

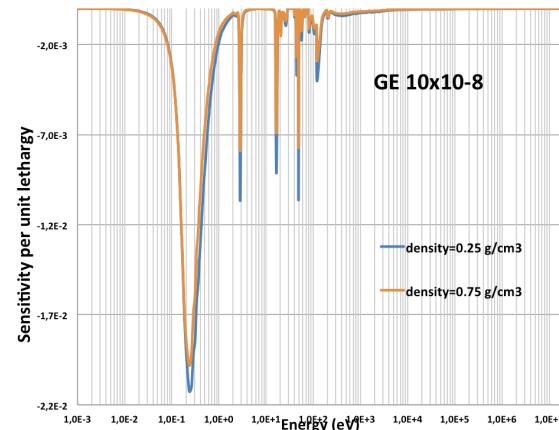
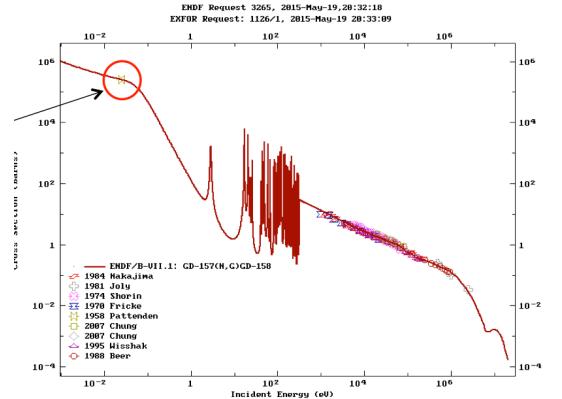
ENEA

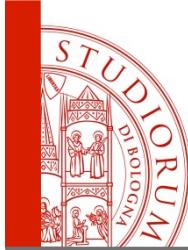
Measurement of the neutron capture cross section for ^{157}Gd and ^{155}Gd relevant to Nuclear Technology

Santiago de Compostela, 27 – 29 May 2015

Federico Rocchi¹, Sergio Lo Meo^{1,2}, Cristian Massimi^{2,3},
Colonna⁴, Antonio Guglielmelli¹, Massimo Barbagallo², Donato Maurizio Castelluccio^{1,2}, Nicola
Vannini^{2,3}

¹ ENEA Research Centre of Bologna (Italy)
² INFN Section of Bologna (Italy)
³ Physics and Astronomy Dept. Alma Mater Studiorum – University of Bologna (Italy)
⁴ INFN Section of Bari (Italy)

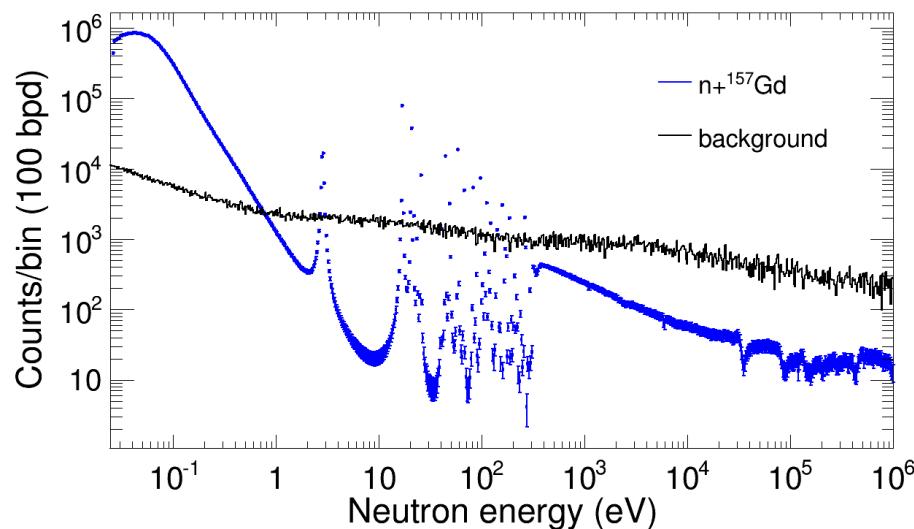




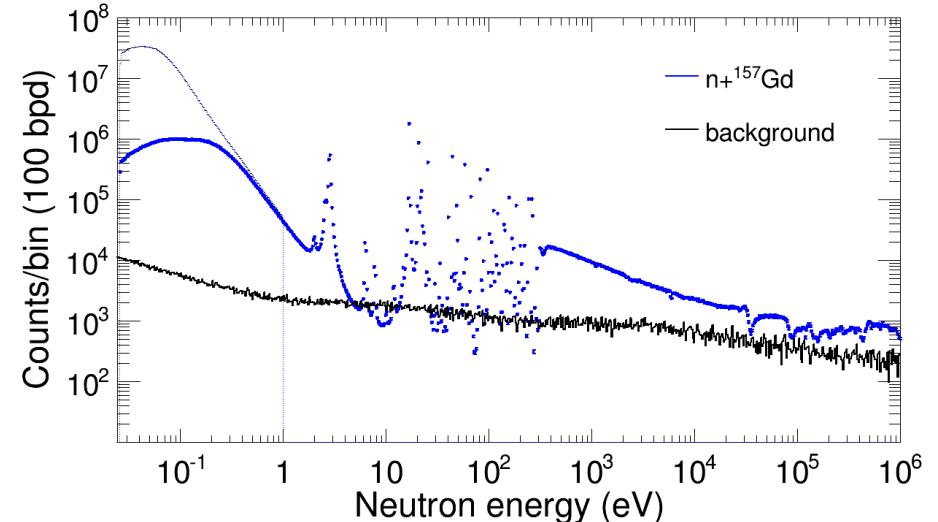
Beam time request

^{157}Gd expected counting rate

5 mg of ^{157}Gd (6.1×10^{-6} at/b)



200 mg of ^{157}Gd (2.4×10^{-4} at/b)

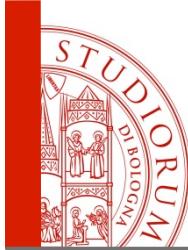


2 highly enriched (~ 88%) ^{157}Gd samples are needed

- **Very thin** (6.1×10^{-6} at/b) 5 mg, radius = 1 cm
- **Thin** (2.4×10^{-4} at/b), 200 mg, radius = 1 cm

