Transfer reactions with ^{8}Li

(a status report)

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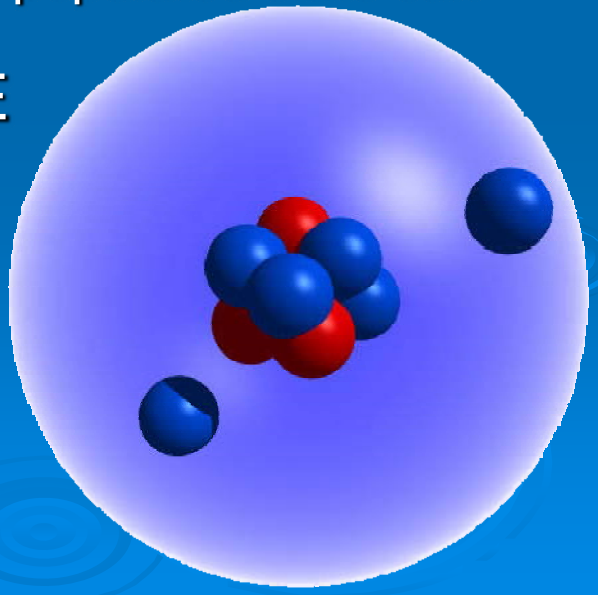
Scientific motivation

- Structure of neutron-rich lithium isotopes through a set of experiments
  - isotopic chain with the last bound two-neutron halo nucleus ^{11}Li
- Transfer reactions in inverse kinematics allows us to obtain the angular distribution →
  - *l* value of the populated state
  - How large part of the wave function for the populated state can be described as a single particle state
- Made possible thanks to REX-ISOLDE
- Compare with theoretical models:
  - *ab-initio*
  - shell model

  through the spectroscopic factors



Scientific motivation

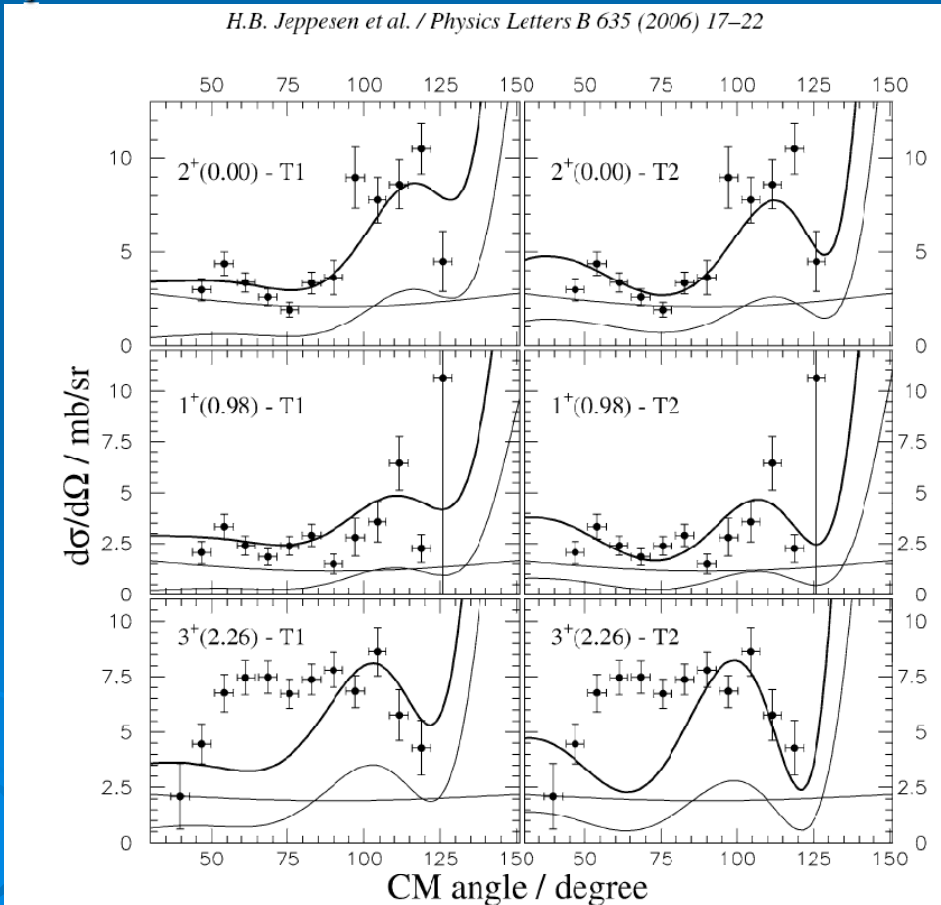
- $^{2}H(^{9}Li,t)^{8}Li$ (Jeppesen et al. Phys. Lett. B 635 (2006) 17-22) Discrepancy in spectroscopic factors on absolute scale
- Benchmark exp

