REACTIONS WITH ^{9}LI AT HIE-ISOLDE

14th Nordic Meeting on Nuclear Physics, Svalbard

Jesper Halkjær Jensen

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AARHUS
UNIVERSITET

GOAL

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- Probe single particle states in ^{11}Li and ^{10}Li

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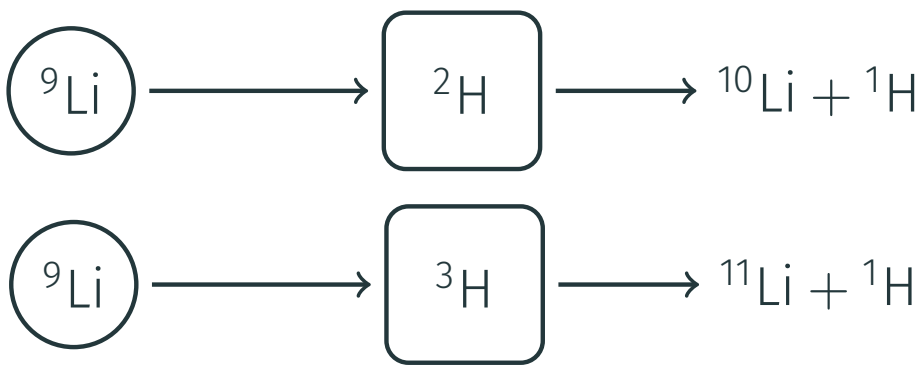
- Populate excited spectrum via transfer reactions



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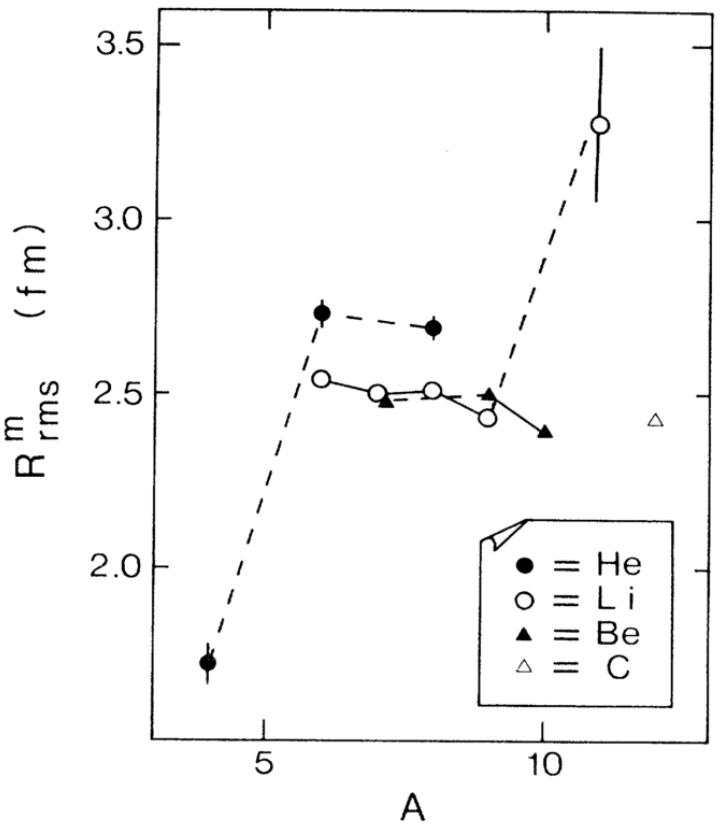

[I. Tanihata et al. PRL 55 (1985)]

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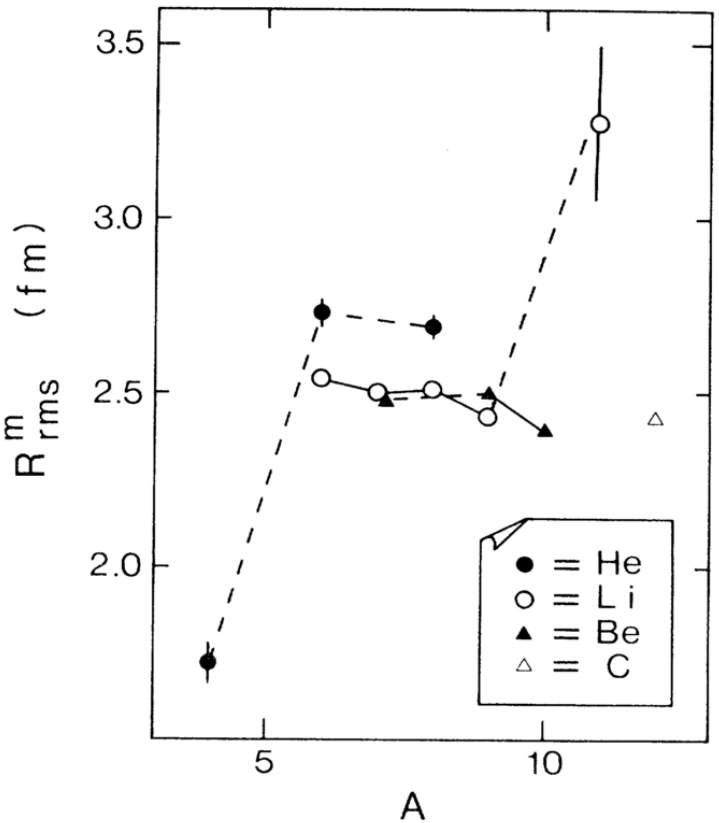

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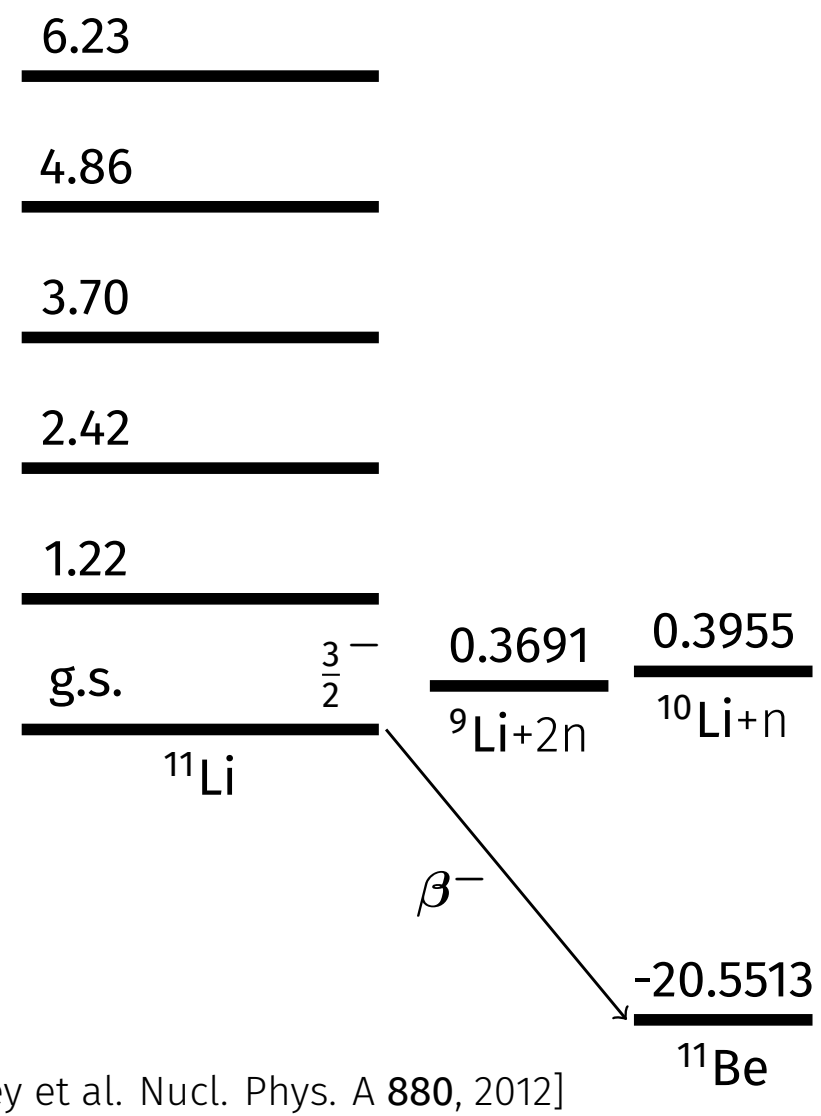

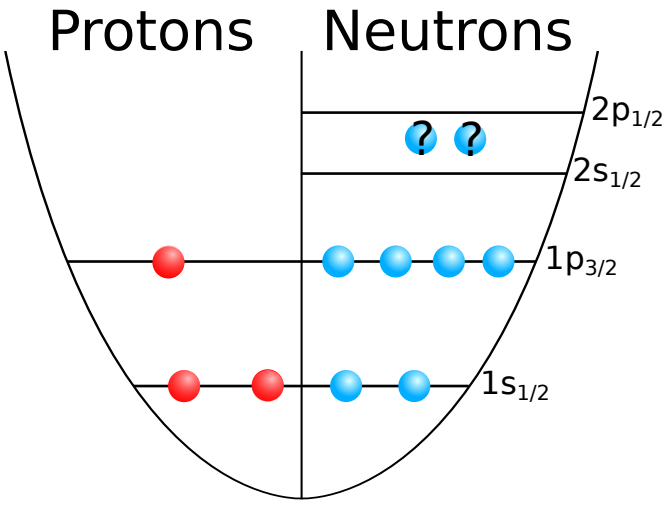

[J.H. Kelley et al. Nucl. Phys. A **880**, 2012]

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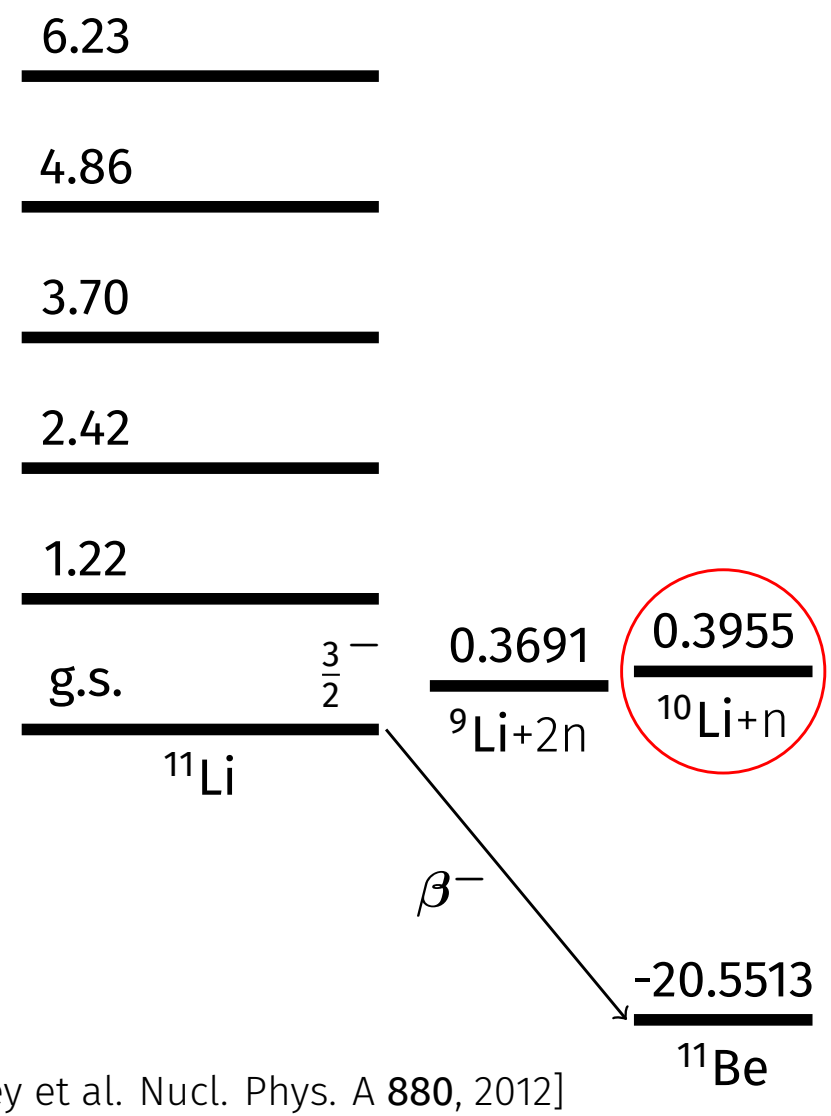

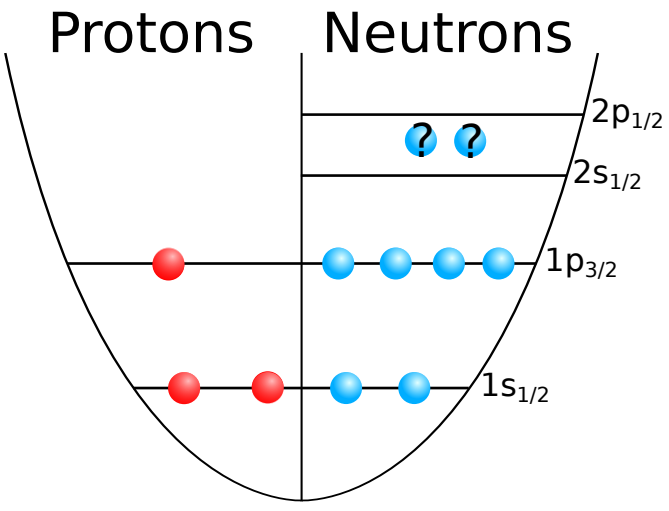

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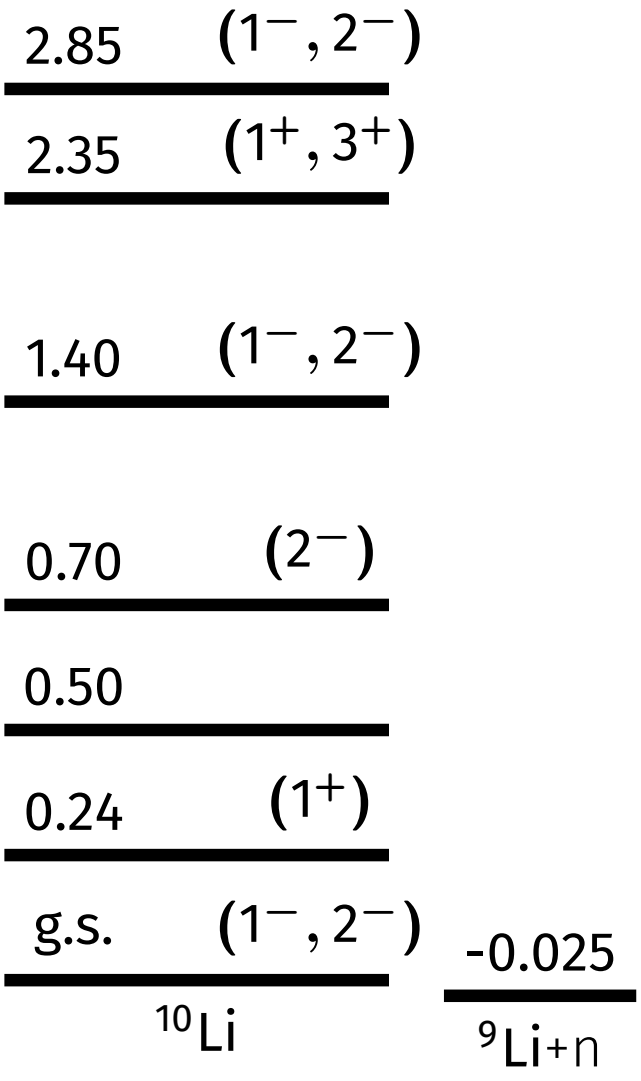

