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Quantum cryptography for satellite communication

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Quantum key distribution (QKD) is a secure method of transferring encryption keys between two distant parties. It provides a physical layer of security rather than a mathematical algorithm used in conventional encryption systems. As QKD is of paramount importance in the future ICT landscape, various innovative solutions have been developed and tested to expand the spatial coverage of these networks [R. Alleaume, 2007, C. Elliott, 2004, F. Xu, 2009]. One such technique to create a global QKD network is to couple quantum-secured MANs with secured ground-to-satellite links. We present our recent work in ground-to-balloon QKD systems as an intermediary to the satellite QKD.

We have considered a number of parameters in developing our solution. Firstly, the link with the earth station should be guaranteed and robust. Other parameters that we have taken into account include the design of the payload, tracking systems, synchronization balloon/satellite and ground station and choice of the public channel.

The balloon or satellite will send the QKD signal to the ground station. We use the radio modulation PSK for the transmission of data and synchronize the laser signal for QKD. In this way the distance and velocity relative between earth and satellite (or Balloon) is not a constraint. The public channel will be used to send a string of bits (from satellite to earth) that indicates the data start and from that moment, for every bit of the clock, the satellite sends the quantum bit. Radio communication will be used also for the public communication during the QKD transmission. Data for correction for the tracking laser will be controlled by a feedback loop on the ground station, however, the tracking system of the Balloon or satellite must work separated from the ACS.

**Level (Hons, MSc,
 PhD, other)?**

MSc

**Consider for a student
 award (Yes / No)?**

Yes

**Would you like to
 submit a short paper
 for the Conference
 Proceedings (Yes / No)?**

Yes

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