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Coulomb Excitation of 66Ge

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This work pertains to determining the spectroscopic quadrupole moment for the first 2+ state in 66Ge using "safe"Coulomb excitation measurements. Motivation to study 66Ge arises from the anomalous rotational behaviour of the high-lying first 2+ state observed in even-even isotopes in the A ˜ 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 198Pt and is interpreted as the result of the presence of an intruder state [4]. The A ˜ 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 64Ge through oblate-prolate shape coexistence in 68Se and 72Kr to some of the most deformed nuclei at 76Sr and 80Zr.

Our experiment was performed at HIE-ISOLDE during July 2017. A 4 mg/cm2 target of 196Pt was bombarded with 66Ge beams at 4.395 MeV/u. This was the first experiment carried out using accelerated unstable Ge beams. The initial aim was to study 70Se, but the beam was contaminated with 66Ge. At first it was thought not to be a problem, but it became clear that the ratio between 70Se and 66Ge grew in favour of 66Ge. The beam was then tuned to run 66Ge for the rest of the experiement. 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 27.34 mm, covering scattering angles from 19 to 56 degrees. Studying the shape of 66Ge 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 66Ge will be presented during the ISOLDE Workshop.

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