

$n+^{155,157}\text{Gd}$

C. Massimi for the Gd crew

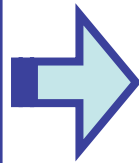
Bari, 28/11/2017

cristian.massimi@unibo.it

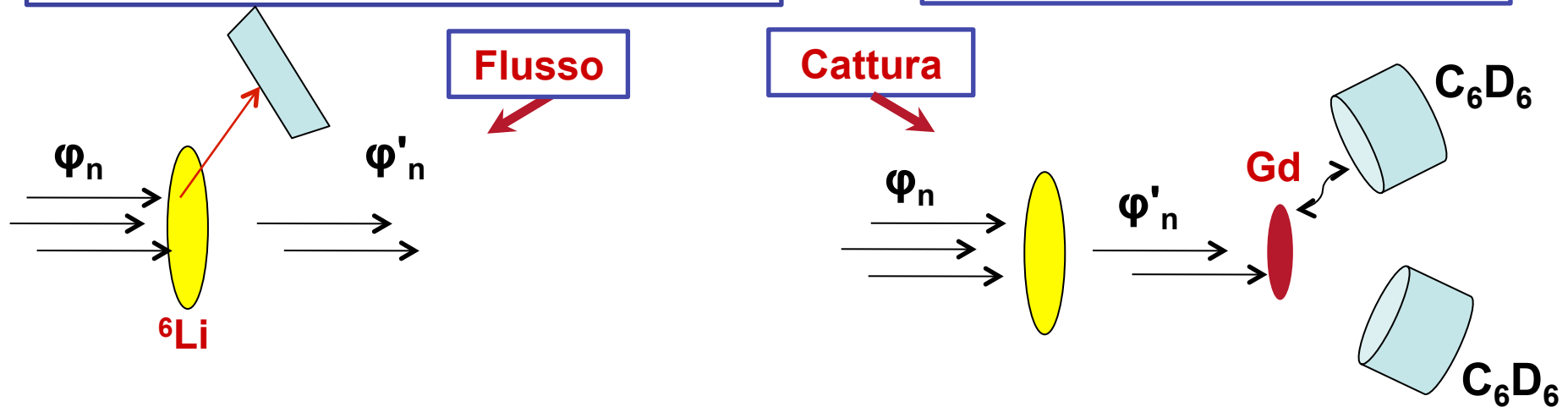


Misura di $\sigma_\gamma(E)$

Lo *yield di cattura* rappresenta la frazione di fascio di neutroni che dà origine ad una cattura radiativa nel campione

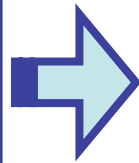


$\sigma_\gamma(E)$ tramite l'analisi delle risonanze (parametrizzazione secondo la **matrice R**)

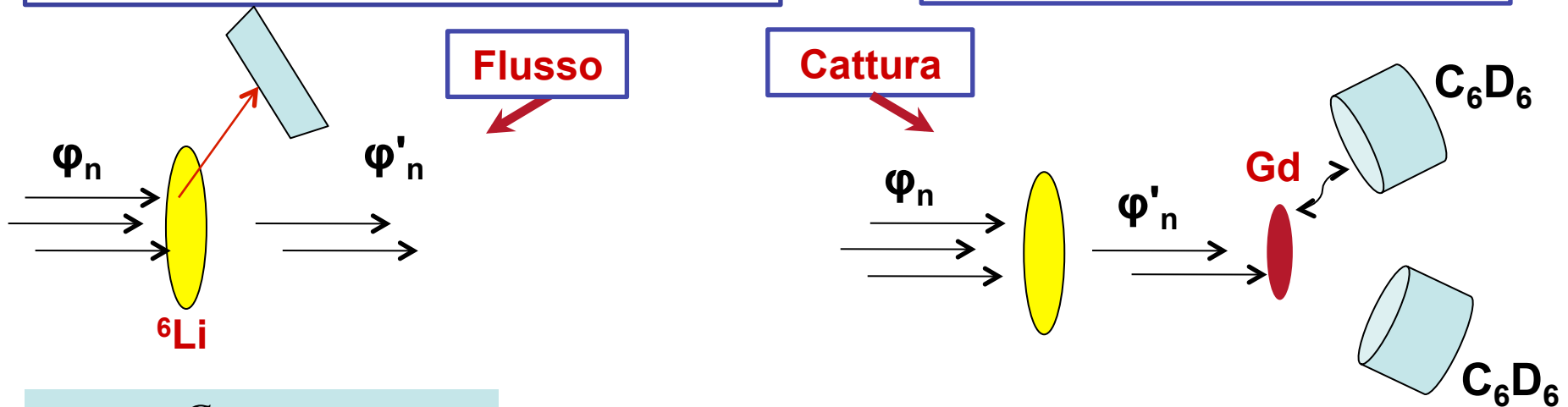


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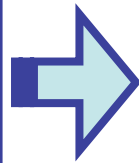
$$Y_n = \frac{C_n}{\varepsilon_n \Omega_n A_n \varphi_n}$$

$$Y_n = (1 - e^{-n\sigma_{tot}}) \frac{\sigma_\alpha}{\sigma_{tot}} \sim n\sigma_\alpha$$

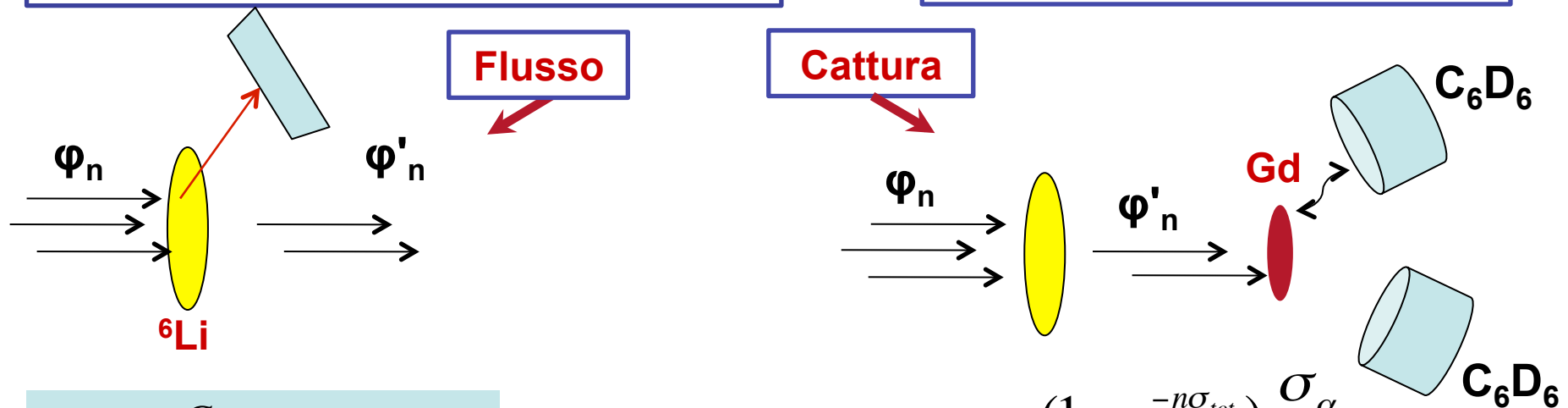
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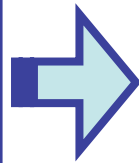
$$\varphi_n = \frac{C_n}{\varepsilon_n \Omega_n A_n n\sigma_\alpha}$$

$$Y_C = \frac{\varepsilon_n \Omega_n A_n}{\varepsilon_C \Omega_C A_C} \times \frac{C_W}{C_n} \times \frac{(1 - e^{-n\sigma_{tot}}) \sigma_\alpha}{e^{-n\sigma_{tot}} \sigma_{tot}}$$

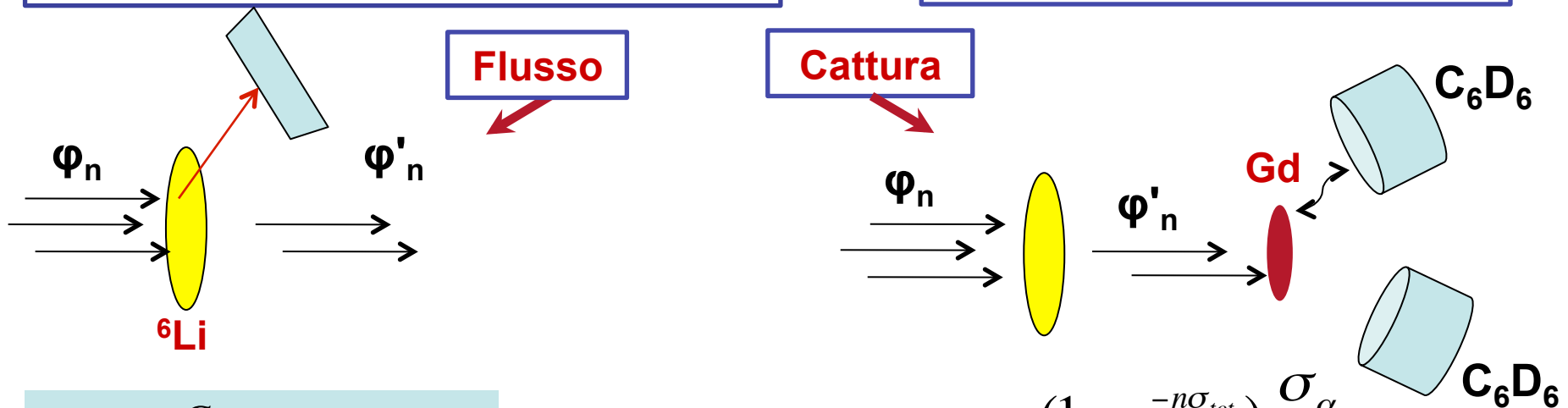
$$Y_C = N \times \frac{C_W}{C_n} \times \frac{Y_n}{e^{-n\sigma_{tot}}}$$

Misura di $\sigma_\gamma(E)$

Lo *yield di cattura* rappresenta la frazione di fascio di neutroni che dà origine ad una cattura radiativa nel campione



$\sigma_\gamma(E)$ tramite l'analisi delle risonanze (parametrizzazione secondo la **matrice R**)



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$$Y_C = \frac{\varepsilon_n \Omega_n A_n}{\varepsilon_C \Omega_C A_C} \times \frac{C_W}{C_n} \times \frac{(1 - e^{-n\sigma_{tot}}) \frac{\sigma_\alpha}{\sigma_{tot}}}{e^{-n\sigma_{tot}}}$$

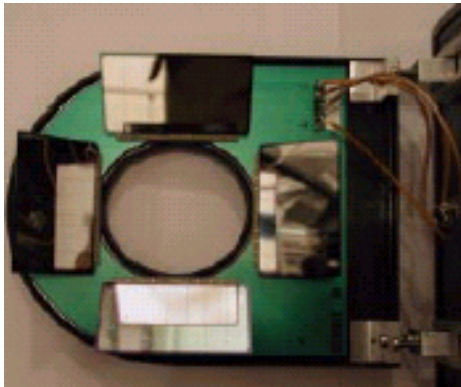
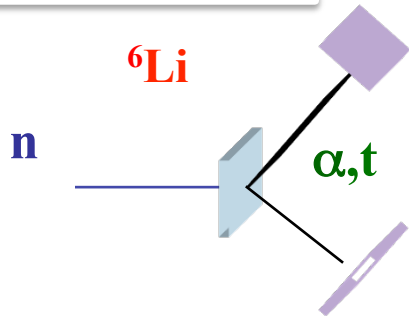
$$Y_C = N \times \frac{C_W}{C_n} \times \frac{Y_n}{e^{-n\sigma_{tot}}}$$



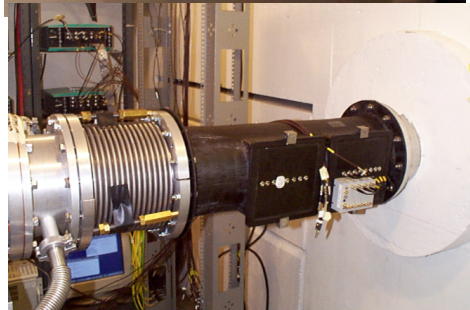
Misura di flusso



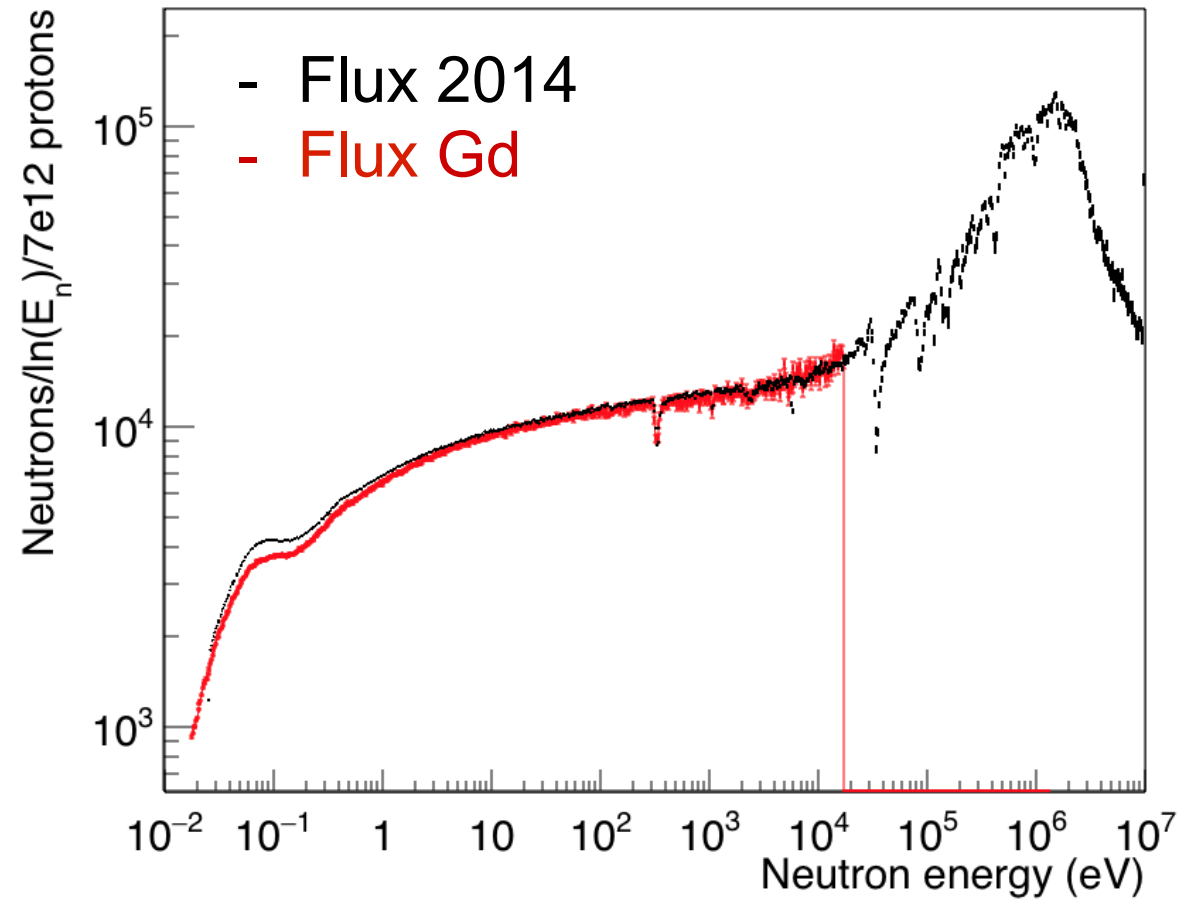
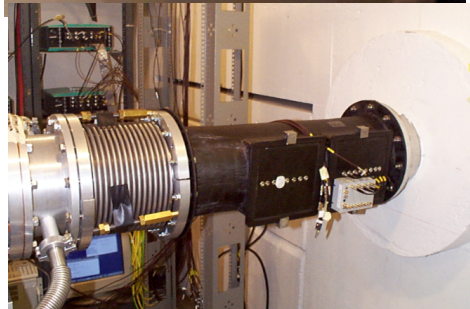
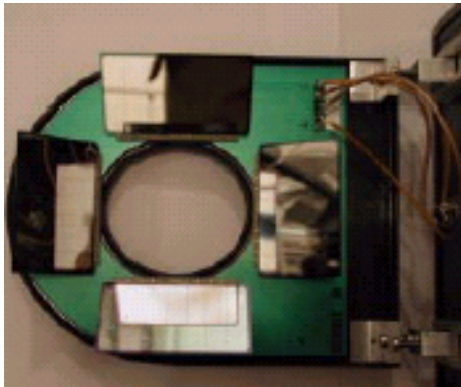
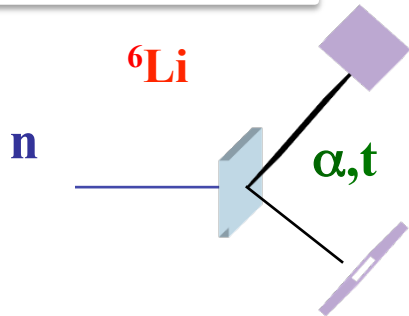
SiMon – EAR1

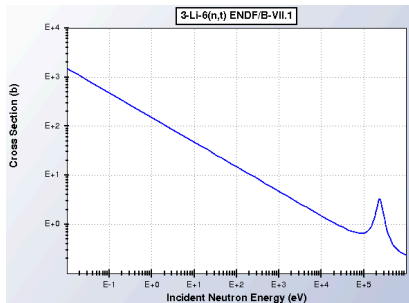


Energy deposition MeV



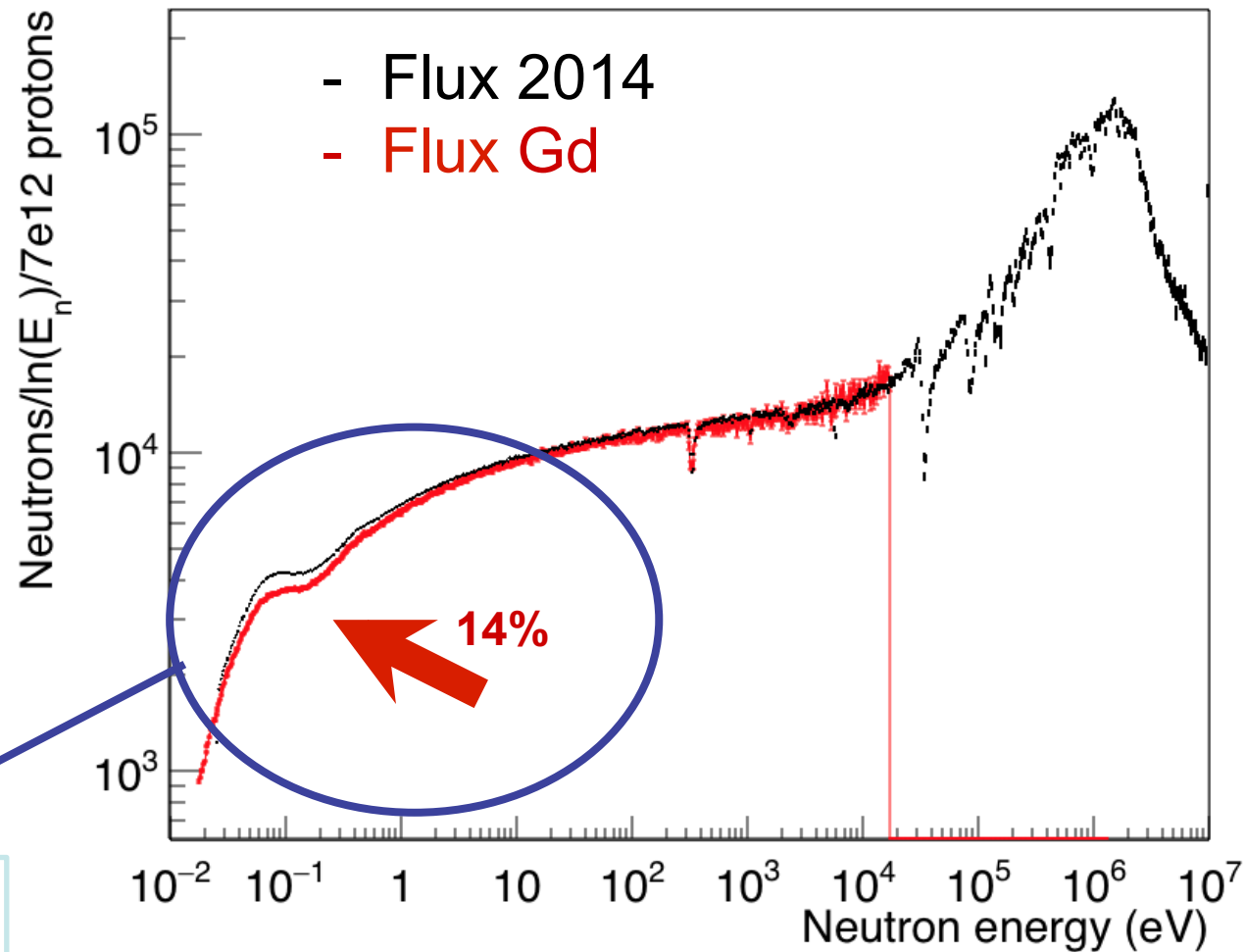
SiMon – EAR1





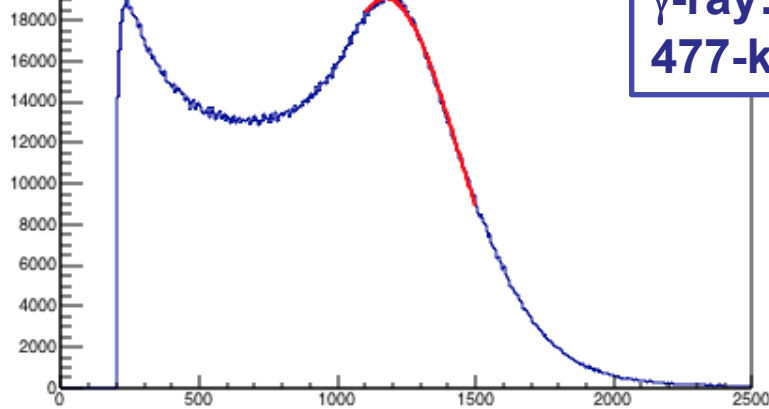
L'unico cambiamento rispetto al passato è l'accumulo di ^{10}B nel circuito di moderazione

zona di maggiore interesse per Gd



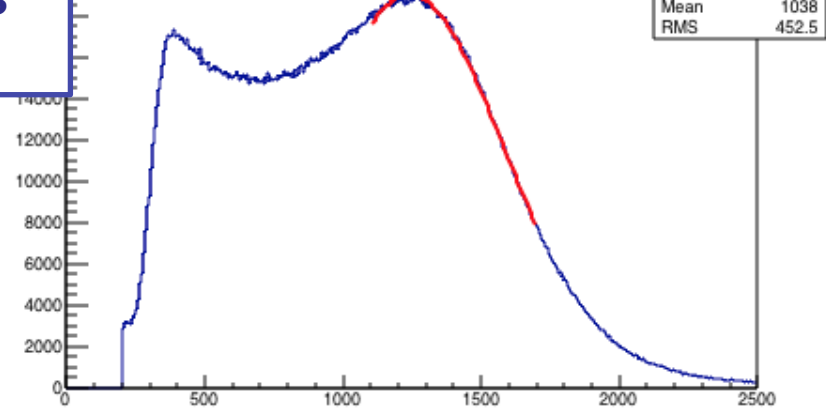
Calibrazioni

C6D6#1 Cs-137

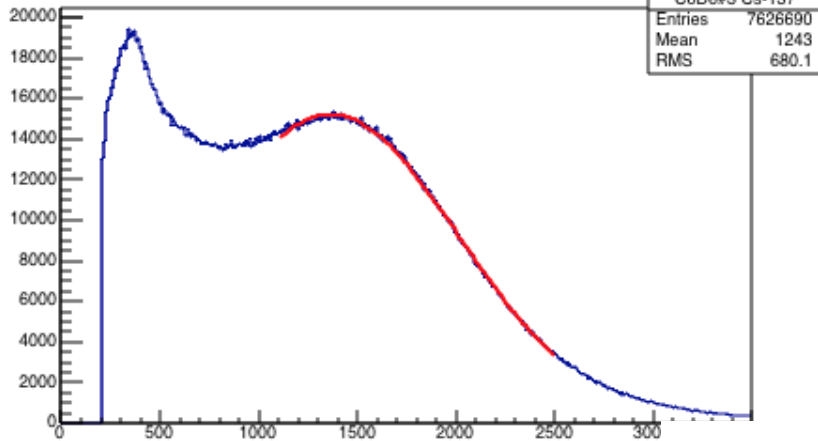


Standard
 γ -ray: ^{137}Cs
 477-keV

C6D6#2 Cs-137

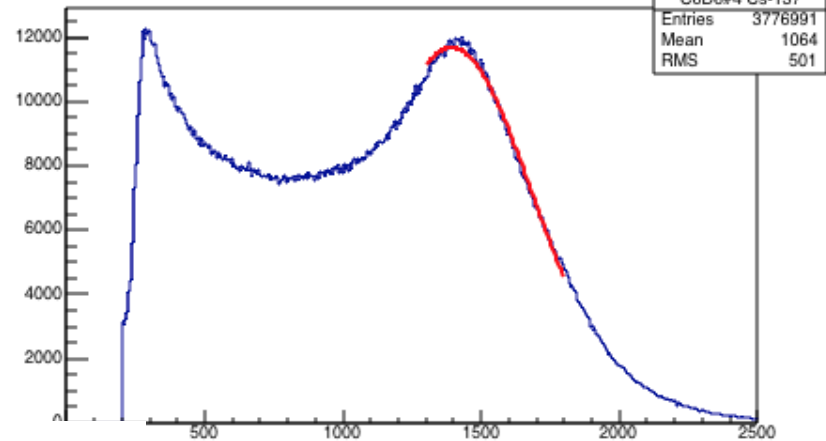


C6D6#3 Cs-137



Canali fADC

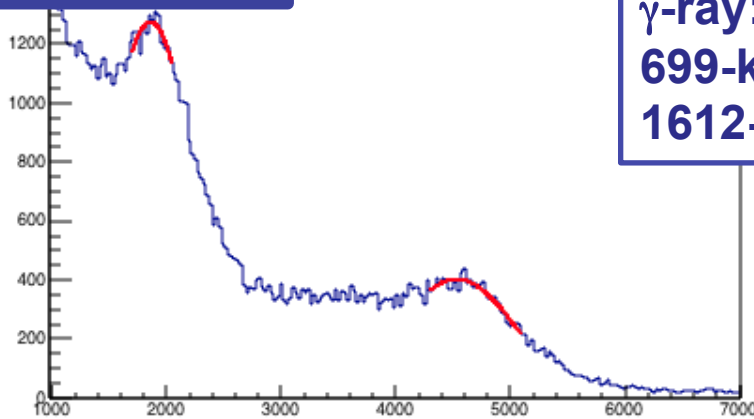
C6D6#4 Cs-137



Canali fADC

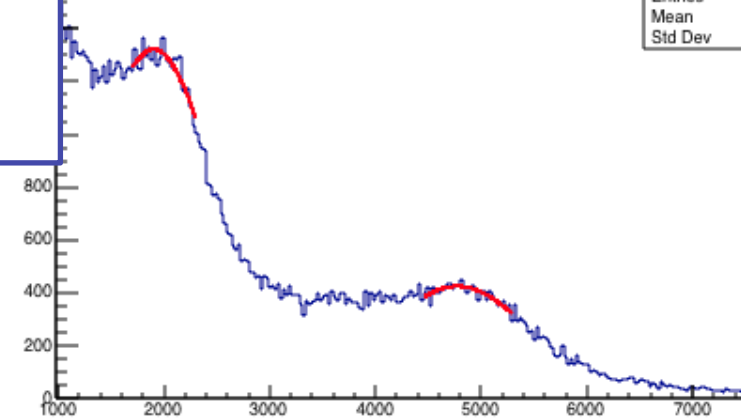
Calibrazioni

C6D6#1 Y-88



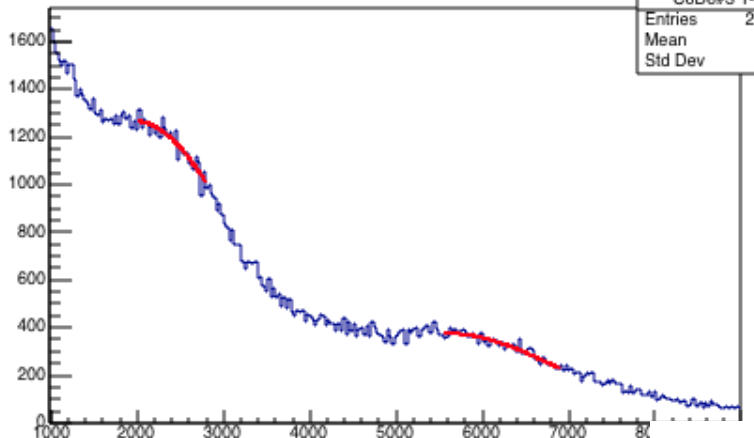
Standard
 γ -ray: ^{88}Y
 699-keV
 1612-keV