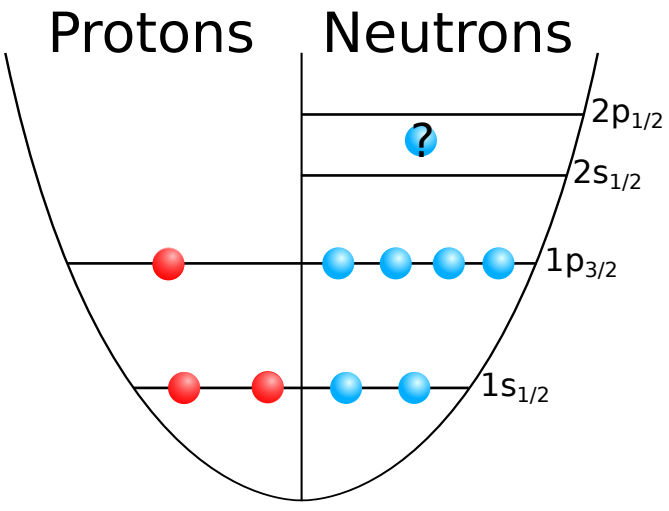

[D.R. Tilley et al. Nucl. Phys. A **745**, 2004]

EXPERIMENTAL CAMPAIGN

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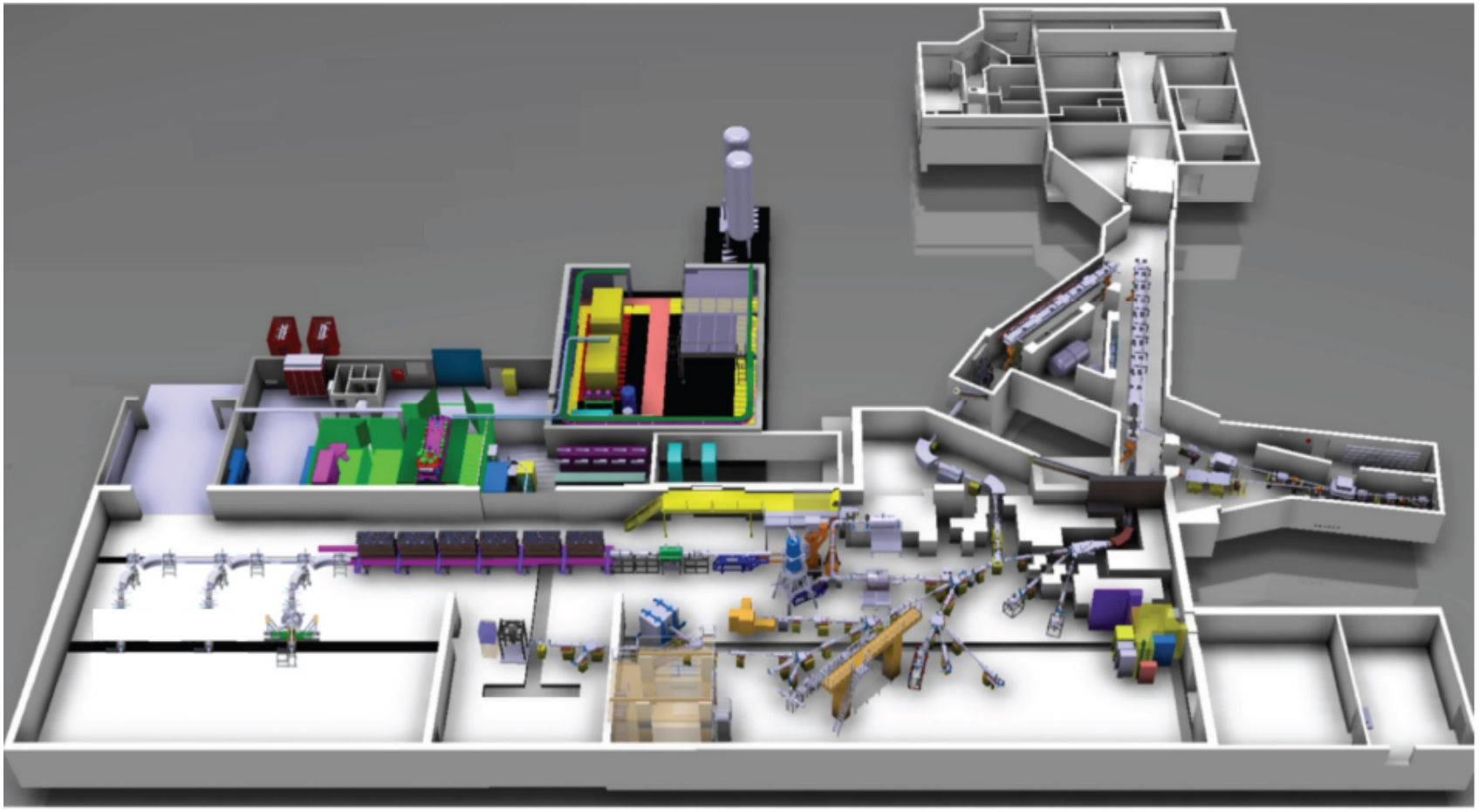
ISOLDE



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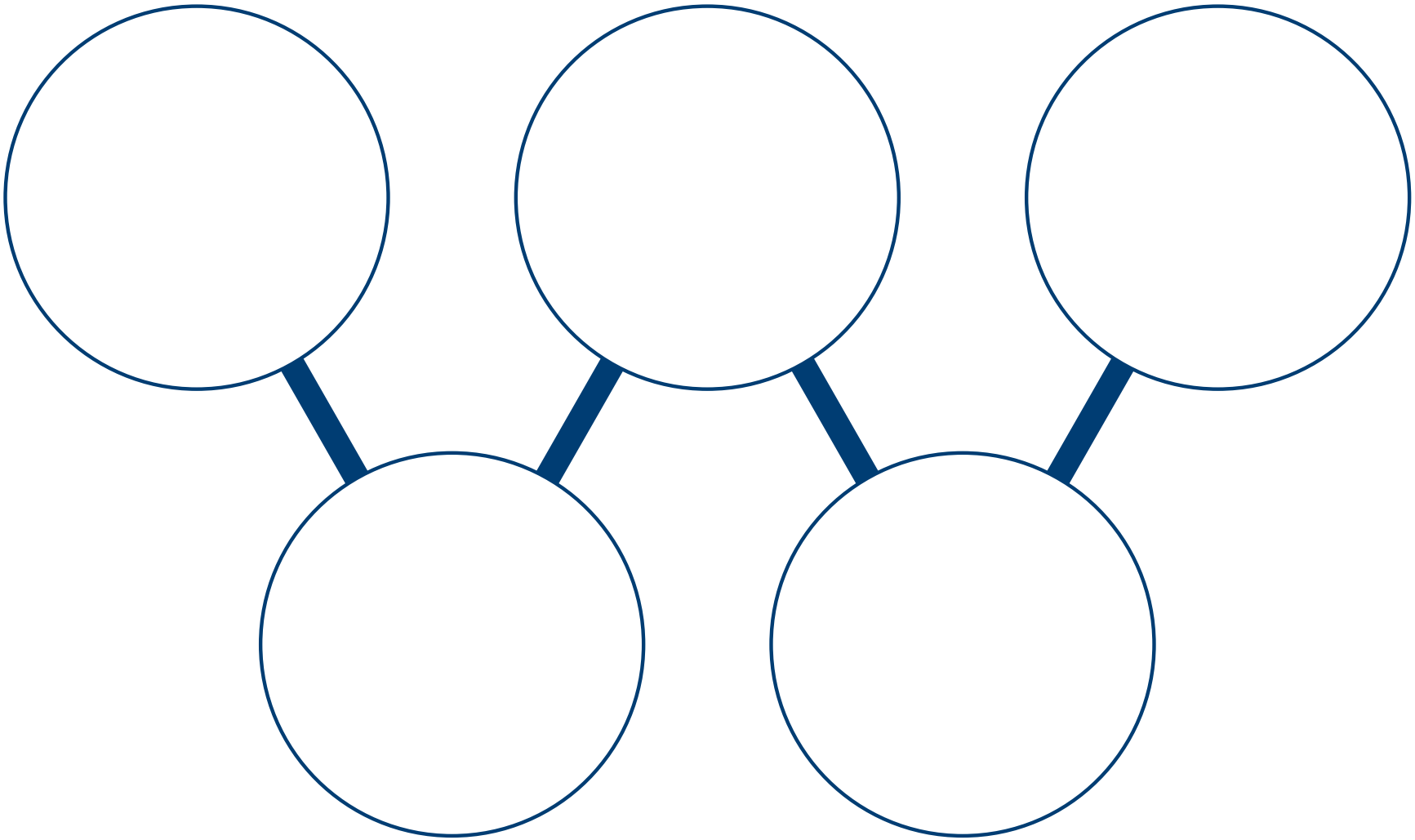

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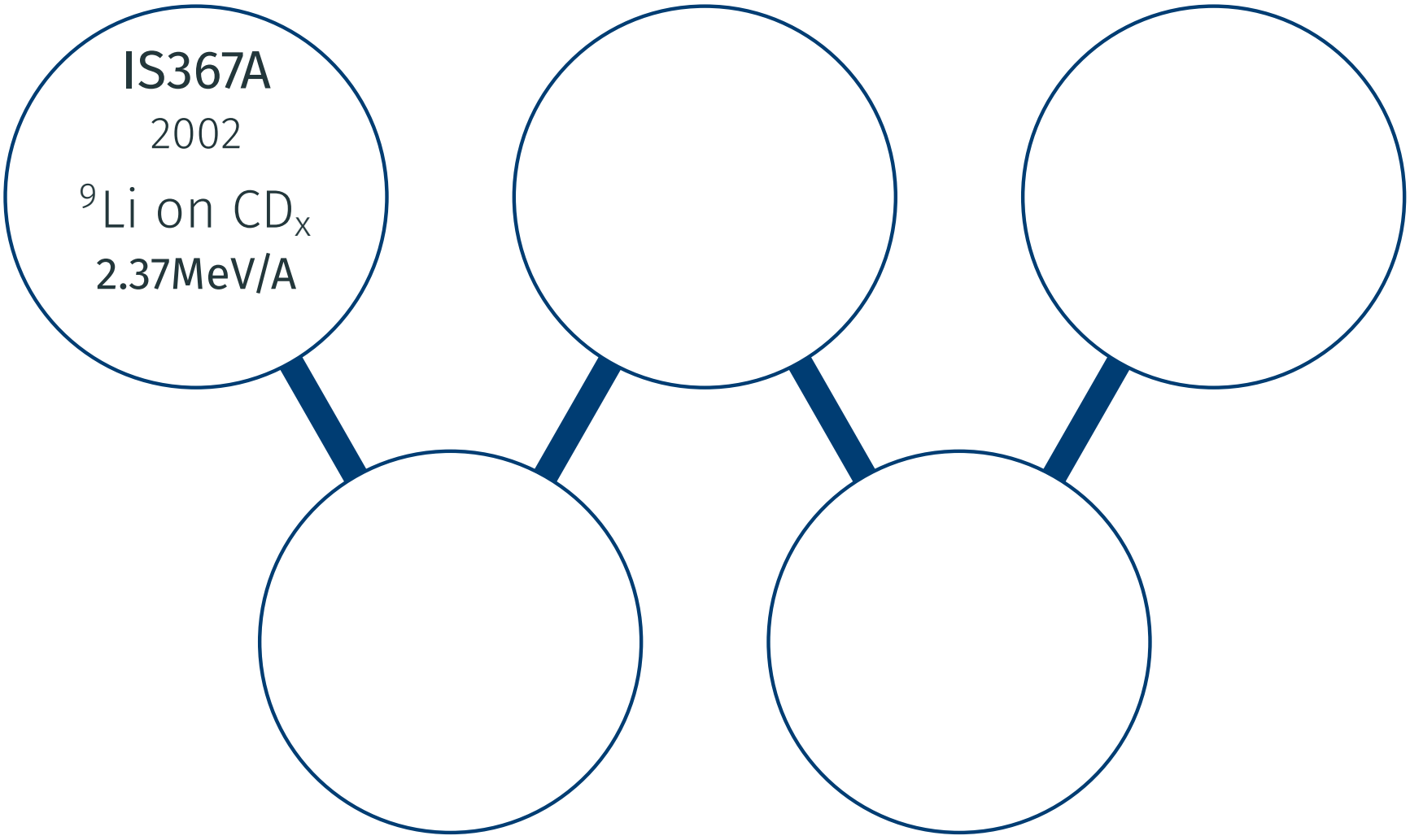

