

$^{94,95,96}\text{Mo}$ @ EAR2 and EAR1

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Importance of molybdenum

NUCLEAR TECHNOLOGIES:

- Fission fragments in nuclear power plants;
- Feasibilities studies on UMo fuel for research reactors;
- Transport casks for radioactive materials.

NUCLEAR ASTROPHYSICS:

- Contaminant in presolar silicon grains;
- Stellar nucleosynthesis of heavy elements;
- Constrains on astrophysical models.

Importance for SANDA

SANDA WP2:

Task 2.2: Neutron capture cross sections

Subtask 2.2.1. Capture measurements of fissile isotopes

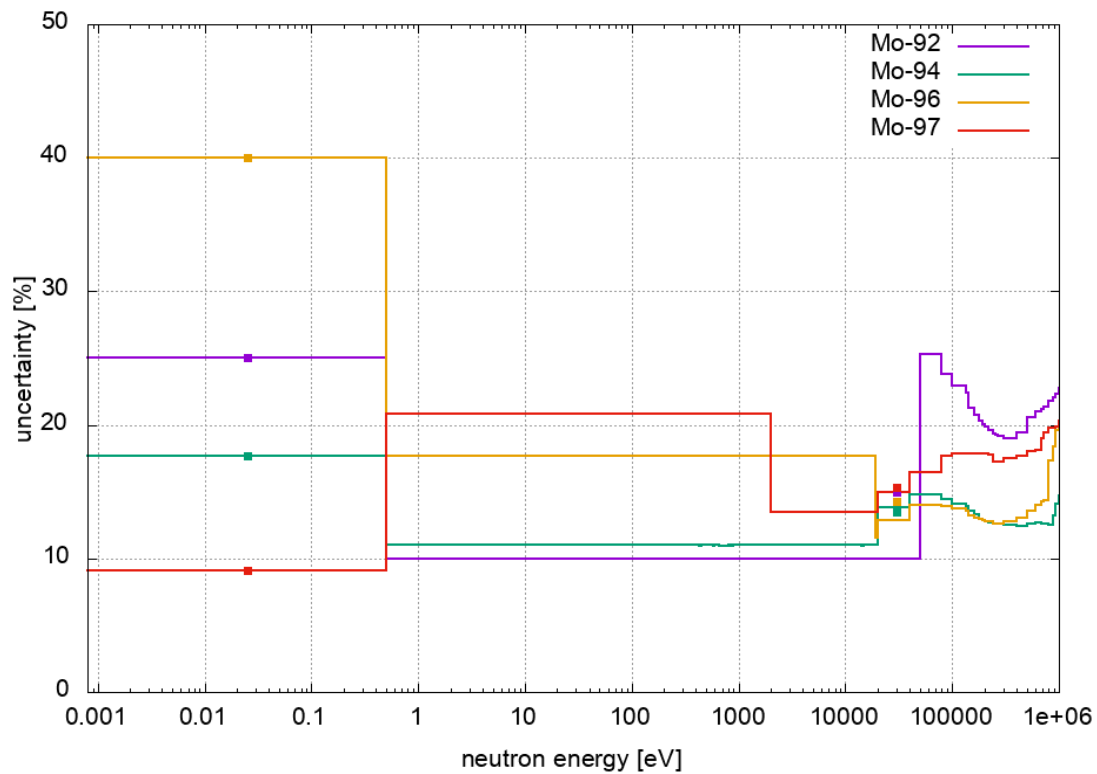
Combined measurement of the $^{239}\text{Pu}(n,\gamma)$ and $^{239}\text{Pu}(n,f)$ cross sections at GELINA and n_TOF.

Subtask 2.2.2. Capture measurement of stable isotopes

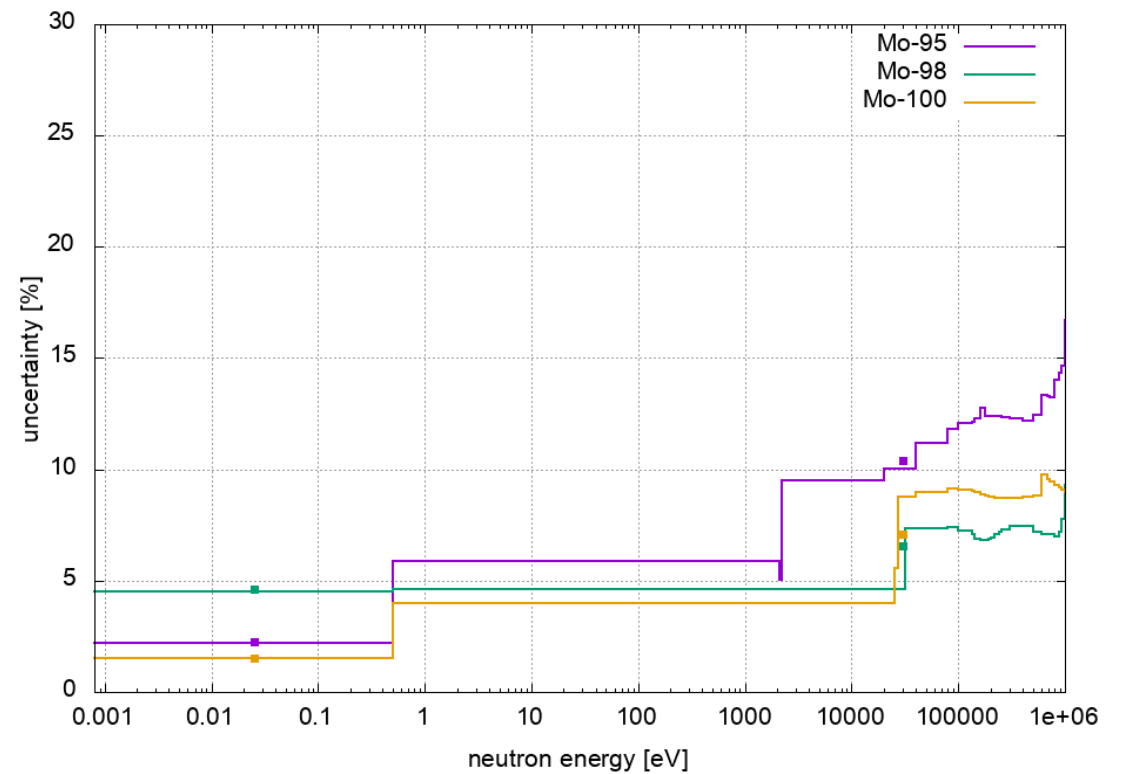
$^{92,94,95}\text{Mo}(n,\gamma)$ cross sections at GELINA and n_TOF .

