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Streamer dynamics scaling with positive polarity pulsed voltage and gas pressure in a helium plasma jet ROBERT LEIWEKE, UES, Inc, BISWA GANGULY, Air Force Research Laboratory — We have investigated the variation of streamer speed, current, diameter and emission intensity profiles as functions of positive polarity 20 ns rise time pulsed applied voltage ranging from 6 kV up to 11 kV, at 500 Torr gas pressure using a 2 mm diameter helium plasma jet entrained by N_2 co-flow in a 30 mm diameter pyrex cell. The streamer speed has been measured from the spatio-temporal intensity of He $3^3D \rightarrow 2^3P$ transition at 589 nm using both PMT and 5 ns gated ICCD imaging; the streamer diameter is obtained from the ICCD imaging. The streamer current was measured using wideband width current sensor and it varied from 0.1 mA up to 0.8 mA. Streamer speed increased almost linearly and peak currents varied nonlinearly with the applied voltage. The streamer diameter, estimated from imaging, was nearly constant at 0.9 mm indicating that the observed streamer may be several overlapping streamers propagating through the helium gas channel. The peak electron density of $\approx 2 \times 10^{10}$ cm^{-3} is estimated from current continuity and streamer diameter. We have also performed voltage dependent streamer dynamics measurements at gas pressures from 150 up to 740 Torr, and the data shows that streamer properties do not follow the same scaling behavior as in air plasma.

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