A first step toward the modeling of instabilities in high power pulse magnetron sputtering plasmas\textsuperscript{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 $\Omega$, 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 $n_e(\theta, t)$ and neutral $n_n(\theta, t)$ 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.

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