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Metamaterial Enhanced Terahertz Spectroscopy of Biomolecules LOGAN CHIEFFO, GEORGE KEISER, ANDREW STRIKWERDA, Boston University, Department of Physics, KEBIN FAN, Boston University, Department of Mechanical Engineering, SHYAMSUNDER ERRAMILLI, Boston University, Department of Physics, XIN ZHANG, Boston University, Department of Mechanical Engineering, RICHARD AVERITT, Boston University, Department of Physics — As the field of metamaterials experiences exponential growth, an increasing number of studies have focused on understanding near-field coupling between arrays of metamaterials and their local environment. Examples include a second array of metamaterials, phonon bands in semiconductors, and even small molecules. In this work, we demonstrate metamaterial coupling to a thin film of biomolecules. Protein films are deposited onto arrays of gold split ring resonators (SRRs) on thin silicon nitride substrates. As the LC resonance of the SRR is tuned across the low frequency terahertz (THz) modes of the biomolecule, hybridization results in mode splitting. The thin substrates (400nm) and the large electric field enhancement intrinsic to the SRRs provide ultrasensitive detection of the THz modes in the protein, allowing for the THz response to be measured from thin films which would otherwise not be observable.

Logan Chieffo
Boston University, Department of Physics

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