Erratum: Coherent spin rotations in open driven double quantum dots [Phys. Rev. B 77, 165312 (2008)]

Rafael Sánchez, Carlos López-Monís, and Gloria Platero

(Received 17 February 2009; published 17 March 2009)

DOI: 10.1103/PhysRevB.79.119903 PACS number(s): 73.23.Hk, 73.40.Gk, 73.63.Kv, 85.75.−d, 99.10.Cd

In our paper, we describe the electronic dynamics in an open double quantum dot in the spin blockade regime under the effect of crossed dc and ac magnetic fields. In the case when the dc magnetic field is inhomogeneous, we found that the introduction of a bichromatic ac magnetic field allows one to trap the system in a superposition of states that suppresses transport, in analogy with coherent population trapping, cf. Sec. III in our paper. In effect, if we consider the Hamiltonian term

$$\hat{\tilde{H}}^{(2)}_{\mathrm{B},0}(t) = \sum_{i=\mathrm{L,R}} [\Delta_i \hat{S}^i_z + B_{\mathrm{ac}}(\hat{S}^i_x \cos \Delta_i t + \hat{S}^i_y \sin \Delta_i t)], \tag{1}$$

we can perform a unitary transformation, $\hat{U}(t) = e^{-i\Sigma_j \omega_j \hat{S}^j_z t}$, that removes the time dependence:

$$\hat{H}^{(2)\prime}_{\mathrm{B},0} = \hat{U}(t)^\dagger (\hat{\tilde{H}}^{(2)}_{\mathrm{B},0}(t) - i\hbar\partial_t)\hat{U}(t) = \sum_{i=\mathrm{L,R}} [(\Delta_i - \hbar\omega_i)\hat{S}^i_z + B_{\mathrm{ac}}\hat{S}^i_x]. \tag{2}$$

When the double resonance condition $\hbar\omega_i = \Delta_i$ is fulfilled, the superposition $|S_2\rangle = \frac{1}{\sqrt{2}}(|\uparrow,\uparrow\rangle - |\downarrow,\downarrow\rangle)$ is a zero-eigenvalue eigenstate of (2) but not of (1), as was said in our paper. Then, the back transformed state

$$|\psi_{\mathrm{d}}(t)\rangle = \frac{1}{\sqrt{2}}(e^{-i(\Delta_{\mathrm{L}}+\Delta_{\mathrm{R}})t}|\uparrow,\uparrow\rangle - e^{i(\Delta_{\mathrm{L}}+\Delta_{\mathrm{R}})t}|\downarrow,\downarrow\rangle) \tag{3}$$

is not affected by the ac magnetic field. Additionally, due to the Pauli exclusion principle, which avoids tunneling, one finds that $e^{-i(\varepsilon_{\mathrm{L}}+\varepsilon_{\mathrm{R}}+V)t}|\psi_{\mathrm{d}}(t)\rangle$ is a solution of the Schrödinger equation for the closed double quantum dot and, therefore, is the dark state we were looking for. This error does not affect the results and conclusions of this paper.

Also, the explicit time dependence should be removed from the Hamiltonian in Eq. (1) of our paper.

We acknowledge Maria Busl for pointing out our error.

