

Optimal design of a micro-scaled de-multiplexer

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A method of inverse design [1] that consists of an integration of the Multiple Scattering Theory with a Genetic Algorithm is applied to generate an optical wavelength de-multiplexer, based on Si cylinders placed in a background of SiO₂. This ultra compact device, only 2μm thick, is designed to separate the two wavelengths 1.55μm and 1.50μm with a minimal possible cross-talk. The optimization is carried out by removing cylinders from a perfectly crystalline cluster, made of only five layers, and in this way guide the flow of light through the slab by tailoring the scattering process in-between the cylinders. This method has earlier been successfully used to design photonic [1] and phononic [2-3] devices.

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[2] A. Håkansson, L. Sanchis, and J. Sánchez-Dehesa, *Phys. Rev. B*, **70**, 214302 (2005)

[3] A. Håkansson, J. Sánchez-Dehesa and F. Cervera, *Appl. Phys. Lett.*, **86**, 054102 (2005)