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Shape and collectivity in ^{80}Ge studied via Coulomb Excitation

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The stable to neutron-rich isotopes of germanium are a critical testing ground for nuclear models due to their complex and rapidly changing nuclear structure. The even- A $^{72-78}\text{Ge}$ isotopes exhibit triaxial deformation, and the presence shape coexistence has also been suggested in ^{72}Ge [1]. A transition from prolate to oblate shapes occurs at ^{70}Ge [2], and another region of triaxiality has been proposed around the neutron-rich $^{84,86,88}\text{Ge}$ isotopes based on their low-lying level schemes [3]. With two neutrons removed from the singly-magic ^{82}Ge , the rare-isotope ^{80}Ge is important for a systematic understanding of the structural evolution of neutron-rich nuclei in this region of the nuclear chart.

A barrier-energy projectile Coulomb excitation experiment studying ^{80}Ge was performed at the ReA3 facility of the NSCL using the JANUS [4] setup. This technique is sensitive to direct indicators of nuclear shape and deformation, namely E2 transition strengths and quadrupole moments. Electromagnetic matrix elements were extracted from the experimental data via a joint use of the

GOSIA and GOSIA2 codes [5]. Most notably, the quadrupole moment of ^{80}Ge was measured for the first time, and the precision of the B(E2) transition strength was improved. The experimental results indicate a large, prolate deformation for ^{80}Ge .

Two sets of large-scale shell-model calculations, with different effective interactions, were performed for $^{70-82}\text{Ge}$ in order to better understand the current experimental results as well as the structural evolution in this region. The calculations reproduce both the current result for the ^{80}Ge transition strength as well as the trend observed in the heavy Ge isotopes. The quadrupole moments proved more challenging for theory, though both sets of shell-model calculations performed point to a larger prolate deformation in ^{80}Ge compared to its neighboring isotopes. The present measurement is consistent with this picture.

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