

SPACE COMMUNICATIONS AND NAVIGATION SYMPOSIUM (B2)  
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DEMONSTRATING MINIATURISED, ENTANGLED PHOTON-PAIR SOURCES ON BOARD  
NANOSATELLITES TO ENABLE FUTURE QKD MISSIONS.

**Abstract**

We report on our progress developing highly-miniaturised, polarisation-entangled, photon-pair sources for CubeSats. We have a correlated photon source in orbit in the NUS Galassia 2U CubeSat. We also have an entangled photon-pair source in production and a high brightness ( 1Mcps) entangled photon-pair source in development for our upcoming CQT SpooQySat 3U CubeSats. All our sources are proof-of-principle demonstrations that the hardware necessary for entanglement-based QKD can be miniaturised and made sufficiently robust for operation in nanosatellites. The photon pairs they produce are measured with liquid crystal-based Bell state analysers and geiger-mode avalanche photo-diodes onboard the source. These space missions allow our on-the-ground radiation, thermal and vibration tests to be validated and the real-world operation and aging of the source in space to be studied. A BBM92 QKD-capable design of the source has been used in a phase A study of a satellite-to-satellite QKD demonstration mission by the University of New South Wales, Canberra. This mission study uses two 6U CubeSats in LEO and aims to demonstrate QKD over separations of increasing distances as the two CubeSats drift apart.