Development OF ITER VERTICAL NEUTRON CAMERA DIAGNOSTIC SYSTEM IN 2020 [[1]](#footnote-1)\*)

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The ITER vertical neutron camera (VNC) is a diagnostic system designed to build a real-time neutron source profile. The VNC has 11 lines of sights located in the upper 18 and lower 14 ports of the tokamak vacuum chamber [1]. Fission chambers based on 238U and diamond detectors are used to detect fast neutrons in the VNC. VNC detectors are placed in the fast neutron detection unit (FNDU). Each FNDU contains two diamond detectors with integrated calibration sources based on 241Am and 137Cs isotopes and two fission chambers.

At current moment, diagnostics is at the final design stage of development. During diagnostic development, the problem of a significant background of scattered neutrons in collimator channels was successfully solved. By optimizing the design of the detectors and the shape of the collimators, the signal-to-background ratio was improved by 3-4 times.

FNDU of optimized design was manufactured and the detectors were tested under conditions close to those in the channels of the VNC collimators: operating temperature up to 150°C, baking up to 250°C, 14 MeV neutron flux with a density of up to 109 n / cm2s. Based on the test results, it can be concluded that the FNDU detectors will provide measurement of the neutron flux in ITER conditions with the required project accuracy.

As part of the development, a mock-up of the VNC measuring circuit was made and tested, including diamond detector, a communication line based on mineral insulated cable, mock-up of a current preamplifier and an optical galvanic isolation. The contribution of each component of the analog electronic circuit to the total measurement error is determined.

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References

1. L. Bertalot, et.al. Concept design and integration aspects of ITER vertical neutron camera. Vol. 2015-Janua, 2015, pp. 1-9.

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