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Weak-coupling instabilities of SU(N) fermions on the Bernal-stacked honeycomb bilayer in presence of on-site Hubbard Interactions[1]
SUMIRAN PUJARI, University of Kentucky, THOMAS C. LANG, University of Innsbruck, RIBHU K. KAUL, University of Kentucky — Bernal-stacked bilayer graphene hosts an interesting 'non-relativistic' semi-metallic dispersion different from monolayer graphene. At this quadratic band touching, short-range interactions are marginal and hence cause instabilities to a variety of ground states. In this work we consider the instabilities of even N species of fermions on the Bernal bilayer with an $SU(N)$-symmetric contact interaction. For $SU(2)$ fermions with an on-site Hubbard interaction the ground state has been found to be to a magnetic Nel state for all strengths of the interaction. In contrast, the leading weak coupling instability for $N > 2$ is a non-magnetic ground state, which is gapped and odd under time reversal. On the other hand, at strong coupling we expect Nel or VBS ground states of the effective self-conjugate $SU(N)$ spin models. Motivated by this observation, we investigate the phase diagram for even $N > 2$ using determinantal quantum Monte Carlo computations.

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