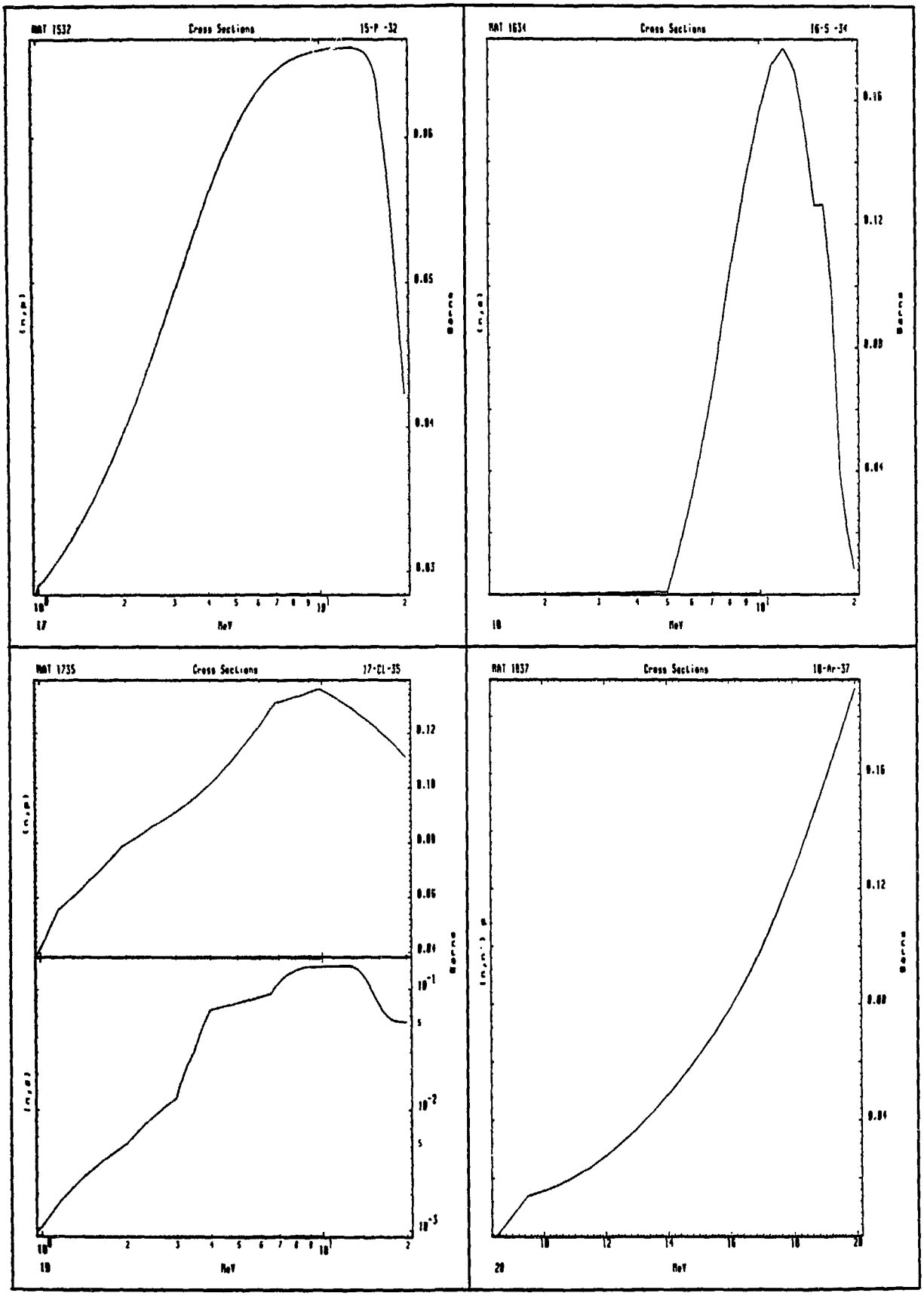

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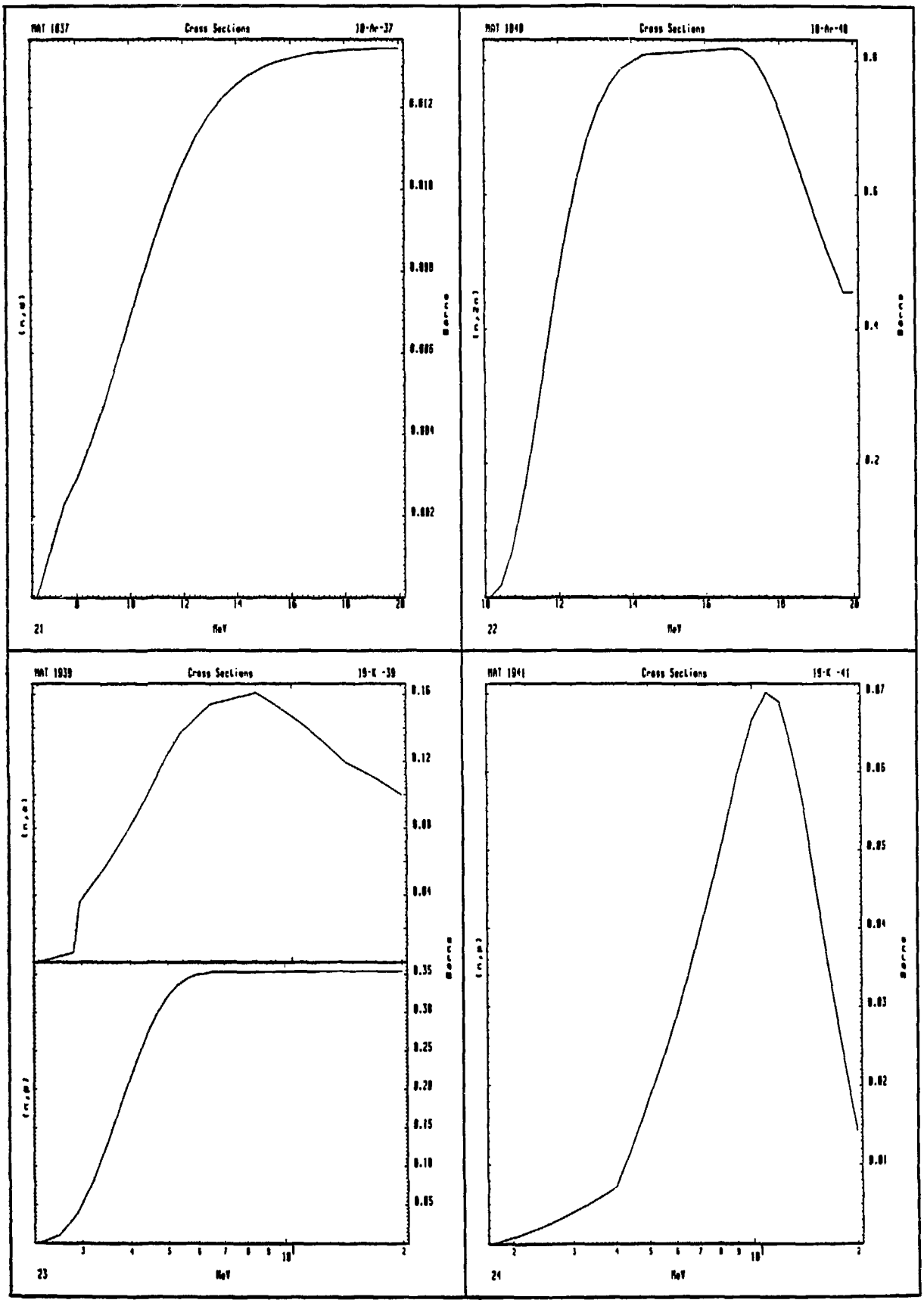

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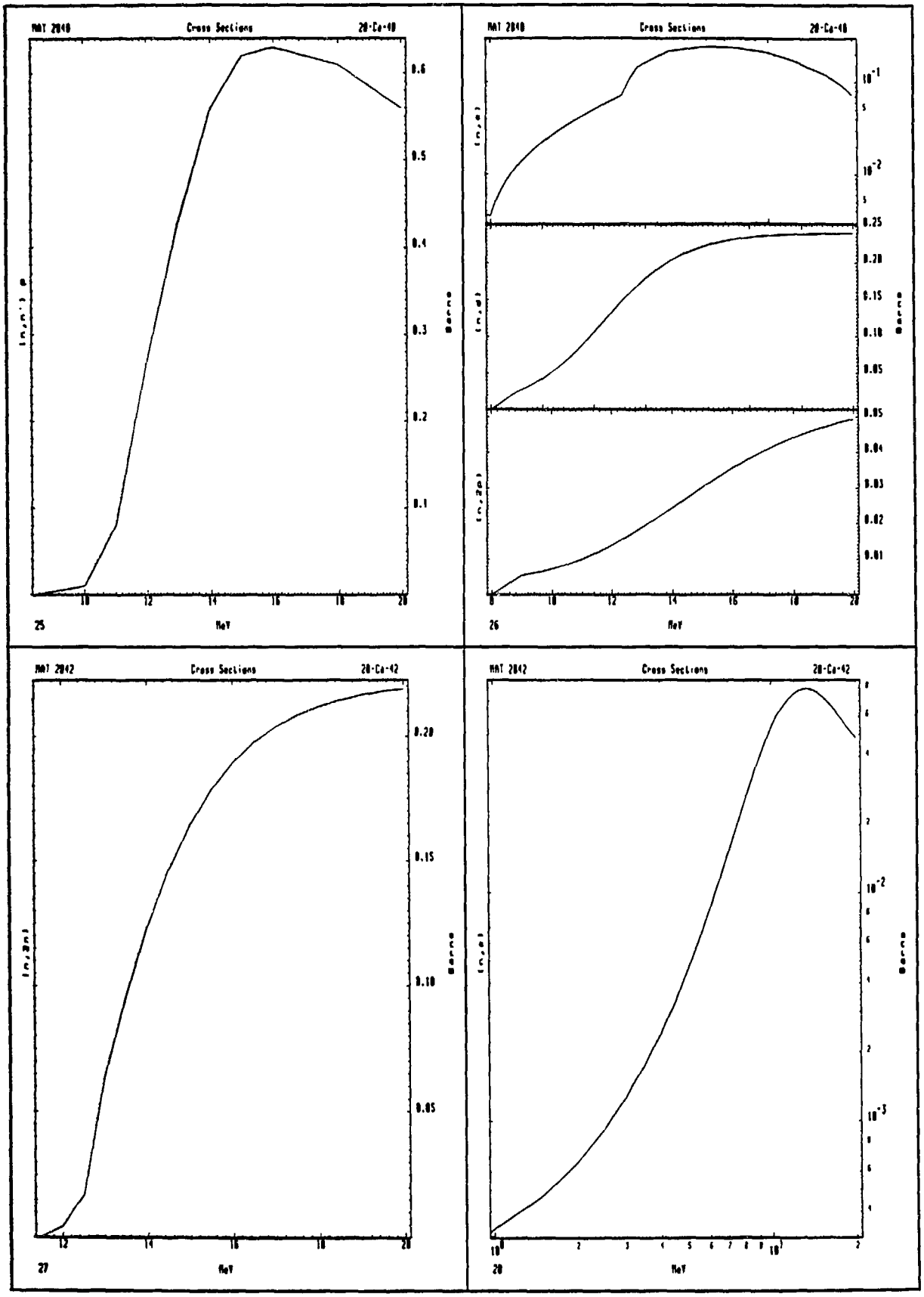

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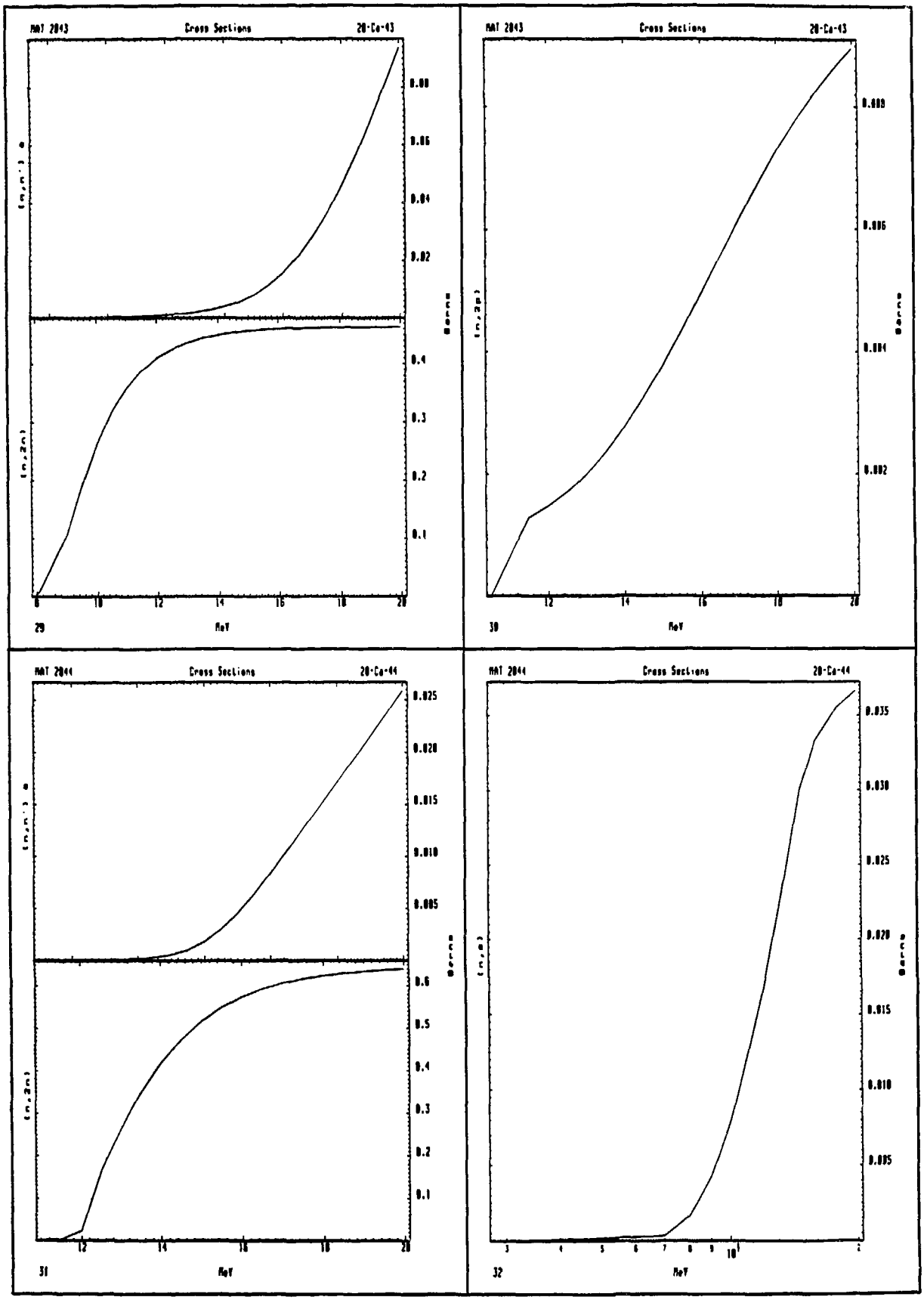

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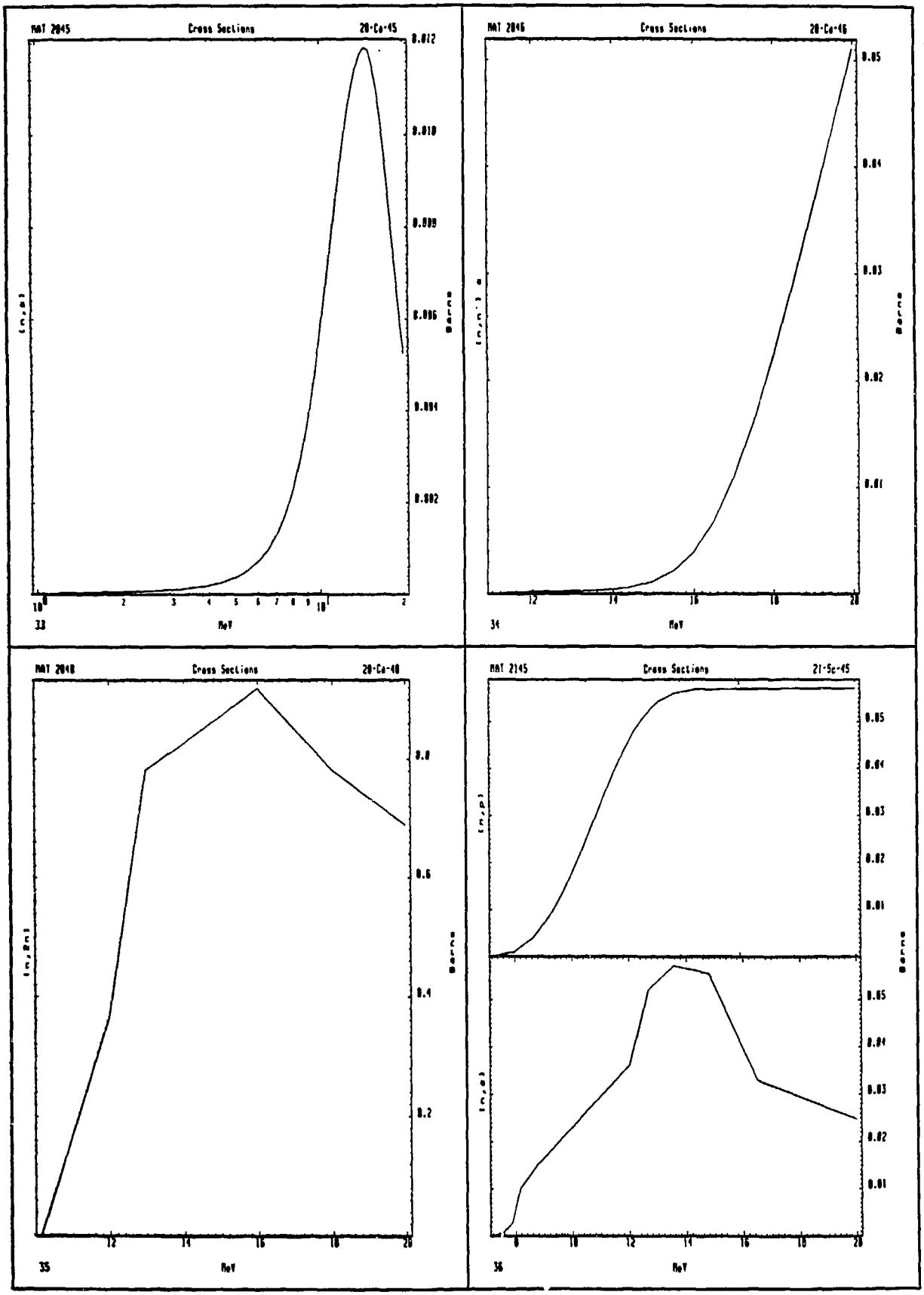

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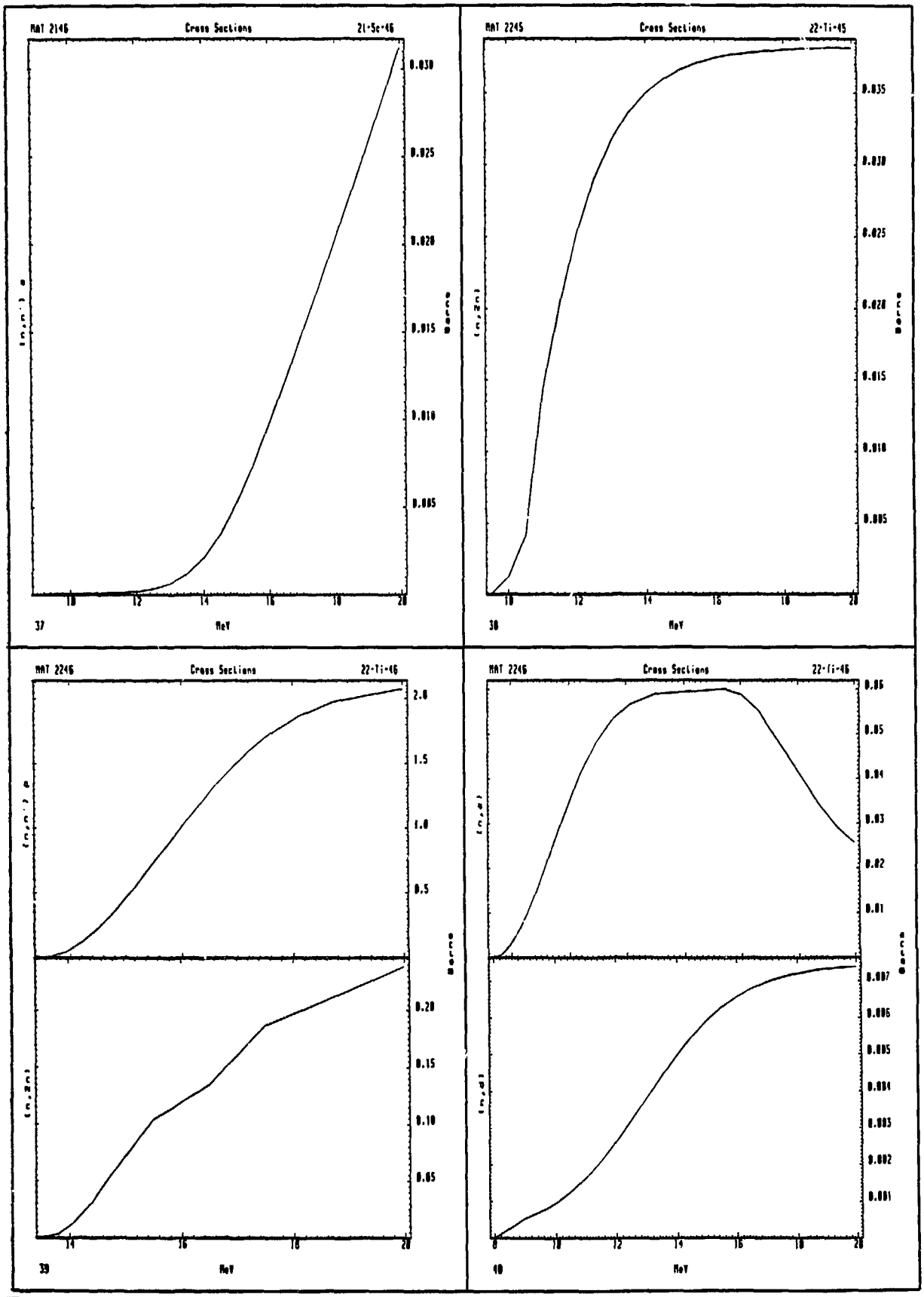

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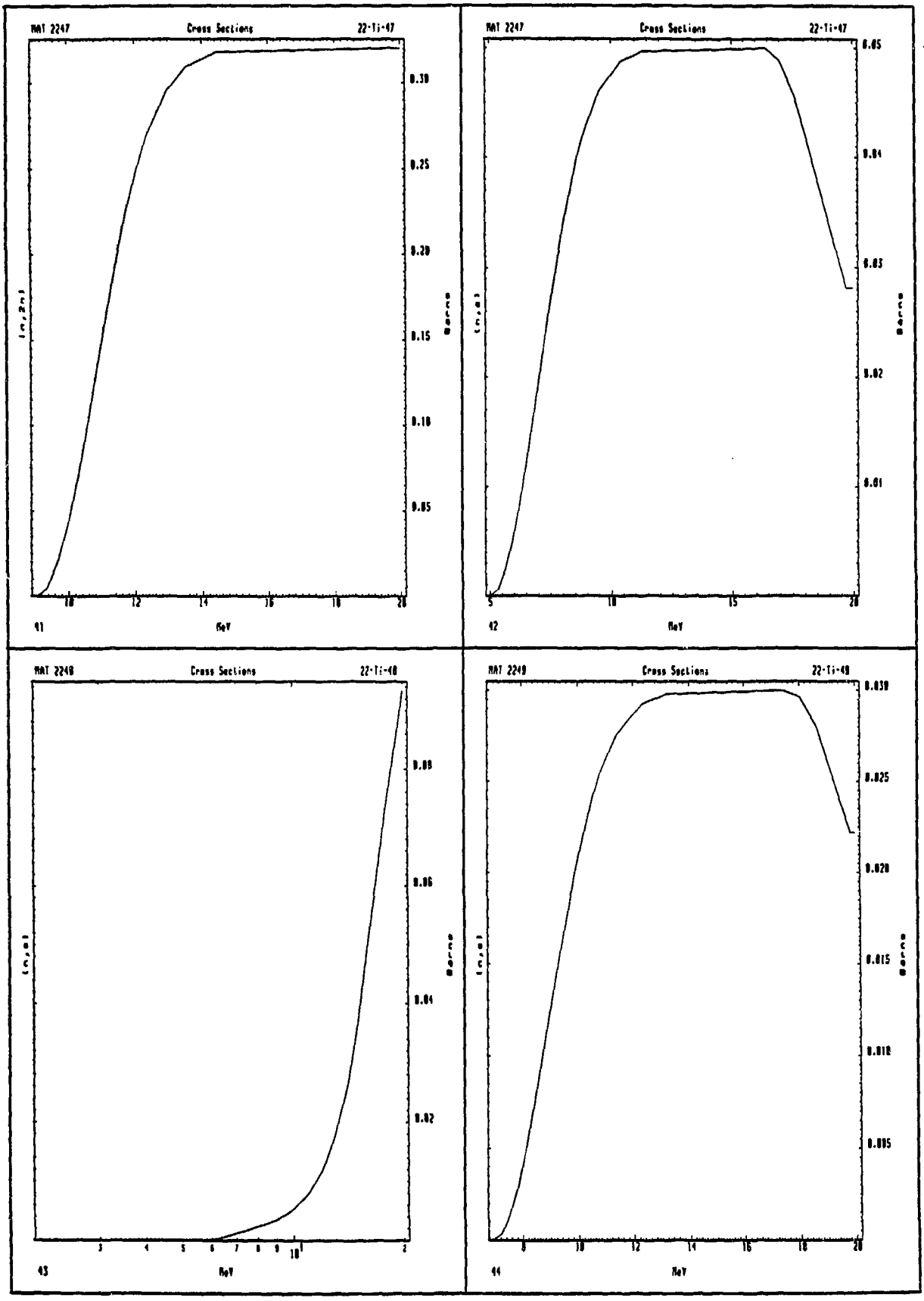

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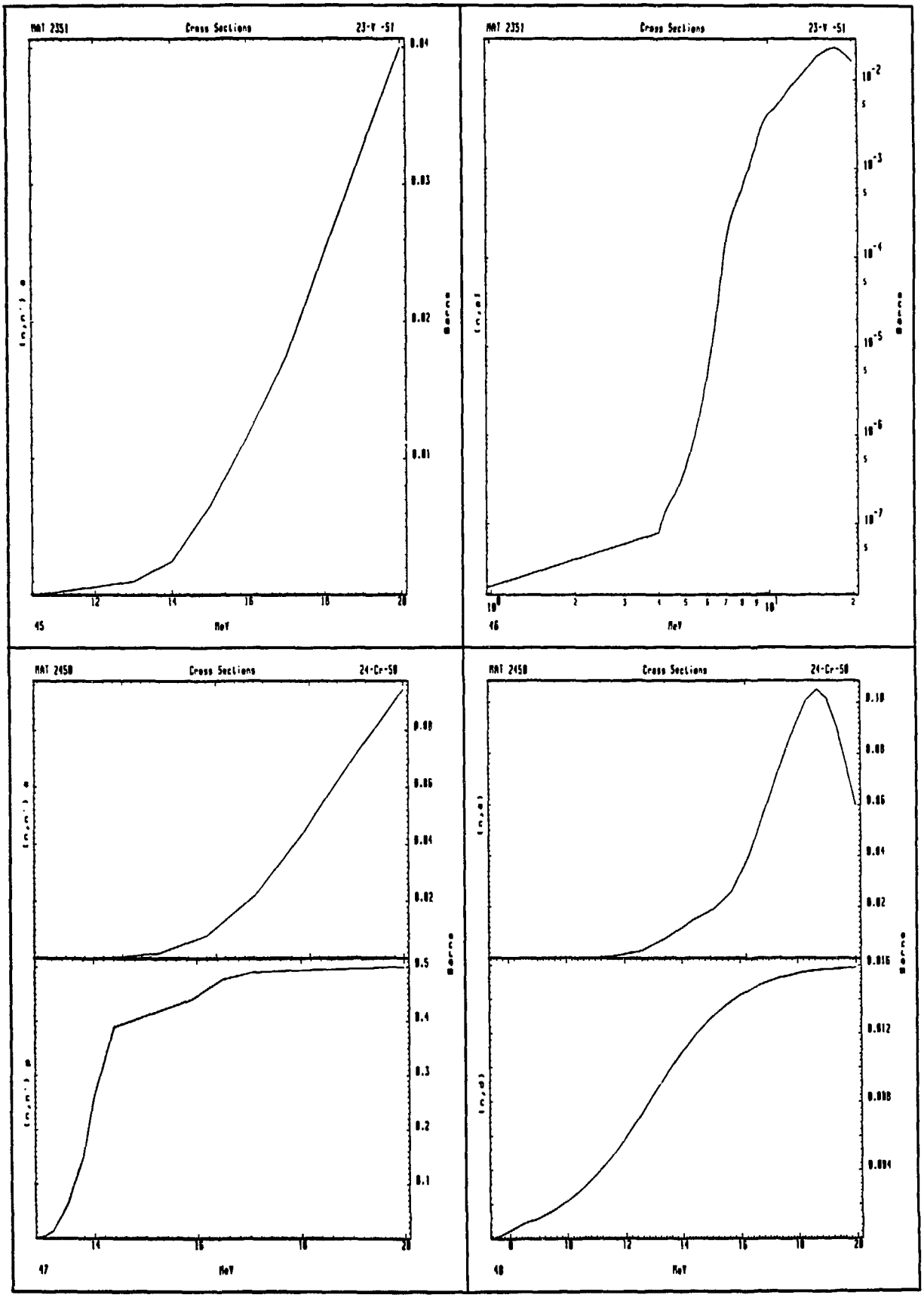

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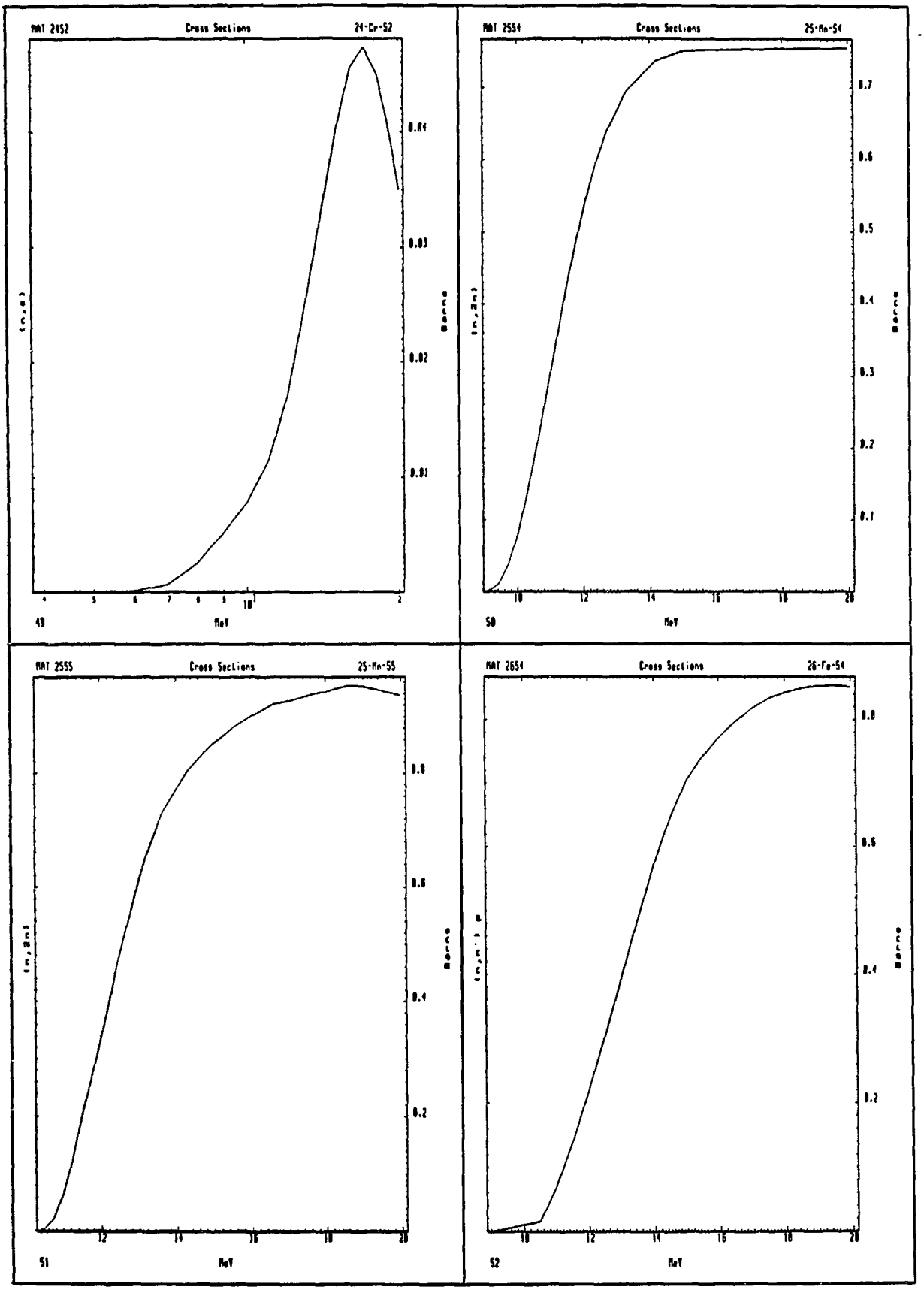

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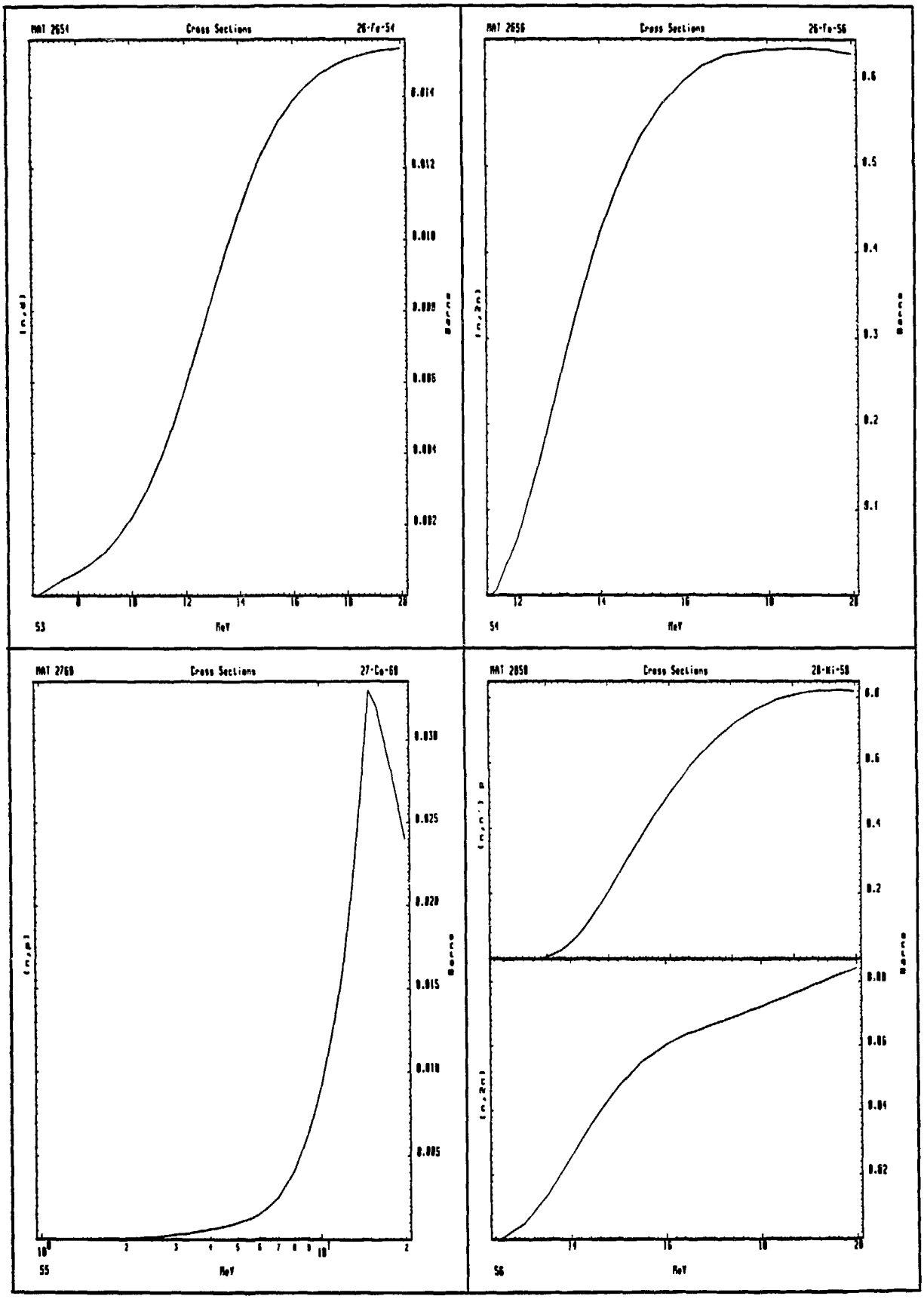
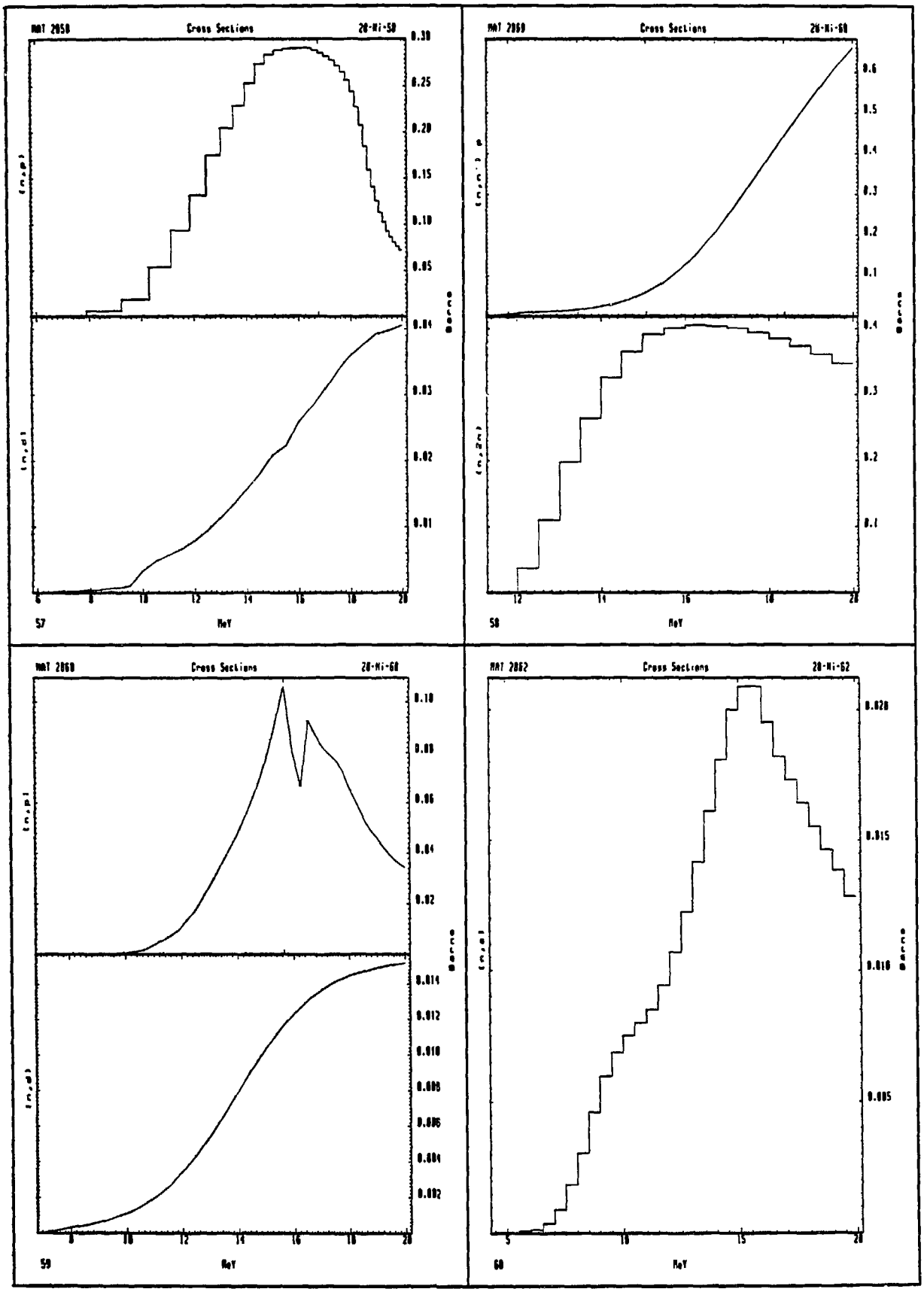
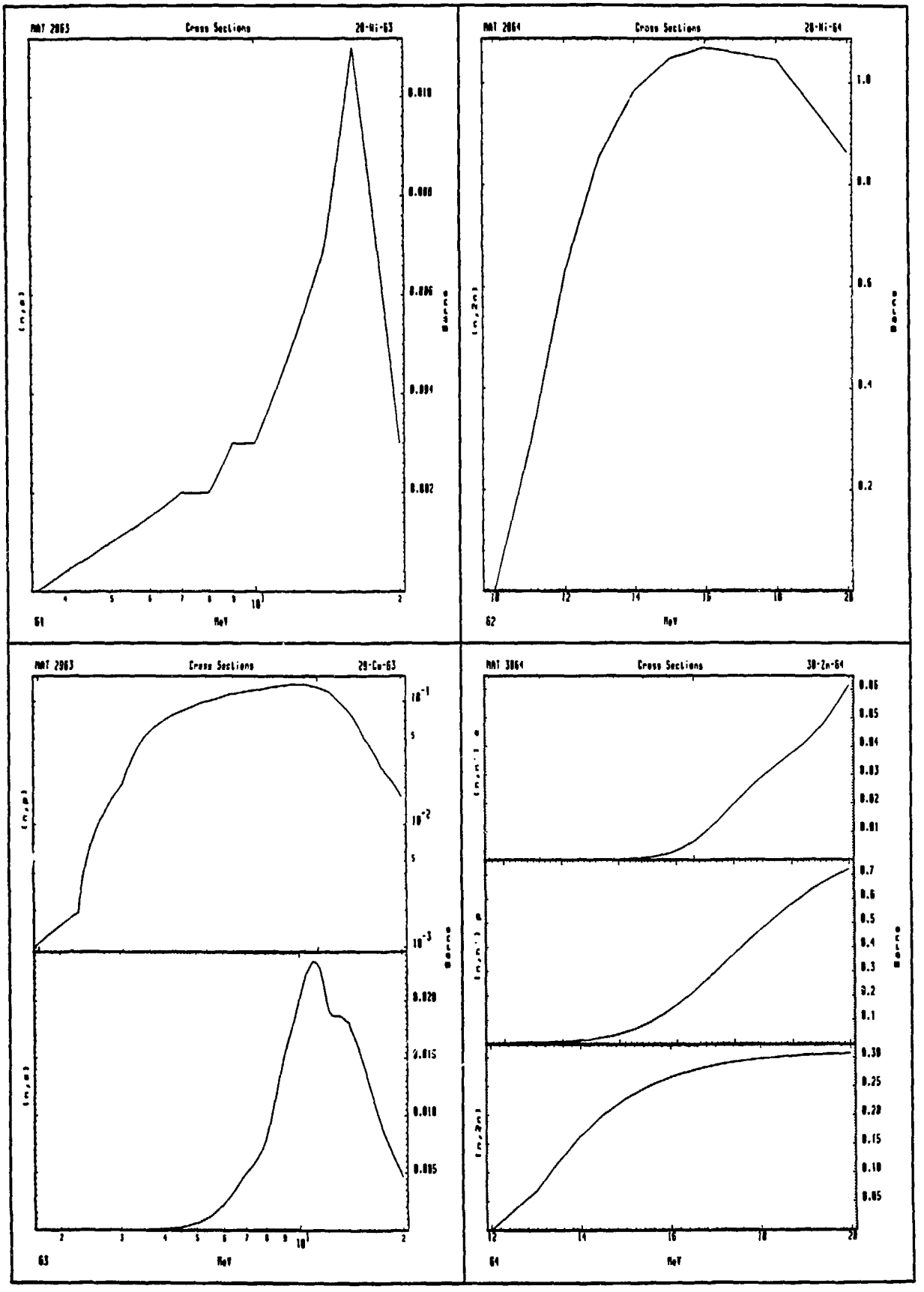


