^{241}Am capture with the TAC

Emilio Mendoza Cembranos
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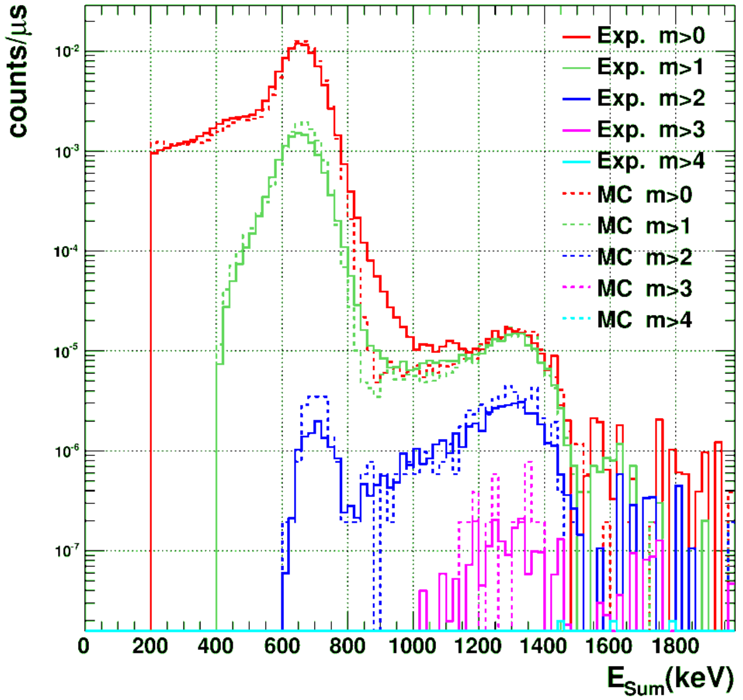
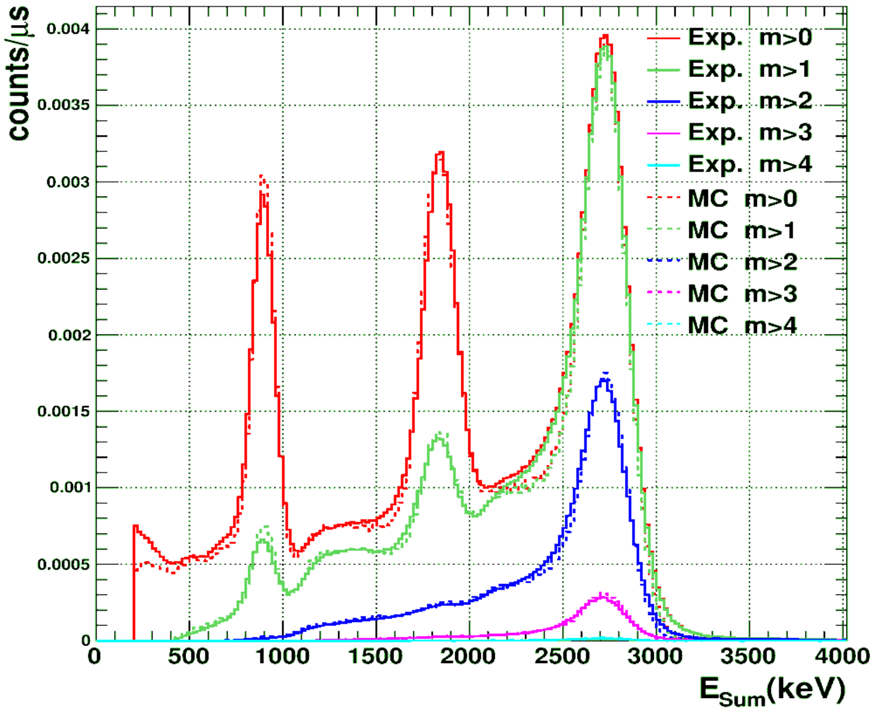
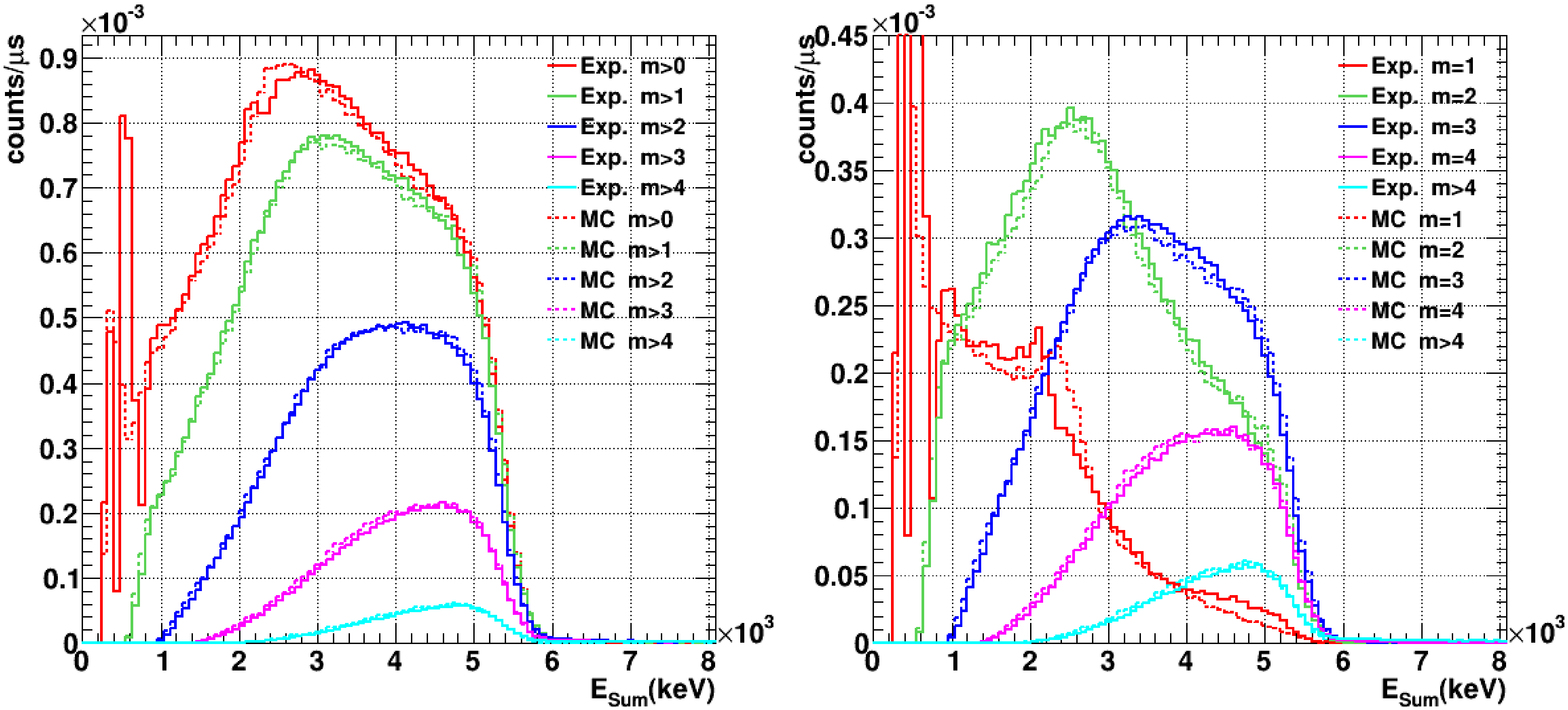
- Alpha-gamma discrimination. ✓
- Energy calibration:
  - Calibration sources. ✓
  - Run by run (with the alpha spectra). ✓
- Time calibration. ✓
- Dead time characterization. ✓
- Normalization between runs. ✓
- Monte Carlo simulations (validation, efficiency, beam interception factor). ✓
- Background
- Normalization
- Tests

