Spectroscopy of ^{111}Cd: Challenging the Particle-Vibration Model

B.J. Coombes,[1] A.E. Stuchbery,[1] M.W. Reed,[1] A. Akber,[1] J.T.H. Dowie,[1] M. Gerathy,[1] T.J. Gray,[1] T. Kibédi,[1] A.J. Mitchell,[1] and T. Palazzo[1]

[1]*Department of Nuclear Physics, The Australian National University, ACT 2601, Australia*

Quadrupole collectivity has traditionally been studied through the measurement of electric quadrupole moments. Recently it has been shown that *g* factors can be sensitive to the nature of collective excitations in a way that electric quadrupole moments are not [1]. In this new investigation the *g* factors of excited states in ^{111}Cd were measured and compared with the predictions of particle-vibration and particle-rotor models. Particle-γ angular correlations were also measured following Coulomb excitation with 90 MeV ^{32}S beams from the ANU 14UD Pelletron accelerator. Particular attention was focused on the $5/2^+$ and $3/2^+$ states reported [2] at 752.8 and 754.9 keV, respectively. No population of the purported 3/2$^+$ state was observed.

In the limit of a spherical nucleus with no vibration coupling and no deformation, the particle-vibration and particle-rotor models of ^{111}Cd begin with the same *g* factors. It was shown in a previous analysis that applying a small deformation provides a large change in the *g* factors for low-lying excited states in ^{111}Cd, bringing these values in line with measurements [1]. A puzzle for the particle-vibration model in the present data is the non-observation of a strongly Coulomb excited $3/2^+$ state with an excitation energy near the 2^+ excitation energy of the core ($E(2_1^+) \sim 600$ keV), similar to the 3/2$^+$ 681-keV level in ^{113}Cd.

The new data will be presented and discussed in terms of particle-vibration versus particle-rotor interpretations of the level structure and electromagnetic properties of ^{111}Cd.

---

[1] A.E. Stuchbery, S.K. Chamoli and T. Kibédi *Phys. Rev. C.* **93**, 031302(R) (2016).
[2] Jean Blachot, *Nuclear Data Sheets* **110**, 1239 (2009).