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Detection of fissionable materials in cargoes using monochromatic photon radiography[1] AREG DANAGOULIAN, RICHARD LANZA, BUCKLEY O'DAY, Massachusetts Institute of Technology, LNSP TEAM — The detection of Special Nuclear Materials (e.g. Pu and U) and nuclear devices in the commercial cargo traffic is one of the challenges posed by the threat of nuclear terrorism. Radiography and active interrogation of heavily loaded cargoes require $\sim 1-10MeV$ photons for penetration. In a proof-of-concept system under development at MIT, the interrogating monochromatic photon beam is produced via a $^{11}B(d,n\gamma)^{12}C$ reaction. To achieve this, a boron target is used along with the 3MeV d^+ RFQ accelerator at MIT-Bates. The reactions results in the emission of very narrow 4.4MeV and 15.1MeV gammas lines. The photons, after traversing the cargo, are detected by an array of $NaI(Tl)$ detectors. A spectral analysis of the transmitted gammas allows to independently determine the areal density and the atomic number (Z) of the cargo. The proposed approach could revolutionize cargo inspection, which, in its current fielded form has to rely on simple but high dose bremsstrahlung sources. Use of monochromatic sources would significantly reduce the necessary dose and allow for better determination of the cargo's atomic number. The general methodology will be described and the preliminary results from the proof-of-concept system will be presented and discussed.

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