

NQSN TESTBED: A FULLY INTEROPERABLE QUANTUM-SAFE NETWORK WITH VERSATILE REFERENCE APPLICATIONS

NATIONWIDE COLLABORATION PLATFORM & FIELD TESTBED FOR QUANTUM-SAFE COMMUNICATIONS

TESTBED INFRASTRUCTURE

- Open network accessible for partners to perform field trials and proof of concepts for technology evaluation

SECURITY FRAMEWORK

- Security evaluation of Quantum communication equipment to seed certification

REFERENCE GUIDELINES

- Build readiness to support users in adoption and development of national reference specifications

TESTBED

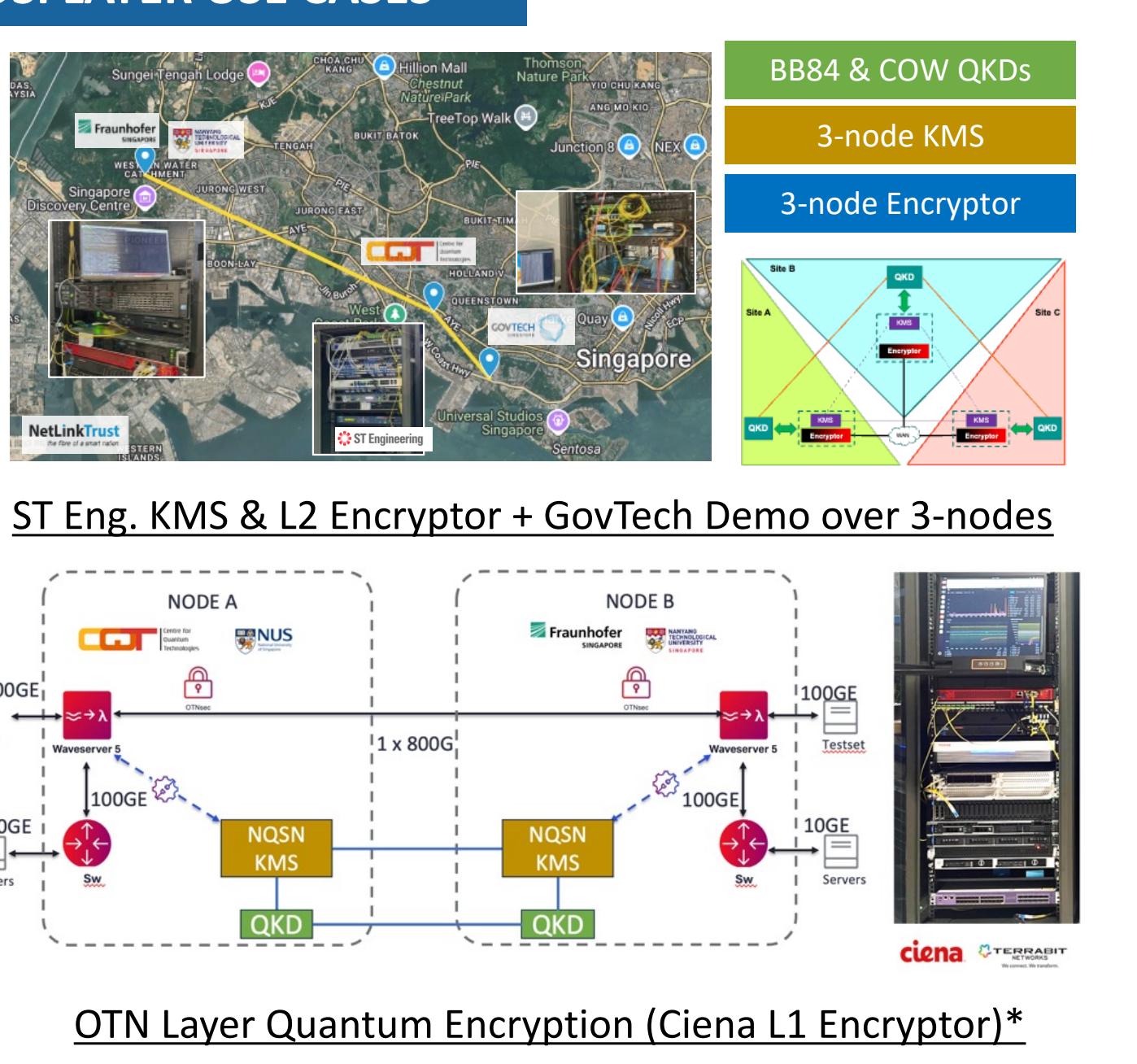
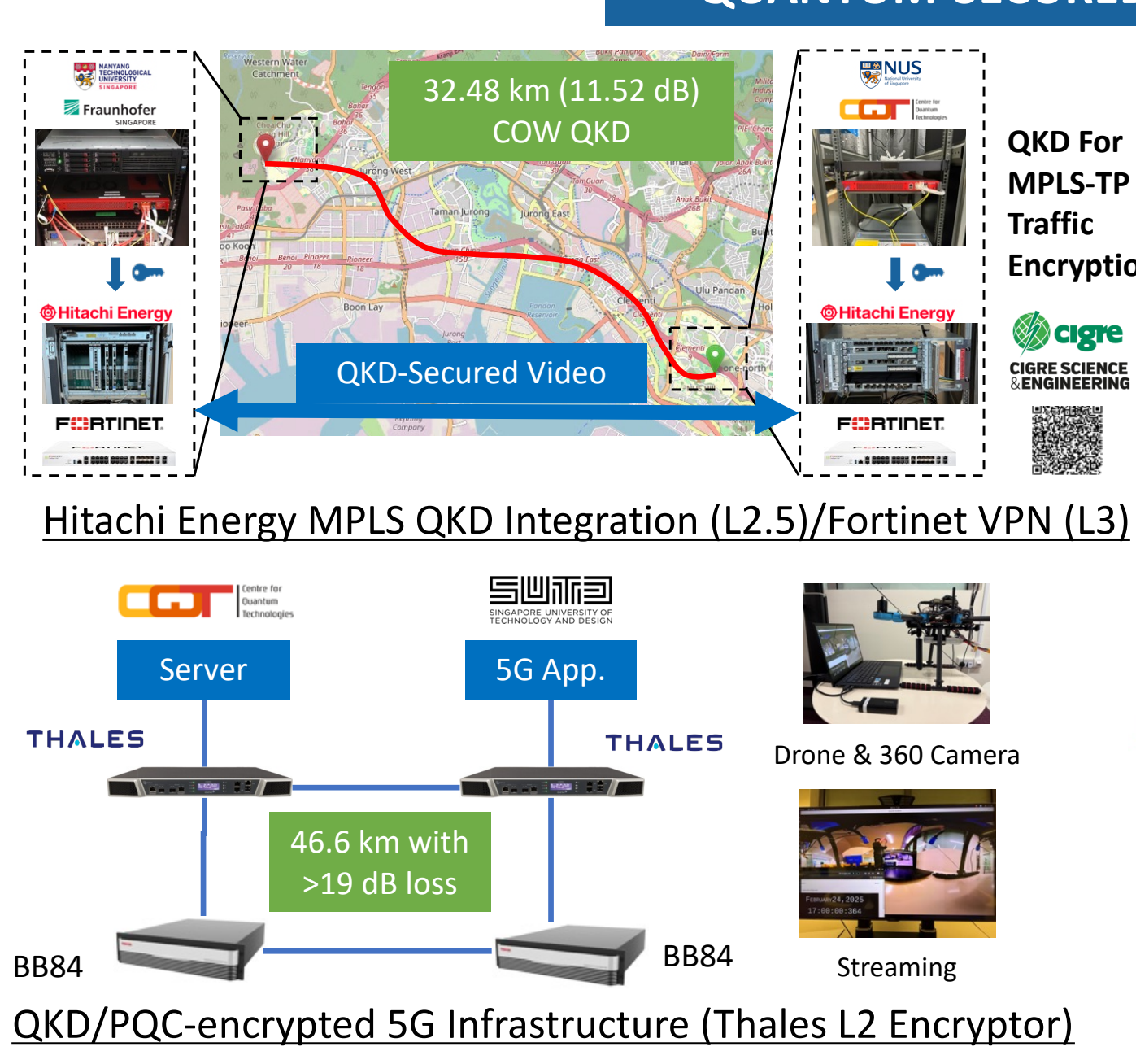
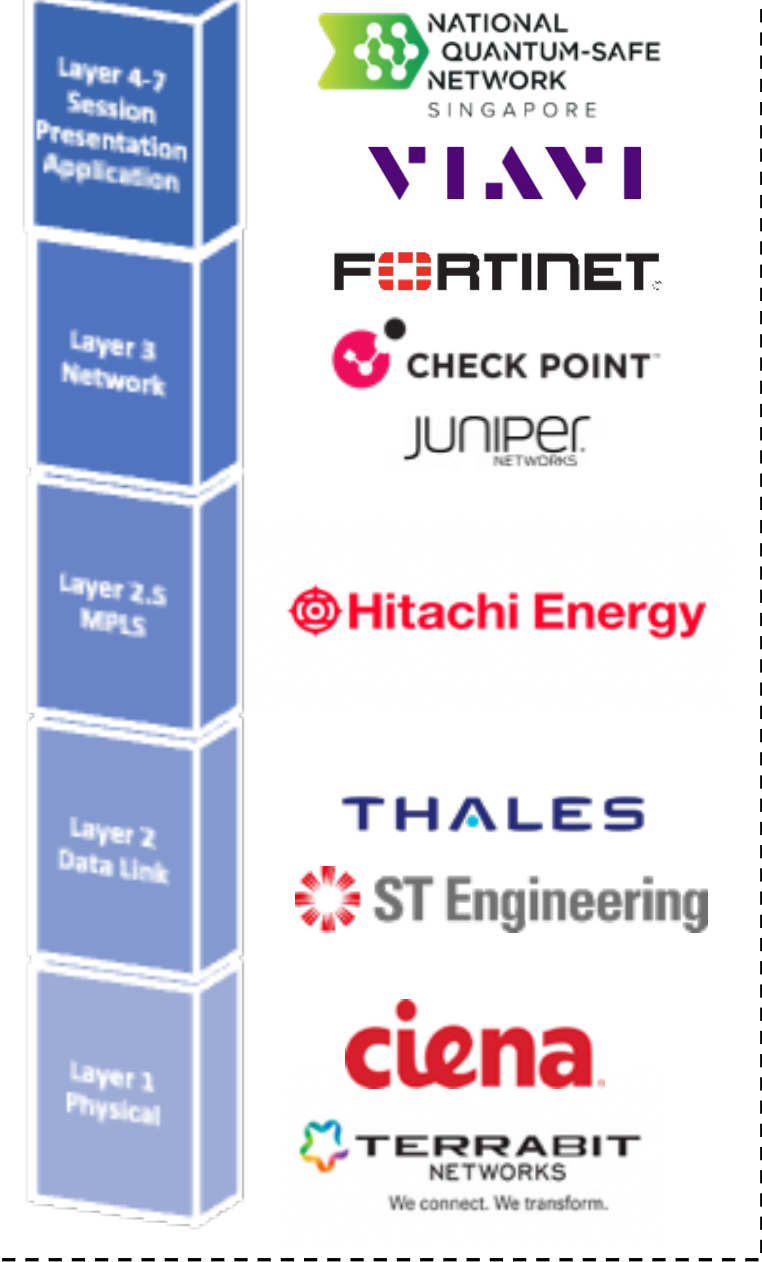
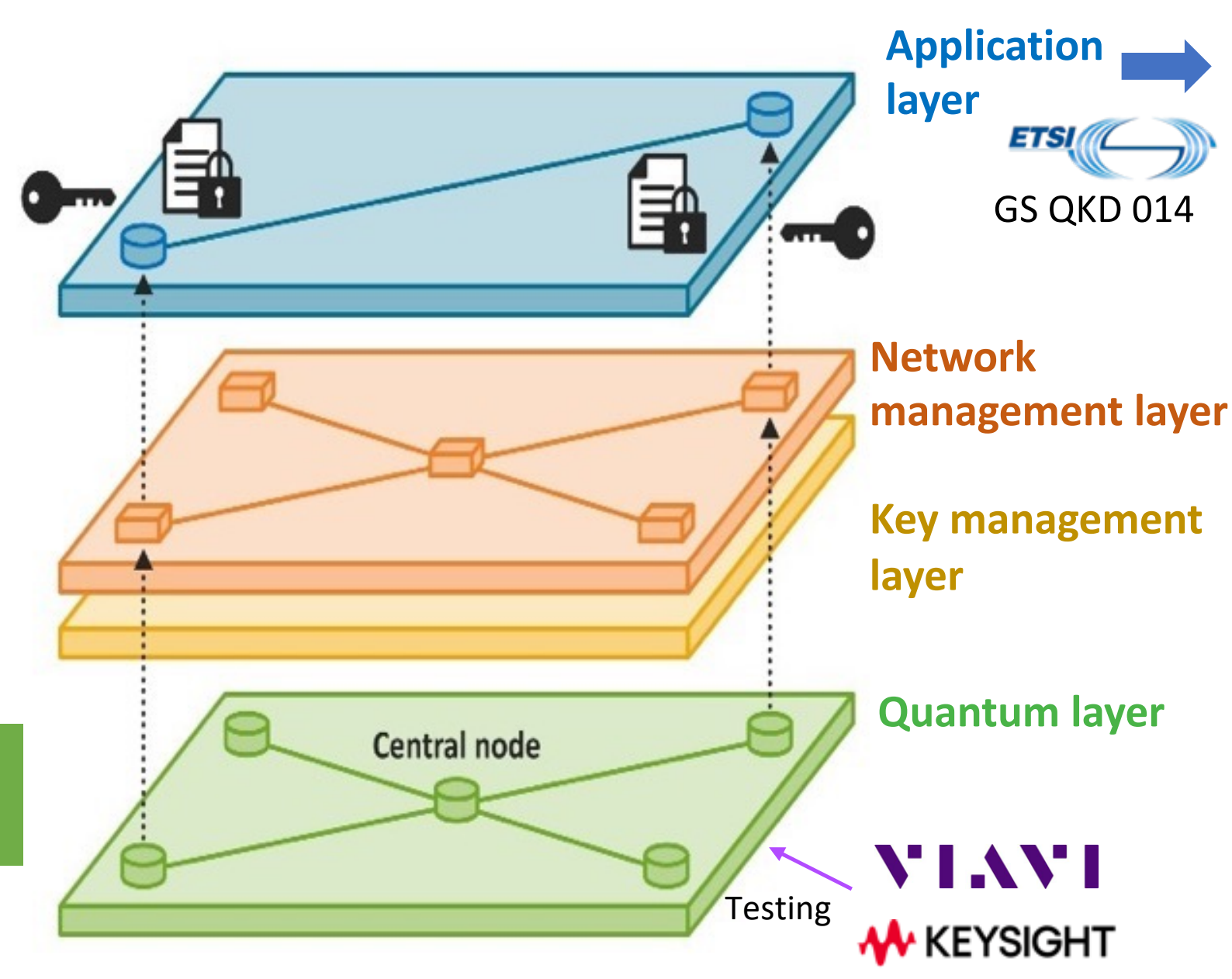
STANDARDIZATION

