TOTAL NEUTRON YIELD MEASUREMENT OF ITER TOKAMAK-REACTOR BY DNFM & VNC DIAGNOSTICS [[1]](#footnote-1)\*)

DOI: 10.34854/ICPAF.2020.47.1.177

Kovalev A.O., Rodionov R.N., Portnov D.V., Nemtsev G.E., Kashchuk Yu.A.

Project Center ITER, Moscow, Russia, [a.kovalev@iterrf.ru](mailto:a.kovalev@iterrf.ru).

Measurement of the total neutron yield is a fundamental issue of ITER tokamak reactor control in planned experiments with deuterium and deuterium-tritium plasma. To solve this problem, Project Center ITER is developing diagnostics "Divertor neutron flux monitor" (DNFM)[1] and "Vertical neutron camera" (VNC)[2].

DNFM diagnostics consists of three identical modules, which contain ionization fission chambers (FC) with different isotopic composition of the fissile material (235U and 238U). DNFM modules will be located under the divertor cassettes on the wall of the vacuum vessel in three positions in the toroidal direction.

VNC diagnostics consists of two blocks located in the upper and lower diagnostic ports. Restoration of the source neutron profile is the main task of diagnostics, however, the VNC will provide measurements of the plasma neutron yield as a secondary one. It is planned to use FC with 238U as collimated radiation detectors.

The measurement range of the total neutron yield by DNFM diagnostics is from 1014 up to 1020 n/s. the Lower limit of measurements for the VNC diagnostics is 1016 n/s.

This work is devoted to various approaches to measuring the plasma neutron yield:

1. independent diagnosis by DNFM;
2. independent diagnosis by VNC;
3. diagnostics DNFM and VNC, as a single measuring complex.

Based on the basic 500 MW DT scenario of the ITER plasma, the neutron yield measurement procedure simulation was carried out for the analyzed approaches. Disadvantages of the diagnostics DNFM (the location of detectors in the same plane under the neutron source) and VNC (narrow measurement range) can be compensated by combining them into a single measuring complex.

The work was performed in accordance with the state contract dated 12/26/2018 No. H.4a.241.19.19.1009 “Development, pilot production, testing and preparation of the equipment to ensure the fulfillment of obligations under the ITER project in 2019”.

ITER is a nuclear facility INB No. 174. The views expressed in this paper do not necessarily reflect the official position of the IO ITER and the Project Center ITER.

References

1. Yu.A. Kaschuck, et al., “Divertor Neutron Flux Monitor: Conceptual Design and Calibration”, AIP Conf. Proc. 988, 303 (2008).
2. L. Bertalot, el.al., “Concept design and integration aspects of ITER vertical neutron camera”, First EPs Conference on Plasma Diagnostics - 1st ECPD 14-17 April 2015, Villa Mondragone, Frascati (Rome), Italy.

1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/XLVII/E/ru/IB-Kovalev.docx) [↑](#footnote-ref-1)