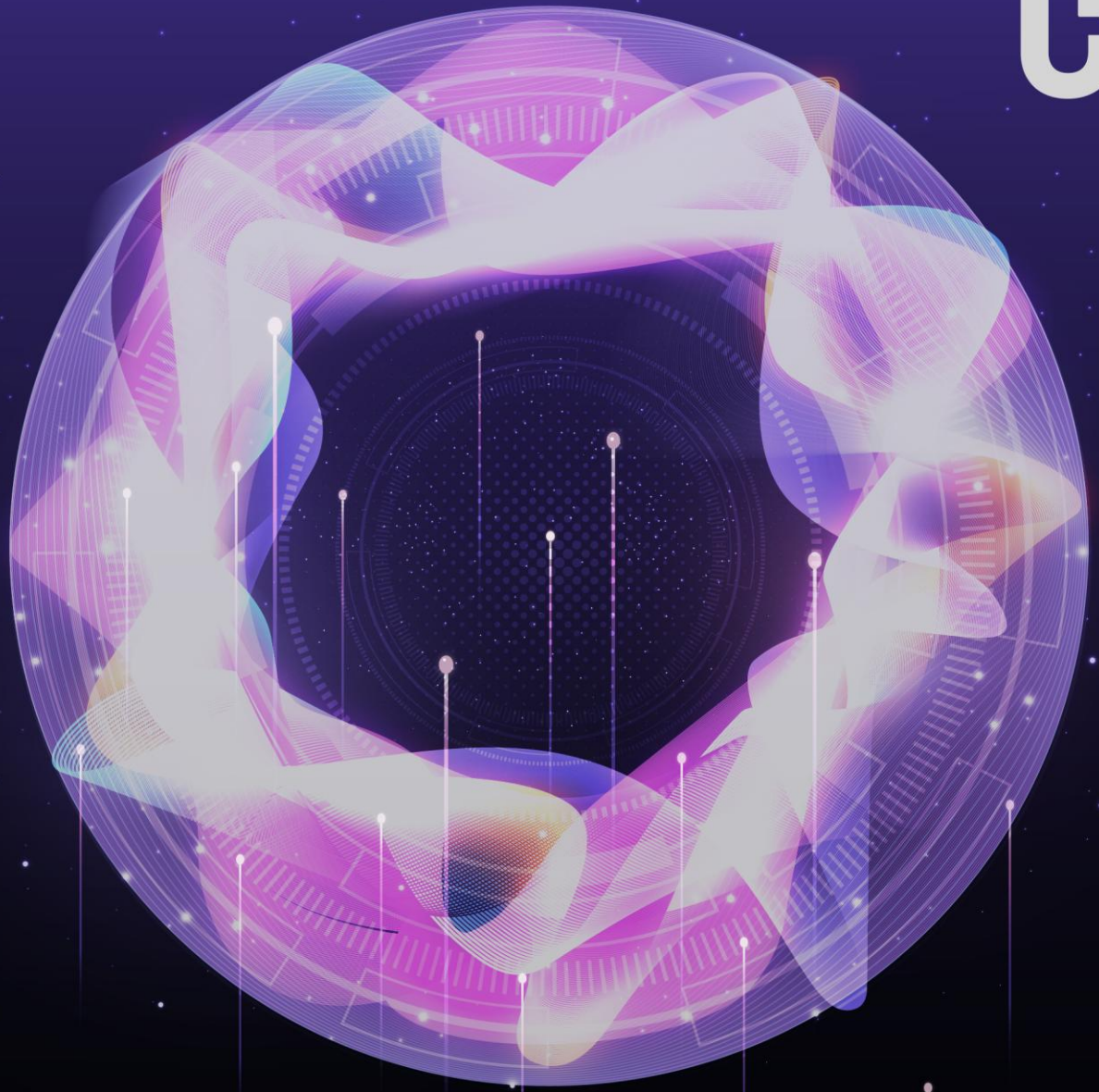
UNE Normalización Española

POLITÉCNICA

UNIVERSIDAD POLITÉCNICA DE MADRID



Quantum Technologies Standardization

October 2025

Workshop

QuTechSpace

Funded by the European Union

This project has received funding from the European Union's Horizon Europe research and innovation programme under the project *"Quantum technology components for space communication" (QuTechSPace, grant agreement No 101135225)*

