Demonstrating MCNP® version 6.2 Correlated Fission Capabilities and MCNP6 Associated Packages: Intrinsic Source Constructor, MCNPTools, and DRiFT (Detector Response Function Toolkit)

This workshop will consist of several parts, with presentations on code capabilities under development at Los Alamos National Laboratory. Attendees will be provided with examples and documentation, and instructors will remain after code demonstrations to work with attendees on their specific simulation interests. Neither computers nor access to MCNP will be provided; however, participants may bring their own laptops to the workshop.

Workshop Schedule

- Introduction to Workshop
- Intrinsic Source Constructor (ISC) and MCNPTools
- MCNP: Simulating Correlated Data in Fission Events
- DRiFT: A Detector Response Function Toolkit for MCNP Output
- Discussion and Addressing Attendees’ Specific Simulation Interests

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Workshop Schedule

13:00 – 13:45 Introduction to Workshop. History of MCNP
   Avneet Sood, Group Leader, XCP-3 Monte Carlo Methods, Codes and Applications

The Monte Carlo method for radiation particle transport has its origins at LANL dating back to the 1940’s. The creators of these methods were Drs. Stanislaw Ulam, John von Neumann, Robert Richtmyer, and Nicholas Metropolis. Monte Carlo methods for particle transport have been driving computational developments since the beginning of modern computers; this continues today. In the 1950’s and 1960’s, these new methods were organized into a series of special-purpose Monte Carlo codes, including MCS, MCN, MCP, and MCG. These codes were able to transport neutrons and photons for specialized LANL applications. In 1977, these separate codes were combined to create the first generalized Monte Carlo radiation particle transport code, MCNP. In 1983, MCNP3 was released for public distribution to the Radiation Safety Information Computational Center (RSICC). The last release of MCNP, version 6.2, was released in April 2018. Approximately 20,000 copies of MCNP have been distributed to users in government institutions, academia, and private industries worldwide. This talk will review our history, current status, and future directions.

13:45 – 14:45 Intrinsic Source Constructor (ISC) and MCNPTools Description
   CJ Solomon, Scientist, XCP-3 Monte Carlo Methods, Codes and Applications

MCNPTools is a software package to process and manipulate MCNP outputs, specifically mctal, meshtal, and ptrac files. The package provides object oriented access to the files through C++, Python, and Perl interfaces. Additionally, some standalone binary utilities are packaged that perform operations on the files.

The Intrinsic Source Constructor (ISC) is a package to compute source description given a radioactive material composition. The package includes the libisc, a library that can be built and linked into other tools in C++ or python, and misc, a standalone binary specifically for generating SDEF source specifications for MCNP.

14:45 – 15:15 Break

15:15 – 16:00 MCNP: Simulating Correlated Data in Fission Events
   Mike Rising, Scientist, XCP-3 Monte Carlo Methods, Codes and Applications

In the most recent MCNP6.2 release several fission multiplicity event generators have been implemented due to the need within the nuclear nonproliferation and global security communities for a predictive capability to model signatures of special nuclear materials. This workshop will introduce fission multiplicity models, discuss how to best use the models within MCNP, and provide several examples of how the models have been compared to experimental measurements of SNM.

16:00 – 16:45 DRiFT: A Detector Response Function Toolkit for MCNP Output
   Madison Andrews, Scientist, XCP-3 Monte Carlo Methods, Codes and Applications

DRiFT is a user-friendly Detector Response Function Toolkit under development at LANL. It uses MCNPTools to post-process MCNP output and create realistic nuclear instrumentation response. This workshop will describe DRiFT features with examples centered on correlated fission organic scintillator neutron measurements. DRiFT capabilities include the ability to couple varying scintillator materials, PMT, and digitizer modules.