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# MODELING OF THE RESPONSE FUNCTION OF ITER DNFM FISSION CHAMBERS *)

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The International Thermonuclear Experimental Reactor (ITER) under construction is set to be the world's largest tokamak. Its purpose is to demonstrate and test key technologies required for future fusion-based power plants. The following parameters are planned to be reached during the tokamak operation: magnetic field is about 5.3 T, the plasma current is 15 MA, the fusion power may reach up to700 MW with a pulse duration of ~300 seconds. A wide range of diagnostics has been developed to ensure the safe operation of the reactor and to obtain reliable information about plasma parameters in all possible scenarios of tokamak operation. One of the main diagnostics responsible for monitoring neutron yield and fusion power during the discharge is the Divertor Neutron Flux Monitor (DNFM). DNFM includes several in-vessel fission chambers (FC) with 235- and 238-uranium coating of the electrodes [1].

The objective of this work was a detailed simulation of both 235- and 238-uranium FC response function during measurements of fast DD- (2.5 MeV) and DT- (14.1 MeV) neutrons and a neutron flux with a spectrum typical for the actual location of the DNFM detector units. We built a detailed model of the fission chamber taking into account realistic geometry of electrodes and density of material deposition, we conducted an experimental evaluation of correctness of the numerical model versus measured data. This allowed for modelling of the realistic pulse-height spectrum, determination of discrimination threshold and analysis of calibration coefficient of DNFM diagnostic. Specialized GEANT4 [2] software was used for modeling. This software implements the Monte Carlo method for calculating the transport and interaction of ionizing radiation with matter. Experimental verification of the model was carried out by irradiating FCs with fast neutrons of the AmBe source.

The developed model allows for a more precise analysis of the detector unit performance during ITER plasma discharges by taking into account the contribution made by FC electrode geometry to the observed amplitude spectra and to reliably estimate the FC calibration coefficient. The model is proposed as one of the key elements to the digital twin of the DNFM system.

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