Motivation

Pictures from ESA [SAGA, EAGLE 1, QKDSat] and Thales Alenia Space [TeQuantS]

Work Item: "Standardization needs for satellite-based QKD"

- Extending **quantum communication** to **space** is inevitable for the exchange of QKD key material on a **global scale.**
- **EU policymakers** are aware of the strategic importance and are investing in **infrastructure projects,** thereby driving the **commercialization** of SatQKD.
- A **roadmap** providing insights into the **standardization gaps and needs** is highly relevant and in the interest of **European policymakers** and the **industry.**

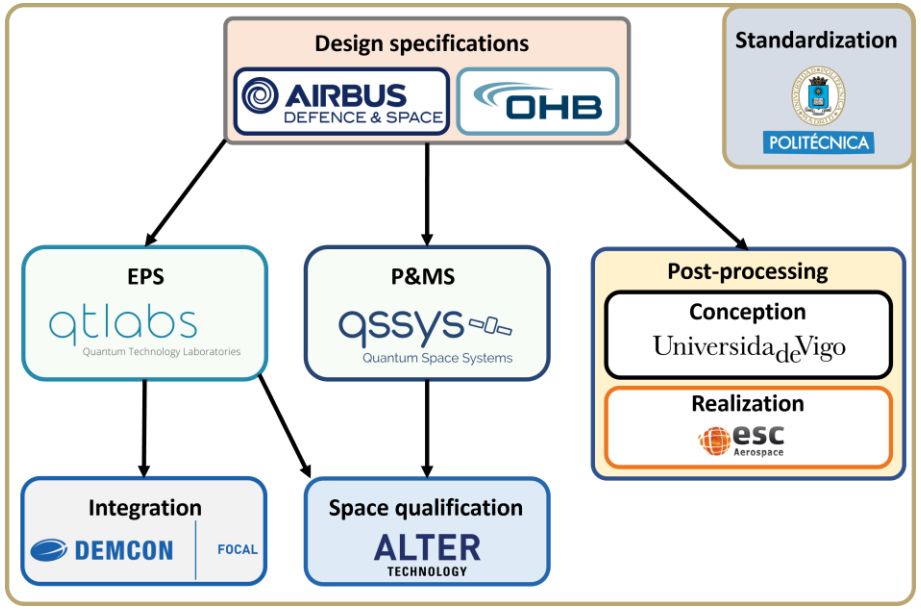
UNE

UNIVERSIDAD POLITÉCNICA DE MADRID

Funded by the European Union

QuTechSpace

Origin: QuTechSpace Project



O5: Facilitation of **standardization activities** for space quantum communication to promote interoperability and consensus.

First Task: Draft a **Roadmap**

Normalización Española

UNE

UNIVERSIDAD POLITÉCNICA DE MADRID

Funded by the European Union

QuTechSpace

Work Item Creation

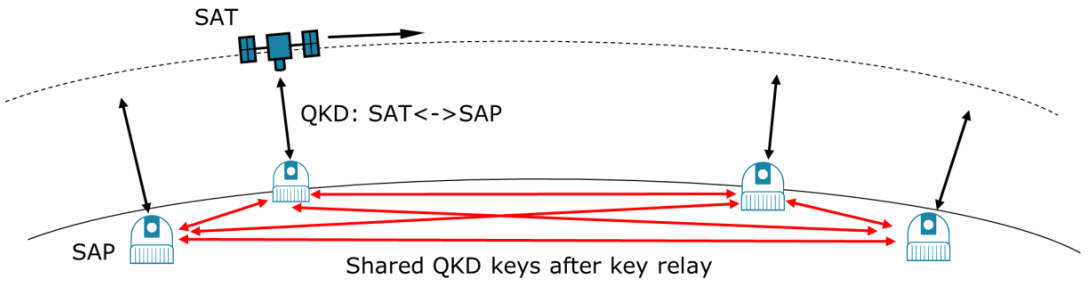
- QuTechSpace consortium decision to develop the SatQKD standardization roadmap in CEN/CENELC, JTC22 - WG4

