Abstract Submitted
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Development of a Virtually Imaged Phased Array (VIPA) Spectrometer for Electron and Ion Temperature Measurement[1] CHRISTOPHER LIMBACH, Texas A&M University — Laser Thomson scattering is a well-known non-intrusive diagnostic technique for characterization of plasmas with high spatial and temporal resolution. Depending on the ratio of the scattering length to the Debye length, the scattering process may occur in the coherent, incoherent or transitional regime and the scattered light spectrum may span from picometers to nanometers around the excitation wavelength.
In this work, we report on the development and application of a high resolution and high bandwidth spectrometer based on a virtually imaged phased array (VIPA) optical element. Coupled with a grating for cross-dispersion, the device permits characterization of the Thomson line shape (form factor) across all scattering regimes. Operating with a maximum resolution of 0.24 GHz and a bandwidth of several nanometers, we demonstrate simultaneous point measurements of the Thomson electron and ion features in a laser-induced atmospheric pressure plasma. The resulting time-resolved dataset of ion and electron temperature and electron density is discussed in the context of the transition from local thermal equilibrium to non-equilibrium during the plasma recombination process with applications to Laser-Induced Breakdown Spectroscopy (LIBS)

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Christopher Limbach
Texas A&M University

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