

UNIVERSITY OF JYVÄSKYLÄ

Anomalous transition strengths in ^{168}Os

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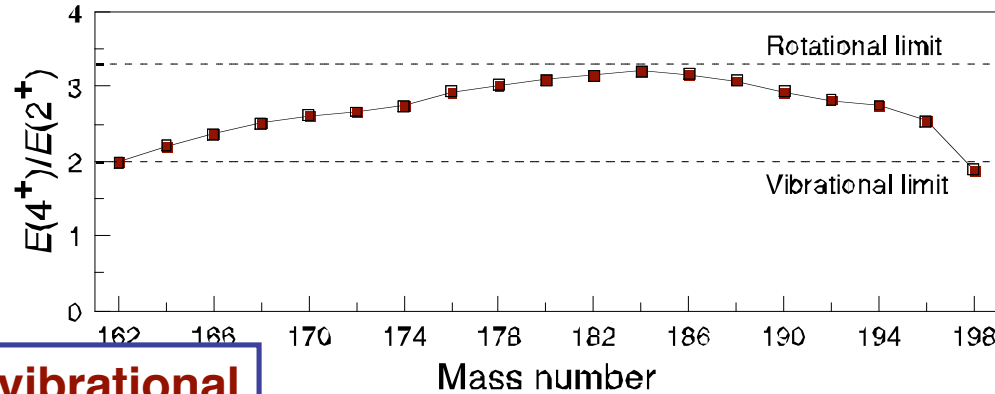
25 June-28 June 2012



Outline

- Introduction to the trends in the neutron-deficient Os region.
- RDDS lifetime measurements with the JUROGAM γ -ray spectrometer at the Accelerator Laboratory of the University of Jyväskylä.
- Results – evidence of hindered $B_{4/2}$ ratio in ^{168}Os .
- Conclusions (or *no* conclusions...)

