# Low cost and scalable QKD using continuous variables

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EPIC Online Technology Meeting on Quantum Communication and QKD

EPIC
European Photonics Industry Consortium

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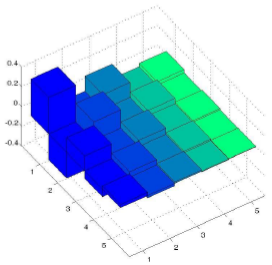
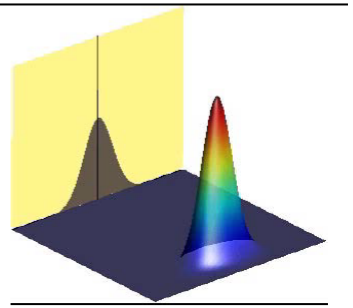
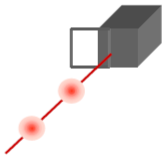
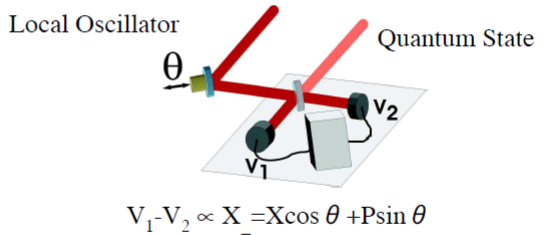
**Vision and Mission**
Bring digital to every person, home and organization for a fully connected, intelligent world

# Discrete vs. continuous light

| Light is : | Discrete Photons | Continuous Wave |
|---|---|---|
| We want to know : | their Number & Coherence | its Amplitude & Phase (polar)<br>its Quadratures X & P (cartesian) |
| We describe it with : | Density matrix $\rho_{n,m}$  | Wigner function W(X,P)  |
| We measure it by : | Counting: APD, VLPC, TES...  | Demodulating : Homodyne Detection   $V_1-V_2 \propto X_\theta = X\cos\theta + P\sin\theta$ |
| « Simple » States | Fock States | Gaussian States |



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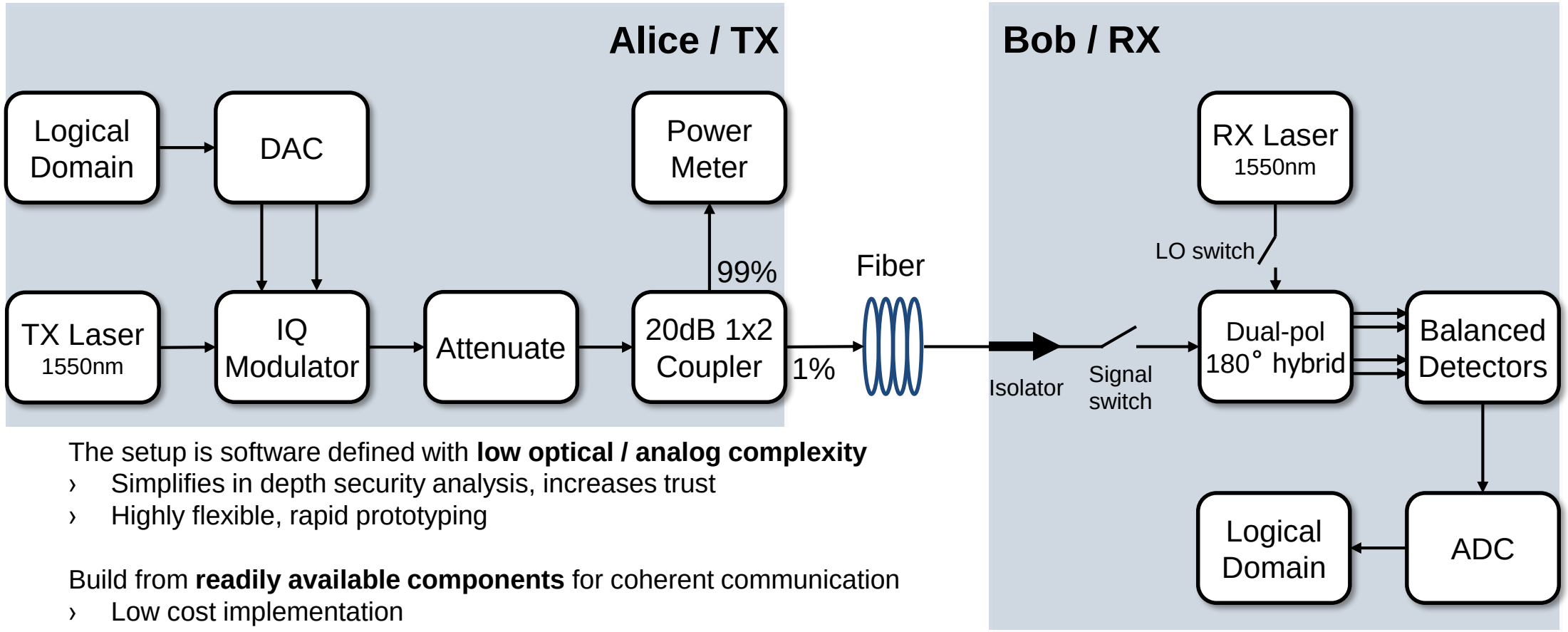
# Low complexity hardware architecture




The setup is software defined with **low optical / analog complexity**

- Simplifies in depth security analysis, increases trust
- Highly flexible, rapid prototyping

