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Entanglement based quantum networking

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Abstract

Quantum communication is inherently a two party point to point protocol. Its information theoretically perfect security depends on the physical impossibility of exactly duplicating individual quantum states. However, this very property also makes long distance and network based implementations very difficult. This is because Information cannot be read and then resent without compromising the security of the quantum network.

Multiplexed distribution of entanglement allows the simple and scalable distribution of bipartite entangled states to all pairs of multiple users. The users can then perform measurements on these states to implement many protocols including Quantum Key Distribution, Anonymous protocols, Digital Signatures, Secure Initial Authentication Transfer and network flooding. We present the experimental implementation of all these protocols on our 8-user city wide quantum network using deployed telecom infrastructure. Lastly we present preliminary data on how we can extend this type of quantum network over even longer fibre distances of up to 50km.