Abstract Submitted
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Coulomb Impurity Screening in Graphene VALERI KOTOV, Boston University — I will discuss the vacuum polarization charge density around a Coulomb impurity with charge $Z|e|$. Perturbation theory in powers of $Z\alpha$ (where $\alpha = e^2/v_F$ is the effective coupling constant in graphene), shows that the polarization charge is localized at the impurity site. An exact calculation, based on the Green's function in a Coulomb field, leads to a non-perturbative result, valid to all orders in $Z\alpha$ [1]. Taking into account also electron-electron interactions in the Hartree approximation, we solve the problem self-consistently in the subcritical regime, where the impurity has an effective charge $Z_{\rm eff}$, determined by the localized induced charge. We find that an impurity with bare charge $Z = 1$ remains subcritical, $Z_{\rm eff}\alpha < 1/2$, for any α, while impurities with $Z = 2, 3$ and higher can become supercritical at certain values of α.
[1] I.S. Terekhov, A.I. Milstein, V.N. Kotov, and O.P. Sushkov, arXiv:0708.4263.

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