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Simulations of ferrite-dielectric-wire composite negative index materials FREDERIC RACHFORD, Naval Research Laboratory, DOUGLAS ARMSTEAD, The College of Wooster, VINCENT HARRIS, CARMINE VITTORIA, Northeastern University — We have performed extensive finite difference time domain (FDTD) simulations to design ferrite based negative index of refraction (NIM) composites. Our simulations center on the use of Barium M type ferrite with in-plane anisotropy. A wire grid is employed to provide negative permittivity. The ferrite and wire grid interact to provide both negative and positive index of refraction transmission peaks in the vicinity of the BaM resonance. We find that the wires and the ferrite must be spatially separated by a low loss dielectric (Mylar). The ferrite and dielectric media are modeled as thin lamina with a mono-directional wire grid centered in the dielectric lamina. The ferrite and dielectric lamina are paired with combined thickness equal to the square wire grid lattice distance. We assume the presence of a in plane orienting magnetic field. Working with thin planar oriented ferrite lamina implies that the composites will have a negative index in only one direction of propagation. Notwithstanding the extreme anisotropy in the index of refraction of the composite, negative refraction is seen at the composite air interface allowing the construction of a focusing concave lens with magnetically tunable focal length.

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