

Weak decay of Λ -hypernuclei: future perspectives of a powerful discovery tool

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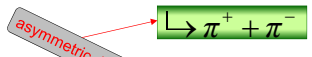
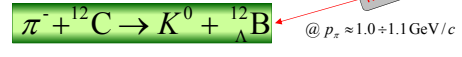
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A further hypernuclear decay study @ J-PARC

original idea: K^0 spectroscopy



asymmetric decay

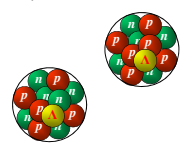
never exploited before!!!

Physics motivations

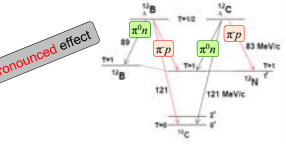
determination of:

- $\Gamma_{\text{tot}} \equiv \hbar/\tau$
- Γ_{π}
- Γ_{π^0} (possibly)
- Γ_{ρ}

- full decay pattern
- nuclear structure effects
- charge dependence effects



particularly pronounced effect

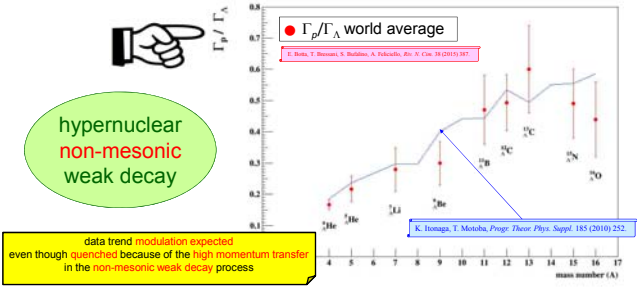
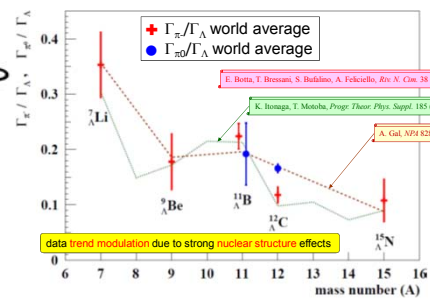


$\frac{\Gamma_{\pi}({}^{\Lambda}\text{B})}{\Gamma_{\pi}({}^{\Lambda}\text{C})} = ?$ $\frac{\Gamma_{\pi}({}^{\Lambda}\text{C})}{\Gamma_{\pi}({}^{\Lambda}\text{B})} = ?$

T. Motoba, NPA 547 (1992) 115c: ≈ 3 T. Motoba, NPA 547 (1992) 115c: ≈ 8

K. Inouga, T. Motoba, Prog. Theor. Phys. Suppl. 185 (2010) 252: $= 2.9$

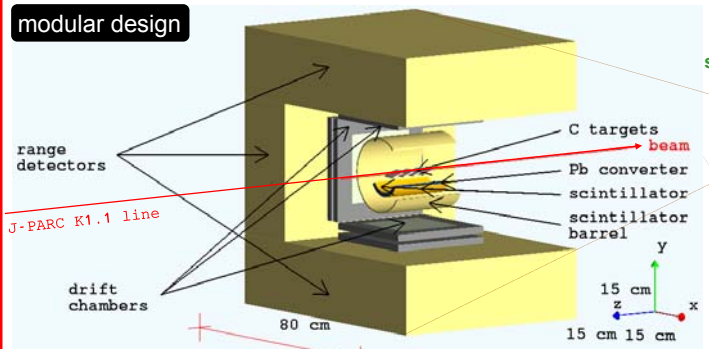
The cultural background



more and precise experimental points required!

Experimental concept layout (not to scale)

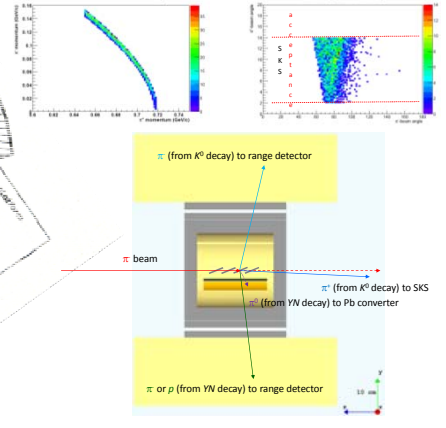
modular design



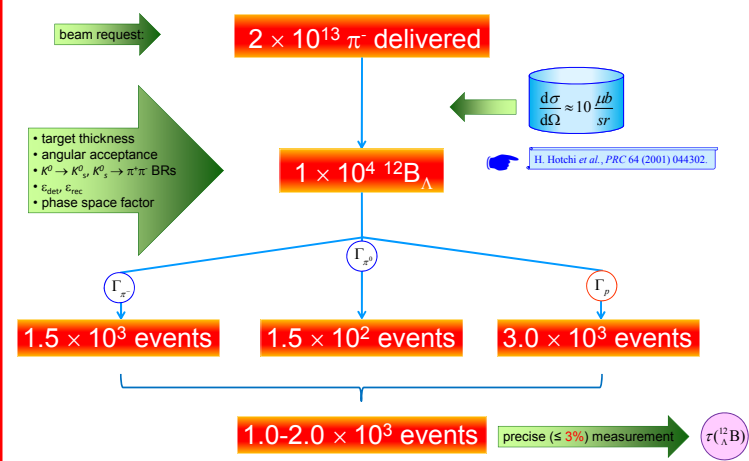
Design performances:

- $\sigma_{\text{MM}} \leq 3 \text{ MeV (FWHM)}$
- $\sigma_{\text{time}} \leq 100 \text{ ps (FWHM)}$
- $\Delta\Omega \approx 2 \pi \text{ sr}$
- $\sigma_{\text{T(prongs)}} \approx 3 \text{ MeV}$
- $\sigma_{\theta} \approx 100 \text{ mrad}$

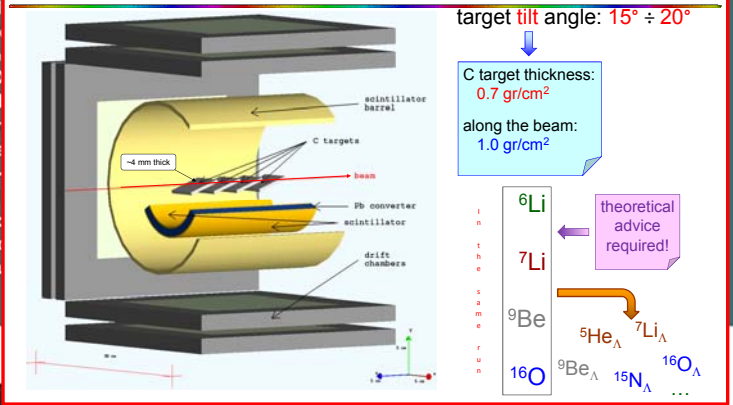
Reaction kinematics:



Expected rates (preliminary estimate)



Possible extension (further targets to study other n-rich hypernuclei)



- Further readings:
- 1) M. Agnello et al., PLB 738 (2014) 499
 - 2) E. Botta et al., PLB 748 (2015) 86
 - 3) E. Botta et al., RNC 38 (2015) 387
 - 4) M. Agnello et al., NPA 954 (2016) 176