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Reduced Breakdown Delay via Memory and Penning Effects in High Power Microwave Dielectric Window Discharges[1] BRIAN KUPCZYK, XUN XIANG, JOHN SCHARER, JOHN BOOSKE, University of Wisconsin - Madison — Development of high power microwave (HPM) distributed discharge limiters relies critically on minimizing the delay time between HPM incidence and diffuse plasma creation. Breakdown is achieved by illuminating a gas cell with a train of ∼25kW, ∼2 kV/cm, 800ns-long pulses at 41 HZ repetition rate. Using mixtures of neon with small concentrations of argon or xenon at pressures between 5-350 torr, we have observed breakdown in <100ns for particular choices of gas composition and pressure. Breakdown times predicted by published theoretical models[2] are approximately 3-5 times longer than our experimental observations. Careful study of experimental trends suggest surface charge accumulation on the gas cell's polycarbonate window and Penning-like effects in mixtures of noble gases may explain the observation of breakdown times shorter than the theoretical models predict.

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[2]Y.Y. Lau, J.P. Verboncoeur, H.C. Kim, "Scaling laws for dielectric window breakdown in vacuum and collisional regimes," Appl. Phys. Letters, Vol. 89, 261501-1.

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