Propositions

accompanying the dissertation

DESIGN AND OPERATION OF DEGENERATE QUANTUM DOT SYSTEMS FOR TOPOLOGICAL QUANTUM COMPUTING

by

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1. Arrays of alternating quantum dots and Andreev bound states are the resource-optimal way to demonstrate the emergence of a topological phase. [This proposition pertains to this dissertation.]

2. It is not possible to observe the parafermionic character of the zero modes in a spinful two-site chain of quantum dots coupled via Andreev bound states. [This proposition pertains to this dissertation.]

3. Next-nearest neighbor couplings through the mediating Andreev bound states deteriorate the localization of Majorana zero modes in quantum-dot-based Kitaev chains. [This proposition pertains to this dissertation.]

4. Cylindrical Germanium/Silicon core/shell nanowires will allow spin filtering due to their tunable, spin-selective van Hove singularity.

5. Availability of reliable local parity measurements is a necessary prerequisite to scale up Majorana-based quantum computing architectures.

6. Flux-induced quantum-capacitance oscillations do not unambiguously identify Majorana zero modes in proximitized semiconductors.

7. Multiterminal superconducting junctions integrated with quantum-dot metamaterials can realize non-Abelian Weyl-node braiding.

8. Hybrid Germanium quantum dot systems will allow to implement better Kitaev chains than present platforms.

9. Quantum dot arrays coupled via Andreev bound states in two-dimensional electron gases can approximate a parafermionic chain.

10. Unequal relationships of subordinates to their supervisor lead to a measurable deterioration of the working climate.

These propositions are regarded as opposable and defendable, and have been approved as such by the promotors Prof. Dr. M. T. Wimmer and Dr. A. R. Akhmerov