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Rapid X-Band Microwave Breakdown in Ne/Ar[1] JOHN SCHARER, XUN XIANG, BRIAN KUPCZYK, JOHN BOOSKE, University of Wisconsin - Madison — Observations of rapidly formed (< 50-300 ns) distributed plasma discharges using X-band microwaves are presented. A stainless steel cylindrical chamber is used to observe microwave breakdown in Ne/Ar gas mixes from 10 to 760 torr. The magnetron illuminates the plasma breakdown chamber using 25 kW, 9.382 GHz with 0.8 μs pulse-width power. Microwave diodes are used to measure incident and reflected power, providing information to determine the discharge and attenuation characteristics at different pressures. Reflected power measurements show that over 70% of the incident power is reflected due to plasma formation. Ne/ Ar mixture gas shortens the breakdown time. Optical emission spectra experiments allow one to determine the gas temperature, effective electron temperature and plasma density. Microwave mixers are used to compare the amplitude and phase of the reflected signal in phase and in quadrature (90 degrees) relative to a fixed incident phase reference signal. Together with a 1-D plasma model, the effective plasma density, collision frequency and electron temperature are estimated. An ICCD provides fast time-scale optical images to estimate the plasma size, also revealing the temporal plasma formation and decay processes.

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