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Title: Time Encoded Dual Particle Imager (LANTERN)

Abstract
The LANTERN system is being developed as a man portable dual particle imager. The main goal is to improve image quality in the transition from thin large diameter to thick small diameter coded aperture masks. Unconventional masks are being designed for this purpose in collaboration with Sandia National Laboratories. The LANTERN system acts as a test bed for cylindrical time-encoded imaging (cTEI), where detector counts are modulated over time, mirroring the coded aperture mask rotating around it. The first masks to be created include tungsten and polycarbonate layers in a one dimensional uniformly redundant array. These masks can help image both gamma rays and neutrons. The polycarbonate in each mask is created with the use of additive manufacturing, allowing for nonstandard sizing and shapes. Subsequent designs introduce more tungsten layers in places such as the outer radius of the mask and on the side walls of every open element. Tungsten can also be added around the detector element to form a collimator to further reduce the detection field of view. Preliminary simulations show modest improvements in angular resolution for some of these designs.