Jiang *et al.* Reply: In the preceding Comment by Konig, Gefen, and Silva [1], their main point is to question the approximation we used in solving the Green's function $G^r_{dd}(\omega)$ of the quantum dot (QD) [2]. They believe that our approximation is inappropriate to describe spin-flip-related dephasing processes caused by intradot interaction. We agree that we, indeed, used an approximation in calculating $G^r_{dd}(\omega)$. However, we emphasize that we have taken the higher-order terms in solving $G^r_{dd}(\omega)$ than appeared in their previous publications [3,4]. Our results are similar to theirs (like the asymmetric AB oscillation), except our interpretation of those results and conclusion are different from theirs.

Before we make detailed comparisons, we would first like to make several remarks. (i) They and we used the same formulas to calculate the current [5]. (ii) In their device as well as ours, the interaction exists only in the QD, so all Green functions can be exactly expressed using the intradot Green function $G^r_{dd}(\omega)$ [5]. This means once $G^r_{dd}(\omega)$ is obtained, then all other Green functions as well as the current can be calculated without any further approximations. (iii) By using those exact relations among the Green functions, the current can be expressed solely by $G^r_{dd}(\omega)$. In their paper [4], they write down the current expressions [see their Eqs. (3.9) and (3.12)] without much justification. In our work, we calculate G^r_{dd}, then other Green functions, and finally the current. It is obvious that these two approaches are exactly the same. The only difference between our formalism and theirs is what to use for $G^r_{dd}(\omega)$.

Now let us compare the approximations used in their work and ours in calculating the Green function $G^{r(0)}_{dd}$ or G^r_{dd} for a very small $t_{\rm ref}$.

In our work [2], we first exactly calculate the isolated QD Green functions $g^r_{dd}(\omega)=[\omega-\epsilon_{d\sigma}-U+Un_{\bar\sigma}]/[(\omega-\epsilon_{d\sigma})(\omega-\epsilon_{d\sigma}-U)]$. As a second step, we use the Dyson equation to obtain G^r_{dd}: $G^r_{dd} = g^r_{dd} + g^r_{dd}t_1\tilde g^r_{11}t_1G^r_{dd} + g^r_{dd}t_4\tilde g^r_{44}t_4G^r_{dd} + g^r_{dd}t_1\tilde g^r_{14}t_4G^r_{dd} + g^r_{dd}t_4\tilde g^r_{41}t_1G^r_{dd}$, where $\tilde g^{r,<}$ are the Green functions of the device decoupled to the QD (i.e., with $t_1 = t_4 = 0$) and they can be solved exactly. We agree that the second step is not exact, but it is a fairly good approximation while the QD is weakly coupled to other parts of the system.

Furthermore, if only for analytical results (i) and (ii) on page 3 in our Letter, not for the numerical calculations, we do not need to use the above approximation. We may first assume that the Green functions $\tilde G^r$ for the system decoupled to the source and drain leads has been exactly solved. Thus, $\tilde G^r$ is definitely beyond the Hartree approximation. Second, we use the Dyson equation to obtain the Green function of the whole system. Then the results (i) and (ii) on page 3 can also be obtained in a straightforward manner although $\tilde G^r$ is still unknown.

Next, let us examine what approximations are used in their papers [3,4]. (i) For $U=0$, they get $G^{r(0)}_{dd}(\omega) = 1/(\omega-\epsilon_d+i0^+)$, where ϵ_d is the intradot level. (ii) For $U=\infty$, in calculating the first-order flux-dependent current $I^{(1)}$ they take $G^{r(0)}_{dd} = (P_0+P_\sigma)/(\omega-\epsilon_d+i0^+) = \frac{1}{1+f(\epsilon_d)}\frac{1}{\omega-\epsilon_d+i0^+}$. (iii) For $U=\infty$, in calculating the zeroth-order current $I^{(0)}$ [i.e., to obtain Eq. (3.16) from Eq. (3.9) in Ref. [4]] they take $G^{r(0)}_{dd} = (P_0+P_\uparrow+P_\downarrow)\times \frac{1}{\omega-\epsilon_d+i(\Gamma_L+\Gamma_R)/2} = \frac{1}{\omega-\epsilon_d+i(\Gamma_L+\Gamma_R)/2}$. So they do not calculate $G^{r(0)}_{dd}$ at all, and they directly write down $G^{r(0)}_{dd}$ from their intuitive picture. In particular, for $U=\infty$ they use different expressions of $G^{r(0)}_{dd}$ in the currents $I^{(0)}$ and $I^{(1)}$. Notice that there is only one $G^{r(0)}_{dd}$, and it should not be given two different expressions.

It is worth mentioning that they consider that our approximation method loses all the dephasing processes. However, we still obtain the asymmetric AB oscillation. For the sake of argument, let us assume they are right. Then it means that the asymmetric AB oscillation amplitude can be obtained without considering the dephasing processes. So one cannot obtain the dephasing conclusion from the asymmetric amplitude, contradictory to their conclusion.

Finally, we reply to their other three comments. (i) They comment that $r_T > 1$ near resonance in our Fig. 2 invalidates it as a good measure of coherence. In fact, this has been emphasized in our Letter [2], e.g., see the paragraph after Eq. (1), or the left column of page 3, etc. (ii) They comment that our Eq. (4) is wrong, as it relies on the single-particle formalism. Notice in Eq. (4) we discuss the case of $U=0$ [see the paragraph before Eq. (4)]. (iii) They comment that $\Delta G(\phi)$ should be zero at $\phi=0$. We made a typographical error in the figure caption: ΔG should be defined as $\Delta G \equiv G(\phi) - G_0$. We gratefully acknowledge them for pointing this out.

In conclusion, we believe that the $e-e$ interaction does not induce the dephasing effect, and the asymmetric AB amplitude originates from the constraint of the closed two-terminal setup.

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Received 26 September 2004; published 5 May 2005
DOI: 10.1103/PhysRevLett.94.179702
PACS numbers: 73.23.Hk, 73.40.Gk, 73.63.Kv

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