1-D & 2-D Photonic Band Gaps in PMN-PT for Optical Communication

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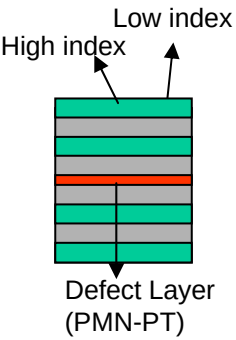
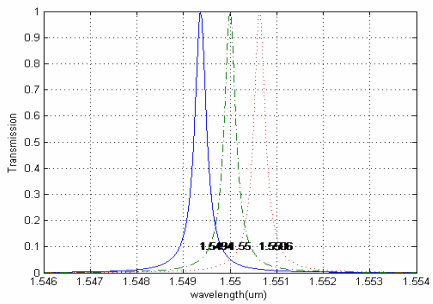
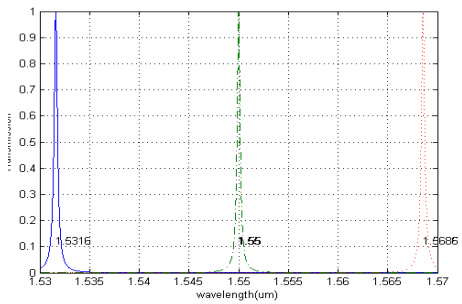
- **Motivation:** Analysis & modulation of photonic band gaps in 1D & 2D electro-optic (EO) materials
- **Applications:** Spectral filters, wavelength tunable filters, electro-optic switches, waveguides

Wavelength tunable filter





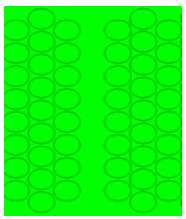
Defect index: (-/+)0.1% change
Defect Peak: 1549.4/1550.6nm



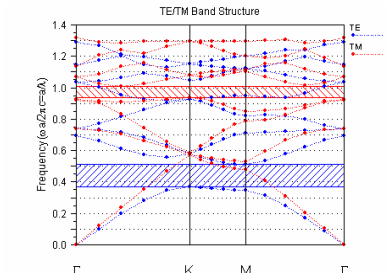
Defect index: (-/+)1.6% change
Defect Peak: 1531.6/1568.6nm

A defect layer of PMN-PT (EO material) in the middle of alternating high & low index layers (each quarter wavelength thick) guides light in to central wavelength (1550nm)of the bandgap of this 1D structure. A change in the refractive index of PMN-PT shifts the transmission peak to other wavelengths. A minimum refractive index change tunes 0.8nm spaced channels and maximum change cover C-band(1530-1565nm).

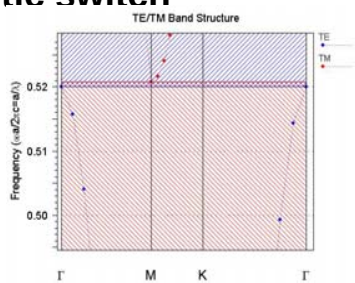
Electro optic switch



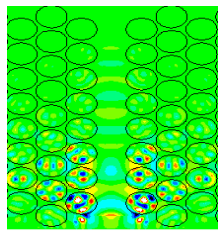
Hexagonal array of air holes in PMN-PT



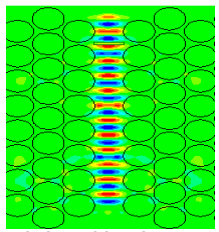
Without Electric Field (isotropic PMN-PT)
No hybrid bandgap



With Electric Field (anisotropic PMN-PT)
Hybrid bandgap



TE mode does not guide through the defect in isotropic case.



Light of both polarizations guides through the defect in anisotropic case

Publication: "Opening of complete 2-D photonic band gap in photonic crystals of a hexagonally arranged lattice having very low refractive index contrast", submitted to APL, March-2007.