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Streamer properties in a repetitively pulsed plasma jet from 1 to 100 kHz[1] BRIAN SANDS, UES, Inc. (AFRL), BISWA GANGULY, Retired, JAMES SCOFIELD, Air Force Research Laboratory — We investigate the properties of guided streamers in a nanosecond repetitively pulsed dielectric barrier plasma jet at repetition rates up to 100 kHz. In this regime, remnant ionization and neutral metastable concentrations are significant in the channel through which the streamer propagates. Both helium and a Penning mixture of helium and argon are investigated as feed gases for a plasma jet in a controlled pressure chamber with a flowing nitrogen background. The applied voltage pulse was set at 8 kV, with a risetime of 15 ns and falltime of 8.5 μs. Streamer dynamics were monitored using spatiotemporally-resolved emission spectroscopy with a PMT filtered at 706.5 nm He (3^3S - 2^3P) and 587.6 nm He (3^3D - 2^3P) to track the streamer head. Temporally-resolved ICCD imaging was also used to characterize discharge development. Tunable diode laser absorption spectroscopy was used to measure He (2^3S_1) and Ar ($^3P_2$) metastable densities in the streamer channel, and streamer current was measured using an inductive current monitor. As the pulse rate is increased, the streamer dynamics are significantly altered, while production of He (2^3S_1) and Ar ($^3P_2$) is enhanced with alternate production channels becoming important in the case of He (2^3S_1).

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