Abstract Submitted
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**$^{25}$Si $\beta$-decay spectroscopy using the Gaseous Detector with Germanium Tagging (GADGET) system**[1] LIJIE SUN, National Superconducting Cyclotron Laboratory, MSU, MOSHE FRIEDMAN, The Hebrew University of Jerusalem, TAMAS BUDNER, National Superconducting Cyclotron Laboratory, MSU, DAVID PREZ-LOUREIRO, Canadian Nuclear Laboratories, EMANUEL POLLACCO, Universit Paris-Saclay, CHRISTOPHER WREDE, ALEX BROWN, MARCO CORTESI, CATHLEEN FRY, BRENT GLASSMAN, JOE HEIDEMAN, MOLLY JANASIK, AARON MAGILLIGAN, MICHAEL ROOSA, JORDAN STOMPS, JASON SURBROOK, PRANJAL TIWARI, National Superconducting Cyclotron Laboratory, MSU — The protons and $\gamma$ rays emitted in $^{25}$Si $\beta$ decay were measured using the GADGET system. Three $^{24}$Mg $\gamma$-ray lines, eight $^{25}$Al $\gamma$-ray lines, and a 719-keV proton branch were observed for the first time in $^{25}$Si decay. A Monte Carlo method was used to model the Doppler broadening of $^{24}$Mg $\gamma$-ray lines caused by proton emissions. All the proton-bound states of $^{25}$Al are observed to be populated in the $\beta$ decay of $^{25}$Si. We have reported the first measurement of the $^{25}$Si $\beta$-delayed $\gamma$-ray intensities through the $^{25}$Al unbound states. An enhanced decay scheme of $^{25}$Si has been constructed and compared to the mirror decay of $^{25}$Na and the shell-model calculations using two newly-developed *sd*-shell Hamiltonians, USDC and USDI. This work offers insights into the fine nuclear structure of $^{25}$Al.

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