C6D6#2 Y-88



C6D6#2 Y-88	
Entries	191820
Mean	2759
Std Dev	1456

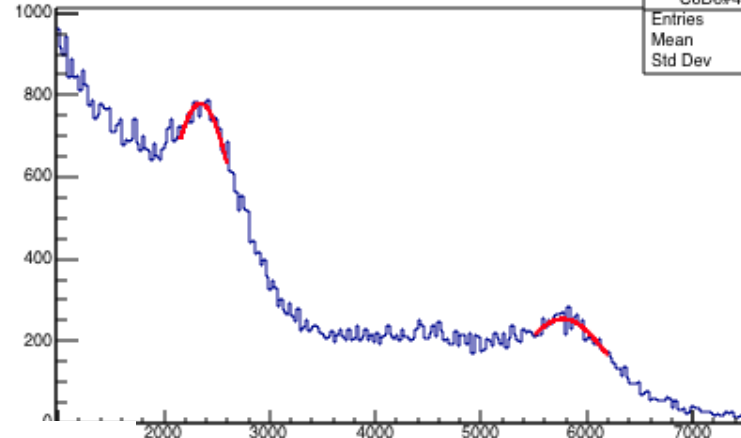
C6D6#3 Y-88



C6D6#3 Y-88	
Entries	255718
Mean	3293
Std Dev	1909

Canali fADC

C6D6#4 Y-88

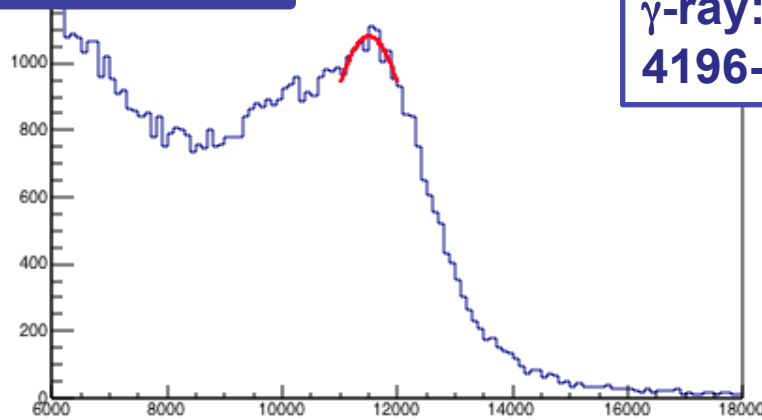


C6D6#4 Y-88	
Entries	141352
Mean	2932
Std Dev	1582

Canali fADC

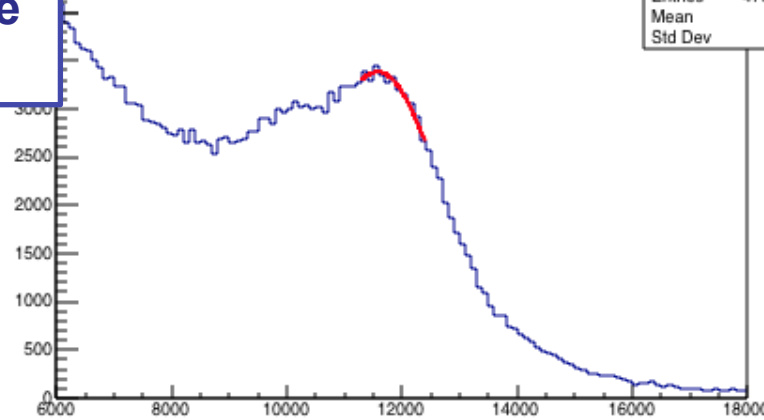
Calibrazioni

C6D6#1 Am/Be



Standard
 γ -ray: AmBe
 4196-keV

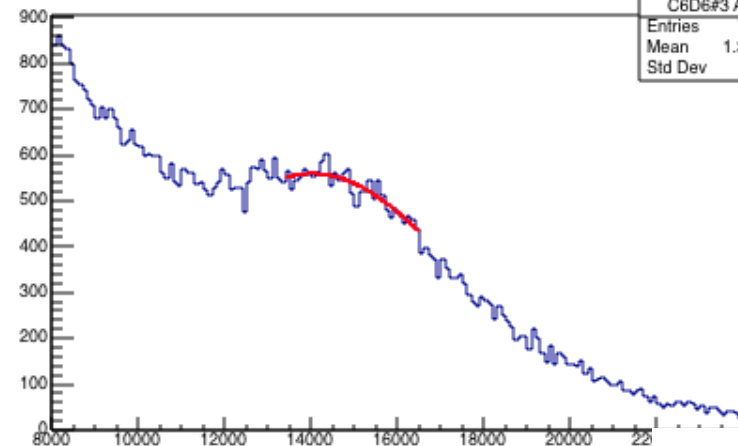
C6D6#2 Am/Be



C6D6#2 Am/Be	
Entries	4765273
Mean	9804
Std Dev	2418

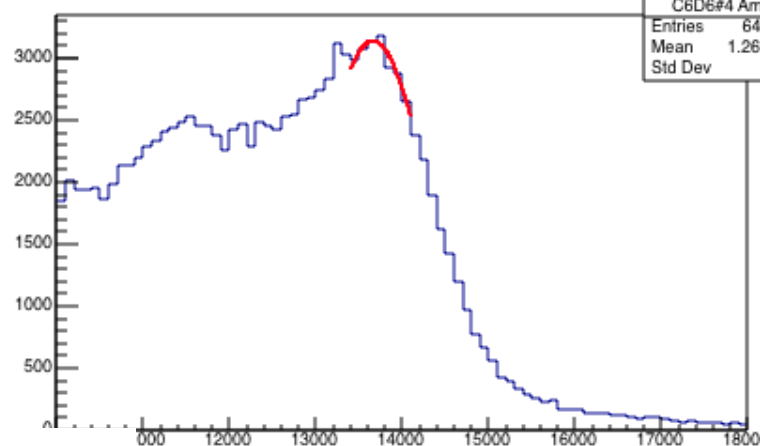
Canali fADC

C6D6#3 Am/Be



C6D6#3 Am/Be	
Entries	7660070
Mean	1.329e+04
Std Dev	3635

C6D6#4 Am/Be



C6D6#4 Am/Be	
Entries	6493080
Mean	1.261e+04
Std Dev	1465

Canali fADC

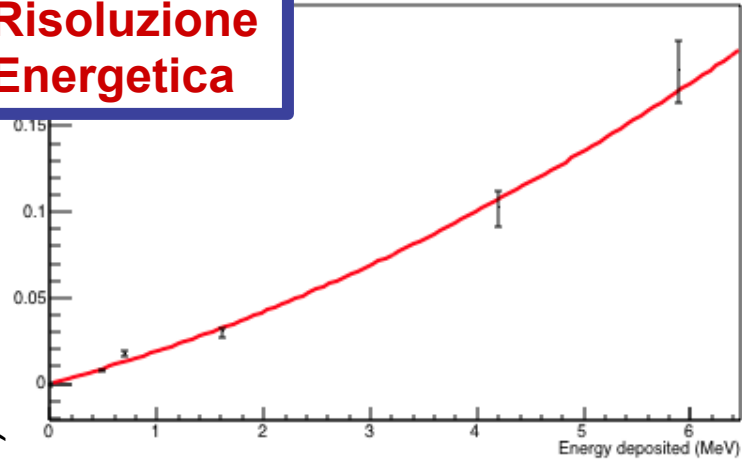


Misura di cattura / 0

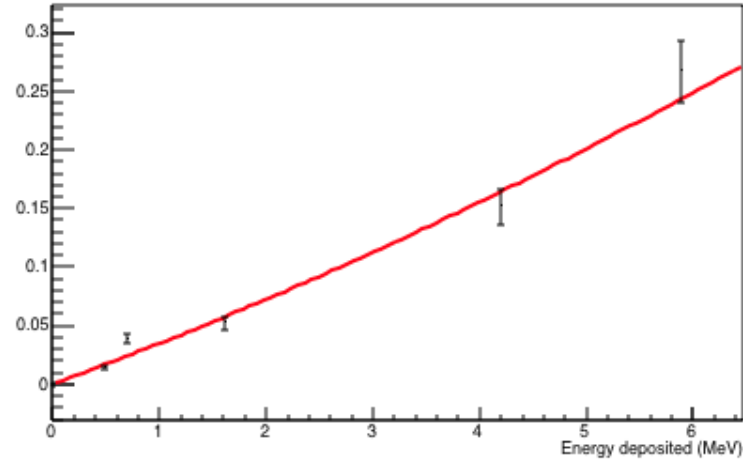


Risoluzione Energetica

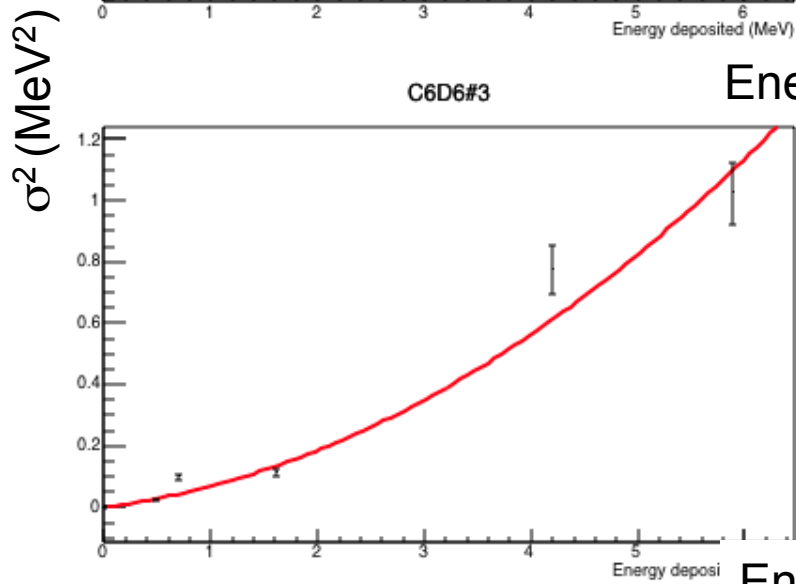
C6D6#1



C6D6#2

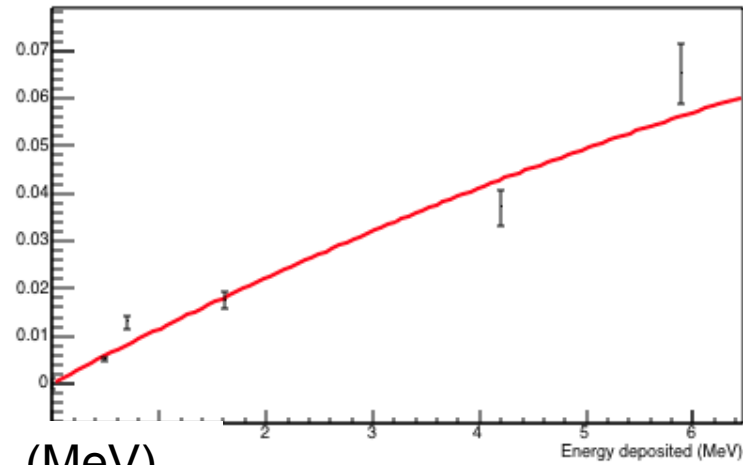


C6D6#3



Energia E_γ (MeV)

C6D6#4



Energia E_γ (MeV)



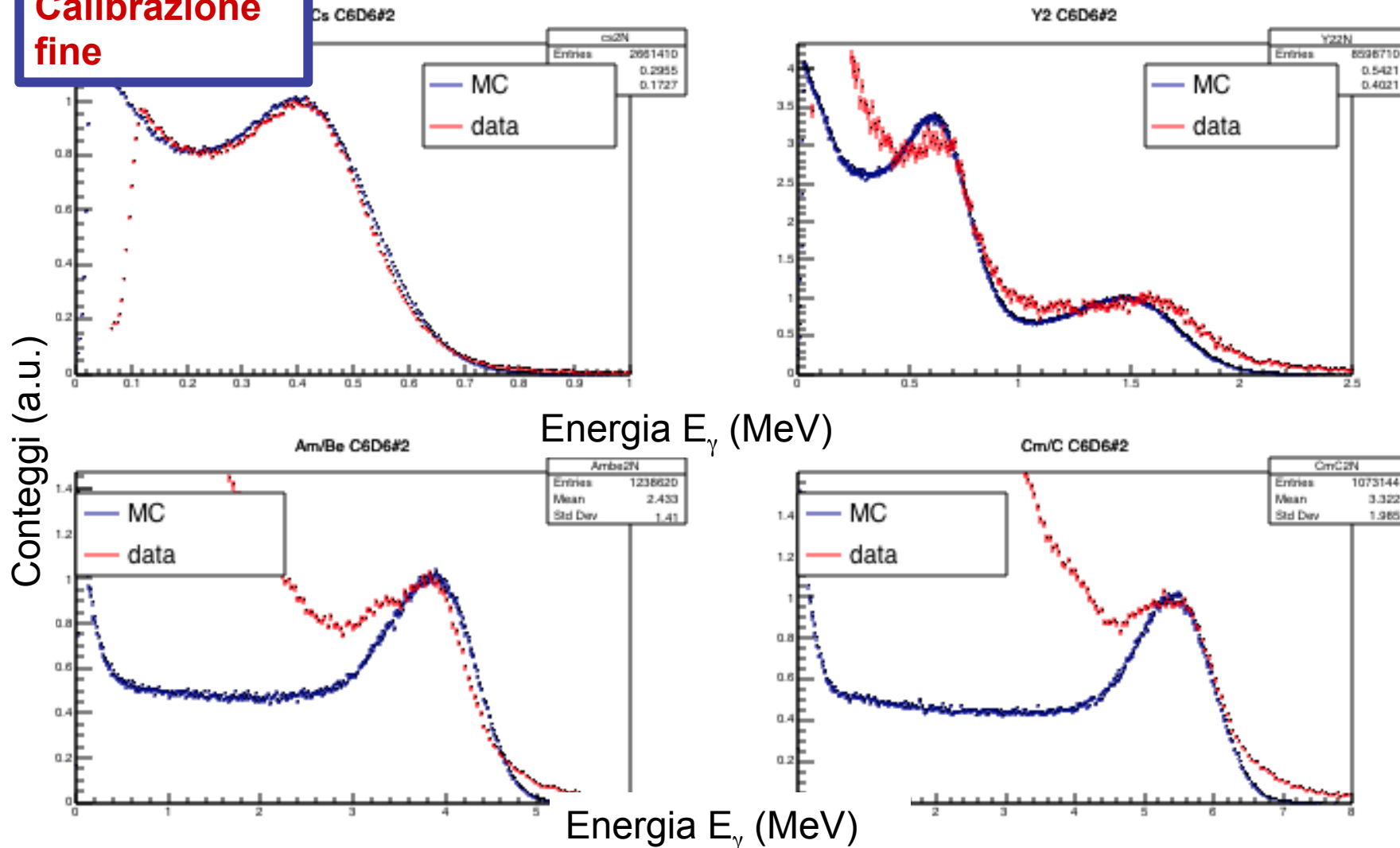


Misura di cattura / 0



Istituto Nazionale
di Fisica Nucleare

**Calibrazione
fine**





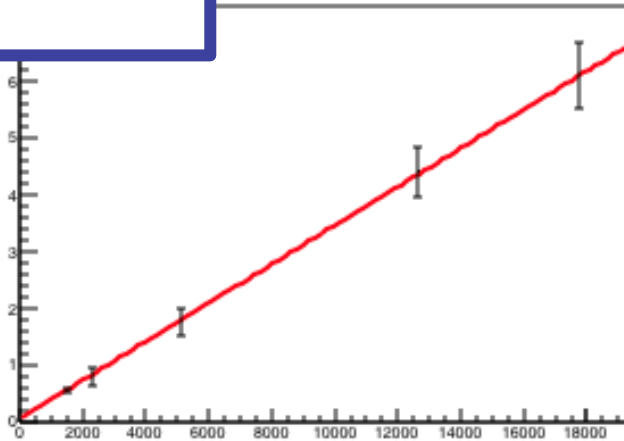
Misura di cattura / 0



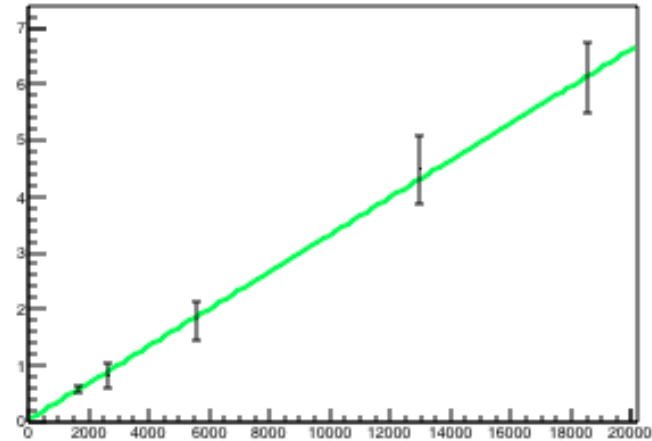
**Calibrazione
fine**

Energia E_γ (MeV)

Calibrazione C6D6#1

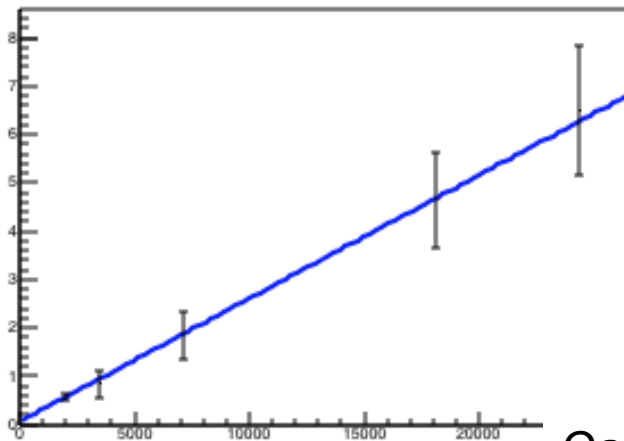


Calibrazione C6D6#2

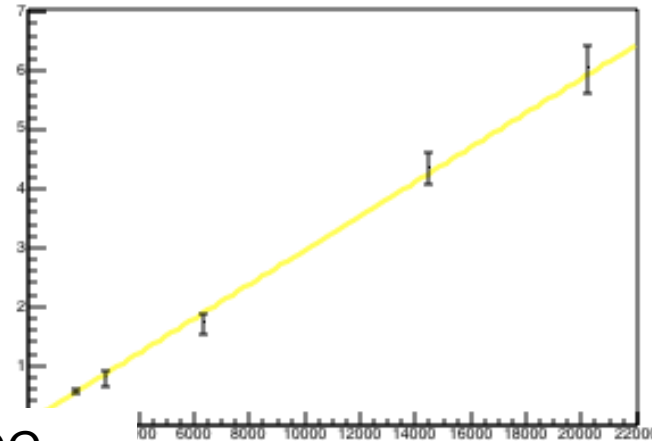


Canali fADC

Calibrazione C6D6#3



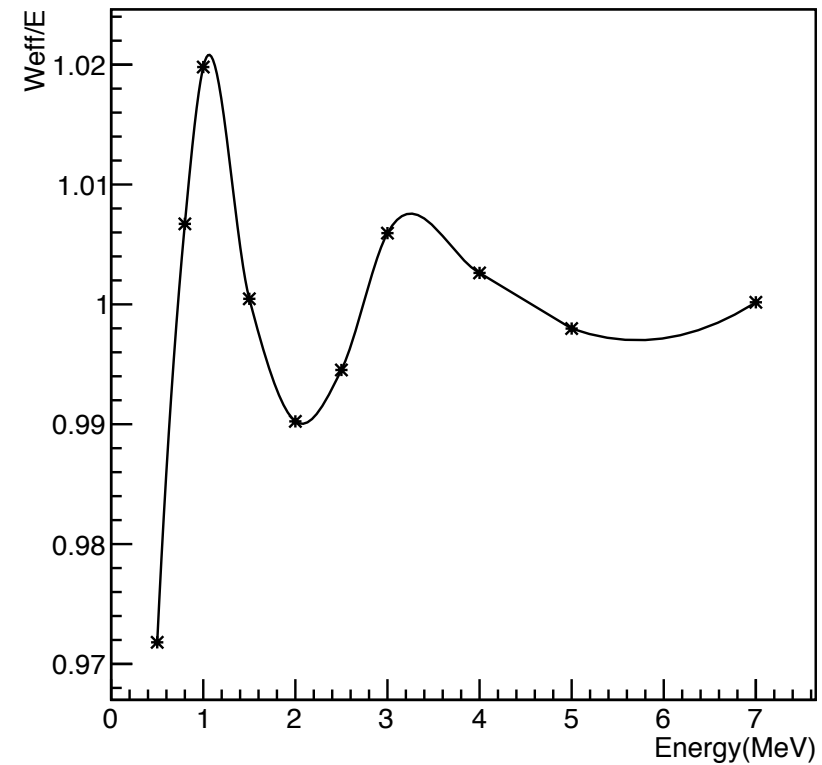
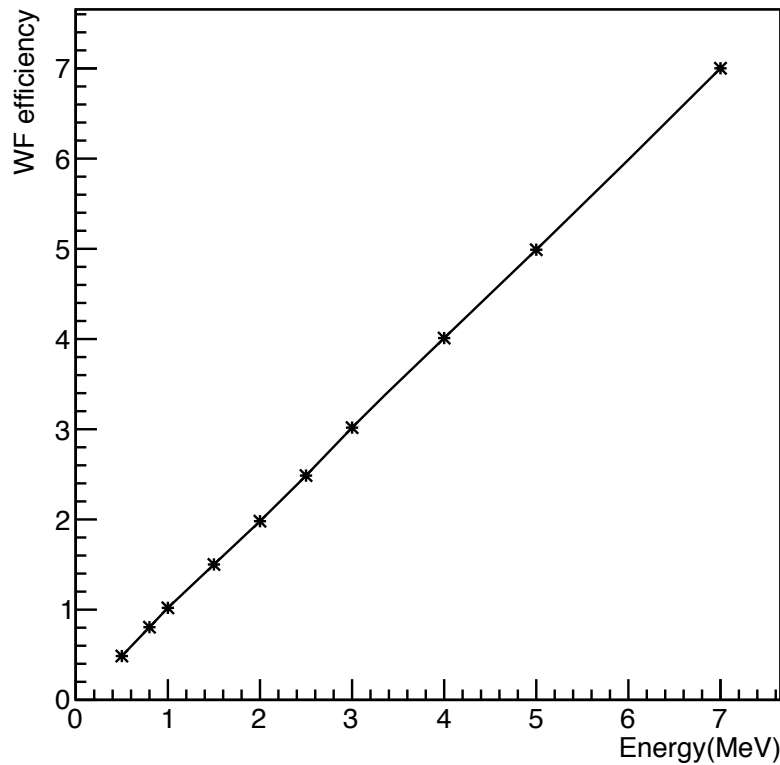
Calibrazione C6D6#4



Canali fADC



Weighting Functions



Energia E_γ (MeV)



Misura di cattura



Calibrazioni + Weighting Functions

- **Calibrazioni**
 - ✧ Lineari
 - ✧ Quadratiche

- **Weighting Function**
 - ✧ omogenee soglia 150 keV
 - ✧ omogenee soglia 200 keV
 - ✧ Esponenziali soglia 150 keV (7 casi)
 - ✧ Esponenziali soglia 200 keV (7 casi)





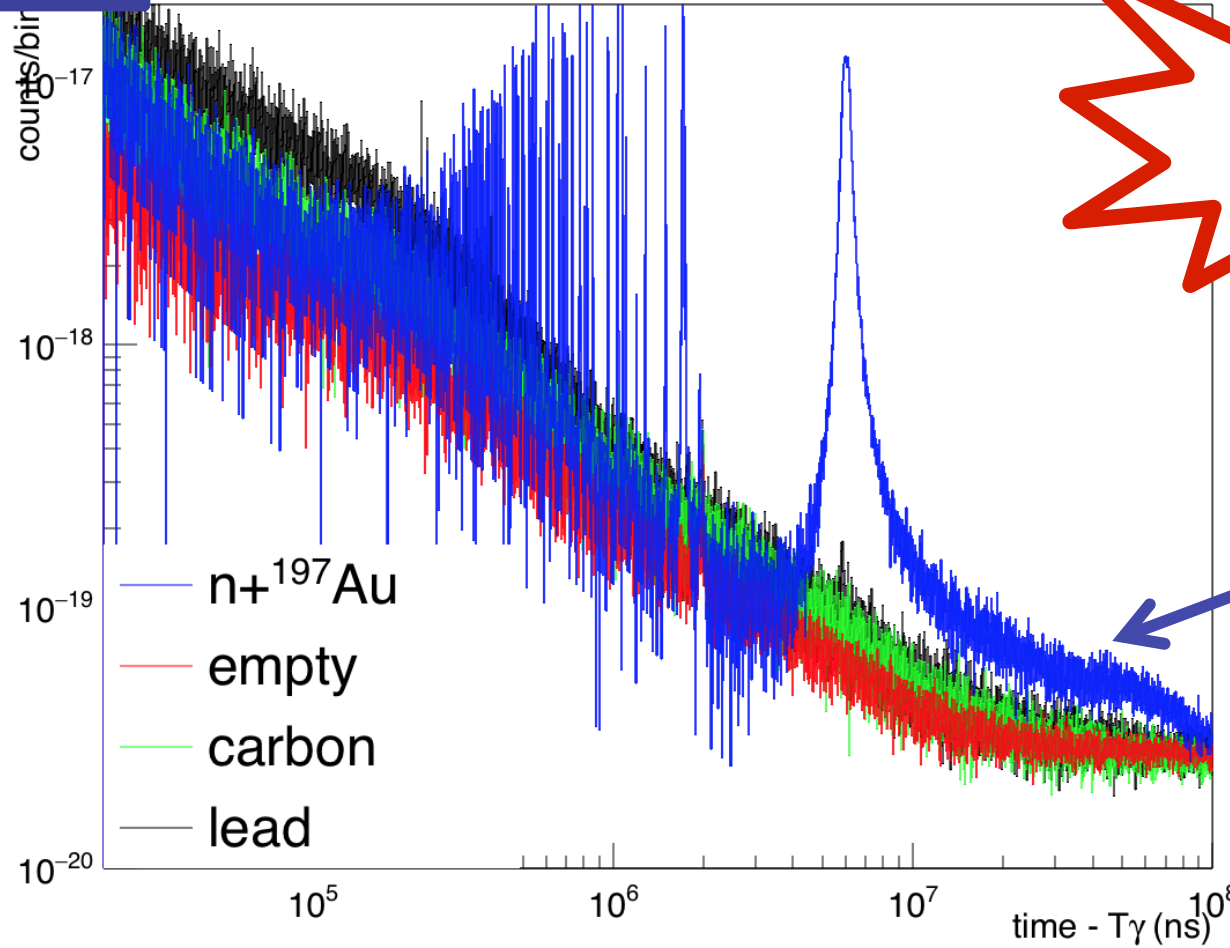
Misura di cattura / 3



**Spettri
Sperimentali**

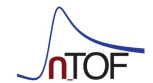
Spettro tempi di volo

Oro



Senza
WF

Signal /
background
~ 2.5





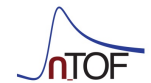
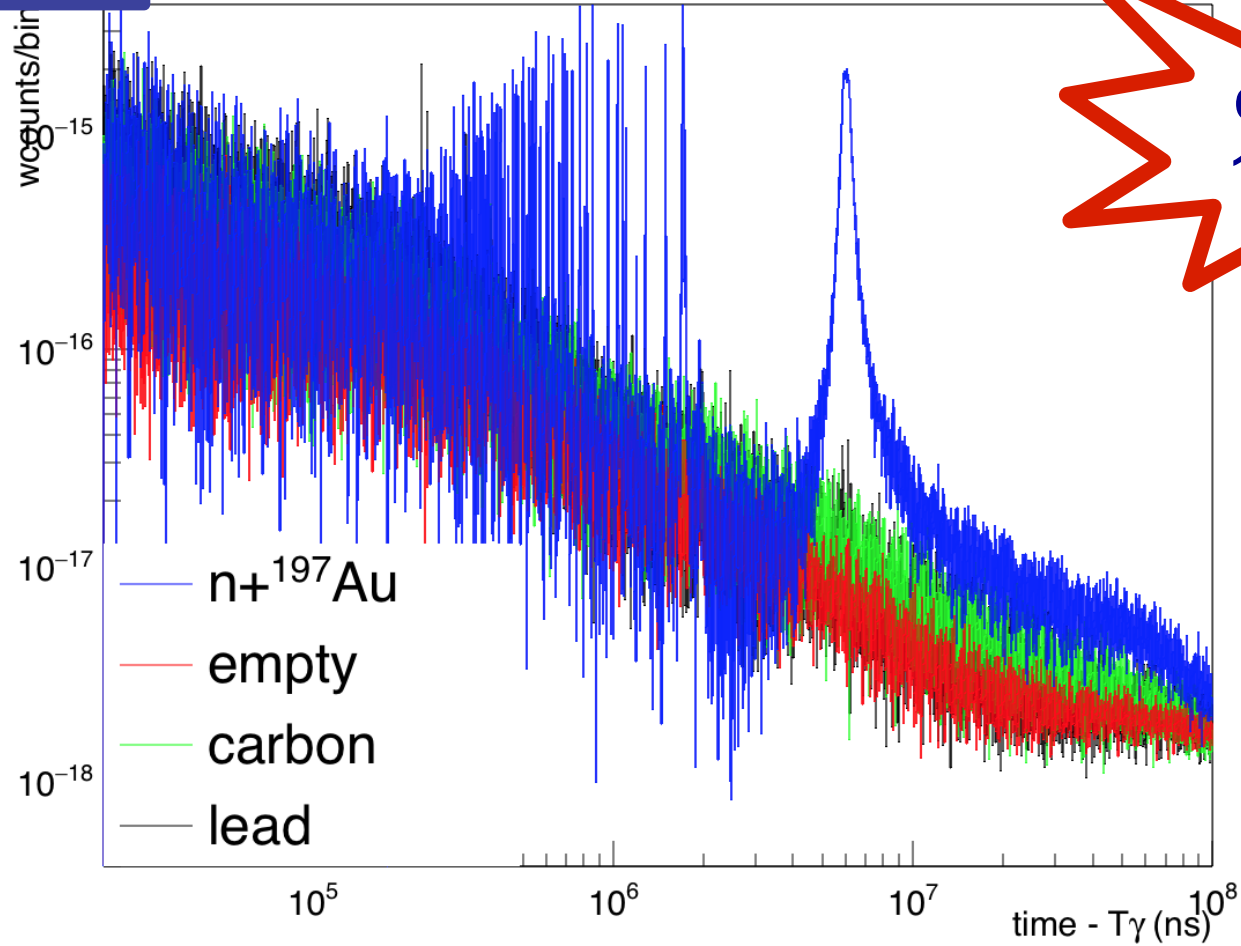
Misura di cattura / 3



