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Generic mixed columnar-plaquette phases in Rokhsar-Kivelson models RALKO ARNAUD, POILBLANC DIDIER, LPT - University of Toulouse, France, MOESSNER RODERICH, MPI-PKS, Dresden, Germany — We revisit the phase diagram of Rokhsar-Kivelson models, which are used in fields such as superconductivity, frustrated magnetism, cold bosons, and the physics of Josephson junction arrays. From an extended height effective theory, two simple generic phase diagrams are obtained. The first one is a first order transition scenario between the columnar and the plaquette phases, common in such models. The second, more exotic, exhibits a second order transition and contains a mixed phase that interpolates continuously between columnar and plaquette states. From exact diagonalization and Green's funtion Monte Carlo techniques, we present evidence that a realization of the latter scenario occurs in the Rokhsar-Kivelson square lattice Quantum Dimer model. This model, originally proposed in the context of high-temperature superconductivity, and its descendants have taken on a central role in the study of quantum systems incorporating a hard local constraint. By combining an analysis of the excitation gaps of different symmetry sectors with information on plaquette structure factors, we show the presence of a phase exhibiting both the plaquette and the columnar properties. This also presents a natural framework for resolving the disagreement between previous studies.

Ralko Arnaud
LPT - University of Toulouse

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