Part 1: Plots of reaction cross-sections and ground state production cross-sections



- Part 1: Plots of reaction cross-sections and ground state production cross-sections



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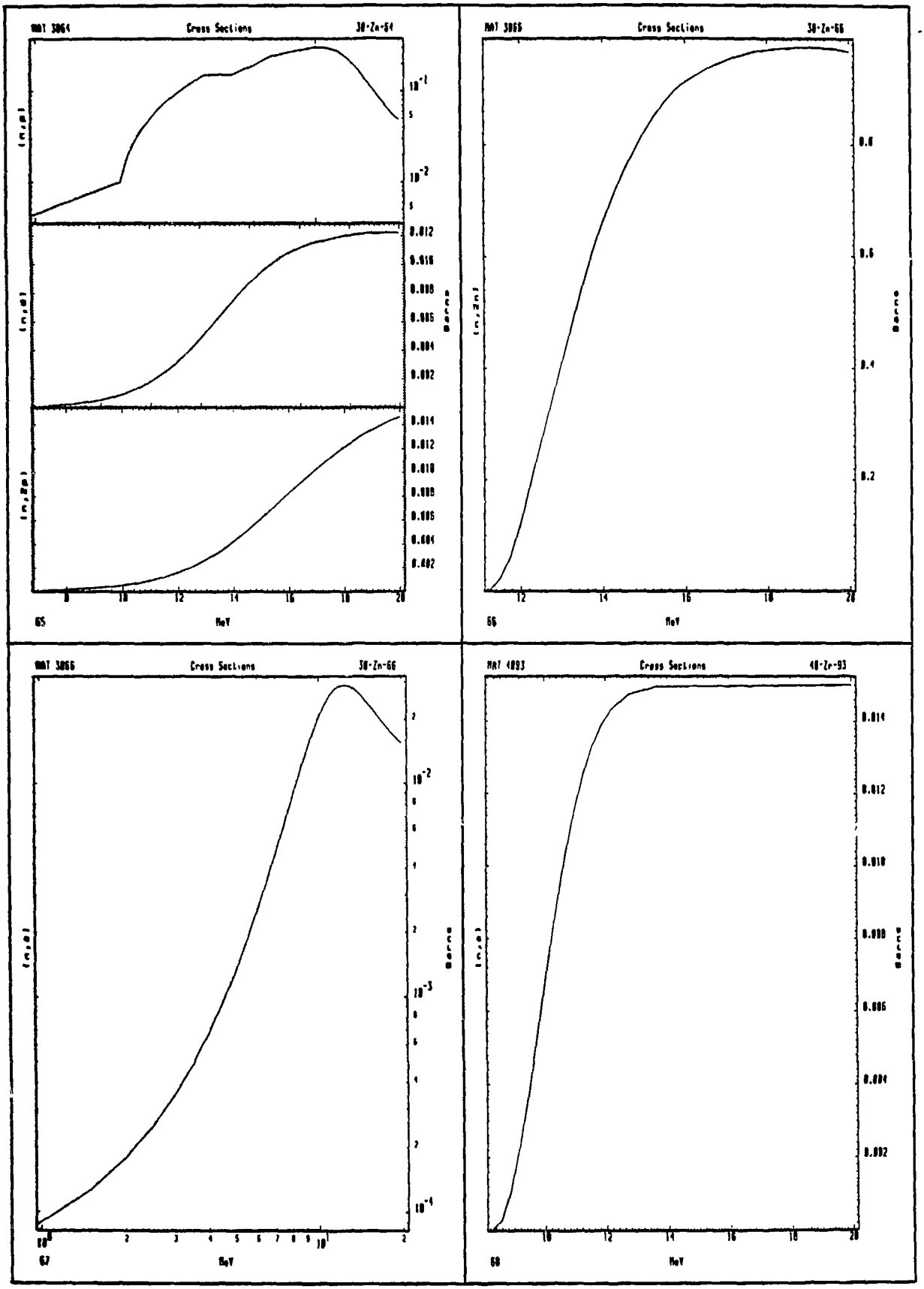

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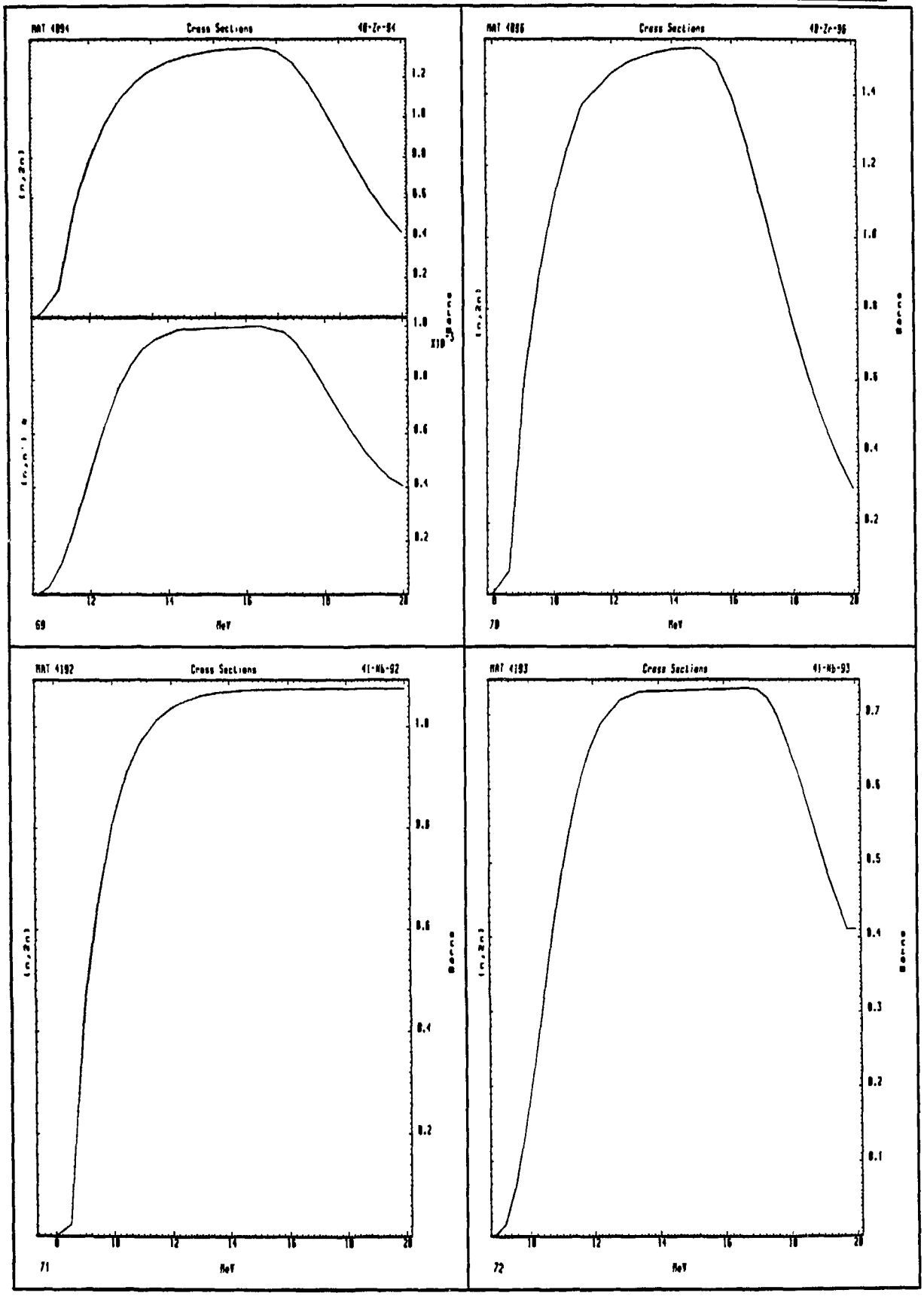

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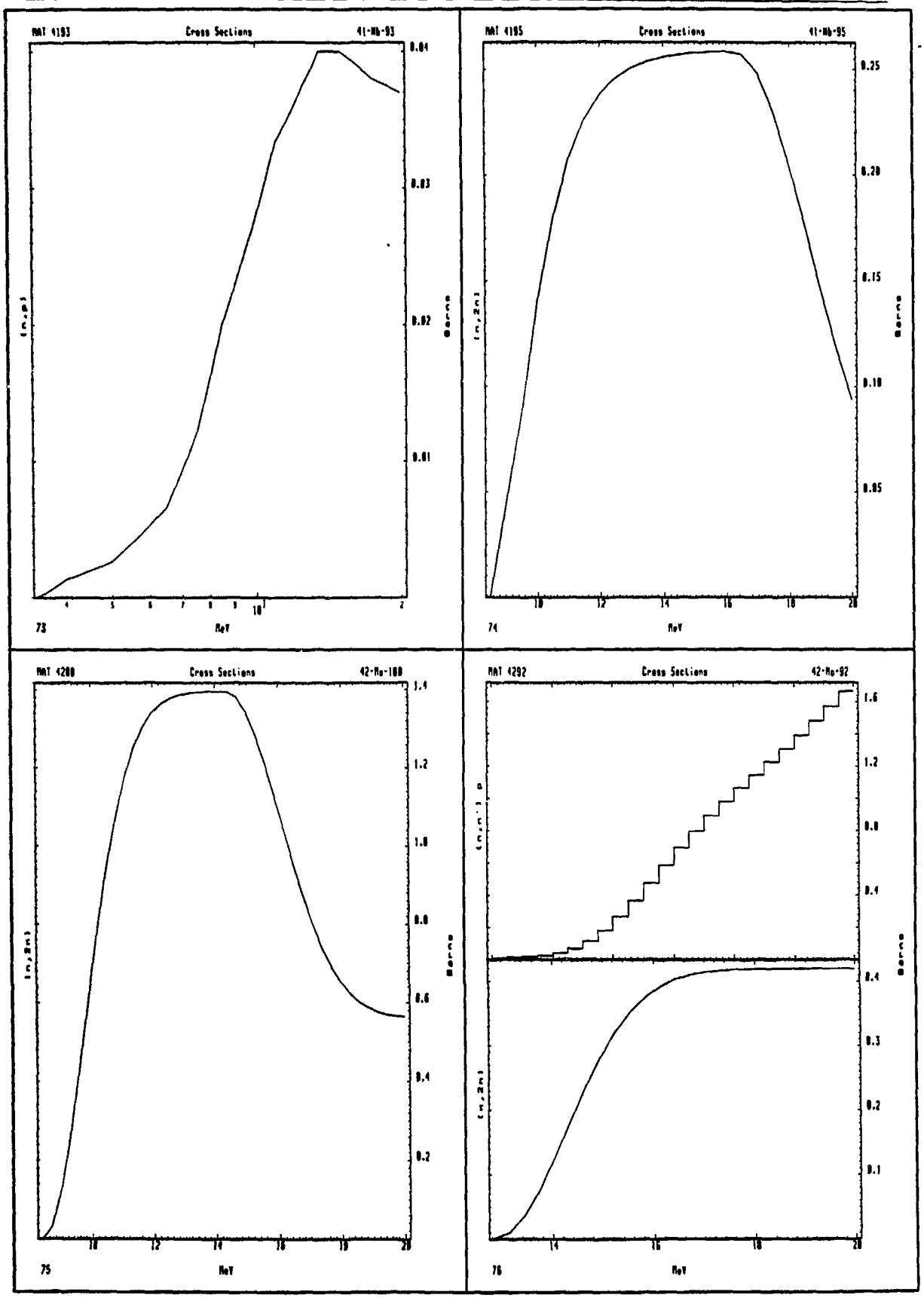

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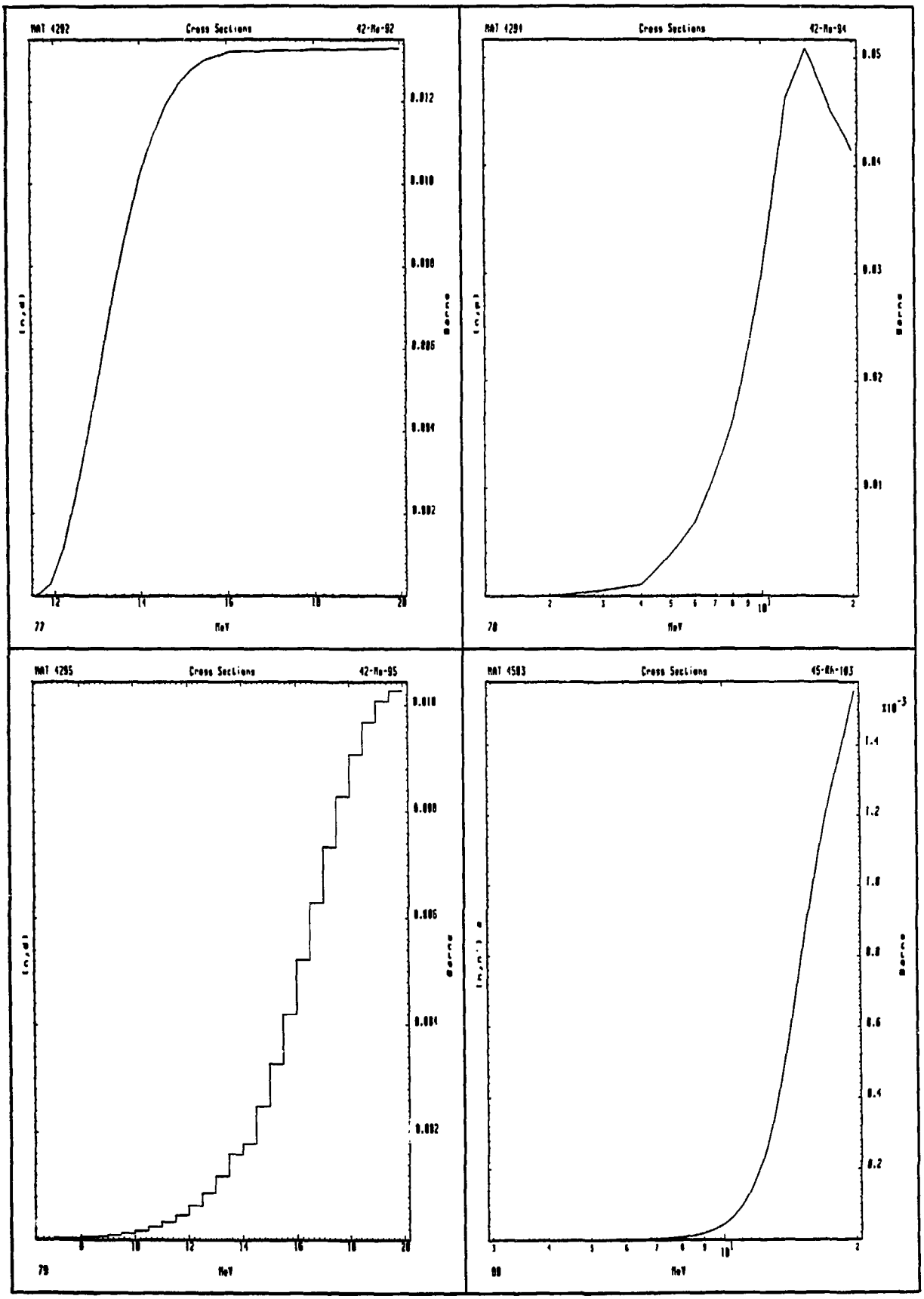

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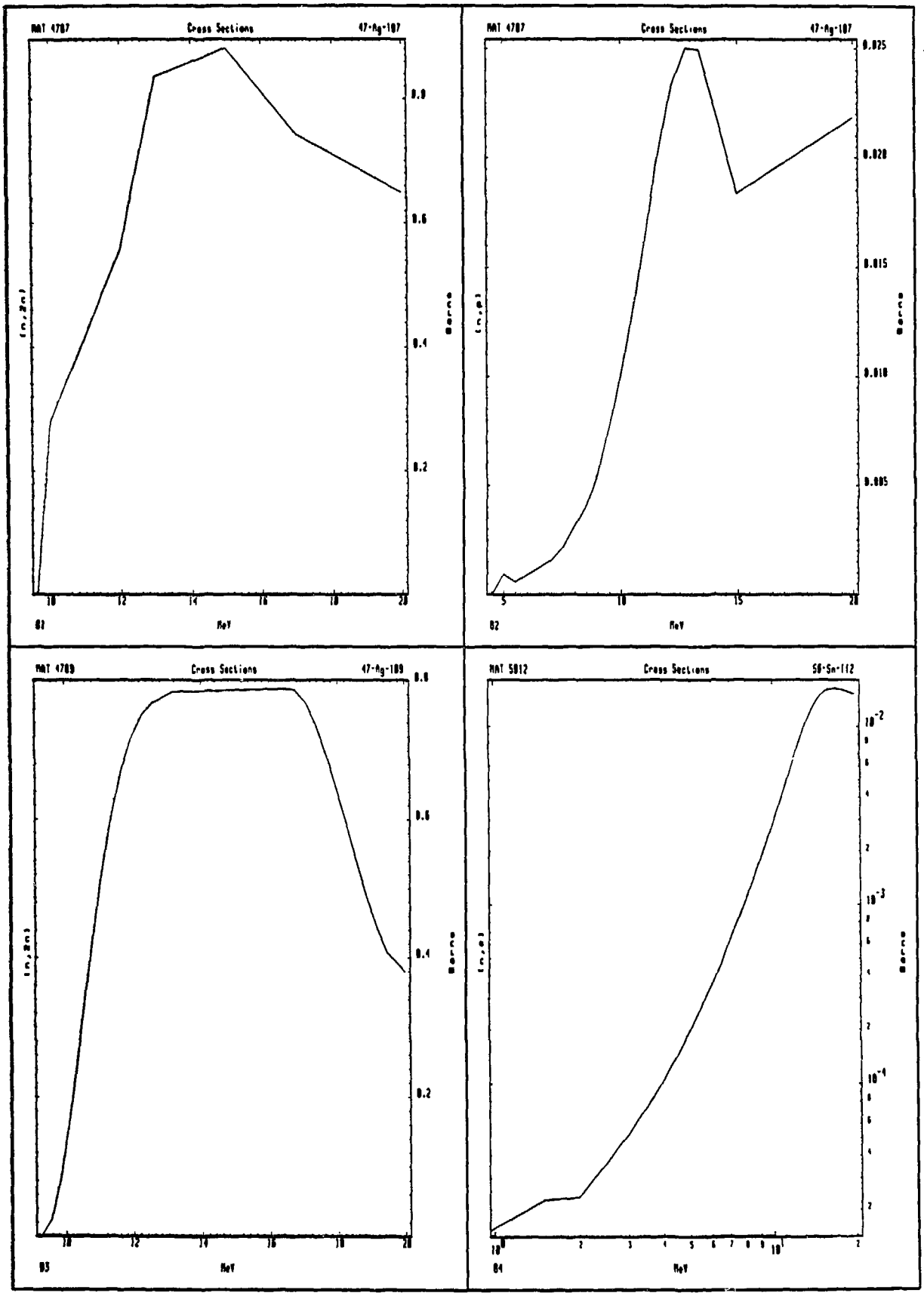

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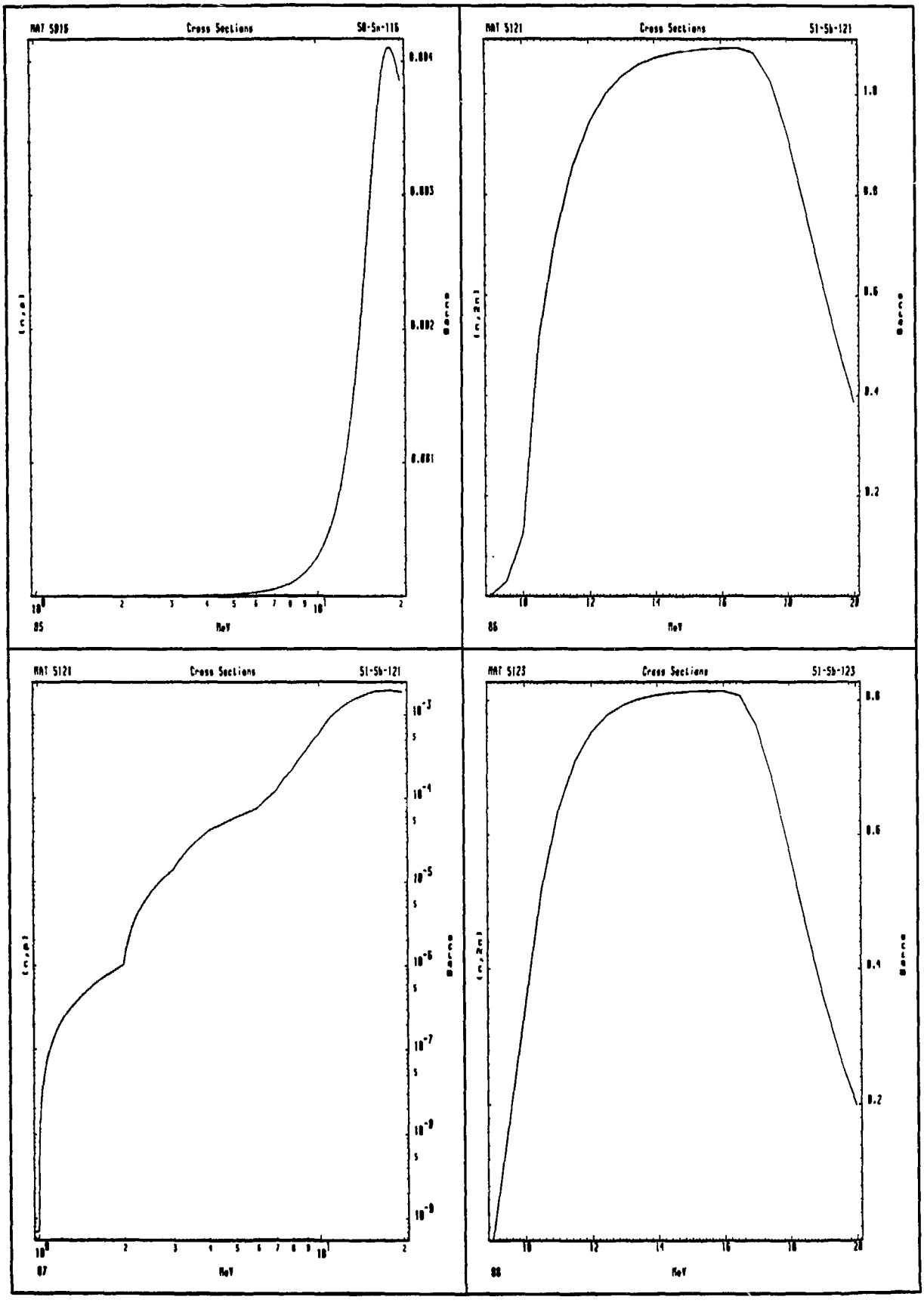

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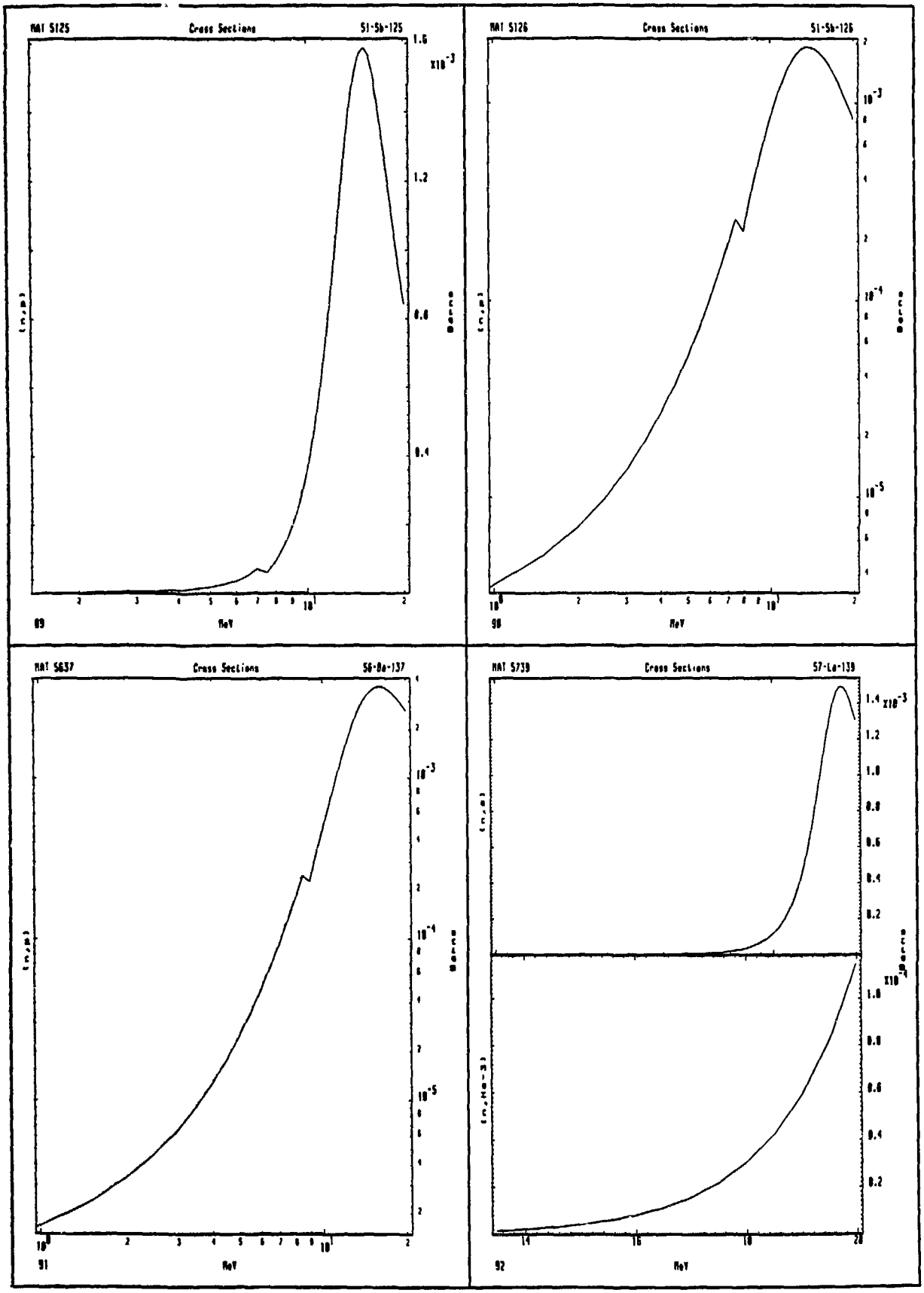

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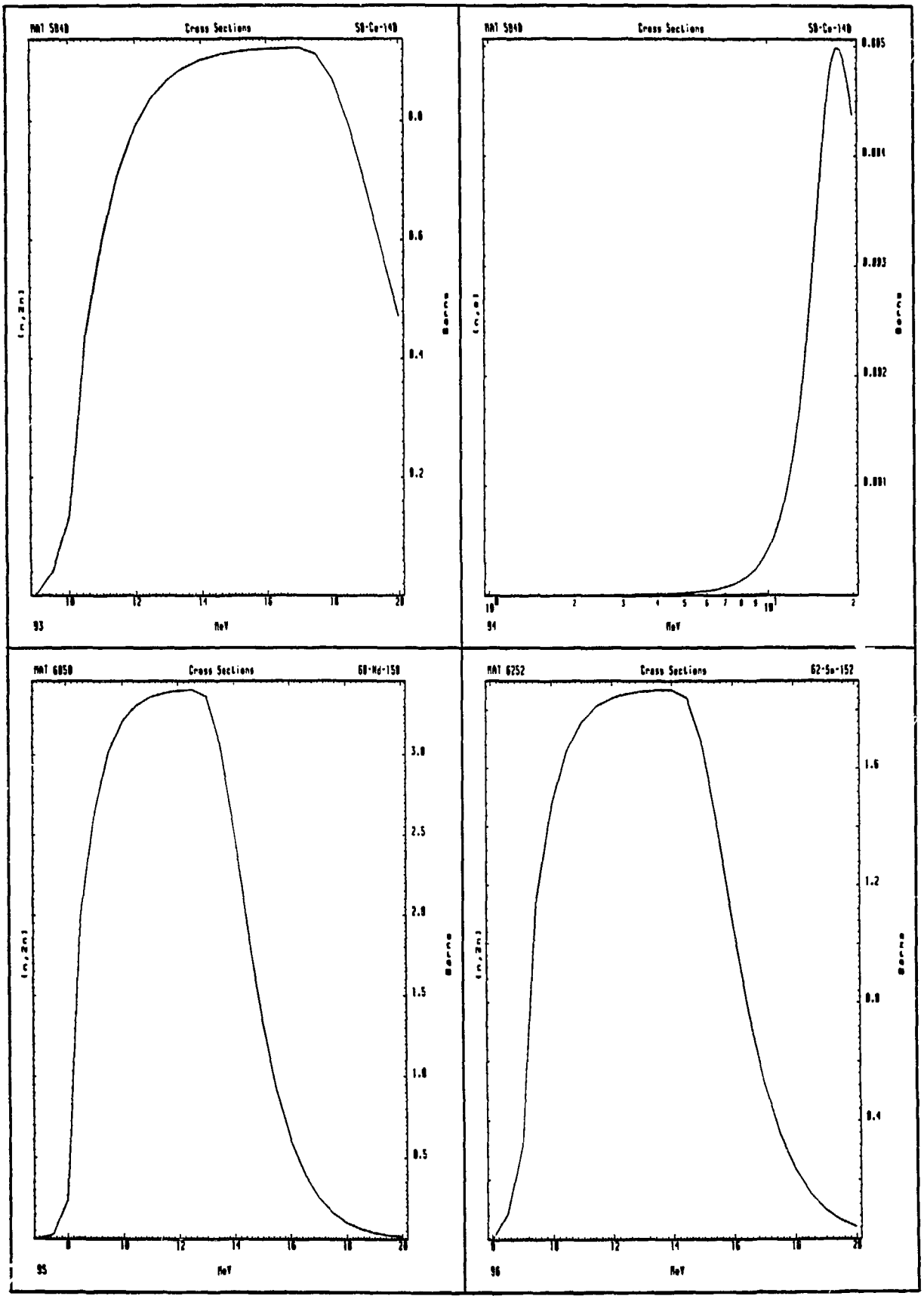

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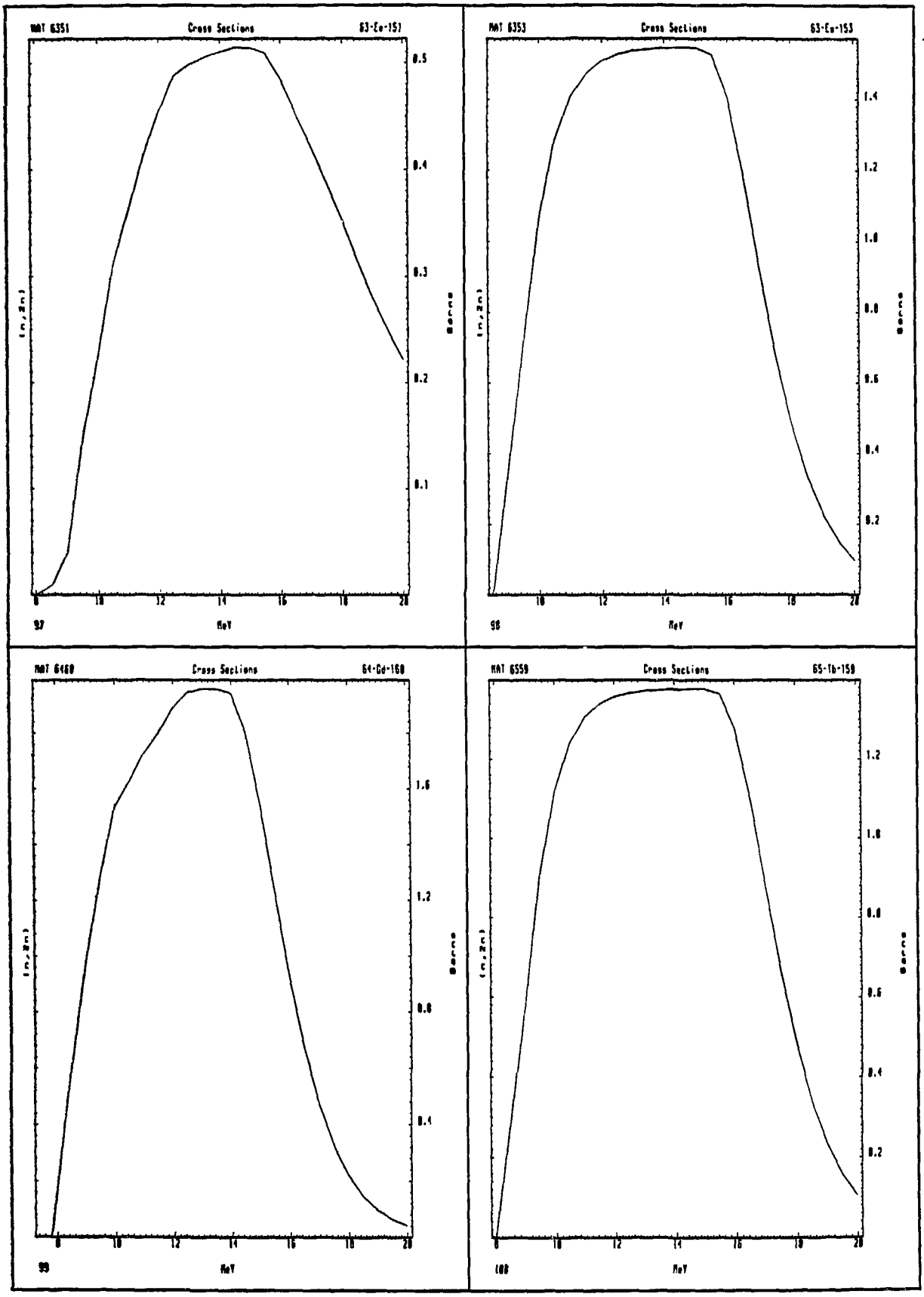