5×10^{17} protons per sample + background study $\sim 1.4 \times 10^{18}$ protons

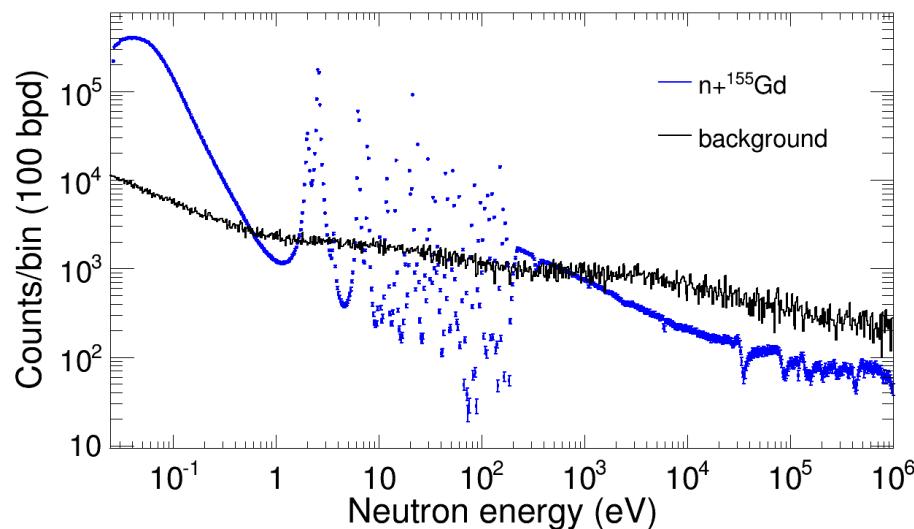




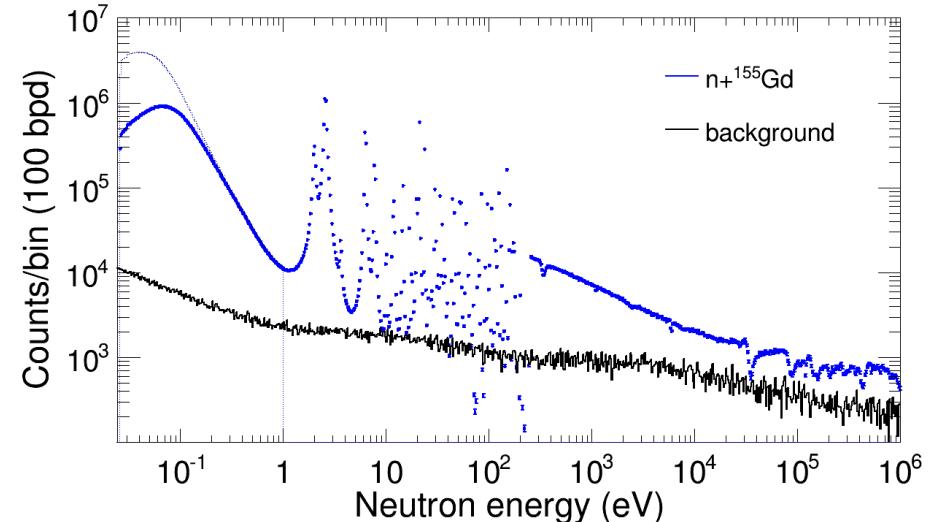
Beam time request

155Gd expected counting rate

10 mg of ^{155}Gd (1.2×10^{-5} at/b)



100 mg of ^{155}Gd (1.2×10^{-4} at/b)

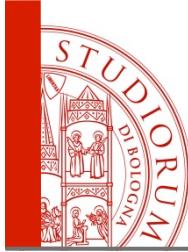


2 highly enriched (>90%) ^{155}Gd samples are needed

- **Very thin** (1.2×10^{-5} at/b) 10 mg, radius = 1 cm
- **Thin** (1.2×10^{-4} at/b), 100 mg, radius = 1 cm

5×10^{17} protons per sample + background study $\sim 1.4 \times 10^{18}$ protons

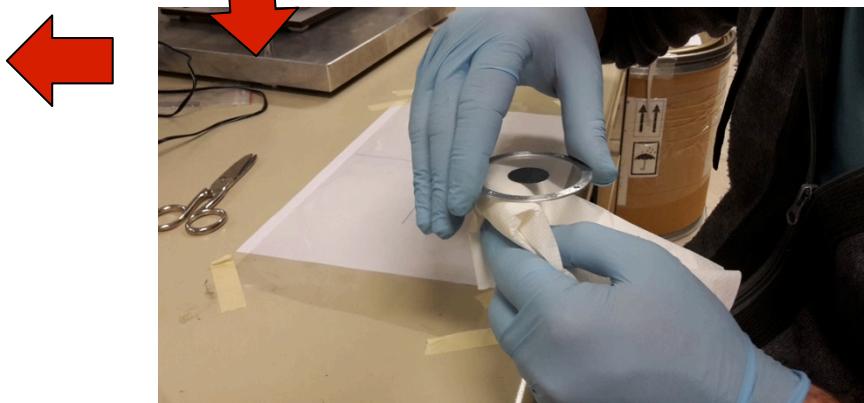
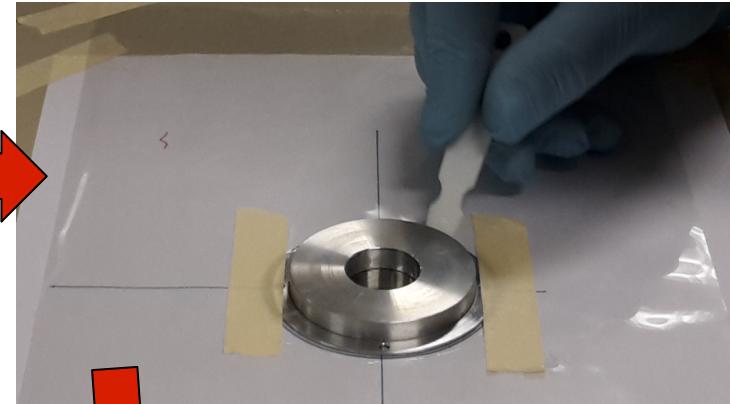


