Erratum to: Theories of Linear Response in BCS Superfluids and How They Meet Fundamental Constraints

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Due to some typos in the preparation of the revised version of this manuscript, some equations are incorrect. We show the correct equations as follows. All the discussions and conclusions remain intact. Equation (115) should be

$$\hat{\gamma}_S^\mu(P+Q, P) = \begin{pmatrix} \gamma_{S\uparrow}^\mu(P+Q, P) & 0 \\ 0 & -\gamma_{S\downarrow}^\mu(-P, -P-Q) \end{pmatrix}.$$

Equation (116) should be

$$\tilde{Q}_S^{\mu\nu}(Q) = \frac{n}{m} h^{\mu\nu} + \sum_P (\gamma_{S\uparrow}^\mu(P+Q, P) G(P+Q) \gamma_{S\uparrow}^\nu(P, P+Q) G(P)$$

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$$\begin{aligned}
& -\gamma_{S\uparrow}^{\mu}(P+Q, P)F(P+Q)\gamma_{S\downarrow}^{\nu}(-P-Q, -P)F(P) \\
& -\gamma_{S\downarrow}^{\mu}(-P, -P-Q)F(P+Q)\gamma_{S\uparrow}^{\nu}(P, P+Q)F(P) \\
& +\gamma_{S\downarrow}^{\mu}(-P, -P-Q)G(-P-Q)\gamma_{S\downarrow}^{\nu}(-P-Q, -P)G(-P)) \\
& = \frac{n}{m}h^{\mu\nu} + \sum_P (\gamma_{S\uparrow}^{\mu}(P+Q, P)G(P+Q)\gamma_{S\uparrow}^{\nu}(P, P+Q)G(P) \\
& -\gamma_{S\uparrow}^{\mu}(-P, -P-Q)F(P)\gamma_{S\downarrow}^{\nu}(P, P+Q)F(P+Q) \\
& -\gamma_{S\downarrow}^{\mu}(-P, -P-Q)F(P+Q)\gamma_{S\uparrow}^{\nu}(P, P+Q)F(P) \\
& +\gamma_{S\downarrow}^{\mu}(P+Q, P)G(P)\gamma_{S\downarrow}^{\nu}(P, P+Q)G(P+Q)).
\end{aligned}$$

Equation (117) should be

$$\Gamma_{S\sigma}^{\mu}(P+Q, P) = \gamma_{S\sigma}^{\mu}(P+Q, P) - \Delta^2 G_0(-P)\gamma_{S\bar{\sigma}}^{\mu}(-P, -P-Q)G_0(-P-Q).$$

Please ignore the statement “which is the same as its EM counterpart except there is a minus sign.” below Eq. (117). Equation (118) should be

$$\begin{aligned}
q_{\mu}\Gamma_{S\sigma}^{\mu}(P+Q, P) &= S_{\sigma}(G_0^{-1}(P+Q) - G_0^{-1}(P)) \\
&\quad + S_{\sigma}\Delta^2 G_0(-P)G_0(-P-Q)(G_0^{-1}(-P) - G_0^{-1}(-P-Q)) \\
&= S_{\sigma}(G_0^{-1}(P+Q) - G_0^{-1}(P)) - S_{\sigma}(\Sigma(P+Q) - \Sigma(P)) \\
&= S_{\sigma}(G^{-1}(P+Q) - G^{-1}(P)).
\end{aligned}$$

Moreover, the equation number for the Ward identity (or WI) above Eqs. (113) and (118) was labeled as (74), but it should be labeled as (118).