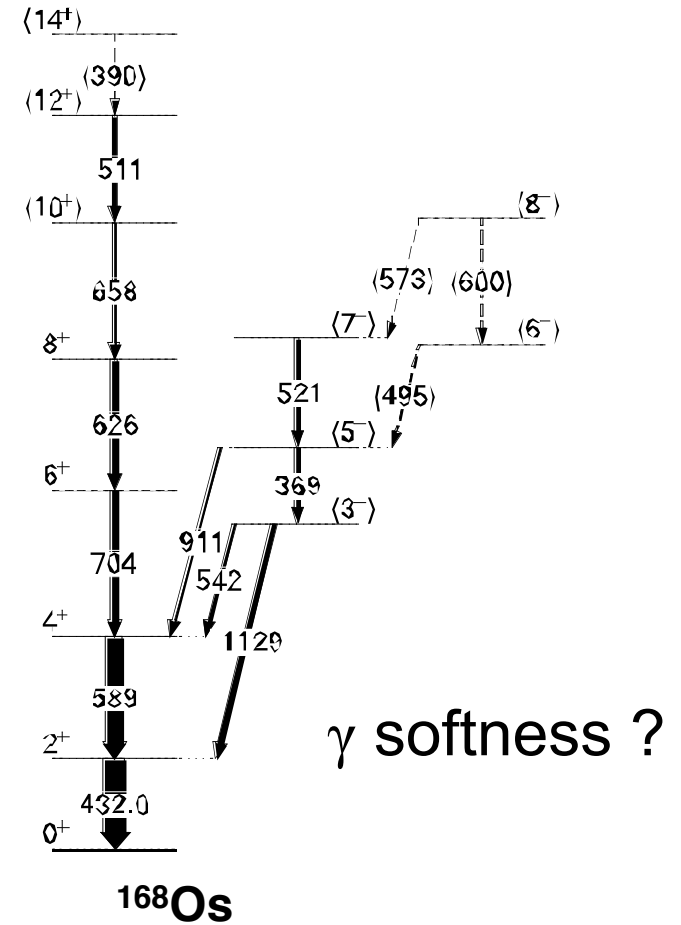
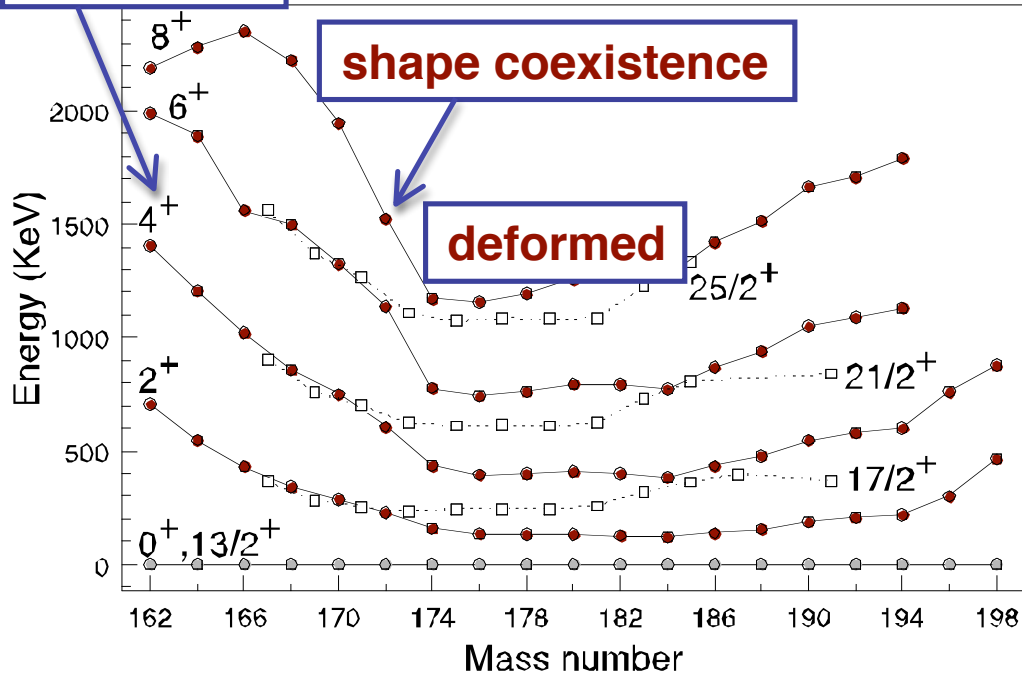
Trends in the neutron-deficient Os nuclei



