Stray light suppression for Thomson scattering diagnostic on linear magnetized plasma device

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Abstract
In Thomson scattering (TS) diagnostic system, the stray light is a key factor affecting the measurement of electron velocity distribution function and density. The suppression issue is particularly severe for the low density and low temperature plasma due to very few scattered photons and narrow line broadening. The traditional methods, such as Brewster window, beam dump and transmission pipeline with black-coated internal surface, have been adopted in the stray light suppression system on our Linear Magnetized Plasma (LMP) device. Moreover, an assembly of apertures are placed in the optical path. Via numerical simulation, the optimal configuration of the adjustable aperture tube (size and location) that provide the best suppression has been found. Finally, the optimal aperture group with 6 mm and 8 mm tapered apertures can maintain over 97% transmission rate of the main laser energy while reducing stray light by 1-2 order of magnitude.

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