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ENDF/B-VIII versus ENDF/B-VII: What's Different?

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ABSTRACT

Recently the new ENDF/B-VIII library was released; this completely replaces the earlier ENDF/B-VII library. One of the first questions we ask about a new library is: **What's Different?** Here I attempt to at least partially answer this question. I present results in both tabulated form (so you can quickly determine if any evaluations of interest to you have changed), and graphic form (so that you can see how much evaluations have changed and in what energy ranges).

May 2018

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Vienna, May 2018

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Overview

Recently the new ENDF/B-VIII library [1, 2] was released; this completely replaces the earlier ENDF/B-VII library [3]. One of the first questions we ask about a new library is: **What's Different?** Here I attempt to at least partially answer this question. I present results in both tabulated form (so you can quickly determine if any evaluations of interest to you have changed), and graphic form (so that you can see how much evaluations have changed and in what energy ranges).

Here is a quick summary of ENDF/B-VIII and VII

	Evaluations
ENDF/B-VIII	557
ENDF/B-VII	423 (422 as also in VIII)
MF=1 to 6, neutron data different	137
MT=1, total cross section different	70

This report is designed to show the reader where ENDF/B-VIII and VII differ, so that the reader can easily determine if there have been any important changes in evaluations that they are interested in.

For the tables I have compared what I refer to as the ENDF neutron data, namely MF=1 through 6. Here I did a character-by-character comparison of the same sections (MF/MT) of the original data, referred to as ENDF2C, that appear I both ENDF/B-VIII [1] and VII [3]; here I found differences in 137 evaluations.

For the plots I have only compared the total cross sections at room temperature (293.6 K) for all evaluations that are common to both libraries. I found that of the 423 evaluations in ENDF/B-VII, 70 of these have total cross sections that differ by 1% or more from the evaluation of the same isotope in ENDF/B-VIII. Plots of all 70 appear later in this report.

WARNING: This should be considered only a preliminary comparison; obviously there can be more subtle important differences that do not affect the total cross sections. However, my experience is that it is difficult to make any substantial changes in neutron cross sections without impacting the total cross section.

Below I present plots comparing the total cross section of these 70 isotopes. The plots are only broad overviews of the total cross sections over their entire energy range. If you have interest in more detailed plots for specific evaluations, you can download the POINT2018 [4] and POINT2015 [5] and the PREPRO [6, 7] code that I used to prepare and view the data. This is all I needed to do my comparisons, and is all you should need to do any more detailed comparisons to meet your individual needs.

What I present in the plots is the original ENDF/B-VII.0 and VII.1 data after it has been processed by my PREPRO2018 codes [7]; these codes linearized the data, added the resonance contributions and Doppler broadened to room temperature (293.6 K) the cross sections.

Availability of ENDF/B-VIII Final and POINT2018

ENDF/B-VIII Final [1, 2] data library is now freely available through the National Nuclear Data Center (NNDC), Brookhaven National Laboratory. **POINT2018** [4] and **POINT2015** [5] are FREELY available on-line; see the links listed with references.

Periodic Table

ENDF/B-VII and VIII both span the periodic table of elements from Z = 1 to 100, but not all elements are represented. The below table summarizes the number of evaluations included for each elements (Z) in ENDF/B-VII (7) and VIII (8). 0* indicates no data for this element, e.g., ENDF/B-VIII does not include any data for Z = 85, 86, and 87.

Z	7	8	Z	7	8	Z	7	8	Z	7	8	Z	7	8
1	3	3	21	1	1	41	3	3	61	5	10	81	2	3
2	2	2	22	5	5	42	8	9	62	9	11	82	4	5
3	2	2	23	2	3	43	1	2	63	7	7	83	1	2
4	2	2	24	4	5	44	10	11	64	8	9	84	0*	3
5	2	2	25	1	2	45	2	3	65	2	4	85	0*	0*
6	1	2	26	4	5	46	7	9	66	7	11	86	0*	0*
7	2	2	27	3	3	47	4	12	67	2	2	87	0*	0*
8	2	3	28	6	7	48	9	11	68	6	9	88	4	4
9	1	1	29	2	3	49	2	3	69	3	4	89	3	3
10	0*	3	30	6	7	50	14	15	70	0*	9	90	8	8
11	2	2	31	2	3	51	5	6	71	2	2	91	5	5
12	3	3	32	5	7	52	11	15	72	6	9	92	12	12
13	1	2	33	2	3	53	5	10	73	3	3	93	6	7
14	3	5	34	7	9	54	12	14	74	5	7	94	10	11
15	1	1	35	2	3	55	5	5	75	2	3	95	7	7
16	4	5	36	7	9	56	9	11	76	0*	9	96	11	11
17	2	3	37	3	3	57	3	3	77	2	4	97	6	6
18	3	6	38	6	7	58	8	10	78	0*	9	98	8	9
19	3	3	39	3	3	59	3	3	79	1	1	99	6	6
20	6	9	40	7	7	60	8	9	80	7	10	100	1	1

What's New and Old: ENDF/B-VIII vs. VII

ENDF/B-VIII (POINT2018) includes **557** evaluations, compared to **423** evaluations in ENDF/B-VII (POINT2015). There are **135** new evaluations included in VIII which were not included in VII. **422** of the **423** evaluations from VII are included in VIII; the only one not included is **6-C-Nat**, which has been replaced by its isotopes. Note, that with **6-C-Nat** replaced by its isotopes, **VIII does not include any elemental mixtures**.

135 New Evaluations in POINT2018 (ENDF/B-VIII)

Neutron	**18-Ar-41**	**33-As-73**	**47-Ag-112**	**52-Te-131**	**61-Pm-143**	**68-Er-163**	**72-Hf-181**	**77-Ir-192**	**81-Tl-204**
6-C -12	**20-Ca-41**	**34-Se-75**	**47-Ag-113**	**52-Te-131m**	**61-Pm-144**	**68-Er-165**	**72-Hf-182**	**77-Ir-194m**	**82-Pb-205**
6-C -13	**20-Ca-45**	**34-Se-81**	**47-Ag-114**	**53-I -128**	**61-Pm-145**	**68-Er-169**	**74-W -181**	**78-Pt-190**	**83-Bi-210m**
8-O -18	**20-Ca-47**	**35-Br-80**	**47-Ag-115**	**53-I -132**	**61-Pm-146**	**69-Tm-171**	**74-W -185**	**78-Pt-191**	**84-Po-208**
10-Ne-20	**23-V -49**	**36-Kr-79**	**47-Ag-116**	**53-I -132m**	**61-Pm-150**	**70-Yb-168**	**75-Re-186m**	**78-Pt-192**	**84-Po-209**
10-Ne-21	**24-Cr-51**	**36-Kr-81**	**47-Ag-117**	**53-I -133**	**62-Sm-145**	**70-Yb-169**	**76-Os-184**	**78-Pt-193**	**84-Po-210**
10-Ne-22	**25-Mn-54**	**38-Sr-85**	**47-Ag-118m**	**53-I -134**	**62-Sm-146**	**70-Yb-170**	**76-Os-185**	**78-Pt-194**	**93-Np-236m**
13-Al-26m	**26-Fe-55**	**42-Mo-93**	**48-Cd-107**	**54-Xe-125**	**64-Gd-159**	**70-Yb-171**	**76-Os-186**	**78-Pt-195**	**94-Pu-245**
14-Si-31	**28-Ni-63**	**43-Tc-98**	**48-Cd-109**	**54-Xe-127**	**65-Tb-158**	**70-Yb-172**	**76-Os-187**	**78-Pt-196**	**98-Cf-247**
14-Si-32	**29-Cu-64**	**44-Ru-97**	**49-In-114**	**56-Ba-131**	**65-Tb-161**	**70-Yb-173**	**76-Os-188**	**78-Pt-197**	
16-S -35	**30-Zn-69**	**45-Rh-104**	**50-Sn-121m**	**56-Ba-139**	**66-Dy-154**	**70-Yb-174**	**76-Os-189**	**78-Pt-198**	
17-Cl-36	**31-Ga-70**	**46-Pd-103**	**51-Sb-122**	**58-Ce-137**	**66-Dy-155**	**70-Yb-175**	**76-Os-190**	**80-Hg-197**	
18-Ar-37	**32-Ge-71**	**46-Pd-109**	**52-Te-121**	**58-Ce-137m**	**66-Dy-157**	**70-Yb-176**	**76-Os-191**	**80-Hg-197m**	
18-Ar-39	**32-Ge-75**	**47-Ag-108**	**52-Te-121m**	**60-Nd-149**	**66-Dy-159**	**72-Hf-175**	**76-Os-192**	**80-Hg-203**	

423 Evaluations in POINT2015 (ENDF/B-VII)

(422 in VIII; 6-C-Nat is NOT included in VIII)

1-H -1	20-Ca-44	32-Ge-74	42-Mo-92	49-In-115	54-Xe-131	61-Pm-147	68-Er-166	88-Ra-224	94-Pu-242
1-H -2	20-Ca-46	32-Ge-76	42-Mo-94	50-Sn-112	54-Xe-132	61-Pm-148	68-Er-167	88-Ra-225	94-Pu-243
1-H -3	20-Ca-48	33-As-74	42-Mo-95	50-Sn-113	54-Xe-133	61-Pm-148m	68-Er-168	88-Ra-226	94-Pu-244
2-He-3	21-Sc-45	33-As-75	42-Mo-96	50-Sn-114	54-Xe-134	61-Pm-149	68-Er-170	89-Ac-225	94-Pu-246
2-He-4	22-Ti-46	34-Se-74	42-Mo-97	50-Sn-115	54-Xe-135	61-Pm-151	69-Tm-168	89-Ac-226	95-Am-240
3-Li-6	22-Ti-47	34-Se-76	42-Mo-98	50-Sn-116	54-Xe-136	62-Sm-144	69-Tm-169	89-Ac-227	95-Am-241
3-Li-7	22-Ti-48	34-Se-77	42-Mo-99	50-Sn-117	55-Cs-133	62-Sm-147	69-Tm-170	90-Th-227	95-Am-242
4-Be-7	22-Ti-49	34-Se-78	42-Mo-100	50-Sn-118	55-Cs-134	62-Sm-148	71-Lu-175	90-Th-228	95-Am-242m
4-Be-9	22-Ti-50	34-Se-79	43-Tc-99	50-Sn-119	55-Cs-135	62-Sm-149	71-Lu-176	90-Th-229	95-Am-243
5-B -10	23-V -50	34-Se-80	44-Ru-96	50-Sn-120	55-Cs-136	62-Sm-150	72-Hf-174	90-Th-230	95-Am-244
5-B -11	23-V -51	34-Se-82	44-Ru-98	50-Sn-122	55-Cs-137	62-Sm-151	72-Hf-176	90-Th-231	95-Am-244m
6-C -Nat	24-Cr-50	35-Br-79	44-Ru-99	50-Sn-123	56-Ba-130	62-Sm-152	72-Hf-177	90-Th-232	96-Cm-240
7-N -14	24-Cr-52	35-Br-81	44-Ru-100	50-Sn-124	56-Ba-132	62-Sm-153	72-Hf-178	90-Th-233	96-Cm-241
7-N -15	24-Cr-53	36-Kr-78	44-Ru-101	50-Sn-125	56-Ba-133	62-Sm-154	72-Hf-179	90-Th-234	96-Cm-242
8-O -16	24-Cr-54	36-Kr-80	44-Ru-102	50-Sn-126	56-Ba-134	63-Eu-151	72-Hf-180	91-Pa-229	96-Cm-243
8-O -17	25-Mn-55	36-Kr-82	44-Ru-103	51-Sb-121	56-Ba-135	63-Eu-152	73-Ta-180	91-Pa-230	96-Cm-244
9-F -19	26-Fe-54	36-Kr-83	44-Ru-104	51-Sb-123	56-Ba-136	63-Eu-153	73-Ta-181	91-Pa-231	96-Cm-245
11-Na-22	26-Fe-56	36-Kr-84	44-Ru-105	51-Sb-124	56-Ba-137	63-Eu-154	73-Ta-182	91-Pa-232	96-Cm-246
11-Na-23	26-Fe-57	36-Kr-85	44-Ru-106	51-Sb-125	56-Ba-138	63-Eu-155	74-W -180	91-Pa-233	96-Cm-247
12-Mg-24	26-Fe-58	36-Kr-86	45-Rh-103	51-Sb-126	56-Ba-140	63-Eu-156	74-W -182	92-U -230	96-Cm-248
12-Mg-25	27-Co-58	37-Rb-85	45-Rh-105	52-Te-120	57-La-138	63-Eu-157	74-W -183	92-U -231	96-Cm-249
12-Mg-26	27-Co-58m	37-Rb-86	46-Pd-102	52-Te-122	57-La-139	64-Gd-152	74-W -184	92-U -232	96-Cm-250
13-Al-27	27-Co-59	37-Rb-87	46-Pd-104	52-Te-123	57-La-140	64-Gd-153	74-W -186	92-U -233	97-Bk-245
14-Si-28	28-Ni-58	38-Sr-84	46-Pd-105	52-Te-124	58-Ce-136	64-Gd-154	75-Re-185	92-U -234	97-Bk-246
14-Si-29	28-Ni-59	38-Sr-86	46-Pd-106	52-Te-125	58-Ce-138	64-Gd-155	75-Re-187	92-U -235	97-Bk-247
14-Si-30	28-Ni-60	38-Sr-87	46-Pd-107	52-Te-126	58-Ce-139	64-Gd-156	77-Ir-191	92-U -236	97-Bk-248
15-P -31	28-Ni-61	38-Sr-88	46-Pd-108	52-Te-127m	58-Ce-140	64-Gd-157	77-Ir-193	92-U -237	97-Bk-249
16-S -32	28-Ni-62	38-Sr-89	46-Pd-110	52-Te-128	58-Ce-141	64-Gd-158	79-Au-197	92-U -238	97-Bk-250
16-S -33	28-Ni-64	38-Sr-90	47-Ag-107	52-Te-129m	58-Ce-142	64-Gd-160	80-Hg-196	92-U -239	98-Cf-246
16-S -34	29-Cu-63	39-Y -89	47-Ag-109	52-Te-130	58-Ce-143	65-Tb-159	80-Hg-198	92-U -240	98-Cf-248
16-S -36	29-Cu-65	39-Y -90	47-Ag-110m	52-Te-132	58-Ce-144	65-Tb-160	80-Hg-199	92-U -241	98-Cf-249
17-Cl-35	30-Zn-64	39-Y -91	47-Ag-111	53-I -127	59-Pr-141	66-Dy-156	80-Hg-200	93-Np-234	98-Cf-250
17-Cl-37	30-Zn-65	40-Zr-90	48-Cd-106	53-I -129	59-Pr-142	66-Dy-158	80-Hg-201	93-Np-235	98-Cf-251
18-Ar-36	30-Zn-66	40-Zr-91	48-Cd-108	53-I -130	59-Pr-143	66-Dy-160	80-Hg-202	93-Np-236	98-Cf-252
18-Ar-38	30-Zn-67	40-Zr-92	48-Cd-110	53-I -131	60-Nd-142	66-Dy-161	80-Hg-204	93-Np-237	98-Cf-253
18-Ar-40	30-Zn-68	40-Zr-93	48-Cd-111	53-I -135	60-Nd-143	66-Dy-162	81-Tl-203	93-Np-238	98-Cf-254
19-K -39	30-Zn-70	40-Zr-94	48-Cd-112	54-Xe-123	60-Nd-144	66-Dy-163	81-Tl-205	93-Np-239	99-Es-251
19-K -40	31-Ga-69	40-Zr-95	48-Cd-113	54-Xe-124	60-Nd-145	66-Dy-164	82-Pb-204	94-Pu-236	99-Es-252
19-K -41	31-Ga-71	40-Zr-96	48-Cd-114	54-Xe-126	60-Nd-146	67-Ho-165	82-Pb-206	94-Pu-237	99-Es-253
20-Ca-40	32-Ge-70	41-Nb-93	48-Cd-115m	54-Xe-128	60-Nd-147	67-Ho-166m	82-Pb-207	94-Pu-238	99-Es-254
20-Ca-42	32-Ge-72	41-Nb-94	48-Cd-116	54-Xe-129	60-Nd-148	68-Er-162	82-Pb-208	94-Pu-239	99-Es-254m
20-Ca-43	32-Ge-73	41-Nb-95	49-In-113	54-Xe-130	60-Nd-150	68-Er-164	83-Bi-209	94-Pu-240	99-Es-255
							88-Ra-223	94-Pu-241	100-Fm-255

