Abstract

John Kuchta
University of Michigan
jkuchta@umich.edu

Time-Encoded Dual Particle Imager (lanTErn)

Image resolution is lost when downsizing to a handheld imaging system due to the transition from a small detector & thin mask to a large detector & thick mask model. The lanTErn project has implemented several metrics to find optimal mask patterns and designs to recover image resolution. The lanTErn project is a testbed for several unconventional mask designs for the imaging of neutrons and gamma-rays. The designs will all be following a large detector, thick mask model and use time-encoded imaging (TEI), with many of the masks being one dimensional. Two dimensional mask models are explored with the collaboration of Sandia National Laboratories. Each lanTErn design will incorporate additive manufacturing using polycarbonate for the mask elements and the light tight box for the detector. Several masks were designed to investigate the following: the increased collimation of gamma-rays in a thick mask, the increase in angular resolution by introducing extra layers of tungsten mask at the outer edge of the mask, and a design with tungsten on the side walls and inner edge of the mask elements. Several mathematical models were created to produce optimal mask patterns for designs without an available uniformly redundant array, which would produce an acceptable image resolution.