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Title:THz near-field Faraday imaging in hybrid metamaterials

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Abstract:We report on direct measurements of the magnetic near-field of metamaterial split ring resonators at terahertz frequencies using a magnetic field sensitive material. Specifically, planar split ring resonators are fabricated on a single magneto-optically active terbium gallium garnet crystal. Normally incident terahertz radiation couples to the resonator inducing a magnetic dipole oscillating perpendicular to the crystal surface. Faraday rotation of the polarisation of a near-infrared probe beam directly measures the magnetic near-field with 100 femtosecond temporal resolution and ($\lambda/200$) spatial resolution. Numerical simulations suggest that the magnetic field can be enhanced in the plane of the resonator by as much as a factor of 200 compared to the incident field strength. Our results provide a route towards hybrid devices for dynamic magneto-active control of light such as isolators, and highlight the utility of split ring resonators as compact probes of magnetic phenomena in condensed matter. © 2012 Optical Society of America.

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