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Quantum information processing between different atomic ions¹ XIANG ZHANG, BO ZHENG, JUNHUA ZHANG, MARK UM, SHUOMING AN, TIANJI ZHAO, LUMING DUAN, KIHWAN KIM, Center for Quantum Information and Institute for interdisciplinary Information Science, Tsinghua University, Beijing 100084 — There is increasing interest in utilizing and combining the advantages of different quantum systems. Here, we discuss the experimental generation of entanglement between the quantum states of different atomic ions through the Coulomb interaction at the same linear radio-frequency trap. This scheme would be extended to implement the teleportation of quantum information from one kind of atom to the other. Moreover, the hybrid system of trapped ions is expected to play an essential role in the realization of a large quantum system, where a quantum state of one species is used for quantum operation and that of the other is for the cooling and stabilization of the whole ion chain. Finally, we will report the experimental progress on building the hybrid trapped ion system.

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