Abstract Submitted
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The nature of quantum criticality in the Hubbard model on honeycomb lattice IGOR HERBUT, Simon Fraser University, FAKHER ASSAAD, Universitat Wurzburg — Hubbard model on graphene's honeycomb lattice at the filling one half and at zero temperature exhibits the semi-metallic phase at weak coupling, and the insulating Neel ordered phase at strong coupling. The nature of the phase transition between these two phases has been a contentious issue in literature. We will present evidence from recent quantum Monte Carlo calculations in favor of the direct, continuous transition, without an intermediate spin-liquid phase. Both the staggered magnetization and the single-particle gap display excellent finite-size scaling, with the same scaling function, and with the critical exponents which are in accord with the dimensional expansion that was devised for the problem near three spatial dimensions. We will discuss the effective Gross-Neveu-Yukawa low-energy theory for this quantum phase transition, with the new "fermionic" critical point, at which Dirac fermions are fully coupled, and cannot be simply "integrated out". Some new universal amplitudes which characterize this interesting phase transition with massless excitations on both sides will be mentioned. References: F. Assaad and I. F. Herbut, Physical Review X, vol. 3, 031010 (2013); I. F. Herbut, V. Juricic, and O. Vafek, Physical Review B, vol. 80, 075432 (2009).

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