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Spectroscopy of low-lying excited states of 50Ar

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An interesting aspect of nuclear structure is the shell evolution for isotopes with extreme isospin values. Experimental evidence show the presence of a sub-shell closure at N = 32 for 52Ca, 54Ti and 56Cr. Mass measurements on 52,53K suggest that this sub-shell closure is maintained below Z=20. For the case of the 48Ar, low lying 2+, 4+ and the second 2+ states, as well as the B(E2)↑ value have been accessed using different techniques, and a triaxial character has been suggested. A recent γ-ray spectroscopy measurement of 50Ar, reported an energy of the first 2+ state of 1178(18) keV. The satisfactory reproduction of this experimental results by shell model calculations indicated the conservation of the shell gap at N = 32 for Ar isotopes. In the same measurement, a tentative transition with energy of 1582(38) keV was suggested to correspond to the 4 +⟶2+ transition. However, the limited statistics did not allow for a coincidence analysis to obtain any definitive conclusion on the existence of the peak, nor on spin and parity assignments. To further investigate the nature of the N=32 shell gap below Ca, the analysis of different reaction channels populating 50Ar is of high importance.

We will report on the preliminary results of the measurements of proton and neutron knockout reactions as well as inelastic scattering populating 50Ar performed at RIKEN within the third SEASTAR campaign. Isotopes of interest were produced after the fragmentation of a 70Zn beam at 345 MeV/u on a Be target and identified with BigRIPS. Selected isotopes were focused onto the liquid-hydrogen target of the MINOS device and gamma rays from the reactions were detected with the DALI2+ array. Outgoing particles were identified using the SAMURAI magnet and related detectors. Preliminary results on the spectroscopy of low-lying levels for 50Ar will be presented and the cross sections to populate the different states from different reaction channels will be discussed.

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