



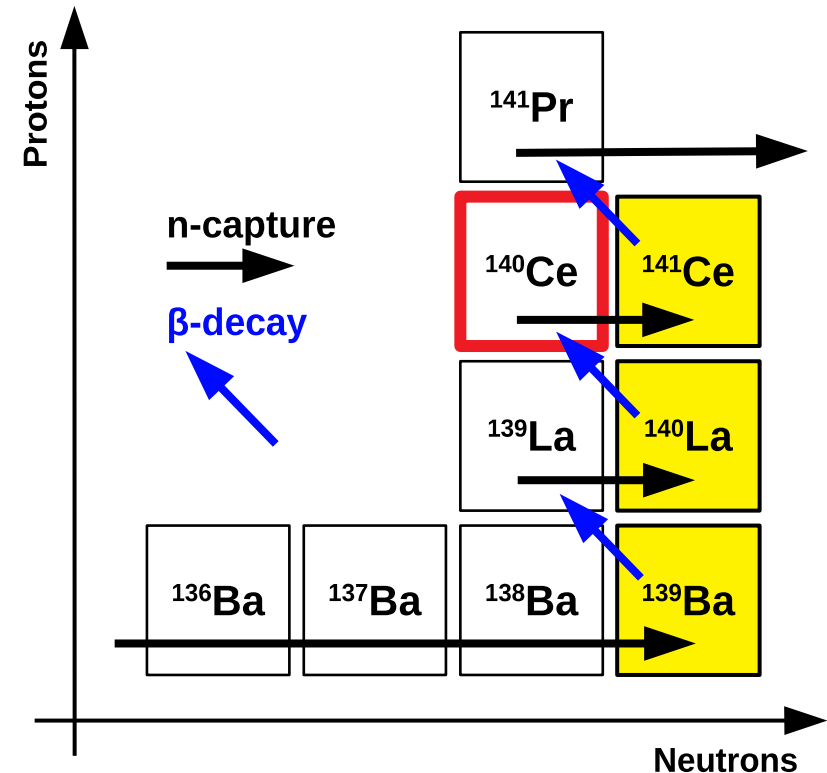
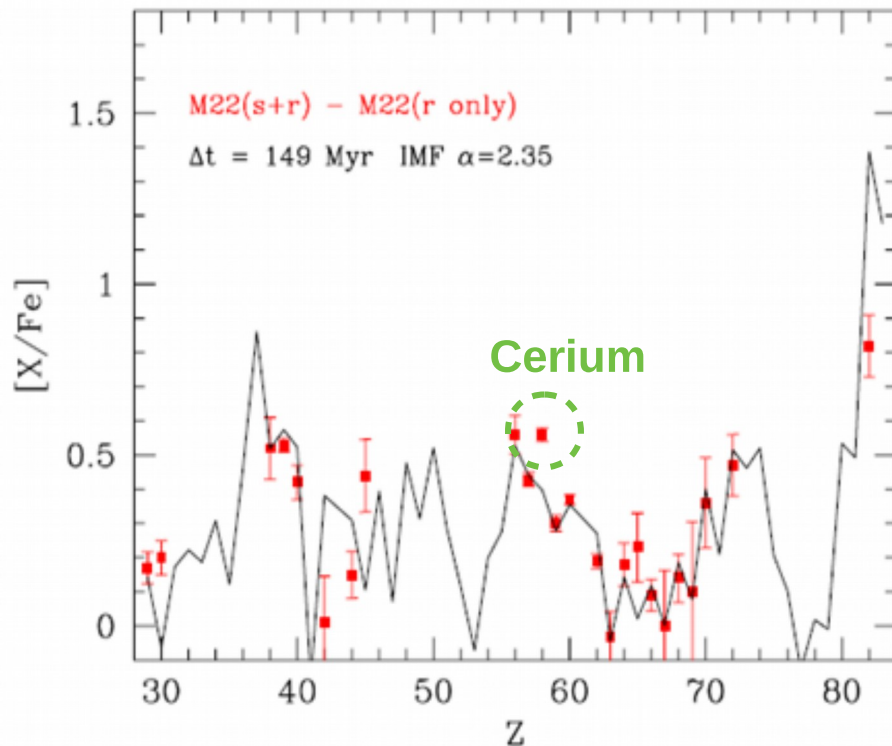
Status of $^{140}\text{Ce}(n,\gamma)$



Why Cerium?

