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Coulomb excitation of re-accelerated ^{208,210}Rn and ^{206}Po beams

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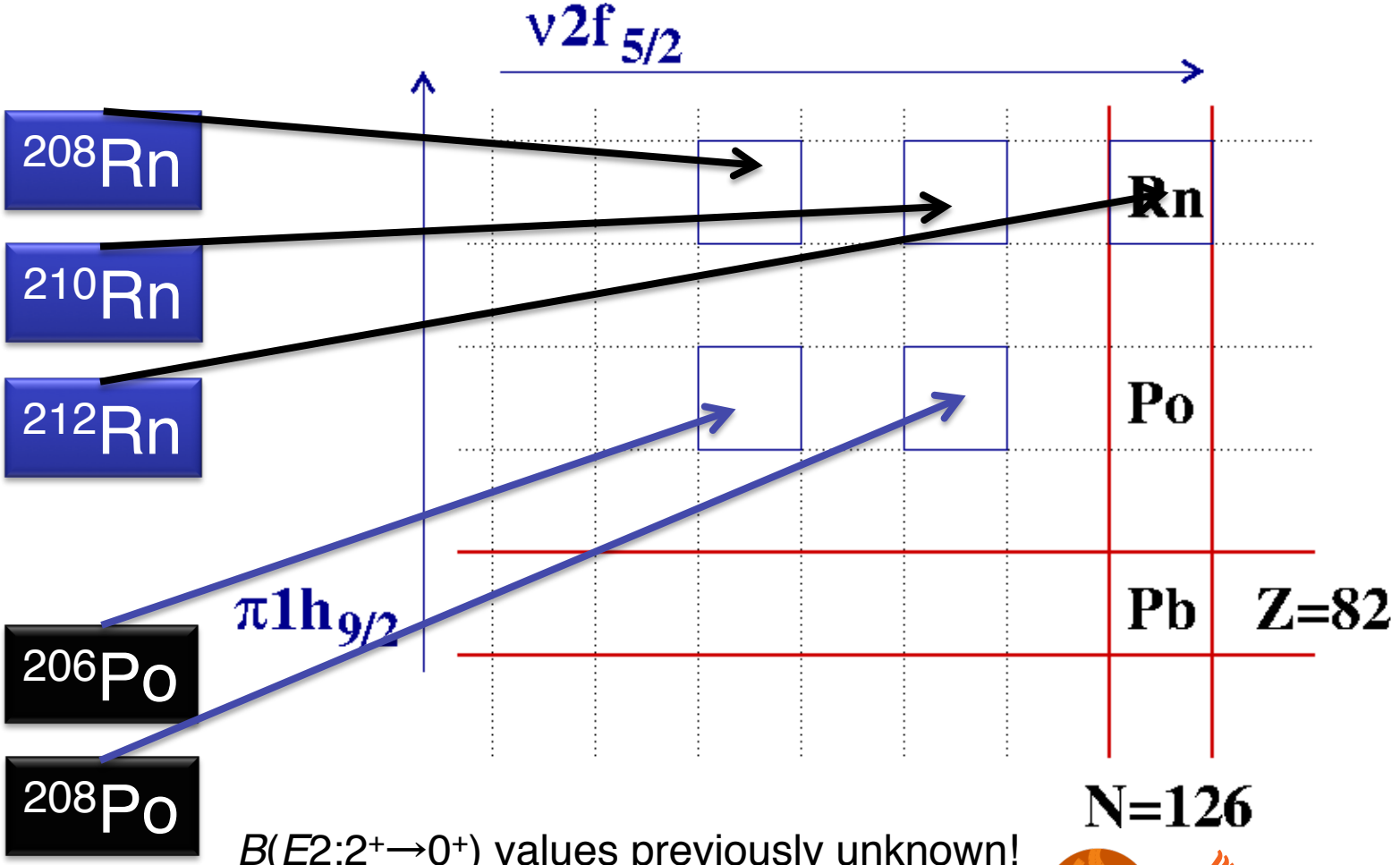
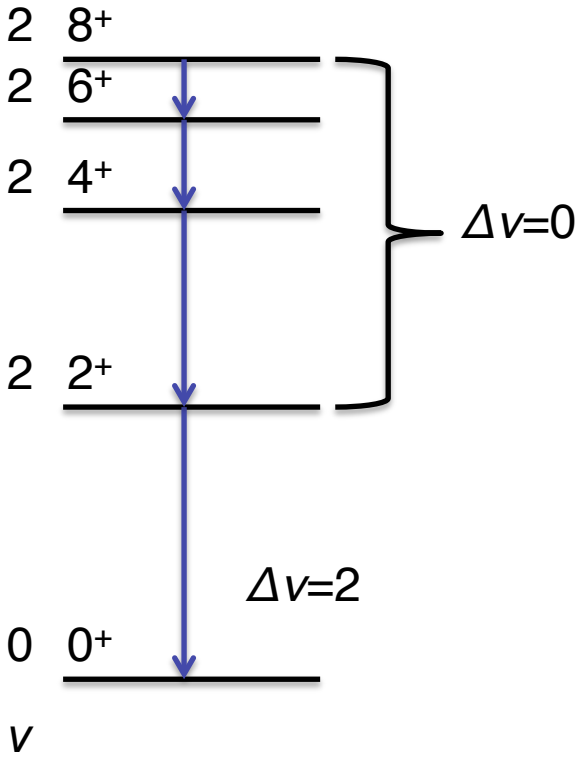
Neutron-deficient trans-Pb region