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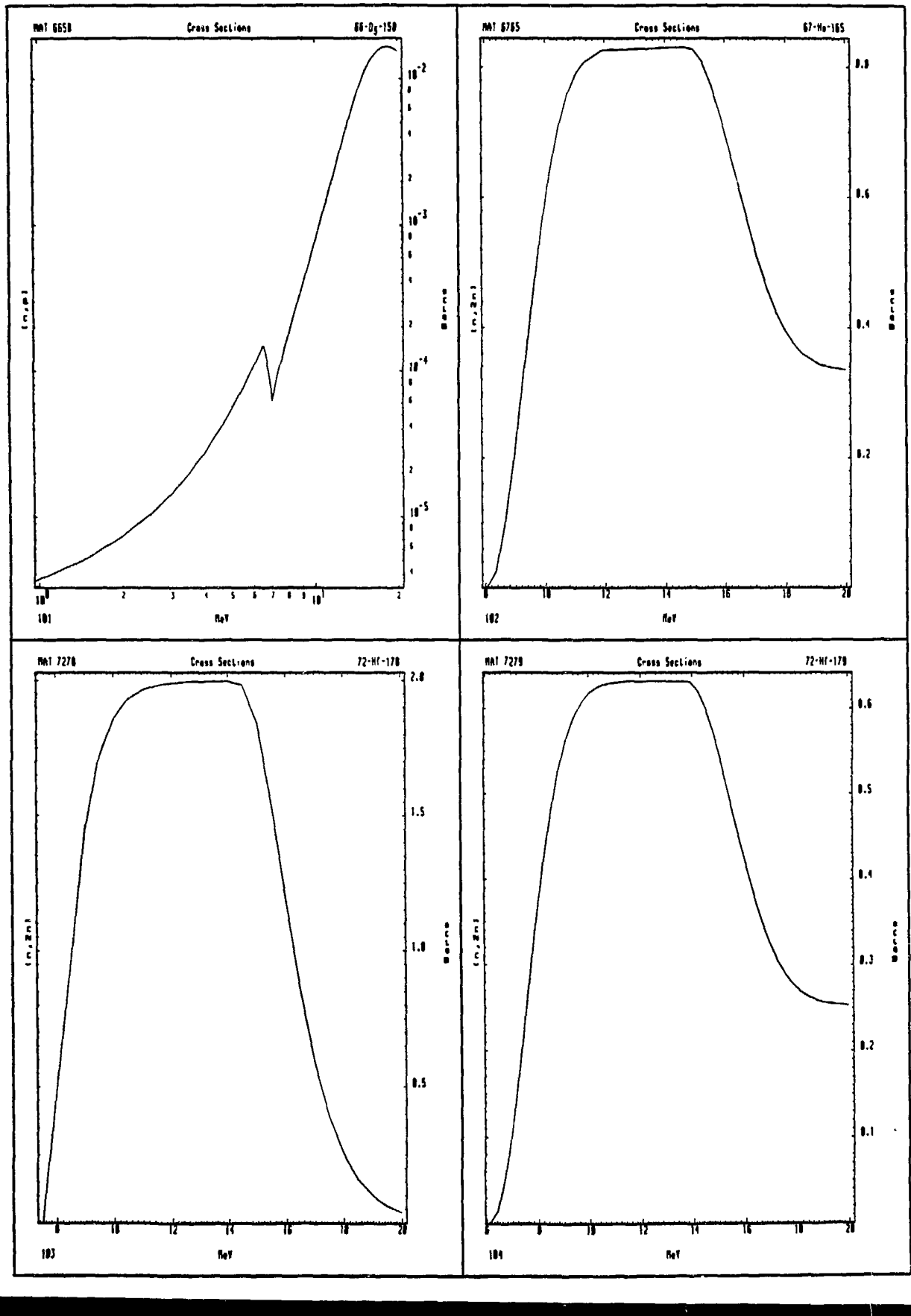

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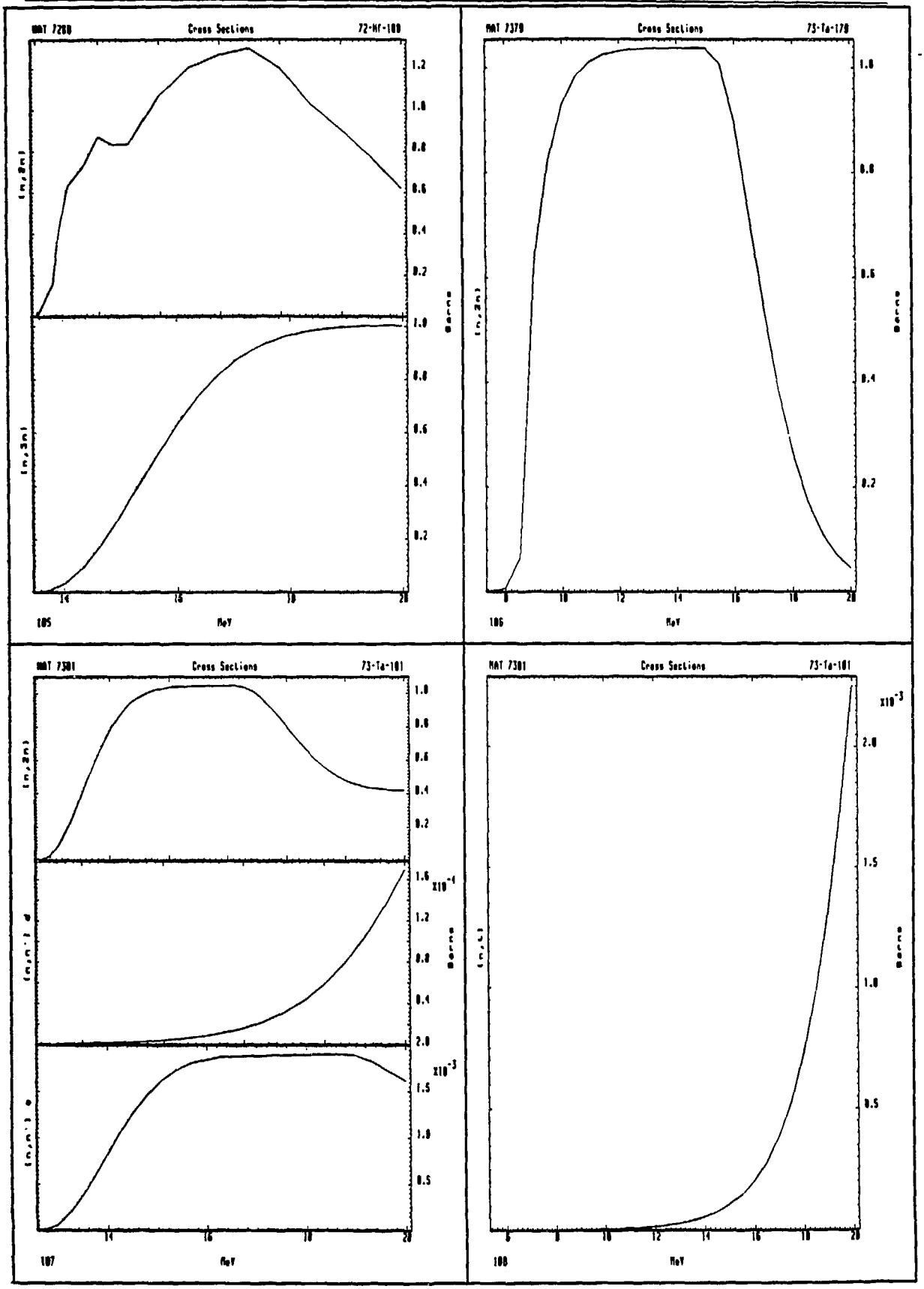
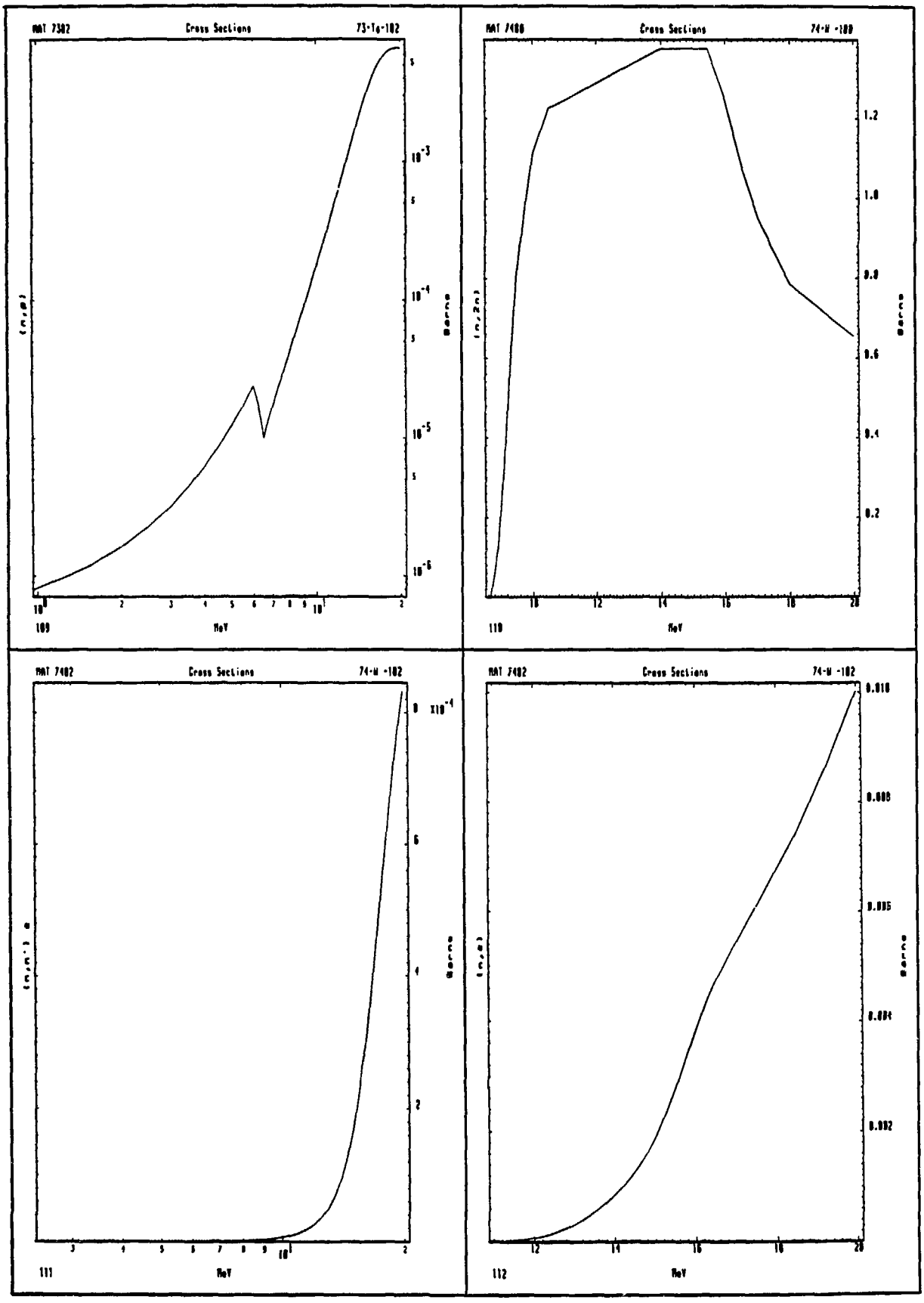


Part 1: Plots of reaction cross-sections and ground state production cross-sections



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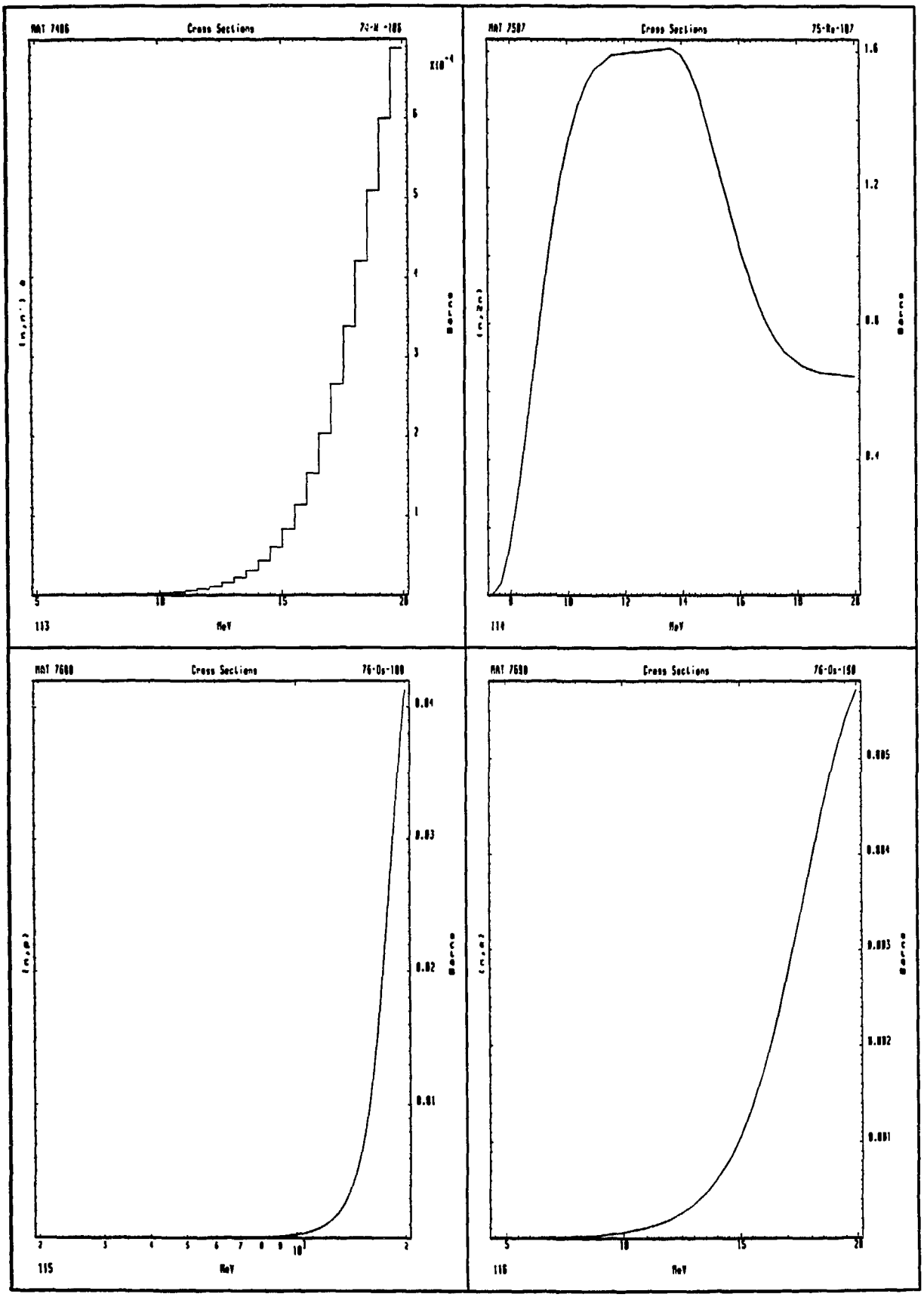

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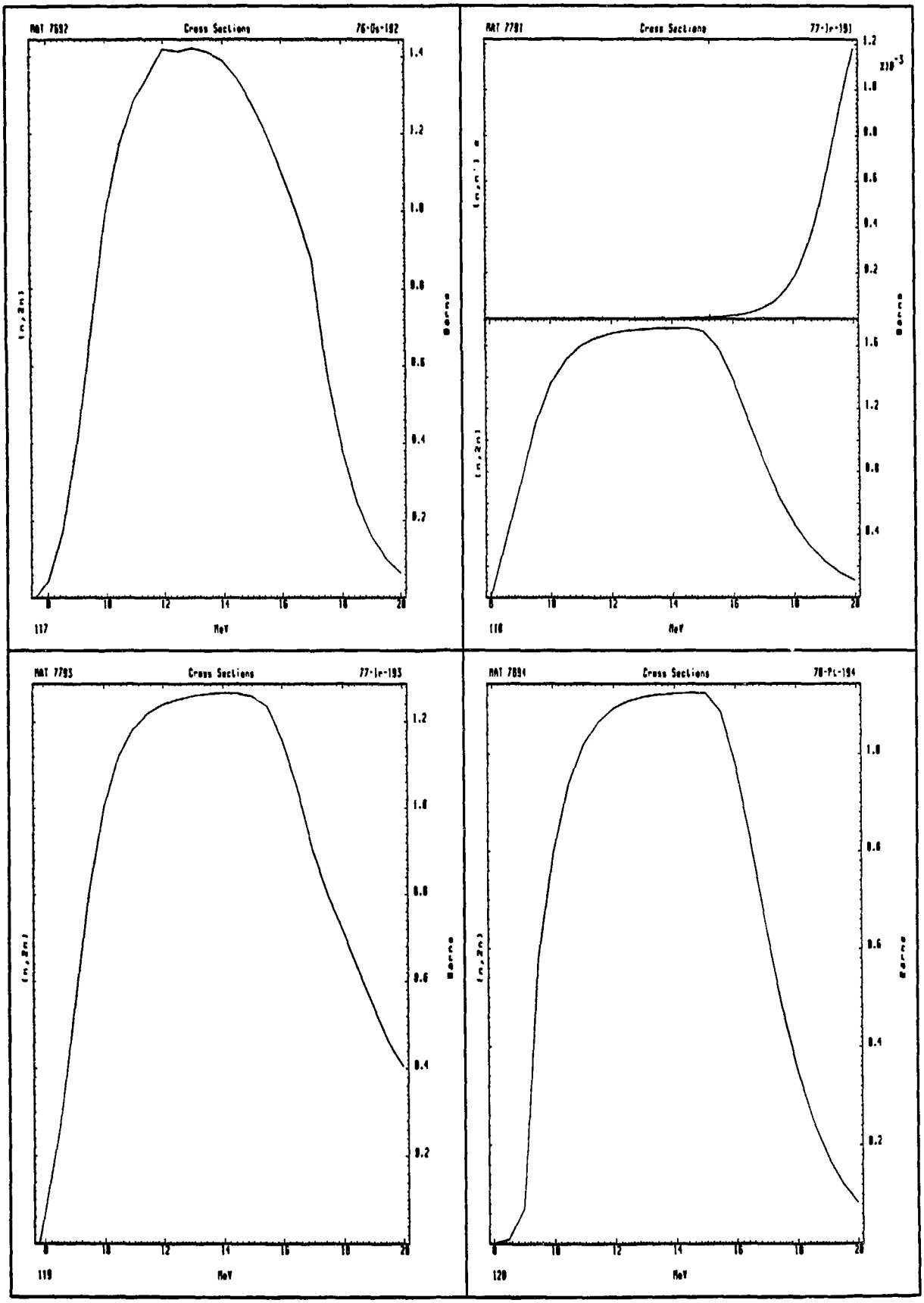
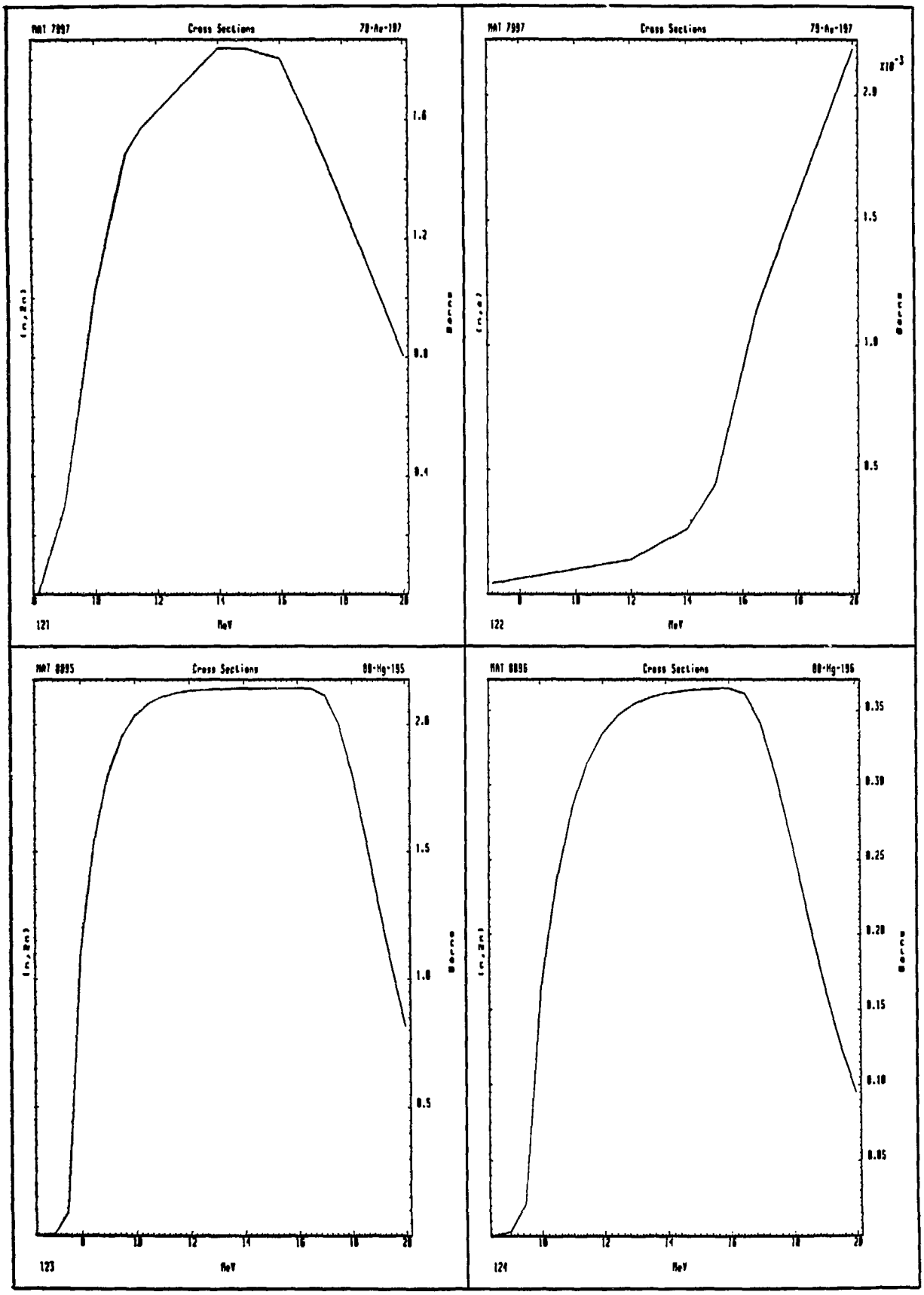
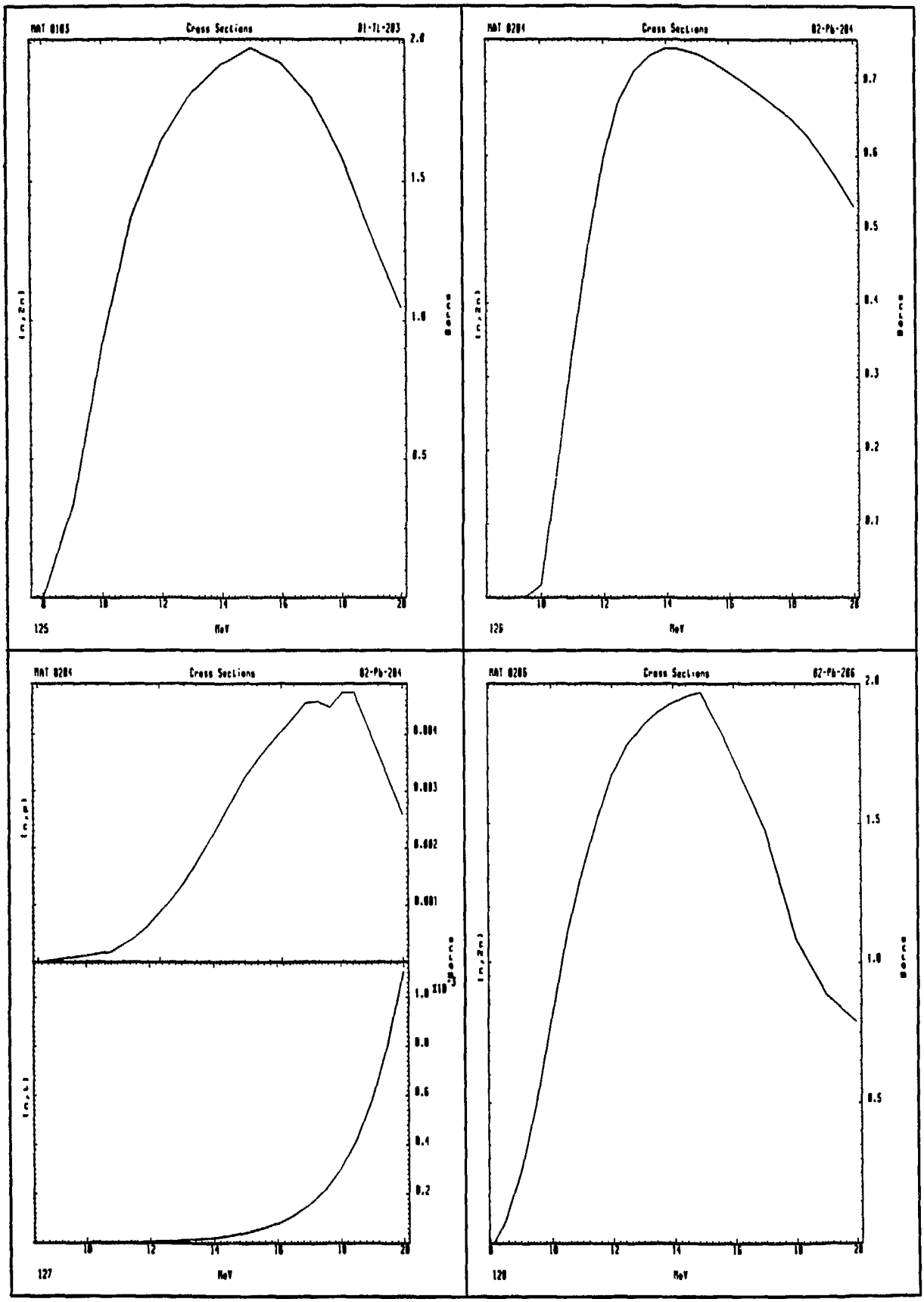


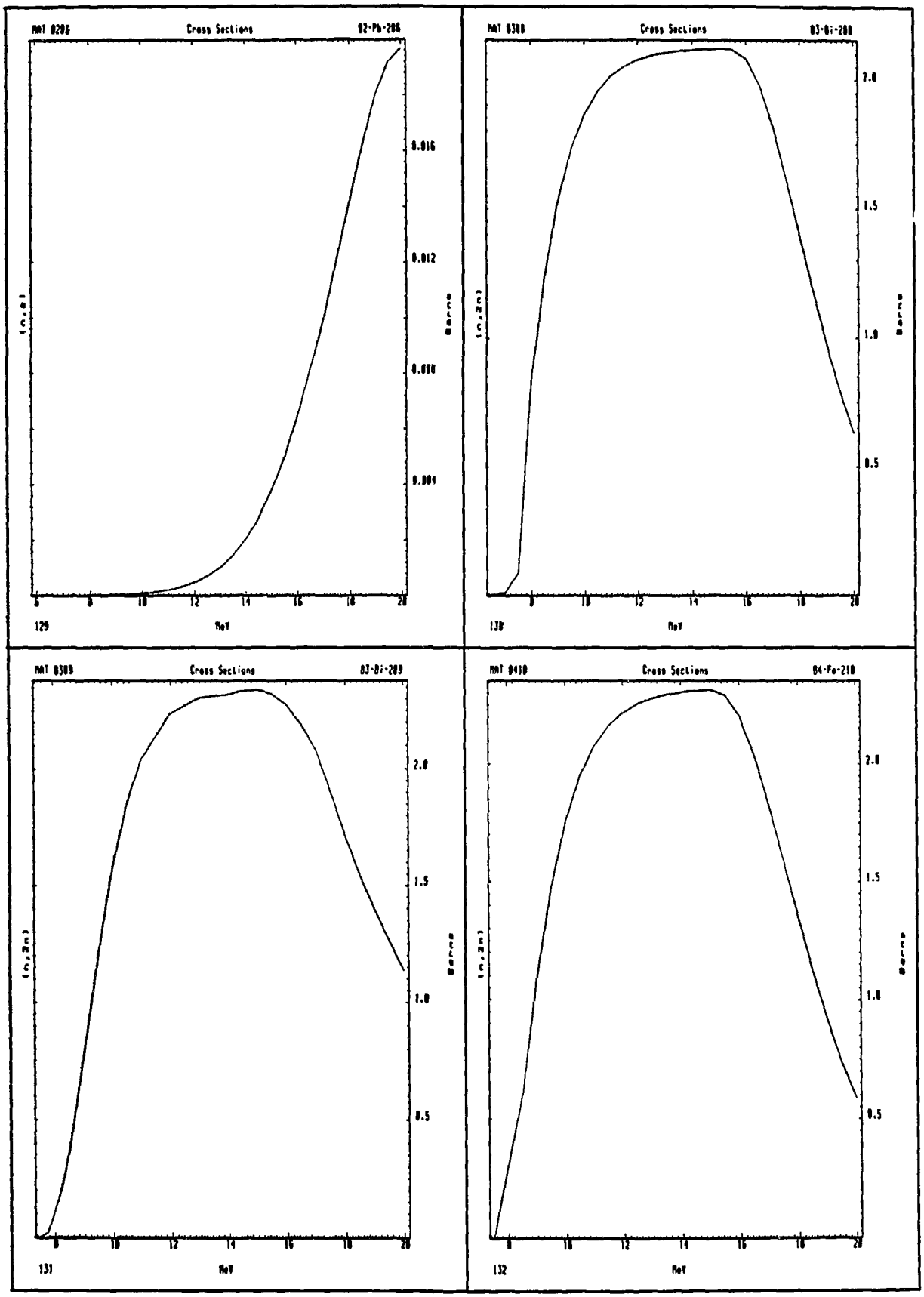
Part 1: Plots of reaction cross-sections and ground state production cross-sections



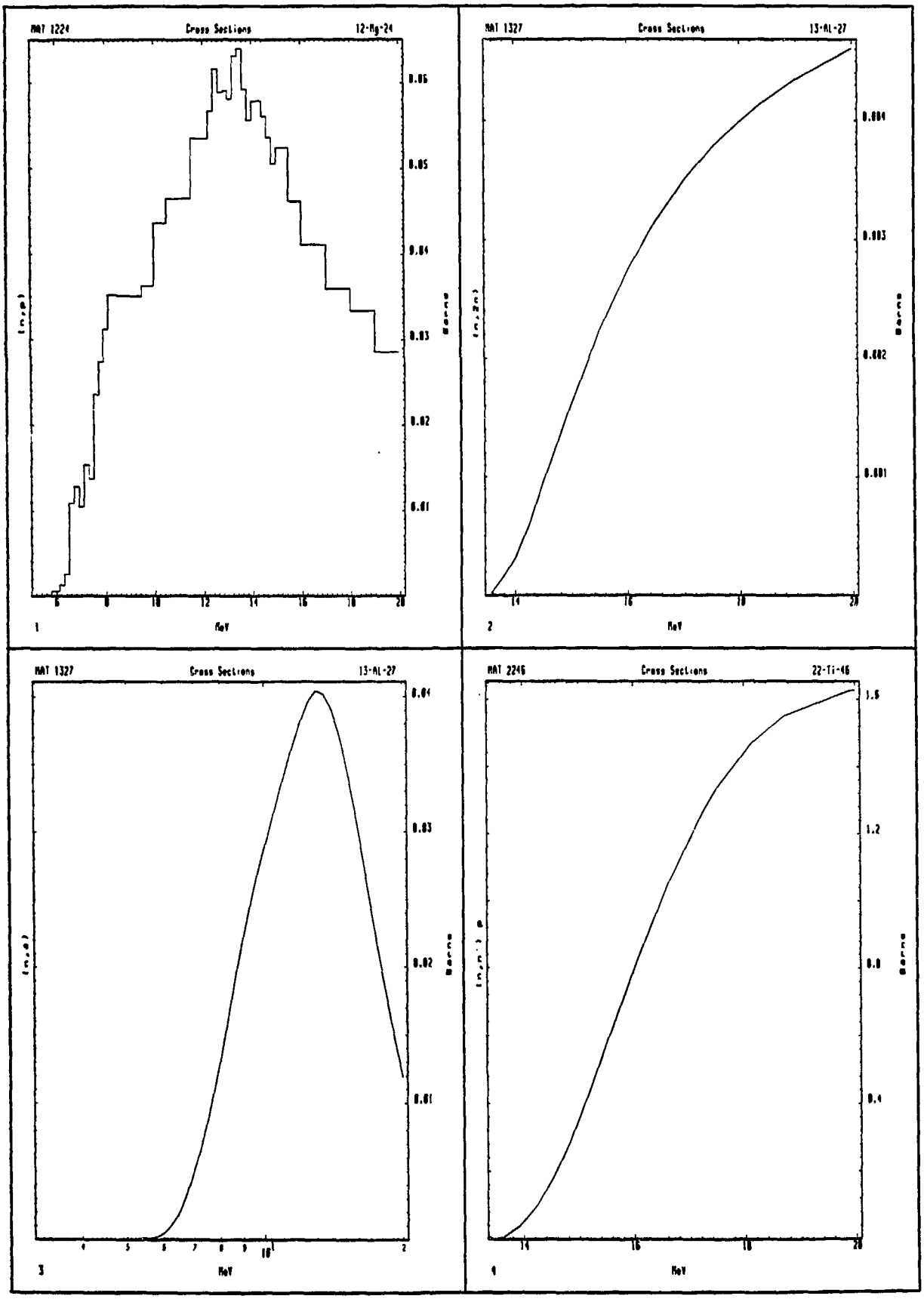
Part 1: Plots of reaction cross-sections and ground state production cross-sections



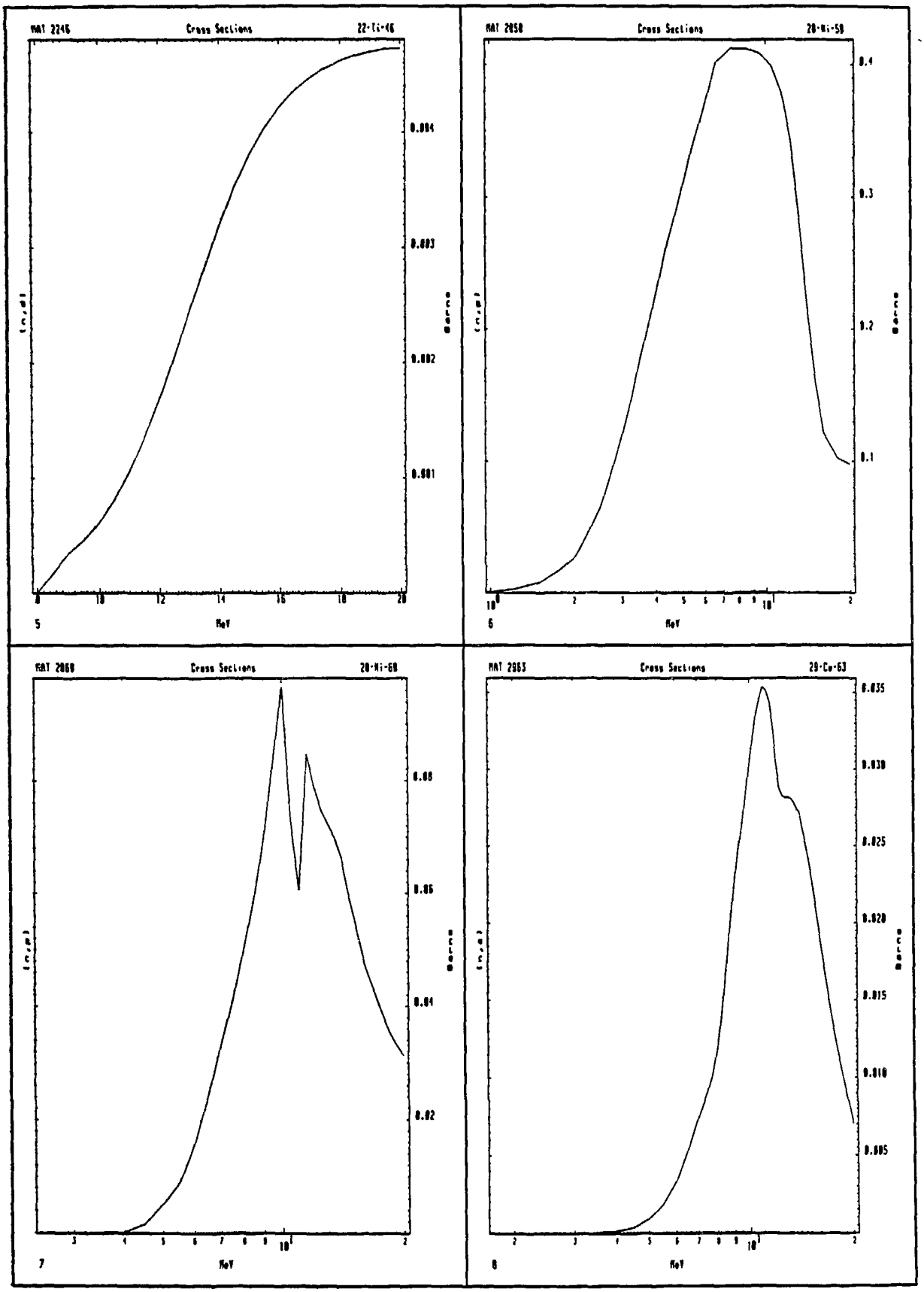
Part 1: Plots of reaction cross-sections and ground state production cross-sections



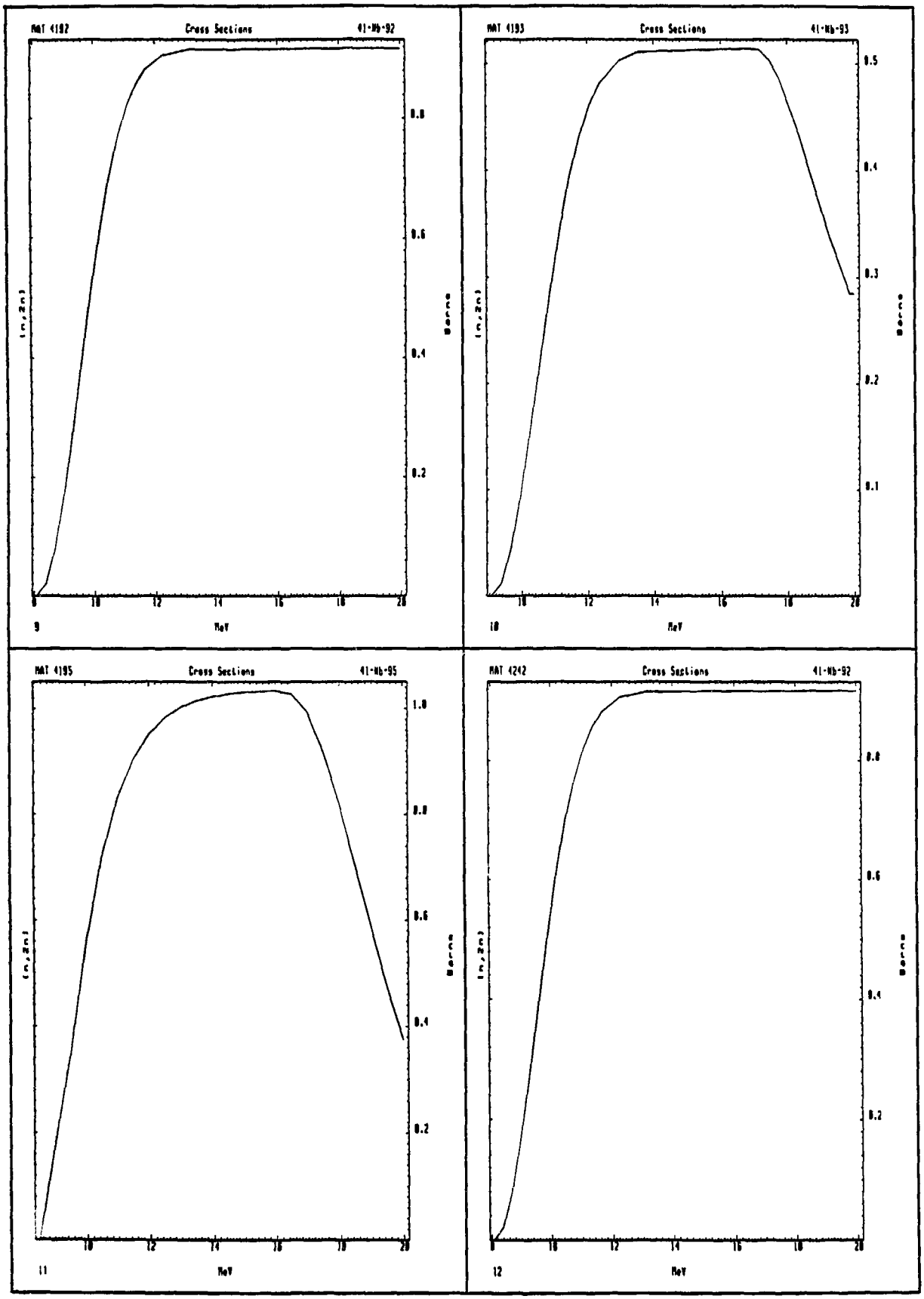
Part 2: Plots of reaction cross-sections into isomeric states



