MEASUREMENT AND SIMULATION OF ATMOSPHERIC-PRESSURE STREAMER DISCHARGE

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Abstract. Electric field, electron density, electron energy distribution, density of reactive species, and gas temperature are measured in an atmospheric-pressure positive streamer discharge in air. Spatiotemporal resolved laser spectroscopies, including femtosecond E-FISH, Thomson scattering, Talbot interferometer, and laser-induced fluorescence (LIF), are used (Inada et al. 2022, Tomita et al. 2020, Inada et al. 2019, Ono 2016). To avoid difficulties due to the lack of spatial reproducibility caused by streamer branching for measurements that require accumulation of many discharge pulses, a high reproducible, pseudo-2D single filament streamer is used. For example, the Thomson scattering required accumulation of 20,000 discharge pulses. Some of the results are compared with the results of 2D streamer simulation developed by our group (Komuro et al. 2013, Komuro et al. 2018). The shape, propagation, optical emission, and discharge current are also measured and compared with the simulation results to validate the simulation model (Ono and Komuro 2020). The simulation, measurements of electric field and electron density, and measurement of electron energy distribution were performed by Dr. Atsushi Komuro, Dr. Yuki Inada, and Dr. Kentaro Tomita, respectively.

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