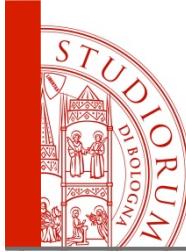


$^{155,157}\text{Gd}(n,\gamma)$ @ EAR1

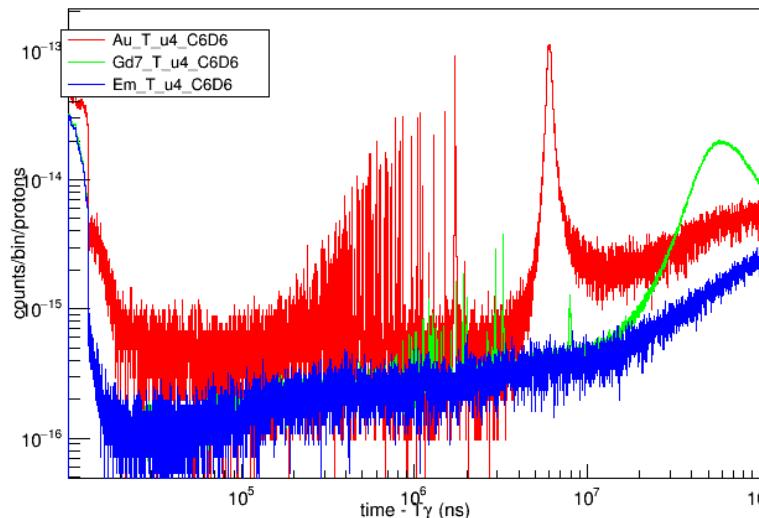
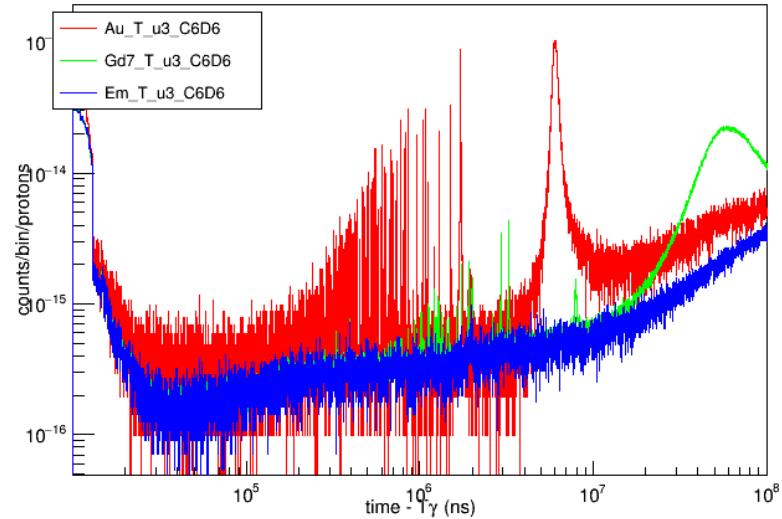
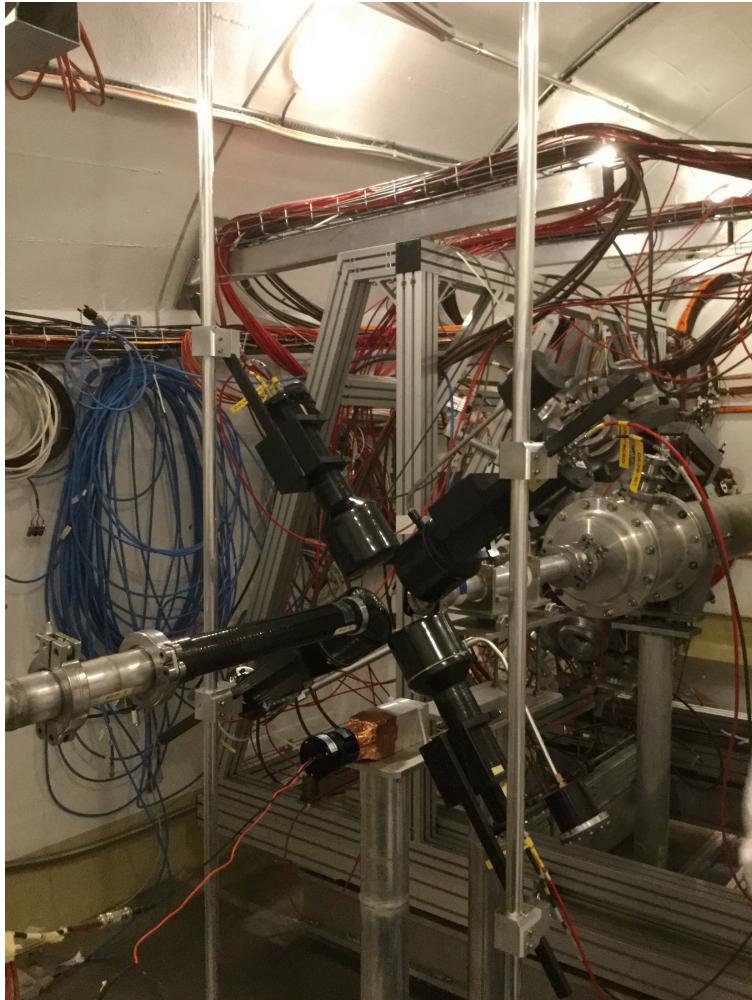


