Editorial

Quantum communication and quantum computation are two major branches of quantum information. In quantum communication, principles of quantum physics provide us with the capability of on-site detection of eavesdropping (ODE). In quantum key distribution, random numbers are distributed between two remote parties. If an eavesdropper is found, then the communicated data will be discarded. If no eavesdropper is found, the transmitted data is then post-processed to a very high security level and used as keys. Quantum key distribution could not communicate secret message directly, because it cannot obliterate the information leakage before eavesdropper detection (OILBED). In quantum secure direct communication, not only eavesdropper can be found on-site, but also the obliteration of information leakage before eavesdropper detection can be realized. OILBED makes quantum secure direct communication to transmit secret messages directly. If the communication is bi-directional, then it becomes a quantum dialogue. It is believed that a global quantum network could be built by running intra-city quantum communication with fibers, and the inter-city quantum communications by the use of ground-satellite, satellite-satellite, and satellite-ground links. On the other hand, quantum principles enable quantum computer to compute or process much more powerfully. The Shor algorithm, the Grover algorithm and simulations of quantum systems are three major quantum algorithms. The simulation of quantum systems is one of the important application of quantum computation in quantum computers with just a few quantum bits. In such prototype system, quantum algorithms can be demonstrated and studied.

This special topic of *SCIENCE CHINA Physics, Mechanics & Astronomy* collected eight papers. To be ready with satellite-ground quantum key distribution, Wang et al. [1] completed an experimental validation work on dynamic polarization compensation. Su et al. [2] presented their work on the preparation of entangled states for quantum network. Liang et al. [3] reviewed the recent development on single-photon detection, a critical component in quantum communication and quantum computation. New protocols have also been studied. Zheng et al. [4] presented a protocol of quantum dialogue. Gao et al. [5] reported their minimum best success probability result in quantum telegraphy. Quantum simulation of “zitterbewegung” using ion-trap scheme is proposed by Liu et al. [6]. An experimental realization of the quantum deletion algorithm was given by Long et al. [7]. Finally, Zhao et al. [8] studied the long time evolution of a spin in a spin bath, an important result that could help to find a new candidate for quantum memory or quantum computation.

This special topic is only part of the efforts of the Chinese quantum information community at present. We hope this special issue will reflect the on-going research effort of the quantum information community in China, and help to stimulate the efforts and draw attention of respective researchers.

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- 2 Su X L, Jia X J, Xie C D, et al. Preparation of multipartite entangled states used for quantum information networks. *Sci China-Phys Mech Astron*, 2014, 57(7): 1210–1217
- 3 Liang Y, Zeng H P. Single-photon detection and its applications. *Sci China-Phys Mech Astron*, 2014, 57(7): 1218–1232
- 4 Zheng C, Long G F. Quantum secure direct dialogue using Einstein-Podolsky-Rosen pairs. *Sci China-Phys Mech Astron*, 2014, 57(7): 1238–1243
- 5 Gao F, Fang W, Wen Q Y. Minimum best success probability by classical strategies for quantum pseudo-telepathy. *Sci China-Phys Mech Astron*, 2014, 57(7): 1244–1249
- 6 Liu T, Feng M, Yang W L, et al. Quantum simulation of ‘zitterbewegung’ in a single trapped ion under conditions of parity-keeping and parity-breaking. *Sci China-Phys Mech Astron*, 2014, 57(7): 1250–1255
- 7 Long Y, Feng G R, Pearson J, et al. Experimental quantum deletion in an NMR quantum information processor. *Sci China-Phys Mech Astron*, 2014, 57(7): 1256–1261
- 8 Zhao Y K, Zhao M S, Chen Z B. Long time evolution of a spin interacting with a spin bath in arbitrary magnetic field. *Sci China-Phys Mech Astron*, 2014, 57(7): 1262–1265