ECOSYSTEM & USE CASES

RESEARCH ACTIVITIES

NQSN INITIATIVES

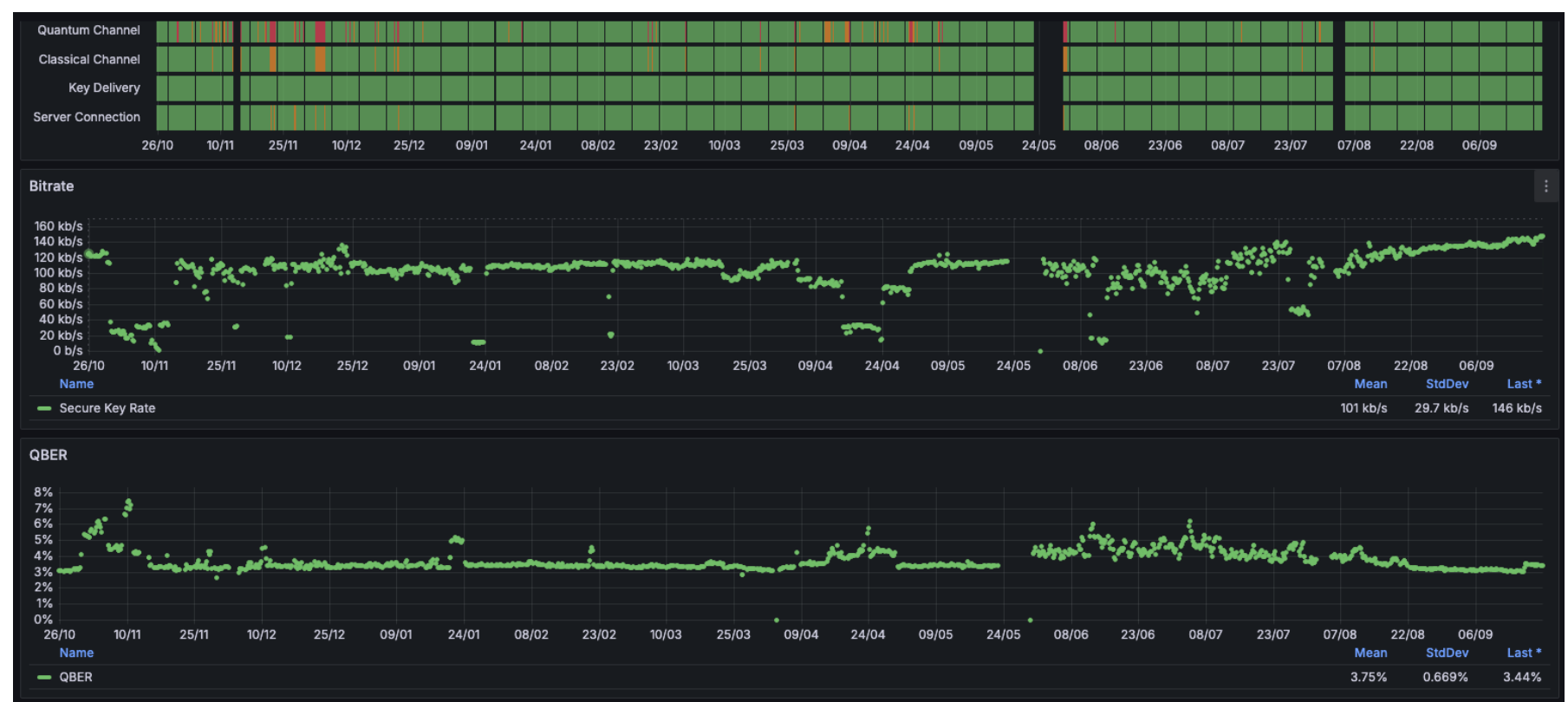
- Encryptions & Quantum-Safe Applications
- Interoperability Scalability
- Multi QKD protocols Existing Fiber infra



