Abstract Submitted
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Quantum entanglement of helium atom in high-lying Rydberg states[1] LI-GUANG JIAO, Y.K. HO, Institute of Atomic and Molecular Sciences, Taiwan — Quantum entanglement for identical particles in atomic systems and quantum dots has attracted considerable interest in recent years. With the successes of our group in accurately calculating the quantum entanglement (measured by von Neumann or the linear entropy) for the helium atom in ground and lower-lying excited states [1], we move on to the higher-lying Rydberg states and concentrate on the asymptotic behavior of the entanglement in loosely bound states. By applying the Lowdin's canonical orthogonalization method to the Slater-type orbital configuration-interaction basis sets [2], we have obtained quite accurate wave functions for the $1sns\ ^1S^e$ with n=1 to 15 and $2sns\ ^3S^e$ states, with n=2 to 15, and from which entanglement entropies for such states are quantified by calculating the occupation numbers of the respective one-electron reduced density matrix $<i|\rho_1|j>$through a generalized eigenvalue problem. At the meeting, we will present our results and show the correlation between energies, effective quantum numbers, and entanglement for states in these Rydberg series.

[1] Y. C. Lin and Y. K. Ho, *Phys. Rev. A* **87** (2013) 022316; *Can. J. Phys.*, accepted (2014);
[2] L. G. Jiao and Y. K. Ho, *Int. J. Quan. Chem.*, online published (2015).

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