Detailed Differences

I have compared in more detail the original evaluations, exactly as distributed by the National Nuclear data Center (NNDC), Brookhaven. For this comparison I have not changed the original evaluations except to put them all into standard FORTRAN, C, C++, form; these are what are identified at the on-line POINT libraries as ENDF2C [4, 5].

Of the 423 evaluations in VII, 422 were also included in VIII. I have checked what I will call the "neutron" ENDF files, MF=1 through 6, and major reactions (MT=2, 102, 18, 4 and 16), character by character for differences between the evaluations in VII and VIII. I have found differences in 137 of these evaluations, i.e., the remaining 285 evaluations are character by character identical in both libraries.

The below table summarizes my results. I have only listed results for the 137 evaluations where I found differences**. An "X" in any position indicates that both VII and VIII include the same section (the same MF/MT), but these sections are NOT IDENTICAL in VII and VIII.**

What I have checked and listed in the below table, reading left to right,

1) The evaluation identification
2) MF=1/MT=452 = total neutrons per fission
3) MF=2 = resonance parameters

Beyond this point the organization of the table switches to array results by MT, including MT=2 (elastic), MT=102 (capture), MF=18 (fission), MT=4 (total inelastic), and MT=16 (n,2n). Under each of these 5 reactions I define whether or not I found differences in MF=3 through 6,

3 = cross sections
4 = angular distributions
5 = energy distributions
6 = double differential distributions

For example, if you look at the below table, for 17-Cl-35, you will see that I found differences for resonance parameters (MF=2), tabulated elastic cross sections (MT/MF=2/3), tabulated capture cross sections (MT/MF=102/3) and tabulated total inelastic (MF/MF=4/3). All of the other data is identical in ENDF/B-VII and VIII.

Evaluation	MF=1	MF=2	MT=2				MT=102				MT=18				MT=4				MT=16			
MF(3,4,5,6)	nu	res	3	4	5	6	3	4	5	6	3	4	5	6	3	4	5	6	3	4	5	6
1-H -1		X	X	X			X			X												
1-H -2				X																		
3-Li-6		X	X	X			X								X							
3-Li-7							X								X					X	X	
4-Be-7		X	X	X																		
4-Be-9				X																		X
5-B -10		X	X	X			X															
5-B -11				X																		
7-N -15																				X		
8-O -16		X	X	X			X								X							X
8-O -17							X								X							
11-Na-23			X				X								X							
17-Cl-35		X	X				X								X							
17-Cl-37			X				X								X							
18-Ar-38			X				X								X							
18-Ar-40			X	X			X								X				X			
20-Ca-40		X	X				X															
21-Sc-45		X	X												X							
24-Cr-54			X				X								X							
26-Fe-54		X	X	X			X								X				X			X
26-Fe-56		X	X	X			X								X				X			X
26-Fe-57		X	X	X			X								X				X			X
26-Fe-58		X	X	X			X								X				X			X
27-Co-58			X				X															
27-Co-58.M			X				X								X							
27-Co-59			X	X			X								X				X			
28-Ni-58			X	X			X								X				X			X
28-Ni-59		X	X	X			X												X			
28-Ni-60			X	X			X								X				X			X
28-Ni-61			X	X			X								X				X			X
28-Ni-62			X	X			X								X				X			X
28-Ni-64			X	X			X								X				X			X
29-Cu-63		X	X	X			X								X				X			X
29-Cu-65		X	X	X			X								X				X			X
33-As-74		X	X	X			X			X									X			X
36-Kr-78		X	X	X			X												X			X
38-Sr-88		X	X																			
40-Zr-90		X	X				X												X			X
40-Zr-91		X	X	X			X			X					X							X
40-Zr-92		X	X	X			X															
40-Zr-94		X	X				X															
40-Zr-95			X				X								X							
40-Zr-96		X	X				X															
41-Nb-93		X	X				X															
42-Mo-95				X																		
44-Ru-105			X				X								X							
45-Rh-103		X																				
45-Rh-105		X	X	X			X								X				X	X	X	
50-Sn-120			X	X			X								X				X			

Evaluation MF(3,4,5,6)	MF=1 nu	MF=2 res	MT=2 3 4 5 6	MT=102 3 4 5 6	MT=18 3 4 5 6	MT=4 3 4 5 6	MT=16 3 4 5 6
50-Sn-122		X	X X	X		X	X X X
50-Sn-124		X	X X	X		X	X X X
50-Sn-126		X	X	X		X	
52-Te-132			X X	X X		X	X X
54-Xe-123			X	X			
54-Xe-124		X	X X	X			X X
54-Xe-135		X					
58-Ce-136			X			X	
60-Nd-143			X	X		X	
61-Pm-148.M		X					
62-Sm-144		X	X			X	
63-Eu-153			X	X			X
63-Eu-154		X					
64-Gd-152			X			X	
64-Gd-154		X					
64-Gd-160			X	X		X	
66-Dy-160			X			X	
69-Tm-168				X	X	X	
69-Tm-169						X	
69-Tm-170			X	X		X	
72-Hf-174		X	X X	X		X	X
72-Hf-176			X X	X		X	X
72-Hf-177			X X	X		X	X
72-Hf-178			X X	X		X	X
72-Hf-179			X X	X		X	X
72-Hf-180			X X	X		X	X
73-Ta-180		X	X	X			
73-Ta-181			X				
74-W -182		X	X	X			
74-W -183		X	X	X			
74-W -184		X	X	X			
74-W -186		X	X	X			
75-Re-185		X	X	X			
75-Re-187		X	X	X			
79-Au-197		X	X	X		X	
81-Tl-203			X	X		X	
82-Pb-204				X		X	
82-Pb-206			X	X		X	
90-Th-232					X		
92-U -230	X		X	X	X	X	
92-U -232	X		X	X	X	X	
92-U -233	X	X	X X	X	X X X	X	X X
92-U -235	X	X	X X	X	X X X	X	X X
92-U -238	X	X	X X	X	X X	X	X X
92-U -239	X	X	X X	X	X X	X	X X
92-U -240		X					
92-U -241	X	X		X	X	X	
93-Np-236	X						

Evaluation	MF=1	MF=2	MT=2				MT=102				MT=18				MT=4				MT=16			
MF(3,4,5,6)	nu	res	3	4	5	6	3	4	5	6	3	4	5	6	3	4	5	6	3	4	5	6
93-Np-238	X																					
94-Pu-239	X	X	X				X				X	X	X						X			X
94-Pu-240	X	X	X				X				X				X							
94-Pu-243	X	X																				
94-Pu-244	X																					
94-Pu-246	X																					
95-Am-241			X	X			X						X		X				X			X
95-Am-243		X											X									
95-Am-244				X																		
95-Am-244.M				X																		
96-Cm-241	X																					
96-Cm-242	X																					
96-Cm-243				X																		
96-Cm-244	X																					
96-Cm-246	X																					
96-Cm-247	X		X				X				X				X							
96-Cm-248	X			X																		
96-Cm-249	X																					
96-Cm-250	X																					
97-Bk-245	X																					
97-Bk-246	X																					
97-Bk-247	X																					
97-Bk-248	X																					
97-Bk-249	X																					
97-Bk-250	X																					
98-Cf-246	X																					
98-Cf-248	X																					
98-Cf-249	X																					
98-Cf-250	X																					
98-Cf-251	X																					
98-Cf-252	X																					
98-Cf-253	X																					
98-Cf-254	X																					
99-Es-251	X																					
99-Es-252	X																					
99-Es-253	X																					
99-Es-254	X																					
99-Es-255	X																					
100-Fm-255	X																					

70 Plots of Total with 1% or More Differences

The following plots only present an overview of the difference in the total cross section (MF/MT=3/1) for the 70 cases where I found differences of 1% on more between the ENDF/B-VIII and VII data. For each evaluation there is only one plot covering the entire energy range of each evaluation; for most ENDF/B evaluations this spans the energy range from 10^{-5} eV to 20 MeV, or more.

