Quantum devices towards 1D topological superconductivity

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A crucial problem in the construction of a large, many-qubit quantum computer is quantum decoherence: A physical system will remain in a coherent superposition of states only for a finite (short) time. Another approach, topological quantum computation, makes the system immune to the usual sources of quantum decoherence due to its topological protection.

One of the main directions to realize the topological quantum bit is combining topological materials with conventional superconductors. In the last few years, our research demonstrates the possibility of realizing the topological superconductivity in engineered 3D Dirac semimetals and their 1D hinge states. This paves the way for future applications of topological quantum devices.