

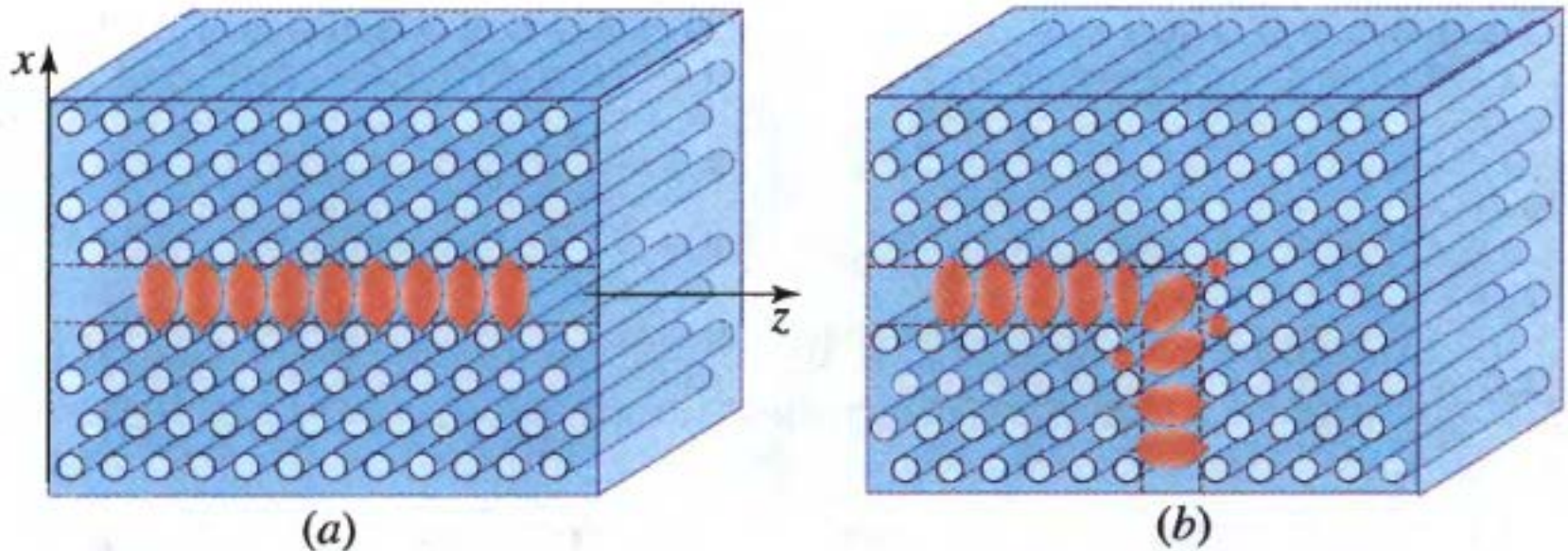
Fiber Optic Communications

Lecture 12: On-Chip Interconnects

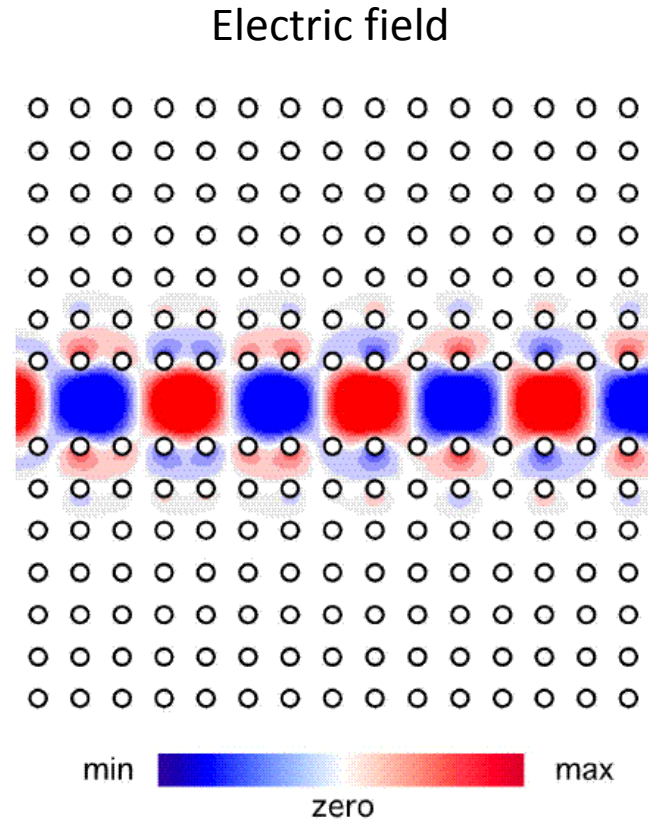
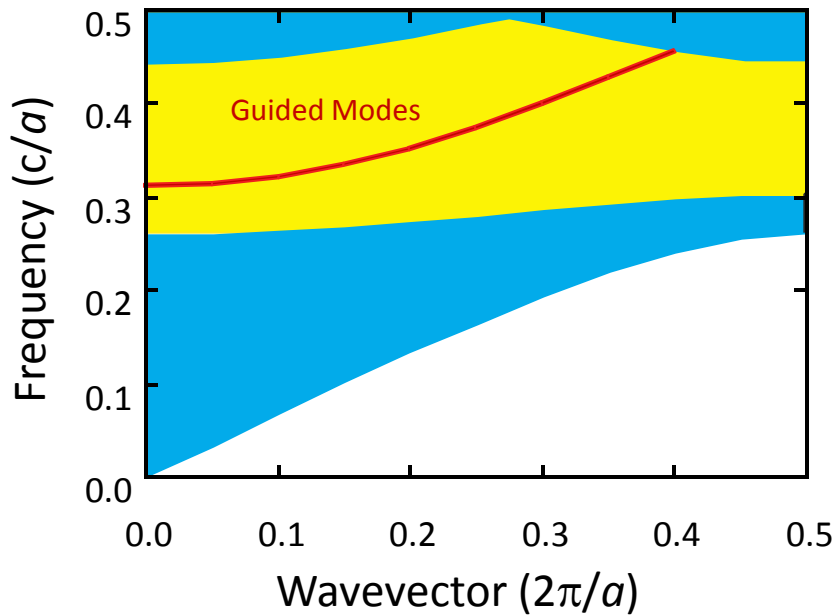
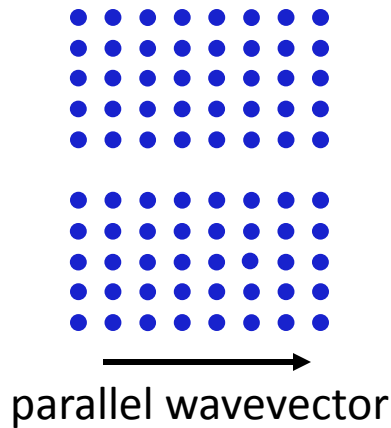
- Guided Wave Interconnects
- Photonic Crystals
- Photonic Waveguides
- Photonic Slabs

2D Photonic-Crystal Waveguides

Waveguides may also be created by introducing a path of defects in a 2D photonic crystal. A 2D photonic crystal comprising of a set of parallel cylindrical holes, placed in a dielectric material at the points of a periodic triangular lattice, exhibits a complete photonic bandgap for waves traveling along directions parallel to the plane of periodicity.

