Status report about charge instability

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We collect some results obtained by means of different implementations of fRG equations using a full frequency dependent vertex. It emerges a very peaked structure in the charge-channel for finite frequency-transfer, that in some region of the parameter space becomes divergent. Such a divergence has no obvious physical interpretation. The peaked structure seems to be characteristic of the frequency dependence of the vertex, as it is shown by means of simpled diagrams. On the other hand the *divergence* of this structure may be very sensitive to the detailed structure of the Green's function used in the calculation, i.e., very sensitive to the use, or not, of dressed propagators, even when the correction to the self-energy appear to be small (i.e., self-energy Fermi liquid-like).

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I. FRG WITHOUT SELF-ENERGY

The results shown in this section are obtained in standard fRG using an interaction cutoff: $G_0^\Lambda = \Lambda G_0$. The calculations are performed on the Matsubara frequency axis for temperature $T = 0,08t$, where t is the nearest neighbors hopping. The momentum dependence of the vertex is treated by means of a form factor decomposition, while keeping 29 patches in the respective bosonic momentum transfer . The critical scale is fixed by the condition that the absolute value of one of the channels exceeds a value of $1200t$ (we obtain similar results when from an analysis of the suscpetibilities).
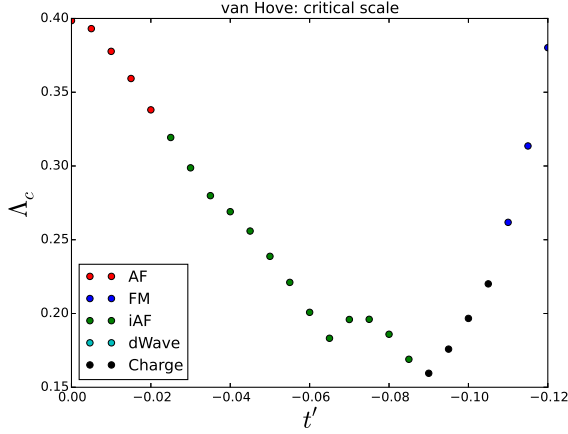
$$a = a; \qquad (1)$$

FIG. 1: Critical scale in full frequency fRG (interaction cutoff) as a function of the nearest neighbors hopping and for van Hove filling. The color of the symbol indicates the kind of instability that is realized.
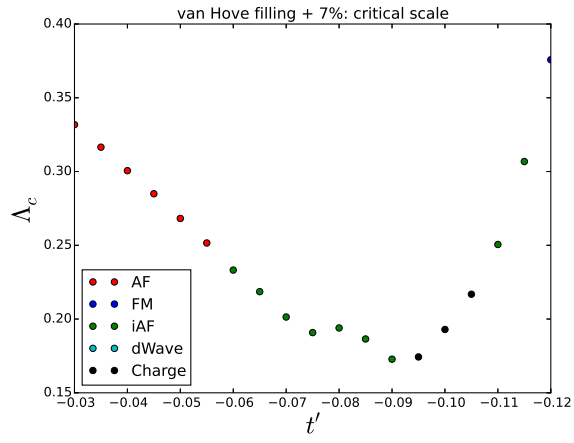
FIG. 2: Critical scale in full frequency fRG (interaction cut-off) as a function of the nearest neighbors hopping and for van Hove filling $+ 7 \%$. The color of the symbol indicates the kind of instability that is realized.