Abstract Submitted
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Plasma dynamics, pattern formation and streamer development during microwave breakdown[1] BHASKAR CHAUDHURY, GUO-QIANG ZHU, JEAN-PIERRE BOEUF, LAPLACE (LAboratoire PLAsma et Conversion d Energie), CNRS and Universite de Toulouse, France — Filamentary plasma structure formation and self-organization during microwave breakdown in the millimeter range (110 MHz) at atmospheric pressure in air are investigated using a two-dimensional computational model. Maxwell's equation coupled with plasma fluid equations are numerically solved and compared with the experimental results of Hidaka et al., Phys. Plasmas 16, 055702 (2009). The plasma model is based on a simple, quasi-neutral diffusion-ionization equation with an effective diffusion coefficient equal to the free electron diffusion coefficient at the plasma edge and to the ambipolar diffusion coefficient in the plasma bulk (Boeuf et al. Phys. Rev. Lett. 104 015002 (2010)). The model predicts the formation of patterns that are qualitatively similar to those seen in the experiments, and that propagate toward the microwave source with velocities that are in excellent agreement with the experiments. We discuss the physical parameters controlling the propagation speed of the plasma front, the maximum plasma density that is reached in the filaments, and the shape of the observed patterns. We show that the structure of the plasma pattern in these conditions is very sensitive to the value of the electron-ion recombination coefficient.

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