Analysis of the ^{104}Sn experiment at PreSPEC

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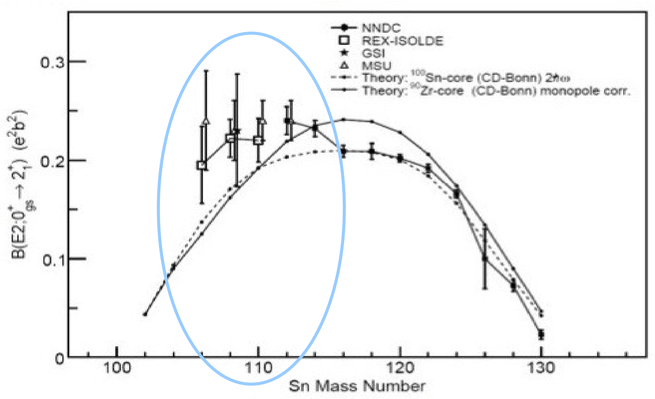
MOTIVATION

Determination of the **B(E2:$0^+ \rightarrow 2^+$)** value of **^{104}Sn**

^{104}Sn is the last isotope in the vicinity of ^{100}Sn predicted with full calculation by the Shell Model

Evolution of the reduced transition probability values in the isotopic chain of Sn:



discrepancies between theoretical and experimental B(E2) values for light isotopes

The evolution of nuclear shell structure in the vicinity of ^{100}Sn - the heaviest self-conjugate doubly magic nucleus - is an important benchmark for the Shell Model

EXPERIMENT

unstable **^{104}Sn** produced in an in-flight facility

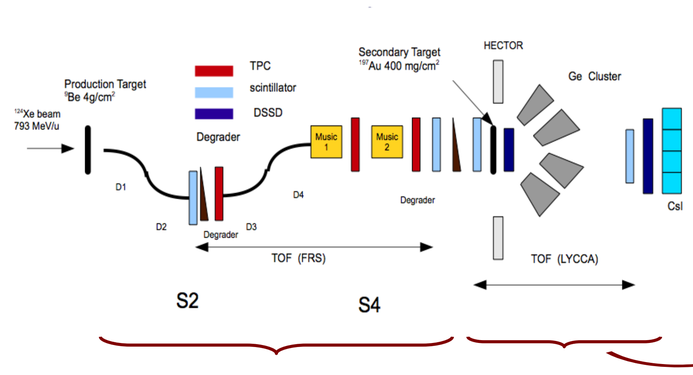
In beam γ-ray spectroscopy measurements via **Coulomb excitation at relativistic energies**

Single step excitation of the first 2+ state

extraction of the B(E2) values

Best method for this measurement: life time measurements hampered by existence of higher isomeric states and by short life time of the 2^+ state

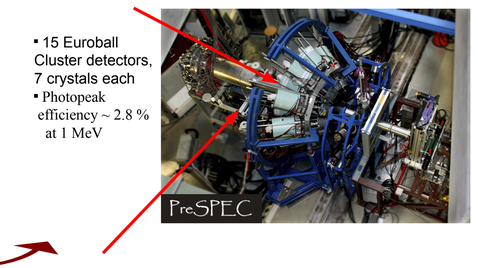
SET UP



FRS In flight Separator

Ge Clusters

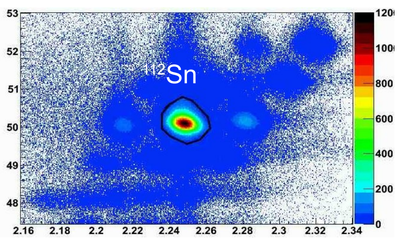
- 15 Euroball Cluster detectors, 7 crystals each
- Photopeak efficiency ~ 2.8 % at 1 MeV