Monte Carlo simulations

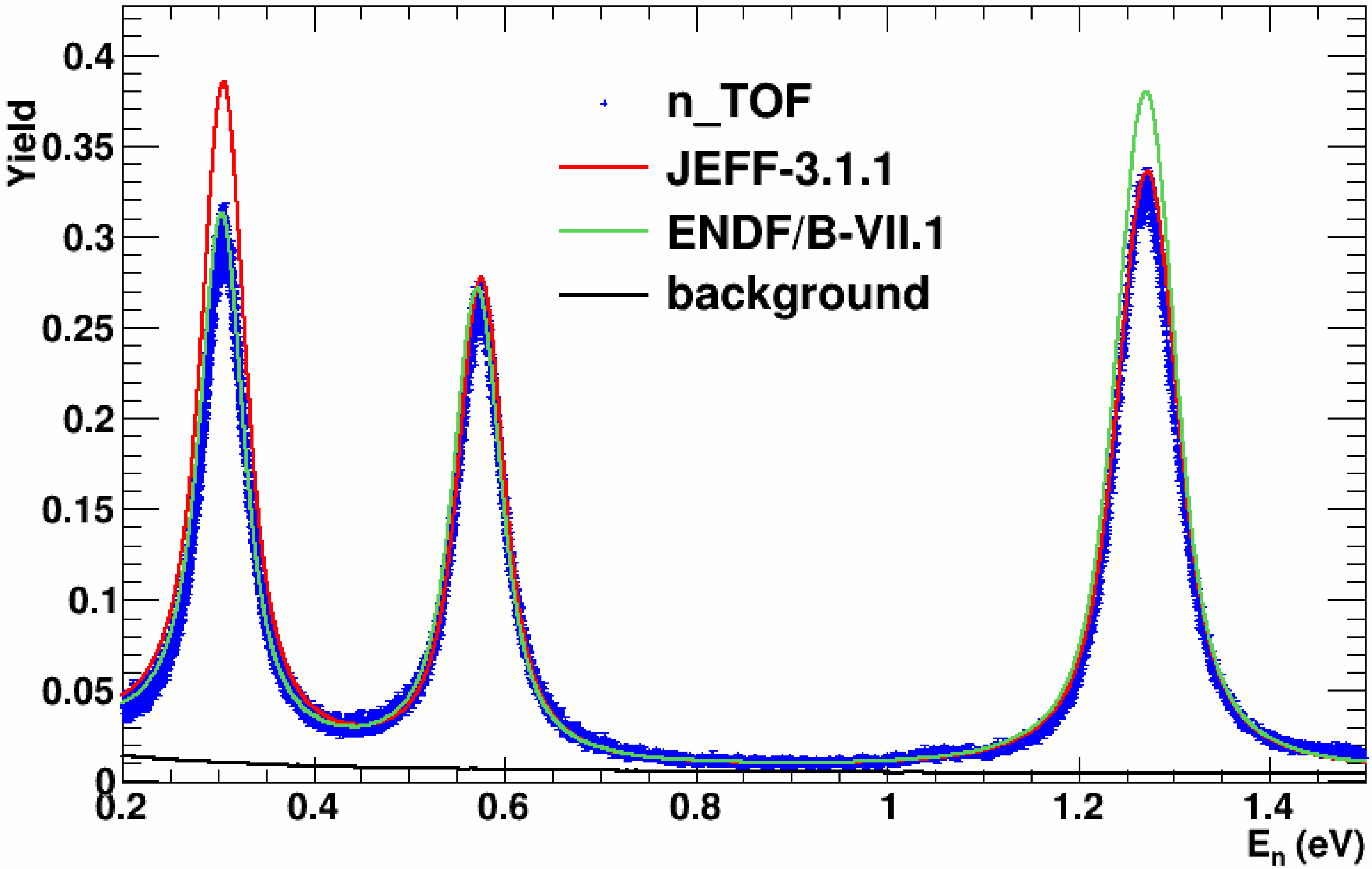




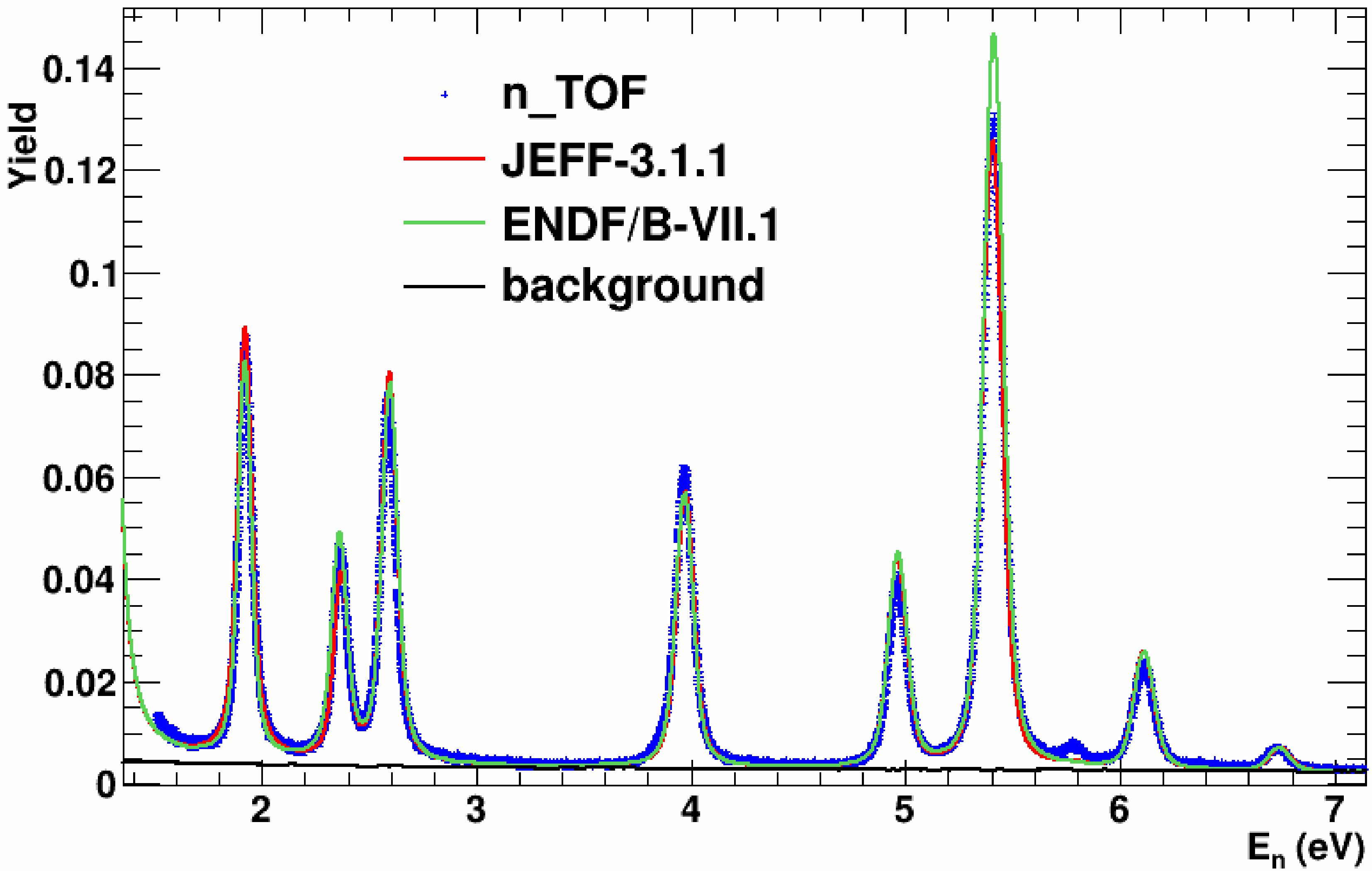
Monte Carlo simulations



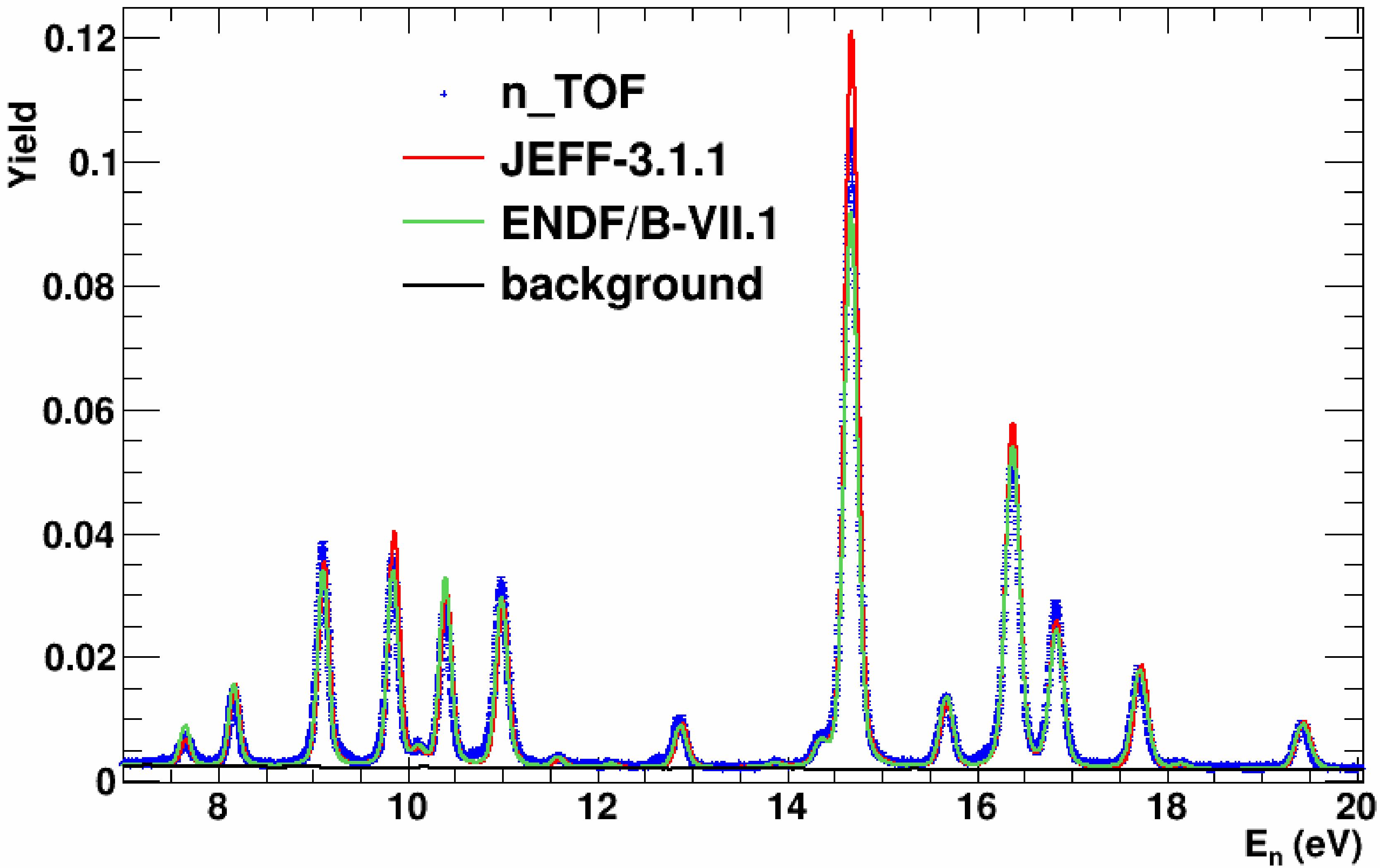
The yield: first three resonances



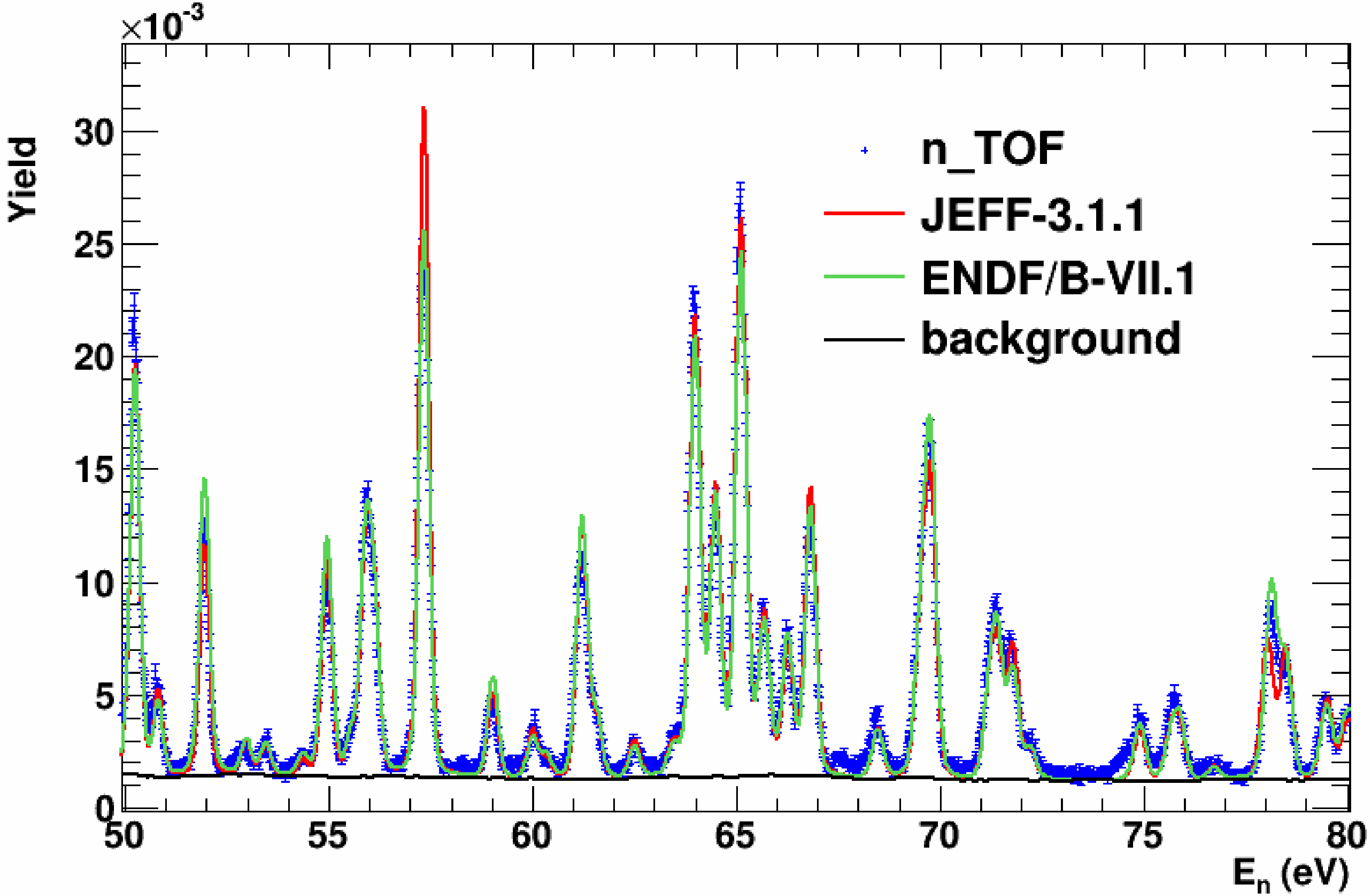
The yield: the resolved resonance region (ii)



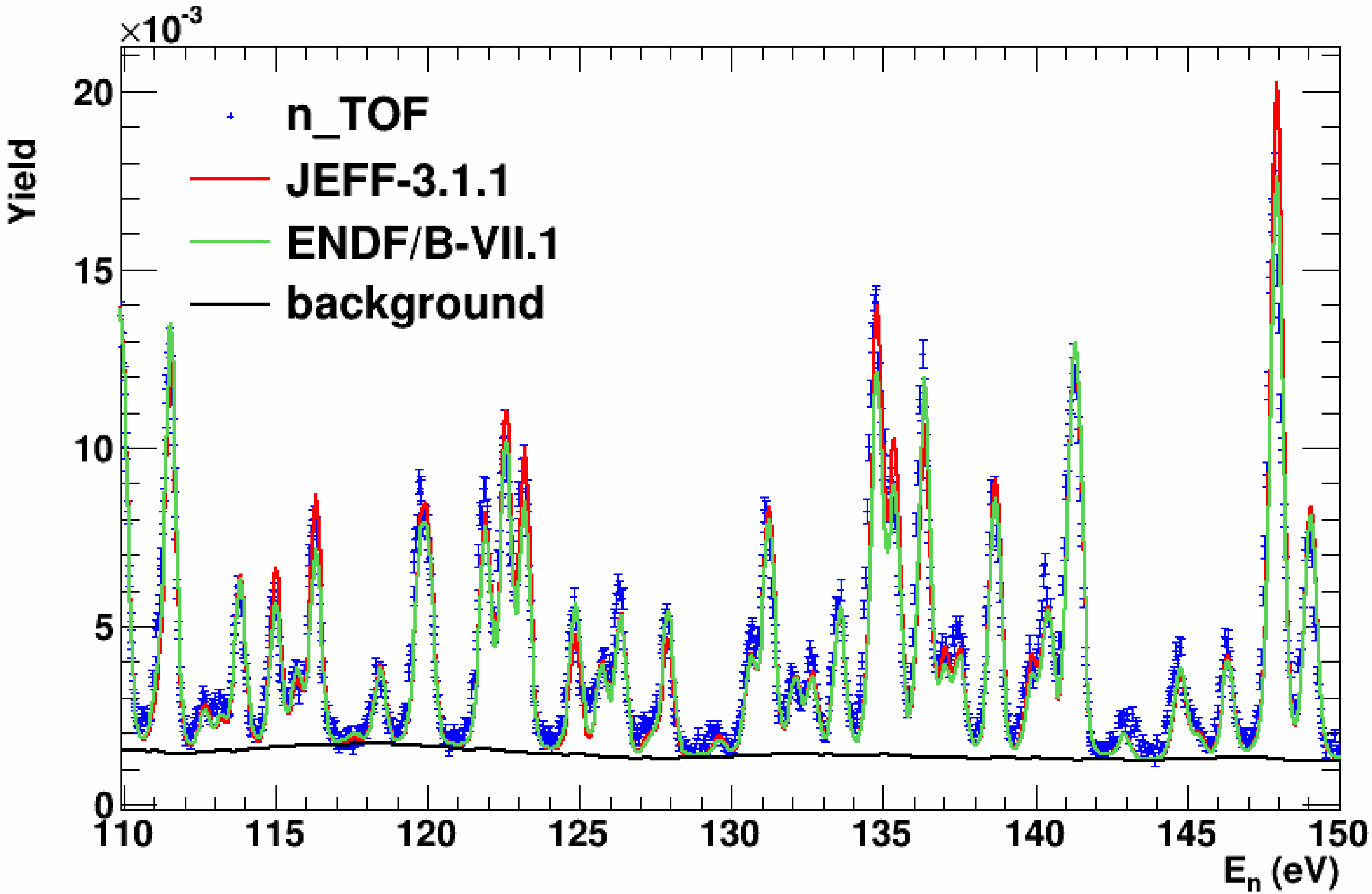
The yield: the resolved resonance region (iii)