Cerium is mostly produced via **s-process**, the final abundance of ^{140}Ce (89% of natural cerium) predicted by stellar models strongly depends on its destruction channel $^{140}\text{Ce}(n,\gamma)$.

Small cross section (magic number of neutrons), the **MACS (Maxwellian average cross section)** is determined by resonances in keV region.

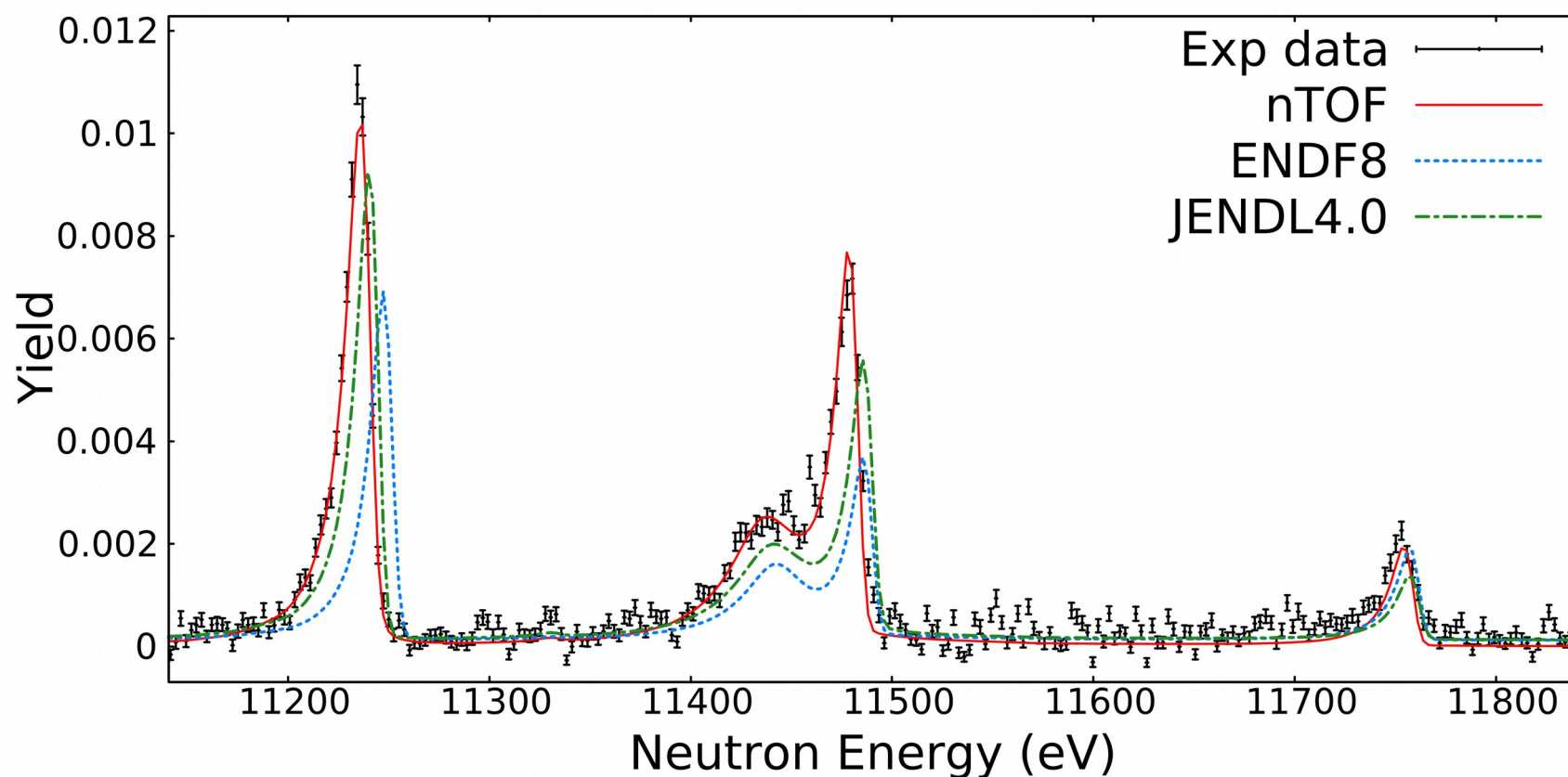


