Quenching of spectroscopic factors in ^{10,12}Be(d, ^{3}He) reactions

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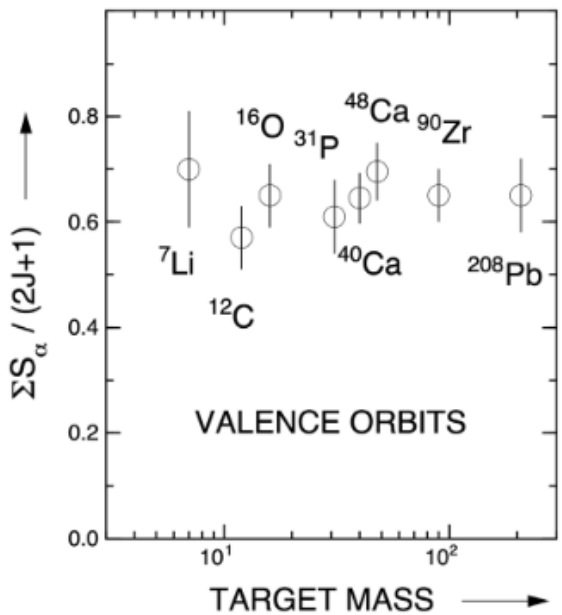
A recap on spectroscopic factors

Spectroscopic factors shed light on the occupancy of single-particle states:

$$\left.\frac{d\sigma}{d\Omega}\right|_{exp} = C^2S \cdot \left.\frac{d\sigma}{d\Omega}\right|_{s.p}, \quad C^2S = \begin{cases} (2j+1) & \text{removing} \\ 1 & \text{adding} \end{cases} \quad \text{in IPSM}$$

Experimentally:
Reduction of ~ 65 %!

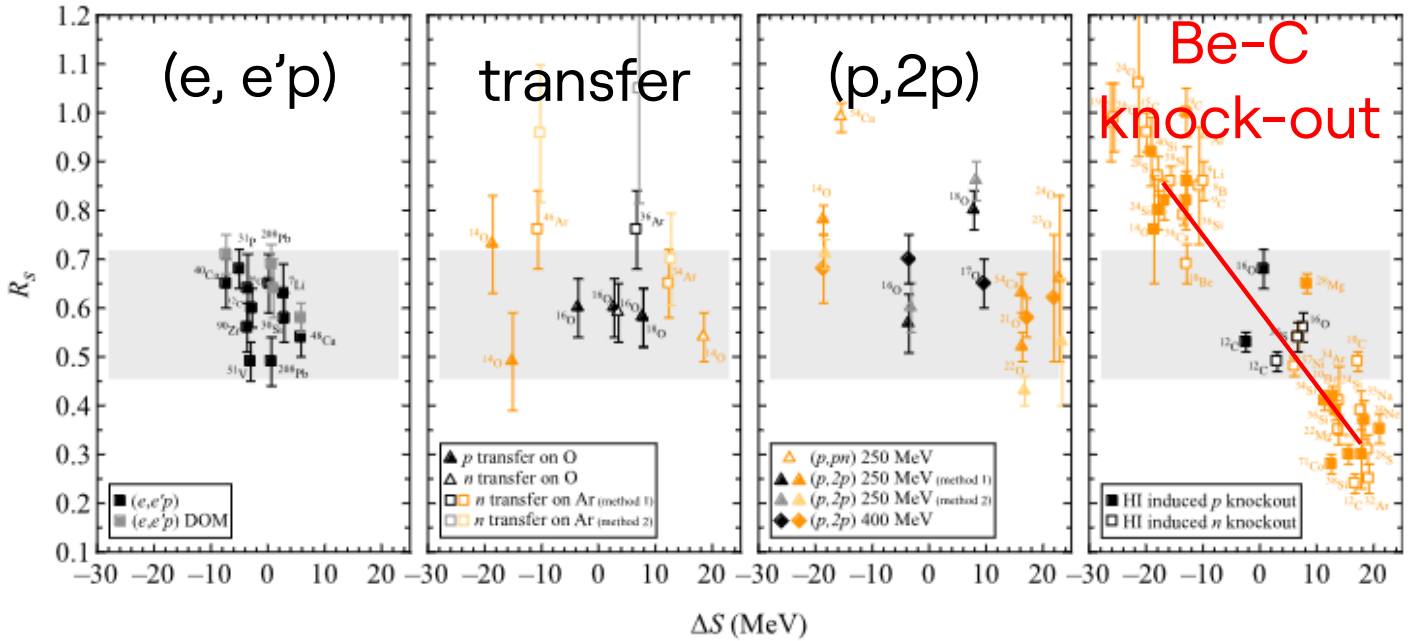
- **Short-range**: tensor forces,...
- **Long-range** correlations: vibrations, giant resonances,...