The yield: the resolved resonance region (iv)



The yield: the resolved resonance region (v)



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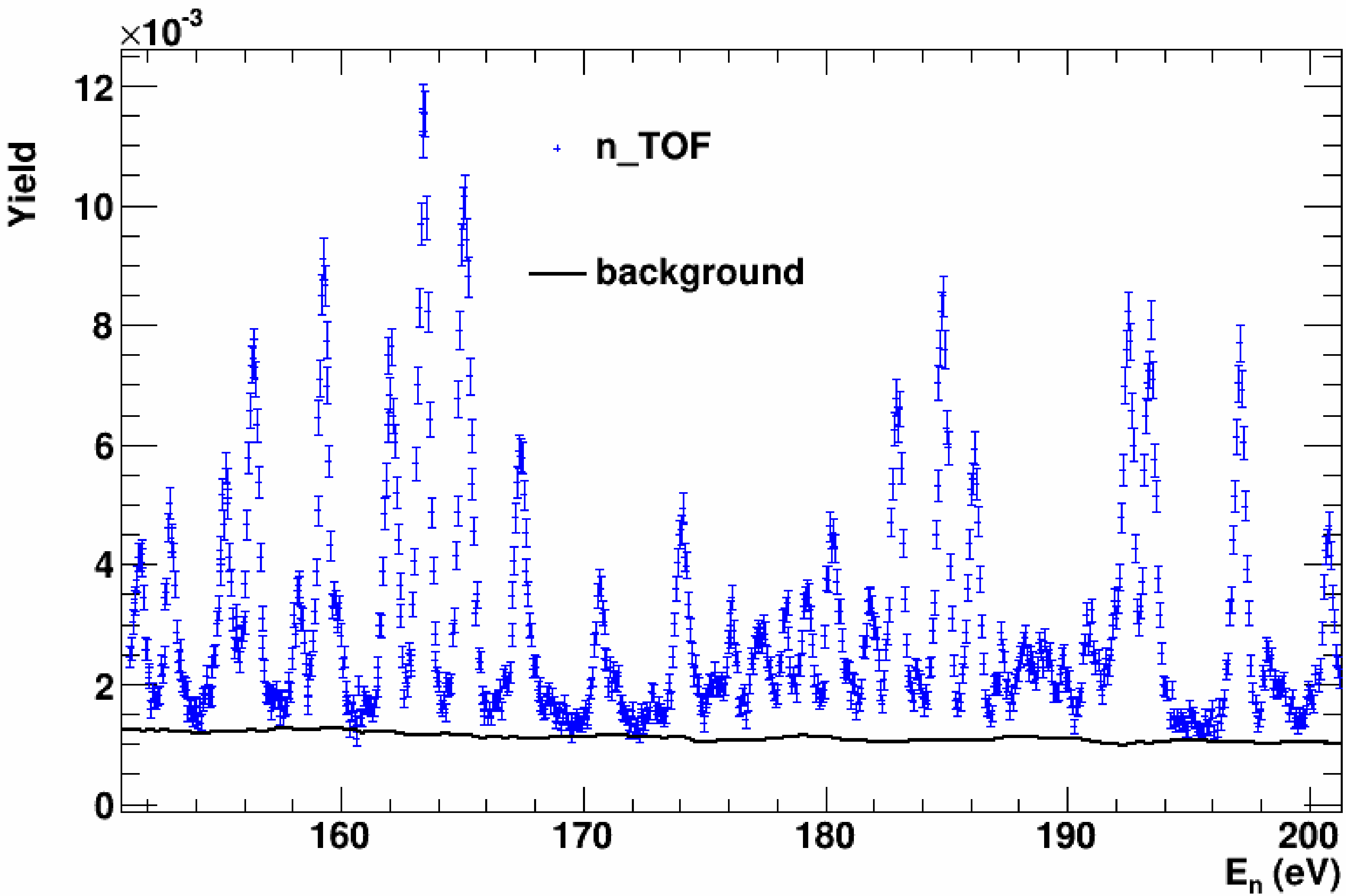
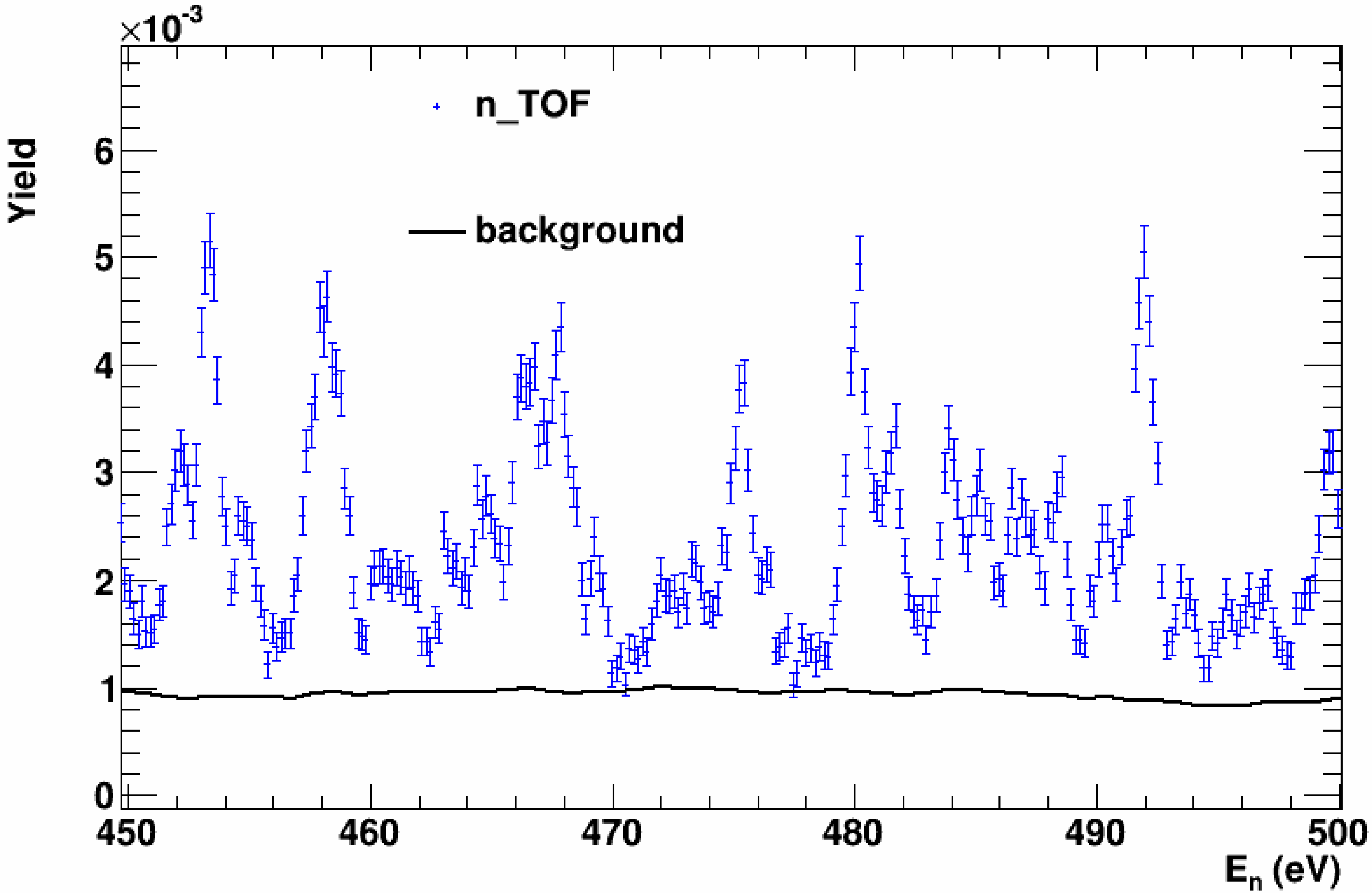
n_TOF meeting, Bologna, Nov 2013

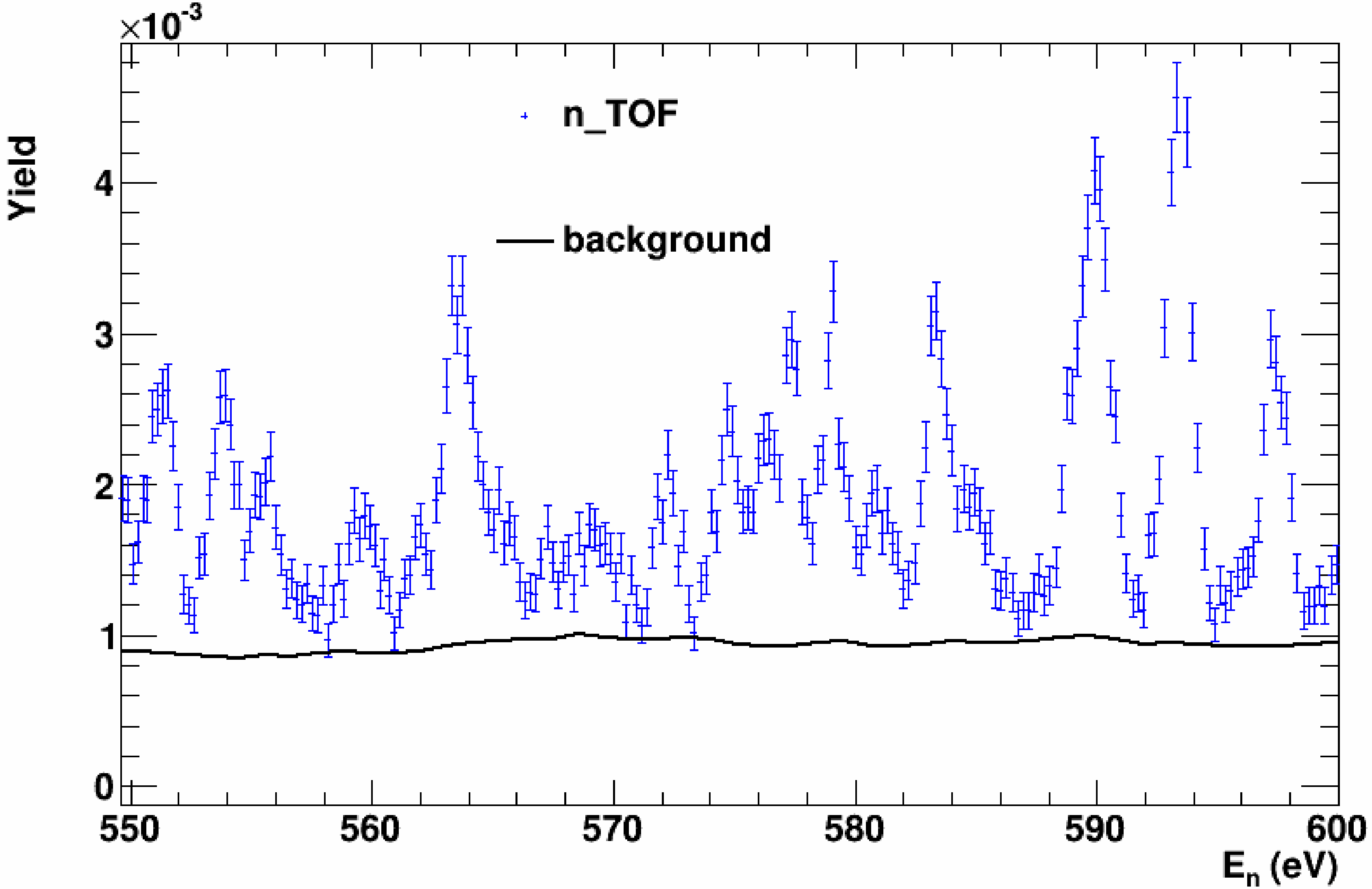
The yield: the extended resolved resonance region (vi)