vibrational

shape coexistence

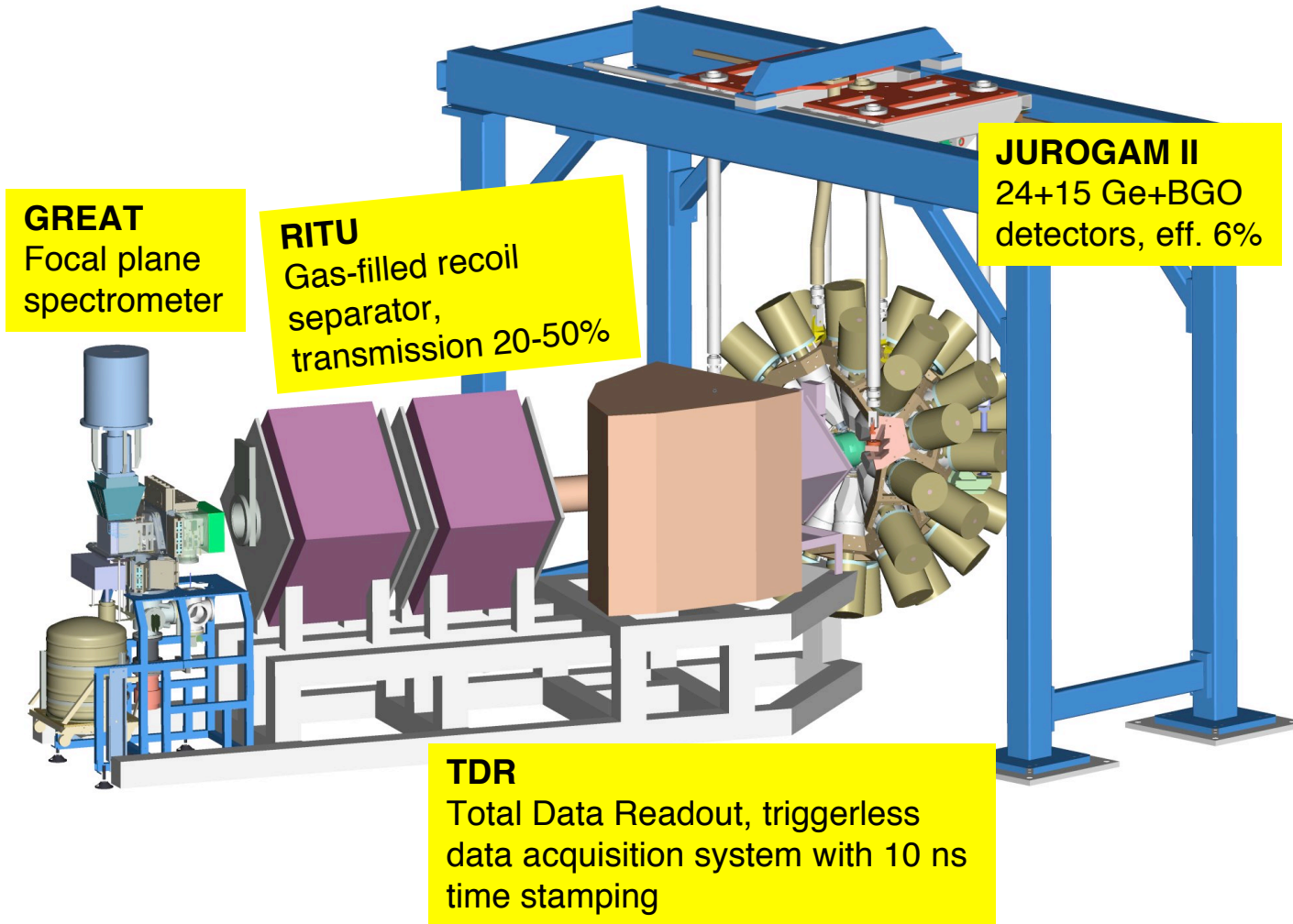
deformed



γ softness ?

^{168}Os has got 16 neutrons fewer than its last stable counterpart.