**Spettri
Sperimentali**

Spettro tempi di volo

Oro



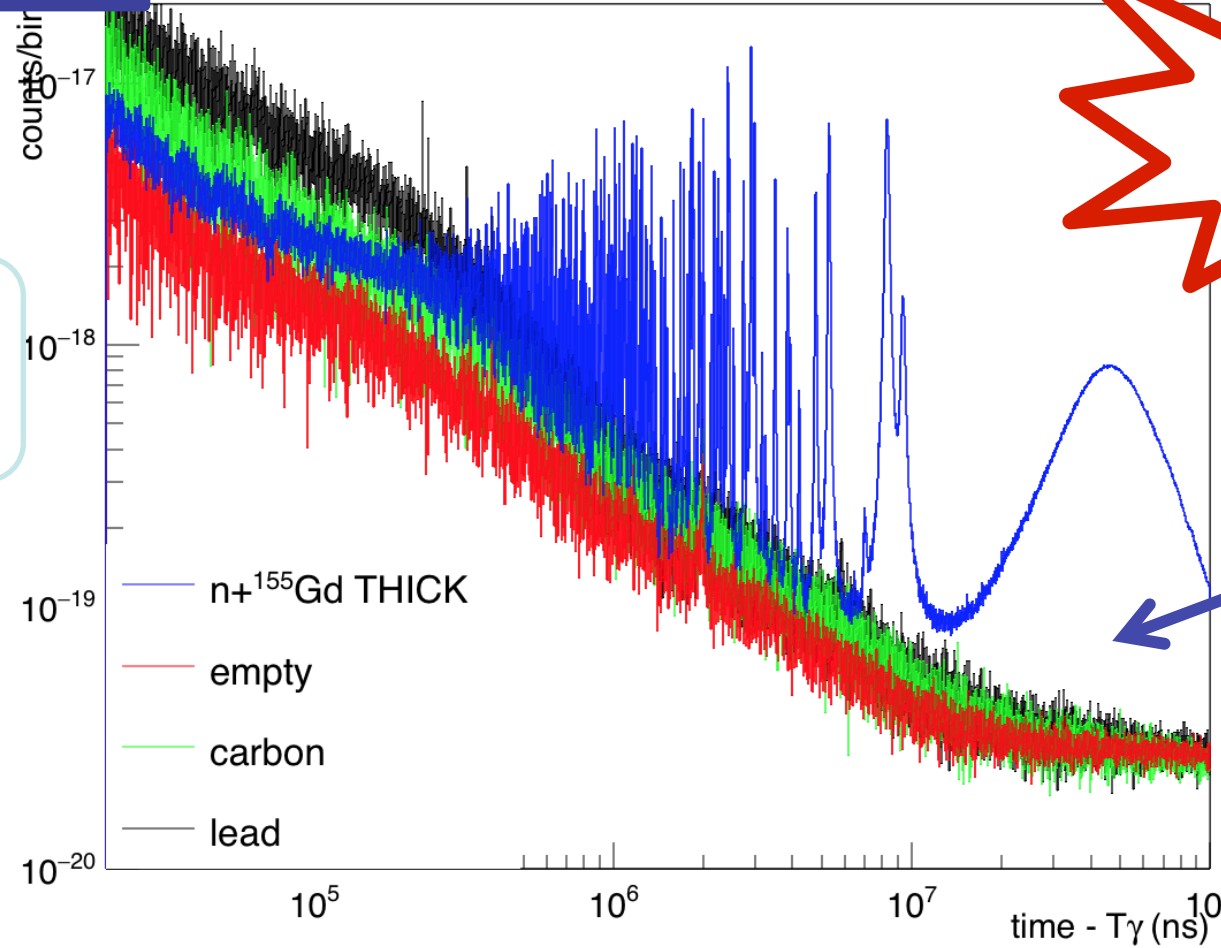


Misura di cattura / 3



**Spettri
Sperimentali**

Spettro tempi di volo



Gd
Thick

Signal /
background
~ 40



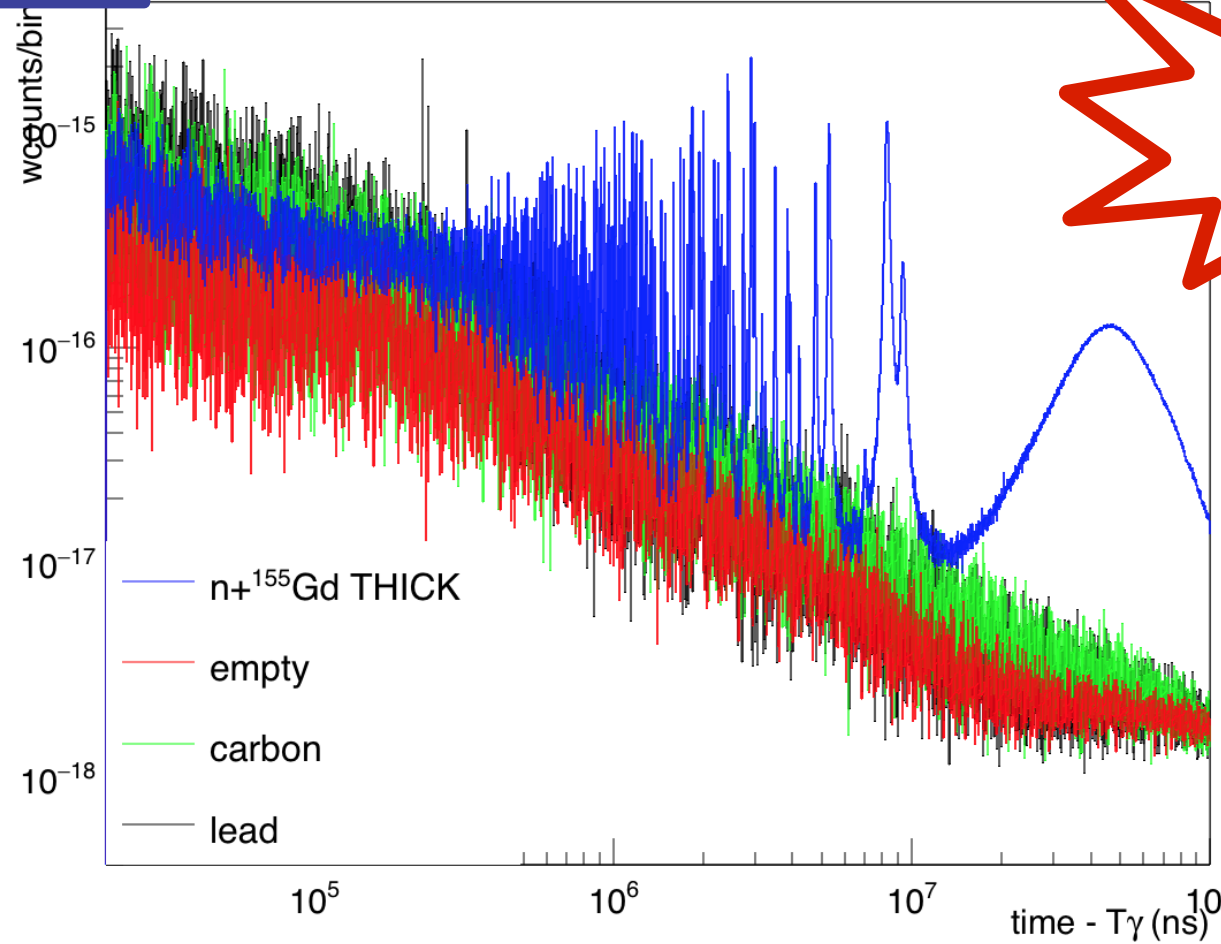


Misura di cattura / 3



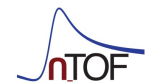
**Spettri
Sperimentali**

Spettro tempi di volo



con WF
150 keV

Gd



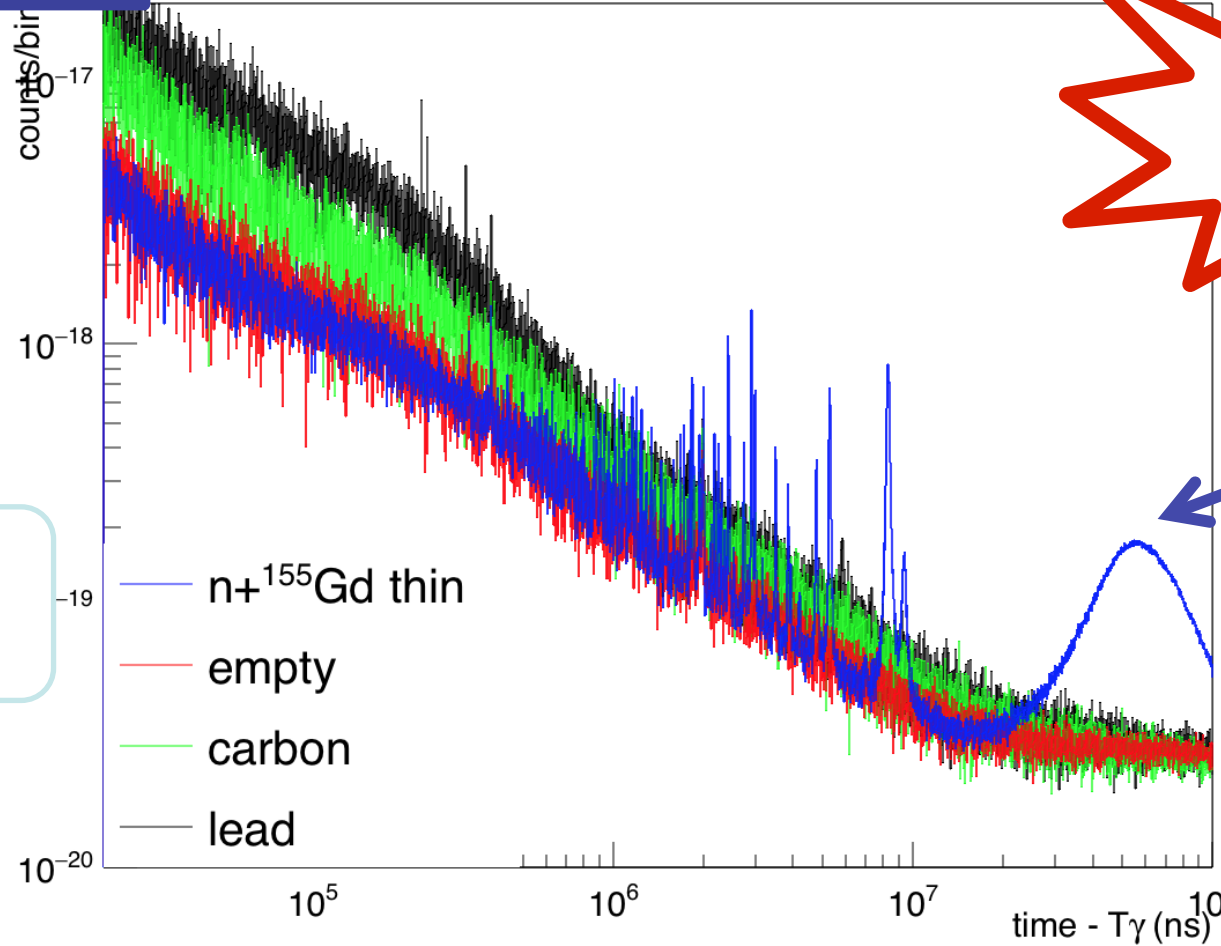


Misura di cattura / 3



**Spettri
Sperimentali**

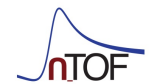
Spettro tempi di volo



Senza
WF

Signal /
background
~ 4

Gd
thin





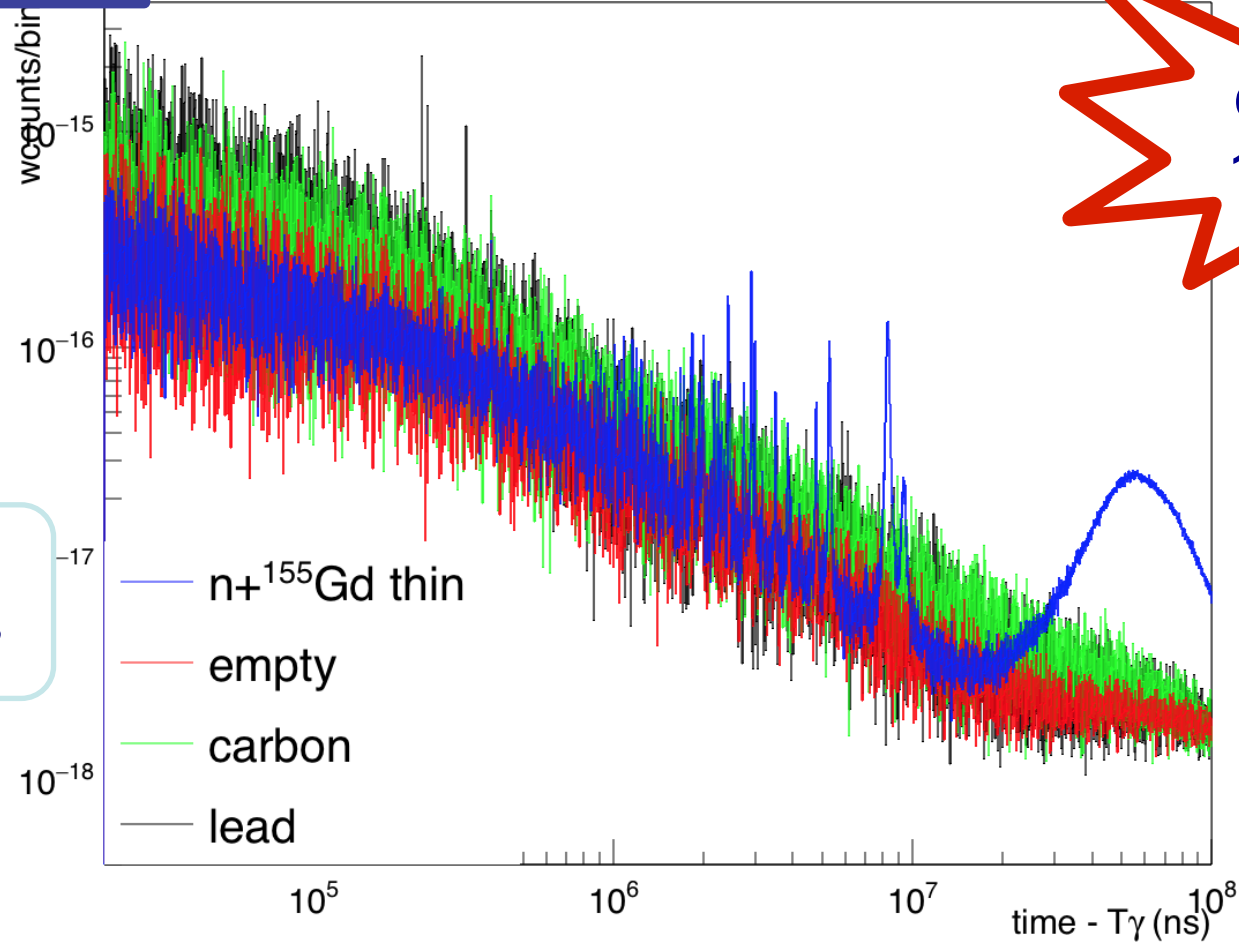
Misura di cattura / 3



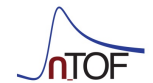
**Spettri
Sperimentali**

Spettro tempi di volo

con WF
150 keV



Gd
“sottile”



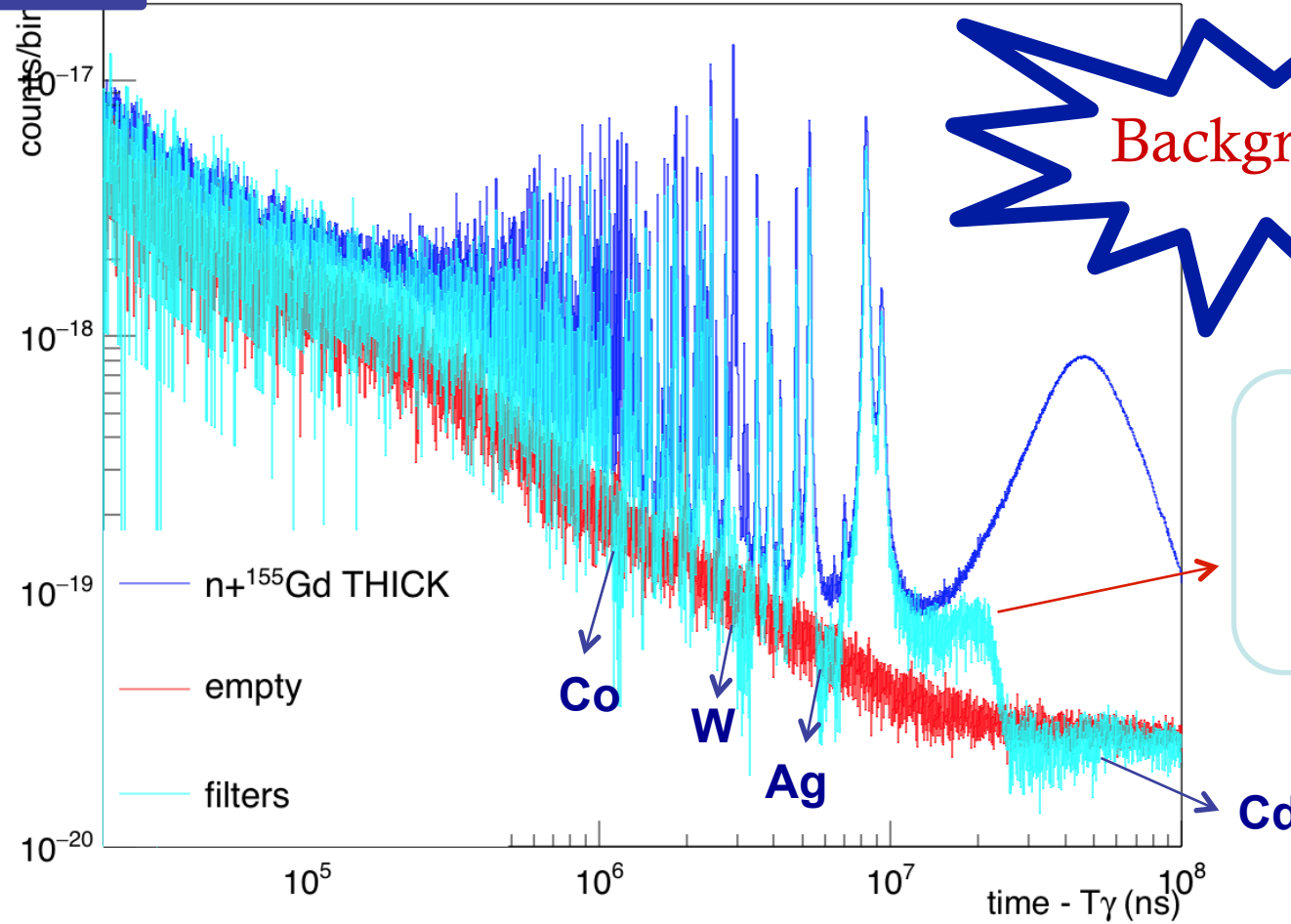


Misura di cattura / 4



**Spettri
Sperimentali**

Spettro tempi di volo



Gd

"Black-resonance technique" ...o filtri



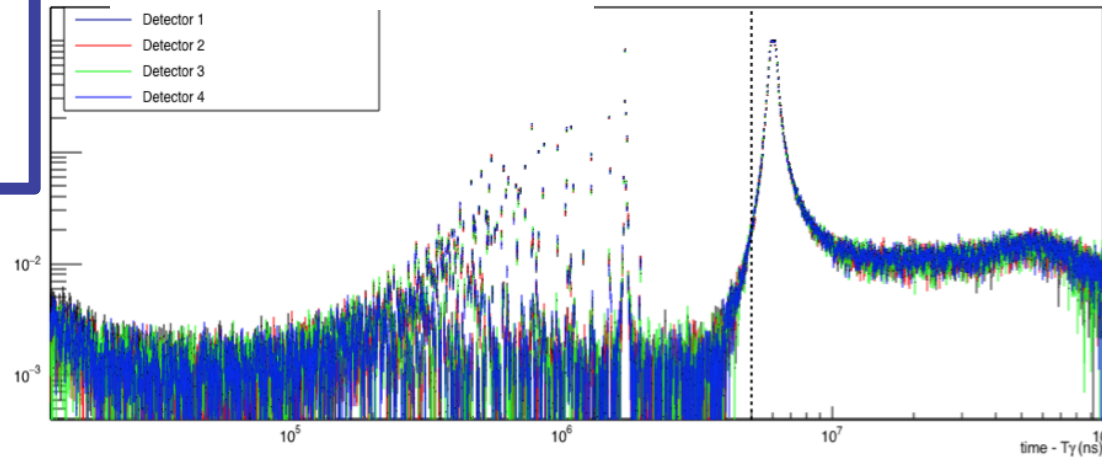
Studi di
Qualità

- background

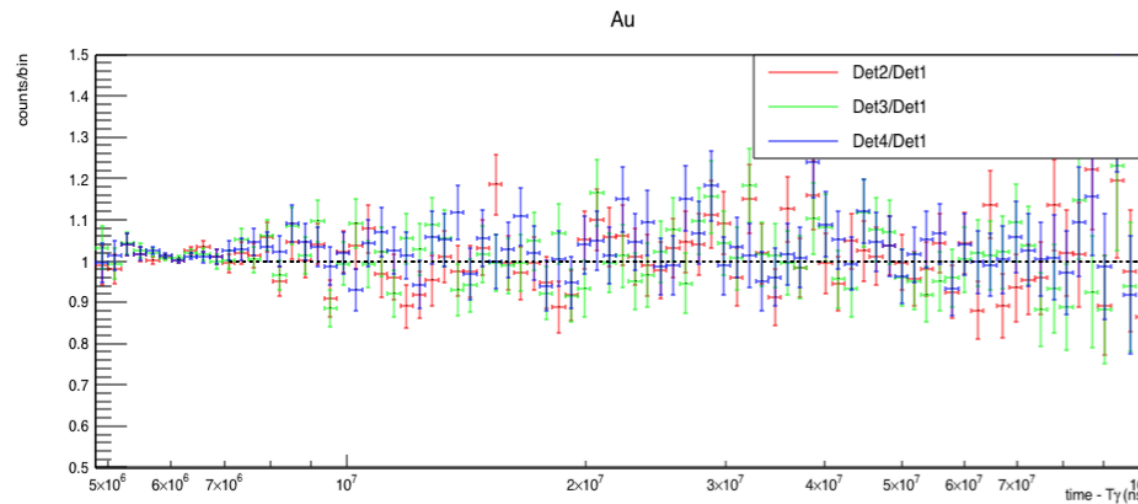
Confronto degli spettri di tempo di volo, dopo la sottrazione del background

Non si notano deviazioni nella regione di maggior interesse

Spettro tempi di volo



Conteggi
Au
dei 4
rivelatori



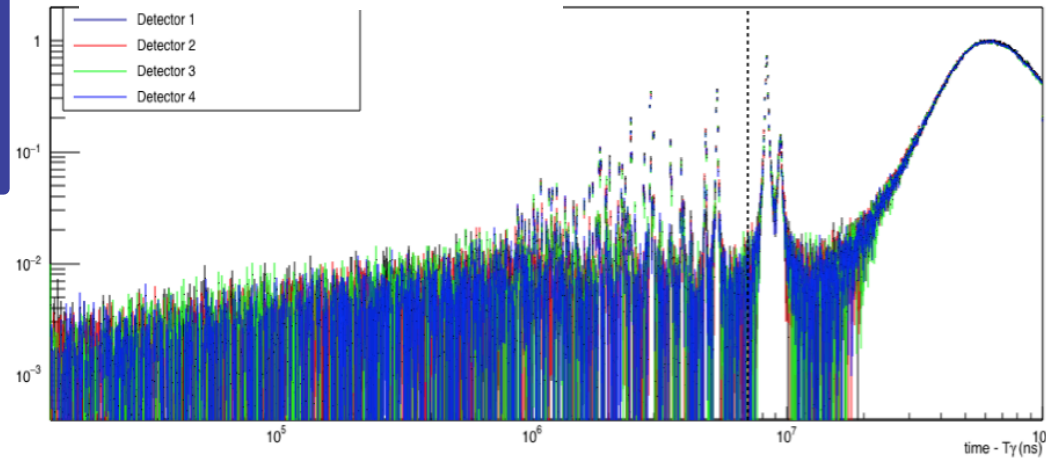
Rapporti

Studi di
Qualità
• background

Confronto degli spettri
di tempo di volo,
dopo la sottrazione
del background

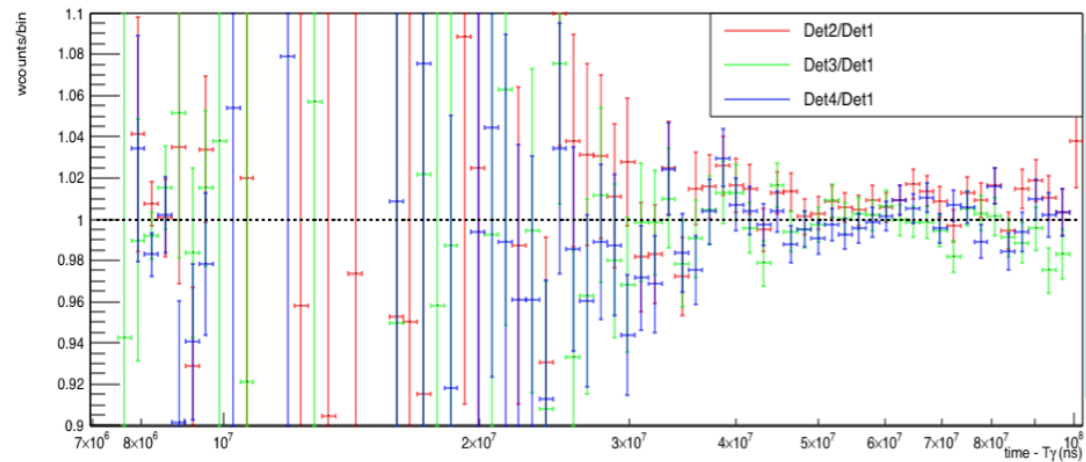
Non si notano
deviazioni nella
regione di maggior
interesse

Spettro tempi di volo



Conteggi
Gd
dei 4
rivelatori

Gt



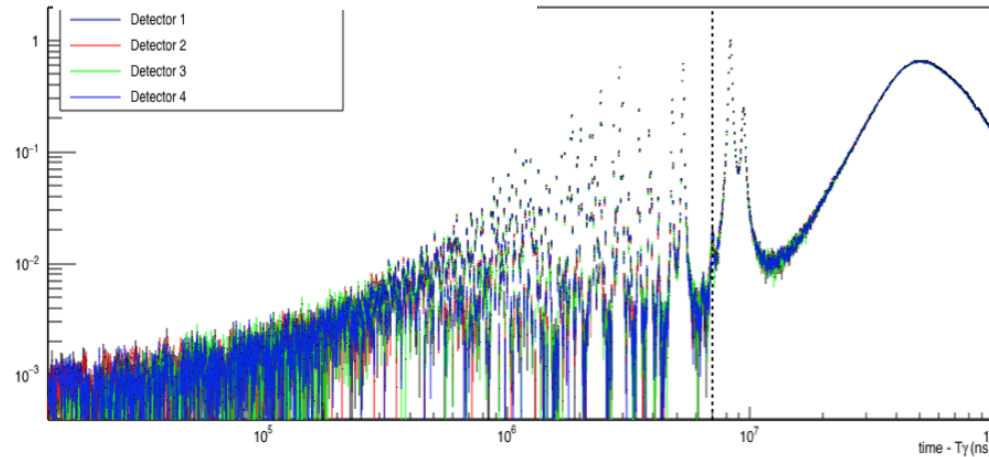
Rapporti

Studi di
Qualità
• background

Confronto degli spettri
di tempo di volo,
dopo la sottrazione
del background

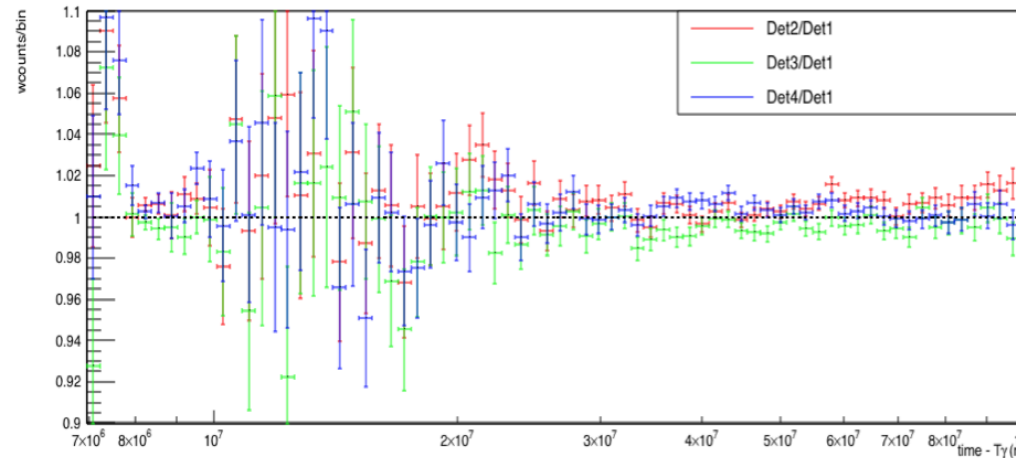
Non si notano
deviazioni nella
regione di maggior
interesse

Spettro tempi di volo



Conteggi
Gd
dei 4
rivelatori

GT



Rapporti

Studi di
Qualità

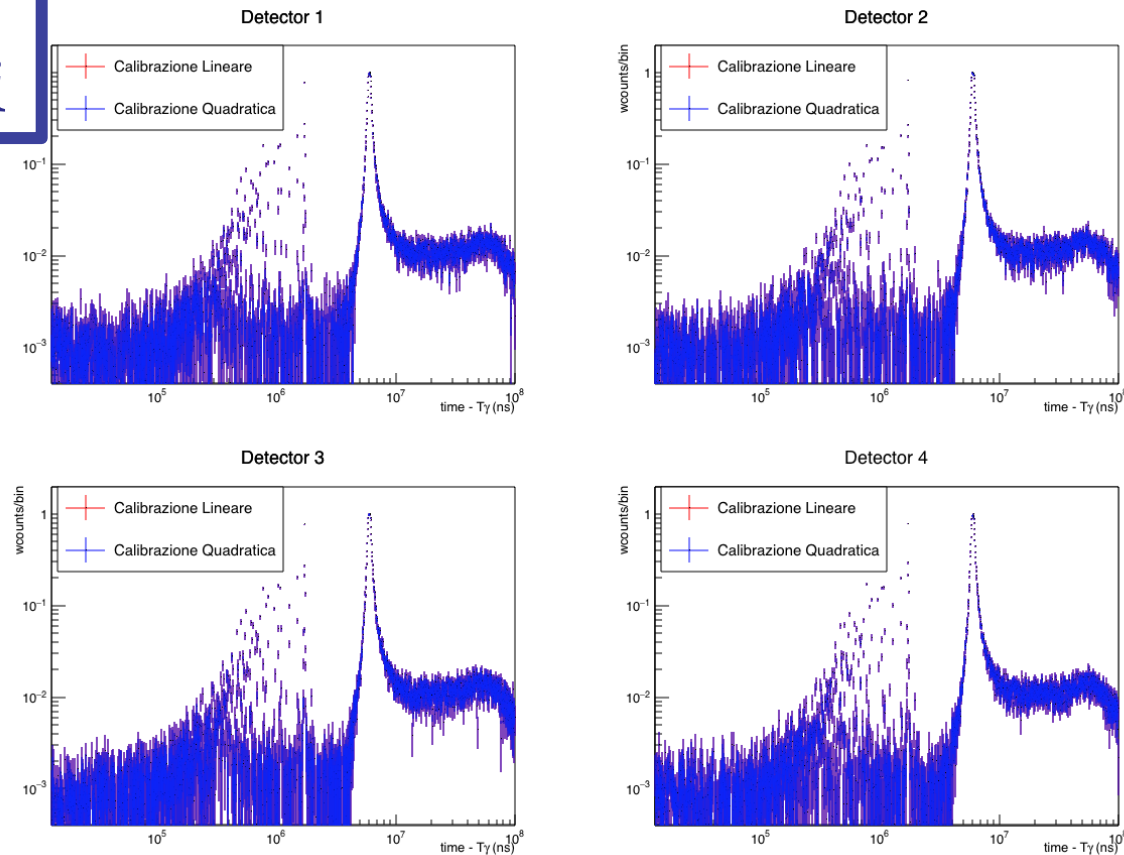
- calibrazioni

Confronto degli
spettri di tempo di
volo, dopo la
sottrazione del
background per
diverse calibrazioni



Non si notano
deviazioni nella
regione di maggior
interesse

Spettri tempi di volo



Conteggi
Au

Studi di
Qualità

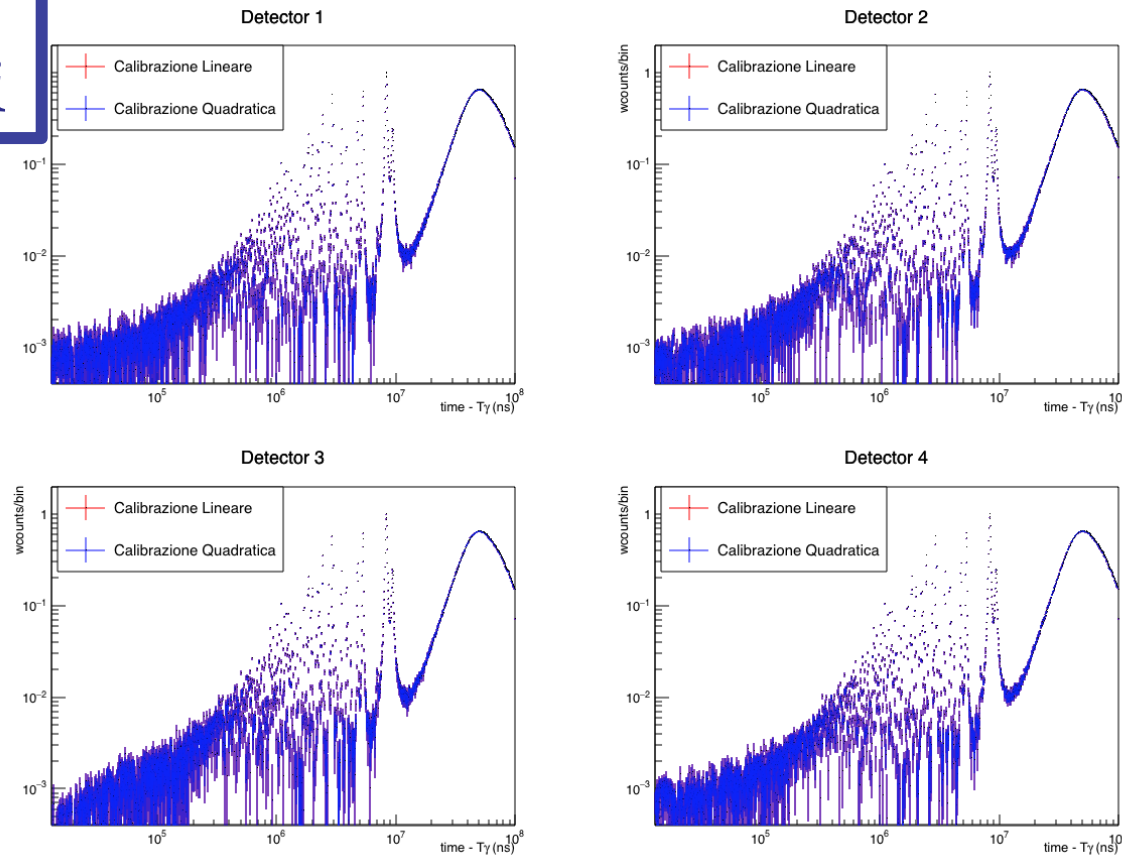
- calibrazioni

Confronto degli
spettri di **tempo di
volo**, dopo la
**sottrazione del
background** per
diverse calibrazioni



Non si notano
deviazioni nella
regione di maggior
interesse

Spettri tempi di volo



Conteggi
Gd

Studi di
Qualità

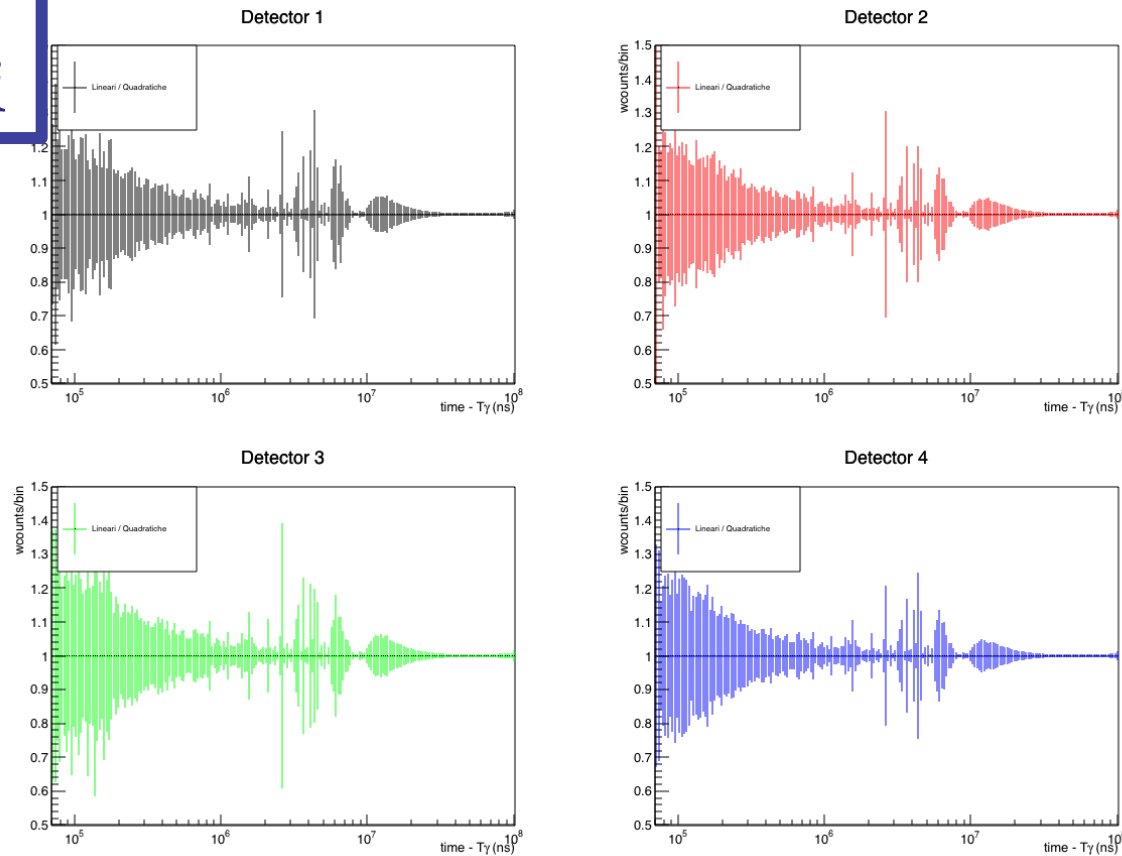
- calibrazioni

Confronto degli
spettri di tempo di
volo, dopo la
sottrazione del
background per
diverse calibrazioni