The 70 plots are grouped 4 per page, for a total of 18 pages; I judged 70 pages of plots to be excessive and larger plots add little additional information. For more detail full sized 70 plots are now available on-line at,
redcullen1.net/HOMEPAGE.NEW/ENDFB-VIII-Diff/ENDF-VIII-Diff.htm

70 Evaluations with 1% or more Total Differences

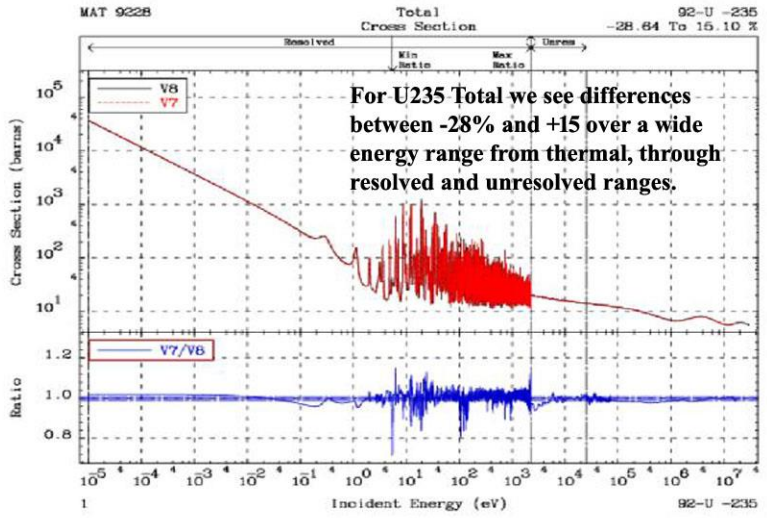
1-H -1	27-Co-58	40-Zr-96	72-Hf-174	79-Au-197
3-Li-6	27-Co-58.M	41-Nb-93	72-Hf-176	82-Pb-206
4-Be-7	27-Co-59	45-Rh-105	72-Hf-177	92-U -232
5-B -10	28-Ni-59	50-Sn-120	72-Hf-178	92-U -233
8-O -16	28-Ni-61	50-Sn-122	72-Hf-179	92-U -235
11-Na-23	29-Cu-63	50-Sn-124	72-Hf-180	92-U -238
18-Ar-38	29-Cu-65	52-Te-132	73-Ta-180	92-U -239
18-Ar-40	33-As-74	54-Xe-123	73-Ta-181	92-U -240
20-Ca-40	36-Kr-78	54-Xe-124	74-W -182	92-U -241
21-Sc-45	38-Sr-88	58-Ce-136	74-W -183	94-Pu-239
26-Fe-54	40-Zr-90	60-Nd-143	74-W -184	94-Pu-240
26-Fe-56	40-Zr-91	61-Pm-148.M	74-W -186	94-Pu-243
26-Fe-57	40-Zr-92	62-Sm-144	75-Re-185	95-Am-241
26-Fe-58	40-Zr-94	63-Eu-154	75-Re-187	95-Am-243

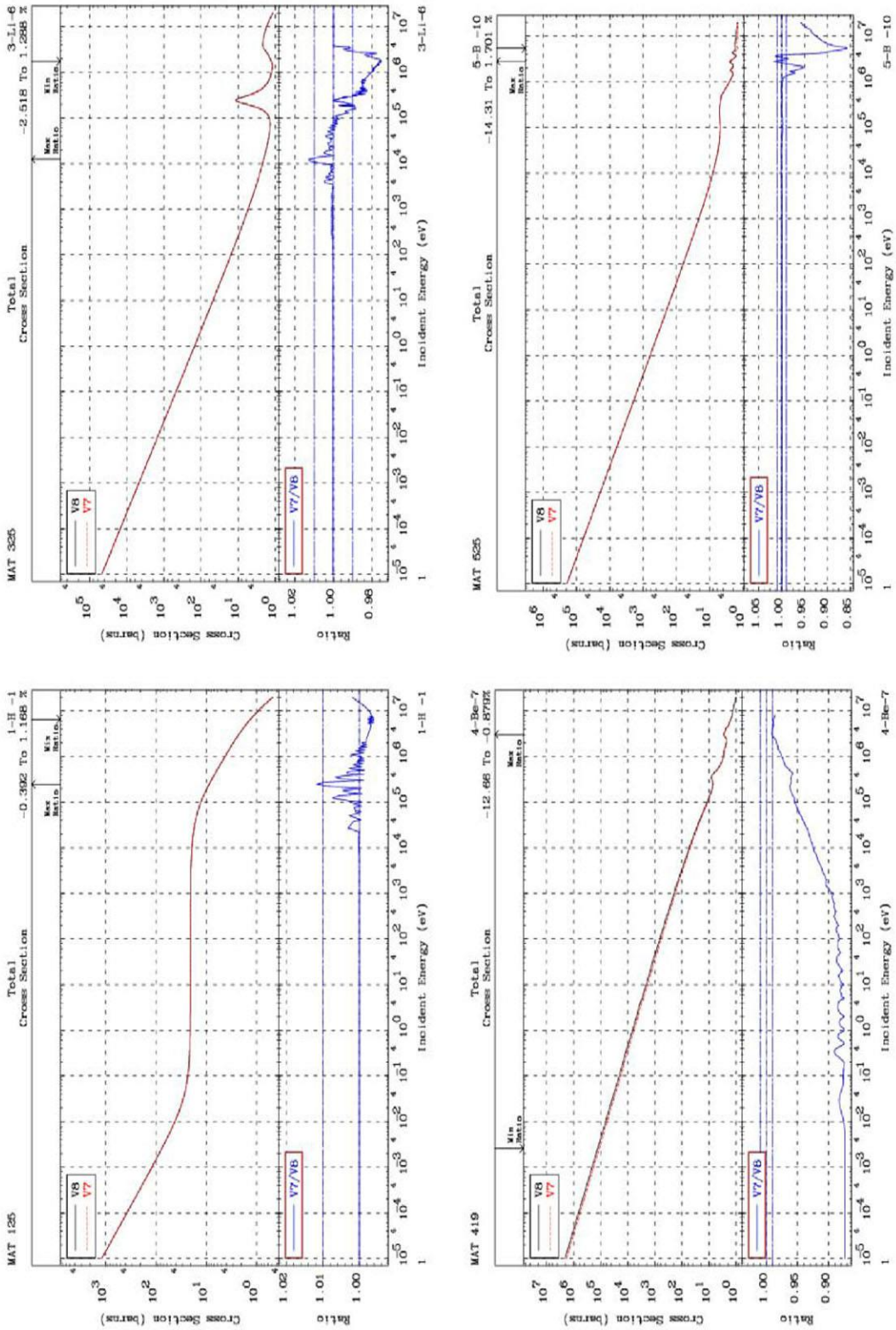
Each plot is divided into the upper two-thirds to show the total cross section for V8 (**black**) and V7 (**red**). The lower third of each plot shows the ratio of the V7 total divided by the V8 total.

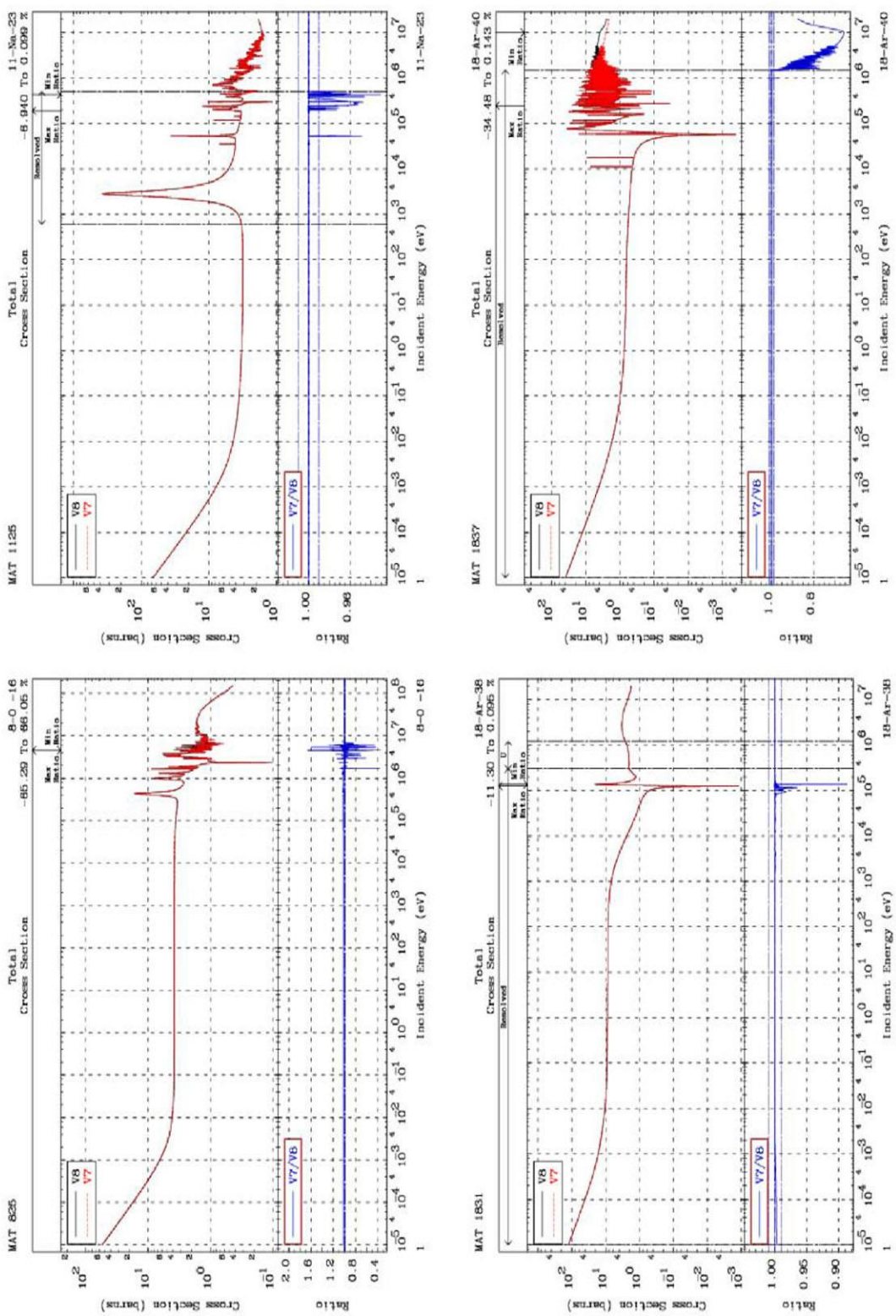
From each plot you can see,

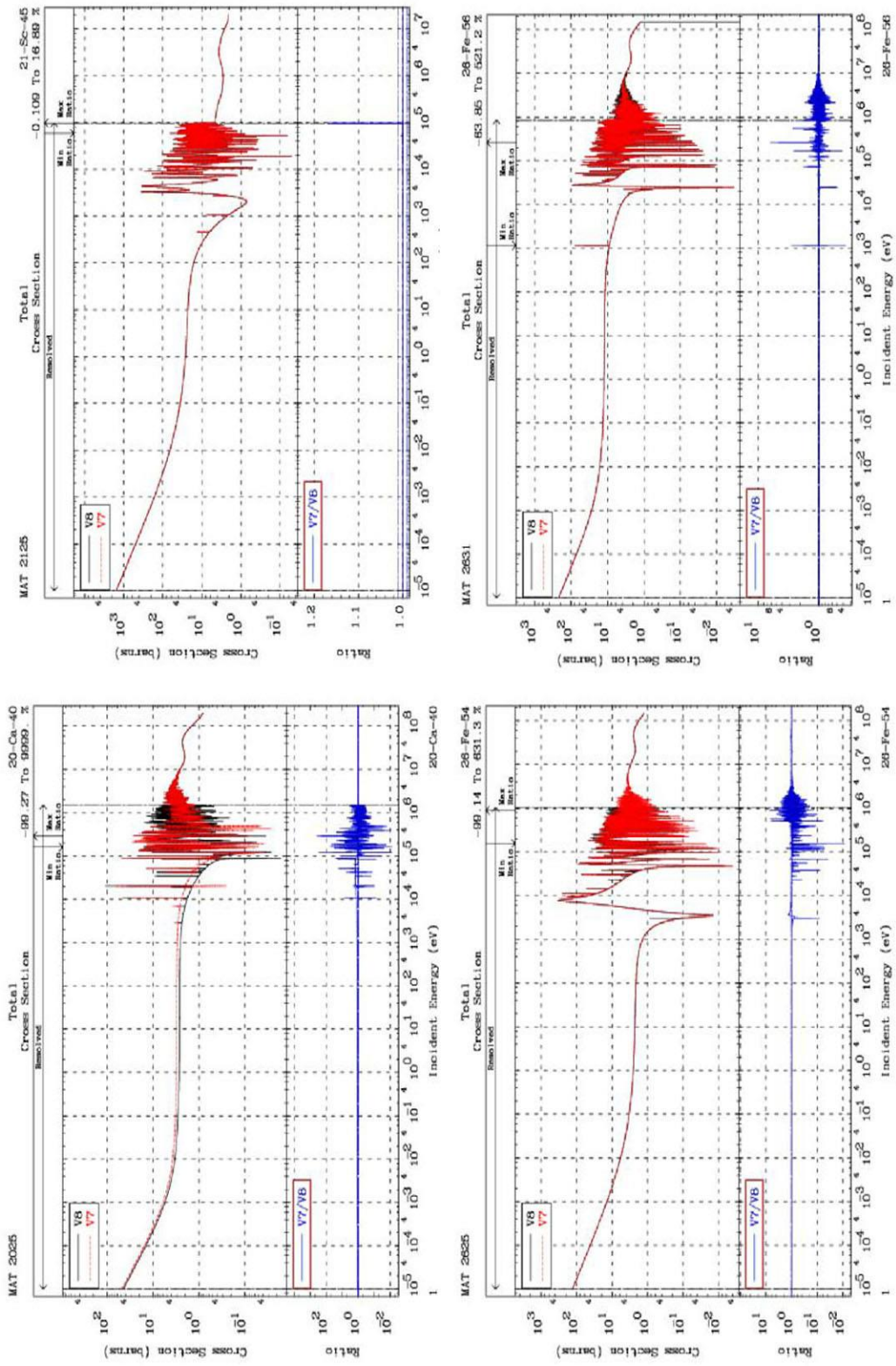
1) The isotope identification, in the upper right-hand corner
2) Maximum negative and positive % differences, below isotope id
3) The energy range of resolved and unresolved energy ranges, if any
4) Vertical arrows show the position of maximum differences
5) The energy and cross section scales.

