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Solomon, Pelton, and Yamamoto Reply: Using a micropost cavity in our April 2001 Letter [1], we demonstrated spontaneous emission (SE) modification of spectrally isolated quantum dots (QDs) coupled to a single, discrete cavity mode. In the preceding Comment, Gayral and Gérard (GG) do not dispute our central result. However, GG suggest that the different QD SE rates in the cavity, Fig. 1(b) of [1], could be due, not to the cavity detuning effect, but to a coincidental alignment of the cavity resonance with a combination of single exciton and multi-exciton lines. This possibility is excluded because the emission intensities from the three QDs linearly increase with the pump power, an unmistakable signature of single excitonic emission. Biexciton emission, for instance, increases quadratically with pump power.

The most significant concern of GG is that we neglected the spatial dependence of the electric field intensity, $|\vec{E}(r)|^2$, in our calculation. If $\vec{\mu}$ is the QD-electric dipole moment, the QD-electric field interaction is $|\vec{\mu} \cdot \vec{E}(r)|^2$. In idealized micropost cavities the position dependence of $|\vec{\mu} \cdot \vec{E}(r)|^2$ cannot in general be neglected but is less significant in our real cavities due to imperfections and can often be neglected. Our $0.5 \mu\text{m}$ diameter cavity has a steep taper and extends to only two lower distributed Bragg reflector pairs. Reflection at the interface between the post and planar regions occur, as well as large diffraction into the unetched lower portion, resulting in both a shift of the longitudinal electric field modal node position from the plane of QDs, and a spread of the radial field distribution of the fundamental HE_{11} mode towards the post edge. Figure 1 shows the total electric field intensity distribution in the actual post structure calculated using a finite-difference time-domain (FDTD) method [2]. The ratio of the electric field intensities at the edge and center of the post is $|E_{\text{min}}/E_{\text{max}}|^2 \simeq 0.35$, which contrasts the value quoted by GG of 0.02.

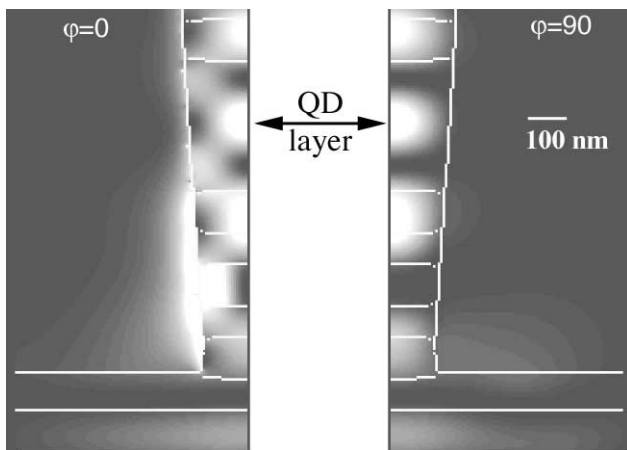


FIG. 1. FDTD electric field intensity distribution, $|\vec{E}|^2$, in the tapered micropost cavity of [1] for in-plane angles, ϕ of 0° and 90° , where the post is delineated in white.

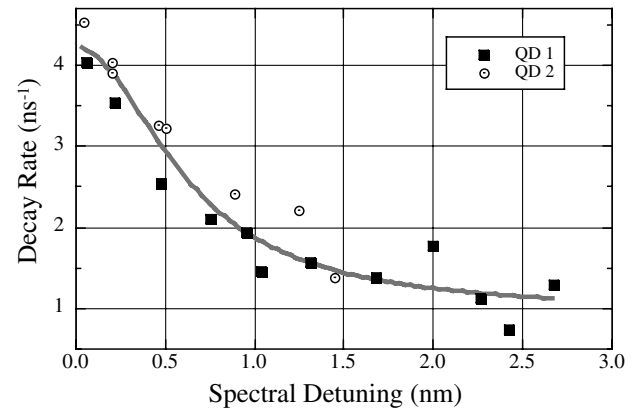


FIG. 2. SE decay rate as a function of spectral detuning of single excitonic emission from a micropost cavity containing two QDs (\blacksquare , \circ). A Lorentzian fit is shown. The observed spatial field variation between the QDs is small compared to the spectral detuning.

Because of the smaller electric field variation, finding situations in which this spatial variation can be neglected is not so unlikely. In our experiment the good agreement between theory, assuming a constant $|\vec{\mu} \cdot \vec{E}|^2$, and experiment justifies neglecting variations in $|\vec{\mu} \cdot \vec{E}|^2$. The theory contains no free parameters; the cavity Q used in the theory is obtained using the filtered spontaneous emission under high pump conditions. To reiterate, if an electric field spatial dependence contributed to the QD decay rate beyond our experimental error, a discrepancy between theory and experiment would be present. Coincidental alignment of $|\vec{\mu} \cdot \vec{E}(r)|^2$ and the spectral detuning for each QD will not satisfy our criterion.

To add further experimental justification, we have tuned the excitonic emission lines from two QDs through the fundamental cavity mode resonance of a similar device by changing the sample temperature. The results, shown in Fig. 2, indicate that the enhanced spontaneous emission rate is compatible with our previous result [1] and again $|\vec{\mu} \cdot \vec{E}(r)|^2$ can be neglected. We can therefore conclude the enhancement factor is 4–5 for both QDs.

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[1] G. S. Solomon, M. Pelton, and Y. Yamamoto, Phys. Rev. Lett. **86**, 3903 (2001).

[2] M. Pelton *et al.*, IEEE J. Quantum Electron. **38**, 170 (2002); J. Vučković *et al.*, Phys. Rev. A **66**, 023808 (2002).