Non si notano
deviazioni nella
regione di maggior
interesse

Spettri tempi di volo



Rapporti

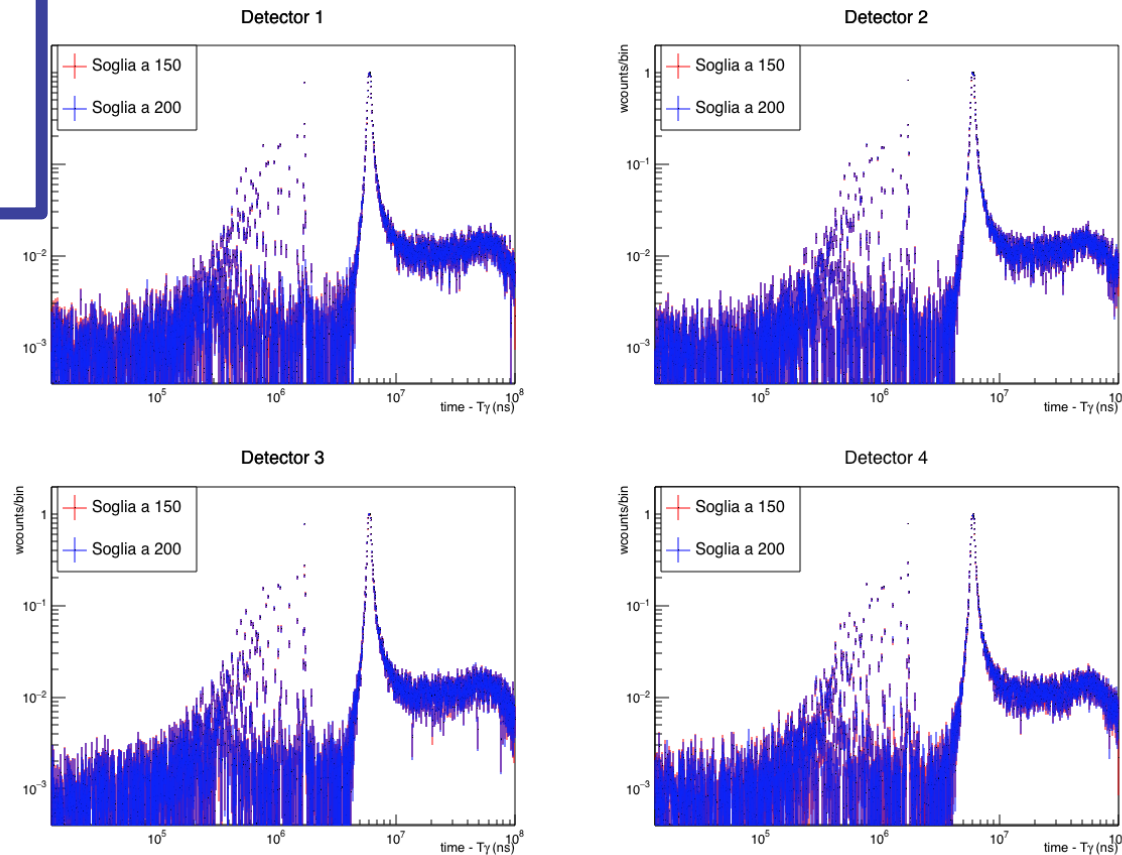
Studi di
Qualità

- **Weighting Function**

Confronto degli
spettri di **tempo di volo**, dopo la
sottrazione del background per
diverse WF / soglie

Non si notano
deviazioni nella
regione di maggior
interesse

Spettro tempi di volo



Conteggi
Au

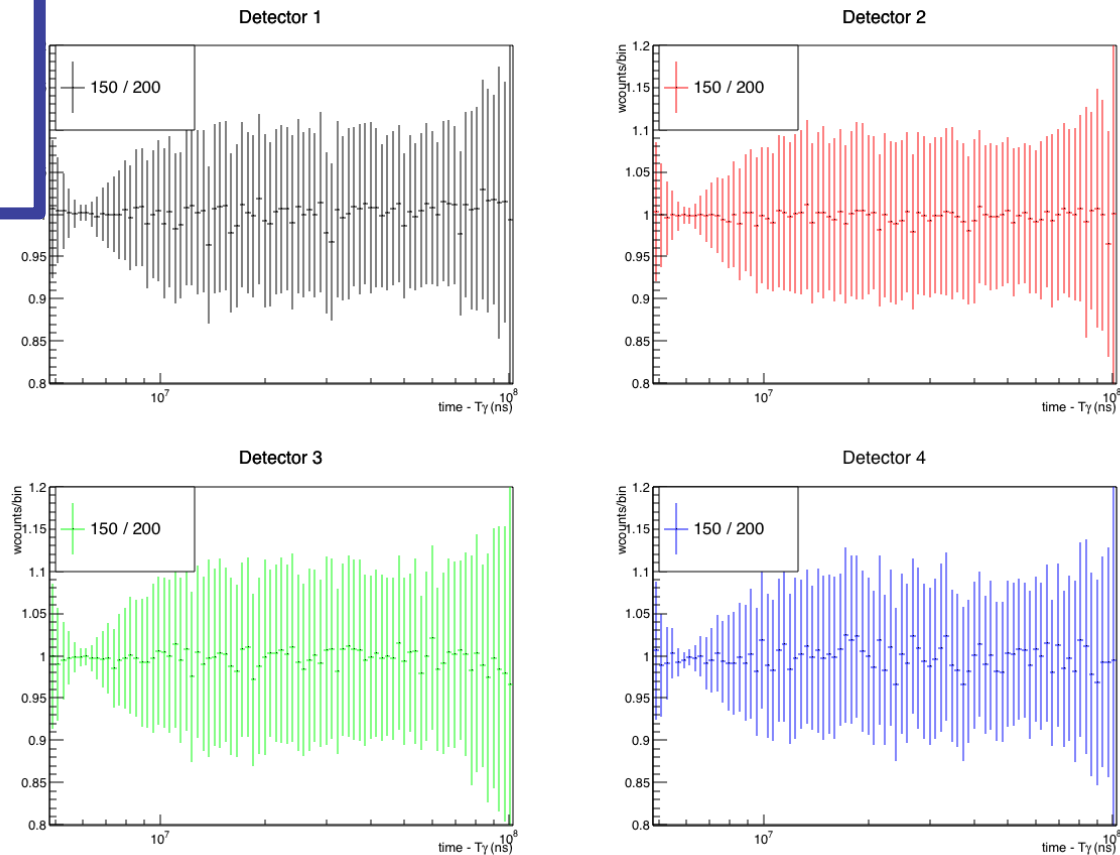
Studi di
Qualità

- **Weighting Function**

Confronto degli
spettri di **tempo di volo**, dopo la
sottrazione del background per
diverse WF / soglie

Non si notano
deviazioni nella
regione di maggior
interesse

Rapporto Spettri TOF



Rapporti

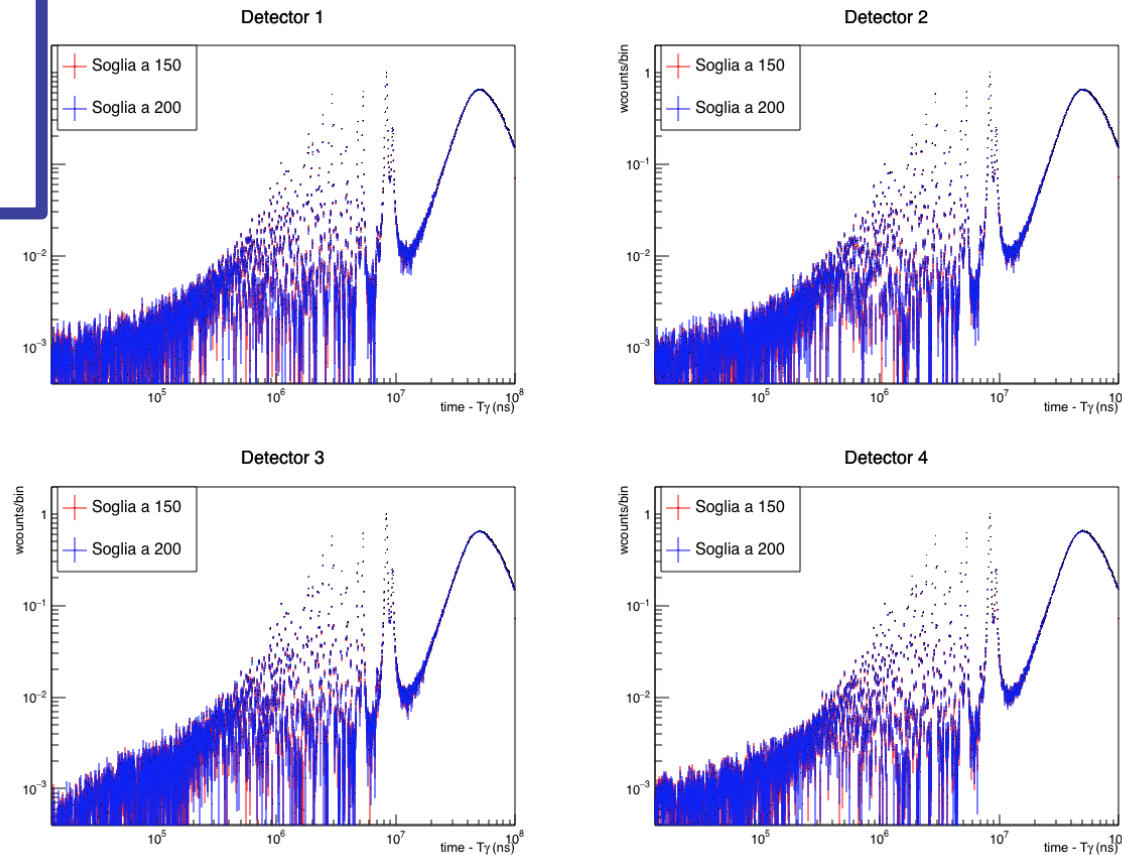
Studi di
Qualità

- **Weighting Function**

Confronto degli
spettri di **tempo di volo**, dopo la
sottrazione del background per
diverse WF / soglie

Non si notano
deviazioni nella
regione di maggior
interesse

Spettro tempi di volo



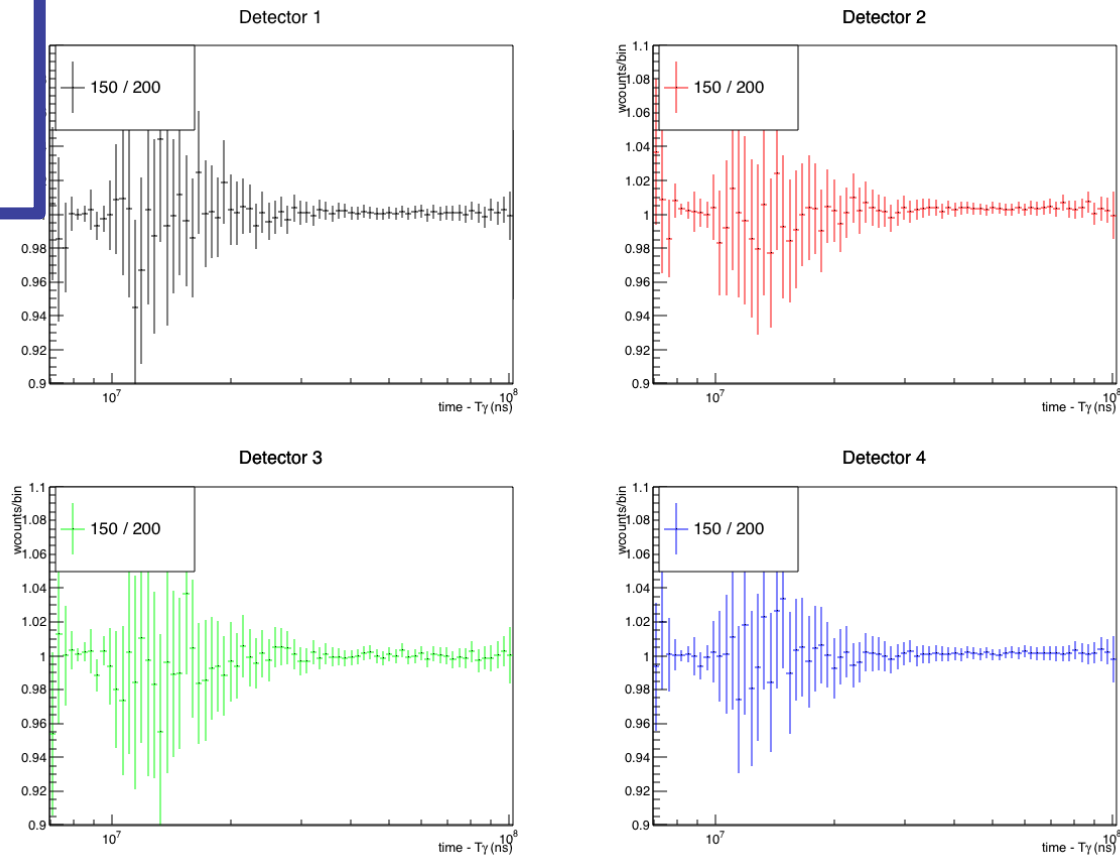
Studi di
Qualità

- **Weighting Function**

Confronto degli
spettri di **tempo di volo**, dopo la
sottrazione del
background per
diverse WF / soglie

Non si notano
deviazioni nella
regione di maggior
interesse

Rapporto Spettri TOF



Rapporti

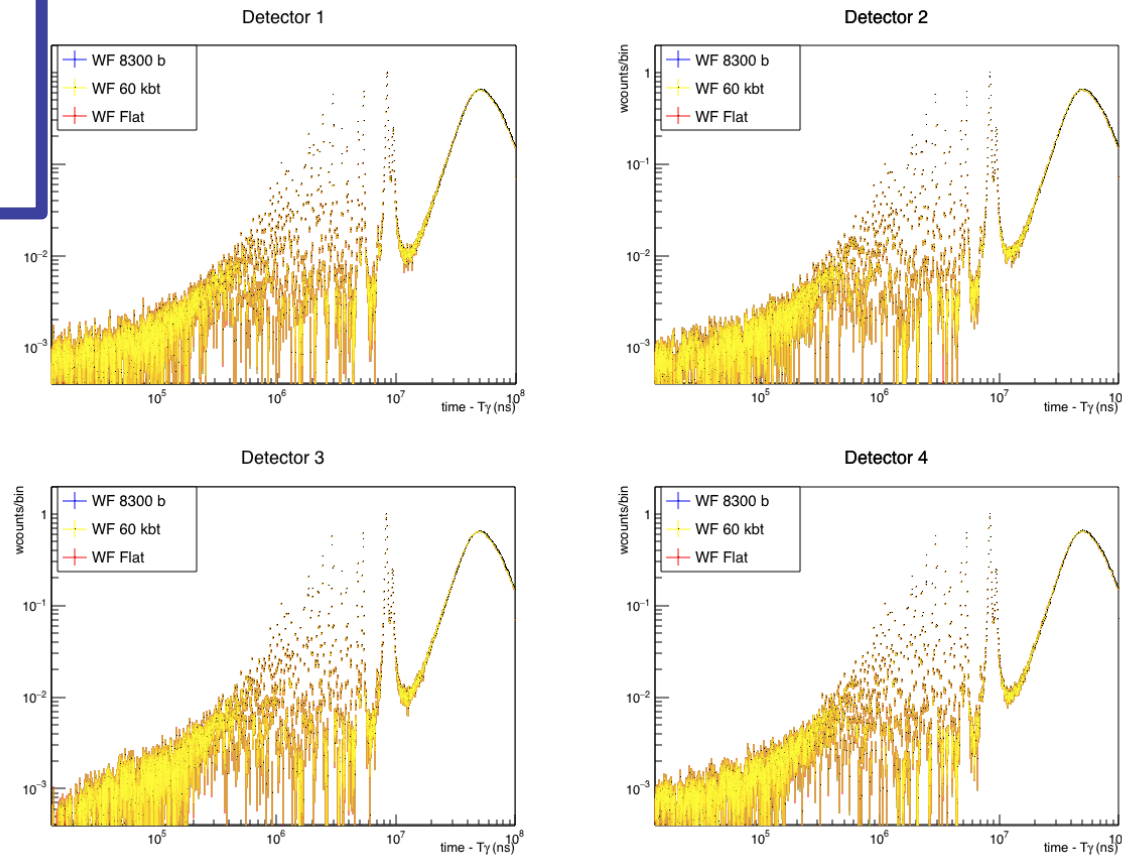
Studi di
Qualità

- **Weighting Function**

Confronto degli
spettri di **tempo di volo**, dopo la
sottrazione del
background con WF
esponenziali

Non si notano
deviazioni nella
regione di maggior
interesse

Spettro tempi di volo



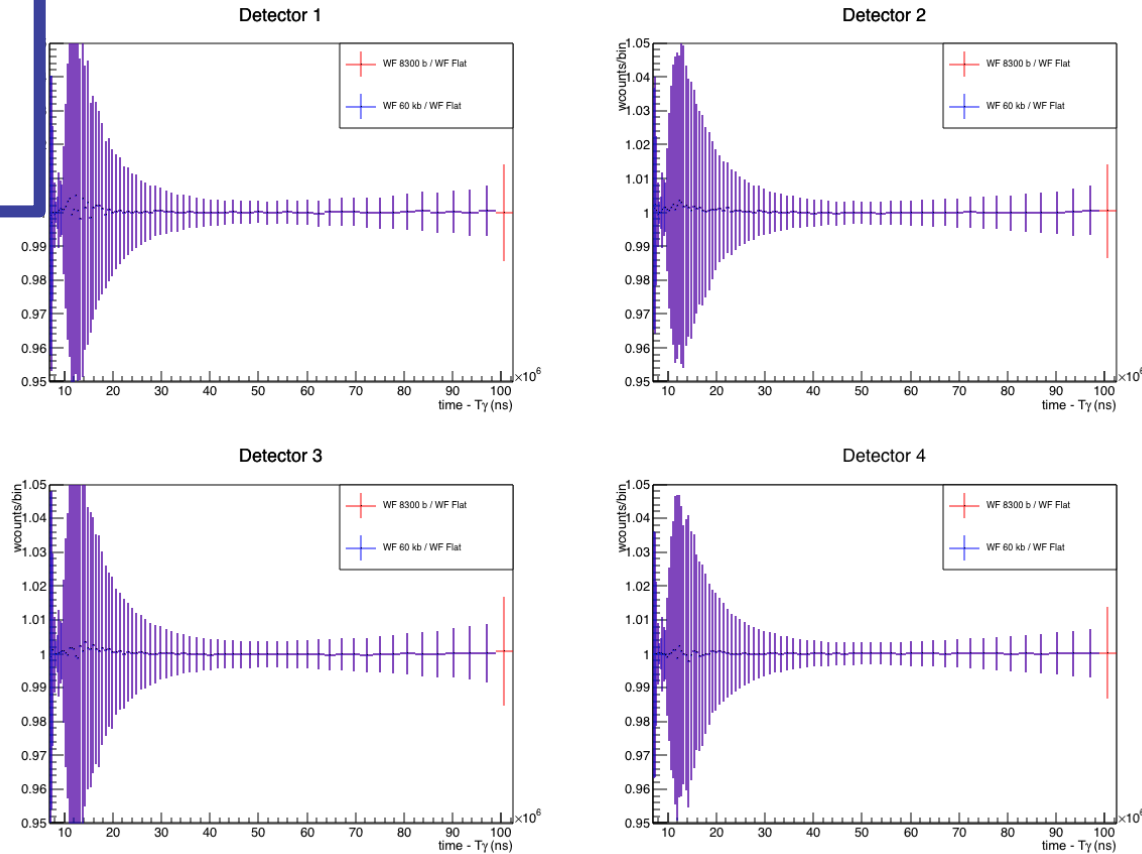
Studi di
Qualità

- **Weighting Function**

Confronto degli
spettri di **tempo di volo**, dopo la
sottrazione del
background con **WF**
esponenziali

