Stern *et al.* Reply: It is well understood that the dipole-dipole interaction, $U(r)$, between excitons creates a depletion region with a radius r_0 around each exciton, and thereby decreases the interaction energy by a factor f. Ivanov *et al.* argue that in determining the value of f one should account for screening by the surrounding excitons, and provide a model predicting large values of f, up to $f \approx 0.8$ at exciton density of 10^{11} cm^{-2}. We shall show in the following that the approach used in [1] to account for the screening is flawed, and that one can safely neglect the screening by the surrounding excitons.

We first note that in deriving Eq. (1), Ivanov *et al.* implicitly assumed that a *local thermodynamic equilibrium* is established in the nanoscopic depletion region. To see this, one writes the local chemical potential μ_l at the depletion region as $\mu_l = T\ln\{1 - \exp[\pi\hbar^2 n_l/(2MT)\} + \langle H_l \rangle$, and a similar expression for the chemical potential at infinity μ_∞. Here $\langle H_l \rangle = U + u_0 n_l$ and $\langle H_\infty \rangle = u_0 n$ (we use the same notations as in [1]). It is easy to show that by requiring that $\mu_l = \mu_\infty$ one obtains Eq. (1). However, to be able to define a *local* chemical potential within the depletion region it is required that the mean free path $l = (2r_0 n)^{-1}$ of the excitons is much smaller than $r_0 \sim (e^2 d^2/\epsilon T)^{1/3}$. Contrary to the claim in Ref. [5] of the Comment, this is a basic requirement for defining a thermodynamic quantity in any system: electron gas, excitons, or air. It is easy to show that at $T \leq 6$ K and $n \leq 5 \times 10^{10}$ cm^{-2} this requirement is not satisfied. This undermines the basis for the derivation of Ivanov *et al.* and consequently invalidates their conclusions. The complexity of the problem calls for a careful analysis, certainly if one wishes to draw quantitative conclusions. However, one can make a qualitative argument which justifies neglecting the effect of screening. This argument is based on a recent paper [2] that shows that the major contribution to the interaction energy comes from a small subset of the excitons that reside very close to each other, $r \ll n^{-1/2}$. Since the probability to find several or many excitons between these nearby excitons is very low, it is plausible to neglect the screening by the surrounding excitons.

Ivanov *et al.* use the quantum mass action law to estimate the density of free electron-hole pairs (e-h), $n_{e\text{-}h}$, and conclude that the population is mostly excitonic even at total density, n_{total}, approaching 10^{11} cm^{-2}. The curves they show, however, are for the lowest part of the density range, e.g., for $n_{\text{total}} \leq 2 \times 10^{10}$ cm^{-2}. Even at this low density range $n_{e\text{-}h}$ would increase significantly for more realistic values of the exciton binding energy and radius. Figure 1(a) shows the density of free e-h as a function of temperature for $n_{\text{total}} = 4 \times 10^{10}$ cm^{-2}. A sharp rise of $n_{e\text{-}h}$ is clearly seen above 4 K, which is indeed the Mott transition [3]. The strong effect of the screening by the free e-h is readily visible by comparing the dashed line (which assumes no screening) to the solid line, in contradiction to the claim of Ivanov *et al.* These calculations (as well as those in the Comment) use a simple static screening model. Clearly, a more realistic screening model is needed to predict quantitatively the threshold for the Mott transition.

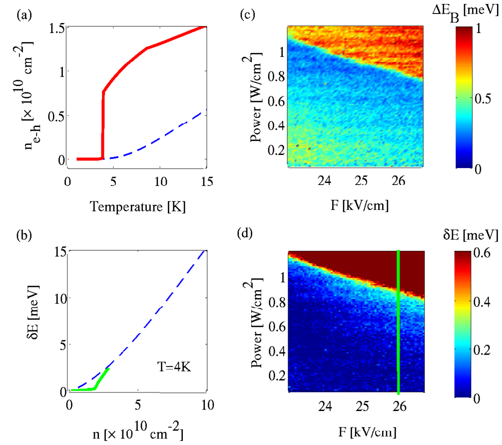

FIG. 1 (color online). (a) Calculated $n_{e\text{-}h}$ as a function of temperature for $n_{\text{total}} = 4 \times 10^{10}$ cm^{-2} and $E_b = 3$ meV, assuming no screening (dashed line) and static screening (solid line). (b) The blueshift δE as a function of density as predicted by Ivanov *et al.* (dashed line) and the experimental data at $F = 26$ kV/cm (solid line). (c) The diamagnetic shift, ΔE_B, at $B = 1$ T and (d) the blueshift, δE, as a function of power and electric field F at $T = 4$ K.

Finally, we compare the model suggested in [1] with the experimental findings. In Fig. 1(b) we show the blueshift δE as a function of density as predicted in [1]. It is seen that it predicts huge values of δE, as high as 16 meV, for excitons with a binding energy of only 3 meV. To examine this prediction, we performed a diamagnetism measurement on the same sample with a broad defocused beam, thus eliminating the effects of lateral diffusion and ring formation [Fig. 1(c)]. A clear abrupt change from excitonic to free e-h behavior is observed at very low δE [4]. We find that excitonic diamagnetism is observed only at low blueshift, $\delta E \approx 0.3$ meV, and at large blueshifts, $\delta E \gtrsim 1$ meV, the system is of free e-h. This experimental evidence contradicts the main claim of the Comment.

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