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Space-time separation of electronic correlations JAN M. TOMCZAK, THOMAS SCHÄFER, BENJAMIN KLEBEL, ALESSANDRO TOSCHI, Vienna University of Technology — While second-order phase transitions always cause strong nonlocal fluctuations, their effect on spectral properties crucially depends on the dimensionality. First, we show that for the important case of three dimensions the electron self-energy is well separable into a local dynamical part and static nonlocal contributions[1]. In particular, using the dynamical vertex approximation for the doped 3D Hubbard model, we demonstrate that the quasiparticle weight remains essentially momentum independent, despite overall large nonlocal corrections to the self-energy when approaching the spin-ordered state. This generalizes earlier empirical findings of this property in the iron pnictides[2] and transition metal oxides[3] based on Hedin's GW approximation. With this insight, we here propose a "space-time-separated" scheme for many-body perturbation theory that is up to ten times more efficient than current implementations. Finally, we discuss limits of the space-time separation of correlation effects by studying the crossover from three to two dimensions.

[1] T. Schäfer, A. Toschi, JMT. PRB 91, 121107(R) (2015)
[2] JMT, M. van Schilfgaarde, G. Kotliar. PRL 109, 237010 (2012)
[3] JMT, M. Casula, T. Miyake, S. Biermann PRB 90, 165138 (2014)

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