

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

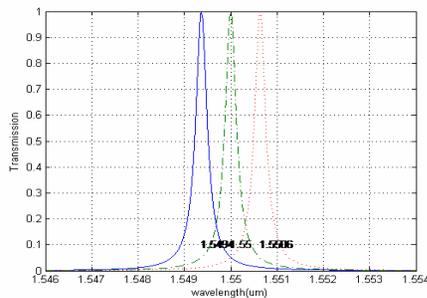
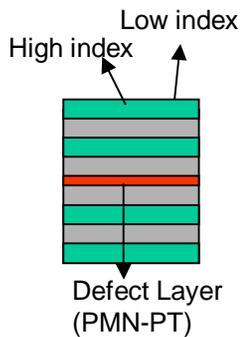
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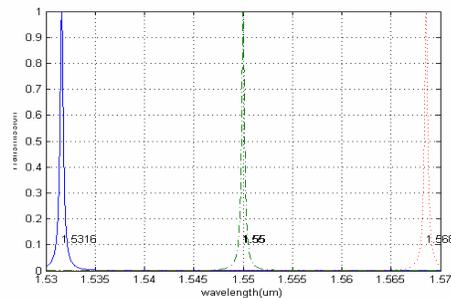
Nanofabrication Center, Characterization Facility

- **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



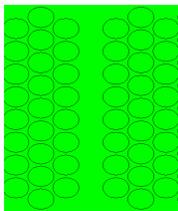
Defect index: (-/+) $0.1\%$  change  
Defect Peak: 1549.4/1550.6nm



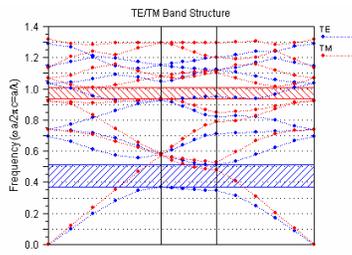
Defect index: (-/+) $1.6\%$  change  
Defect Peak: 1531.6/1568.6nm

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).

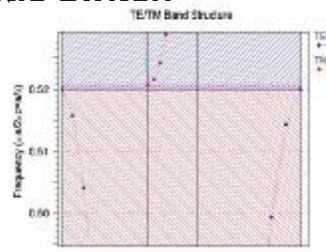
## Electro optic switch



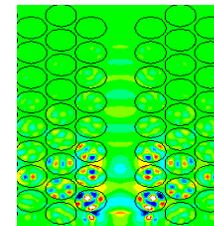
Hexagonal array of air holes in PMN-PT



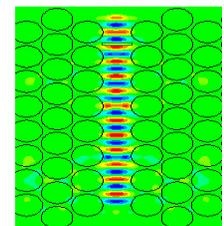
Without Electric Field (isotropic PMN-PT)  
No hybrid bandgap



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