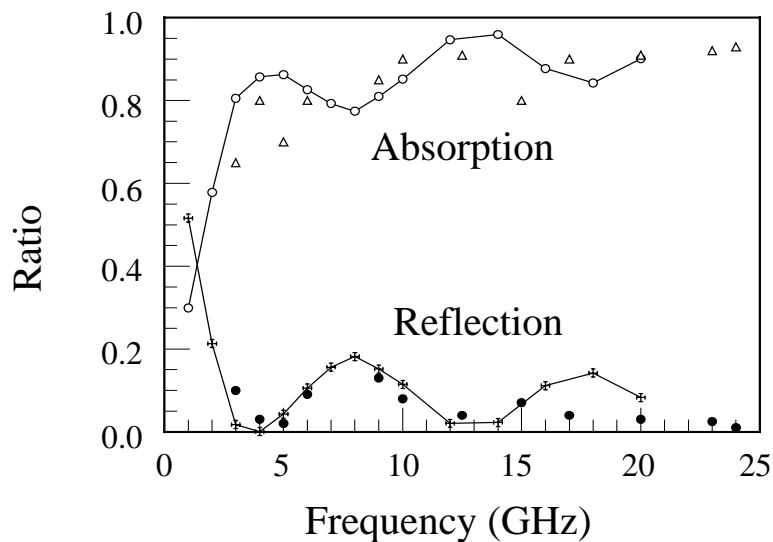


A broad band (4-25 GHz) calorimeter for diagnosing high power microwave sources

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The measurement of microwave output energy is critical for reliable evaluation of the properties of high power, single pulse microwave sources. We describe the design, calibration and use of a broad band (4-25 GHz) calorimeter with resolution of ± 0.05 J. The calorimeter absorbs the microwave energy across the entire output of an antenna cross-section. Thus the measurement is insensitive to the output radiation pattern and the operating RF mode. The calorimeter is composed of a microwave absorber, a measurement instrumentation and a thermal stabilization system. An ethanol layer (15 mm thick) sandwiched between two planar acrylic plates acts as an absorber. The calculated (solid line) and measured (dots) power absorption ratio (over 80%) is shown in the figure as a function of frequency. A fine wire is immersed in the ethanol and heated by a computer-controlled current supply programmed to thermally stabilize the ethanol. This system also functions to calibrate each energy measurement by generating a reference energy pulse of 1 or 5 Joule. The results of measuring the output energy of a tunable, plasma loaded backward wave oscillator will be presented.



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