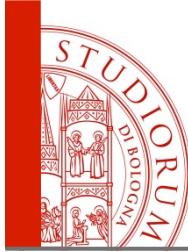
ORNL - USA



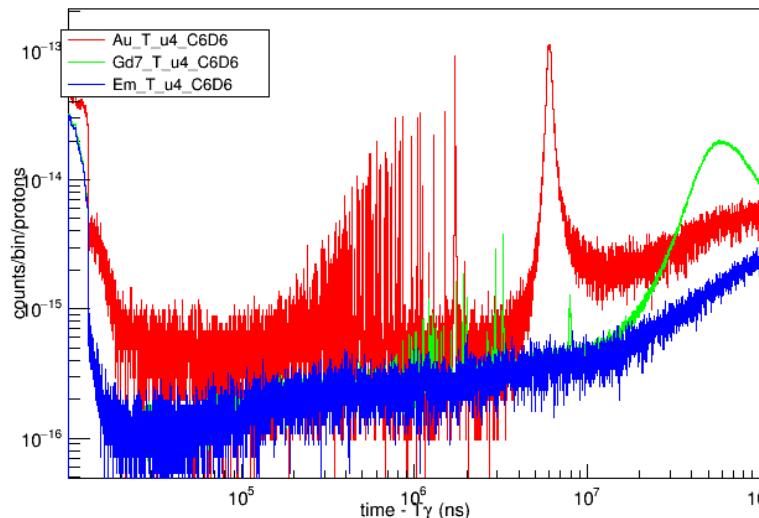
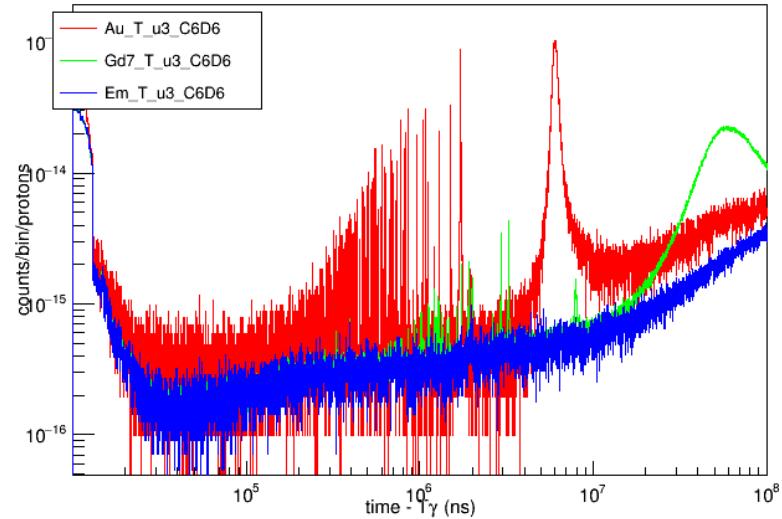
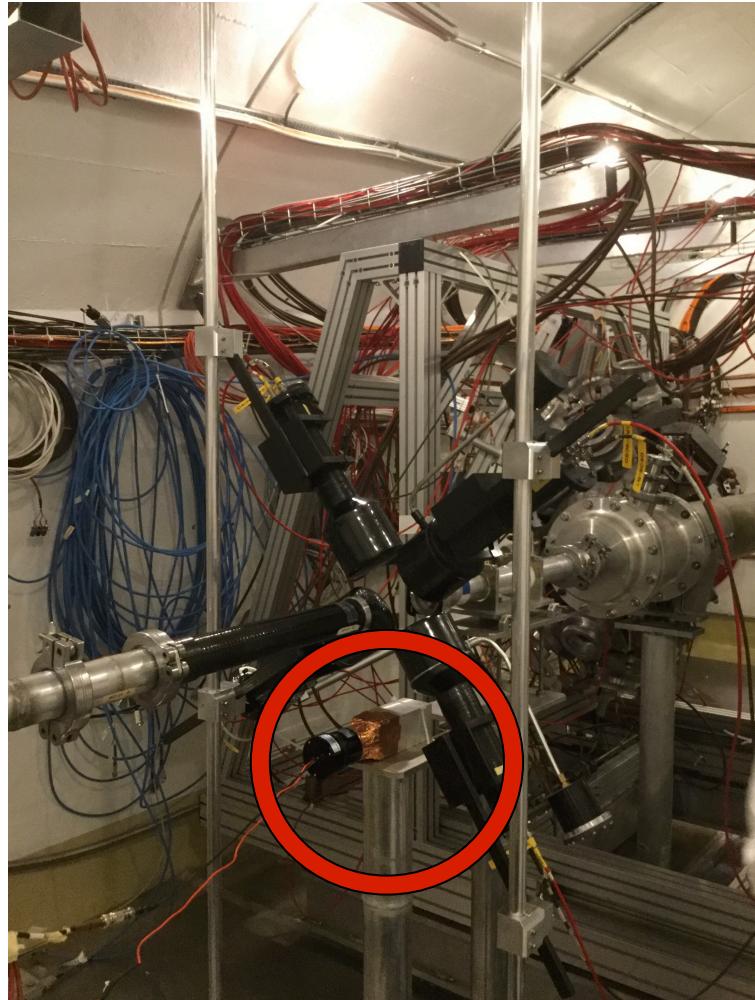


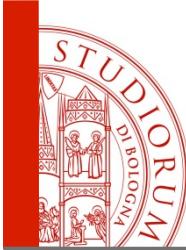
$^{155,157}\text{Gd}(n,\gamma)$ @ EAR1





$^{155,157}\text{Gd}(n,\gamma)$ @ EAR1





$^{155,157}\text{Gd}(\text{n},\gamma)$ @ EAR1

TOTALE p	giorni	%	PROTONI	DESCRIZIONE
1,85E+18	5	99	3,96E+17	Gd157 sottile
	5	103	4,12E+17	Gd157 spesso
92	4	101	3,54E+17	Gd155 sottile
	4	82	3,29E+17	Gd155 spesso
	0	73	3,63E+16	Au
	1	53	7,89E+16	Empty
	1	61	9,16E+16	Empty Colla
			1,43E+17	Background



- Calibrazioni + MC
- ^{155}Gd
- ^{157}Gd
- Flusso
- ...



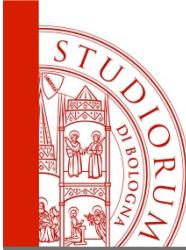
$^{155,157}\text{Gd}(\text{n},\gamma)$ @ EAR1

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	1	53	7,89E+16	Empty
	1	61	9,16E+16	Empty Colla
			1,43E+17	Background



- Calibrazioni + MC → M.M. + A.M. + S.L.M.
- ^{155}Gd → M.M.
- ^{157}Gd → D.M.C. + G.C.
- Flusso → C.M.
- ... → ...

