

Abstract Submitted
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Student Excellence Award Finalist: Synchronizing Probe Measurements to Plasma Waves: Plasma Parameters of HiPIMS 'spokes'¹
JULIAN HELD, PHILIPP MAASS, VOLKER SCHULZ-VON DER GATHEN, ACHIM VON KEUDELL, Ruhr University Bochum — In high power impulse magnetron sputtering (HiPIMS), bright plasma spots are observed during the discharge pulses that rotate with velocities in the order of 10 km/s in front of the target surface. It has proven very difficult to perform any quantitative measurements on these so-called spokes, that emerge stochastically during the build-up of each plasma pulse. In this contribution, we present a method to perform measurements integrating over many discharge pulses, but without phase averaging of the spoke location, thus preserving the information of the spoke structure. This method is then applied to perform Langmuir probe measurements, employing magnetized probe theory to determine the plasma parameters inside the magnetic trap region of the discharge. Spokes are found to cause strong modulations in electron density, electron temperature, and plasma potential. The electron density is modulated by about 40%, fluctuating between $1 \times 10^{20} \text{ m}^{-3}$ and $4 \times 10^{19} \text{ m}^{-3}$. Furthermore, the plasma potential is observed to fluctuate between -7 V and 1 V, indicating the possibility for anomalous electron transport.

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Julian Held
Ruhr University Bochum

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