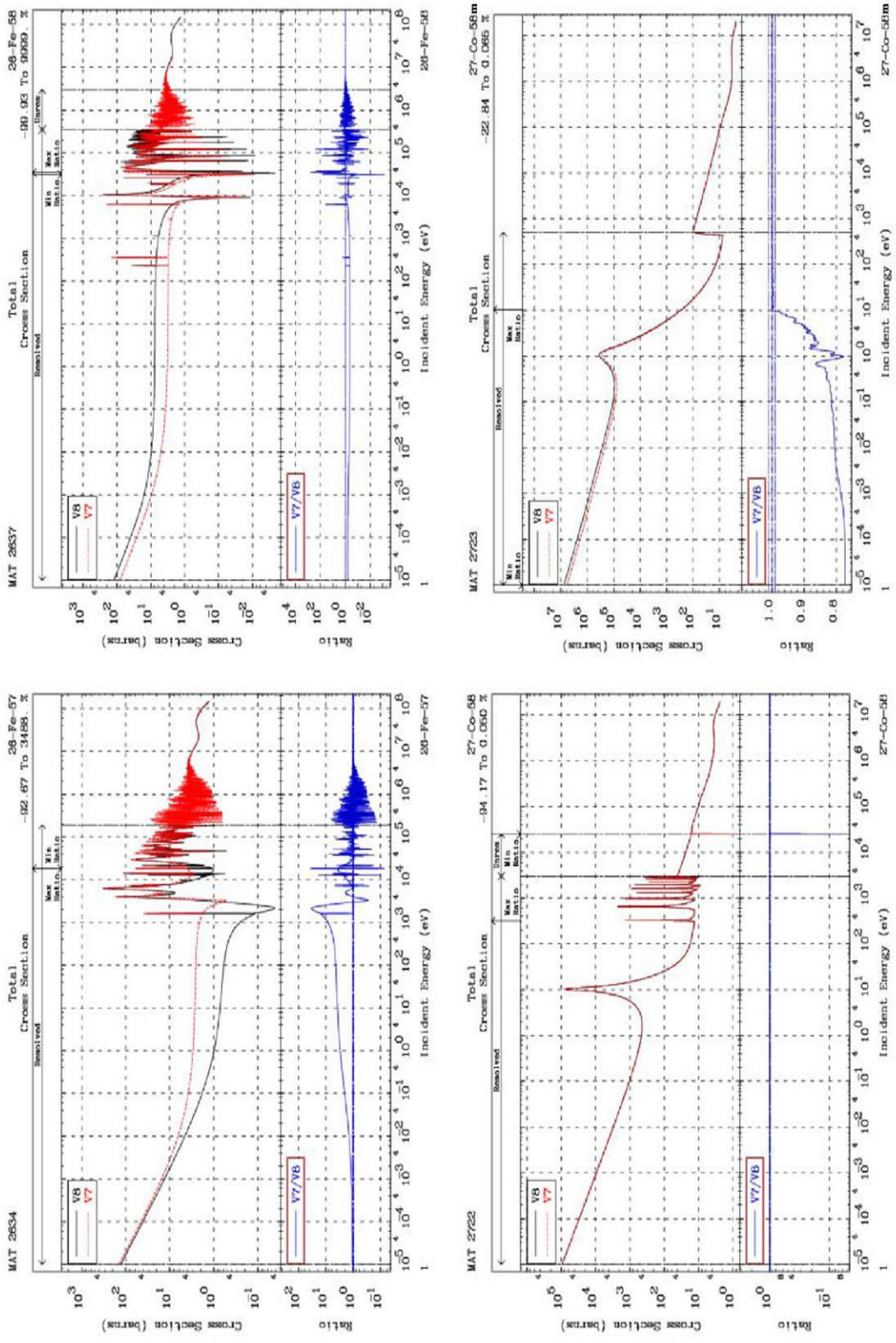
Below is an example to which I added an explanatory comment

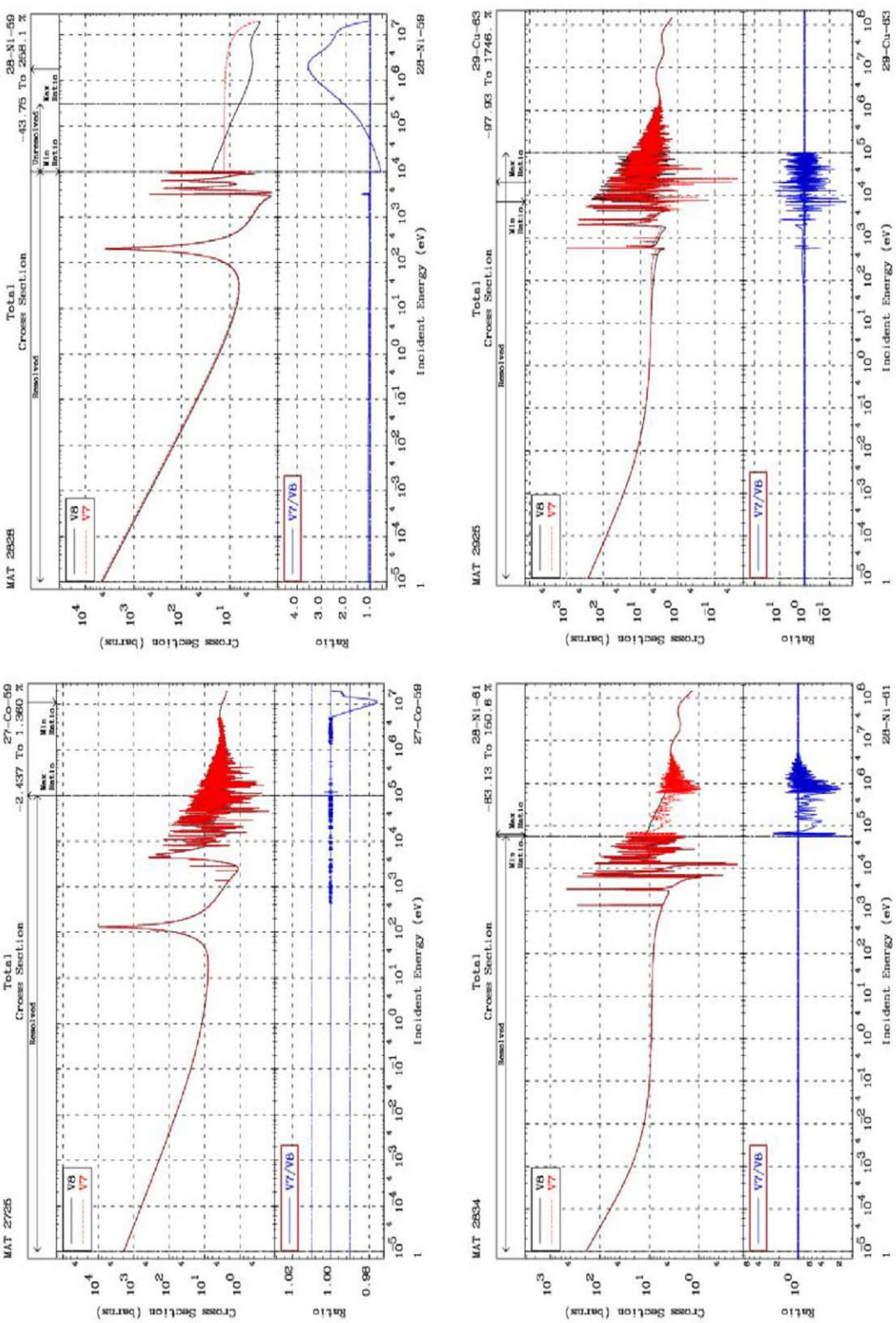


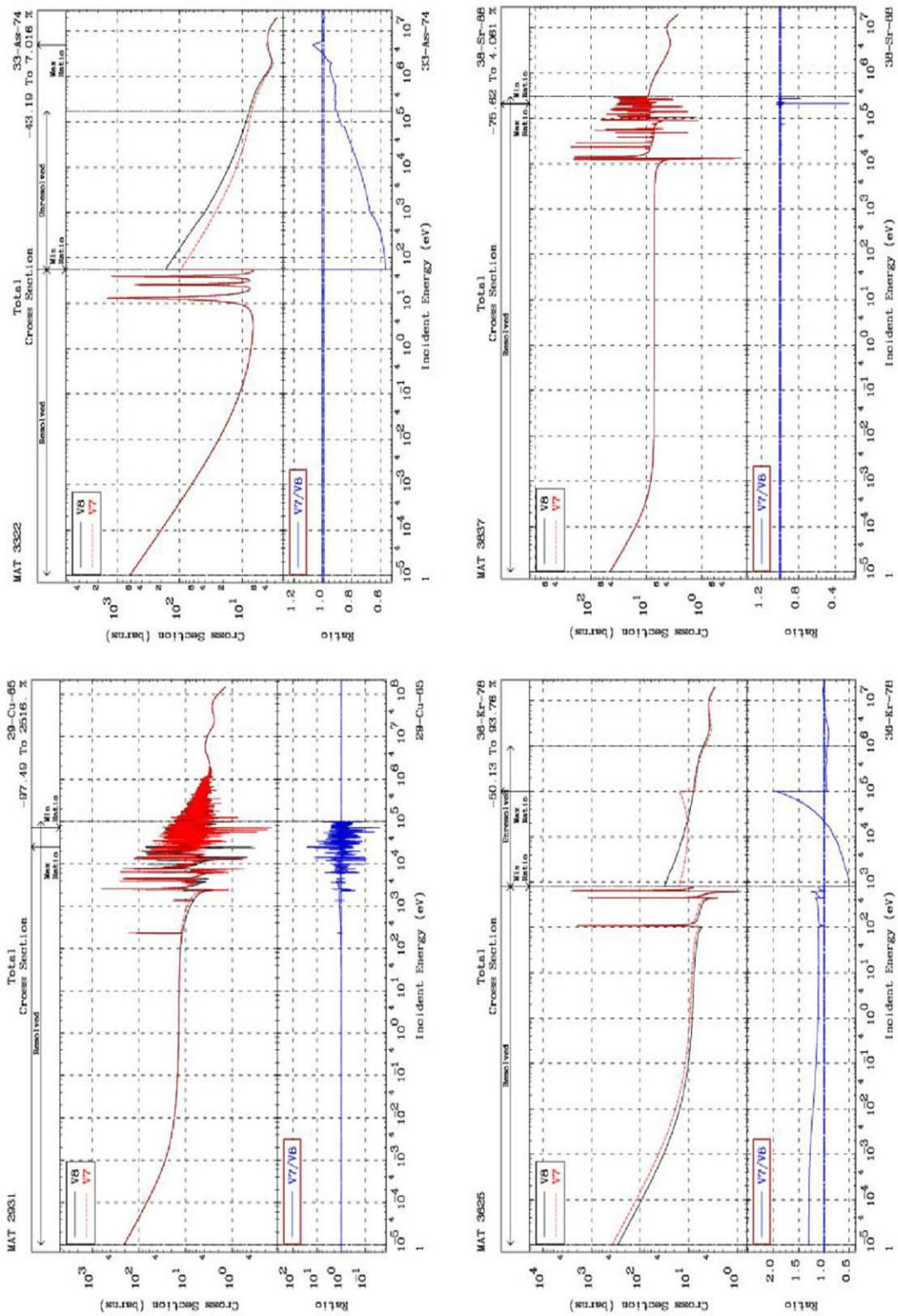

MAT 325
Total
Cross Section
-2.518 To 1.288 %
3-Li-6
V8
V7
V7/V8
Cross Section (barns)
Ratio
Incident Energy (eV)
MAT 625
-14.31 To 1.701 %
5-B -10
MAT 125
-0.3692 To 1.168 %
1-H -1
MAT 419
-12.66 To -0.8703 %
4-Be-7

