



Quantum Key Distribution

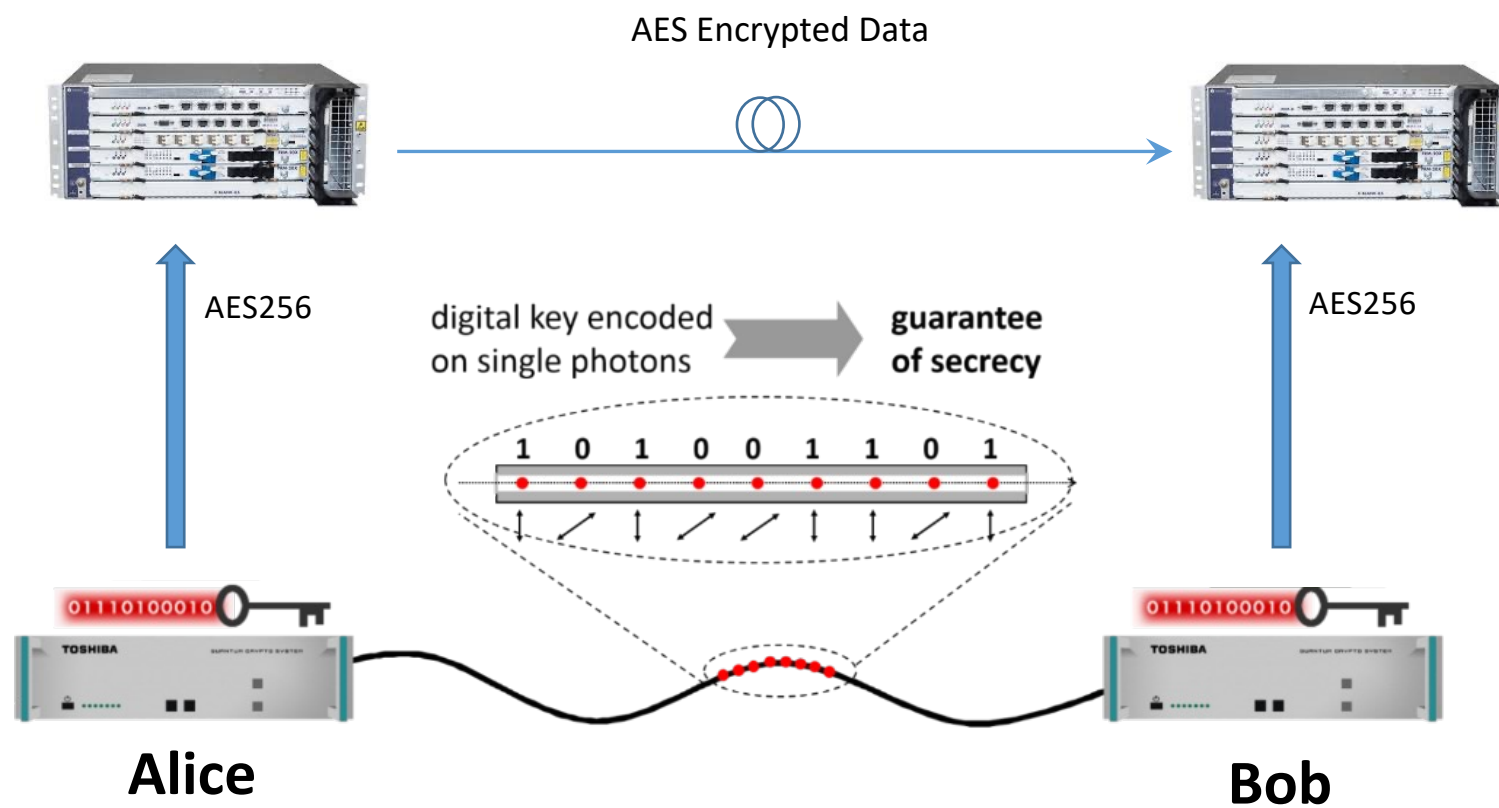
Multiplexing Quantum Key Material with Data Waves