Cross section uncertainties in ENDF/B-VIII

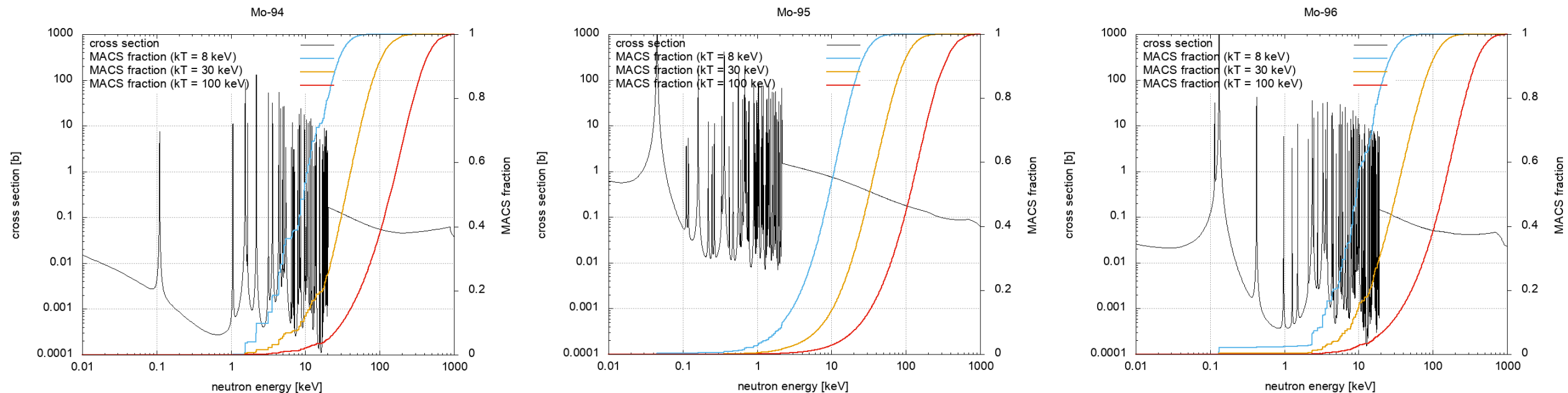
Capture cross section uncertainties - ENDF/B-VIII.0 data set



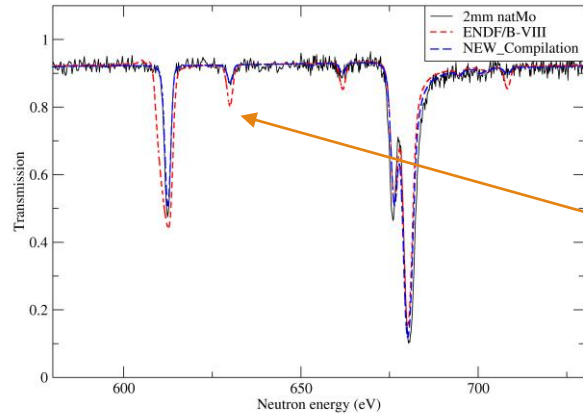
Capture cross section uncertainties - ENDF/B-VIII.0 data set



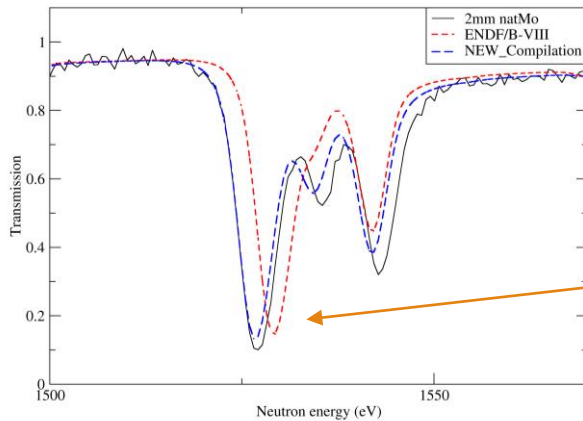
MACS fractions



New resonance compilation

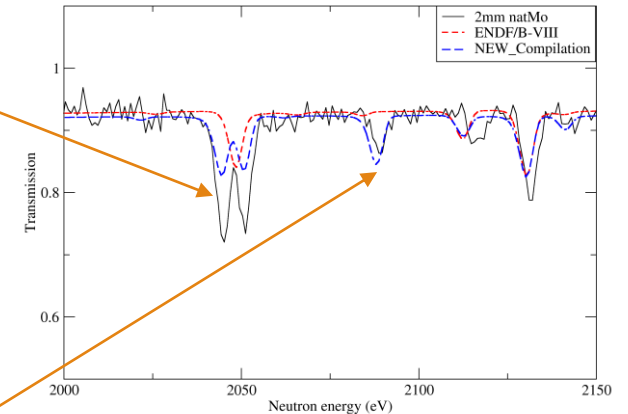


Incompatible
resonance
parameters

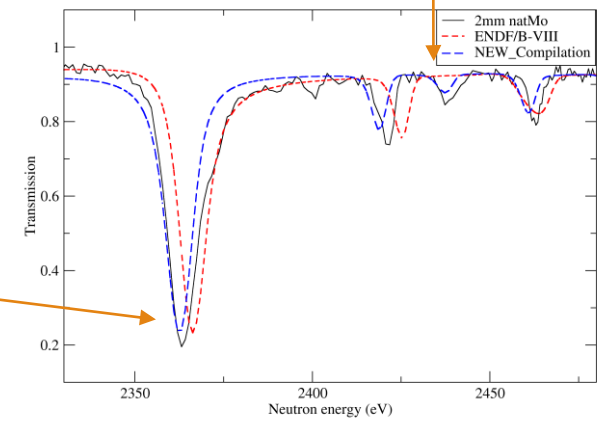


Inconsistent
energies

Unresolved
doublet



Missing
resonances



Experimental activity

EAR2 (2021)

- ~2 weeks of beam time ($1.8E18$ protons);
- Powder samples in aluminum canning;
- natMo samples (powder and pellet);
- Thermal region and first resonances (few keV).