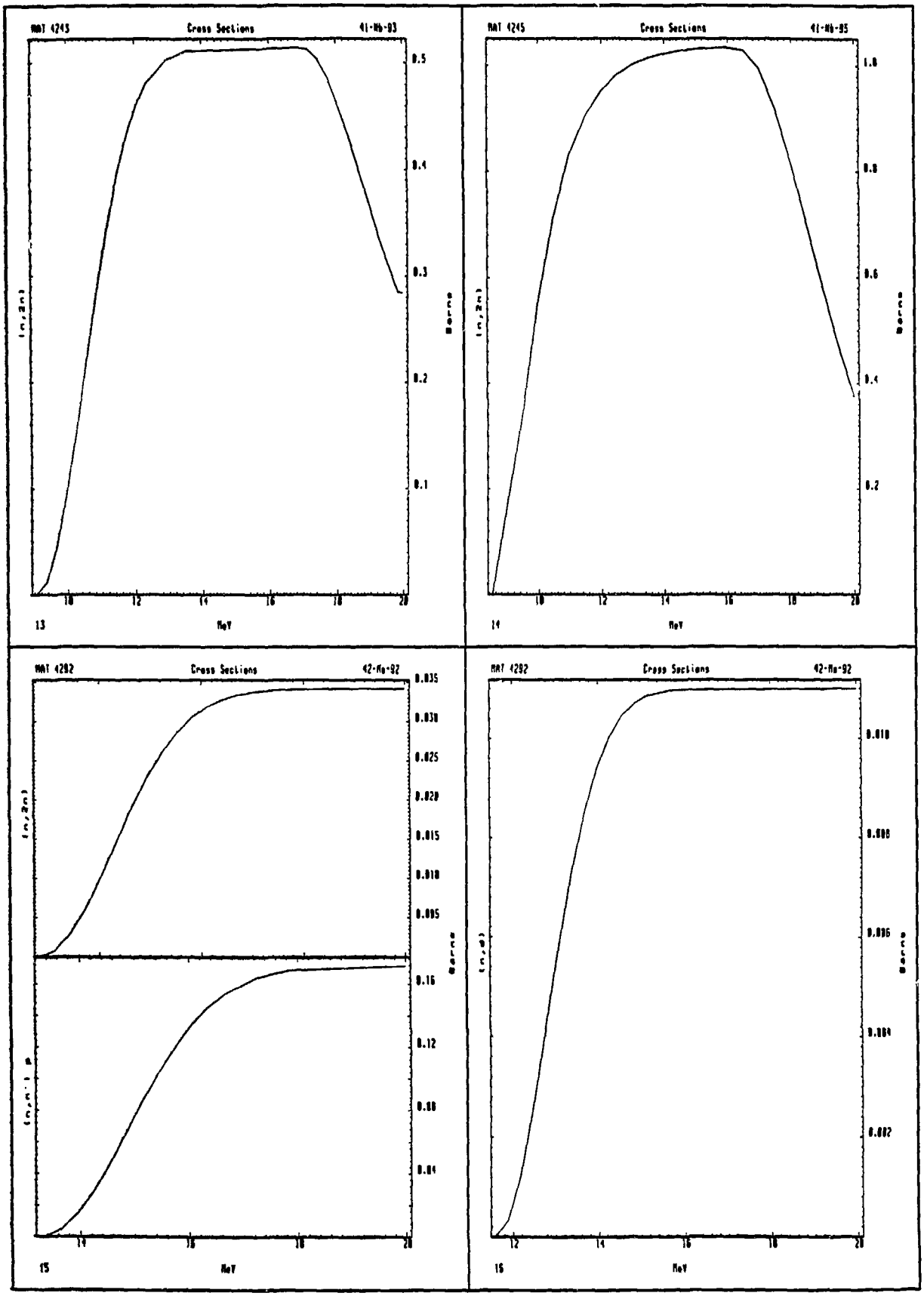
Part 2: Plots of reaction cross-sections into isomeric states



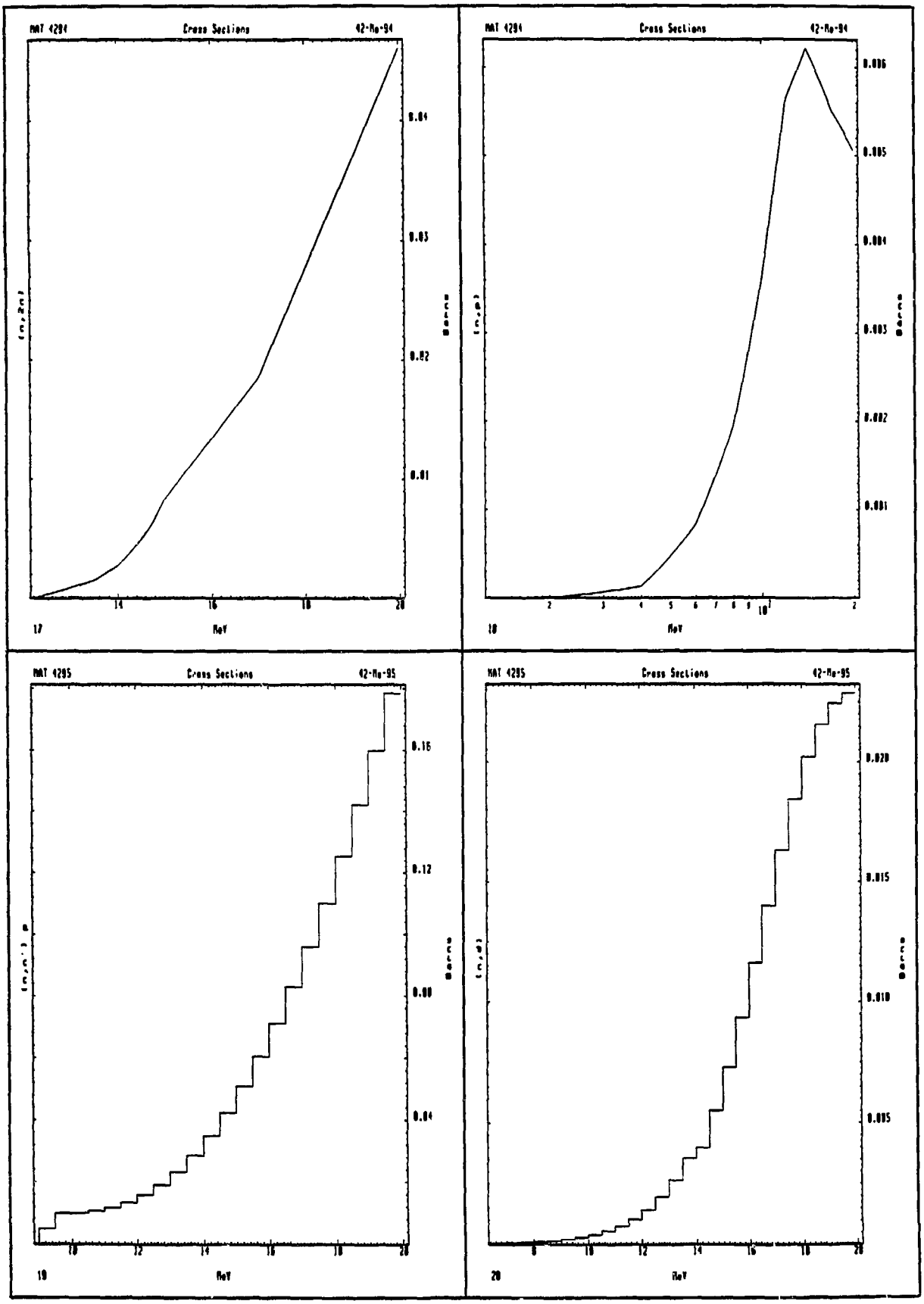
Part 2: Plots of reaction cross-sections into isomeric states



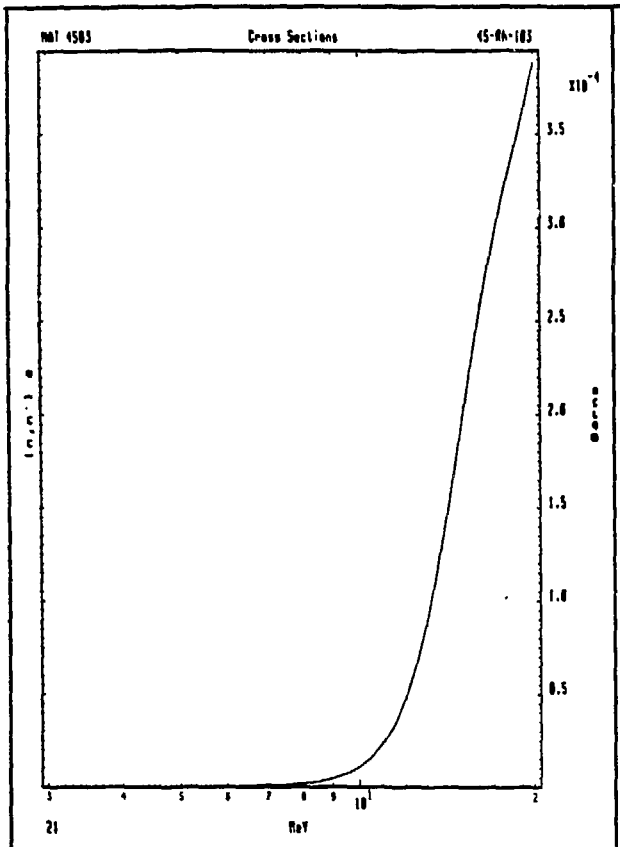
Part 2: Plots of reaction cross-sections into isomeric states

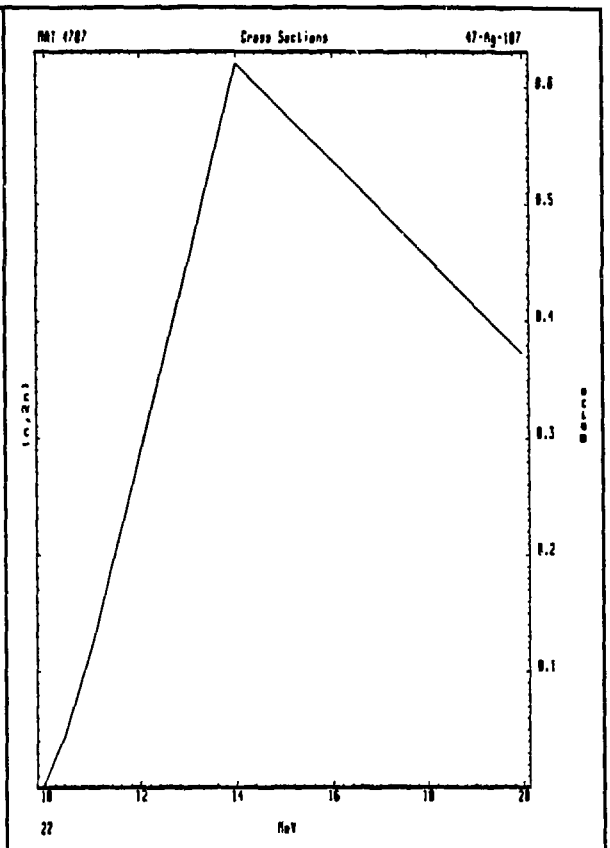


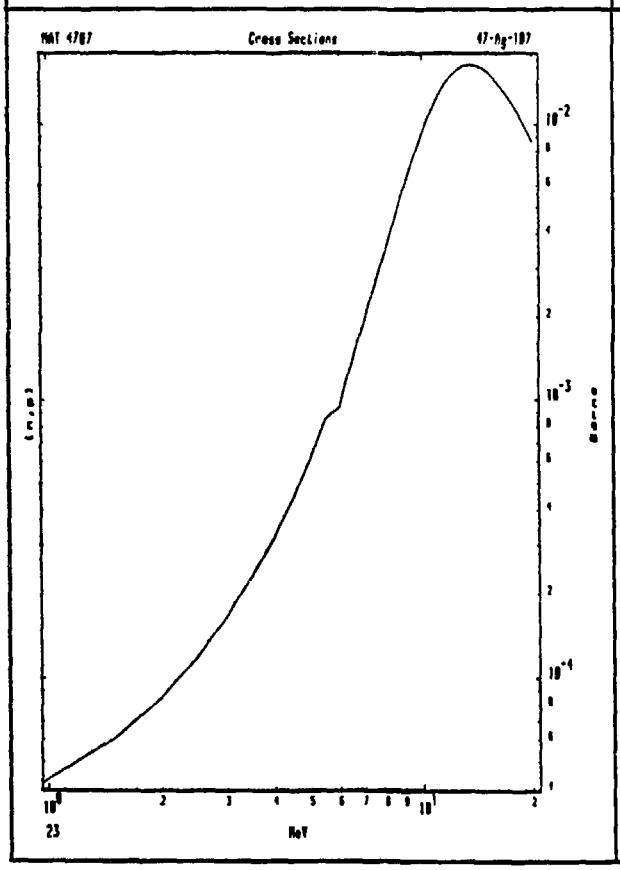
Part 2: Plots of reaction cross-sections into isomeric states

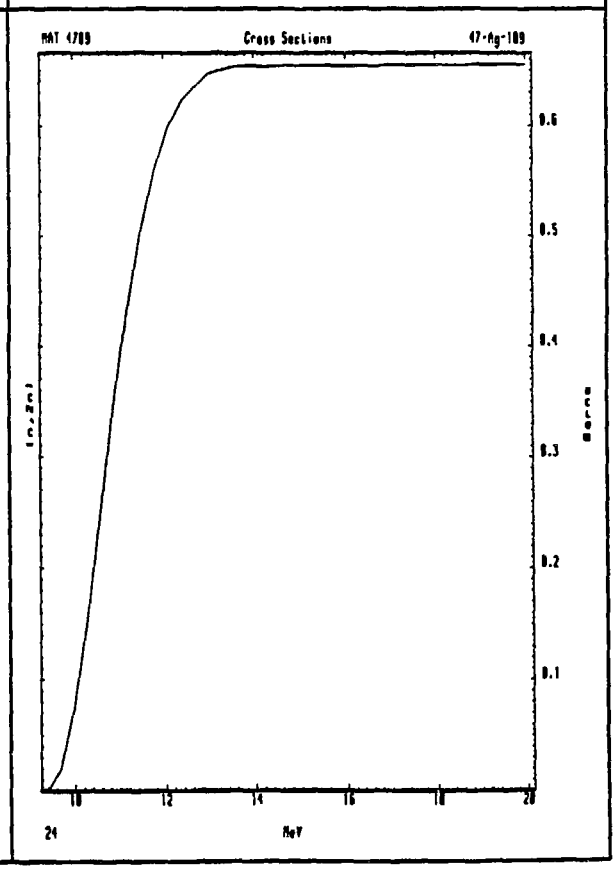


Part 2: Plots of reaction cross-sections into isomeric states

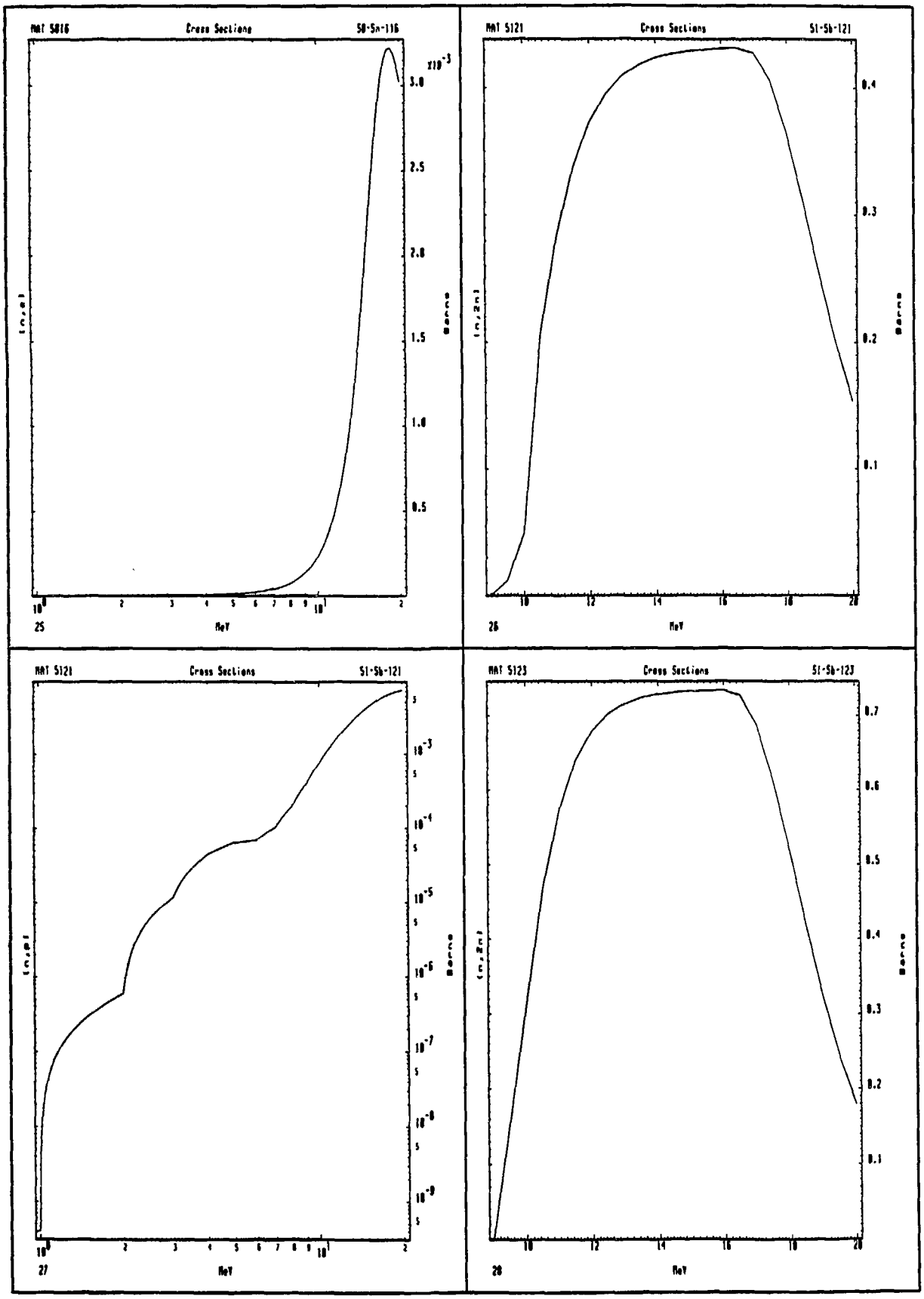






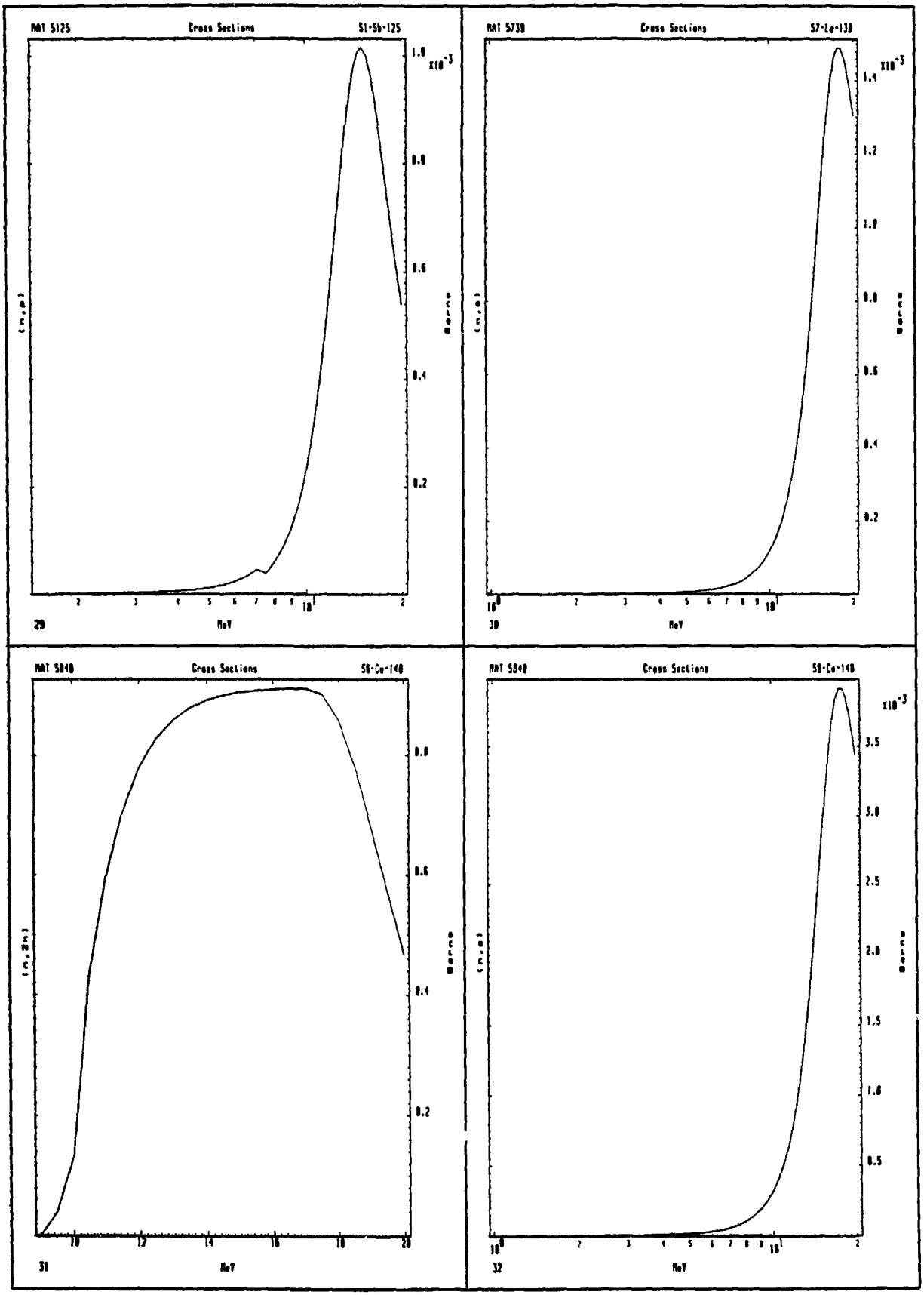


Part 2: Plots of reaction cross-sections into isomeric states



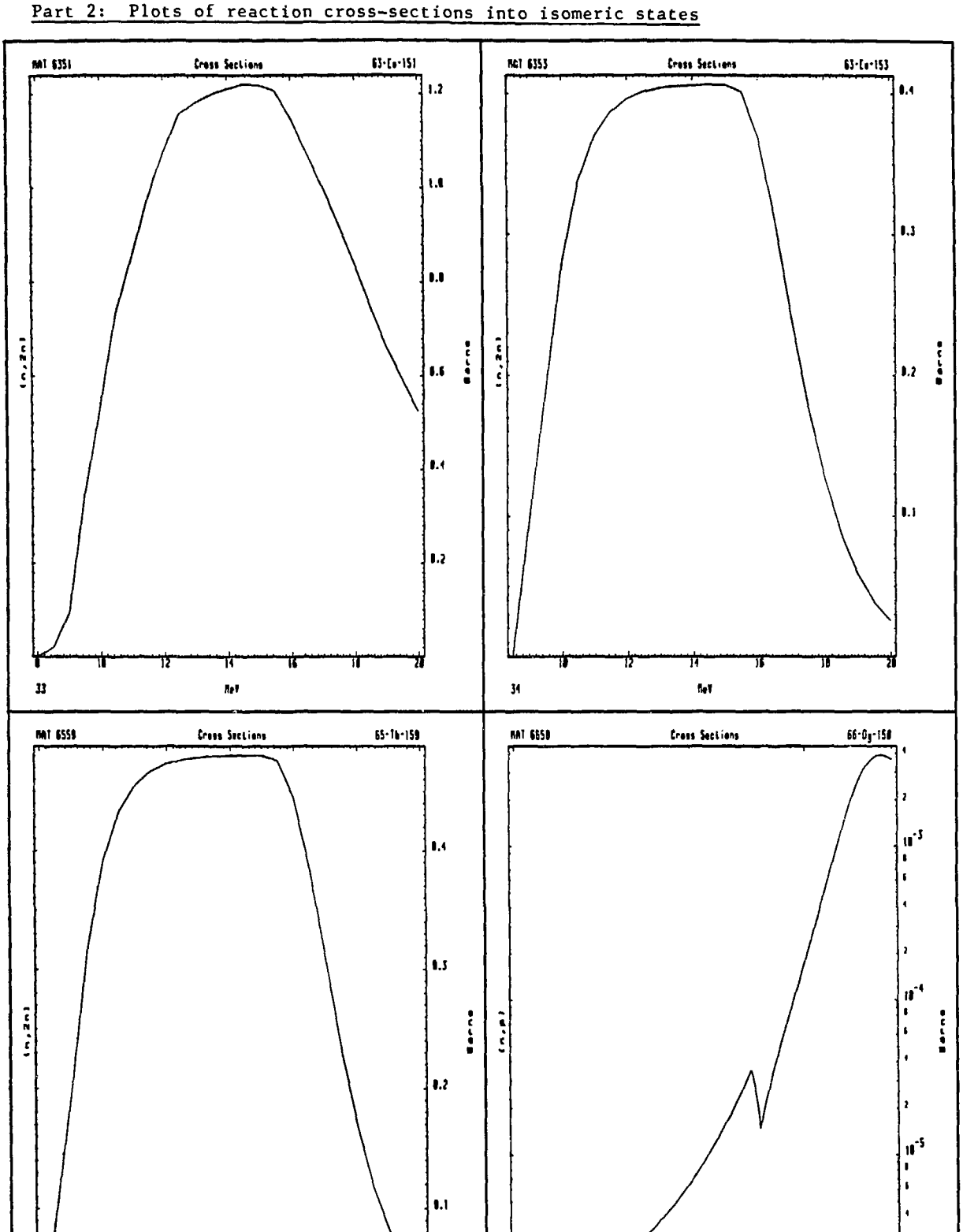
Part 4: Plots of (n,gamma) cross-sections and capture cross-sections into ground state

Part 2: Plots of reaction cross-sections into isomeric states



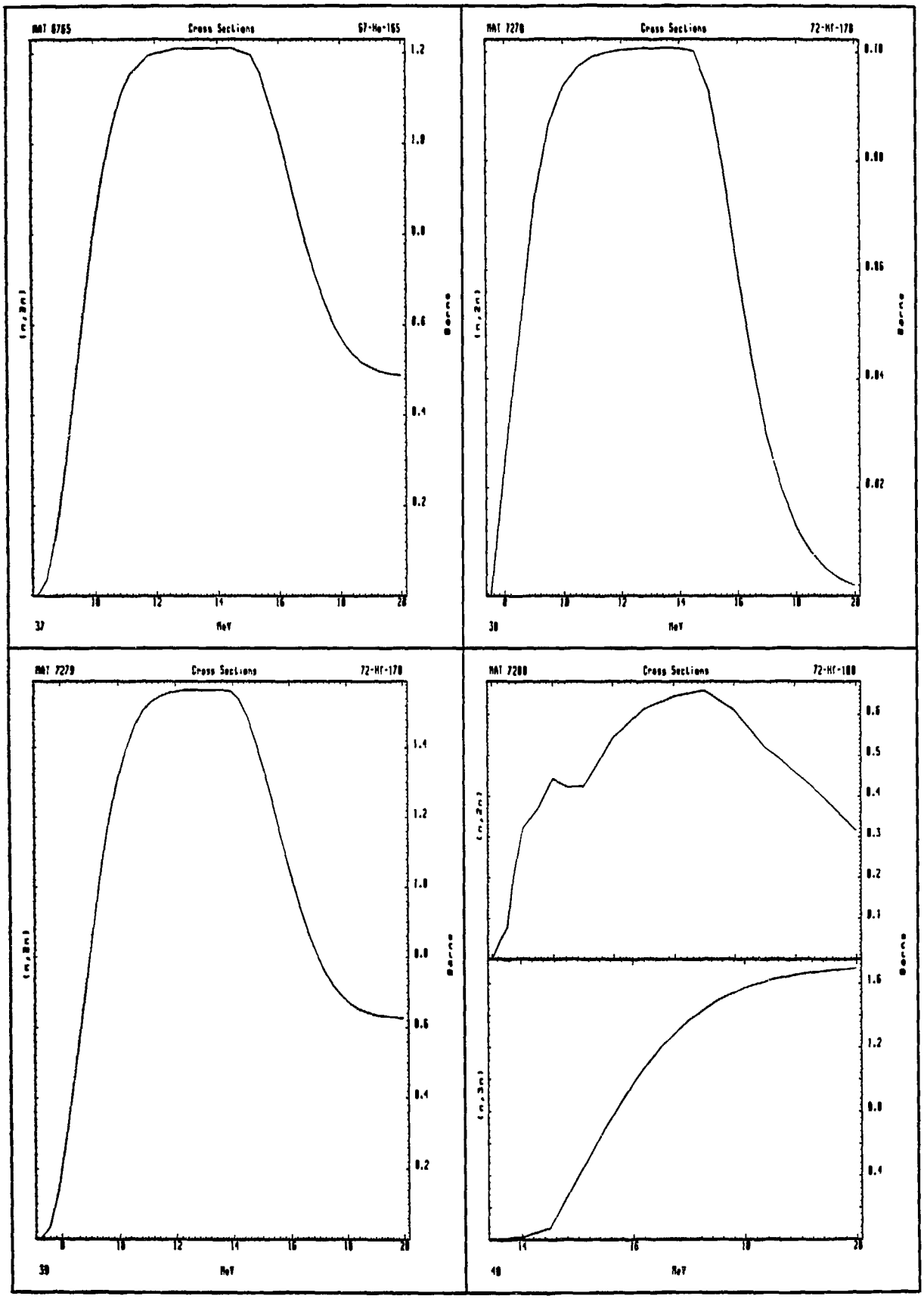
Part 4: Plots of (n,gamma) cross-sections and capture cross-sections

Part 2: Plots of reaction cross-sections into isomeric states



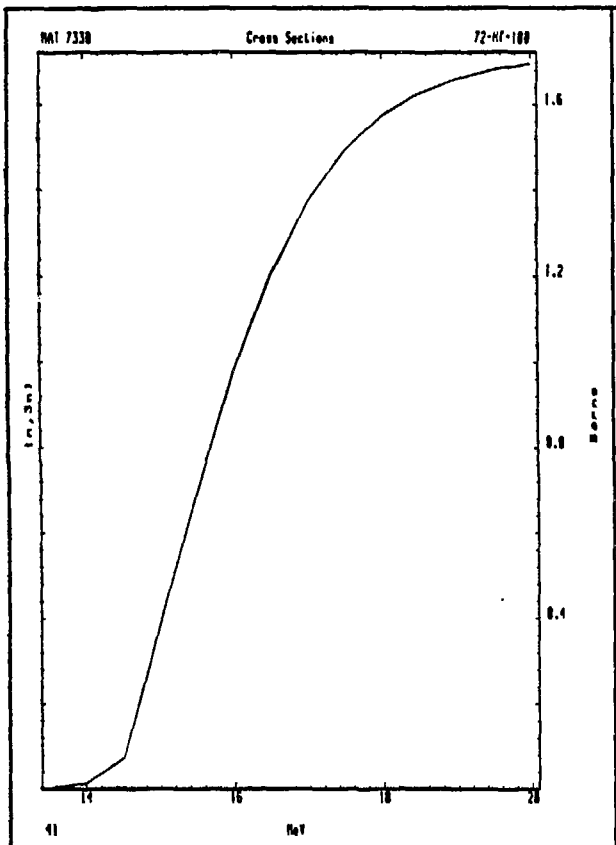
Part 4: Plots of (n,gamma) cross-sections and capture cross-sections

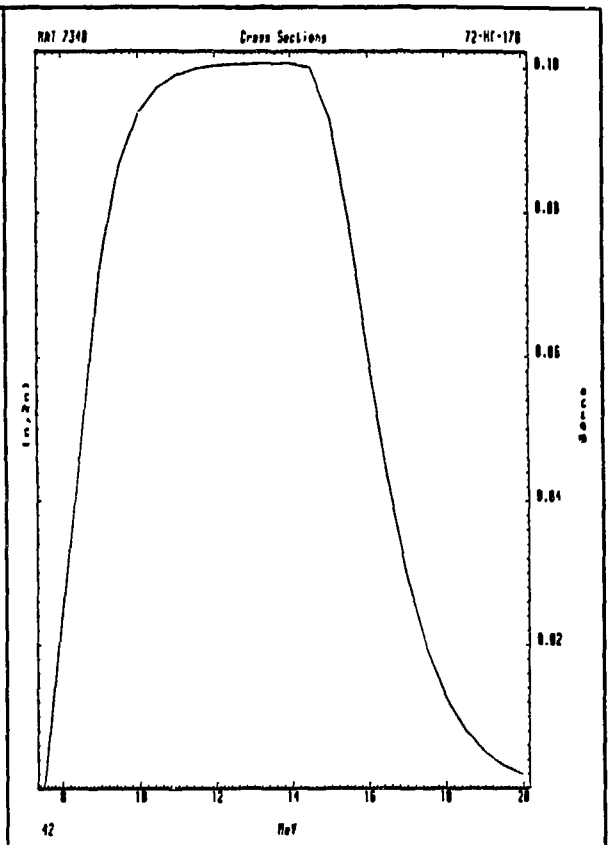
Part 2: Plots of reaction cross-sections into isomeric states

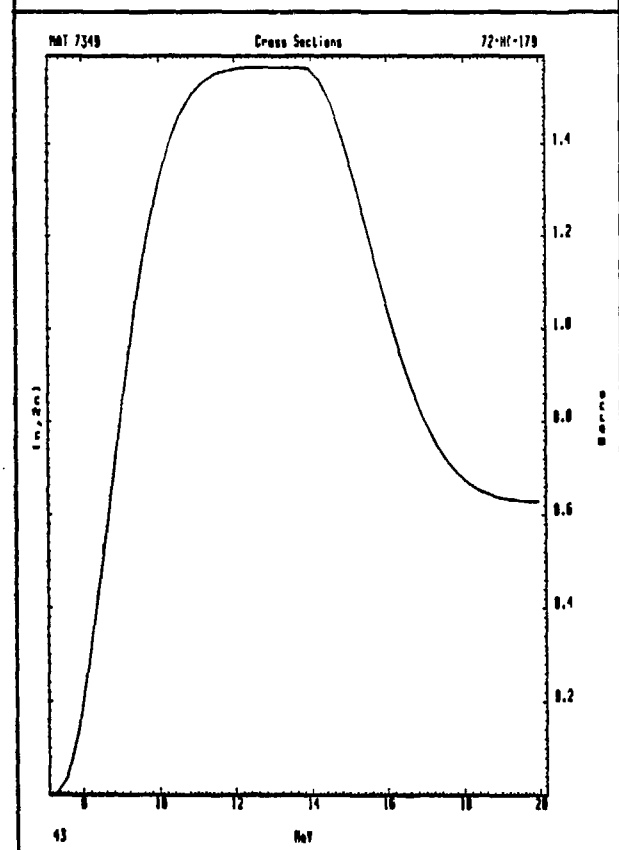


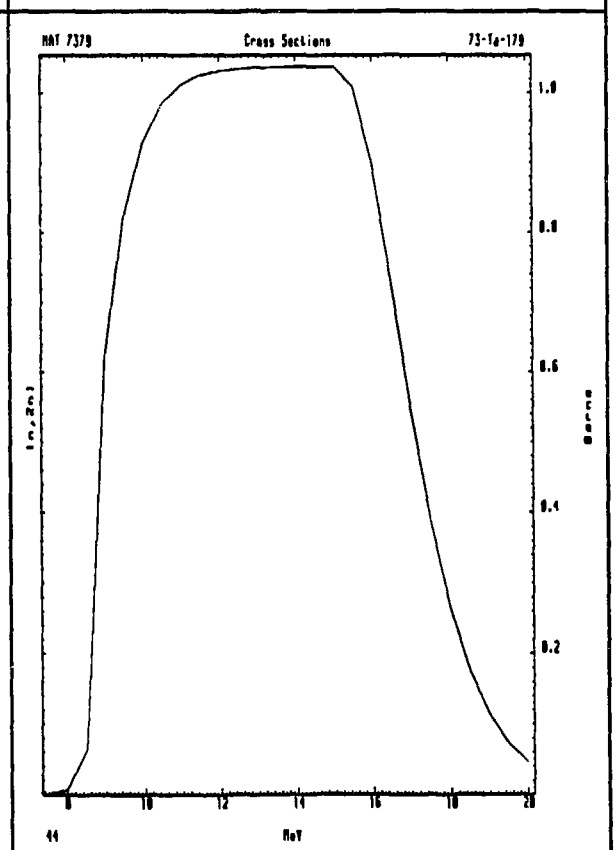
Plots of (n,gamma) cross-sections and capture cross-sections

