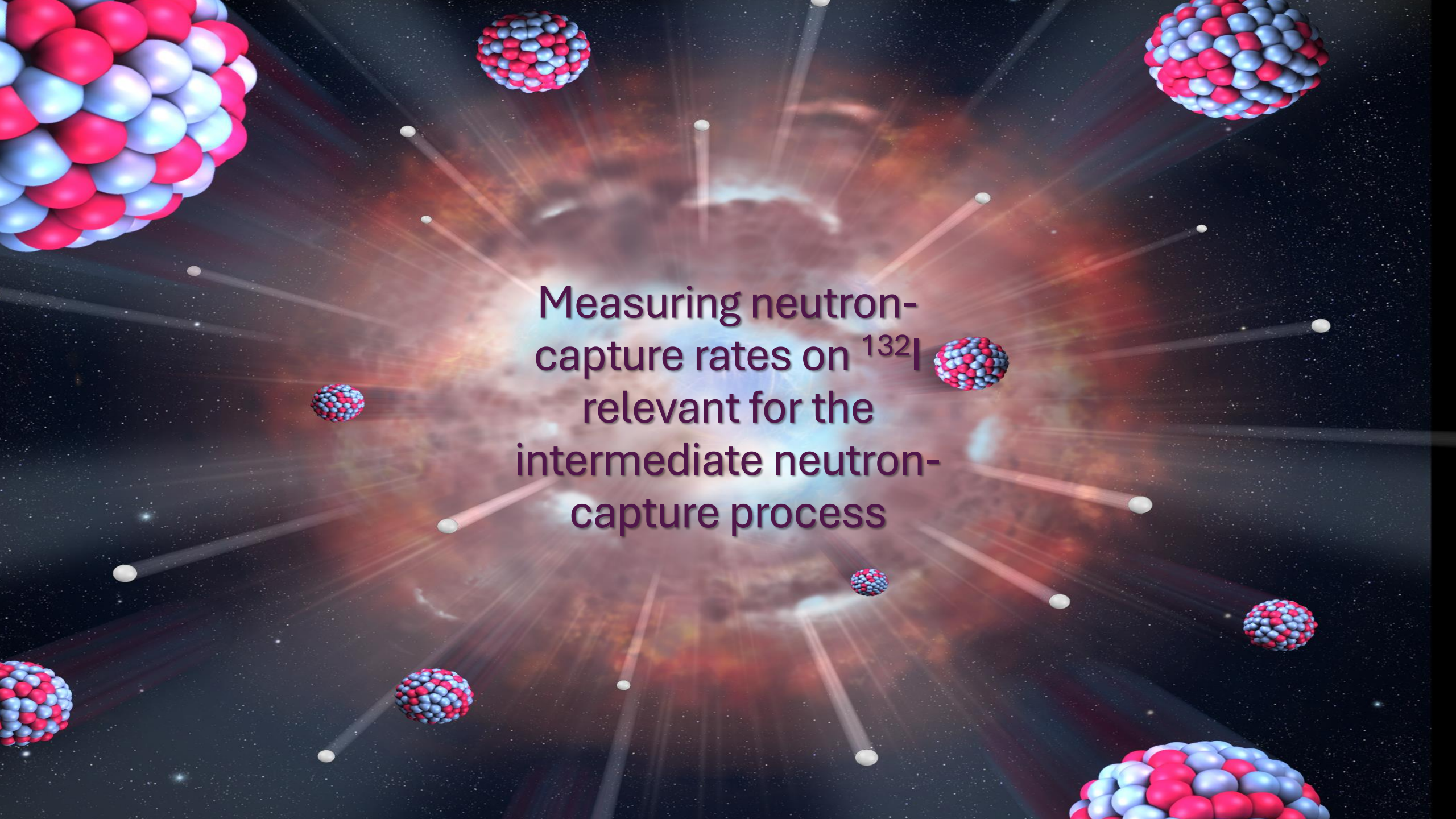
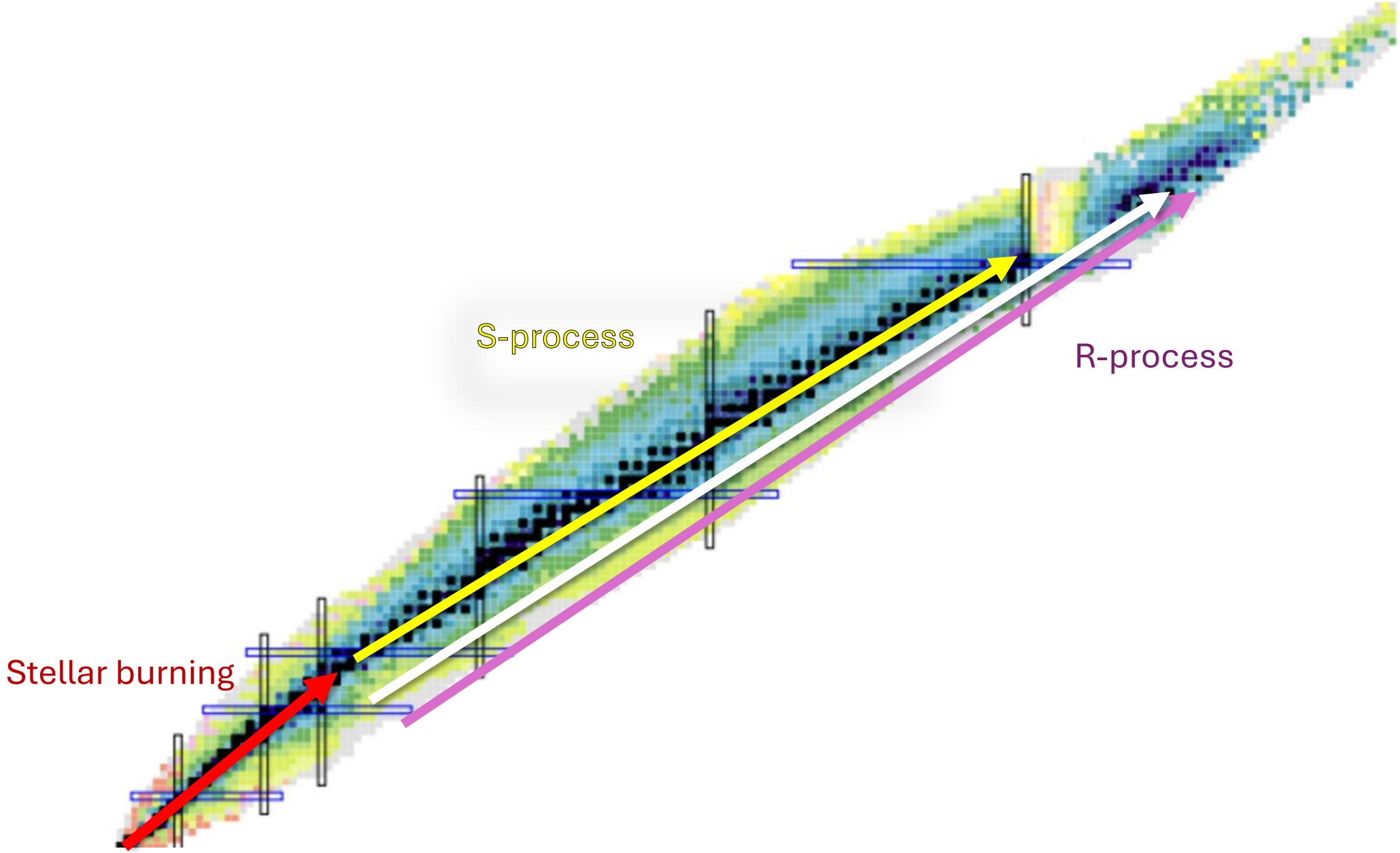
Indirect measurement of the ^{132}I(n,γ)^{133}I neutron-capture rate on the exotic ^{132}I for the intermediate neutron-capture process

