

Status of the ENDF/B-VII Library

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Contributors

■ LANL

- many new evaluations for neutron and charged particle induced reactions
- resonance region by ORNL
- include actinides and charged particles on light nuclei
- non-actinides n- and p-evaluations up to 150 MeV using MT=5 representation
- tested with NJOY

Contributors (cont.)

- ORNL
 - resonance region
 - most evaluations in cooperation with LANL (high energy region)
 - a few purely ORNL evaluations use ENDF/B-VI.8 for the fast neutron energy region

Contributors (cont.)

- BNL/KAERI & BNL/JAERI
 - entirely new evaluations for neutron induced reactions on fission products
 - resonance part from the recent Mughabhab evaluation
 - fast neutron energy region calculated with EMPIRE
 - except 99-Tc, 153-Eu, and 157-Gd all evaluations should be tested with NJOY

Contributors (cont.)

- IAEA-CRP/LANL
 - 160 photonuclear evaluations
 - based on the results of the IAEA Coordinated Research Project
 - contributing Labs: LANL, KAERI, CJD, Begin
 - formatting corrected at LANL and tested with NJOY

Statistics of submitted evaluations

- neutron evaluations: 56
 - proton evaluations: 10
 - deuteron evaluations: 5
 - triton evaluations: 3
 - He-3 evaluations: 2
 - photonuclear evaluations: 160
- Total number of new evaluations: 236

Submitted evaluations

- BNL/KAERI – neutron
 - Mo-95, Tc-99, Ru-101, Rh-103, Pd-105, Ag-109, Xe-131, Cs-133, Pr-141, Nd-143, 145, Sm-147, 149, 150, 151, 152, Eu-153, Gd-155, 157 Dy-160, 161, 162, 163, 164 (**24 evaluations**)
- BNL/JAERI - neutrons
 - Ge-70, 72, 73, 74, 76 (**5 evaluations**)
- ORNL – neutron
 - F-19, Cl-35, 37, Pu-241 (**4 evaluations**)
- LANL/ORNL – neutron
 - Si-28, Pb-208, U-232, 233, 234, 235, 238 (**7 evaluations**)

Submitted evaluations (cont.)

- LANL - neutrons
 - Al-27, Hg-196, 198, 199, 200, 201, 202, 204, U-236, 237, 239, 240, 241, Np-237, Pu-239, Am-241 (**16 evaluations**)
- LANL - protons
 - H-3, Li-6, 7, Hg-196, 198, 199, 200, 201, 202, 204 (**10 evaluations**)
- LANL – deuterons
 - H-2, H-3, He-3, Li-6, 7 (**5 evaluations**)
- LANL – tritons
 - H-3, He-3, Li-6 (**3 evaluations**)
- LANL – 3-He
 - He-3, Li-6 (**2 evaluations**)

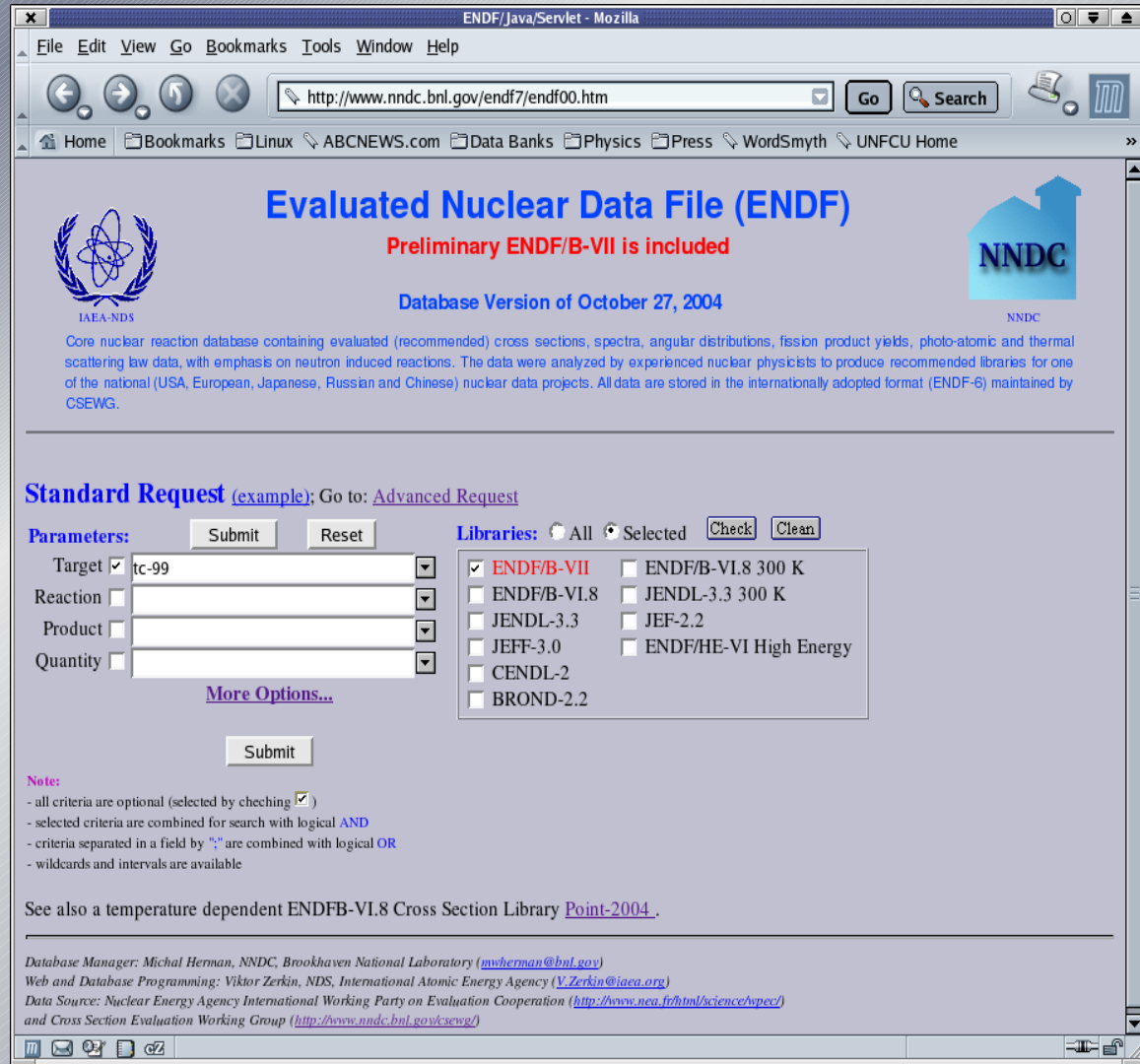
Expected evaluations

- Data for fission products resulting from the WPEC SG23 (anything up to nearly 200 evaluations)

Web-interface (www.nndc.bnl.gov/endl7/endl00.htm)