Part 2: Plots of reaction cross-sections into isomeric states



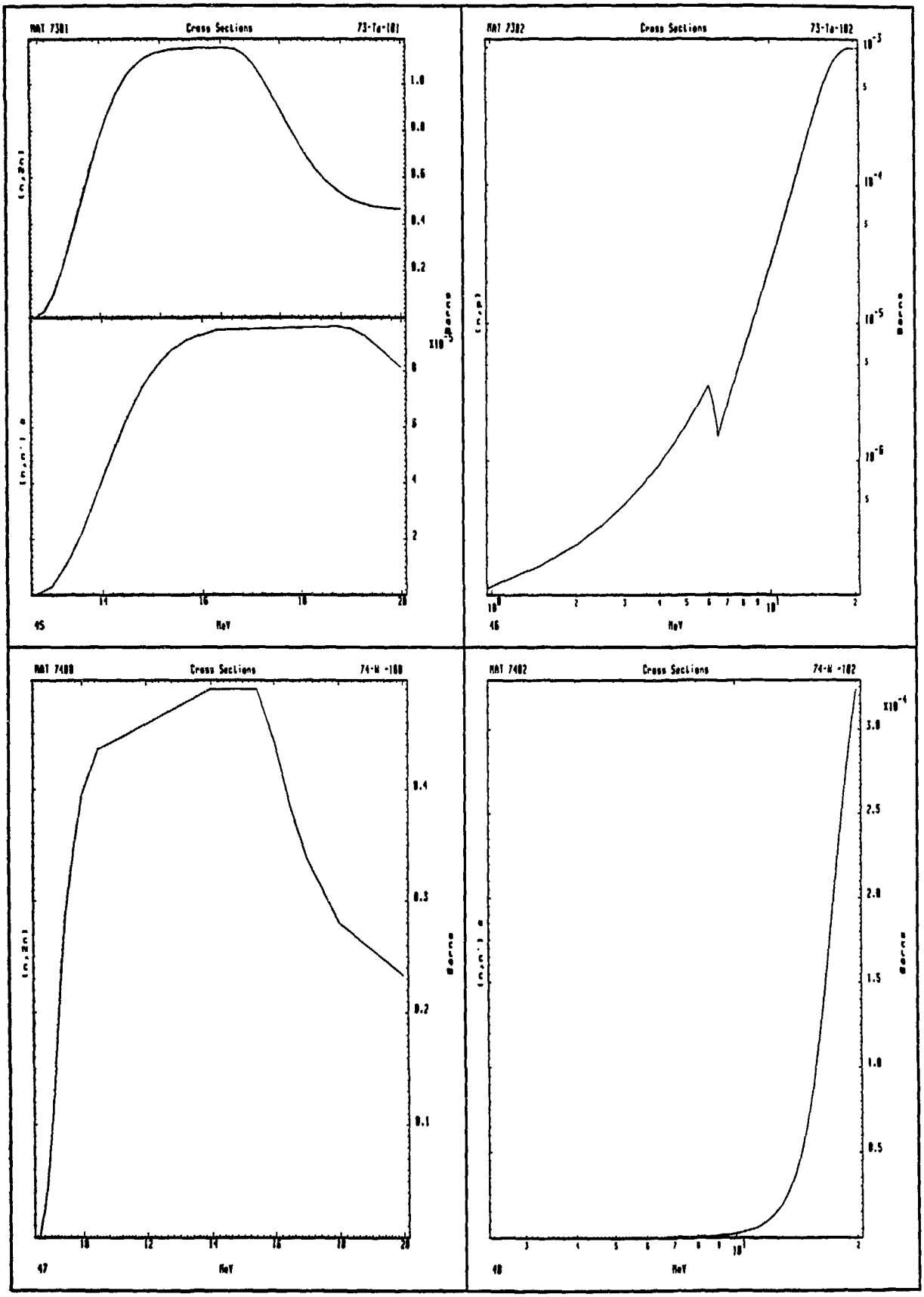






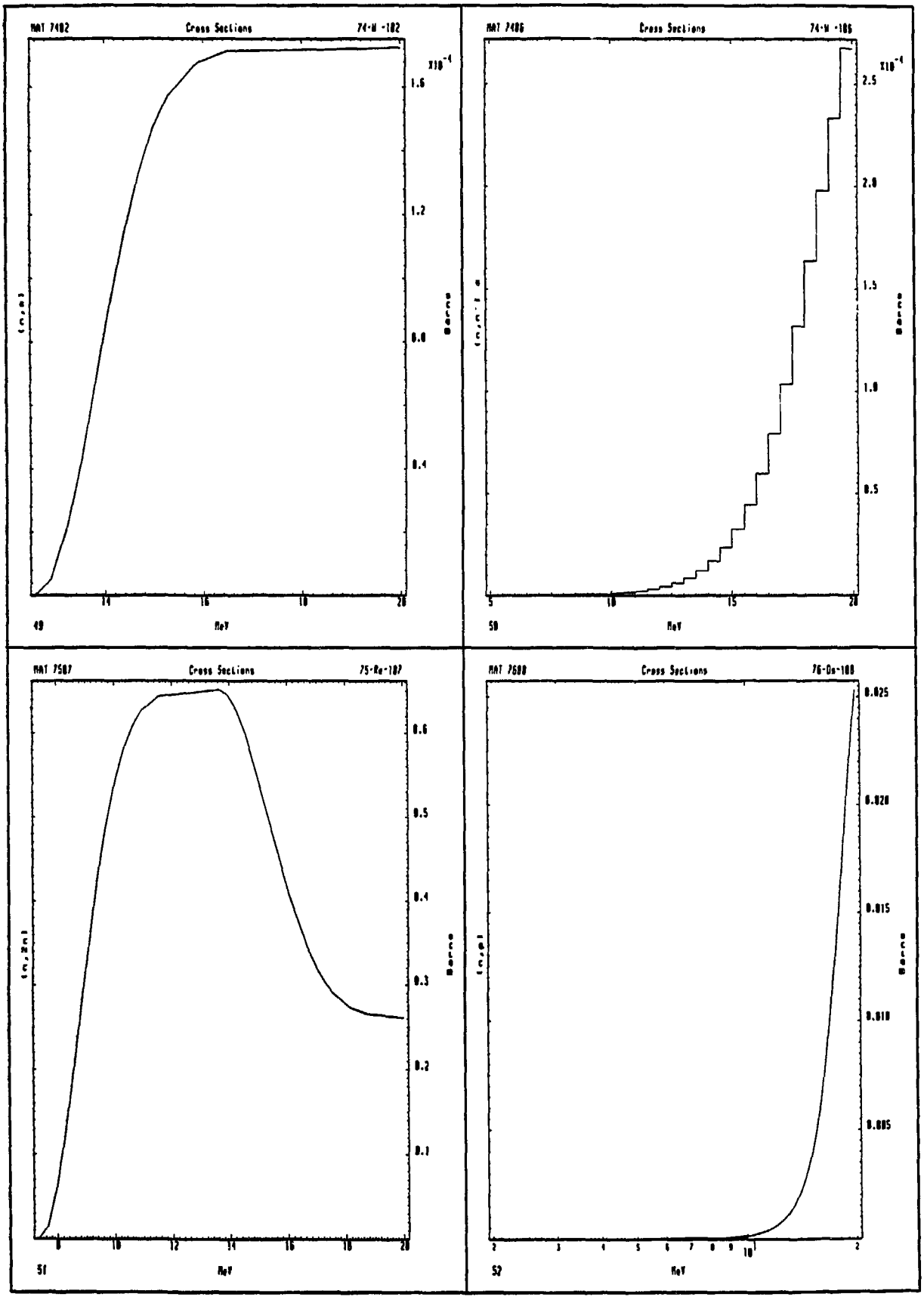
Part 4: Plots of (n,gamma) cross-sections and capture cross-sections into ground state

Part 2: Plots of reaction cross-sections into isomeric states



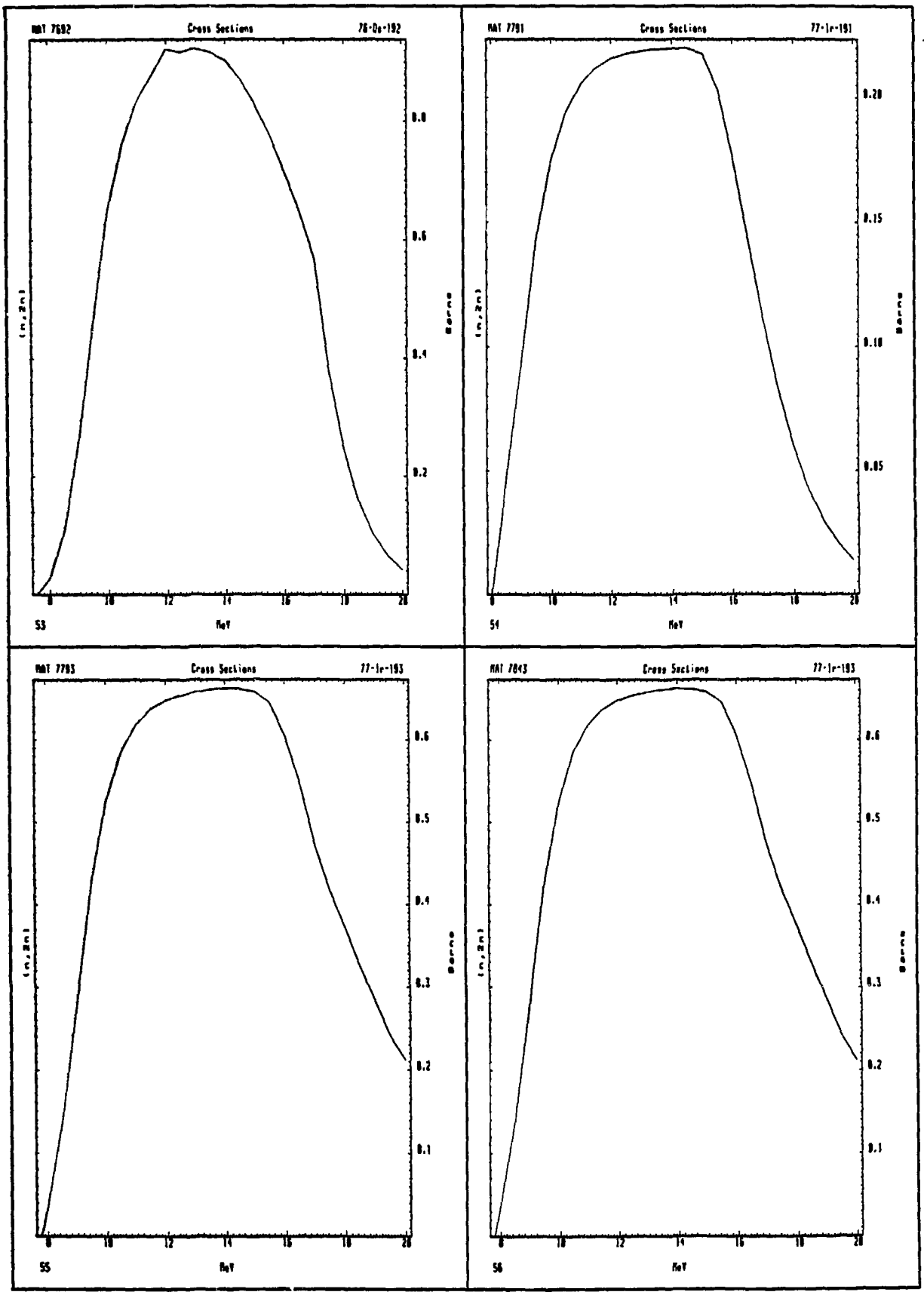
Part 4: Plots of (n,gamma) cross-sections and capture cross-sections

Part 2: Plots of reaction cross-sections into isomeric states



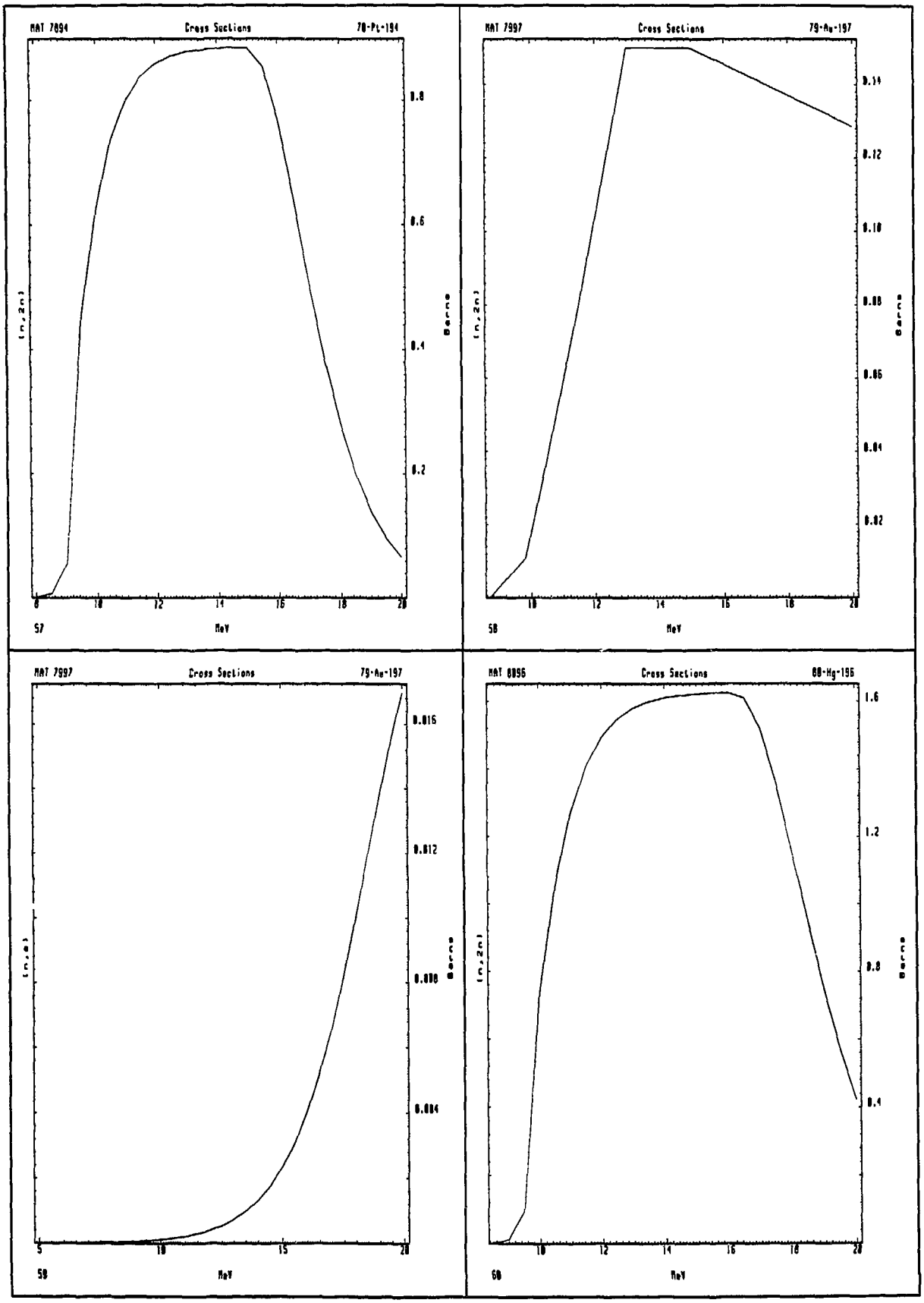
Part 4: Plots of (n,gamma) cross-sections and capture cross-sections

Part 2: Plots of reaction cross-sections into isomeric states



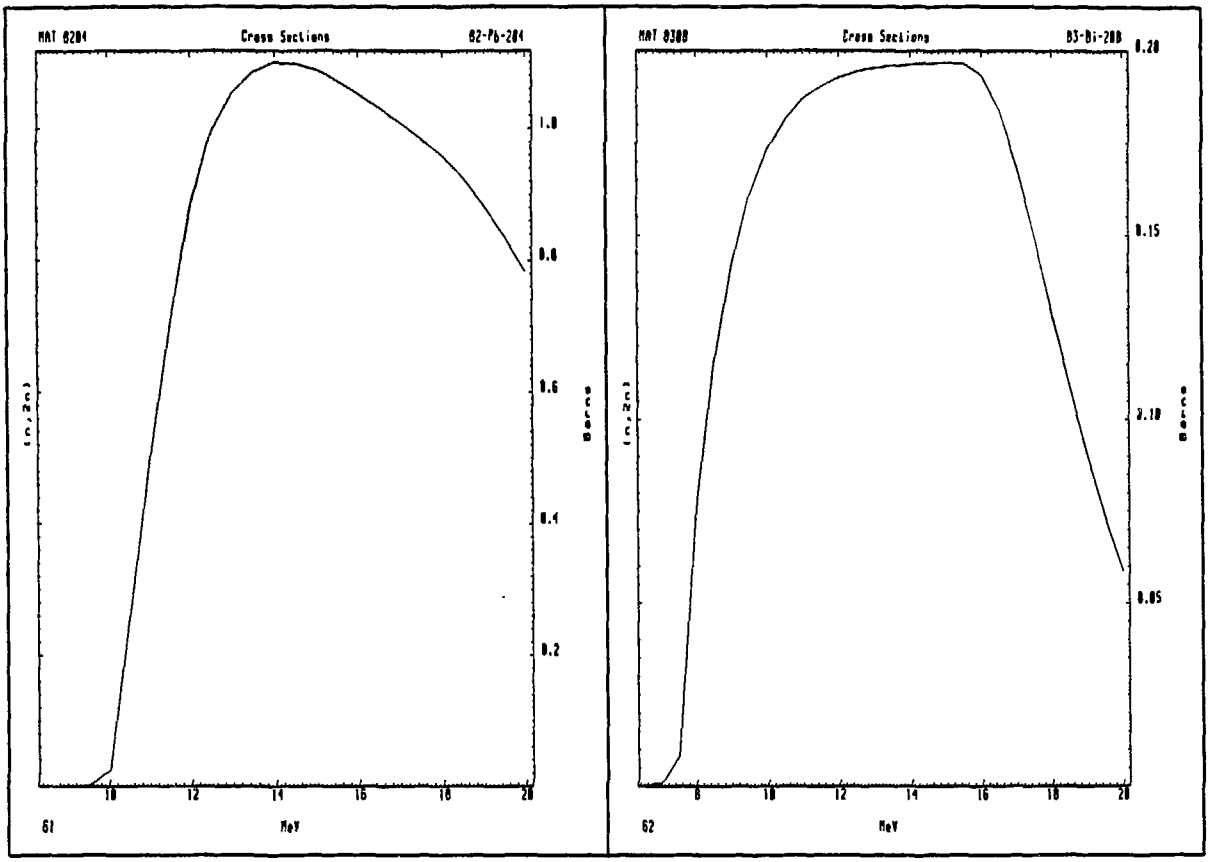
Part 4: Plots of (n,gamma) cross-sections and capture cross-sections

Part 2: Plots of reaction cross-sections into isomeric states



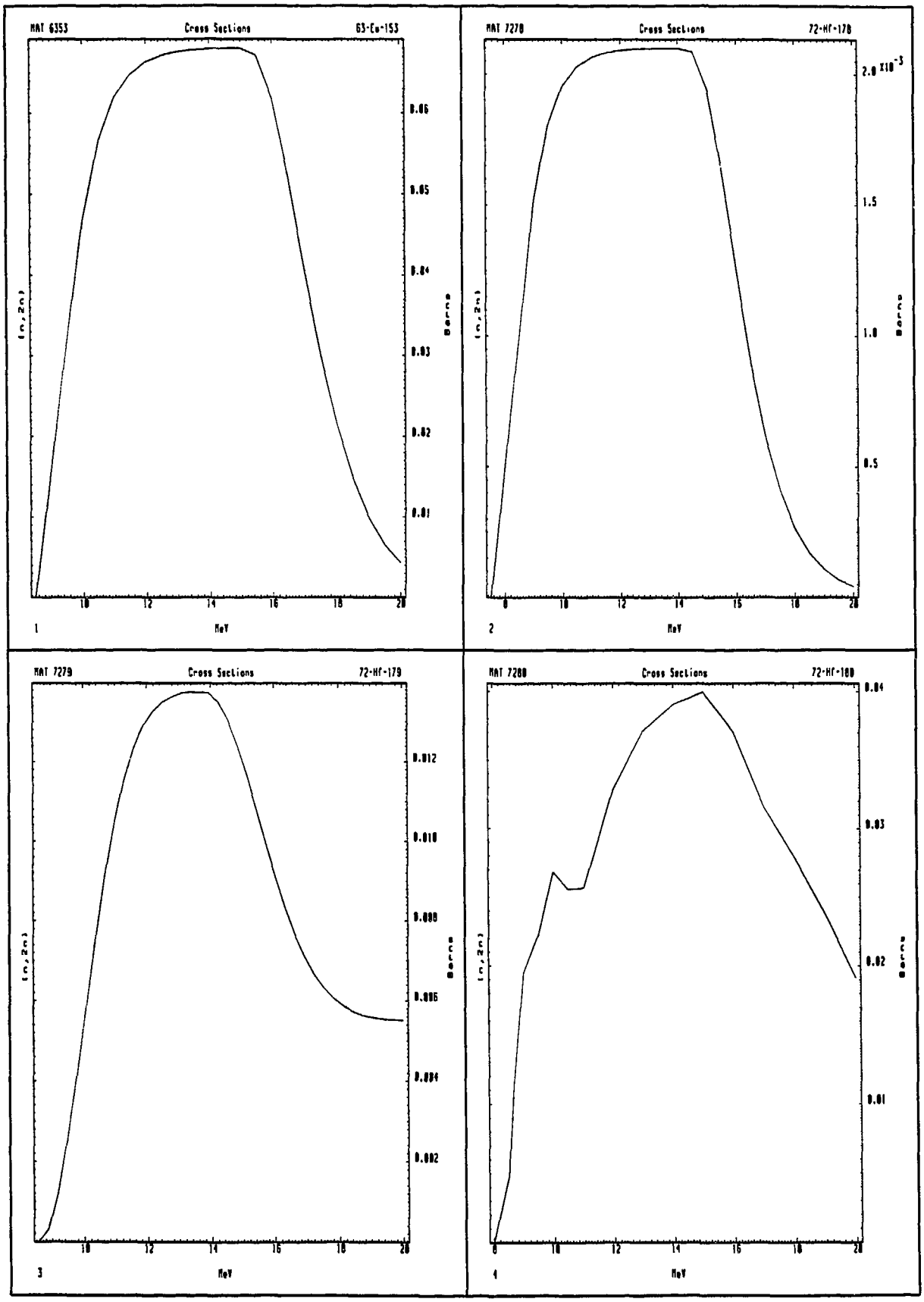
Part 4: Plots of (n,gamma) cross-sections and capture cross-sections

Part 2: Plots of reaction cross-sections into isomeric states



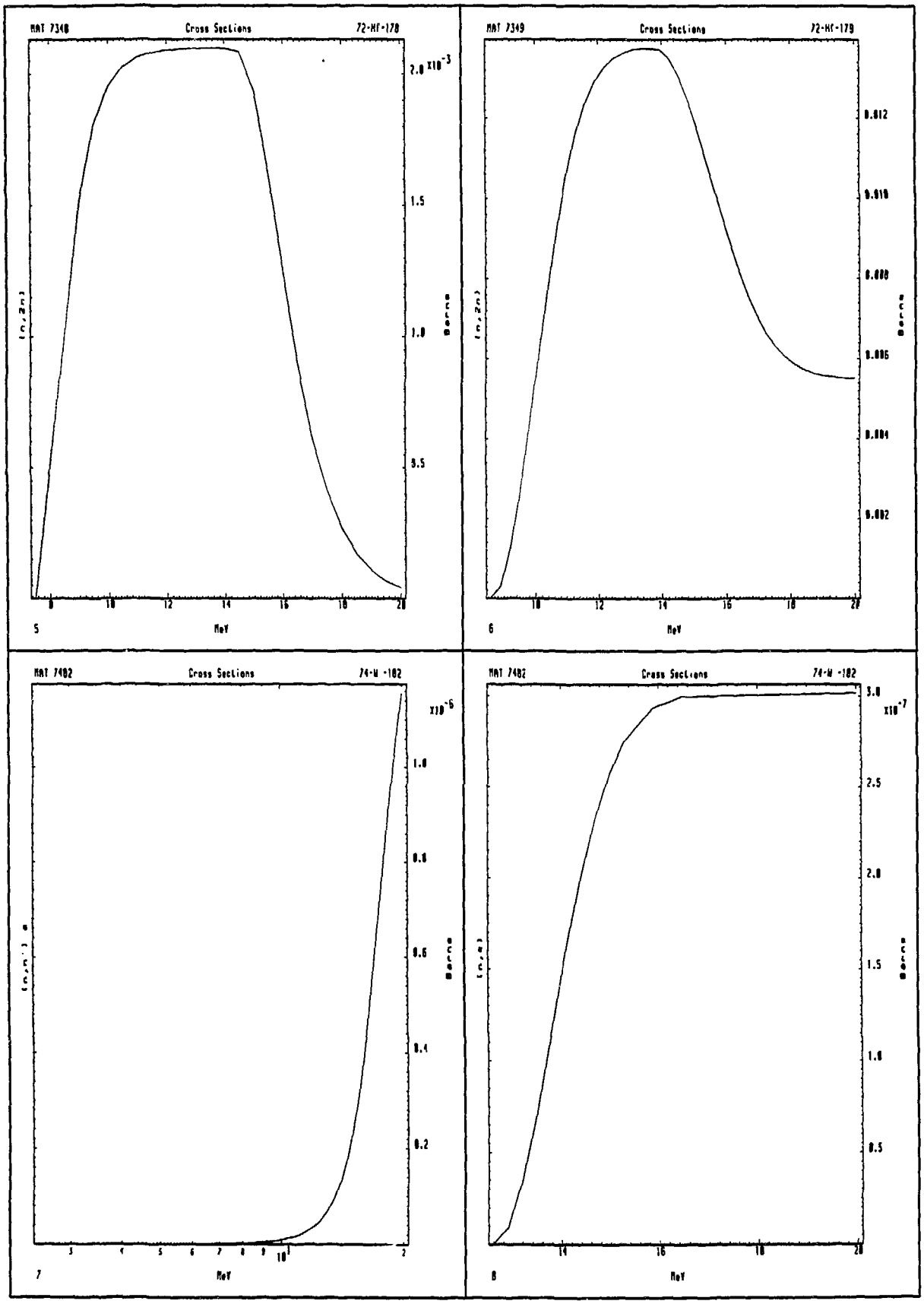
Part 4: Plots of (n gamma) cross-sections and capture cross-sections

Part 3: Plots of 2nd isomer production cross-sections



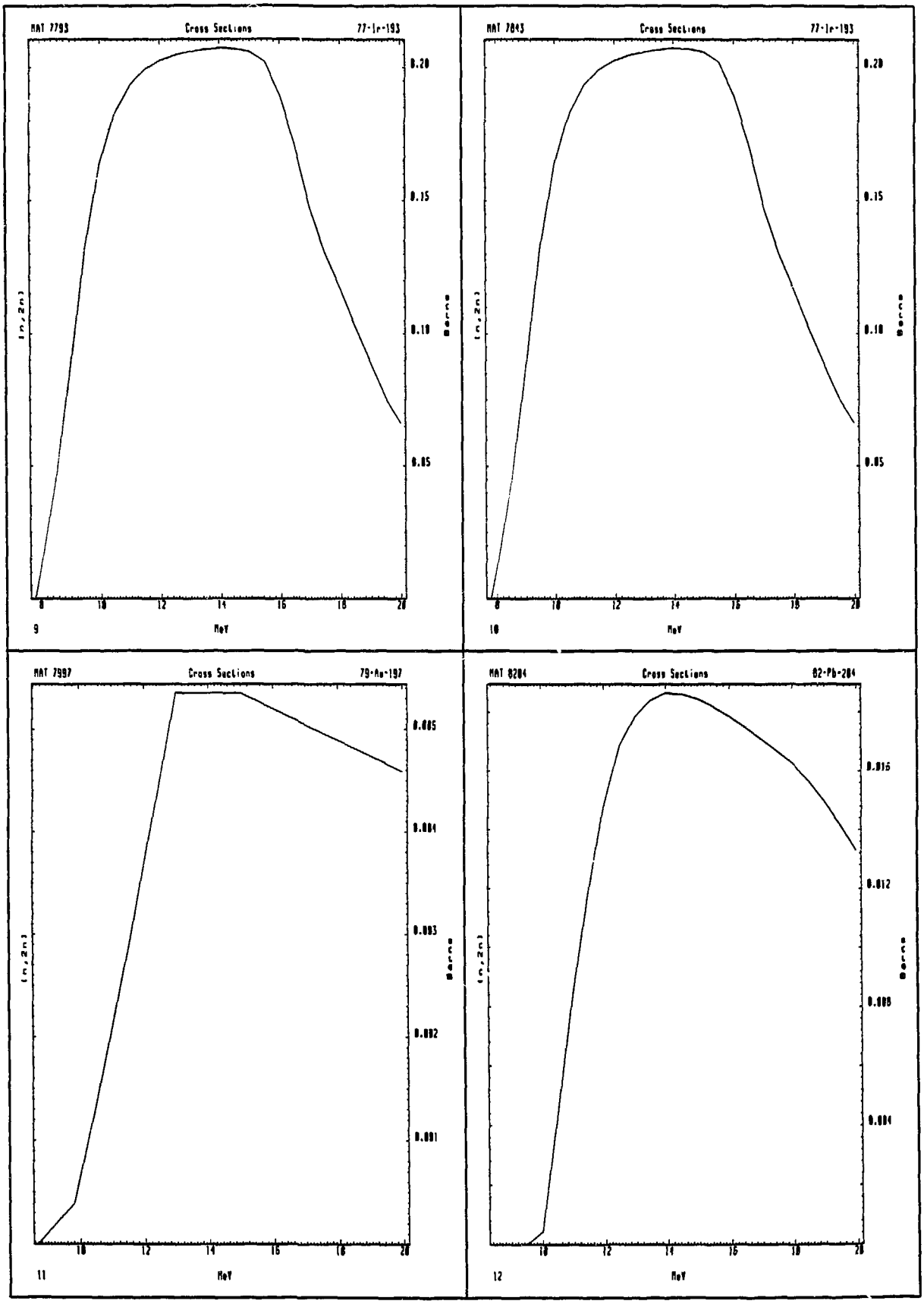
Part 4: Plots of (n,gamma) cross-sections and capture cross-sections into ground state

Part 3: Plots of 2nd isomer production cross-sections

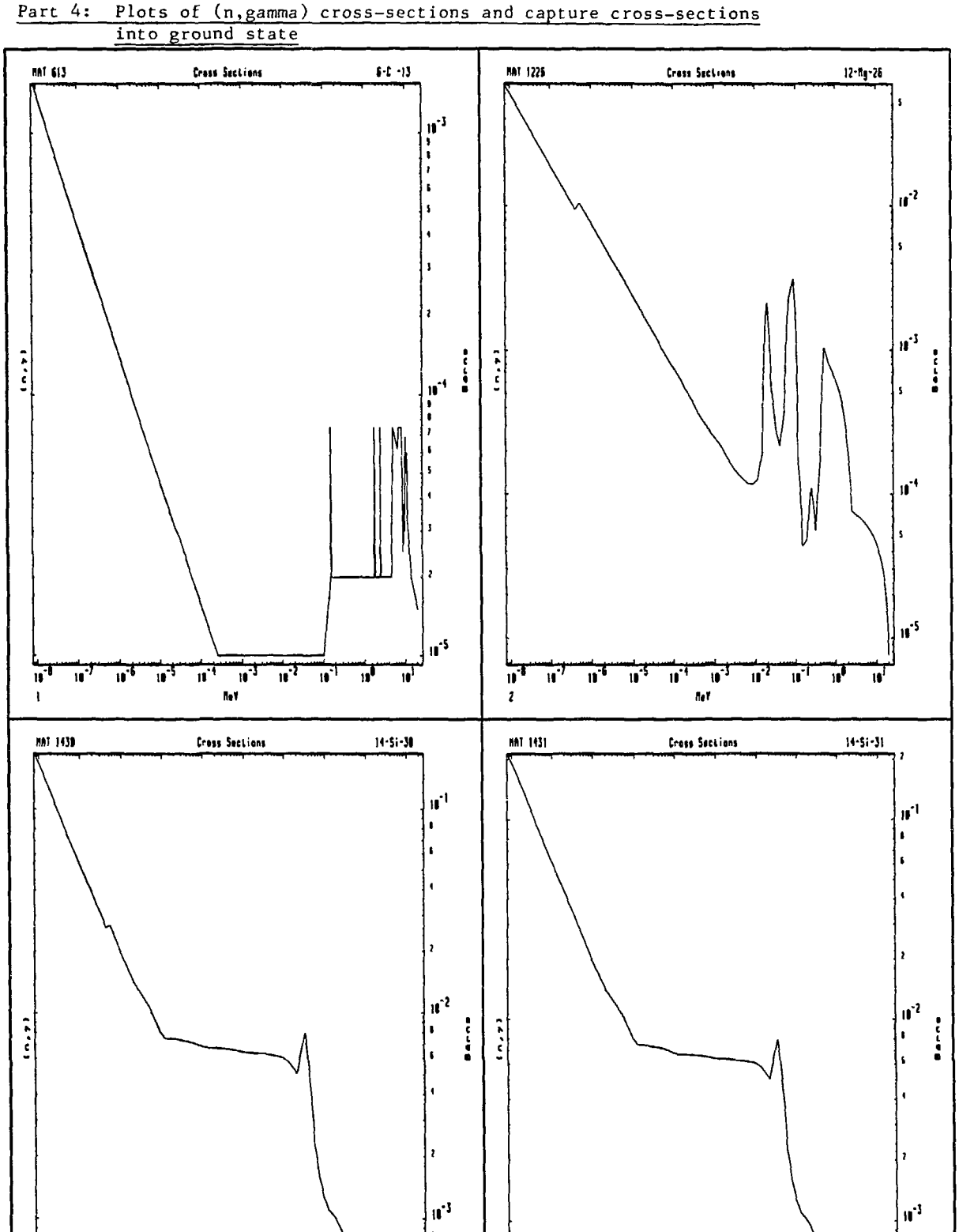


Part 4: Plots of (n,gamma) cross-sections and capture cross-sections

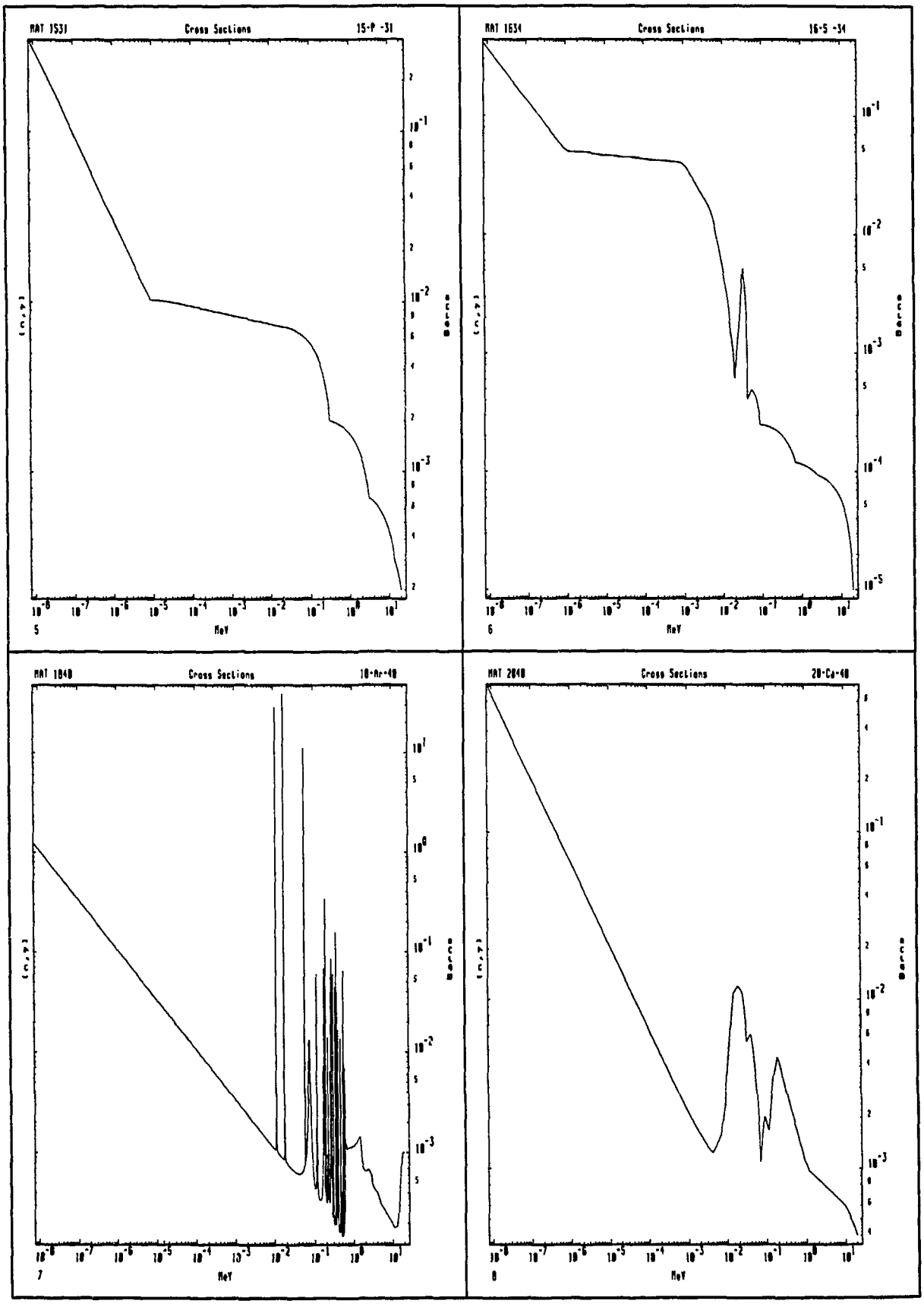
Part 3: Plots of 2nd isomer production cross-sections



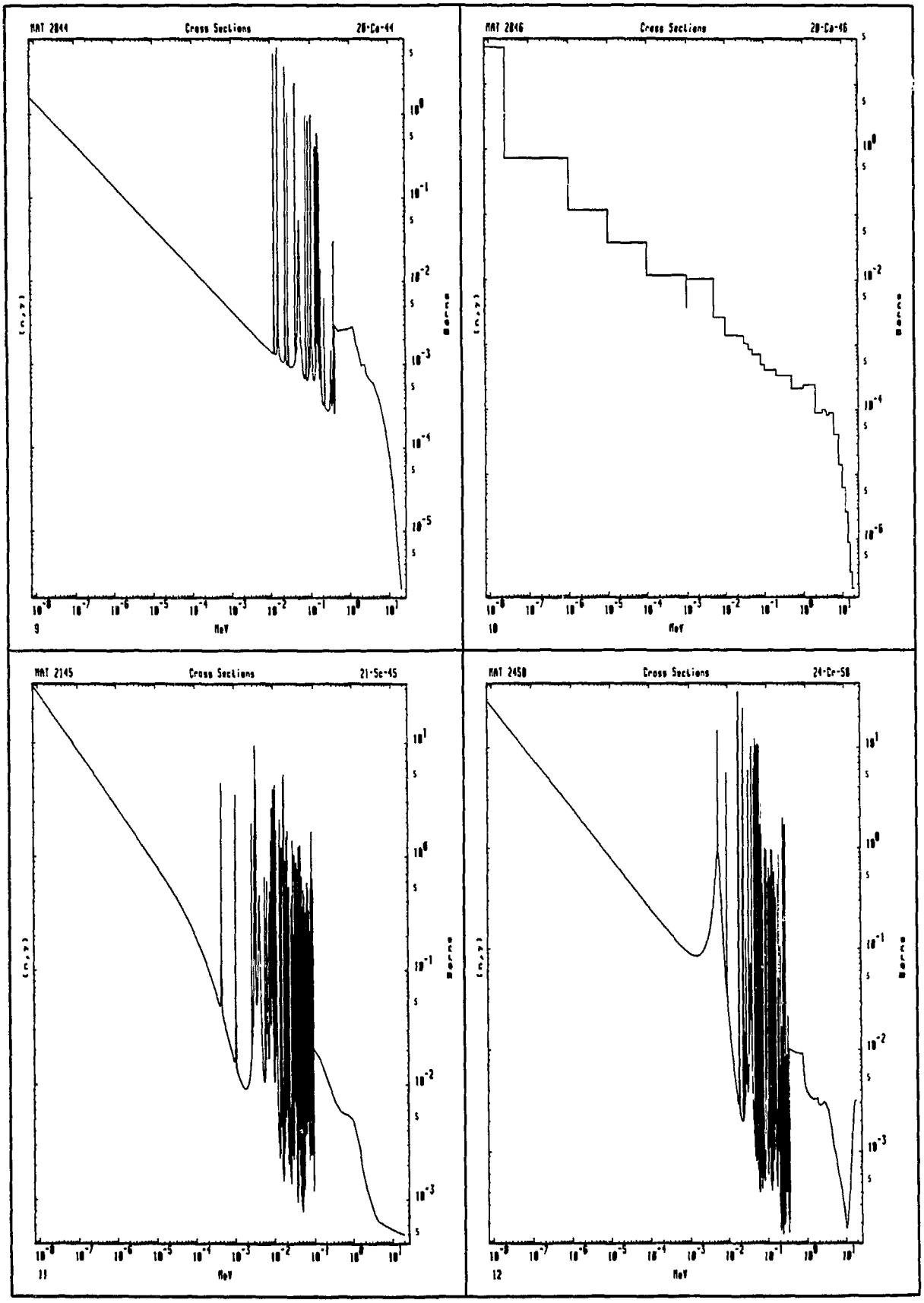
Part 4: Plots of (n,gamma) cross-sections and capture cross-sections into ground state



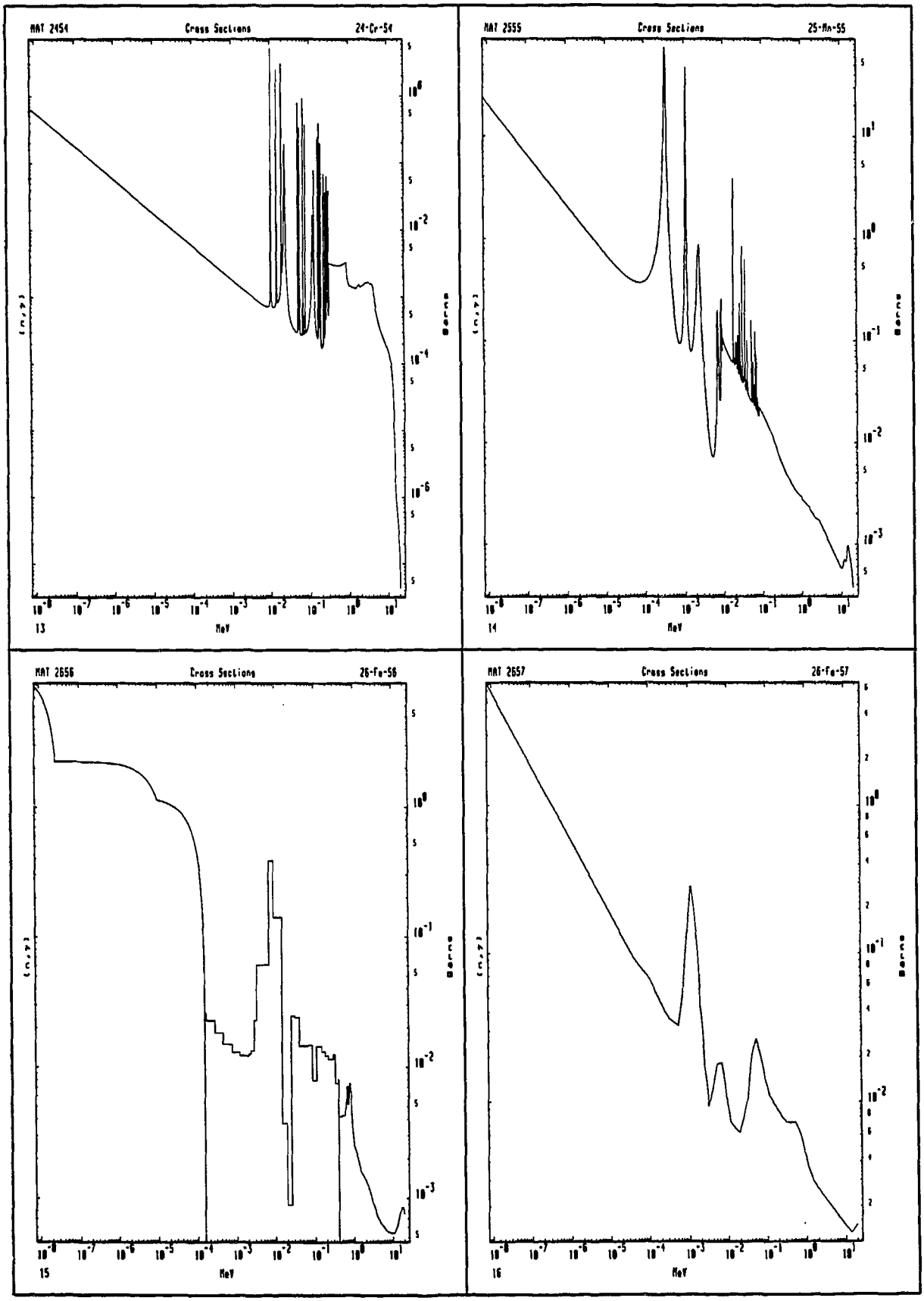
Part 4: Plots of (n,gamma) cross-sections and capture cross-sections into ground state



