Organics (II) [Baubonais]

The predicted $t_1$ is $t_1 \sim 100 K$. Thus there should be a crossover into 2D system in phase diagram.

This does not occur because of confinement. Where density $\rho$ state $N(E)$ is suppressed by wavefunction renormalization:

$$t_{1} \sim z(T) t_{1}, \quad z(T) \sim (T/\varepsilon_{F})^{\theta} \iff \text{from 2-loop}$$

$$T_{x} = t_{1} \left( \frac{t_{1}}{\varepsilon_{F}} \right)^{\theta} \Rightarrow \theta = O(g^{2})$$

Hence no crossover.

But then why do we get long-ranged AF order?

Ans: By hoping $\rho_{e} \sim n$ pair across chain (\sim interchain density-wave propagation)

Hence under renormalization:

$$\mu_{s} = (G_{0}, t_{1}, g_{1}, g_{2}, g_{3}) \quad [\ell = 0]$$

$$\mu_{s}(\ell) = (z(\ell) G_{0}, z(\ell) t_{1}, g_{1}(\ell), g_{2}(\ell), g_{3}(\ell), T_{x}(\ell), \ldots)$$

This predicts:

which agrees with experiment.
Now consider SDW -- SC transition, which is missed by mean-field.

In 1D, CDW/SDW channel

Cooper channel

The interference of these two channels give rise to Luttinger liquid.

In higher dimension the interference is not perfect:

non-matching channels

matching channel

\[ g_{12,13} \xrightarrow{\text{not perfect}} g_{12,3}(k_1, k_{21}, k_{11}, k_{22}) \]

This allows for phase transition in the 2D case.