Contribution to the Workshop on Emergence of New States of Matter in Magnetic Systems and Beyond

"Projected excitations of Gutzwiller wave functions"

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We use a generalized Gutzwiller approach[1] to study projected particle (hole) excitations for homogeneous systems and systems with long-range collinear antiferromagnetic (AFM) order. As in the standard Gutzwiller scheme,[2] the effects of the strong electronic correlations are given via the suppression of the site double occupancy; for our computations it is helpful to consider a lattice with a reservoir site unaffected by this suppression of the double occupancy. In this approach we can evaluate observables for correlated states with single excitations and we can obtain the probabilities for the tunneling of a particle (hole) into the projected state.

Our results are due only to the physical properties of the trial state and not to the choice of a specifical Hamiltonian: in this sense, they are model-independent but not universal, because they rely on the features of the chosen Gutzwiller wave function (projected Fermi Liquid, BCS superconductor, AFM...)

We compare approximated analytical results obtained in the Gutzwiller Approximation and exact numerical Variational Monte Carlo results. We will present mainly quantities and matrix elements for the AFM Gutzwiller states, but also for the projected BCS states. Possible comparisons with tunneling experiments will be also shortly discussed.

[1] N. Fukushima, B. Edegger, V. N. Muthukumar, and C. Gros, Phys. Rev. B **72**, 144505 (2005).

[2] M. C. Gutzwiller, Phys. Rev. Lett. **10**, 159 (1963); F. C. Zhang, C. Gros, T. M. Rice, and H. Shiba, Supercond. Sci. Tech. **1**, 36 (1988).