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Topology of Invertible Quantum Spin Systems

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An SPT (symmetry-protected topological) phase is a type of physical phase of matter that is distinguished by certain topological invariants. It has been one of the major topics in condensed matter physics over the past few decades. In dimensions up to 2, invertible phases protected by the symmetry of a group G are classified by topological invariants called the group cohomology. Motivated by the search for a more conceptual, homotopy-theoretic understanding of this fact, Kitaev proposed a conjecture in 2013. In the recent preprint [1], a mathematical proof of this conjecture was given. In this talk, I will explain the background and consequences of the result of [1].

References:

[1] Y. Kubota, Stable homotopy theory of the invertible quantum spin systems I, preprint (2025), arxiv:2503.12618.