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Quantum critical metals at vanishing fermion flavor number

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Stellingen

behorende bij het proefschrift

Quantum critical metals at vanishing fermion flavor number

1. Although less intuitive, a quantum critical metal in the limit of vanishing number of fermion flavors, has more in common with the finite flavor case, than the model in a matrix large N limit.

Chapter 2

2. The ordering of limits in models of quantum critical metals is both crucial and subtle.

Chapter 3

3. As opposed to most studied quantum field theories, perturbation theory of quantum critical metals does not necessarily have zero radius of convergence.

Chapter 4

4. While not physically singular, the point of equal Fermi velocity and boson velocity of a quantum critical metal provides enough symmetry to bootstrap much of the physics in a boson dominated limit.

Chapter 5

5. Contrary to the conclusion by Fitzpatrick et al., the fermion two-point function found in the matrix large N limit of quantum critical metals in $d = 3 - \epsilon$ dimensions does not survive ϵ -expansion to $\epsilon = 1$.

A. L. Fitzpatrick, S. Kachru, J. Kaplan, and S. Raghunathan, Phys. Rev. B **89**, 165114 (2014).

6. A more thorough investigation of whether the low-energy limit commutes with the infinite sum of perturbation theory is necessary before restricting low-energy fermions to two patches at all orders of the perturbation theory of a two-dimensional quantum critical metal.

M. A. Metlitski and S. Sachdev, Phys. Rev. B **82**, 075127 (2010).

7. When studying the Landau-damping free matrix large N limit of a quantum critical metal it is not necessary to work in $3 - \epsilon$ dimensions to obtain non-perturbative results on the two-point function.

A. L. Fitzpatrick, S. Kachru, J. Kaplan, and S. Raghu, Phys. Rev. B **89**, 165114 (2014).

8. The vanishing fermion flavor number limit studied in the work by Altshuler et al. does not have a consistent definition in terms of a limit of the parameters of the action.

B. L. Altshuler, L. B. Ioffe, and A. J. Millis, Phys. Rev. B **50**, 14048 (1994).

9. The failure of academia to provide job security to the majority of researchers diminishes research quality and results in unnecessary suffering.

Petter Sätterskog
Leiden, November 23, 2017