Erratum: Diagrammatic expansion for positive spectral functions beyond GW : Application to vertex corrections in the electron gas [Phys. Rev. B **90, 115134 (2014)]**

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In our original paper we proposed a diagrammatic approach to generate approximate spectral function with the positive semidefiniteness (PSD) property. The proposed approach stands as is, but we have missed a diagram in the PSD self-energy of Fig. 15. Specifically, the fourth partition in Fig. 10, named Σ_5 in our original paper, can be written in terms of half-diagrams as illustrated in Fig. 13. If one properly labels the dangling lines (see Fig. 1), then Σ_5 reads

$$\Sigma_5^< = i \sum_{i_1 j_1 i_2 j_2=1}^{\infty} \sum_{pq} D_{p_1 p_2 p_3 q_1 q_2}^{(i_2 j_2)} D_{p_2 p_1 p_3 q_2 q_1}^{(i_1 j_1)*} \quad (1)$$

which differs from the last term of Eq. (44) since in D^* the indices (p_1, p_2) and (q_1, q_2) are interchanged with respect to D . As a consequence Σ_5 is *not* a perfect square. According to the rules in Eqs. (30)–(32) the additional partition to consider for restoring

FIG. 1. Same as Fig. 13 but with labels on the dangling lines.

$$\Sigma_{5,\text{PSD}}^< = \text{diagram 1} + \text{diagram 2}$$

FIG. 2. PSD form of Σ_5 .

the PSD property leads to

$$\Sigma_{5,\text{PSD}}^< = i \sum_{i_1 j_1 i_2 j_2=1}^{\infty} \sum_{\underline{pq}} D_{p_1 p_2 p_3 q_1 q_2}^{(i_2 j_2)} (D_{p_1 p_2 p_3 q_1 q_2}^{(i_1 j_1)*} + D_{p_2 p_1 p_3 q_2 q_1}^{(i_1 j_1)*}) \quad (2)$$

whose diagrammatic representation is given in Fig. 2.

The first partition in Fig. 2 is contained in the second diagram of Fig. 15. Instead the second partition should be added to the diagrams of Fig. 15 to guarantee the PSD property. Notice that the added partition contains a GW self-energy insertion. Therefore, if one works with GW Green's functions this partition should be discarded for otherwise a double counting would occur.

In conclusion, the correct expression for the PSD self-energy with vertex correction and random-phase approximation (RPA) screened interaction reads

$$\begin{aligned} \Sigma_{\text{PSD}}^< = & i \sum_{j_1 j_2=1}^{\infty} \sum_{P \in \pi_2} (-)^P \sum_{\underline{pq}} (D_{p_1 p_2 q_1}^{(j_2)} + \tilde{D}_{p_1 p_2 q_1}^{(j_2)}) (D_{P(p_1)P(p_2)q_1}^{(j_1)*} + \tilde{D}_{P(p_1)P(p_2)q_1}^{(j_1)*}) \\ & + i \sum_{i_1 j_1 i_2 j_2=1}^{\infty} \sum_{\underline{pq}} D_{p_1 p_2 p_3 q_1 q_2}^{(i_2 j_2)} (D_{p_1 p_2 p_3 q_1 q_2}^{(i_1 j_1)*} + D_{p_2 p_1 p_3 q_2 q_1}^{(i_1 j_1)*}), \end{aligned} \quad (3)$$

and Fig. 15 should be replaced by Fig. 3 below.

$$\Sigma_{\text{PSD}}^< = \text{diagram 1} + \text{diagram 2} + \text{diagram 3} + \text{diagram 4} + \text{diagram 5} + \text{diagram 6} + \text{diagram 7}$$

FIG. 3. PSD self-energy with vertex correction and RPA screened interaction.