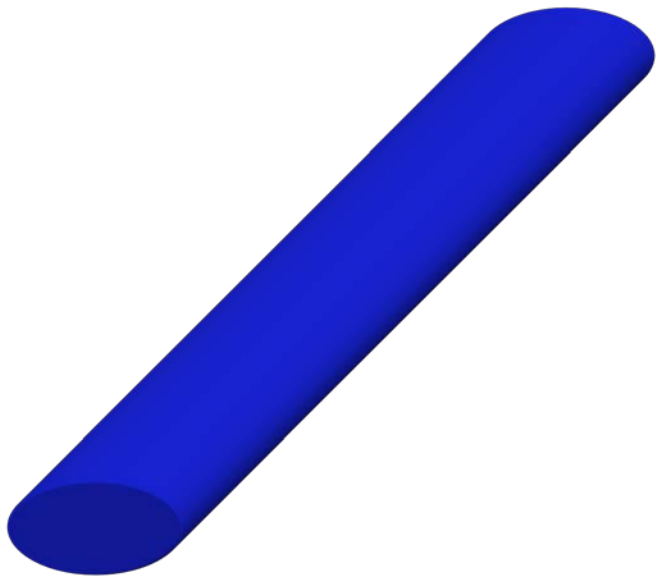


Line Defect States: Projected Band Diagram



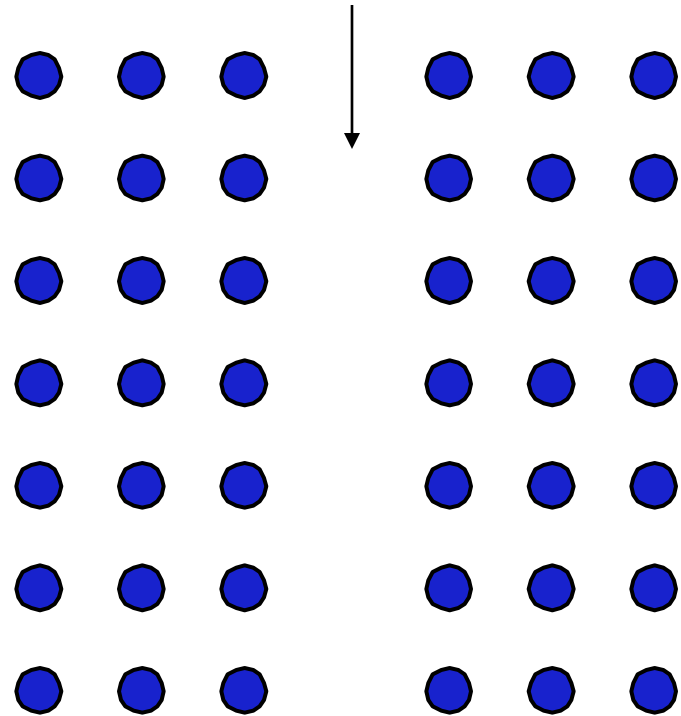
Photonic Crystal vs. Conventional Waveguide

