Abstract Submitted
for the GEC19 Meeting of
The American Physical Society

Electron energy distribution function evolution in microwave microplasma ARGHAVAN ALAMATSAZ, AYYASWAMY VENKATTRAMAN, University of California, Merced — Microwave microplasmas have been an active research area in the last decade due to their interesting applications. Due to the challenges associated with detailed experimental study of electron dynamics in microplasmas, numerical simulations have played an important role in improving our understanding of microwave microplasmas operation. Most of these computational studies have utilized a continuum approach with only a few studies using kinetic methods. In a recent work, we compared particle-in-cell with Monte Carlo collision (PIC-MCC) method and a fluid model in the microwave regime illustrating reasonable agreement with respect to plasma number density, applied potential, and current density. In this study, the goal is to further the investigation and determine the underlying reasons for the similarities or discrepancies between the microplasma behaviors predicted by the two methods by comparing their electron energy distribution functions (EEDF). In this regard, PIC-MCC simulations are performed for argon microwave microplasmas at excitation frequencies ranging from microwave to THz and the obtained EEDF is compared with the one predicted by zero-dimensional Boltzmann solvers (such as BOLSIG+) which is usually used in continuum models. The role of excitation frequency on the evolution of the EEDF and its consequences on the numerical predictions of a continuum simulation are presented. Specific emphasis is placed on the time evolution of the EEDF (during one cycle) in the vicinity of the oscillating sheath edge where a significant fraction of the heating occurs at moderate frequencies.

Arghavan Alamatsaz
University of California, Merced

Date submitted: 31 May 2019 Electronic form version 1.4