L. Lapikás, Nuclear Phys. A 553 (1993)

A long-standing puzzle

A trend with asymmetry energy $\Delta S \equiv S_n - S_p$ is found depending on the experimental **probe**!

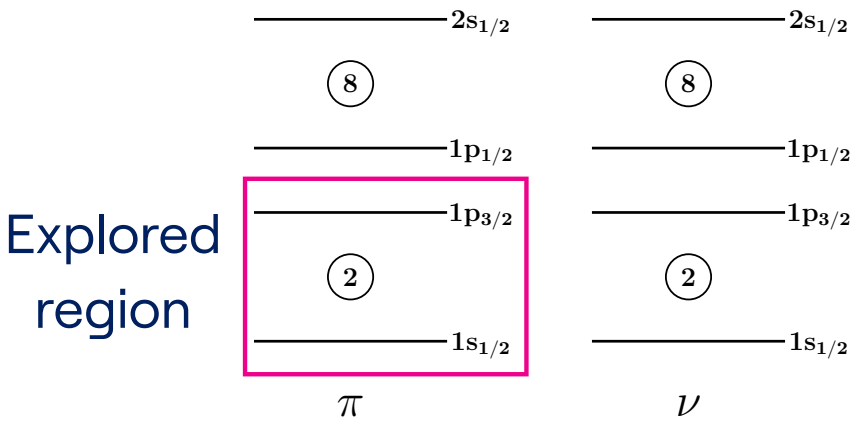


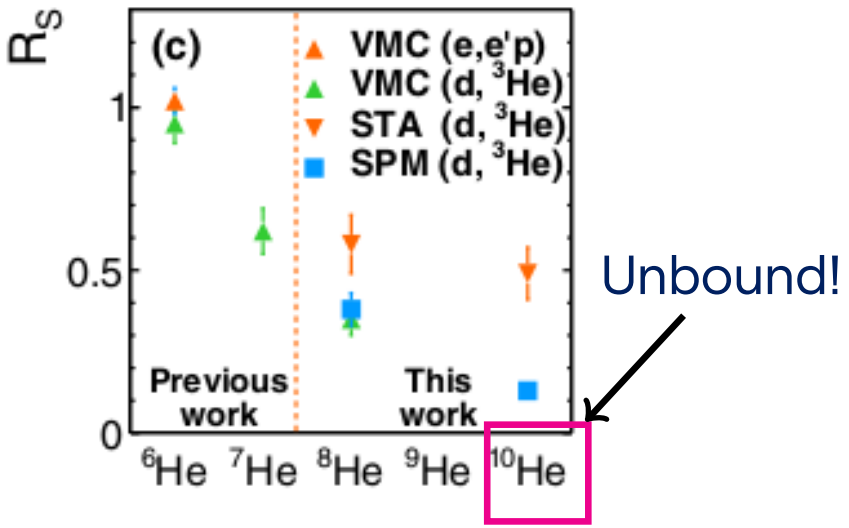
T. Aumann et al. Prog. Part. Nucl. Phys. 118 (2021)

$\Rightarrow$ measure towards more exotic nuclei: $|\Delta S| \uparrow$

Status with light isotopes

Several experiments allowed for the extraction of C^2S with Li-induced (d, ^{3}He) reactions:





A. Matta et al., Phys. Rev. C 92 (2015)

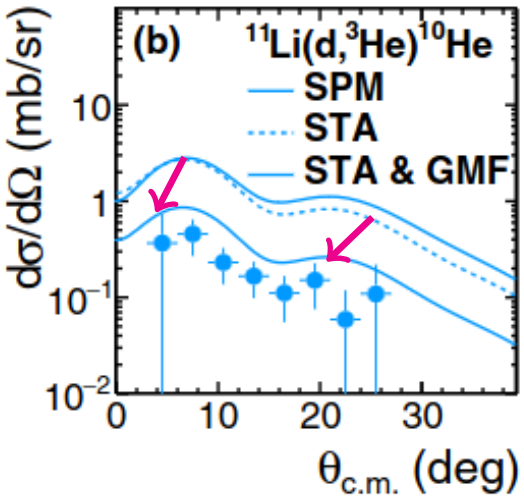
Several challenges in this region:

1 Dealing with **unbound** nuclei (^{10}He)

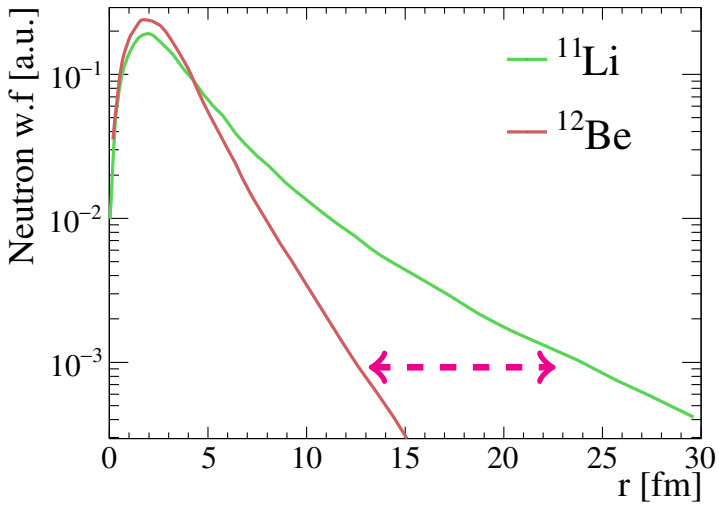
2 Impact of core exitations (completar algo +)

Importance of GMF

Towards exotic nuclei (loosely bound or halo), a ***geometrical mismatch factor*** emerges from the very different w.f. in the overlap:



A.Matta et al., Phys. Rev. C 92 (2015)



N. K. Timofeyuk, private communication (in E748 proposal)

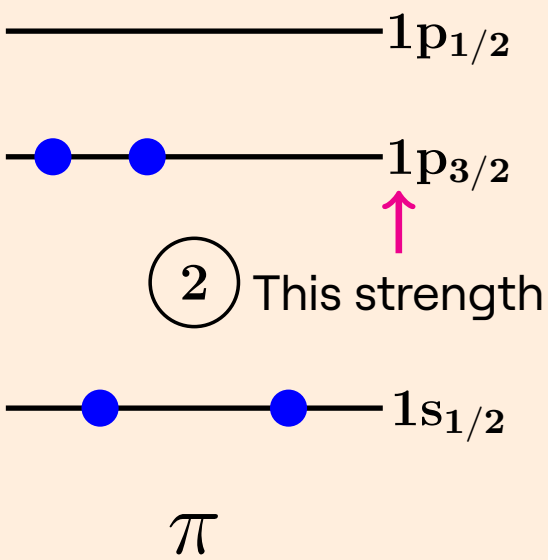
⇒ Need to establish more systematics for this parameter

Physics case of E748

E748 @ GANIL back in 2017. Using ^{10,12}Be(d,^{3}He) reactions to:

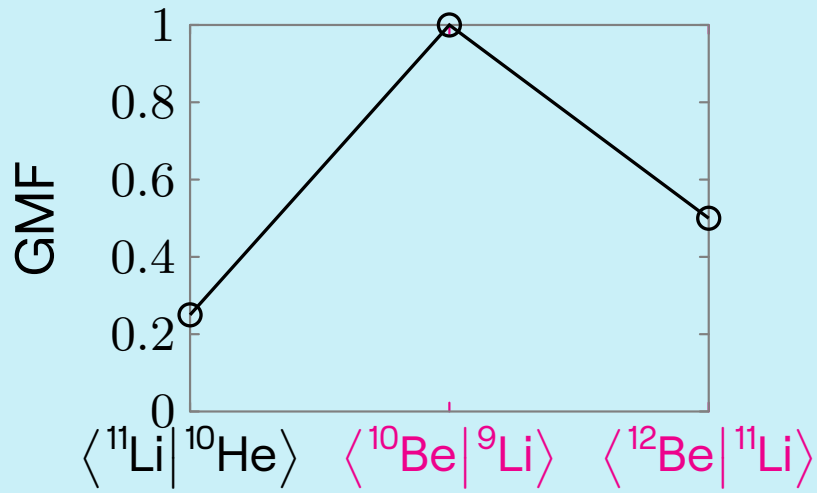
Overlaps:

- $\left\langle {}^{10}\mathrm{Be} \middle| {}^{9}\mathrm{Li} \right\rangle$, $\Delta S = -12.8$ MeV
- $\left\langle {}^{12}\mathrm{Be} \middle| {}^{11}\mathrm{Li} \right\rangle$, $\Delta S = -19.8$ MeV



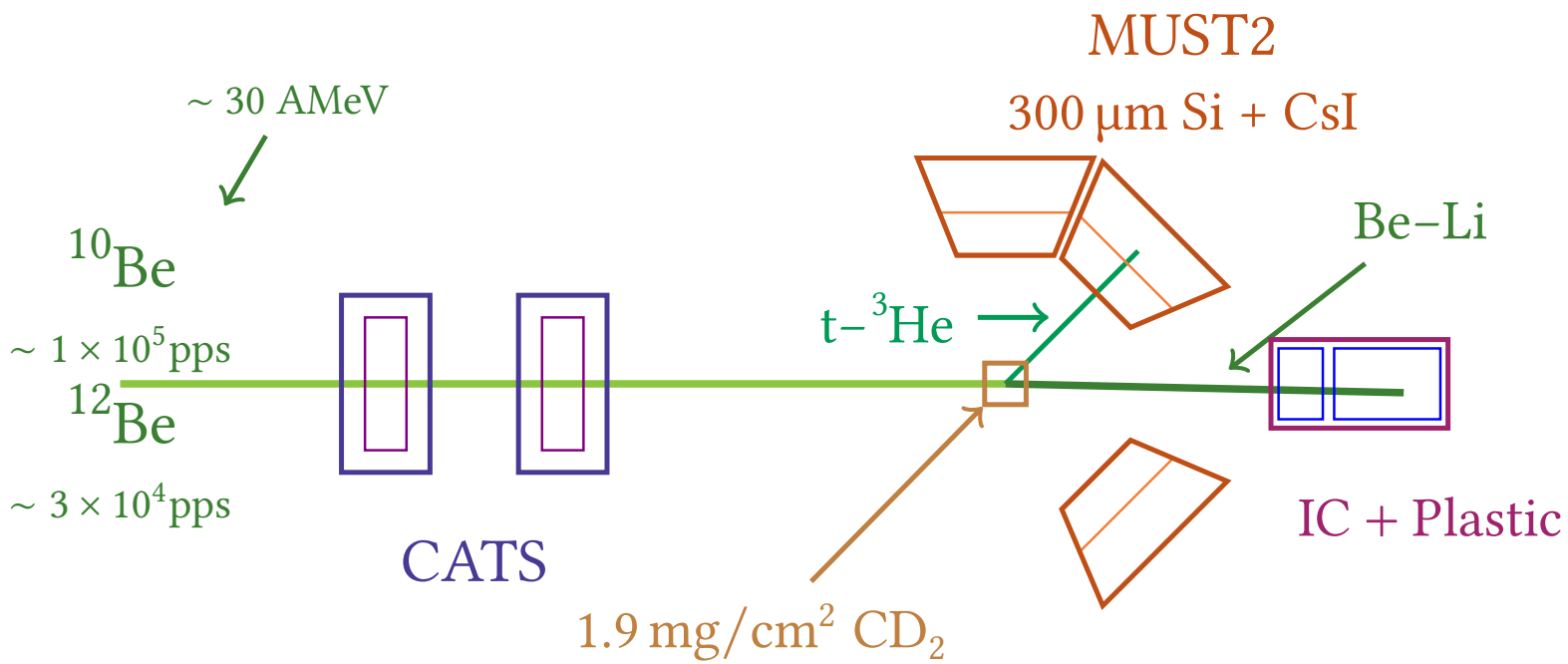
Explore effects of GMF:

- $\left\langle {}^{10}\mathrm{Be} \middle| {}^{9}\mathrm{Li} \right\rangle$, GMF ~ 1
- $\left\langle {}^{12}\mathrm{Be} \middle| {}^{11}\mathrm{Li} \right\rangle$, GMF $\sim 0.5?$



Experimental setup

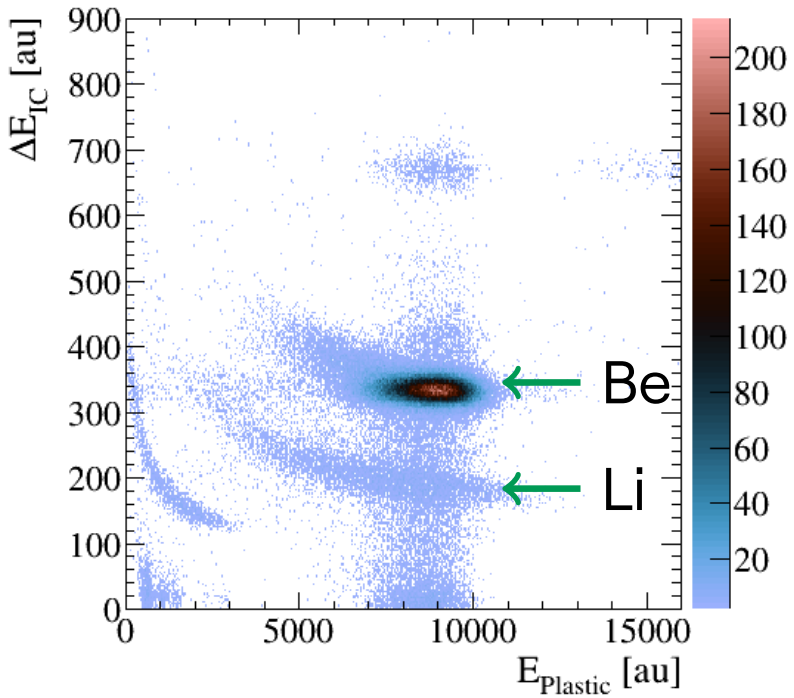
Tradional solid target experiment @ LISE