O. Straniero, S. Cristallo, L. Piersanti APJ **785** (2015) 77

Resonances analysis

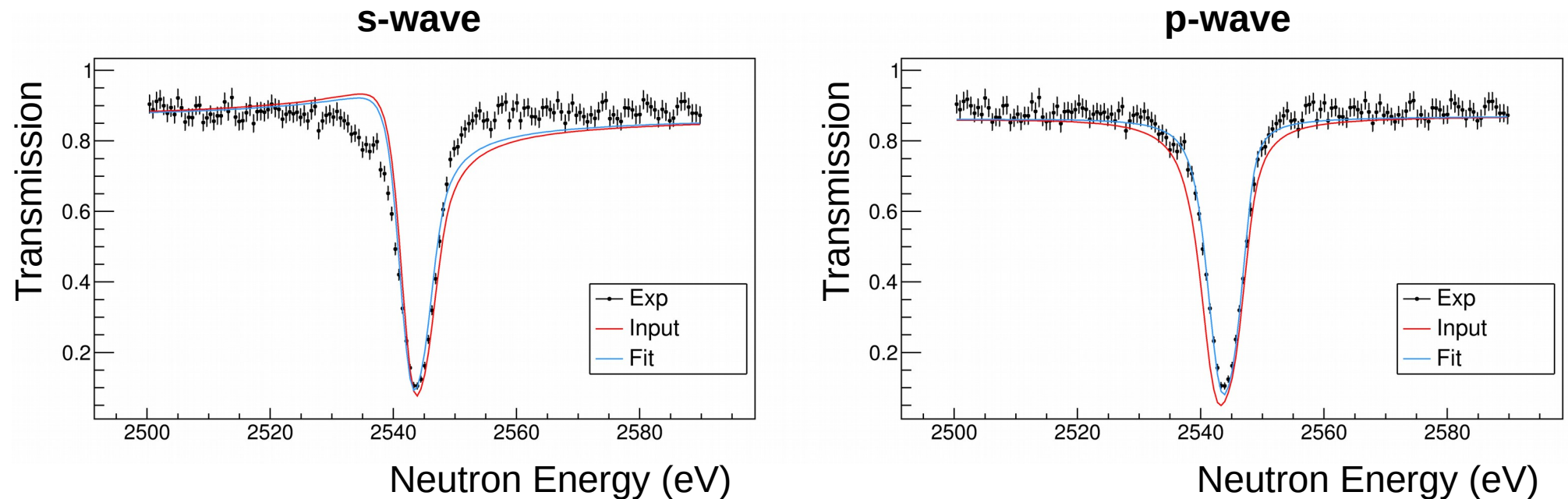
The resonances has been analyzed **up to 65 keV**, adopting the **JENDL4.0 spin&parity assignment** (same as ENDF-B/VIII & Mughabghab).

In general our data are in better agreement with JENDL4.0 parameters than ENDF8.



