β spectroscopy of proton-rich nucleus 28S

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As member of the T_z=-2 family, ^{28}S is a nucleus rather light near the proton drop line, and has high β-delayed proton (βp) branching ratio. Precise β-decay spectroscopy of proton-rich nucleus ^{28}S serves as a powerful tool to study the isospin symmetry breaking, and to test the unitarity of CKM matrix through the superallowed Fermi transition between isobaric analog states. Nevertheless, only one experimental study was previously published by Pougheon et al. without detecting γ rays in 1989. The present work was conducted at Heavy Ion National Laboratory of Accelerator (HIRFL) in Lanzhou. The interested nucleus ^{28}S was produced through projectile fragmentation (PF) method where ^{32}S^{16+} beam (about 80 MeV/u) bombarded ^{9}Be target, and subsequently implanted in a detector system composed of double-sided silicon strip detectors (DSSD), quadrant silicon detectors (QSD), and clover-type high-purity germanium detectors. By measuring p and γ following β decay, the half-life and energy with higher accuracy were obtained. Different decay channels were clearly identified through the coincidence method to construct complete decay scheme, and the results were consistent with theoretical calculations. The mirror nuclei ^{28}S-^{28}Mg was also studied, which gave no evidence for existence of isospin symmetry breaking.

Development of a VUV Pulsed Laser System for Ion Trap Spectroscopy of Thorium-229

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Thorium-229 has an extraordinarily low-energy nuclear isomeric state at approximately 8.4 eV, which lies within the vacuum ultraviolet (VUV) region and is accessible via laser light. This unique transition has attracted interest for its potential application in future nuclear clocks, with high-resolution spectroscopy using trapped ions considered an important step toward their realization. In this study, we have developed a VUV pulsed laser system based on nonlinear four-wave mixing in xenon gas. This system generates laser pulses at wavelengths suitable for addressing the isomer transition of Thorium-229. In this presentation, we will report on the current status of the development of the VUV laser system optimized for future ion trap spectroscopy of Thorium-229.