Karel van Klink, MSc
Network Evolution Intern

GÉANT Infoshare – QKD deployments
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Public

Quantum Key Distribution



Methodology

- Literature review
 - Standardisation
 - Certification
 - Required hardware and software
- Experiments
 - Toshiba equipment performance
 - Multiplexing QKD and data waves

Literature Review

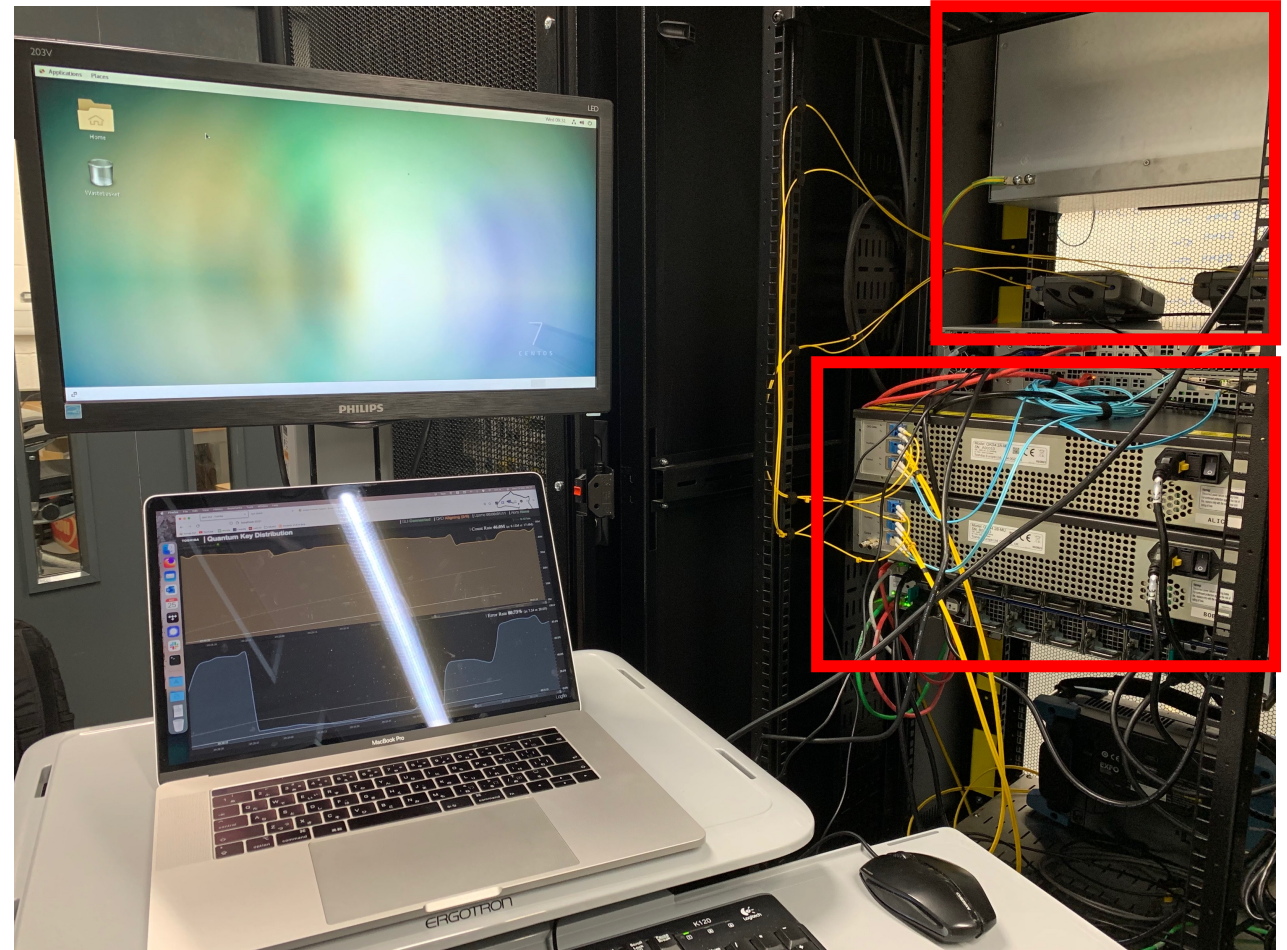
- Current work on standardisation
 - Architecture
 - Hardware
 - Software
- Future work

