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Fabrication and Optical Measurements of Nanoscale Meta-Materials: Terahertz and Beyond[1] ZHAO HAO, MICHAEL C. MARTIN, Advanced Light Source Division, Lawrence Berkeley National Laboratory, ALEX LIDDLE, ERIK H. ANDERSON, Center for X-Ray Optics, Lawrence Berkeley National Laboratory, WILLIE J. PADILLA, Los Alamos National Laboratory, DAVID SCHURIG, DAVID R. SMITH, ECE Department, Duke University — We report on our efforts to simulate and fabricate micro- and nano-scale meta-materials, and experimentally measure negative magnetic permeability and electric susceptibility in such structures. We make use of the nano-fabrication technology and expertise of Lawrence Berkeley National Lab's Center for X-Ray Optics (CXRO) for fabricating potential left-handed meta-materials. We begin by verifying micron-scale split-ring-resonator structures which have magnetic resonances at terahertz (THz) frequencies, following reference [1]. Our structures, however, are fabricated on extremely thin ($\sim$20 nm) SiN films, making the resonators close to free-standing. We then scale the structures to sub-micron dimensions to bring the resonance frequencies higher. We will present simulations and experimental results on these nano-scale structures.
[1] T. J. Yen, W. J. Padilla, N. Fang, D. C. Vier, D. R. Smith, J. B. Pendry, D. N. Basov, X. Zhang, Science, 303, 1494-1496 (2004).

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