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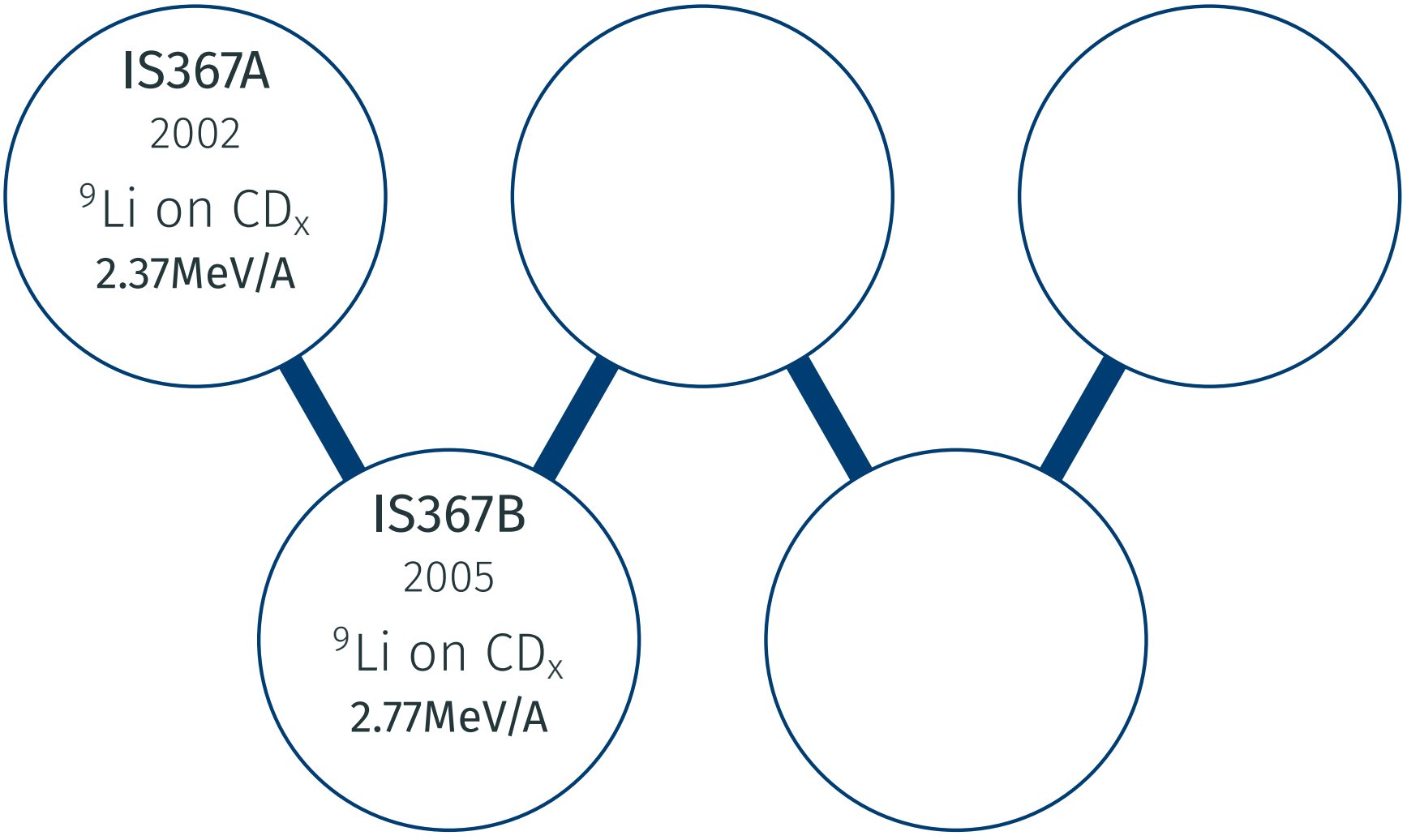

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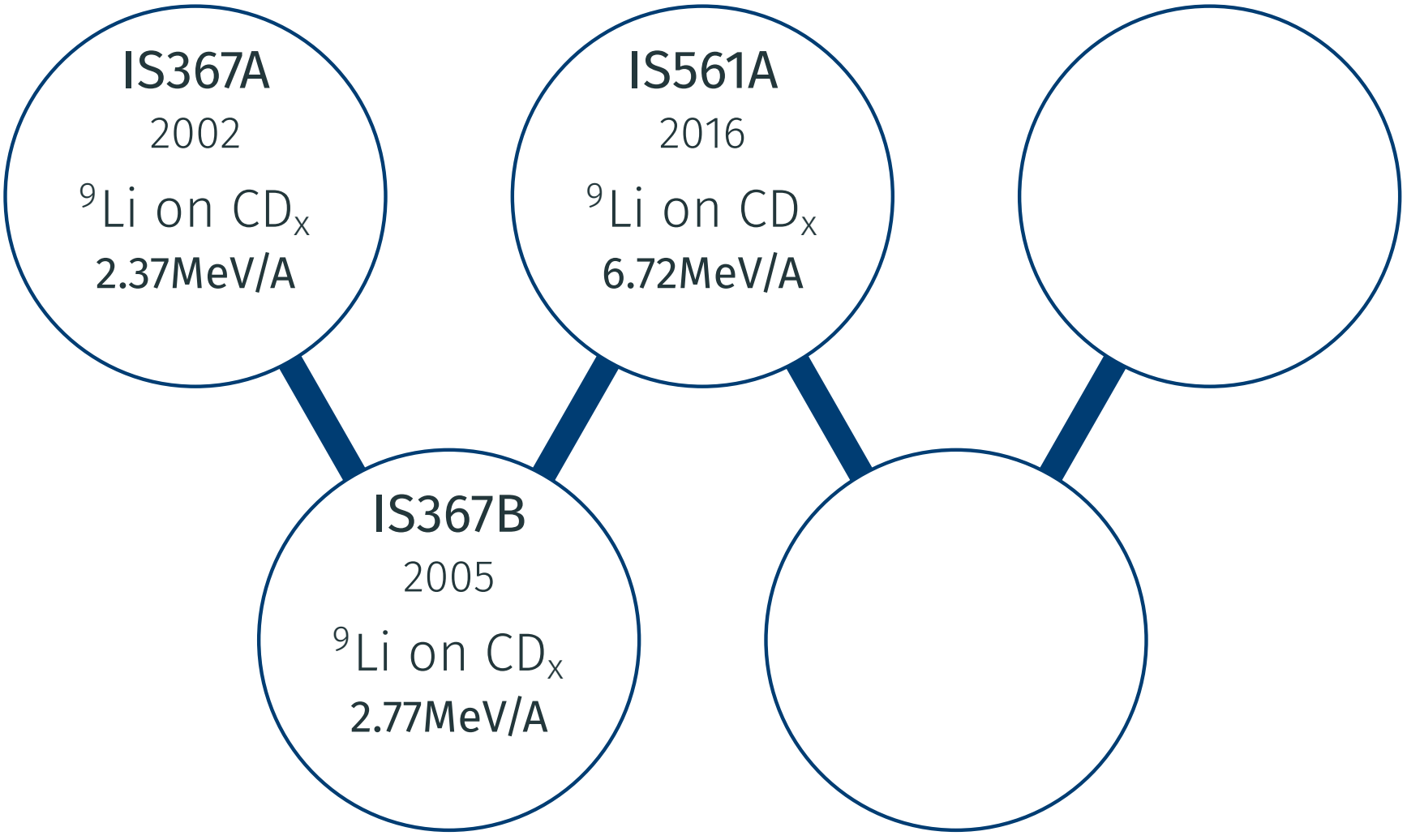

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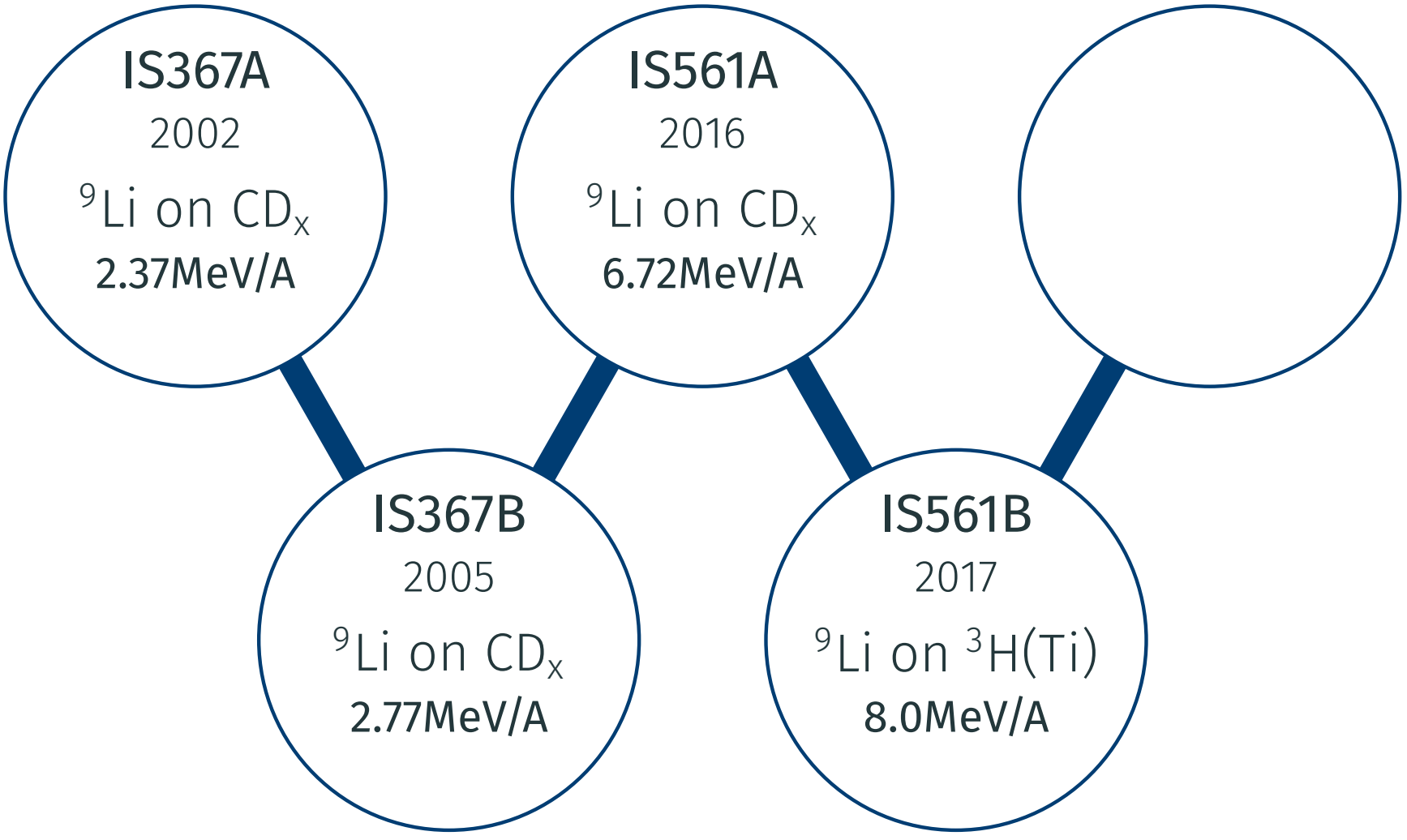

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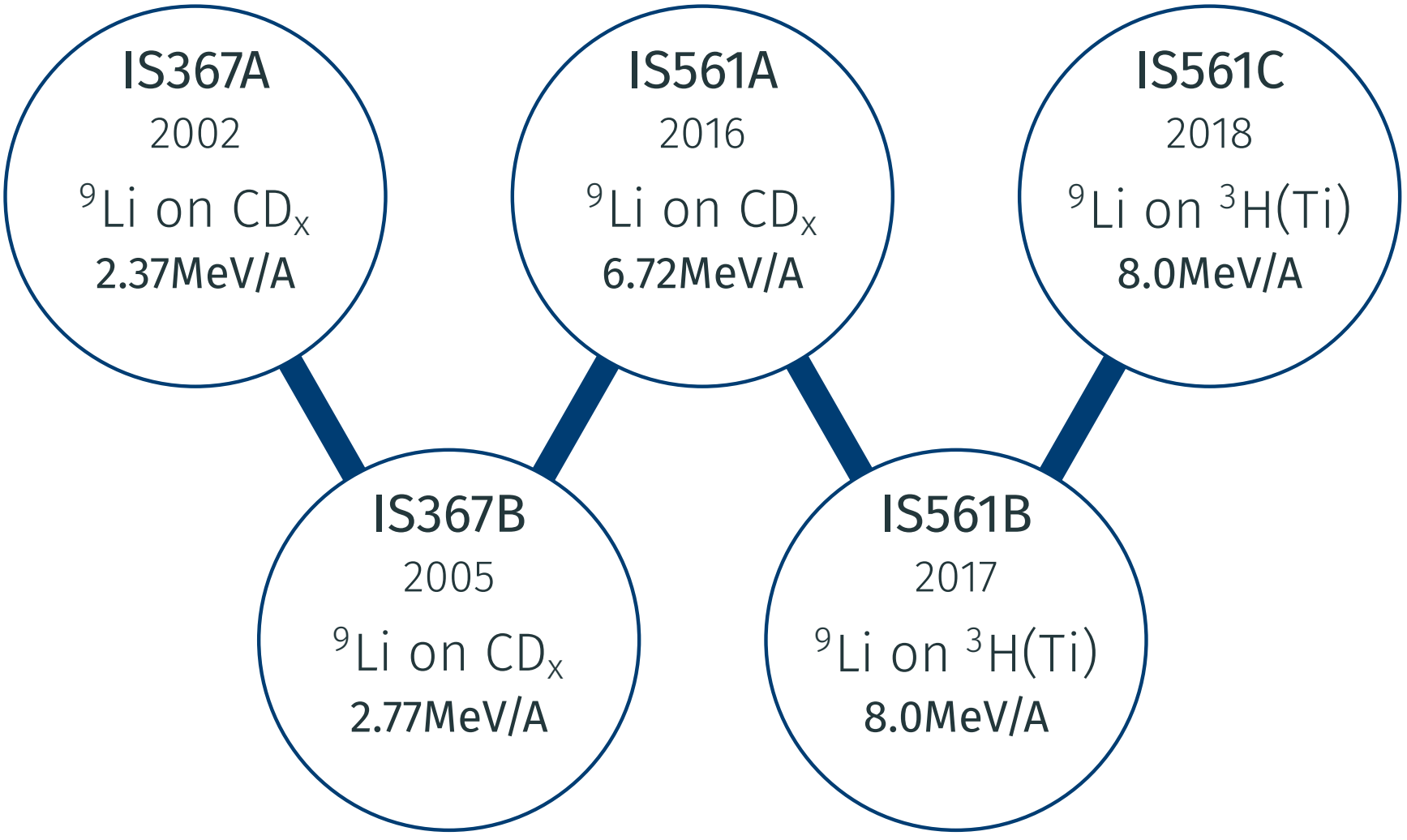
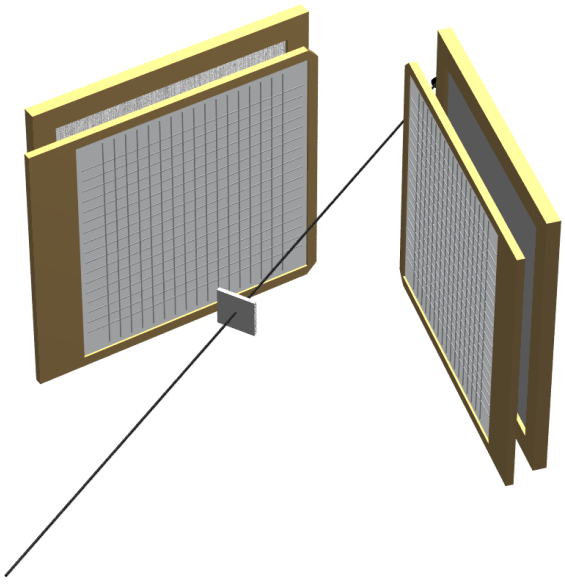


