

Project Title

Benchmark Evaluation of TREAT Reactor M2 and M3 Transient Experiments

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ABSTRACT:

The objective of this project is to evaluate and produce TREAT reactor benchmarks under steady state and transient conditions. The benchmarks will support the TREAT restart effort and will be contributed to the International Reactor Physics Experiment Evaluation Project (IRPhEP) for inclusion in the International Handbook of Evaluated Reactor Physics Benchmark Experiments. The benchmark evaluation will be performed using data generated during the “Power Calibration Experiment for test M2” and “IFR Safety Tests M2 and M3” that were conducted in the TREAT reactor. The evaluations will be conducted using high fidelity codes such as the Monte Carlo tools MCNP and SERPENT and will also use the NEAMS MAMMOTH tool, which is an implicit coupling of the neutron transport solver in RATTLESNAKE to the fuel performance routines in BISON using the MOOSE multi-physics framework. Both the steady state and transient conditions of the M2 and M3 tests will be evaluated. Furthermore, TREAT has a graphitic core. Historical work has shown that the predictions of the outcomes of TREAT tests are highly sensitive to the graphite thermal neutron scattering cross sections that influence the evolution of the thermal neutron energy spectrum in the core. Therefore, in this project, thermal neutron scattering (i.e., $S(\alpha,\beta)$) libraries of graphite, tailored to the specifics of the TREAT core, will be generated and utilized in the evaluation.