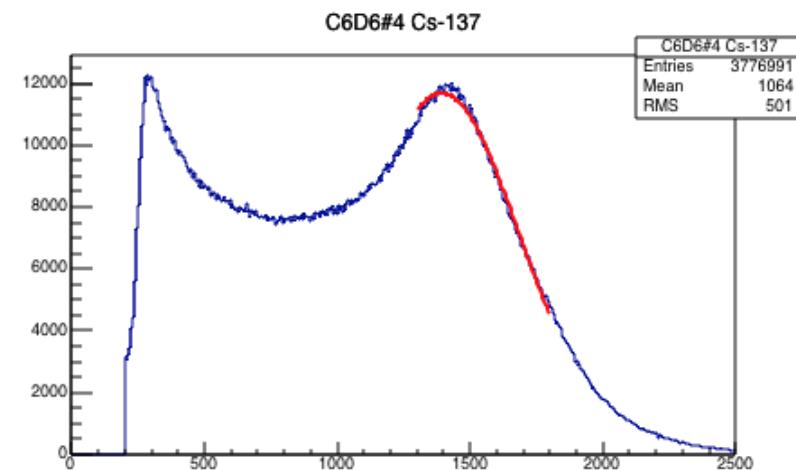
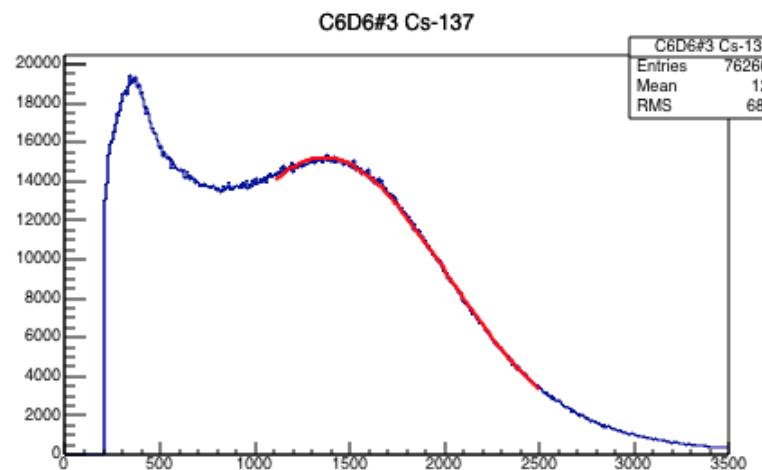
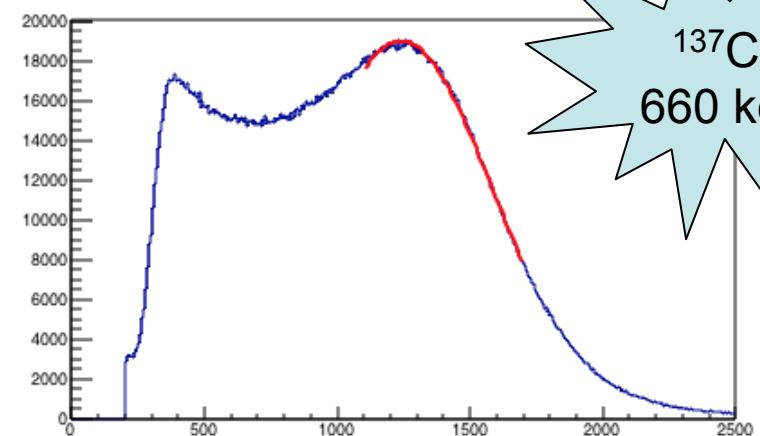
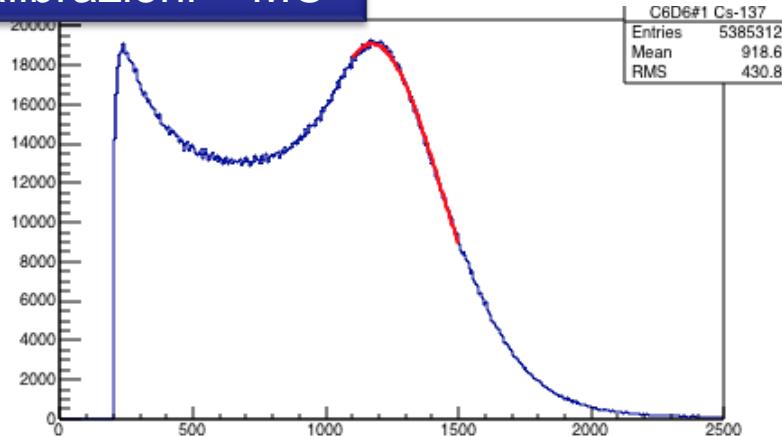