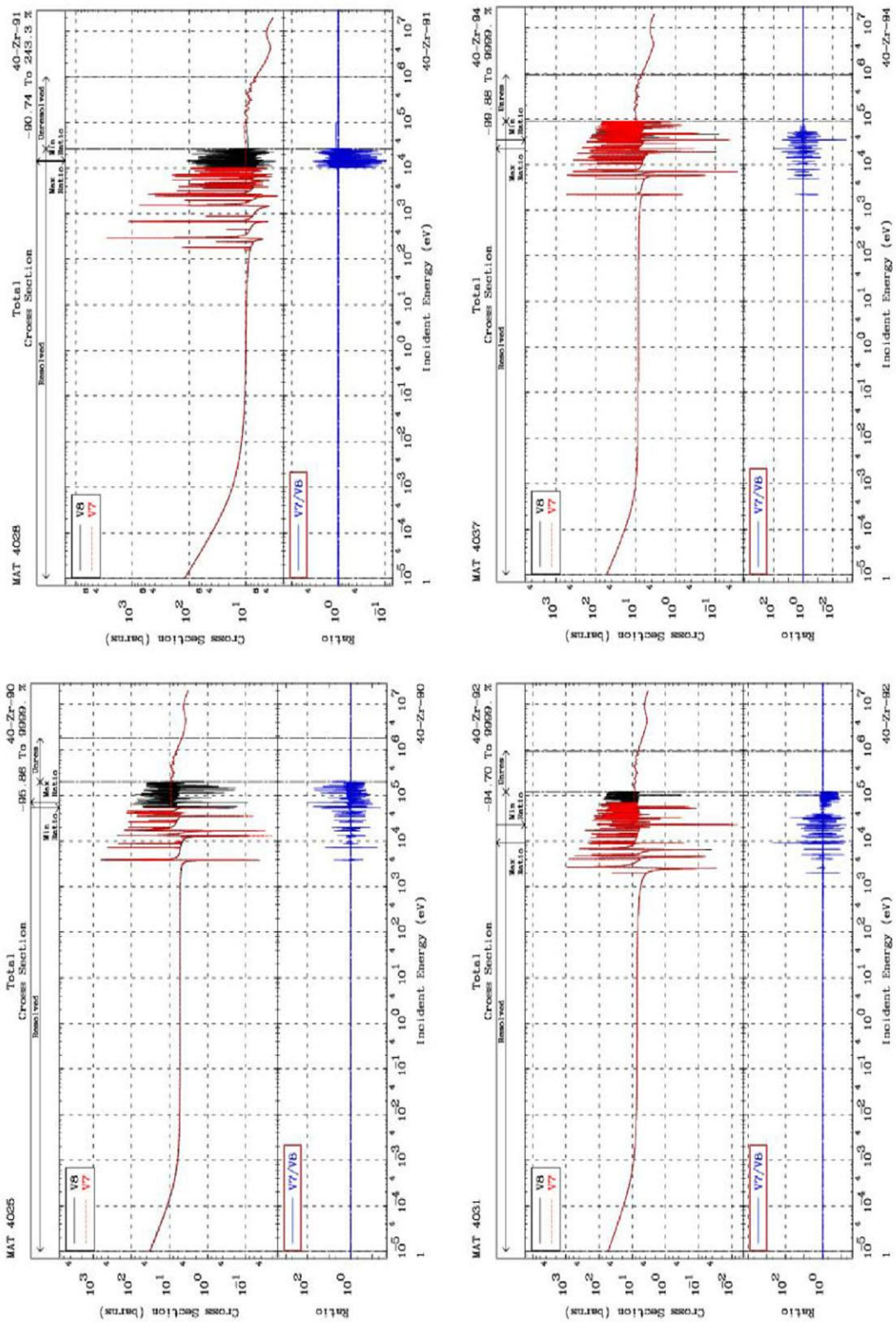

MAT 1125
Total
Cross Section
11-Na-23
-8.940 To 0.099 %
Resolved
Max Ratio
Min Ratio
V8
V7
V7/V8
Cross Section (barns)
Ratio
Incident Energy (eV)
MAT 1837
18-Ar-40
-34.48 To 0.143 %
MAT 825
8-O-16
-85.29 To 66.06 %
MAT 1831
18-Ar-38
-11.30 To 0.096 %

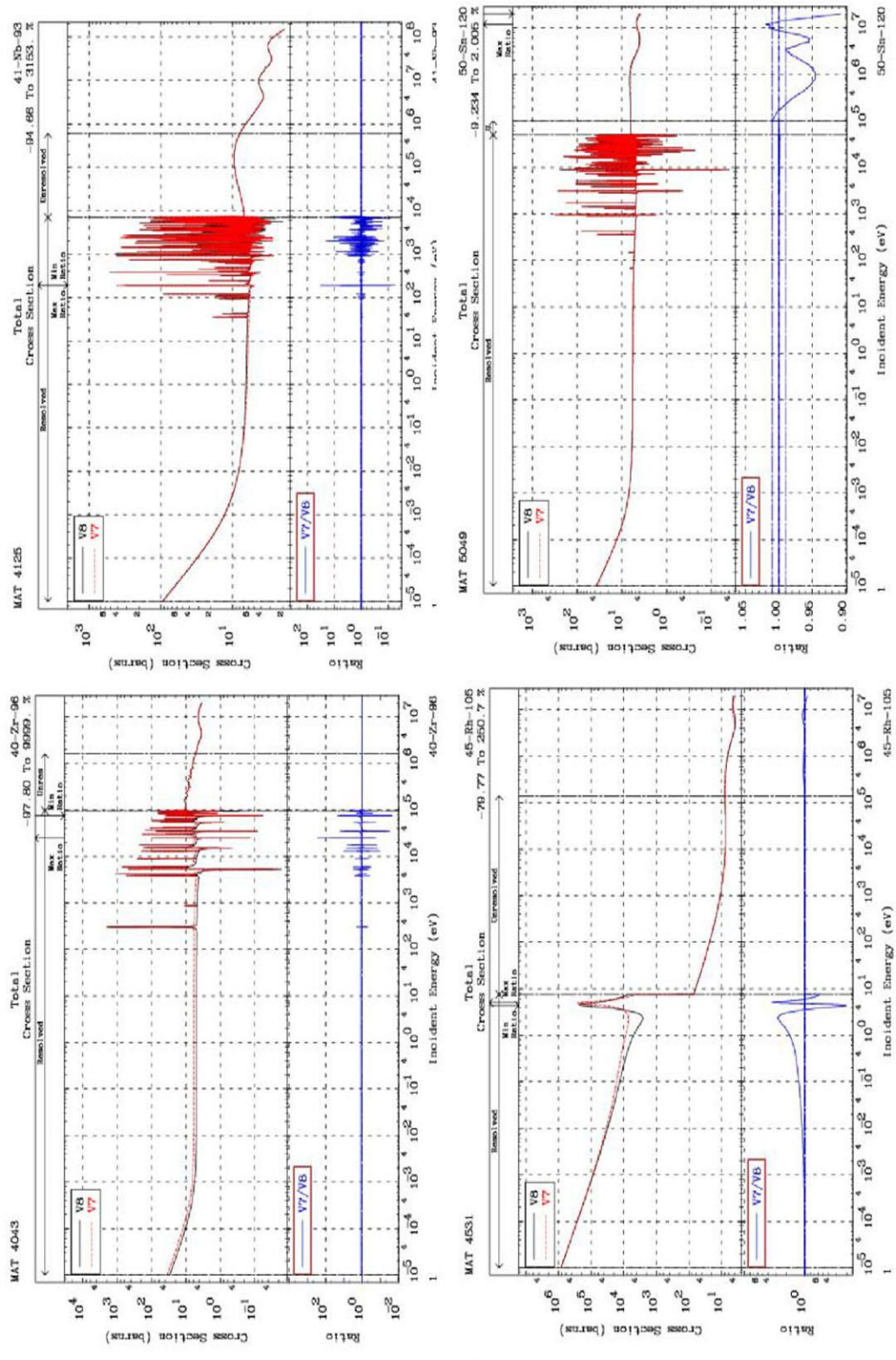

MAT 2125
Total
Cross Section
21-Sc-45
-0.109 To 16.89 %
MAT 2631
26-Fe-56
-83.85 To 521.2 %
MAT 2025
20-Ca-40
-99.27 To 9999. %
MAT 2625
26-Fe-54
-99.14 To 831.3 %
Resolved
Min Ratio
Max Ratio
V8
V7
V7/V8
Cross Section (barns)
Ratio
Incident Energy (eV)

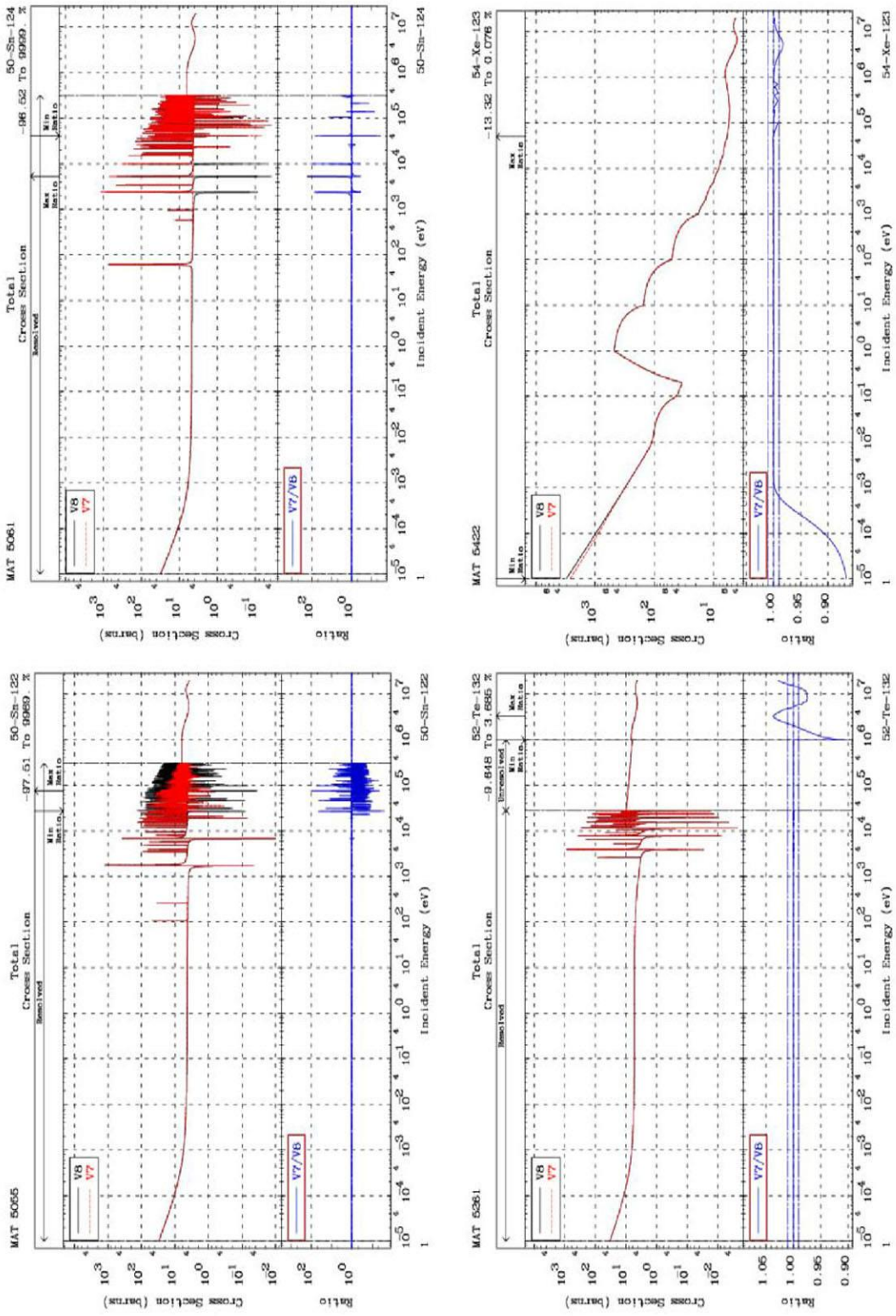

MAT 2637
Total
Cross Section
Resolved
V8
V7
V7/V8
Cross Section (barns)
Ratio
Incident Energy (eV)
26-Fe-58
-99.93 To 9999. %
MAT 2723
27-Co-58m
-22.84 To 0.065 %
MAT 2634
26-Fe-57
-82.67 To 3488. %
MAT 2722
27-Co-58
-94.17 To 0.050 %

