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Possible algebraic spin liquid in half-filled Hubbard model at intermediate U/t ZIXIANG LI, Institute for Advanced Study, Tsinghua University, Beijing, 100084, China, ZI YANG MENG, Beijing National Laboratory for Condensed Matter Physics, and Institute of Physics, Chinese Academy of Sciences, Beijing 100190, China, HONG YAO, Institute for Advanced Study, Tsinghua University, Beijing, 100084, China — Using large-scale fermion-sign-free projective Determinant Quantum Monte-Carlo (DQMC) method, we study the half-filled Hubbard model on the square lattice with staggered-flux. We calculate the single-particle gap, charge gap, as well as the improved dimensionless estimator of the antiferromagnetic (AF) order parameter, and map out the ground state phase diagram of this model spanned by U/t and staggered-flux. The lattice in our DQMC simulations has 2*L*L sites with largest L=28. In the case of \pi-flux, finite-size scaling analysis indicates a possible algebraic quantum spin liquid phase between the semi-metal phase at small U/t and the AF phase at large U/t. The algebraic spin liquid occurs in the arrange of 5.4 <U/t <5.6. When the staggered-flux is smaller than the critical value of about \pi/10, the Fermi velocity in this system is largely anisotropic and it exhibits a direct transition from semi-metal phase to AF phase.

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