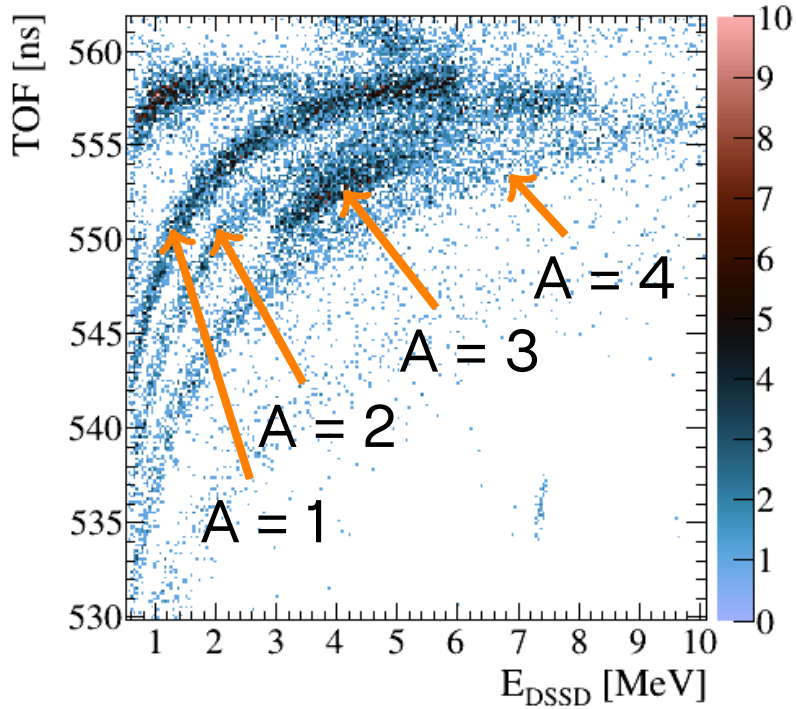


A glance at the analysis

1 **Heavy** ID at $0°$

2 **Light** PID in DSSD

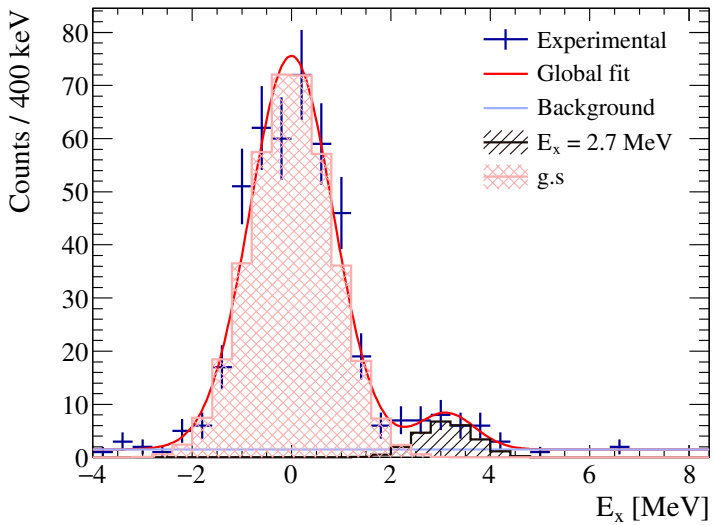


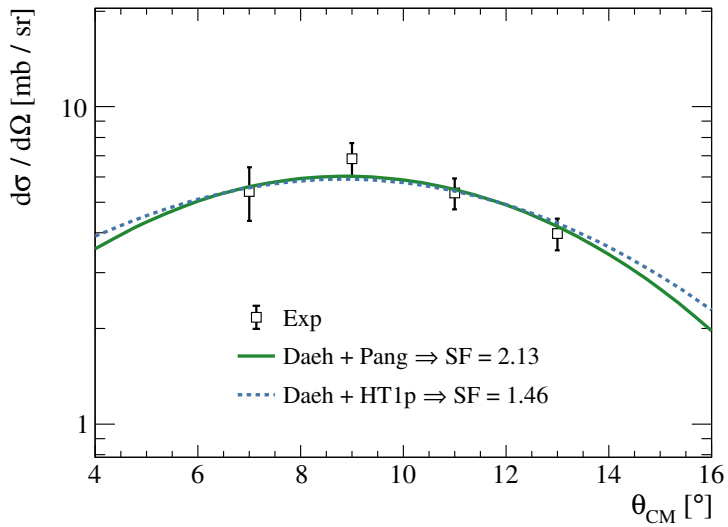


3 E_x from **missing mass technique**

$$E_{\text{beam}} + (E, \theta)_{\text{Lab}} \rightarrow E_x$$

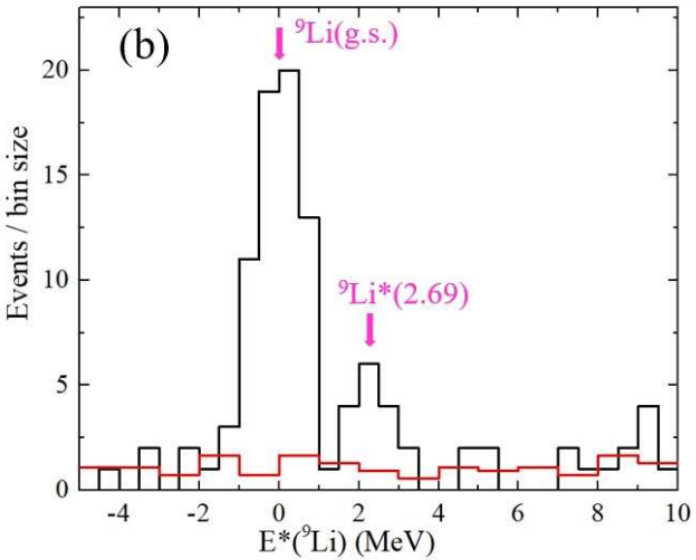
Results: ^{10}Be(d,^{3}He)^{9}Li

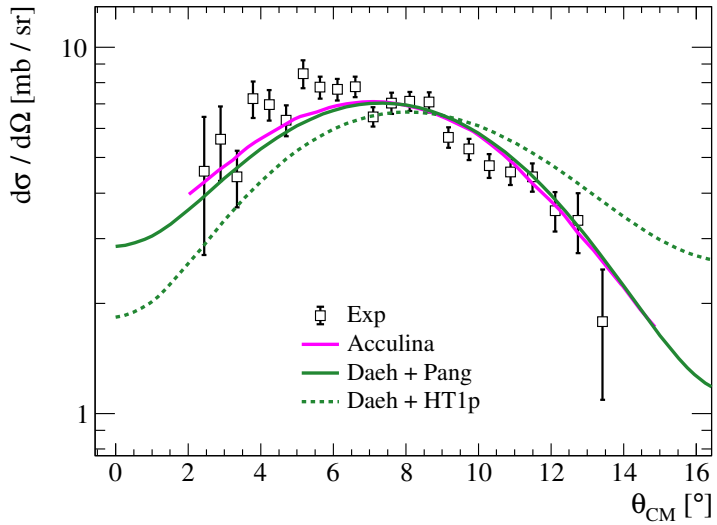