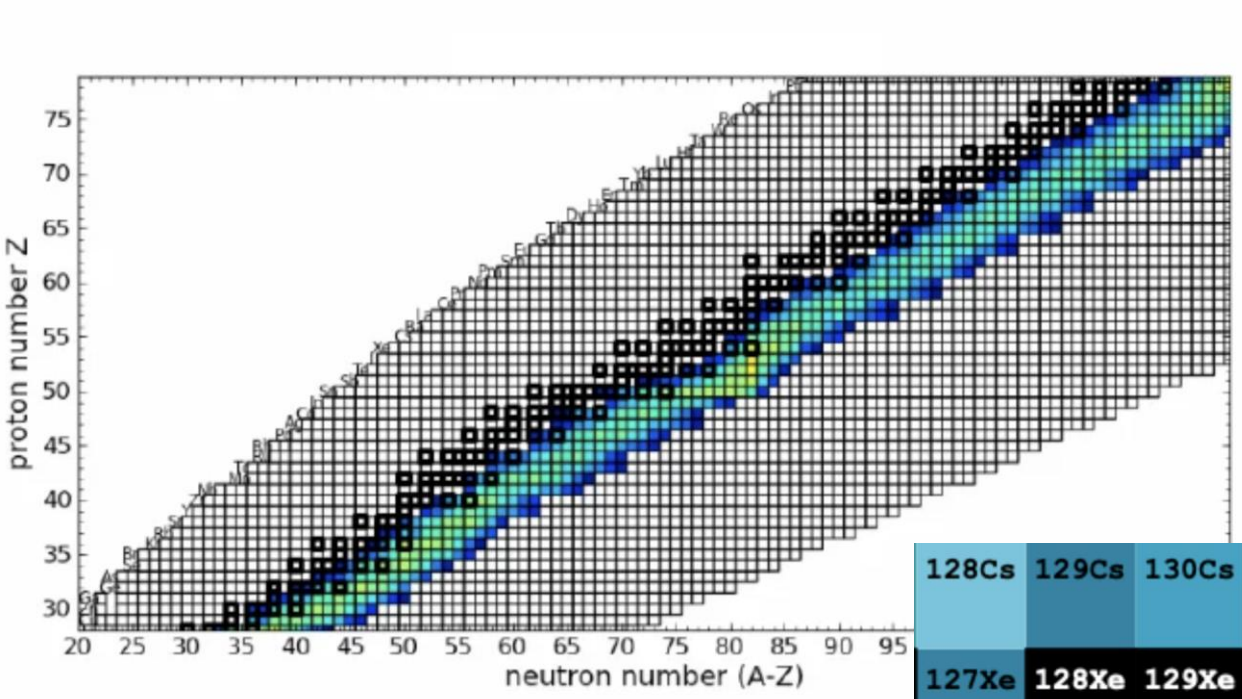

Measuring neutron-capture rates on ^{132}I relevant for the intermediate neutron-capture process

