

ITER Core Thomson scattering: Objectives and Error Analysis **FIP/P4-27**



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(i) Core TS baseline and advanced requirements are analysed, and alternative conceptual design is proposed.

Baseline requirements include $0.5 < T_e < 40$ keV, density of $0.3 \cdot 10^{20} \text{ m}^{-3} < n_e < 3 \cdot 10^{20} \text{ m}^{-3}$, coverage of the core region $-0.3 < r/a < 0.85$ and frequency 10 Hz for advanced control and key physics studies.

Advanced requirements include improved temporal and spatial resolutions for wider physical tasks (e.g., small profile perturbations and fast processes in the core).

Alternative conceptual design of multipoint Thomson scattering in ITER Core plasma is presented vs CDR version and LIDAR. Suggested in-vessel two-mirror collection optics is non-inferior to LIDAR in terms of reliability and simplicity. Laser beam layout covering $-0.3 < r/a < 0.85$ is considered using several lasers with various locations of beam waists. A challenge of spatial resolution ~ 67 mm for large scattering angle $\sim 160^\circ - 170^\circ$ is addressed to decrease throughput of the collection optics. Besides simplifying the design, the lower throughput will reduce the collected background.

(ii) Outlook:

- Design of both probing and collecting optics.
- Study of electron velocity distribution for deviations from the Maxwellian one, with respective hardware adjustment.
- Feasibility study of supplementary techniques, i.e. several probing wavelengths and conventional TS + polarimetry.