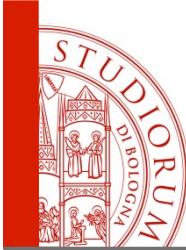


155,157Gd(n,γ) @ EAR1



Calibrazioni + MC



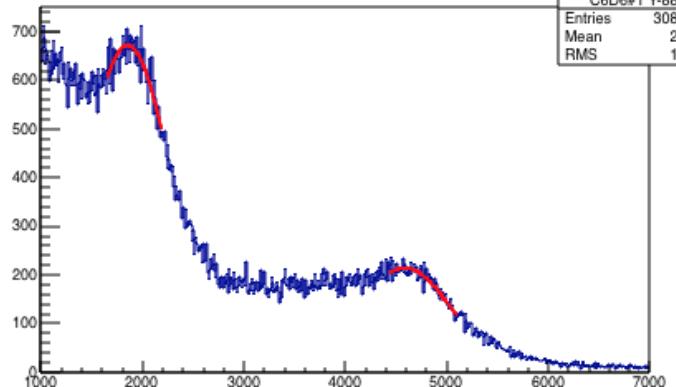


155,157Gd(n,γ) @ EAR1

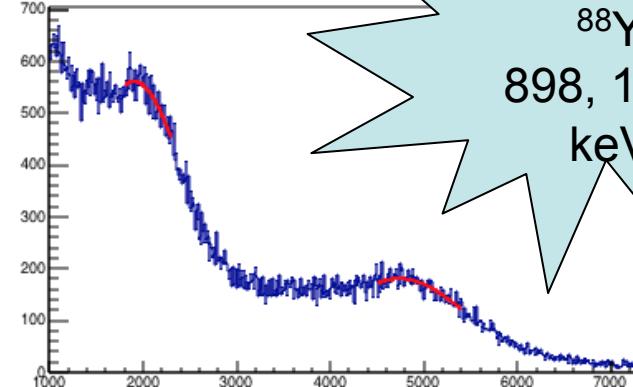


Calibrazioni + MC

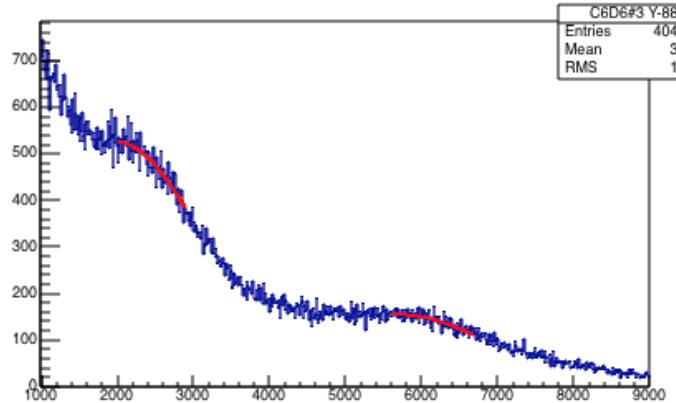
C6D6#1 Y-88



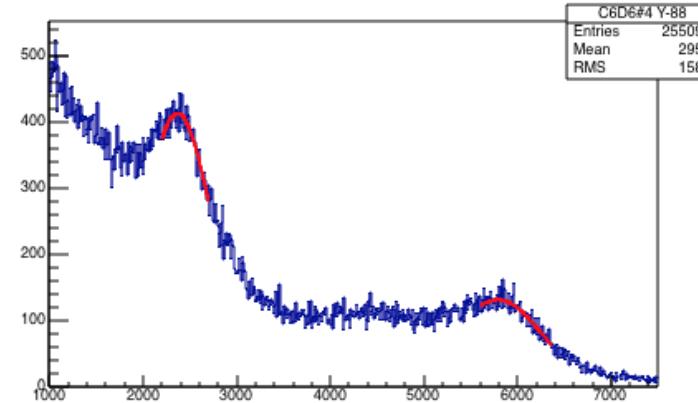
C6D6#2 Y-88

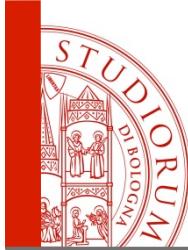


C6D6#3 Y-88



C6D6#4 Y-88

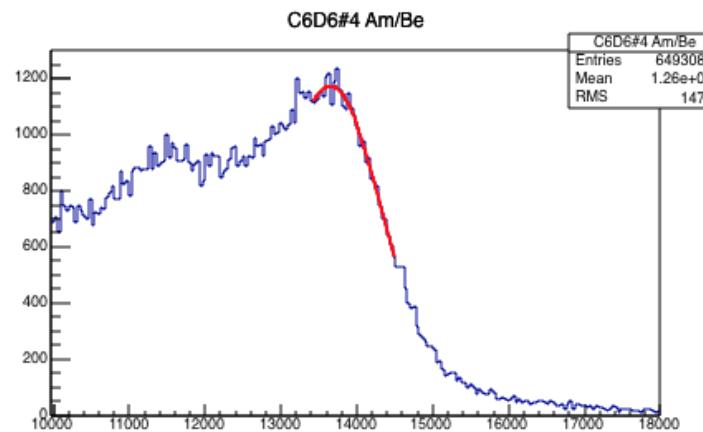
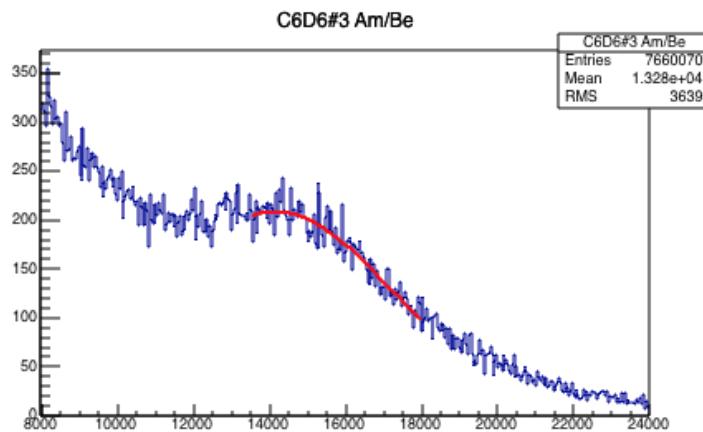
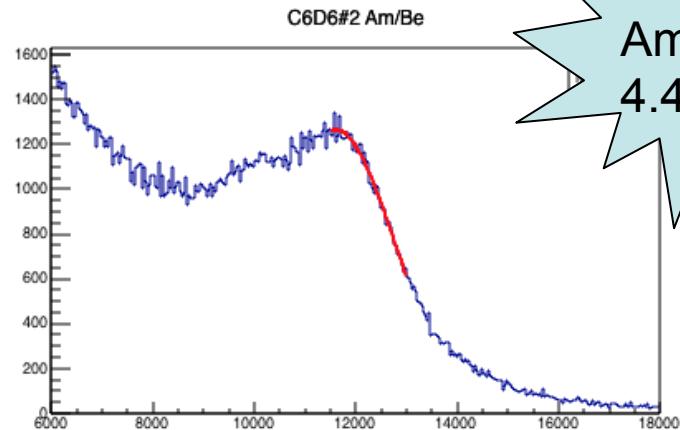
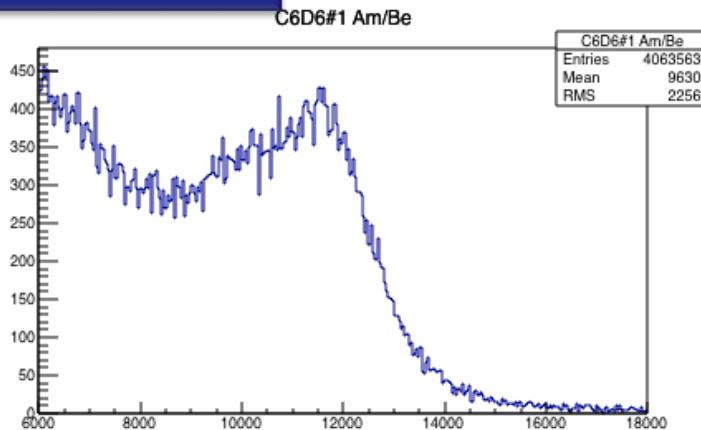


