*β*-decay spectroscopy of 25Si using the

Gaseous Detector with Germanium Tagging system

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*β*-decay spectroscopy provides valuable information on exotic nuclei and a stringent test for nuclear theories beyond the stability line. We aim to search for new *β*-delayed protons and *γ* rays of 25Si to investigate the properties of 25Al excited states. 25Si *β* decays were measured by using the Gaseous Detector with Germanium Tagging system at the National Superconducting Cyclotron Laboratory. The protons and *γ* rays emitted in the decay were detected simultaneously. Three 24Mg *γ*-ray lines and eight 25Al *γ*-ray lines were observed for the first time in 25Si decay. A new proton branch at 719(4) keV and new proton-*γ*-ray coincidences were identified. A Monte Carlo method was used to model the Doppler broadening of 24Mg *γ*-ray lines caused by proton emissions. Shell-model calculations using two newly-developed *sd*-shell Hamiltonians， USDC and USDI, were performed. The excitation energies, *γ*-ray and proton branchings, *β*-feeding intensities, log *ft* values, and Gamow-Teller transition strengths for the states of 25Al populated in the *β* decay of 25Si were determined and compared to the mirror decay of 25Na and the shell-model calculations. We have reported the first measurement of the 25Si *β*-delayed *γ* ray intensities through the 25Al unbound states. All the proton-bound states of 25Al are observed to be populated in the *β* decay of 25Si. We have resolved some inconsistencies between the previous measurements and provide new information on the 25Al level scheme. An enhanced decay scheme has been constructed and the comparison to the shell model offers insights into the fine structure of 25Al.