Tagging instrumentation at JYFL

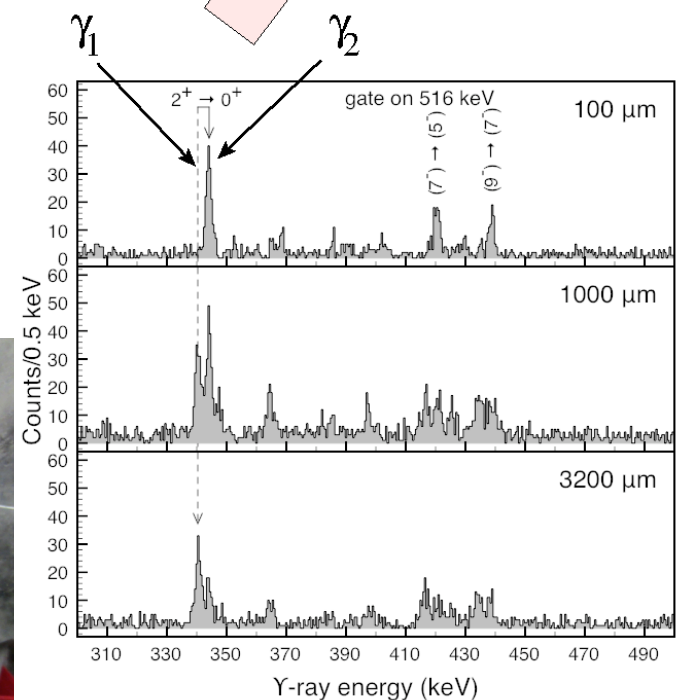
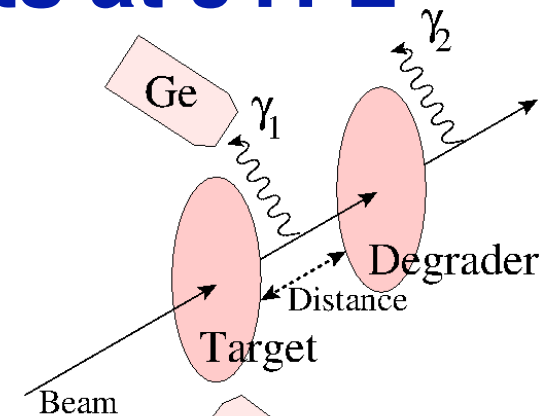
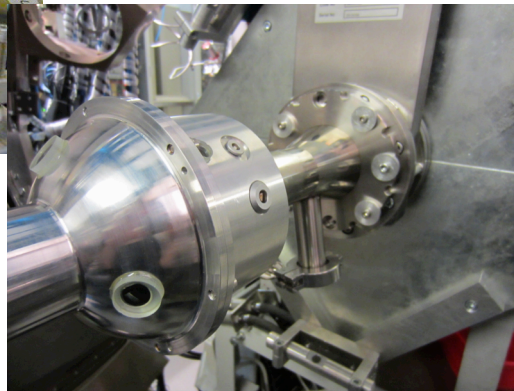


Lifetime measurements at JYFL

- Recoil distance Doppler-shift (RDDS) lifetime measurements (plunger).
- Combined with the RITU separator and selective tagging methods.

