Measurable lattice effects in graphene

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We calculate the magnetic susceptibility for the hexagonal tight-binding model [1] using a formalism initially introduced by Fukuyama [2] and find that lattice effects, up to now neglected in the ongoing discussion on the magnetic behavior in graphene, yield a relevant or even dominant contribution when compared to other sources (see figure) [3]. We also find new results for the much studied charge response of graphene and show that lattice effects restore the typical behavior of 2D-Friedel oscillations, observable for reasonably high doping levels [3]. We finally present analytical results for the dynamical polarizability of the hexagonal tight-binding model and discuss the van Hove singularity [4].

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Figure

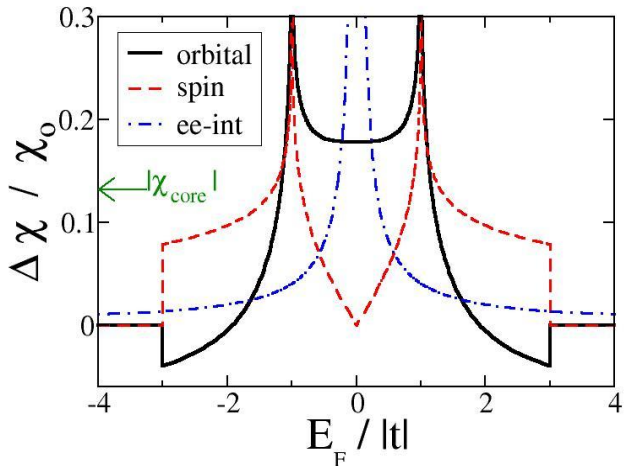

Figure caption: *Continuous line: lattice contribution to the orbital magnetic susceptibility [3]. Dashed line: Pauli's spin paramagnetic contribution. Dashed-dotted line: contribution from electron-electron interaction to the orbital susceptibility [5]. The arrow marks an estimate of the absolute value of the diamagnetic contribution from core electrons [6].*