High-index region, TIR



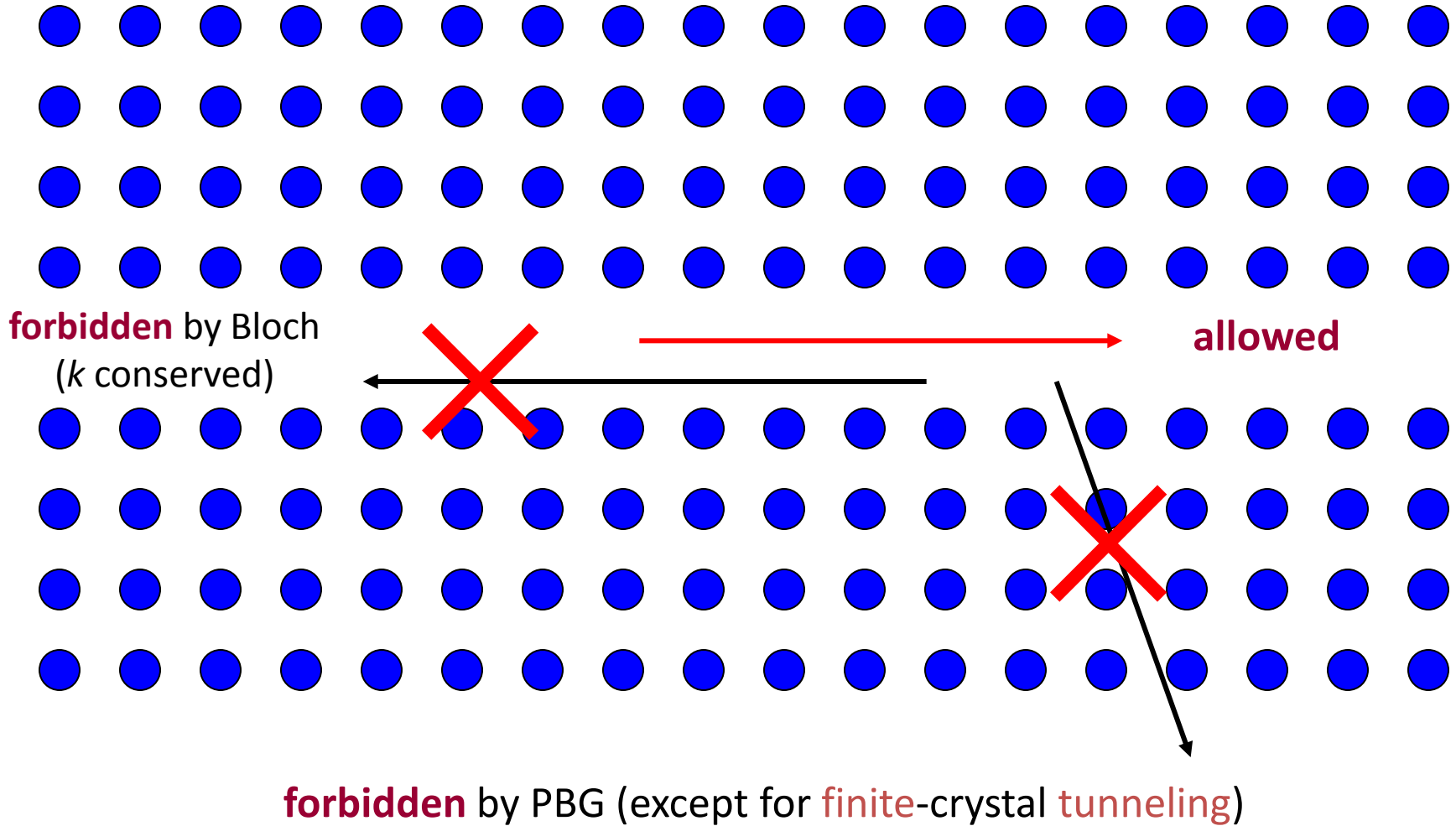
Conventional waveguide