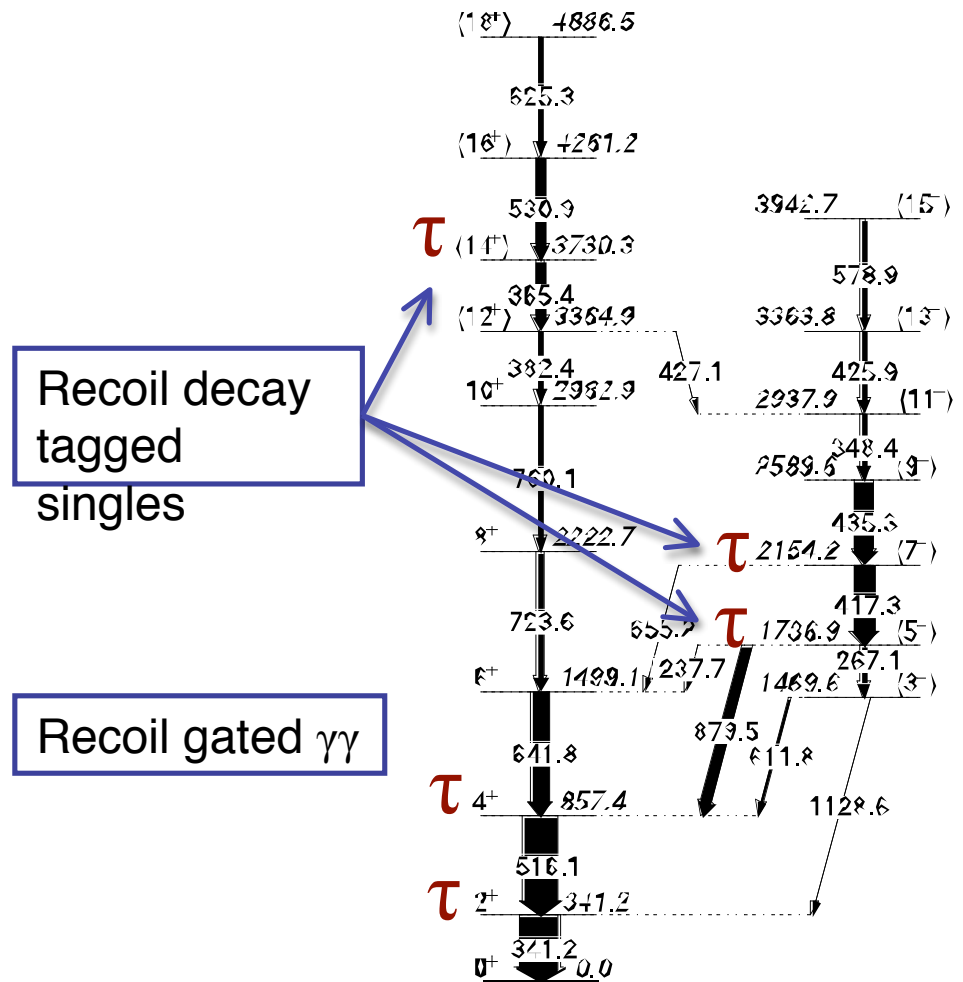


DPUNS plunger device commissioned May 2012.

