RAPID- A New Paradigm for Particle Transport Simulation

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Abstract

This paper discusses the novel Multi-stage, Response-function Transport (MRT) methodology, which enables solving complex and large radiation transport problems in real time!

It elaborates on the RAPID (Real-time Analysis for Particle-transport In-situ Detection) code system and its steady-state and transient algorithms that are developed based on the MRT methodology. It presents the results of benchmarking (calculation & experiment) of its critical/subcritical and detector response algorithms for spent fuel pools, spent fuel casks, and/or reactor cores (power and research), and its burnup and reactor kinetics algorithms for test problems.

Additionally, the talk introduces the VRS-RAPID web application that is a novel multi-user virtual reality system (VRS) for input preparation, real-time simulation, and output processing and visualization in a virtual environment.

The paper demonstrates that RAPID and its web application would provide unique capability for design and operation of accelerator driven systems. Particularly, its capability for real-time simulation facilitates core optimization and uncertainty quantification, and offers in-situ detection for core monitoring.