FRG Analysis

April 10, 2023

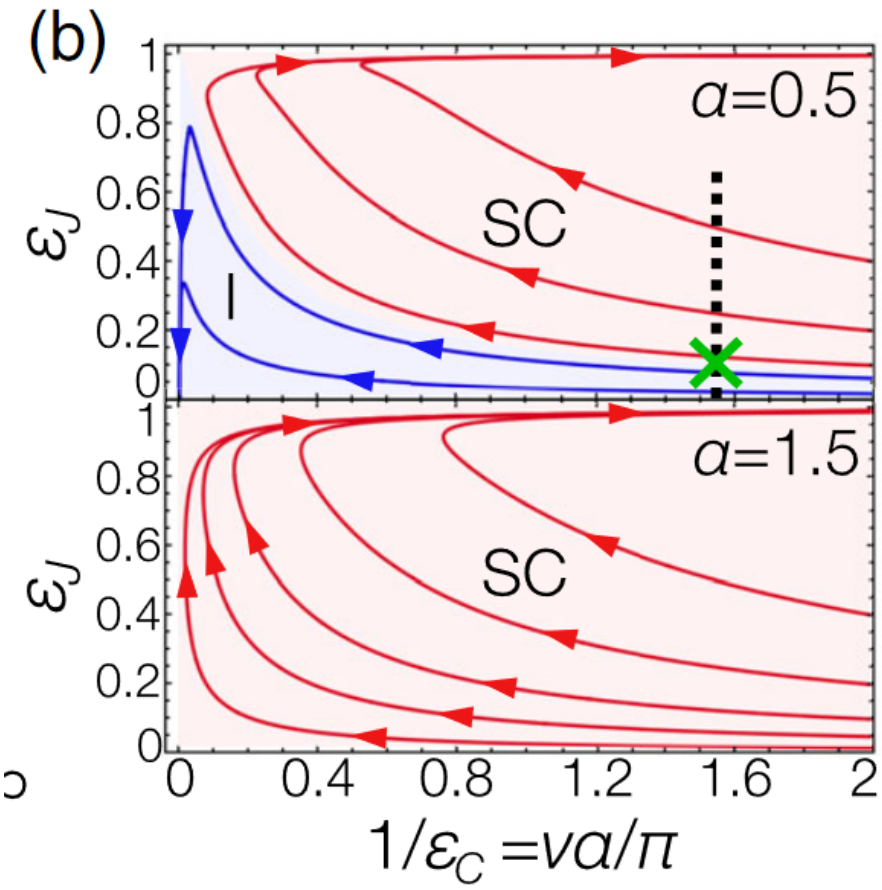

Figure 1: Figure.1-(b) Numerical solution of flow equations. μ_{10} at $\alpha = 0.5$

analysis condition :
① Using functional ansatz, (retaining the most relevant Fourier mode.)

② Renormalized wavefunction.

flow equations :
$d_J \ln \epsilon_J = 1 - \int_0^\infty \frac{dy}{\pi} g(y) \dots$ ⓐ
$d_C \ln \epsilon_C^{-1} = -1 + \epsilon_J^2 \int_0^\infty \frac{dy}{\pi} h(y) \dots$ ⓑ

Equation ⓐ $\rightarrow \epsilon_J \ll 1$, seperate to two parts,

$$1 - \frac{1 - \sqrt{2\epsilon_C}8}{>} 0 \quad \epsilon_C^{-1} \gg 1 \tag{1}$$

$$1 - \frac{1}{\alpha} \quad \epsilon_C^{-1} \rightarrow 1 \tag{2}$$

(2) : **Presence of DQPT** at $\alpha_C = 1$, previous perturbative result.
(1) : **dangerously irrelevant term** $\nu \propto \epsilon_C^{-1}$.

Because of the dangerously ν,
when $\frac{E_J}{E_C}$ is larger than a critical value,
Theory flows into the SC fixed point $\alpha < 1$,
= Absence of DQPT in transmon regimes