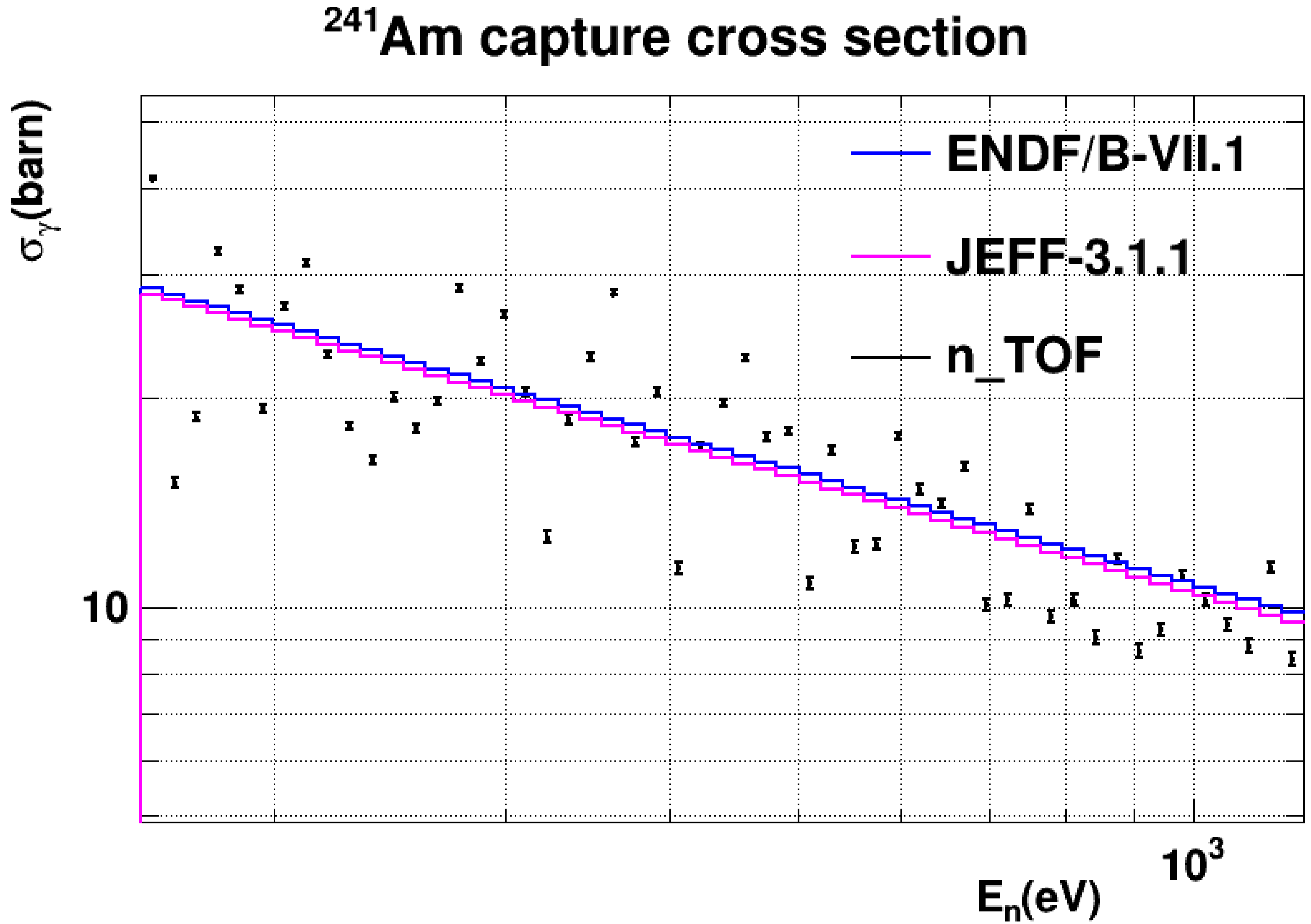
The yield: the extended resolved resonance region (vii)



The yield: the extended resolved resonance region (viii)

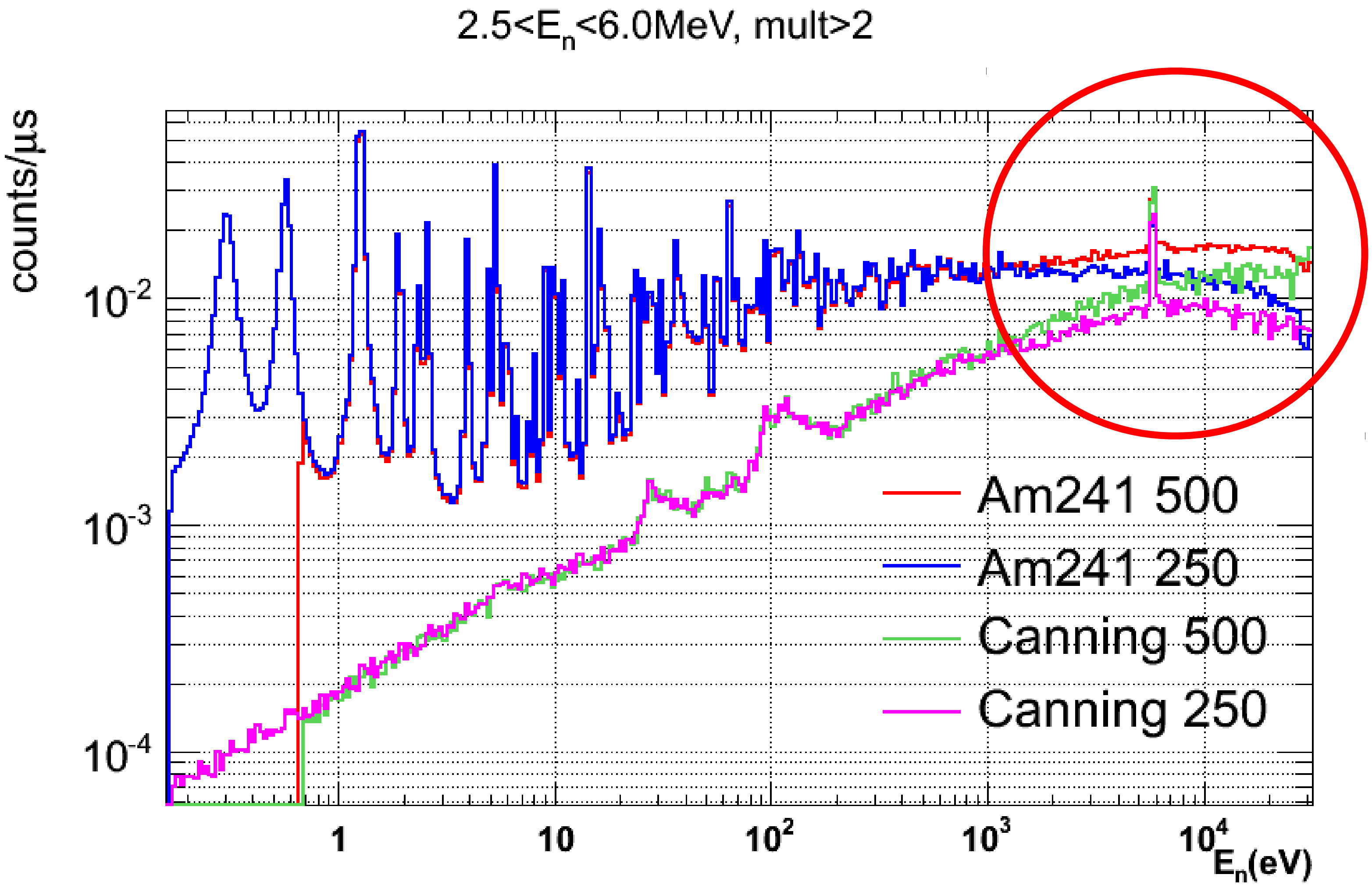


The yield: the unresolved resonance region (iv)



- Alpha-gamma discrimination. ✓
- Energy calibration:
  - Calibration sources. ✓
  - Run by run (with the alpha spectra). ✓
- Time calibration. ✓
- Dead time characterization. ✓
- Normalization between runs. ✓
- Monte Carlo simulations (validation, efficiency, beam interception factor). ✓
- Background
- Normalization
- Tests

250 MS/s != 500 MS/s ???



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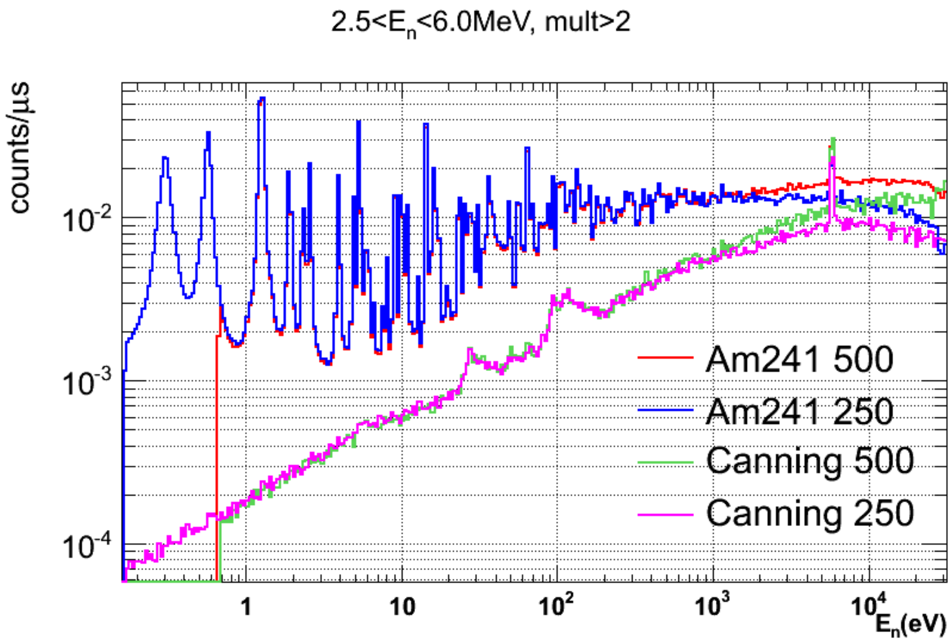
Emilio Mendoza Cembranos
n_TOF meeting, Bologna, Nov 2013

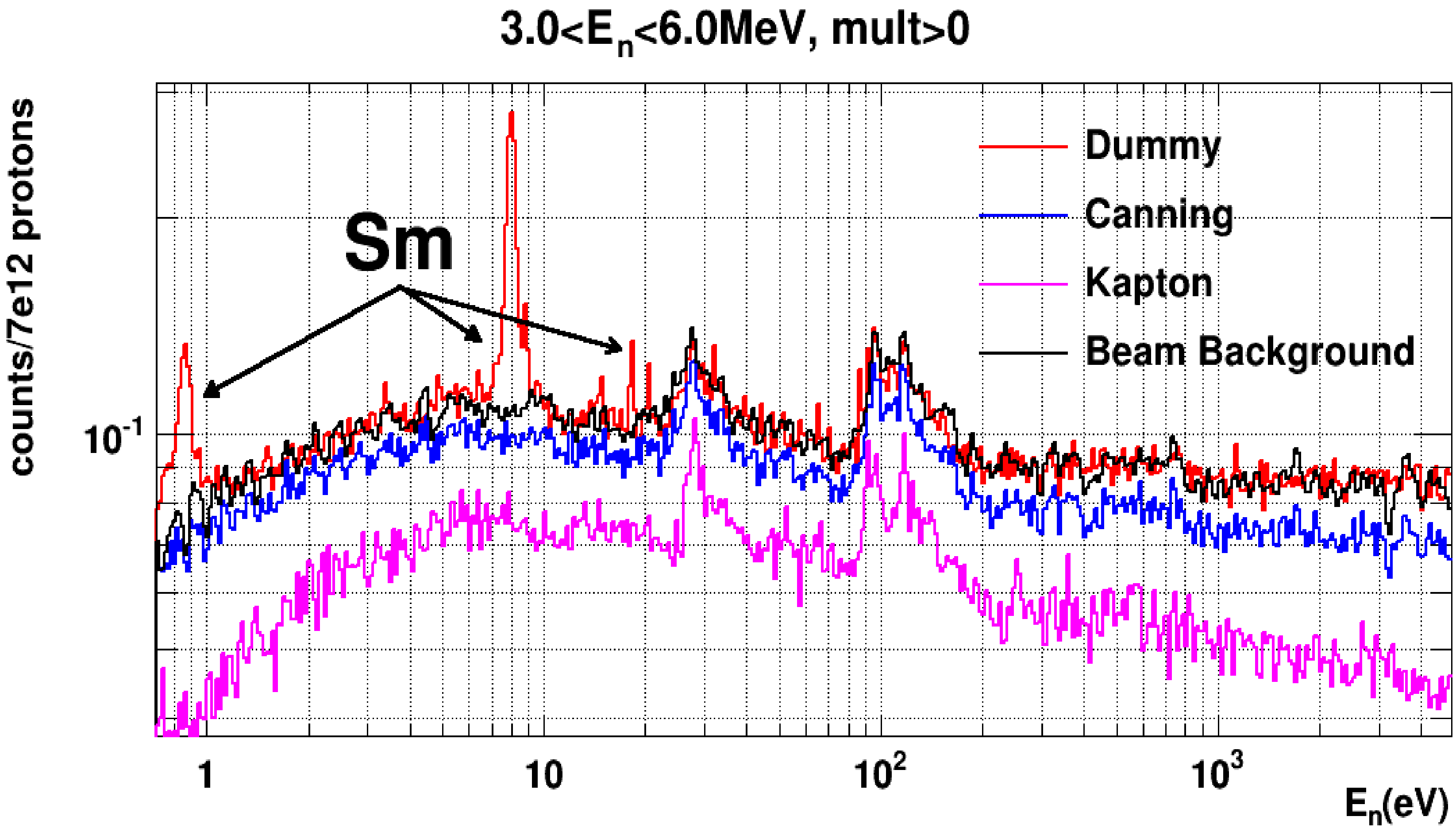
250 MS/s != 500 MS/s ???



