Neutronic analysis of ITER vertical neutron camera [[1]](#footnote-1)\*)

DOI: 10.34854/ICPAF.2020.47.1.184

Rodionov R., Kumpilov D., Nemtcev G., Vysokih J., Khafizof R.

Institution “Project Center ITER”

ITER Vertical Neutron Camera (VNC) is a neutron diagnostic system intended to measure neutron emission profile in poloidal plasma cross-section [1]. VNC consists of two subsystems – Upper VNC located in Upper Diagnostics Port-Plug #18 and Lower VNC located in Lower Port #14. Upper VNC contains 6 collimators, Lower VNC – 5 collimators. At the end of each collimator there is a Detector Unit. Every Detector Unit contains two 238U fission chambers and two diamond detectors of different sensitivity.

In present work neutronic analysis of VNC was carried out. Neutron and photon transport calculations were performed in 40° ITER C-MODEL for 500MW d-t plasma neutron source using MCNP code [2]. Signal-to-background ratios for VNC detectors were obtained as well as radiation heating volume distribution. Neutron flux spatial distribution as well as neutron spectra were calculated for Upper and Lower VNC. Data obtained was used for VNC material activation analysis using FISPACT-II code [3]. As a result, the dynamics of VNC material activity was obtained.

 Activation calculations allowed to construct decay gamma source for VNC components and decay gamma transport calculations were performed using MCNP code. The spatial distribution of gamma-radiation dose rate was calculated in the surrounding space around VNC components after extraction from the tokamak. Material activation data will be utilized to develop VNC decommissioning procedure.

The work is supported with the state contract of 26.12.2018 № Н.4а.241.19.19.1009 «Special equipment development, experimental manufacturing, testing and delivery preparation to meet Russian Federation’s liabilities on ITER project in 2019 year»

References

1. XLVI Zvenigorod international conference on plasma physics and controlled fusion. Status of the development of Vertical Neutron Camera Diagnostic System. Nemtcev G, et al.
2. MCNP USER’S MANUAL Code Version 6.2, Los Alamos National Laboratory report LA-UR-1729981
3. M. Flemming, et al, The FISPACT-II User Manual, UKAEA-R(18)001 Issue January 2018
1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/XLVII/E/ru/II-Rodionov.docx) [↑](#footnote-ref-1)