Existing Standardisation

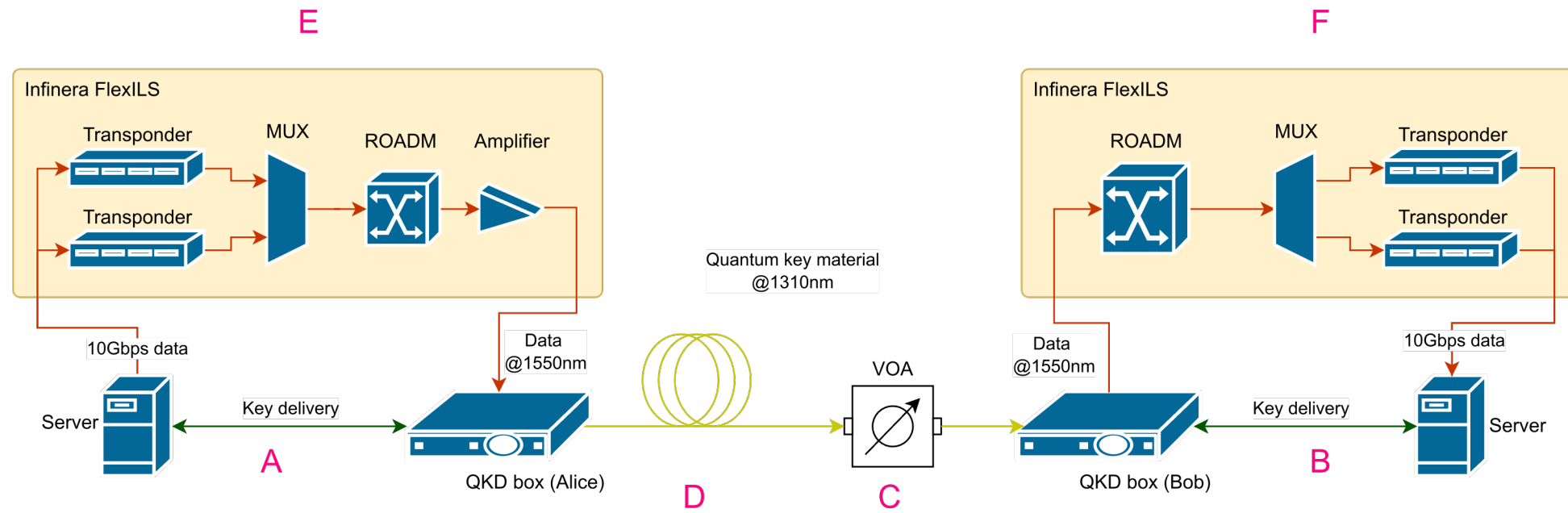
- Recommendations only
- Implementation left up to vendors
- No QKD-specific certification exists yet

Experiments

- QKD in O-band, data in C-band
- Multiplex data at multiple power levels
 - Secret Key Rate
 - QBER
- Maximum sustainable attenuation
 - Which link spans could we cover?

