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Argon Ion Temperatures in a 10kW Helicon Source[1] MITCHELL PAUL, West Virginia University, SAIKAT CHAKRABORTY THAKUR, University of California San Diego, EARL SCIME, West Virginia University, GEORGE TYNAN, University of California San Diego — There is a need to conduct experiments in plasmas with nearly equal ion and electron temperatures to suppress temperature-driven effects such as ion acoustic instabilities. Typical laboratory helicon plasmas operate below 1 kW, where the ion temperature is much less than electron temperature. Previous ion temperature measurements in the Controlled Shear Decorrelation Experiment (CSDX) and the Resonant Antenna Ion Device (RAID) exist only up to a maximum of 4 kW forward power. Projections based on measurements in RAID suggest that nearly equal ion and electron temperatures will occur at helicon source powers of 10 kW. Laser induced fluorescence (LIF) measurements of the ion velocity distribution functions and the ion temperatures in CSDX are presented for forward powers up to 10 kW. These high powers are achieved with a novel water-cooled dielectric chamber through which the rf is coupled to the plasma. Perpendicular ion temperatures up to ˜2.5 eV are observed at 10 kW, assuming Maxwellian fits to the ion velocity distributions. These results are in agreement with the RAID scaling at 4 kW. Based on these observations, we extrapolate trends perpendicular ion temperatures at even larger RF powers in helicon sources.

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