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Strong-Weak Coupling Self-Duality and Dimensional Reduction in the Two-Dimensional p+ip Superconducting Arrays and Frustrated Magnets CENKE XU, UC Berkeley, JOEL MOORE, UC Berkeley — We discuss models of superconducting arrays and frustrated magnets in two dimensions which show quantum phase transitions and self-dualities that are characteristic of one-dimensional problems. The first part of the talk explains how the geometric dependence of Josephson tunneling in time-reversal-breaking superconductors leads naturally to effective Hamiltonians containing four-point interactions rather than two-point interactions. This work was motivated by the observation of possible T-breaking p+ip order in Sr2RuO4, but similar four-point interactions appear in the 1/S expansion of certain standard models of frustrated magnetism. We show that many models on the square lattice with four-point interactions contain infinitely many gauge-like symmetries, and generalize the self-duality of the quantum Ising model in one dimension to related models in all higher dimensions. The existence of these nonperturbative self-dualities gives exact information on the phase diagram of the superconducting array models and on the phase transition between globally T-ordered and globally T-breaking states.

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