

# QKD-SAT

## ENGINEERING ASSURANCE

SATELLITE COMMUNICATIONS ENGINEERING

## SATELLITE QUANTUM KEY DISTRIBUTION SYSTEM ASSURANCE

Our Client is developing an innovative technology platform to globally distribute quantum keys (QKD) using a LEO satellite constellation, meant to address growing security concerns from several application markets. Telespazio UK, through its recent acquisition of e2E, were engaged to produce the end-to-end system level reliability prediction, system availability analysis and overall maintainability strategy.

In assessing the ability of the QKDsats system to perform its function satisfactorily, we structured our work using appropriate European Cooperation for Space Standardisation (ECSS) specifications and relevant military standards. The key challenge we had to resolve was that the QKDsats programme is currently comprised of 4 segments, each being developed and managed via separate subcontractor arrangements. Segment level analysis and associated documents, for example the critical items list, long lead items, prohibited materials and single point failure lists have been used to support the RA&M activities.

The reliability prediction was completed using a parts count approach, due to the bespoke nature of certain devices/subsystems and the degree/criticality of the new software development. In defining an optimum maintenance regime, Telespazio UK has ensured the maintenance strategy includes the sparing for a mission lifetime of at least 10 years. We have also led the analysis and development of the dependability aspects at system level, including both Failure Mode Effects and Criticality analysis (resulting in a Fault Detection, Isolation, and Recovery strategy) and a safety assessment.

The provision of our systems engineering resources, supplied at short notice has enabled the Customer to minimise programme schedule impacts by supplementing in-house engineering skills-shortages. The calibre of expertise supplied enabled recruitment needs to be removed from the critical path providing for better longer term skills decision making. Specific expertise has been provided in spacecraft product assurance, systems requirement management, system security engineering and segment level definitions (specifically TT&C). MBSE techniques and tools have also been used to assist with subsystem and interface requirement definitions.