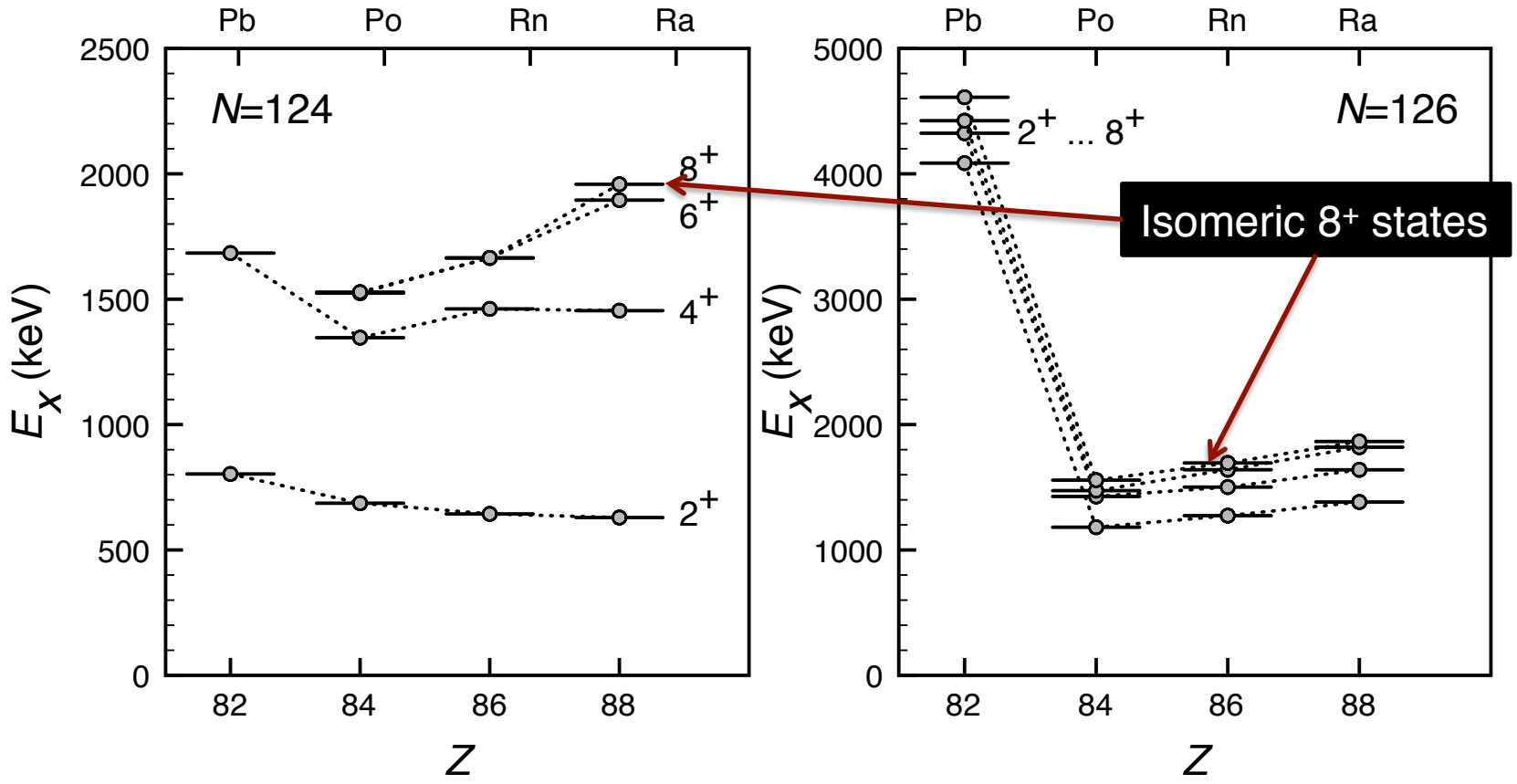
$B(E2;2^+ \rightarrow 0^+)$ values previously unknown!

Neutron-deficient trans-Pb region

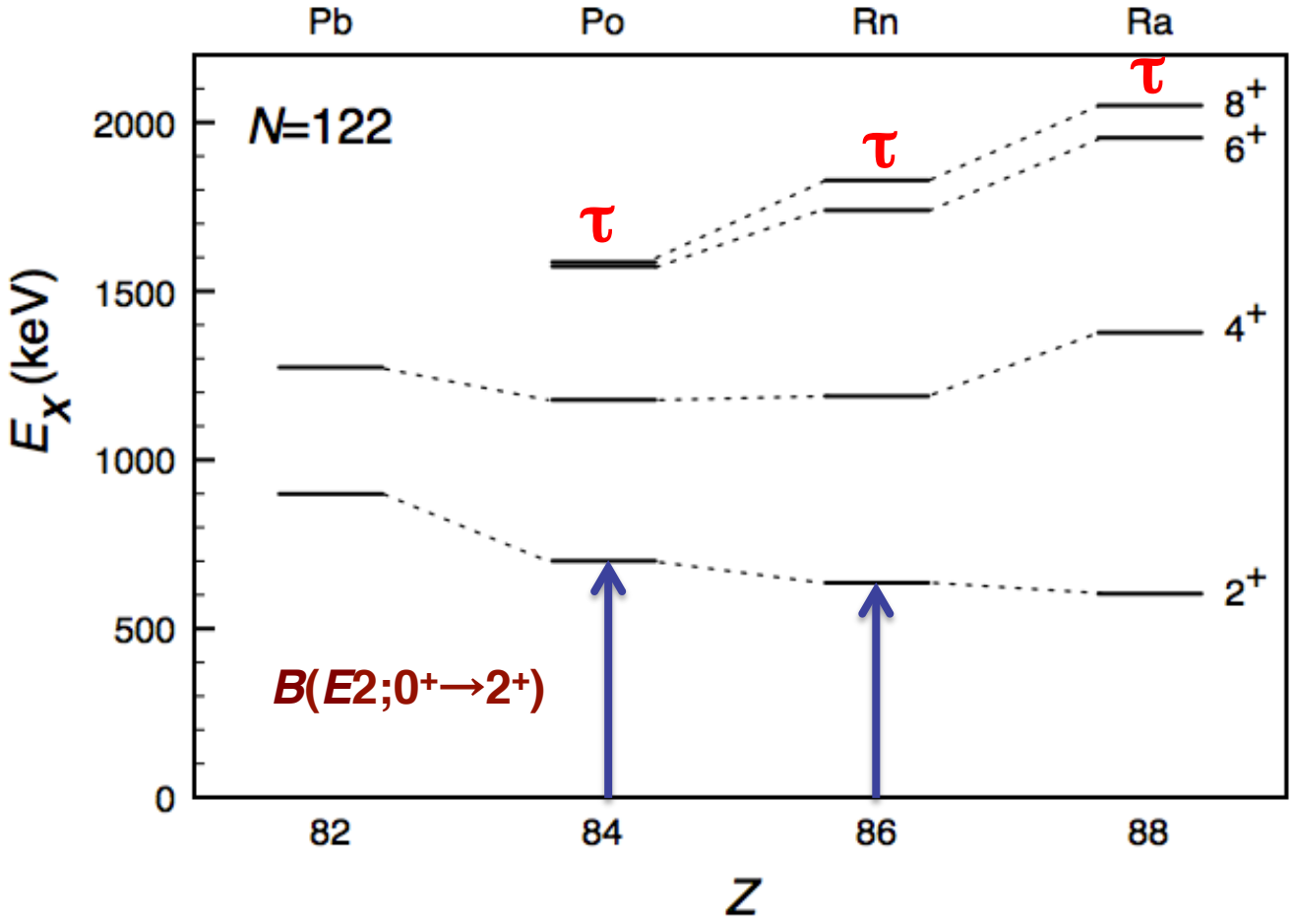
- Relative high-*j* proton single-particle orbital (*j*=9/2) dominates the structure - seniority ν can be regarded as a good quantum number.
- In the trans-Pb nuclei with $120 \leq N \leq 128$ the neutrons occupy high n, low ℓ orbitals and therefore they should have weaker interactions with the $1h_{9/2}$ protons. This implies that the seniority can be preserved.
- Motivation: **to map the boundaries of seniority regime and collectivity**



