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Topological Mott insulator on the checkerboard lattice with a quadratic band crossing SHOUSHU GONG, National High Magnetic Field Laboratory, KUN YANG, OSKAR VAFEK, National High Magnetic Field Laboratory and Department of Physics, Florida State University — We study quantum anomalous Hall (QAH) phase of spinless fermions on a checkerboard lattice at half filling using density matrix renormalization group. This system has a quadratic band crossing point in the absence of interaction. With growing nearest-neighbor (V_1) and second-neighbor (V_2) repulsive interactions, we identify a nematic Mott insulator phase in the V_1 dominant regime and a stripe charge density wave phase in the V_2 dominant regime. In the intermediate regime, we identify a QAH phase induced by interactions, which spontaneously breaks time reversal symmetry. By threading a U(1) charge flux θ in the cylinder, we find charge pumping from one edge to the other with increasing flux, which gives a quantized topological Chern number $C = 1$ at $\theta = 2\pi$ that characterizes gapless edge states. In the weak interaction regime, we do not find any symmetry breaking on our studied system size. Interestingly, with increasing cylinder width, nonzero chiral order emerges at the smaller interaction, which suggests that the weak interaction regime is likely to be also a QAH phase, which however is too weak to be detected by our finite-size calculations.

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