Stellingen

Behorende bij het proefschrift

Strongly correlated electrons in Sachdev-Ye-Kitaev models and Twisted bilayer graphene

1. Many crucial aspects of the SYK model persist upon reducing the connectivity of the interactions from all-to-all.

   [*Chapter 2*]

2. Coupled Yukawa SYK models allow one to compute the Josephson current between two superconductors non-perturbatively in the coupling interaction.

   [*Chapter 3*]

3. The wormhole solutions obtained in the Yukawa SYK model only allow transmission of electronic excitations, but not Cooper pairs.

   [*Chapter 3*]

4. The Kondo effect can be used as a probe to identify crucial qualitative features of the band structure of twisted bilayer graphene.

   [*Chapter 4*]

5. Although the mechanism of superconductivity in the Yukawa SYK model is **not** of the conventional electron-phonon type, it still shows an isotope effect. Conversely, an observation of the isotope effect is not an immediate guarantee of a BCS like superconducting mechanism.

   I. Esterlis, J. Schmalian *Phys. Rev. B 100, 115132 (2019)*

6. A Moire pattern in the real space lattice of a material is a strong indicator of the possible existence of flat bands in the said material.

7. The existence of a true quantum critical point has not been confirmed beyond reasonable doubt. This is because any function can be made to look like a power law on a log-log scale for less than a decade.

8. Arrays of SYK dots in the weak inter-dot tunneling limit can be used to model the phase diagram near the Mott phase of cuprates, but such a description fails in the strange metallic phase.

   A. A. Patel, H. Guo, I. Esterlis, S. Sachdev *Science 381,790-793 (2023)*

9. Although aggressively marketed as such, it is unclear whether quantum computers will be useful for understanding much about quantum many body problems.

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Leiden, xxth xxxxxx 2024