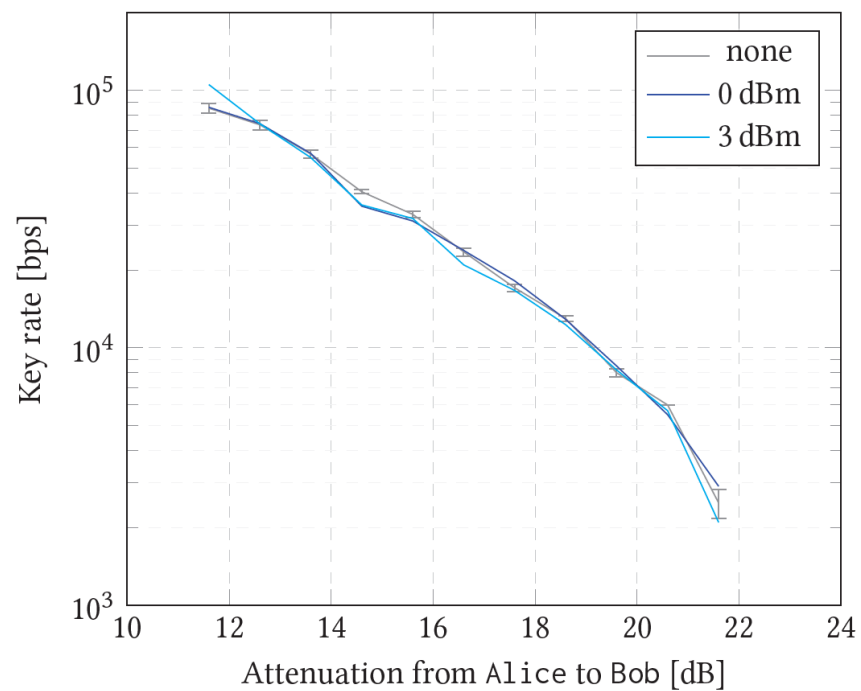


Lab Setup

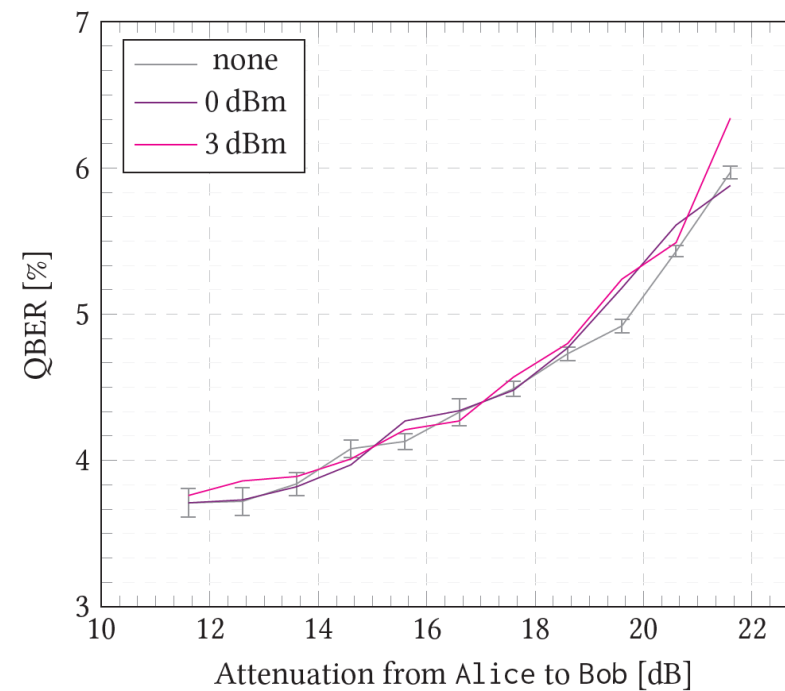


Results (Single Data Wave)

