JANIS Book

of triton-induced cross-sections

Comparison of evaluated and experimental data from

ENDF/B-VII.1, TENDL-2011 and EXFOR

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OECD NEA Data Bank

Introduction

This document compares evaluated cross-sections below 200 MeV with corresponding experimental data from the EXFOR database for a number of evaluated libraries (Table 1), nuclear reactions and associated reaction products (Table 2). This document was produced using tools based on the NEA Java-based nuclear information software (JANIS) and associated databases [1].

Caveat: When studying plots, please take into account that the energy resolution of experimental data is not always comparable with the resolution of the evaluated data.

Graphical comparison of nuclear data

Experimental data sets are identified by their EXFOR entry number. All experimental data are plotted on the graph but the legend will ignore all of them if there are more than 20 data sets.

Evaluated data are plotted with full lines for exclusive cross-sections explicitly defined by a MT number, whereas dashed lines indicate residual production cross-sections given in MT5. A star '*' after the name of the library indicates additional operations performed by JANIS, e.g. summation over the ground and metastable yields, reconstruction of residual production cross-sections over the whole energy range.

The data are plotted in log-log scale (on the left hand side) and lin-log scale (on the right hand side). The best representation depends on the Q value of the reaction and/or the magnitude of the variation in the cross-section values.

Table of reactions and Q values

In order to identify individual contributions in residual production cross-sections, reactions leading to the same product are listed along with their associated Q values. The latter are calculated using mass excess from the 2003 Nubase and Atomic Mass Evaluation [2].

Navigation in this document

The data are sorted by element, then by isotope and finally by reaction. In order to facilitate access to the information, two navigation modes are available in addition to the usual bookmark. At the top of each page, on the first row, the previous (<<) and next (>>) "Isotope links" allow the reader to move from one isotope to another while staying on the same MT reaction. On the second row, the "MT links" allow scanning all reactions of a given isotope. The latter navigation mode is actually similar to the use of the page up and page down keys.

References

[1] N. Soppera *et al.*, *Journal of the Korean Physical Society*, 59 (2011) 1329. See also www.oecd-nea.org/janis.

[2] G. Audi, A.H. Wapstra, *et al.*, *Nuclear Physics* A 729 (2003) 3-676.

Table 1: list of databases used in the inter-comparison

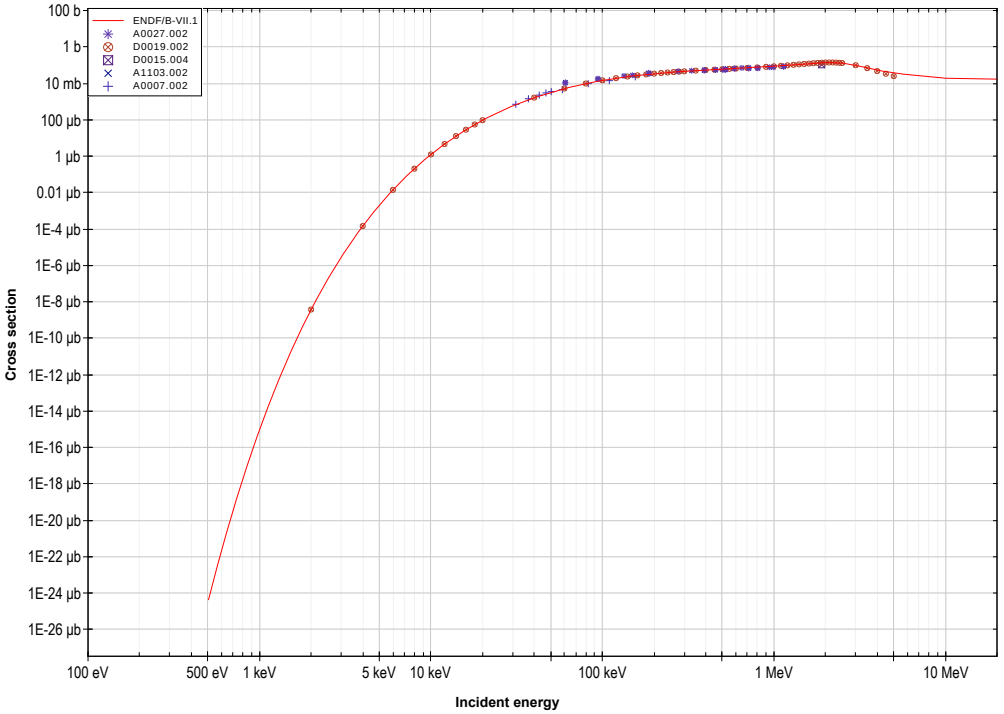
Library	Release date
ENDF/B-VII.1	December 2011
TENDL-2011	December 2011
EXFOR	May 2012

Table 2: list of exclusive reactions used in the inter-comparison

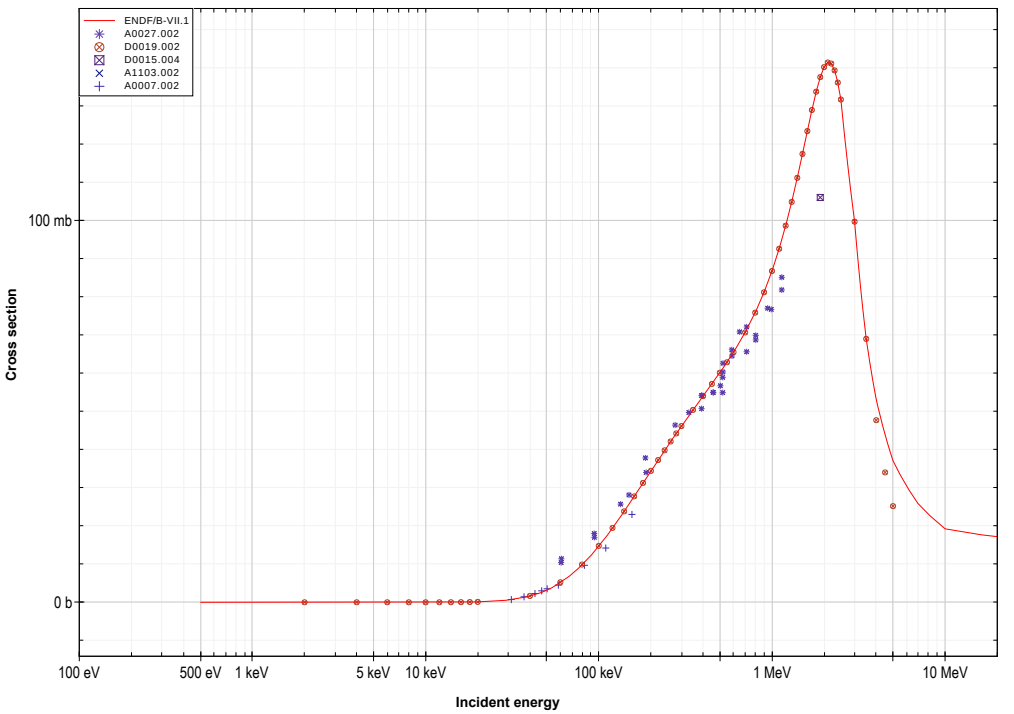
MT	Reaction	MT	Reaction	MT	Reaction	MT	Reaction
4	n	102	gamma	159	2n+p+a	181	3n+p+a
11	2n+d	103	p	160	7n	182	d+t
16	2n	104	d	161	8n	183	n+p+d
17	3n	105	t	162	5n+p	184	n+p+t
18	fission	106	h	163	6n+p	185	n+d+t
22	n+a	107	a	164	7n+p	186	n+p+h
23	n+3a	108	2a	165	4n+a	187	n+d+h
24	2n+a	109	3a	166	5n+a	188	n+t+h
25	3n+a	111	2p	167	6n+a	189	n+t+a
28	n+p	112	p+a	168	7n+a	190	2n+2p
29	n+2a	113	t+2a	169	4n+d	191	p+h
30	2n+2a	114	d+2a	170	5n+d	192	d+h
32	n+d	115	p+d	171	6n+d	193	h+a
33	n+t	116	p+t	172	3n+t	194	4n+2p
34	n+h	117	d+a	173	4n+t	195	4n+2a
35	n+d+2a	152	5n	174	5n+t	196	4n+p+a
36	n+t+2a	153	6n	175	6n+t	197	3p
37	4n	154	2n+t	176	2n+h	198	n+3p
41	2n+p	155	t+a	177	3n+h	199	3n+2p+a
42	3n+p	156	4n+p	178	4n+h	200	5n+2p
44	n+2p	157	3n+d	179	3n+2p		
45	n+p+a	158	n+d+a	180	3n+2a		

