Towards Practical Hybrid Quantum Networks for Security

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Abstract

Contrary to classical networks, quantum networks use the principles of quantum physics to transmit and process information offering immense potential in several areas including secure communication, powerful computing, advanced sensing capabilities and many upcoming domains. Quantum entanglement, an essential trait of quantum physics, offers an extra layer of security in distributing keys and also simplifies their analysis. In addition, it is useful in computing, imaging and sensing applications. This talk will highlight the development of entangled photon sources in our lab for both free-space and fibre based applications, and characterization of their quantum features. Efforts of our group so far in realizing quantum key distribution using hybrid schemes for lab scale and for long distance including real field environment would also be detailed. The need of multi-node quantum networks for realizing quantum internet would also be discussed focussing on applications related to security. Specifically, the practical aspects of entanglement enabled hybrid networks will be emphasized, focussing on the need of coexistence of classical and quantum signal on the same fibre, which are primitives for realizing such practical intercity quantum networks.