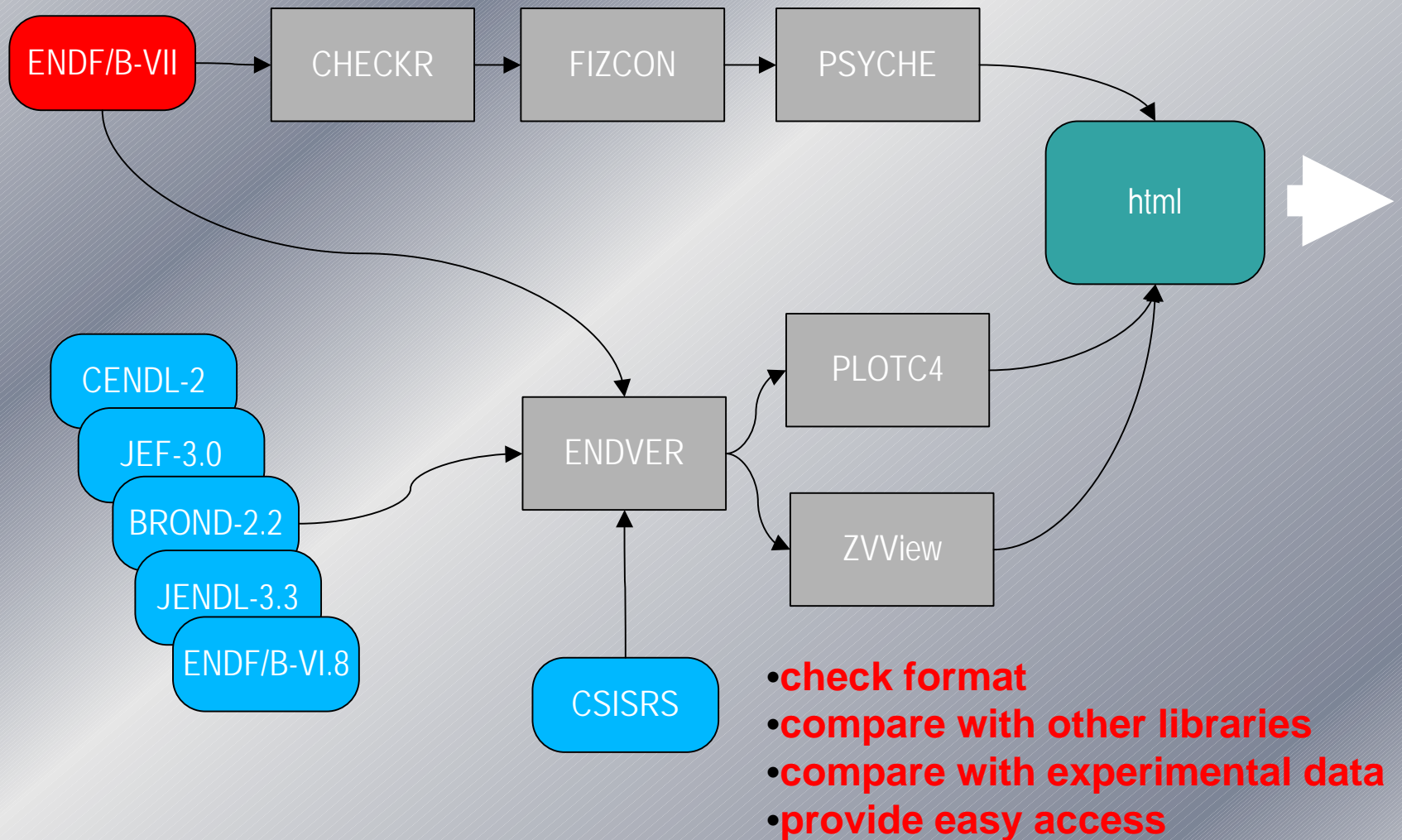
Convenient access to the relational database with pre-ENDF/B-VII and most important ENDF libraries

- Flexible retrieval requests
- View file structure/contents
- Statistics
- Comparison plots with other libraries and experimental data (MF= 4, 5 and 6 to be available shortly)



The screenshot shows a Mozilla browser window displaying the ENDF web interface. The browser title is "ENDF/Java/Servlet - Mozilla". The address bar shows the URL "http://www.nndc.bnl.gov/endl7/endl00.htm". The page content includes the IAEA-NDS logo, the title "Evaluated Nuclear Data File (ENDF)", and the text "Preliminary ENDF/B-VII is included" and "Database Version of October 27, 2004". Below this is a description of the core nuclear reaction database. The main section is titled "Standard Request" and includes a "Parameters" form with fields for Target (tc-99), Reaction, Product, and Quantity. There are "Submit" and "Reset" buttons. To the right is a "Libraries" section with checkboxes for various libraries, including ENDF/B-VII, ENDF/B-VI.8, JENDL-3.3, JEF-2.2, JEFF-3.0, ENDF/HE-VI High Energy, CENDL-2, and BROND-2.2. A "More Options..." link is also present. At the bottom, there is a "Note" section with search criteria instructions and a link to a temperature-dependent ENDFB-VI.8 Cross Section Library.

ENDF/B-VII management (flowchart)



ENDF/B-VII verification

www.nndc.bnl.gov/csewg_members/eval/

Preliminary ENDF/B-VII Library - Mozilla

File Edit View Go Bookmarks Tools Window Help

file:///home/herman/evalkit/index.html

Home Bookmarks Linux ABCNEWS.com Data Banks Physics Press WordSmynth UNFCU Home

Preliminary ENDF/B-VII Library

Submitted files fall into 4 different categories:

1. n reactions up to 20 MeV
2. n and p reactions up to 150 MeV
3. charged particle reactions on light nuclei
4. photonuclear reactions up to 150 MeV

Full set of plots were obtained with the ENDVER package for the first group. The remaining ones are covered partially. In particular, cross sections formatted using MF=6, MT=5 representation could not be processed.

Projectile	MAT	Nuclide	Emax	Date	Labs	Authors	Submitted	Errors reported
n	925	9-F-19	20.0	EVAL-JUN90	CNDC,ORNL	Z.X.ZHAO,C.Y.FU,D.C.LARSON	10/2003	CHECKR FIZCON
n	1325	13-Al-27	150.0	EVAL-FEB97	LANL	M.B.CHADWICK & P.G.YOUNG	02/2001	CHECKR FIZCON
n	1425	14-Si-28	150.0	EVAL-JUN97	LANL,ORNL	M.B.CHADWICK,P.G.YOUNG,D.HETRICK	12/2002	CHECKR
n	1725	17-Cl-35	20.0	EVAL-OCT03	ORNL	R.SAYER,K.GUBER,L.LEAL,N.LARSON	10/2003	CHECKR FIZCON
n	1731	17-Cl-37	20.0	EVAL-OCT03	ORNL	R.SAYER,K.GUBER,L.LEAL,N.LARSON	10/2003	FIZCON
n	3225	32-Ge-70	20.0	EVAL-AUG04	BNL,JAERI	O.Iwamoto,M.Herman,S.Mughabghab+	09/2004	FIZCON
n	3231	32-Ge-72	20.0	EVAL-AUG04	BNL,JAERI	O.Iwamoto,M.Herman,S.Mughabghab+	09/2004	CHECKR FIZCON
n	3234	32-Ge-73	20.0	EVAL-AUG04	BNL,JAERI	O.Iwamoto,M.Herman,S.Mughabghab+	09/2004	FIZCON
n	3237	32-Ge-74	20.0	EVAL-AUG04	BNL,JAERI	O.Iwamoto,M.Herman,S.Mughabghab+	09/2004	FIZCON
n	3243	32-Ge-76	20.0	EVAL-AUG04	BNL,JAERI	O.Iwamoto,M.Herman,S.Mughabghab+	09/2004	FIZCON
n	4234	42-Mo-95	20.0	EVAL-OCT03	BNL+KAERI	Lee,Oh,Mughabghab,Oblozinsky	06/200	
n	4325	43-Tc-99	20.0	EVAL-SEP02	BNL,KAERI	P.Oblozinsky,I.Sirakov,Y.Lee+	06/2004	CHECKR FIZCON
n	4440	44-Ru-101	20.0	EVAL-OCT03	BNL+KAERI	Lee,Oh,Mughabghab,Oblozinsky	11/2003	
n	4525	45-Rh-103	20.0	EVAL-Feb03	BNL+KAERI	Lee,Chang,Mughabghab,Oblozinsky	12/2003	

Example: 233-U

Location Edit View Go Bookmarks Tools Settings Window Help

Location: file:/home/herman/evalkit/n-233U.html

n-233U

Preliminary ENDF/B-VII Library

ENDF/B-VII-file	Description	EXFOR-data
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Incident particle: n
Target: 233-U
MAT: 9222
Date: EVAL-MAR03
Authors: YOUNG, CHADWICK, TALOU, LEAL, DERRIE
Lab: LANL, ORNL
Maximum incident energy: 30.0 MeV

Outputs of checking codes

[CHECKR](#) [FIZCON](#) [PSYCHE](#)

Log-outputs of pre processing codes

[LINEAR](#) => [RECENT](#) => [SIGMA1](#) => [FIXUP](#) => [LEGEND](#)

