# Corrigendum to Thesis: Majorana Fermions at Self Generated Interfaces

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June 3, 2025

**Correction Notice:**

1. In the originally published version of this thesis, the constant appearing in the RPA theory on page 34 was incorrectly written as $2\lambda$, as referenced in Appendix A. The correct value of the constant is $\lambda/2$, as clarified in Appendix B. This discrepancy is an error only in the writing of the equations and does not affect the figures presented or the scientific conclusions of the thesis.
2. The CDW line in the phase diagrams on page 43 cannot be considered reliable, as a deeper understanding of the system's behavior has revealed limitations in its construction. A revised version is in progress. This does not affect the phase diagrams themselves or the remainder of the thesis.

The errors have been corrected in the online version of the thesis. The author apologizes for the oversight.

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Online Access to Thesis: https://github.com/nikolaprodanov/Master-Thesis

# Appendix A: Original Page with Error



Let's analyze the susceptibility given in equation (3.6). We can interpret the expression as a bubble diagram $\mathcal{B}_0(q)$, which represents the difference between two distinct bubble diagrams: one composed of two regular Green's functions and another composed of two anomalous Green's functions, see Figure 3.5.

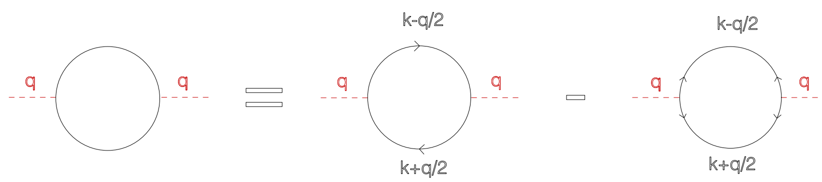



**Figure 3.5.** Representation of the bubble diagram $\mathcal{B}_0(q)$. This diagram consists of two components: one bubble diagram featuring two regular Green's functions, and another bubble diagram featuring two anomalous Green's functions, with the latter being subtracted from the former. In the diagram, the black lines denote the Green's functions, while the red line denote the external field.

RPA theory explains that in the presence of an external field modulated by a wavevector $q$, the bubble diagram $\mathcal{B}_0(q)$ represents the zeroth order in the terms of the coupling constant of the system with the external field. This corresponds to the scenario where no external field is present. In contrast, the real bubble diagram $\mathcal{B}(q)$ includes an infinite series of higher-order bubble diagrams with increasing powers of the coupling constant. Refer to Figure 3.6.

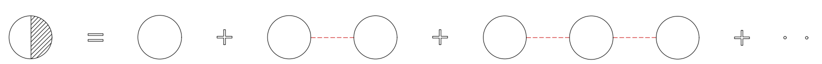


**Figure 3.6.** Representation of the real bubble diagram $\mathcal{B}(q)$ at $T = 0K$ from RPA theory. The empty bubbles represent the no-interaction bubble diagram $\mathcal{B}_0(q)$ meanwhile the red dashed lines represent the coupling with the external field. RPA theory suggest that the real bubble diagram is an infinite sum of combinations of the no-interacting bubble diagram and the coupling with the Field.

Given that the coupling constant appearing in the RPA is $2\lambda$, which can be derived by examining the Peierls instability at half-filling, the real bubble diagram is:

$$\mathcal{B}(q) = \mathcal{B}_0(q) + \mathcal{B}_0(q)2\lambda\mathcal{B}_0(q) + \mathcal{B}_0(q)2\lambda\mathcal{B}_0(q)2\lambda\mathcal{B}_0(q) + ... = \frac{\mathcal{B}_0(q)}{1 - 2\lambda\mathcal{B}_0(q)} \tag{3.14}$$

Which translates equivalently to the susceptibility $\chi(q)$ as:

$$\chi(q) = \frac{\chi_0(q)}{1 - 2\lambda\chi_0(q)} \tag{3.15}$$

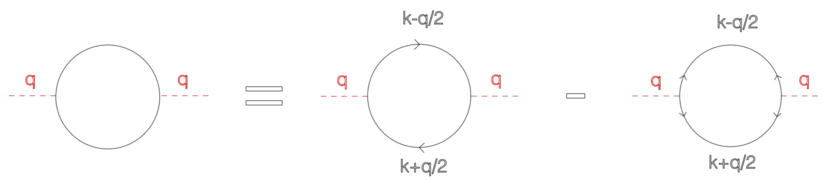
Where $\chi_0(q)$ would denote the Kitaev susceptibility without the electron-field interaction. The new evaluated susceptibility may diverge if the denominator in (3.15) is zero. This condition indicates that there is a divergence of the susceptibility if and only if:

$$1 - 2\lambda\chi_0(q) = 0 \tag{3.16}$$

# Appendix B: Corrected Page



Let's analyze the susceptibility given in equation (3.6). We can interpret the expression as a bubble diagram $\mathcal{B}_0(q)$, which represents the difference between two distinct bubble diagrams: one composed of two regular Green's functions and another composed of two anomalous Green's functions, see Figure 3.5.

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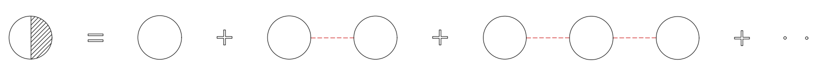

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Given that the coupling constant appearing in the RPA is $\frac{\lambda}{2}$, which can be derived by examining the Peierls instability at half-filling, the real bubble diagram is:

$$\mathcal{B}(q) = \mathcal{B}_0(q) + \mathcal{B}_0(q)\frac{\lambda}{2}\mathcal{B}_0(q) + \mathcal{B}_0(q)\frac{\lambda}{2}\mathcal{B}_0(q)\frac{\lambda}{2}\mathcal{B}_0(q) + ... = \frac{\mathcal{B}_0(q)}{1 - \frac{\lambda}{2}\mathcal{B}_0(q)} \tag{3.14}$$

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