

Holographic BCS theory

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Motivation

- Real motivation – phase transition between superconducting and normal phases in high- T_c superconductors
- It definitely has non-BCS nature (NO Fermi liquid in the normal state)

Holographic BCS as an intermediate step

- Most of existing models of holographic superconductivity are too “mean field”

$$\mathcal{L} = -\frac{1}{4}F^{ab}F_{ab} - V(|\Psi|) - |\partial\Psi - iA\Psi|^2$$

BCS in AdS

- Einstein-Maxwell-Dirac action +

$$i \Psi^\dagger \hat{C} \Gamma^5 \Psi$$

- Pure AdS geometry with hard wall

$$ds^2 = \frac{1}{z^2} (dz^2 + dt^2 + dx^2 + dy^2)$$

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- Numerical derivation of dispersion relations
 - The superconducting gap develops self-consistently due to fermionic interactions