Hypothesis:

1. **The geometry was different in the 500 MS/s and in the 250 MS/s configurations.**
2. **The analysis routine give different results depending on the sampling rate.**
3. **The digitizers "work" different at 500 MS/s than at 250 MS/s.**
4. **Other options.**

Background

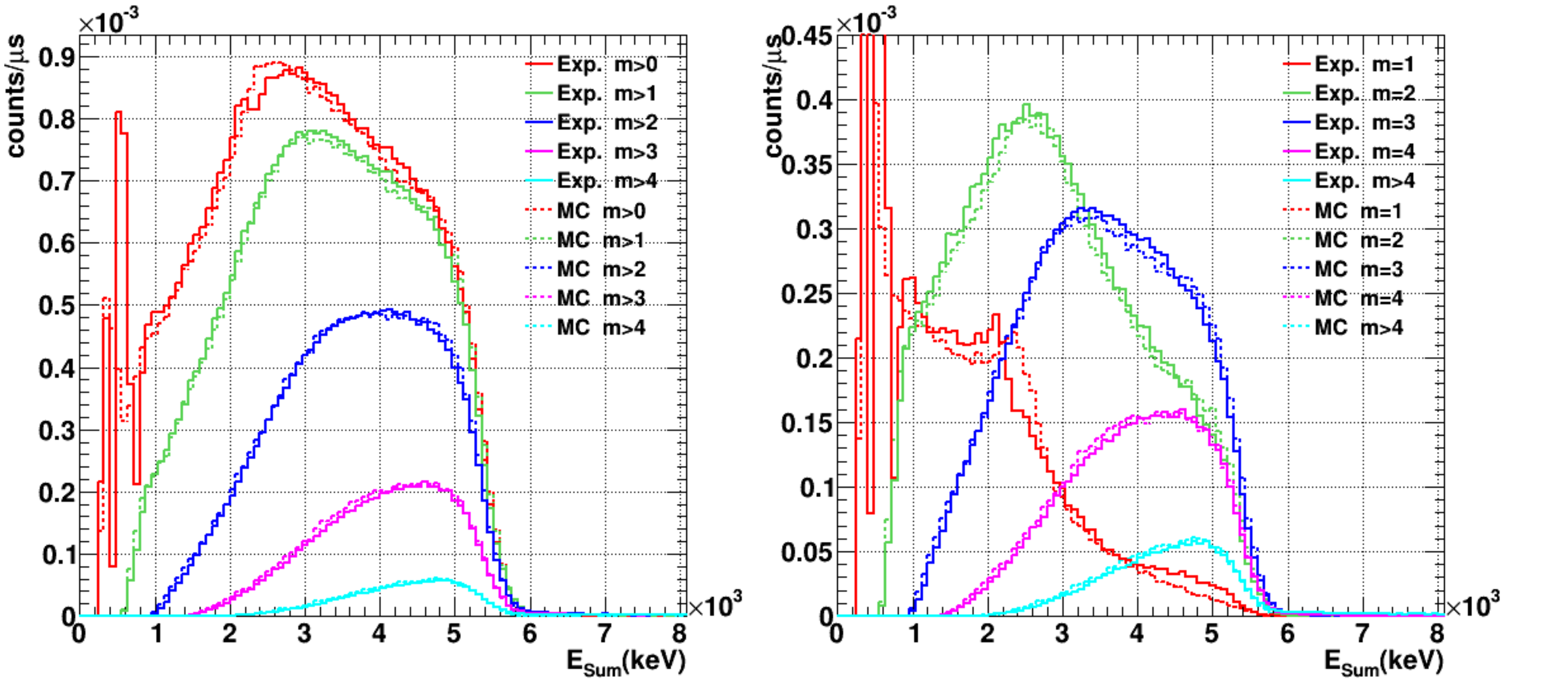


3.0<E_n<6.0MeV, mult>0
counts/7e12 protons
10^-1
Dummy
Canning
Kapton
Beam Background
Sm
1
10
10^2
10^3
E_n(eV)

Normalization

- In order to reproduce the capture yield obtained from the evaluated libraries it is necessary to multiply the n_TOF capture yield by ~0.65.
- There are two variables which are strongly related with the capture yield:
  - The detection efficiency
  - The beam interception factor

Detection efficiency



In order to reproduce the normalization given by the evaluated libraries, the efficiency should be higher. However, it cannot be (much) higher, since it cannot exceed 100 % (close when weak conditions are applied to the detected events).

Simulated BIF

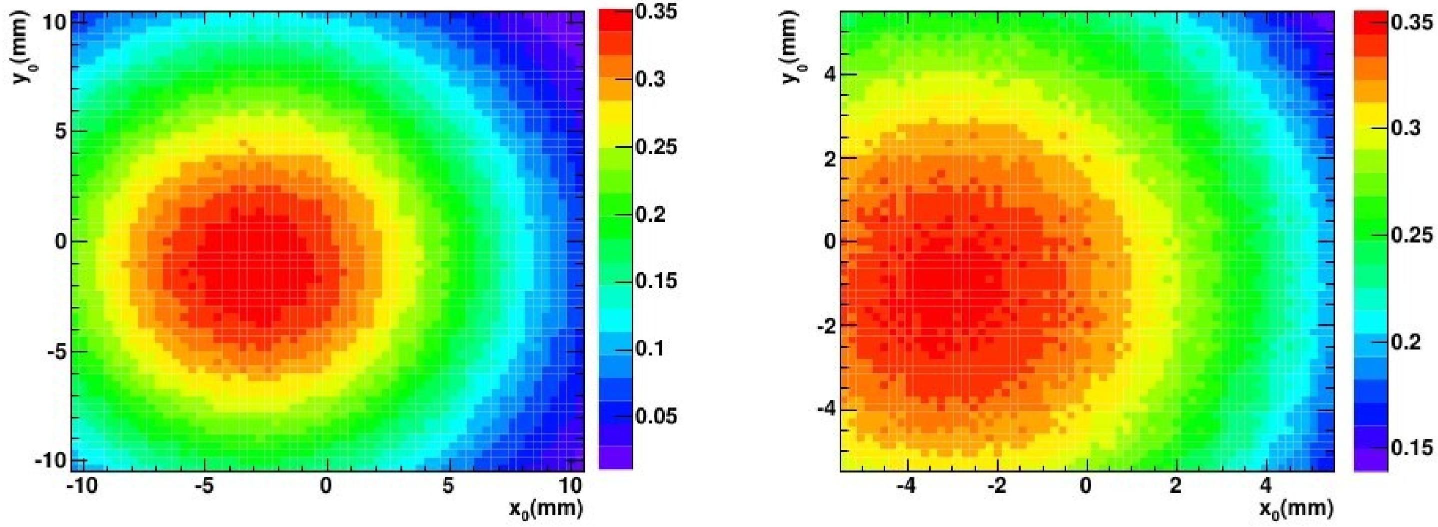
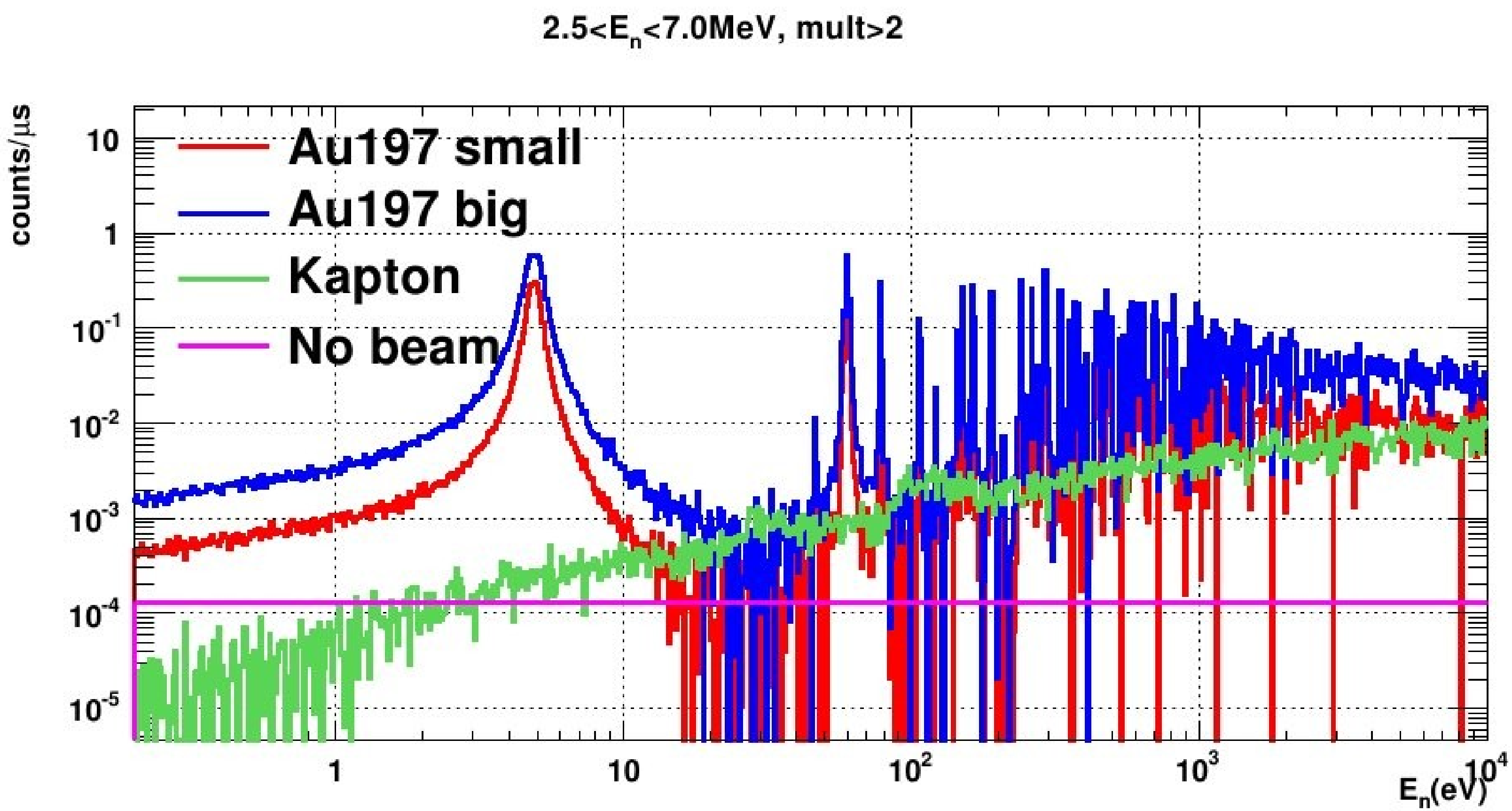


Figure 2.61: Simulated BIF, as a function of the center of the sample, (x_0,y_0), at 1 eV. The same radius of 6.1 mm has been assumed in all the cases.