EAR1 (2022)

- ~ 8 weeks of beam time in 2022;
- Pressed pellet samples produced at JRC-Geel;
- Resonance region;

Enriched samples

- Samples enriched in $^{94,95,96}\text{Mo}$ produced using metallic powder;
- 2g of powder available for each isotope;
- Enrichment of at least 95% in each isotope;
- Powder enclosed in aluminum capsules of 20mm diameter;

^{94}Mo	^{95}Mo	^{96}Mo
98,97%	95,40%	95,90%

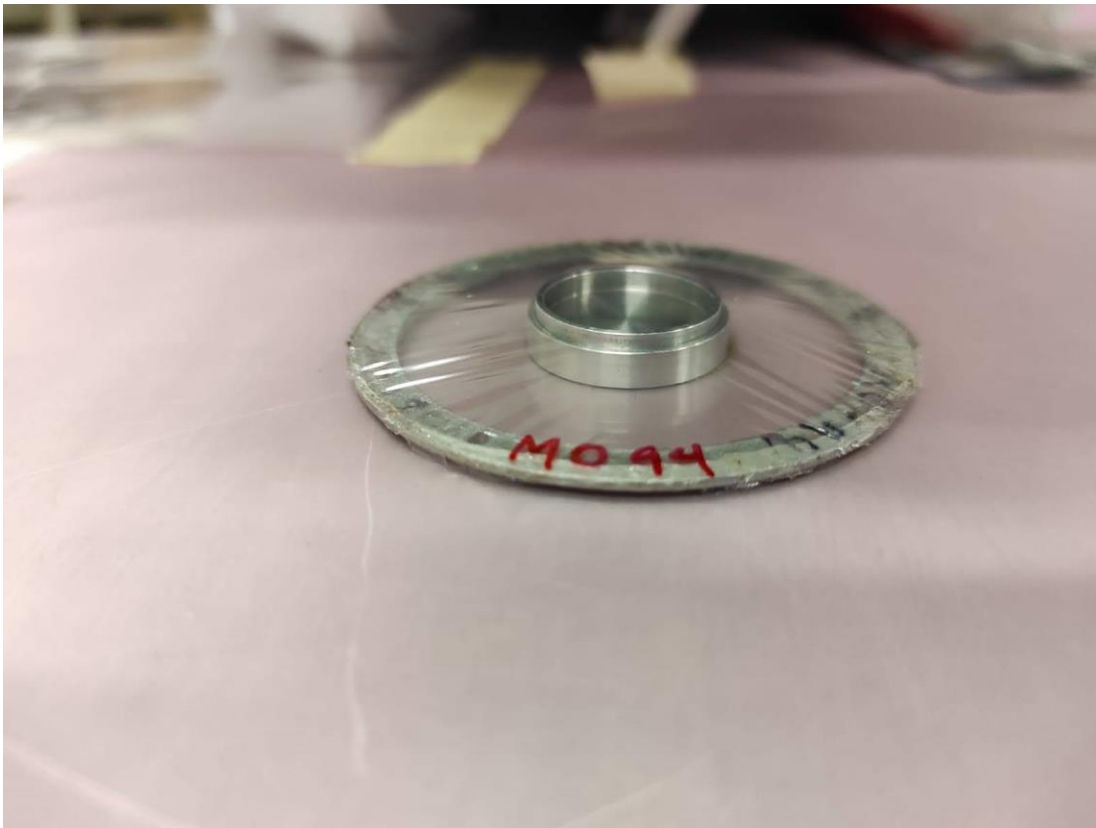


Enriched samples @EAR2

Sample	Mass	Areal density
^{94}Mo	1737,5 mg	3,47E-3
^{95}Mo	929,2 mg	1,86E-3
^{96}Mo	1611 mg	3,22E-3
natMo pellet	2003,3 mg	4,00E-3
natMo powder	985,7 mg	1,97E-3



