Abstract Submitted
for the GEC20 Meeting of
The American Physical Society

Investigation of electron power absorption dynamics in magnetized CCRF plasmas with 1D PIC/MCC simulations in cylindrical geometry[1] DENIS EREMIN, DENNIS ENGEL, BIRK BERGER, MORITZ OBERBERG, CHRISTIAN WOELFEL, JAN LUNZE, PETER AWAKOWICZ, JULIAN SCHULZE, RALF PETER BRINKMANN, Ruhr University Bochum — One of the most important aspects of any plasma discharge is how electrons gain energy from the electric field and channel it into the ionization reactions producing new particles needed for the discharge sustainment. In the present work we use numerical modeling to advance this knowledge for rf-magnetrons. Although the magnetic field geometry in planar magnetrons requires at least a 2D description in the configuration space for a realistic description, we use a simpler 1D geometry in order to illustrate some of important phenomena connected with the energy exchange between electrons and the electric field followed by the use of so acquired electron energy in the discharge life cycle. To reproduce the geometrical asymmetry leading to the establishment of a large negative self-bias, we use cylindrical geometry with powered inner electrode and a blocking capacitor. By conducting corresponding simulations for argon, we demonstrate that the electric field reversal, which arises due to the need to maintain the current continuity in the bulk plasma and charged particle flux balance at the electrodes in presence of the confining magnetic field, generates strong Hall currents, producing Ohmic heating and fast electrons with enough energy to participate in direct impact ionization.

[1]Funding by the German Research Foundation (DFG) via the C4 project within the project framework SFB-TR 87 and the project Plasmabasierte Prozessfhrung von reaktiven Sputterprozessen (No. 417888799) is gratefully acknowledged.

Denis Eremin
Ruhr University Bochum

Date submitted: 27 May 2020 Electronic form version 1.4