Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

**Thermal phase transitions in the vicinity of the quantum critical point of spinless fermions on the honeycomb lattice** STEPHAN HESSELMANN, STEFAN WESSEL, RWTH Aachen University — We consider spinless fermions on a honeycomb lattice (spinless $t-V$ model), which provide a minimal realization of lattice Dirac fermions. Nearest neighbor interactions drive a quantum phase transition from a semi-metallic phase to a charge ordered phase, which spontaneously breaks the chiral $Z_2$ symmetry of the Dirac fermions. The critical theory is given by the Gross-Neveu-Yukawa theory, which describes the process of mass generation due to the broken chiral symmetry. At finite temperature, and if $V > V_c$, the quantum critical point connects to a line of second order thermal phase transitions that restore the broken chiral symmetry. We employ recent sign-problem-free continuous time quantum Monte Carlo methods to investigate the finite temperature phase diagram of the model. Furthermore we give estimates for the critical exponents of the Gross-Neveu chiral Ising universality class by studying the extension of the quantum critical regime to finite temperatures.

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Date submitted: 09 Nov 2016 Electronic form version 1.4