	1-H-3	3-Li-6 >>
	MT16 (t,2n) or MT5 (He4 production)	MT28 (t,n+p) >>

H3 (t,2n) log-log



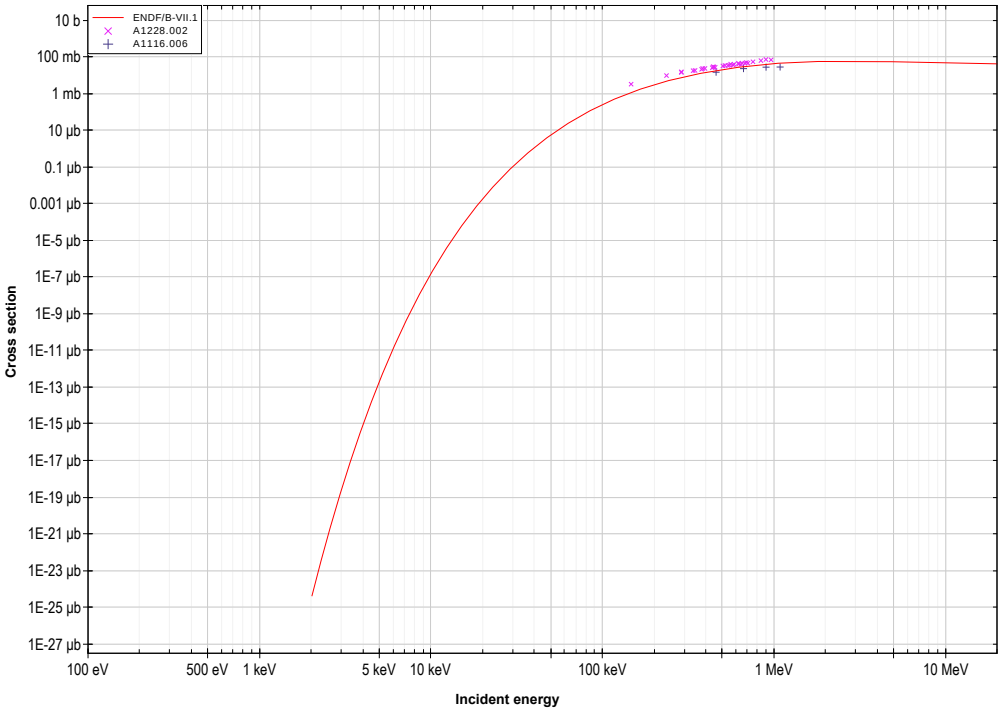
H3 (t,2n) lin-log



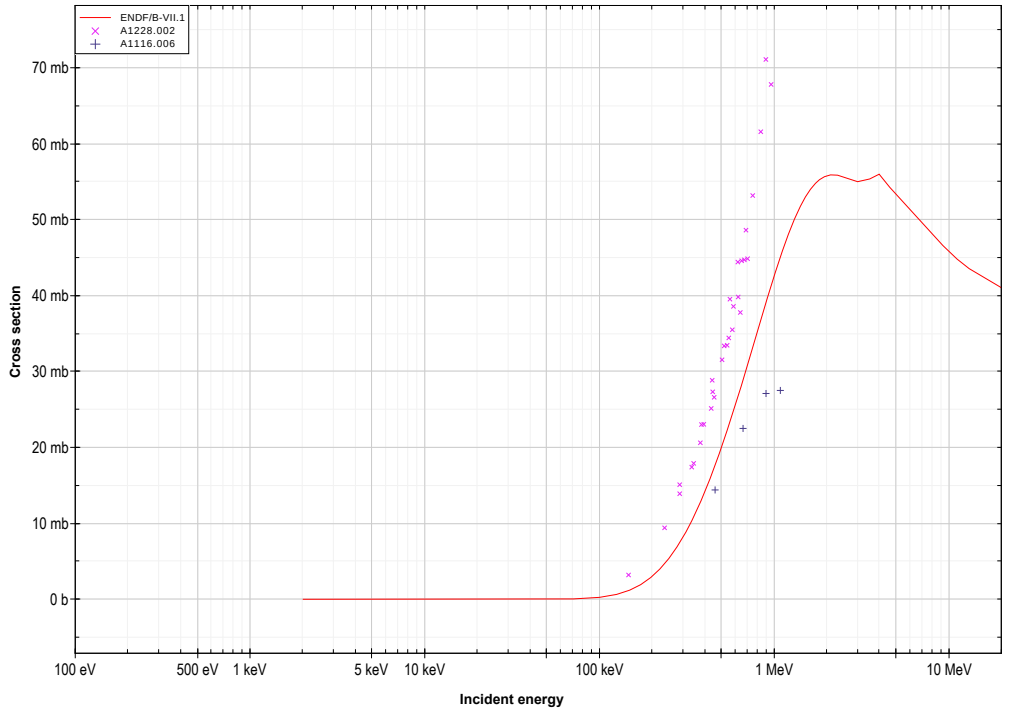
Reaction	Q-Value
H3(t,2n)He4	11332.06 keV

