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Two-dimensional Effects in High Power Microwave Breakdown
SANG KI NAM, CHUL-HYUN LIM, JOHN VERBONCOEUR, University of California Berkeley — A major limiting factor in transmission of high power microwave radiation is dielectric window breakdown. A one-dimensional particle-in-cell/Monte Carlo collision (PIC/MCC) model was used to study dielectric window breakdown from vacuum multipactor to collisional microwave discharge for noble gases [1]. It showed that multipactor on the dielectric window drives breakdown at low pressure, and volumetric collisional ionization is the main mechanism for breakdown at high pressure. A Monte Carlo (MC) model was also used to investigate dielectric window breakdown in two-dimensionals, including spatial variation of the microwave electric field in transverse direction [2]. The breakdown times were consistent with their experiment data and also showed the interesting feature of electron clusters above the window. MC, however, is not self-consistent and neglects the space charge effect resulting from the charge build-up. In this work, two-dimensional PIC/MCC was employed to investigate the breakdown in oxygen including the space charge effect. [1] H.C. Kim, and J.P. Verboncoeur, Phys. Plasmas, 13, 123506(2006). [2] J.T. Krile, A.A. Neuber, and H. G. Krompholz, Appl. Phys. Lett., 89, 201501(2006).

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