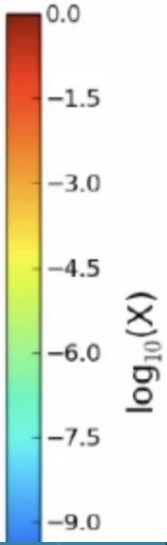

S-process
R-process
Stellar burning

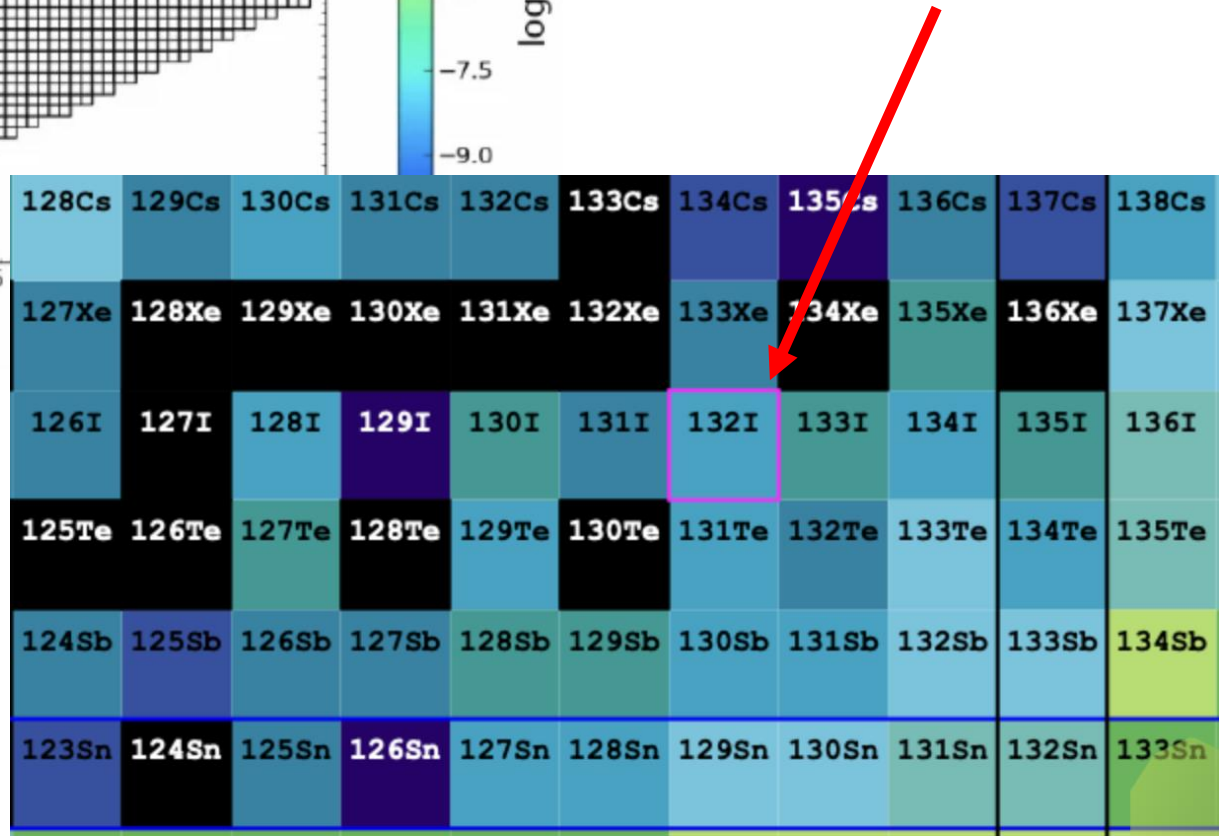
Accurate modelling of the *i*-process requires input on

neutron-capture rates

for unstable, neutron-rich nuclei such as ^{132}**I**





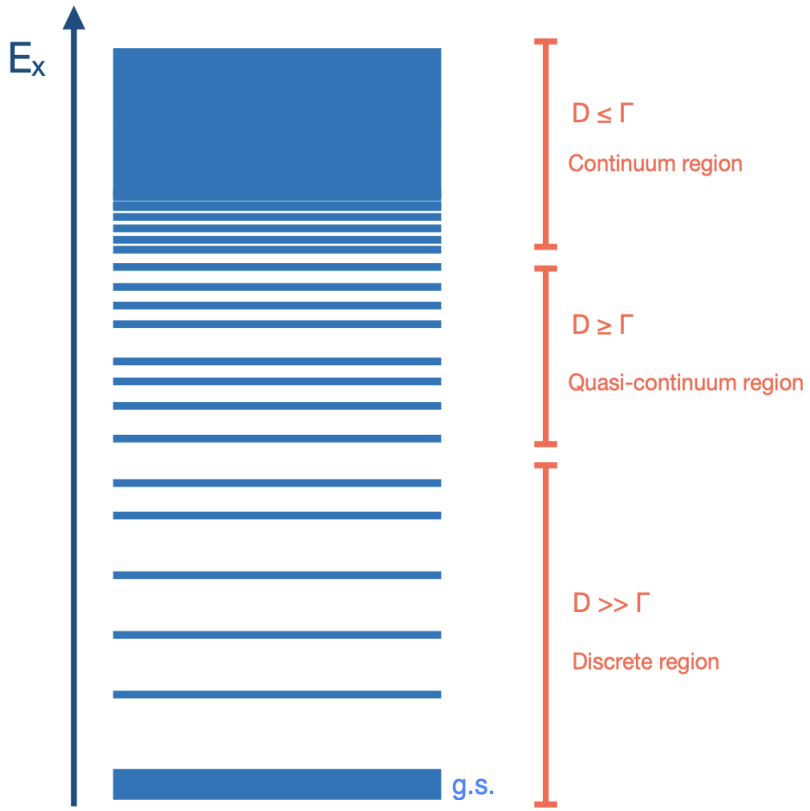


The i-process pathway

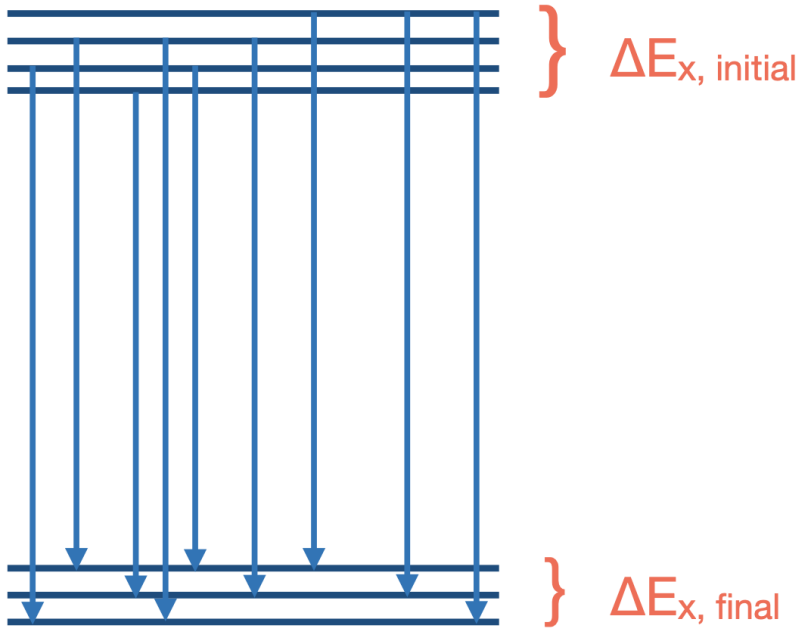
How do we obtain neutron-capture rates of ^{132}I?