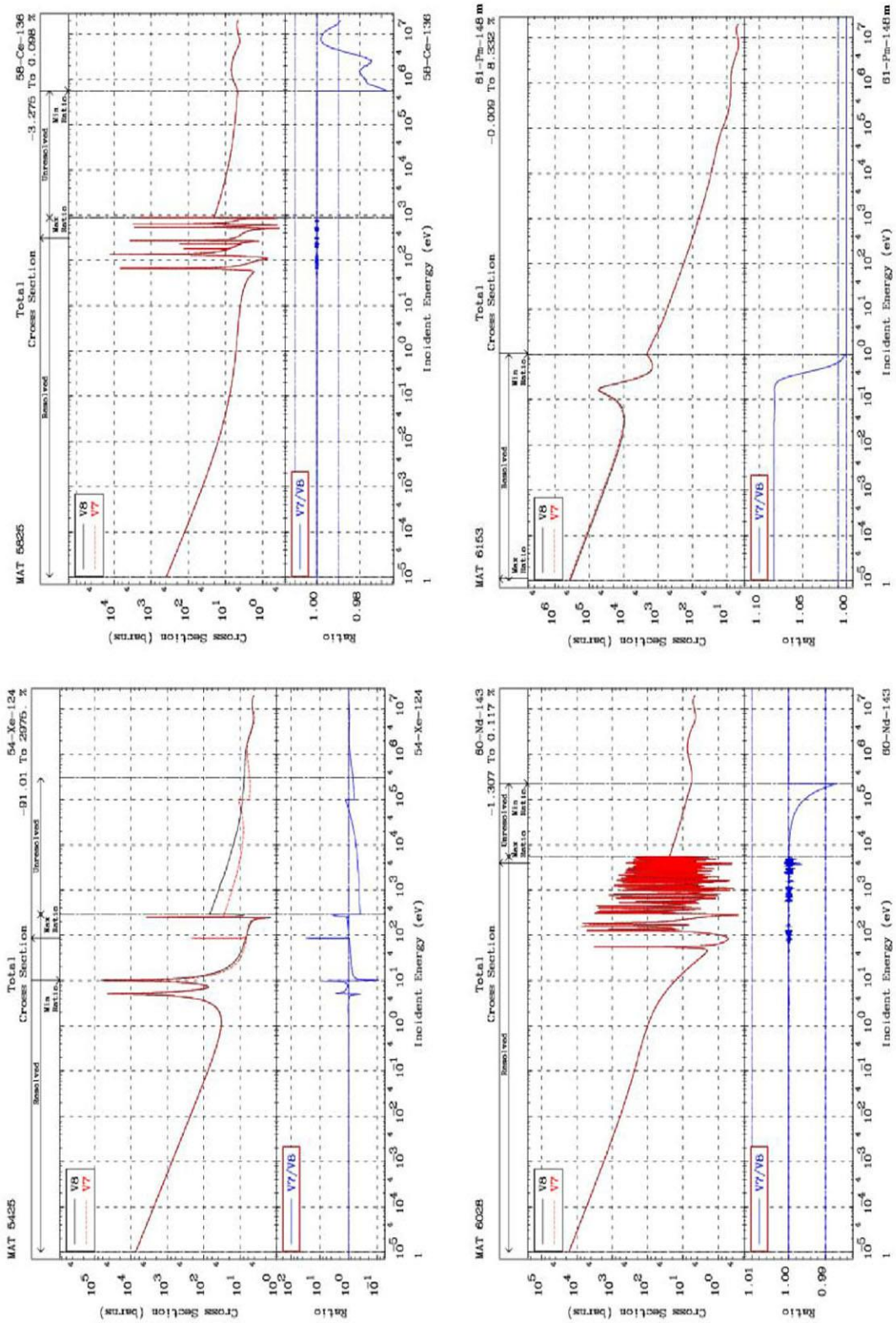

MAT 2825
Total
Cross Section
Resolved
V8
V7
V7/V8
Cross Section (barns)
Ratio
Incident Energy (eV)
29-Cu-63
MAT 2828
28-Ni-59
MAT 2725
27-Co-59
MAT 2834
28-Ni-61

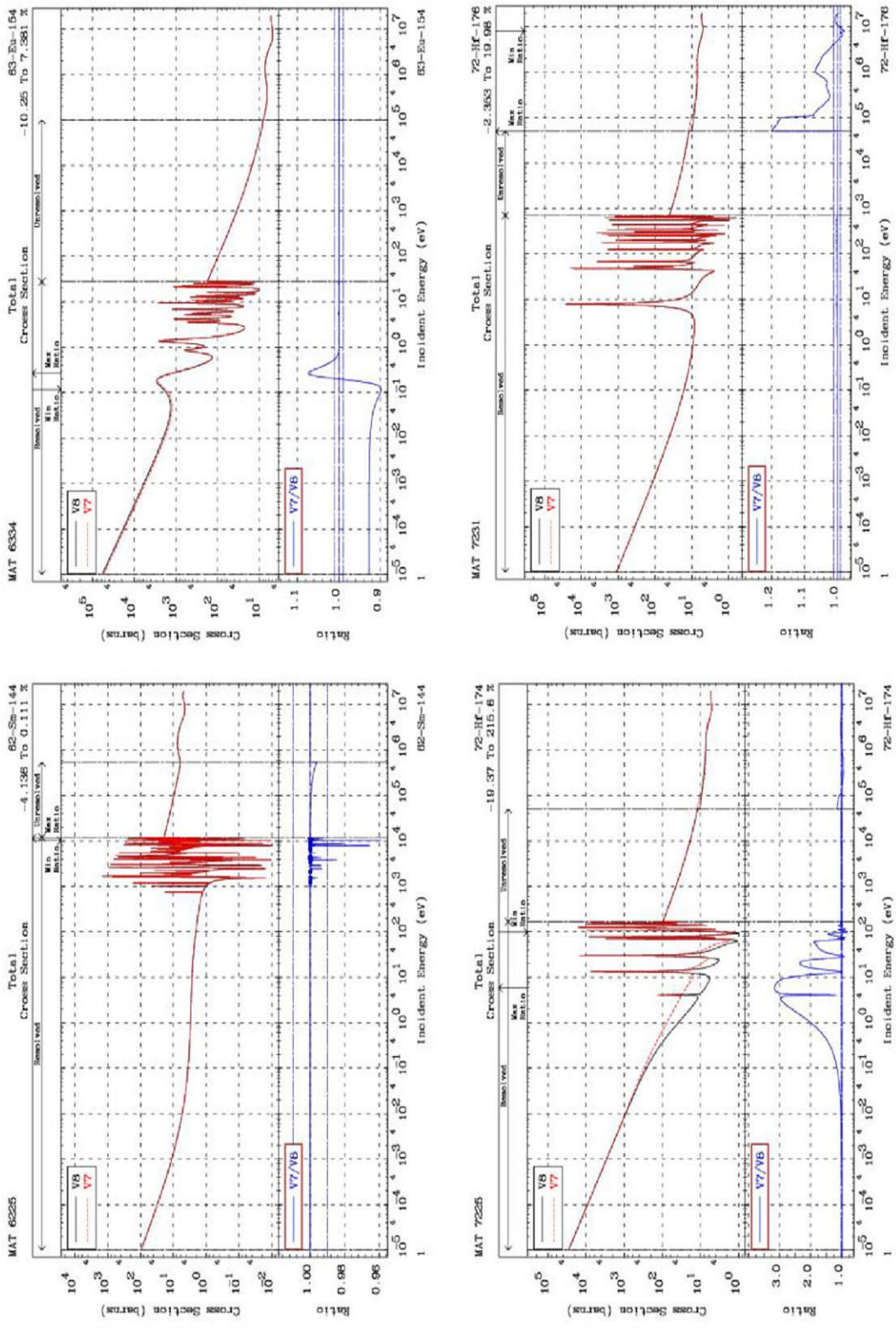

MAT 3322
33-As-74
-43.19 To 7.016 %
Total
Cross Section
Resolved
Unresolved
Min Ratio
Max Ratio
V8
V7
V7/V8
Cross Section (barns)
Ratio
Incident Energy (eV)
MAT 3837
38-Sr-88
-75.62 To 4.061 %
MAT 2931
29-Cu-65
-97.49 To 2516. %
MAT 3625
36-Kr-78
-50.13 To 93.78 %

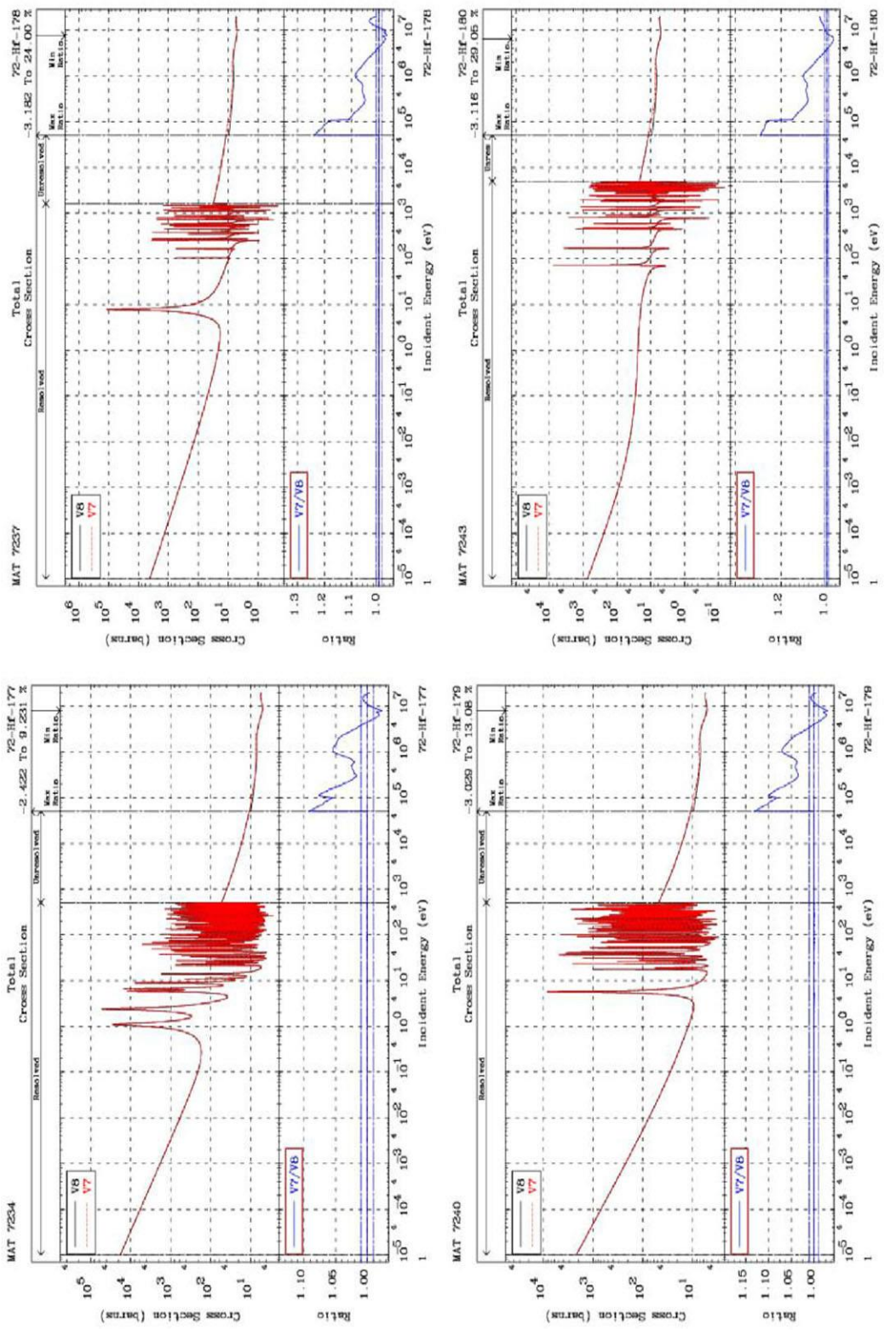

MAT 4028
40-Zr-91
-80.74 To 243.3 %
Total
Cross Section
Unresolved
Resolved
Max Ratio
Min Ratio
V8
V7
V7/V8
Cross Section (barns)
Ratio
Incident Energy (eV)
40-Zr-91
MAT 4037
40-Zr-94
-98.88 To 9999. %
MAT 4025
40-Zr-90
-85.86 To 9999. %
MAT 4031
40-Zr-92
-84.70 To 9999. %

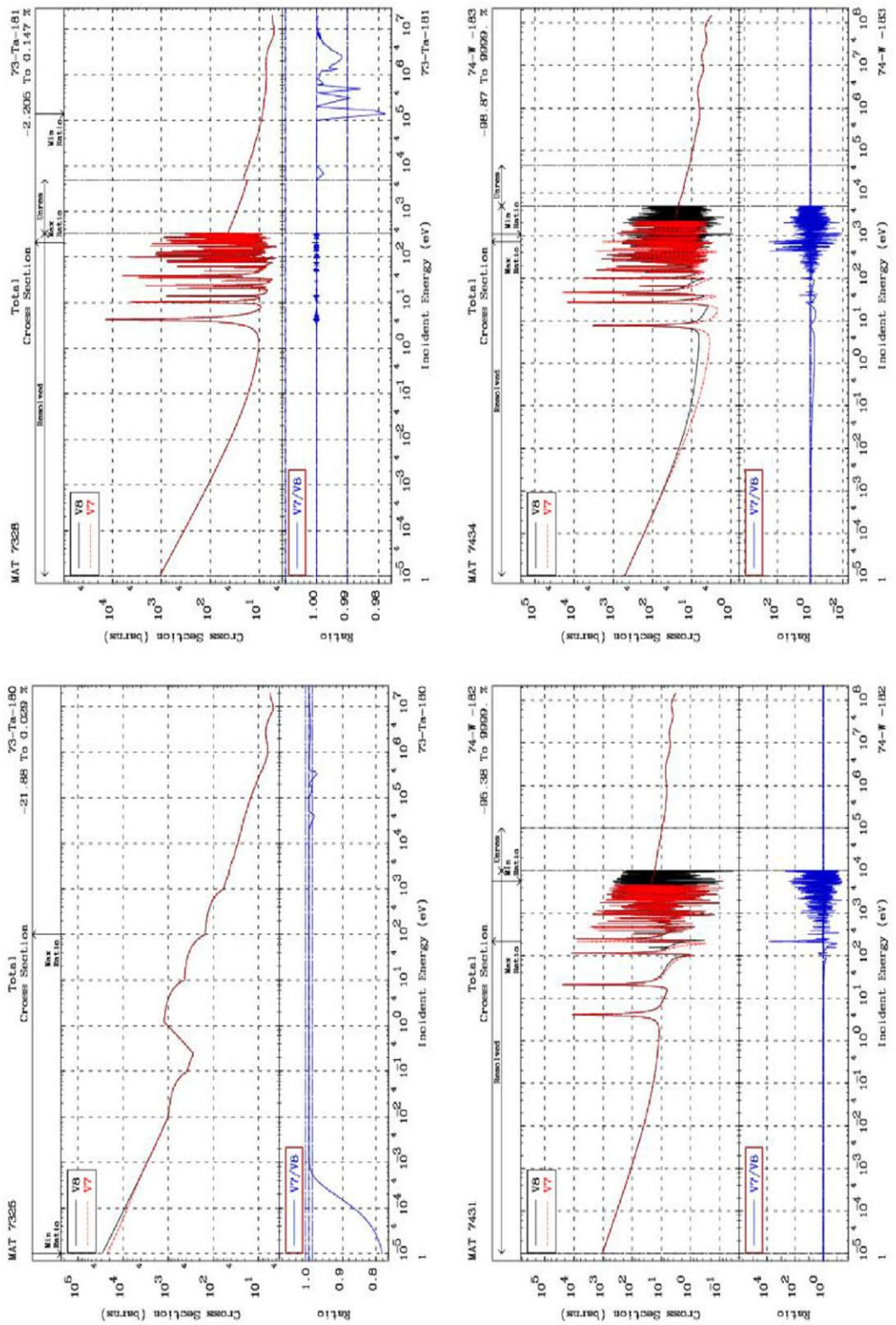

MAT 4125
41-Nb-93
-94.66 To 3153. %
Total
Cross Section
Resolved
Unresolved
Max Ratio
Min Ratio
V8
V7
V7/V8
Cross Section (barns)
Ratio
MAT 5049
50-Sn-120
-9.234 To 2.006 %
MAT 4043
40-Zr-96
-97.80 To 9999. %
MAT 4531
45-Rh-105
-79.77 To 250.7 %
Incident Energy (eV)