Experimental BIF



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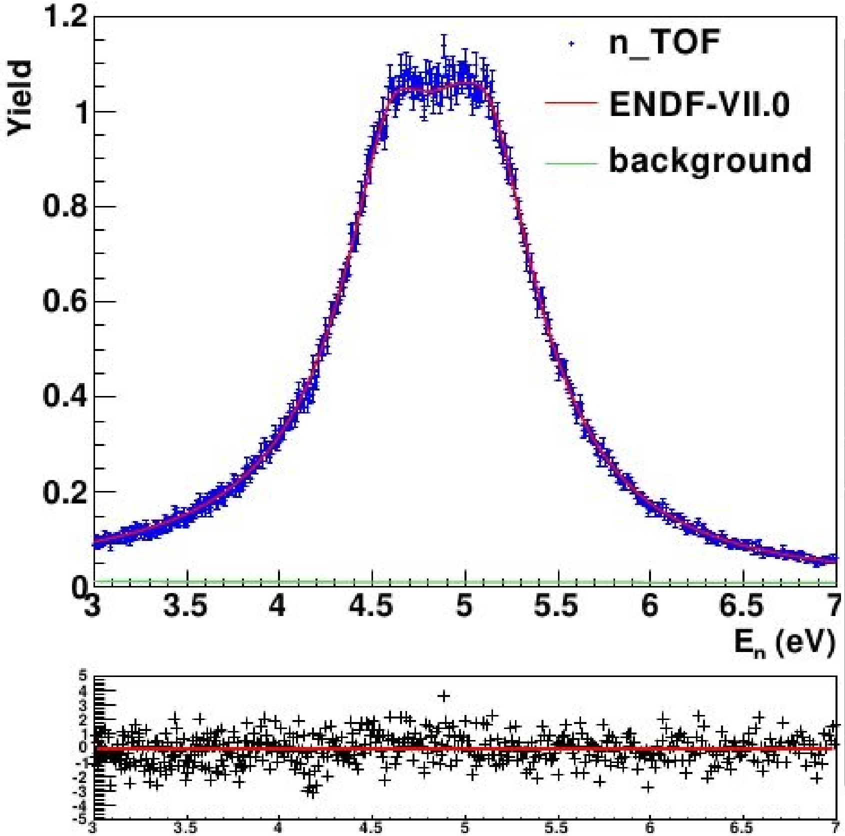
Experimental BIF

Threshold	mult>0	mult>1	mult>2	mult>3	mult>4
100	0.280946	0.277521	0.279753	0.283783	0.276493
200	0.281045	0.277662	0.280634	0.283208	0.277428
300	0.281317	0.277723	0.281389	0.283755	0.28006
400	0.281527	0.278712	0.282103	0.284962	0.298025

Table 2.10: Ratio between the ^{197}Au measurements 4 and 5, integrated in the 0.2-3 eV energy range, under 2.5-7 E_{Sum} conditions, after subtracting the corresponding backgrounds.

Experimental BIF



Conditions	th=200keV	th=300keV	th=400keV
	Normal pulse intensity (measurement 2)		
2.5-10 mult>0	1.09039000	1.09231313	1.09249423
2.5-10 mult>1	1.07806185	1.08831487	1.09127446
2.5-10 mult>2	1.04175348	1.07925396	1.08772810
2.5-7 mult>0	1.03754640	1.09006332	1.09018090
2.5-7 mult>1	1.04507390	1.08480671	1.08770107
2.5-7 mult>2	1.05039286	1.07445133	1.08314102
	Low pulse intensity (measurement 3)		
2.5-10 mult>0	1.06472644	1.06601700	1.06513353
2.5-10 mult>1	1.07665912	1.06329837	1.06253049
2.5-10 mult>2	1.03596168	1.05561222	1.05216715
2.5-7 mult>0	1.06691727	1.06785704	1.06667084
2.5-7 mult>1	1.05763579	1.06427098	1.06319177
2.5-7 mult>2	1.03591340	1.05548475	1.05177762

There is a 7% difference between both calculations of the BIF !!!

Conclusions

- There is still some work to do in:
  - The normalization.
  - The determination of the background.
  - Analysis at “high” neutron energies.
- The rest of the analysis is already done.
- I hope the analysis will finish soon.

^{235}U capture with the TAC

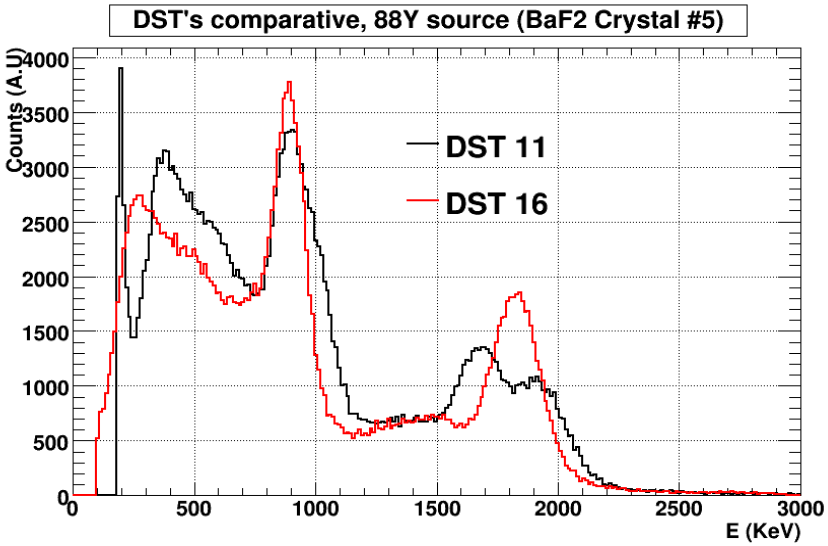
Javier Balibrea Correa
Nuclear Innovation Unit (CIEMAT, Spain)

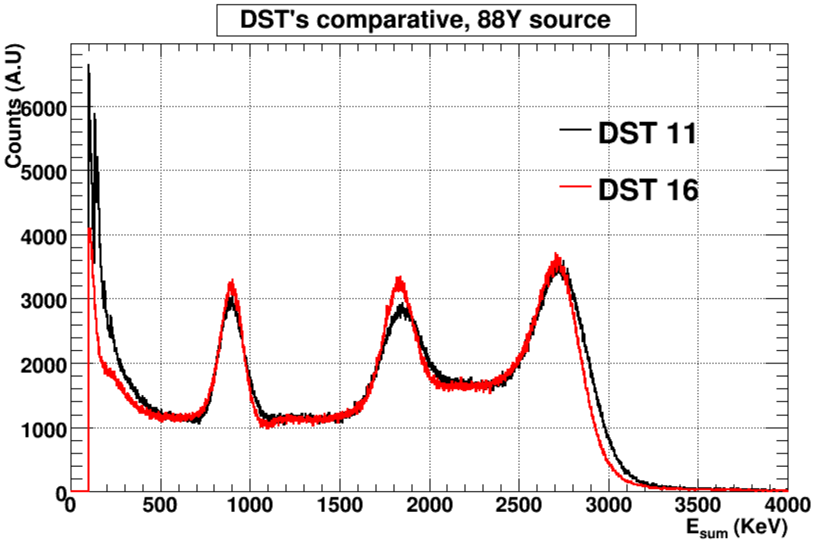
^{235}U Analysis Status

- Measurement has been processed again with new DST's.
- α/γ signal discrimination in BaF2 crystals done.
- Energy calibration for individual BaF2 crystals done .
- Time calibration between BaF2 crystals for coincidences in TAC done.
- Time calibration between FTMG detectors and TAC for coincidences done.
- Check Beam detectors.
- Very preliminary deposited energy histograms for 2FTMG configuration.
- Very preliminary capture and fission Yield for 2FTMG configuration.
- Very preliminary fission's gammas have been simulated.

DST processing

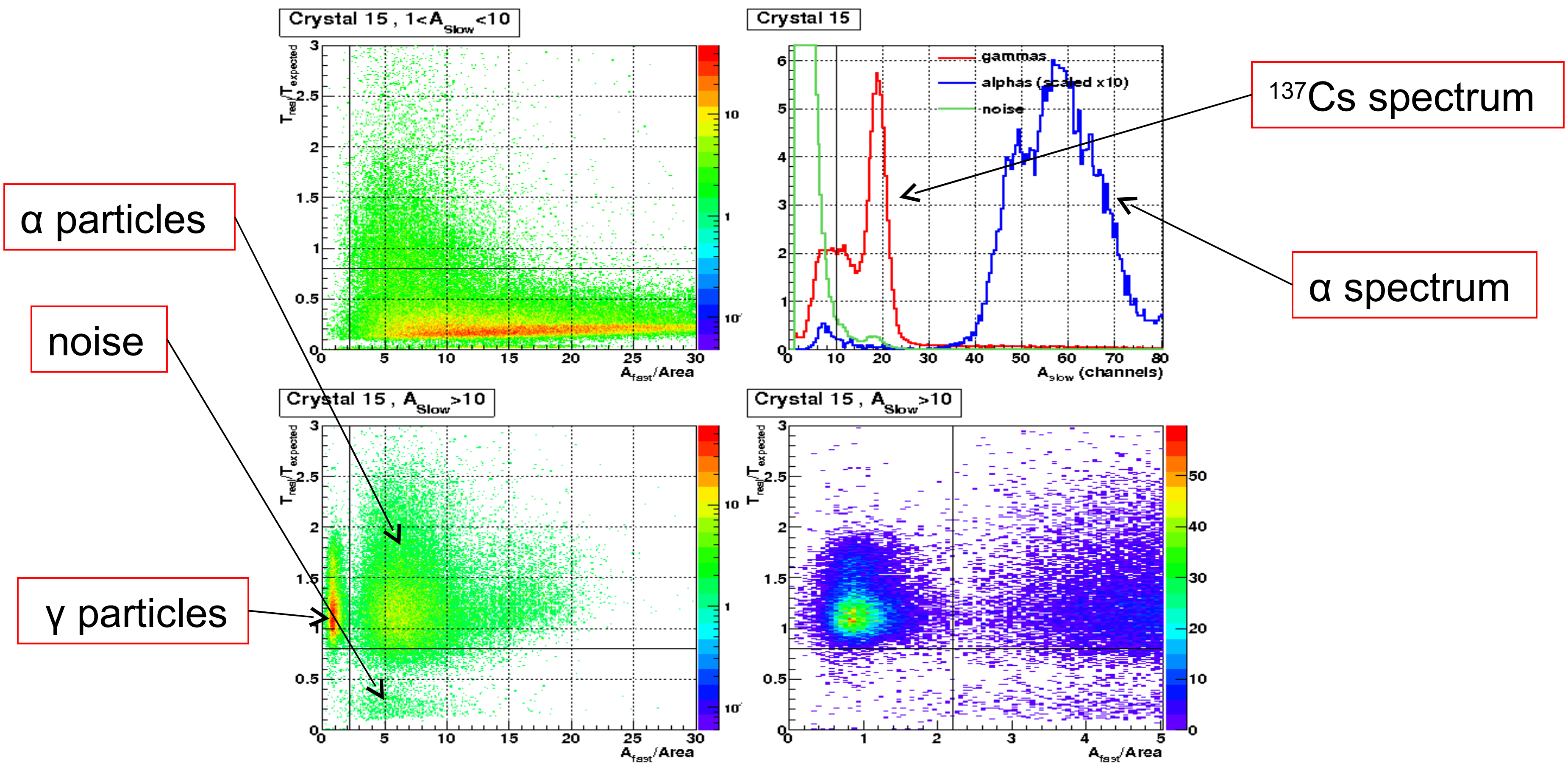
- The measurement has been processed with a new DST's version (DST 16)
- Differences between both energy deposition spectrum in single crystal and TAC are observed.





α/γ discrimation

•A study for α/γ and noise discrimination in individual BaF2 crystals have done.



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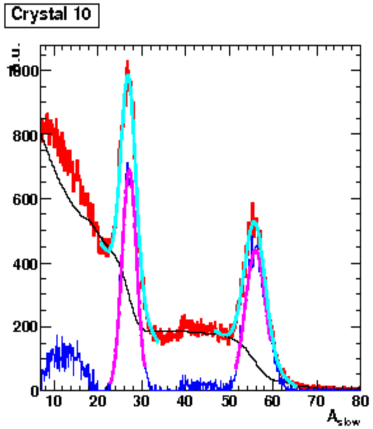
n_TOF meeting, Bologna, Nov 2013

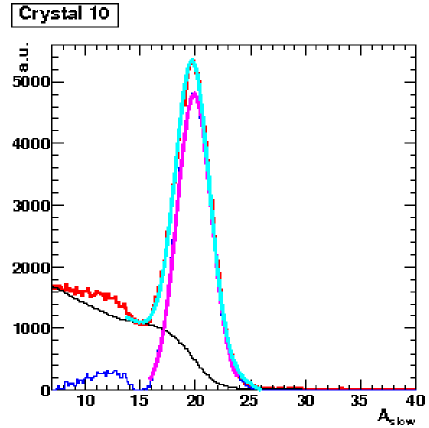
TAC calibration

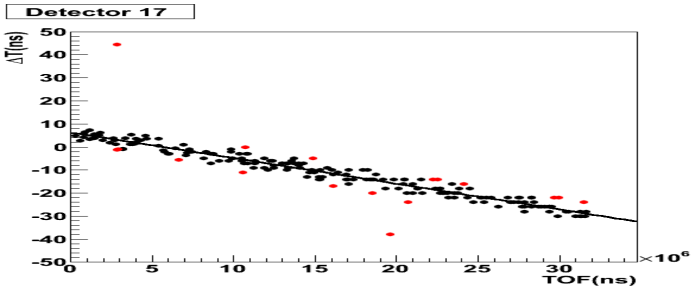
- Energy TAC calibration for each BaF2 crystals have performed using ^{88}Y and ^{137}Cs sources.