	2-He-3	
<< MT16 (t,2n)	**MT28 (t,n+p) or MT5 (He4 production)**	MT16 (t,2n) >>

He3 (t,n+p) log-log



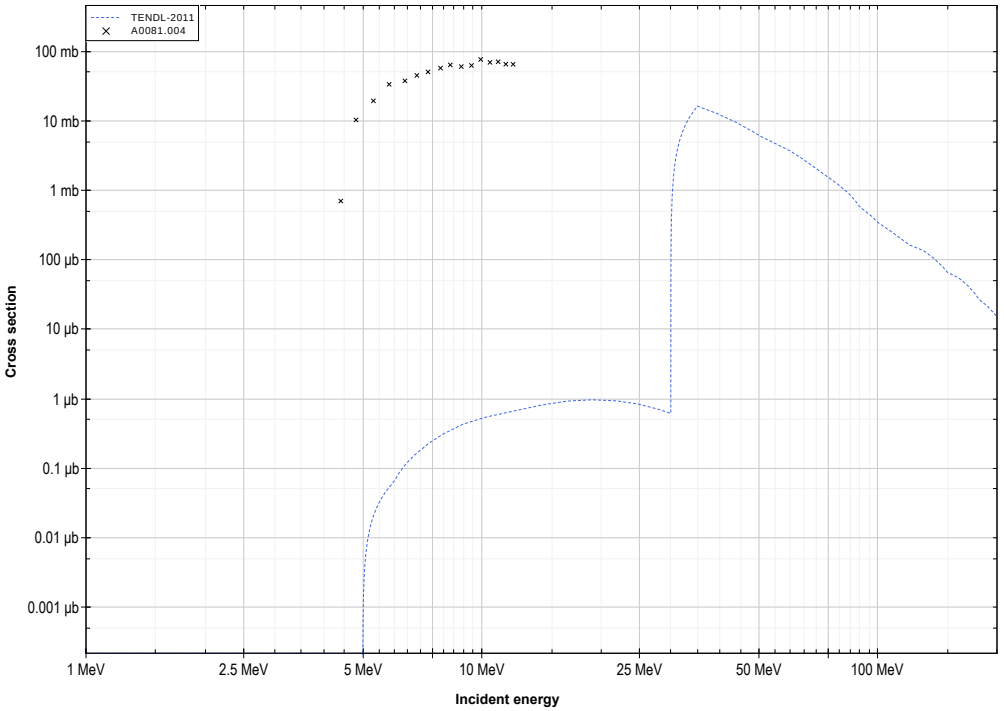
He3 (t,n+p) lin-log



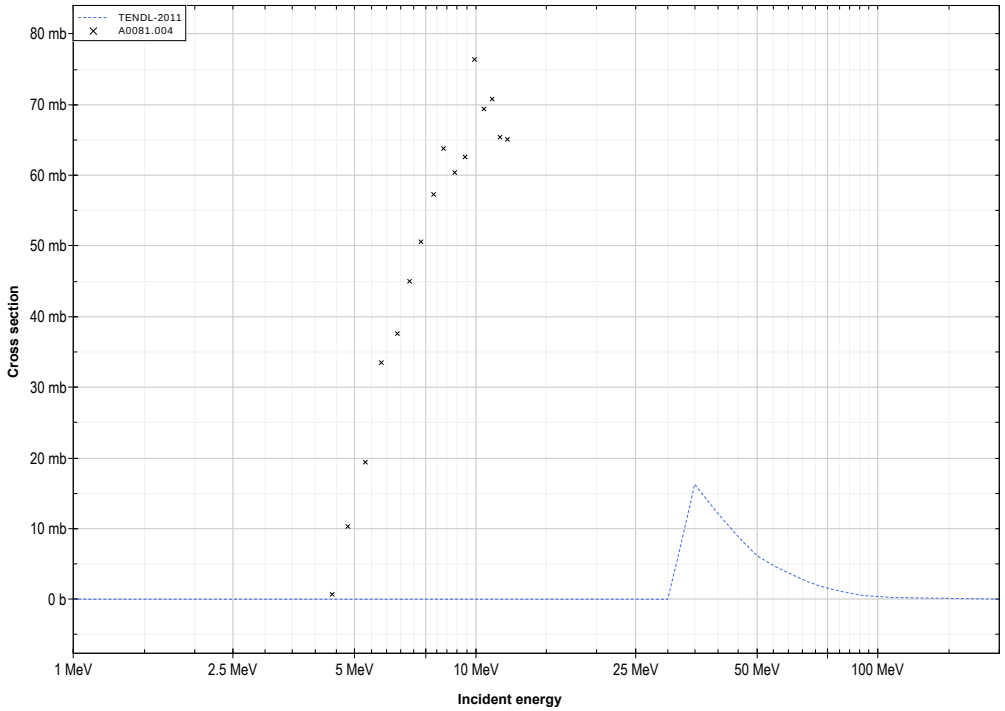
Reaction	Q-Value
He3(t,d)He4	14320.38 keV
He3(t,n+p)He4	12095.82 keV

<< 1-H-3	**3-Li-6**	
<< MT28 (t,n+p)	**MT16 (t,2n) or MT5 (Be7 production)**	MT103 (t,p) >>

Li6 (t,2n) log-log



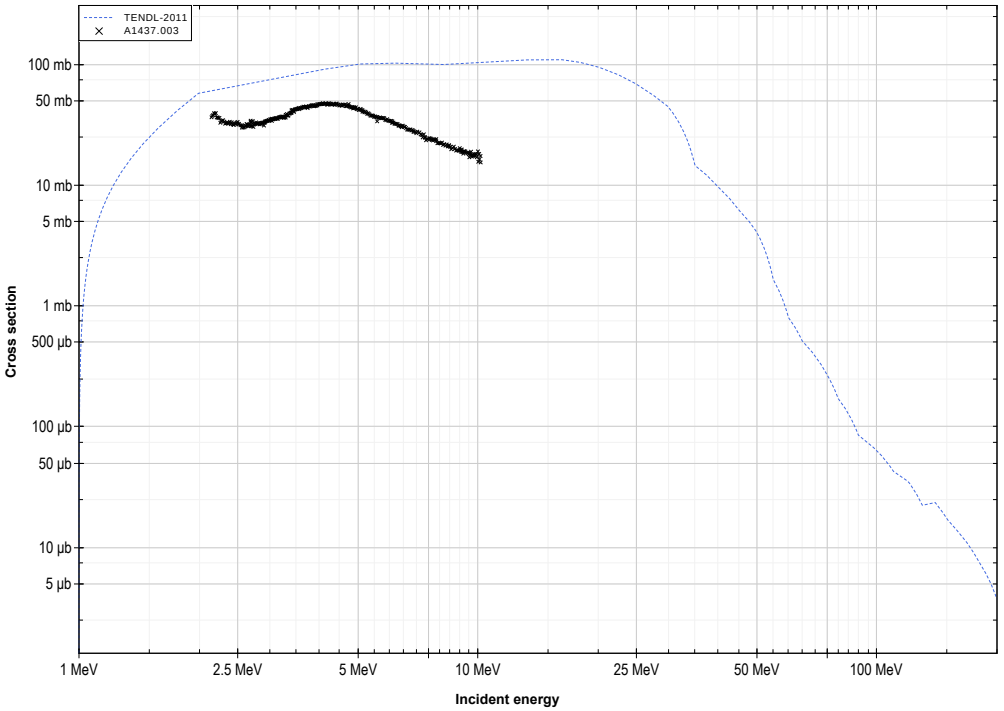
Li6 (t,2n) lin-log



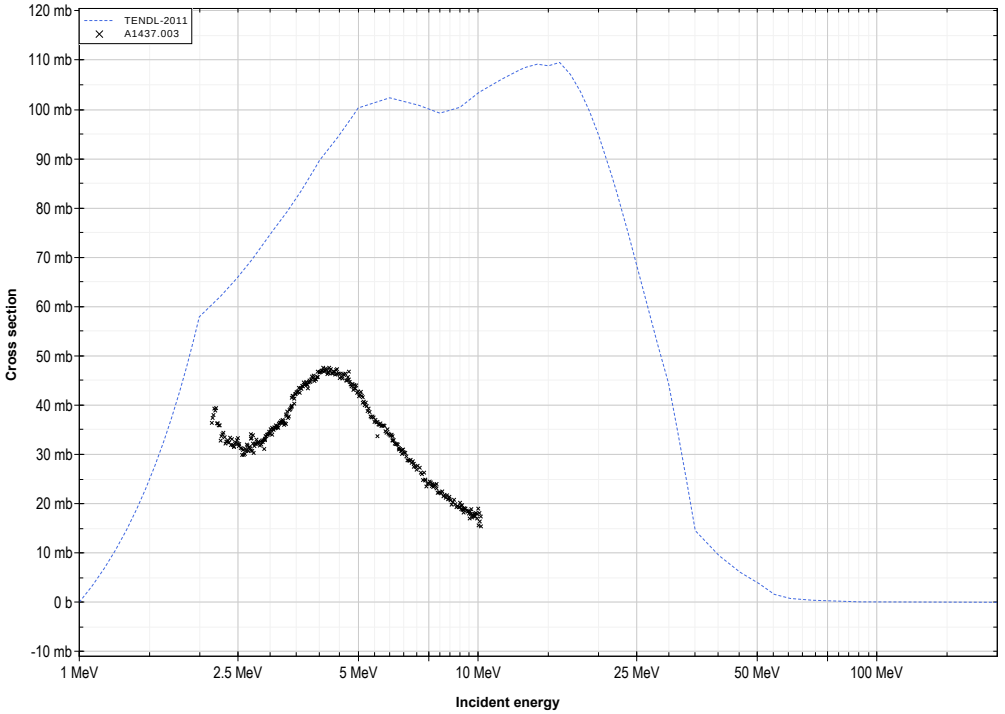
Reaction	Q-Value
Li6(t,2n)Be7	-2876.07 keV

	3-Li-6	3-Li-7 >>
<< MT16 (t,2n)	**MT103 (t,p) or MT5 (Li8 production)**	MT103 (t,p) >>

