Abstract Submitted
for the GEC16 Meeting of
The American Physical Society

First measurements of the temporal evolution of the plasma density in HiPIMS discharges using THz time domain spectroscopy STEFFEN M. MEIER, Institute for Plasma and Atomic Physics, Ruhr-University Bochum, Germany, ANTE HECIMOVIC, Institute for Application-Oriented Plasma Physics, Ruhr-University Bochum, Germany, TSANKO V. TSANKOV, DIRK LUGGENHÖLSCHER, UWE CZARNETZKI, Institute for Plasma and Atomic Physics, Ruhr-University Bochum, Germany — High Power Impulse Magnetron Sputtering (HiPIMS), commonly used for coating and deposition applications, are characterized by high power and plasma densities, short pulse lengths and a complex confining magnetic field. This poses great challenges for the diagnostics, both in terms of temporal resolution and in being non-perturbative. Therefore, up to now the plasma density in the confinement region of the magnetron during HiPIMS discharges was known only approximately from numerical simulations or estimations from optical measurements. Our recent development of the dual-frequency multichannel boxcar THz time domain spectroscopy now offers the possibility for a direct measurement of the plasma density in the confinement region of the magnetron. It allows the determination of line-integrated plasma densities above $1 \cdot 10^{12}$ cm^{-2} with a very high temporal resolution in the sub-ns-range. Here, the development of the technique is briefly outlined and its application to a 5 cm diameter HiPIMS discharge with a Ti target under various conditions is presented. Plasma density evolution with a temporal resolution of $\approx 4\mu$s is shown. The results are correlated to temporally resolved optical emission measurements providing insight into the discharge processes.

Steffen Marius Meier
Ruhr-University Bochum

Date submitted: 10 Jun 2016 Electronic form version 1.4