SETUPS

SETUP



- Two DSSD telescopes
- No coverage in backward direction

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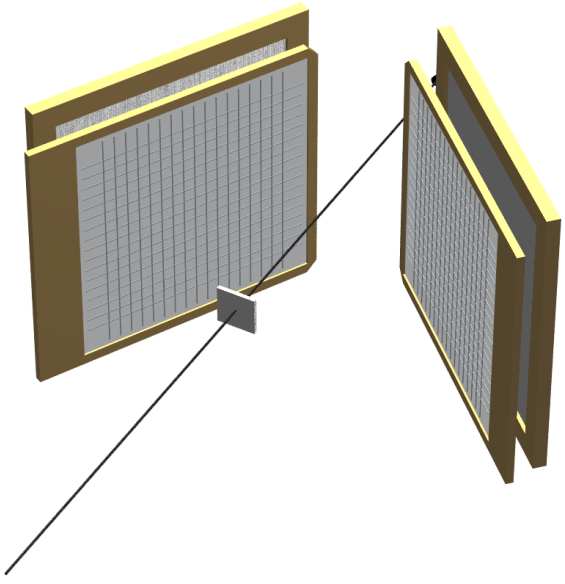

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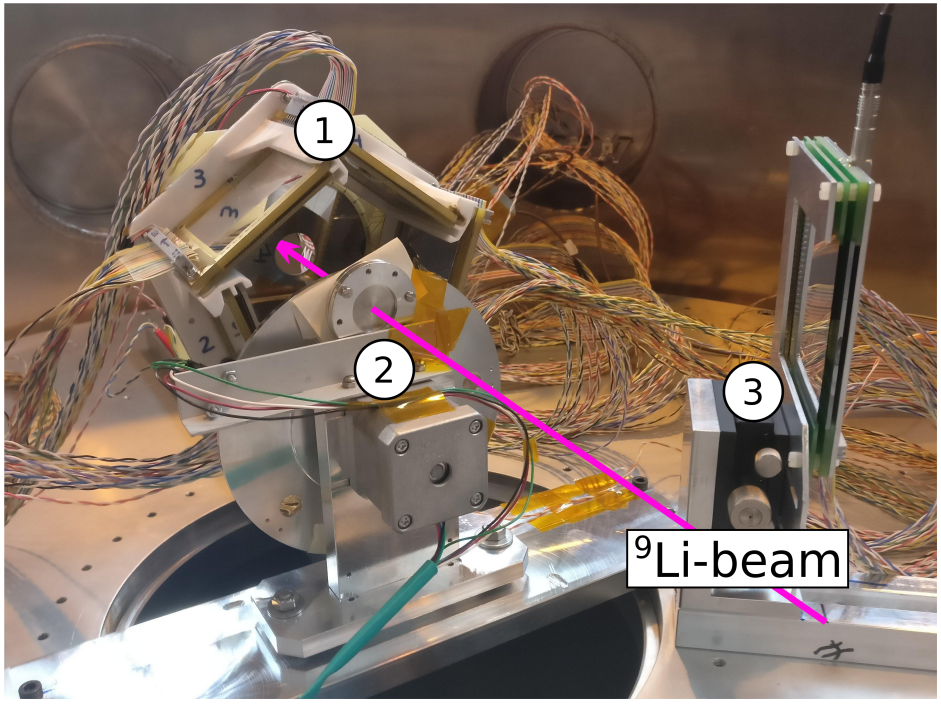

- 5 DSSD telescopes in forward direction
- 1-2 DSSD telescopes in backward direction

RESULTS

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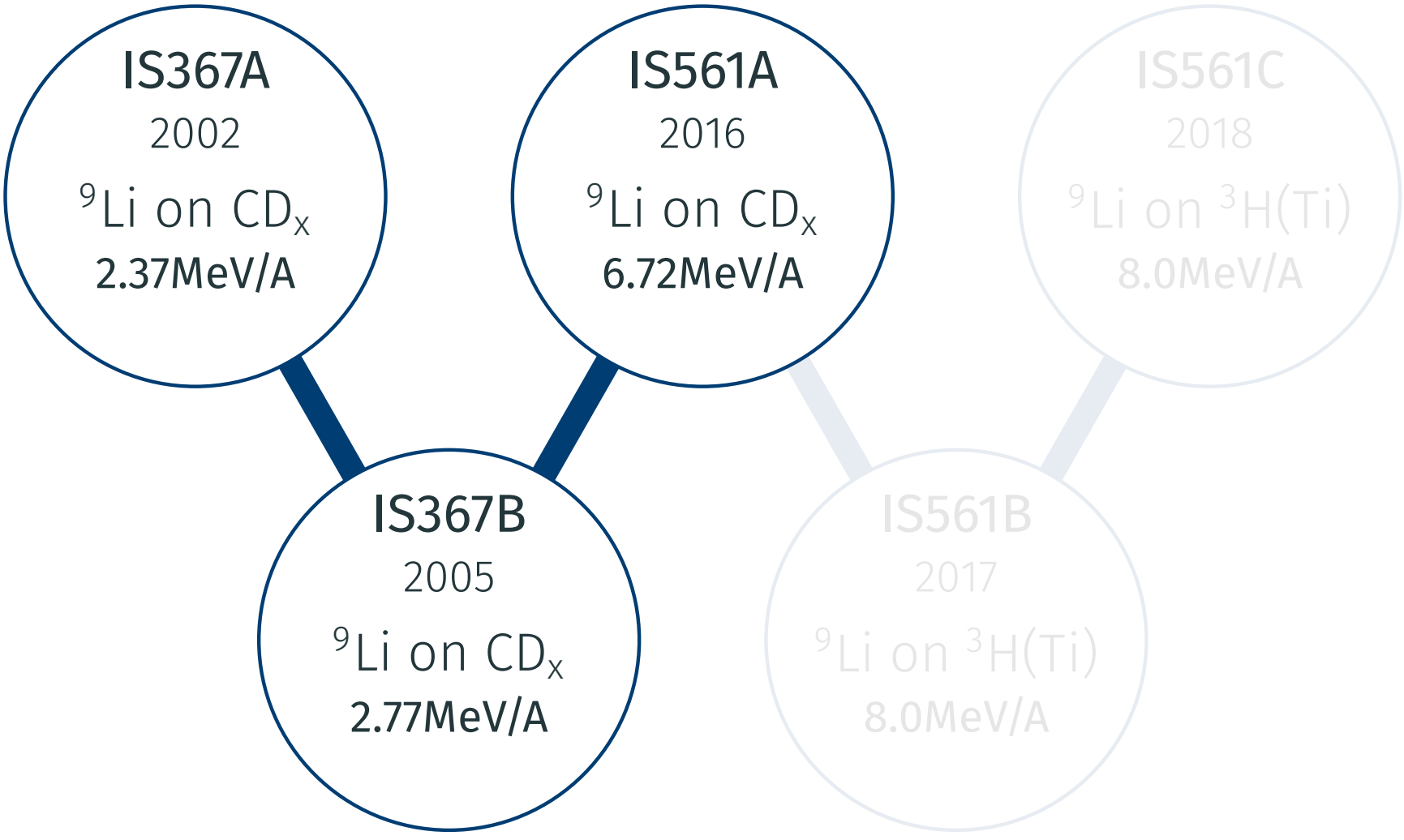
IS367A
2002
^{9}Li on CD_x
2.37MeV/A
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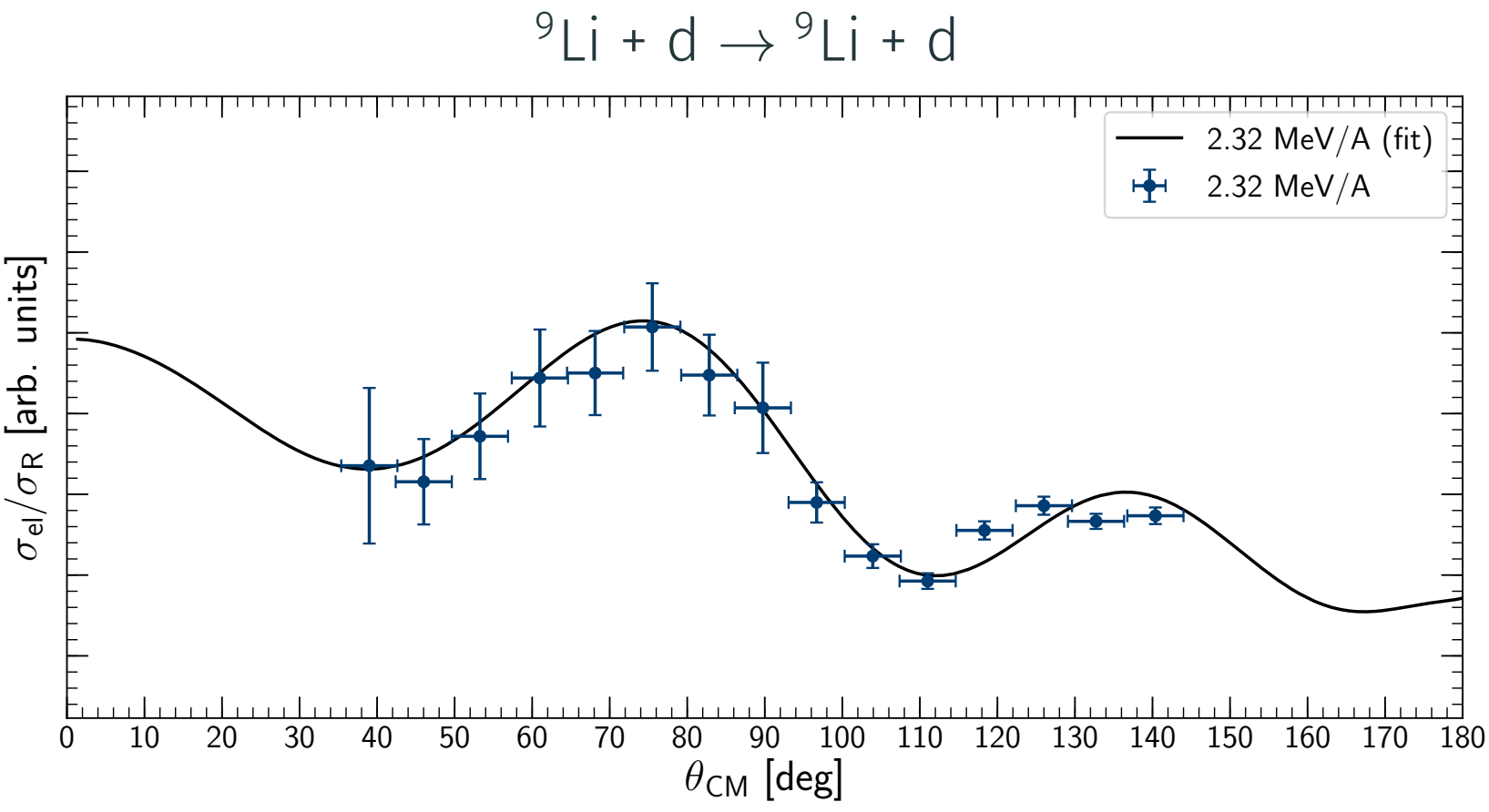
ENERGY EVOLUTION OF ^{9}LI



[H. B. Jeppesen et al. 2005]

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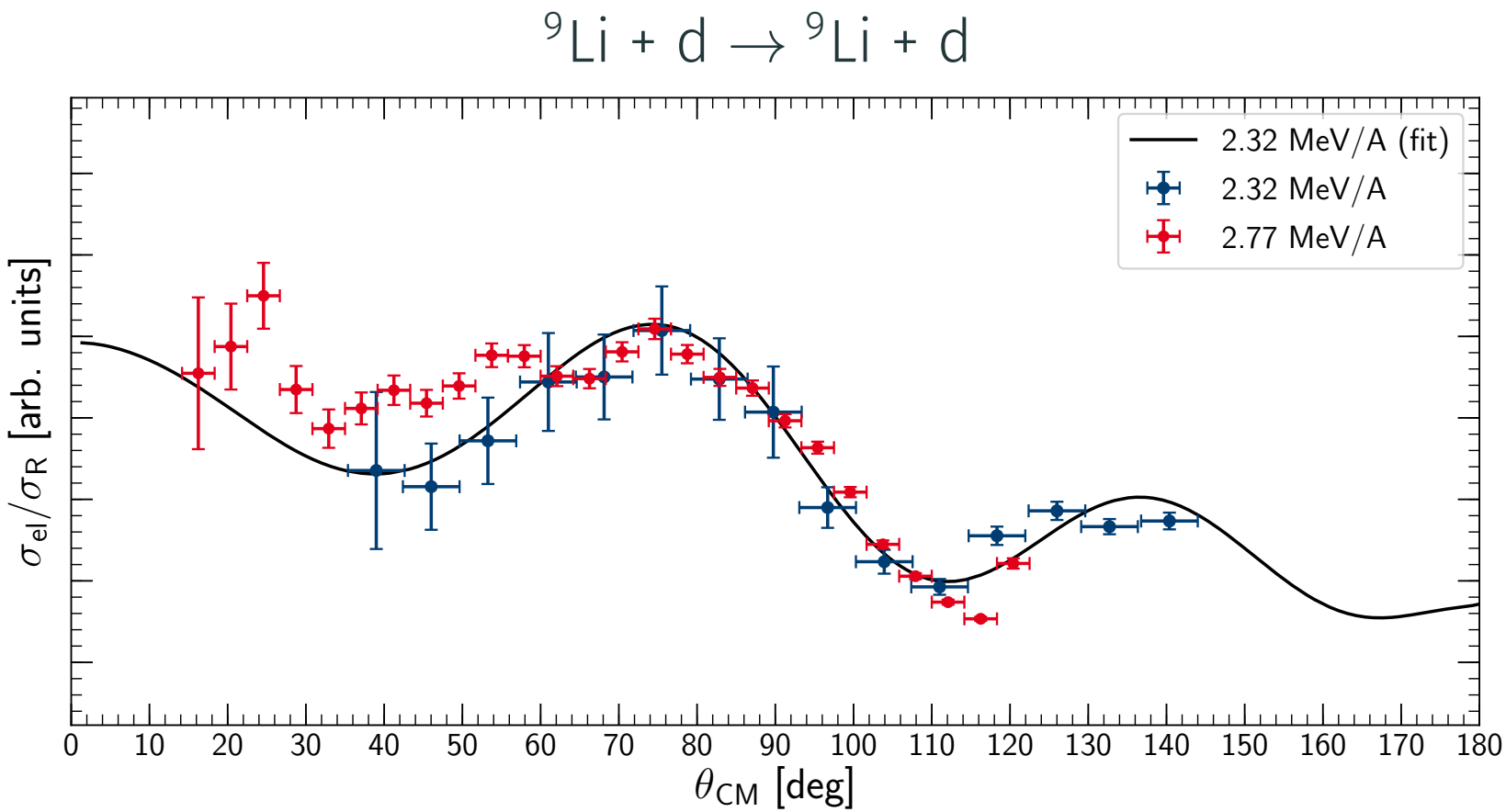