Through information on ^{133}I

Nuclear Level Density

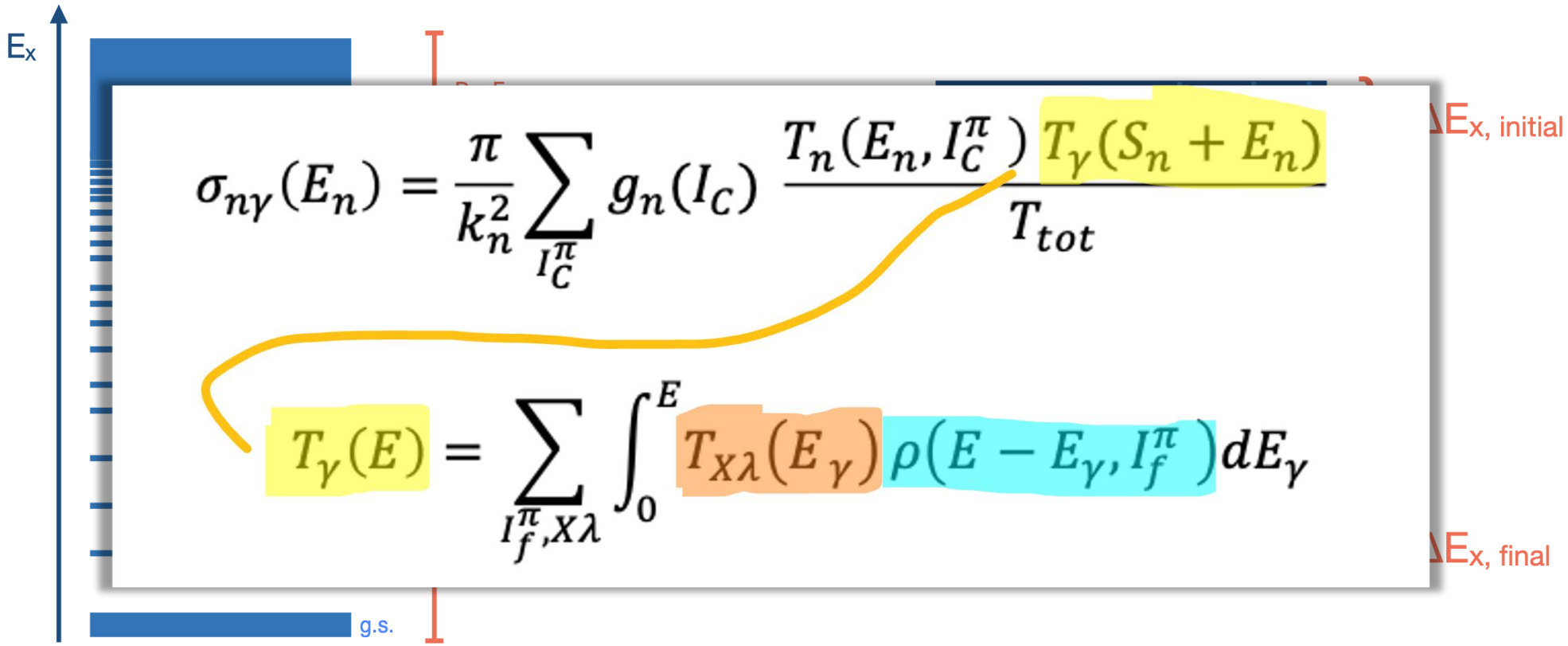


γ-ray strength function



Nuclear Level Density

γ-ray strength function



$$\sigma_{n\gamma}(E_n) = \frac{\pi}{k_n^2} \sum_{I_C^\pi} g_n(I_C) \frac{T_n(E_n, I_C^\pi)\, T_\gamma(S_n + E_n)}{T_{tot}}$$

$$T_\gamma(E) = \sum_{I_f^\pi, X\lambda} \int_0^E T_{X\lambda}(E_\gamma)\, \rho(E - E_\gamma, I_f^\pi)\, dE_\gamma$$

Extract:

