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Search for mixed-symmetry states in 136Te and 138Xe

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We propose to study the excitation and decay of a second excited 2+ state in the nucleus 136Te at an excitation energy around 1.5-1.6 MeV which is predicted by theoretical calculations to be of mixed-symmetry character. This study will allow to explore for the first time the potential of the Coulomb excitation technique at intermediate energies for the study of mixed-symmetry states (MSS) in radioactive nuclei. We plan to use the known electromagnetic transition strength between the ground and the first excited 2+ state in 132Te, B(E2;01+⟶21+)= 0.216(22) e2b2, for the normalization of the experimental yields to be obtained in 136Te. In this way, our experiment will provide at the same time a verification of the B(E2) anomaly observed in previous studies in 132Te and 136Te, two protons and either two neutron-holes or two neutrons outside doubly magic 132Sn. It is planned to extend these studies to the heavier N=84 isotone 138Xe. The nuclei of interest will be produced in the projectile fission of a 238U beam on a lead target and Coulomb excited at intermediate energies on a lead target positioned at the F8 focus of the BigRIPS fragment separator. De-excitation γ-rays will be detected by the DALI2 spectrometer in coincidence with the reaction products identified in the Zero Degree Spectrometer. The results of these measurements will shed new light on the irregularities observed in the development of quadrupole collectivity in nuclei around 132Sn and will allow to discriminate between the different theoretical approaches employed in the description of this region of the chart of nuclei far-off stability.

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