Abstract Submitted
for the DPP12 Meeting of
The American Physical Society

Rapid Formation of Distributed Plasma Discharges using X-Band Microwaves[1] XUN XIANG, BRIAN KUPCZYK, JOHN BOOSKE, JOHN SCHARER, University of Wisconsin, Madison — Observations of rapidly formed (<50-300 ns) distributed plasma discharges using X-band microwaves are presented. A cylindrical stainless steel chamber enclosed with polycarbonate windows is used to observe microwave breakdown in Ar and Ne gas from 10 to 760 torr. The chamber is illuminated by the output of 25 kW, 0.8 μs pulse-width, 9.382 GHz magnetron through an X-band waveguide pressed against the polycarbonate window. Measured incident, reflected, and transmitted microwave power to a moveable monopole antenna located beyond the discharge chamber are used to detect the discharge and attenuation characteristics as the pressure is varied. Observations of localized transmission spike measurements of -20 dB that occur within 50 ns caused by the plasma under certain conditions have been made. Additionally, an ICCD provides fast (<50 ns) time-scale optical images of the plasma, revealing the plasma formation and decay processes. Optical emission spectroscopy measurements provide plasma breakdown characteristics including gas and electron temperatures, plasma density and the plasma lifetime. Plasma modeling is also used to compare the experimental data with theoretical models.

[1]Research supported by an AFOSR grant on microwave distributed plasma breakdown.

John Scharer
University of Wisconsin, Madison

Date submitted: 24 Jul 2012 Electronic form version 1.4