Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Spatial entanglement in two-electron atomic systems[1] YEW KAM HO, Y.-C. LIN, Institute of Atomic and Molecular Sciences — Recently, there have been considerable interests to investigate quantum entanglement in two-electron model atoms [1, 2]. Here we investigate quantum entanglement for the ground and excited states of two-electron atomic systems using correlated wave functions, concentrating on the particle-particle entanglement coming from the continuous spatial degrees of freedom. We use the two-electron wave functions constructed by employing B-spline basis to calculate the linear entropy of the reduced density matrix $L = 1 - Tr_A(\rho_A^2)$ as a measure of the spatial entanglement. Here $\rho_A = Tr_B(|\varphi\rangle_{AB\,AB}\langle\varphi|)$ is the one-electron reduced density matrix obtained after tracing the two-electron density matrix over the degrees of freedom of the other electron. Here, we investigate spatial entanglement for two-electron systems with Z=1 to Z=10. When Z is decreased from Z=1.0 to about $Z \leqq 0.911$, the H^- ion becomes unbound. This would lead in a situation of one electron bound by the nucleus with the other electron being free. Such a wave function would be expected to have a spatial entanglement of L= 1/2. Numerical results will be presented at the meeting.

[1] J. P. Coe and I. D'Amico, *J. Phys.: Conf. Ser.* **254**, 012010 (2010)
[2] D. Manzano *et. al.*, *J. Phys. A: Math. Theor.* **43**, 275301 (2010)

[1]Supported by NSC of Taiwan

Yew Kam Ho
Institute of Atomic and Molecular Sciences

Date submitted: 04 Nov 2011 Electronic form version 1.4