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Prototype of a Muon Tomography Station with GEM detectors for Detection of Shielded Nuclear Contraband MICHAEL STAIB, VALLARY BHOPATKAR, WILLIAM BITTNER, MARCUS HOHLMANN, JUDSON LOCKE, JESSIE TWIGGER, Florida Institute of Technology, KONDO GNANVO, University of Virginia — Muon tomography for homeland security aims at detecting well-shielded nuclear contraband in cargo and imaging it in 3D. The technique exploits multiple scattering of atmospheric cosmic ray muons, which is stronger in dense, high-Z materials, e.g. enriched uranium, than in low-Z and medium-Z shielding materials. We have constructed and are operating a compact Muon Tomography Station (MTS) that tracks muons with eight 30 cm $\times$ 30 cm Triple Gas Electron Multiplier (GEM) detectors placed on the sides of a cubic-foot imaging volume. A point-of-closest-approach algorithm applied to reconstructed incident and exiting tracks is used to create a tomographic reconstruction of the material within the active volume. We discuss the performance of this MTS prototype including characterization and commissioning of the GEM detectors and the data acquisition systems. We also present experimental tomographic images of small high-Z objects including depleted uranium with and without shielding and discuss the performance of material discrimination using this method.

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