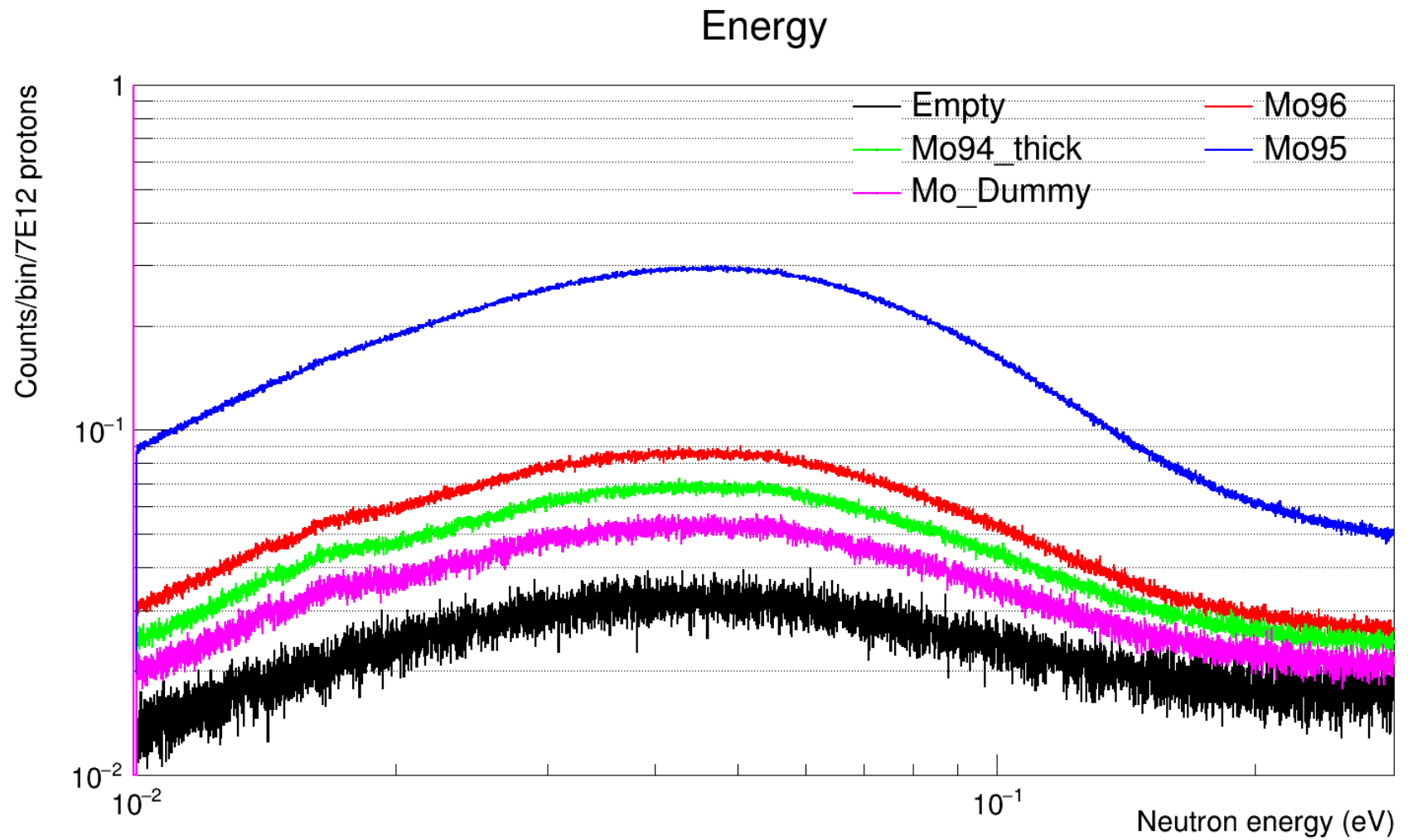
Enriched samples @EAR2



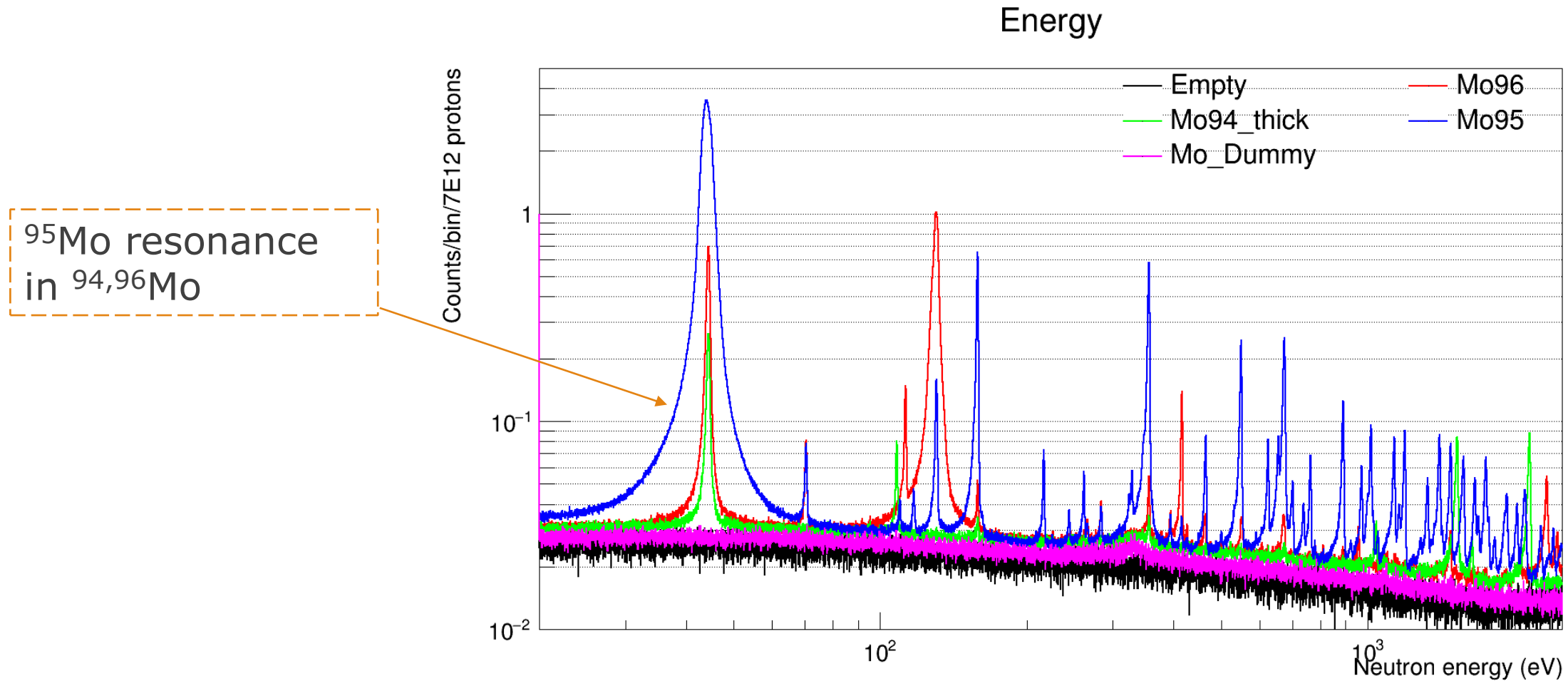
Measurements @EAR2

Sample	Protons
^{94}Mo (thick)	4,9E17 (2,8E17)
^{95}Mo	3,7E17
^{96}Mo	4,2E17
natMo	2,1E17
Au	7,3E15
Dummy	1,1E17
Empty	1,1E17
Pb	4,3E16
Filters (Ag, Bi, Cd)	7,3E16
TOTAL	1,84E18

EAR2 preliminary results



EAR2 preliminary results



Thank you for your attention

Powder content

⁹²Mo	⁹⁴Mo	⁹⁵Mo	⁹⁶Mo	⁹⁷Mo	⁹⁸Mo	¹⁰⁰Mo
0,63%	98,97%	0,36 %	0,01%	0,01%	0,01%	0,01%
0,31%	0,69%	95,40%	2,24%	0,51%	0,65%	0,2%
0,28%	0,24%	1,01%	95,90%	1,00%	1,32%	0,25%

