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Consequences of Spatial Antisymmetry on Light.[1] ANGELO MASCARENHAS, BRIAN FLUEGEL, NREL — When light traverses an interface across which the permittivity, ε, and permeability, μ, change sign, it undergoes negative refraction and the medium with negative values of ε and μ must be interpreted as having a negative refractive index $n = -\sqrt{\varepsilon\mu}$. In the past few years this has been experimentally demonstrated by several groups. We have analyzed light propagating in lattices comprised of 2-D tilings in which alternating tiles are made up of media with refractive index whose values alternate in sign acoss tile boundaries. Using both numerical ray tracing and wave equation expansion, we show that when the tiling belongs to certain antisymmetric plane groups, every light ray is exactly bound into a closed, lossless path. The extension to antisymmetric 3-D space groups is also discussed. The study provides unique insights into the consequences of spatial antisymmetry on light.

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