Abstract Submitted
for the DAMOP06 Meeting of
The American Physical Society

Gaussian quantum operator representations for fermions PETER DRUMMOND, JOEL CORNEY, University of Queensland — We introduce a positive phase-space representation for fermions, using the most general possible multimode Gaussian operator basis. The representation generalizes previous bosonic quantum phase-space methods to Fermi systems. We derive equivalences between quantum and stochastic moments, as well as operator correspondences that map quantum operator evolution onto stochastic processes in phase space. The representation thus enables first-principles quantum dynamical or equilibrium calculations in many-body Fermi systems. Potential applications are to strongly interacting and correlated Fermi gases, including coherent behaviour in open systems and nanostructures described by master equations. Examples of an ideal gas and the Hubbard model are given, as well as a generic open system, in order to illustrate these ideas. These results are relevant to the well-known Fermi sign problem in dealing with many-body fermion calculations.

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Date submitted: 30 Jan 2006 Electronic form version 1.4