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ITR/P5-44: Theoretical Issues of High Resolution H-alpha Spectroscopy Measurements in ITER

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A survey of theoretical issues of high resolution H-alpha spectroscopy measurements in ITER, which have been under consideration at the stage of the H-alpha (and Visible Light) Spectroscopy Diagnostic Conceptual Design Review, is given. These include: (i) comparative analysis of predictive numerical modeling of 2D spatial distributions of plasma parameters (densities and temperatures) in the divertor and scrape-off layer (SOL) at a steady-state stage of discharge in ITER with the SOLPS4.3 (B2-EIRENE) code, (ii) semi-analytic, 1D model of neutral atoms velocity distribution function (VDF) in the SOL and its comparison with the EIRENE stand-alone simulations of neutral deuterium VDF, applied on the plasma background calculated by the SOLPS4.3 (B2-EIRENE) code, (iii) semi-analytic model for the spectra of the light emitted in the Balmer lines in divertor and taken by spectrometers after diffusive or multiple mirror reflections from all-metal first wall (divertor stray light (DSL) problem), (iv) formulation of an inverse problem for assessment of tritium-to-deuterium ratio and total neutral density recovery in the SOL from high resolution H-alpha spectroscopy measurements, (v) assessment of the above measurements'accuracy under condition of a substantial dominance of DSL spectral intensity over that for the Balmer-alpha emission from the SOL for a number of lines of sight in ITER.

Country or International Organization of Primary Author

Russian Federation

Primary author: Mr KUKUSHKIN, Alexander B. (Russian Federation)

Co-authors: Mr GORSHKOV, Alexei V. (NRC Kurchatov Institute); Dr KUKUSHKIN, Andrei S. (ITER Organization); Dr ALEKSEEV, Andrey G. (NRC Kurchatov Institute); Mr VUKOLOV, Dmitry K. (NRC Kurchatov Institute); Dr VESHCHEV, Evgeny (ITER Organization); Dr VUKOLOV, Konstantin Yu. (NRC Kurchatov Institute); Dr LEVASHOVA, Maria G. (NRC Kurchatov Institute); Dr KADOMTSEV, Mikhail B. (NRC Kurchatov Institute); Dr LISGO, Steve (ITER Organization); Dr LISITSA, Valeriy S. (NRC Kurchatov Institute); Dr KOTOV, Vlad (Forschungszentrum Jülich GmbH); Dr SHURYGIN, Vladimir A. (NRC Kurchatov Institute); Mr NEVEROV, Vladislav S. (NRC Kurchatov Institute)

Presenter: Mr KUKUSHKIN, Alexander B. (Russian Federation)

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