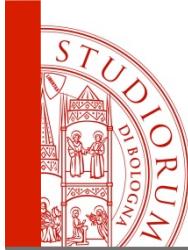


$^{155,157}\text{Gd}(\text{n},\gamma)$ @ EAR1



Calibrazioni + MC

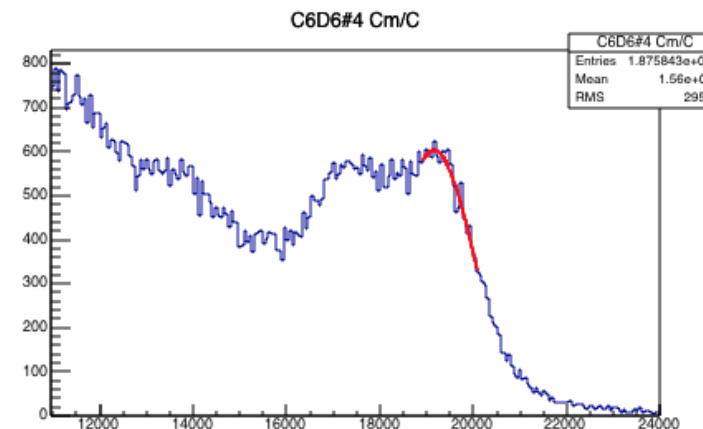
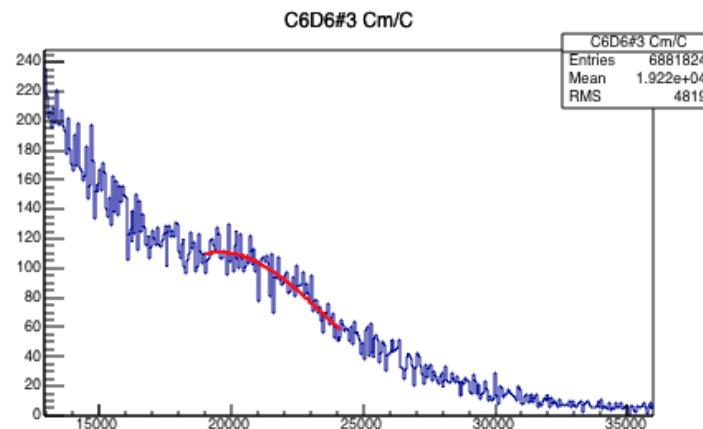
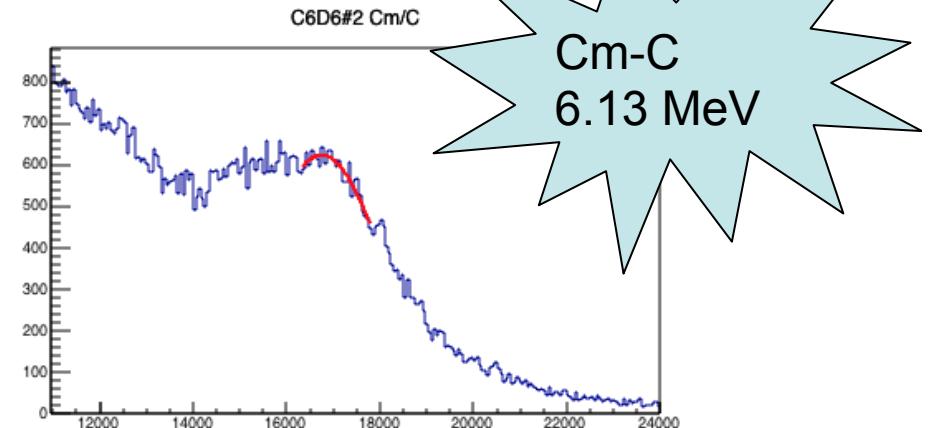
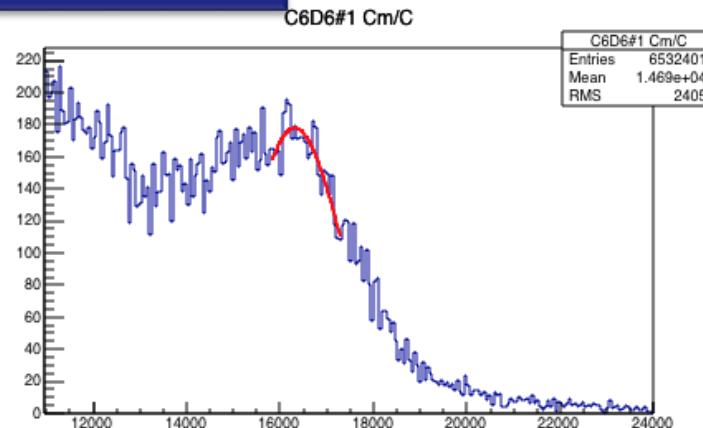


