Method of similarity of the neutron field applied   
to the calculation of the activation of the vacuum components  
 of the diagnostics reflectometer from the strong magnetic field side for ITER

Portnov D., Rodionov R.

Private Foundation SK RosAtom ITER Developing center, Moscow, Russia, [d.portnov@iterrf.ru](mailto:d.portnov@iterrf.ru)

The paper presents the results of radiation transport simulation in the area of antenna and waveguide location the Reflectometer from the Strong Magnetic Field diagnostics of ITER [1]. The distributions of neutron and photon fields and the corresponding heat release power were obtained using MCNP [2]. The necessary level of spatial resolution is revealed and the levels of thermal loading in all points of interest (more than 1000 points and two 3D-meshes) are obtained. Also, the calculations of activation and damage to the materials of the antenna and the waveguide with the help of a program FISPACT [2].

To calculate the damage of materials in a large array of points, the method of similarity of the neutron field was applied, in order to reduce the cost of resources and time for the detailed calculation of neutron fields at all points of interest. At most points, the calculation is performed in a relatively rough energy breakdown, and then the result is selected to calculate the activation characteristics from the set obtained in the calculations for a more detailed breakdown. Field similarity metrics, energy breakdown decomposition and rebinding methods, as well as the degree of applicability and limitations of the method are determined.

The work is supported with the state contract of 19.04.2018 № Н.4а.241.19.18.1027 «Special equipment development, experimental manufacturing, testing and delivery preparation to meet Russian Federation’s liabilities on ITER project in 2018 year»

References

1. R. Juarez, Neutronics guidelines for ITER Diagnostics Division, ITER IDM RLVRDP.
2. S.W. Mosher et al., ADVANTG―An Automated Variance Reduction Parameter Generator, ORNL/TM-2013/416, August 2015.
3. X-5 Monte Carlo Team, MCNP — A General Monte Carlo N-Particle Transport Code, Version 5, Volume I, MCNP Overview and Theory, Los Alamos National Laboratory Report, LA-UR-03-1987, April 24, 2003 (Revised 10/3/05).