

# Evolution of collectivity in the N=50 isotones towards 100Sn

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We propose to measure the reduced transition probabilities  $B(E2; 0^+g.s. \rightarrow 2^+1)$  of  $^{96}\text{Pd}$  and  $^{98}\text{Cd}$  by means of inelastic scattering at intermediate energies. The radioactive  $^{96}\text{Pd}$  and  $^{98}\text{Cd}$  beams are produced by fragmentation of a 345 MeV/u  $^{124}\text{Xe}$  beam on a  $^9\text{Be}$  target. The isotopes of interest are selected and identified with the BigRIPS separator, then impinged on the secondary target. A Au and a Be secondary targets are used for the inelastic scattering. The gamma-rays emitted from the excited states are measured with the DALI2+ array, and the outgoing particles are identified with the ZeroDegree Spectrometer. The cross sections populating to the  $2^+1$  states on the Au and the Be targets are extracted from the observed gamma-ray intensities. The excitation of the  $2^+1$  state is caused by both the electromagnetic and the nuclear interaction between target and projectile. To extract the reduced transition probability  $B(E2)$ , reaction model calculations will be performed and the nuclear deformation length and  $B(E2)$  value for the projectile nucleus will be adjusted to reproduce simultaneously the measured cross sections on the Au and the Be targets.

The  $^{96}\text{Pd}$  and  $^{98}\text{Cd}$  are only 4 and 2 valence protons below the doubly magic  $^{100}\text{Sn}$ . The measurement of this experiment will allow for a detailed comparison of the nuclear structure between the  $^{56-78}\text{Ni}$  ( $Z=28$ ) isotopes versus the  $^{78}\text{Ni}$ - $^{100}\text{Sn}$  ( $N=50$ ) isotonic chain, both regions sharing the same  $p_{3/2}$ ,  $f_{5/2}$ ,  $p_{1/2}$  and  $g_{9/2}$  orbitals for valence neutrons and protons, respectively. The shell model calculations in the  $f_{5/2}$ ,  $p$ ,  $g_{9/2}$  model space in Ref.[1] predict a decrease of collectivity towards the complete occupation of the  $g_{9/2}$  orbitals, with  $B(E2; 2^+1 \rightarrow 0^+g.s.)$  value of about 150 e2fm<sup>4</sup> for  $^{98}\text{Cd}$ . Nevertheless, it is well known that the single-particle  $d_{5/2}$  orbital above the magic number 50 for neutrons and protons, together with the quasi-SU3 partner  $g_{9/2}$  can give rise to collectivity [2]. In Ref.[2], it is suggested that the findings of B. Cederwall and collaborators in  $^{92}\text{Pd}$  [3] indicates the necessity to consider the  $d_{5/2}$  orbital above the magic number 50 to describe the nuclei in this region. With the  $B(E2)$  measurements of this experiment, the role of the  $d_{5/2}$  orbital in the structure of the nuclei approaching  $^{100}\text{Sn}$  will be explored.

[1] R. M. Pérez-Vidal, et al., Phys. Rev. Lett. **129**, (2022) 112501

[2] A. P. Zuker, et al., Phys. Rev. C **92**, (2015) 024320

[3] B. Cederwall, et al., Nature (London) **469**, (2011) 69

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