Shape studies in neutron-rich cerium isotopes

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Belonging to the mass region of the neutron-rich lanthanides of the nuclide chart, the cerium isotopes with $146 \leq A \leq 152$ are transitional nuclei characterized by a few nucleons outside of the so-called closed shells. It is predicted that isotopes in this region possess octupole deformation [1], which can be manifested with the appearance of an excited 3- state [2]. Octupole correlations are the result of the long range octupole-octupole interaction between nucleons occupying pairs of orbitals which differ by 3 units in both orbital and total angular momentum, which gives rise to an asymmetric pear-shaped form [3].

A β-decay experiment has been performed at the radioactive ion beam facility ISAC at the TRIUMF particle accelerator center in Vancouver, Canada in June 2018 where beams of neutron-rich Cs isotopes were initially produced from a UCx target and implanted on a moving tape collector. Spectroscopy of ^{146,148,150,152}Ce has been performed produced following the decay of ^{146,148,150,152}La using the GRIFFIN spectrometer for the detection of gamma-rays and conversion electrons. In addition to the 16 HPGe clover detectors of GRIFFIN, 8 LaBr3 detectors were used to allow for fast-timing measurements of excited-state lifetimes.

In this talk, preliminary results of gamma-ray angular correlations that are used to assign the spin of the proposed low-lying negative-parity states [4] will be presented. Moreover, it has been possible to measure characteristic B(E1)/B(E2) ratios to infer the magnitude of the octupole deformation and compare to theoretical predictions [1]. Additional excited levels have also been identified in ^{148}Ce and initial suggestions about their structure will also be discussed.

References:

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