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Modeling of Error Signal and Locking of Laser to Photonic Crystal Nanocavity DARKHAN TUYENBAYEV, BENJAMIN FROST, MALIK RAKHMANOV, Univ of Texas, Brownsville — In many applications of silicon nanophotonics, lasers are brought to resonate in photonic crystal nanocavities. We analyze the possibility of locking a laser to a photonic crystal nanocavity using computer simulations. The nanocavity is formed by a single point defect in a 2-d square lattice of holes in a silicon slab. We couple light to the cavity through a line-defect waveguide and detect the leakage light from the cavity through an auxiliary waveguide. The resonance is achieved by choosing the frequency at the guided mode within the band gap of the photonic crystal. Detuning the light from perfect resonance gives rise to intensity beats in two waveguides which generate the error signal. This error signal is then used in feedback control loop to lock the laser to the cavity. The calculations are performed with the Finite-Difference Time-Domain (FDTD) model and the numerical analysis of the photonic band structure.

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