Li6 (t,p) log-log



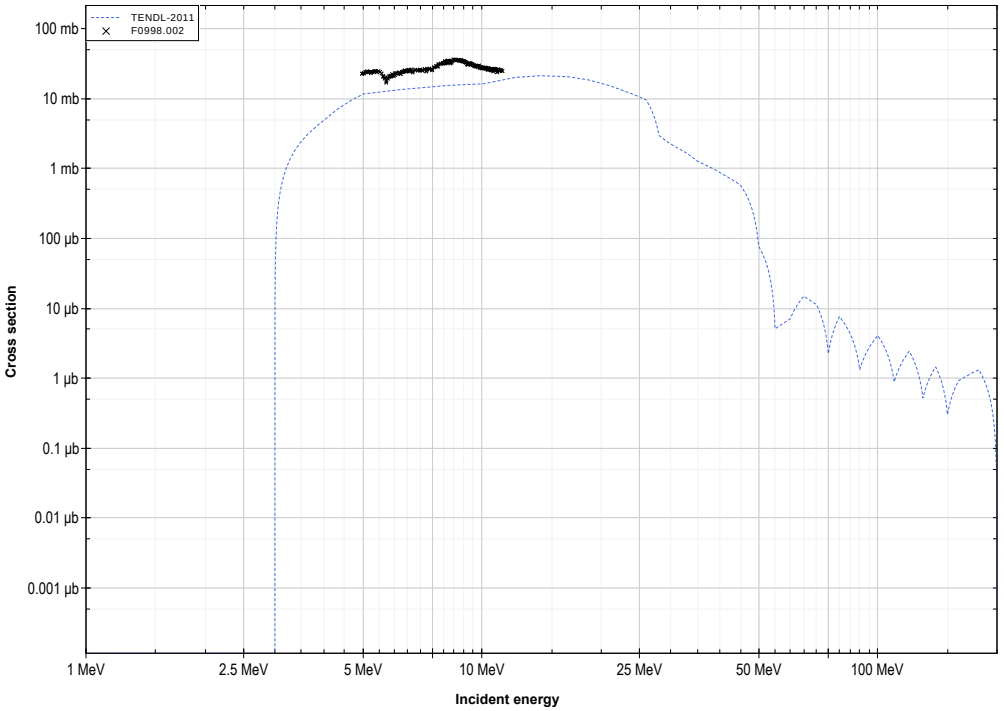
Li6 (t,p) lin-log



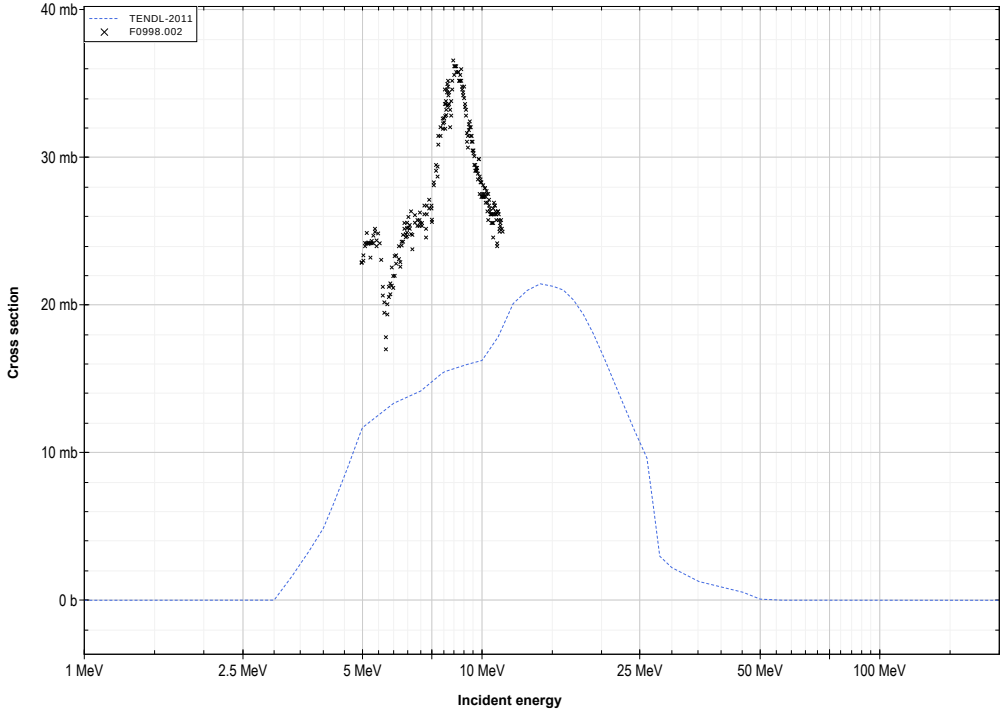
Reaction	Q-Value
Li6(t,p)Li8	800.79 keV

<< 3-Li-6	**3-Li-7**	5-B-11 >>
<< MT103 (t,p)	**MT103 (t,p) or MT5 (Li9 production)**	MT104 (t,d) >>

