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H1 Photonic Crystal Microcavities for Quantum Information
JENNA HAGEMEIER, Physics Department, University of California Santa Barbara, USA, CRISTIAN BONATO, Huygens Laboratory, Leiden University, The Netherlands, TUAN-ANH TRUONG, Materials Department, University of California Santa Barbara, USA, HYOCHUL KIM[1], Physics Department, University of California Santa Barbara, USA, PIERRE PETROFF, Materials Department, University of California Santa Barbara, USA, DIRK BOUWMEESTER, Physics Department, University of California Santa Barbara, USA and Huygens Laboratory, Leiden University, The Netherlands — Semiconductor quantum dots coupled to photonic crystal microcavities show promise for quantum information processing in solid-state systems. For many applications, the cavity mode needs to have high extraction efficiency and unpolarized emission. Here we describe a possible implementation using the two orthogonally-polarized, spectrally-degenerate dipole modes of the H1 photonic crystal microcavity. By modifying the shape of the far-field profile, high collection efficiency from the H1 cavity modes can be achieved while maintaining a high cavity quality factor. We optimize and experimentally measure the far-field profiles of our cavities, which show good agreement with simulations. We also implement techniques to minimize the energy splitting of the two dipole modes due to fabrication imperfections, which are compatible with the far-field optimization.

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