Contribution ID: **139** Type: **Oral**

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

Thursday, 16 June 2022 09:50 (20 minutes)

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.

[1] - K. Heyde. The Nuclear Shell Model. Springer Series in Nuclear and Particle Physics. Springer Berlin Heidelberg, Berlin, Heidelberg, 1990.
[2] - J. Eberz et al. Nuclear Physics A, 464(1):9–28, 1987
[3] - R. Stroberg et al. Annual Review of Nuclear and Particle Science, 69(1), 2019.
[4] - P. Gysbers et al. Nature Physics, 15(5):428–431, 2019.
[5] - J. Dobaczewski et al. J. Phys. G: Nucl. Part. Phys., 48(10):102001, 2021.
[6] –J.Engel and J. Menéndez. Reports on Progress in Physics, 80(4):046301, 2017
[7] –J. Dobaczewski et al. Phys. Rev. Lett., 121:232501, 2018.
[8] - S. Pastore et al. Phys. Rev. C, 87:035503, 2013.

Primary author: VERNON, Adam (Massachusetts Institute of Technology)

Co-authors: GARCIA RUIZ, Ronald Fernando (Massachusetts Institute of Technology); MIYAGI, Takayuki (TRIUMF); Dr BINNERSLEY, Cory (The University of Manchester); Prof. BILLOWES, Jonathan (The University of Manchester); Dr BISSELL, Mark (The University of Manchester); Dr BONNARD, Jeremy (University of York); COCOLIOS, Thomas (KU Leuven); Prof. DOBACZEWSKI, J. (Univ of York); FLANAGAN, Kieran (7 - Photon Science Institute, The University of Manchester, CERN); Prof. GEORGIEV, Georgi (French National Centre for Scientific Research); Dr GINS, Wouter (10Department of Physics, University of Jyväskylä, Finland); DE GROOTE, Ruben (KU Leuven); Dr HINKE, Reinhart (EP Department, CERN); HOLT, Jason (TRIUMF/McGill); KOSZORÚS, Agota (KU Leuven); Dr LEIMBACH, David (EN Department, CERN,); Dr LYNCH, Kara (CERN); NEYENS, Gerda (KU Leuven, CERN); Dr STROBERG, Ragnar (University of Washington); WILKINS, Shane (Massachusetts Institute of Technology); Prof. YANG, Xiaofei (Peking University); Dr YORDANOV, Deyan (Universite Paris-Saclay)

Presenter: VERNON, Adam (Massachusetts Institute of Technology)

Session Classification: NS2022 Plenary

Track Classification: Oral Presentations