

Complete 3D inverse design tool for dielectric slab based Scattering Optical Elements

A. Håkansson¹, S. Boscolo² and M. Midrio²,

(1) NIMS, International Center for Young Scientists, 1-1 Namiki, Tsukuba, Ibaraki 305-0044 JAPAN

(2) Dipartimento di Ingegneria Elettrica Gestionale e Meccanica,
Università degli Studi di Udine, Udine 33100, ITALY.

The quality in the fabrication process of photonic crystal slabs makes it possible to do device engineering by introducing defects into the crystal lattice structure. It has been shown that this process can be controlled using inverse design (ID) establishing a new family of devices named scattering optical elements (SOE) [1-2]. However, since automatic computational design is very costly, both in memory and CPU time, these design tools are almost always relying on an simplified two dimensional electromagnetic field solver. Here we will show that 3D-ID of SOE slab structures is feasible with low computational cost by using a special multiple scattering technique optimized for photonic crystal slabs [3]. The important differences between the 3D and 2D design tool will be analyzed and discussed.

[1] L. Sanchis *et al.* Appl. Phys. Lett., **84**, 4460 (2004)

[2] A. Håkansson *et al.*, Appl. Phys. Lett., **87**, 193506 (2005)

[3] S. Boscolo *et al.* J. Lightwave Tech., **22**, 2778 (2004)