

## Monomode mirrors for multimode photonic crystal waveguides

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Photonic crystals straight waveguides are easily multimode, so that designing cavities from closed waveguides yields poor results if no care is taken. Upon reflection at a mirror built up from deep trenches or "native" photonic crystal, the impinging fundamental mode partially feeds higher order modes, and the resulting eigenmode features increase losses and degrade quality factor.

A significant improvement results if the cavity is forced to operate on its fundamental mode by suppressing modal interactions at the mirror. We show here an appropriate design of the mirror shape for that purpose. In other words, the reflector shape is blazed in a way adapted to the discrete modes of the straight waveguide.

Cavity modes based on a "W3" waveguide have been calculated in 2D in a supercell, and analysed on the basis of the straight guide eigenmodes to quantify the modal reflection. We find a mirror shape preserving the symmetry of the fundamental mode and minimizing the projection on the higher order modes. Tenfold improvement is obtained at this stage. Finite-difference time-domain simulations are then used to evaluate all the optical properties of the proposed novel cavity structures.

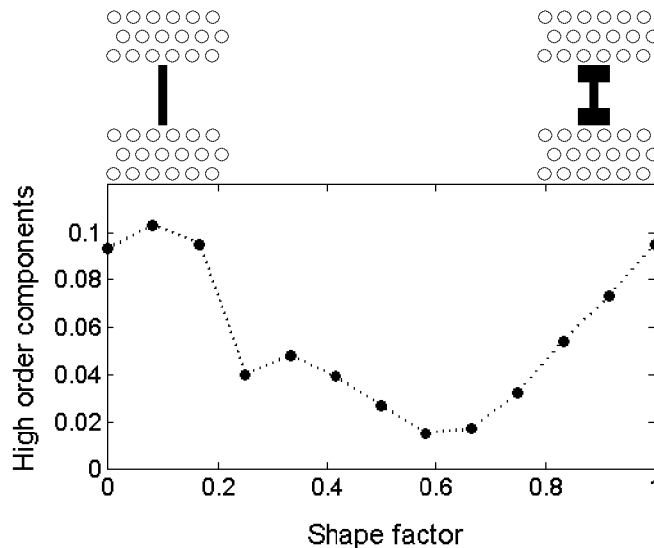


Fig.1 Evolution of higher order modes components of the reflection in a W3 waveguide as the shape of the mirror evolves from a simple trench to a blazed hole. The vertical dimensions are also optimized.