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Cyber-security threats to space missions and countermeasures to address them (4)

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QUANTUM KEY DISTRIBUTION USING SPACE-BASED PHOTON SOURCES

Abstract

S-fifteen Space Systems is a spin-off company that is developing space-based, quantum-safe communications built on research performed at the Centre for Quantum Technologies (CQT) at the National University of Singapore. The team is developing technologies such as QKD (Quantum Key Distribution) which harness unique properties of quantum physics to enable highly secured encryption services. QKD can generate encryption keys that are secure against computational hacks and that can be distributed to remote parties with solid guarantees that they have not been intercepted by man-in-the-middle eavesdroppers.

Currently, most encryption keys derive their security from complex mathematical functions that require unfeasibly large classical computers to crack, but quantum computers are coming online soon that will compromise many of these keys. Since QKD derives its security from fundamental physical laws it is provably secure against future computational developments. QKD requires that information be transmitted optically, typically with bits encoded in individual photons that must be uniquely distinguished and timestamped at the transmitter and receiver. Accordingly the signals are very weak and susceptible to loss compared with classical laser communications. Within optical fibers they are restricted to distances of 50-100km before physically secured, trusted repeater stations are required. Using free-space optics the losses are lower and by delivering QKD from space the entire world can be connected securely.

S-fifteen Space Systems is the only startup with a successful on orbit demonstration of a quantum light source, and is committed to bringing future-proof security to the commercial world.