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Design and Characterization of a Centimeter-Scale Coaxial Plasma Railgun MATHEW R. COLEMAN, COLIN S. ADAMS, Virginia Polytechnic Institute and State University — A small coaxial plasma railgun has been designed to produce jets of argon-helium plasma with electron density $\approx 10^{16}$ cm^{-3}, temperature ≈1–2 eV, and velocity ≈10–20 km/s. These parameters closely match those of jets produced by an existing linear plasma-armature railgun used to study the underlying physics of shocks in multi-ion-species plasmas. The coaxial design is anticipated to improve control of the species mixture in the jets produced by the railgun. The railgun is sized to fit within a KF-40 full nipple such that the railgun can be simply mounted and removed from the vacuum chamber. All components are modular and serviceability is assured by eschewing the use of adhesives. This new railgun consists of two tubular, tungsten-copper, coaxial electrodes with a glass-ceramic breech insulator. Gas is injected using a gas puff valve to prefill the railgun. The railgun is operated at a maximum current of 90 kA and a maximum voltage of 11 kV using an LC pulse forming network. Low current operation limits jet velocity, but extends component lifetimes.

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