Abstract Submitted
for the DPP13 Meeting of
The American Physical Society

Microwave measurements on a well-collimated dusty plasma sheet for communications blackout applications[1] ERIC GILLMAN, BILL AMATUCCI, Naval Research Laboratory — A linear hollow cathode produces an electron beam that is accelerated into a low pressure (50 to 150 mTorr) background of Argon, producing an electron beam discharge. A relatively constant 170 Gauss axial magnetic field is produced by two electromagnet coils arranged in a Helmholtz configuration. This results in a well-collimated electron beam, producing a 2-dimensional discharge sheet (40 cm high by 30 cm wide by 1 cm thick) with densities as high as 10^{12} cm^{-3}. The plasma sheet is intended to replicate the parameters of the plasma layer produced around hypersonic and reentry vehicles. The electron beam is accelerated vertically towards a grounded beam dump electrode. This electrode is modified to include an array of six piezo buzzers modified and filled with alumina powder. When powered with a modest voltage, the piezoelectric shakers drop dust particles into the plasma sheet discharge directly below. A transmitting microwave horn is oriented normal to the dense plasma sheet while the receiving horn is mounted on a stage that can be rotated up to 180 degrees azimuthally. Microwave transmission and scattering measurements of the plasma sheet are made in the S-band and X-band for applications related to communications blackout.

[1]This research was performed while the primary author held a National Research Council Research Associateship Award at the Naval Research Laboratory.

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Date submitted: 12 Jul 2013 Electronic form version 1.4