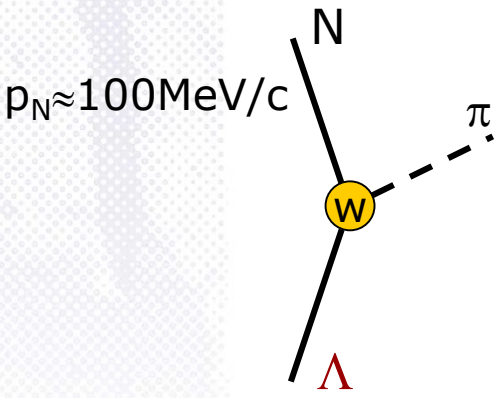
Spectroscop of Hypernuclei
Why is it interesting?

Josef Pochodzalla

What are Hypernuclei

- Hyper nclei
- Status

free Λ decay

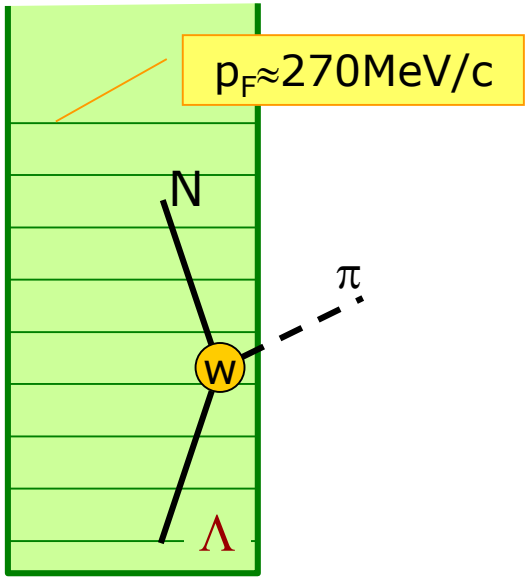


$\Lambda \rightarrow p\pi^- + 38MeV$ (64%)

$\Lambda \rightarrow n\pi^0 + 41MeV$ (36%)

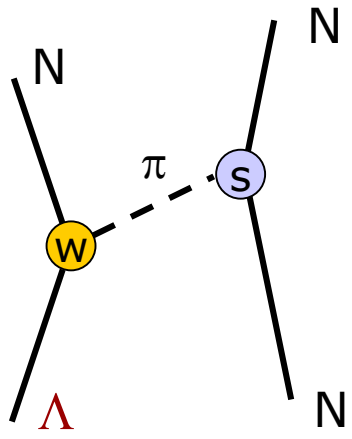
$\tau_\Lambda = 263ps$

mesonic decay of hypernuclei



suppresed by Pauli blocking

non-mesonic decay of hypernuclei



$\Lambda p \rightarrow np + 176MeV$

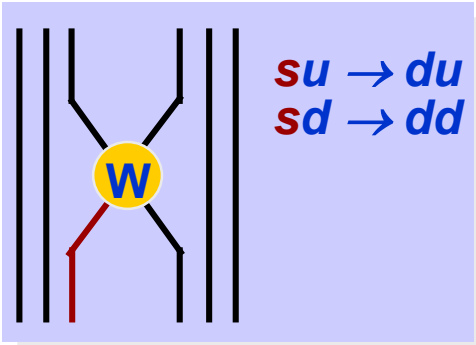
$\Lambda n \rightarrow nn + 176MeV$

Why hypernuclei are interesting

JOHANNES GUTENBERG UNIVERSITÄT MAINZ

Hypernuclei represent a link between

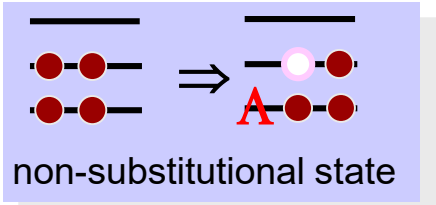
- hypernuclei as a femto-laboratory
  - baryon-baryon interaction in SU(3)



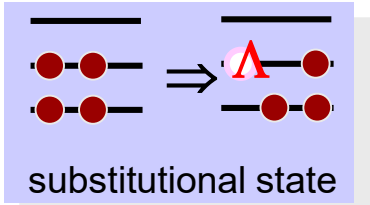
- hyperons as a probe for nuclear structure
  - the presence of a hyperon may modify the size, shape
  - new specific symmetries

Λ Hypernuclei (back to Europe)

- strangeness production (π^+, K^+)
  - $p_{BEAM} \approx 1$ GeV/c
  - high beam intensity
  - low cross section (1-10 mb/sr)
  - q > 200 MeV/c $\Rightarrow$ large Δp, ΔL
- strangeness exchange (K^-, π^-)
  - low beam intensity
  - larger cross section (100 mb/sr)
  - magic momentum $\Rightarrow$ low Δp, ΔL
- (e,e´K^+)
  - unnatural parity states
  - new nuclei ($p \rightarrow \Lambda$: $^{10}_{\Lambda}$Be)
  - polarised beam
  - sub-MeV resolution possible (0.3 MeV) for *particle unstable* states



