Abstract Submitted
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Mach Probe Wakes are Important in Weakly Magnetized, Collisional Plasmas[1] JORDAN JAMES GOSSELIN, SAIKAT THAKUR, UC San Diego, STEPHANIE SEARS, JOHN MCKEE, EARL SCIME, West Virginia University, GEORGE TYNAN, UC San Diego — Mach probes are often used as the diagnostic for flow in the scrape off layer (SOL) of tokamaks and in linear devices because of their low cost and ease of construction. However, proper interpretation of the Mach number has been debated, and interpretation methods use different calibration factors for different plasma parameters. The Controlled Shear Decorrelation eXperiment (CSDX) operates in an intermediate magnetization regime. To validate theories in this regime, measurements of the parallel ion velocity were made with Mach probes and laser induced fluorescence (LIF) at magnetic fields from 400 to 1600 gauss. We find that Mach probe measurements indicate higher velocities than LIF at fields above 400 gauss. Reduced downstream plasma density due to probe shadowing is a strong candidate for the cause of the discrepancy. An advective-diffusive model for the geometric shadowing and downstream plasma density is presented. When the model for the density drop is included, the Mach probe results agree with the LIF data. This result should be included by groups using Mach probes to measure parallel velocities in plasmas where the ion-neutral mean free path is shorter than the probe shadow length, Lps = $a^2 C_s / D_{perp}$ in linear devices, the SOL, or divertor region of tokamaks.

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Jordan James Gosselin
UC San Diego

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