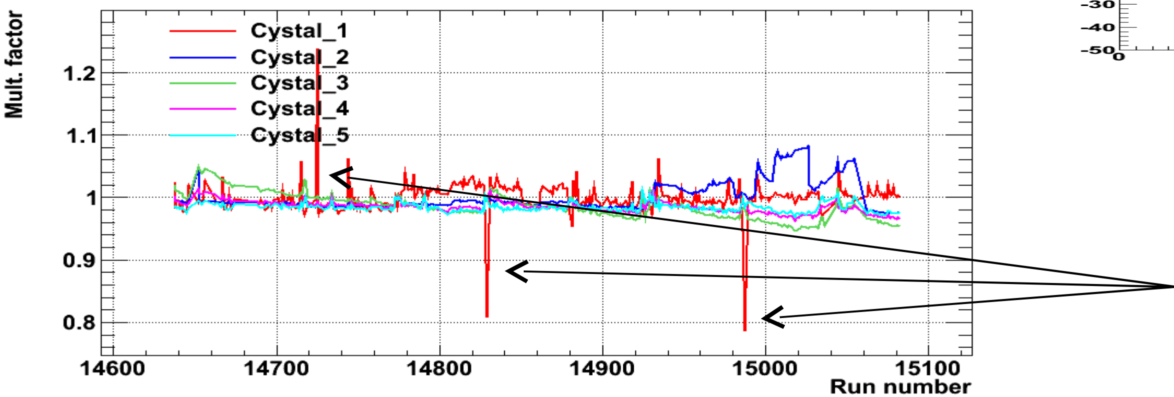
- Ganancie's changes in each run has fitted using α contamination.

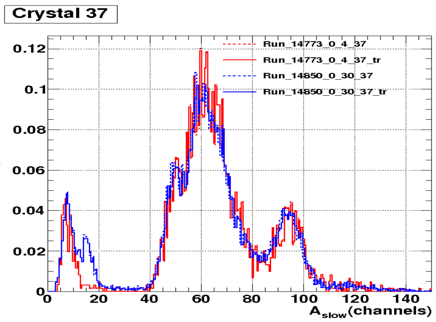
- Time calibration has done with a time window for coincidences in TAC ~20ns





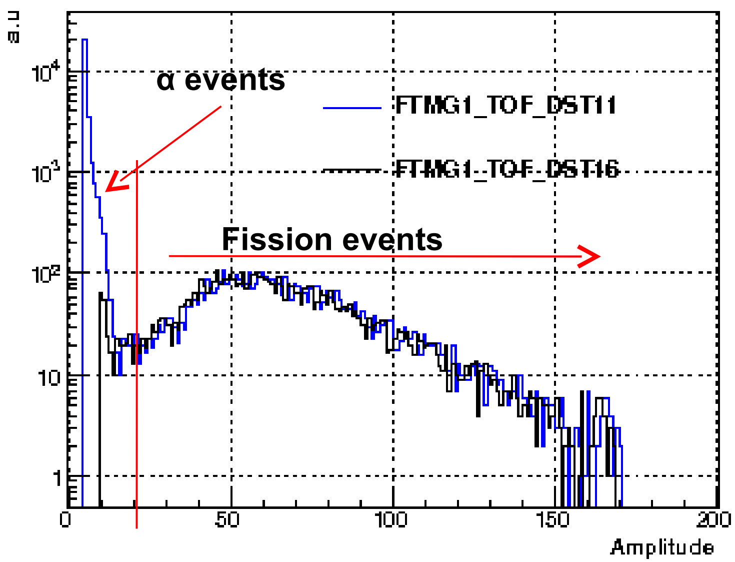


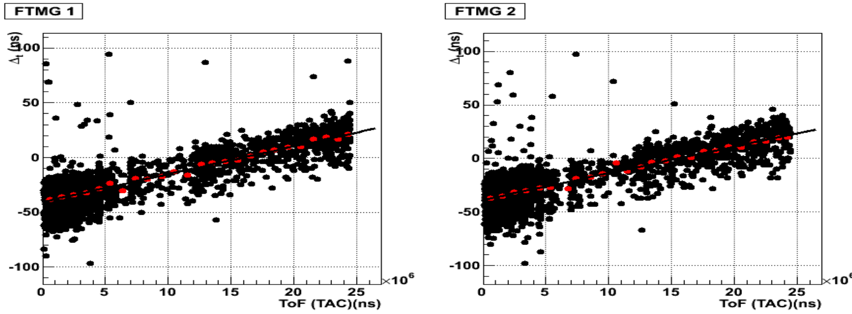


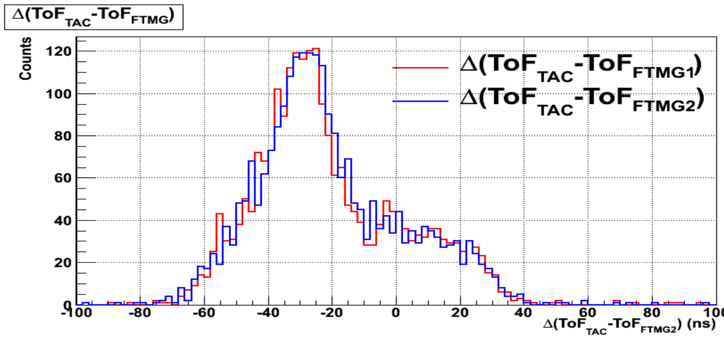


FTMG detectors

- Events with amplitudes more than threshold are tagged like fission events.
- Timming correlation between TAC and FTMG detectors have been studied in 2 configurations (2 FTMG and 10 FTMG).
- Time windows for coincidences with TAC in both configurations are ~120 ns.







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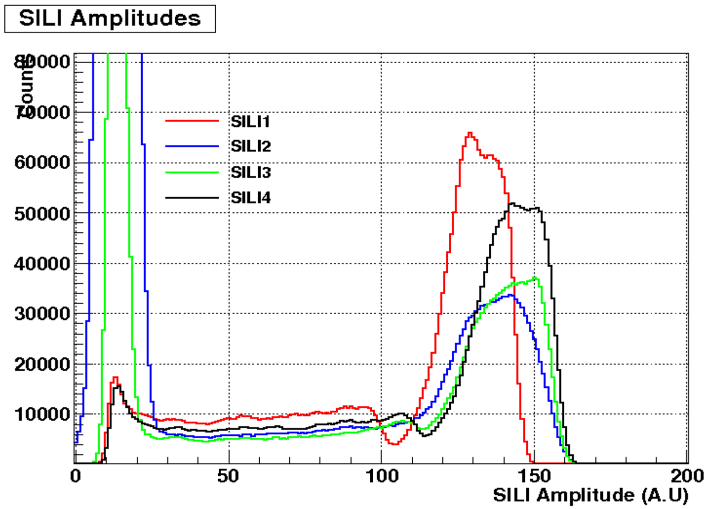
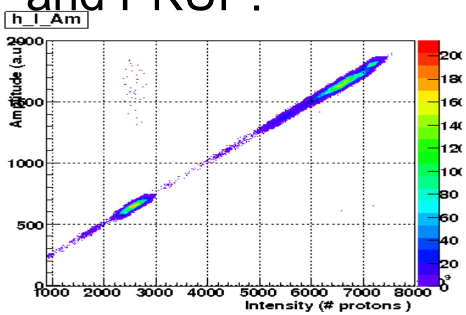
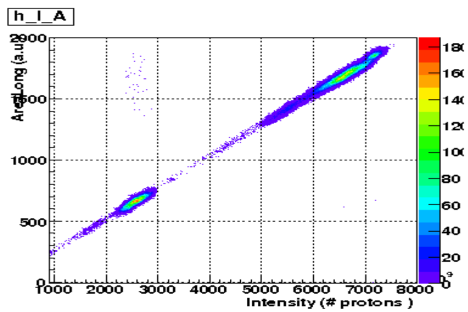
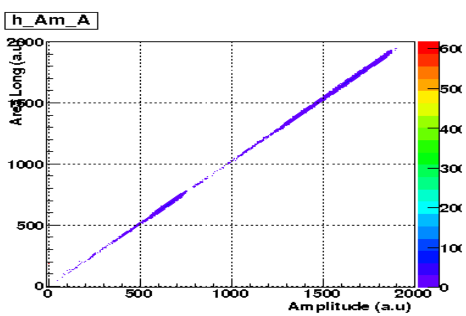
Beam detectors

•Check linearity between PKUP and beam monitors.
•Check relationship between SILI detectors and PKUP.

