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Lattice Monte Carlo studies of quantum critical phenomena in graphene TIMO LAHDE, University of Washington, JOAQUIN DRUT, The Ohio State University — The Lattice Monte Carlo approach is well suited to the study of strongly interacting fermionic systems, such as the quasi-relativistic charge carriers in graphene, as it is non-perturbative and takes full account of quantum fluctuations. Recent simulational results on the semimetal-insulator critical point in graphene are presented, with emphasis on the question whether the transition to an insulating phase is of second order or of infinite order. This critical point is likely to be relevant for the physics of suspended graphene, as its location determined in arXiv:0807.0834 (see abstract by J. E. Drut) suggests that suspended graphene should be an insulator rather than a semimetal. An observable of particular interest is the DC conductivity of graphene, as most analytical studies underpredict this by a factor ~ 3. It has been pointed out that a complete description of the DC conductivity of graphene should account for non-perturbative effects due to the long-range Coulomb interaction between the fermionic quasiparticles. A possible method for determining the DC conductivity of graphene using the Lattice Monte Carlo technique is presented.

Timo Lahde
University of Washington

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