Highly-directional sources by periodic and non-periodic dielectric rods

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We show that a point source embedded in a periodic lattice of rods designed to possess a small and negative refractive index [1] emits highly-directional radiation (see Fig. 1). The source properties can be further improved by engineering the structure with inverse design [2] (see Fig. 2). Here, experimental results performed in the microwave regime will be reported supporting the theoretical predictions.

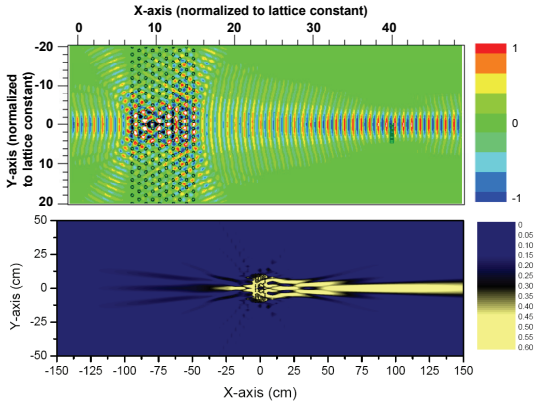

Figure 1. Electric field distribution of the directional source based on a periodic distribution of rods (FDTD simulation).

Figure 2. Modulus of the electric field for the directional source based on a non-periodic distribution of rods obtained by inverse design (Multiple scattering calculations).

[1] A. Martínez, M. A. Piqueras, and J. Martí, Appl. Phys. Lett. 89, 131111 (2006).
[2] A. Håkansson *et al.*, Phys. Rev. Lett. 96, 153902 (2006).