Non si notano
deviazioni nella
regione di maggior
interesse

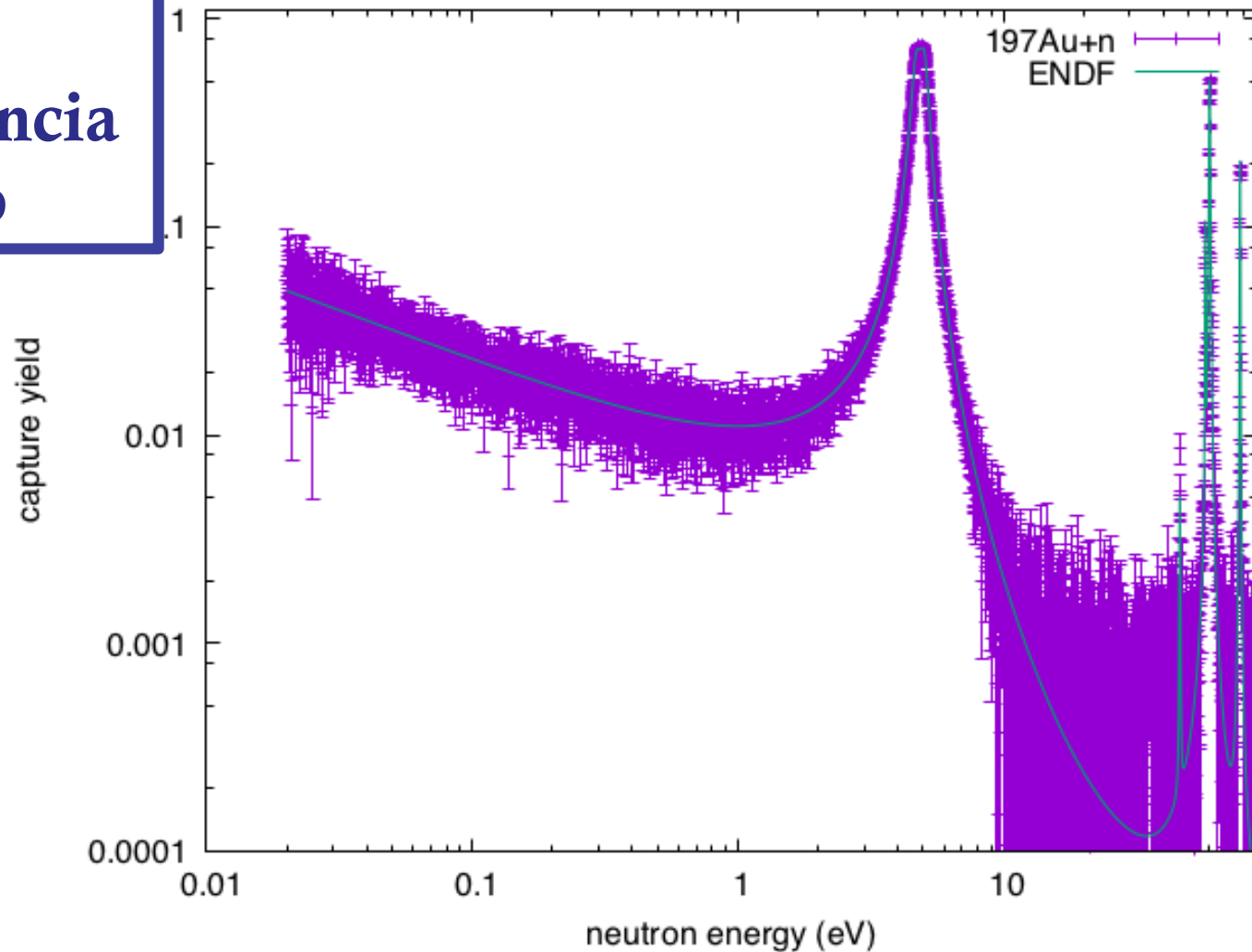
Rapporto Spettri TOF



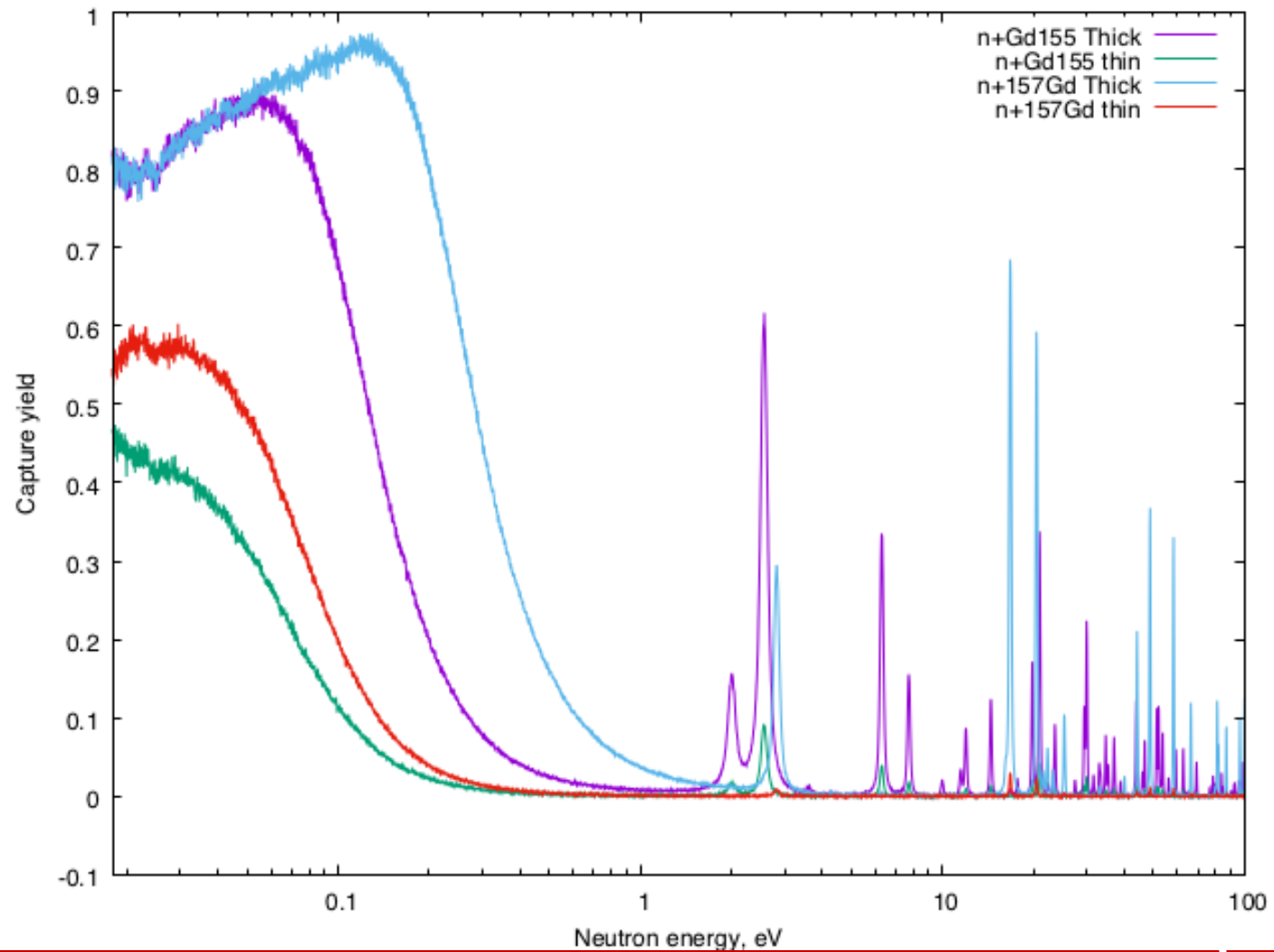
Rapporti

Studi di
Qualità

- Si comincia
dall'oro

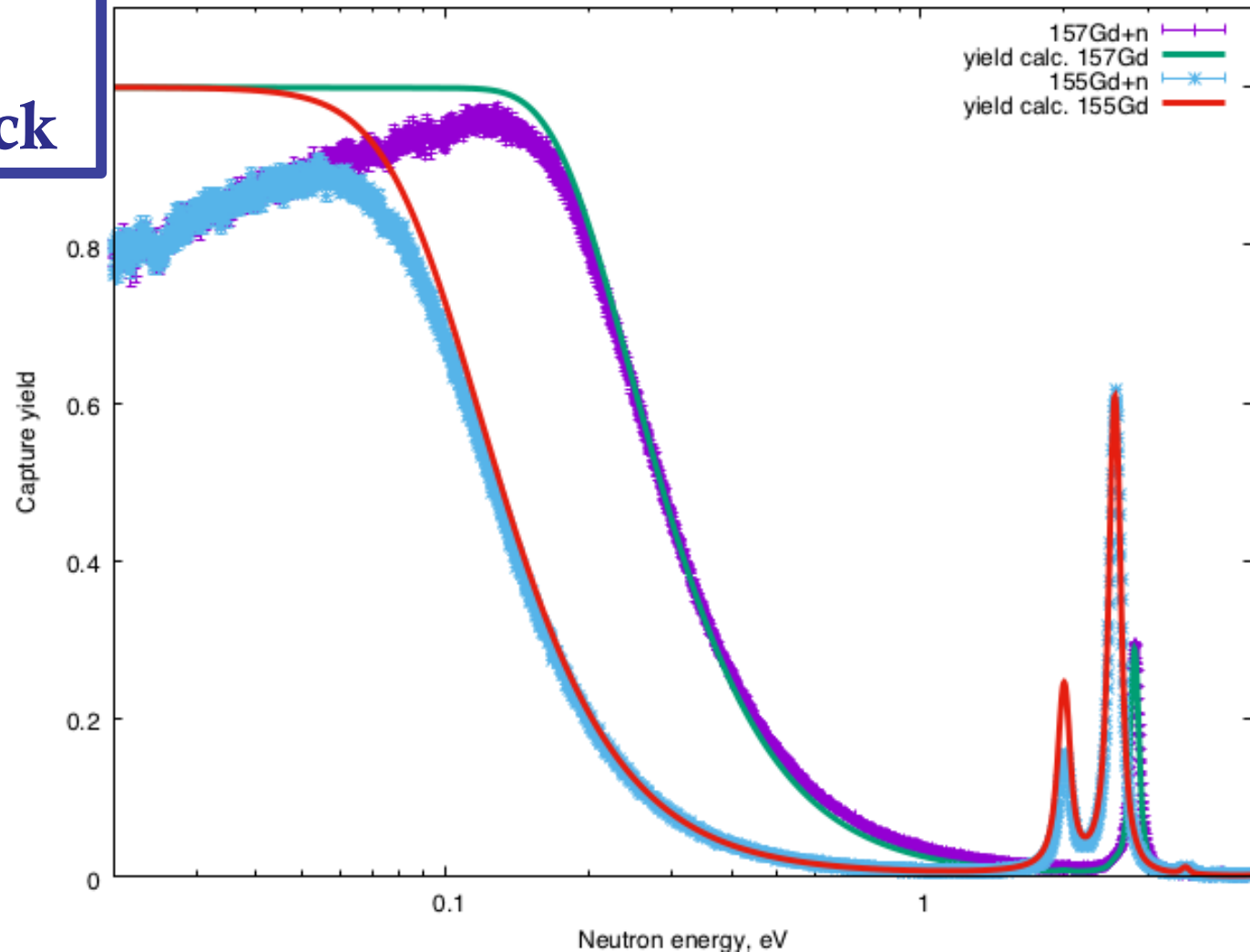


Studi di
Qualità
• Gd

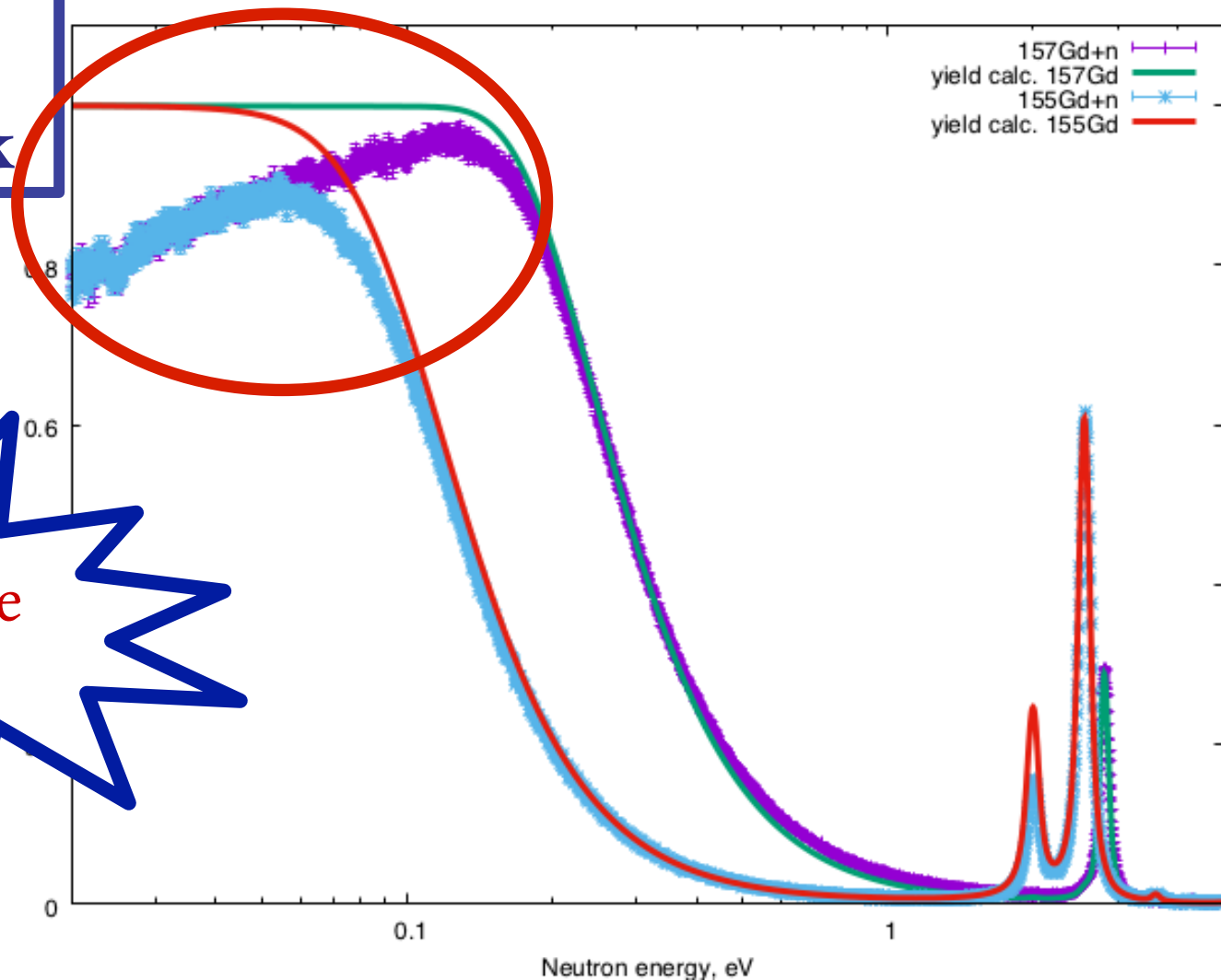


Studi di
Qualità

- Gd Thick



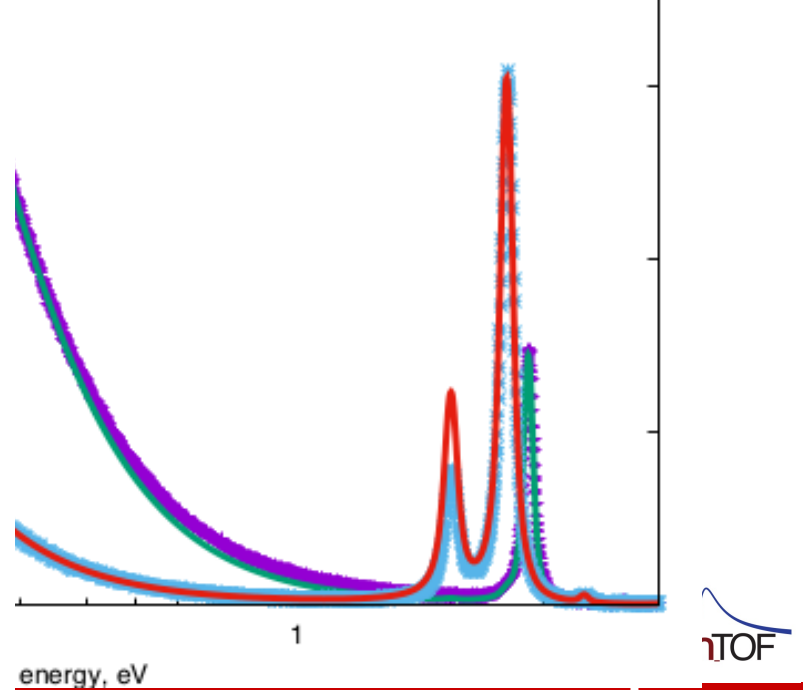
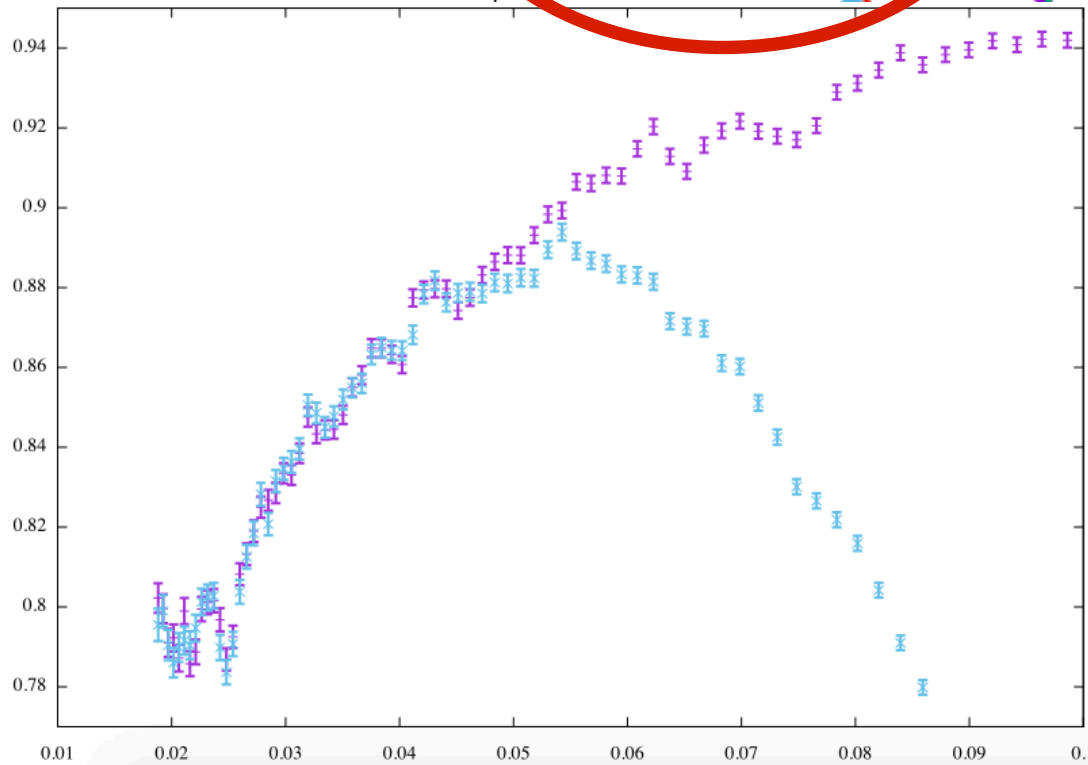
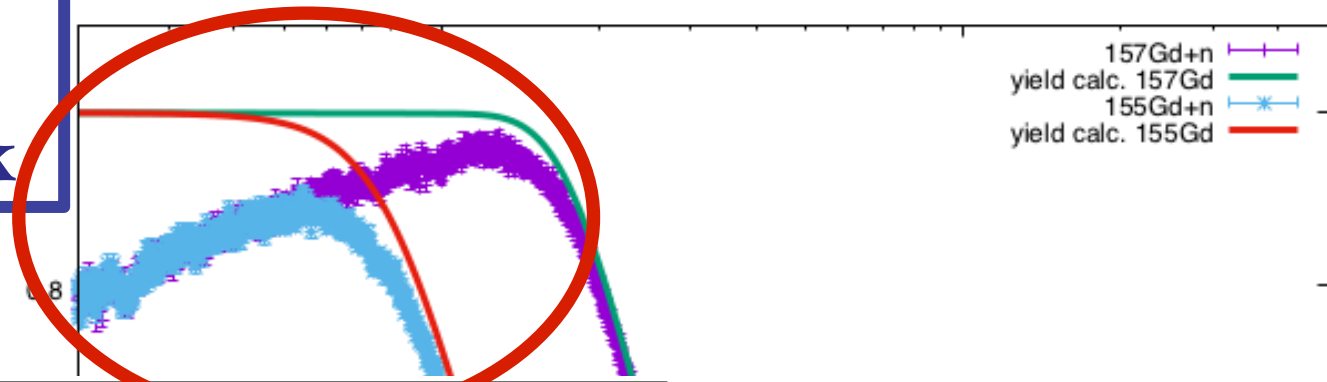
Studi di
Qualità
• Gd Thick



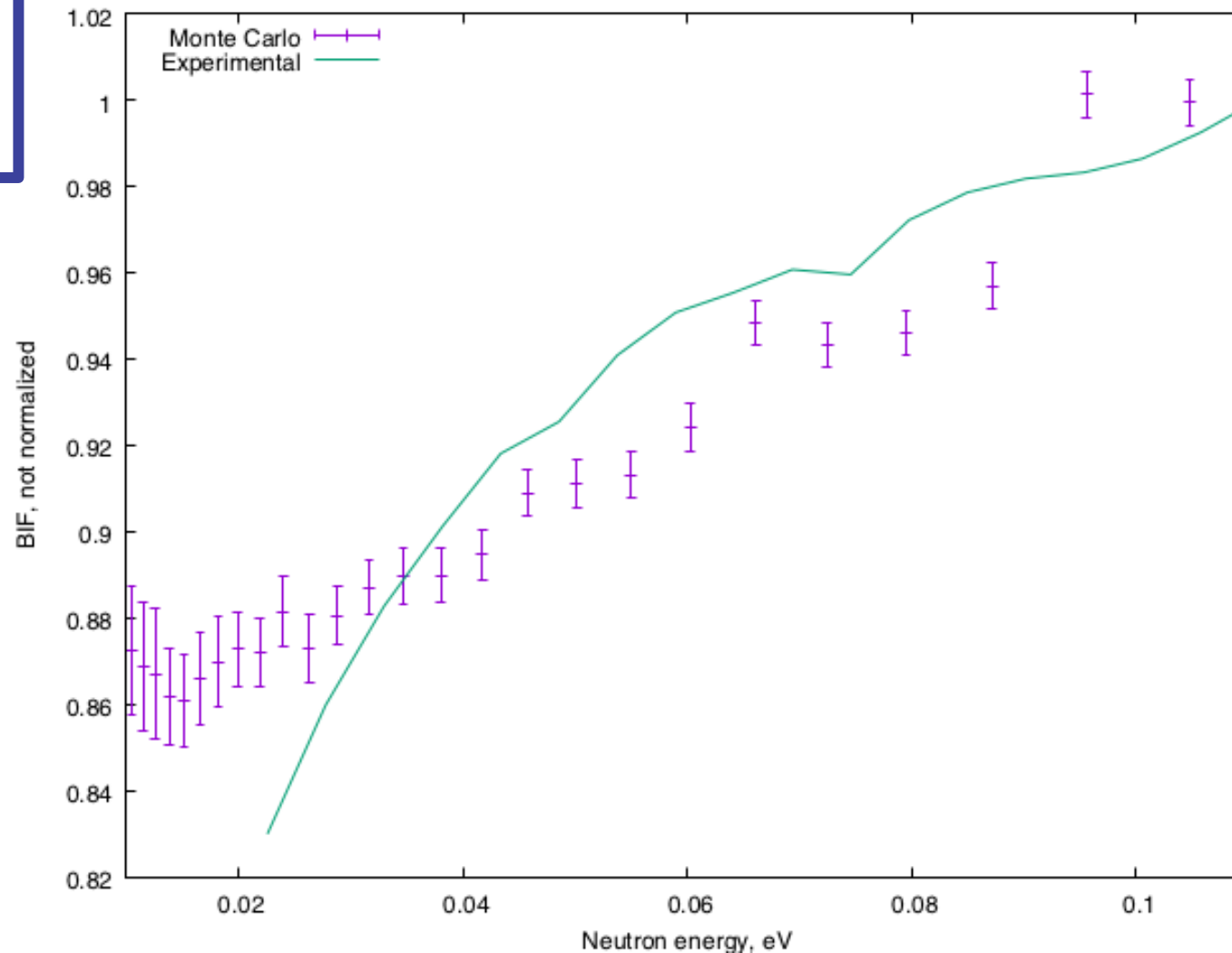
Variazione
del BIF

Studi di
Qualità

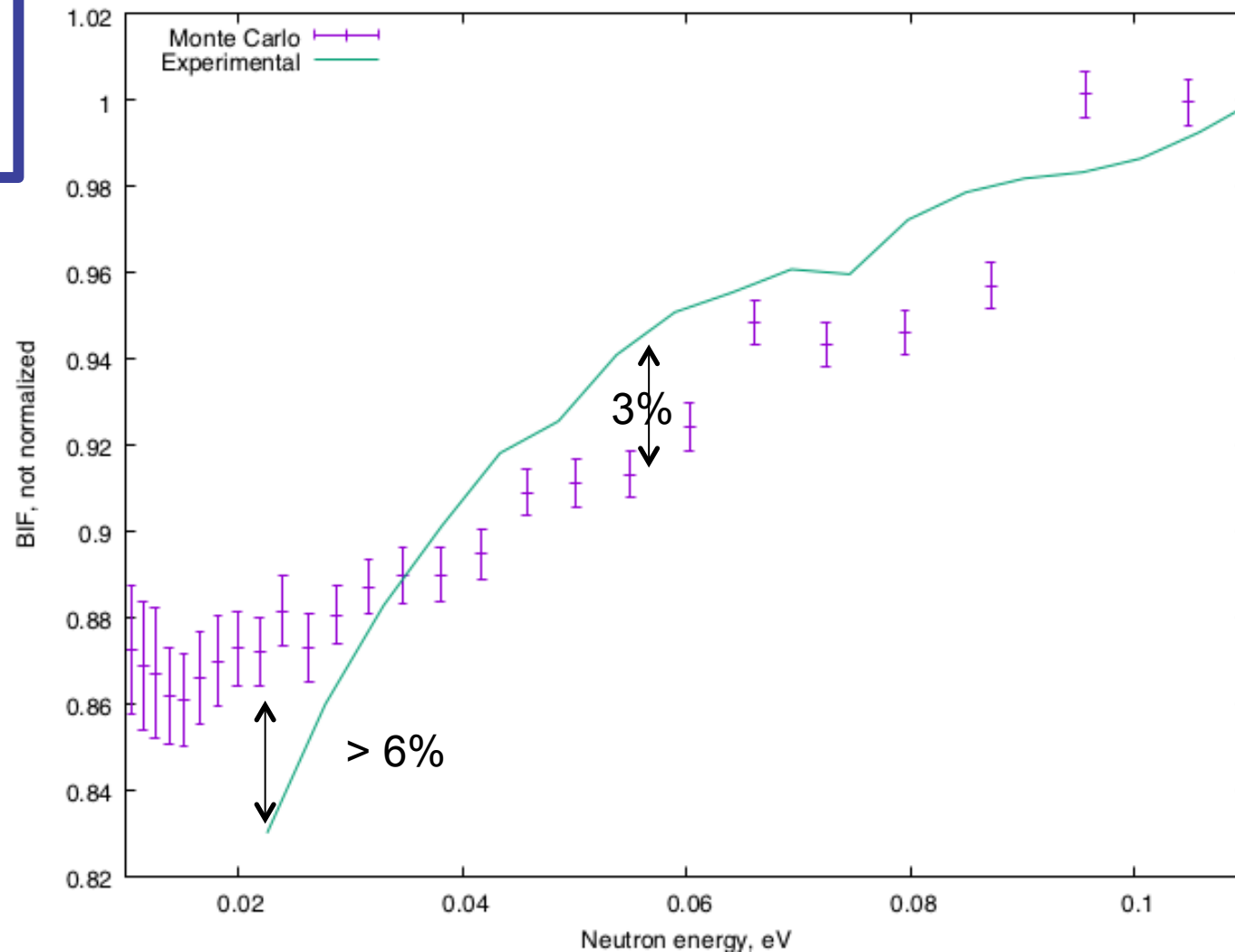
• Gd Thick



Studi di
Qualità
• BIF

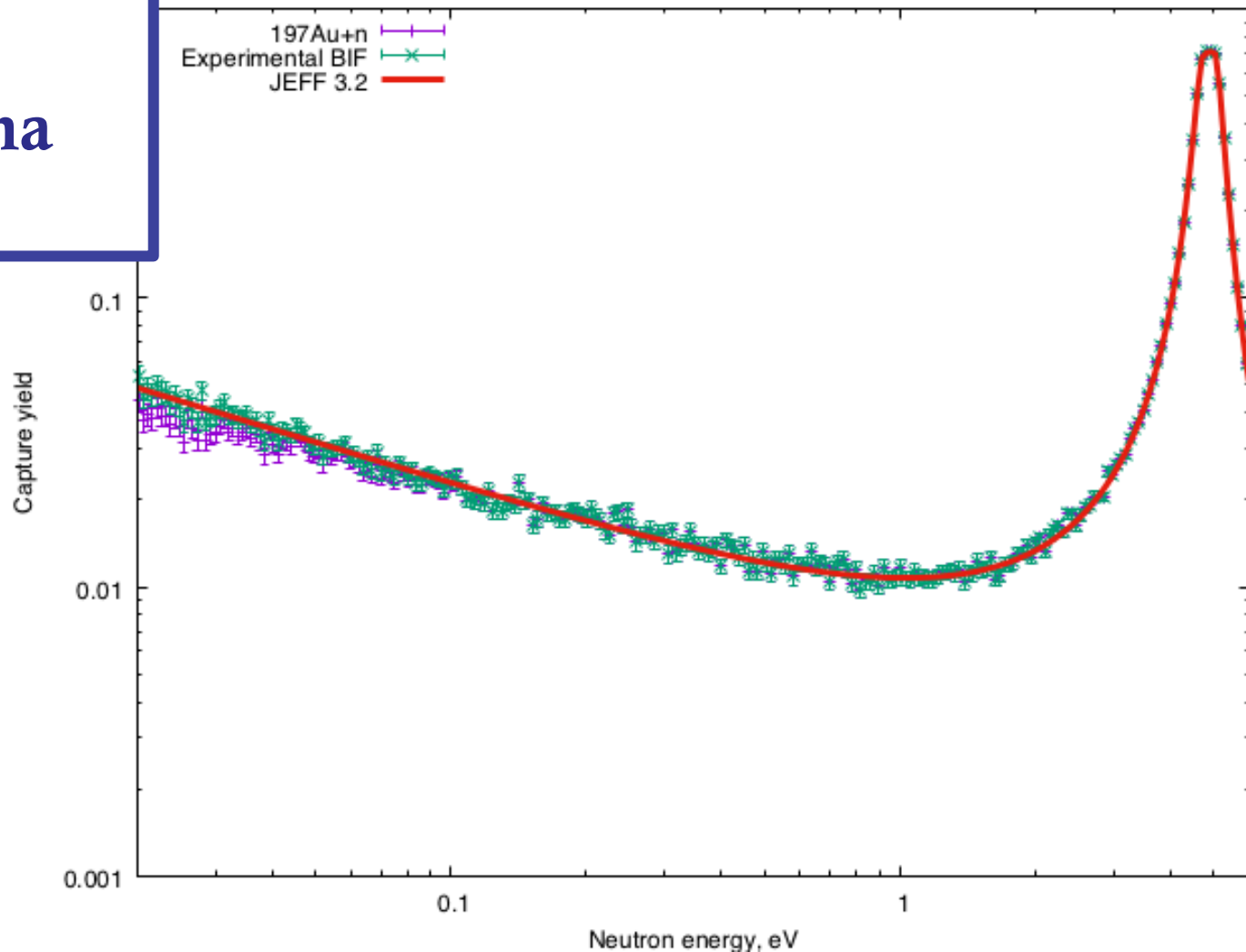


Studi di
Qualità
• BIF



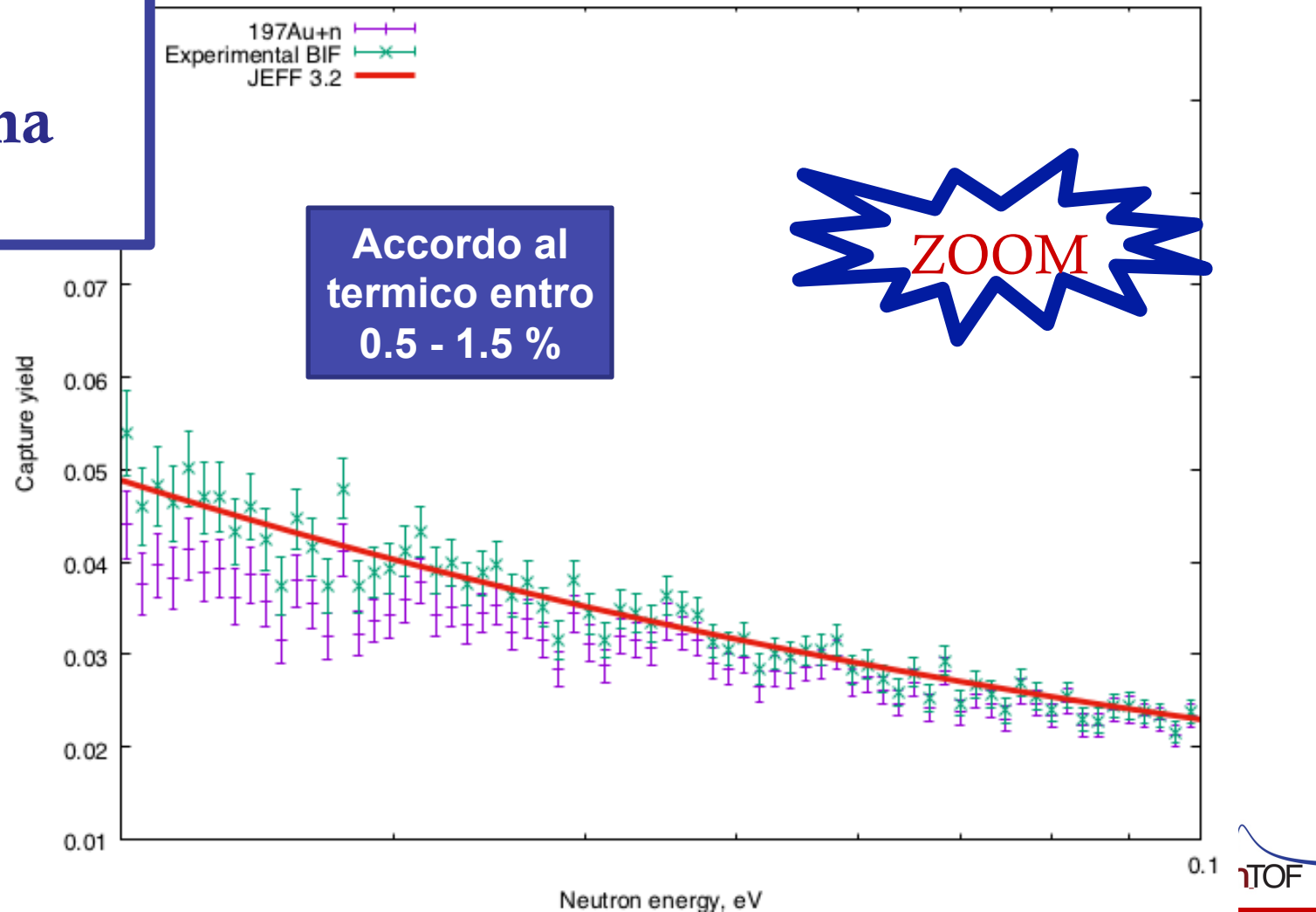
Studi di
Qualità

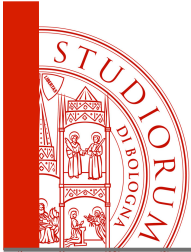
- Si ritorna all'oro



Studi di
Qualità

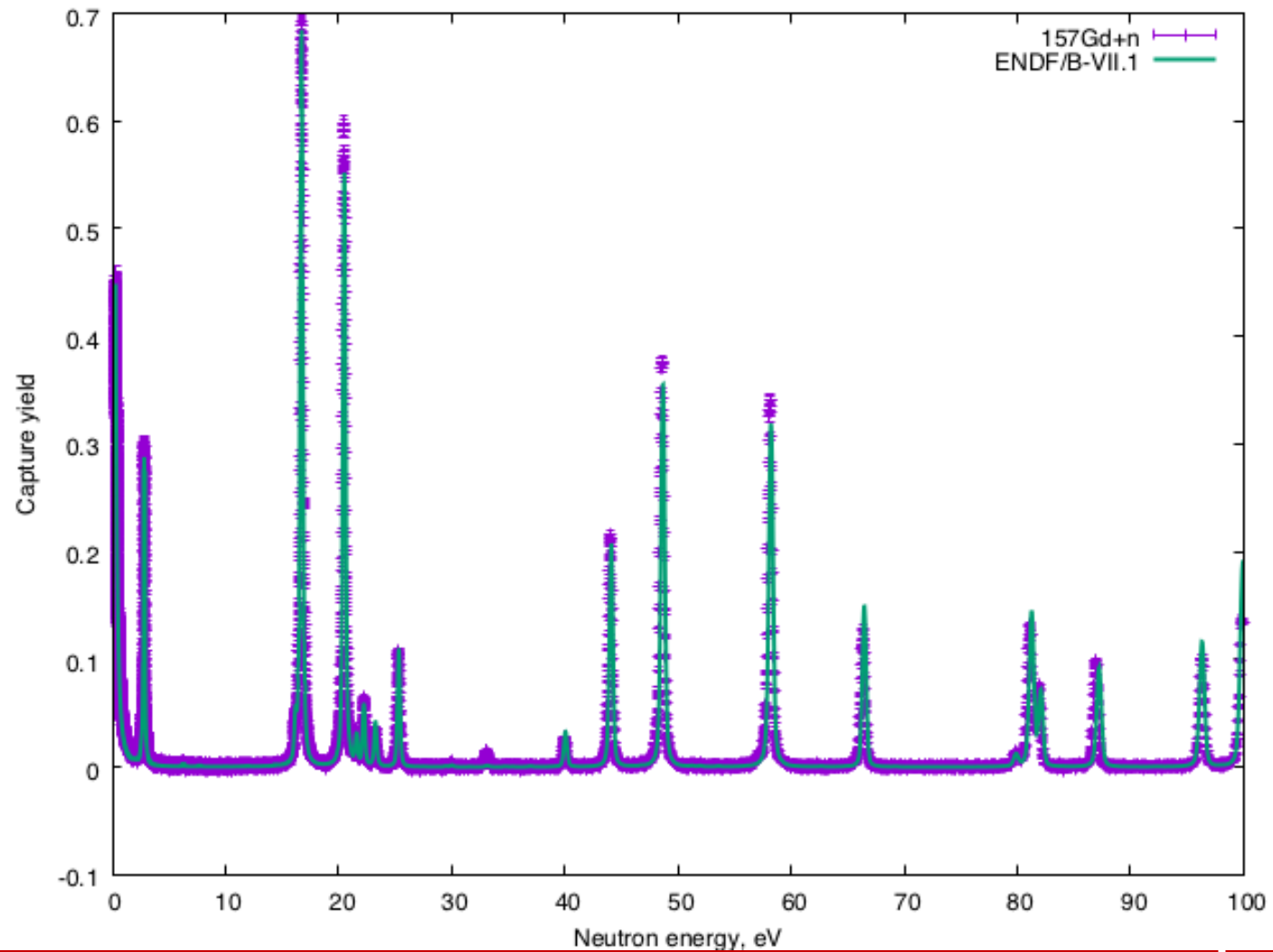
- Si ritorna
all'oro



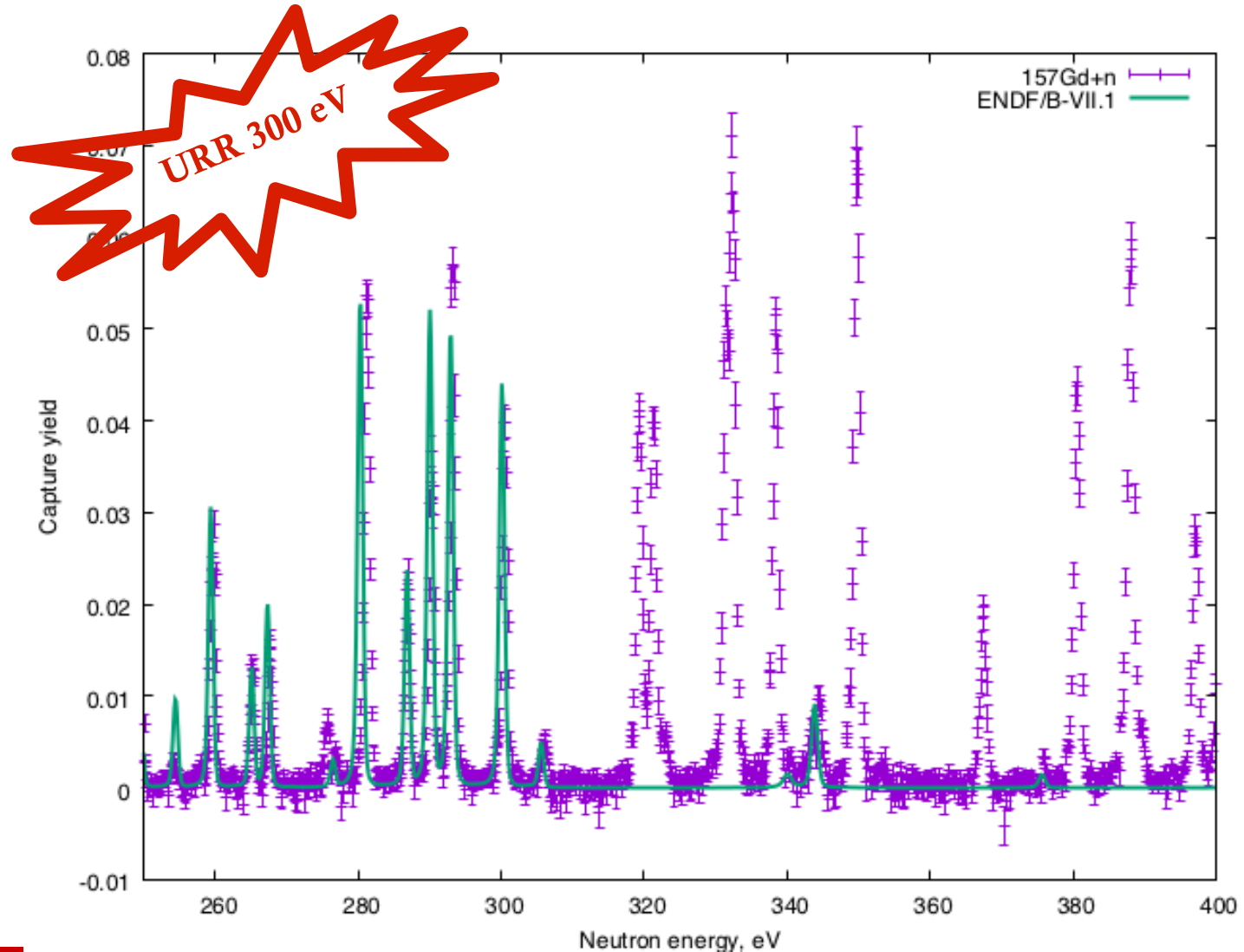


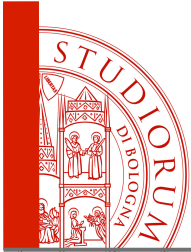
Yield

**Gd157
thick**

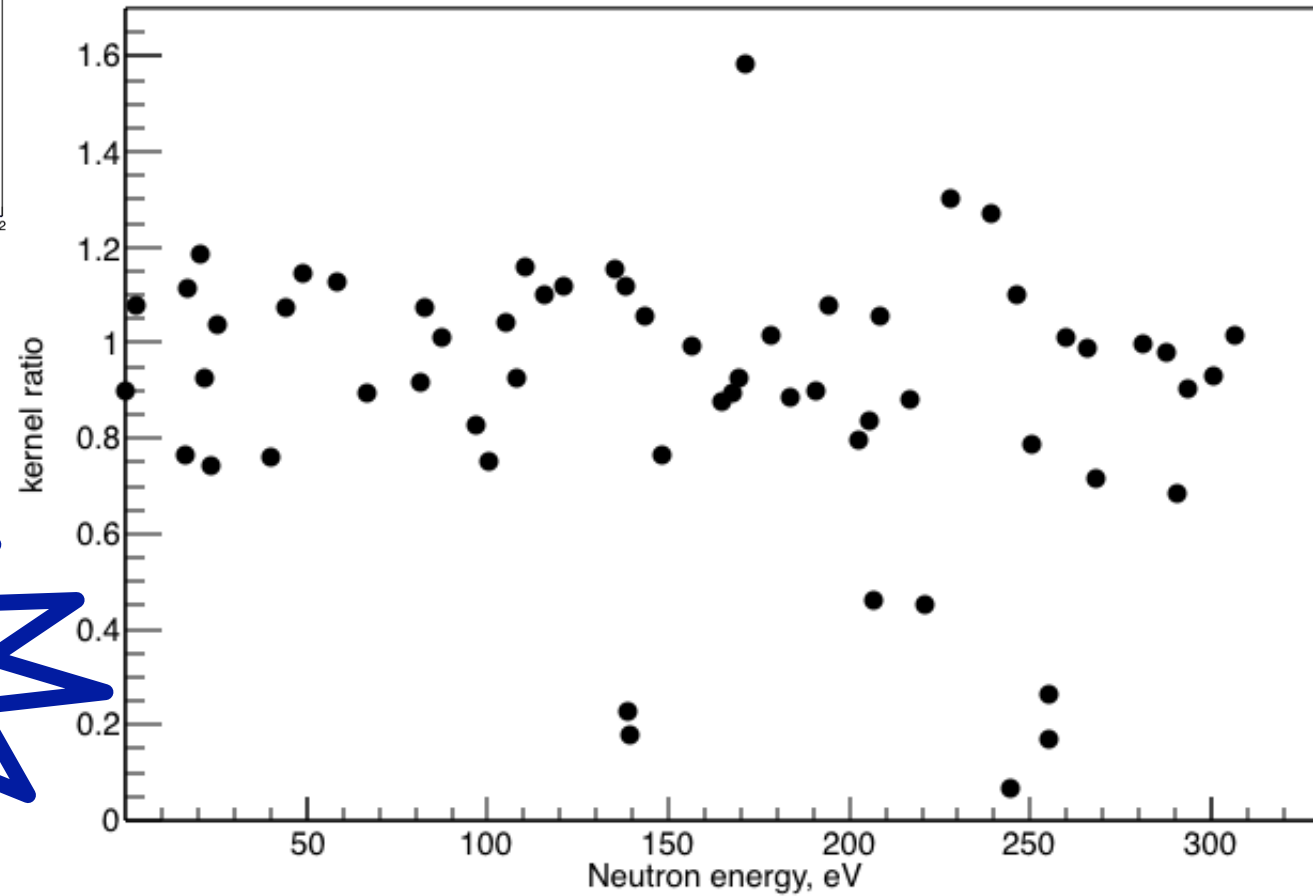
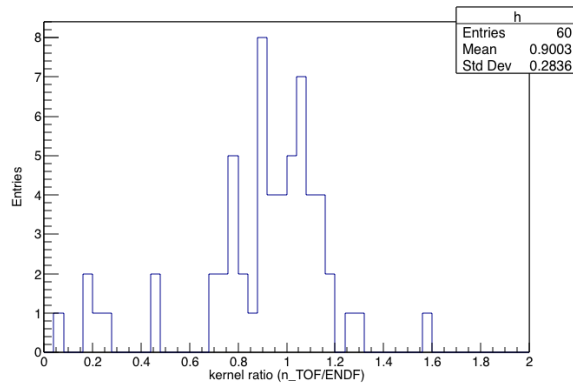