Comments

- Errors reported by FIZCON

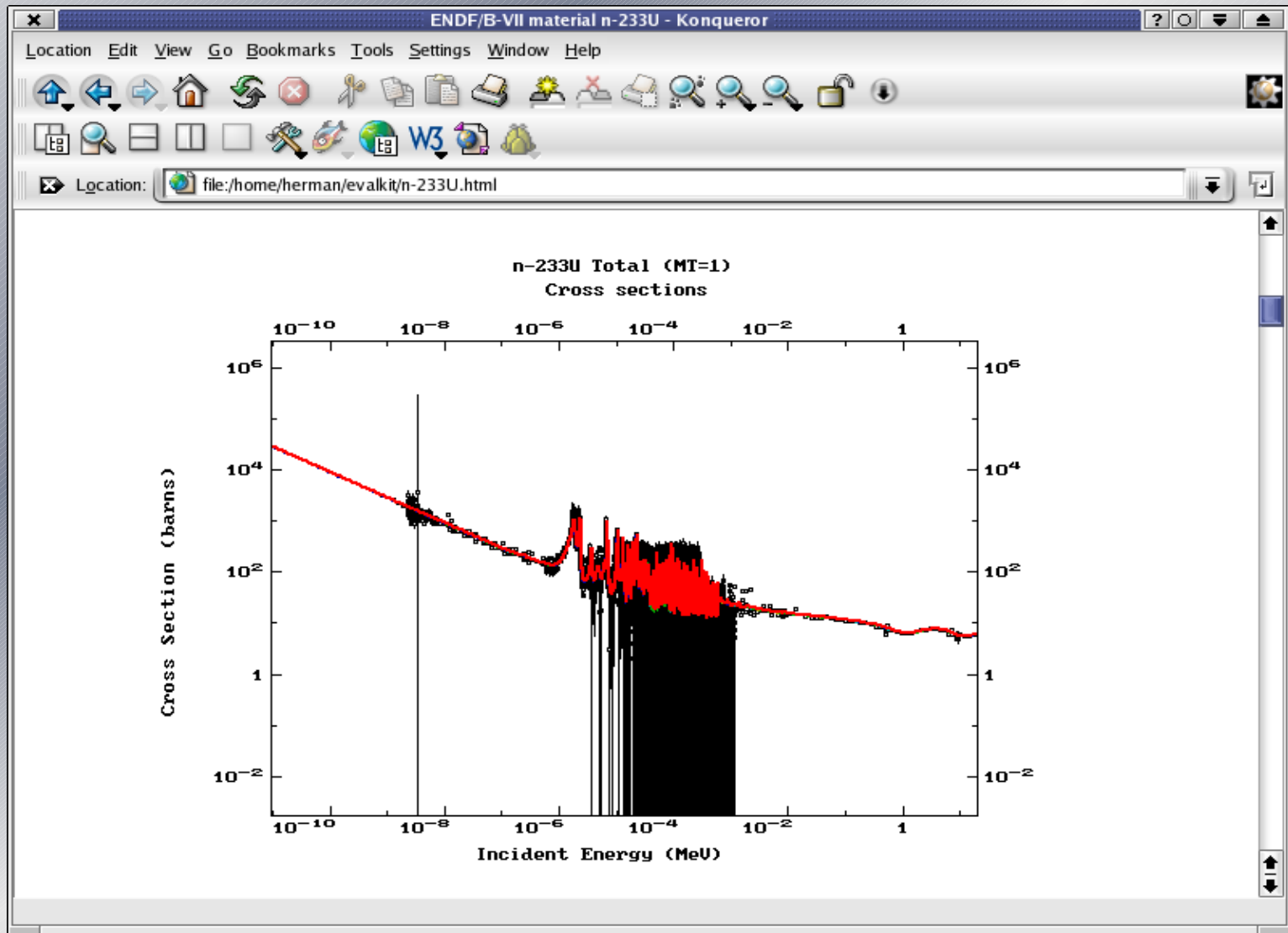
PLOT4 plots

Set of non-interactive (pdf) [plots](#) comparing ENDF-VII evaluation with experimental data available from EXFOR

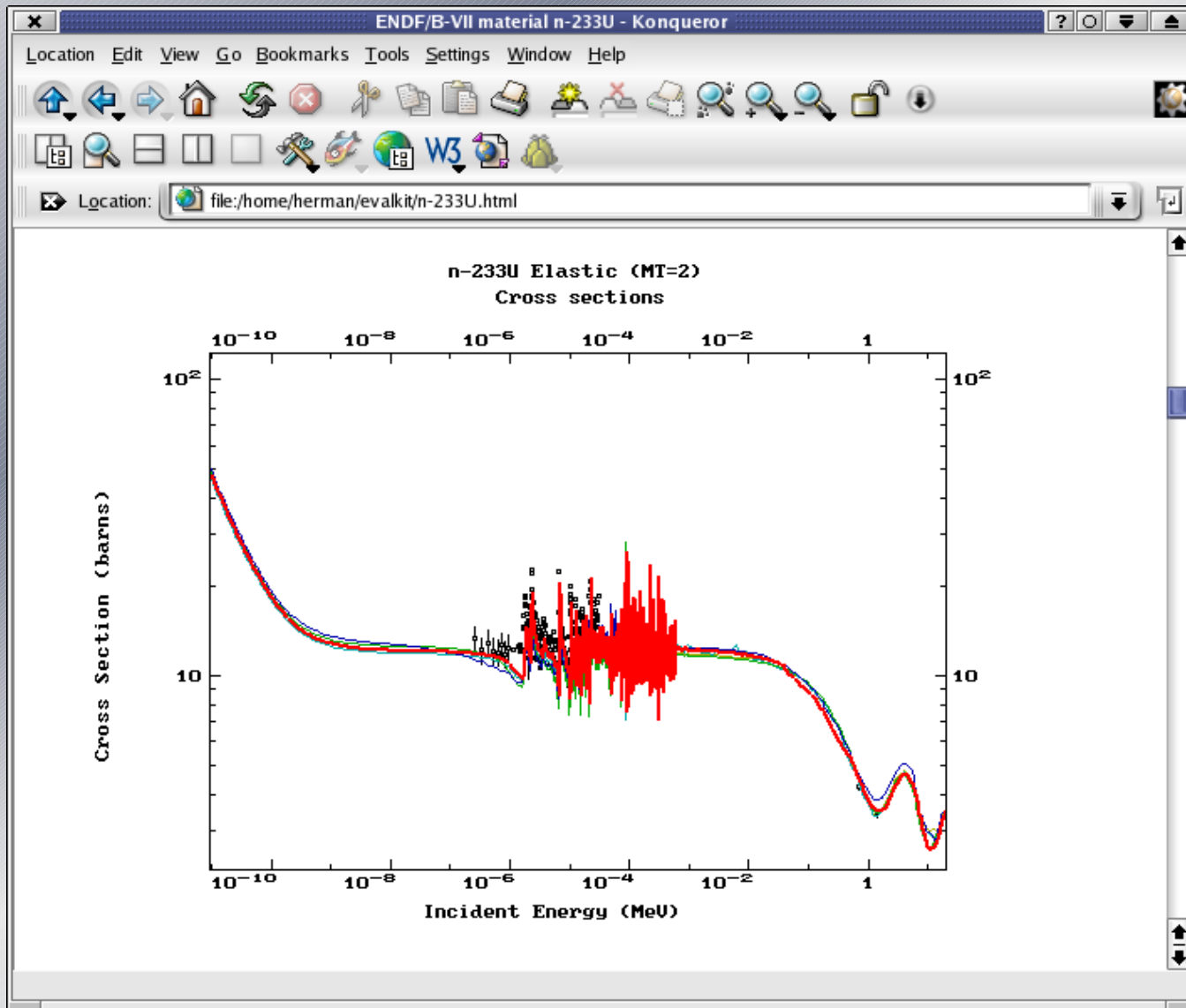
ZVView plots of cross sections

Comparison of ENDF-VII against experimental data and ENDF-VI.8 , JENDL-3.3 , JEF-3.0 , BROND-2.2 evaluations. This is a standard set of plots produced regardless of experimental data. Depending on availability of experimental data in EXFOR the PLOT4 set (see above) may contain more or fewer plots. Click on the pictures below to enter interactive ZVView plotting (ZVView package needs to be installed. Click [here](#) for a short ZVView manual)