- Proposal and approval of the work item (end of 2024) „**Standardization needs for satellite-based QKD**“

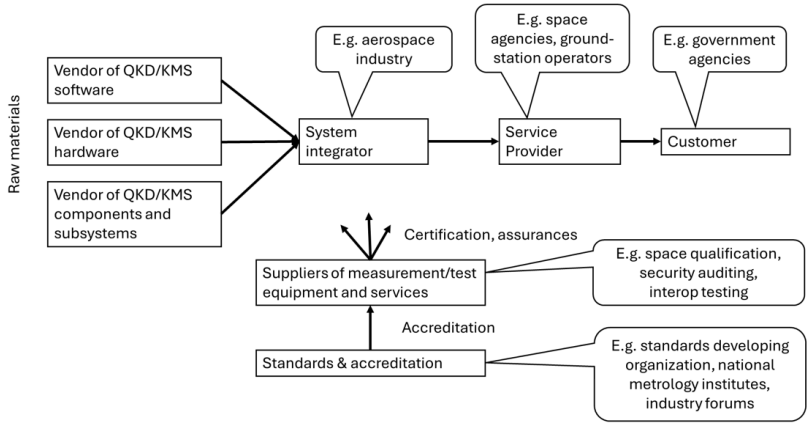
- Ad hoc group formation: qtlabs, ADS, OHB, TAS, TESAT, ALTER TECHNOLOGY, ESC aerospace, Merqury, Orange, Huawei Europe, NPL, TNO, several Universities, EC – DG CNECT, JRC, ESA,...

Introduction and Scope

- Differences to fiber-based QKD



- Market View on SatQKD



UNE

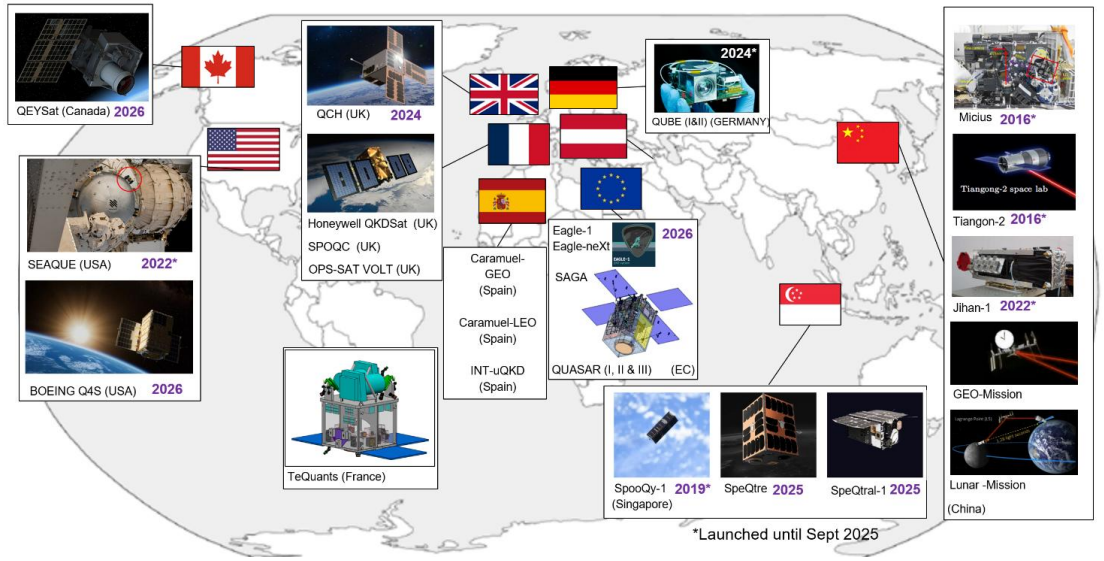
POLITÉCNICA

UNIVERSIDAD POLITÉCNICA DE MADRID

Funded by the European Union

QuTechSpace

State of the Art



- Review and Market Survey of SatQKD missions
- Common characteristics and best practices
  (e.g., Orbit classes, Quantum Link configuration, QKD Protocol,…)