Reaction channels:

$^{2}H(^{8}Li,p)^{9}Li^{(*)}$ – (d,p)

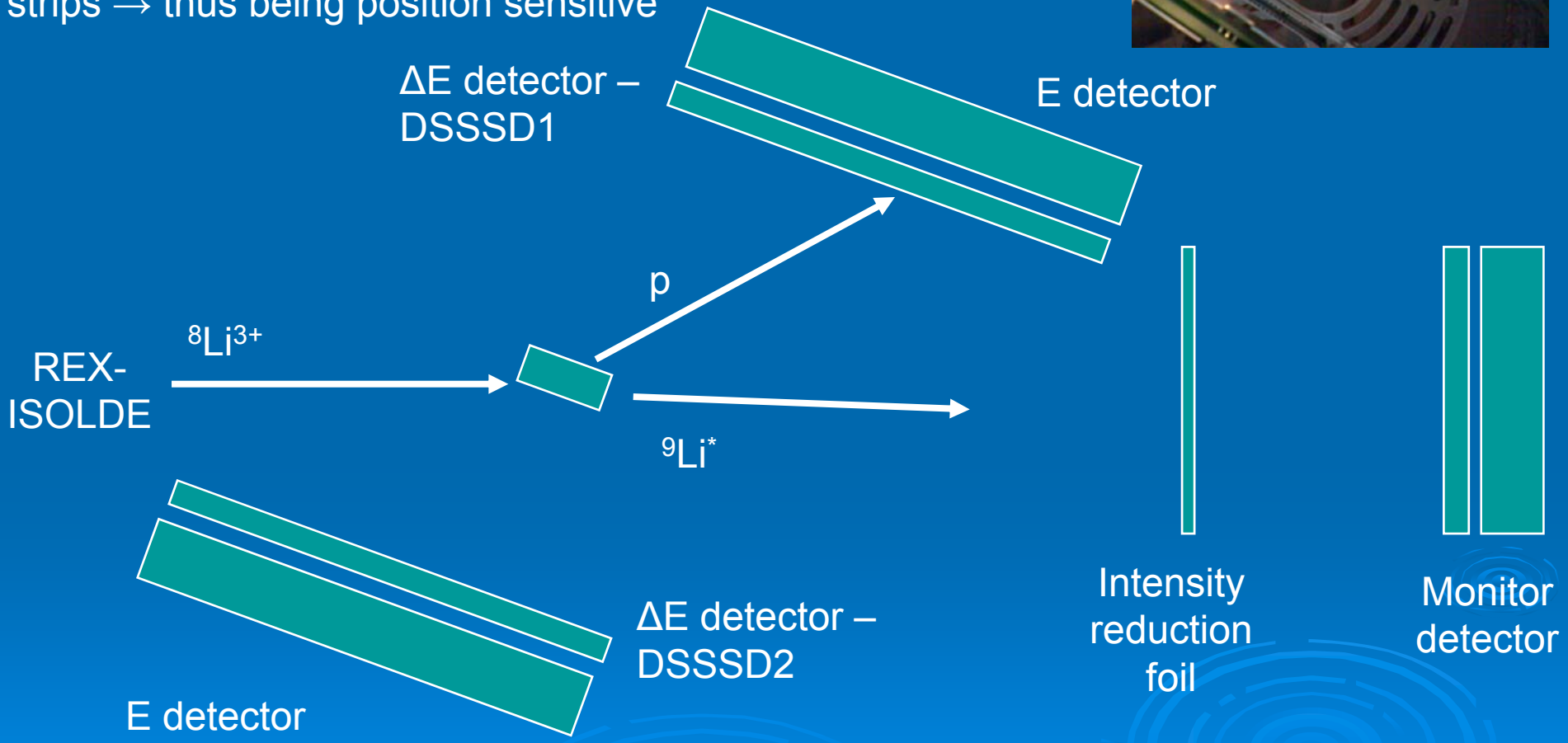
$^{2}H(^{8}Li,d)^{8}Li^{(*)}$ – (d,d)

$^{2}H(^{8}Li,t)^{7}Li^{(*)}$ – (d,t)