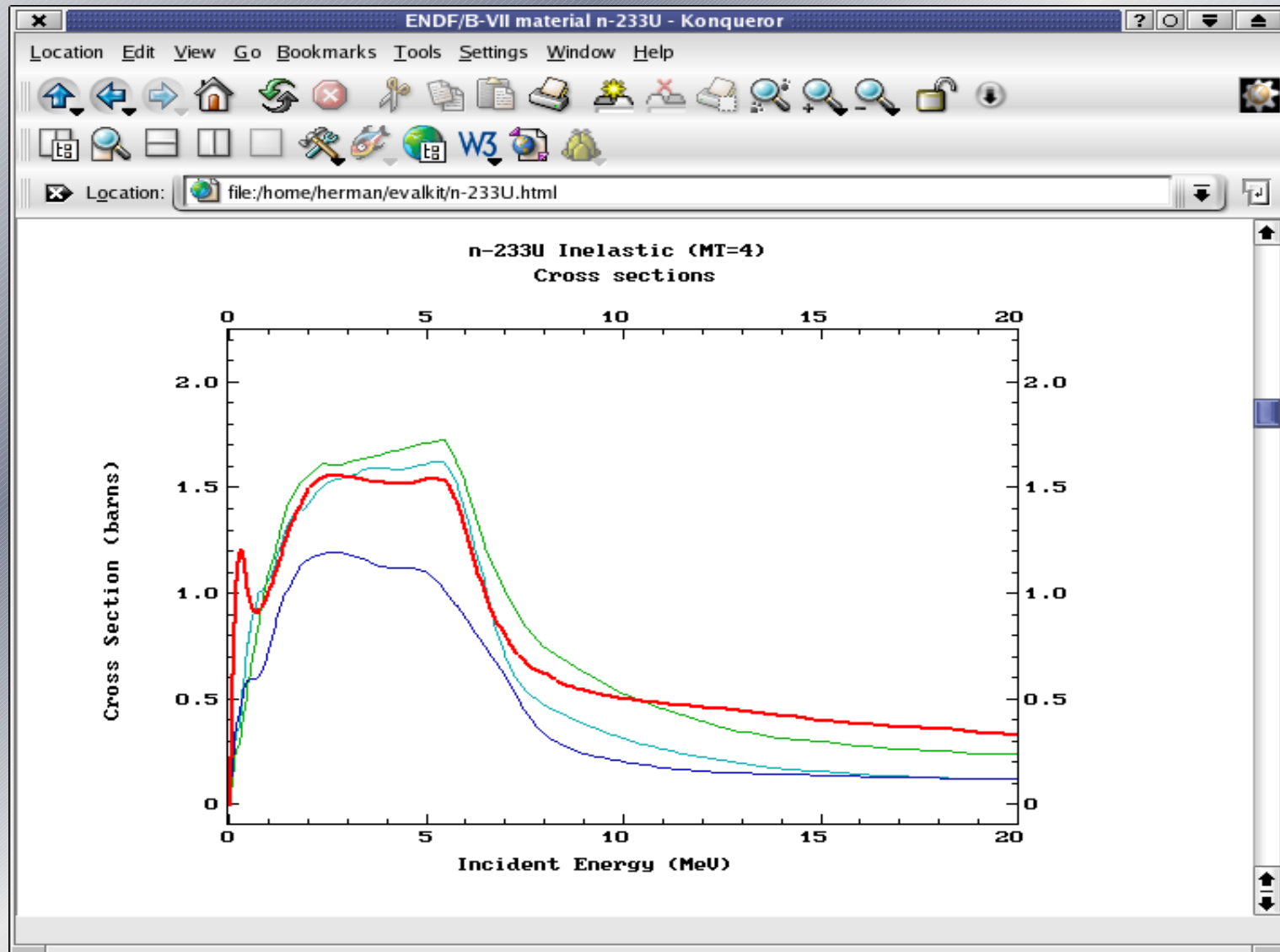
Total



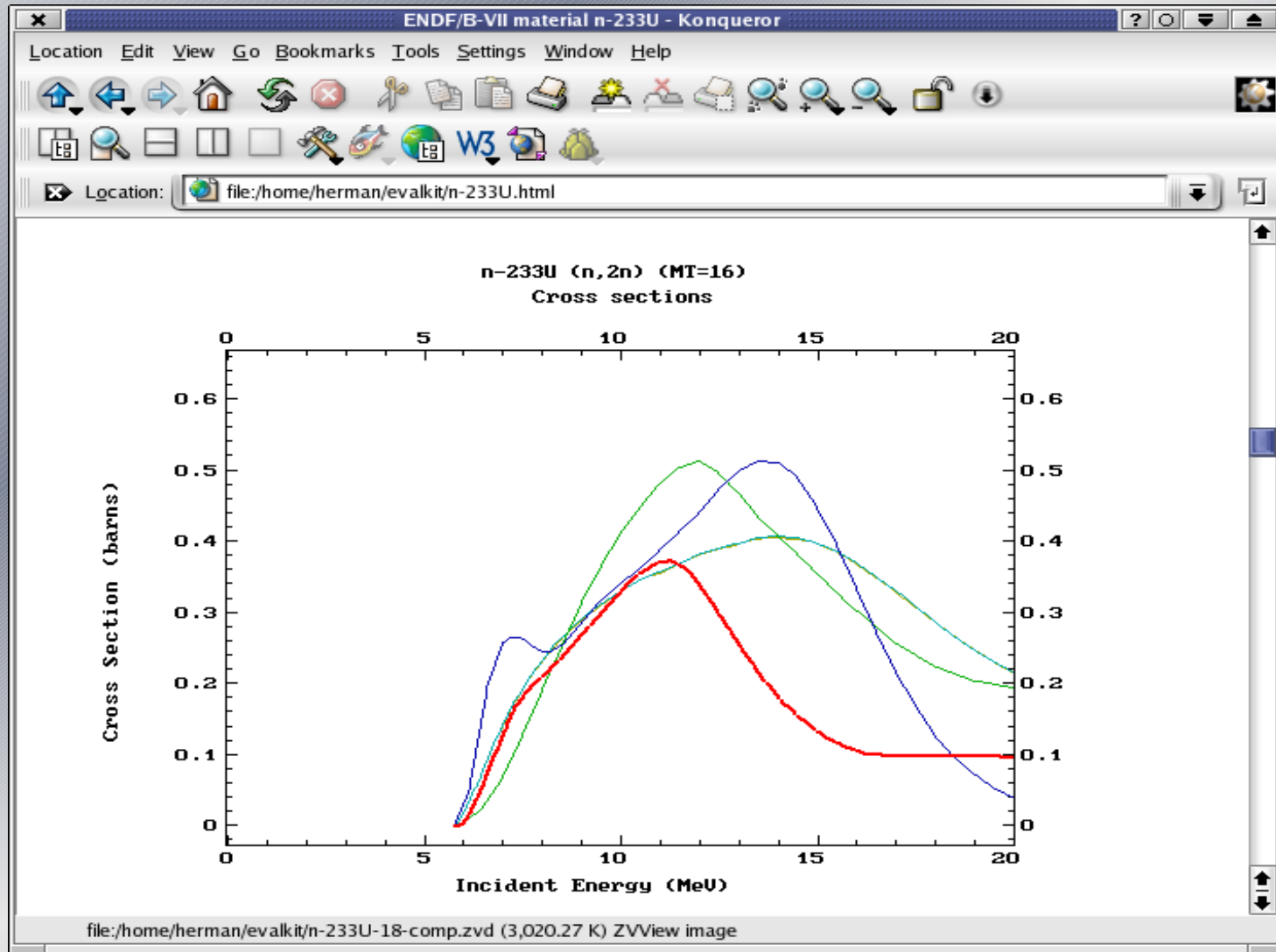
Elastic