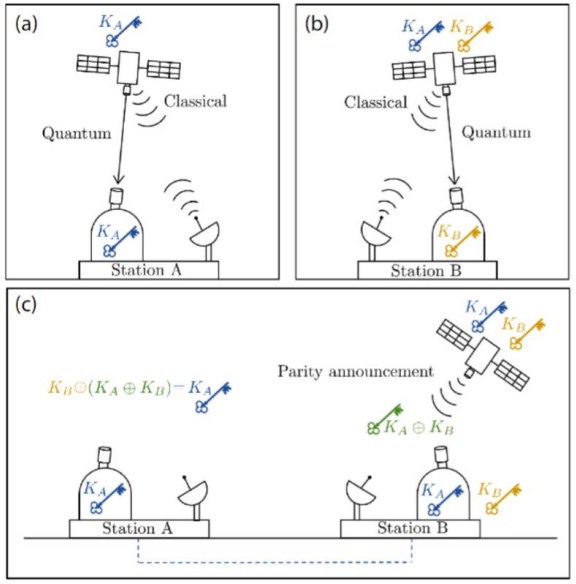
UNIVERSIDAD POLITÉCNICA DE MADRID

Funded by the European Union

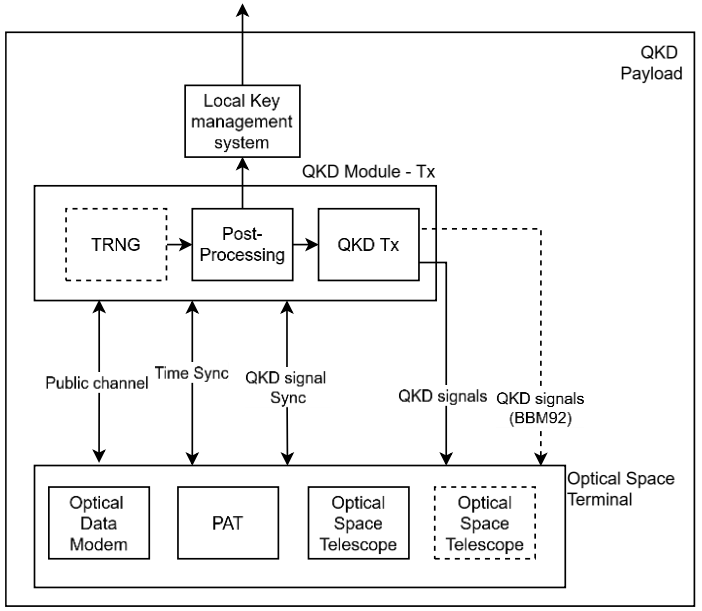
QuTechSpace

Functional Architecture and ConOps

- Which functions & interfaces are essential for SatQKD?
- Which QKD network layers do they correspond to?
- What is the high-level Concept of Operations?



Grieve, James et al. (2017)



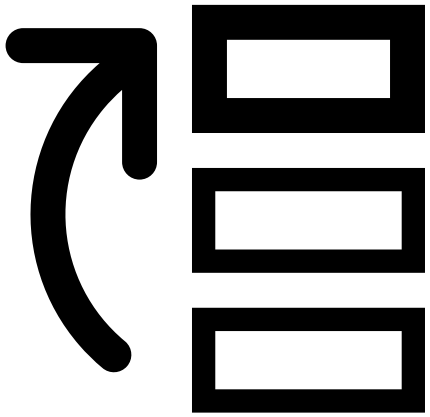
Normalización Española

Standardization Needs and Gaps

Examples:

- There are standards for free-space Laser comms BUT…
- There are key management standards BUT…
- There are no QKD layer interface standards BUT…
- There are security assurance standards for QKD BUT…

Standardization Priorities



Prioritize standardization needs based on:

- Market readiness
- Technological readiness
- Certification readiness
- Interoperability need

Ultimate goal of the roadmap:

Propose high-priority standardization needs