Longest Odd-Odd Chain of Nuclei with 1^+ Ground States

- We performed high-precision mass measurements of the odd-odd **^{108,110,112,114,116}Rh ground and isomeric states** using the **Canadian Penning Trap** at Argonne National Laboratory. These measurements not only **validated excitation energies** of several previously known isomeric states but also **provided evidence for a newly identified isomeric state in ^{114}Rh**.

- ^{108,110,112,114,116}Rh also lie in a mid-shell region, where nuclear shapes are highly susceptible to deformation, typically leading to variations in spin-parity assignments. Despite this, these isotopes are part of the **longest known odd-odd isotopic chain with a consistent 1^+ ground-state spin-parity assignment**, spanning $^{104-118}$Rh.

- To investigate this peculiarity, realistic phenomenological mean-field calculations using the universal Wood-Saxon Hamiltonian were performed. These calculations successfully explained the microscopic origin of all eight 1^+ Rhodium configurations via energy minimization with no parameter adjustment.

- In addition, multi-quasiparticle blocking calculations were conducted to study the configuration of low-lying states in the odd-odd Rh nuclei and elucidate the observed anomalous isomeric yield ratio of ^{114}Rh.

A typical count histogram during the CPT mass measurement of ^{110}Rh

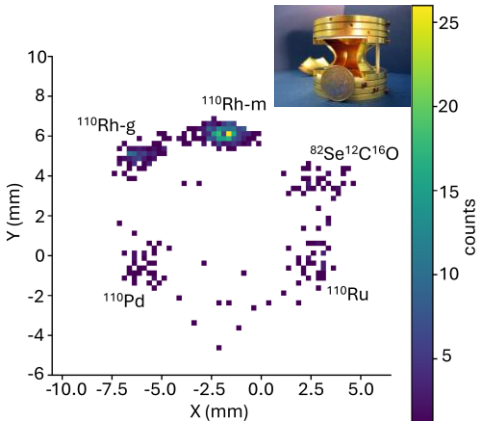
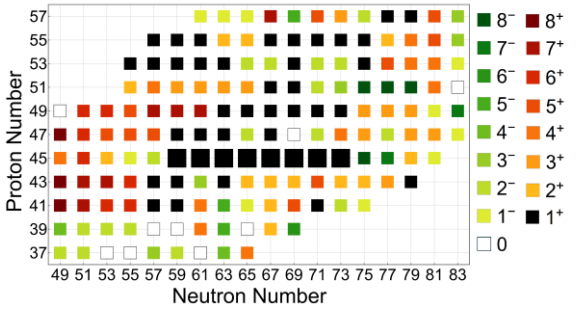


Chart of nuclides with spin-parity



B. Liu, M. Brodeur, J. A. Clark, I. Dedes, J. Dudek, F. G. Kondev, D. Ray, G. Savard, A. A. Valverde, A.Baran, D.P.Burdette, A.M.Houff, R.Orford, W.S.Porter, F.Rivero, K.S.Sharma and L.Varriano, Phys. Rev. C, **111**, 034308 (2025)

NSF PHY-2310059