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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 standalone 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.

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