

**PiAI Seminar Series: Physics informed AI in Plasma Science**

**10:00-11:00, 08 June 2020 (CEST:UTC+2)**

**17:00-18:00, 08 June 2020 (JST:UTC+9)**

**Web Seminar**

Data analysis demands in the investigation of instabilities and waves in high power impulse magnetron sputtering.

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High power impulse magnetron sputtering (HiPIMS) plasmas use conventional magnetron targets, but applying the power as short pulses with power densities at the target of several  $\text{kWcm}^{-2}$  and pulse lengths of 10 to 200  $\mu\text{s}$  and duty cycles of a few percent only. HiPIMS plasmas are characterized by a high degree of ionization and a very energetic metal growth flux leading to superior material properties. The dynamic of high power impulse magnetron plasmas (HiPIMS) is very complex and various mechanisms are being proposed to describe the various instabilities and waves in the system. Most prominent is the appearance of rotating spokes along the racetrack of the magnetrons, which is uniquely connected to the good performance of those plasmas. This dynamic is inherently coupled to complex data analysis demands to understand the output from various diagnostics ranging from optical emission spectroscopy, probe diagnostics to mass spectrometry. Several data analysis challenges are being discussed: (i) time series analysis of triggered spokes, (ii) image analysis for the identification of mode numbers, (iii) signal analysis for the synchronization of time shifts.