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ITER Core Thomson scattering: Objectives and Error Analysis

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Measuring electron temperature and density profiles is a high priority task for tokamak diagnostics because the electron component is one of the main channels for the anomalous
power loss and it is strongly sensitive to transient processes in the tokamak plasma. The Core TS in ITER must cover the whole core region r/a < 0.85, R > 6 m with a spatial resolution of 67 mm or better and must be able to measure the electron temperature of 0.5 < Te < 40 keV and density of 0.3 10ˆ20 mˆ-3 < ne < 3 10ˆ20 mˆ-3. In this paper we apply and extend the analytical approach for assessment of the measurement error and optimization of the ITER Core TS system based on analyses of the core plasma TS diagnostics for non-Maxwellian and Maxwellian plasmas via solving an inverse
problem for error assessment. The extension of the approach includes:
(i) a comparative analysis of different ways of implementing the ITER Core TS system, including the classical approach, for both the back and forward scattering geometry, and LIDAR (time-of-flight measurements along probing chords, performed with a single spectrometer);
(ii) simulations of the electron VDF under the conditions of the ECRH/ECCD in ITER, using the CQL3D and GENRAY codes;
(iii) analysis of possible advantages and limitations of the polarimetry for recovering Te from measurements of the spectrum of the depolarized TS for Te ˜ 40 keV.

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