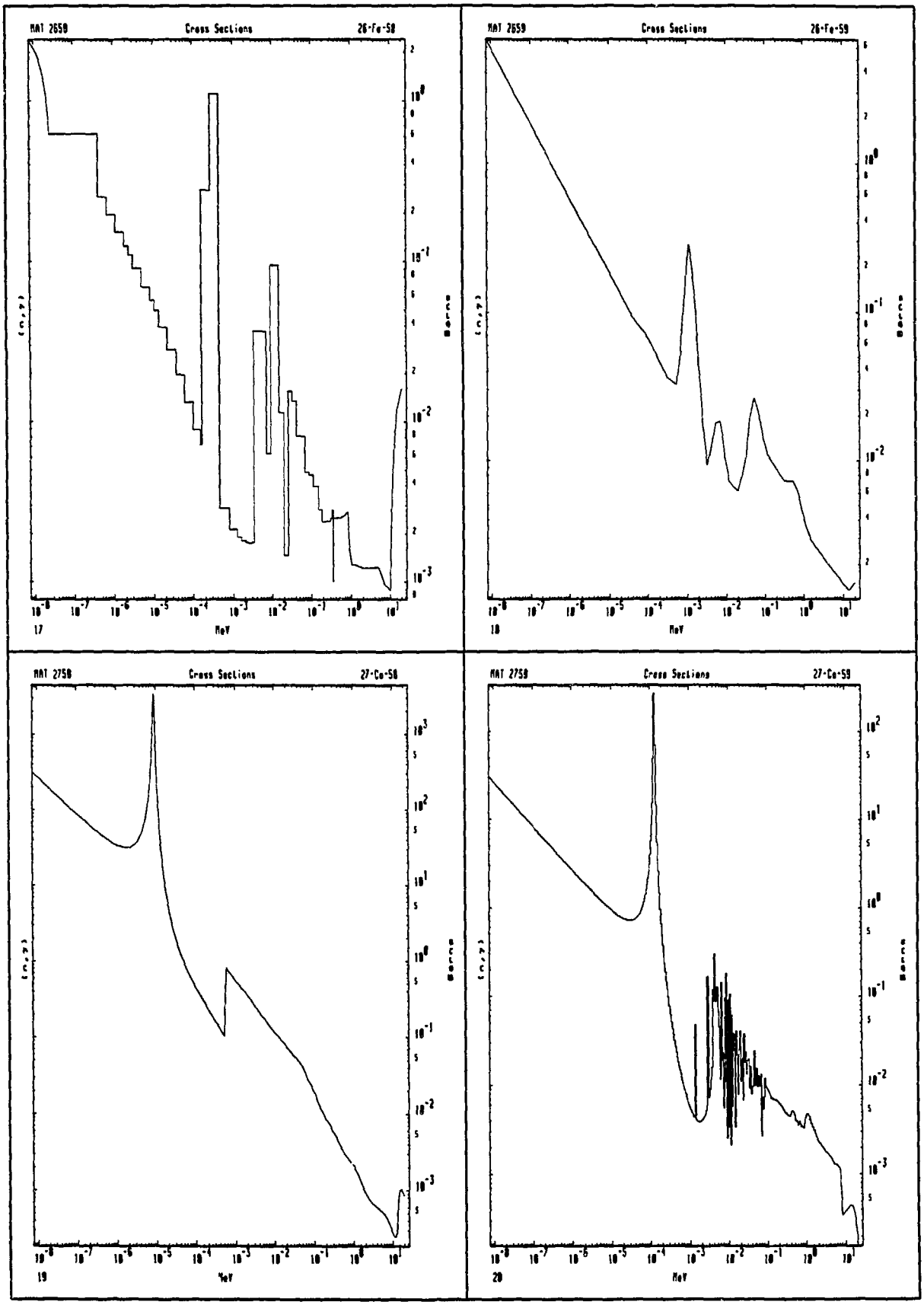
Part 4: Plots of (n,gamma) cross-sections and capture cross-sections into ground state



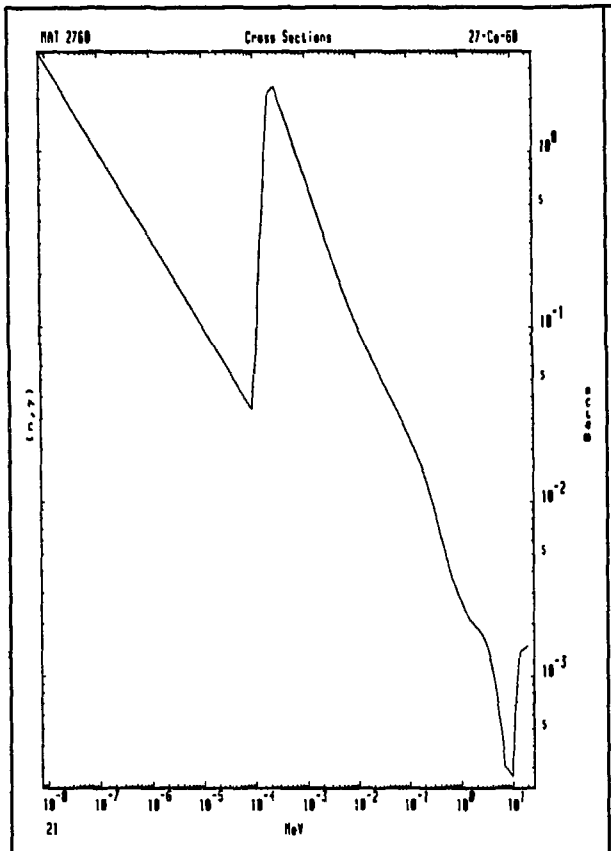
Part 4: Plots of (n,gamma) cross-sections and capture cross-sections into ground state

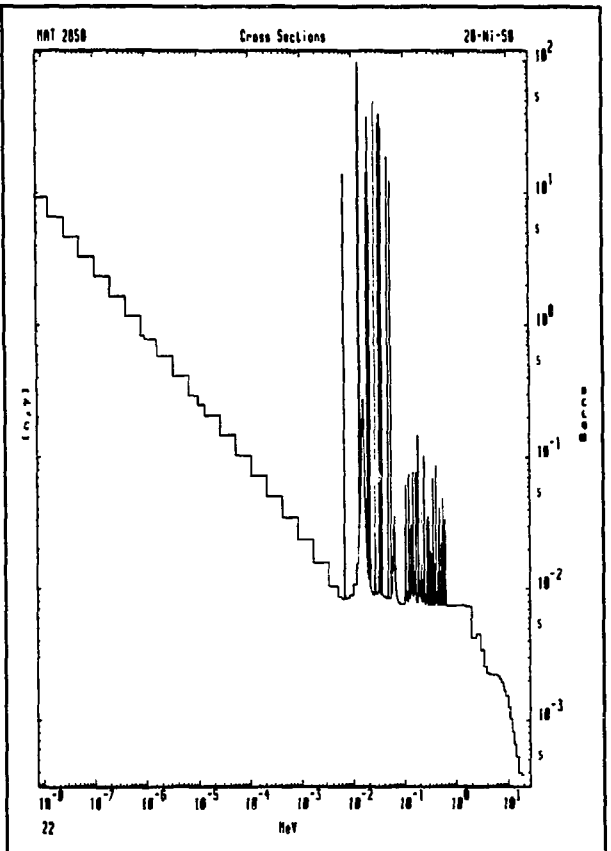


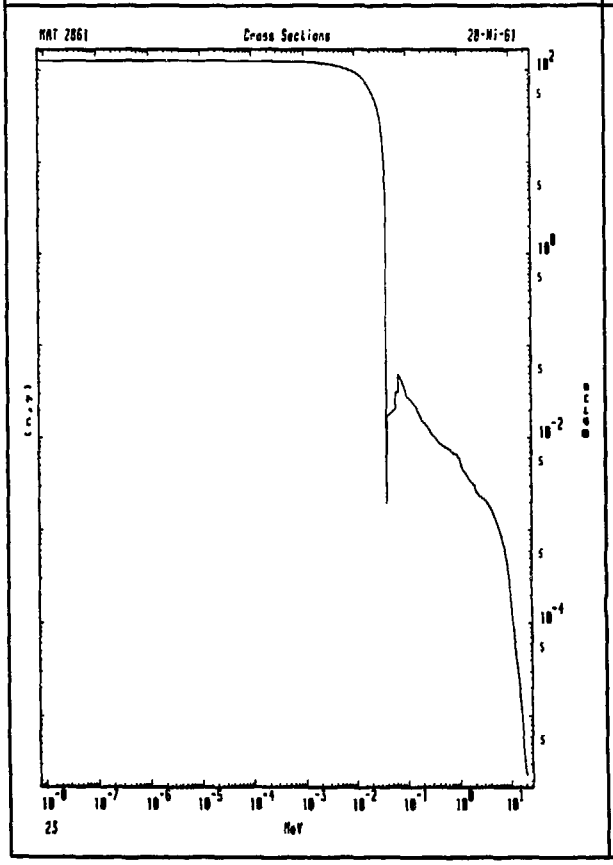
Part 4: Plots of (n,gamma) cross-sections and capture cross-sections into ground state

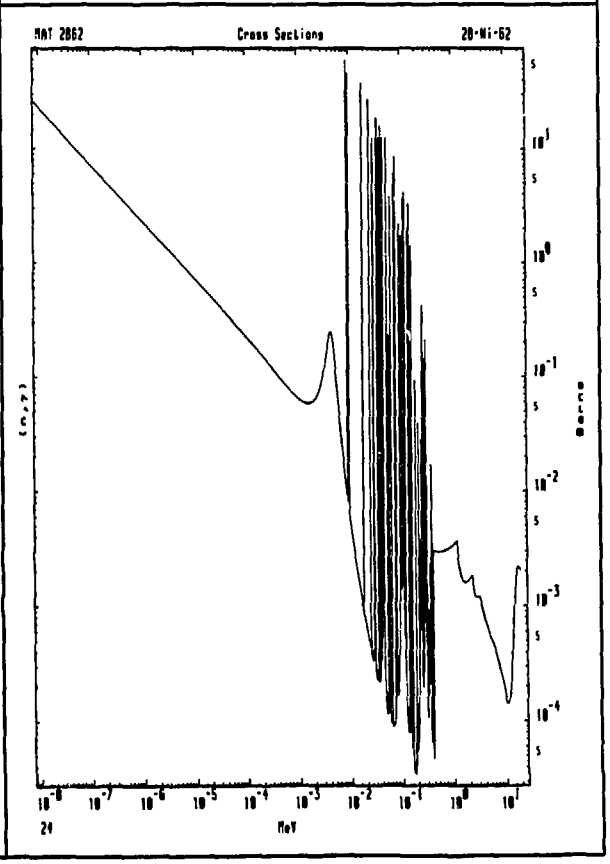


Part 4: Plots of (n,gamma) cross-sections and capture cross-sections into ground state

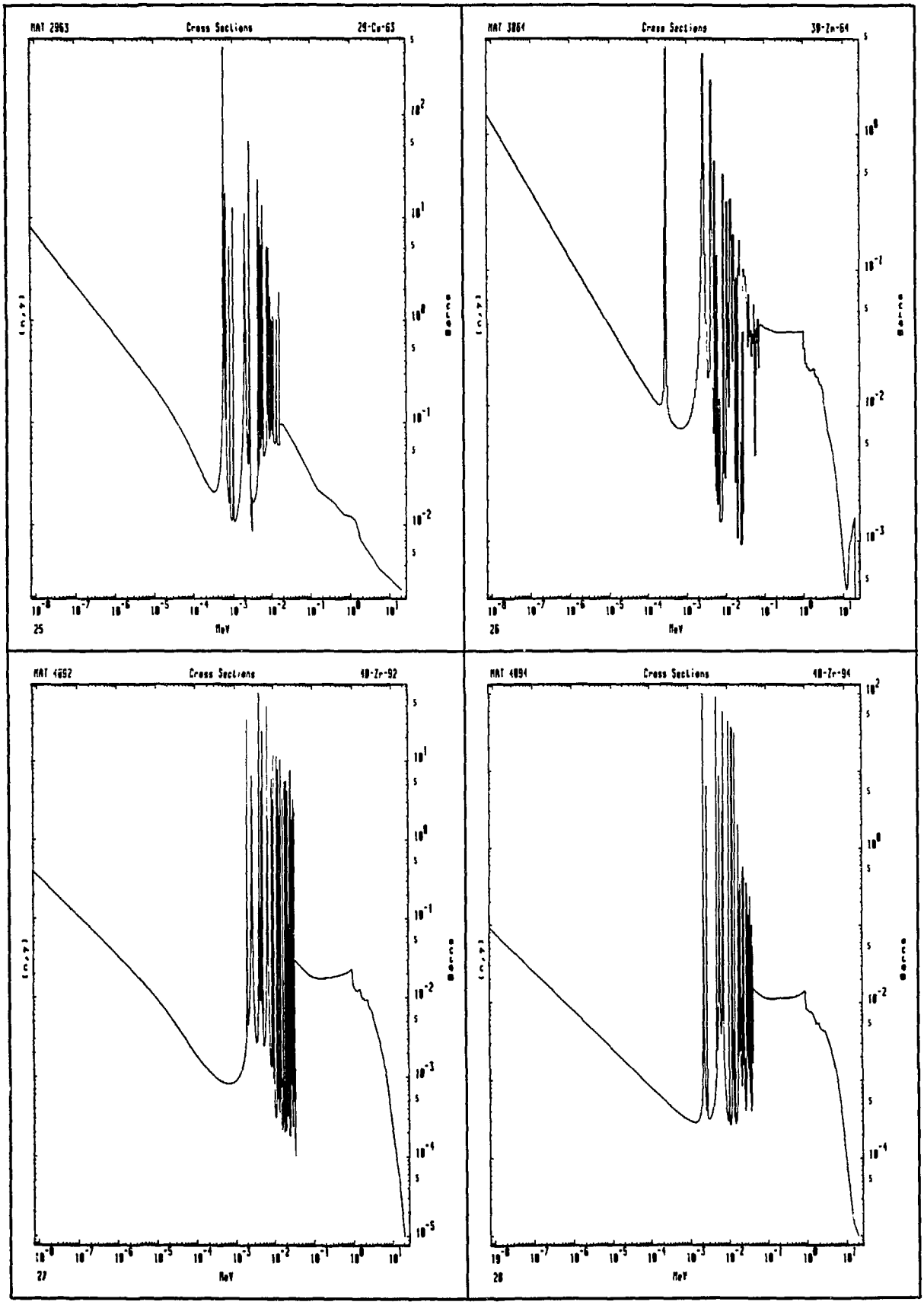




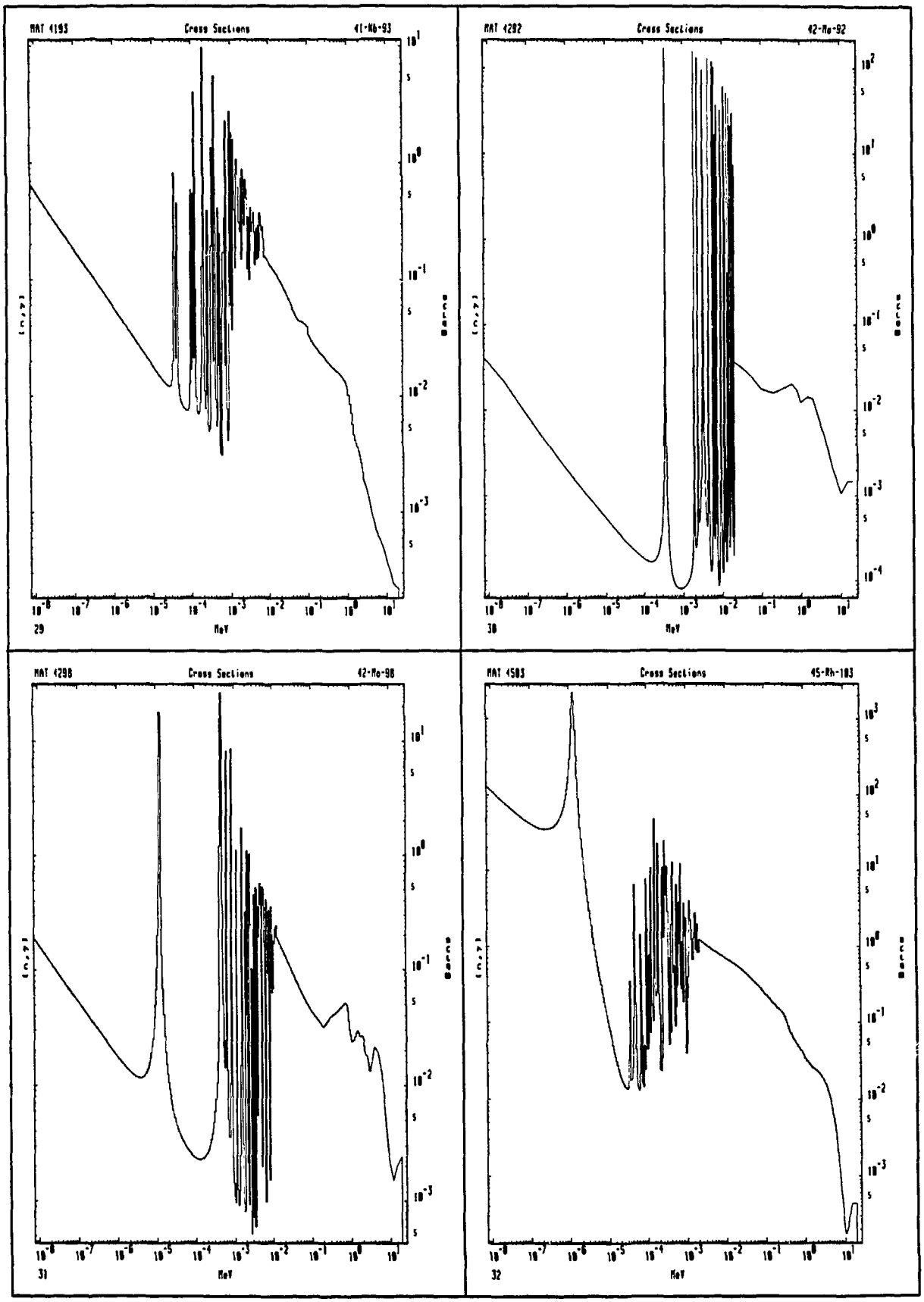




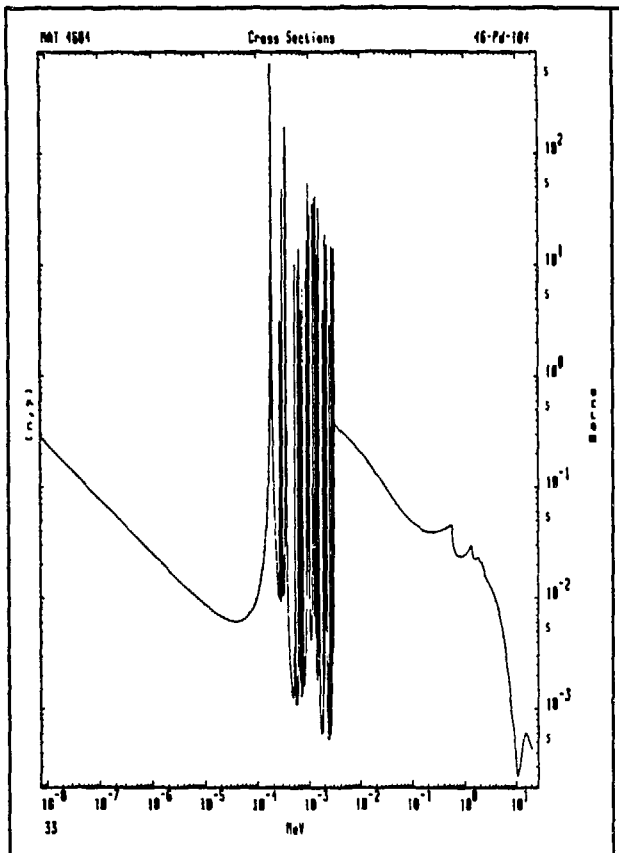
Part 4: Plots of (n,gamma) cross-sections and capture cross-sections into ground state

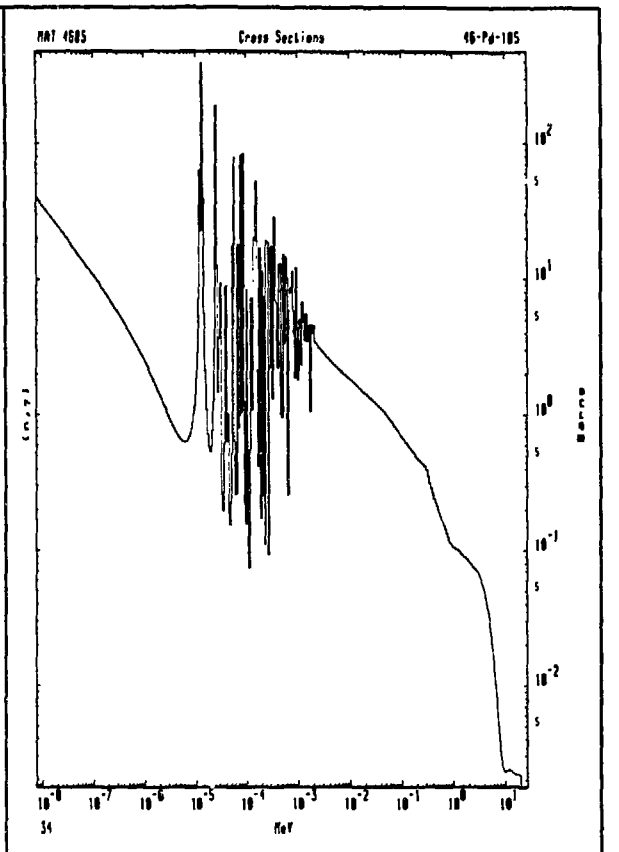


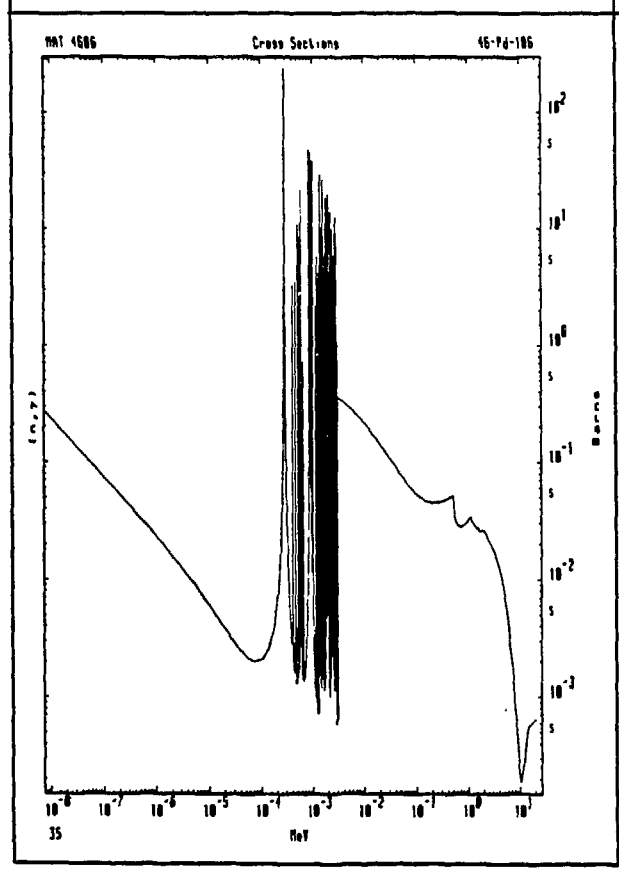
Part 4: Plots of (n,gamma) cross-sections and capture cross-sections into ground state

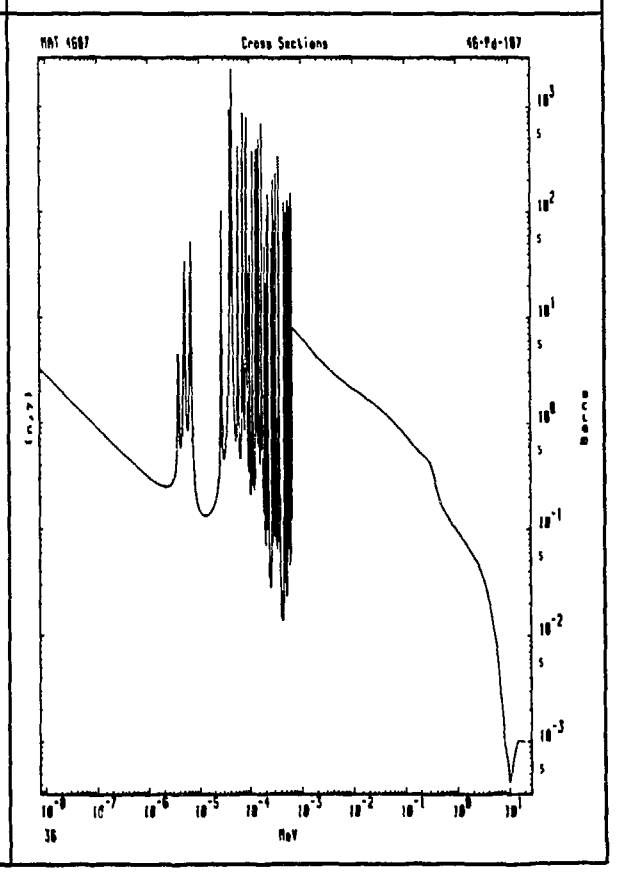


Part 4: Plots of (n,gamma) cross-sections and capture cross-sections into ground state

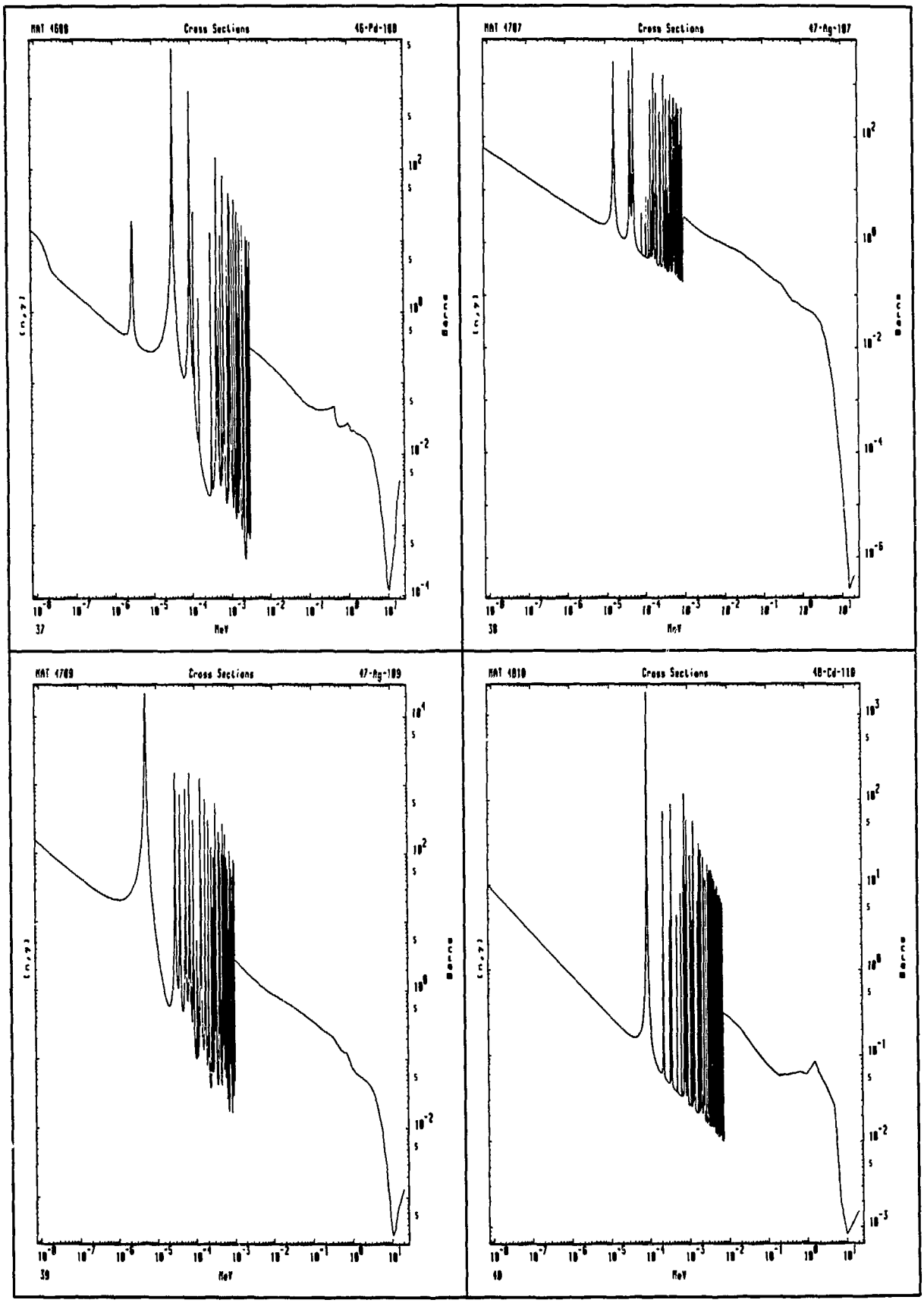




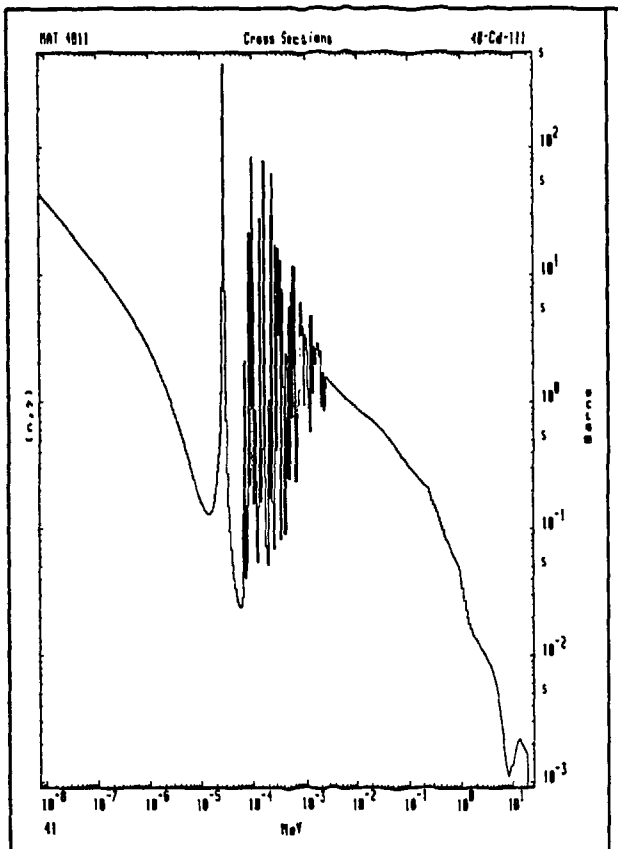


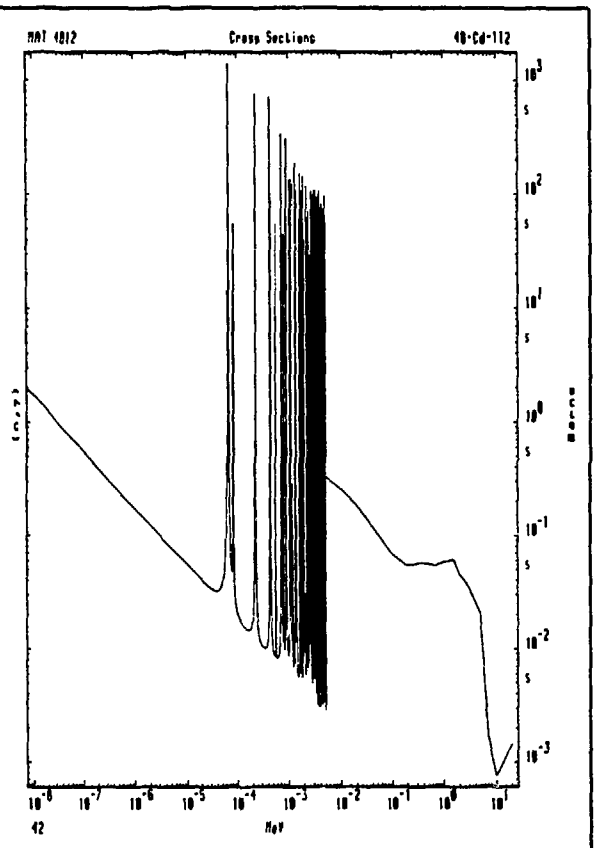


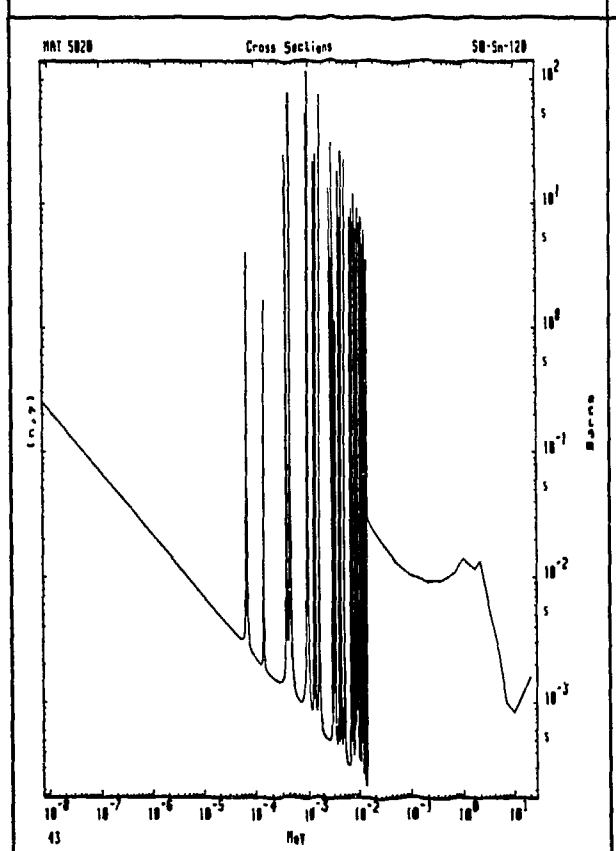
Part 4: Plots of (n,gamma) cross-sections and capture cross-sections into ground state

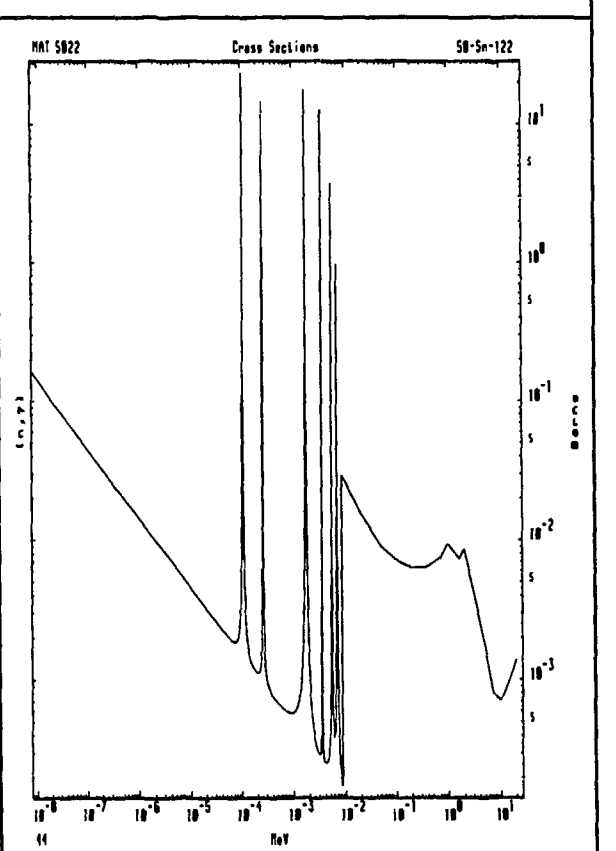


Part 4: Plots of (n,gamma) cross-sections and capture cross-sections into ground state