Experimental set-up

DSSSD1 & 2 have 32 front & 32 back strips → thus being position sensitive

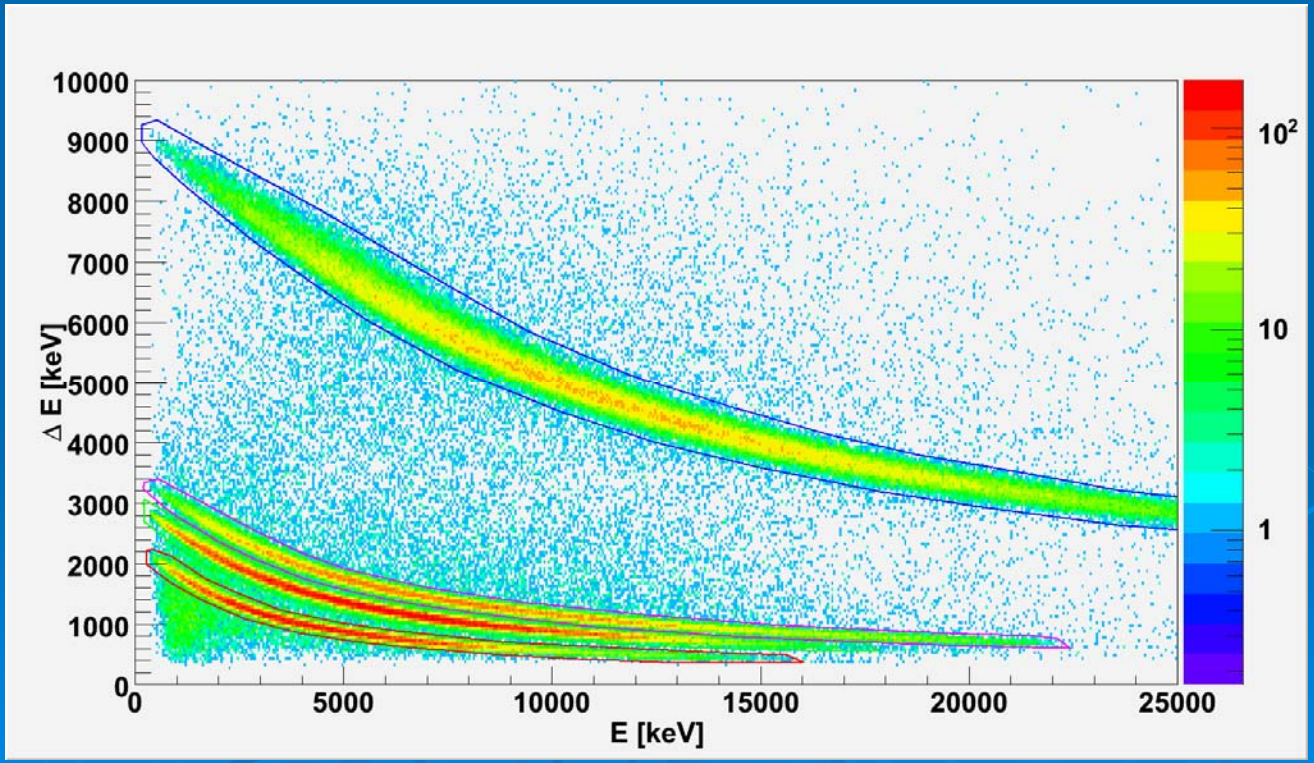


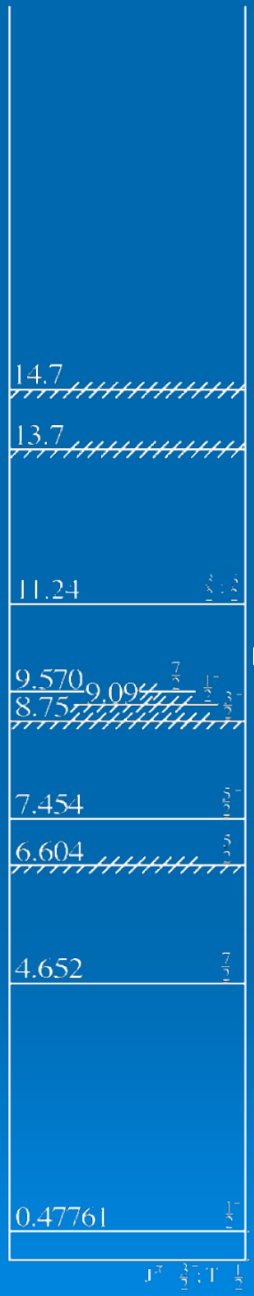
ΔE + E detector = telescope detector

Particle identification

Using the telescope detector in the forward direction:

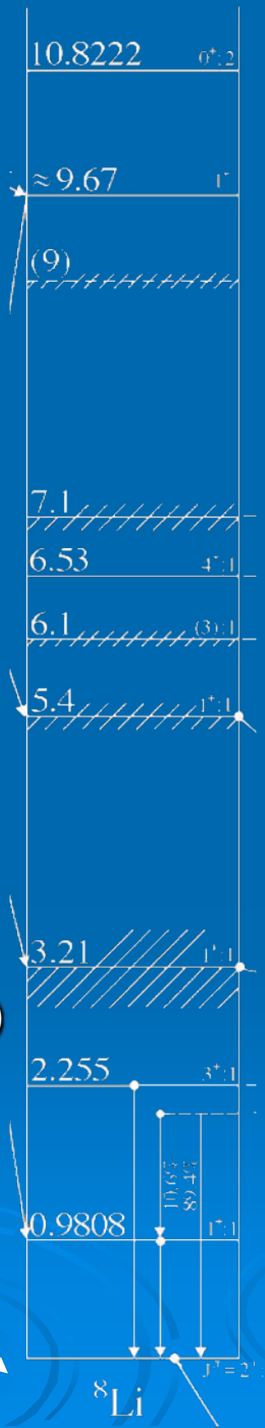
Graphical cut





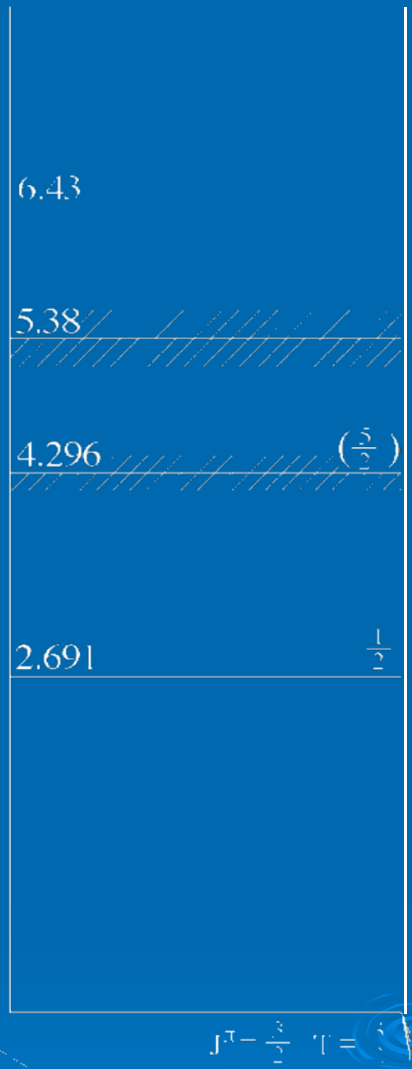
Energy levels of ^{7}Li:

g. s. (3/2-)
0.47761 MeV (1/2-)
4.652 MeV (7/2-)
6.604 MeV (5/2-)



Energy levels of ^{8}Li:

g. s. (2+)
0.9808 MeV (1+)
2.255 MeV (3+)
3.21 MeV (1+)



Energy levels of ^{9}Li:

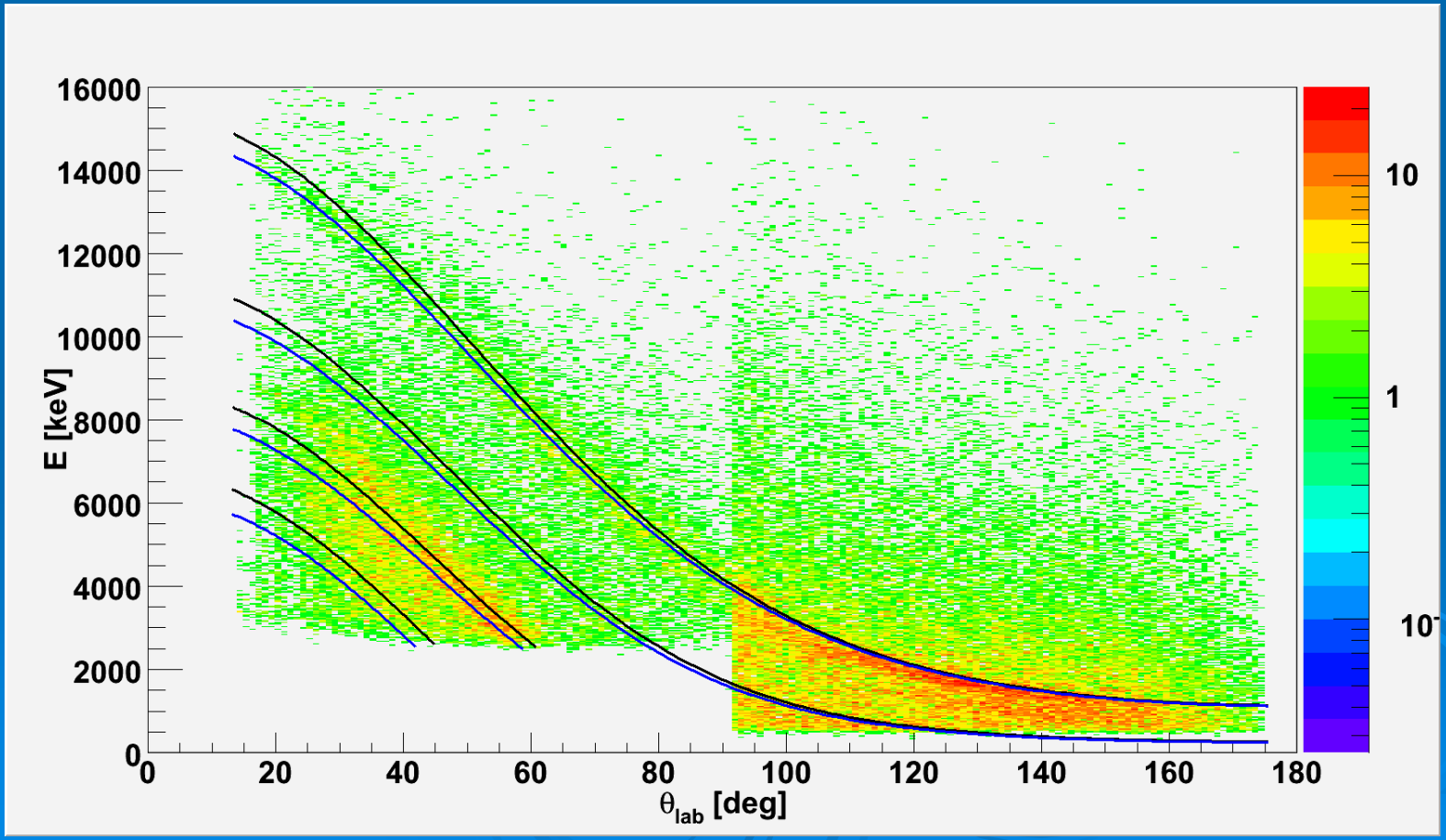
g. s. (3/2-) ^{9}Li
2.691 MeV (1/2-)
4.296 MeV (5/2-)
5.38 MeV

Data from TUNL

Energy vs. angle distributions

$^{8}Li + {}^{2}H \rightarrow {}^{9}Li^{*} + p$

The kinematical curves overlaid represent feeding to the known low-lying states in ^{9}Li. In each The curves correspond to reactions in the beginning and in the end of the target.