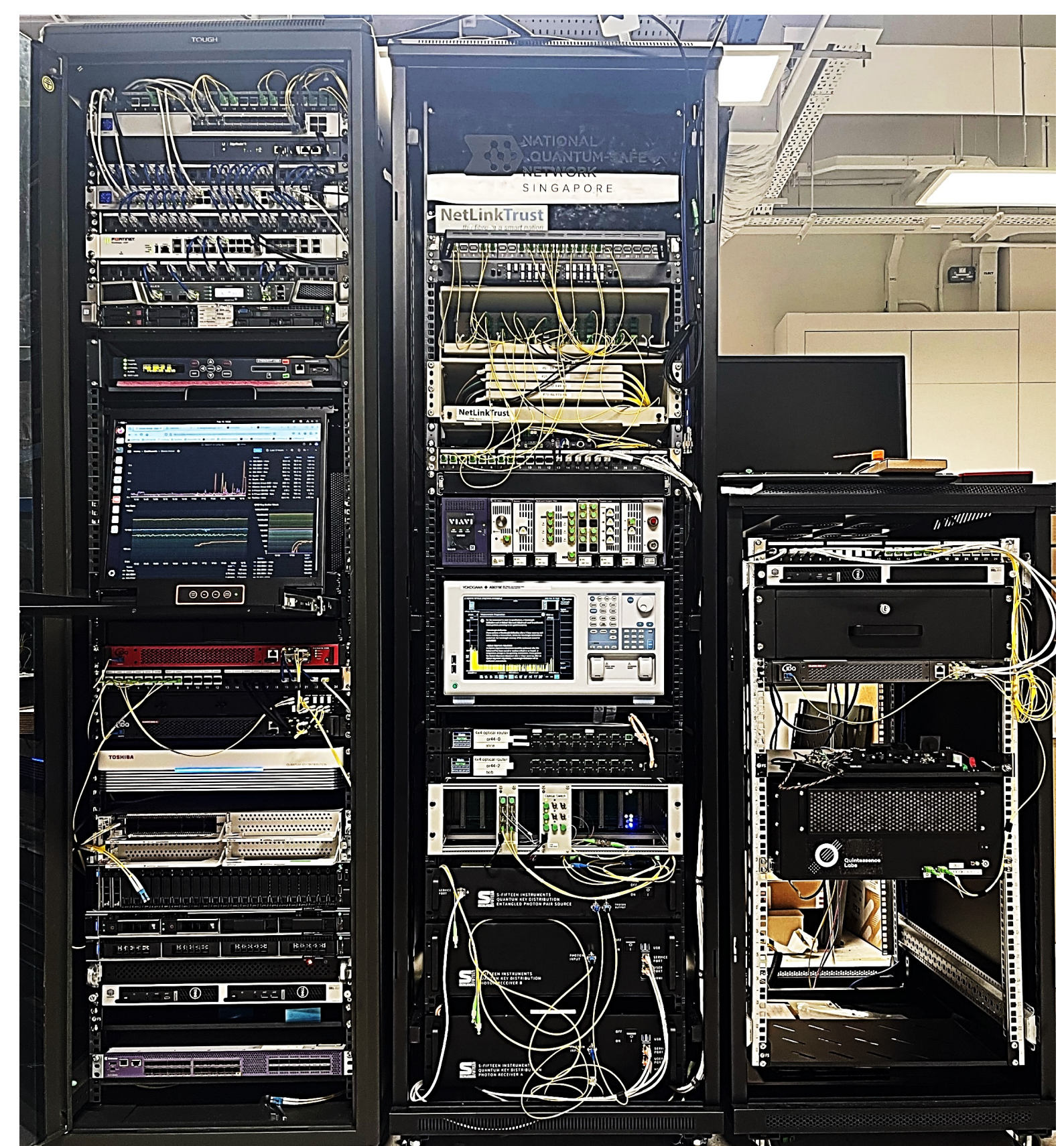
Compliance with ITU-T Y.3800; IMDA TSAC RS QKDN