**Gd157
thick**





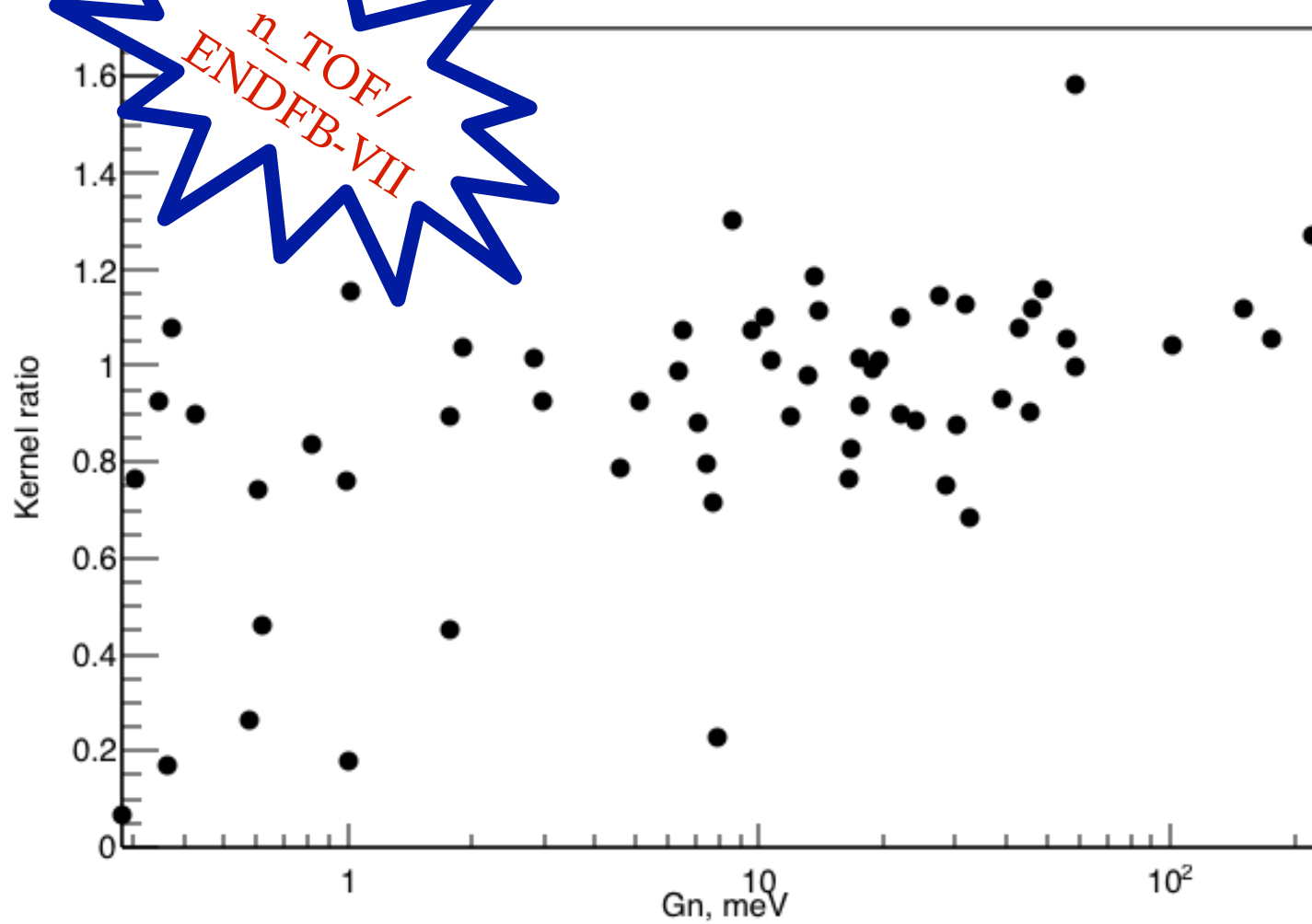
RSA ^{157}Gd



**n_TOF/
ENDFB-VII**

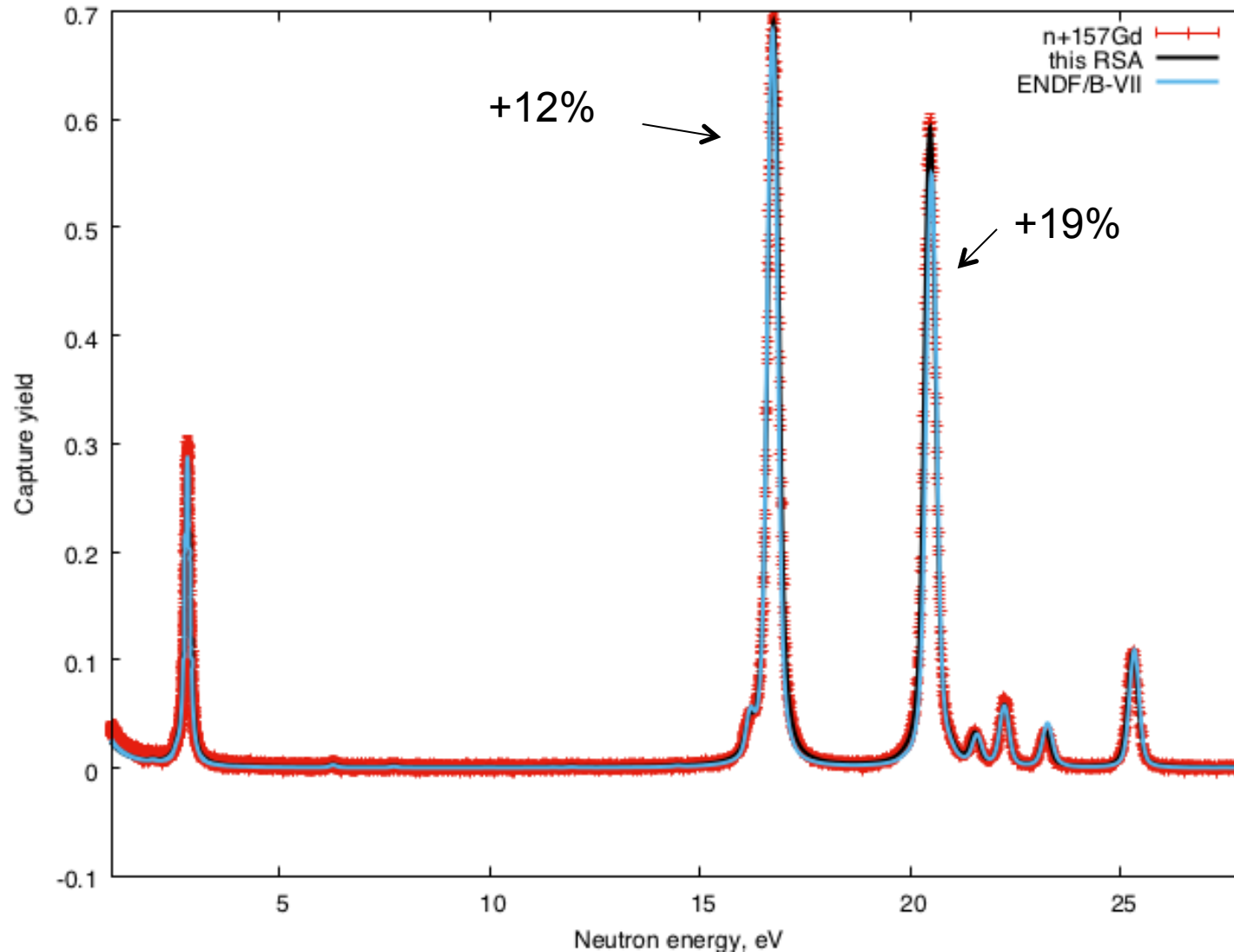


RSA ^{157}Gd



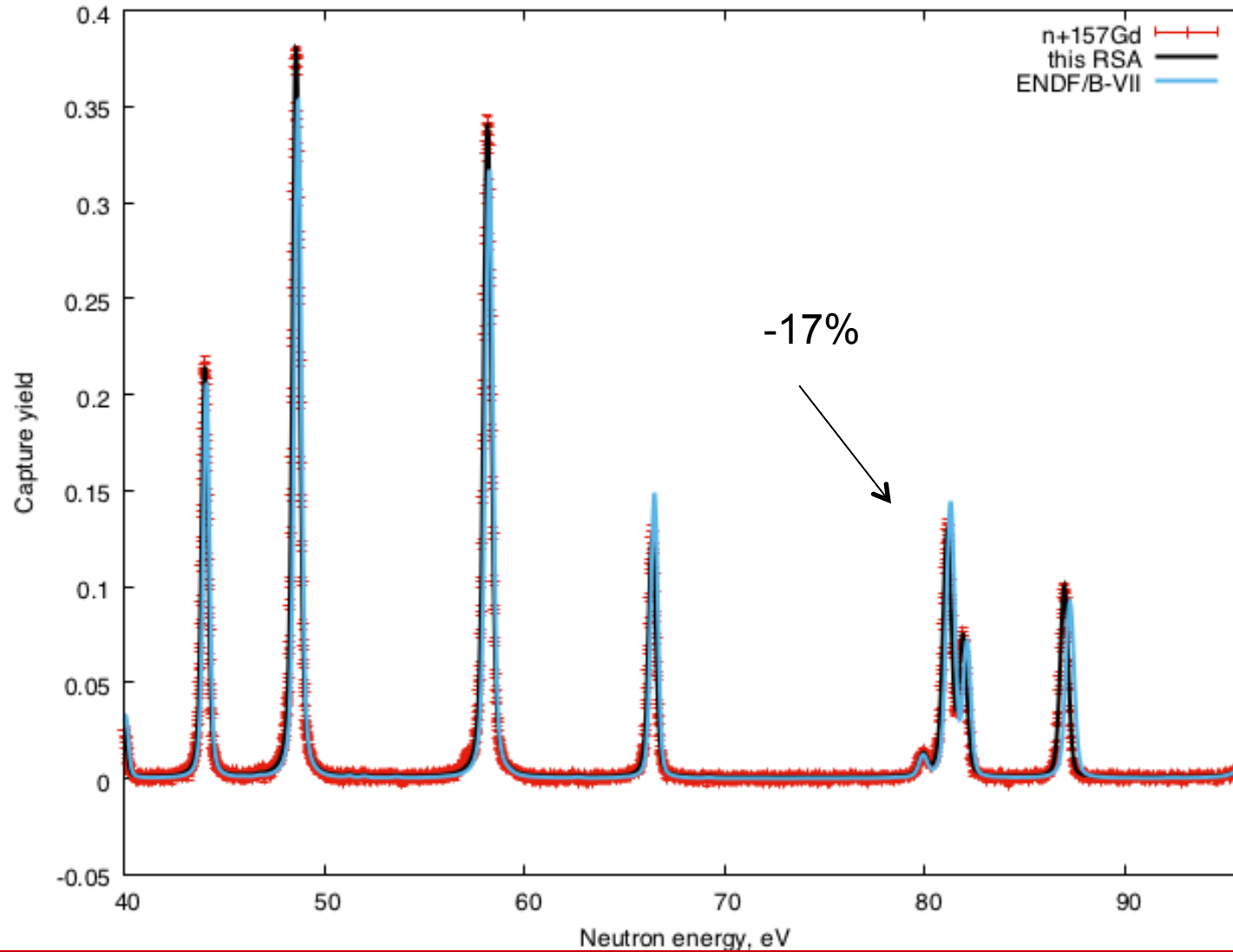


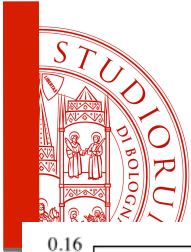
RSA ^{157}Gd



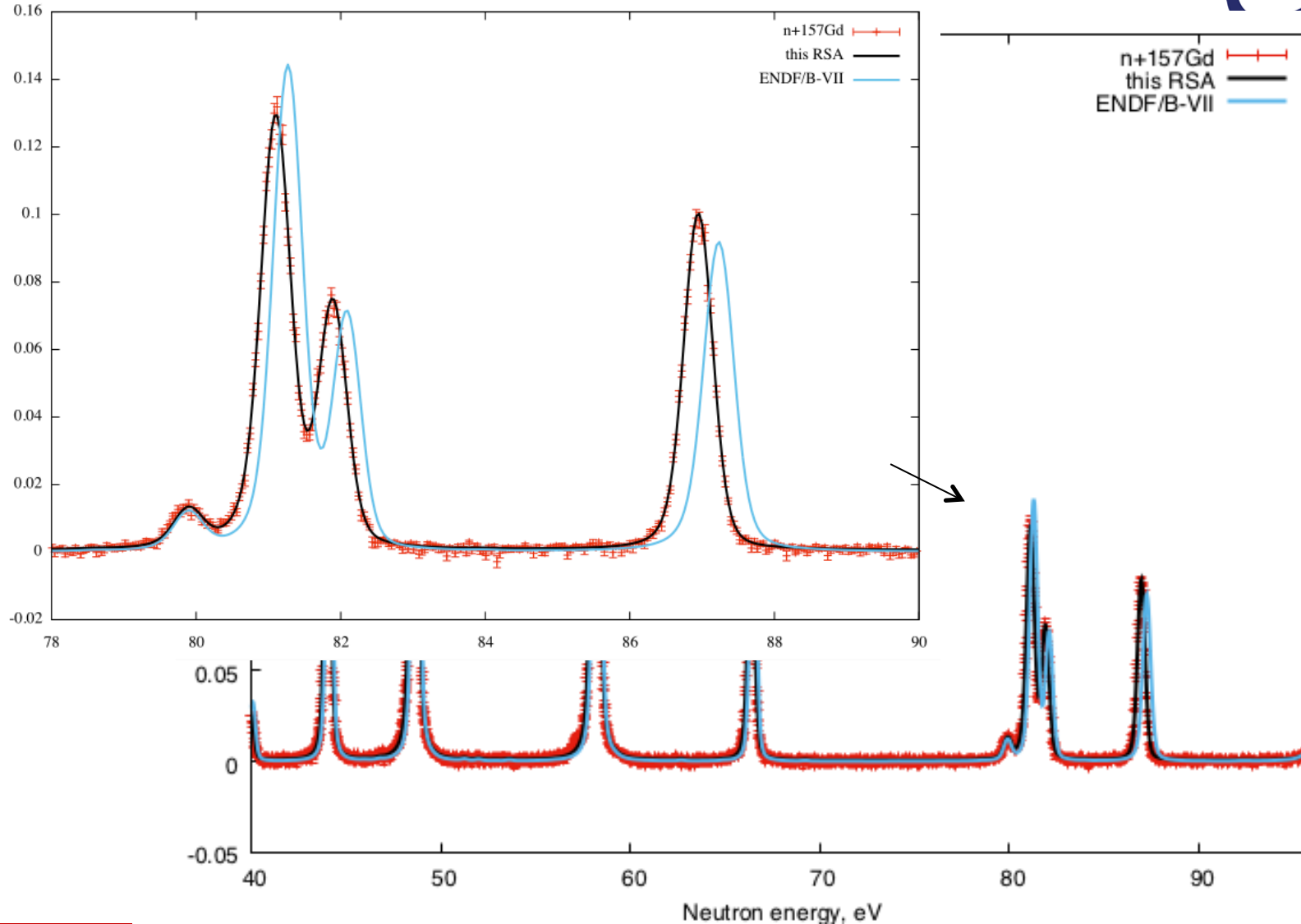


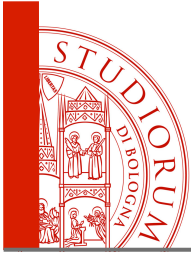
RSA ^{157}Gd



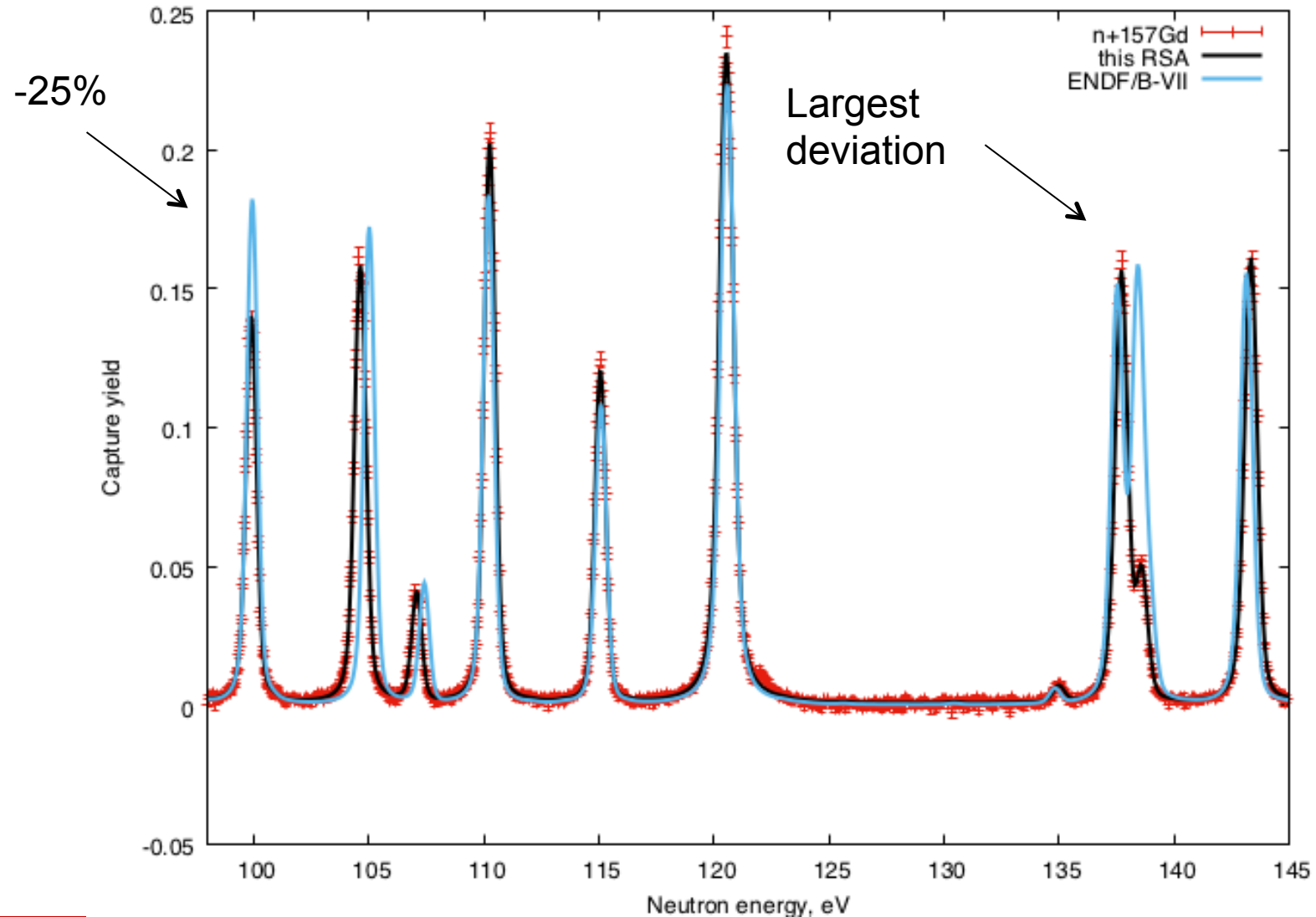


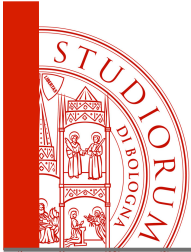
RSA ^{157}Gd



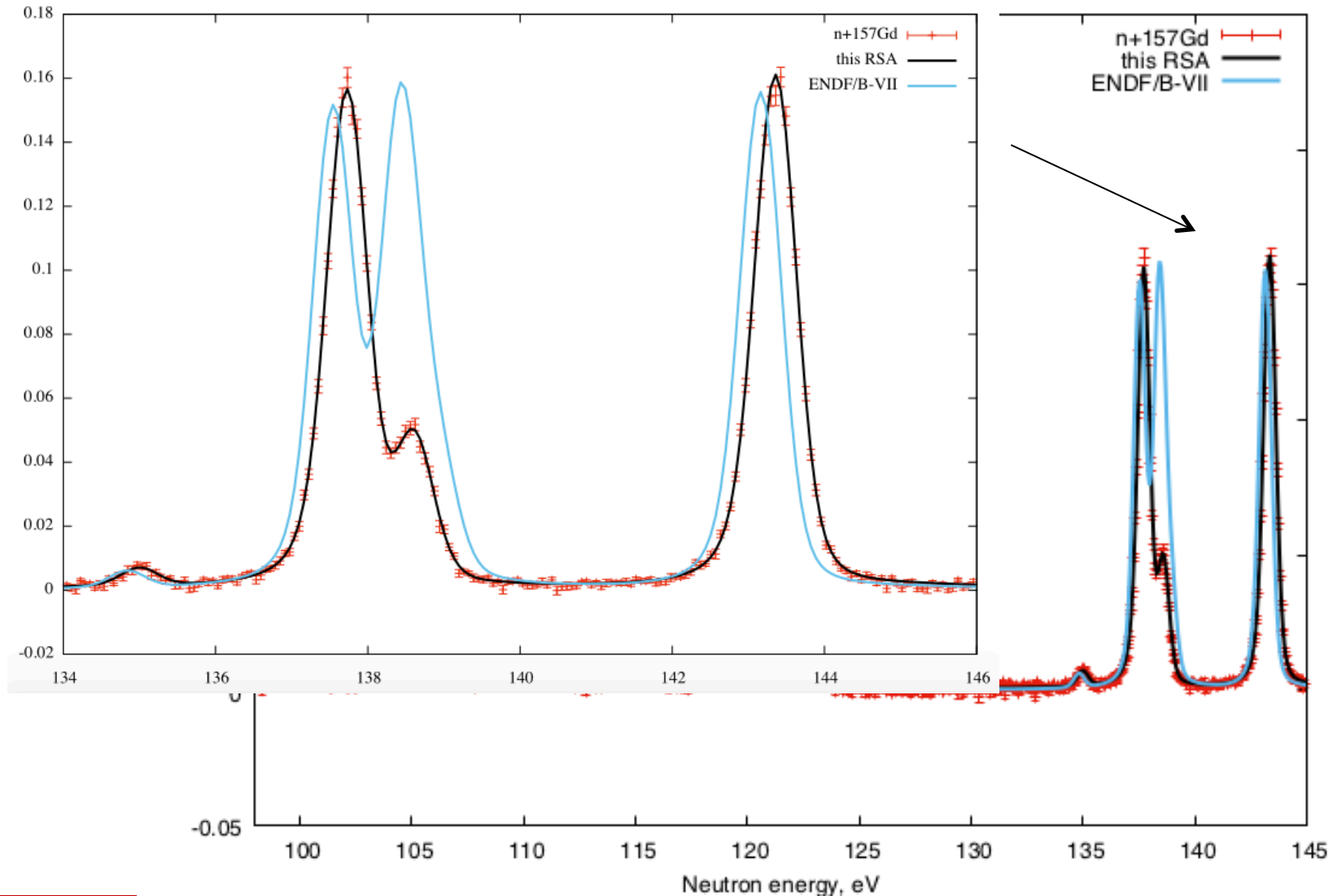


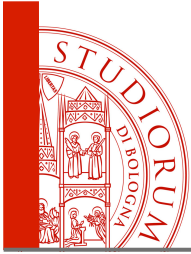
RSA ^{157}Gd



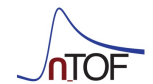
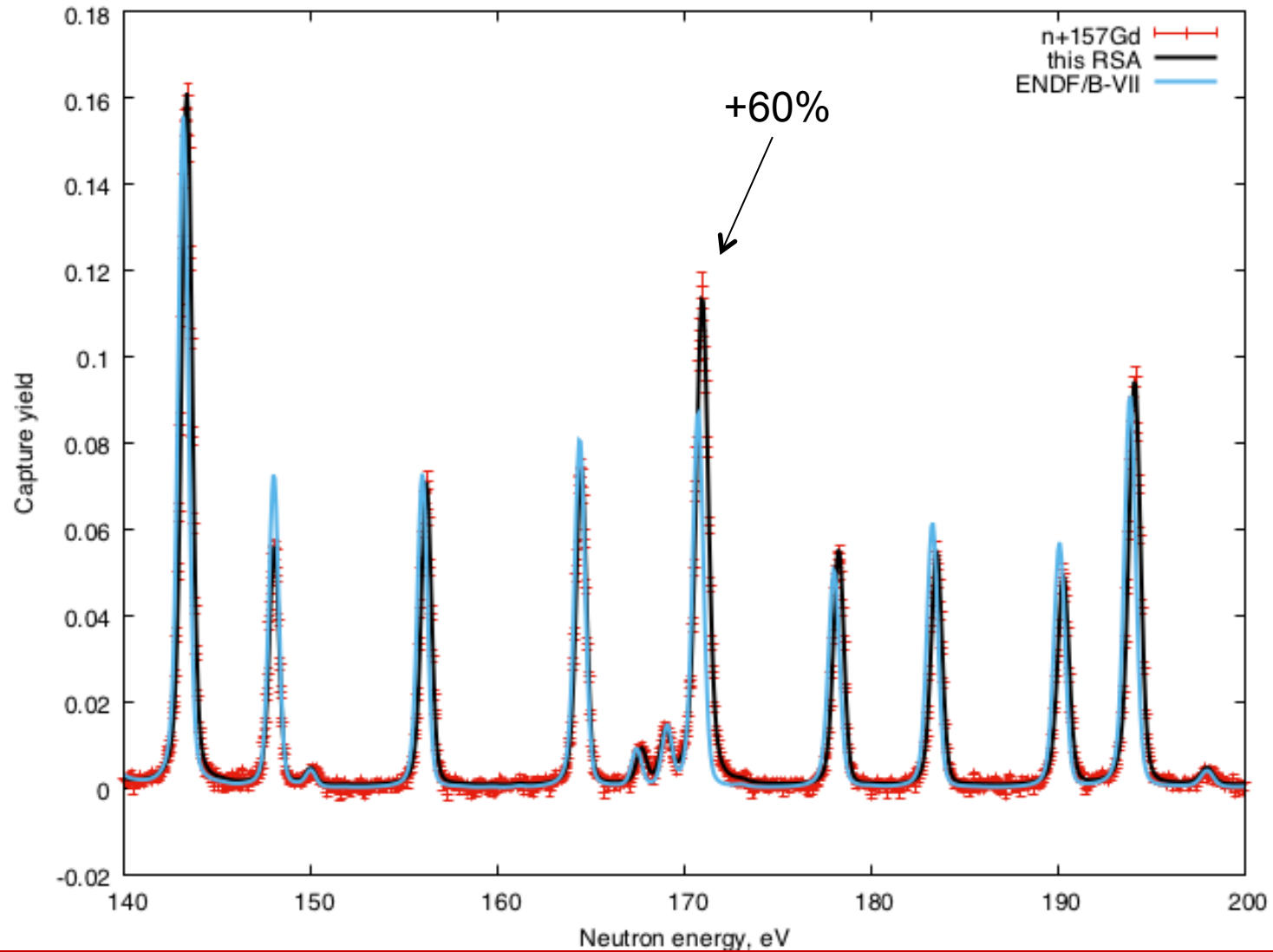


