Abstract Submitted
for the GEC12 Meeting of
The American Physical Society

A first step toward the modeling of instabilities in high power pulse magnetron sputtering plasmas[1] SARA GALLIAN, DENIS EREMIN, TORBEN HEMKE, THOMAS MUSSENBROCK, RALF PETER BRINKMANN, Ruhr University Bochum, WILLIAM N.G. HITCHON, University of Wisconsin Madison — High Power Pulsed Magnetron Sputtering (HPPMS) is a novel Ionized Physical Vapor Deposition (IPVD) technique, able to achieve an ultra dense plasma with a high ionization degree among the sputtered atoms. This is accomplished by applying a large bias voltage to the target in short pulses with low duty cycle. Several authors have recently reported the presence of rotating structures during a HPPMS discharge. According to the experimental observations, these emissions peaks rotate with constant angular velocity Ω, when the discharge parameters are held constant. Here, we attempt to describe these structures with a collection of simplified models with increasing levels of detail. We start by solving analytically a system of 1D Advection-Diffusion-Reaction equations for the electron $n_\mathrm{e}(\theta, t)$ and neutral $n_\mathrm{n}(\theta, t)$ densities. Then, we focus on the secondary electron behavior and follow the evolution of their energy. In the light of previous results, we develop a time dependent global model for the ionization region. We solve self-consistently the rate equations for background gas and metal species. The secondary electrons are responsible for the main inelastic collision processes and are therefore treated in detail, kinetically.

[1]The authors gratefully acknowledge funding by the Deutsche Forschungsgemeinschaft within the frame of SFB-TR 87.

Sara Gallian
Ruhr University Bochum

Date submitted: 18 Jun 2012 Electronic form version 1.4