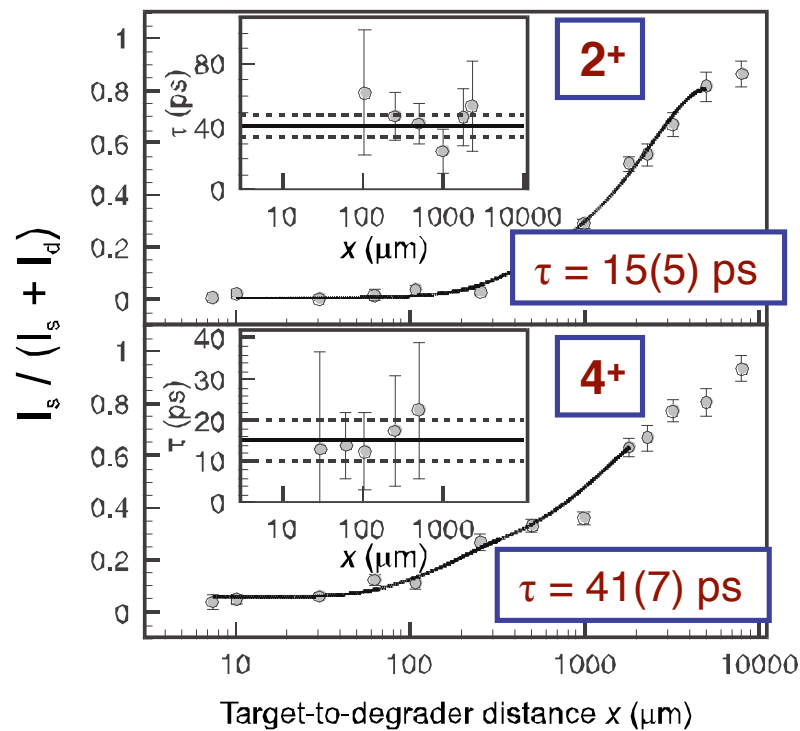
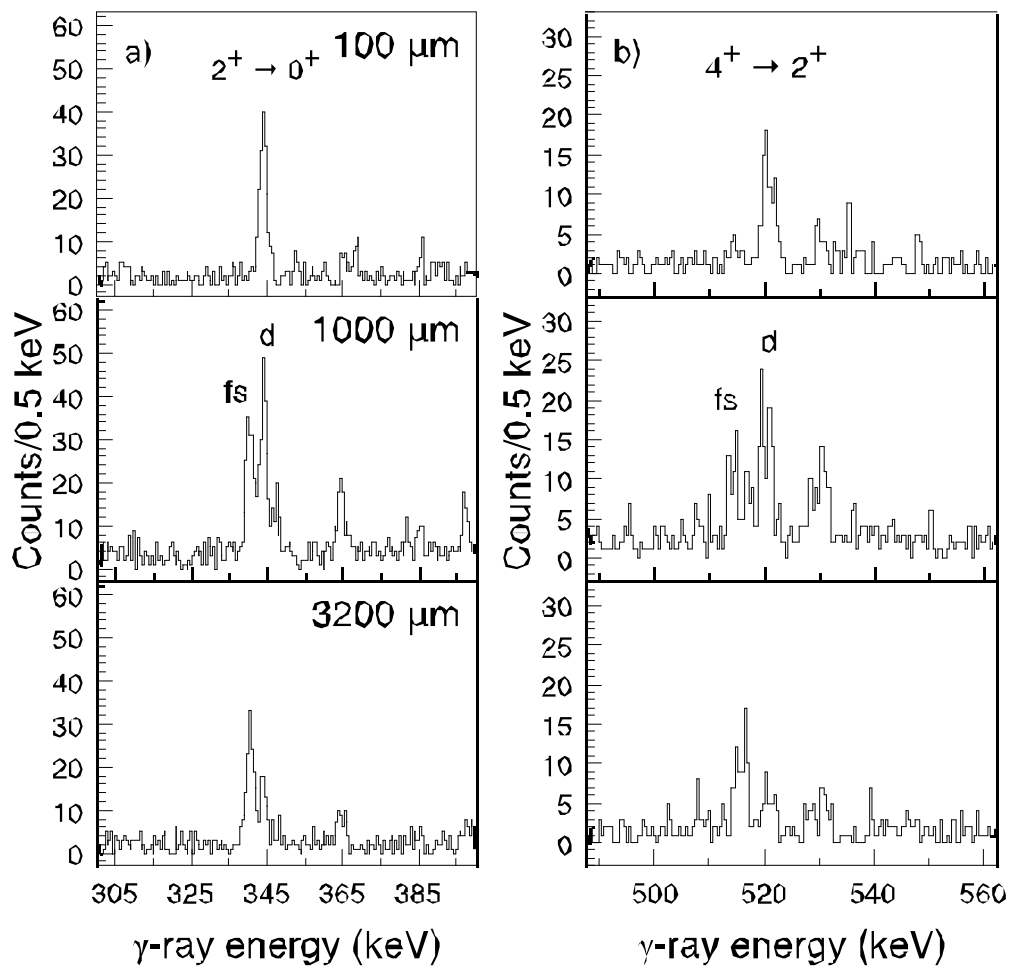


