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Luttinger liquid on a lattice

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Stellingen

behorende bij het proefschrift

Luttinger liquid on a lattice

1. The lattice artefacts encountered by Wang, Assaad, and Ulybyshev [Phys. Rev. B **108**, 045105 (2023)] in the discretization of the Luttinger model can be avoided by a local space-time discretization of the action.

Chapter 2.

2. The existence of an exact matrix-product-operator (MPO) representation with scale-independent bond dimension for a translationally invariant hopping Hamiltonian is equivalent to the ability to obtain its spectrum from a local generalized eigenvalue problem.

Chapter 3.

3. The spectral localizer can act as a landscape function that identifies Majorana zero-modes in a disordered chiral p -wave superconductor.

Chapter 4.

4. The bulk conductance of a two-dimensional system in a perpendicular magnetic field, enabled by Van Hove singularities near the Brillouin zone edge, is only measurable if the lattice constant exceeds the nanometer scale.

Chapter 5.

5. The zero-bias conductance peak in a double-barrier normal-superconductor junction splits when the ratio of barrier transmissions reaches a critical value.

C.W.J. Beenakker and V.A. Zakharov, arXiv:2506.18515

6. The computer simulation of the chiral 3-4-5-0 model, reported by Meng Zeng *et al.* [Phys. Rev. Lett. **128**, 185301 (2022)], cannot be considered a validation of the “Boundary Fully Gapping Rules” for symmetric mass generation of Wang and Wen [arXiv:1307.7480].

7. The specification of the scale factor of the spectral localizer in terms of the norm of the Hamiltonian matrix, given by Doll, Loring, and Schulz-Baldes [arXiv:2403.18931], is not reliable.

8. Surface acoustic wave induced transparency in the reflection spectrum exhibits magnetochiral anisotropy, appearing only when the wave propagates in a direction that aligns its angular momentum with the external magnetic field, enabling resonant coupling to spin-split hole states.

9. Being politically apathetic is irresponsible and dangerous, like covering your eyes and ears in a room with a known predator.
10. The modern Russian regime exhibits thirteen out of the fourteen defining features of fascism in Umberto Eco, *Ur-Fascism* (1995).
11. While academic boycotts carry symbolic significance, there is no conclusive evidence that they weaken the regime-supporting role of academic institutions; on the contrary, they risk undermining internal opposition and isolating academia, making it more vulnerable to authoritarian control.
12. Questioning common practices, such as meat consumption or gender coding, is essential to living reflectively and contributing to ethical and social progress.

Vladimir Zakharov
Leiden, 23 September 2025