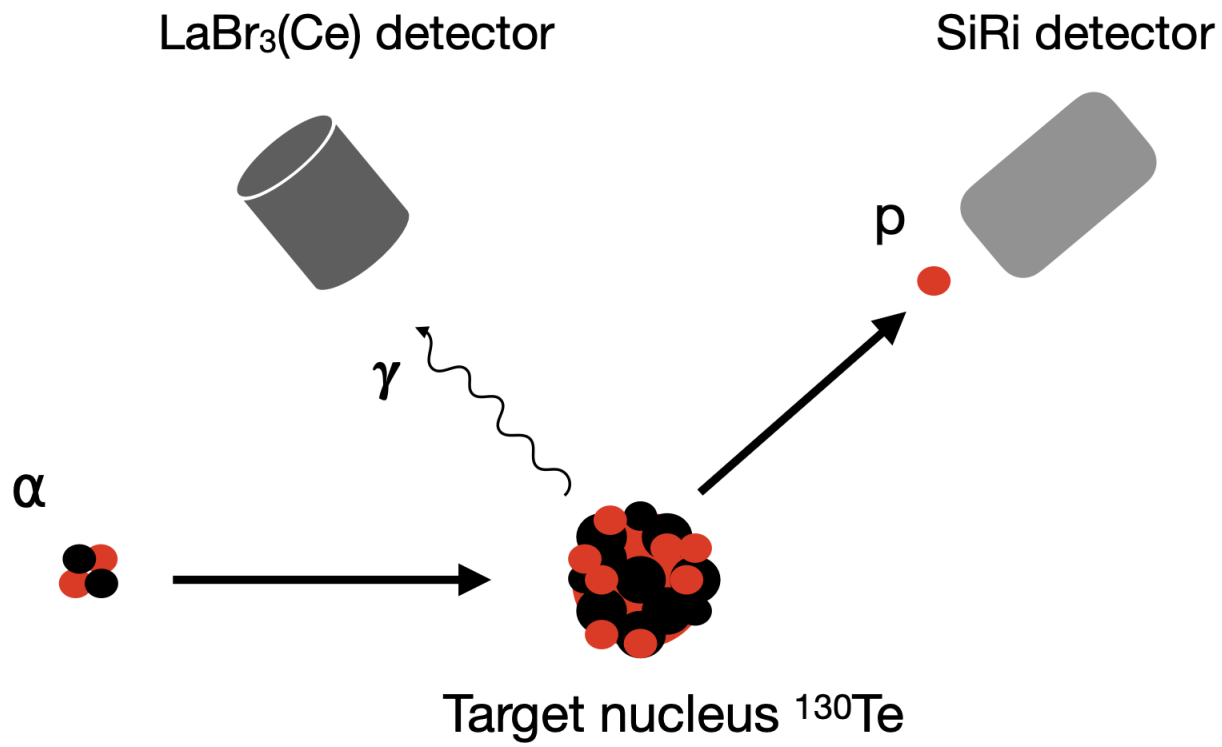
Nuclear level density

Gamma-ray strength function

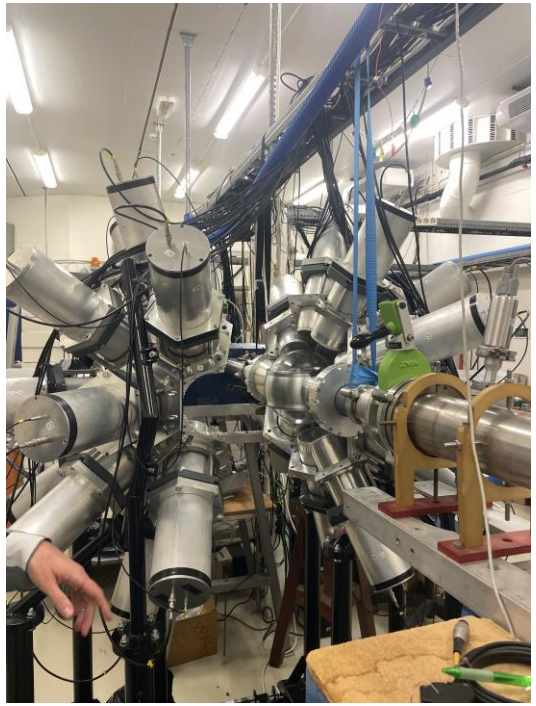
The Oslo Method!

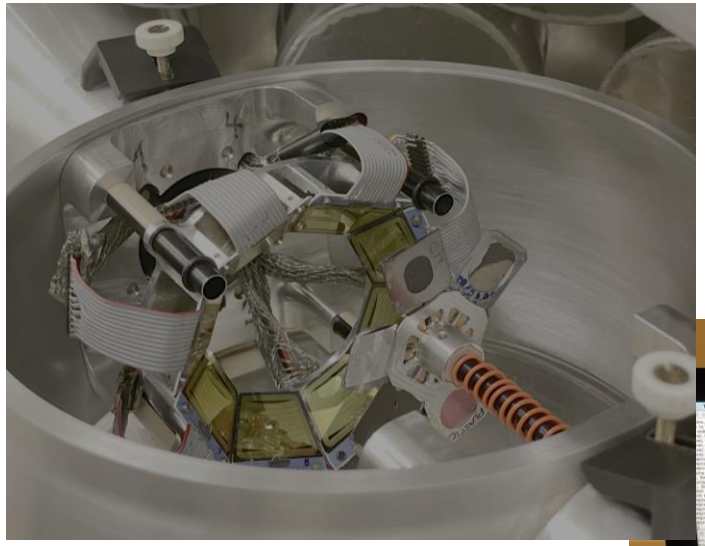
The Experiment

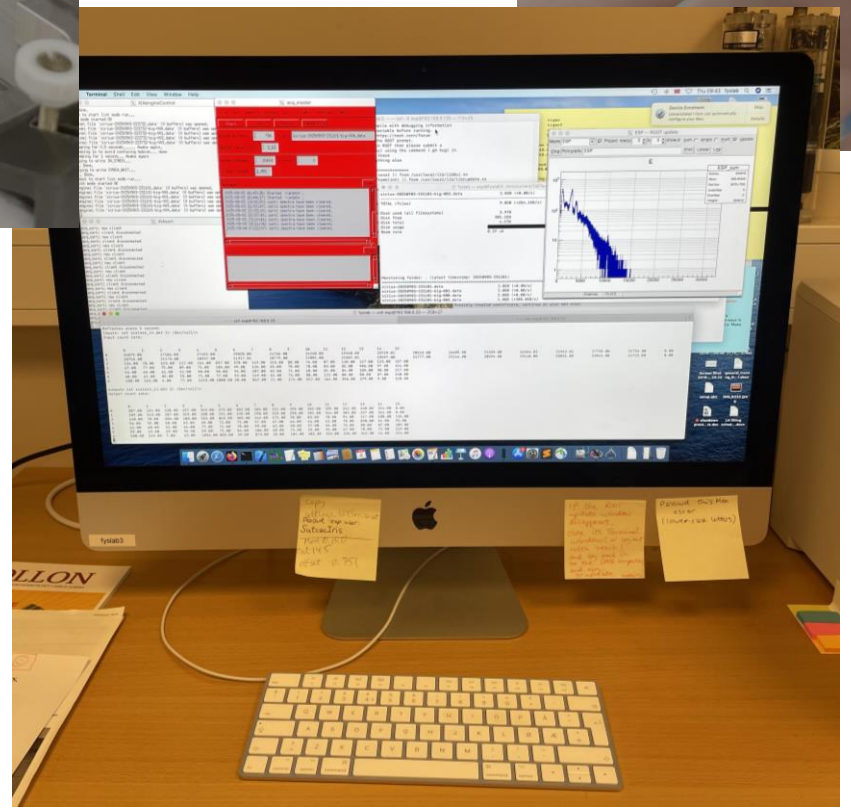
$^{130}Te(\alpha, p\gamma)^{133}I$ reaction

