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Ion Heating Arising from the Damping of Short Wavelength Fluctuations at the Edge of a Helicon Plasma Source[1] EARL SCIME, RICHARD MAGEE, MATTHEW GALANTE, West Virginia University, ROBERT HARDIN, Oak Ridge National Laboratory — In previous studies, the appearance of substantial ion heating at the specific combinations of driving antenna frequency and magnetic field strength that result in the equivalence of the driving antenna frequency with the lower hybrid frequency provided strong, but indirect, evidence of the damping of short wavelength, "slow" wave fluctuations in the edge of helicon sources. For typical helicon source parameters, the driving antenna can couple to two plasma modes; the weakly damped "helicon" wave, and the strongly damped, slow wave. Internal magnetic field measurements routinely demonstrate the existence of wave fields consistent with fast waves in helicon sources. However, measurement of the slow wave is considerably more difficult given its extremely short wavelength and evanescent nature. Here we present two direct measurements of spatially localized, few hundred kHz, short wavelength fluctuations that are parametrically driven by the primary antenna. The short wavelength fluctuations appear for plasma source parameters such that the driving frequency is approximately equal to the lower hybrid frequency. Measurements of the time evolution of the ion temperature and fluctuation profiles provide additional confirmation of the ion heating through wave damping hypothesis.

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