Abstract Submitted
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Particle-In-Cell simulation of a magnetized plasma column exhibiting a non-linear rotating structure JEAN-PIERRE BOEUF, BHASKAR CHAUDHURY, LAPLACE, CNRS and University of Toulouse, France, STANIMIR KOLEV, University of Sofia, Bulgaria — A two-dimensional Particle-In-Cell Monte Carlo Collisions (PIC-MCC) model is used to study plasma transport across the magnetic field in a magnetized plasma column sustained by energetic electrons emitted from filaments and injected in the central part of the column. The conditions are similar to those of experimental magnetized plasmas studied for example in the MISTRAL device [1]. Experiments show that the boundary conditions at the end of the plasma column (presence of a limiter, applied voltages) play an essential role in the development of instabilities. Because of the 2D nature of the model, the column is supposed to be uniform in the direction parallel to the magnetic field (only flute instabilities can be described), but electron and ion losses at the ends of the plasma column are taken into account self-consistently in the model. Simulations performed under conditions close to those of the experiments of Ref. [1] (argon, pressure 10^{-2} Pa, magnetic field around 20 mT) predict the formation of a rotating electrostatic plasma structure with spiral arm whose properties are qualitatively and quantitatively close to those observed in the experiments. The model can in particular explain the unexpected distribution of ion velocity measured by Laser Induced Fluorescence in Ref. [1]. We discuss the nature of this instability and its relation with the modified Simon-Hoh instability. [1] C. Rebont, N. Claire, Th. Pierre, and F. Doveil, Phys. Rev. Lett. 106, 225006 (2011)

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