Proton transfer using RIB + ^{7}Li reactions at ATLAS

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ATLAS Workshop
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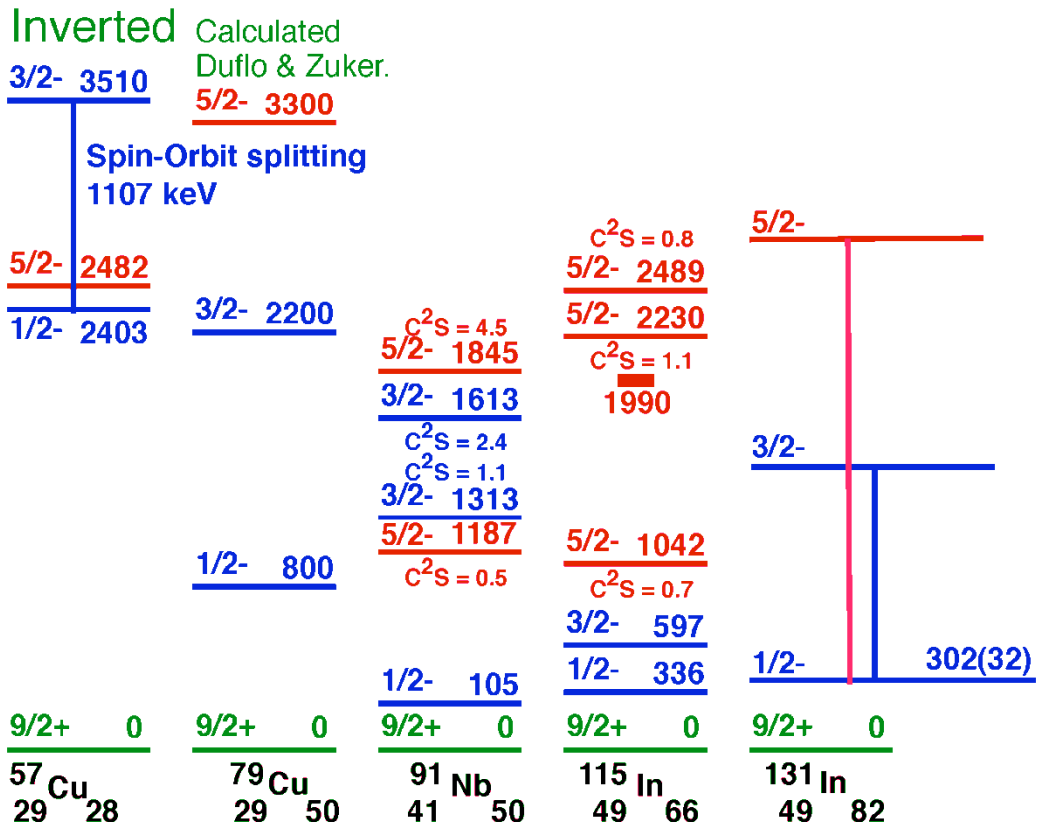
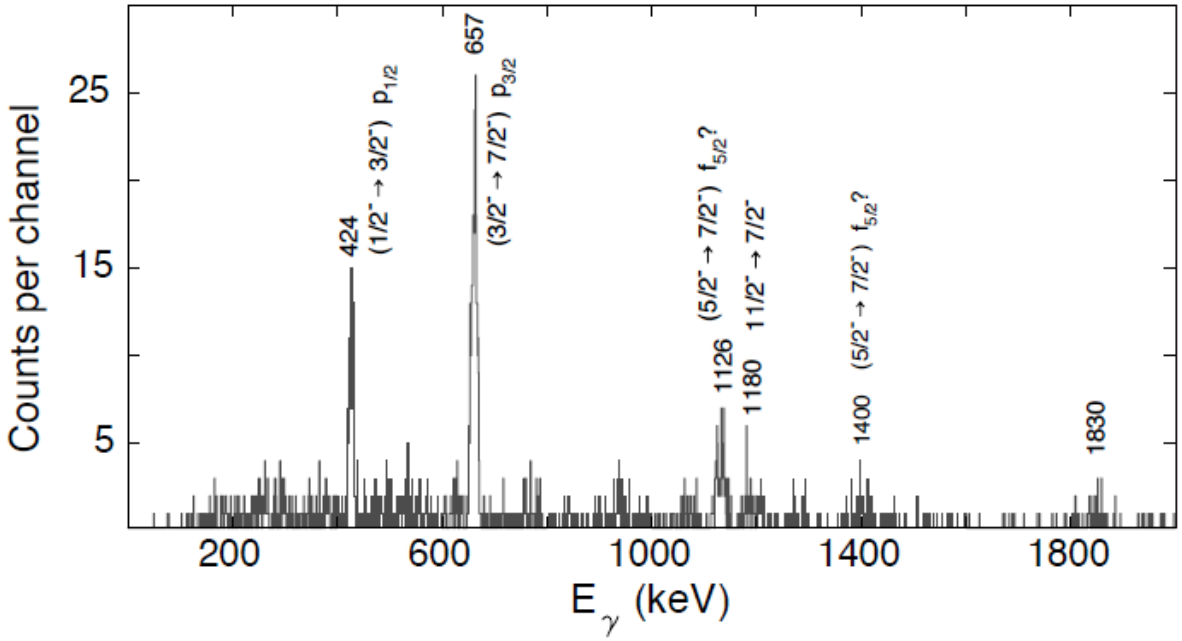
- Investigation of single-particle and single-hole states in neutron-rich nuclei, e.g. near N=82 (energies, spins, parities…).

