

Design of a Time-Encoded Warhead Verification System

Principal Investigator: Jasmina Vujic

Supporting Investigators: Rebecca Krentz-Wee, Kai Vetter, Peter Marleau, Patricia Schuster

Abstract

This work continues the development of a demonstrated warhead confirmation system using two-dimensional time-encoded imaging (2D-TEI) to provide an authenticatable option for confirmation measurements. The 2D-TEI mask modulates the detection rate such that it is constant if and only if two objects are identical. This means that a monitoring party could be allowed full access to the system before, during, and after confirmation without risk of leaking sensitive information. The current work focuses on improved confidence by adding sensitivity to other relevant signatures and adding a layer of information protection by the implementation of irreversible linear transformations of the data in real time.

Goals, Objectives, and Deliverables

- Address the need for the ability to classify warheads by type while protecting sensitive information
- Improve the confidence in verification measurement by measuring multiple types of signatures
- Development and construction of a time-encoded gamma imaging system
- Improve confidence by adding a layer of information protection which irreversibly transforms the data in real time

Results/Technical Challenges

- Designed a 2D-TEI gamma system with a tungsten alloy mask with similar imaging properties to the current 2D-TEI fast neutron imaging system
- Mask design is a compromise between efficiency, resolution, and size/weight
- Need to ensure that multiple measurements added together or long measurements don't reveal sensitive information

Planned Accomplishments

- Construction of a TEI gamma mask
- Measurement of sources to compare the gamma and neutron masks
- Development of an implementation of irreversible linear transformations of the data in real time

Research Team

Principal Investigator Contact Information:

- Jasmina Vujic
- UC Berkeley
- vujic@nuc.berkeley.edu

Supporting Investigators:

- Rebecca Krentz-Wee, UC Berkeley
- Kai Vetter, UC Berkeley
- Peter Marleau, Sandia National Lab
- Patricia Schuster, University of Michigan
- NNSC—Nuclear Science & Security Consortium

Notes