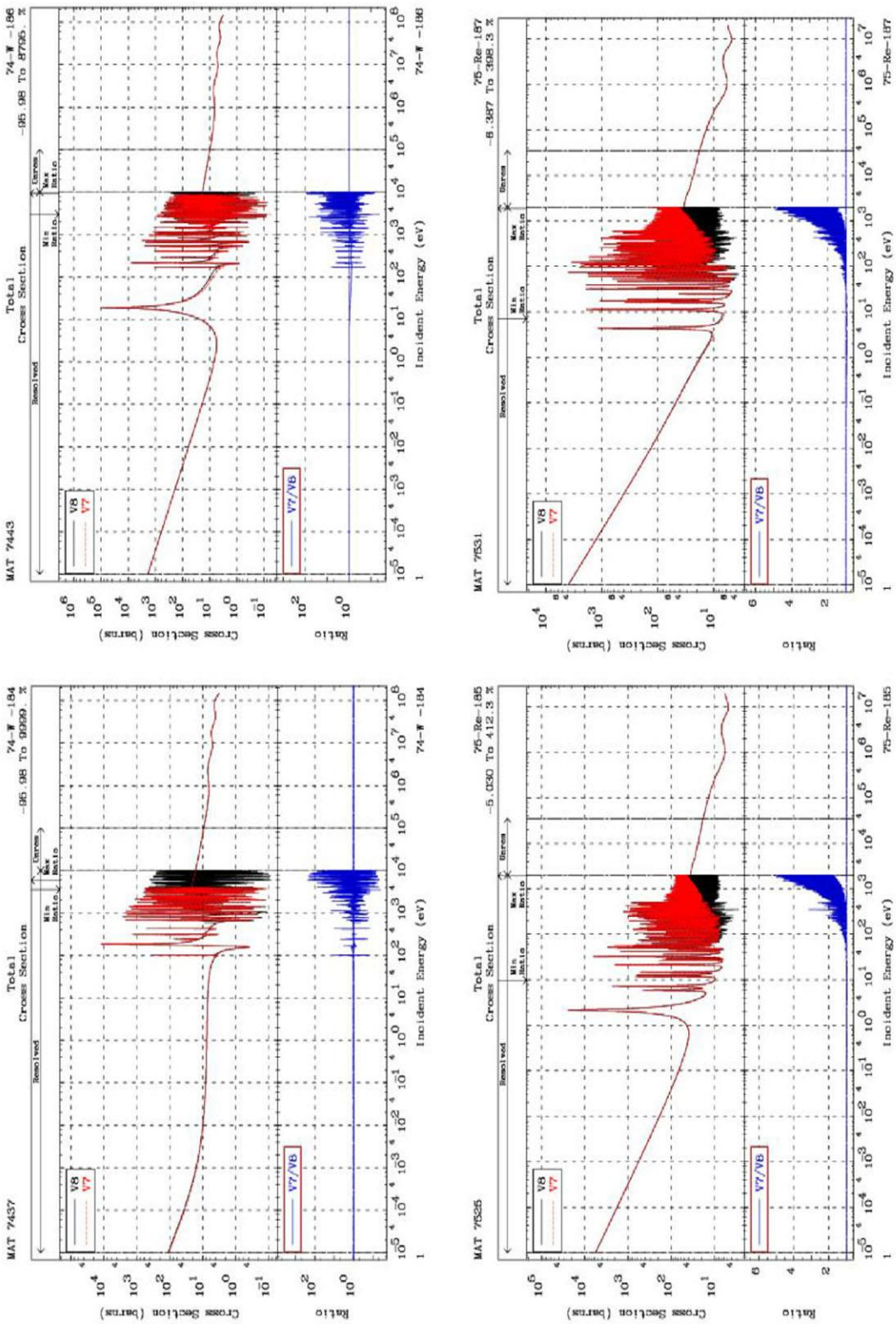

MAT 5061
50-Sn-124
-96.52 To 9999. %
Total
Cross Section
Resolved
Max Ratio
Min Ratio
V8
V7
V7/V8
Cross Section (barns)
Ratio
Incident Energy (eV)
MAT 6422
54-Xe-123
-13.32 To 0.076 %
MAT 5065
50-Sn-122
-97.51 To 9999. %
MAT 6361
52-Te-132
-9.848 To 3.665 %
Unresolved

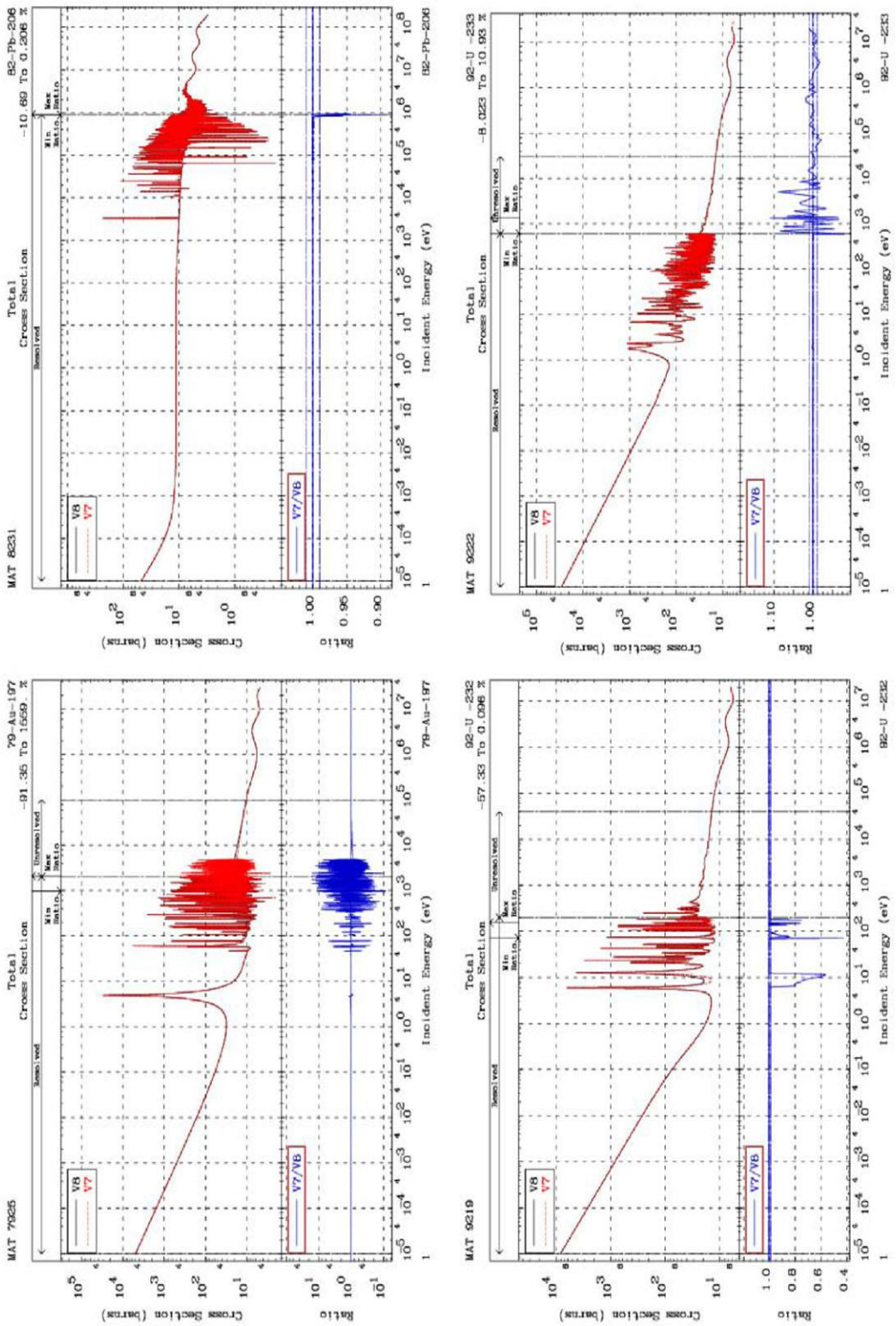

MAT 5825
58-Ce-136
-3.275 To 0.008 %
Total
Cross Section
Resolved
Unresolved
Min Ratio
Max Ratio
V8
V7
V7/V8
Cross Section (barns)
Ratio
Incident Energy (eV)
MAT 6153
61-Pm-148 m
-0.009 To 8.332 %
MAT 5425
54-Xe-124
-91.01 To 2975. %
MAT 6028
60-Nd-143
-1.307 To 0.117 %

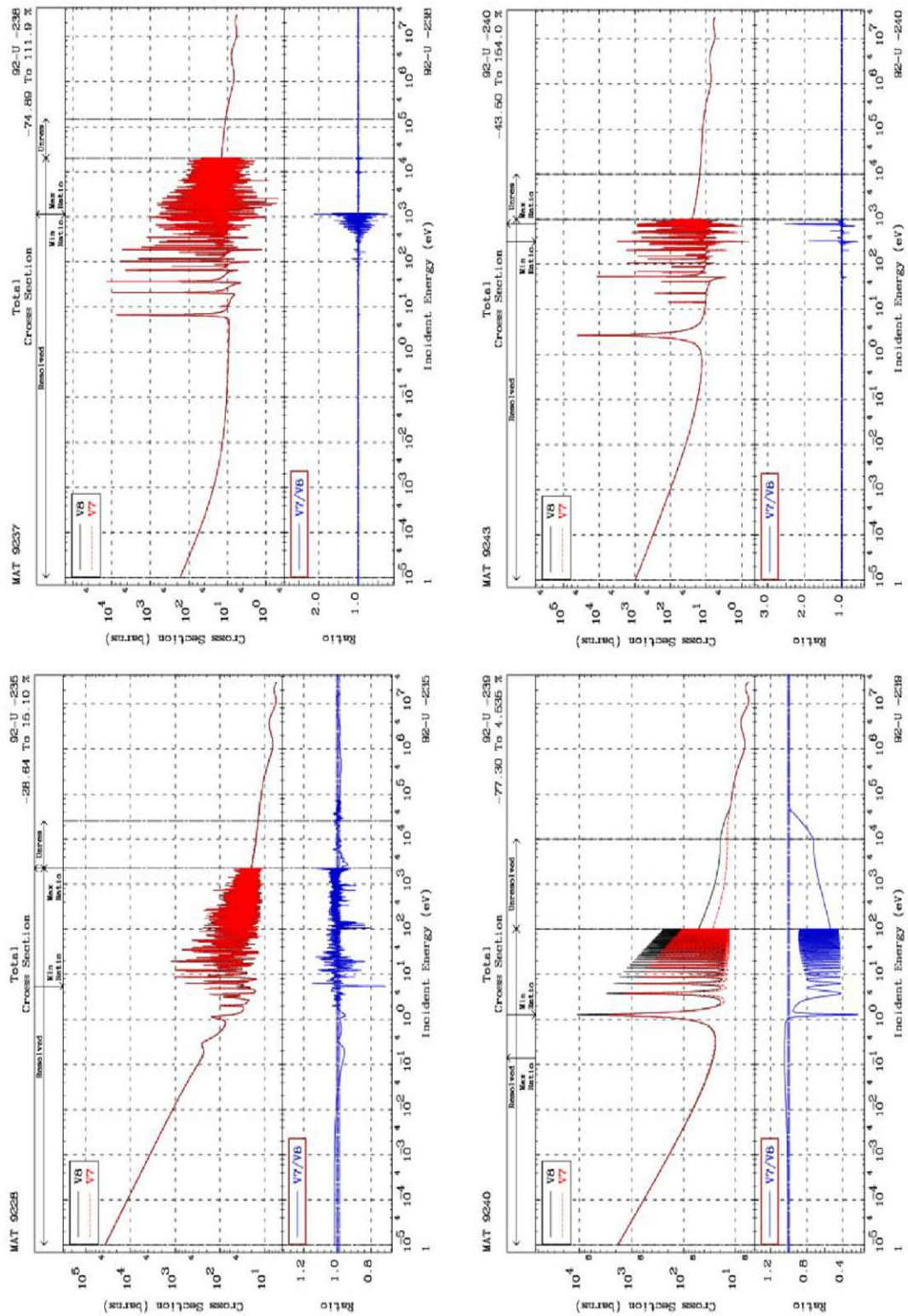

MAT 6334
Total
Cross Section
63-Eu-154
-10.25 To 7.381 %
Resolved
Unresolved
Min Ratio
Max Ratio
V8
V7
V7/V8
Cross Section (barns)
Ratio
Incident Energy (eV)
MAT 7231
72-Hf-176
-2.353 To 19.08 %
MAT 6225
62-Sm-144
-4.136 To 0.111 %
MAT 7225
72-Hf-174
-19.37 To 215.6 %

