Negative refraction and superlensing in photonic quasicrystals

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Photonic quasicrystals are attracting a great deal of interest, driven by the higher level of (weak) symmetry (and thus, in principle, lower spatial dispersion), as compared to ordinary (periodic) crystals [1]. Recently, negative refraction and superlensing have been demonstrated in the microwave region for a 2D quasicrystal made of dielectric rods in air and based on a 12-fold-symmetric square-triangle tiling [2]. However, some of the basic underlying mechanisms are not yet fully understood. In particular, all angle negative refraction and subwavelength imaging properties of a flat lens based on the above mentioned structure deserve a deeper investigation.

In an attempt to shed further light on the above aspects, we present a comprehensive parametric study, based on full-wave numerical simulations (Fourier-Bessel multipole expansion) backed by experimental verifications (X-band near-field imaging). In particular, we investigate the role of the global vs. local symmetry and of the structure termination.

[1] W. Man *et al.*, *Nature* **436**, 993 (2005).
[2] Z. Feng *et al.*, *Phys. Rev. Lett.* **94**, 247402 (2005).