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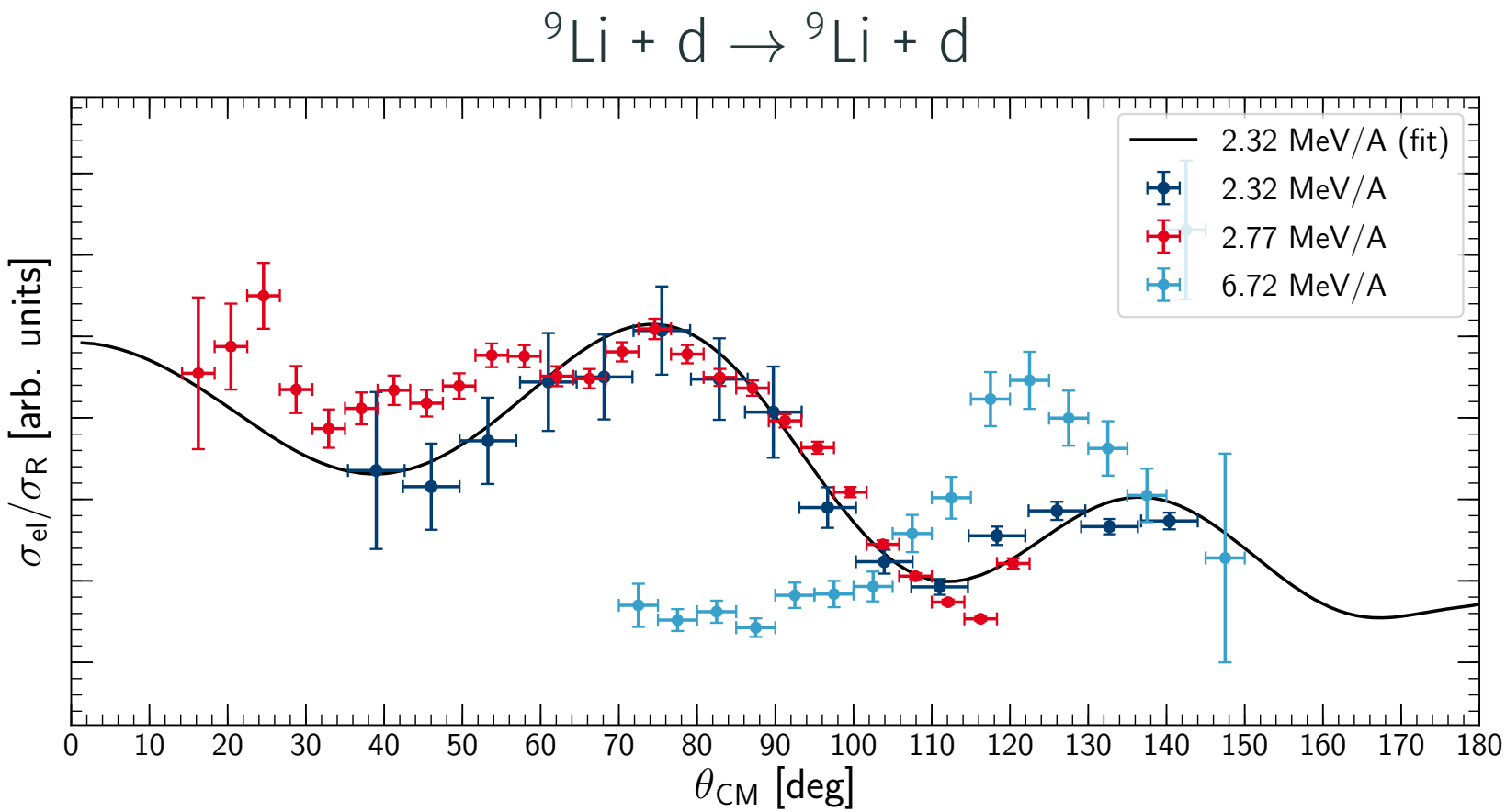
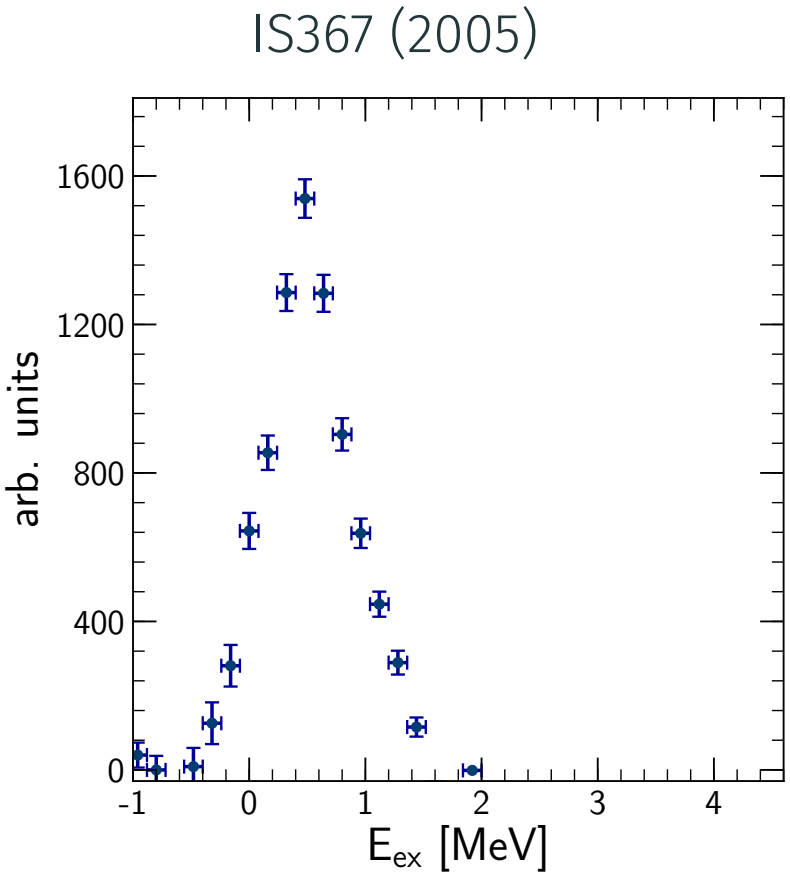
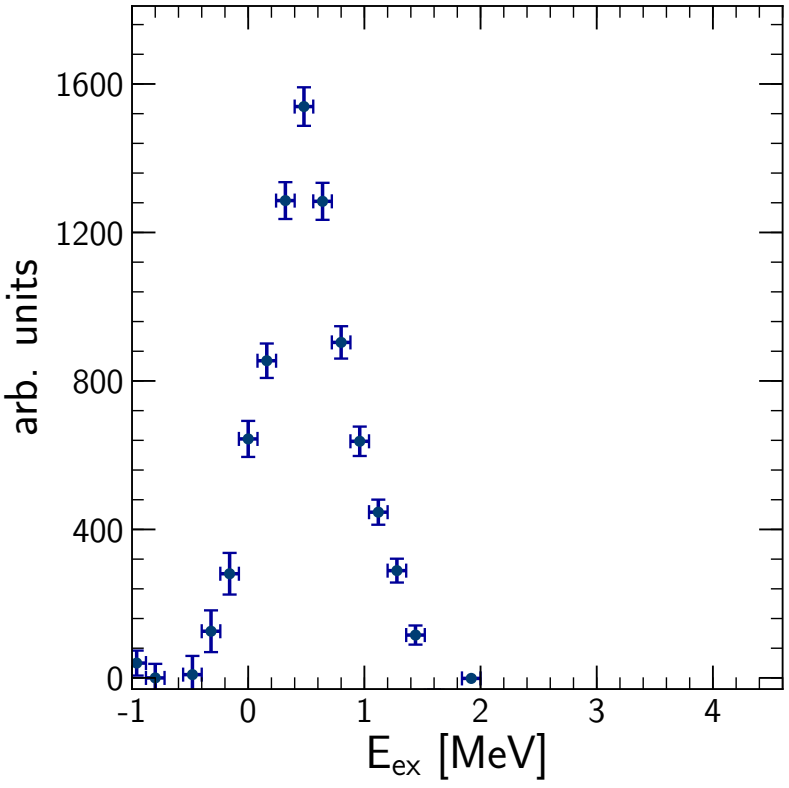


^{10}LI

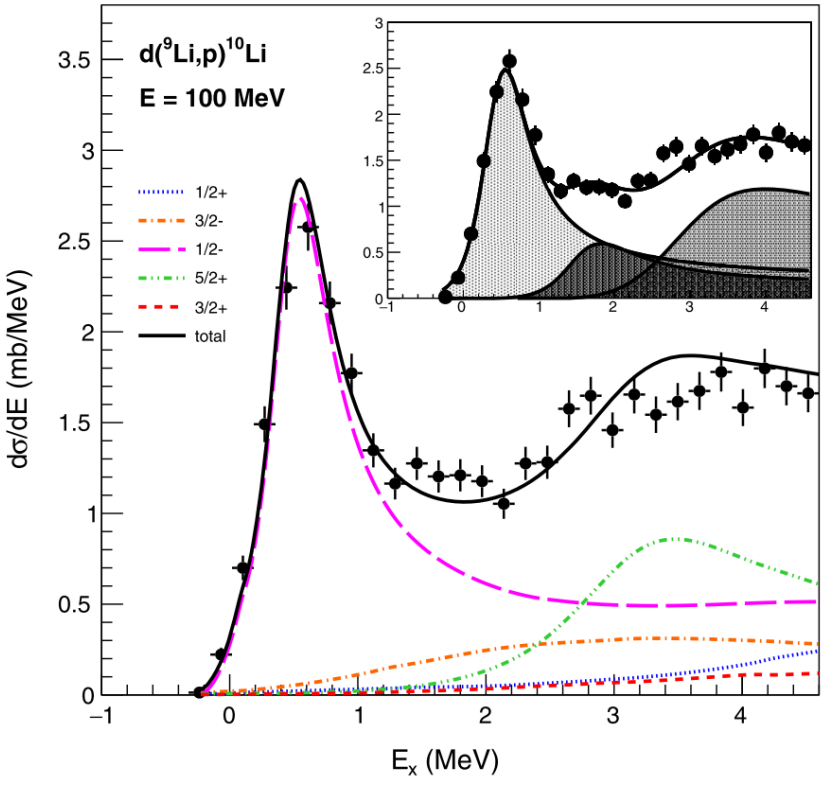


^{10}Li

IS367 (2005)



[M. Cavallaro et al, 2017]



p-wave contribution looks consistent. What about s-wave?

^{10}Li (preliminary)

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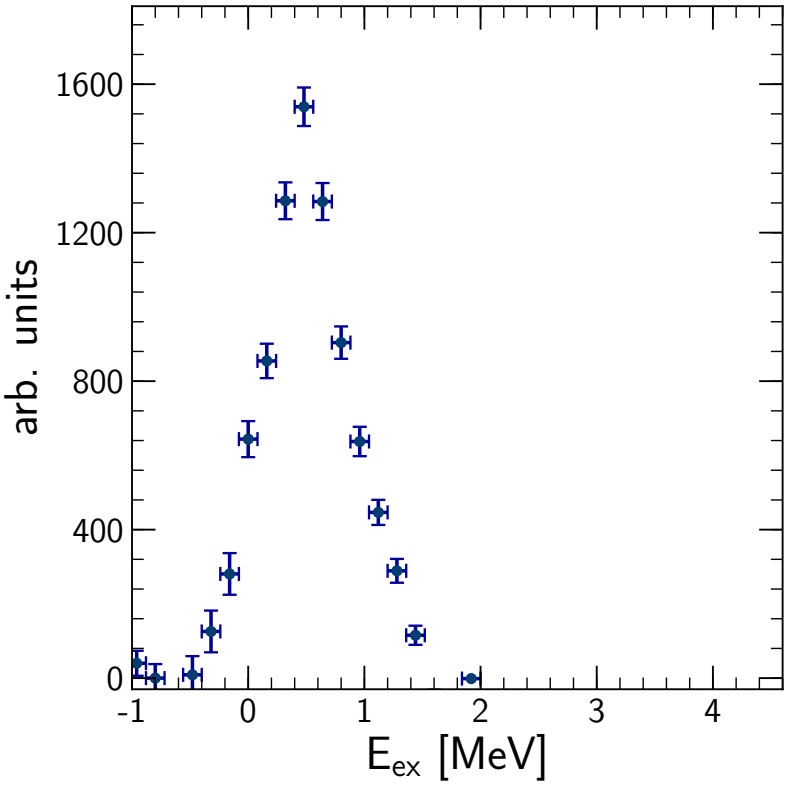
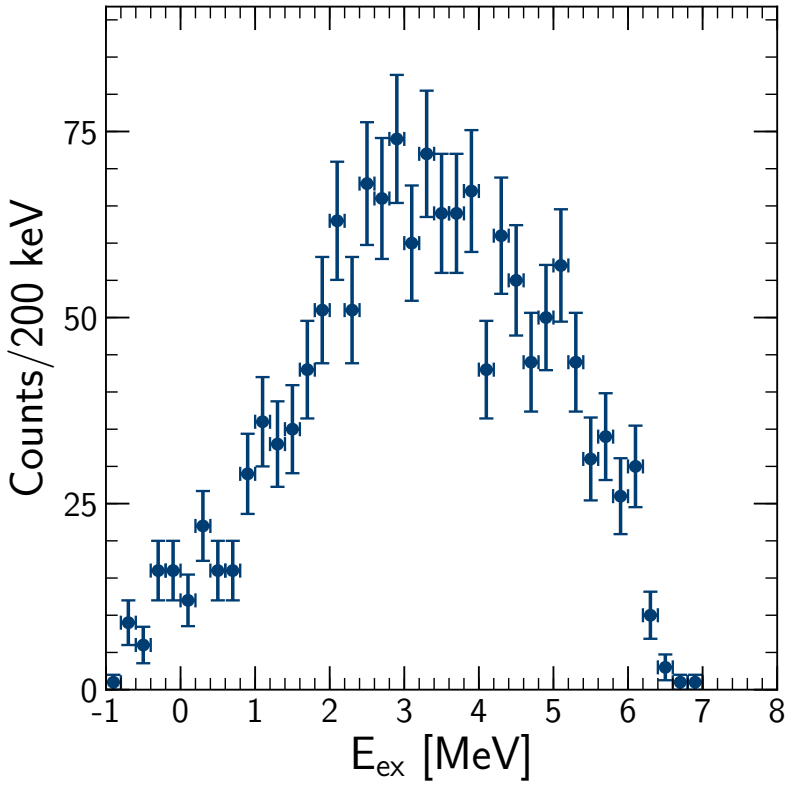


IS561 (2017)



