Abstracts

Magnetism from conductors and enhanced nonlinear phenomena

J.B. Pendry, A.J. Holden, D.J. Robbins and W.J. Stewart. "Magnetism from conductors and enhanced nonlinear phenomena." 1999 Transactions on Microwave Theory and Techniques 47.11 (Nov. 1999 [T-MTT] (Mini-Special Issue on Electromagnetic Crystal Structures, Design, Synthesis, and Applications)): 2075-2084.

We show that microstructures built from nonmagnetic conducting sheets exhibit an effective magnetic permeability /spl mu//sub eff/, which can be tuned to values not accessible in naturally occurring materials, including large imaginary components of /spl mu//sub eff/. The microstructure is on a scale much less than the wavelength of radiation, is not resolved by incident microwaves, and uses a very low density of metal so that structures can be extremely lightweight. Most of the structures are resonant due to internal capacitance and inductance, and resonant enhancement combined with compression of electrical energy into a very small volume greatly enhances the energy density at critical locations in the structure, easily by factors of a million and possibly by much more. Weakly nonlinear materials placed at these critical locations will show greatly enhanced effects raising the possibility of manufacturing active structures whose properties can be switched at will between many states.

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