Frontiers in Gamma Ray Spectroscopy FIG18

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First Spectroscopy of 40Mg

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Content :

The study of nuclei far from stability is one of the most active and challenging areas of nuclear structure physics. One of the most exotic neutron-rich nuclei currently accessible to experiment is 40Mg, which lies at the intersection of the nucleon magic number N=28 and the dripline, and is expected to have a large prolate deformation similar to that observed in neighboring isotopes 32-38Mg. In addition, the occupation of the weakly bound low-l p3/2 state may lead to the appearance of a neutron halo structure. 40Mg offers an exciting possibility and rare opportunity to investigate the coupling of weakly bound valence particles outside a deformed core, and the influence of collective rotational motion near to particle threshold.

I will discuss the results of an experiment carried out at RIBF (RIKEN) to study excited states in 40Mg produced by a 1-proton removal reaction from a ~240 MeV/u 41Al secondary beam. 40Mg and other final products were separated and identified using the Zero Degree Spectrometer. Prompt gamma rays were detected using the DALI2 array.

The observed excitation spectrum is compared to theory and shown to reveal unexpected properties compared to predictions and to those observed in neighboring, more bound, Mg isotopes.

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