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Pulsating Electrohydrodynamic Cone-Jets: from Choked Jet to Oscillating Cone DAVID BOBER, CHUAN-HUA CHEN, Duke University — Pulsating cone-jets occur in a variety of electrostatic spraying and printing systems. We report an experimental study of the pulsation frequency to reconcile two models based on a choked jet and an oscillating cone, respectively. The two regimes are demarcated by the ratio of the supplied flow rate (Q_s) to the minimum flow rate (Q_m) required for a steady Taylor cone-jet. When $Q_s < Q_m$, the electrohydrodynamic flow is choked at the nozzle because the intermittent jet, when on, emits mass at the minimum flow rate; the pulsation frequency in the choked jet regime is proportional to Q_s/Q_m. When $Q_s > Q_m$, the Taylor cone anchored at the nozzle experiences a capillary oscillation analogous to the Rayleigh mode of a free drop; the pulsation frequency in the oscillating cone regime plateaus to the capillary oscillation frequency which is independent of Q_s/Q_m.

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