Contribution ID: **30** Type: **not specified**

AGATA@GANIL(E786s): Protons in the sd shells along the N=28 chain: only spectators ?

Friday, 12 November 2021 10:10 (20 minutes)

The evolution of the nuclear shell closure along N=28 has gathered much interest due to the observed discrepancies between the well established shell model with SDPF-U interaction and measurements of the half-magic 46Ar isotope.
In particular, while remarkable agreement was observed between theoretical and experimental values of Sn, transition probabilities measured with intermediate Coulomb excitation diverge by a factor of two from their predicted values[1, 2]. The reason behind this mismatch has been pinned down to the proton transition matrix elements[2] and hints at an incorrect description of the sd proton space below Z=20 [3].
The experiment we proposed aimed at shedding some light on this peculiar problem by directly probing the proton component of the wavefunction via a proton-pickup direct reaction: 46Ar(3He, d)47K at an energy of 350 MeV.
The experiment, performed at the Spiral 1 facility in GANIL with a post-accelerated radioactive 46Ar beam impinging on a high-density cryogenic 3He target, will assess the amount of d3/2 state relative to the s1/2 relying on a state-of-the-art experimental setup for a precise reconstruction of the kinematics of the reaction.
The heavy reaction fragment was identi ed by the high acceptance magnetic spectrometer, VAMOS, while the high-granularity silicon DSSSD detector, MUGAST, allowed the measurement of the angular distribution of the light ejectile while also performing particle identi cation. The AGATA[5] gamma-ray tracking germanium array measured the gamma rays produced by the decay of the 47K excited states. Experimental results will be compared with theoretical models to infer information on the proton wavefunction of 46Ar.
References
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Session Classification: AGATA Collaboration Meeting: SESSION 4