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Biased Substrate Effects on Ion Heating in Magnetized ICP

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In helicon or magnetized inductively coupled plasma, ion heating anisotropy had been reported by many researchers, but they couldn't find the mechanism. In this work, for the purpose of finding ion heating mechanisms, dc bias is applied to the substrate to increase sheath voltage in argon plasma. Our suggestion is that the heated neutrals through charge exchange collisions with accelerated ions from sheath potential can heat the bulk ions by charge exchange collision or ionization again.

The VDF(Velocity Distribution Function)s of argon ion metastables($3d'^4F_{7/2}$) have been measured by diode LIF(Laser Induced Fluorescence) technique in MICP (magnetized inductively coupled plasma). The wavelength of the tunable diode laser is centered at 668.6nm for the transition of $3d'^4F_{7/2} \rightarrow 4p^4D^0_{5/2}$. Resulting fluorescence is at 442.72nm for $4p^4D^0_{5/2} \rightarrow 4s^4P_{3/2}$ transition. We have measured ion temperature, density and velocity from the VDFs, varying the bias potential and magnetic field strength.