

Abstract Submitted
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Dynamical Electric and Magnetic Metamaterial Response at Terahertz Frequencies WILLIE PADILLA, ANTOINETTE TAYLOR, Los Alamos National Laboratory, CLARK HIGHSTRETE, MARK LEE, Sandia National Laboratories, RICHARD AVERITT, Los Alamos National Laboratory — Utilizing terahertz time domain spectroscopy, we have characterized the electromagnetic response of a planar array of split ring resonators (SRRs) fabricated upon a high resistivity GaAs substrate. The measured frequency dependent magnetic and electric resonances are in excellent agreement with theory and simulation. For two polarizations the SRRs yield negative electric response ($\epsilon < 0$). We demonstrate, for the first time, dynamical control of the electrical response of the SRRs through photoexcitation of free carriers in the substrate. An excited carrier density of $\sim 4 \times 10^{16} \text{cm}^{-3}$ is sufficient to short the gap of the SRRs thereby turning off the electric resonance demonstrating the potential of such structures as terahertz switches. Due to the universality of metamaterial response over many decades of frequency, these results have implications for other regions of the electromagnetic spectrum.

Willie Padilla
Los Alamos National Laboratory

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