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Award Abstract #0833639

## Collaborative Research: ARI-MA: Tensioned Fluid Metastable State Special Nuclear Material Detector

NSF Org: [ECCS](#)  
[Division of Electrical, Communications and Cyber Systems](#)

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Program Manager: Rajinder P. Khosla  
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### ABSTRACT

Collaborative Research: ARI-MA: Tensioned Fluid Metastable State Special Nuclear Material Detector

The objective of this research is to develop novel, transformational impact, low-cost, effective, portable particle detector systems to detect highly enriched uranium and other special nuclear materials. Seed funding-sponsored research reveals that "tensioned" metastable states in materials potentially offer unique, unsurpassed capabilities for detection. The approach is to develop a theoretical foundation of interaction of nuclear particles with fluids in metastable states. Prototype device designs will be fabricated and assessed experimentally versus state-of-the-art systems for sensitivity and selectivity for neutron vs. gamma vs. alpha vs. fission product detection. Qualification of operation under American National Standards Institute standard test environments will be performed.

The main intellectual merit of this project will be a transformation in highly enriched uranium and other special nuclear materials detection methods by paving the way to novel, low cost, compact to large, high efficiency, readily adaptable

and portable detectors. Scientific merit will be attained through the advancement of the fundamental understanding of tensioned fluids and detection techniques.

Addressing the broader impact, the diverse research group includes two major university systems, a Historically Black Colleges and Universities institution and an inner city high school. The project will provide training and educational experiences to students from high school to PhD. Benefits to the society include progress in addressing the problem of nuclear threat detection and strengthened partnerships for teaching and research. The new knowledge and equipment will be employed in academic courses. As allowable, research results will be disseminated through journal and conference papers and student presentations .

#### **BOOKS/ONE TIME PROCEEDING**

B.Archambault, J. Lapinskas, J. Wang, J. Webster and R. P. Taleyarkhan. "Ascertainig Directional Information from Incident Nuclear Radiation", 09/15/2008-08/31/2009, "*Proc. 17th Int. Conf. Nuclear Engr. (ICONE-17), Brussels, Belgium, July, 2009*", 2009, "Proc. 17th Int. Conf. Nuclear Engr. (ICONE-17), Brussels, Belgium, July, 2009".

T. Grimes, Y. Xu and R. P. Taleyarkhan. "Neutron Spectroscopy via Unfolding for Tension Metastable Fluid Detector", 09/15/2008-08/31/2009, "*Proceedings of IEEE-DHS Conference, Boston, MA, USA, May 2009*", 2009, "Proceedings of IEEE-DHS Conference, Boston, MA, USA, May 2009".

by J. A. Webster, A. Sansone, B. Archambault and R. P. Taleyarkhan. "Tension Metastable Fluid Detectors for Active Interrogation of Special Nuclear Materials", 09/15/2008-08/31/2009, "*Proc. of IEEE-DHS Conference, Waltham, MA, May, 2009*", 2009, "Proc. of IEEE-DHS Conference, Waltham, MA, May, 2009".

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