Low index region

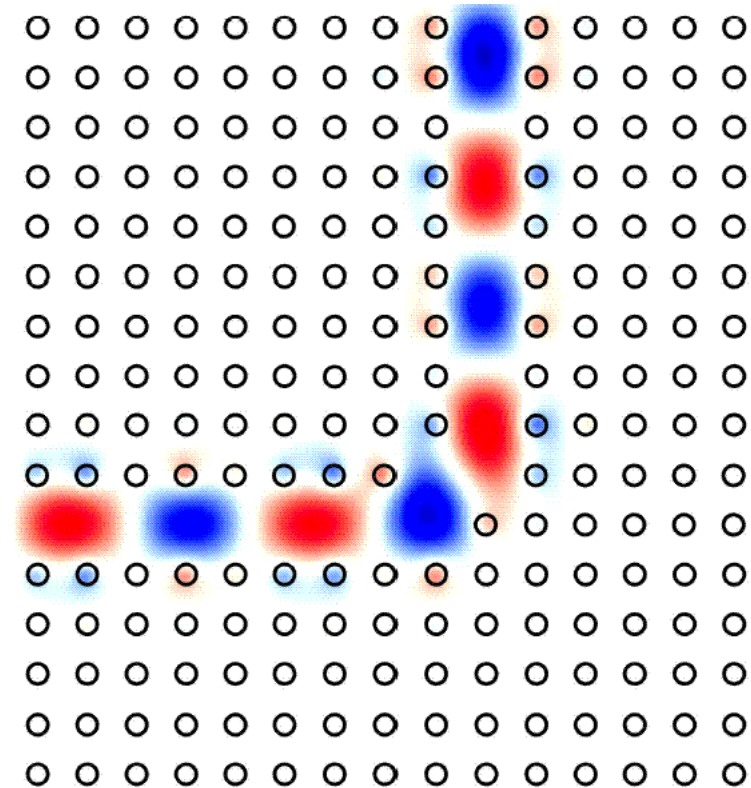
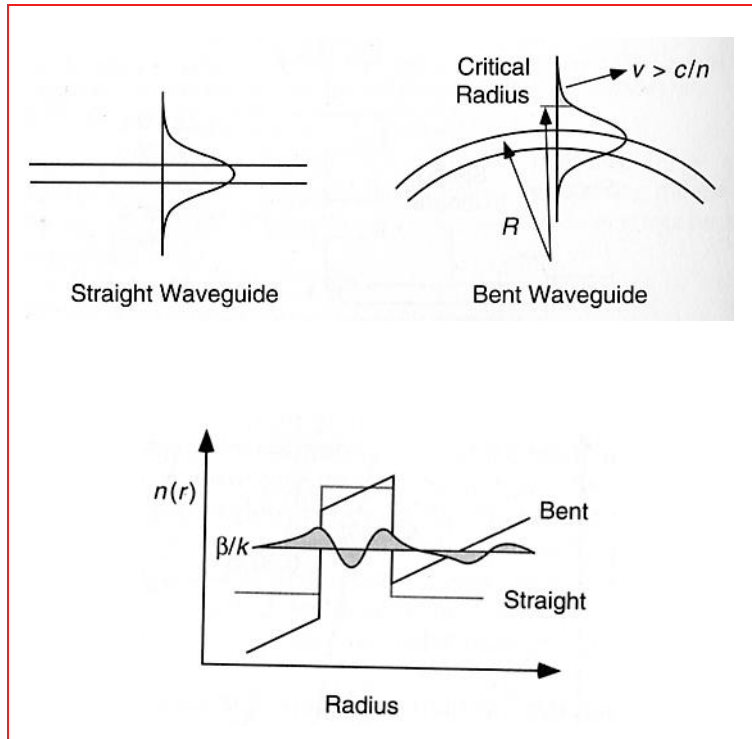