Average bit-rate against attenuation

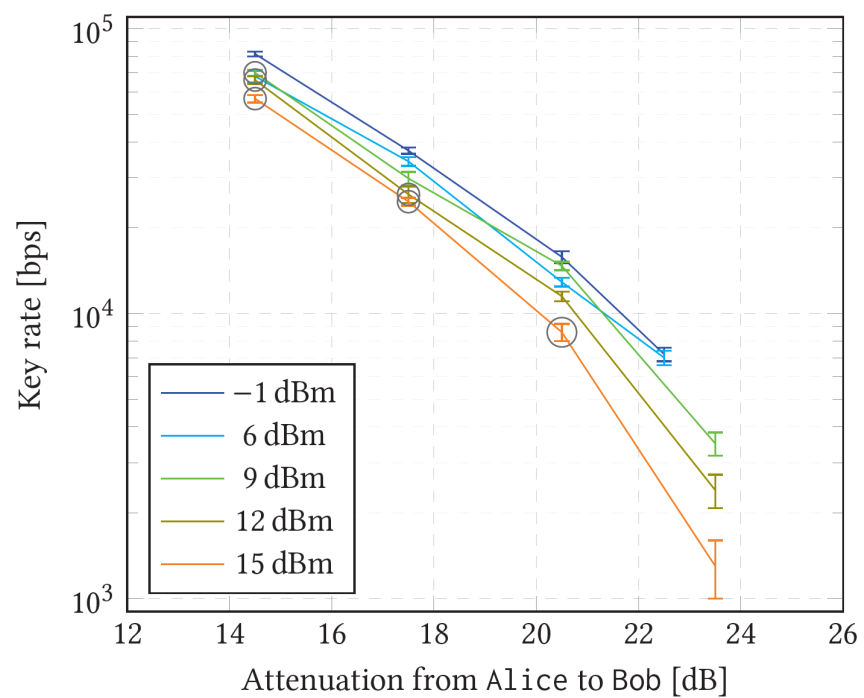


Average QBER against attenuation

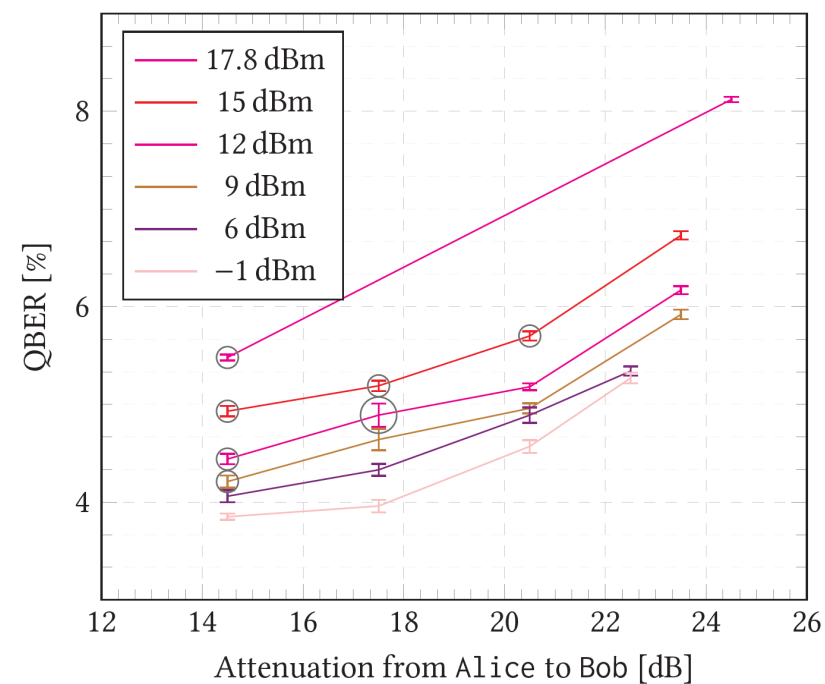


Results (Two Data Waves)

