Applications of topology to Weyl semimetals and quantum computing

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Stellingen

behorende bij het proefschrift

Applications of topology to Weyl semimetals and quantum computing

1. Weyl points in a type-II Weyl semimetal that are too far from the Fermi level to exhibit Klein tunnelling will not play a role in the properties of the material (Chapter 2).

2. Superconductivity provides a loophole in the no-go theorem that relies on gauge invariance to prohibit the equilibrium chiral magnetic effect (Chapter 3).

3. Quantum error correction cannot optimally account for noise fluctuations on a scale faster than approximately 1000 stabilizer measurement cycles (Chapter 5).

4. The advantages of fermionic quantum computing schemes for digital quantum simulation will outweigh the increase in error brought on by a lack of local fermion parity conservation (Chapter 7).

5. The flag-fault tolerance scheme of Chamberland and Beverland needs only a single flag qubit per ancilla.
   C. Chamberland and M. E. Beverland, Quantum **2**, 53 (2018).

6. The 'leakage paralysis' effect of Ghosh *et al.* will not occur in a fully quantum mechanical code.
   J. Ghosh, A. G. Fowler, J. M. Martinis, and M. R. Geller, Phys. Rev. A **88**, 062329 (2013).

7. Error mitigation strategies such as those considered in McArdle *et al.* and Bonet-Monroig *et al.* will be used by fault-tolerant quantum computers.
   S. McArdle, X. Yuan, and S. C. Benjamin, Phys. Rev. Lett. **122**, 180501 (2019).
   X. Bonet-Monroig, R. Sagastizabal, M. Singh, and T. E. O'Brien, Phys. Rev. A **98**, 062339 (2019).

8. Estimation of energy derivatives, along the lines of arXiv:1905.03742, will be as essential for the success of digital quantum simulation as the estimation of the eigenenergies themselves.

9. Freedom of movement is a human right.

10. Quantum computers are only at the same stage as classical computers were in the early 1930s.

11. Evil gains power by being an emergent phenomenon.

12. An undergraduate degree teaches you how to find answers. A PhD teaches you how to find questions.

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