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Crystalline Confined Phases in Lattice Gauge Theories

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In the Wilson formulation, lattice gauge theories with compact gauge group are confining, at least in the strong coupling limit. In addition, the ground state usually preserves discrete symmetries such as translational and charge conjugation symmetry. In this talk, we consider generalized lattice gauge theories: quantum link models and self-adjoint extensions of Wilson-type theories in (2+1)-dimensions, which in addition to being confined, also spontaneously break charge conjugation or lattice translation invariance, thus giving rise to exotic crystalline confined phases. Qualitatively new phenomena, such as the fractionalization of the fundamental flux unit, can also be observed in these quantum link models, and may be observable in quantum simulations using, quantum circuits or ultracold atoms in an optical lattice.

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