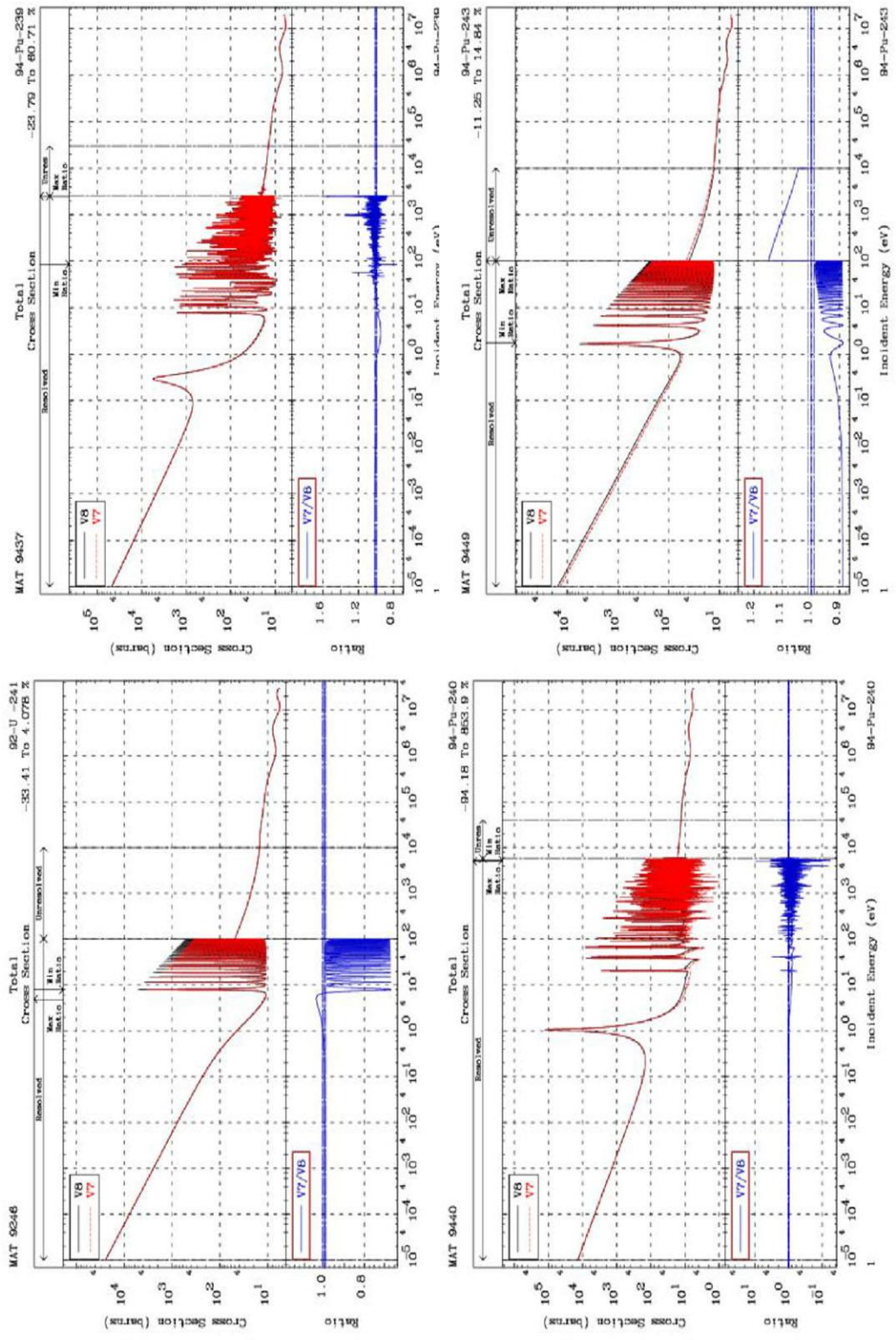

MAT 7237
72-Hf-178
-3.182 To 24.00 %
Total
Cross Section
Resolved
Unresolved
Max Ratio
Min Ratio
V8
V7
V7/V8
Cross Section (barns)
Ratio
Incident Energy (eV)
MAT 7243
72-Hf-180
-3.116 To 29.06 %
MAT 7234
72-Hf-177
-2.422 To 9.231 %
MAT 7240
72-Hf-179
-3.029 To 13.08 %

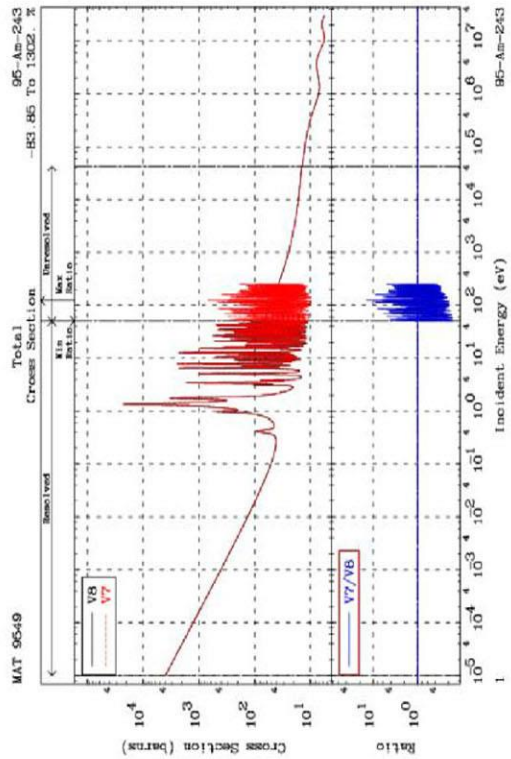

MAT 7328
73-Ta-181
-2.205 To 0.147 %
Total
Cross Section
Resolved
Unres
Max Ratio
Min Ratio
V8
V7
V7/V8
Cross Section (barns)
Ratio
Incident Energy (eV)
MAT 7434
74-W -183
-88.87 To 9969. %
MAT 7325
73-Ta-180
-21.88 To 0.029 %
MAT 7431
74-W -182
-86.38 To 9969. %

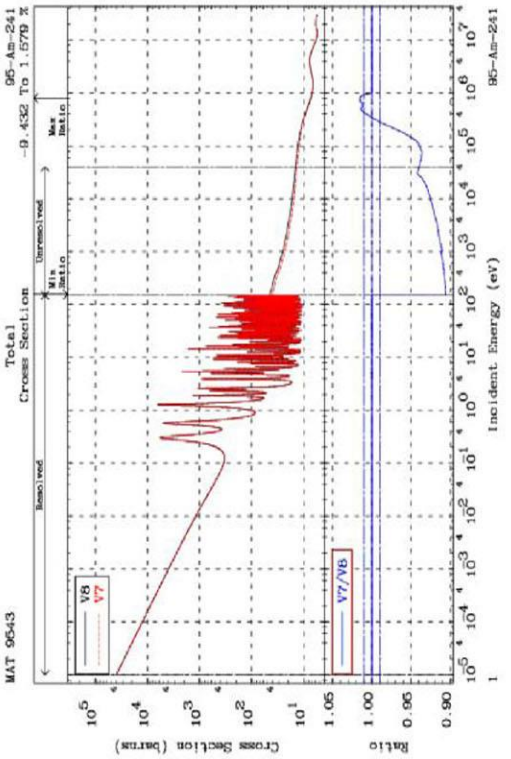

MAT 7437
74-W -184
-95.98 To 9969. %
MAT 7443
74-W -186
-95.98 To 8705. %
MAT 7525
75-Re-185
-5.050 To 412.3 %
MAT 7531
75-Re-187
-8.387 To 398.3 %
Total
Cross Section
Resolved
Min Ratio
Max Ratio
Deres
V8
V7
V7/V8
Cross Section (barns)
Ratio
Incident Energy (eV)


MAT 8231
82-Pb-206
-10.89 To 0.206 %
Total
Cross Section
Resolved
Unresolved
Min Ratio
Max Ratio
V8
V7
V7/V8
Cross Section (barns)
Ratio
Incident Energy (eV)
MAT 9222
92-U -233
-8.023 To 10.93 %
MAT 7925
79-Au-197
-91.35 To 1559. %
MAT 9219
92-U -232
-57.33 To 0.096 %


MAT 9237
92-U -238
-74.80 To 111.9 %
MAT 9243
92-U -240
-43.50 To 154.0 %
MAT 9228
92-U -235
-28.64 To 15.10 %
MAT 9240
92-U -239
-77.30 To 4.535 %
Total
Cross Section
Resolved
Unresolved
Win Ratio
Max Ratio
V8
V7
V7/V8
Cross Section (barns)
Ratio
Incident Energy (eV)


MAT 9437
Total
Cross Section
94-Pu-239
-23.79 To 60.71 %
Resolved
Unresolved
Max Ratio
Min Ratio
Thres
V8
V7
V7/V8
Cross Section (barns)
Ratio
Incident Energy (eV)
MAT 9449
94-Pu-243
-11.25 To 14.84 %
MAT 9246
92-U -241
-33.41 To 4.078 %
MAT 9440
94-Pu-240
-94.18 To 853.9 %


MAT 9549
95-Am-243
-83.85 To 1302. %
Total
Cross Section
Resolved
Win Ratio
Unresolved
Max Ratio
V8
V7
V7/V8
Cross Section (barns)
Ratio
Incident Energy (eV)
95-Am-243


MAT 9543
95-Am-241
-9.432 To 1.579 %
Total
Cross Section
Resolved
Win Ratio
Unresolved
Max Ratio
V8
V7
V7/V8
Cross Section (barns)
Ratio
Incident Energy (eV)
95-Am-241

References

[1] **ENDF/B-VIII.0**: The 8th Major Release of the Nuclear Reaction Data Library with CIELO-project Cross Sections, New Standards and Thermal Scattering Data, D.A. Brown, M.B. Chadwick, R. Capote, A.C. Kahler, A. Trkov, M.W. Herman, AA. Sonzogni, Y. Danon, *et. al.*, Nucl. Data Sheets **148** (2018) 1-142. redcullen1.net/HOMEPAGE.NEW/Papers/ENDFB-VIII/ENDFB-VIII.pdf

[2] **ENDF-102**: ENDF-6 Formats Manual: Data Formats and Procedures for the Evaluated Nuclear Data Files ENDF/B-VI, ENDF/B-VII and ENDF/B-VIII, BNL-203218-2018-INRE, Rev. 215, Feb. 2018, edited by A. Trkov, M. Herman and D.A. Brown, National Nuclear Data Center, Brookhaven National Lab. http://www.nndc.bnl.gov/csewg/docs/endf-manual.pdf

[3] **ENDF/B-VII.0**: Next Generation Evaluated Nuclear Data Library for Nuclear Science and Technology, with M.B. Chadwick and many others, Nuclear Data Sheets **107** (2006) 2931-3060.

[4] **POINT2018**: ENDF/B-VIII Final Temperature Dependent Cross Section Library, Report IAEA-NDS-227, April 2018, IAEA, Vienna, Austria. http://www.nndc.bnl.gov/endf/b8.0/POINT2018/POINT2018.htm

[5] **POINT2015:** ENDF/B-VII.1 Final Temperature Dependent Cross Section Library, Report IAEA-NDS-221, March 2015, IAEA, Vienna, Austria. https://www-nds.iaea.org/point/

[6] **PREPRO2017**: 2017 ENDF/B Pre-processing Codes, IAEA-NDS-39, Rev. 17, Mat 2017. (ENDF/B-VII or Proposed VIII Tested). https://www-nds.iaea.org/public/endf/prepro/

[7] **PREPRP2018**: 2018 ENDF/B Pre-processing Codes, to be released later in 2018.

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