SPINS, MOMENTS AND SIZES OF $^{100\text{-}130}$Cd BY LASER SPECTROSCOPY

D. T. Yordanov[1], D. L. Balabanski[2], M. L. Bissell[3], K. Blaum[1], B. Cheal[4], K. T. Flanagan[4], N. Frömmgen[5], G. Georgiev[6], C. Geppert[5,9], M. Hammen[5], M. Kowalska[7], K. Kreim[1], A. Krieger[5], G. Neyens[3], R. Neugart[5], W. Nörtershäuser[5,8], J. Papuga[3], M. M. Rajabali[3], R. Sánchez[8]

[1]*Max Planck Institute for Nuclear Physics, Saupfercheckweg 1, 69117 Heidelberg, Germany*
[2]*INRNE, Bulgarian Academy of Science, BG-1784 Sofia, Bulgaria*
[3]*Instituut voor Kern- en Stralingsfysica, KU Leuven, B-3001 Leuven, Belgium*
[4]*School of Physics and Astronomy, The University of Manchester, Manchester M13 9PL, UK*
[5]*Institut für Kernchemie, Universität Mainz, D-55099 Mainz, Germany*
[6]*CSNSM-IN2P3-CNRS, Université de Paris Sud, F-91405 Orsay, France*
[7]*Organisation Européenne pour la Recherche Nucléaire, CH-1211 Geneva 23, Switzerland*
[8]*Helmholtzzentrum für Schwerionenforschung GmbH, D-64291 Darmstadt, Germany*
[9]*Helmholtz Institute Mainz, D-55099 Mainz, Germany*

We report on the first study of cadmium by high-resolution laser spectroscopy. Nuclear spins, electromagnetic moments and root mean square charge radii of ground and isomeric states have been determined along the chain, ultimately reaching the neutron 50 and 82 shell closures. These experimental data provide a solid basis for enhancing the nuclear theories in the vicinities of the doubly magic ^{100}Sn and ^{132}Sn. Specific nuclear-structure questions, for instance, whether the cadmium isotopes are spherical vibrators or rigid rotors, can now be resolved.

The technique of collinear laser spectroscopy was applied at ISOLDE-CERN. The first part of the program studied the intense beams of $^{106\text{-}124,\ 126}$Cd, which also covered the β^- isomers in that range. For enhanced sensitivity the exotic species towards ^{100}Cd and ^{130}Cd were measured as bunched beams and making use of an exotic atomic transition at 214nm. The later also clears the path to other isotopic chains so far inaccessible by laser spectroscopy due to atomic transitions deep in the UV spectrum. Long-lived β^- isomers were observed in ^{127}Cd and ^{129}Cd for the first time. 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. 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 are sensitive to changes in the degree of collectivity between the ground states and the isomers, not only from their quadrupole moments, but also through their charge radii.

In this contribution the experimental results and their preliminary interpretation will be presented in the context of the shell structure in the vicinity of Z=50 and its evolution towards the neutron 50 and 82 shell closures.