Average bit-rate against attenuation



Average QBER against attenuation



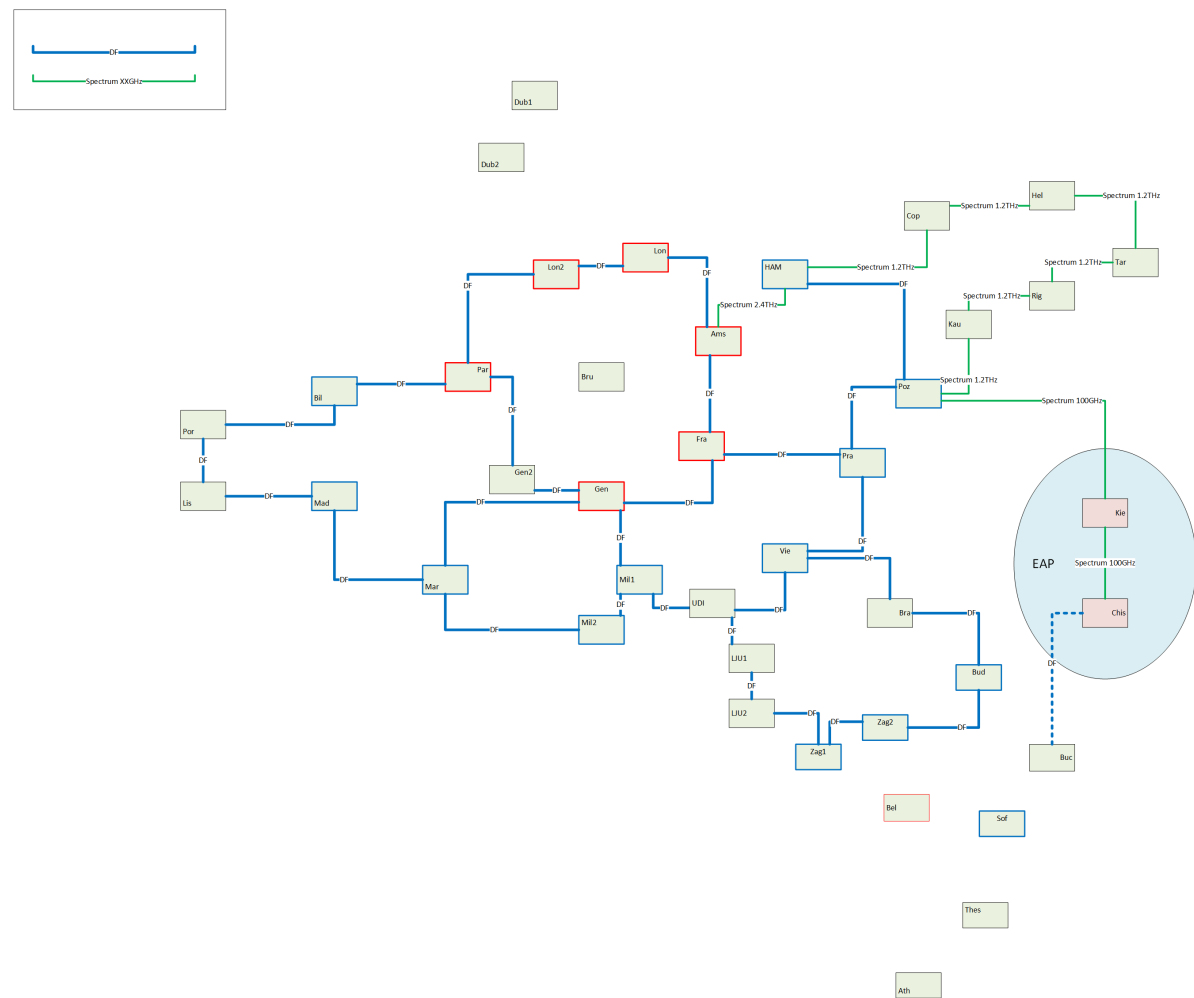
Experimental Results

- For every +3dBm increase in power:
 - SKR goes down by ~15%
 - QBER goes up by ~6%
- Maximum sustainable attenuation found to be 23.5dB
 - Estimated to be 22dB with a filled C-band

