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Quantum correlated percolation LIANG CAO, Syracuse Unviersity, M. JENG, Microsoft Corporation, J. M. SCHWARZ, Syracuse Unviersity — Abstract: Quantum percolation is the study of hopping transport of a quantum particle on randomly diluted percolation clusters. Inspired by correlated percolation models of geometrical jamming, we extend quantum percolation to investigate hopping transport on percolation clusters with geometric constraints on the occupation of bonds/sites. An example of a geometric constraint is each occupied site must have at least k occupied neighboring sites to remain occupied (k-core percolation). Another example is particular sets of neighboring sites containing at least one occupied site for an occupied site to remain occupied (spiral model). Both models exhibit long-range geometrical correlations differing from ordinary percolation and give rise to a discontinuous phase transition (in high dimensions for k-core percolation). To investigate how these atypical long-range geometrical correlations affect the hopping transport of a quantum particle, we numerically study the level statistics of quantum k-core percolation on the Bethe lattice and the two-dimensional quantum spiral model. While the quantum k-core model exhibits an insulator-to-metal transition as the occupation probability is increased, preliminary results indicate that there is no insulator-to-metal transition in the two-dimensional quantum spiral model. Studies of a three- dimensional quantum spiral model will also be addressed as will possible physical applications of quantum jamming.

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