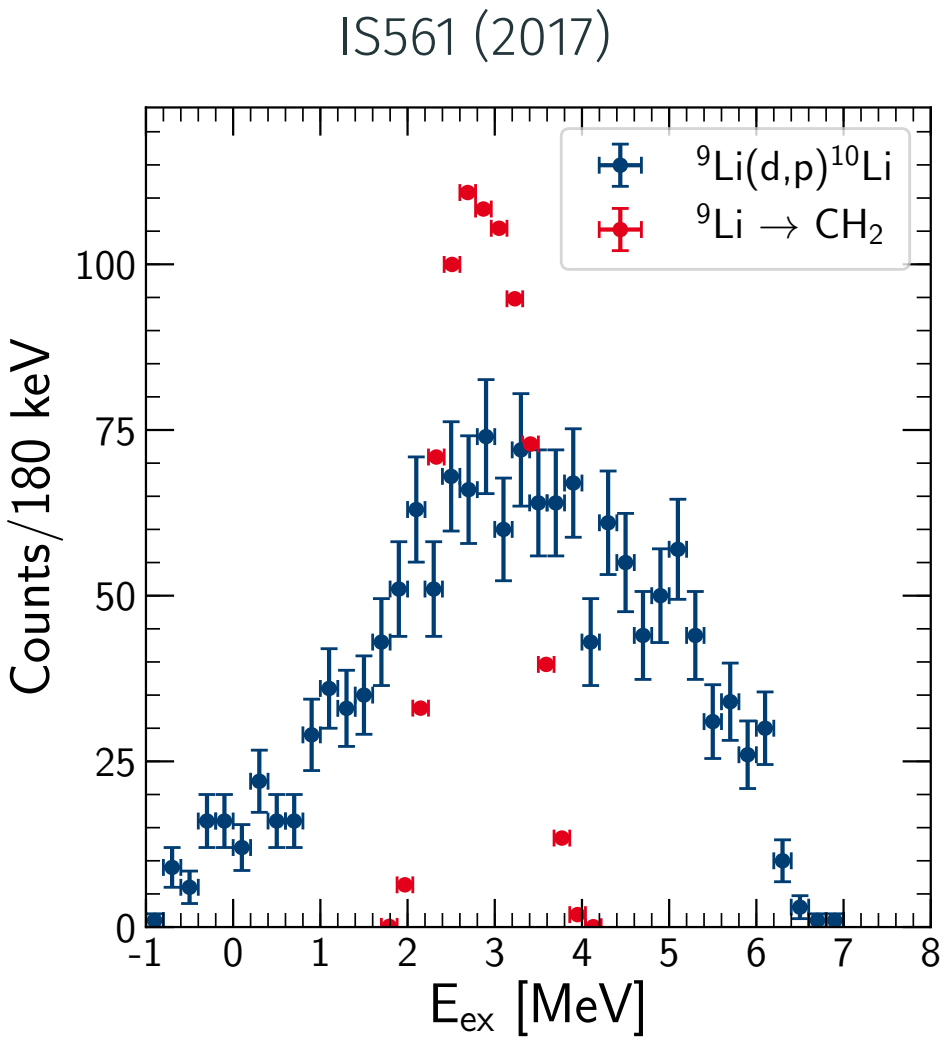
No background subtraction!

^{10}Li (preliminary)

Main background:

- ^{1}H from simulation
- C from data

Main challenge: statistics



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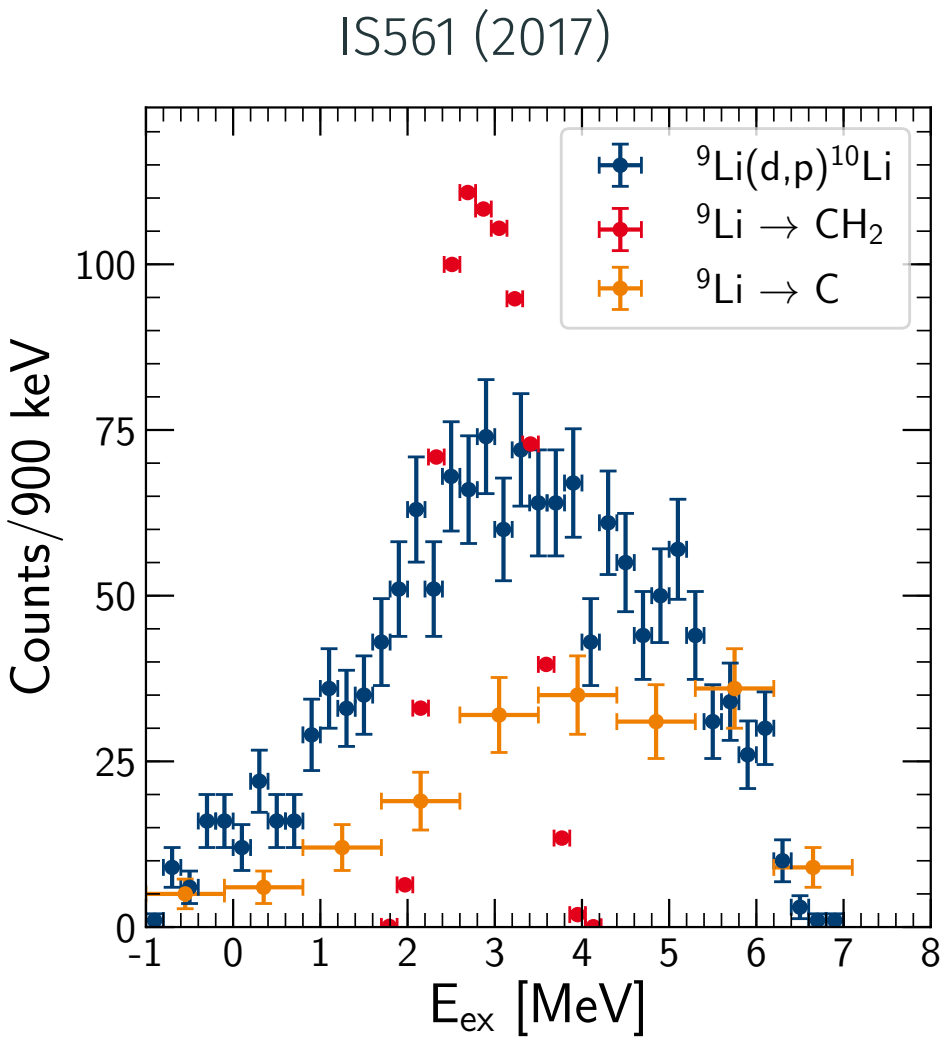
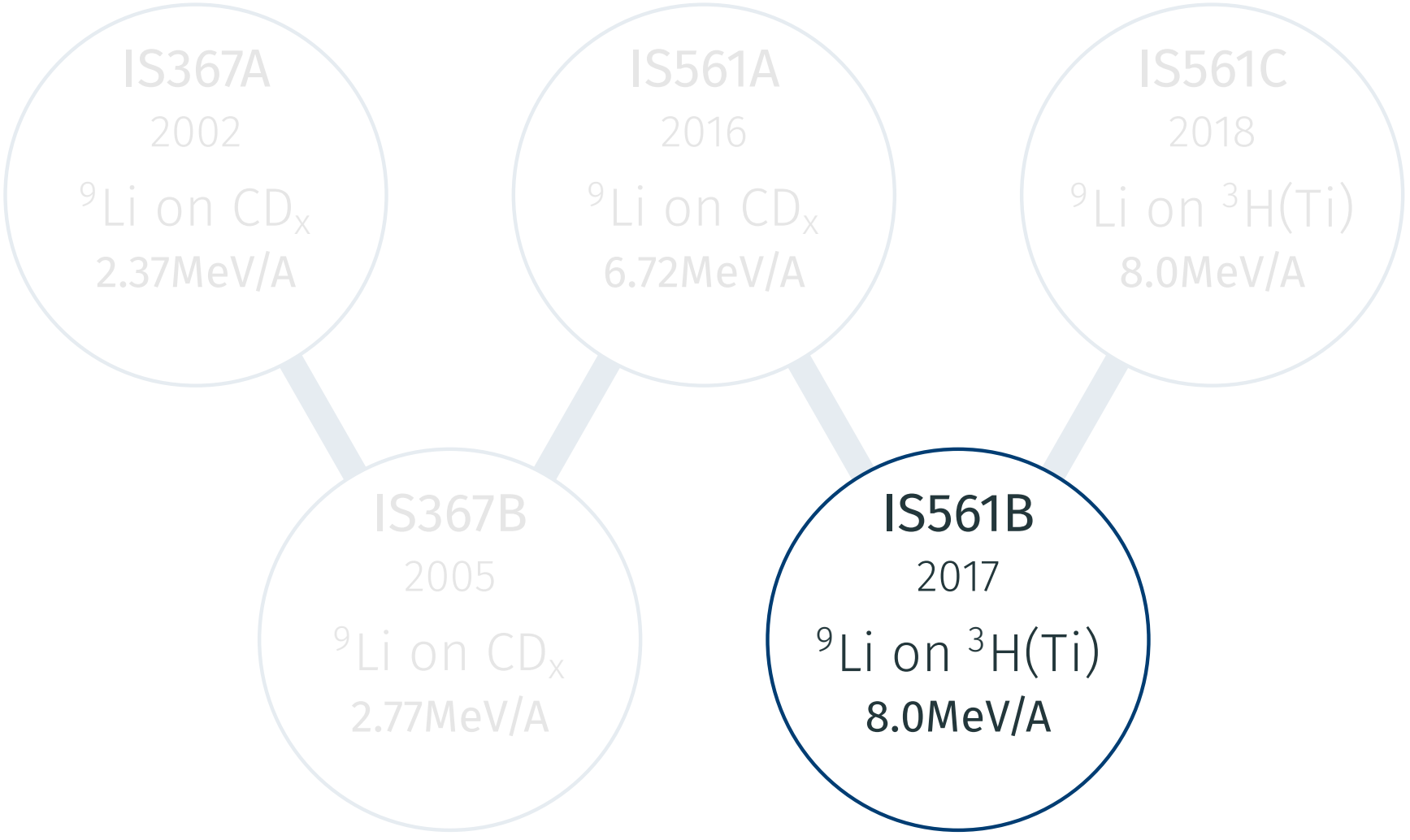


IS561B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HIE-ISOLDE

Energy measurement:	8.0MeV/A
Radioactive beam:	$^{9}Li^{3+}(A/q = 3)$
Pilot beam:	$^{12}C^{4+}(A/q = 3)$
Target:	GPS
Run time:	80h ($\approx$ 6h down time)

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- Tritons decay to ^{3}He
- High beam energy $\rightarrow$ Many open Ti reactions
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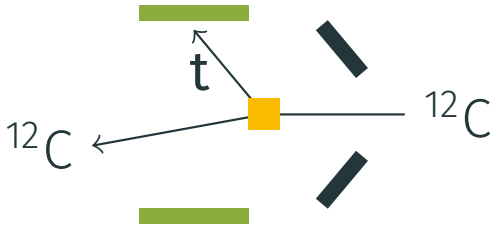
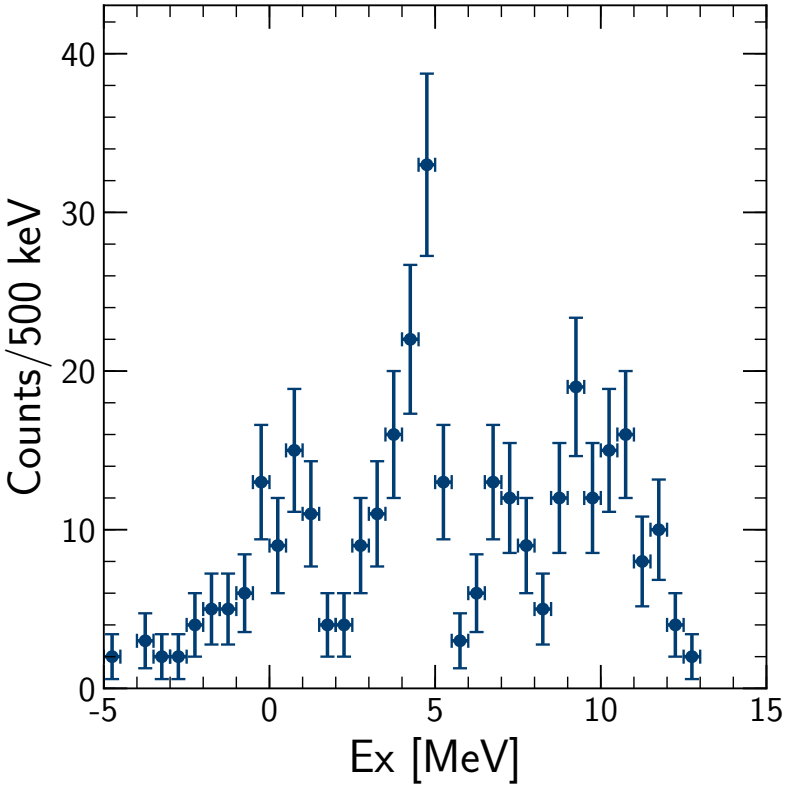
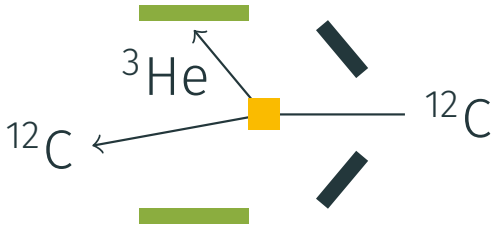
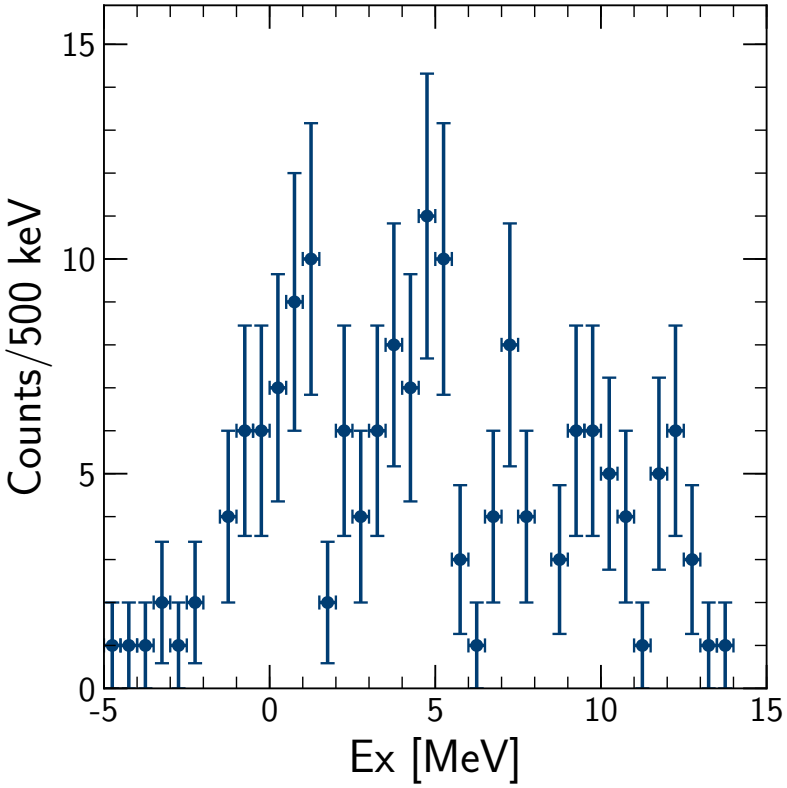
We start with ^{12}C pilot beam in forward direction, where we can identify particles.

