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Non-Magnetic Negative Refraction Index Materials ROBYN WANGBERG, Oregon State University, EVGENII NARIMANOV, Princeton University, VIKTOR PODOLSKIY, Oregon State University — Novel phenomena in recently discovered materials with a negative refraction index include inversed Doppler Effect, reversal of Snell law, subwavelength imaging, and reversed Cherenkov radiation. The conventional designs to build these exciting media typically require simultaneously negative values of dielectric permittivity and magnetic permeability, and often rely on resonance to achieve the non-trivial magnetic response. This resonance leads to large losses in the system and makes the present negative-n materials almost impractical. In this work we develop a new approach to build a material with negative index of refraction. In contrast to conventional designs, our material is intrinsically non-magnetic and uses an anisotropic dielectric constant to provide a negative-n (left-handed) behavior in waveguide geometry. We describe optical properties of the proposed structure and its realizations for frequency ranges from GHz to THz to infrared to optics. We also illustrate the effect of finite conductance waveguide walls on the electromagnetic properties of the system.

Robyn Wangberg
Oregon State University

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