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Application of Thomson Scattering System Toward Direct Measurement of Meniscus Shape of the Negative Ion Beam

Major issue toward stable and high power negative ion beams for ITER and JT-60SA is that a meniscus shape which dominates the negative ion beam trajectory is not sufficiently understood, and consequently, power deposition has not been correctly simulated. As a challenge to understand the meniscus inside an aperture with 14 mm in diameter, a laser Thomson scattering system, which has been developed for small size and high spatial resolution measurement, was introduced. The first target was to measure electron density around meniscus region because the meniscus can be estimated by electron spatial profile. However, signal from this area was too small due to low density compared to stray light by injected laser, filament and plasma. To solve this, a triple grating spectroscopy was introduced and a multilayer black screen was designed to block the stray light. Finally, electron density was successfully measured accurately (20% error) in low density region ~$5 \times 10^{-17}\mathrm{m}^{-3}$.

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