Abstract Submitted
for the GEC13 Meeting of
The American Physical Society

Kinetic global modeling of the rotating ionization regions in HiPIMS[1] SARA GALLIAN, RALF PETER BRINKMANN, Ruhr University Bochum, WILLIAM N.G. HITCHON, University of Wisconsin-Madison — High Power Impulse Magnetron Sputtering often develops a characteristic slowly rotating high emissivity region. This highly ionized region -or spoke- shows a stationary behavior in the current plateau region and rotates with $\Omega \approx 80$ kHz.[2] It is argued that these spoke-like structures determine the overall plasma density, carry most of the discharge current and are responsible for anomalous cross field electron transport. It is therefore fundamental to understand their formation and relevance in order to characterize the system behavior. First we develop a phenomenological fluid model[3] and we analytically solve for the electron and neutral densities in a rotating steady state situation. Then, we develop a global model specifically for the spoke region that solves for the electron energy distribution function self-consistently with the rate equations for Ar and Al species. The fluxes of neutrals resulting from the movement of the volume are obtained self consistently from the phenomenological fluid model. We evolve the system employing a relaxation method, until convergence.

[1]The authors gratefully acknowledge funding by the Deutsche Forschungsgemeinschaft within the frame of SFB-TR 87.
[2]A. Hecimovic et al. (2013), submitted
[3]S. Gallian et al. (2013), submitted

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Date submitted: 14 Jun 2013 Electronic form version 1.4