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Electron energy distribution function in low-pressure argon plasmas sustained by surface waves L. STAFFORD, D. LAPIERRE, N. EDDINE, Universite de Montreal, R. KHARE, V. DONNELLY, University of Houston — Surface wave (SW) plasmas have attracted considerable attention because of their interest in materials processing. In such plasmas, the spatially averaged plasma frequency ω_p is larger than the wave frequency ω and this ensures the condition for SW propagation. However, due to a spatial plasma density inhomogeneity, local plasma resonances at which $\omega_p = \omega$ can occur over the density profile close to the discharge walls. This can result in large and sharp peaks of the SW electrical field. Through kinetic modeling, it was found that this effect can result in fast electron generation. However, this was never observed experimentally. We used trace-rare-gas-optical-emission-spectroscopy to measure the electron temperature (T_e) and electron energy distribution function (EEDF) in a 50 mTorr Ar plasma operating at 2.45 GHz and sustained in a 8 mm quartz tube. By selecting Ne, Ar, Kr, and Xe lines excited from the ground state which are characteristic of the high energy portion of the EEDF, we found that T_e increased from 5 to 10 eV as the observation point was moved away from the launcher. On the other hand, a constant value of $T_e = 3.1 \pm 0.6$ eV was obtained using Ar, Kr and Xe lines excited to a significant extent through impact with lower energy electrons. Such high-energy tail was not observed in 600 MHz plasmas sustained in a 26 mm tube.

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