2023 LATTICE

Contribution ID: **306**   Type: **Parallel Talk**

Finite-group Laplacian and the physical Hilbert space of finite-group gauge theories

Tuesday, 1 August 2023 13:30 (20 minutes)

One possible approach to the quantum simulation of gauge theories involves replacing the gauge group, a compact Lie group, with one of its discrete finite subgroups. We show how the electric Hamiltonian may be interpreted as a Laplacian operator on the finite group and how this is related to the degeneracy of the electric ground state. Moreover, we discuss the dimension of the physical, gauge-invariant subspace, which is an important question for resource estimation. We give an exact formula for the dimension of the physical subspace of pure gauge theories with an arbitrary finite group on an arbitrary lattice and comment on the case of matter fields.

Topical area

Quantum Computing and Quantum Information

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Session Classification: Quantum Computing and Quantum Information