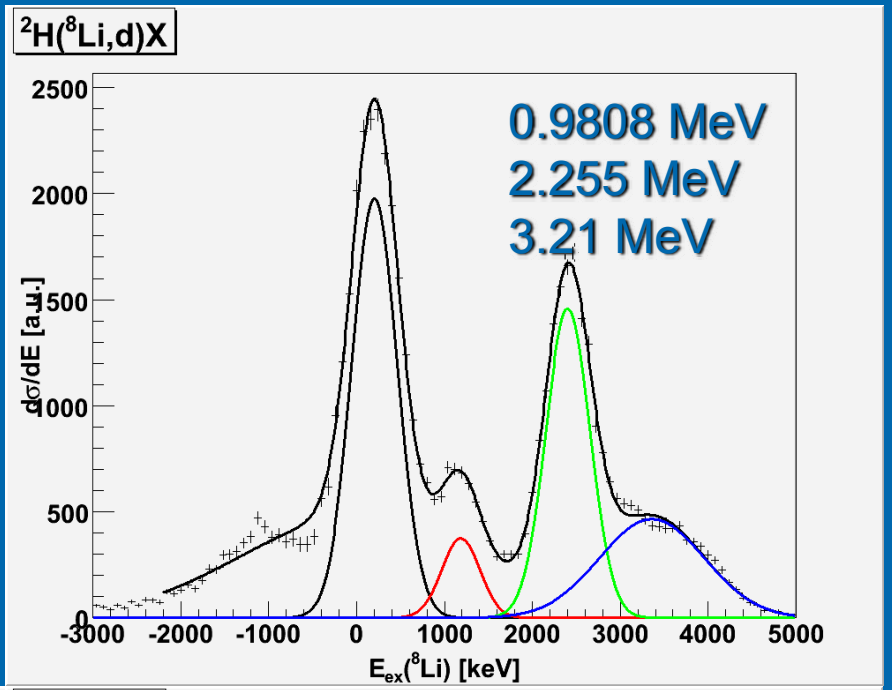


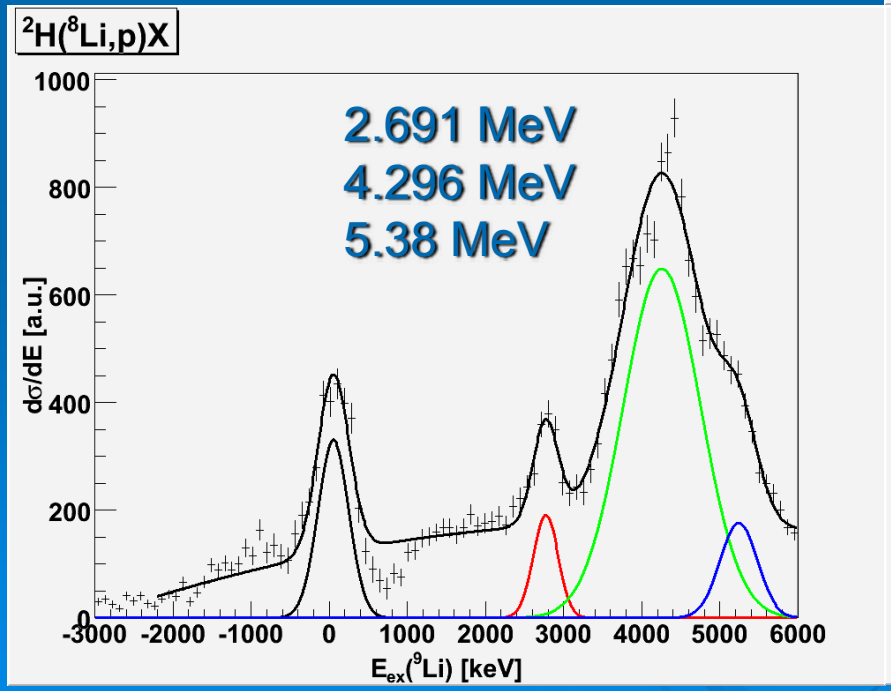
Excitation energy curves

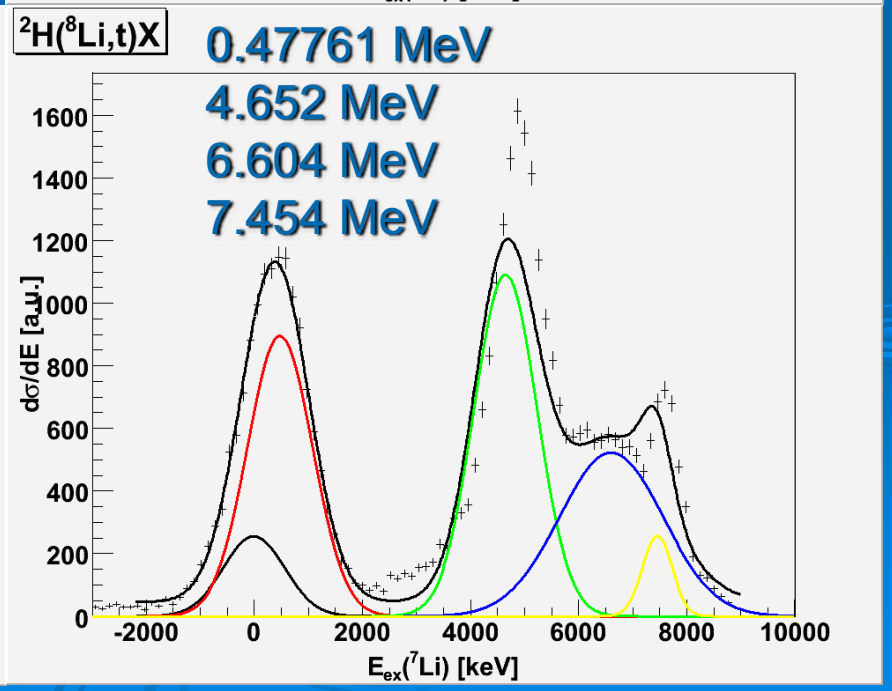
$E_{ex}(^{8}Li)$ →

$E_{ex}(^{9}Li)$ ↓

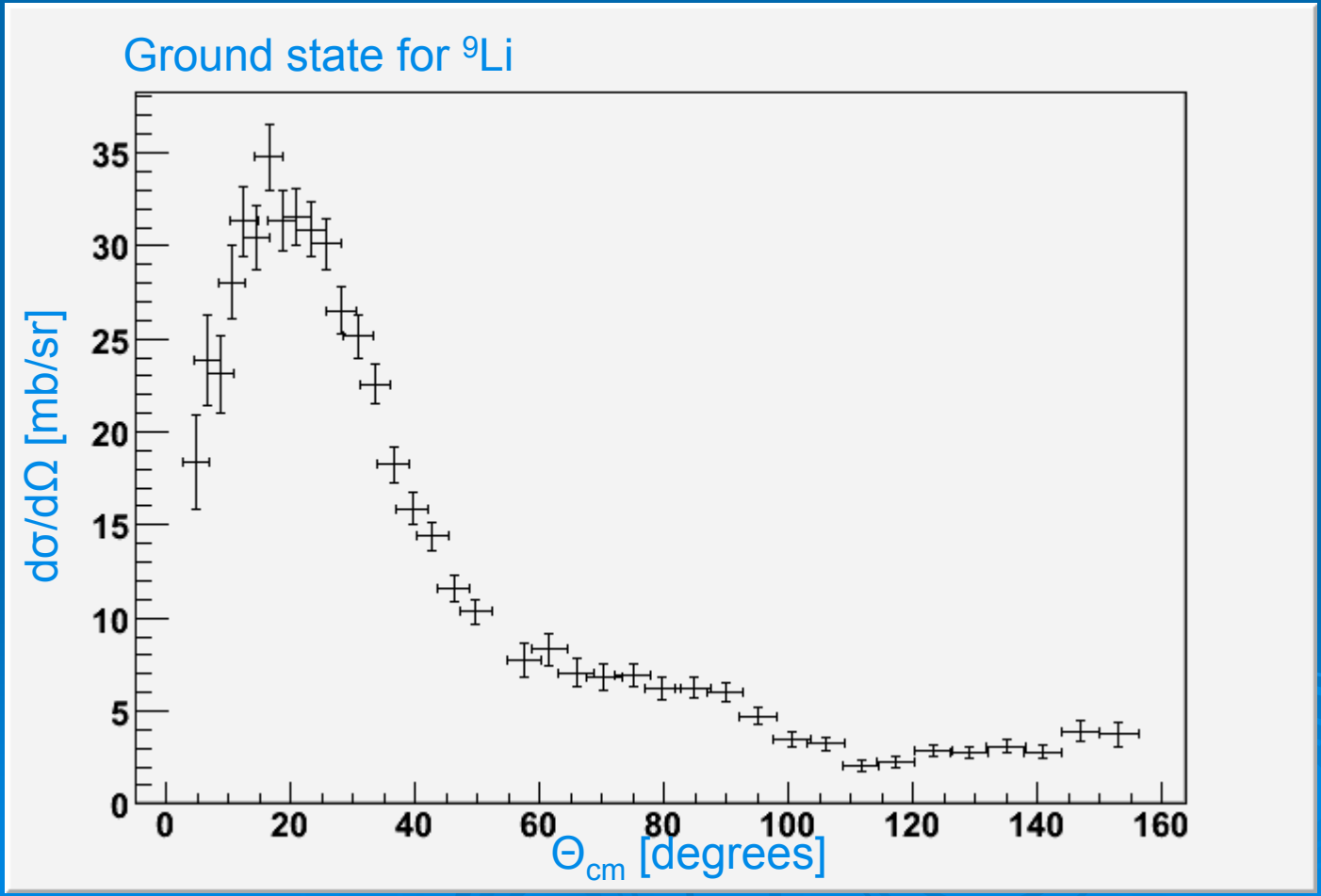
$E_{ex}(^{7}Li)$ ↘



