Abstract Submitted
for the DPP06 Meeting of
The American Physical Society

Experiments on dielectric window breakdown at atmospheric pressure using a 1.5 MW, 110 GHz gyrotron[1] Y. HIDAKA, E.M. CHOI, C.D. JOYE, I. MASTOVSKY, M.A. SHAPIRO, J.R. SIRIGIRI, R.J. TEMKIN, Plasma Science and Fusion Center, Massachusetts Institute of Technology — It is increasingly important to know the power threshold for breakdown of high-power microwave (HPM) transmission through a window as the output powers of HPM devices continue to rise. One of the frequency ranges where breakdown threshold data are scarce is the W-band (75 to 111 GHz). We report preliminary experimental results on window breakdown at atmospheric pressure using the near-Gaussian output beam generated from a 1.5 MW, 110 GHz gyrotron with a pulse length of 3 microseconds. Successful breakdowns were achieved by focusing the beam down to approximately 6-mm radius at a polycarbonate window. The threshold power density and peak electric field were determined to be roughly 2 MW/cm^2 and 50 kV/cm for 50% breakdown probability. Also, we have observed periodic plasma array structures in the time-integrated photographs of breakdown plasmas, and the origin of this periodicity is currently under investigation. These results will be compared with extensive data taken at Texas Tech Univ. at lower frequency, in S-Band.

[1]This research was supported by the US AFOSR MURI04 program.

Yoshiteru Hidaka
Plasma Science and Fusion Center, Massachusetts Institute of Technology

Date submitted: 21 Jul 2006 Electronic form version 1.4