

Functional RG: from weak to strong coupling in the 2D Hubbard model

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We apply the functional RG to the 2D Hubbard model on the square lattice.

First, we show [1] that even at intermediate coupling each fluctuation channel acquires substantial dependencies on all three Matsubara frequencies. At the temperature we are able to access, the leading instabilities are mostly antiferromagnetic, with incommensurate instability vector. At large doping an enigmatic instability appears in the charge channel, as already observed in Ref. [2]. This instability, however, is suppressed by the self-energy feedback.

Next, we focus on the strong coupling regime [4]. This is done by starting the fRG flow from the DMFT solution [3], which includes all the local correlations. The local physics strongly affects the properties of the non-local spin susceptibility. In particular, the local vertex changes the incommensurability vector, which may affect the formation of the d -wave instability. Finally, we discuss the connection between spin fluctuations and d -wave pairing at the temperature we are able to access.

[1] D. Vilardi, C. Taranto, W. Metzner, arXiv:1708.03539, (2017).

[2] C. Husemann, K.-U. Giering, M. Salmhofer, Phys. Rev. B **85**, 075121 (2012)

[3] C. Taranto, S. Andergassen, J. Bauer, K. Held, A. Katanin, W. Metzner, G. Rohringer, and A. Toschi, Phys. Rev. Lett. **112**, 196402 (2012)

[4] D. Vilardi, C. Taranto, W. Metzner, in preparation.