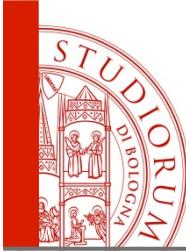


155,157Gd(n,γ) @ EAR1

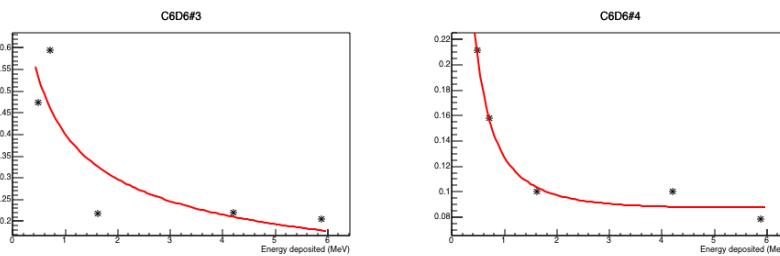
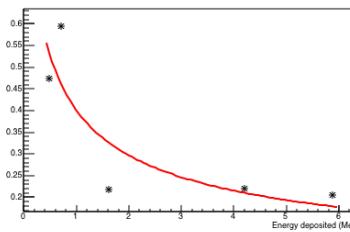
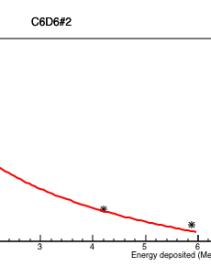
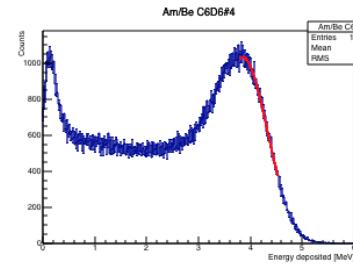
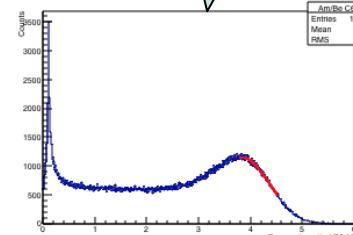
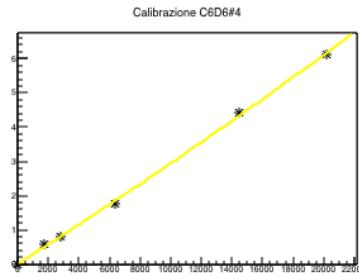
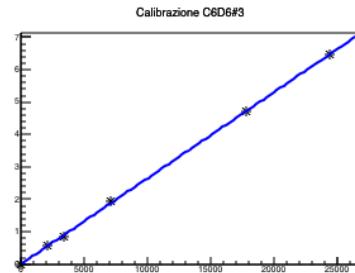
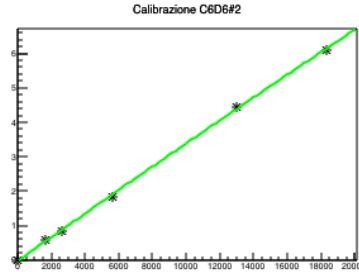
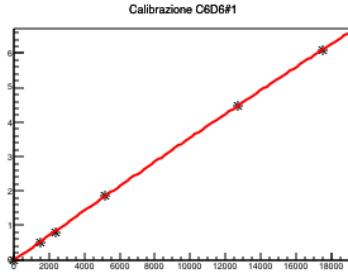


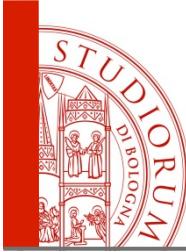
Calibrazioni + MC





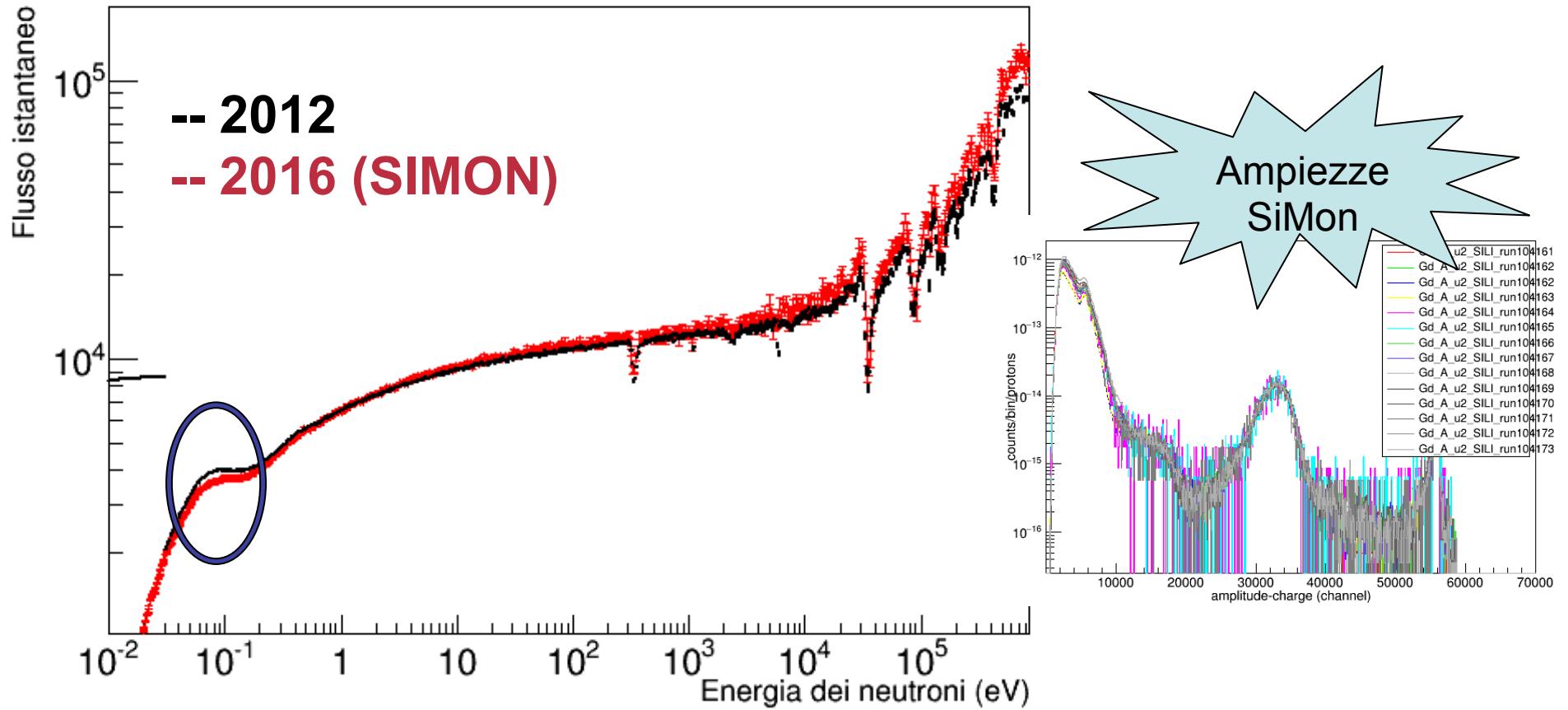
155,157Gd(n,γ) @ EAR1

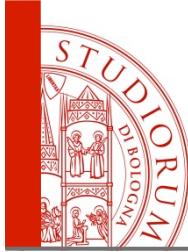




$^{155,157}\text{Gd}(n,\gamma)$ @ EAR1

Flusso





$^{155,157}\text{Gd}(\text{n},\gamma)$ @ EAR1



PROGRAMMA

- WF → problema della probabilità di emissione raggi γ
- Verifica stabilità dei rivelatori
- Studio del background
- ... eccetera eccetera

