

## Erratum: Nonperturbative correlation effects in diluted magnetic semiconductors [Phys. Rev. B **93**, 035206 (2016)]

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The starting point of this paper is the equation of motion (5) for the carrier spin component perpendicular to the impurity magnetization, which has been derived in Ref. [1]. In Eq. (5), a cross-product sign is not printed accurately. Furthermore, in the derivation of this equation in Ref. [1], it was assumed that the effective magnetic field  $\omega_M$  for the carrier spins caused by the impurity magnetization is parallel to the total impurity spin, i.e., the coupling constant  $J_{sd}$  is positive. In the present paper, however, this equation has been applied to the conduction band of CdTe where this condition is not fulfilled. To correct this error, the corresponding equation of motion needs to be derived for an arbitrary sign of  $J_{sd}$ . Toward that end, it is useful to define the quantization axis ( $z$ ) as pointing in the direction of  $\omega_M$ . Then, also the spin-up and spin-down occupations  $n_{\mathbf{k}}^{\uparrow}$  and  $n_{\mathbf{k}}^{\downarrow}$  as well as the parallel impurity spin operator  $S^{\parallel} = \hat{\mathbf{S}} \cdot \frac{\omega_M}{|\omega_M|}$  in the definition of the factors  $b^i$  in Eq. (5) should be defined with respect to the direction of  $\omega_M$ . In this coordinate system, Eq. (5) should be replaced by [2]

$$\begin{aligned} \frac{\partial}{\partial t} \mathbf{s}'_{\mathbf{k}_1} = & - \sum_{\mathbf{k}} \left[ \text{Re}(G_{\omega_{\mathbf{k}}}^{\omega_{\mathbf{k}_1} - \omega_M}) \left( \frac{b^+}{2} - b^0 n_{\mathbf{k}}^{\uparrow} \right) \mathbf{s}'_{\mathbf{k}_1} + \text{Re}(G_{\omega_{\mathbf{k}}}^{\omega_{\mathbf{k}_1} + \omega_M}) \left( \frac{b^-}{2} + b^0 n_{\mathbf{k}}^{\downarrow} \right) \mathbf{s}'_{\mathbf{k}_1} + \text{Re}(G_{\omega_{\mathbf{k}}}^{\omega_{\mathbf{k}_1}}) \frac{b^{\parallel}}{2} (\mathbf{s}'_{\mathbf{k}} + \mathbf{s}'_{\mathbf{k}_1}) \right] \\ & - \sum_{\mathbf{k}} \left[ \text{Im}(G_{\omega_{\mathbf{k}}}^{\omega_{\mathbf{k}_1} - \omega_M}) \left( \frac{b^+}{2} - b^0 n_{\mathbf{k}}^{\uparrow} \right) - \text{Im}(G_{\omega_{\mathbf{k}}}^{\omega_{\mathbf{k}_1} + \omega_M}) \left( \frac{b^-}{2} + b^0 n_{\mathbf{k}}^{\downarrow} \right) \right] \left( \frac{\omega_M}{|\omega_M|} \times \mathbf{s}'_{\mathbf{k}_1} \right). \end{aligned} \quad (5')$$

As a consequence, using the equation derived in Ref. [1] with a negative value of  $J_{sd}$  led to the wrong sign of the relative frequency renormalization  $\frac{\Delta\omega}{\omega_M}$  in Figs. 1 and 3. Actually, the correlation-induced renormalization enhances the precession frequency instead of decreasing it, independently of the sign of  $J_{sd}$ . The magnitude of the renormalization, however, is not influenced.

Also, Eq. (6) has an error with parentheses. It should read

$$G_{\omega_{\mathbf{k}}}^{\omega_{\mathbf{k}_1}} := \frac{J_{sd}^2 n_{Mn}}{\hbar^2 V} \int_{-t}^0 dt' e^{i(\omega_{\mathbf{k}} - \omega_{\mathbf{k}_1})t'}. \quad (6')$$

Furthermore, a factor  $\frac{1}{2}$  is missing in Eq. (21). The corrected version of Eq. (21) is

$$\langle H_{sd}^{\text{cor}} \rangle = - \frac{J_{sd}^2 n_{Mn} \langle S^2 \rangle}{\hbar V} \frac{Am^*}{2} \sum_{\mathbf{k}_1} \ln \left| \frac{\omega_{BZ} - \omega_{\mathbf{k}_1}}{\omega_{\mathbf{k}_1}} \right| n_{\mathbf{k}_1}. \quad (21')$$

Also, due to an error in the computer program, the evaluation of the correlation energy according to Eq. (21) led to a wrong value. For the situation described in this paper, the value of the average correlation energy per electron,  $\langle H_{sd}^{\text{cor}} \rangle / (\sum_{\mathbf{k}} n_{\mathbf{k}})$ , is not  $-1.8 \mu\text{eV}$ , but rather  $-0.34 \text{ meV}$ , which corresponds to a temperature of  $T \approx 4 \text{ K}$ .

The above errors have little influence on the conclusion about the frequency renormalization. While the sign of the frequency renormalization has to be changed, the magnitude remains the same. However, the relatively large corrected value of the correlation energy indicates that the carrier-impurity correlations are strong in low-temperature experiments and should therefore not be neglected, as is usually done by invoking a semiclassical approximation [3–7].

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