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## **PROGRESS IN ITER VERTICAL NEUTRON CAMERA DEVELOPMENT IN 2024 <sup>\*)</sup>**

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The paper presents an overview of the ITER Vertical Neutron Camera (VNC) diagnostic. VNC is a multichannel neutron collimator designed to measure spatial distribution of the intensity of neutron source.

A successful Final Design Review of Upper VNC in-vessel components was held in October 2024 in ITER Organization, showing the results of numerous R&D activities. As a result, work on diagnostic has moved to the production stage.

Optimization of collimators and detectors of the upper VNC was carried out, which resulted in several times increase of signal-to-background ratio and simplification of production process of the diagnostic. The development of Detection Unit (DU) made up of two semiconductor diamond detectors and two ionization fission chambers (FC) with a radiator based on  $^{238}\text{U}$  has been completed. A calibration program for the DU neutron detectors was developed. The sensitivities of diamond detectors and FC to neutrons with energies of 2.45 MeV and 14.1 MeV have been measured. The influence of operation conditions on the possibility of energy calibration of diamond detectors by embedded sources of  $\text{Am}^{241}$  and  $\text{Cs}^{137}$  was experimentally determined, and the response created by gamma-spectrum produced by activated materials of the VNC structure after irradiation was calculated. A neural network-based algorithm for plasma neutron source profile reconstruction was created, allowing for real-time reconstruction in both DD and DT scenarios, and the effect of the loss of different collimator channels on the diagnostic performance was analyzed.

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### **References**

- [1]. Bertalot, L. et al., (2015) Concept Design and Integration Aspects of ITER Vertical Neutron Camera // *Proceedings of Science*

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<sup>\*)</sup> [abstracts of this report in Russian](#)