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Analysis of 2D Quarter Core for VERA benchmark with OpenMC code

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Reactor physics is the study of the behavior of neutrons in nuclear reactors. Monte Carlo codes are a popular method for simulating the behavior of neutrons in complex geometries. One of the Monte Carlo codes is OpenMC code which is an open source code developed by the Massachusetts Institute of Technology. It designed to simulate neutron transport in various geometries allowing flexible geometry and material specifications as well as a range of neutron cross section libraries. VERA Core Physics benchmark aims to validate the performance of computational tools used in the design and analysis of nuclear reactors. The benchmark includes a set of core physics problems such as the prediction of criticality, power distribution and control rod worth. In this paper, Analysis of 2D Hot Zero Power (HZP) Beginning of Cycle (BOC) Quarter Core problem of VERA benchmark will be simulated using OpenMC code and study the capability to predict the results of criticality, pin power distribution as well as control rod worth. The simulations of OpenMC code show a good agreement with the VERA benchmark. These results provide confidence in the capability of OpenMC simulations in high fidelity calculations for generating data to analyze reactor core physics.

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