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Numerical Simulation of Rotating Spokes on a Partially Magnetized ExB Magnetron Sputtering Device[1] MASAYUKI TAKAHASHI, Tohoku University, JEAN-PIERRE BOEUF, University of Toulouse III, INTERNATIONAL COLLABORATION — ExB plasma is sustained on a partially magnetized plasma devices such as Hall thruster and magnetron sputtering because electron heating occurs and electron-impact ionization is maintained. A rotating spoke structure was experimentally and numerically captured on ExB device, and mechanism of spoke rotation was discussed. The past experiment for magnetron sputtering device indicated that the direction of spoke propagation is changed depending on the applied voltage, and -ExB drift motion of the rotating spoke was captured. However, a detailed mechanism on -ExB motion of spokes was not revealed and a propagation velocity of -ExB spoke was not characterized. In this study, we conducted a two-dimensional particle-in-cell (PIC) simulation with Monte Carlo collision (MCC) to capture dynamics of -ExB spoke on the magnetron sputtering devices. Our PIC-MCC simulation described that the electron around the double layer is heated by a cross-field motion of gradient B drift. This high temperature electron induces the electron-impact ionization at the double layer, which causes the spoke propagation to the -ExB direction. Our modeling finally concluded that the propagation velocity of rotating spokes can be characterized by the electron diffusion coefficient and ionization frequency.

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