N=124,126 isotones in the trans-Pb region

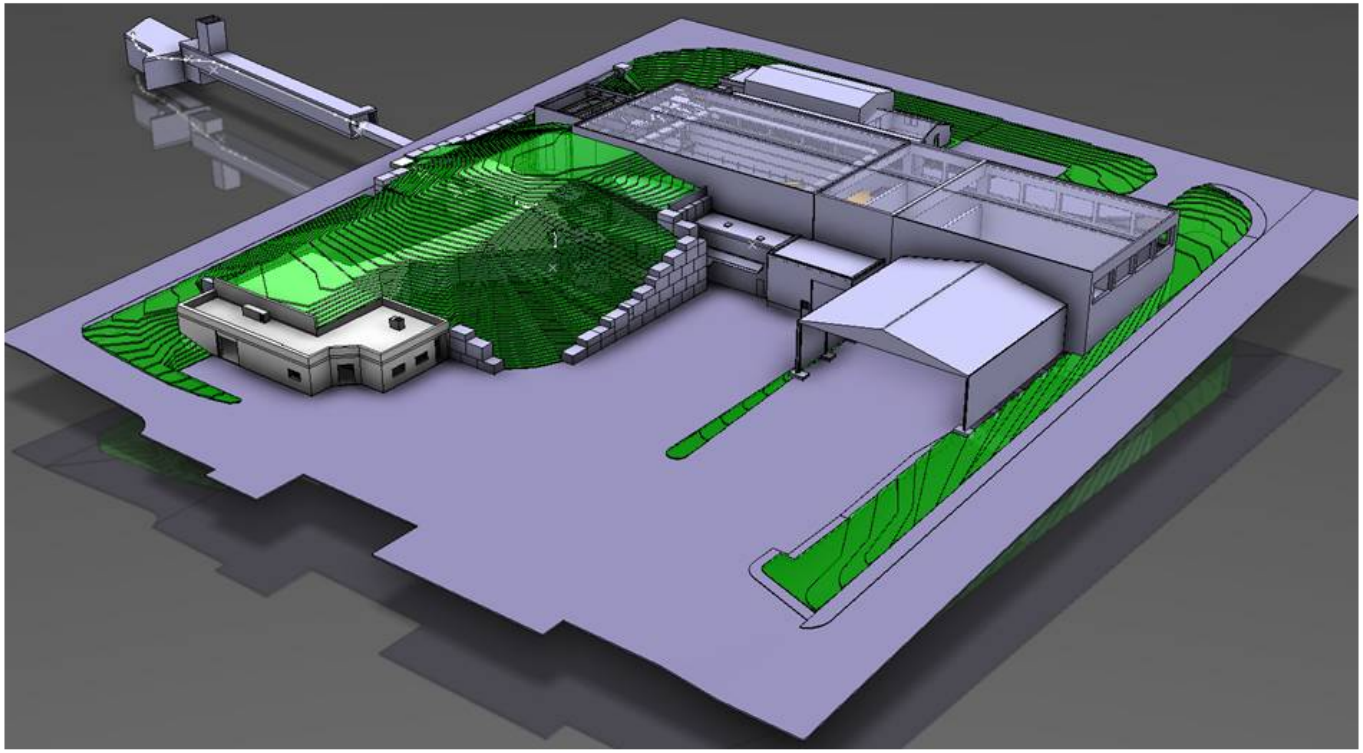


N=122 isotones

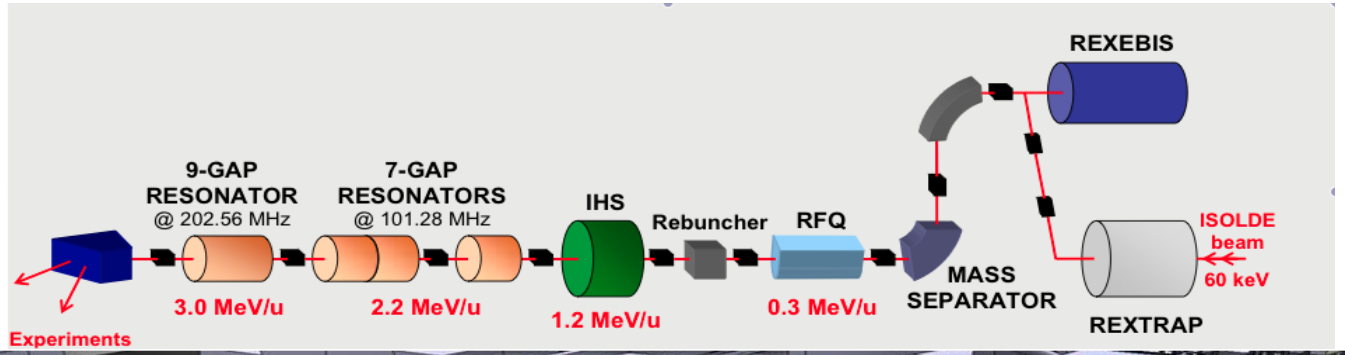


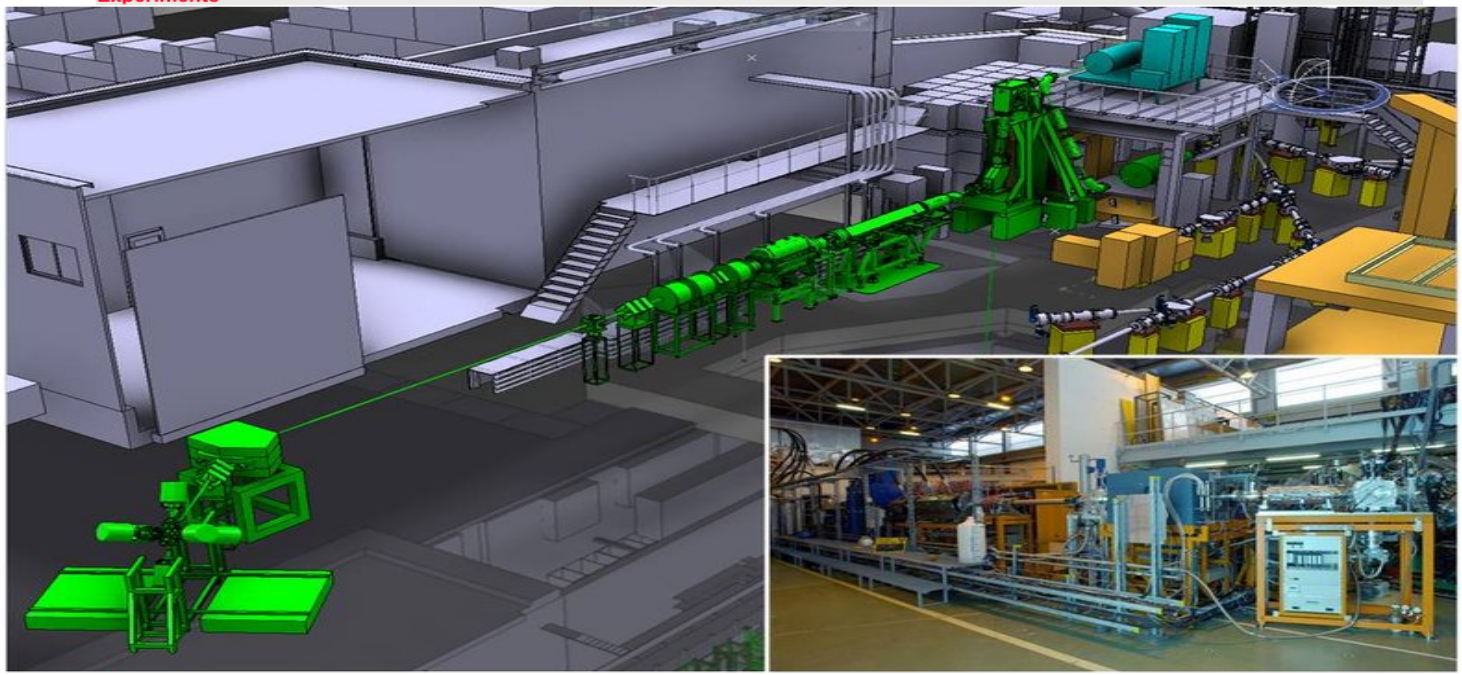
ISOLDE at CERN

1.4 GeV protons from CERN PS-booster bombard thick targets.
Radioactive atoms diffuse out of the heated target.
Chemical and physical separation and purification produce
rare isotope beams for re-acceleration.



