Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Electro-Optical Control of Directional Switching Based on Degenerate Defect State Spliting in Photonic Crystal NATALIA MALKOVA, CUN-ZHENG NING, NASA Ames — We study the splitting of the degenerate defect states inside a two-dimensional photonic crystal. Using the group-theory analysis we find the perturbation potentials that allow for the most efficient splitting of the degenerate states. The results of the theoretical analysis are applied to the particular examples of the two-dimensional square and hexagonal photonic lattices of the dielectric rods in vacuum doped by the defect rod, giving the doubly degenerate E state in the first TM band gap. We show how the choice of the perturbation potential can control both the magnitude and symmetry of the splitting. The perturbation potential can be generated either by piezoelectric effect resulting in lattice distortion or by electro-optical effect resulting in change of the dielectric function. We concentrate on the perturbation potential caused by the electro-optical effect. Application of the effect in fast switch of waveguide devices is presented. We also discuss use of the effect in the design of electrically tunable lasers.

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Date submitted: 06 Dec 2004 Electronic form version 1.4