

ABSTRACT OF THE DISCLOSURE

Disclosed herein are methods and systems of scanning a target for potential threats using the energy spectra of photons scattered from the target to determine the spatial distributions of average atomic number and/or mass in the target. An exemplary
5 method comprises: illuminating each of a plurality of voxels of the target with a photon beam; determining an incident flux upon each voxel; measuring the energy spectrum of photons scattered from the voxel; determining, using the energy spectrum, the average atomic number in the voxel; and determining the mass in the voxel using the incident flux, the average atomic number of the material in the voxel, the energy spectrum, and a
10 scattering kernel corresponding to the voxel. An exemplary system may use threat detection heuristics to determine whether to trigger further action based upon the average atomic number and/or mass of the voxels.