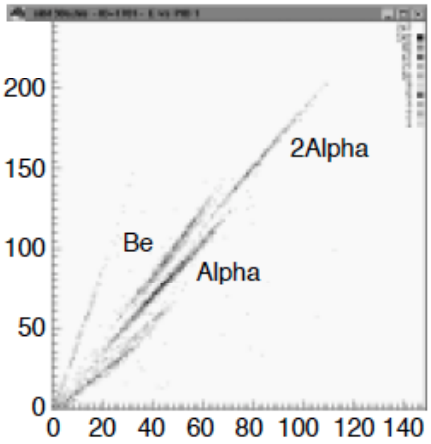


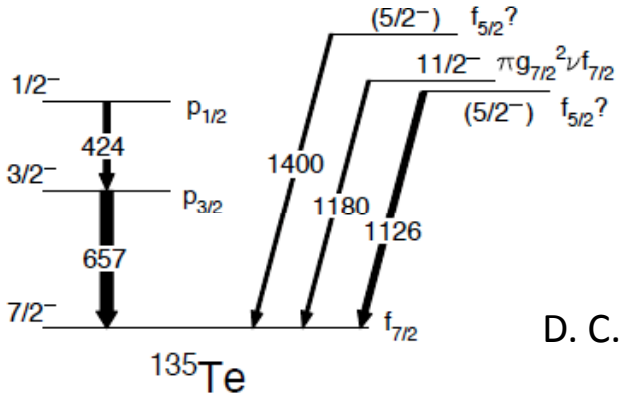
- Idea presented here is “borrowed”, but serves as a reminder of how recently developed techniques can be extended to future ATLAS use.

Pioneering work by D. C. Radford: highly selective study of n transfer to RIB.
^{9}Be(^{134}Te,^{8}Be)^{135}Te at 4 MeV/A, 4x10^{5} ions/s; CLARION + HyBall at HRIBF →
^{8}Be breaks up into 2α—a clean signal in particle detector.



← γ spectrum gated by 2α in HyBall, 16h of data





← single-neutron states identified

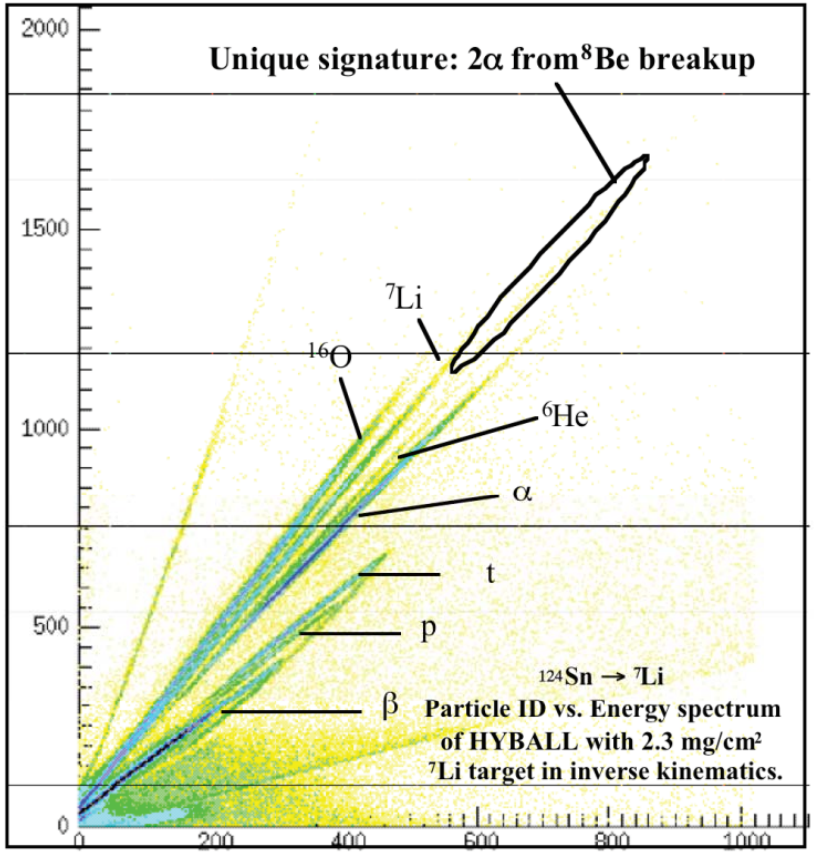
D. C. Radford *et al.,* EPJ **A15**, 171 (2002).