Li7 (t,p) log-log



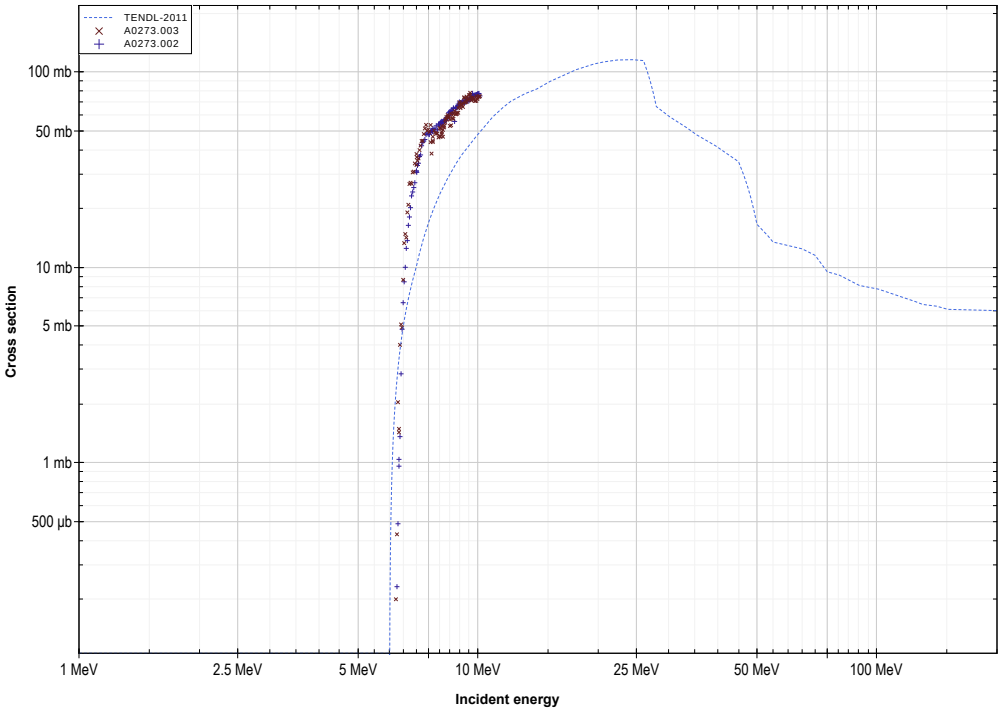
Li7 (t,p) lin-log



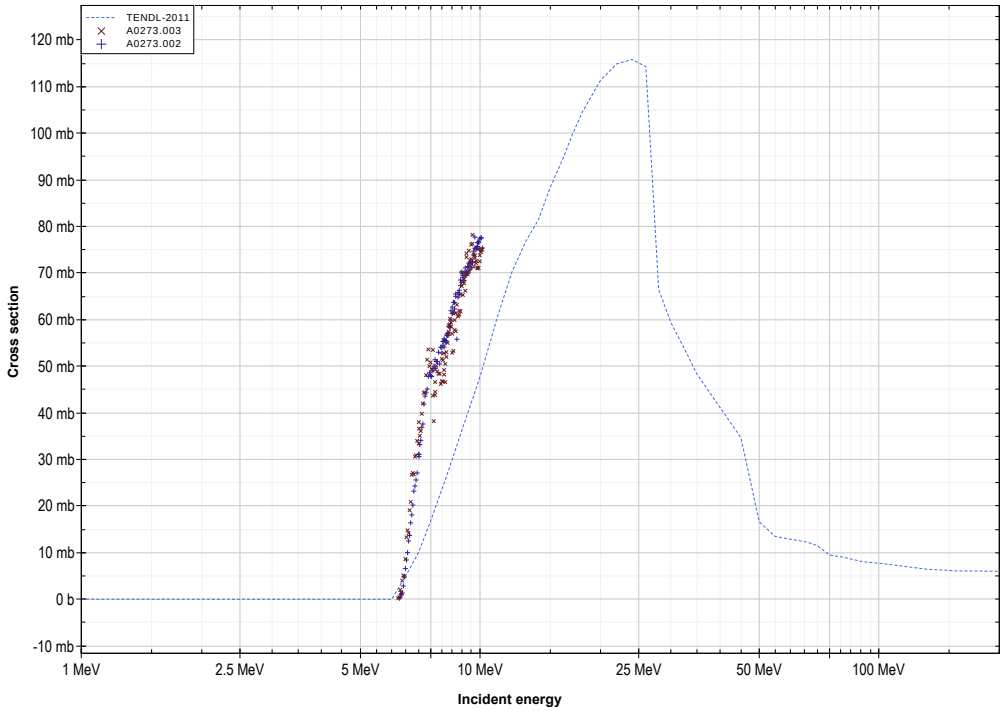
Reaction	Q-Value
Li7(t,p)Li9	-2385.32 keV

	3-Li-7	79-Au-197 >>
<< MT103 (t,p)	**MT104 (t,d) or MT5 (Li8 production)**	MT4 (t,n) >>

Li7 (t,d) log-log



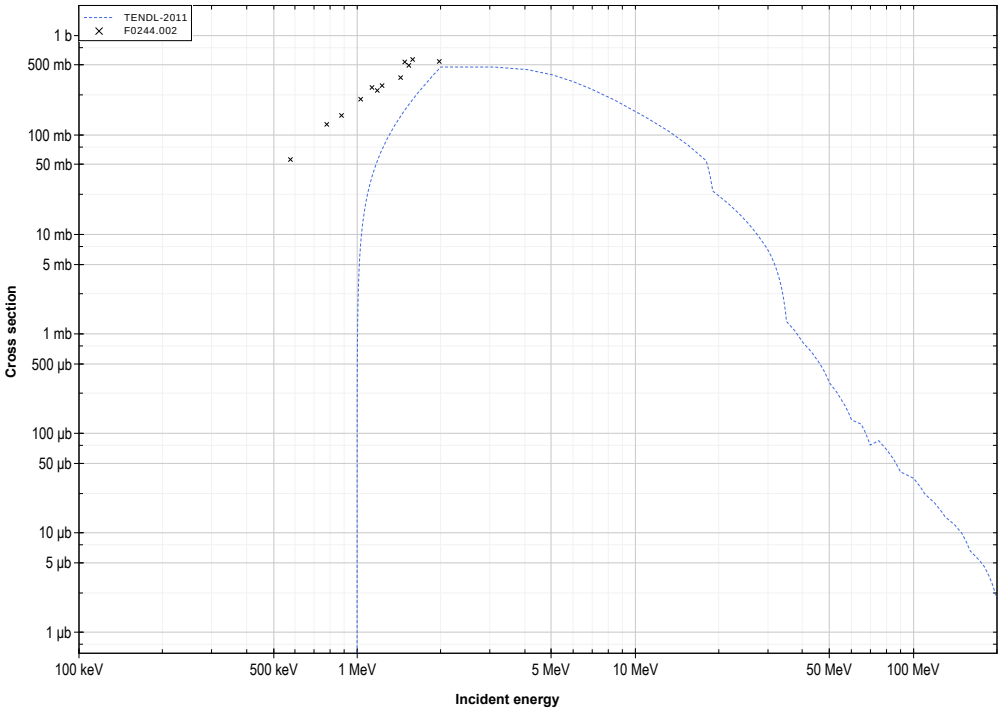
Li7 (t,d) lin-log



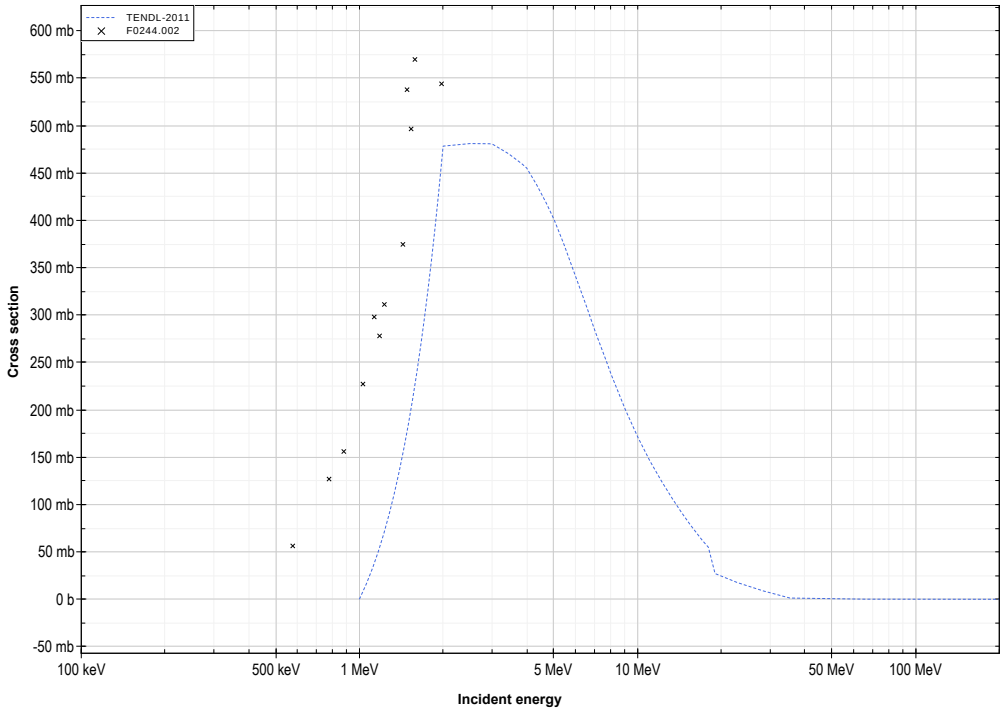
Reaction	Q-Value
Li7(t,d)Li8	-4224.62 keV
Li7(t,n+p)Li8	-6449.18 keV