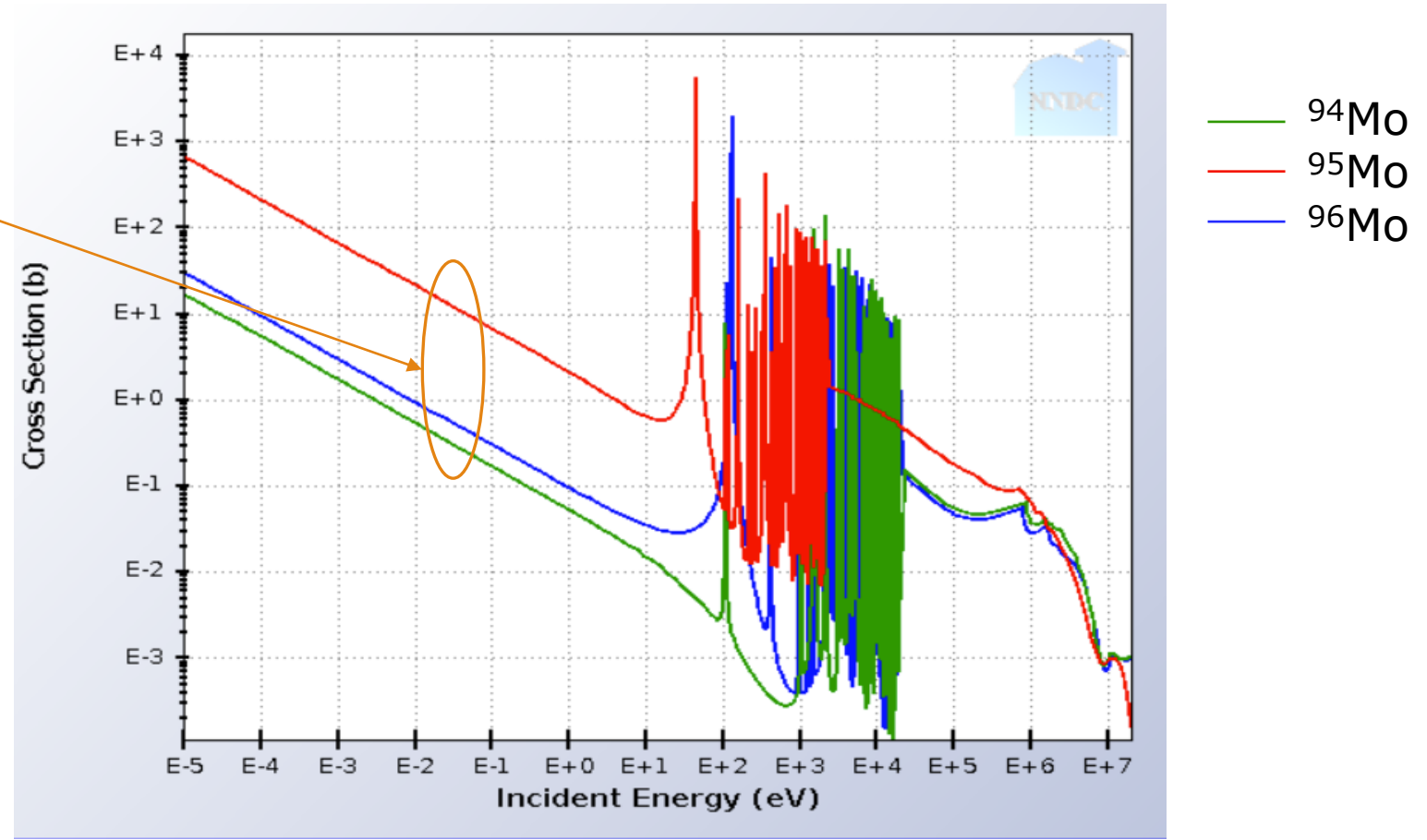
Capture cross section ENDF/B-VIII

Thermal cross section:

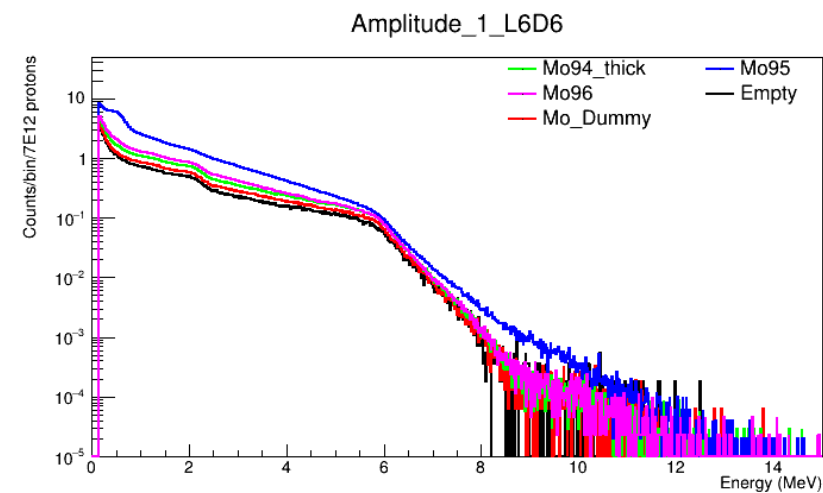
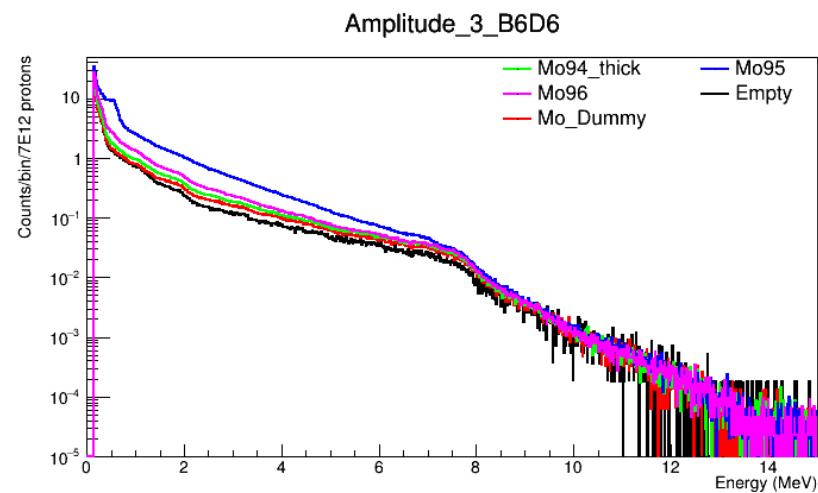
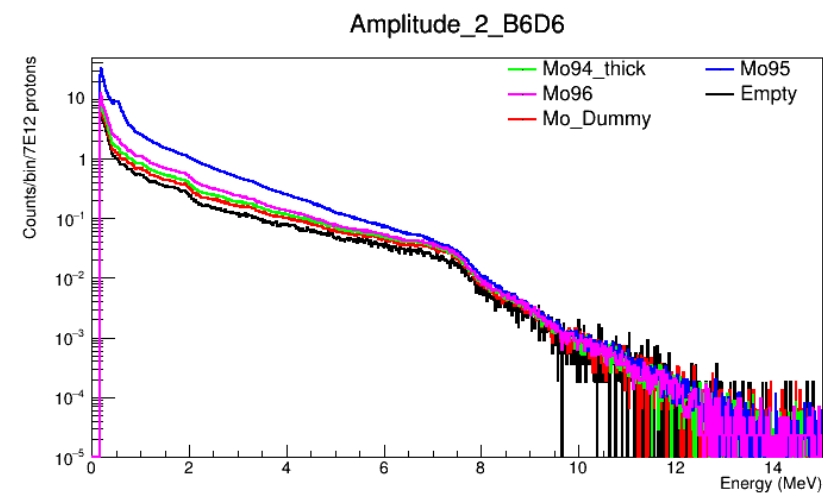
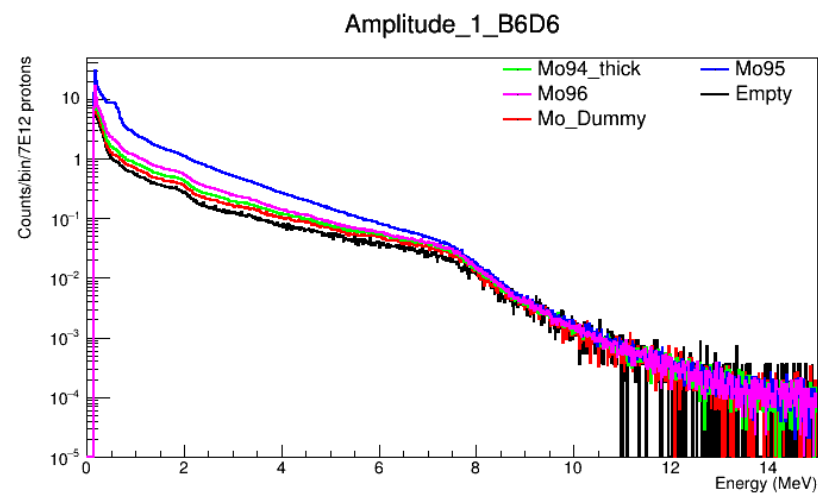
$^{94}\text{Mo} \sim 350\text{mb}$