^{168}Os RDDS experiment

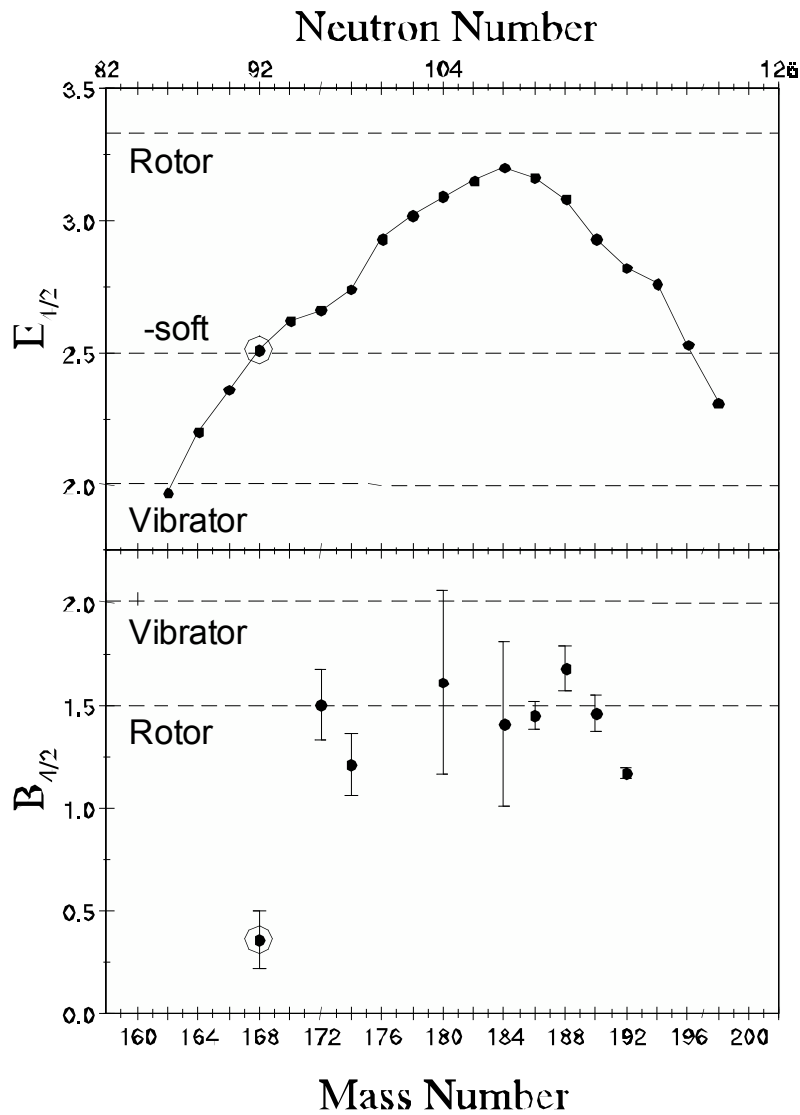
- $^{92}\text{Mo}(^{78}\text{Kr},2p)^{168}\text{Os}$ at 345 MeV.
- Köln plunger device, 1 mg/cm² ^{92}Mo target, 1 mg/cm² Mg degrader.
- $v/c = 3.8\% \Rightarrow 2.8\%$.
- 13 target-to-degrader distances.



^{168}Os RDDS experiment

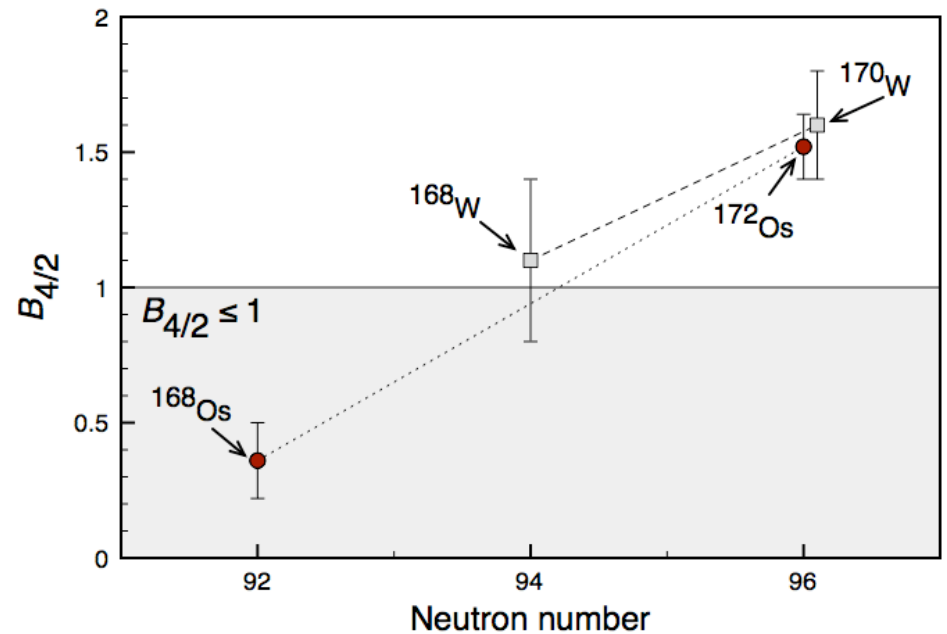


Anomalous $B_{4/2}$ ratio



^{168}Os :

$$B_{4/2} = B(E2; 4^+ \rightarrow 2^+) / B(E2; 2^+ \rightarrow 0^+) = 0.36(14)$$



Anomalous $B_{4/2}$ ratio - conclusions

Two scenarios:

Seniority scheme:

- When high- j orbitals dominate, near the closed shells.
- At mid- j shell the $B(E2)$ values can decrease within a band.

Shape coexistence:

- $4^+ \rightarrow 2^+$ transition connects two coexisting structures (interband transition).
- Hindered transition strength

Typically appearing at or near the shell closures.

Deformed coexisting band at ≈ 2 MeV, ^{168}Os away from the midshell.

Outlook

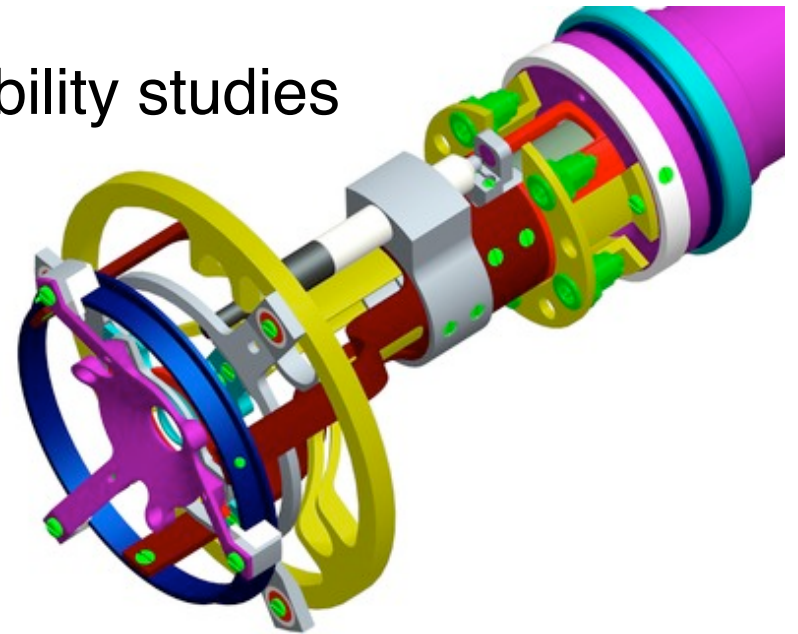
- Interpretation of the results ongoing, paper to be submitted soon.
- ^{166}Os RDDS lifetime measurement at JYFL
September 2012.
- ^{166}W measured earlier at JYFL.
- ^{170}Os and ^{168}W measurements approved by the ATLAS ANL.
- ^{170}Os to be also measured at Orsay (J. Ljungvall).

Outlook

The DPUNS plunger device

- Based on the Köln plunger design, constructed by University of Manchester.
- Can operate in He gas of RITU \Rightarrow differential pumping.
- Commissioned in May 2012, currently in operation.
- Dedicated instrument for recoil separators RITU and MARA (under construction).

Complementary transition probability studies at CERN-ISOLDE and JYFL.



In collaboration with:

Oliver Lodge Laboratory, University of Liverpool

Department of Physics, Royal Institute of Technology

Institut für Kernphysik, Universität zu Köln

Institut für Kernphysik, TU Darmstadt

Physik-Department E12, TU München

STFC Daresbury Laboratory

*School of Physics and Astronomy, University of
Manchester*

Institute of Physics, Slovak Academy of Sciences

Department of Physics and Astronomy, Ghent University

Department of Physics, University of Surrey

Department of Physics, University of Tokyo

*School of Physics, Georgia Institute of Technology,
Atlanta*