Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Analytical Solutions for States of the 3D Hooke's Atom in an External B Field[1] SAMUEL TRICKEY, WUMING ZHU, Physics and QTP, Univ. Florida — Hooke's atom is a 2-electron model with the nuclear-electron attraction replaced by an isotropic harmonic potential. Closed-form solutions for certain eigenstates are known in 3D at B=0; B $\neq$ 0 solutions are known only for the 2D quantum dot. Both solutions are products of center-of-mass oscillators and relative motion factors. Because the uniform-B confining potential is quadratic in the cartesian coordinates normal to B, we can find related analytical solutions for certain eignvalues of the 3D Hooke's atom at B $\neq$ 0. They are more complicated because of the imposed axial symmetry. We sketch the somewhat tedious solution techniques, then compare the analytical and numerical solutions for a large range of field strengths. We have used these results to obtain exact Kohn-Sham orbitals for current density functional theory (CDFT) ["Exact Current DFT Study of Hooke's Atom in Magnetic Fields," W. Zhu and S.B. Trickey to be published]

[1]Work supported in part by U.S. NSF ITR Grant DMR-0218957. Thanks to J. Ashley Alford II for helpful discussions.

Samuel Trickey
Physics and QTP, Univ. Florida

Date submitted: 01 Feb 2005 Electronic form version 1.4