$^{95}\text{Mo} \sim 13\text{b}$

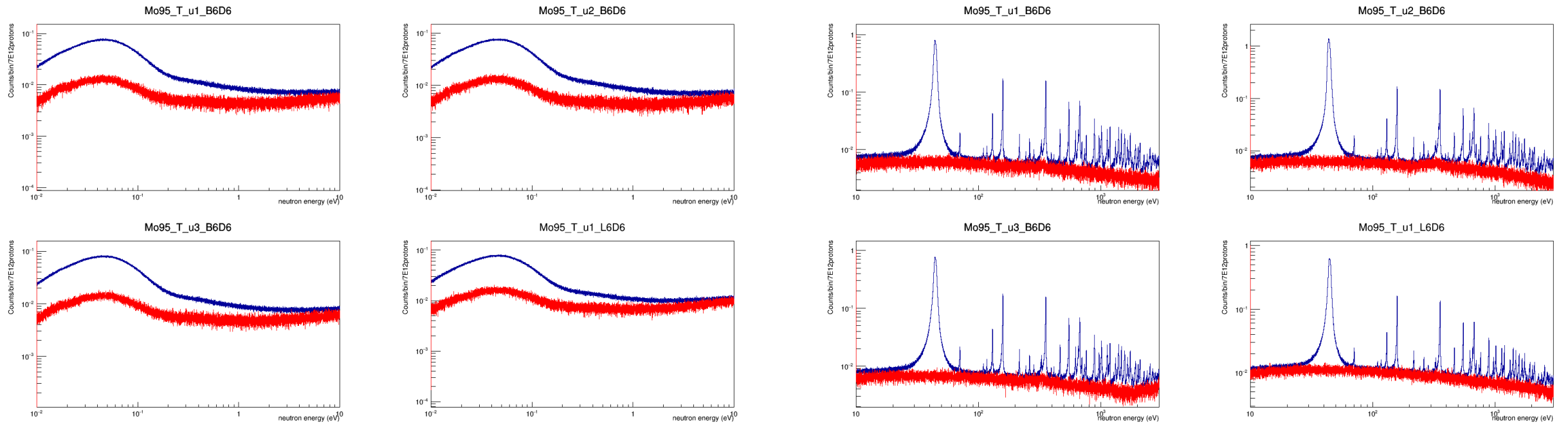
$^{96}\text{Mo} \sim 620\text{mb}$



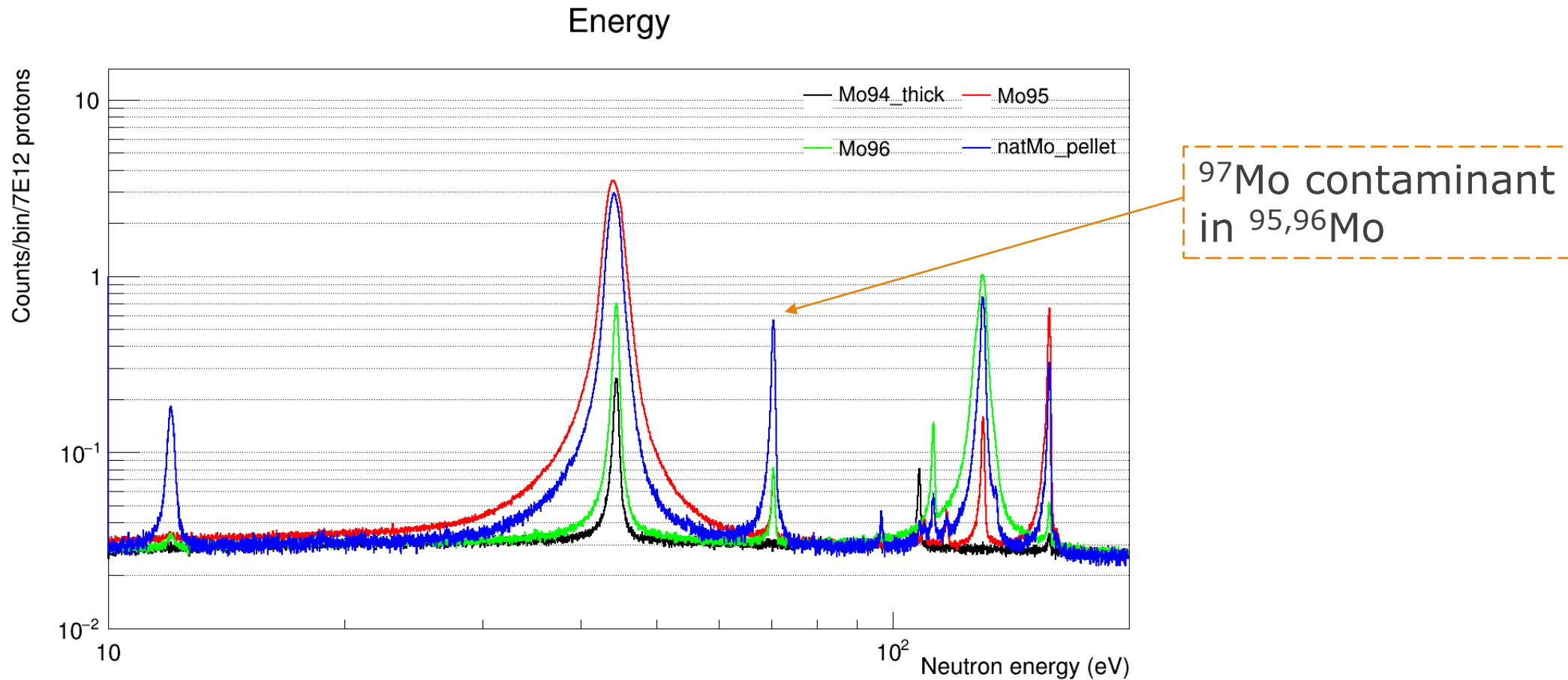
EAR2 preliminary results



EAR2 preliminary results



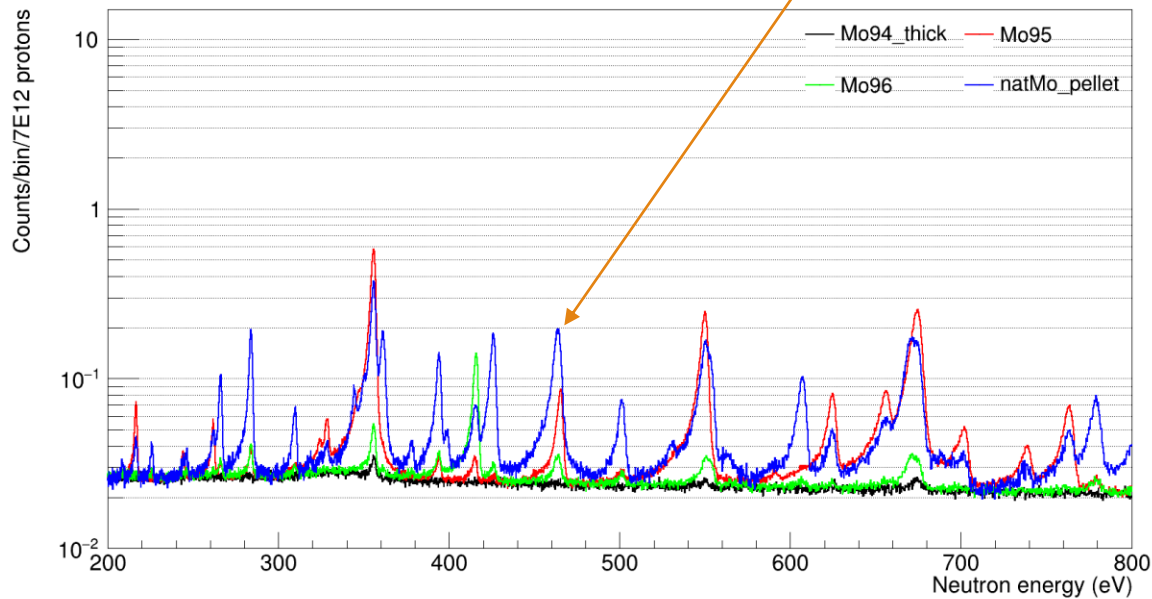
Preliminary results natMo