Quantum-Safe Testbed:

- Nation-wide open fibre optic network (>1500km)
- Star-Mesh quantum key distribution (QKD) network
- Vendor neutral and multi QKD protocol
- Performance, stability and security evaluation
- Interoperable Key Management System (KMS)
- Hybrid QKD/PQC (Post-quantum cryptography) approach



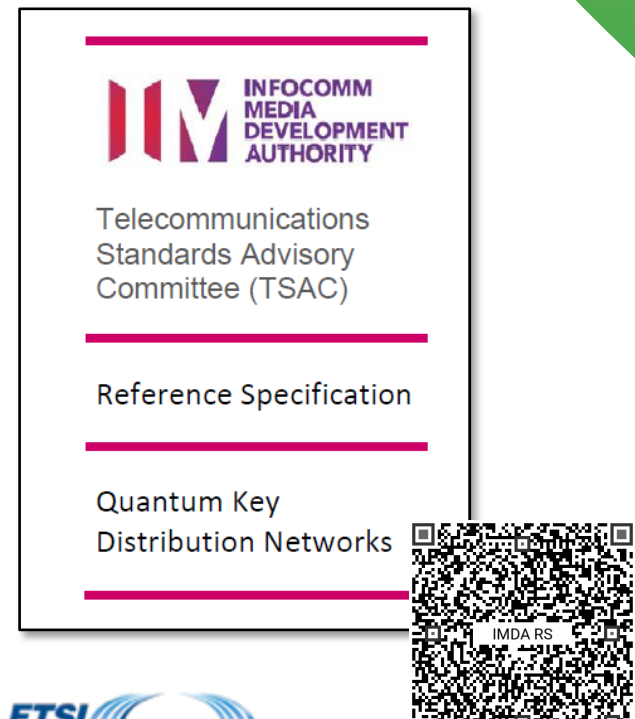
Toshiba LD QKD (BB84) Performance (10/2024-09/2025)



NQSN Central Node with 5 QKD Systems (BB84 x2, COW, GMCS, EB) & Networking Devices

Standardization:

- Actively contributing to international standardization organizations (ITU, IEC, ISO, ETSI)
- ITU work item on QKD protocol framework (on-going)
- Leading Singapore's Quantum Communication Networks Task Force (QCNTF) under IMDA
- 1st phase: published Singapore's first standard on QKD network (Jun 2023)
- 2nd phase: Study Report on QKD modules & networks evaluation & certification (July 2024)



Quantum-Safe Research Activities:

In collaboration with

- CSA SINGAPORE
- DSO
- T Systems
- KEYSIGHT

Quantum-Safe Research Activities:

- NQSN reviewed Germany BSI's Technical Report
- Physical Review Applied, 18(4), 044075 (2022)
- Physical Review A 105, 042411 (2022)
- QCrypt 2024 (arXiv:2410.10245)
- Phys. Rev. A 112, 012612 (2025)
- National Science Review (2025): nwaf147
- arXiv:2409.17558
- Unconventional Imaging, Sensing, & Adaptive Optics 2023 12693, 126931N