LYCCA
ΔE – E - TOF telescope

ISOTOPE IDENTIFICATION

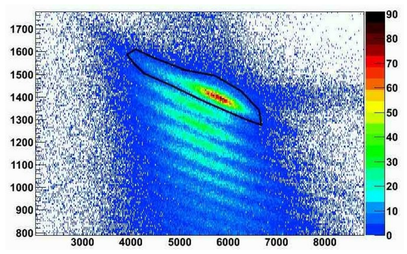
Z Vs AoQ



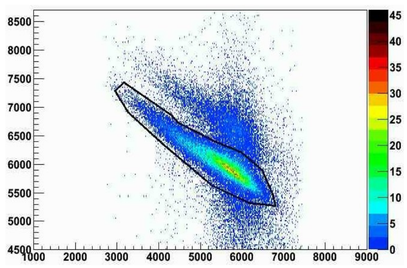
FRS identification

LYCCA identification

dE - E
→ z identification

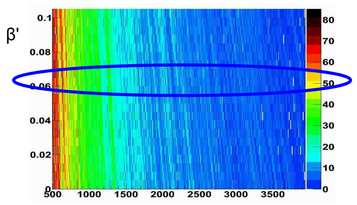


TOF - E
→ mass identification

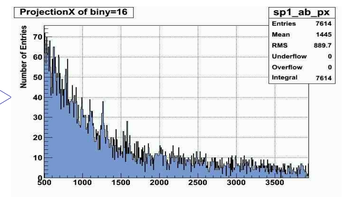


GAMMA SPECTRA ANALYSIS

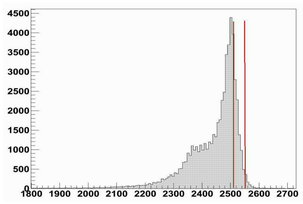
- **beta determination** of particles after the target



X axis projection

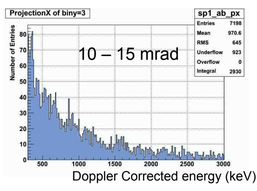


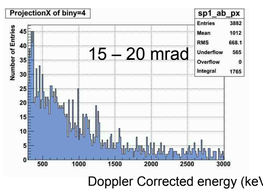
- prompt gamma radiation **time** selection

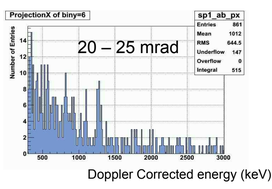


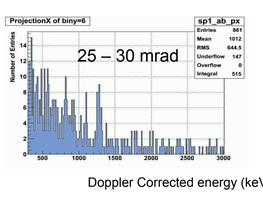
To optimize peak to background ratio

- **scattering angle** selection of the particles after the target



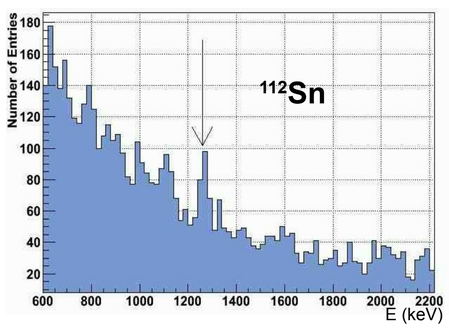


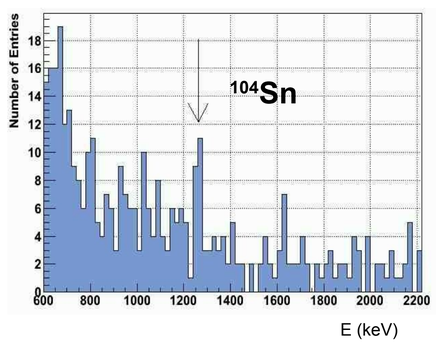




RESULTS

The same procedure has been applied for ^{112}Sn (reference) and ^{104}Sn





PRELIMINARY RESULTS

$$\sigma(E2)^{teor} = B(E2) \times f(b_{min})$$

$$\sigma(E2)^{exp} = \frac{I_\gamma / \epsilon_\gamma}{N_p N_{target}(g/cm^2)}$$

$$B(E2)^{104} = B(E2)^{112} \frac{I_\gamma^{104}}{N_p^{104}} \frac{N_p^{112}}{I_\gamma^{112}} \times 0.88$$

Reference value: $B(E2)_{112Sn}$ = 0,240(14) e^2b^2

Preliminary $B(E2)_{104Sn}$ = 0.094(45) e^2b^2

→ consistent with the predicted value

The analysis is still in progress