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First High-Resolution Laser Spectroscopy of Cadmium: Recent Results and Perspectives

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We report on the first hyperfine-structure study of cadmium by high-resolution laser spectroscopy. The goal is to determine nuclear spins, electromagnetic moments and root mean square (rms) charge radii of ground and isomeric states along the chain, ultimately reaching the neutron 50 and 82 shell closures.

In the first part of the program we studied the intense beams of 106-124,126Cd by fluorescence spectroscopy, which also covered the b- isomers in the odd 111-123Cd. The measurements determined the ground-state spins as being 1/2, 3/2, and 5/2 in close relation with the corresponding single-particle orbitals of the sdgh shell. Evidence is found whether the isomeric configuration is 11/2- in all isotopes, or it is replaced by one of the predicted 7/2- or 9/2- collective states. The data is sensitive to the changes in the degree of collectivity between the ground states and the isomers, not only from their quadrupole moments, but also through their rms charge radii.

In this contribution we will present the results and their preliminary interpretation. The perspectives for extending the measurements towards the exotic isotopes near the doubly-magic 100Sn and 132Sn will be discussed, as this is expected to shed light on a shell-quenching hypothesis and the stellar nucleosyntheses.

Primary author: YORDANOV, Deyan for the COLLAPS collaboration (CERN)

Presenter: YORDANOV, Deyan for the COLLAPS collaboration (CERN)

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