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Coulomb excitation of neutron-rich 44Ar at SPIRAL

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The weakening of the N=28 shell closure for neutron-rich nuclei and the development of deformation and shape coexistence in this mass region were addressed in a low-energy Coulomb excitation experiment using a radioactive 44Ar beam from SPIRAL facility of GANIL. The Ar44 ions were post-accelerated to 2.7 and 3.7 MeV/nucleon and Coulomb excited on 109Ag and 208Pb targets, respectively. The scattered projectiles and recoiling target nuclei were detected in a highly segmented double-sided silicon detector and the gamma rays were detected with the EXOGAM germanium detector array. In addition to the first excited 2+ state, one higher-lying level was populated and two gamma lines from its deexcitation were observed. With the 109Ag target both projectile and target nuclei were excited, which has been used to normalize the excitation probability in 44Ar with the well known transition strengths in 109Ag. The level of statistics was sufficient to subdivide the data into several sub-sets corresponding to different ranges of scattering angles. Since the influence of the quadrupole moment of the first 2+ state on its excitation probability varies significantly with scattering angle, it was possible to obtain from one experiment information on both the transitional and diagonal matrix elements involved in the excitation process.

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