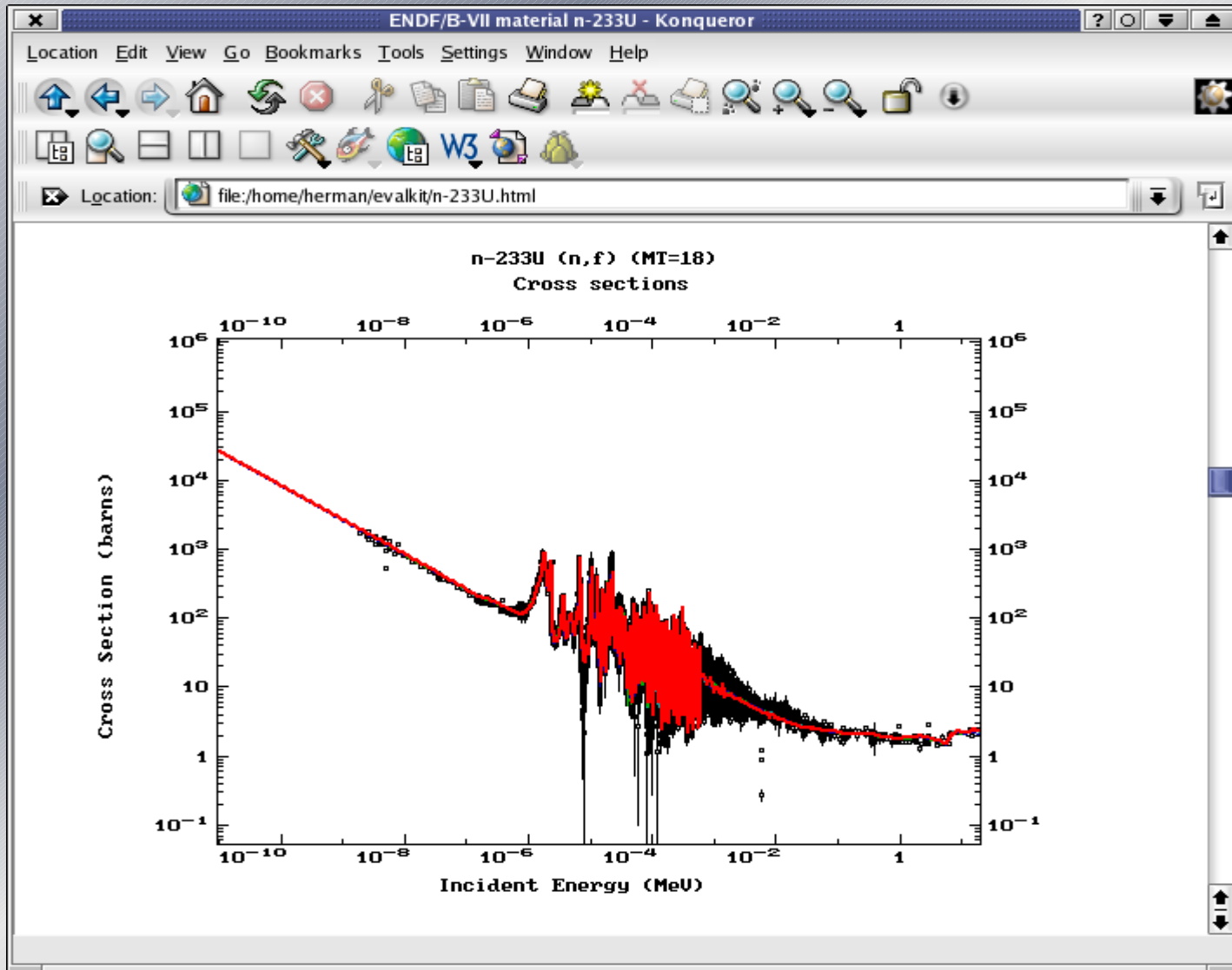
Inelastic



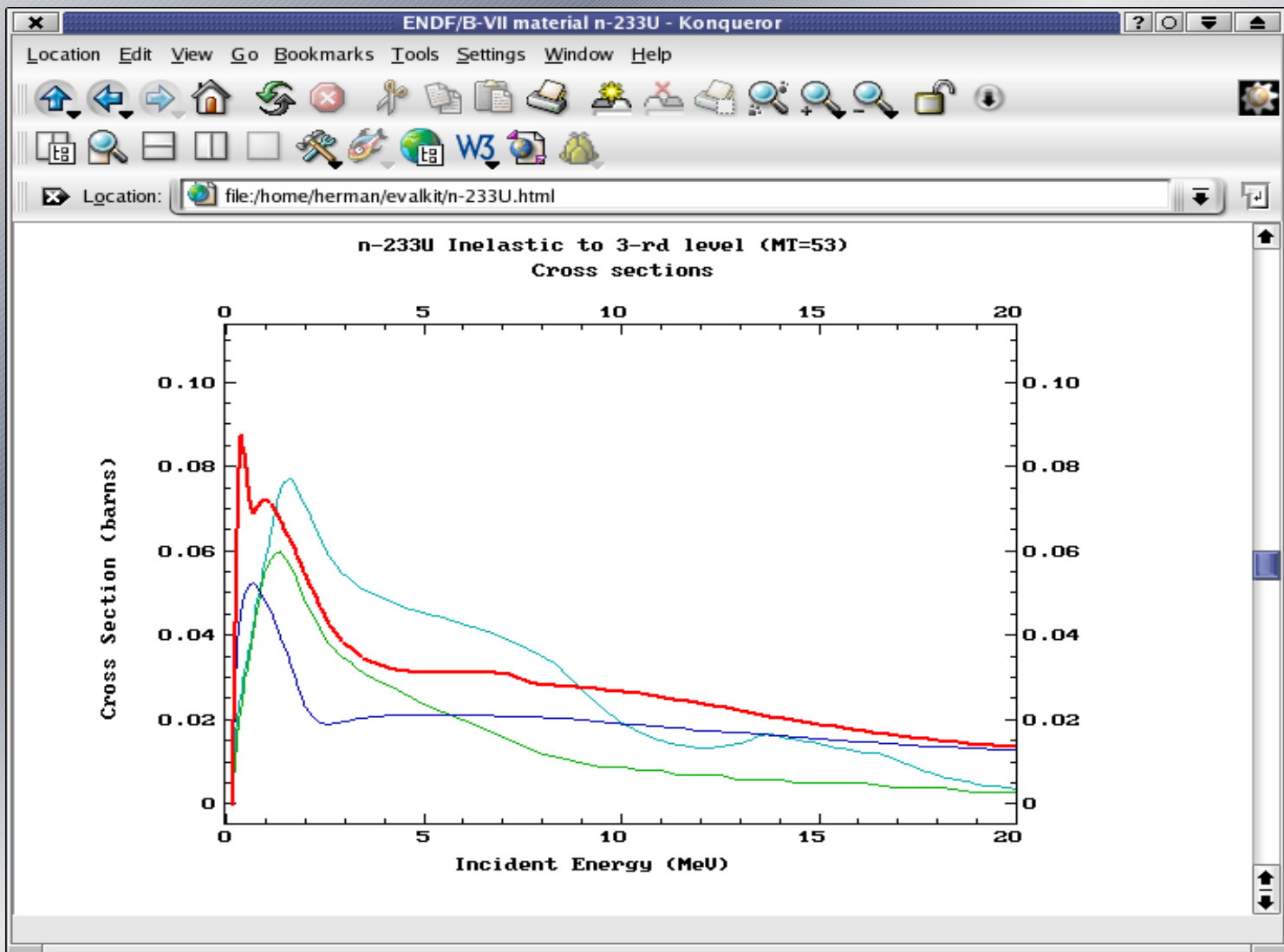
(n,2n)