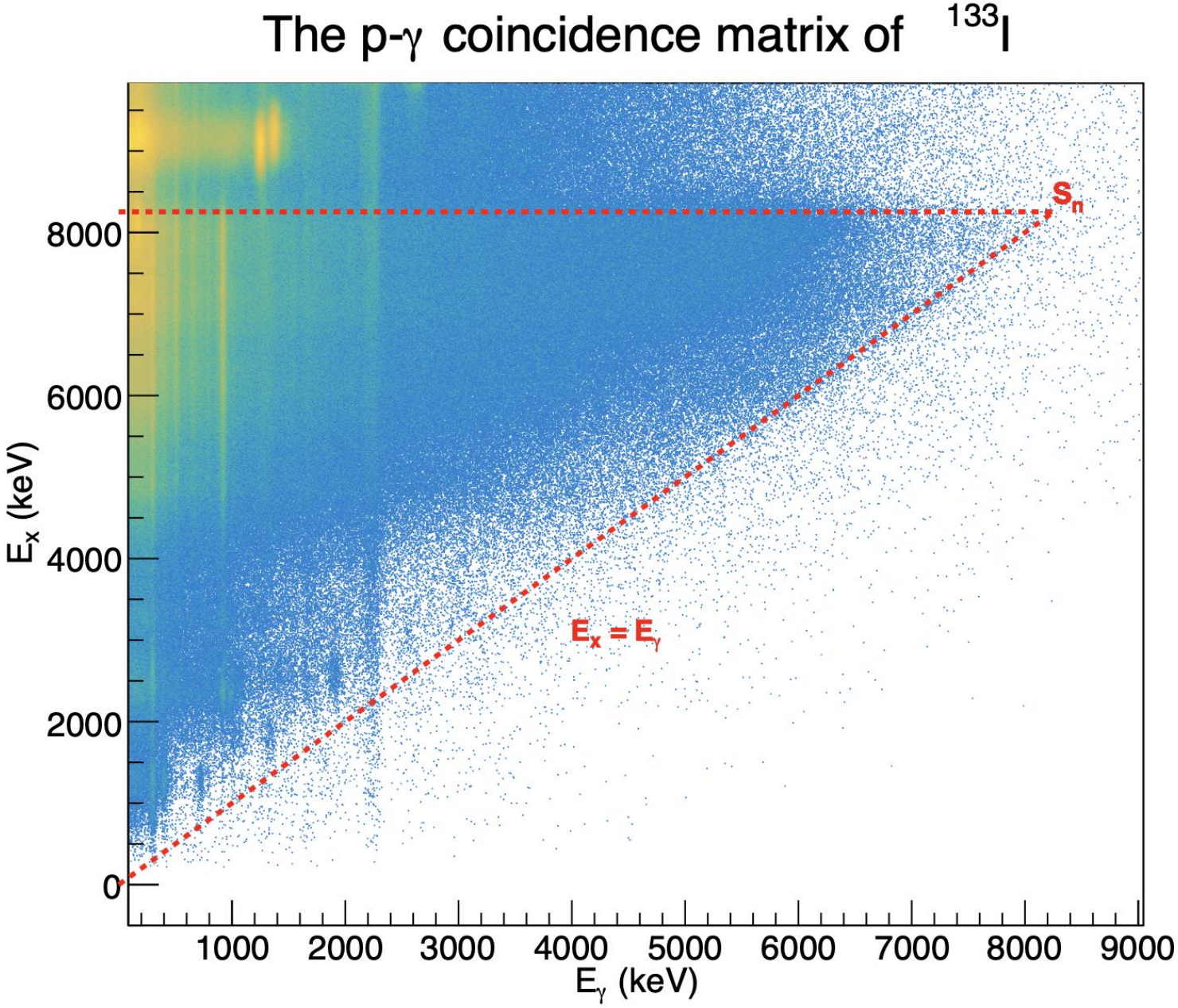


The Experiment

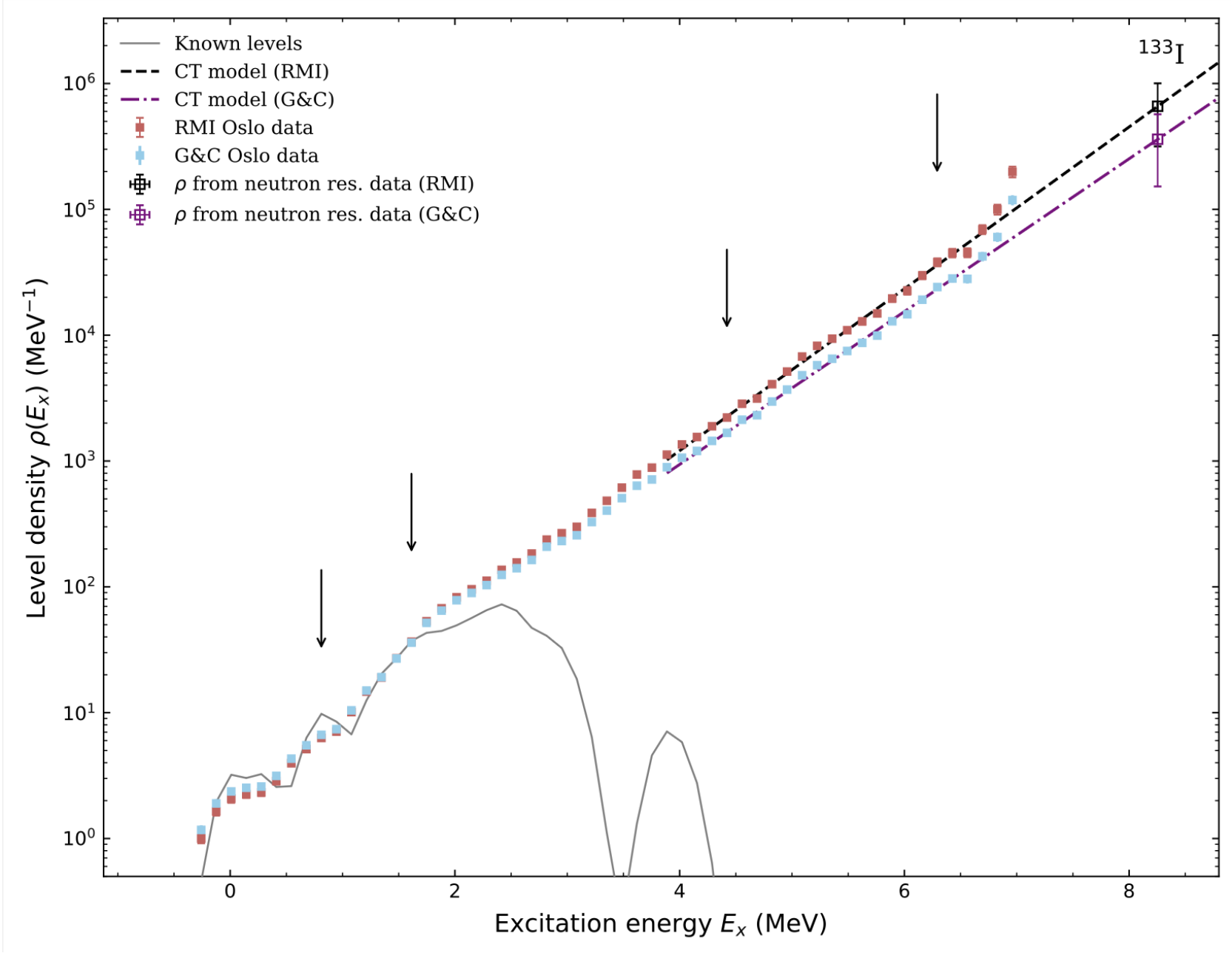




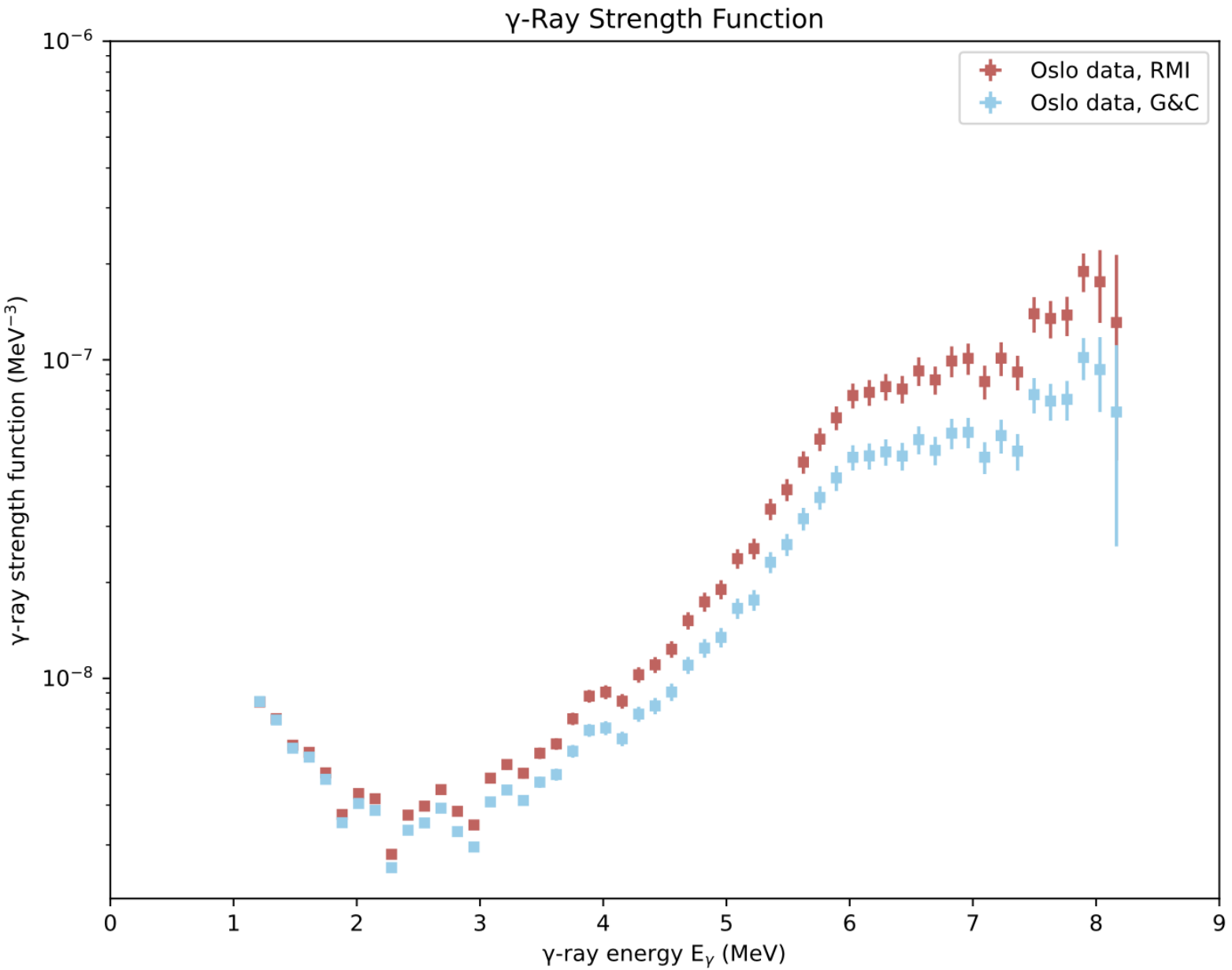



The p-γ coincidence matrix of ^{133}I
S_n
$E_x = E_\gamma$
E_x (keV)
E_γ (keV)
0
2000
4000
6000
8000
1000
2000
3000
4000
5000
6000
7000
8000
9000