^{12}C ON ^{3}H (AND ^{3}HE) (PRELIMINARY)









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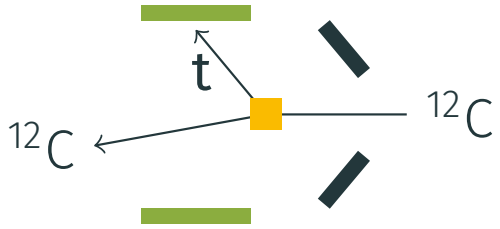
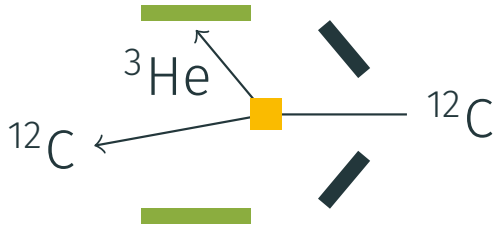
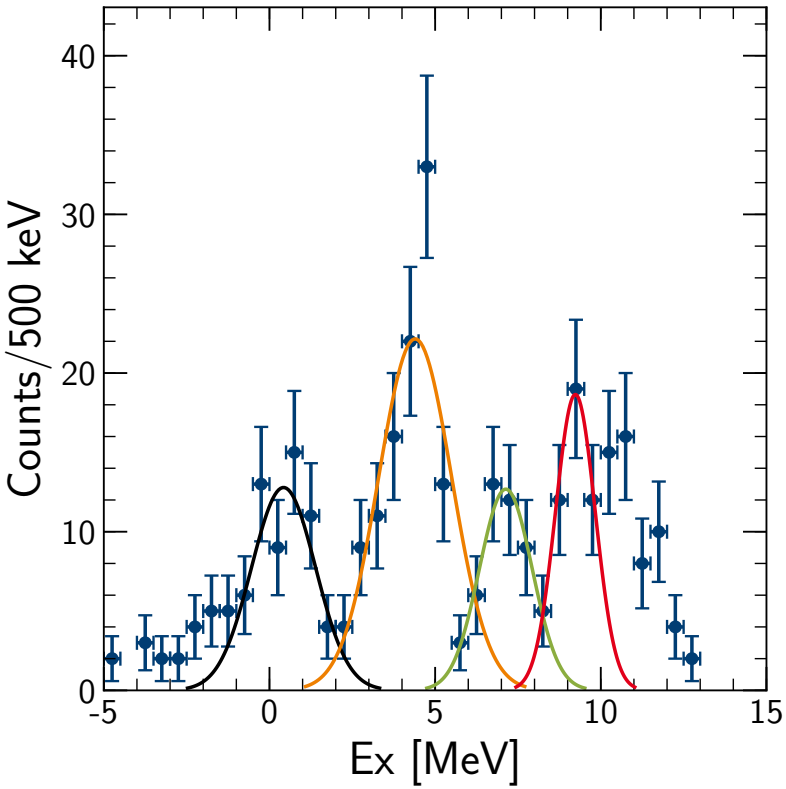
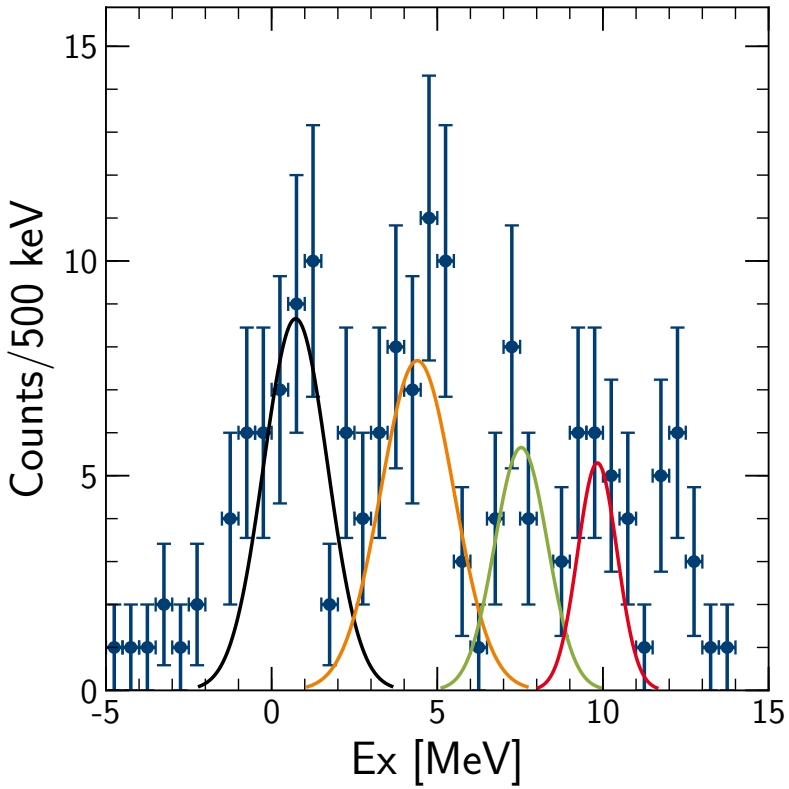








g.s.

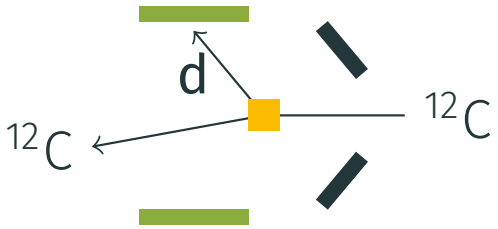
4.4MeV

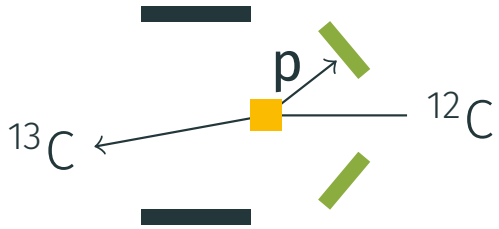
7.7MeV

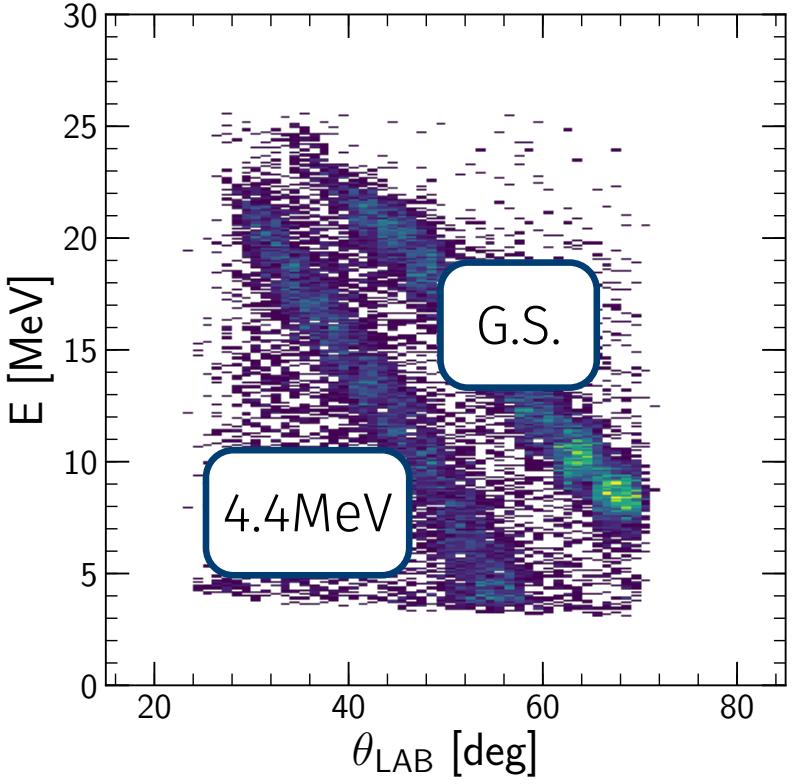
9.6MeV

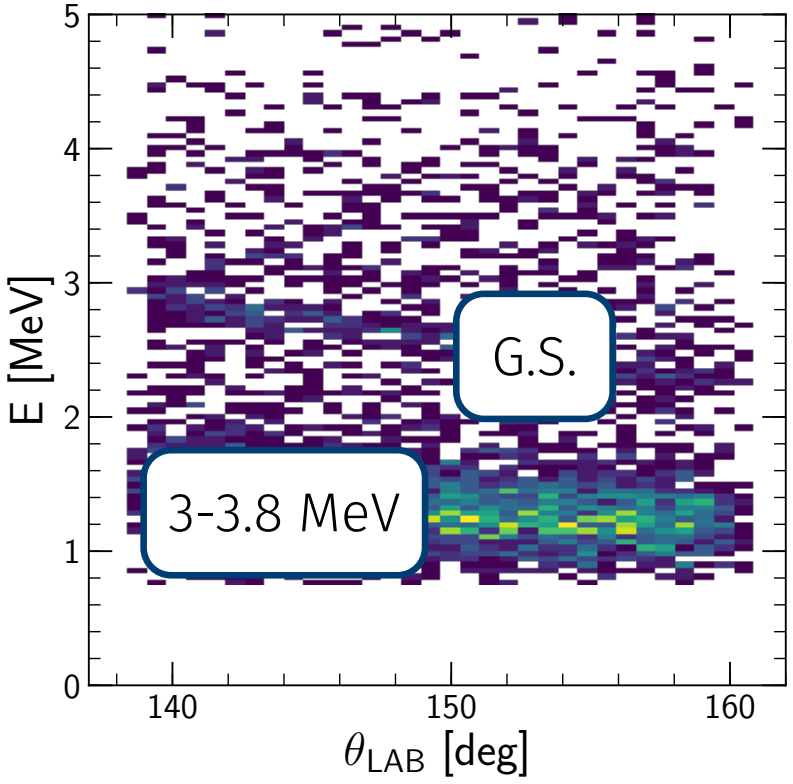
^{12}C ON DEUTERATED PLASTIC

^{12}C ON DEUTERATED PLASTIC (PRELIMINARY)









Very useful for energy and geometry calibrations!

^{9}Li on Ti-backed ^{3}H

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- Primary reaction of interest: ^{9}Li(t,p)^{11}Li
- Background should scale with integrated beam time, beam intensity and target thickness
- We can look at different particles

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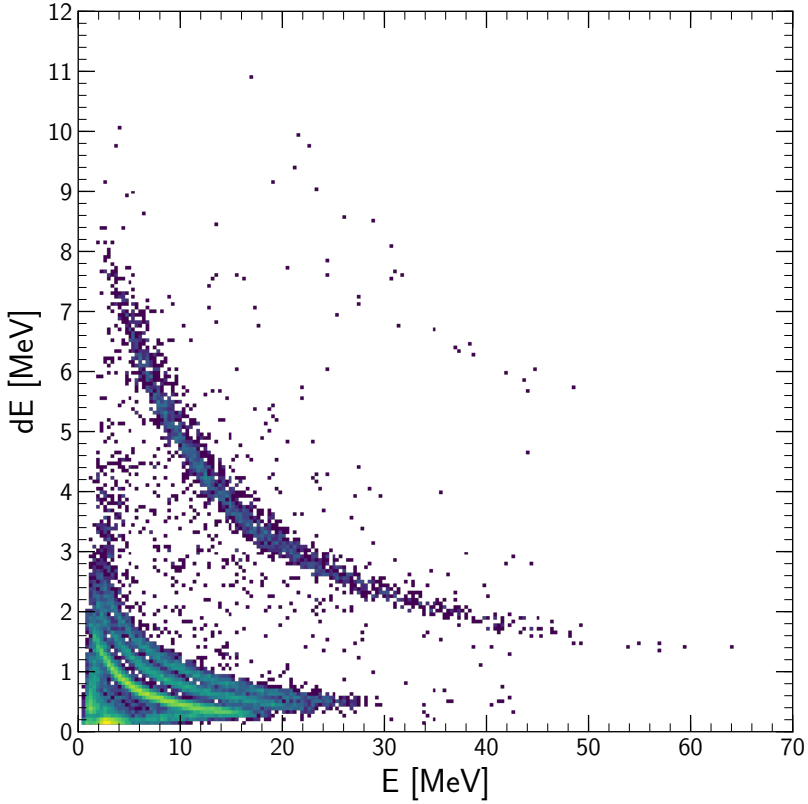

Particle	N_{sig}/N_{bg}
^{1}H	0.49 ± 0.1
^{2}H	0.37 ± 0.2
^{3}H	0.35 ± 0.2
^{4}He	0.36 ± 0.2

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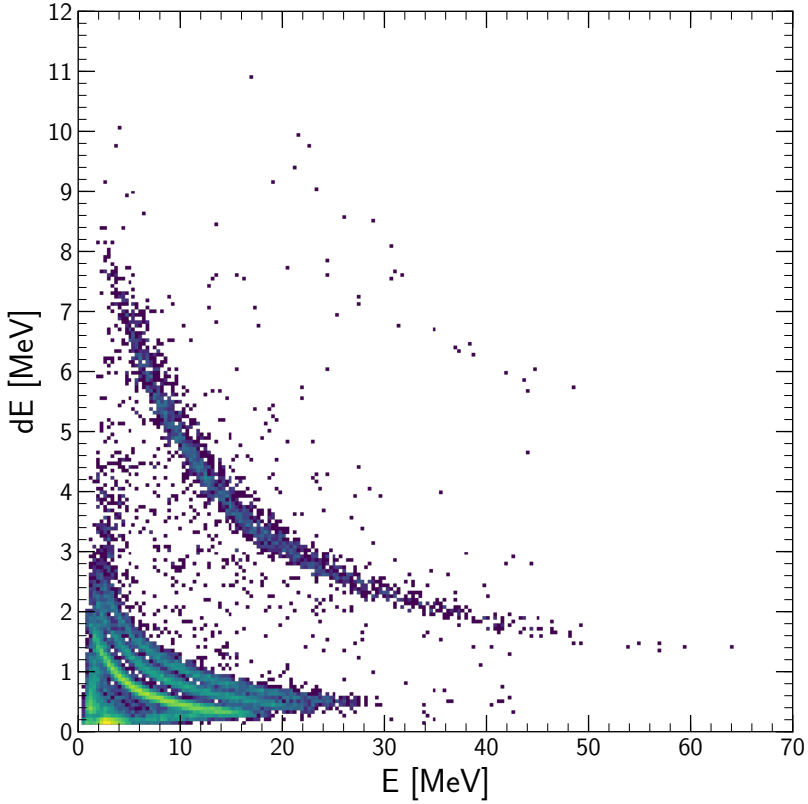

