PRECISE MEASUREMENT OF LOW FREQUENCY VIBRATIONAL MODES IN SOLIDS USING WAVEGUIDE TERAHERTZ TIME DOMAIN SPECTROSCOPY

JOSEPH S. MELINGER, *Naval Research Laboratory, Code 6812, Washington, DC 20375*; N. LAMAN, S. SREE HARSHA, and D. GRISCHKOWSKY, *School of Computer and Electrical Engineering, Oklahoma State University, Stillwater, OK 74078*.

In this talk we describe the technique of waveguide terahertz time-domain spectroscopy whereby an ordered polycrystalline film is formed on a metal surface and its terahertz vibrational response characterized in a sensitive manner using a parallel plate waveguide (PPWG), in the region between 0.3 THz and 4.0 THz (10 cm-1 - 133 cm-1). First, we will describe the characteristics of the metal PPWG that are relevant for its application to terahertz spectroscopy. Next, we will describe the application of the PPWG to the measurement of low frequency vibrational modes of organic and bio-organic solids. We show that inhomogeneous line broadening can be suppressed in cases where an ordered polycrystalline film is formed on the surface of the PPWG. Cooling to cryogenic temperatures then begins to resolve the complex underlying terahertz spectrum of the film.