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Analysis of plasma jets produced by a small railgun-based accelerator MAXIMILIAN SCHNEIDER, MICHAEL SHERBURNE, JACOB ADAMS, BRIAN HENDERSON, COLIN S. ADAMS, Virginia Tech — We report results of an experimental effort to characterize temperature, velocity, electron density, and composition of plasma jets generated at the Virginia Tech Center for Space Science and Engineering Research. The linear railgun, which features a 0.5 x 0.32 cm rectangular bore and 10.2 cm long rails, is fed gas from a 700 kPa manifold by a puff valve capable of opening for pulses of several milliseconds. The rails are powered by an LC pulse-forming network (PFN) designed to deliver ∼100 kA during a pulse of approximately 10 microsecond duration. A modular accelerator design allows rails and insulators fabricated with different materials and geometries to be swapped out with ease. To characterize the resulting plasma jet, a full suite of diagnostics is utilized including a single-chord Mach Zehnder interferometer, photodiode array, spectrometer, image intensified CCD camera, and Rogowski coil. Initial results obtained while charging the PFN to half its design voltage suggest jet velocities of ∼15-25 km/s are obtained consistently. Results from this device will provide groundwork for the design of future jet sources and experiments to study topics ranging from plasma-material interactions to plasma shocks.

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