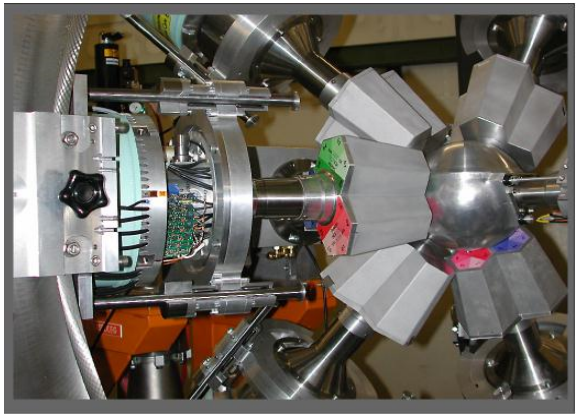
REX-ISOLDE at CERN

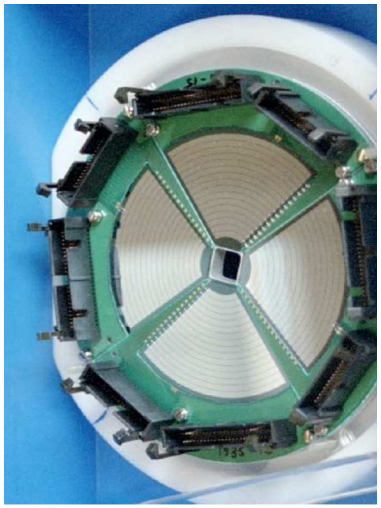


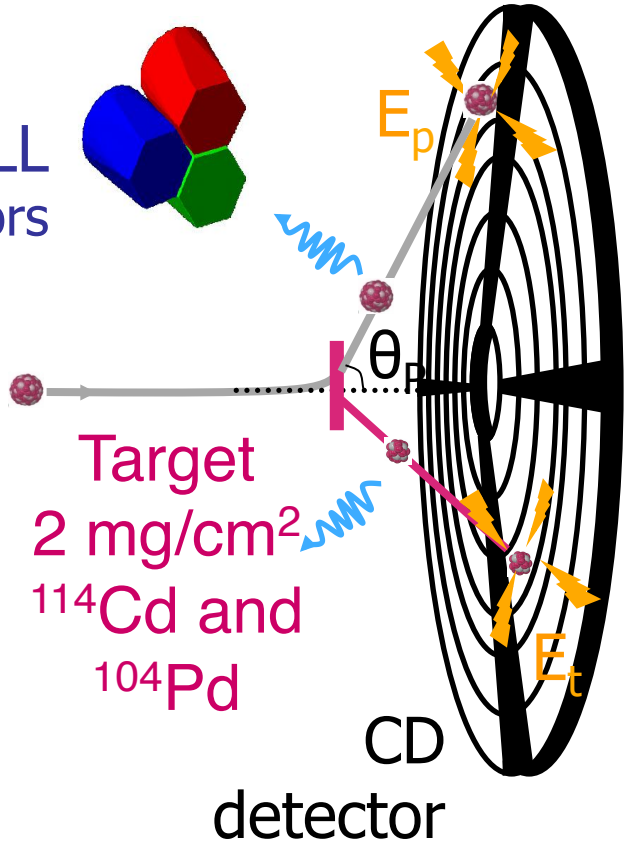


MINIBALL
Coulomb excitation setup

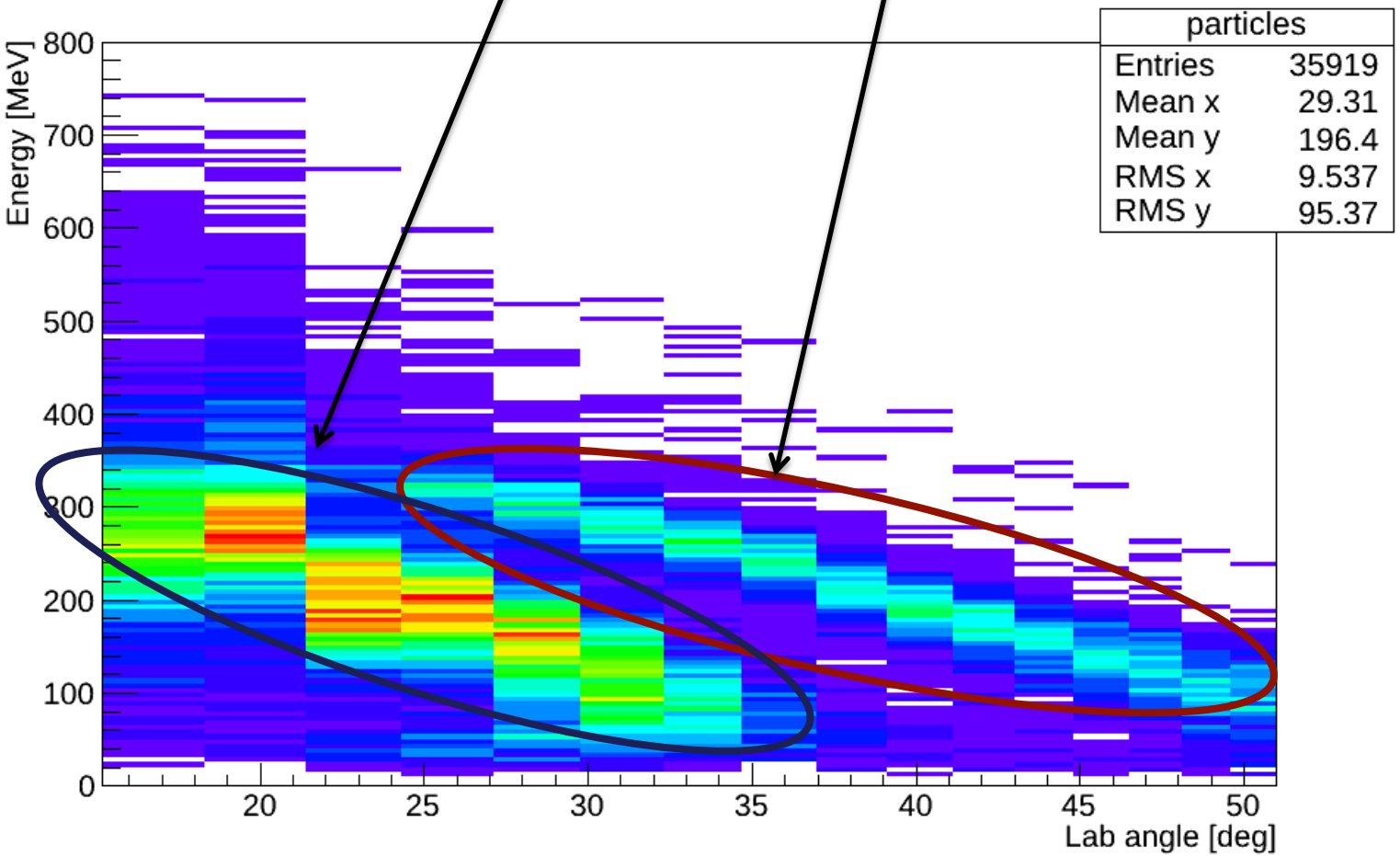
- MINIBALL γ-ray spectrometer (8 triple Ge clusters, six-fold segmented) surrounding a target.
- CD Si detector for recoil detection (16 annular strips).



