SERPENT 2.2 Neutronic Study of the Depleted EBR-II Core

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Abstract. Recent development in the nuclear industry aims to improve the reactor technology in every aspect to create more sustainable designs. Systems utilizing a fast spectrum of neutrons seem especially promising due to the ability to operate in both burner and breeder mode. Implementation of unconventional technologies in designs, however, requires extensive amount of analysis via computational tools. Any computational tool must be first validated against experimental research. Therefore, this paper focusses on in-house validation of Finnish Monte-Carlo based tool SERPENT 2.2 as a part of integration of the relatively new tool at FEI STU. This paper is based on test 138B of EBR-II, documentation of which was included in IRPhE, together with full definition of modeling approach, material compositions etc. The neutronic results obtained are compared to both experimental values (if available) and values estimated utilizing MCNP and SCALE tools in the 2021 sensitivity benchmark "Nuclear Data Sensitivity Study for the EBR-II Fast Reactor Benchmark Using SCALE with ENDF/B-VII.1 and ENDF/B-VIII.0".