Abstract Submitted
for the TSF07 Meeting of
The American Physical Society

Frequency Dependence of the Dielectric Response of Select Materials at Microwave Frequencies R. CAUFIELD, J. ROBERTS, J. DAHIYA, A. ANAND, B. JOHNSON, University of North Texas — Select Materials were probed to determine their susceptibility to microwaves when they were subjected to microwaves over a range of frequencies. In the experiment, the effects sample loading on the magnetic and electrical interactions between a microwave field in a resonant cavity and select samples were monitored using standard perturbation techniques. This interaction is generally described by the equation: $Z = f_1(O_e, E) + f_2(O_m, H)$ (1) Where $f_1(O_e, E)$ is a function of the electric permeability $O_e$and the electric field E, while $f_2(O_m, H)$ is a function of the magnetic permeability $O_m$and the magnetic field H. Changing the volume of the sample that is inserted into a resonant microwave cavity affects the microwave load in the resonant cavity, and thus produces frequency shifts in $f_1$and f_2, and changes in the Q factor of the cavity. Measurements were made for different materials as the microwaves were absorbed by the sample. The $\Delta(1/Q)$ and Δf measurements describe the O_e and O_m interactions within the sample. The results were studied to find the fundamental electric and magnetic properties of the material loaded in the cavity. The results, as well as the behavior of electromagnetic fields allow us to understand the fundamental interaction processes within the sample of material acting as a load in the microwave cavity and to allow us to study frequency dependence on the sample load.

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Date submitted: 04 Oct 2007 Electronic form version 1.4