Erratum: Spin-dependent boundary conditions for isotropic superconducting Green's functions [Phys. Rev. B 80, 184511 (2009)]

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We correct below some inaccuracies of Ref. 1. Our other equations and conclusions are not affected by these changes.

(1) Equations (61) and (62) and the definition of $G_\phi^{L(R)}$ have to be corrected as

$$\begin{aligned}2\check{I}_L(\varepsilon) = {} & G_T[\check{G}_R,\check{G}_L] + G_{MR}[\{\check{\sigma}_Z,\check{G}_R\},\check{G}_L] \\ & + iG_\phi^L[\check{\sigma}_Z,\check{G}_L] + iG_\chi^L[\check{G}_R\check{G}_L\check{\sigma}_Z + \check{\sigma}_Z\check{G}_L\check{G}_R,\check{G}_L] \\ & + iG_\chi^R[\check{G}_R[\check{\sigma}_Z,\check{G}_R],\check{G}_L]\end{aligned} \tag{1}$$

and

$$\begin{aligned}2\check{I}_R(\varepsilon) = {} & G_T[\check{G}_R,\check{G}_L] + G_{MR}[\check{G}_R,\{\check{\sigma}_Z,\check{G}_L\}] \\ & - iG_\phi^R[\check{\sigma}_Z,\check{G}_R] - iG_\chi^R[\check{G}_L\check{G}_R\check{\sigma}_Z + \check{\sigma}_Z\check{G}_R\check{G}_L,\check{G}_R] \\ & - iG_\chi^L[\check{G}_L[\check{\sigma}_Z,\check{G}_L],\check{G}_R]\end{aligned} \tag{2}$$

with $G_\phi^{L(R)}/G_q = -2\sum_n d\varphi_n^{L(R)}$. The definitions of the other coefficients, G_T, G_{MR}, and $G_\chi^{L(R)}$, are unchanged.

(2) In the normal-state limit, the above Eqs. (1) and (2) agree with the boundary conditions introduced formerly[2,3] [see Eq. (C4) of Ref. 1], provided the reflection and transmission mixing conductances $G_{\rm mix}^{L(R),r}$ and $G_{\rm mix}^t$ appearing in this limit are replaced by their expansions to first order in T_n, i.e.,

$$G_{\rm mix}^{L(R),r} \rightarrow (G_T/2) + i\big(G_\phi^{L(R)}/2\big) + 2iG_\chi^{L(R)}$$

and

$$G_{\rm mix}^t \rightarrow (G_T/2) + i\big(G_\chi^L + G_\chi^R\big).$$

(3) At the end of Secs. VII D and VIII A, we indicated a rule to generalize the boundary conditions for isotropic Green's functions (60), (61), (62), and (73) to an arbitrary spin reference frame $(\check{\sigma}_X,\check{\sigma}_Y,\check{\sigma}_Z)$. This rule has to be corrected. When the barrier $\bar{V}_b$ is polarized along a direction $\vec{m}$, one should replace $\check{\sigma}_Z$ by $((1+\check{\tau}_3)\sigma_Z(\vec{m}\cdot\check{\vec{\sigma}})\sigma_Z + (\check{\tau}_3 - 1)\sigma_y(\vec{m}\cdot\check{\vec{\sigma}})\sigma_y)/2$. This rule can be simplified by defining differently the spinors and Green's functions.

(4) The commutators and anticommutators have a special meaning when they are applied to the $\mathbf{\Psi}$ and $\mathbf{\Psi}^\dagger$ operators [see Eqs. (3) and (4) of Ref. 1]; i.e.,

$$\begin{aligned}\{\mathbf{\Psi}(1),\mathbf{\Psi}^\dagger(2)\}_{\mathcal{T}} &= \mathbf{\Psi}(1)\cdot\mathbf{\Psi}^\dagger(2) + \mathcal{T}[\mathcal{T}[\mathbf{\Psi}^\dagger(2)]\cdot\mathcal{T}([\mathbf{\Psi}(1)]],\\ [\mathbf{\Psi}(1),\mathbf{\Psi}^\dagger(2)]_{\mathcal{T}} &= \mathbf{\Psi}(1)\cdot\mathbf{\Psi}^\dagger(2) - \mathcal{T}[\mathcal{T}[\mathbf{\Psi}^\dagger(2)]\cdot\mathcal{T}[\mathbf{\Psi}(1)]],\end{aligned}$$

with $\mathcal{T}$ the transposition operator in the Nambu⊗spin space.

(5) Above Eq. (10), we assume that $\check{G}$, $\check{\Sigma}_{\rm imp}$ and $\check{\Delta}$ can be considered independent of $\vec{\rho}$. However, it is inaccurate to justify these assumptions from the fact of considering wide contacts. It is more accurate to simply state that we consider a geometry where $\check{G}$, $\check{\Sigma}_{\rm imp}$, and $\check{\Delta}$ are independent of $\vec{\rho}$.

(6) To write the Usadel equation as in Eq. (E2), one needs to assume $\Delta(z)\in\mathbb{R}$.

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