Slave Rotor method

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Plan of the lecture

In this set of lectures, first I will introduce the single-impurity Anderson model and its basic physics. Then we will review the slave rotor method introduced by Florens and Gorges [1, 2, 3] and its application to SIAM when the host is a normal metal [1]. Then I will apply the same method to study the SIAM when the host material is graphene. Within the mean field decoupling of rotor and spinon fileds we contrast the behavior of normal metals versus Dirac Fermions in graphene [4]. We find that the underlying honeycomb structure together with the peculiar hybridization form of the substitutional and hollow-site ad-atoms in graphene leads to an anomalous hybridization function which in turn gives rise to a non-Lorentzian local spectral line-shapes. We show that these anomalous lineshape is responsible for a $T_K/D \sim (\tilde{V}/D)^a$ where T_K is the Kondo temperature, $\tilde{V}$ is the strength of hybridization between local and itinerant orbitals, D is the bandwidth, and $a = 2$ for normal metals, while $a = 1$ for Dirac Fermions. This is responsible for incraesed Knodo temperature in graphene as contrasted to typical metals. We further find that for slight electron or hole doping, the T_K vanishes exponentially for *any* value of V while only at the Dirac poitn we need V to exceed a minimum value $V_{\min}$ which we estimate to be reachable in graphene.

References

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