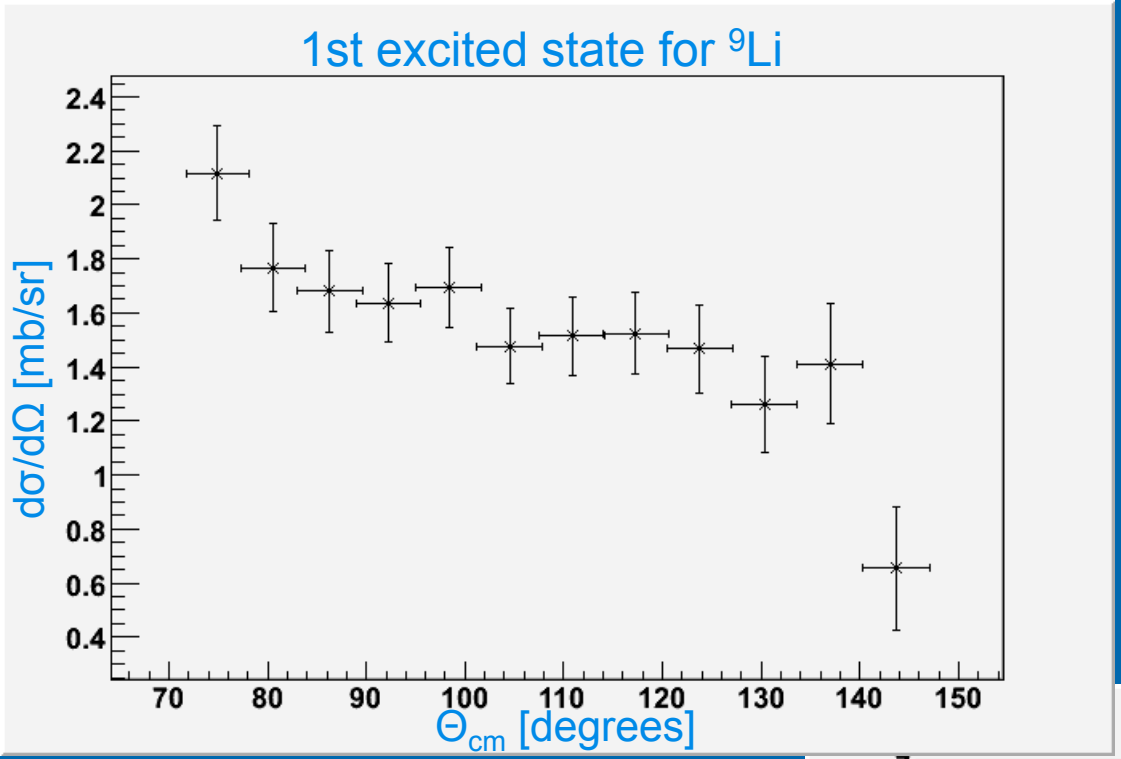


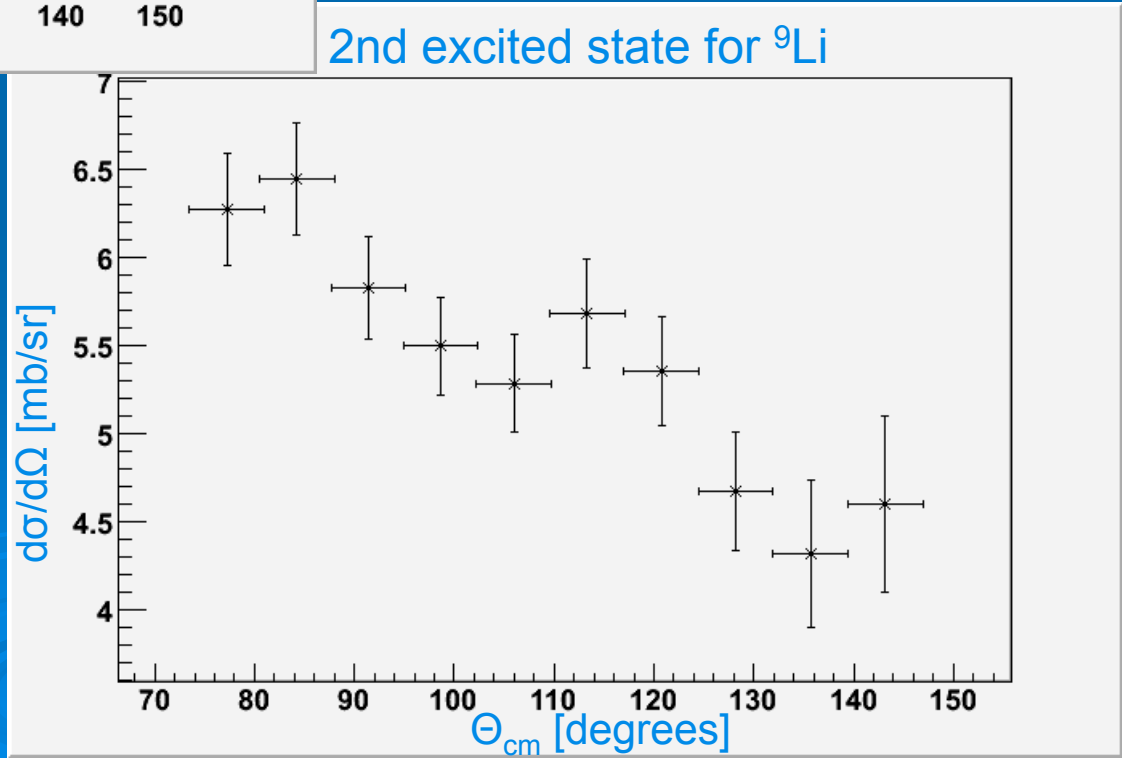


Angular distribution, absolute scale



Angular distribution, absolute scale





To Do

- Angular distribution for the elastic scattering channel
- Compare the different reaction channels with theoretical calculations (DWBA calculations) by Antonio Moro at the Departamento de Física Atómica, Molecular y Nuclear - Universidad de Sevilla .

And now the oxygen is probably gone…
so thank you for your attention!