ID: Type: **Poster**

Demonstration of the RKF Solution Method for Multi-physics Analysis of Radionuclides Evolved in Nuclear Testing

The prediction of radionuclide source term values generated from a nuclear test, and discriminating those radionuclides from a competing background activity, including medical isotope production, is an important metric in treaty monitoring activities. To properly quantify the various fission products and other radioactive materials generated in a nuclear explosion, capturing the effects of nuclide production, decay, transmutation, and chemistry, etc, involves a multi-physics approach that fundamentally requires the solution of the production Bateman equations. These constitute a coupled set of linear differential equations that, depending upon the radionuclides of interest, can have radically diverse time dependencies spanning many orders of magnitude, making their solution numerically stiff at best. An "on the fly" approach to achieving correct isotopic solutions with certified accuracy is possible via the Runge-Kutta-Fehlberg (RKF) solution methodology. RKF employs a variable time step with error control to maintain a targeted error Residual (R). The thrust of this work is to evaluate the efficacy of employing the RKF methodology to dynamically solve for a set of radionuclides important to treaty monitoring, and assess the multi-physics options that can be incorporated in this approach.

Primary author: SJODEN, Glenn (U.S. Air Force Technical Applications Center)

Presenter: SJODEN, Glenn (U.S. Air Force Technical Applications Center)

Track Classification: Theme 3. Verification Technologies and Technique Application