

MCNP benchmarking activities of FENDL 3.2b nuclear data library employing fully-heterogeneous DEMO divertor model

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The paper presents results from neutron flux calculations in the DEMO divertor region in the case of the Helium Cooled Pebble Bed (HCPB) concept used as a breeding blanket (BB) option. Calculations were performed with support by ADVANTG (Automated VARIance reduction Generator) with FW-CADIS variance reduction parameters tool used for the variance reduction purposes. Such coupled computational method led to neutron flux in cells estimation and flux maps production, which were obtained for the divertor of the EU DEMO reactor. The specified DEMO neutron source was used for benchmark studies using FENDL-2.1 and FENDL-3.2b nuclear data libraries for MCNP6 code for neutron transport calculations. Neutron energy spectra as 709 energy groups from 1.05×10^{-11} MeV to 10^3 MeV was used. This paper contains computational data from performed calculations using EU DEMO1 2017 as an 11.25° toroidal sector of the full tokamak model with a homogeneous HCPB breeding blanket structure. As for the divertor, the 2019 full heterogeneous configuration model has been used for benchmarking FENDL libraries.

Results from the neutron flux maps showed that the results are similar in many cases using both nuclear data libraries, however the highest ratio between results is 1.3775 for statistical error and 1.3453 for neutron flux inside the divertor. Neutron flux calculations in different cells of the divertor MCNP model showed similar neutrons disposition in the energy region in both investigated nuclear data libraries. Although ratio results can vary between 1.274 and 0.768, however ratio between the two investigated libraries is 1.006 on average.

Primary authors: STANKUNAS, Gediminas (Lithuanian Energy Institute); BREIDOKAITE, Simona (Lithuanian Energy Institute, Laboratory of Nuclear Installation Safety)

Presenter: STANKUNAS, Gediminas (Lithuanian Energy Institute)