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Phase diagram of the SU(N) Hubbard-Heisenberg model on the honeycomb lattice THOMAS C. LANG, FAKHER F. ASSAAD, Department of Theoretical Physics I, University of Wuerzburg, Germany, ZI YANG MENG, STEFAN WESSEL, ALEJANDRO MURAMATSU, Institute for Theoretical Physics III, University of Stuttgart, Germany — We present a projective $T = 0$ quantum Monte-Carlo study of the ground-state properties of the the SU(N) Hubbard Heisenberg model on hexagonal lattices up to 18×18 unit cells. The phase diagram is mapped out for increasing many body correlations from the large-N limit to SU(2) for even N. It is shown that for all SU(N) symmetric realizations, the model undergoes a quantum phase transition from a semimetal to an insulator for large values of J/t. While for $N \geq 4$ the insulating state is a valence bond crystal the SU(2) Hubbard Heisenberg model exhibits a gapped short range resonating valence bond phase separating the semimetal and an antiferromagnetic insulator. At SU(2) we reproduce the intermediate spin liquid phase found recently in the SU(2) Hubbard model on the hexagonal lattice.

Thomas C. Lang
Department of Theoretical Physics I, University of Wuerzburg

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