Discrete Abelian lattice gauge theories on a ladder and their dualities with quantum clock models

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Abstract

We study a duality transformation from the gauge-invariant subspace of a Z_N lattice gauge theory on a two-leg ladder geometry to an N-clock model on a single chain.
The main feature of this mapping is the emergence of a longitudinal field in the clock model, whose value depends on the super-selection sector of the gauge model, implying that the different sectors of the gauge theory can show quite different phase diagrams.
In order to investigate this and see if confined phases might emerge, we perform a numerical analysis for $N = 2, 3, 4$, using both exact diagonalization and DMRG.

References

[1]   S. Pradhan, A. Maroncelli, and E. Ercolessi, Phys. Rev. B 109, 064410 (2024)