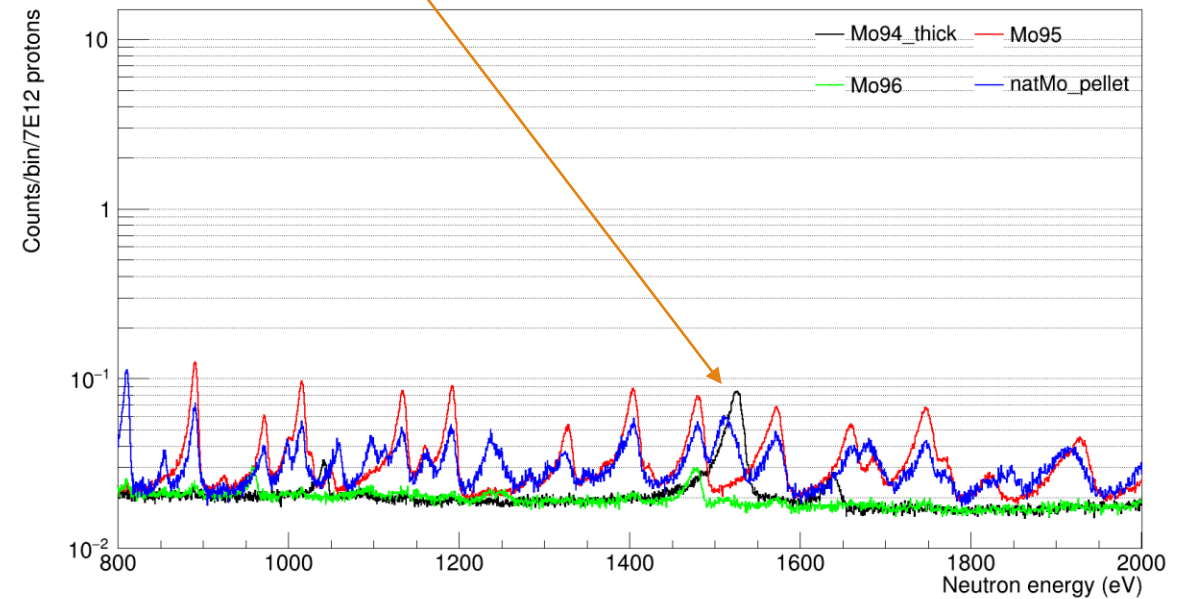
Preliminary results natMo

Unresolved multiplets

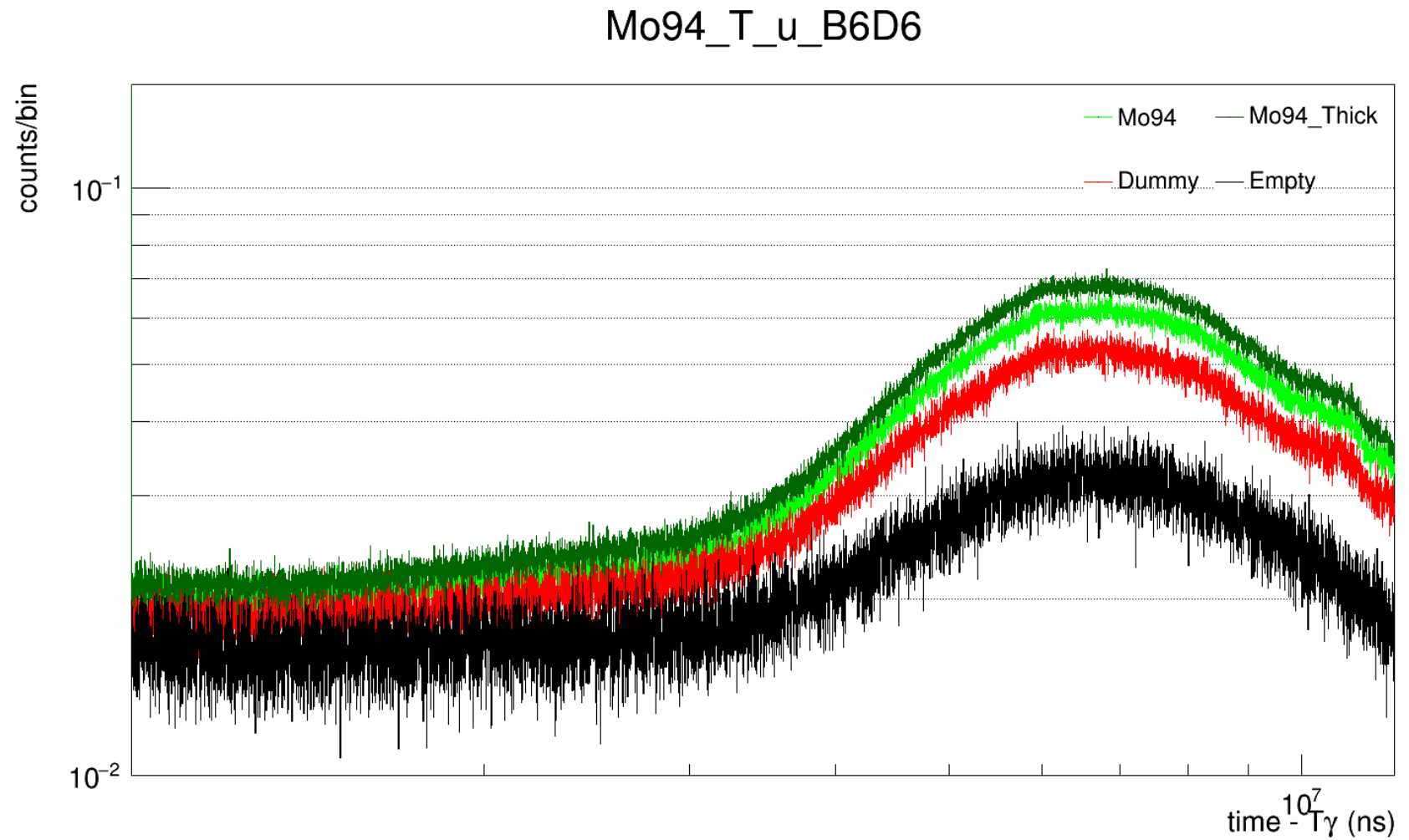
Energy



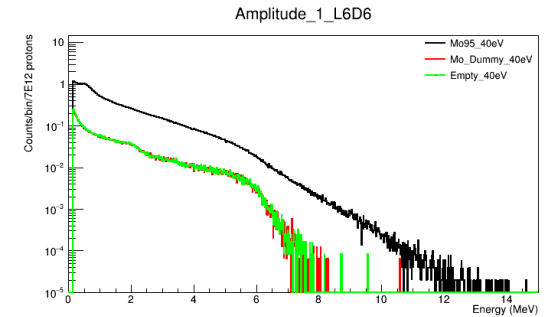
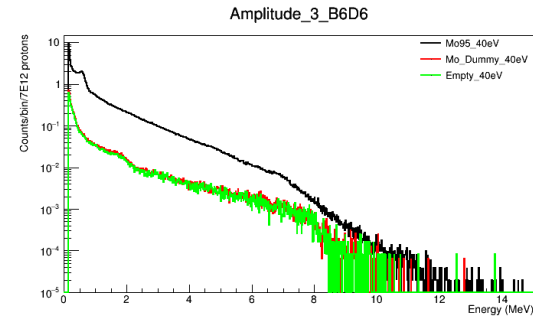
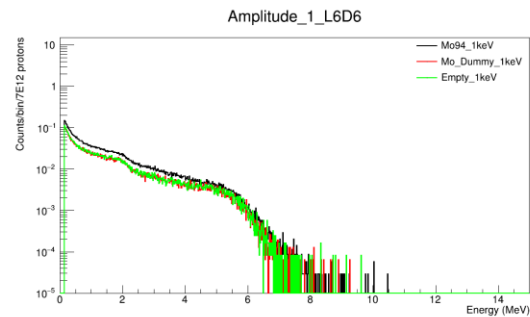
