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Time-Encoded Neutron Imaging for Applications in Nuclear Security ERIK BRUBAKER, JAMES BRENNAN, MARK GERLING, PETER MARLEAU, MATEUSZ MONTERIAL, Sandia National Laboratories, AARON NOWACK, Sandia National Laboratories, now at UT Knoxville, PATRICIA SCHUSTER, Sandia National Laboratories, now at U of Michigan, BEN STURM, MELINDA SWEANY, Sandia National Laboratories — Time-encoded imaging (TEI) refers to a class of techniques that extract directional information from a radiation field by inducing a time modulation in a detected particle flux. These approaches are in many ways analogous to pinhole and coded aperture imaging, in which a spatial modulation rather than a time modulation is induced. TEI is particularly useful for imaging energetic particle radiation such as gamma rays and fission-energy neutrons, which cannot be easily lensed. We developed TEI-based neutron imaging systems for two classes of nuclear security applications. First, high-resolution neutron emission imaging of distributed neutron sources was demonstrated with a single-pixel TEI imager. Second, long standoff source detection via a neutron signature was accomplished using a large-area, self-modulating TEI system. We demonstrate the ability to detect a 1 mCi Cf-252 source at 100 m standoff in 12 minutes.

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