Wrong spin/parity in s-wave

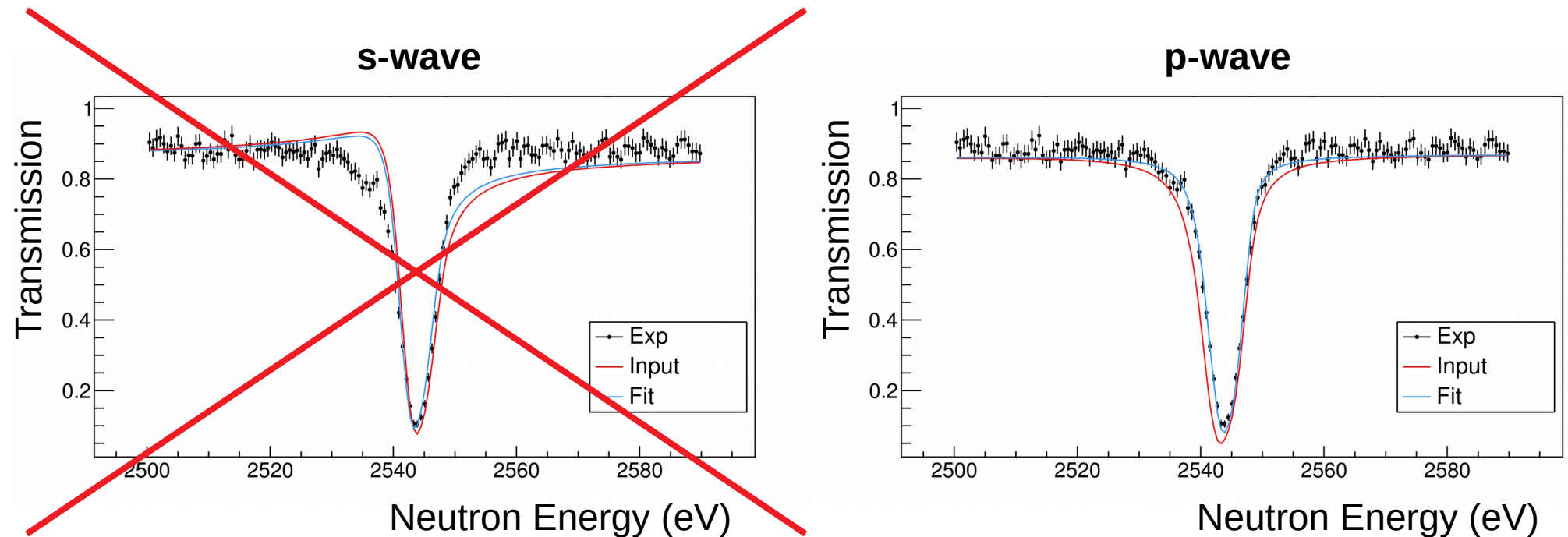
Further looking to the transmission data with the thick target, we noticed that **3 of the 16 fitted s-waves are clearly p-waves**:



Clearly the reduction of s-wave number impacts the relative spacing.

Wrong spin/parity in s-wave

Further looking to the transmission data we noticed that **3 of the 16 s-waves are clearly p-waves** as:



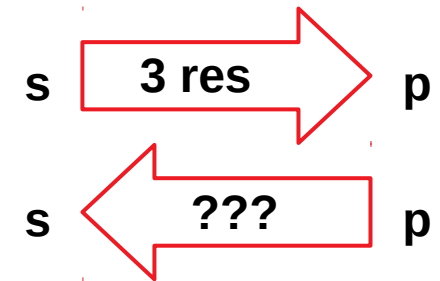
The 3 resonance have been fitted with the new spin combining transmission&capture data.

Conclusions and perspectives

A measurement of $^{140}\text{Ce}(n,\gamma)$ cross section has been successfully performed at n_TOF, the resonance analysis has been carried out up to 65 keV and the parameters of s and p waves has been estimated.

Next steps will be:

1) Check the correctness of the p-wave assignment.



Conclusions and perspectives

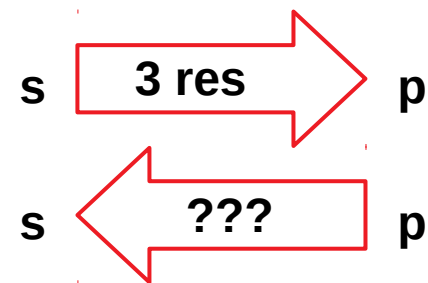
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0) Write paper for special issue of Universe



