**THE UNIVERSITY OF ALABAMA IN HUNTSVILLE**

**MATHEMATICAL SCIENCES COLLOQUIUM**

**Marylesa Howard, Ph.D.**

Principal Scientist (Mathematician, Defense Experimentation and Stockpile Stewardship

National Security Technologies, LLC

with contributions from Aaron Luttman, Michael Fowler, Kevin Joyce, Maggie Hock, Jesse Adams, Johnathan Bardsley, Stephen Mitchell, and Eric Machorro

**Quantifying Uncertainties in Inverse Problems: Meaning and Usefulness of Error Bars on Information Extracted from Stockpile Stewardship Experiments**

 **DATE: Friday, November 6, 2015**

 **TIME: 3:00 p.m. – 4:00 p.m.**

 **PLACE: Shelby Center 218**

**While DOE has moved to a scientific paradigm driven by modeling and simulation – and in which experimentation is motivated primarily by code validation – there is still much to be learned by analyzing data directly and extracting information from experimental data by solving inverse problems. In order to quantify the uncertainties associated with the solutions, however, it is necessary to use statistical approaches to formulating the inverse problems and to understand the nature of the uncertainties for which such formulations can correctly account. In this work we will present data from NNSA X-ray imaging experiments related to the stockpile stewardship program, some inverse problems whose solutions inform the evolution of our experiments and diagnostics systems, and the challenges associated with the Bayesian formalisms used to assign error bars to the information extracted. The discussion will include details of the experiments themselves, where mathematical data analysts fit into the experimental programs, the role of mathematical theory in development of analysis techniques, and results demonstrating the efficacy of solving statistical inverse problems to drive stockpile stewardship.**

**This work was done by National Security Technologies, LLC, under Contract No. DE-AC52-06NA25946 with the U.S. Department of Energy and supported by the Site-Directed Research and Development Program.**

**Refreshments will be served at 2:30 p.m. in SC 201 suite landing.**