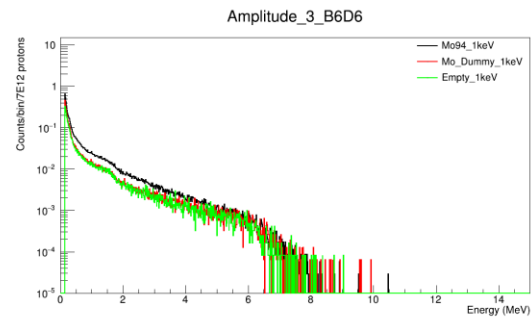
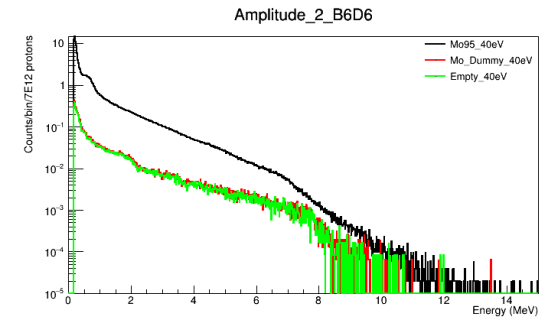
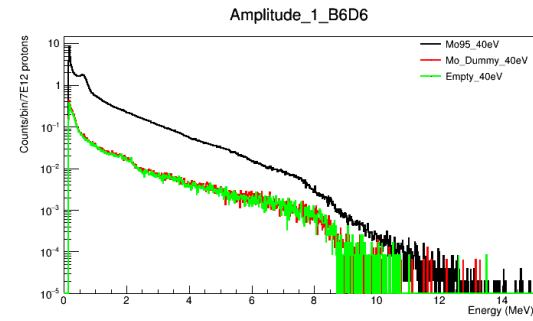
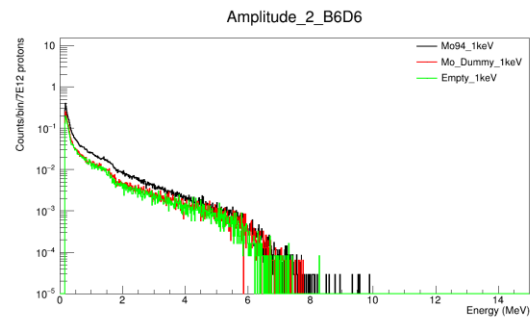
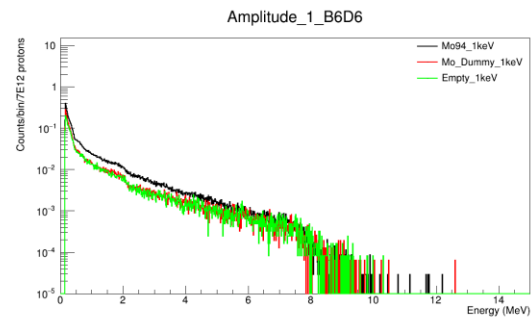
Energy



^{94}Mo mass increase



Amplitude in resonance region



Runs with filters