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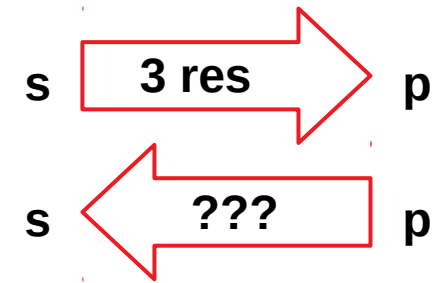
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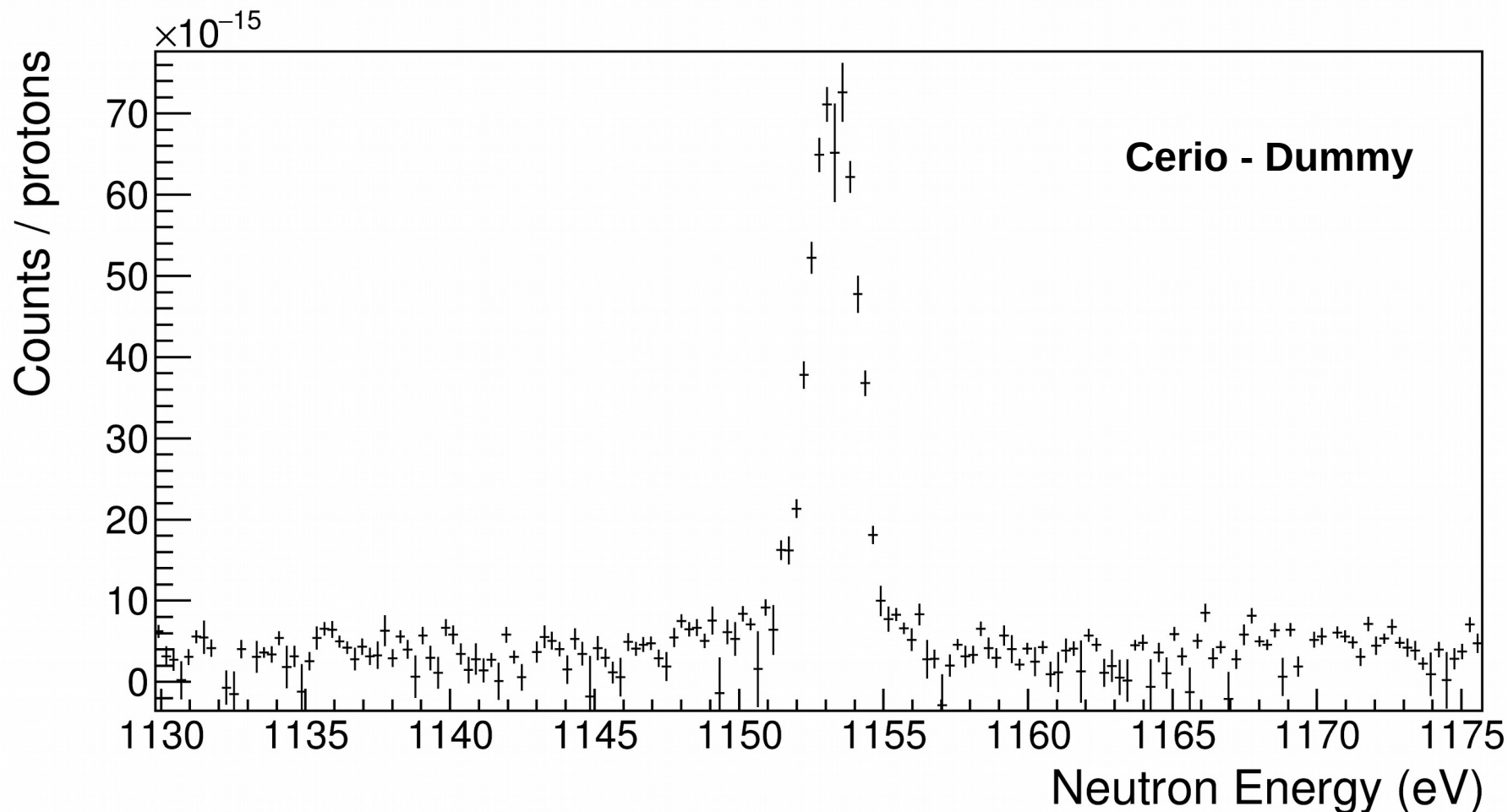


- 1) Check the correctness of the p-wave assignment.
- 2) Complete the work on resonances average parameters and spacing.
- 3) Compute the MACS.
- 4) Include the new MACS in the stellar model and evaluate the impact.