Feasibility of Implementation

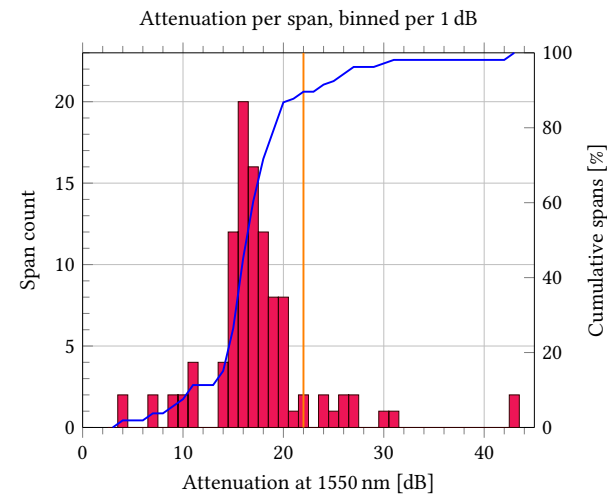
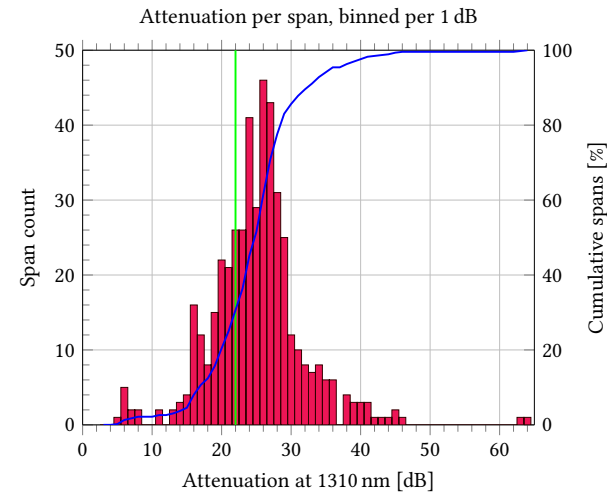
- Multiplex QKD traffic at 1310nm with data at 1550nm
- Use dedicated dark fibre with QKD at 1550nm
- ... or something else