	4-Be-9	
<< MT104 (t,d)	**MT4 (t,n) or MT5 (B11 production)**	MT112 (t,p+α) >>

Be9 (t,n) log-log



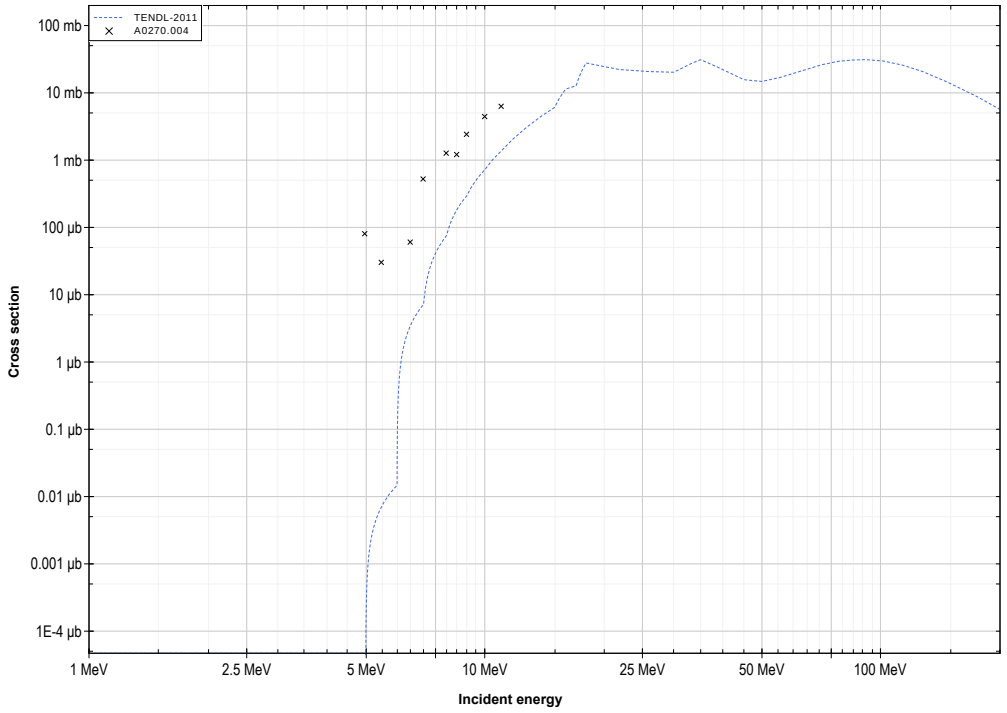
Be9 (t,n) lin-log



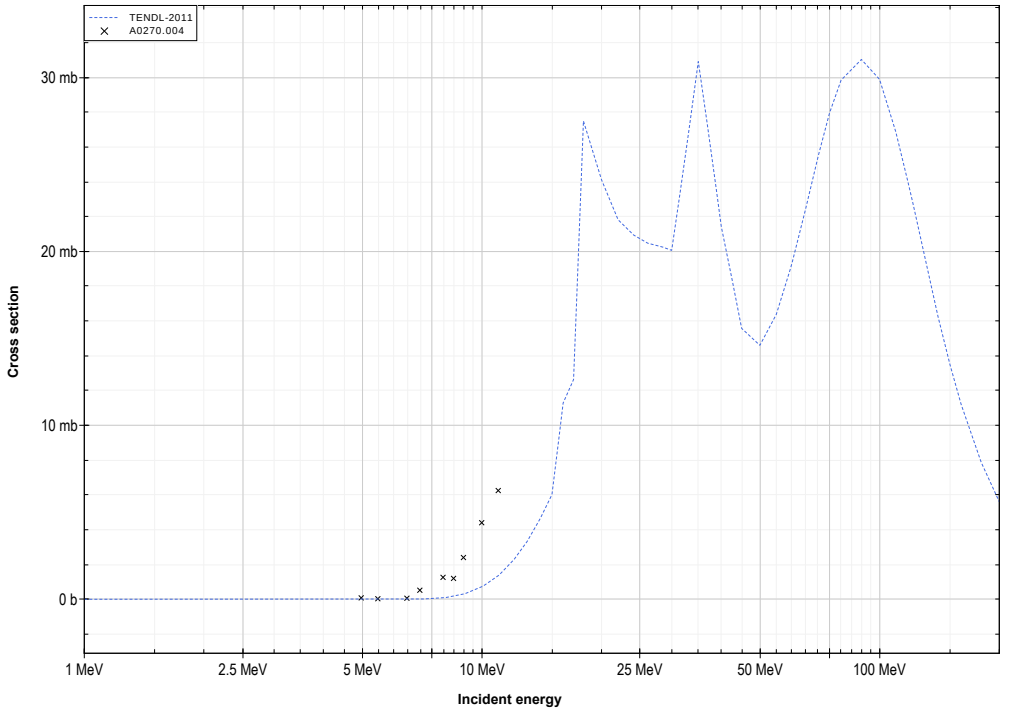
Reaction	Q-Value
Be9(t,n)B11	9558.19 keV

	5-B-10	
<< MT4 (t,n)	**MT112 (t,p+α) or MT5 (Li8 production)**	MT103 (t,p) >>

B10 (t,p+α) log-log



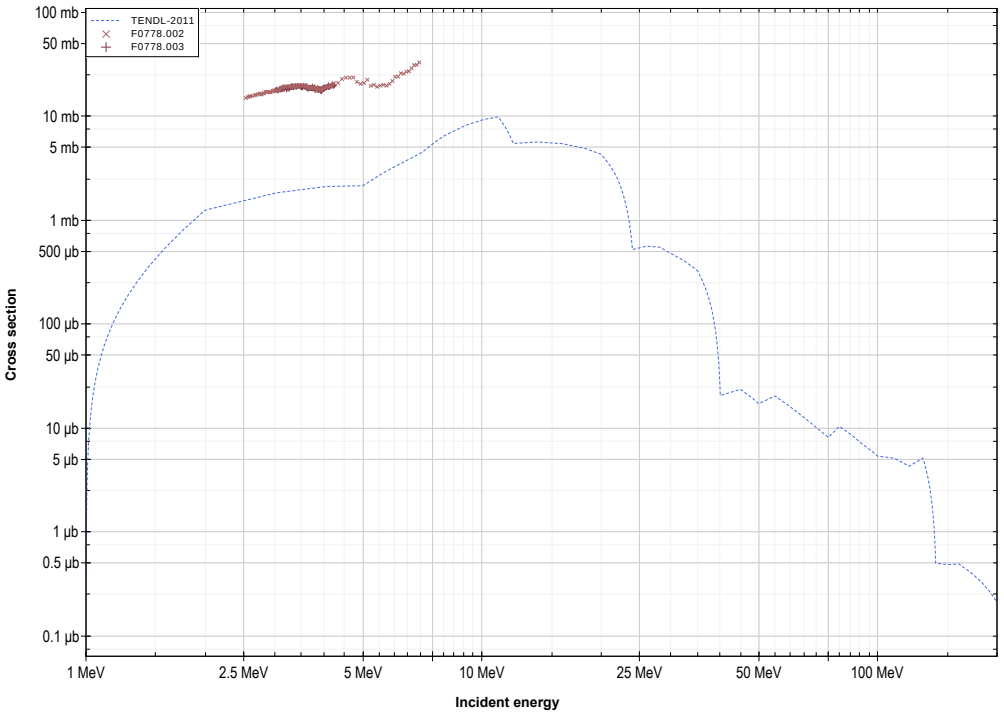
B10 (t,p+α) lin-log



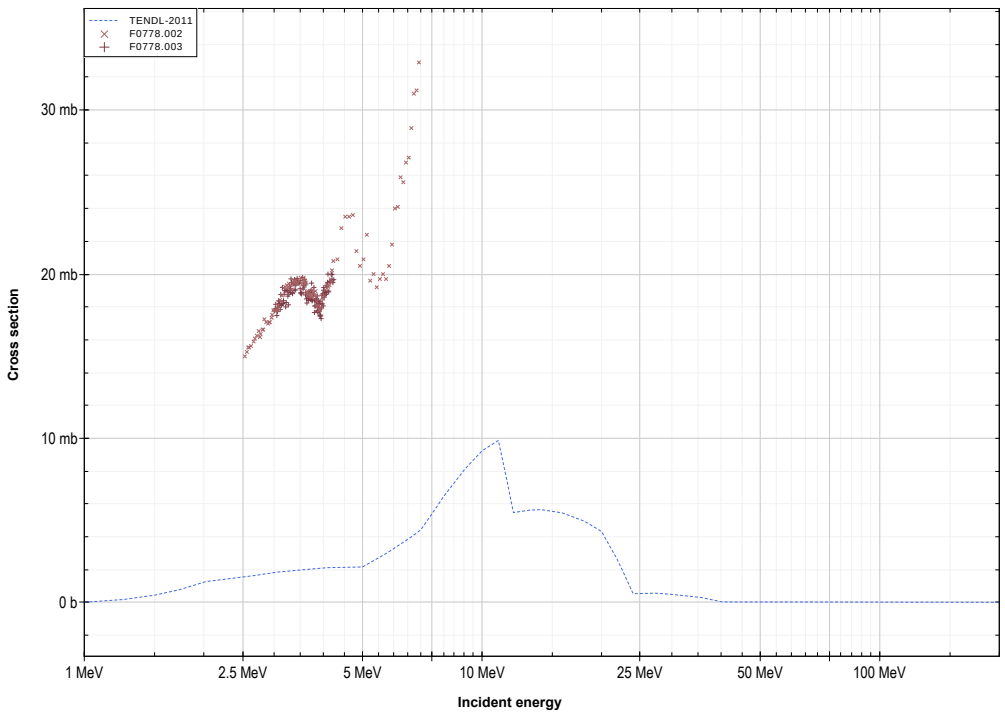
Reaction	Q-Value
B10(t,p+α)Li8	-3660.22 keV
B10(t,d+He3)Li8	-22013.27 keV
B10(t,2p+t)Li8	-23474.08 keV
B10(t,n+p+He3)Li8	-24237.84 keV
B10(t,p+2d)Li8	-27506.75 keV
B10(t,n+2p+d)Li8	-29731.31 keV
B10(t,2n+3p)Li8	-31955.88 keV

