Fluctuation diagnostics of pseudogap and d-wave superconductivity in the two-dimensional Hubbard model

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In recent years, reliable approaches have been developed [1] to identify the dominant fluctuations driving the multifaceted phenomena of many-electron physics. Among those, the “fluctuation diagnostics" [2] was hitherto applied only to normal, paramagnetic phases, allowing to pinpoint the spin-fluctuation nature of the pseudogap occurring in the two-dimensional Hubbard model [1-2]. After extending the approach to the superconducting phase [3], we were able to identify antiferromagnetic fluctuations as the "pairing glue" of d-wave superconductivity both in the underdoped and the overdoped regime of the Hubbard model. However, the predominant magnetic fluctuations might significantly differ [4] from those of conventional spin-fluctuation theory.

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