

SPECTROGRAPHIC TEMPERATURE MEASUREMENT OF A BREAKDOWN ARC WITHIN THE RIMFIRE GAS SWITCH

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ABSTRACT

A procedure for obtaining the temperature of optically thick plasma is described. The plasma is in the form of a gas breakdown arc which conducts approximately 10-kJ of energy in 1- μ s. A spectrographic analysis of the trigger-section of the 6-MV RIMFIRE laser triggered gas switch used in Sandia National Laboratory's "Z-Machine" has been completed. It is assumed that the breakdown plasma has achieved approximate local thermodynamic equilibrium allowing a black-body temperature model to be applied. This model allows the plasma temperature and radiated power to be approximated. The gas dielectric used in these tests was pressurized SF₆. The electrode and the insulator materials are stainless steel and PMMA, respectively. A spectrum range from 250 to 450 nanometers has been observed and calibrated using two spectral irradiance lamps and three spectrograph gratings. The approximate plasma temperature and radiated power are reported.