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Observation of Rayleigh-Taylor instability growth and evolution toward longer wavelengths at a decelerating magnetized-plasma interface COLIN ADAMS, UNM, AUNA MOSER, SCOTT HSU, JOHN DUNN, LANL, MARK GILMORE, UNM — The interaction of a high-Mach-number plasma jet propagating into a background magnetic field is studied experimentally on the Plasma Liner Experiment [1]. The jets, generated by plasma railguns, have densities and temperatures of order 10^{14} cm^{-3} and 1 eV, respectively, at the time of interaction with the magnetic field ($\sim$ few hundred G). Due to ringing railgun current, the jet is comprised of a series of "blobs" traveling at $\sim$ 40–70 km/s, arriving at the region with the applied field at $\sim$ 20–30 μs intervals. When a trailing jet arrives and interacts with the remnants of the leading jet and compressed magnetic field, growing fingers are observed with a multi-frame camera at the front of the trailing jet. The fingers evolve toward longer mode wavelength ($\sim$ few cm) as the incoming jet penetrates into the magnetized region. Spectrometer and interferometer data show deceleration of the incoming jets against the lower-density magnetized background at approximately 10^{10} m/s^2. We compare experimental results to theoretical and computational predictions, showing consistency of the observations with Rayleigh-Taylor instabilities with magnetic and/or viscous stabilization.

[1] S. C. Hsu et al., Phys. Plasmas 19, 123514 (2012).

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