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Nuclear moments of indium isotopes reveal abrupt change at magic number 82

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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.

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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