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Analysis of Dogleg Duct Experiments with 14 MeV Neutron Source Using TRIPOLI-4 Monte Carlo Transport Code

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TRIPOLI-4 Monte Carlo transport code, developed by CEA, has been widely used on fission reactor physics and also can be used on fusion device neutronics. In order to verify the calculation features of TRIPOLI-4 code, a simple dogleg duct model was built to simulate the 14 MeV neutron transport based on a SINBAD fusion benchmark, called Dogleg Duct Streaming Experiment. The reaction rates in the bent duct and on the back surface of the experimental assembly for 93Nb(n,2n)92mNb, 115In(n,n')115mIn and 197Au(n,γ)198Au neutron activation dosimeters were calculated with the TRIPOLI-4 code. To improve the calculation efficiency, variance reduction techniques of TRIPOLI-4 were also performed. The calculation results showed that the variances reduction methods of the TRIPOLI-4 code are helpful, and obviously decrease the calculation time and increase the convergence efficiency. The calculation reaction rates results of 11 points inside and outside of the dogleg duct assembly were taken into account. Results from the TRIPOLI-4 simulation were compared with the experimental ones obtained from the measurements of FNS facility in Japan Atomic Energy Agency (JAEA). The benchmark results show that the TRIPOLI-4 code has a good potential to calculate and estimate neutron streaming effects in fusion device design.

Eligible for student paper award?

No

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