Shen *et al.* Reply: In their Comment [1] on our Letter [2], Wang and Wang (WW) claim that our calculations of the local radiative density of states (LRDOS) and the electromagnetic field energy $U(t)$ are inaccurate and that the results can be improved at the cost of computer time, making the computation less efficient.

We first want to point out that the main message of our Letter [2] is that if the finite-difference time-domain (FDTD) method is used to compute spontaneous-emission rates (SERs) in microcavities, then it is much more efficient to calculate the SER from short-time data of the energy $U(t)$ than from the LRDOS. This conclusion does not depend on the dimensionality of the problem (2D or 3D) or on the spatial and temporal resolution used in the simulation, or in other words on the accuracy of the FDTD data, as we discuss later. Our Letter [2] does not compare the computational efficiency for calculating the SER by means of the FDTD method with that of other methods, nor does it make a quantitative comparison of our results with theoretical results for periodic infinite structures or with experimental data.

In [2], $U(t)$ and the LRDOS are computed for square areas of dimension $4\lambda \times 4\lambda$ with perfect electric conductor (PEC) boundaries. Space is discretized in a square grid with grid spacing $\delta = 0.01\lambda$ and a time step $\delta t = 0.001\lambda/c$ is used. Hence, in contrast to the claims of WW, the simulation grid is not sparse. For these values of the parameters δ and δt the FDTD results are accurate. Furthermore, for a system of $4\lambda \times 4\lambda$ and PEC, the low-energy spectrum consists of well-separated eigenvalues and does not resemble a continuum as WW claim [1]. This is most clearly seen by considering the cavity (or homogeneous medium) for which $\omega_{l,m} = \pi c\sqrt{l^2 + m^2}/4\lambda n$, where l and m denote non-negative integers and n the refractive index. In our FDTD calculation the number of eigenvalues is proportional to the number of grid points used to represent the system which is in our case about 160 000. Hence, the comparison of WW with a calculation using 384 points is meaningless. In [2], we only show the part of the spectrum (approximately $1\% \approx \delta/\lambda$) that is relevant for the SER. However, when comparing our results with those obtained with a method that is solving the eigenvalue problem for a PC, an infinite periodic structure, such as the method used by WW [1,3], one has to take into account that (1) we simulate a small area of the PC with PEC boundaries (not with periodic boundaries) and do not explicitly use the symmetry properties of the PC; (2) the holes in the PC are not perfectly circular and equal, in spite of the fine spatial discretization. It is well known that the finite size of the PC affects the SER [4,5]. Moreover, by not using the crystal symmetry in our simulations, presenting results for a PC is as valuable as if we would have presented results for a microcavity of arbitrary geometry.

The LRDOS, being a sum of Dirac delta functions, is a distribution or a measure, not a "curve," as claimed by WW. "Smoothed" pictures of the LRDOS are the results of using a suitable test function [6]. In Figs. 3 and 4 of [2] we show the raw numerical data for the LRDOS without any smoothing. In order to increase the resolution in k space, it is necessary to increase the size of the system. In contrast to the claim of WW, reducing the grid spacing in the FDTD calculation does not improve the resolution in k space, though it may further improve the accuracy and reduce the numerical dispersion effects [7]. Summarizing, WW compare numerical results for two very different problems, an infinite PC and a small part of a crystal. In addition, based on their (incorrect) assessment of our LRDOS results, WW conclude that our results for $U(t)$ are also questionable. This inference is logically incorrect since it involves two different computations.

In conclusion, using the FDTD method to compute the LRDOS gives only qualitative information about the SER, while computing the energy $U(t)$ gives quantitative information about the SER. By using the unconditionally stable FDTD method to compute $U(t)$, we are guaranteed that, in the absence of external currents, the algorithm conserves the energy exactly. This ensures that the time dependence of $U(t)$ is due to the presence of the source only. Hence, extracting the SER from short-time FDTD simulation data of $U(t)$, obtained by an unconditionally stable method to solve the time-dependent Maxwell equations, may be a simple and efficient method to study spontaneous emission in arbitrary microcavities.

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