Photonic crystal waveguide

Waveguide – Line Defects



High Transmission through Sharp Bends

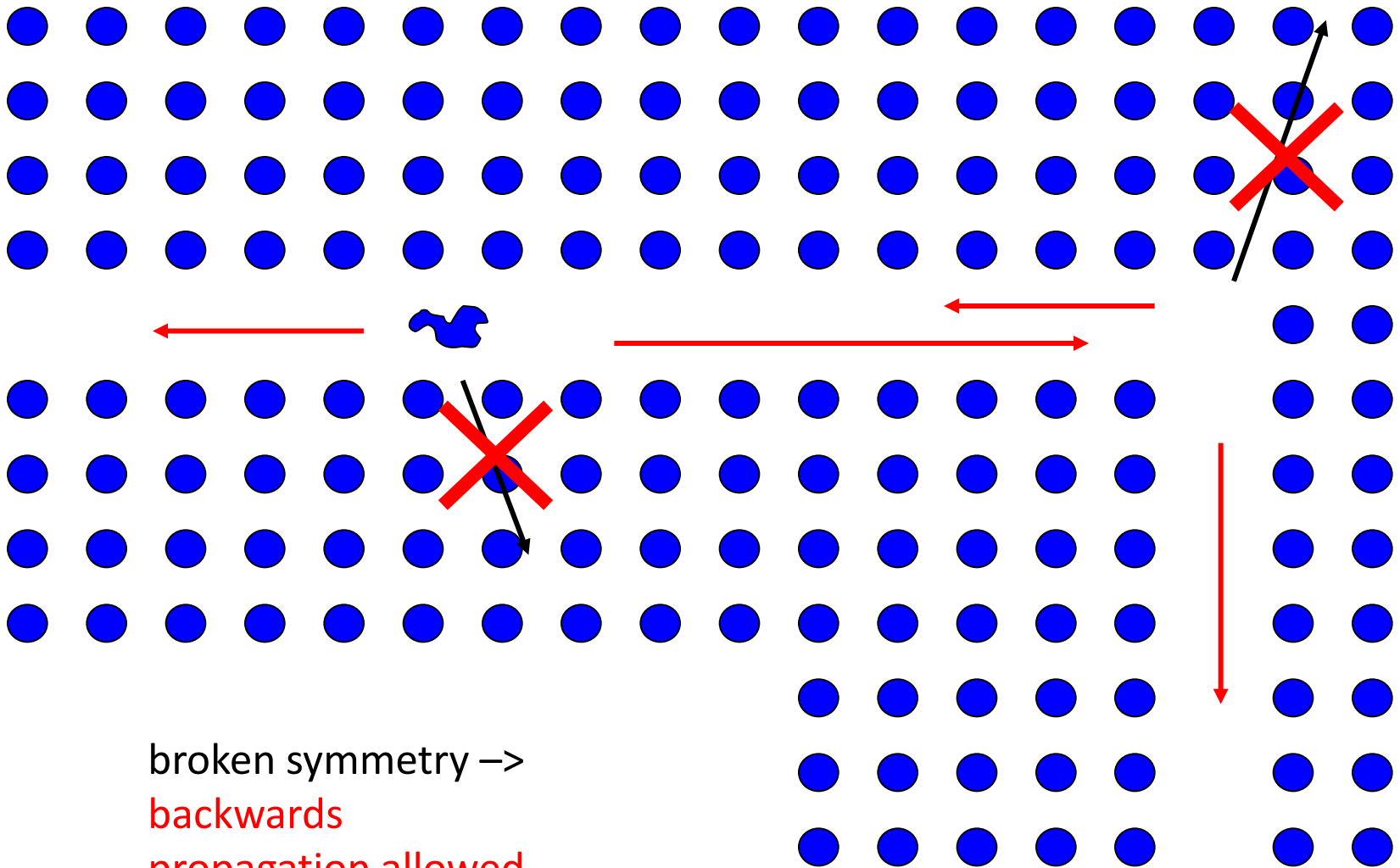


$$\alpha = \frac{1}{2} \left(\frac{\pi}{aV^3} \right)^{1/2} \left[\frac{\kappa a}{\gamma a K_1(\gamma a)} \right]^2 R^{-1/2} e^{-UR}$$

Polluck, Fundamentals of Optoelectronics, 1995

A. Mekis et al, PRL, 77, 3786 (1996)

Bends



broken symmetry →
backwards
propagation allowed