Abstract Submitted
for the GEC19 Meeting of
The American Physical Society

Student Excellence Award Finalist: Control of ion energy distribution functions in intermediate pressure plasmas[1] SCOTT DOYLE, University of York, ANDREW GIBSON, Ruhr-Universitat Bochum, RODERICK BOSWELL, CHRISTINE CHARLES, Australian National University, JAMES DEDRICK, University of York — Ion energy distribution functions (IEDFs) incident upon material surfaces in radio-frequency capacitively coupled plasmas (rf CCPs) are coupled to the spatial and temporal sheath dynamics. Tailoring the ion energy distribution function within intermediate-pressure plasmas ($\approx$ 133 Pa, 1 Torr), finding application in surface modification and aerospace industries, is challenging due to the collisional conditions. In this work, experimentally benchmarked fluid/Monte-Carlo simulations are employed to demonstrate control of the shape of IEDFs in a collisional (200 Pa 1.5 Torr argon) rf hollow cathode discharge through the application of high frequency ($\geq$ 13.56 MHz) voltage waveforms. Two distinct transitions in the shape of the IEDF are observed at 450 V, corresponding to the formation of mid-energy (60 - 180 eV) structures between 40.68 - 54.24 MHz and additional high energy (180 eV) structures between 81.36 - 94.92 MHz. Transitions between these energy ranges occurred at lower applied voltages for increased applied voltage frequencies, providing increased control of the mean and modal ion energy, varying by 106 eV and 280 eV, respectively. Structured IEDFs are of interest to applications requiring control of ion-bombardment energy under collisional conditions.

[1]The authors wish to thank M. J. Kushner for provision of HPEM. Work presented was funded by the Engineering and Physical Sciences Research Council (EPSRC), grant reference number: EP/m508196/1.

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Date submitted: 10 Jun 2019 Electronic form version 1.4