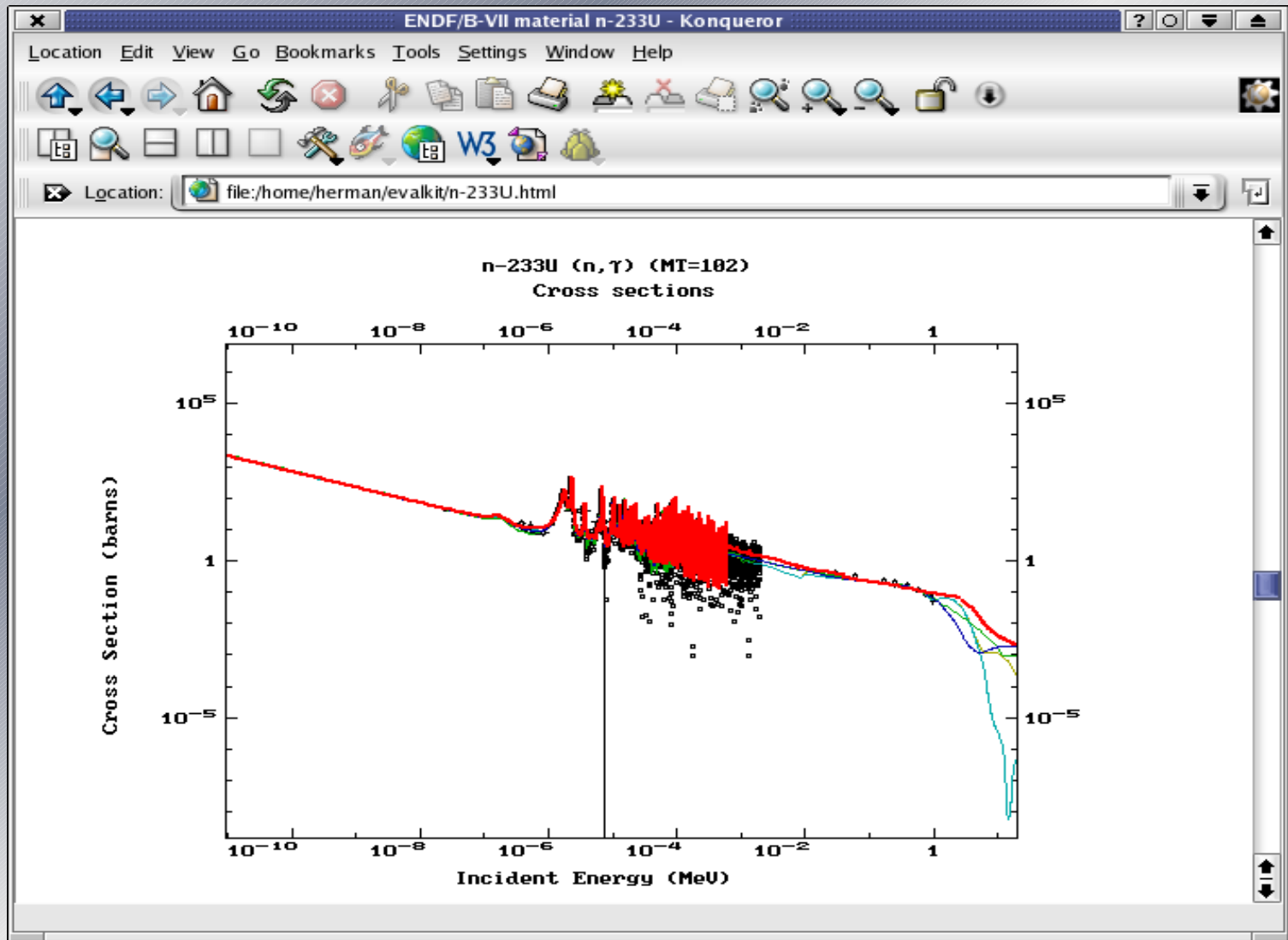
Fission



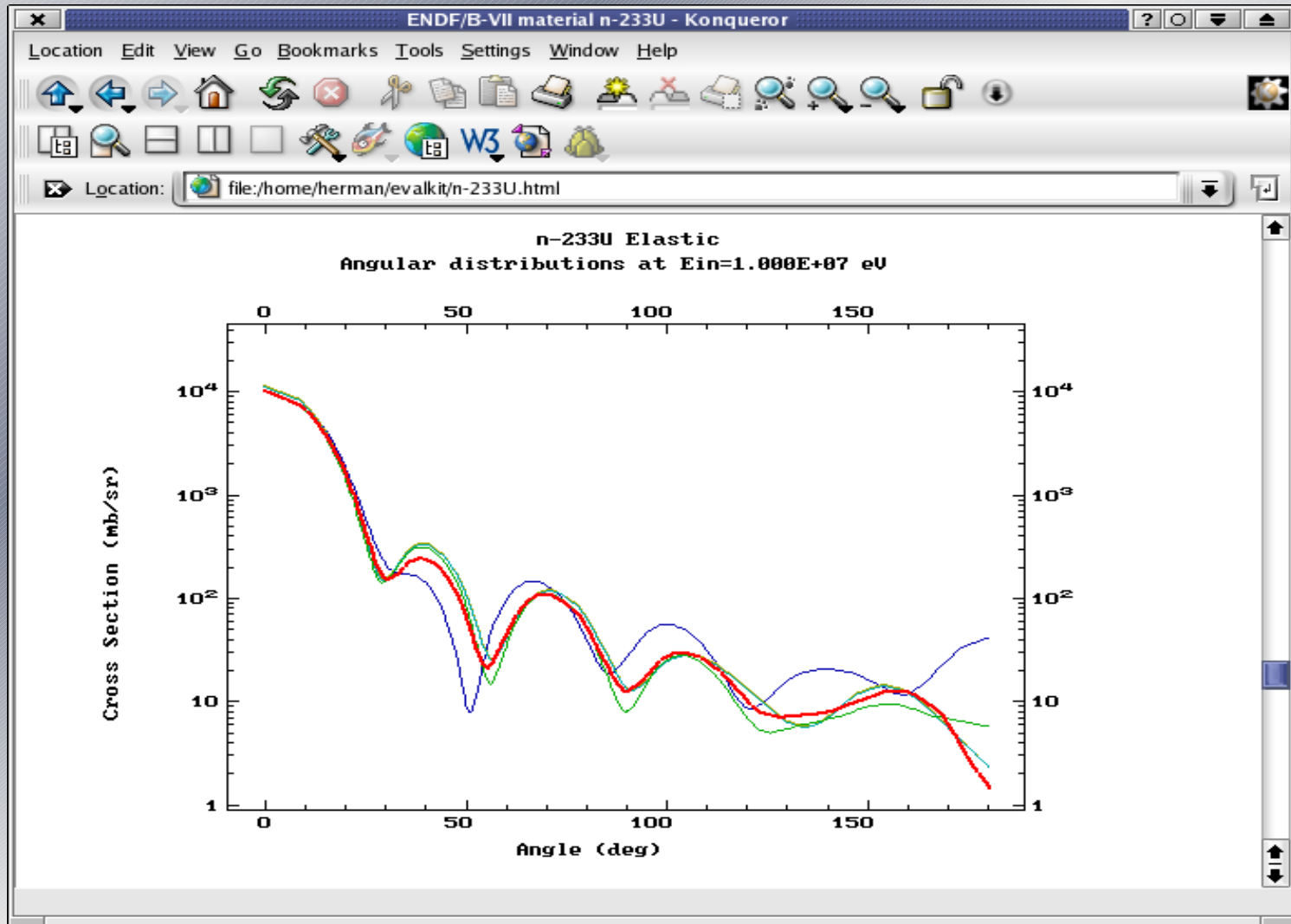
Inelastic to the 3-rd discrete level



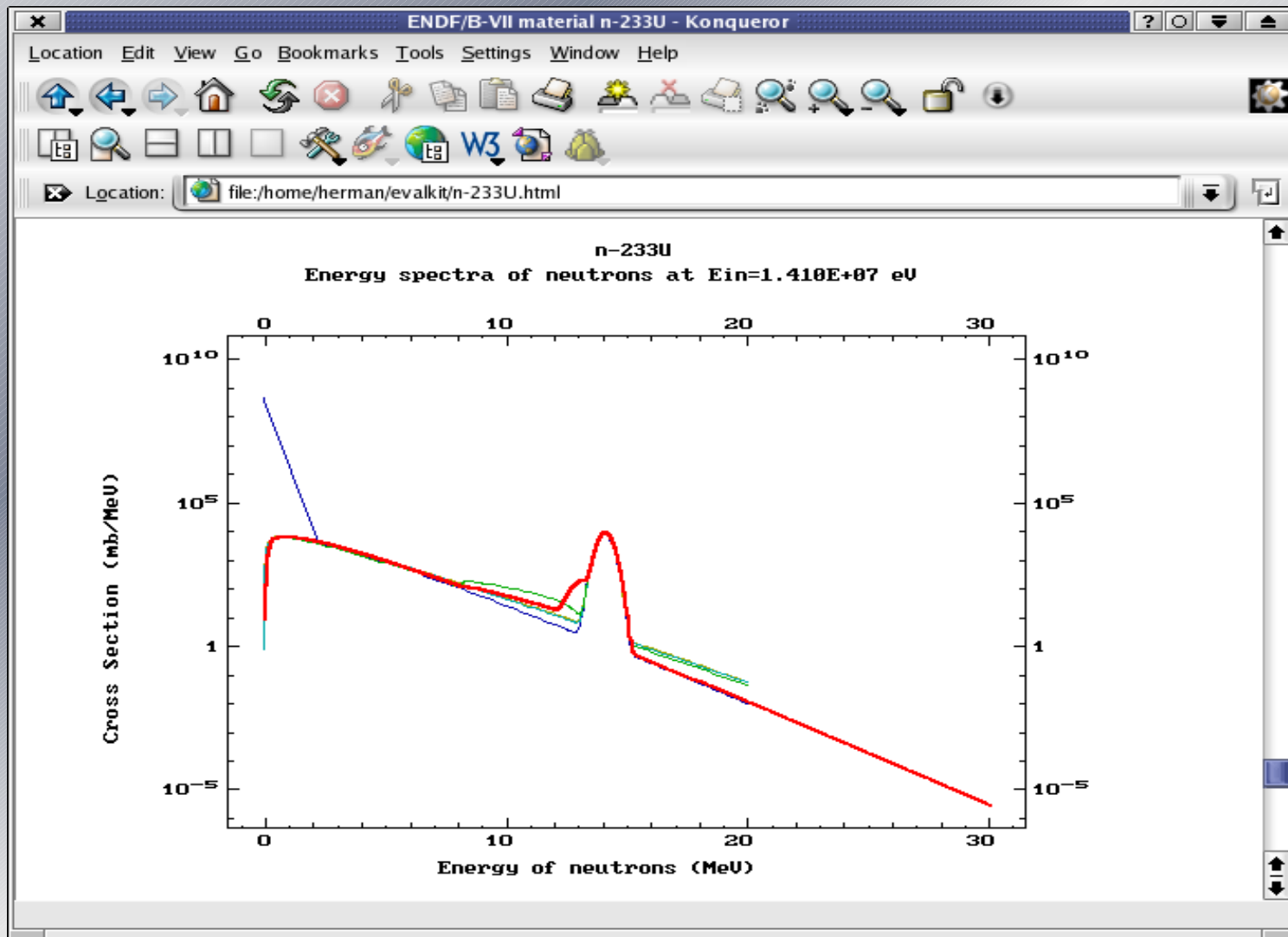
Capture



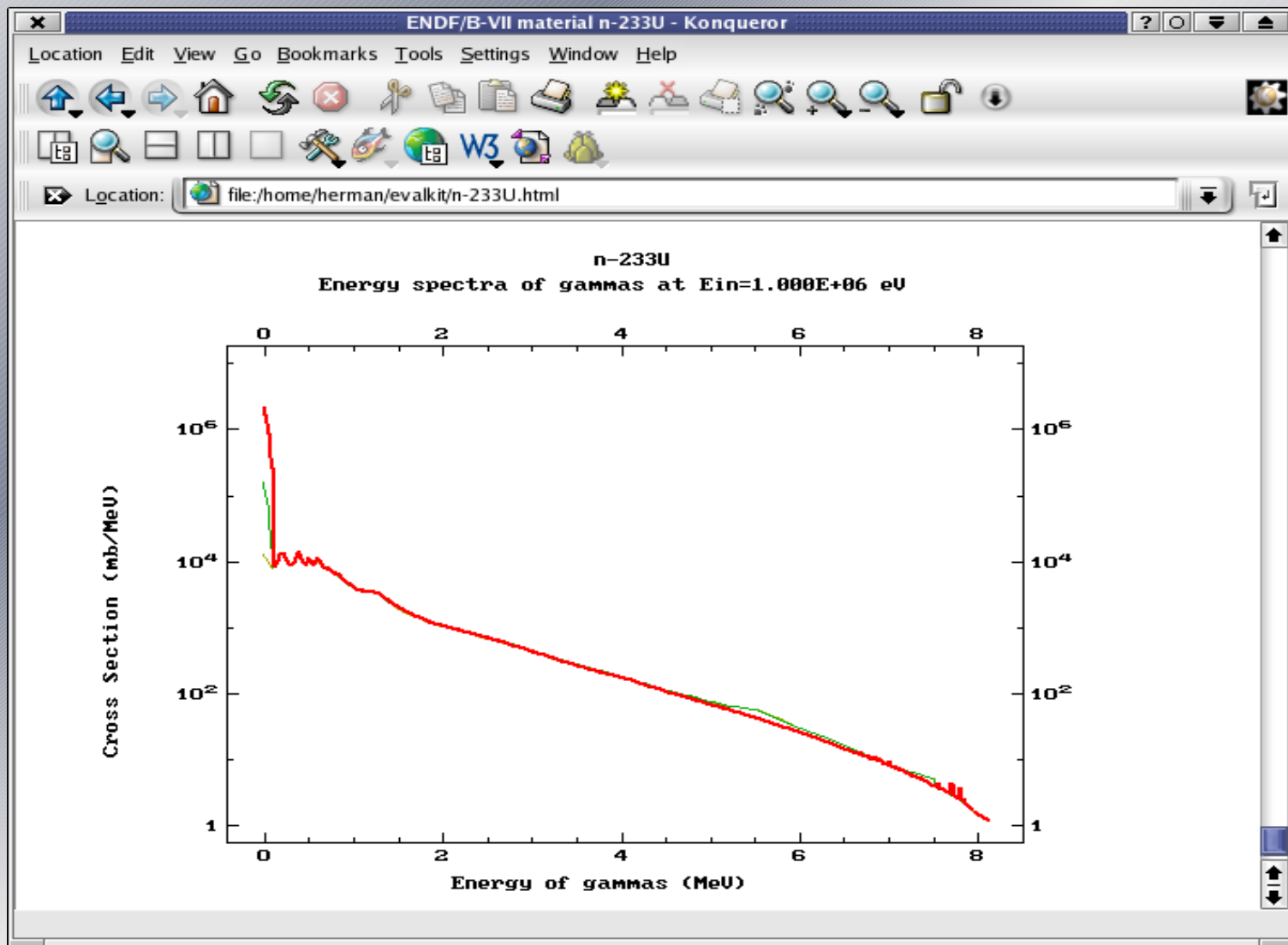
Angular distribution (elastic)



Neutron spectrum



Gamma spectrum



n	4634	46-Pd-105	20.0	EVAL-OCT03	BNL+KAERI	Lee,Chang,Mughabghab,Oblozinsky	11/2003	
n	4731	47-Ag-109	20.0	EVAL-OCT03	BNL+KAERI	Lee,Chang,Mughabghab,Oblozinsky	11/2003	
n	5446	54-Xe-131	20.0	EVAL-Feb03	BNL,KAERI	Lee,Oh,Mughabghab,Oblozinsky	12/2003	
n	5525	55-Cs-133	20.0	EVAL-OCT03	BNL+KAERI	Lee,Chang,Mughabghab,Oblozinsky	11/2003	
n	5925	59-Pr-141	20.0	EVAL-Oct02	BNL+KAERI	Lee,Chang,Oblozinsky,Mughabghab	12/2003	FIZCON
n	6028	60-Nd-143	20.0	EVAL-AUG99	BNL+KAERI	Lee,Chang,Mughabghab,Oblozinsky	12/2003	
n	6034	60-Nd-145	20.0	EVAL-OCT03	BNL+KAERI	Lee,Chang,Mughabghab,Oblozinsky	11/2003	FIZCON
n	6234	62-Sm-147	20.0	EVAL-OCT03	BNL+KAERI	Lee,Oh,Mughabghab,Oblozinsky	11/2003	FIZCON
n	6240	62-Sm-149	20.0	EVAL-Dec02	KAERI+BNL	Lee,Chang,Mughabghab,Oblozinsky	12/2003	
n	6243	62-Sm-150	20.0	EVAL-OCT03	BNL+KAERI	Lee,Oh,Mughabghab,Oblozinsky	11/2003	FIZCON
