Quantum Kasteleyn transition

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Abstract

Dimer models arise as effective descriptions in a variety of physical contexts, and provide paradigmatic examples of systems subject to strong local constraints. Their classical statistical mechanics can be understood in terms of a continuum height model (in 2D) or gauge theory (in 3D), and exhibits unusual phenomena such as algebraic correlations and deconfinement of monomer excitations. In this talk, I will present the quantum version of the venerable Kasteleyn model, which has an unusual phase transition from a dimer solid to a U(1) liquid, and show how the phase structure can be understood in terms of the quantum mechanics of one-dimensional strings. The model provides new insights into the physics of U(1) quantum spin liquids, shedding light on the Polyakov argument for their absence in 2D, and, in 3D, providing a tractable limit for calculation of their properties.

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