

Stable homotopy theory of invertible quantum spin systems

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In the past decade, A. Kitaev proposed that the set of invertible gapped quantum spin systems would form an Ω -spectrum. This conjecture has potentially significant application to the study of SPT phases. We give a mathematically rigorous realization of this proposal with the language of functional analysis and operator algebra. Furthermore, we formulate the idea of placing a quantum spin system on a general space beyond $\mathbb{R}^n$, which gives rise to a model of the generalized homology theory associated with Kitaev's spectrum.

As an application, we study the topological phase of invertible phases protected by a crystallographic symmetry. This talk is based on the preprint

<https://arxiv.org/abs/2503.12618>.