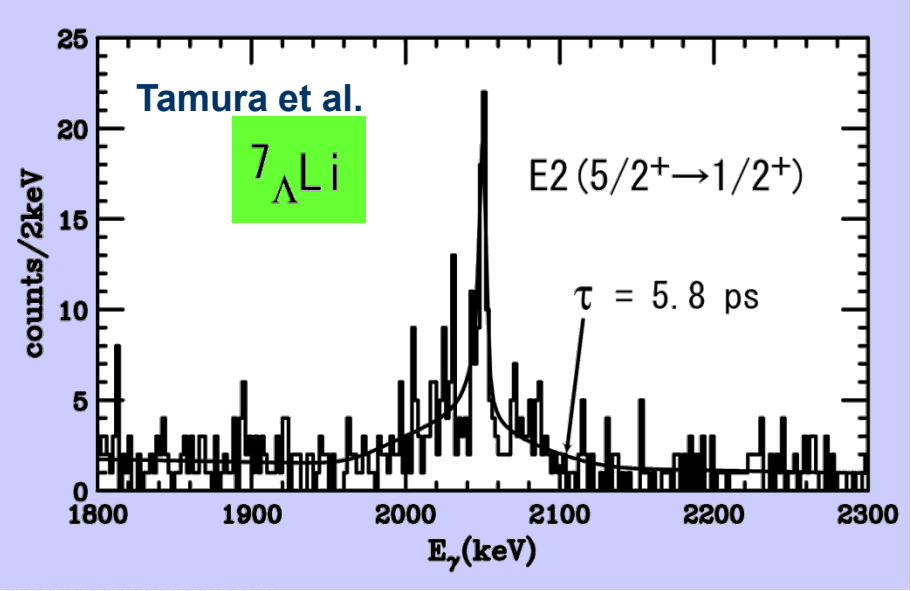
non-substitutional state



substitutional state

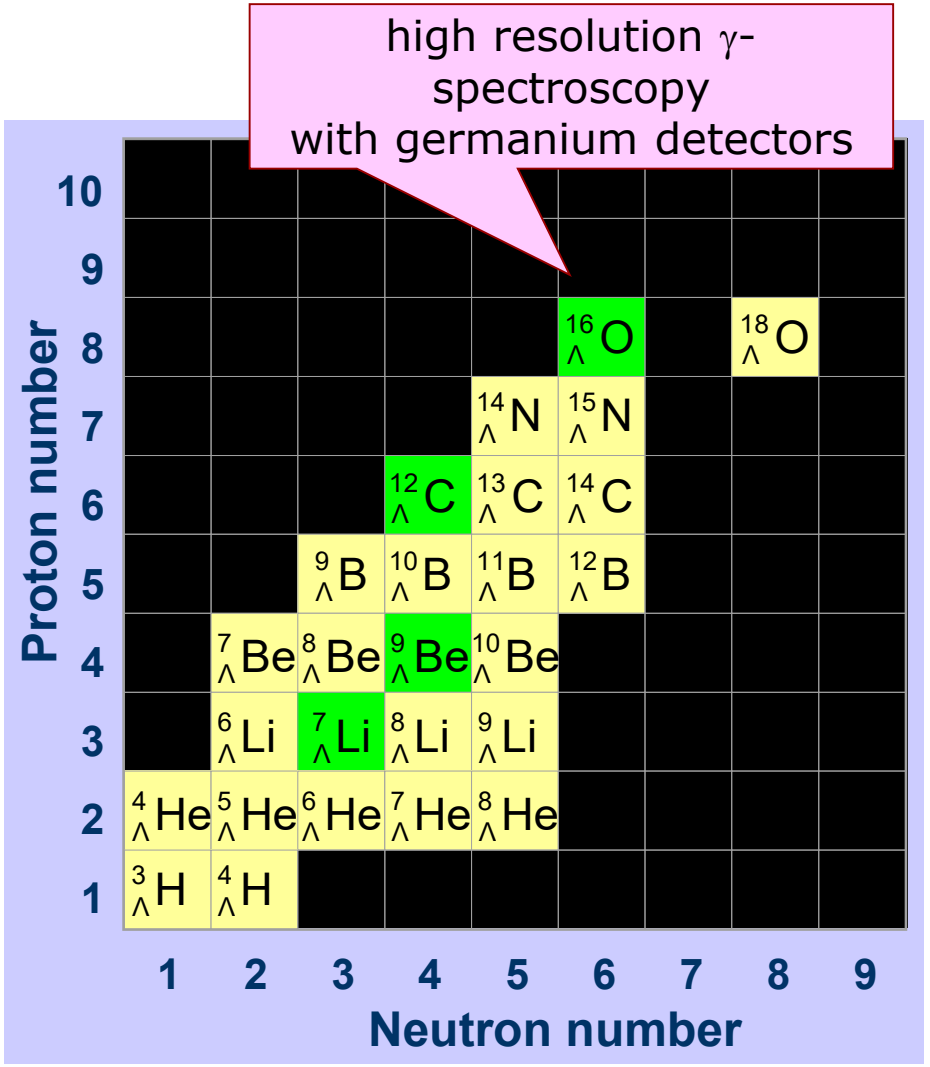
Status of Single Hypernuclei

$$\frac{B(E2;\,{}^{7}_{\Lambda}Li : 5/2^{+} \rightarrow 1/2^{+})}{B(E2;\,{}^{6}Li : 3^{+} \rightarrow 1^{+})} = \frac{3.6 \pm 0.5^{+0.5}_{-0.4}\ e^{2}fm^{4}}{10.9 \pm 0.9\ e^{2}fm^{4}} \approx \frac{1}{3}$$



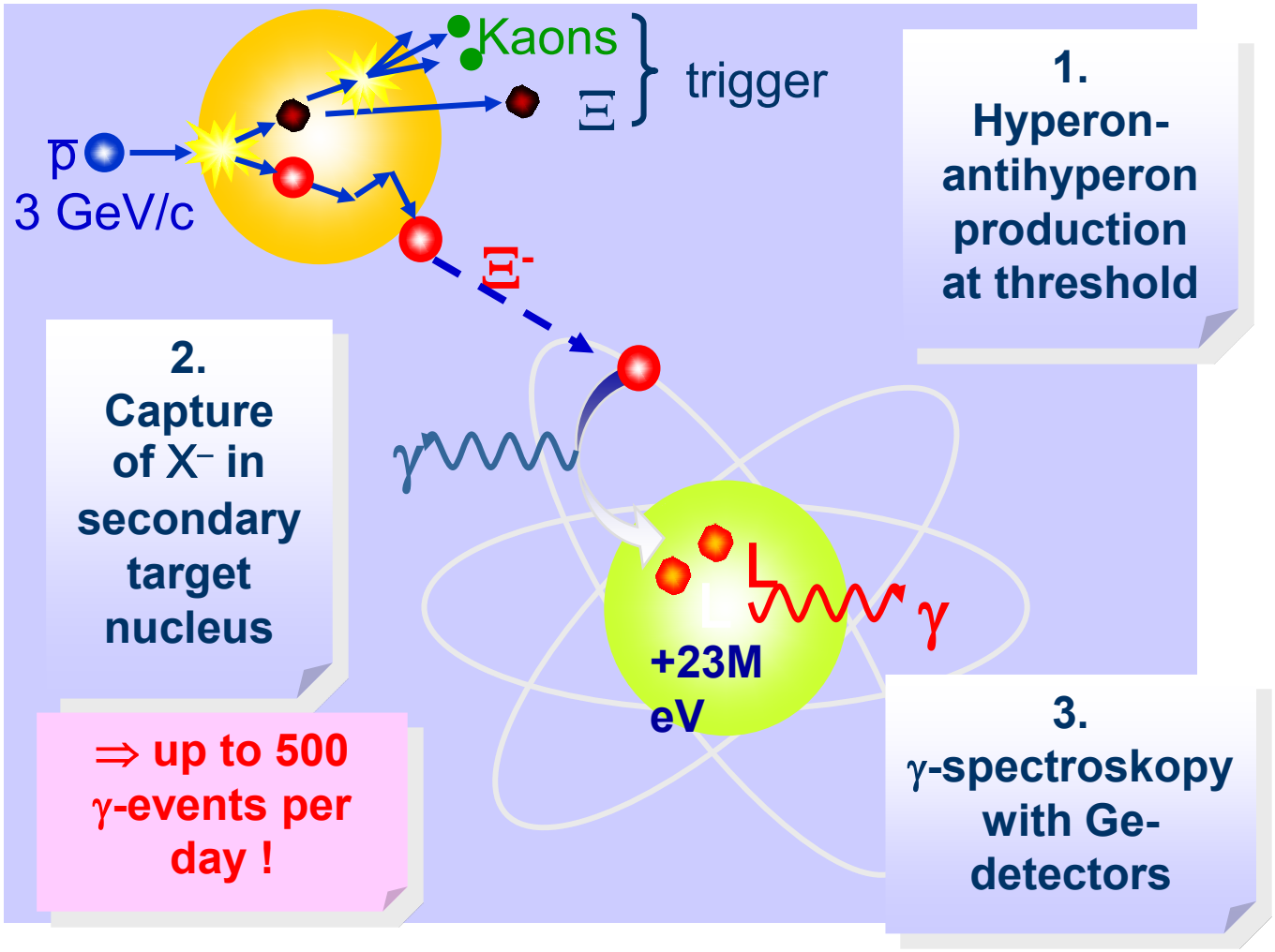
- B(E2)~R^4

⇒ shrinkage of ^{6}Li core by ~20%



Double Hypernuclei

- ΛΛ hypernuclei are a unique tool to study the baryon-baryon force in SU(3)



high resolution γ-spectroscopy of double hypernuclei will be feasible