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Machine Learning methods for studying plasma instabilities in DC magnetized plasmas[1] ANA SAMOLOV, JOHN KOO, SVETLANA RADOVANOV, Applied Materials Inc — The transport of ions extracted from hot cathode DC magnetized ion sources is often limited by the presence of plasma instabilities and stochastic noise. These ion sources are commonly used in high current implanters to generate ion beams. At very high current densities experiments show increase in the stochastic noise and amplitude in frequency spectra associated with the ExB and diamagnetic instabilities. If we assume that the noise is due to ExB rotation, i.e. pronounced when we have both magnetic and electric field in the source, the increase of the electric field in the bulk would result in rotation enhancement. The higher magnetic field leads to stronger potential gradients in the plasma, so ExB effects will most likely increase at higher magnetic fields. Higher gas pressure decreases the electric field in the plasma therefore less noise is expected at high current densities. In this work, we use artificial neural networks (NN) trained on theoretical models and simulations to predict experimental observations of the stochastic noise and rotation at the characteristic frequencies in hot cathode DC magnetized ion sources.

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