modelling of radiation shielding for iter Vertical neutron camera electronics [[1]](#footnote-1)\*)

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ITER Vertical Neutron Camera (VNC) [1] is a neutron diagnostic system intended to measure neutron emission profile in poloidal plasma cross-section. VNC consists of two subsystems – Upper VNC located in Upper Diagnostics Port-Plug #18 and Lower VNC located in Lower Port #14. Upper VNC contains 6 collimators, Lower VNC – 5 collimators. At the end of each collimator there is a Detector Unit. Every Detector Unit contains two 238U fission chambers and two diamond detectors of different sensitivity.

VNC signal is a weak short current pulse, and the preamplification electronics should be placed as close to the detector as possible because of intensive electromagnetical interference. So the VNC electronics are located in the port cells behind the bioshield. According to IO ITER policy [2] radiation shielding in this area should moderate neutron and gamma fluxes by several orders of magnitude.

This report presents the results of radiation shielding modelling. The materials chosen are boron carbide, steel and tungsten. Neutron fields were taken from [3]. For absorbed dose calculations gamma sources of 60Co и 16N radioisotopes were modelled. They are born due steel and water activation respectively.

Transport calculations were performed using MCNP code [4] and MCKIT framework providing MCNP format interface. The isotropic volumetric source spatially distributed around the shielding cabinet was modelled. According to calculation results, optimum shielding cabinet structure was developed.

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References

1. XLVI Zvenigorod international conference on plasma physics and controlled fusion. Status of the development of Vertical Neutron Camera Diagnostic System. Nemtcev G, et al.
2. [ITER Policy on Electronics Exposed to Nuclear Radiation (RAKTPP v1.0)](https://user.iter.org/?uid=RAKTPP&version=v1.0&action=get_document)
3. [ITER Reference Radiation Data (P47ZAY)](https://user.iter.org/?uid=P47ZAY)
4. *MCNP® USER’S MANUAL Code Version 6.2*, Los Alamos National Laboratory report LA-UR-17-29981.Flemming, M et al, The FISPACT–II User Manual, UKAEA-R(18)001 Issue January 2018.
1. \*) [abstracts of this report in Russian](http://www.fpl.gpi.ru/Zvenigorod/XLVII/E/ru/IO-Kumpilov.docx) [↑](#footnote-ref-1)