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Nuclear Engineering and Nonproliferation Advanced Nuclear Technology:
Critical and Subcritical Experiments with Special Nuclear Material

Abstract:
Due to the importance of measurements of multiplying special nuclear material (SNM) to the fields of nuclear nonproliferation, safeguards, and criticality safety etc… critical and subcritical measurements have been continually performed since the 1940s. These measurements take advantage of the fact that neutrons emitted in fission are correlated in time and can be used to gain knowledge about the system being measured. As a result of the improvements in nuclear detection instrumentation and SNM availability, experiments and accompanying predictive simulation capabilities were developed allowing for radiation transport code and nuclear data validation. This presentation will provide an overview of capabilities and recent progress in the area of critical and subcritical measurements with large quantities of SNM.

Bio(s):

Dr. Rian Bahran is a Research and Development Engineer at Los Alamos National Laboratory (LANL), where he leads research and training efforts for nuclear nonproliferation, safeguards, security, and criticality safety. He is currently part of the Critical Experiments Team within the Nuclear Engineering & Nonproliferation Division Advanced Nuclear Technology Group, where he leads several large experimental campaigns with large quantities of nuclear material creating novel work that that support a handful of graduate students and postdocs, addressing vital security and safety issues. In addition to his day-to-day research and mentoring duties, he also leads several major training efforts at LANL including a) a unique nuclear nonproliferation student summer program and b) various international training engagements across multiple continents. Prior to his current position at LANL, Rian worked on predictive radiation transport simulation capabilities as a postdoc and on nuclear data measurements as a PhD candidate at Rensselaer Polytechnic Institute (RPI) where his work was funded by Naval Nuclear Laboratory. Rian received his Ph.D. in Nuclear Engineering and Science from RPI and received a Dual B.S. in Nuclear Engineering & Engineering Physics from the same university. He is currently an adjunct faculty member in the Mechanical, Aerospace, and Nuclear Engineering Department at RPI where he continues to foster technical and educational collaborations between his home institution and his alma mater. He also serves as the Vice-Chair of the Nuclear Nonproliferation Policy Division of the American Nuclear Society (ANS) and as an Associate Editor for the Institute for Nuclear Materials Management (INMM) Journal.

Jesson Hutchinson is a technical staff member in the Advanced Nuclear Technology Group (NEN-2) at Los Alamos National Laboratory (LANL). He was a former nuclear engineering student at Georgia Tech, graduating with a BS in 2004 and MS in 2005. His work at LANL includes critical and subcritical measurements with large quantities of nuclear material. In particular his research has been focused on correlated neutron data measured on subcritical systems and is the author of a recent subcritical benchmark. He has performed extensive measurements and simulations to support detector development, model validation, and also performs criticality safety work to support hands-on operations with nuclear material (including support for NA-22 measurements at DAF).