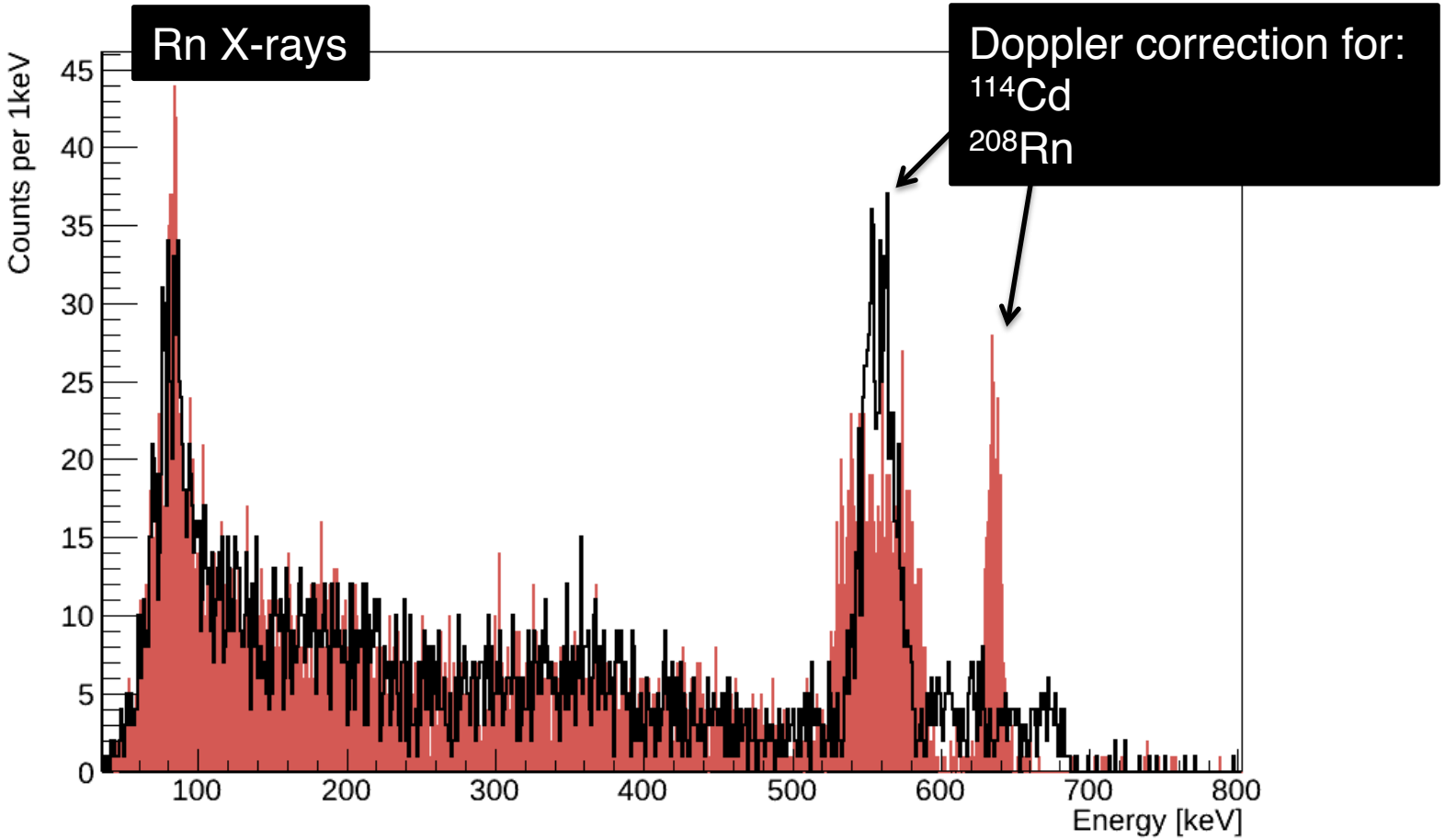




^{208}Rn on ^{114}Cd



Particle gated γ-ray spectrum



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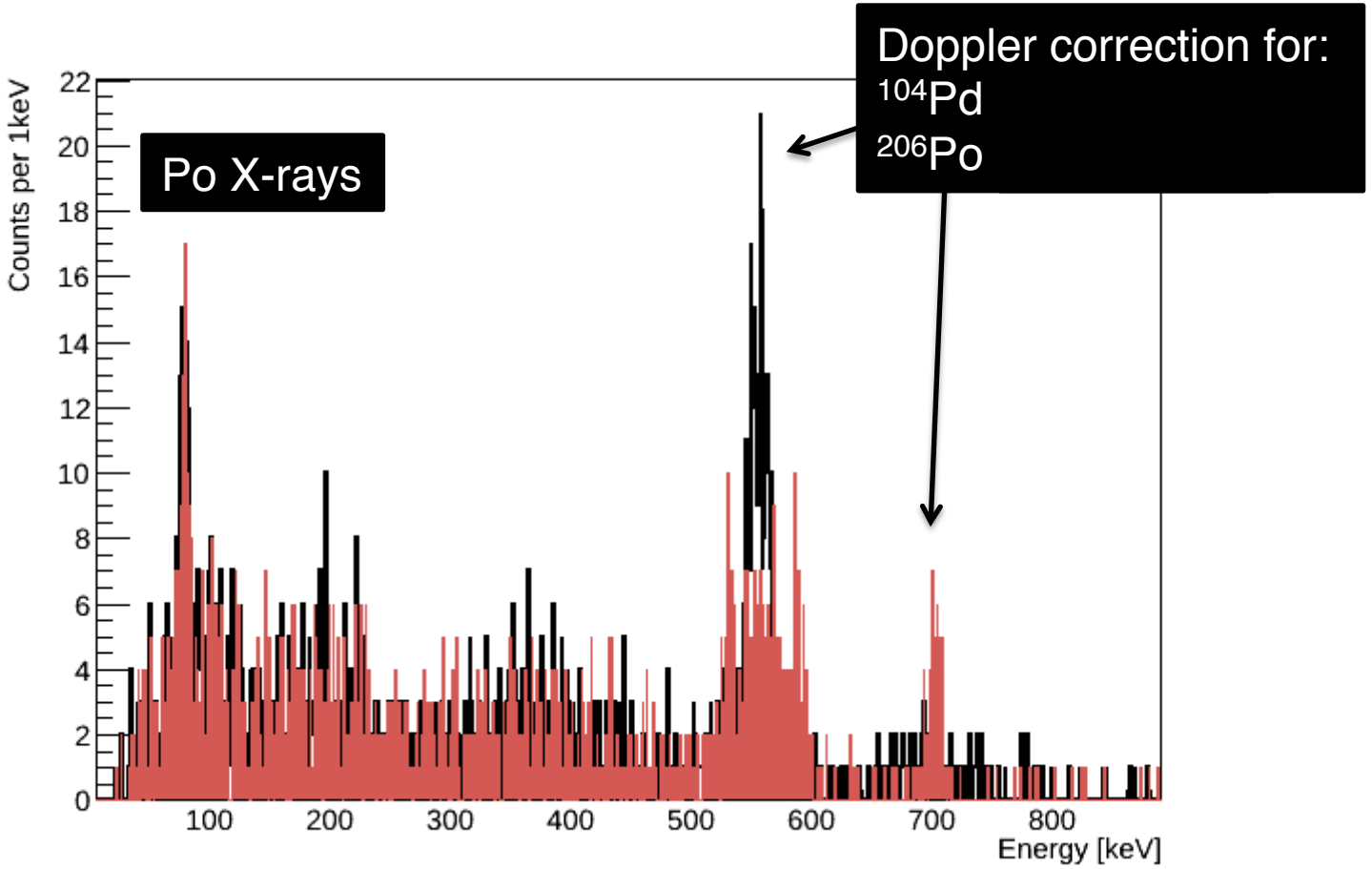


Coulomb excitation analysis

- Coulomb excitation code Gosia2: χ^2 minimisation of *calculated* and *measured* γ-ray intensities
