## **Propositions**

## accompanying the dissertation

## Hybridization of Localized States in Semiconducting and Superconducting Circuits

by

## **Christian Glenn PROSKO**

- 1. To create quantum processors based on charging-energy-protected hybrid qubits, it must be possible to fully characterize individual qubits without DC transport measurements.
- 2. Crossed Andreev reflection need not be a virtual process.

This proposition pertains to chapter 4 of this dissertation.

3. For interferometric readout of a qubit state encoded in charge parity, it is sufficient to couple a single elongated quantum dot to the system at two points.

This proposition pertains to chapters 4 and 5 of this dissertation.

4. In contrast to [Pillet *et al.* Nano Lett. **19**(10) (2019), Haxell *et al.* Nano Lett. **23**(16) (2023), Matsuo *et al.* Sci. Adv. **9**(50) (2023)], measurements of the current-phase relation of a multiterminal Josephson junction are insufficient to distinguish it from an array of non-interacting two-terminal junctions.

This proposition pertains to chapter 6 of this dissertation.

- 5. Two-site quantum-dot Kitaev chains may be formed in electrically floating systems.
- 6. Existing probes of quasiparticle poisoning rates in semiconducting-superconducting hybrid systems are irrelevant to realizing parity and topological qubits.
- 7. Superior signal-to-noise ratios of on-chip resonators compared to flip-chip and off-chip resonators make them the best candidate for capacitive readout of hybrid parity qubits.
- 8. The biased distribution of research positions in academia towards short-term positions impedes the advancement of scientific research.
- 9. Any form of rental housing not owned and administered by a government or nonprofit entity can only increase wealth inequality in a society.
- 10. Free access to higher education upon admission is a prerequisite for a society granting equal opportunity to all people.

These propositions are regarded as opposable and defendable, and have been approved as such by the promotor prof. dr. ir. L. P. Kouwenhoven.