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Hybrid metamaterials for dynamic tuning TOM DRISCOLL, University of California San Diego, SABARNI PALIT, Duke University, MUMTAZ QAZILBASH, University of California San Diego, MARCUS BREHM, F. KEILMANN, Max-Planck-Institut, B. CHAE, H. KIM, IT Convergence & Components Lab, DIMITRI BASOV, University of California San Diego, NAN MARIE-JOKERST, DAVID SMITH, Duke University — Advances in the field of metamaterials have created many new and exciting devices, but the performance and applicability of these devices to date have been hindered by the reliance on a dispersive resonance. In this talk we present a metamaterial device with the ability to dynamically tune the center frequency of its far-infrared resonance in real-time, alleviating many of the limitations of dispersion. Our device combines the familiar Split Ring Resonator (SRR) element with a thin film of rare earth oxide possessing a metal-to-insulator phase transition that occurs just above room temperature. During this phase transition, the electromagnetic responses of the oxide-film and SRR become intertwined, creating a sort of hybrid metamaterial. This interaction allows us to manipulate the resonance of the SRR via the oxide-film material properties. The device exhibits a dynamically tunable resonance – shifting center frequency of the magnetically active SRR mode by as much as 20% within 2 degrees Kelvin of temperature control.

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