- Simultaneous minimisation of *target* and *projectile* excitations
- Quadrupole moment of the 2^+ state assumed to be zero

Structure of the 2^+ states in ^{206}Po and ^{208,210}Rn

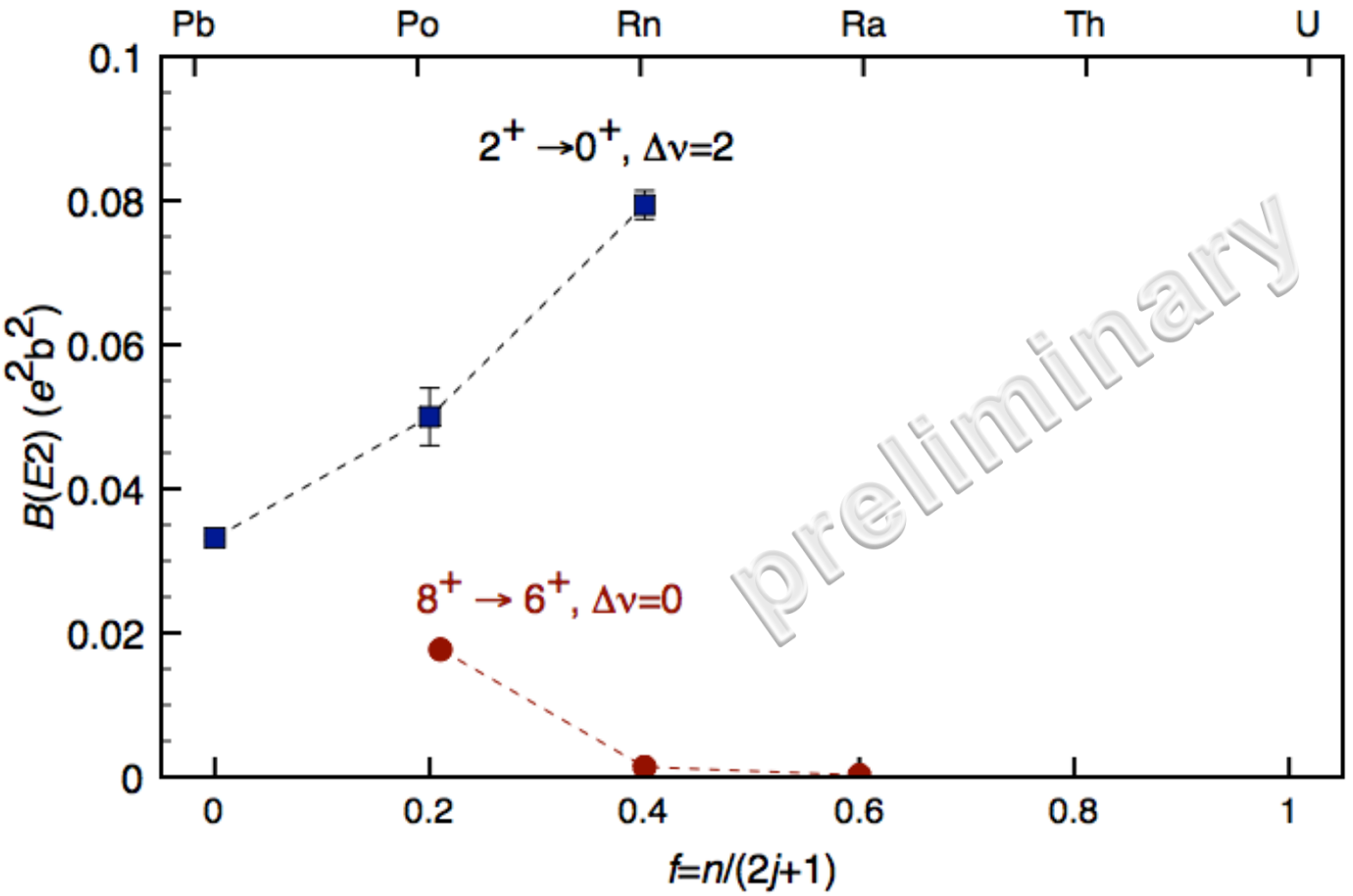
^{206}Po: $B(E2;2^+ \rightarrow 0^+) \approx 7$ W.u.
^{208}Rn: $B(E2;2^+ \rightarrow 0^+) \approx 11$ W.u.
^{210}Rn: $B(E2;2^+ \rightarrow 0^+) \approx 16$ W.u.