Similarly, reactions on ^{7}Li allow for clean selection of p-transfer events:

^{7}Li + p → ^{8}Be → 2α

^{7}Li – p → ^{6}He

Test with stable ^{124}Sn beam, 4 MeV/A
CLARION + HyBall at HRIBF



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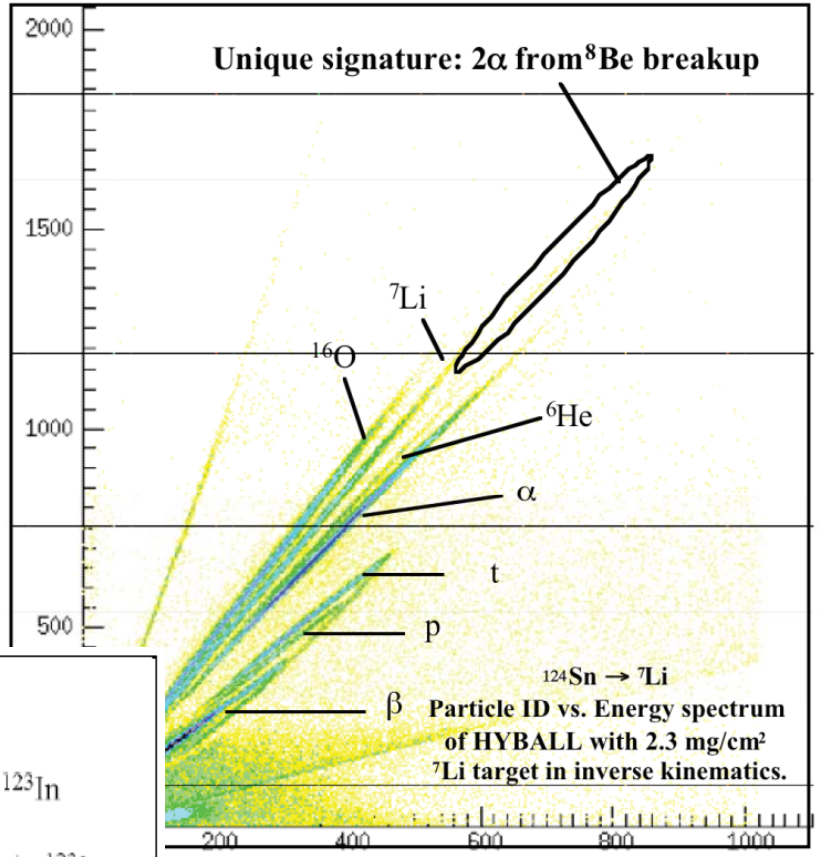
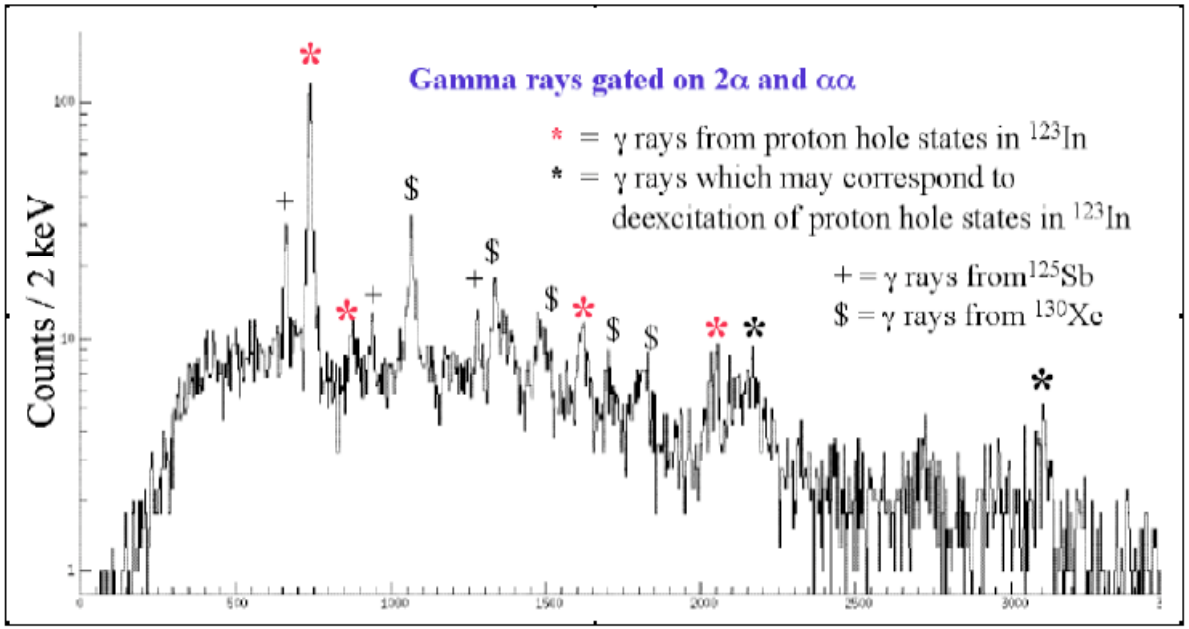




