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Generation of Suprathermal Electrons in Argon Plasmas Sustained by Surface-Waves LUC STAFFORD, OLIVIER BOUDREAULT, STEFANO MATTEI, FREDERIQUE PICHE, JOELLE MARGOT, Universite de Montreal, VINCENT DONNELLY, University of Houston — In plasmas produced by propagating electromagnetic surface-waves (SW), 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 spatial plasma density inhomogeneity, local plasma resonances at which $\omega_p = \omega$ can occur over the radial density profile close to the discharge walls. This yields to large and sharp peaks of the SW electrical field and could perhaps play an important role on electron heating. We used trace-rare-gas-optical-emission-spectroscopy (TRG-OES) to measure the electron energy distribution function (EEDF) in a 50 mTorr Ar plasma sustained in a 8 mm quartz discharge tube. For $\omega/2\pi$=100 MHz, the EEDF was maxwellian with an electron temperature T_e=4eV. At higher excitation frequencies (>1 GHz), the EEDFs could be segmented into 3 temperatures, with Te-low>Te-high<Te-tail. Similar results were obtained across the discharge radius. However, deep in the expansion region near the end of the plasma column where $\omega_p < \omega$ (i.e. where the wave does no longer propagate), the EEDF became maxwellian. This suggests that local plasma resonances near the discharge wall boundaries play an important role on the observed fast electron generation in the main plasma region.

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