- The 6^+ and 8^+ states have been associated as pure members of $\pi h_{9/2}$ multiplet.
- The 2^+ state is more complicated, possibly a mixture of $\pi h_{9/2}$ and $\nu f_{5/2}$ components.
- Interpretation in progress…

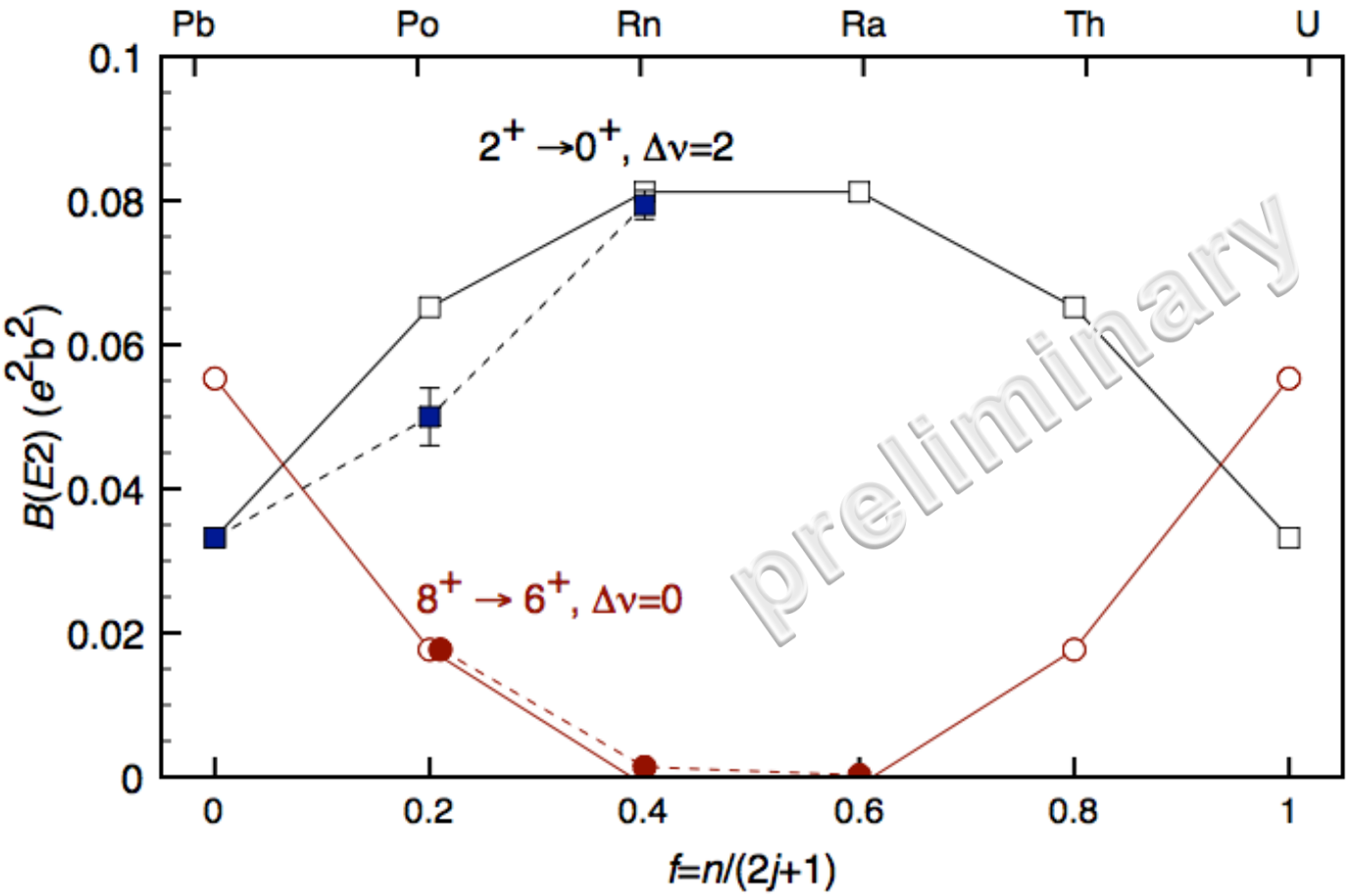
References:

W.J. Triggs et al. NPA 395, 274 (1983)
A.R. Poletti et al. NPA 380, 335 (1982)
A. Zemel & J. Dobes PRC 27, 2311 (1983)

B(*E*2)-value systematics, *N*=122



$B(E2)$-value systematics



Summary & outlook

- Previously unknown $B(E2;2^+ \rightarrow 0^+)$ values have been measured in the neutron-deficient trans-Pb region at REX-ISOLDE
- ^{208}Po and ^{212}Rn studies pending
- Heavy radioactive beams required, only possible at ISOLDE
- Higher energy of HIE-ISOLDE may provide opportunity to probe $B(E2;4^+ \rightarrow 2^+)$ values

Collaboration

University of Jyväskylä
Helsinki Institute of Physics
Universität zu Köln
Yale University
University of Liverpool
TU Darmstadt
KU Leuven
CERN-ISOLDE
CEA-Saclay
Slovak Academy of Sciences
University of York