

# Generation and manipulation of telecom photons towards quantum internet

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## Abstract

By connecting distant quantum devices through entanglement, the entangled quantum devices act as a single huge quantum device. This feature would be useful for realizing long-distance quantum key distribution and quantum sensor/computer network. Such entanglement networks are called quantum internet. As building blocks of quantum internet, development of elemental technologies such as entangled photon pair sources, quantum memories and quantum frequency converters are of importance. Quantum ICT Laboratory in NICT has developed entangle photon pair sources in telecom wavelength band and quantum frequency converters. In the presentation, I talk about two research topics. First, I talk about entangled photon pair sources at telecom wavelength. By using an electro-optic frequency comb and a nonlinear crystal with waveguide structure, we have developed entangled photon pair sources operating in GHz order clock rate. Second, I talk about a quantum frequency converter which can be used to convert the wavelength of single photons emitted from a quantum memory to telecom wavelength. We focus on the photons emitted from a Ca<sup>+</sup> ion trap, and successfully demonstrated the quantum frequency conversion.