Results: ^{10}Be(d,^{3}He)^{9}Li

Recent experiment @ Acculina. Different beam energy of 40 AMeV



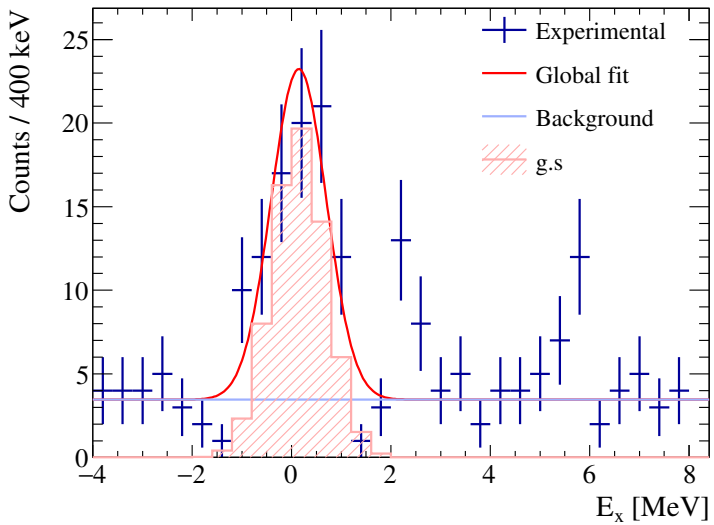


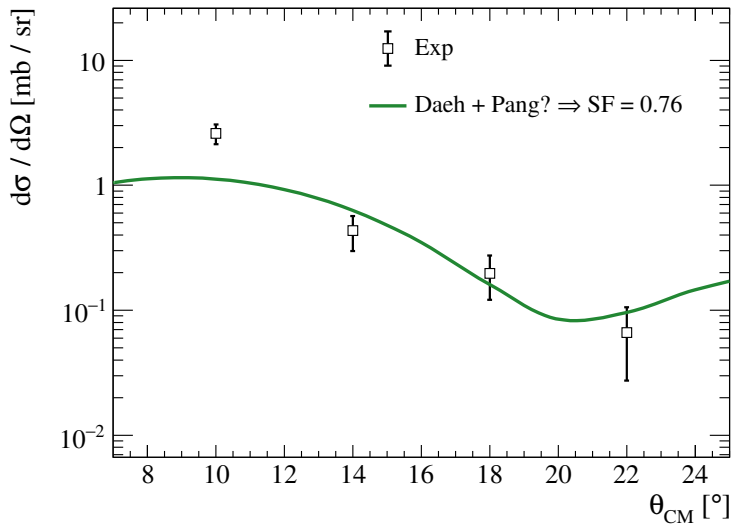
Their analysis:
$C^2S = 1.74$

Our C^2S:

- Pang: $2.679(48)$
- HT1p: $1.848(33)$

Results: ^{12}Be(d,^{3}He)^{11}Li





Conclusions

Ola
A ver
Que
Poñemos
Aqui

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