

MODELING NEUTRON BEHAVIOR IN TRISO FUEL PARTICLES IMDEDED IN A GRAPHITE MATRIX WITH GEANT4

1 Abstract

Renewed interest in nuclear power has prompted the search and development of analytical tools to model the new Generation IV reactor designs. One of these designs is the Pebble Bed Modular Reactor (PBMR), which is a high temperature graphite moderated and helium cooled reactor. The reactor core contains roughly 452,000 pebbles. The pebbles are composed of graphite and TRISO fuel particles with 9.6wt percent U235. The purpose of this paper is to model the behavior of neutrons inside these pebbles. An isotropic neutron gun and a model of the medium are build with GEANT4 to simulate the PBMR reactor environment. The neutron scattering rates and their subsequent energy loss, as well as the dislocations produced in the SiC layer of the TRISO are studied. Comparison to the MCNP code, which is a well established code for reactor calculations, will help validate the GEANT4 results.

References

- [1] PBMR Coupled Neutronics/Thermal Hydraulics Transient Benchmark - The PBMR-400 Core Design, OECD Nuclear Energy Agency, September 2005.
- [2] <http://geant4.web.cern.ch/geant4/G4UsersDocuments/UsersGuides/ForApplicationDeveloper/html/>
- [3] <http://mcnp-green.lanl.gov/manual.html>