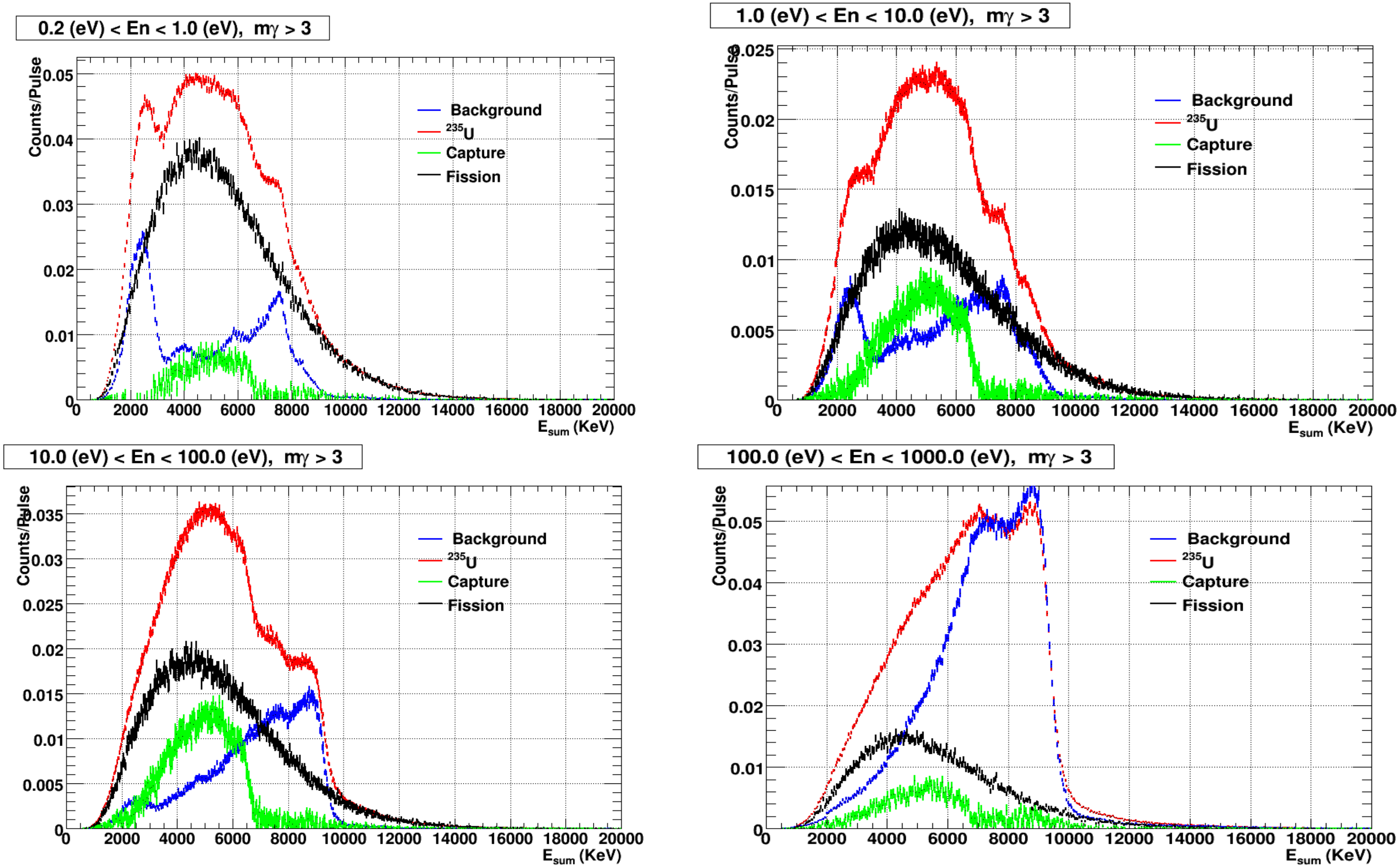








2 Fission tagging micromegas (2FTMGAS)



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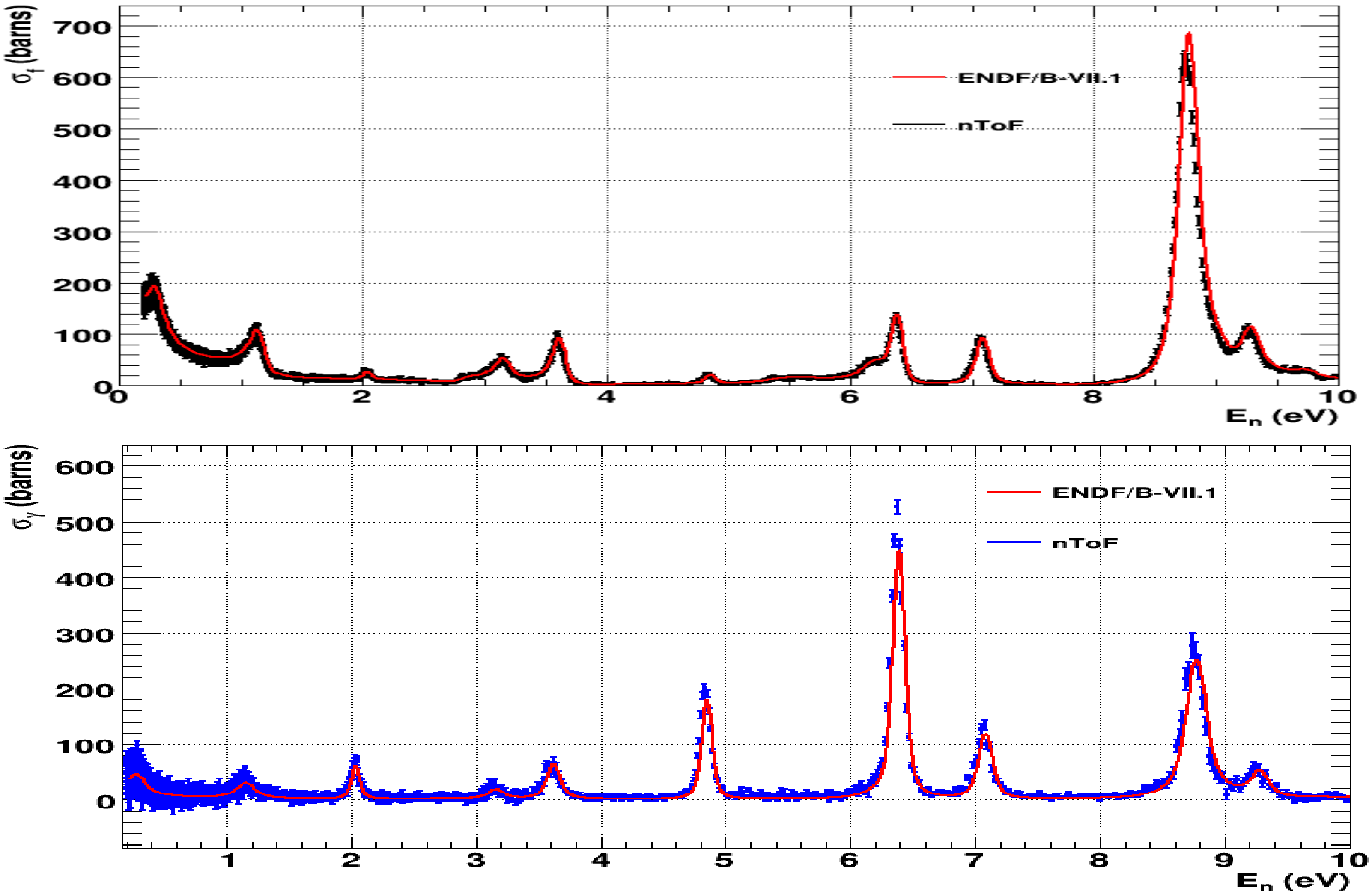

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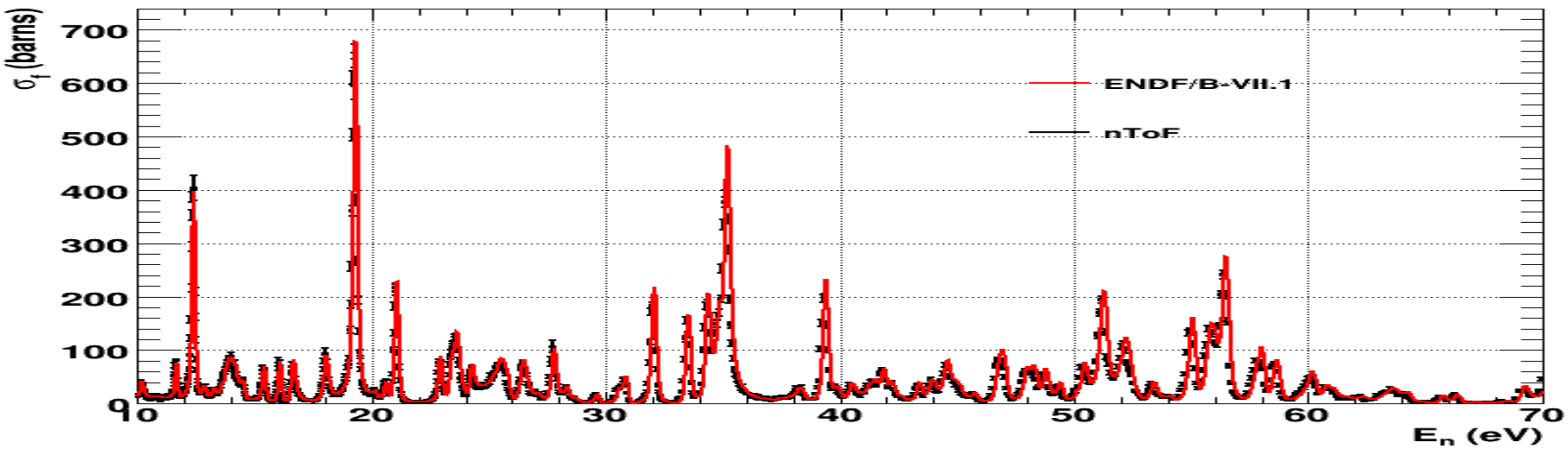
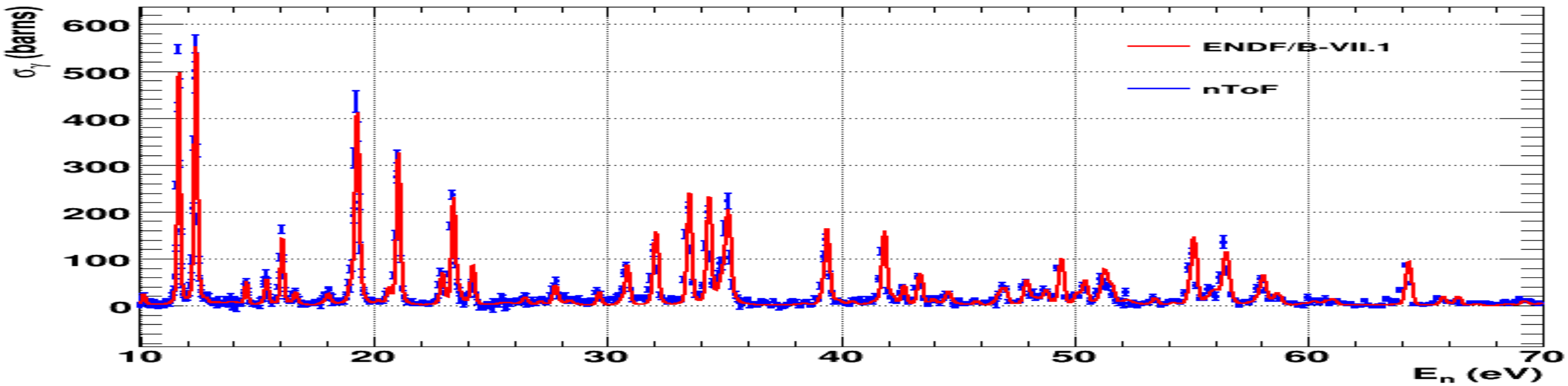
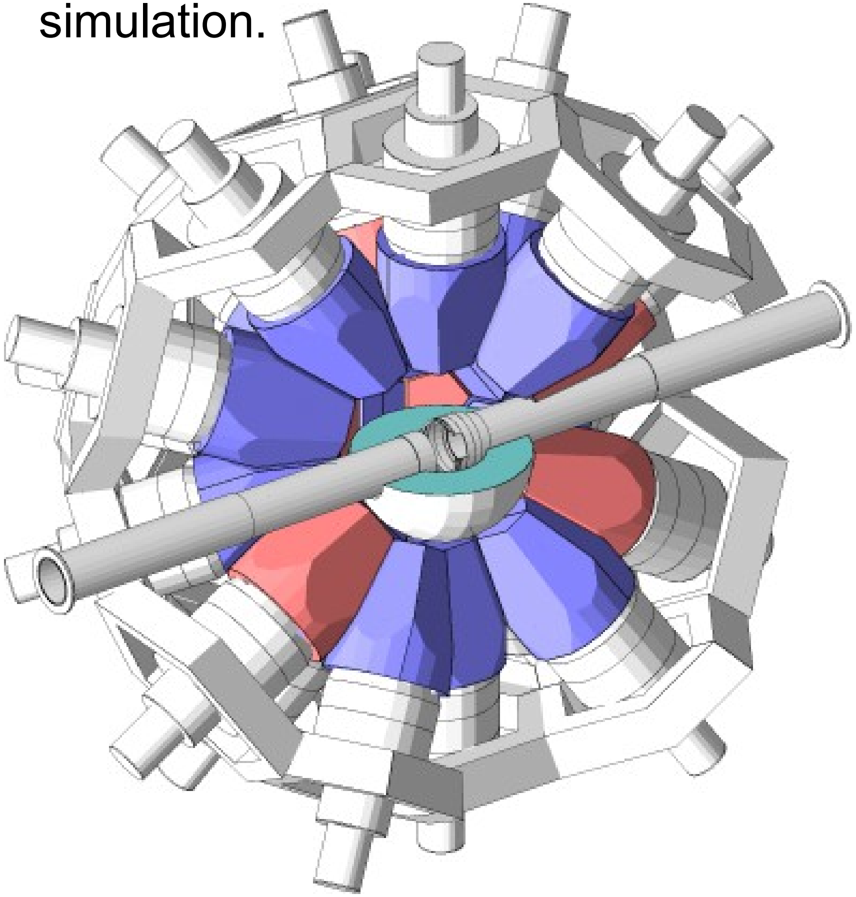
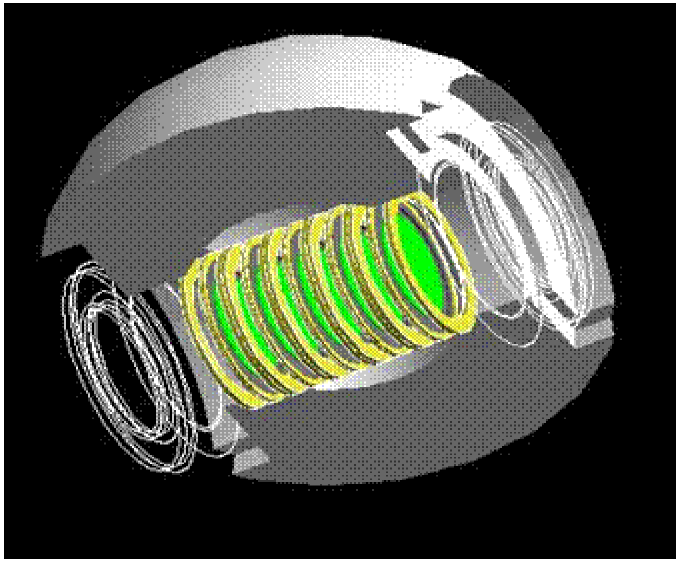


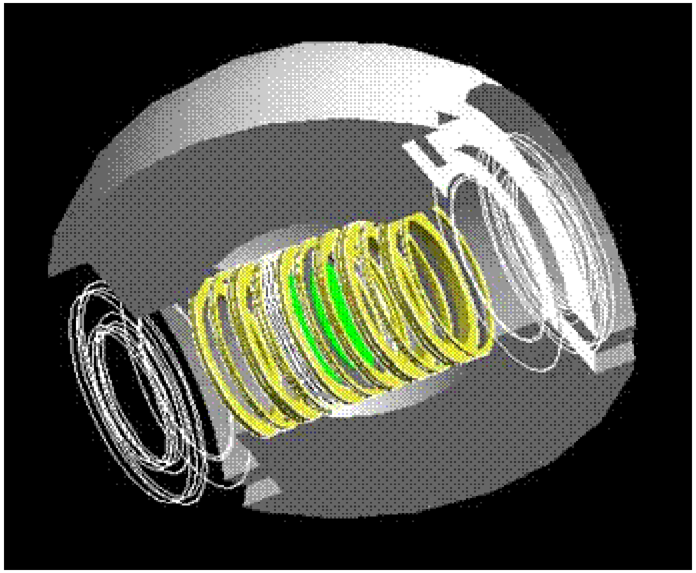


Fission's gammas simulated

- 2FTMGs and 10FTMG configuration has been implemented in M.C geometry simulation.







Very preliminary results for the (n,f) EM cascades

A first simulation with the realistic geometry (10FTMGAS) has been performed with the cascades provided by I. Stetcu and T. Kawano (CGM code – Los Alamos).