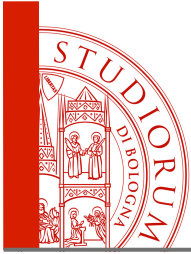
RSA ^{157}Gd



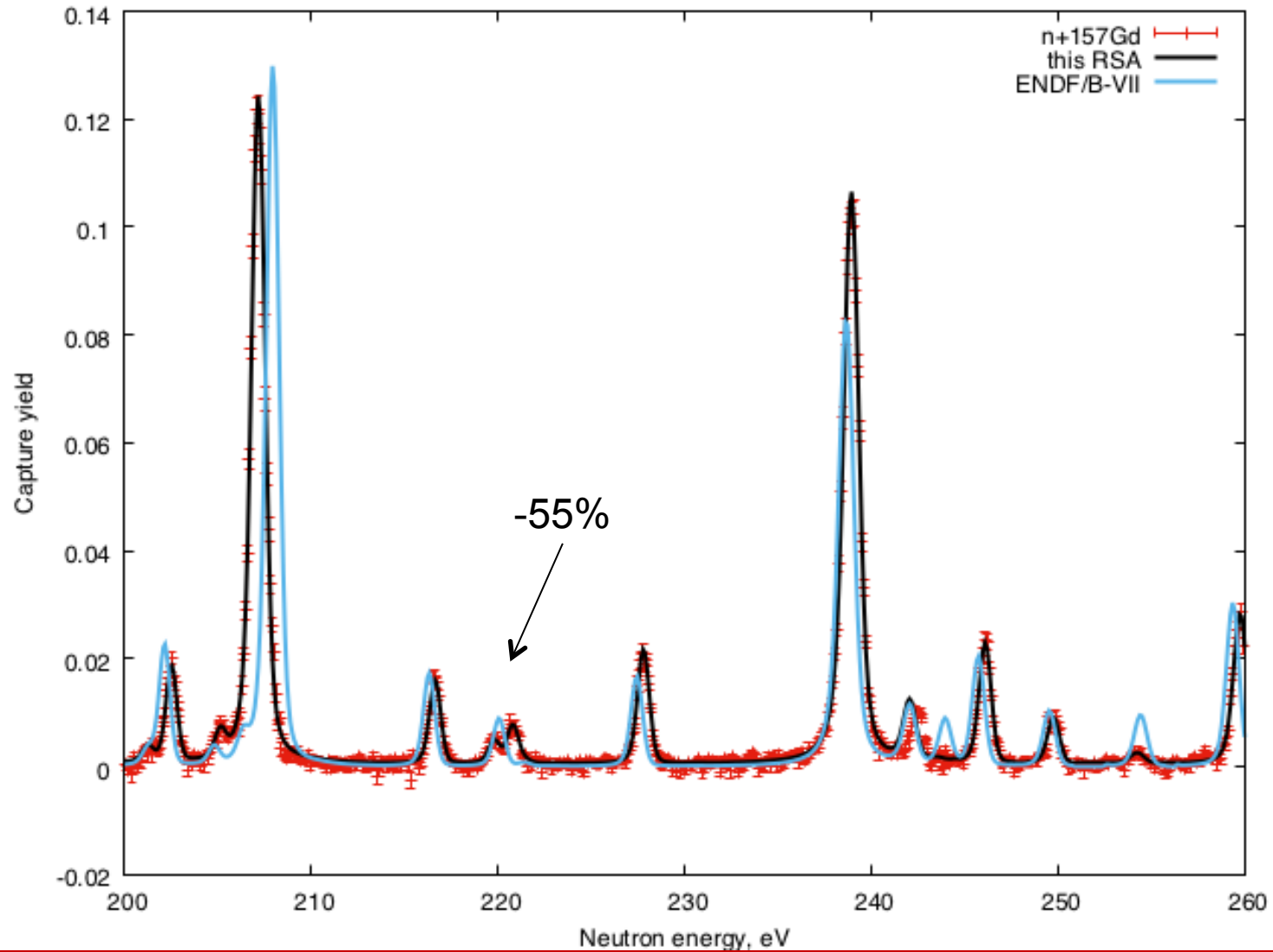


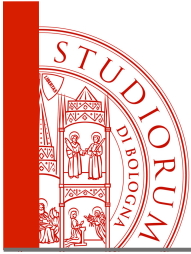
RSA ^{157}Gd



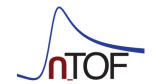
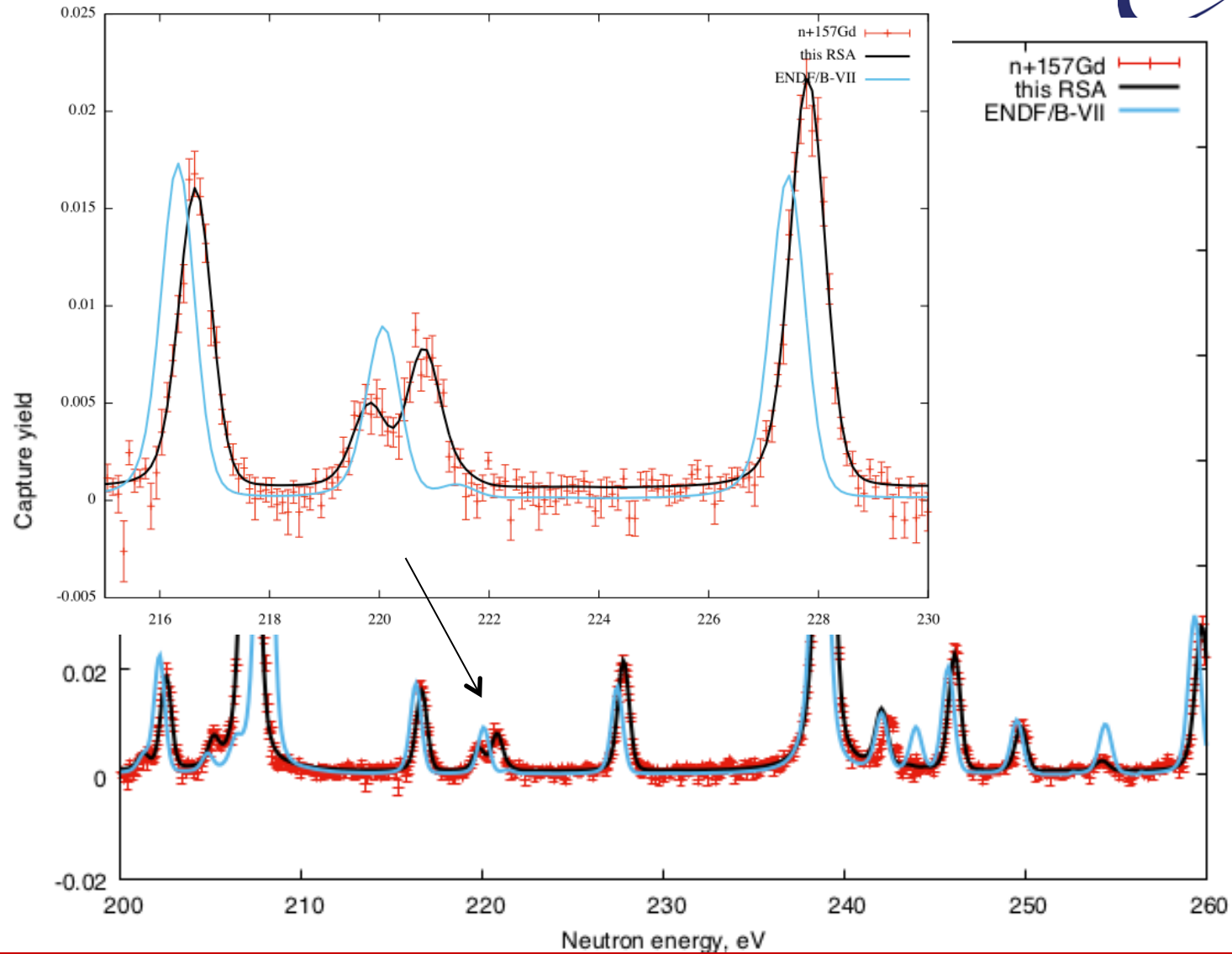


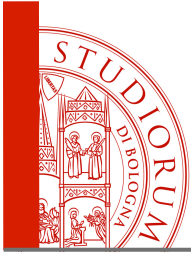
RSA ^{157}Gd



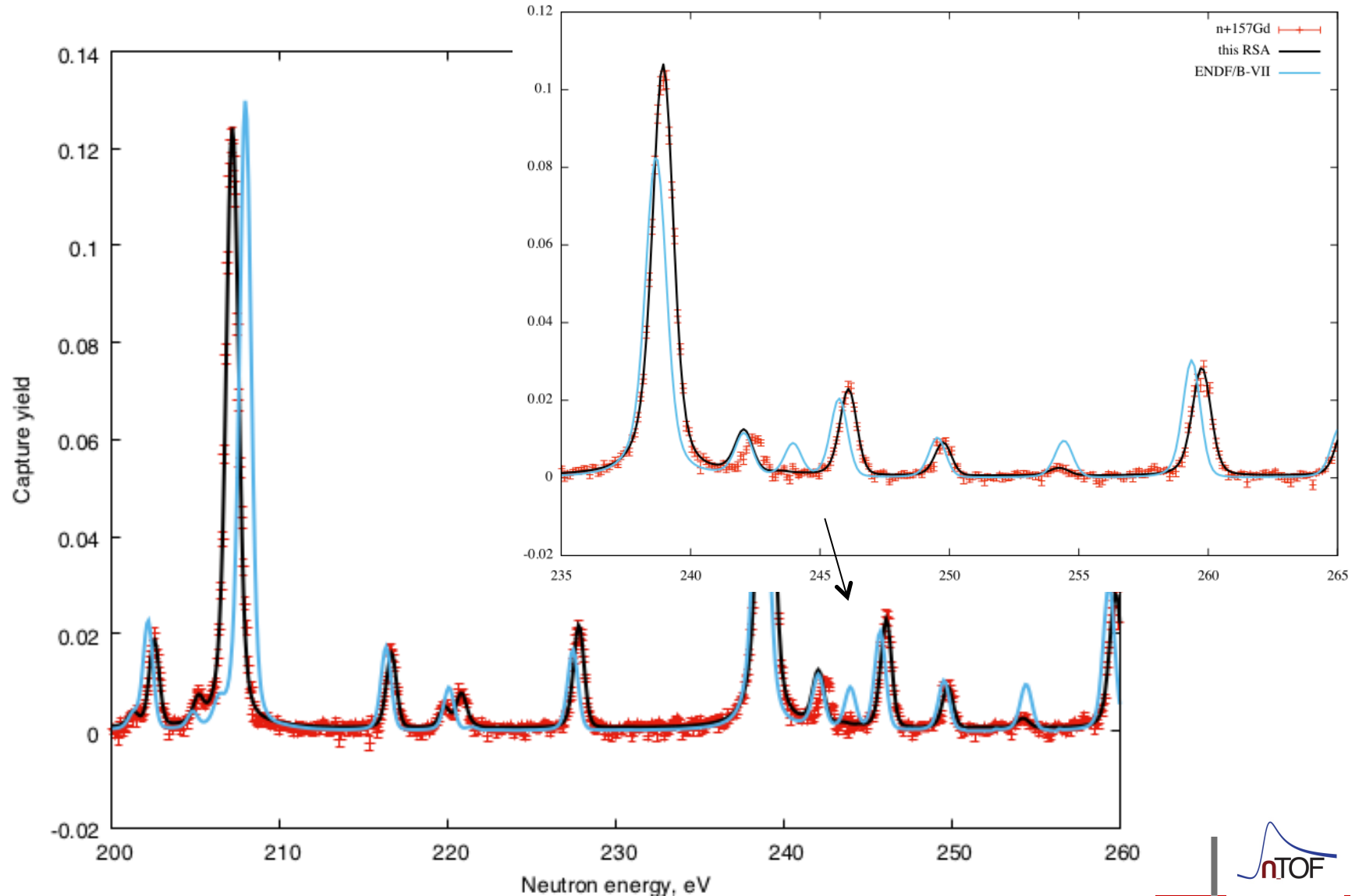


RSA ^{157}Gd



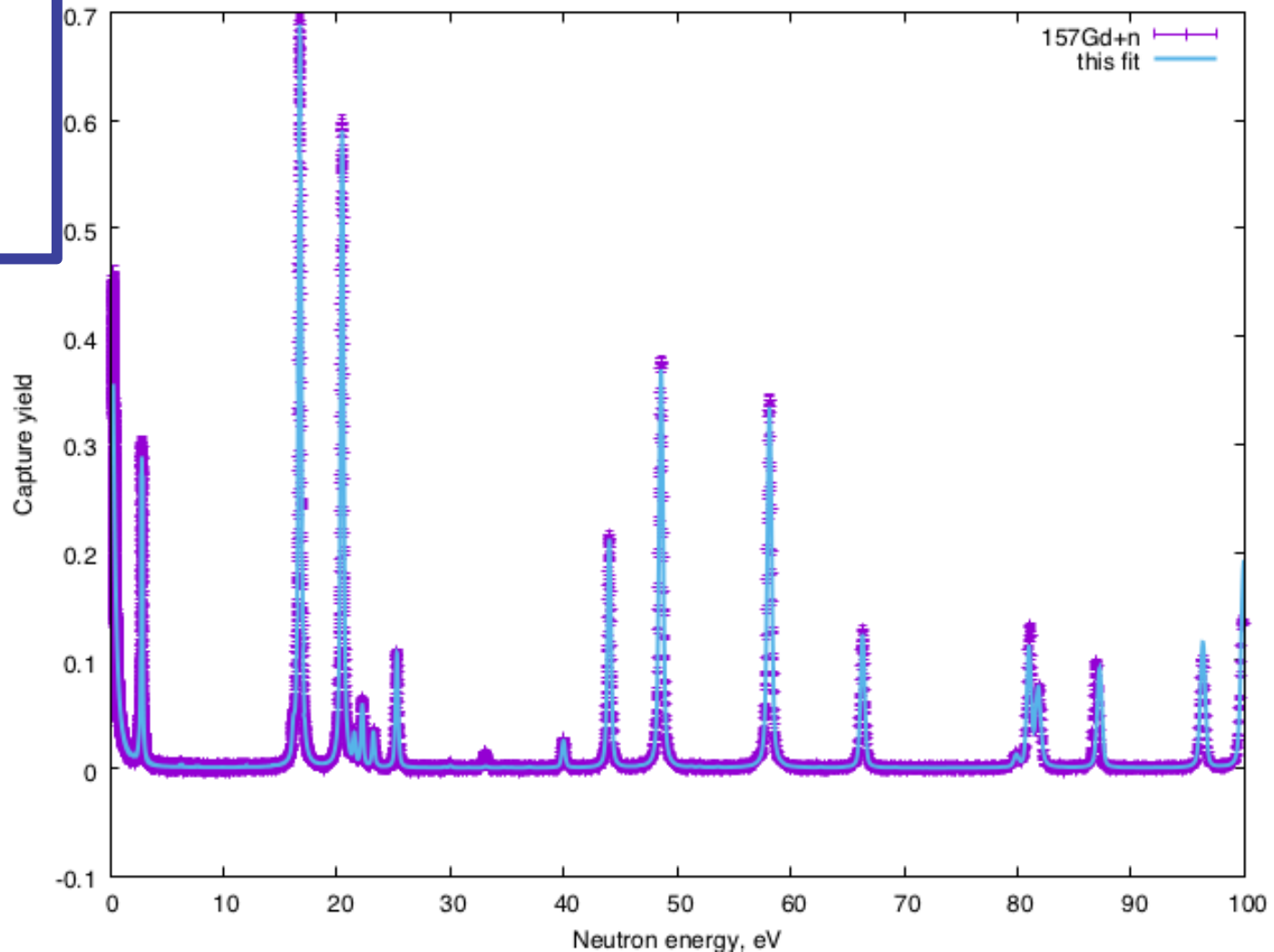


RSA ^{157}Gd



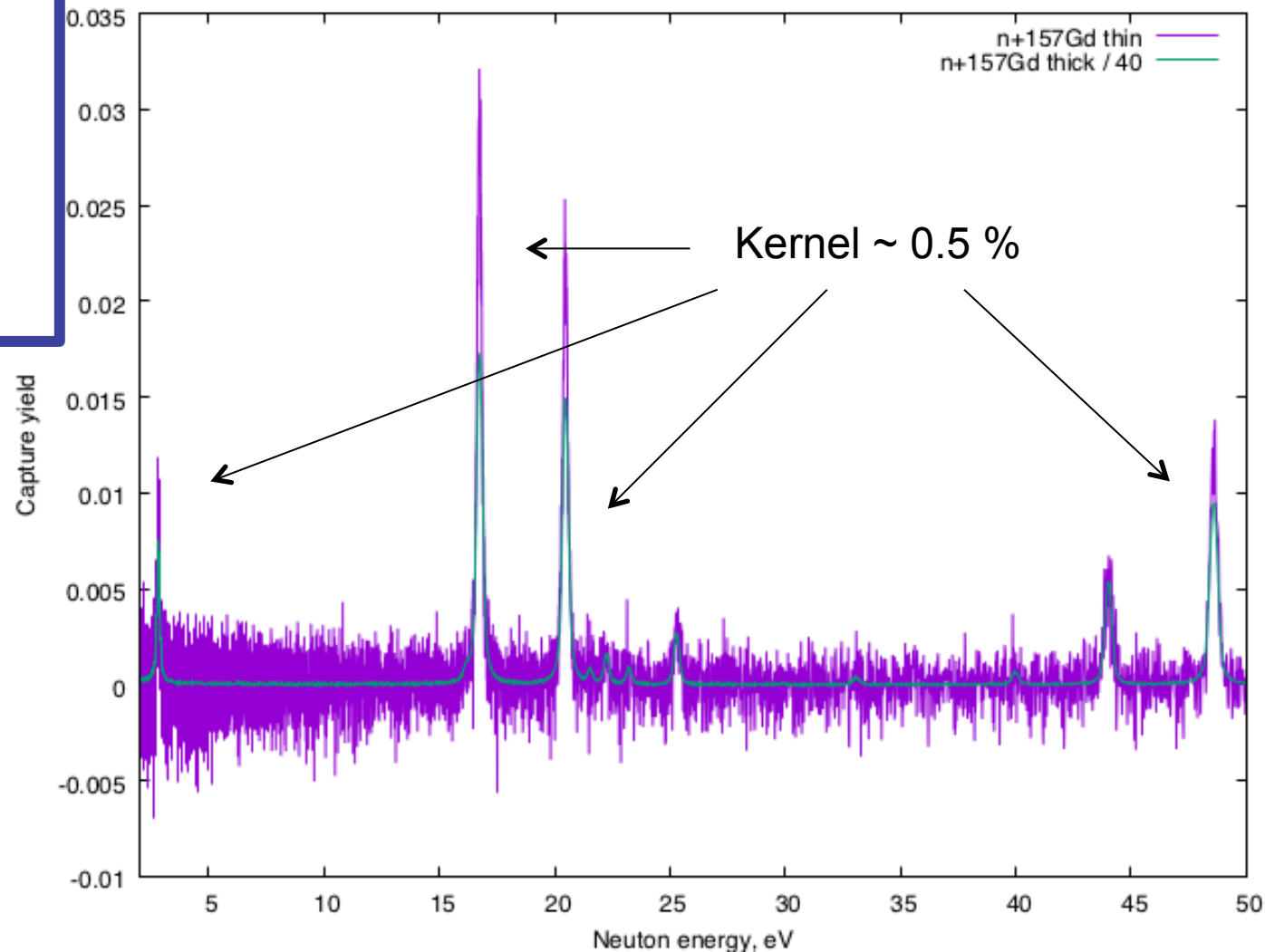
Studi di
Qualità

- **Gd157**
thick



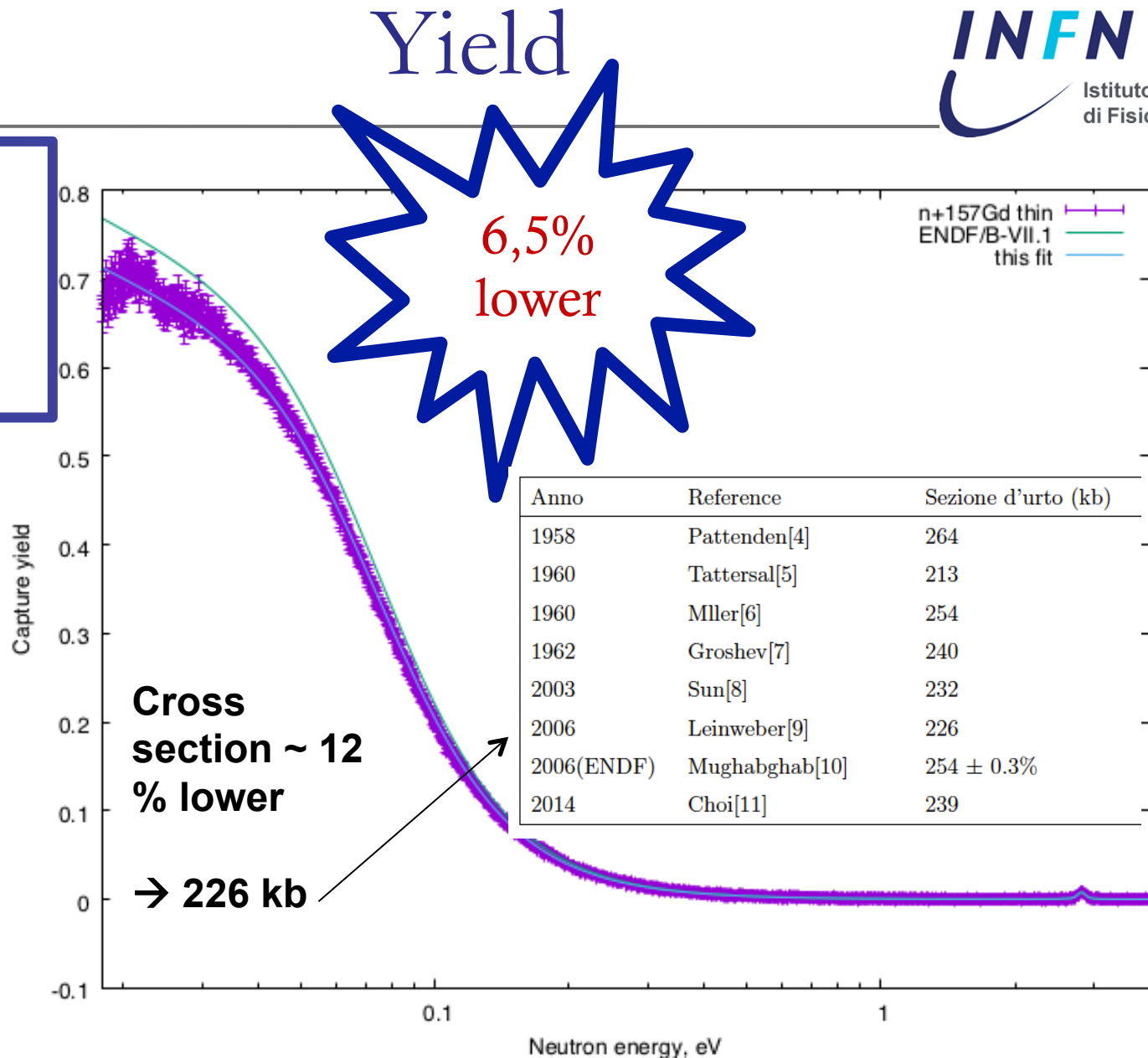
Studi di
Qualità

- **Gd157
thick &
thin**



Studi di
Qualità

- **Gd157 thin**

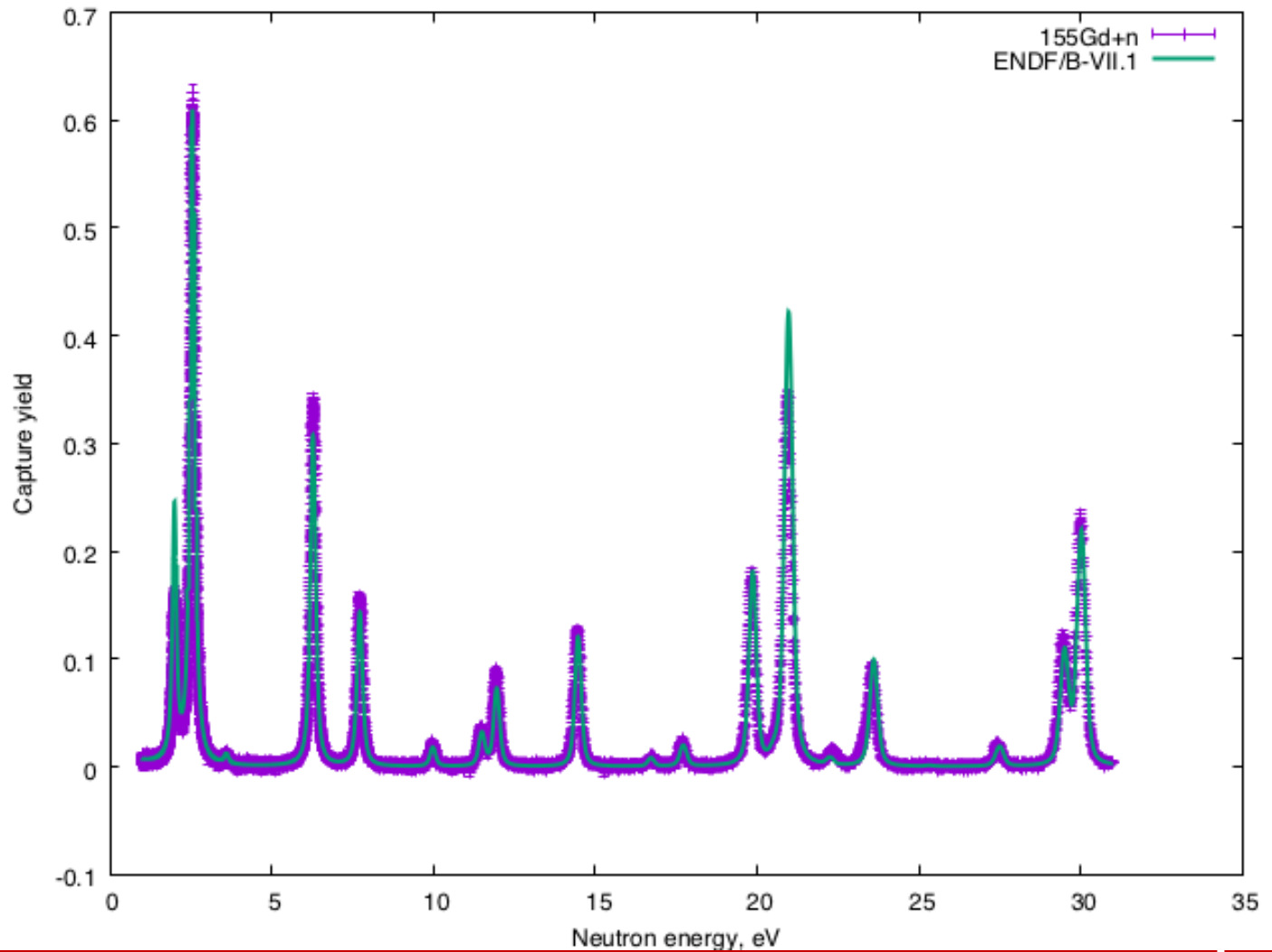




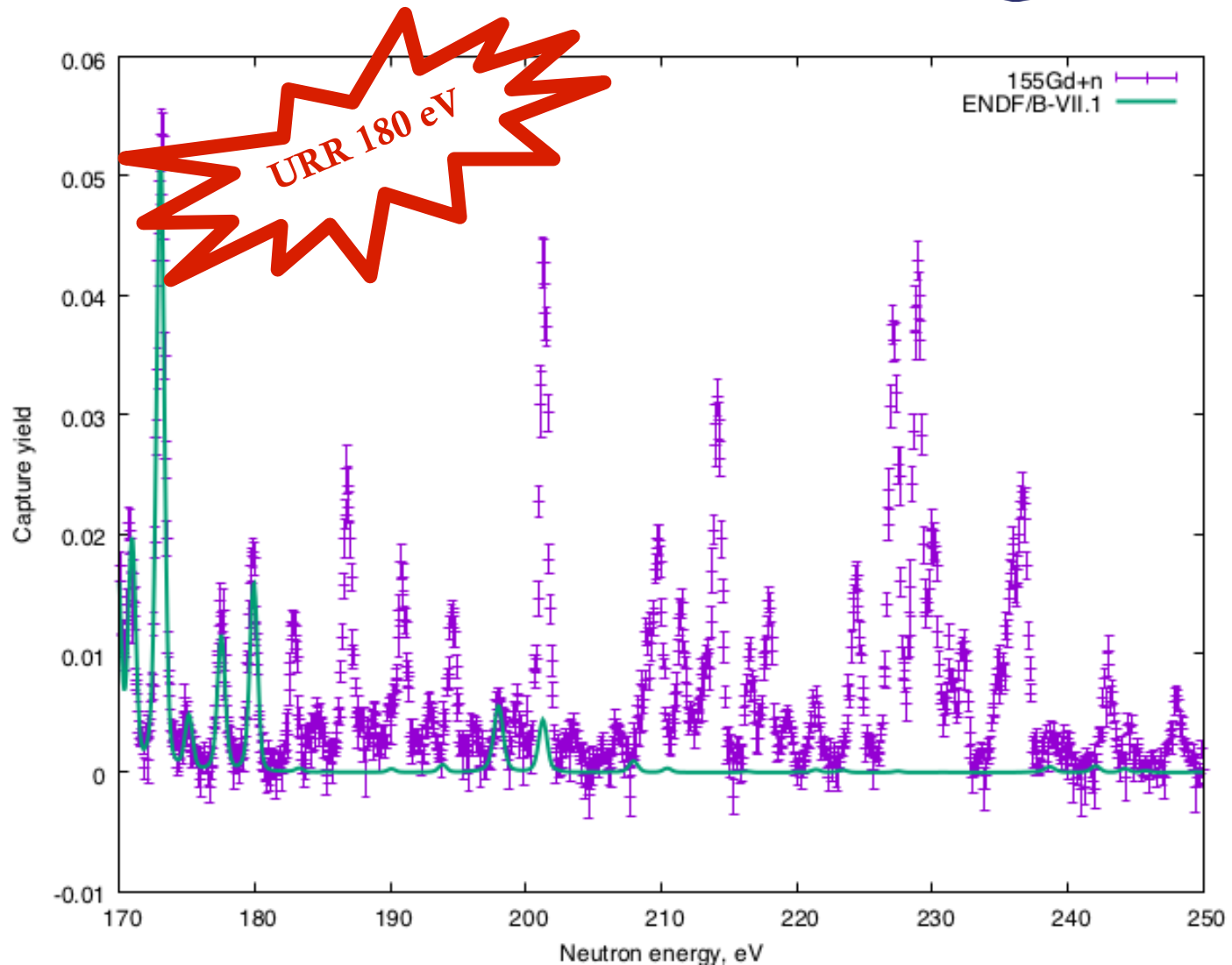
Yield

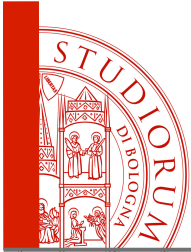


Gd155
Thick

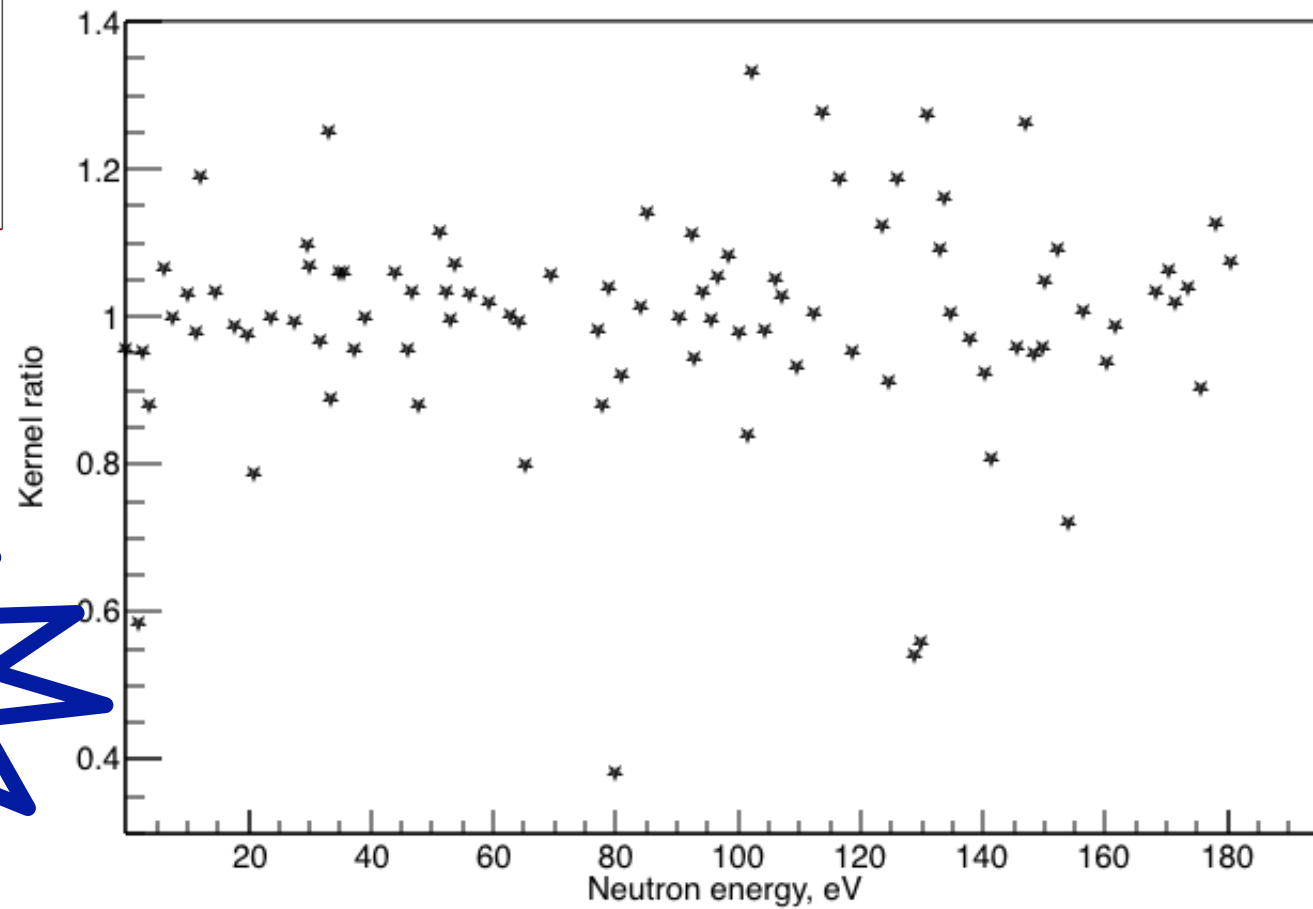
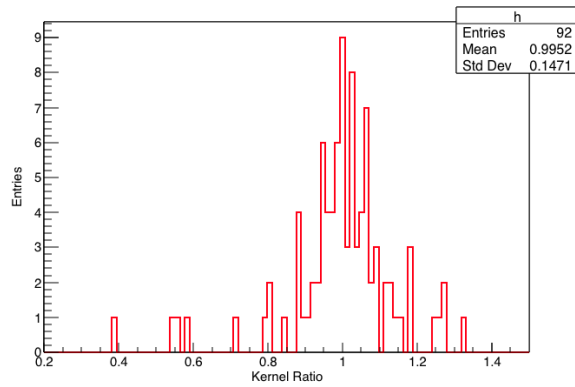