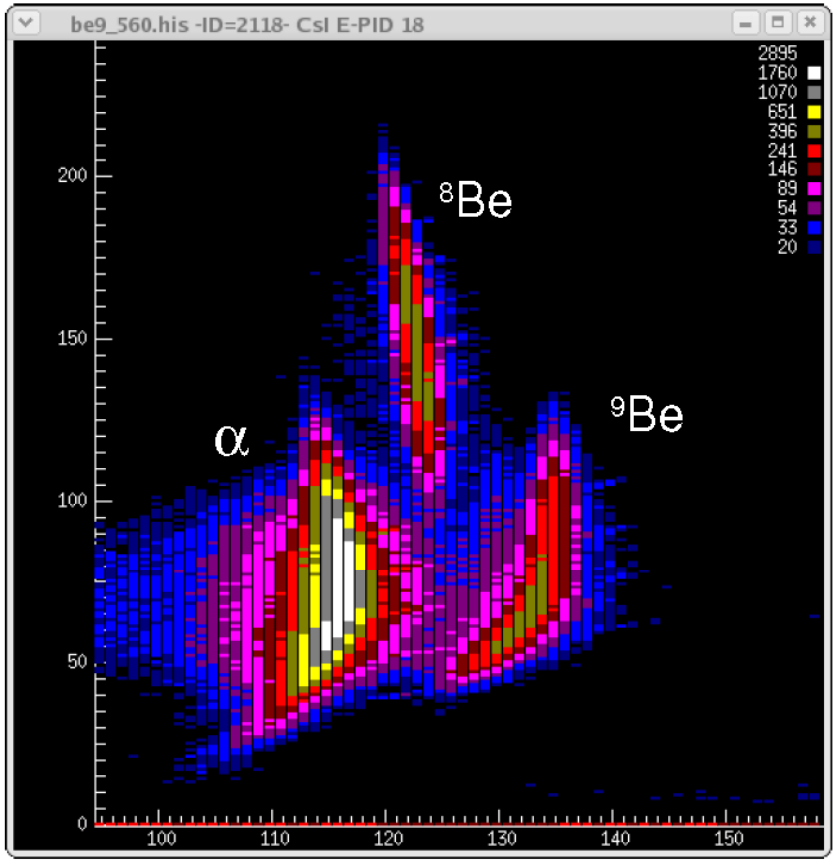
Transfer of a proton from (^{123}In) and to (^{125}Sb) the ^{124}Sn beam was identified.

What we'll need at ATLAS (CARIBU)

- Neutron-rich CARIBU beams with intensities of ~10^5 ions/s or more should provide comparable statistics to previous test runs.
- After intensity upgrades, more of such beams (those initially with ~10^4 ions/s) will become available.
- With sufficiently high beam intensity and detector efficiencies, particle-γ angular correlations can be done.
- Use powerful Ge array…
- …with auxiliary detector near target position for particle identification
  - CsI(Tl) array (e.g. success with Microball and stable beam)
  - Si CD detector?
  - ORRUBA (ARUBA??) + …?
  - …?

^{137}Xe: microball particle-ID spectra

^{9}Be 560 MeV



^{9}Be sub-barrier