Substrate GN4-3N



Feasibility of Implementation

- GÉANT network:
 - ~30% @1310nm
 - ~90% @1550nm



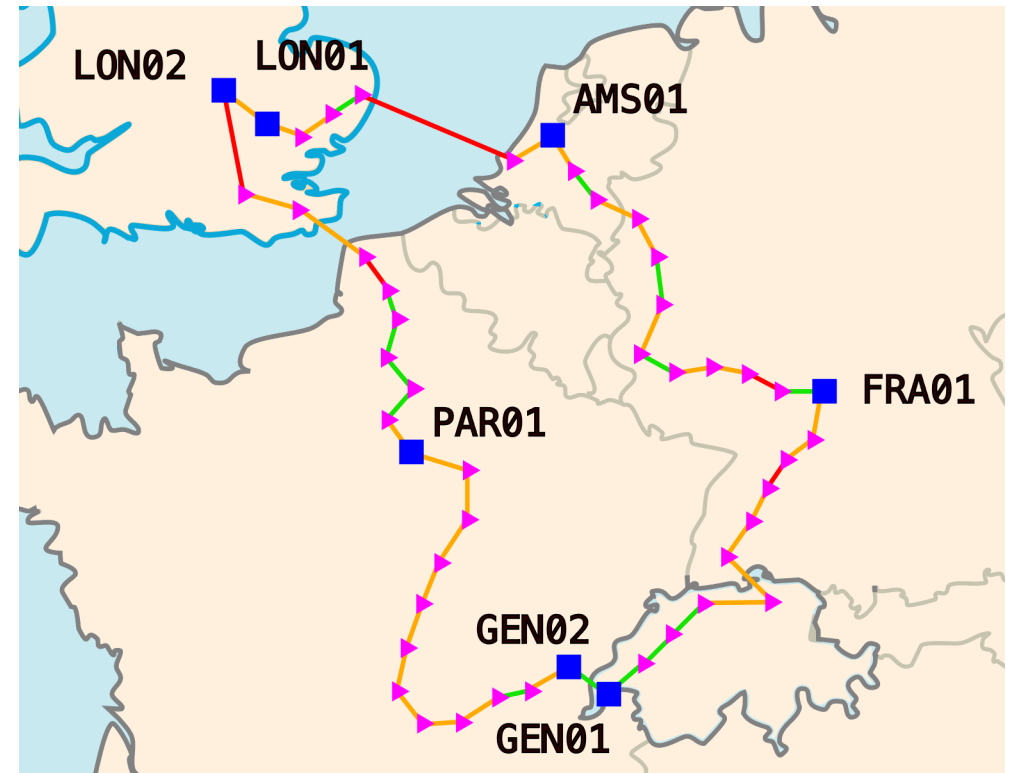
Feasibility of Implementation

- Western ring:
 - ~23% @1310nm
 - ~90% @1550nm

Green: multiplexing possible

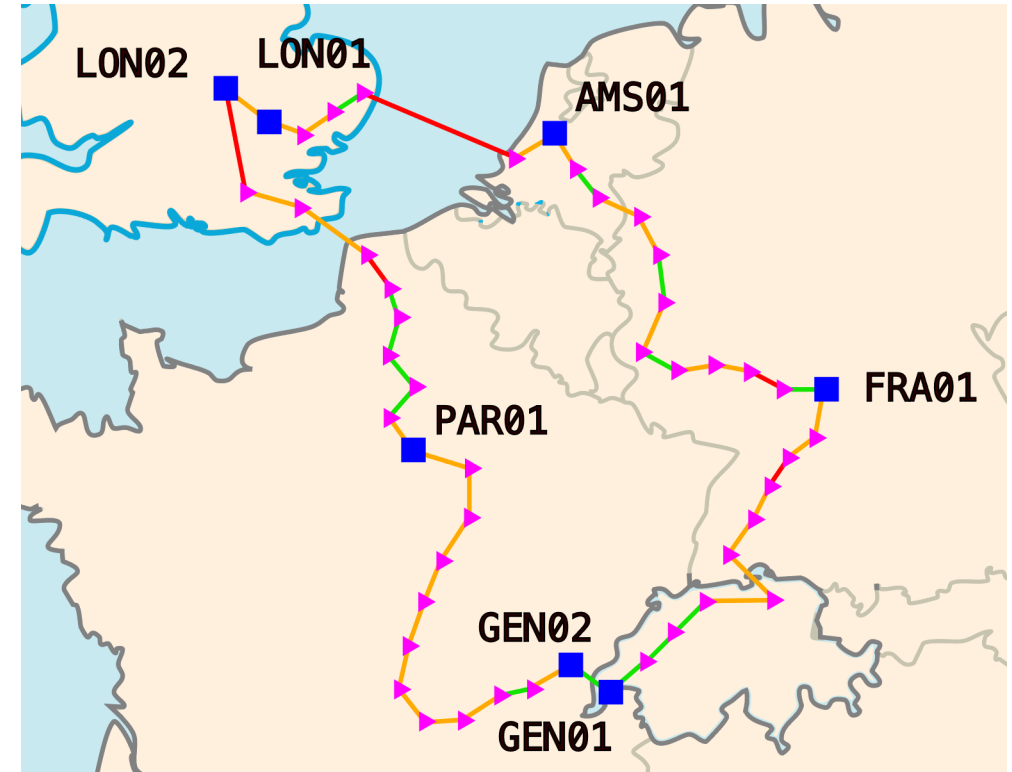
Orange: dark fibre possible

Red: alternative needed



Conclusions

- Hardware support is largely present
- Standardisation is lacking at the moment
- Available software is not up to the task
- Recommended next steps:
 - Implement a field trial link
 - Real-world performance
 - Long-term reliability
 - Track ongoing standardisation efforts





Thank You

Any questions?

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