

An Overview on QubeSat (QKD CubeSat)

Dr Mamatha Maheshwarappa

STFC – RAL Space









Science and Technology Facilities Council







STFC RAL Space Team, UK

CQT Team, Singapore

Mission Objectives



>Objective 1: Build and fly a demonstrator

✓ **SR1**: The system (space and ground elements) must allow the demonstration of entangled photon distribution and the principle of entanglement-based QKD from space to ground.

Objective 2: Provide testing and verification

- SR2: Enough entangled photons should be distributed in the demonstration to enable a key to be created, of at least 64bits in size and with a goal of 256bits.
- SR3: The demonstration of the distribution of a key should occur at least once over the system's mission lifetime. (with a goal of 10 or more such demonstrations)
- SR4: The operational and mission data collected must be suitable to allow analysis of the throughput and overall efficiencies of the creation of keys.

Objective 3: Provide on-going demonstrator

Objective 4: Promote

 SR5: The QKD project must include a marketing and networking element for commercial and government quantum key distribution technology.

Top Level Mission Requirements



Requirements	Definition
Functional	
Primary objective	Design, Develop, Test and Launch a CubeSat to demonstrate Satellite-to-Ground downlink QKD using entangled photons between satellite and the ground station
Spacecraft Form Factor	CubeSat
Orbit	LEO (Polar Sun Synchronous)
Pointing	5uRad
Communication Bands	S-Band/X-Band
Operational	
Duration	~8min/Orbit; 3-4 Orbits/Day/Ground Station (30min over Chilbolton per day)
Science Data	5GB of science data (Downlink) and/or 10MB (Uplink) per science pass
Lasers	Quantum signal, Uplink Beacon Laser & Downlink Beacon Laser
Constraints	
Lifetime	Operational Lifetime of 1 year with a goal of 2 years

Concepts of Operations (ConOps)





Spacecraft Systems Architecture





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CAD Models of the Spacecraft







Ground Station Architecture

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Chilbolton Ground Station

in the first

- Satellite Tracking Facility & Ground Station
- Telemetry link to Satellite Laser ranging (HMX)
- Lat 51.14°N, Long 1.44°W, Altitude 132 m
- S-Band Uplink 10 Mbits/s
- X-Band Downlink 650 Mbits/s
 - ~130 cloud free nights every year.

Thank you!

Dr Mamatha Maheshwarappa mamatha.maheshwarappa@stfc.ac.uk Science & Technology Facilities Council

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