PROGRESS IN DEVELOPMENT OF ITER VERTICAL NEUTRON Camera [[1]](#footnote-1)\*)

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The paper describes progress in the development of diagnostics of ITER tokamak, Vertical Neutron Camera (VNC), a system designed to measure the profile of a neutron source [1]. VNC consists of 11 channels of neutron collimators located in the upper 18 and lower 14 ports of the tokamak vacuum vessel. For the detection of fast neutrons, +U-based fission ionization chambers and diamond detectors are used in VNC. To integrate into the tokamak ports, the detectors are placed inside the detector module, an assembly that provides positioning and connection to engineering communications.

During the development of diagnostics, it was necessary to solve the problem of significant background of scattered neutrons in collimator channels, which leads to low signal to background ratio. For this purpose, fast neutron detector unit (FNDU), an assembly of two diamond detectors and two fission chambers was redesigned, which allows us to increase the length of the collimators by 10 cm and reduce the radiation load on the VNC. This mockup of VNC FNDU has been manufactured and tested. In addition, the shape of the collimator channels has been optimized to increase the proportion of direct signal. Also, an algorithm was developed to restore the neutron source profile, allowing to take into account the influence of the background signal.

According to the requirements of the International Organization ITER, detector modules of the lower and upper VNC, were redesigned to ensure the integration of diagnostic system in the updated modular design of ports and also to provide the connection the gas-filled volume of FNDU to the Service Vacuum System.

Also within this work, we develop the system of signal transmission and data acquisition. Mockup of transmission line between the detector and the pre-amplification electronics has been tested. Concept of radiation shielding to accommodate the VNC electronic components was developed. Based on the results, we can conclude that VNC diagnostics meets the project requirements for the system.

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References

1. 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/IA-Nemtsev.docx) [↑](#footnote-ref-1)