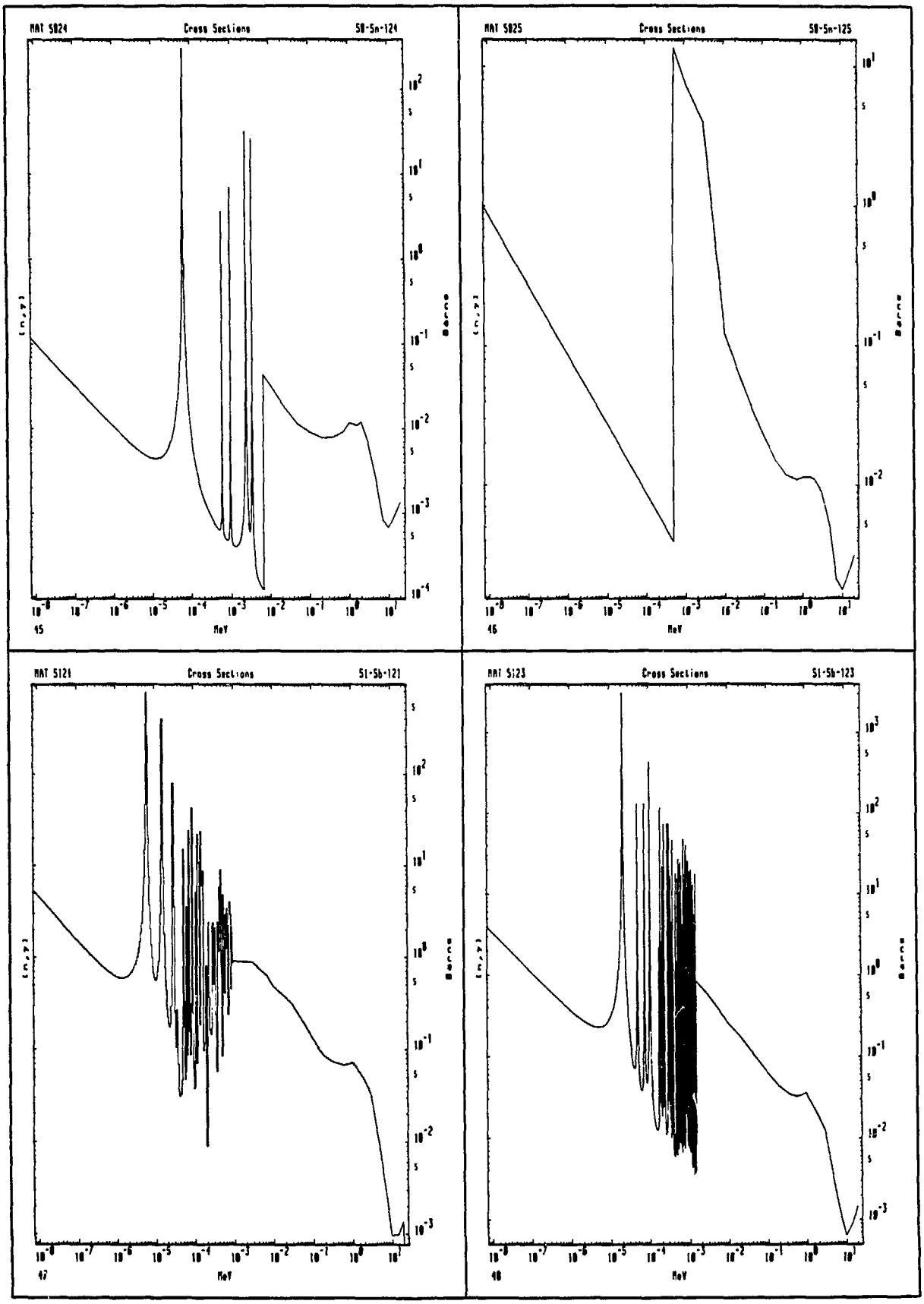




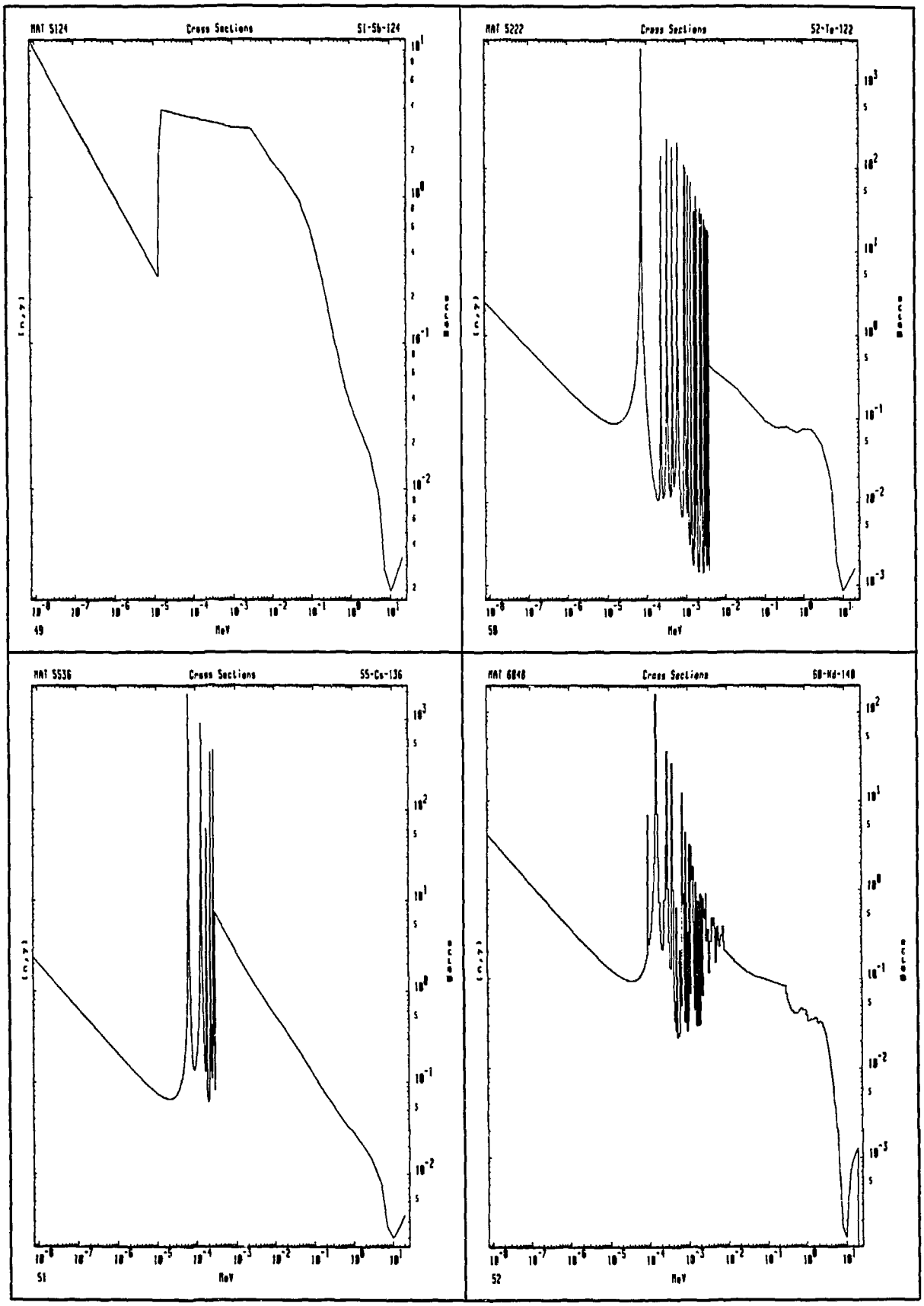




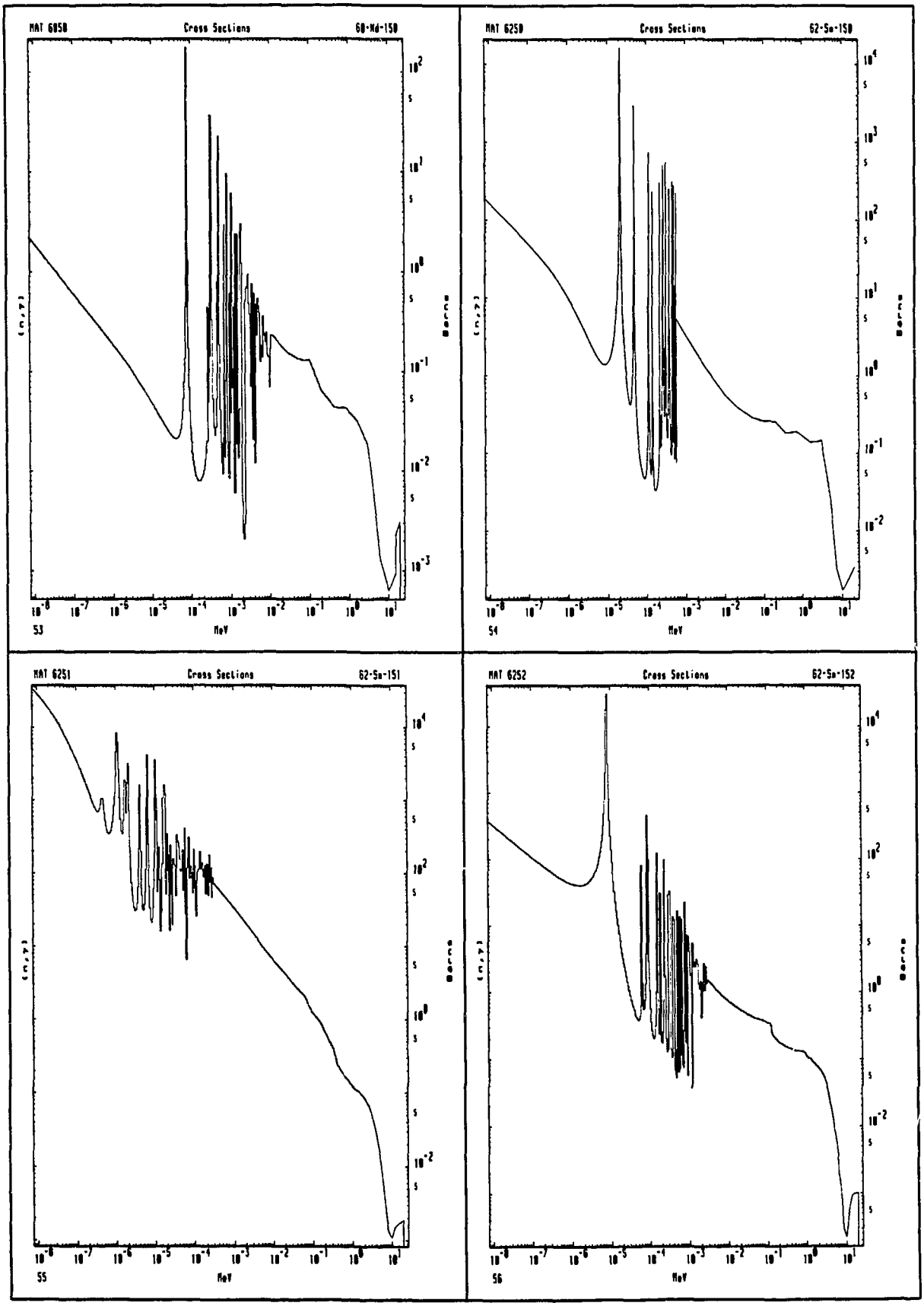
Part 4: Plots of (n,gamma) cross-sections and capture cross-sections into ground state



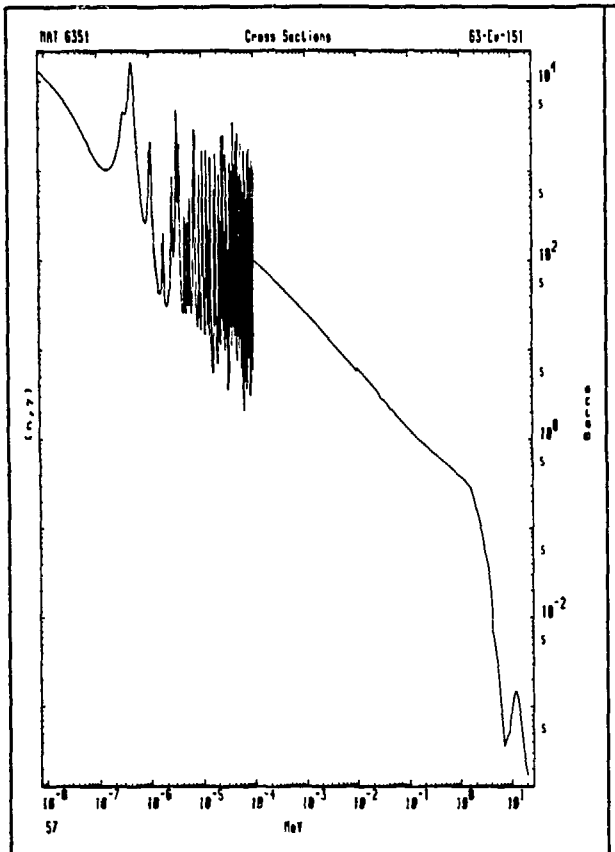
Part 4: Plots of (n,gamma) cross-sections and capture cross-sections into ground state

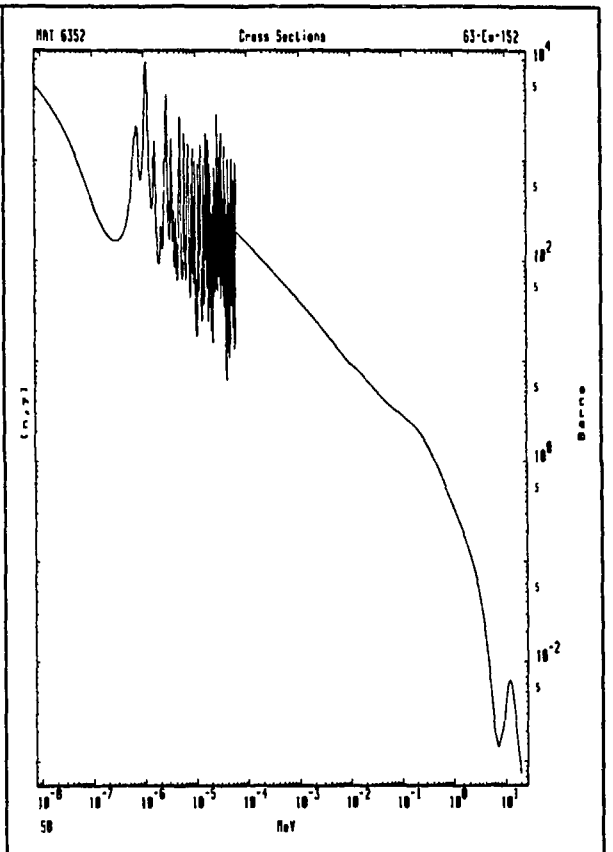


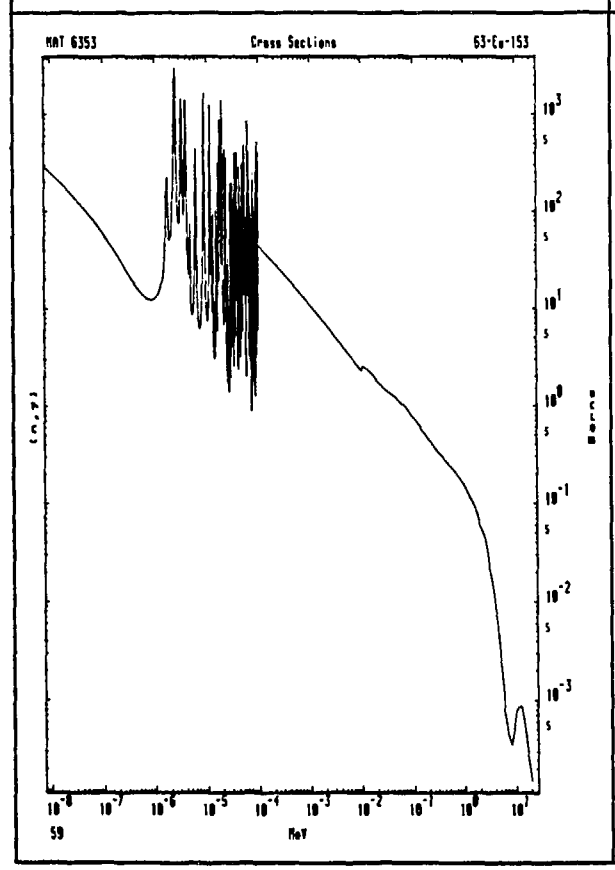
Part 4: Plots of (n,gamma) cross-sections and capture cross-sections into ground state

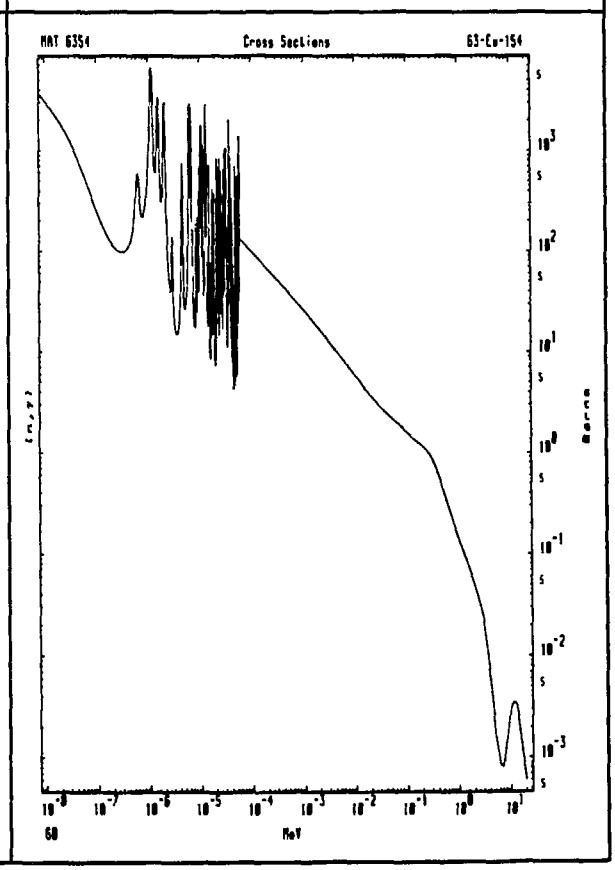


Part 4: Plots of (n,gamma) cross-sections and capture cross-sections into ground state



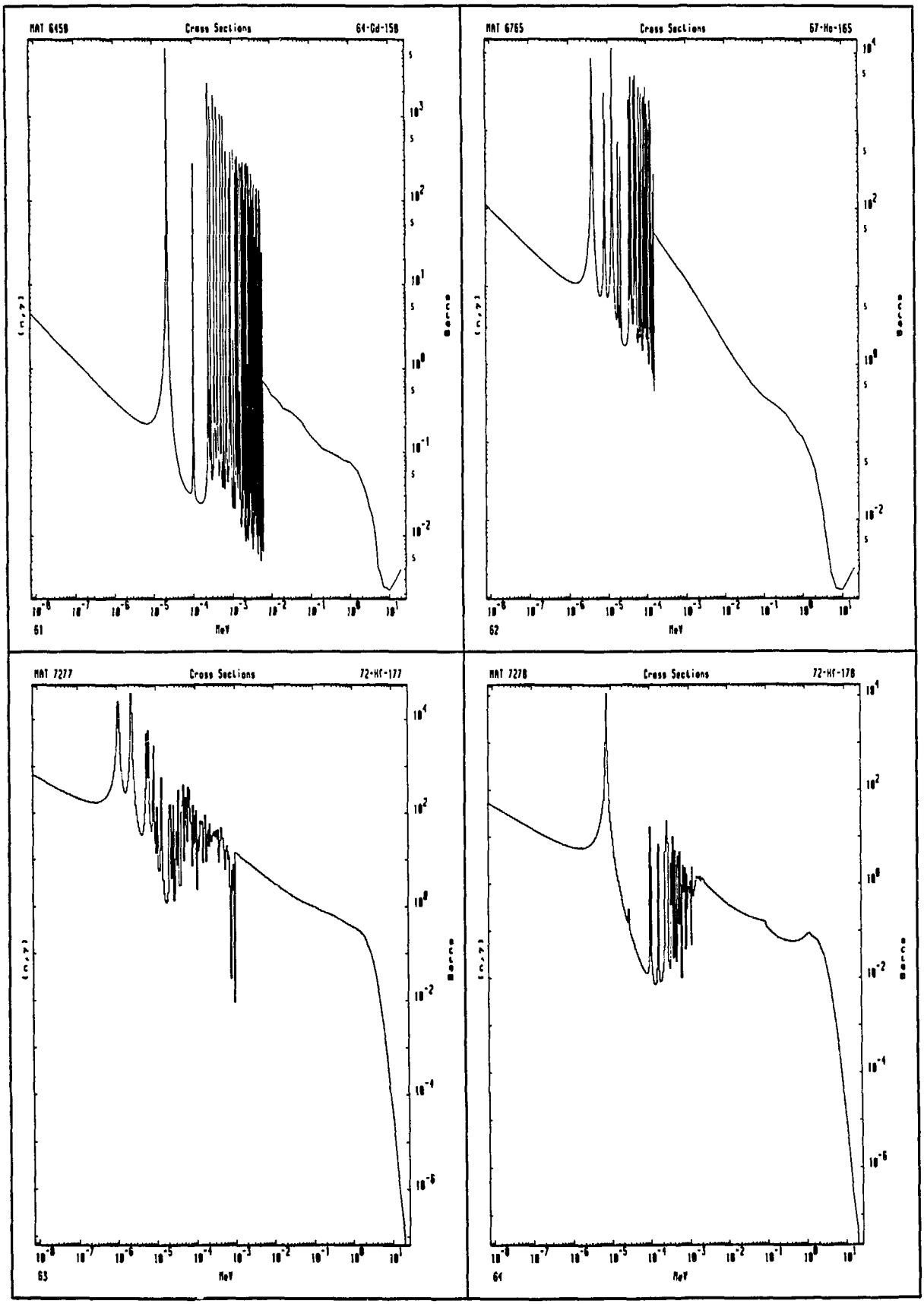






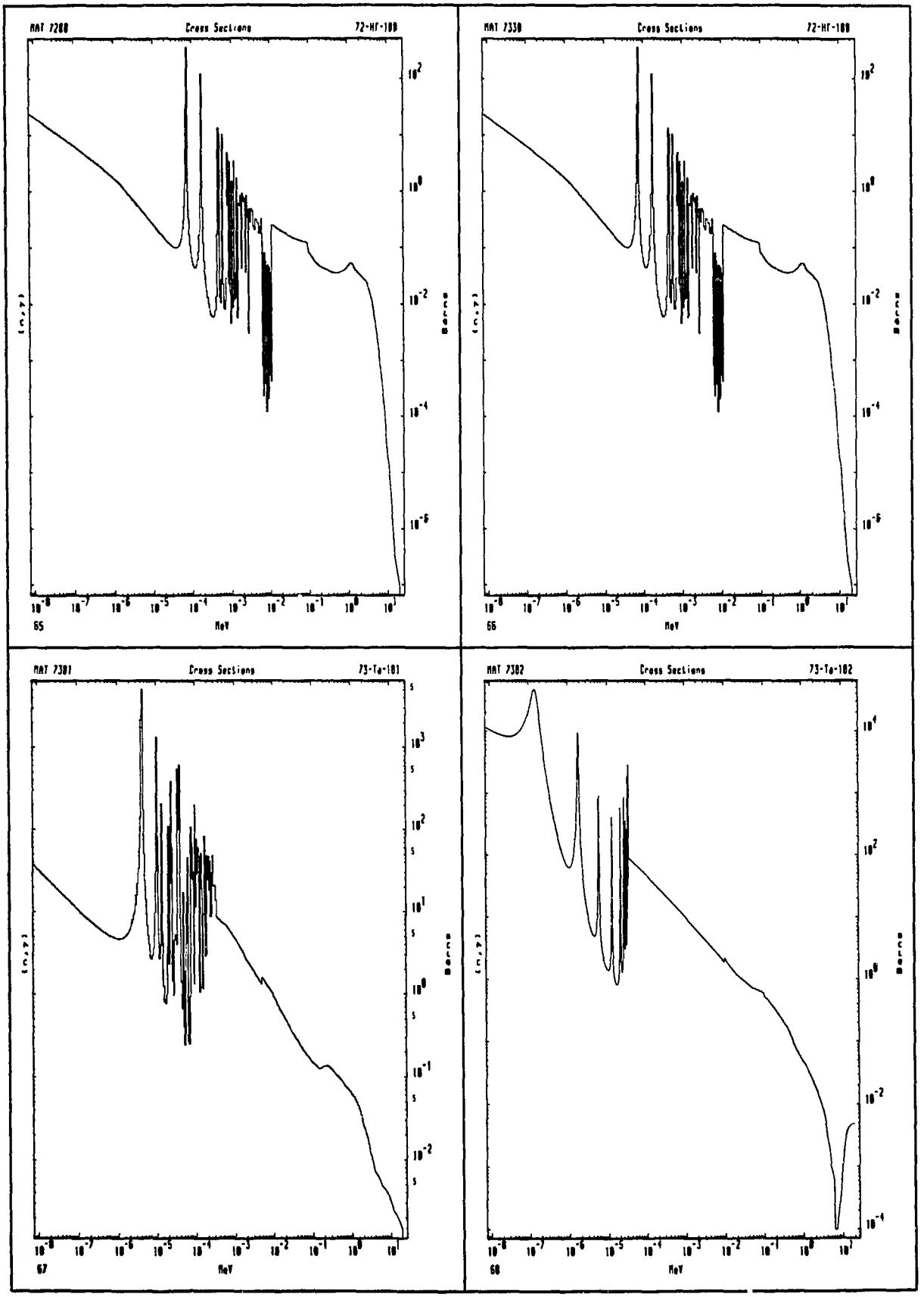
Part 5: Plots of capture cross-sections into isomeric states

Part 4: Plots of (n,gamma) cross-sections and capture cross-sections into ground state

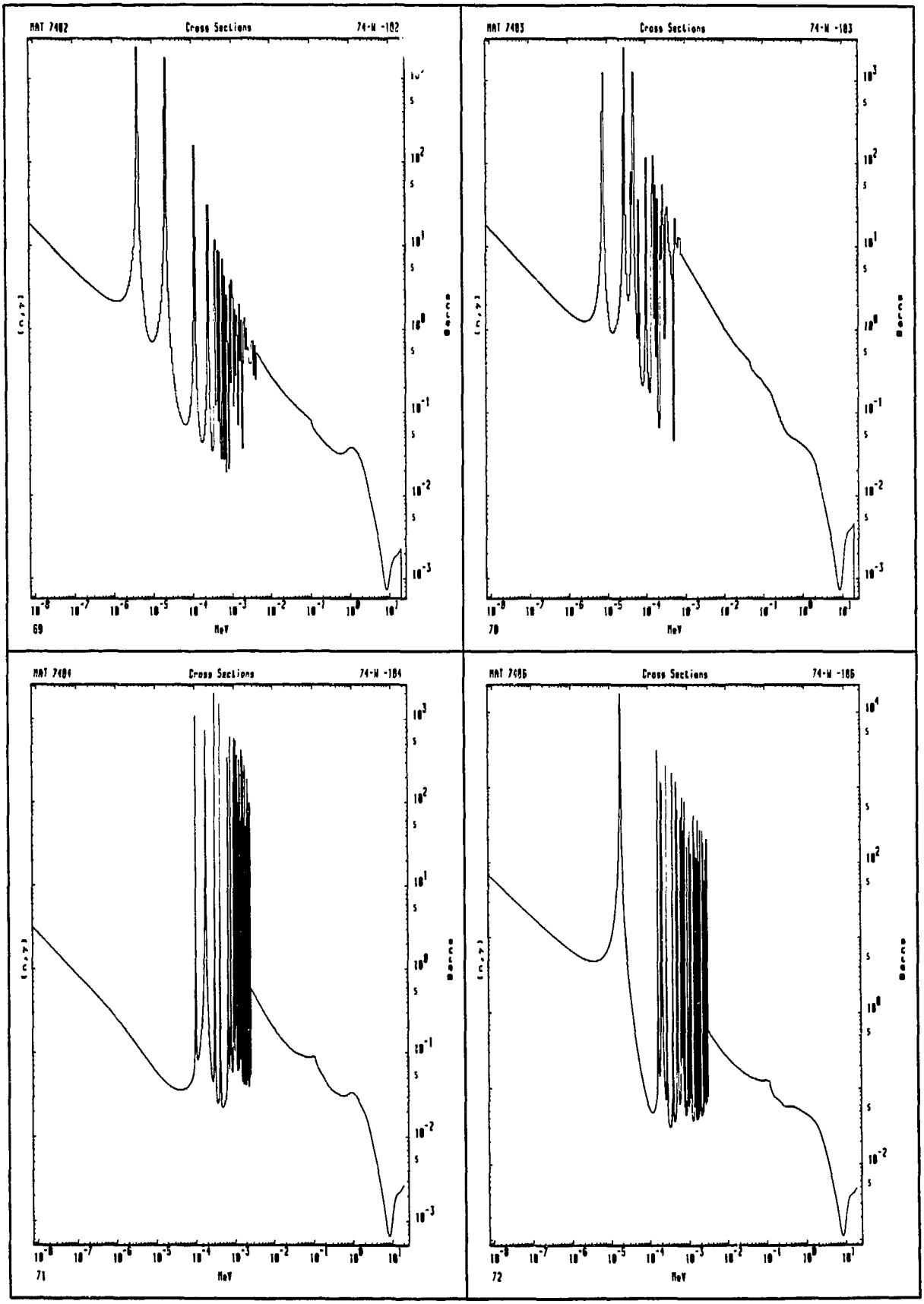


Part 5: Plots of capture cross-sections into isomeric states

Part 4: Plots of (n,gamma) cross-sections and capture cross-sections into ground state

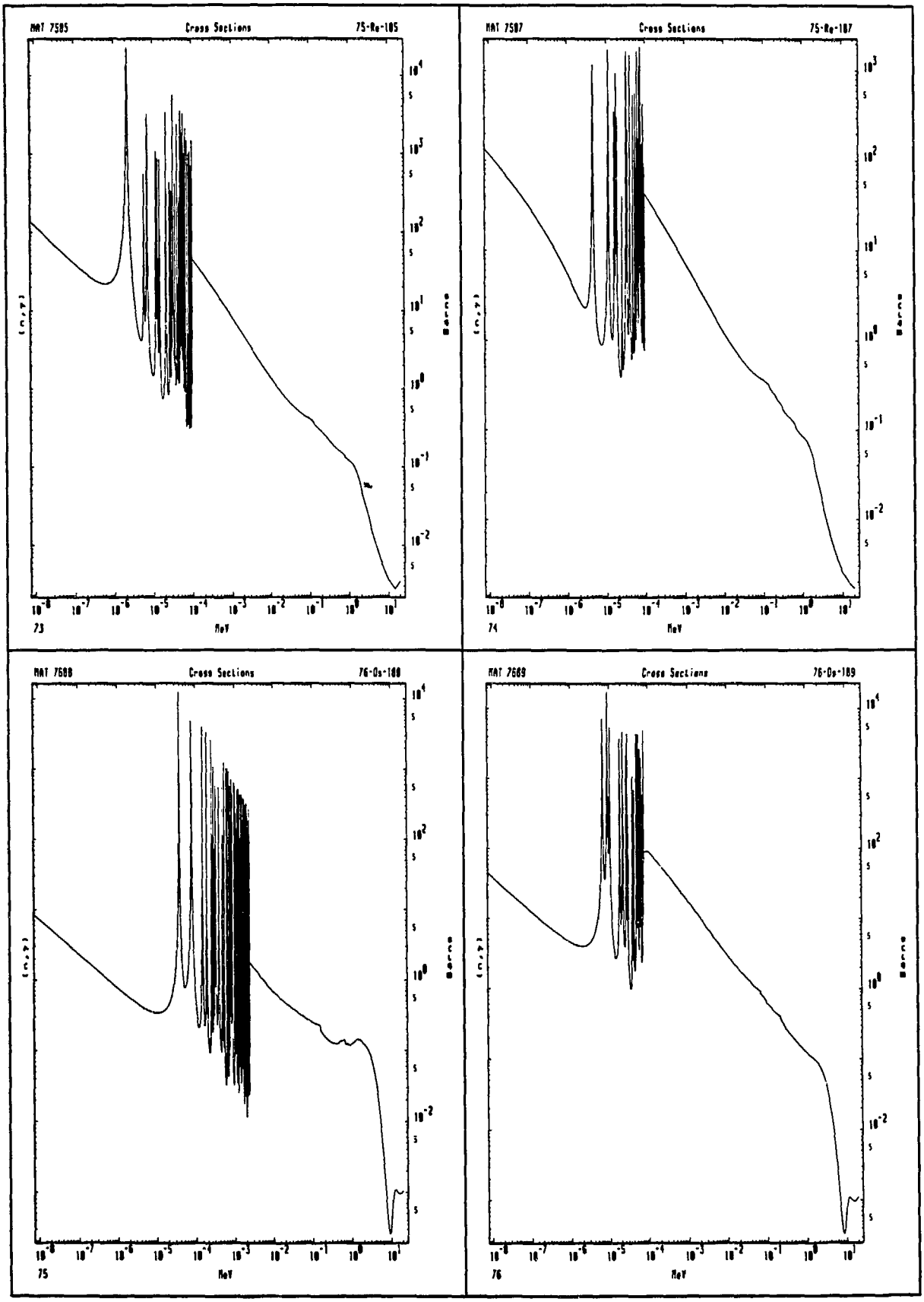


Part 4: Plots of (n,gamma) cross-sections and capture cross-sections into ground state

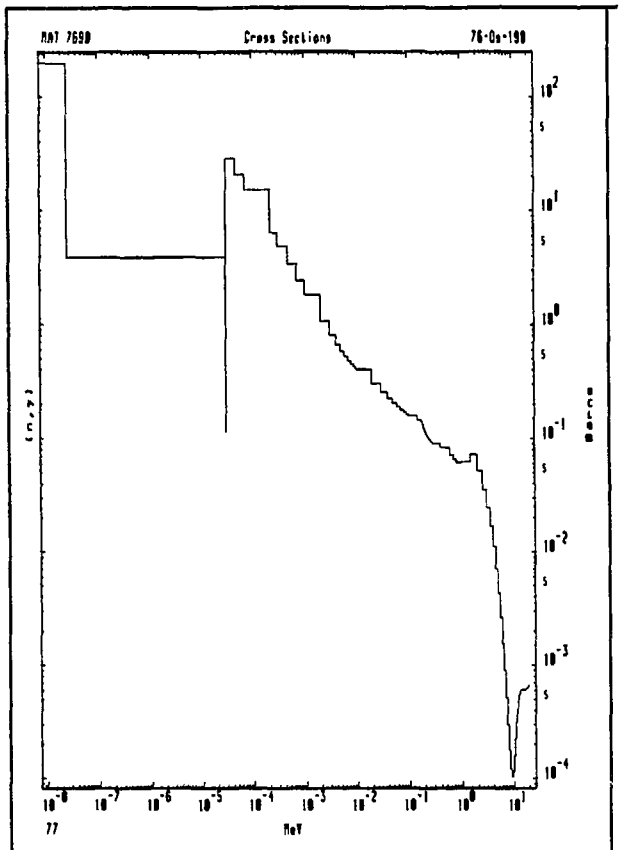


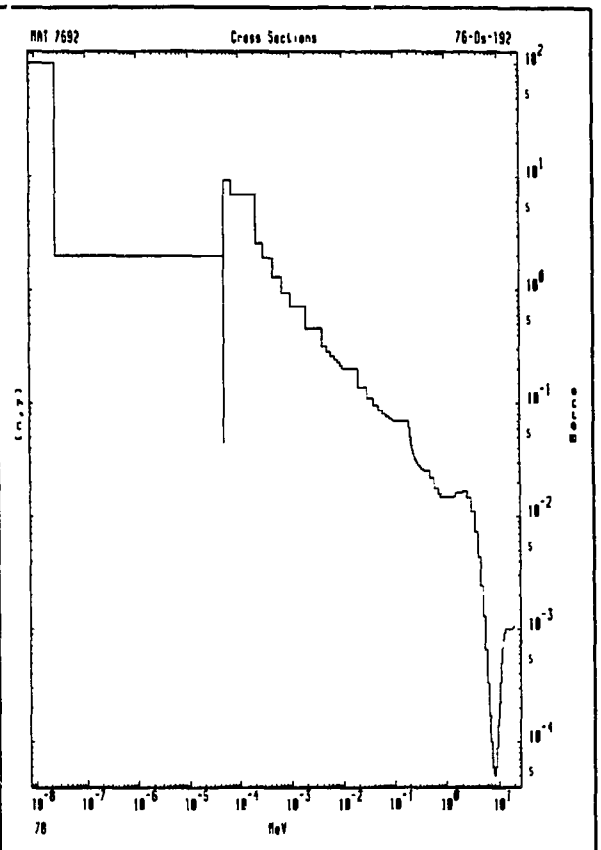
Part 6: Plots of 2nd capture isomer production cross-sections

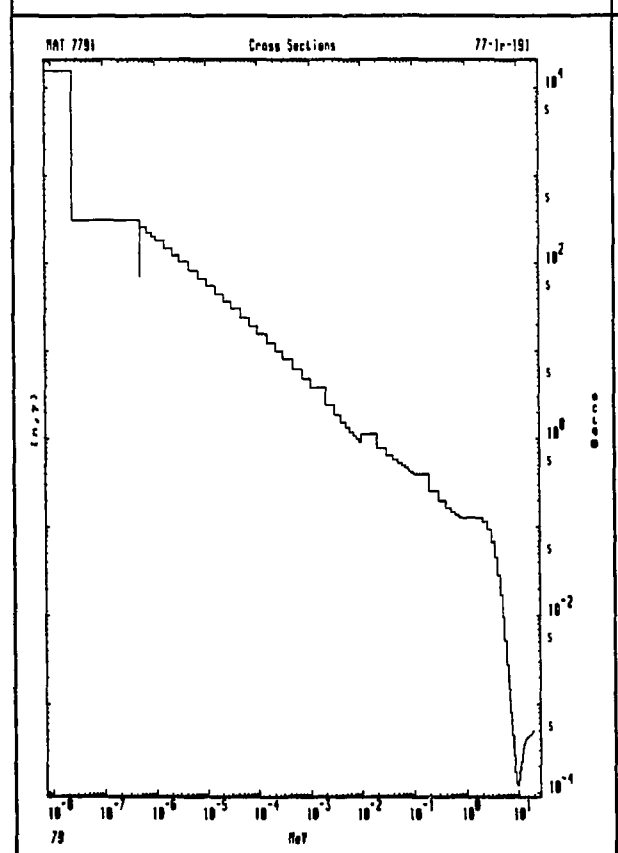
Part 4: Plots of (n,gamma) cross-sections and capture cross-sections into ground state

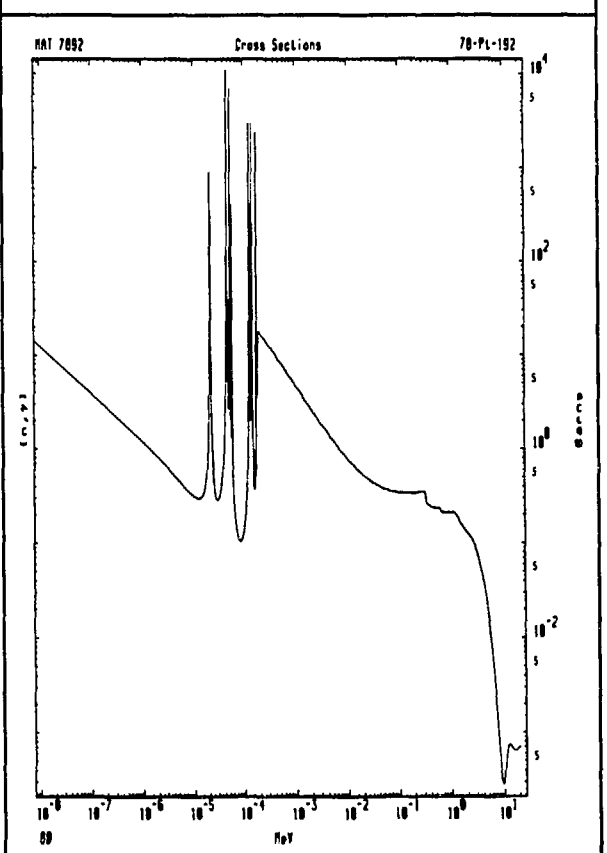


Part 4: Plots of (n,gamma) cross-sections and capture cross-sections into ground state

