

Plenary Talk

PV XII Thu 9:00 Audimax 1

Quantum networks - from dreams to reality — ●JIAN-WEI PAN

— University of Science and Technology of China, 96 Jinzhai Road, Hefei 230026, China

Photons, the fast flying qubits which can be controlled with high precision using linear optics and have weak interaction with environment, are the natural candidate for quantum communications. By developing a quantum science satellite Micius and exploiting the negligible decoherence and photon loss in the out space, practically secure quantum cryptography, entanglement distribution, and quantum teleportation have been achieved over thousand kilometer scale, laying the foun-

dition for future global quantum internet. Surprisingly, despite the extremely weak optical nonlinearity at single-photon level, an effective interaction between independent indistinguishable photons can be effectively induced by a multi-photon interferometry, which allowed the first creation of multi-particle entanglement and test of Einstein's local realism in the most extreme way. By developing high-performance quantum light sources, the multi-photon interference has been scaled up to implement boson sampling with up to 76 photons out of a 100-mode interferometer, which yields a Hilbert state space dimension of 10^{30} and a rate that is 10^{14} faster than using the state-of-the-art simulation strategy on supercomputers.