**Gd155
Thick**





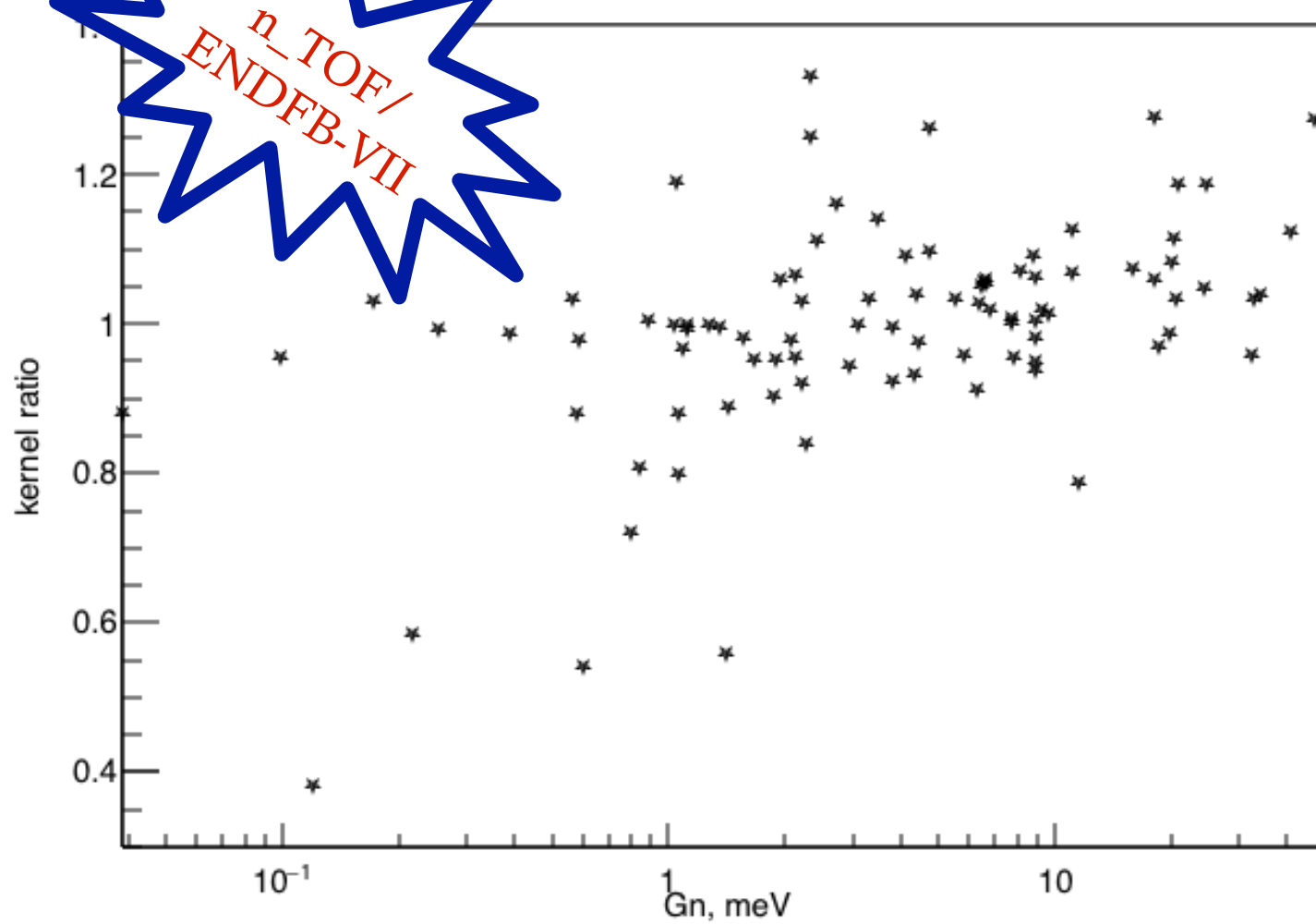
RSA ^{155}Gd

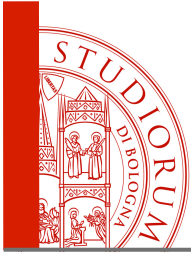


**n_TOF/
ENDFB-VII**

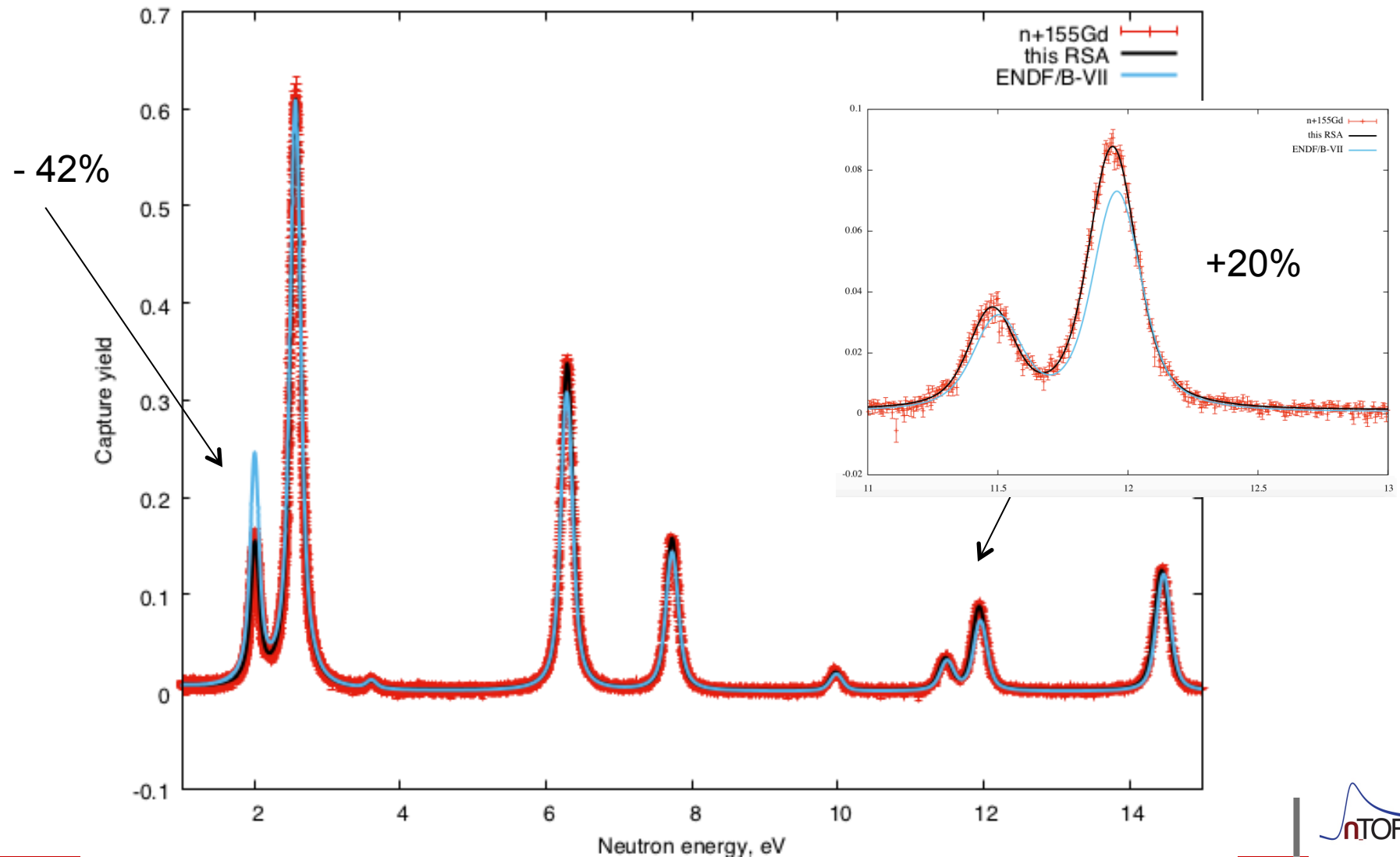


RSA ^{155}Gd



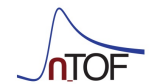
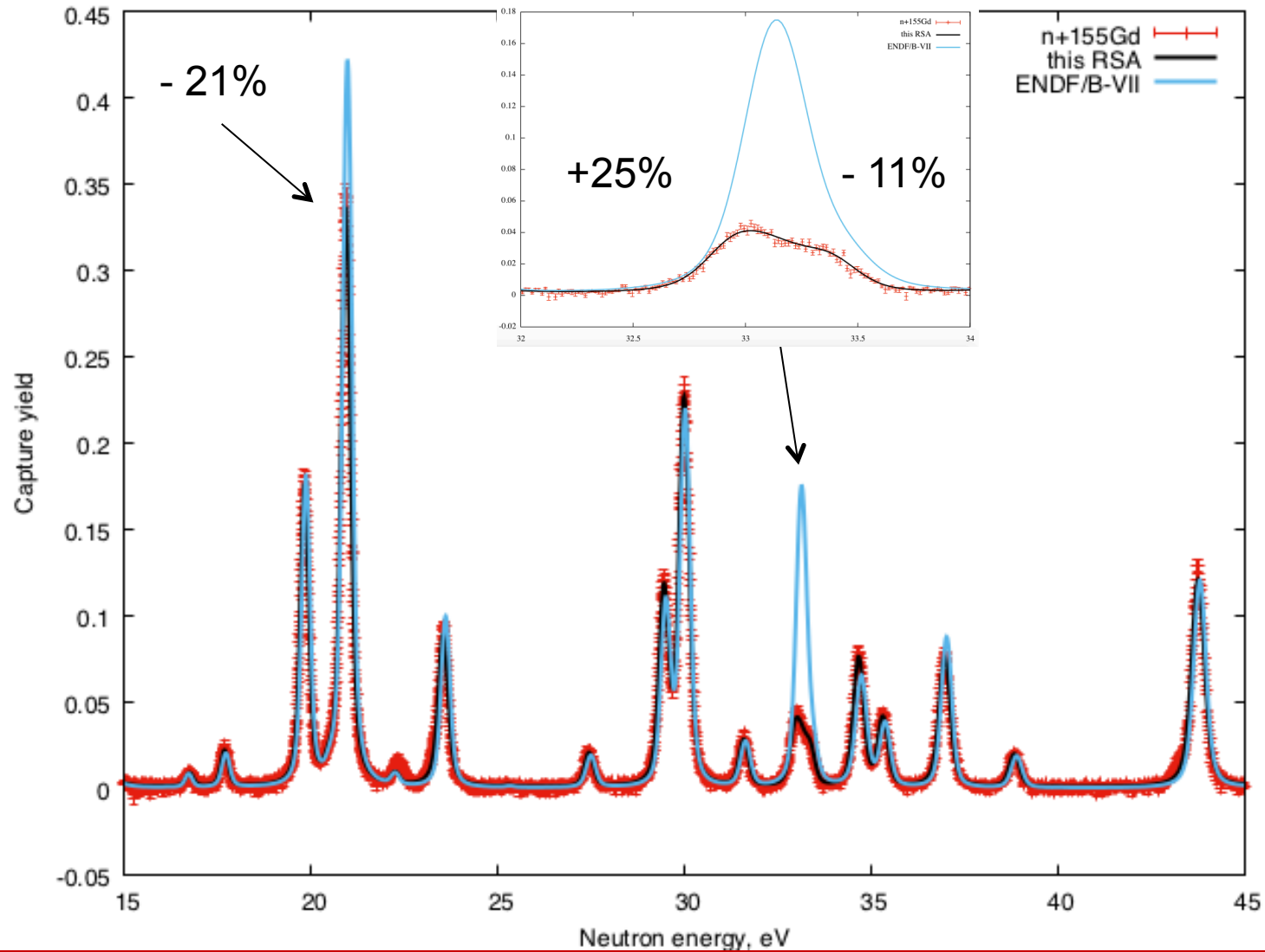


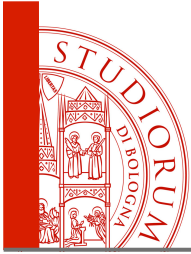
RSA ^{155}Gd



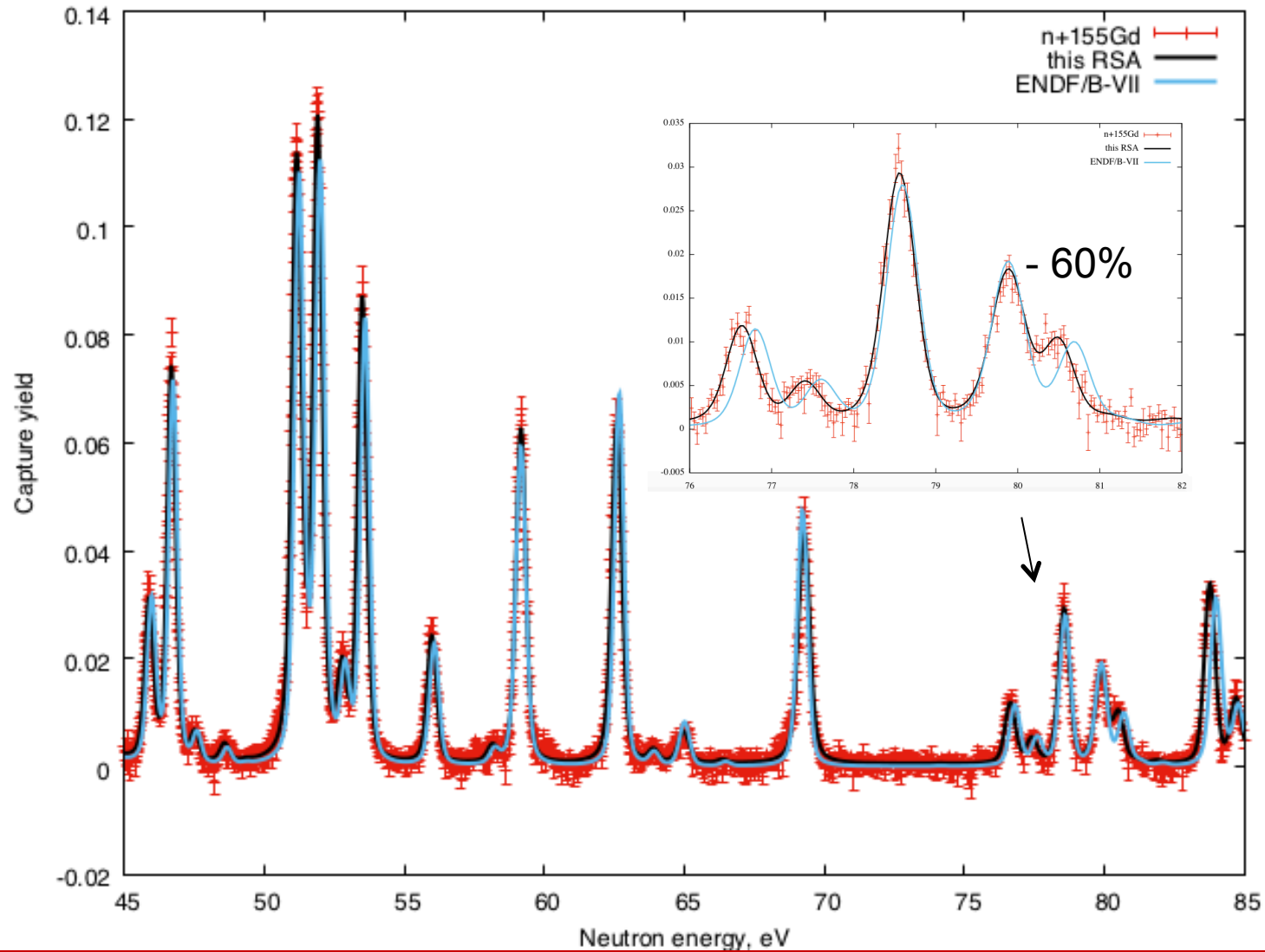


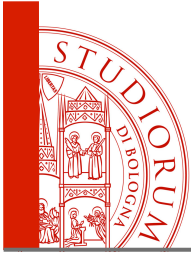
RSA ^{155}Gd



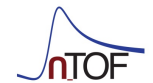
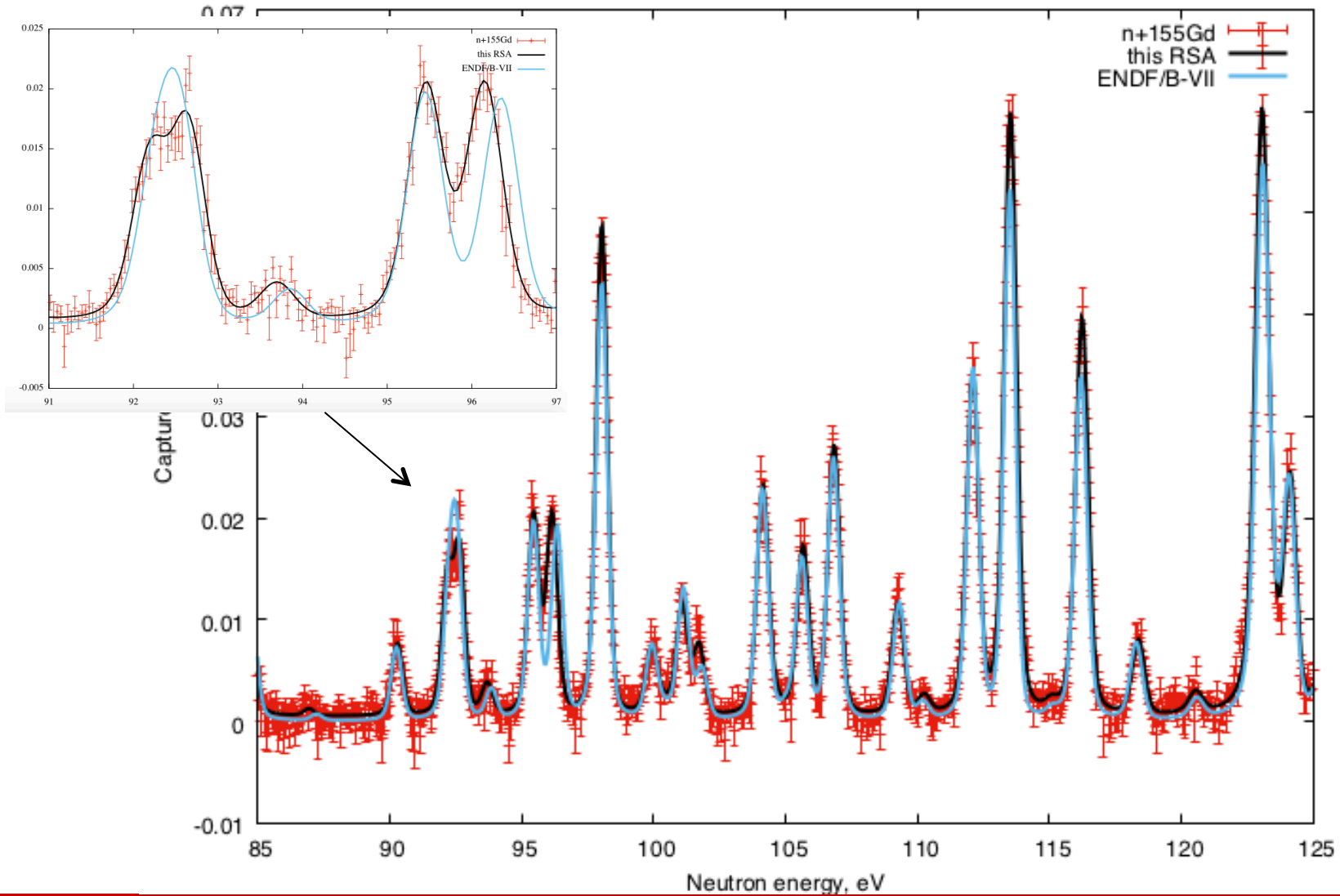


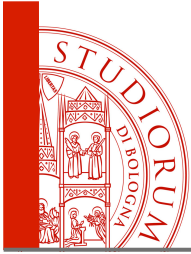
RSA ^{155}Gd



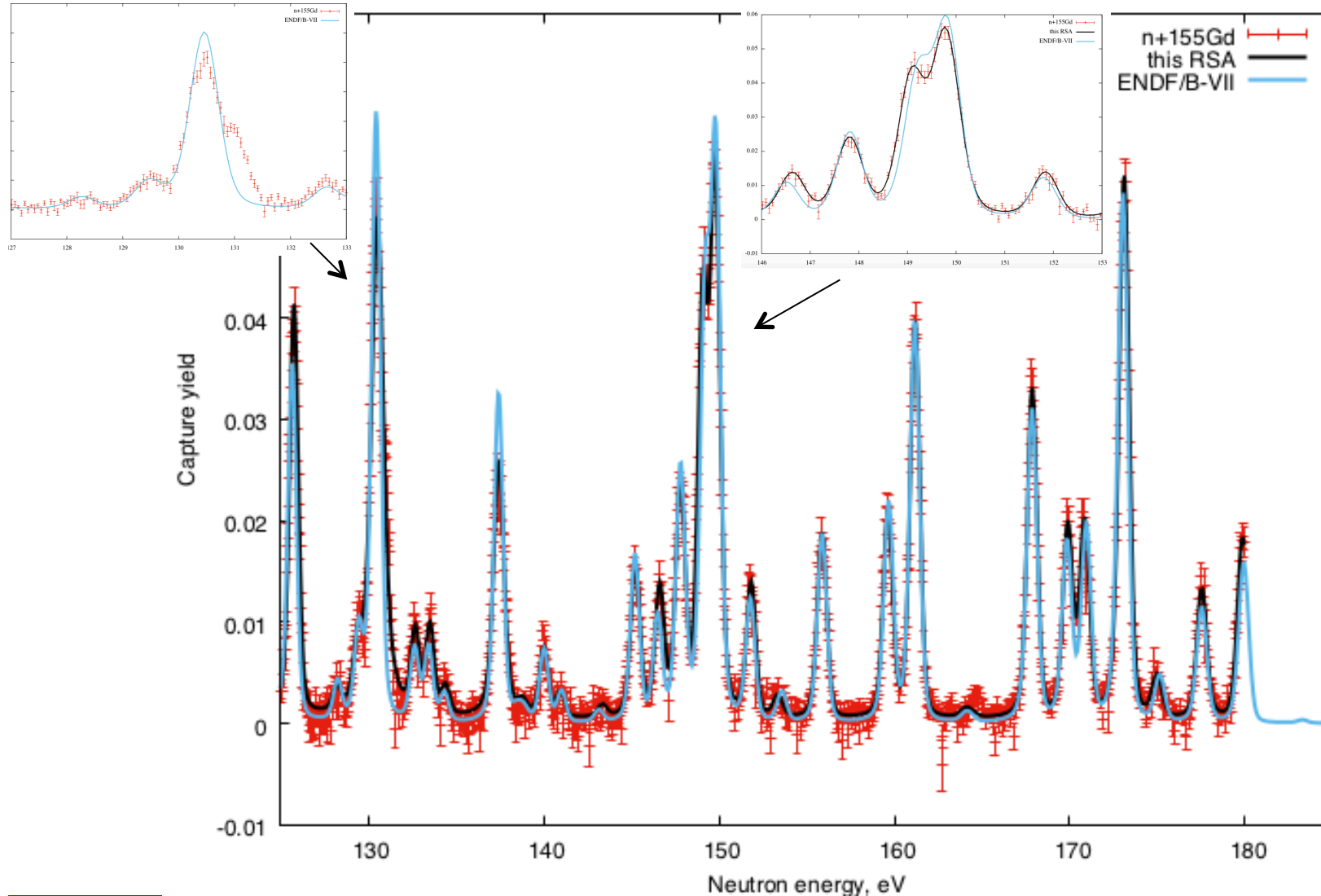


RSA ^{155}Gd



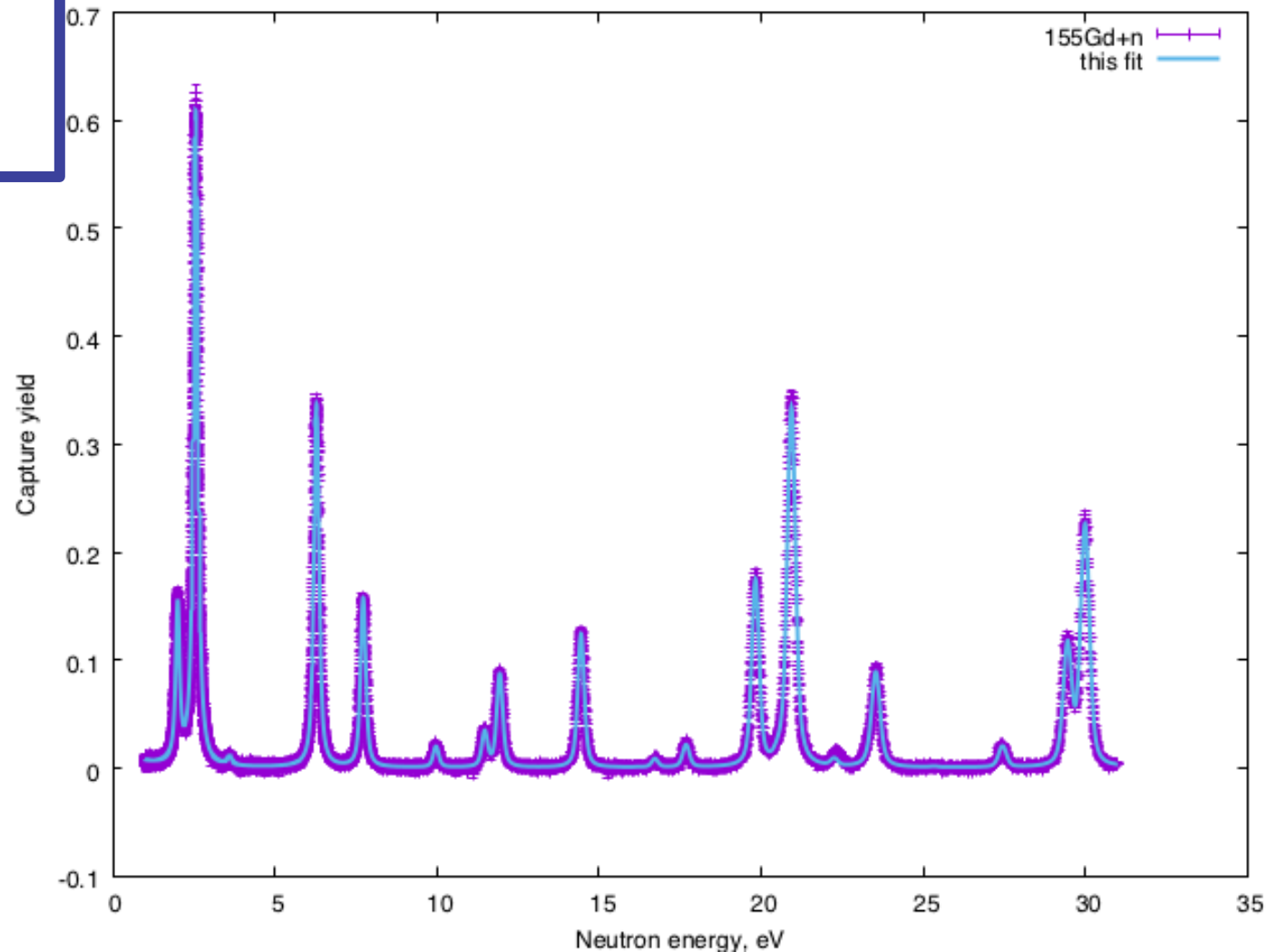


RSA ^{155}Gd



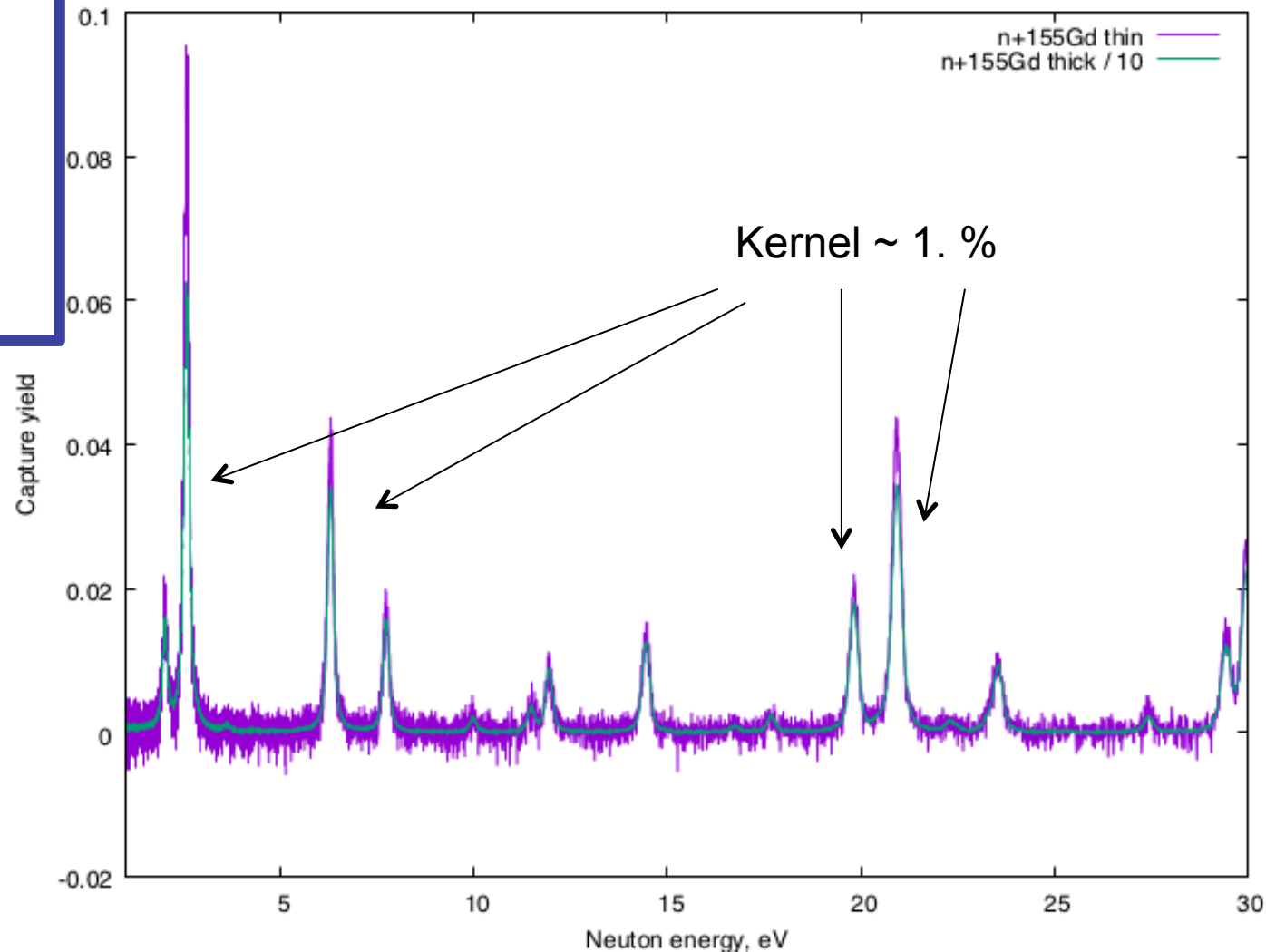
Studi di
Qualità

- Gd155



Studi di
Qualità

- **Gd155
thick &
thin**





Studi di
Qualità

- **Gd155
thin**

