1-D & 2-D Photonic Band Gaps in PMN-PT for Optical Communication  
Ratnanjali Khandwal and Bethanie J. H. Stadler (PI)  
Electrical & Computer Engineering, University of Minnesota

• **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**

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 (1550 nm) 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 0.8 nm spaced channels and maximum change cover C-band (1530-1565 nm).

**Electro optic switch**

Hexagonal array of air holes in PMN-PT  
No hybrid bandgap  

Without Electric Field (isotropic PMN-PT)

With Electric Field (anisotropic PMN-PT)

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

Light of both polarizations guides through the defect in anisotropic case.