Graphical User Interface Simplifies MCNP Use and Provides Burnup Capabilities

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Research Reactor Analysis Program (RRAP)

Overview

- Provides MCNP interface
- Based on Object-Oriented Programming
- Substantial work leading up to RRAP
- Models are very detailed
- Simplifies data management for burnup calculations
- Demo / Results

Looking for candidates interested in development of RRAP versions for other reactor types

RRAP's MCNP Features

- Customized for each facility's reactor geometry
- Allows geometry and/or material changes via a graphical interface
  - move rods around
  - optimize irradiation facilities
- Builds full core MCNP input model (fully commented)
- Retrieves data from output file, then processses and stores it (typical run may bring in over 1,000 values)
- Provides a variety of calculation results
  - excess reactivity
  - flux spectra in irradiation facilities
  - 3-D burnup in fuel
  - activation levels in samples

RRAP History

- Five years ago, funded by U.S. Air Force for Space Reactor Design Optimization
- In 1992 AAI recieved funding to develop the Detailed Reactor Analysis Code (DRAC) that allowed optimization of four types of thermionic space reactors
- In 1993 AAI started modification of DRAC to make RRAP
- Currently there are three TRIGA facilities successfully using RRAP
- Ready to expand to other Research Reactor types

MCNP Model Details

- Full core models
- Includes all beam port holes in reflector regions
- 3-D description of fuel in the core
- Ability to adjust control rod positions independently
- Typical input file ~2500 lines
- burnup rates are calculated in five axial loactions for each rod
- Tracks fuel inventory for every rod in the reactor and in storage

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MCNP Burnup

- MCNP can provide very good reaction rates
- These rates along with a given time step leads to very good burnup data
- Current methods under review by LANL
- MCNP not traditional burnup code due to large amount of manual data manipulation required
- Solved by RRAP