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12.16 Design and Characterization of High-Repetition Rate Lasers and Collection Optics for Thomson Scattering Diagnostics on C-2W

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A new Thomson scattering (TS) system is being constructed on C-2W for obtaining electron temperature and density profiles with high temporal and spatial resolution. Validating the performance of the TS's custom designed system components is crucial to obtaining reliable T_e and n_e profiles of C-2W's plasma. The diagnostic has two systems: one for measuring the central FRC, and one for measuring C-2W's open field line jet region [1]. The custom designed collection lenses for C-2W's TS system are made up of two doublets with image spots of all field points being within 100 μ m radius and a fast numerical aperture (NA) of 0.24 that matches the coupling fiber bundles and polychromators. The high repetition Nd:YAG laser system can generate 4 pulses at 20kHz or 30 pulses at 1KHz with 2J per pulse. With comparison to design specification, we have examined and characterized the imaging properties of the collection lens, the focused laser beam profiles in the TS measurement region at different operating frequencies, beam pointing stability, and beam divergence.[1] K. Zhai Thomson scattering systems on C-2W field-reversed configuration plasma experiments HTPD 2018[2] T. Schindler Spectral and intensity calibration of a Thomson scattering diagnostic for the C-2W field-reversed configuration

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