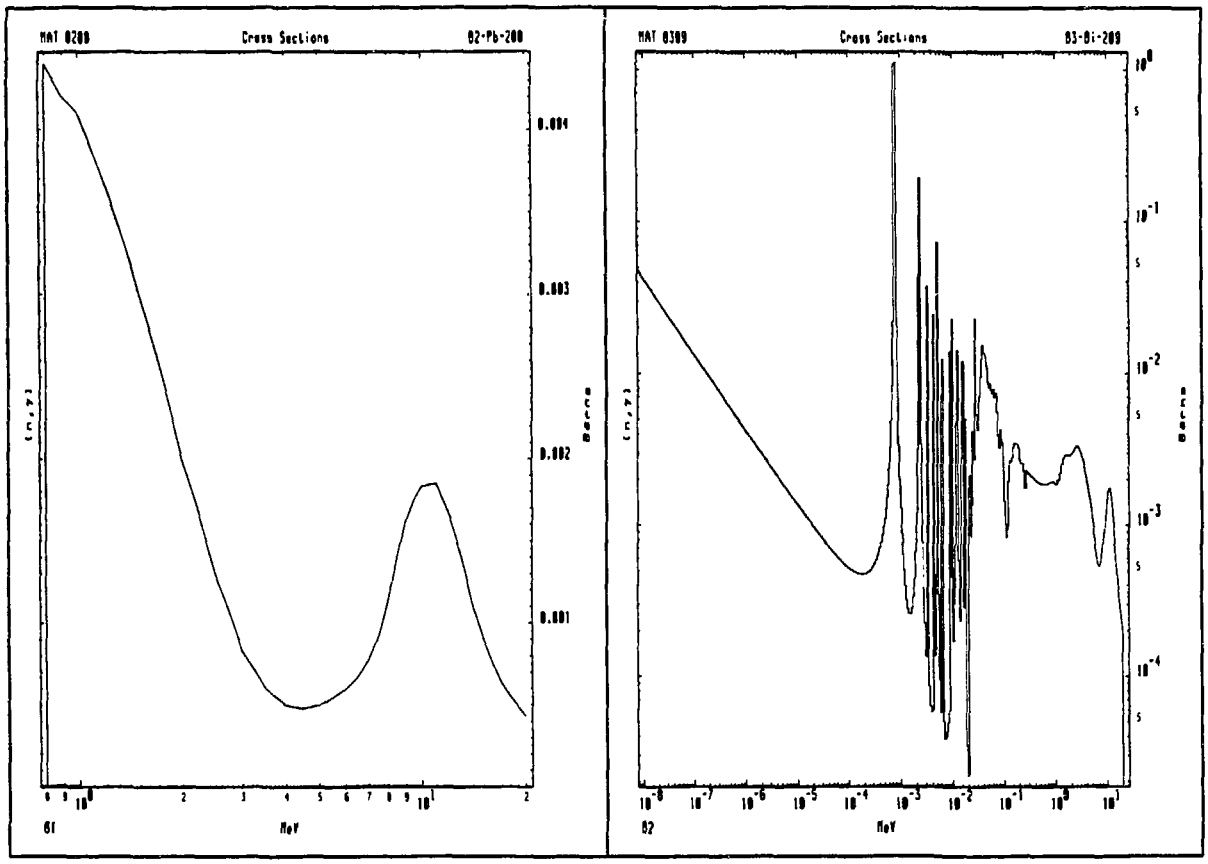




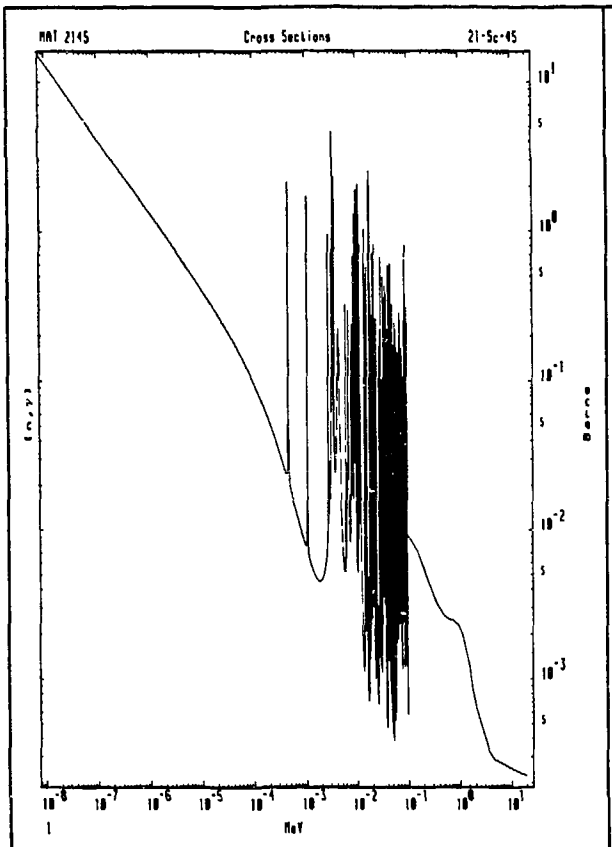


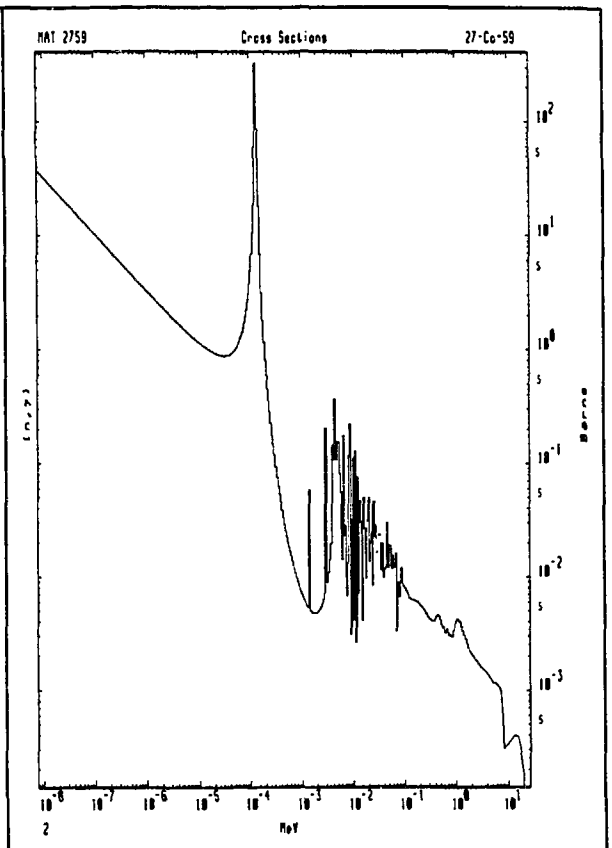


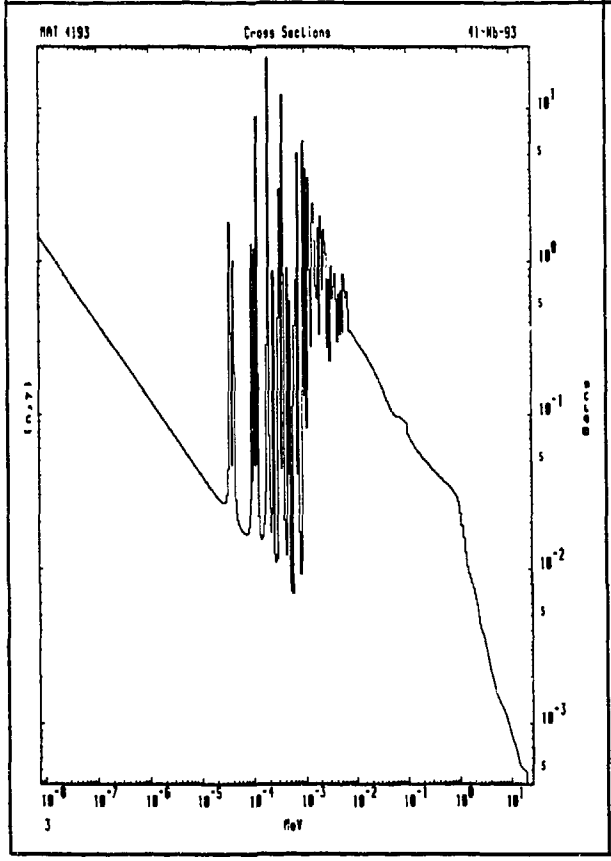
Part 4: Plots of (n,gamma) cross-sections and capture cross-sections into ground state

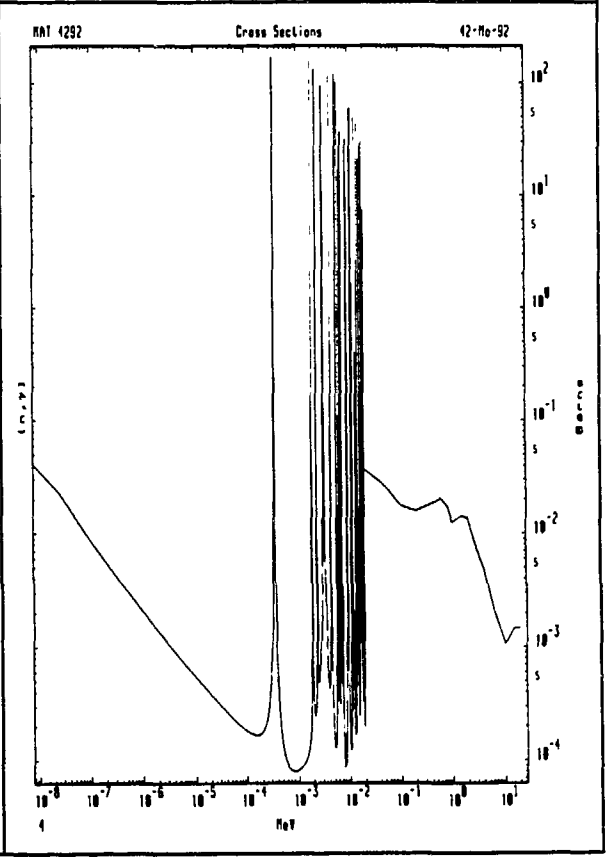


Part 5: Plots of capture cross-sections into isomeric states

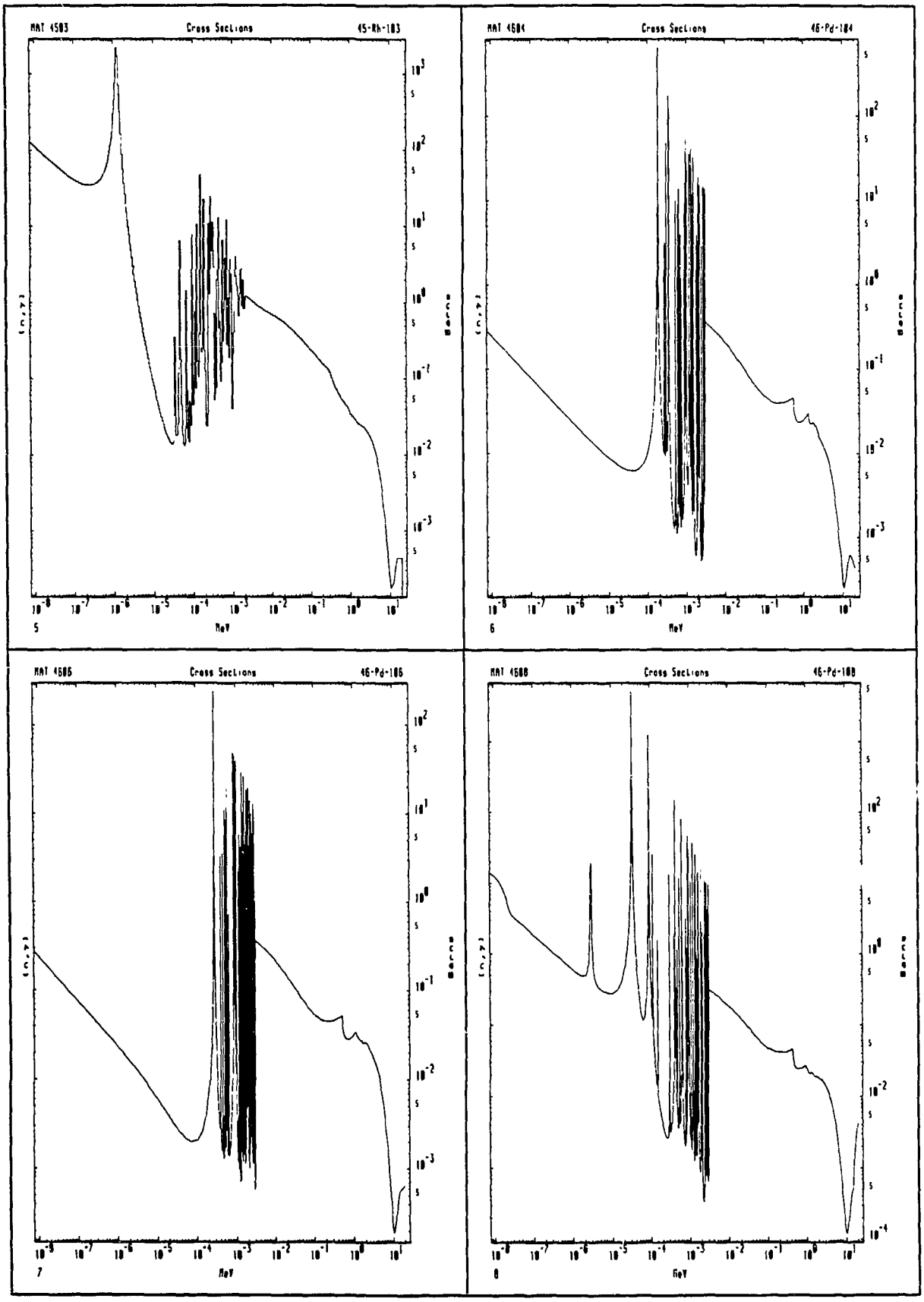




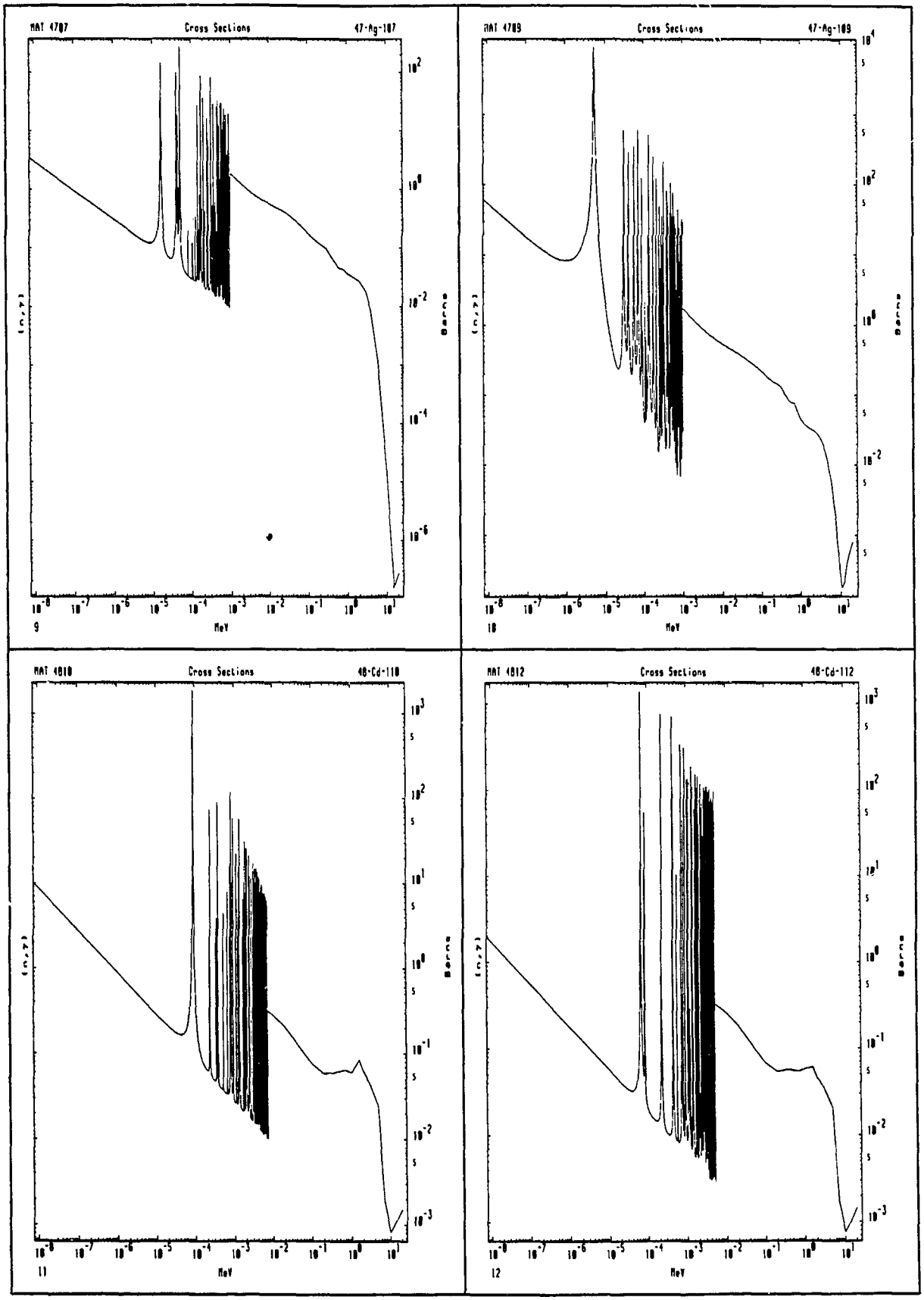




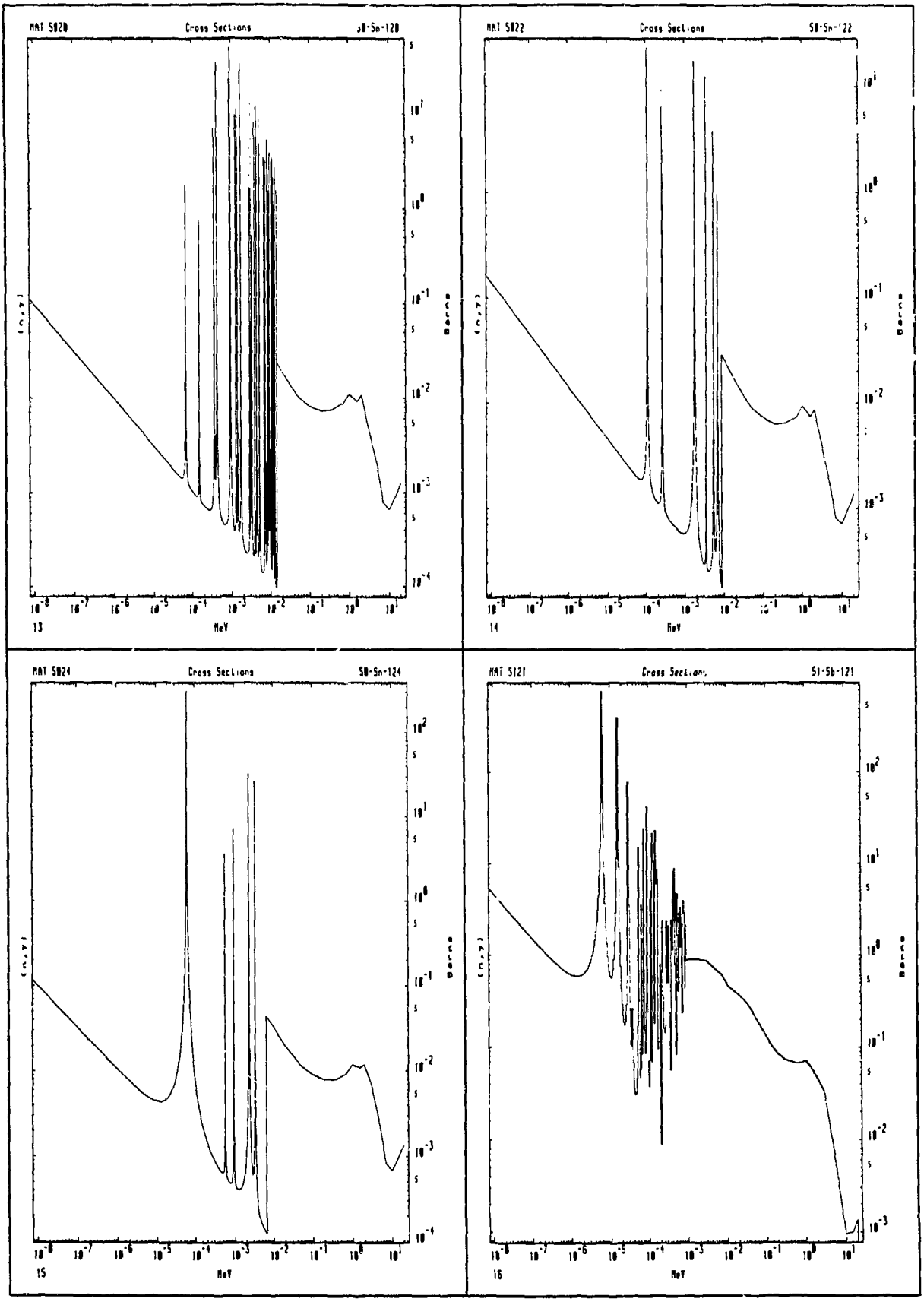
Part 5: Plots of capture cross-sections into isomeric states



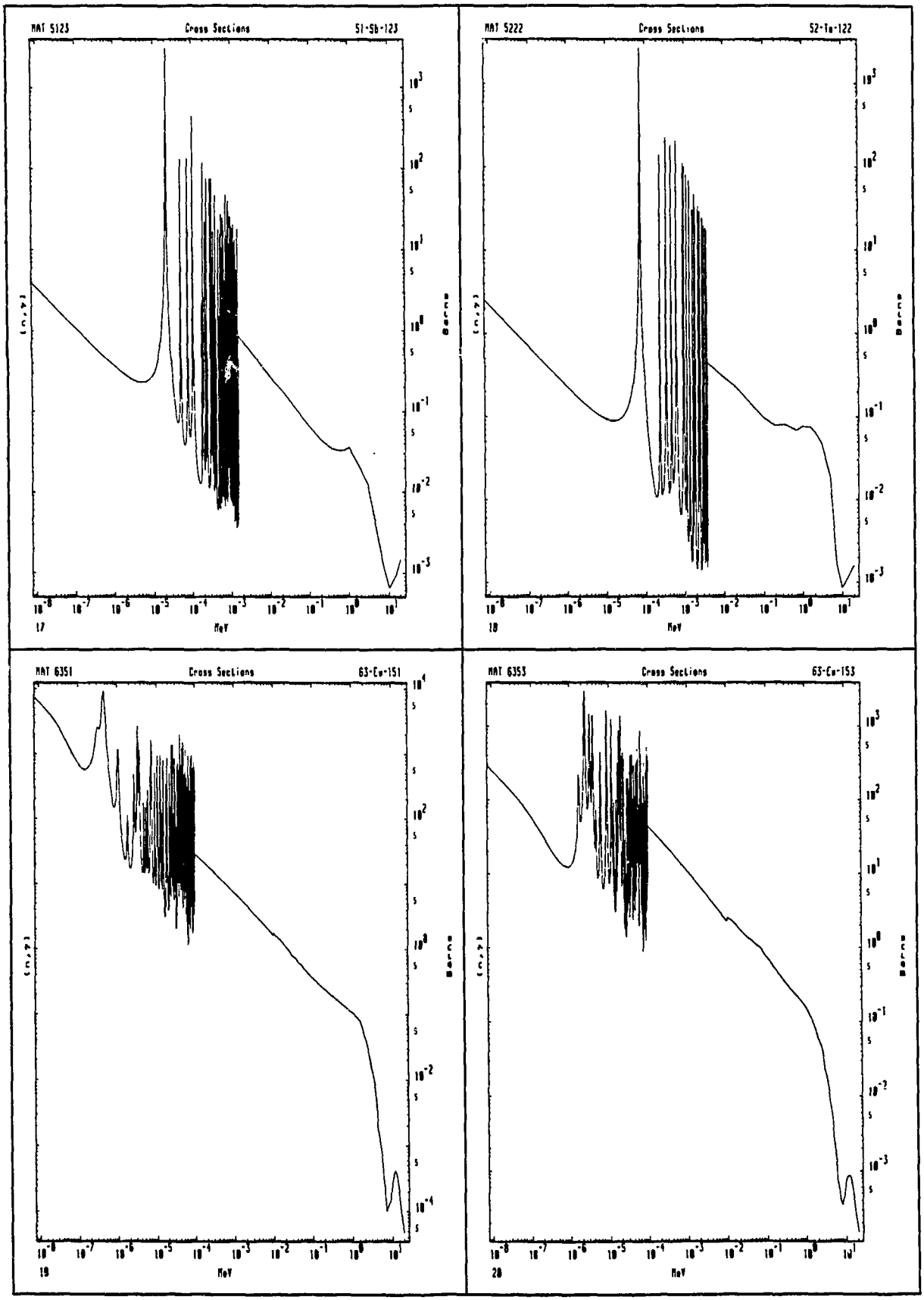
Part 5: Plots of capture cross-sections into isomeric states



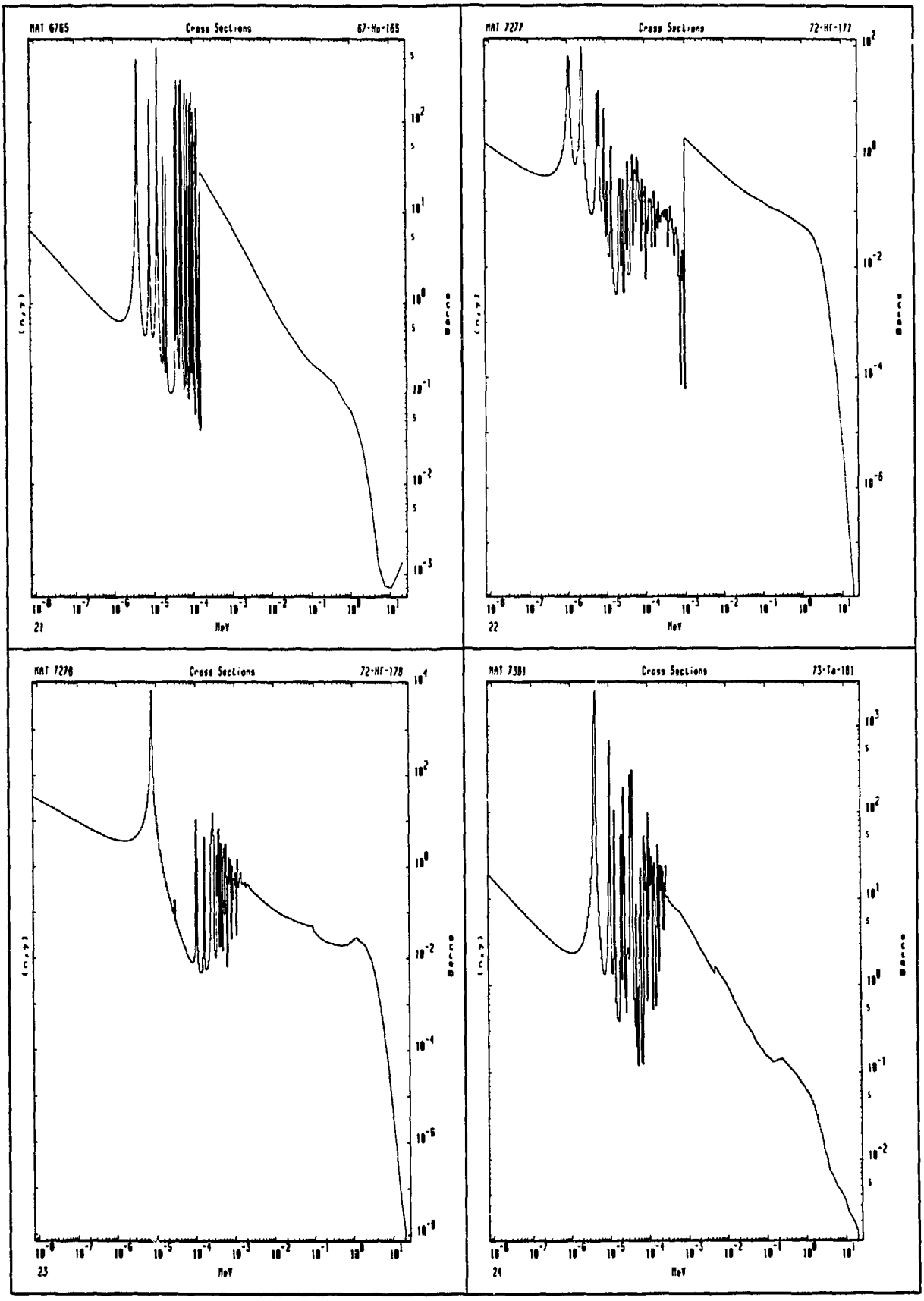
Part 5: Plots of capture cross-sections into isomeric states



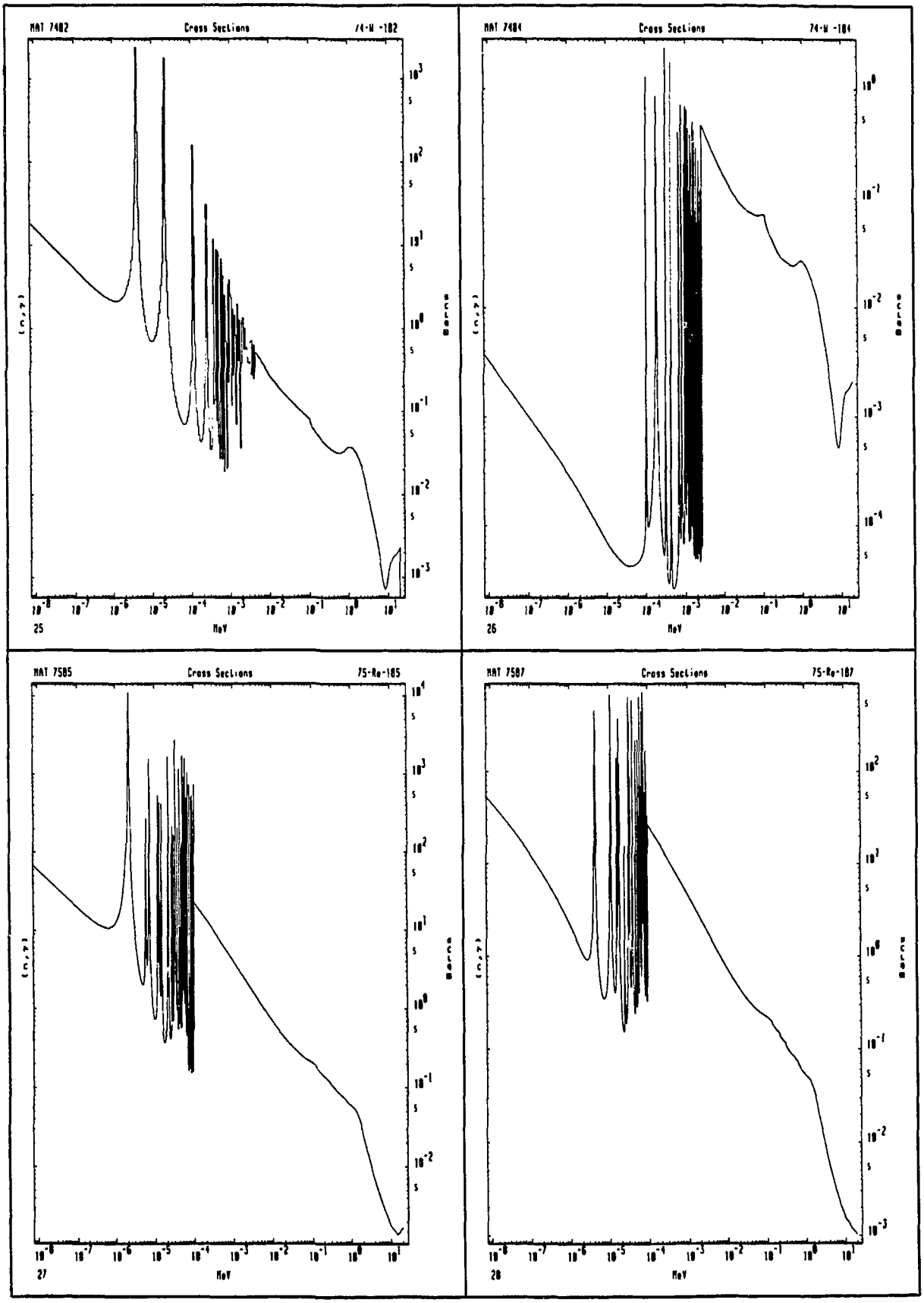
Part 5: Plots of capture cross-sections into isomeric states



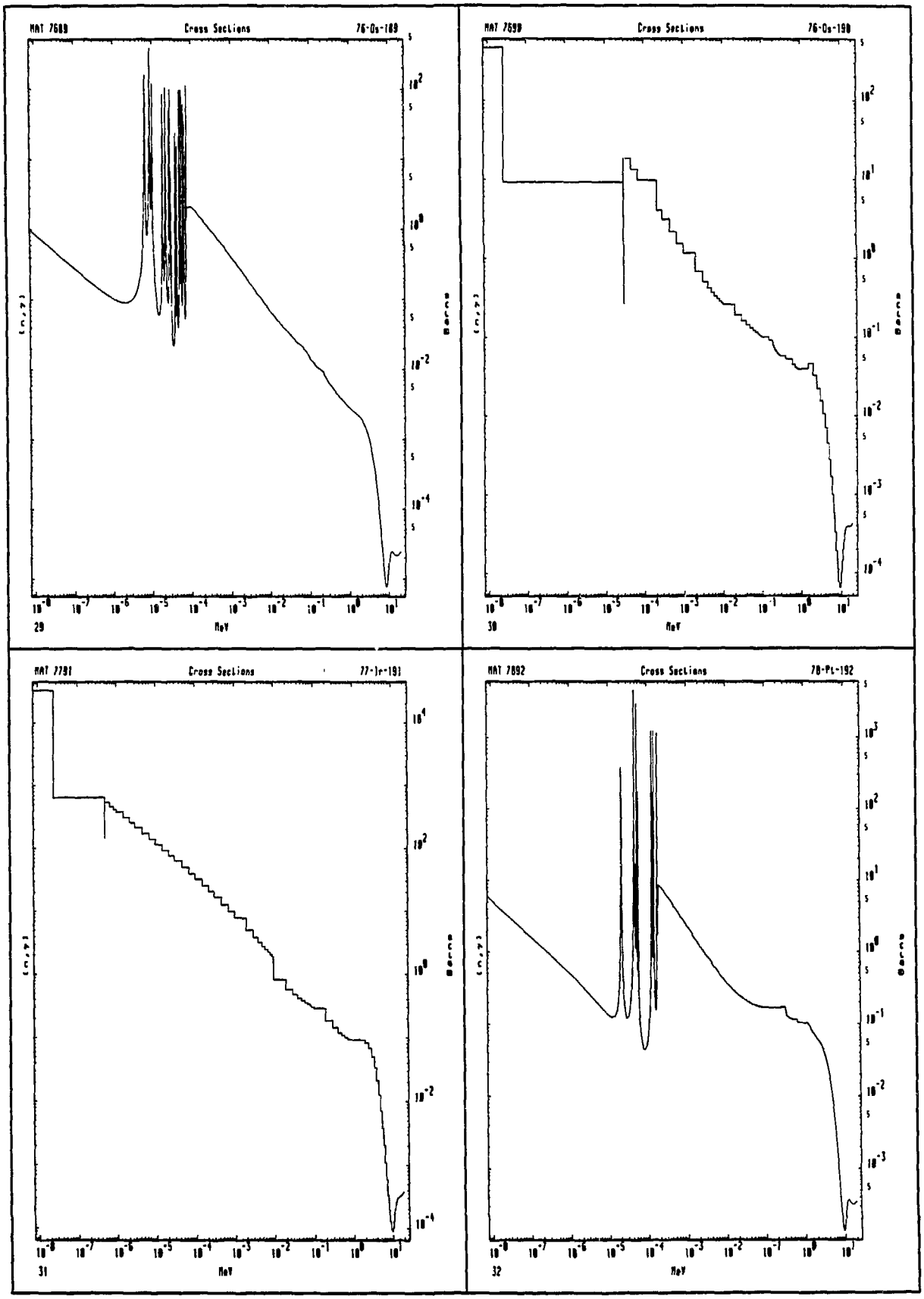
Part 5: Plots of capture cross-sections into isomeric states



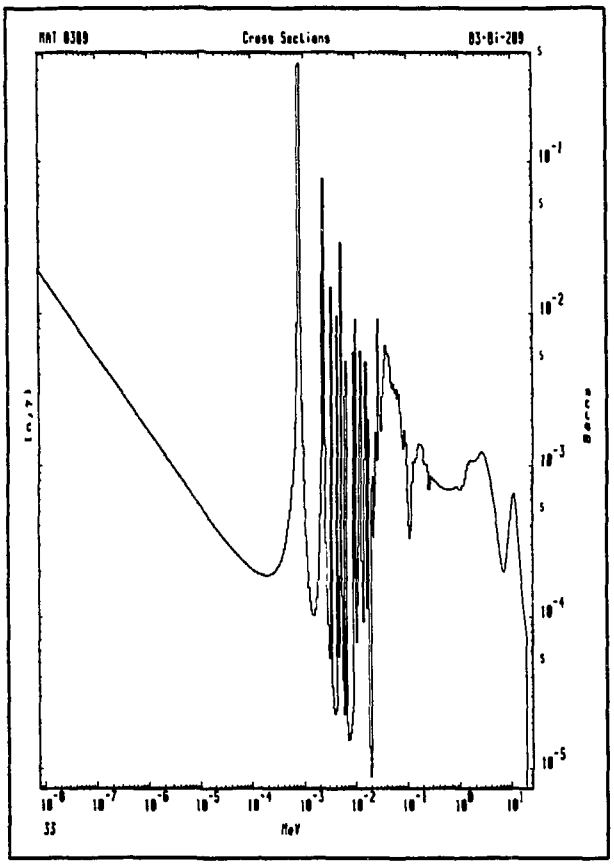
Part 5: Plots of capture cross-sections into isomeric states



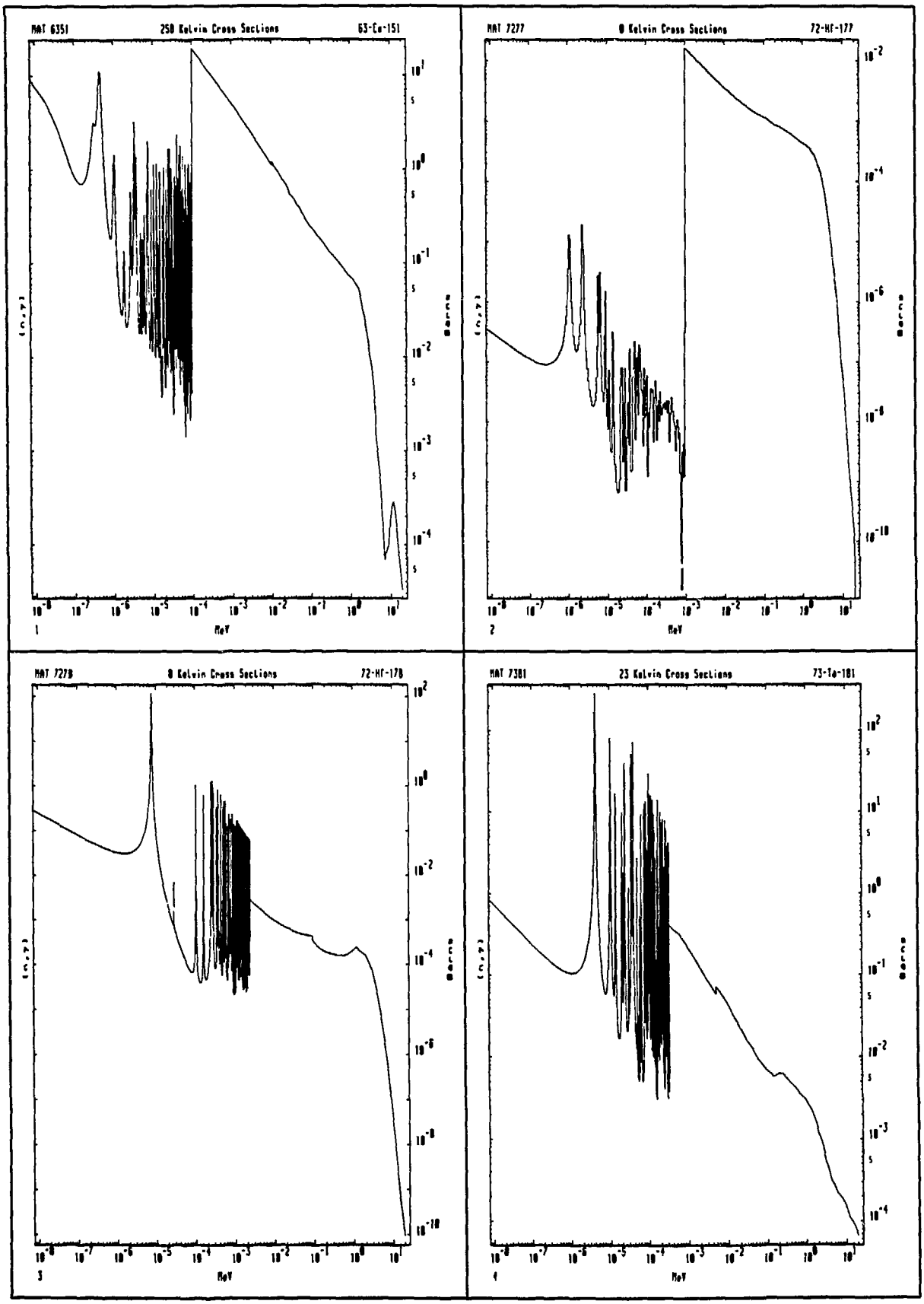
Part 5: Plots of capture cross-sections into isomeric states



Part 5: Plots of capture cross-sections into isomeric states



Part 6: Plots of 2nd capture isomer production cross-sections



Part 6: Plots of 2nd capture isomer production cross-sections