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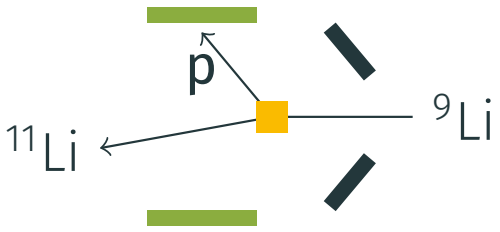

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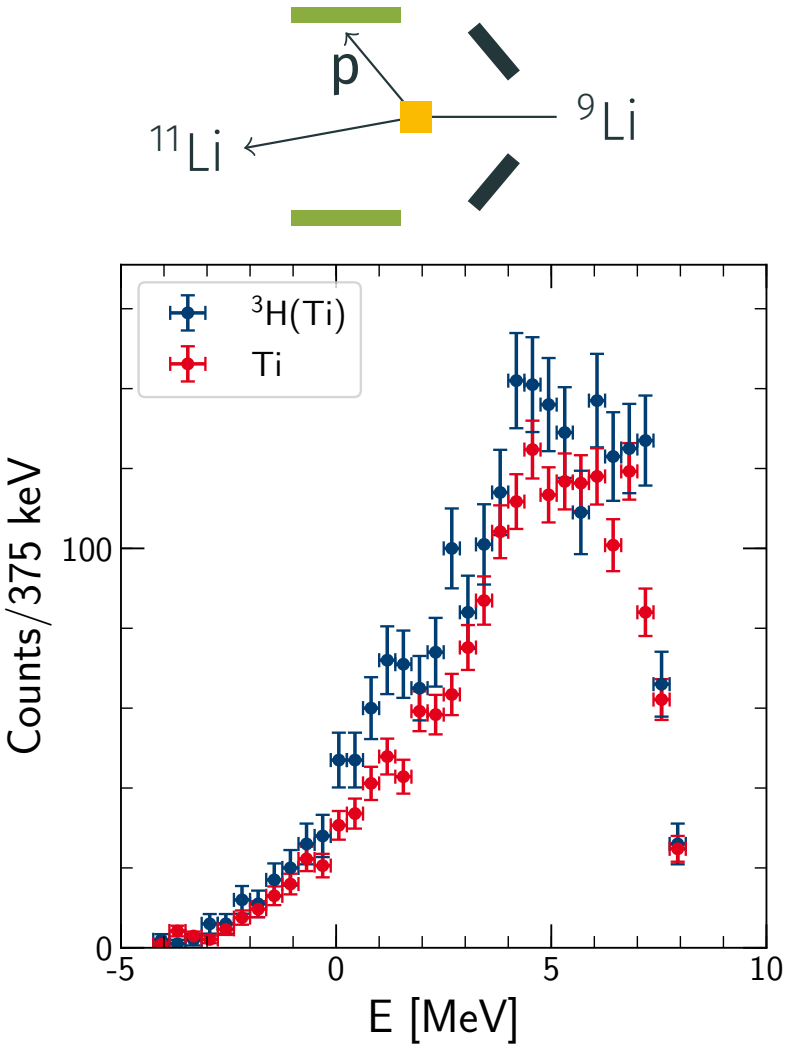

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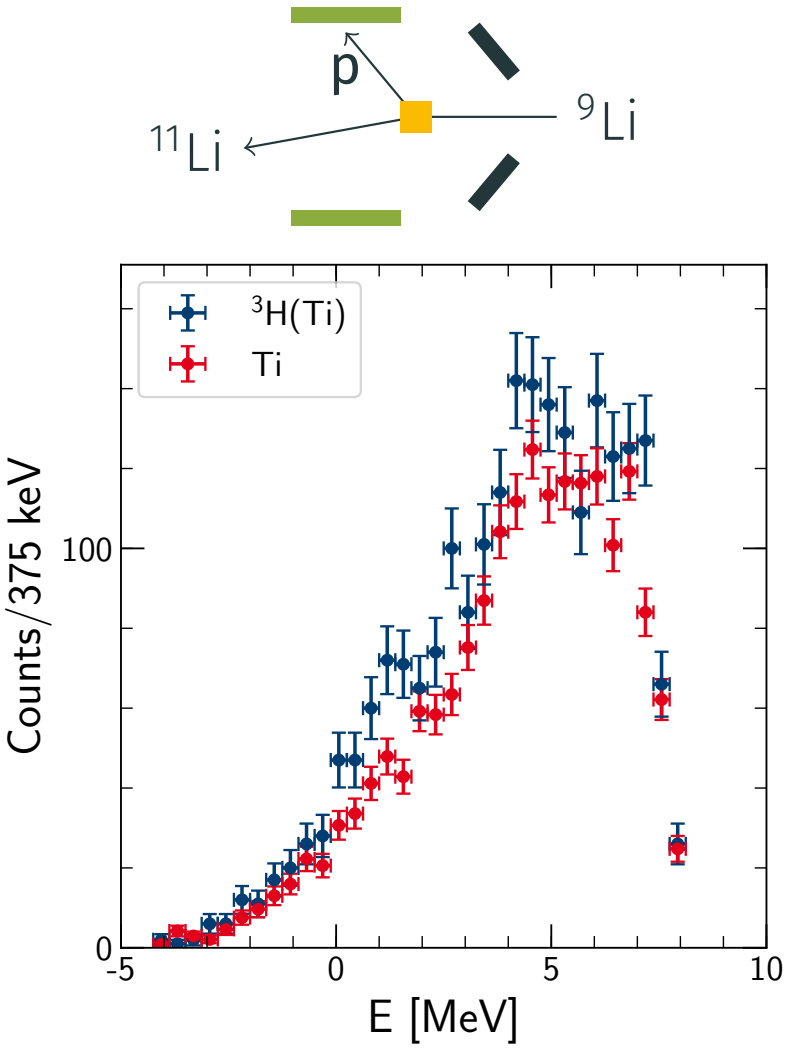

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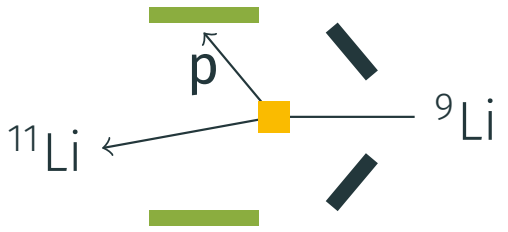
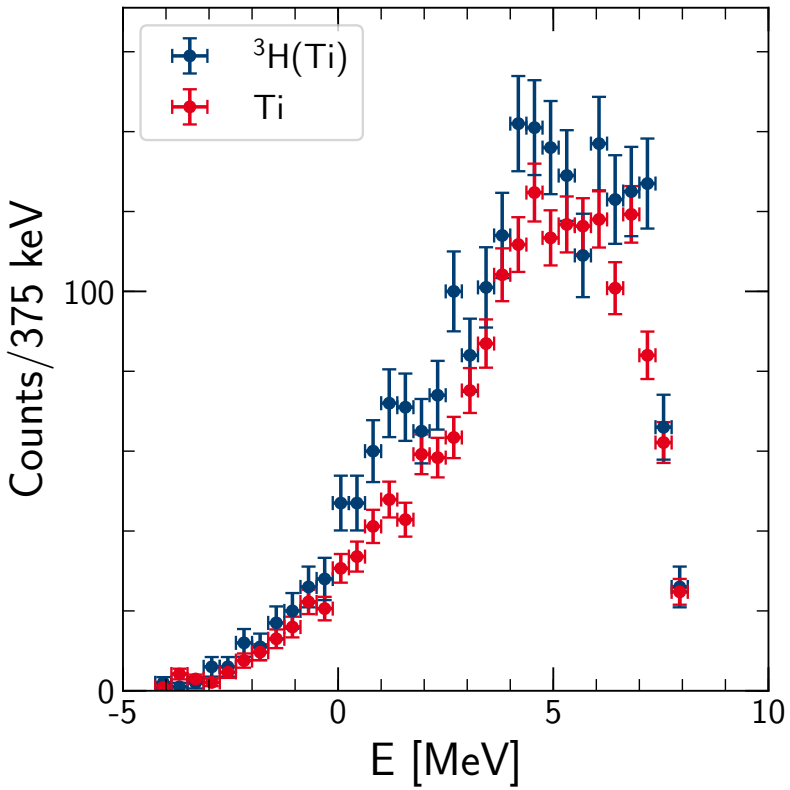
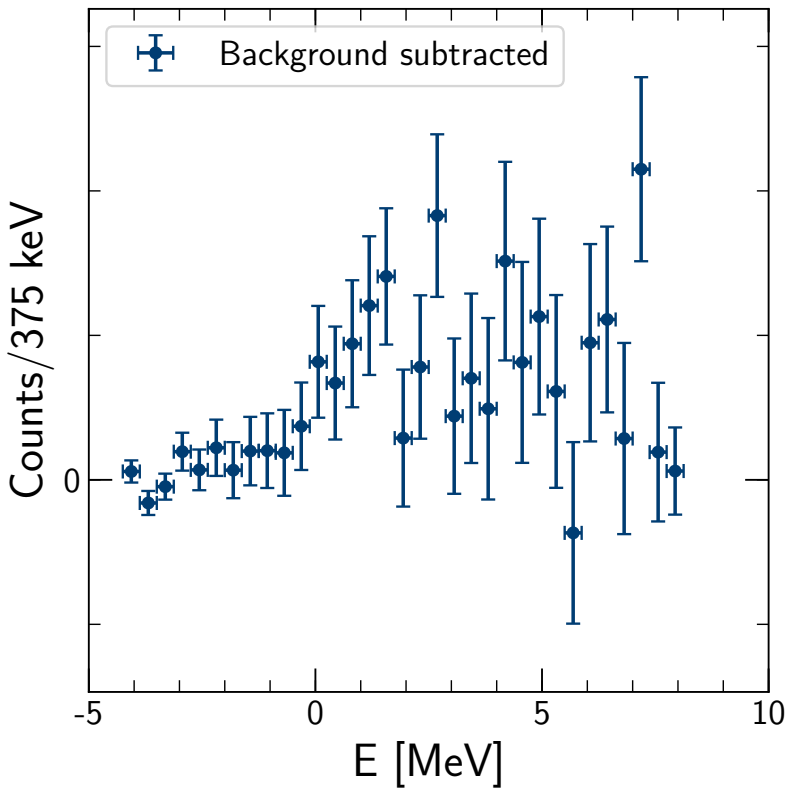
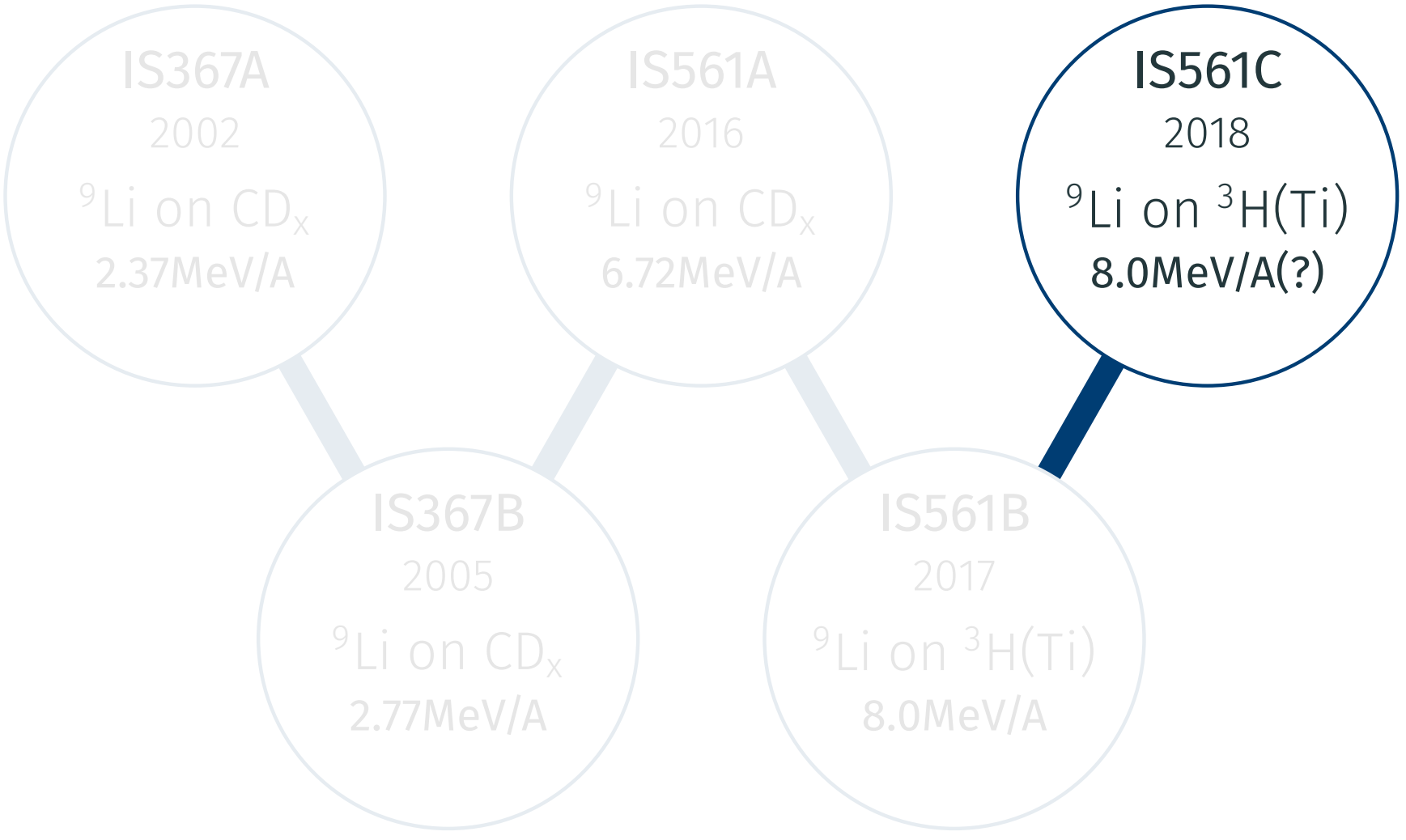






IS561C


IS367A
2002
^{9}Li on CD_x
2.37MeV/A
IS561A
2016
^{9}Li on CD_x
6.72MeV/A
IS561C
2018
^{9}Li on ^{3}H(Ti)
8.0MeV/A(?)
IS367B
2005
^{9}Li on CD_x
2.77MeV/A
IS561B
2017
^{9}Li on ^{3}H(Ti)
8.0MeV/A

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MAGISOL ISOLDE