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A numerical study of the energy gap of the quantum dimer-pentamer model OWEN MYERS, University of Vermont, CHRIS HERDMAN, University of Waterloo — We present a study of the energy gap in the quantum dimer-pentamer model (QDPM) on the square lattice. This model is a generalization of the square lattice quantum dimer model (QDM), with a configuration space comprising fully-packed hard-core dimer coverings of the lattice, as well as configurations containing pentamers, where four dimers touch a vertex. Thus in the QDPM, the fully-packed, hard-core constraint of the QDM is relaxed such that the local dimer number at each vertex is fixed modulo 3; correspondingly, the local $U(1)$ gauge symmetry of the QDM Hilbert space is reduced to a local Z_3 gauge symmetry in the QDPM. Previous work has demonstrated the disordered quantum liquid nature of the ground state of the QDPM at the Rokhsar-Kivelson point. Here we present a study of the energy gap above the ground state at the RK point, as computed via Monte Carlo from imaginary time correlations. To investigate the possibility of Z_3 topological order in this system, we study both the dimer density correlations as well as a Z_3 generalization of Z_2 vision correlations. Such vision correlations have previously been shown to display the nature of the low lying excitations in Z_2 topologically ordered QDMs.

Owen Myers
University of Vermont

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