Shannon information entropy in N particles Moshinsky model[1]

PENG HSUAN-TUNG, National Taiwan Univ., Taiwan; Institute of Atomic and Molecular Sciences, Taiwan, YEW KAM HO, Institute of Atomic and Molecular Sciences, Taiwan — In the Moshinsky model, particles are confined in harmonic traps, and inter-particle interaction is also of harmonic, the von Neumann entropy for such a system can be solved exactly [1], and the Shannon entropy of two particles Moshinsky model has been also investigated [2]. In our present work, we have extended the investigation on statistical correlation of N particles Moshinsky model in the ground state by calculating Shannon information entropy in both position and momentum spaces as a function of numbers of particles, and of interaction strength among particles. We have solved the N particles Moshinsky model wave function with analytical results, and with which Shannon information entropies for the whole system and that for a subsystem consists of p-particle can analytically be computed. The mutual information in position and momentum spaces between a group of p-particle in their ground state, and that of the other group for N-p particles, has also been determined. Our results are also used to test the entropic uncertainty principle, and found that such principle does hold in our system. At the meeting, in addition to the analytical results, we will also show an example for numerical results with $N = 8$, and $p = 1$ to 8. [1] P. Kosìcik and A. Okopinìska, *Few-Body Syst.* **54**:1637–1640 (2013); [2] H. G. Laguna and R. P. Sagar, *Phys. Rev. A* **84**, 012502 (2011).

Yew Kam Ho
Institute of Atomic and Molecular Sciences, Taiwan