CHARACTERIZATION OF THE POWER HANDLING CAPABILITY OF AN S-BAND DOUBLE DISC GAS COOLED MICROWAVE WINDOW

A. Neuber, P. Ferguson*, K. Hendricks**,
D. Hemmert, H. Krompholz, L.L. Hatfield, M. Kristiansen
Departments of Electrical Engineering and Physics,
Texas Tech University, Lubbock, TX 79409-3102
*MDS Company, Union City, CA
**AFRL at Kirtland AFB, NM

The S-Band double disc microwave window comprises a rectangular waveguide to circular pillbox transition with two separate high purity, TiN coated Alumina discs brazed into the pillbox. The geometrical dimensions are optimized for mi-ni-mum electromagnetic wave reflection at a microwave fre-quency of 2.85 GHz in TE10 mode. The window is designed for power levels up to a few 100 MW with several microseconds pulse duration. Crucial for the power handling capability is the gas species and pressure of the gas flow applied for cooling the Alumina discs. The window has been incorporated in a resonant S-Band ring that provides a maximum power of about 100 MW for several microseconds [1]. Since only about 2 J are stored in the ring at any time, a window failure will not result in catastrophic destruction of the window by a single shot. This makes it possible to find the maximum power the window will transmit as a function of pressure and gas species without destroying the window when coming close to or moving into the breakdown regime. Diagnostics include upstream end-on observation of the window with an intensified CCD camera, downstream end-on observation with a nanosecond resolution photodiode and side-on observation of the space between the Alumina discs with a photomultiplier. Also, time resolved forward and reflected microwave power has been measured.

[1] A. Neuber, J. Dickens, D. Hemmert, H. Krompholz, L. L. Hatfield,
M. Kristiansen: Window Breakdown caused by High Power
Microwaves. IEEE Trans. Plasma Sci. 26, 296-303 (1998)

This work was primarily funded by the High Energy Microwave Device MURI pro-gram funded by the Director of Defense Research & Engineering (DDR&E) and managed by the Air Force Office of Scientific Research (AFOSR).