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Geometric phases of d-wave vortices in a model of lattice fermions[1] ZHENYU ZHOU, ALEXANDER SEIDEL, Washington University in St. Louis, OSKAR VAFEK, Florida State University — We study the local and topological features of Berry phases associated with the adiabatic transport of vortices in a d-wave superconductor of lattice fermions. At half filling, where the local Berry curvature must vanish due to symmetries, the phase associated with the exchange of two vortices is found to vanish as well, implying that vortices behave as bosons. Away from half filling, and in the limit where the magnetic length is large compared to the lattice constant, the local Berry curvature gives rise to an intricate flux pattern within the large magnetic unit cell. This renders the Berry phase associated with an exchange of two vortices highly path dependent. However, it is shown that "statistical" fluxes attached to the vortex positions are still absent. Despite the complicated profile of the Berry curvature away from half filling, we show that the average flux density associated with this curvature is tied to the average particle density. This is familiar from dual theories of bosonic systems, even though in the present case, the underlying particles are fermions.

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