n	6246	62-Sm-151	20.0	EVAL-SEP02	KAERI+BNL	Lee,Oh,Oblozinsky,Mughabghab	12/2003	FIZCON
n	6249	62-Sm-152	20.0	EVAL-OCT03	BNL+KAERI	Lee,Oh,Mughabghab,Oblozinsky	11/2003	
n	6331	63-Eu-153	20.0	EVAL-SEP02	BNL+KAERI	P.Oblozinsky,Y.Lee,J.Chang,S.Oh+	02/2003	FIZCON
n	6434	64-Gd-155	20.0	EVAL-OCT03	BNL+KAERI	Lee,Chang,Mughabghab,Oblozinsky	11/2003	
n	6440	64-Gd-157	20.0	EVAL-SEP02	BNL+KAERI	P.Oblozinsky,Y.Lee,J.Chang,S.Oh+	02/2003	
n	6637	66-Dy-160	20.0	EVAL-OCT03	BNL+KAERI	Lee,Oh,Mughabghab	11/2003	
n	6640	66-Dy-161	20.0	EVAL-OCT03	BNL+KAERI	Lee,Oh,Mughabghab	11/2003	
n	6643	66-Dy-162	20.0	EVAL-OCT03	BNL+KAERI	Lee,Oh,Mughabghab	11/2003	
n	6646	66-Dy-163	20.0	EVAL-OCT03	BNL+KAERI	Lee,Oh,Mughabghab	11/2003	
n	6649	66-Dy-164	20.0	EVAL-OCT03	BNL+KAERI	Lee,Oh,Mughabghab	11/2003	
n	8025	80-Hg-196	150.0	EVAL-FEB98	LANL	S.CHIBA, M.CHADWICK,P.YOUNG	04/2002	CHECKR FIZCON
n	8031	80-Hg-198	150.0	EVAL-FEB98	LANL	M.CHADWICK, S.CHIBA,P.YOUNG	04/2002	CHECKR FIZCON
n	8034	80-Hg-199	150.0	EVAL-FEB98	LANL	S.CHIBA, M.CHADWICK,P.YOUNG	04/2002	CHECKR FIZCON
n	8037	80-Hg-200	150.0	EVAL-FEB98	LANL	M.CHADWICK, S.CHIBA,P.YOUNG	04/2002	CHECKR FIZCON
n	8040	80-Hg-201	150.0	EVAL-FEB98	LANL	S.CHIBA, M.CHADWICK,P.YOUNG	02/2002	CHECKR FIZCON



