Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Double Negative Index of Refraction Observed in a Single Layer of Closed Ring Resonators[1] ZHAO HAO, MICHAEL MARTIN, Advanced Light Source, Lawrence Berkeley National Laboratory, BRUCE HARTENECK, STEFANO CABRINI, Molecular Foundry, Lawrence Berkeley National Laboratory, ERIK ANDERSON, Center of X-Ray Optics, Lawrence Berkeley National Laboratory — We report the results of a spectroscopic study of a single layer of nanoscale metallic single closed ring resonators on a free- standing thin membrane at near-normal and grazing angles of incidence[1]. When the magnetic component of the light is perpendicular to the ring plane, we observe a so-called "double" negative index of refraction at near-infrared frequencies attributed to a strong magnetic dipolar resonance and a broad electric resonance in this metamaterial. We experimentally identify the different resonance modes and the spectral region of negative refractive index on a series of samples with different feature and lattice sizes, using multi-oscillator fits and comparing to electromagnetic simulations.
[1] Z. Hao, M. C. Martin, B. Harteneck, S. Cabrini, E. H. Anderson, Appl. Phys. Lett., in press (2008).

[1]This work was supported by the LDRD Program and at M. F. by the Office of Science, Office of Basic Energy Sciences, of Lawrence Berkeley National Laboratory under the DOE Contract No. DE-AC02-05CH11231.

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Date submitted: 27 Nov 2007 Electronic form version 1.4