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Quantum Dot Single Photon Emitter Array Integrated with Dielectric Nanoantenna-Waveguide: Simulation of Multifunctional Optical Response[1] SWARNABHA CHATTARAJ, Dept. of Electrical Engineering, University of Southern California, JIEFEI ZHANG, Dept of Physics and Astronomy, University of Southern California, SIYUAN LU, IBM Thomas J. Watson Research Center, Yorktown Heights, ANUPAM MADHUKAR, Dept of Chemical Engineering and Material Science — Recently we proposed a new paradigm for nanophotonic quantum information processing (QIP) systems comprising on-chip single photon source (SPS) array integrated with light manipulating elements (LMEs) that use collective Mie resonance in subwavelength sized dielectric building blocks (DBBs) [1]. To this end we demonstrated an ordered array of spectrally uniform InGaAs mesa top single quantum dots (MTSQDs) as on-chip SPSs [1, 2] that exhibit spectral uniformity an order of magnitude better than conventional island QDs and show triggered single photon emission at 77.4K. With a planarizing overgrowth on such a MTSQD array the system is ideally suited for lithographic fabrication of the LMEs. In this talk we will present simulation results of DBB based nanoantenna-waveguide LME that produces Purcell enhancement of ˜10 and guides and propagates the emitted photons losslessly, all using the collective magnetic dipole modes of the DBBs. Additionally, explorations of on-chip beam-splitting in the DBB arrays will be presented. Such MTSQD-DBB integrated unit can serve as a building block for complex hierarchical nanophotonic QIP systems. [1] J. Zhang et. al, arXiv:1609.00068 (2016). [2] J. Zhang et. al., Jour. Vac. Sc. Tech. B32, 02C106 (2014).

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