n	8043	80-Hg-202	150.0	EVAL-FEB98	LANL	M.CHADWICK, S.CHIBA,P.YOUNG	04/2002	CHECKR FIZCOON
n	8049	80-Hg-204	150.0	EVAL-FEB98	LANL	S.CHIBA, M.CHADWICK,P.YOUNG	04/2002	CHECKR FIZCOON
n	8237	82-Pb-208	150.0	EVAL-AUG96	LANL,ORNL	M.B.CHADWICK,P.G.YOUNG,C.Y.FU	11/2002	CHECKR
n	9219	92-U-232	30.0	EVAL-OCT01	ORNL,LANL+	M.B.CHADWICK, P.G.YOUNG	04/2002	
n	9222	92-U-233	30.0	EVAL-MAR03	LANL,ORNL	YOUNG,CHADWICK,TALOU,LEAL,DERRIE	04/2003	FIZCOON
n	9225	92-U-234	30.0	EVAL-MAR03	ORNL,LANL+	P.G.YOUNG,M.B.CHADWICK	04/2003	CHECKR
n	9228	92-U-235	20.0	EVAL-JAN03	ORNL,LANL, +	YOUNG, TALOU, CHADWICK, LUBITZ	09/2003	FIZCOON
n	9231	92-U-236	30.0	EVAL-SEP03	LANL	YOUNG,CHADWICK,MACFARLANE,ET AL.	12/2003	CHECKR
n	9346	93-Np-237	20.0	EVAL-OCT02	LANL	P.YOUNG, E.ARTHUR, F.MANN	03/2003	CHECKR FIZCOON
n	9234	92-U-237	30.0	EVAL-SEP00	LANL	P.G.Young, M.B.Chadwick	03/2003	CHECKR
n	9237	92-U-238	30.0	EVAL-FEB03	ORNL,LANL+	P.G.YOUNG,M.B.CHADWICK,L.W.WESTO	03/2003	FIZCOON
n	9437	94-Pu-239	20.0	EVAL-JAN03	LANL	TALOU, CHADWICK, MADLAND, YOUNG	03/2003	FIZCOON
n	9240	92-U-239	30.0	EVAL-SEP00	LANL	P.G.Young, M.B.Chadwick	03/2003	CHECKR
n	9243	92-U-240	30.0	EVAL-SEP03	LANL	YOUNG,CHADWICK,MACFARLANE,ET AL.	10/2003	
n	9543	95-Am-241	30.0	EVAL-AUG03	LANL,	Kawano, Chadwick (tentative)	10/2003	CHECKR
n	9443	94-Pu-241	20.0	EVAL-OCT88	ORNL	L.WESTON,R.WRIGHT,H.DERRIEN +	10/2003	CHECKR FZCOON
n	9246	92-U-241	30.0	EVAL-SEP00	LANL	P.G.Young, M.B.Chadwick	03/2003	CHECKR FIZCOON
p	131	1-H-3	20.0	EVAL-SEP01	LANL	G. M. HALE	11/2002	CHECKR
p	325	3-Li-6	2.5	EVAL-AUG01	LANL	G.M.HALE	11/2002	CHECKR FIZCOON
p	328	3-Li-7	3.0	EVAL-AUG01	LANL	G.M.HALE	11/2002	CHECKR FIZCOON
p	8025	80-Hg-196	150.0	EVAL-FEB98	LANL	S.CHIBA, M.CHADWICK,P.YOUNG	04/2002	CHECKR FIZCOON
p	8031	80-Hg-198	150.0	EVAL-FEB98	LANL	S.CHIBA, M.CHADWICK,P.YOUNG	04/2002	CHECKR FIZCOON
p	8034	80-Hg-199	150.0	EVAL-FEB98	LANL	M.CHADWICK,S.CHIBA,P.YOUNG	04/2002	CHECKR FIZCOON
p	8037	80-Hg-200	150.0	EVAL-FEB98	LANL	M.CHADWICK,S.CHIBA,P.YOUNG	04/2002	CHECKR FIZCOON
p	8040	80-Hg-201	150.0	EVAL-FEB98	LANL	S.CHIBA,M.CHADWICK,P.YOUNG	04/2002	CHECKR FIZCOON

p	8043	80-Hg-202	150.0	EVAL-FEB98	LANL	M.CHADWICK,S.CHIBA,P.YOUNG	04/2002	CHECKR FIZOON
p	8049	80-Hg-204	150.0	EVAL-FEB98	LANL	S.CHIBA,M.CHADWICK,P.YOUNG	04/2002	CHECKR FIZOON
d	128	1-H-2	10.0	EVAL-SEP01	LANL	G. M. HALE		CHECKR
d	131	1-H-3	30.0	EVAL-JAN95	LANL	G. M. HALE AND M. DROSG		CHECKR FIZOON
d	225	2-He-3	1.4	EVAL-FEB01	LANL	G.M. HALE	11/2002	CHECKR
d	325	3-Li-6	12.0	EVAL-SEP01	LANL	G.M.HALE		CHECKR FIZOON
d	328	3-Li-7	20.0	EVAL-	LANL	G.M.HALE	2/2004	CHECKR
t	131	1-H-3	20.0	EVAL-FEB01	LANL	G.M. HALE		CHECKR FIZOON
t	225	2-He-3	20.0	EVAL-AUG01	LANL	G.M. HALE		CHECKR FIZOON
t	325	3-Li-6	0.0	EVAL-	LANL	G.M.HALE	2/2004	CHECKR FIZOON
3-He	225	2-He-3	20.0	EVAL-AUG01	LANL	G.M. HALE	11/2002	CHECKR FIZOON
3-He	325	3-Li-6	20.0	EVAL-	LANL	G.M.HALE	11/2002	CHECKR
g	128	1-H-2	30.0	EVAL-	LANL		04/2003	
g	409	4-Be-9	30.0	EVAL-DEC9		8 B.YU, J.ZHANG, Y.HAN	04/2003	
g	625	6-C-12	150.0	EVAL-OCT99	LANL	M.CHADWICK,P.YOUNG	04/2003	
g	628	6-C-13	140.0	EVAL-DEC99	KAERI	Y.HAN,Y.-O.LEE	04/2003	
g	725	7-N-14	140.0	EVAL-DEC99	KAERI	Y.HAN,Y.-O.LEE	04/2003	
g	728	7-N-15	140.0	EVAL-DEC99	KAERI	Y.HAN,Y.-O.LEE	04/2003	
g	825	8-O-16	150.0	EVAL-NOV99	LANL	M.CHADWICK,P.YOUNG	04/2003	
g	828	8-O-17	140.0	EVAL-DEC99	KAERI	Y.HAN,Y.-O.LEE	04/2003	
g	831	8-O-18	140.0	EVAL-DEC99	KAERI	Y.HAN,Y.-O.LEE	04/2003	
g	1125	11-Na-23	140.0	EVAL-DEC99	KAERI	Y.HAN,Y.-O.LEE	04/2003	
g	1225	12-Mg-24	140.0	EVAL-DEC99	KAERI	Y.HAN,Y.-O.LEE	04/2003	
g	1228	12-Mg-25	140.0	EVAL-DEC99	KAERI	Y.HAN,Y.-O.LEE	04/2003	
g	1231	12-Mg-26	140.0	EVAL-DEC99	KAERI	Y.HAN,Y.-O.LEE	04/2003	

Typical errors

■ CHECKR

- Out of sequence
- MATP is obsolete, should be set to 0
- Format error in card no. ...
- This section requires the presence of section ...

■ FIZCON

- Check normalization= 1.000552
- Presence of file 3, MT= 19 requires an equivalent section in file 5
- Section does not span the same energy range as...
- Contents of file 12 require a section MF= 14
- The minimum incident energy of $1.25462e+06(\text{eV})$ should be $1.00000e-05(\text{eV})$ for $Q= 0.00000e+00(\text{eV})$

■ 'Umlaut errors' – non-standard characters, tabulators

Conclusions

Most files **need to be revised!**

- BNL will rerun all KAERI/BNL evaluations –
 - inclusion of full photon production,
 - correction of unphysical behaviour of high energy tail of MT=51,52,53,...
- CHECKR and FIZCON - complains about 57 out of 76 evaluations, especially about Cl and Hg
- PSYCHE outputs must be critically reviewed – energy balance *might* be unacceptable (30-60%) for a number of evaluations