<< 3-Li-7	**5-B-11**	
<< MT112 (t,p+α)	**MT103 (t,p) or MT5 (B13 production)**	MT107 (t,α) >>

B11 (t,p) log-log



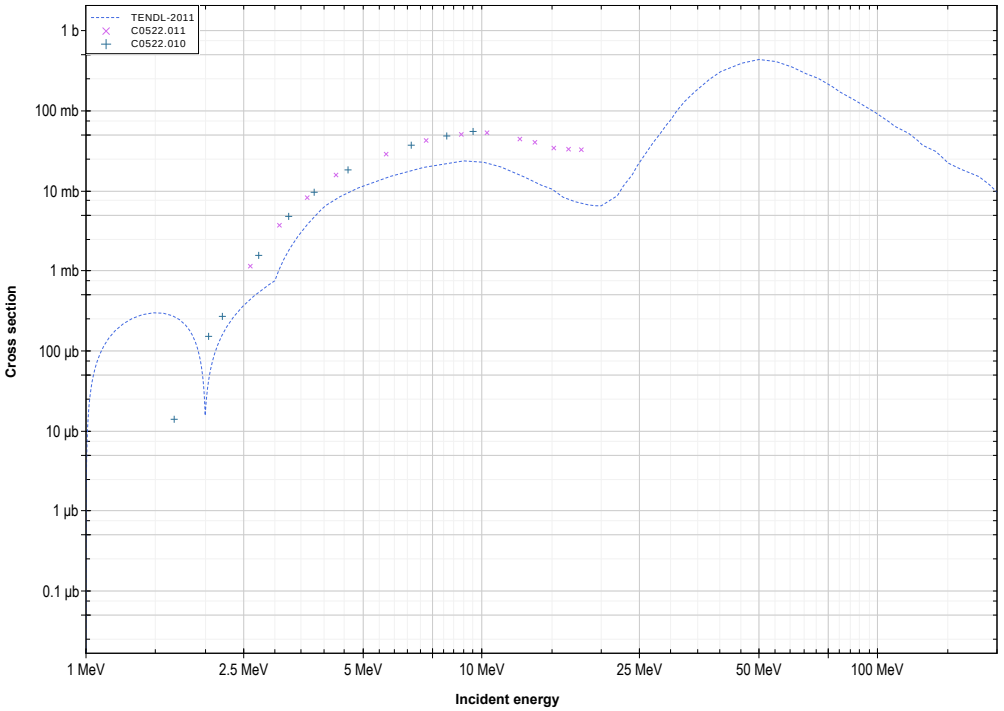
B11 (t,p) lin-log



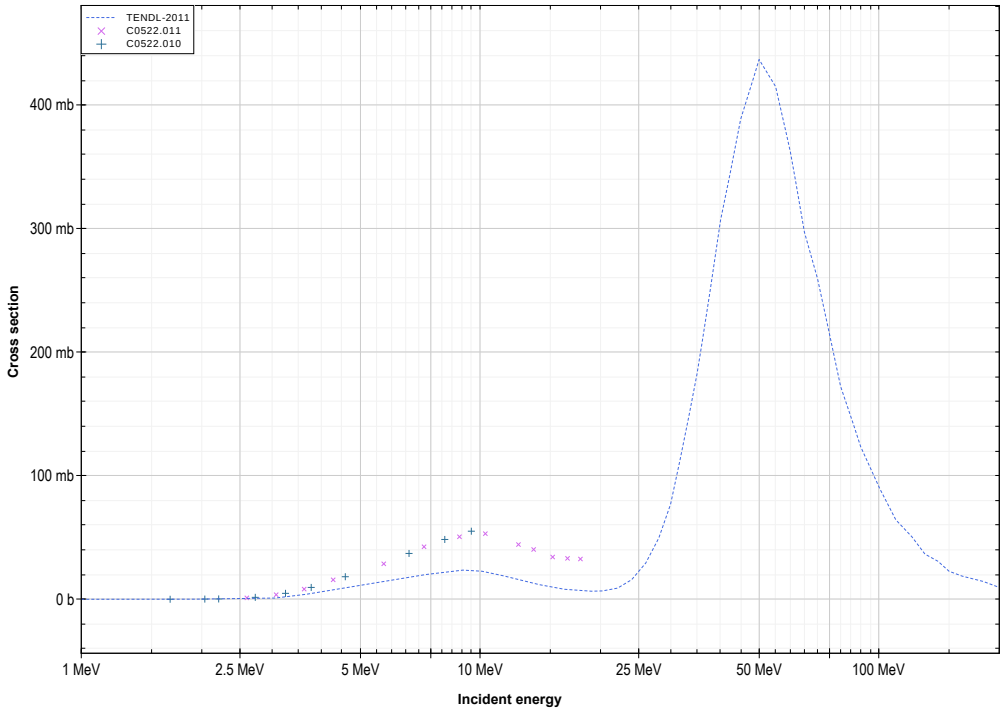
Reaction	Q-Value
B11(t,p)B13	-233.46 keV

