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The doped spin 3/2 half filled Mott insulator STELLAN OSTLUND, Gothenburg University, T. HANS HANSSON, Stockholm University, ANDERS KARLHEDE, Stockholm University — We develop an exact generalized Bogoliubov transformation for the spin 3/2 Hubbard model with large anti-Hunds rule coupling near half filling. Since the transformation is unitary, we can employ standard approximate mean field theory methods in the full Hilbert space to analyze the doped Mott insulator, in contrast to a conventional approach based on truncated Hilbert spaces complemented with hard core constraints. The ground state at exactly half filling is an insulating (Mott) singlet, and according to our analysis a non-Fermi liquid order parameter Δ usually associated with extended s-wave superconductivity, will appear self-consistently as soon as a finite density n of holes is introduced. The non-Fermi liquid behavior is a consequence of the nonlinear nature of the unitary transformation mapping the Mott singlet state to a Fock vacuum which introduces anomalous terms such as Δn in the effective Hamiltonian. Our analysis uses an approach that generalizes readily to multi-band Hubbard models and could provide a mechanism whereby a non-Fermi liquid order parameter proportional to density develops in Mott insulators with locally entangled ground states. For more complicated systems, such an order parameter could coexist naturally with a variety of other order parameters.

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