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PROGRESS IN THE DEVELOPMENT OF A DIAGNOSTIC SYSTEM FOR HIGH-ENERGY PLASMA ATOMS FOR TRT BASED ON DIAMOND SPECTROMETRIC DETECTORS *)

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The diagnostics complex for Tokamak with Reactor Technologies (TRT) [1] must ensure the safety of the installation, the development and optimization of plasma thermonuclear technologies of quasi-stationary plasma discharge with access to thermonuclear ignition and measure the parameters and characteristics of thermonuclear plasma over the entire range of their changes in the TRT discharges. [2]

The results obtained from the analysis of the measured energy spectra of high-energy atoms leaving the plasma volume because of the recharge processes are important for the study of the behavior of fast ions and can be useful for the formation of the modes of operation of the TRT.

This paper presents the progress in the development of a diagnostic system for high-energy plasma atoms of TRT based on diamond spectrometric detectors. Allocation of the system in the TRT vacuum chamber and the estimates of the expected spectra of high-energy atoms at the detector installation sites are clarified.

Since the plasma volume of a thermonuclear device is a source of mixed radiation fields, and a diamond detector can register all types of ionizing radiation, it is proposed to use thin-film (homoepitaxial film thickness of 10–50 μm) diamond structures for the described system, the synthesis of which was performed in an Institution “Project Center ITER” [3]. The use of such structures will reduce the registration of neutron and gamma radiation [4], which are background for the described diagnostic system.

The possibility of spectrometry of high-energy particles of different masses in the energy range of 75–700 keV using the Heavy Ion Accelerator FIAN is demonstrated.

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