I&C OF VERTICAL NEUTRON CAMERA Status [[1]](#footnote-1)\*)

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As part of the Russian contribution to the ITER project, the Project Center ITER is developing the data acquisition and control system (I&C) of Vertical Neutron Camera (VNC) diagnostic. This diagnostic is a multichannel collimator that is used for measurement of the neutron’s parameters including particles produced by both D-D and D-T reactions. This diagnostic makes it possible to estimate the power fusion density, α-source density, the emissivity profile of neutrons and the α-source, ion profile temperature, fusion power and other parameters.

This diagnostic consists of lower and upper fan-shaped collimating structures. A total of 12 detector units will be used, each consisting of two fission chambers and two diamond detectors. The basis of the diagnostic is to collect data from this 12 Detector Units (6 in Upper VNC and 6 in Lower VNC).

At present, a mockup of data acquisition system has been developed for VNC diagnostics, and it also has been successfully tested recently. The mockup includes a diamond detector, a preamplifier, a fiber optic transmitter and a receiver, an analog-to-digital converter (ADC), a FlexRIO module with a built-in field programmable gate array (FPGA). The signal processing unit has been developed on this FlexRIO module. It is used to calculate the parameters from signal received at the input of the ADC.

The upper layers of I&C software architecture were also developed. It includes human machine interface (HMI) in Control System Studio software framework and high-level device drivers. These drivers are able to organize the interaction with the signal processing unit, implement state machines, and perform recording of raw data using a specialized archiving network. Also, as a part of preparation for Final Design Review (FDR), the hardware and software architecture were revised and were reflected in the Enterprise Architect project.

The results obtained will be used at the Vertical Neutron Camera I&C final design review stage.

The work was carried out in accordance with the state contract dated February 14, 2022 No. N.4a.241.19.22.1123 "Development, pilot production, testing and preparation for the supply of special equipment to ensure the fulfillment of obligations under the ITER project in 2022."

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