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Coulomb excitation of ^{66}Ge

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This work pertains to determining the spectroscopic quadrupole moment for the first 2^+ state in ^{66}Ge using “safe” Coulomb excitation measurements. Motivation to study ^{66}Ge arises from the anomalous rotational behaviour of the high-lying first 2^+ state observed in even-even isotopes in the $A \sim 70$ region [1]. Low-lying 0^+ excited states have been suggested for even-even neutron-deficient nuclei Se [2] and Kr [3] which may be an indication of shape coexistence [4]. The same trend was observed in ^{198}Pt and is interpreted as the result of the presence of an intruder state [4]. The $A \sim 70$ region near the $N = Z$ line is a region of rapidly changing nuclear shapes due to the shell gaps at proton and neutron number 34 and 36, making this region an excellent testing ground to study the phenomenon of shape coexistence. In addition, macroscopic-microscopic models suggest gamma-softness for ^{64}Ge through oblate-prolate shape coexistence in ^{68}Se and ^{72}Kr to some of the most deformed nuclei at ^{76}Sr and ^{80}Zr .

Our experiment was performed at HIE-ISOLDE during July 2017. A 4 mg/cm^2 target of ^{196}Pt was bombarded with ^{66}Ge beams at 4.395 MeV/u . This was the first experiment carried out using accelerated unstable Ge beams. The initial aim was to study ^{70}Se , but the beam was contaminated with ^{66}Ge . At first it was thought not to be a problem, but it became clear that the ratio between ^{70}Se and ^{66}Ge grew in favour of ^{66}Ge . The beam was then tuned to run ^{66}Ge for the rest of the experiment. The gamma rays were detected using the MINIBALL array containing 8 cluster of HPGe detectors. Scattered particles were detected using an annular CD detector placed a distance of 25.74 mm , covering scattering angles from 21 to 57 degrees. Studying the shape of ^{66}Ge may shed light on some of the systematics in this rapidly changing region of nuclear shapes. Preliminary results for the spectroscopic quadrupole moment of the first 2^+ state in ^{66}Ge will be presented during the ISOLDE Workshop.

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