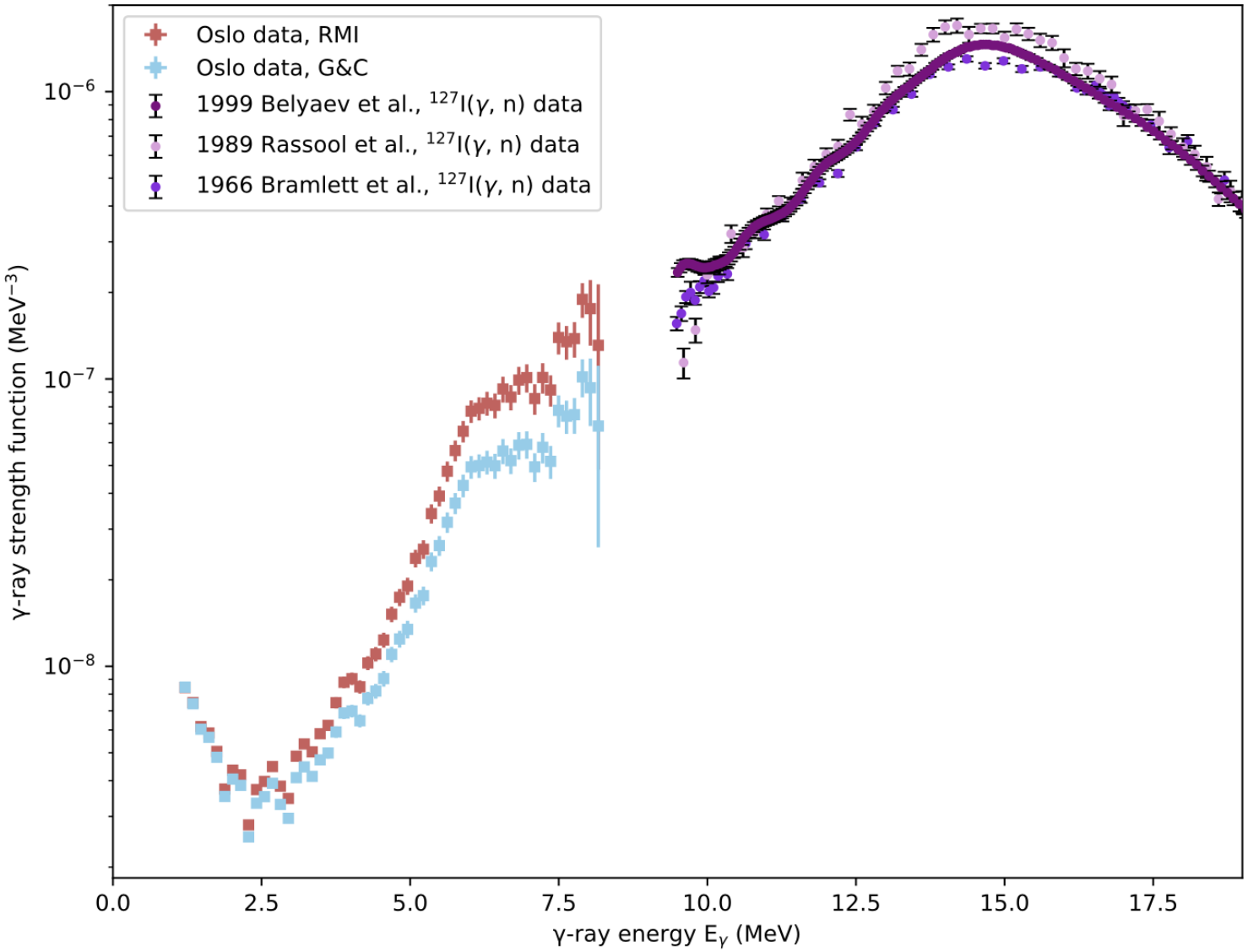
Nuclear level density



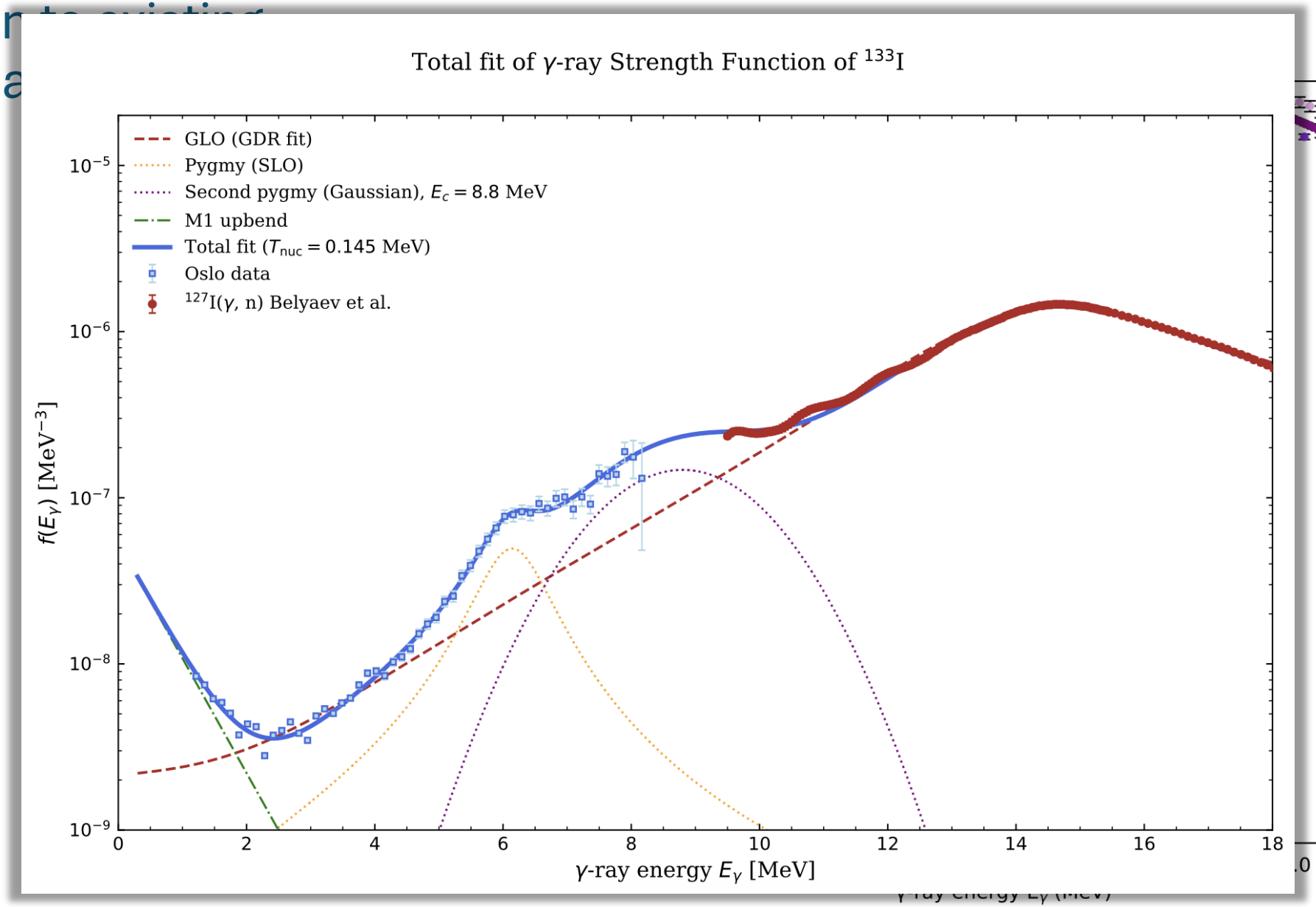
γ-ray strength function



Comparison to existing exp. GDR data



Comparison to existing exp. GDR da



To be continued ...