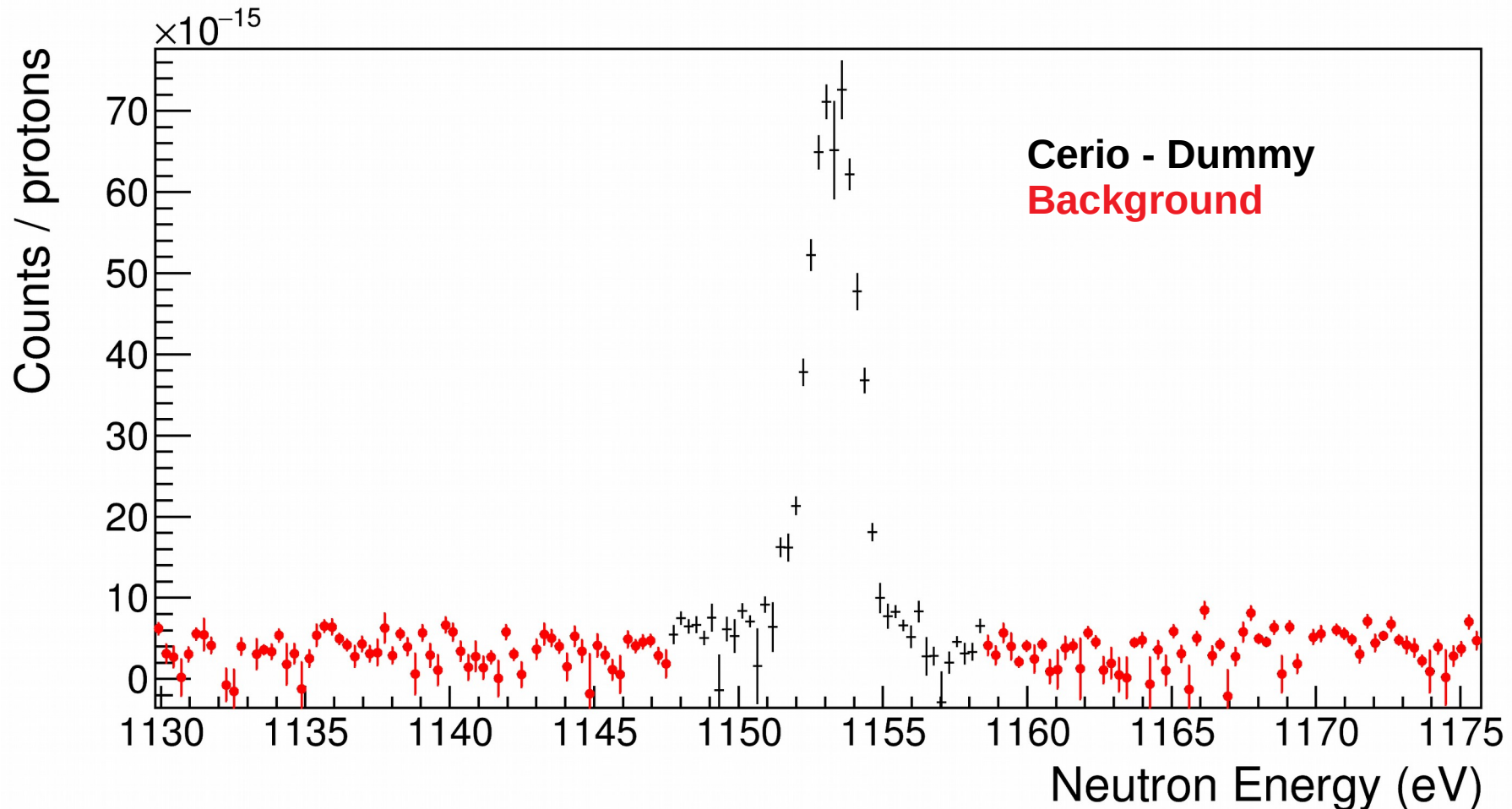
Room for improvement - Background

Il background che osserviamo è temporalmente non correlato, ha un andamento ragionevolmente smooth ed è molto maggiore dei segnali, eccetto che nelle risonanze di cattura del cerio. Quindi sottraggo il lo spettro misurato con il dummy:



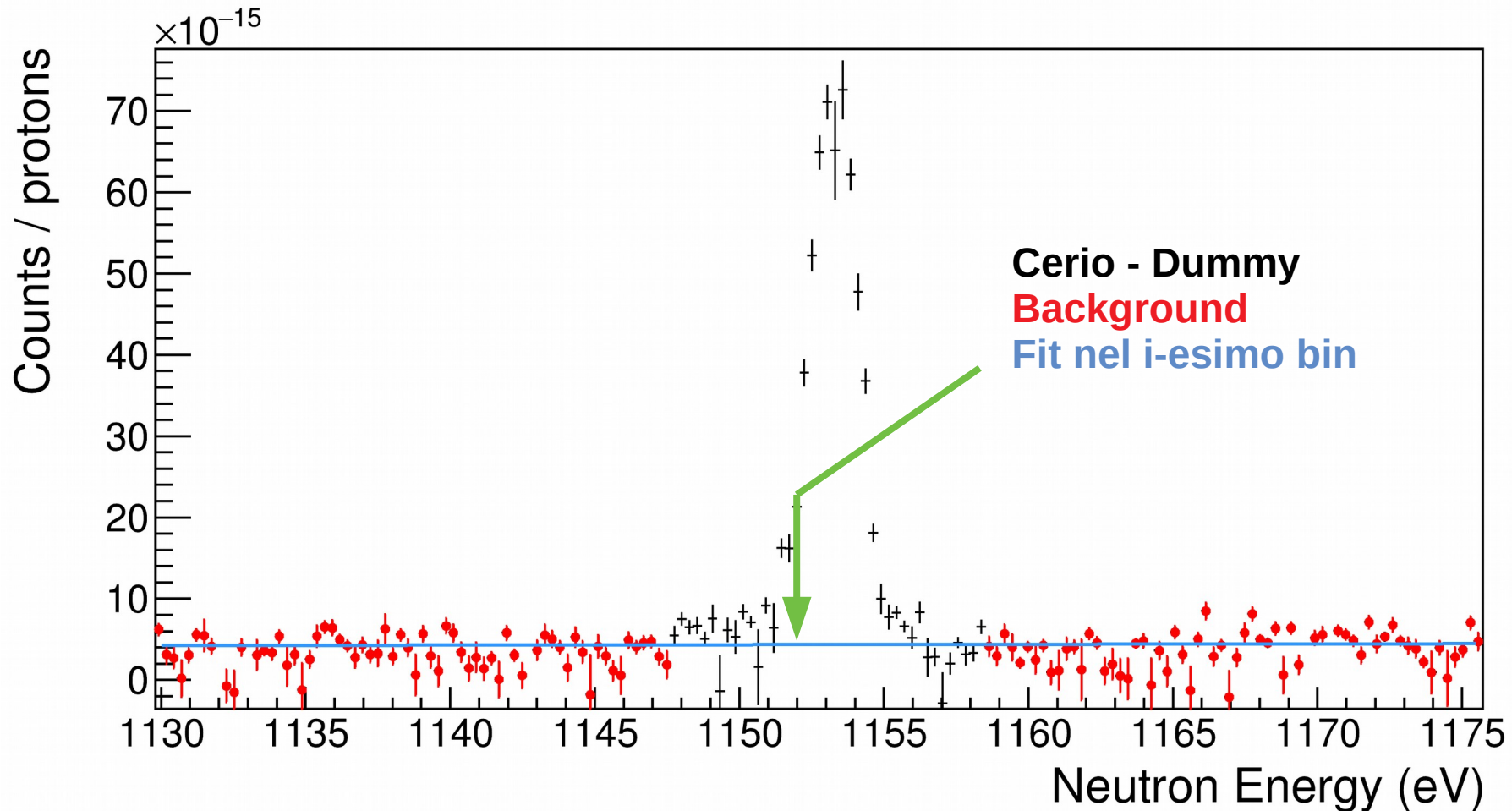
Room for improvement - Background

Creo uno **scatter plot**, sovrapposto al **Cerio-Dummy** ma in cui elimino le risonanze e il loro intorno:



Room for improvement - Background

Per ogni bin effettuo un fit lineare del **background**, per valutarlo nella regione della risonanza, sotto l'ipotesi di un andamento smooth.



Room for improvement - Background

Ottengo l'istogramma del background fittando lo **scatter plot** iniziale in un intervallo più largo di una risonanza, quindi valutando il background fittato nel centro del bin i-esimo.

