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Demonstration of Optical Resonances in a Cylinder-Shell Lattice of Quantum Dots JARED MAXSON, SLAVA ROTKIN, Department of Physics, Lehigh University — We present a model for the calculation of the optical response of a cylinder-shell of quantum dots or metallic nanoparticles. We model such a shell cluster as a lattice of non-permanent point dipoles with a known polarizability and a single transition frequency. We then utilize the second quantization formalism to compute the cluster response. The eigenmodes and quantum mechanical response function of the lattice interacting with an external field, polarized respective to the cylinder axis, are calculated numerically. The cylinder radius is treated as a parameter to identify resonator effects due to the cylindrical geometry. Varying the frequency of the external field, regions of response maxima are determined. In these regions resonant interaction between the coupled dipoles results in transferring significant oscillator strength into a few eigenmodes of the cluster, having high spatial and temporal coherence with the external field. Further analysis of the spatial distribution of dipoles in each region of response maxima reveals significant contributions from groups of modes with equal angular momenta, permitting rigorous excitation classification.

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