	22-Ti-48	
<< MT103 (t,p)	**MT107 (t,α) or MT5 (Sc47 production)**	MT102 (t,γ) >>

Ti48 (t,α) log-log



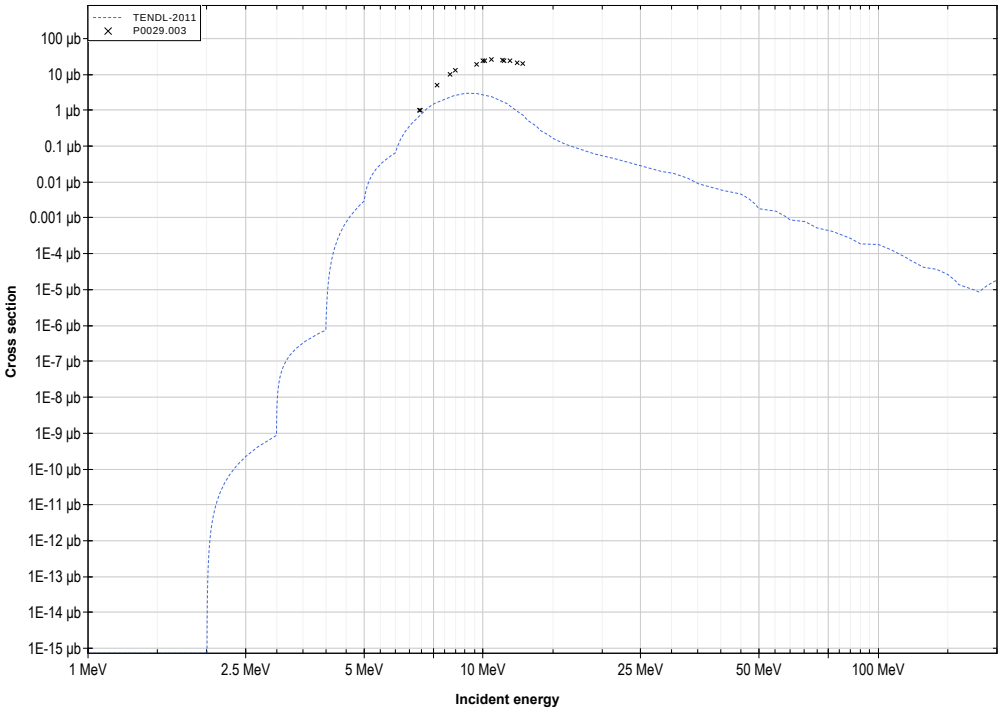
Ti48 (t,α) lin-log



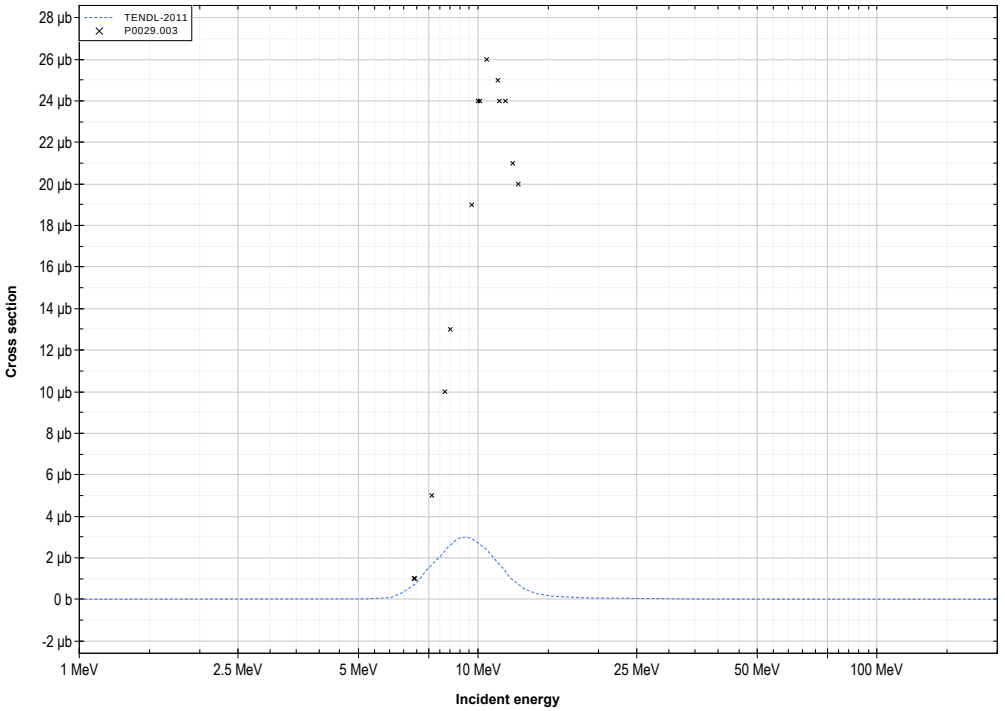
Reaction	Q-Value
Ti48(t,α)Sc47	8369.29 keV
Ti48(t,p+t)Sc47	-11444.57 keV
Ti48(t,n+He3)Sc47	-12208.33 keV
Ti48(t,2d)Sc47	-15477.24 keV
Ti48(t,n+p+d)Sc47	-17701.80 keV
Ti48(t,2n+2p)Sc47	-19926.37 keV

	56-Ba-138	
<< MT107 (t,α)	**MT102 (t,γ) or MT5 (La141 production)**	MT104 (t,d) >>

Ba138 (t,γ) log-log



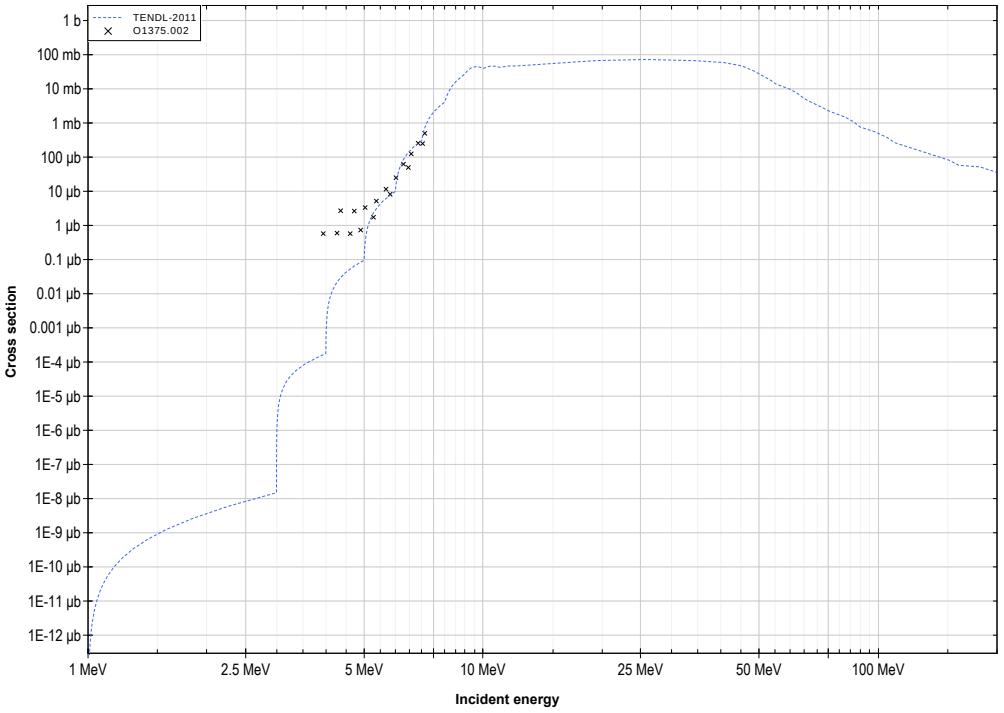
Ba138 (t,γ) lin-log



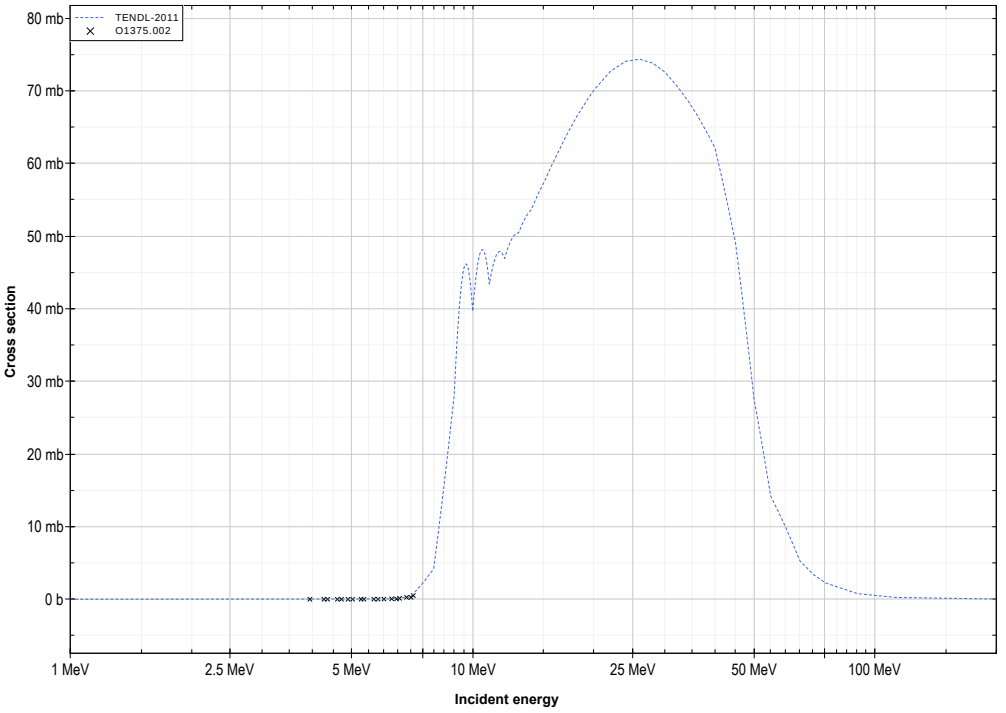
Reaction	Q-Value
Ba138(t,γ)La141	9626.21 keV

<< 3-Li-7	**79-Au-197**	
<< MT102 (t,γ)	**MT104 (t,d) or MT5 (Au198 production)**	

Au197 (t,d) log-log



Au197 (t,d) lin-log



Reaction	Q-Value
Au197(t,d)Au198	255.08 keV
Au197(t,n+p)Au198	-1969.48 keV