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Abrupt change in nuclear moments of indium isotopes at magic number 82 explained by nuclear theory

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In this contribution, we present measurements of the nuclear magnetic dipole moments and nuclear electric quadrupole moments of the 113-131In isotope chain, performed using the Collinear Resonance Laser Spectroscopy experiment at ISOLDE, CERN. In addition to future prospects for laser spectroscopy of In isotopes.

We show that the electromagnetic properties of the neutron-rich indium isotopes significantly differ at N = 82 compared to N < 82, despite the single unpaired proton dominating the behaviour of this complex many-body system. This challenges our previous understanding of these isotopes, which were considered a textbook example for the dominance of single-particle properties in nuclei [1, 2].

To investigate the microscopic origin of our experimental results, we performed a combined effort with developments in two complementary nuclear many-body methods: ab-initio valence space in-medium similarity normalization group [3,4] and density functional theory [5].

When compared with our experimental results, contributions from previously poorly constrained time-odd channels [6,7], and many-body currents [8] are found to be important, demonstrating electromagnetic properties of 'proton-hole'isotopes around magic shell closures at extreme proton-to-neutron ratios can give us crucial insights.

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