Build from **readily available components** for coherent communication

- Low cost implementation
- Allows photonic integration



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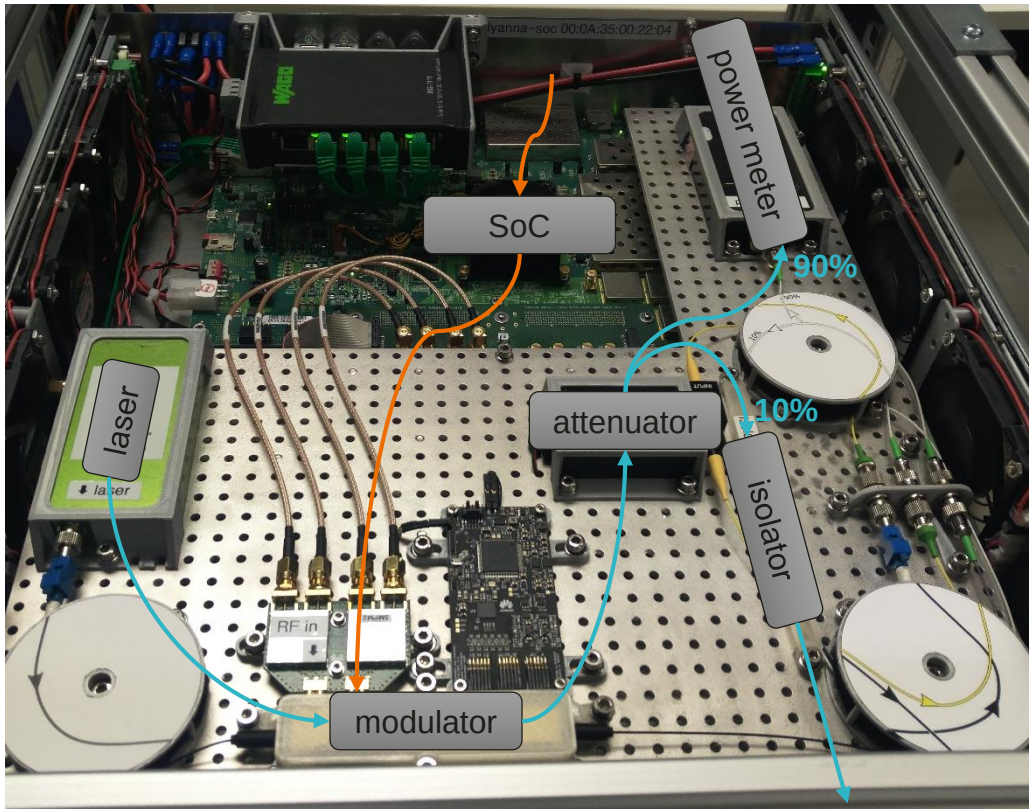
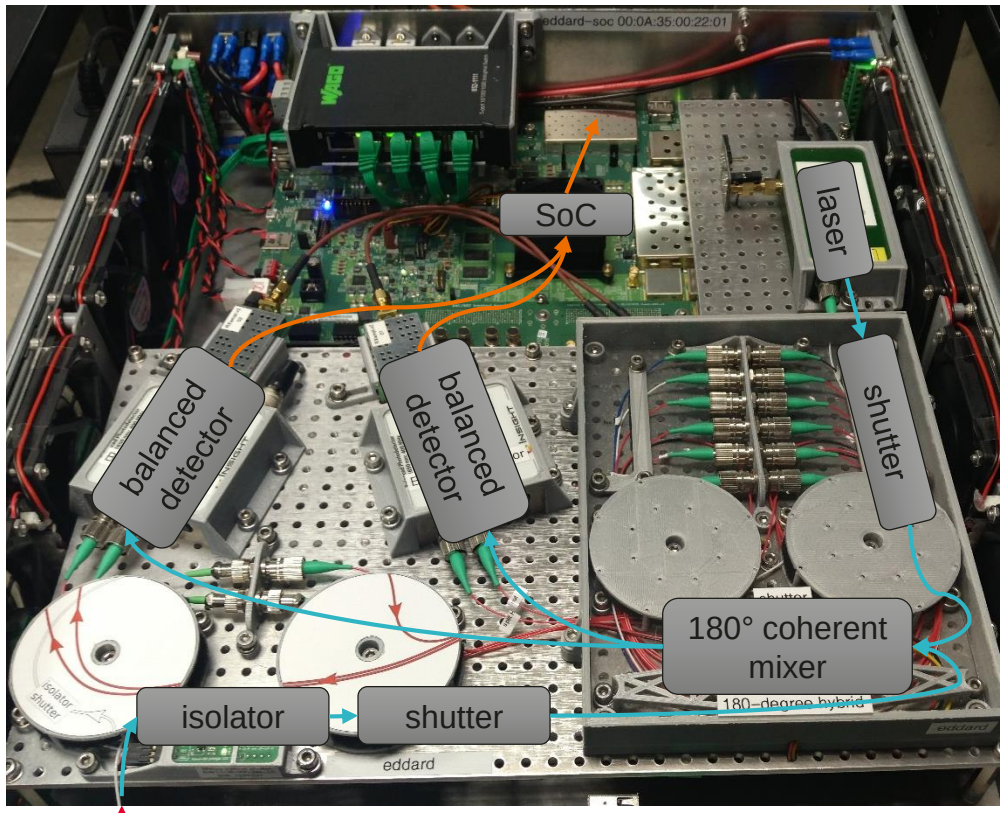
# CV-QKD pre-development prototypes

## Alice




## Bob



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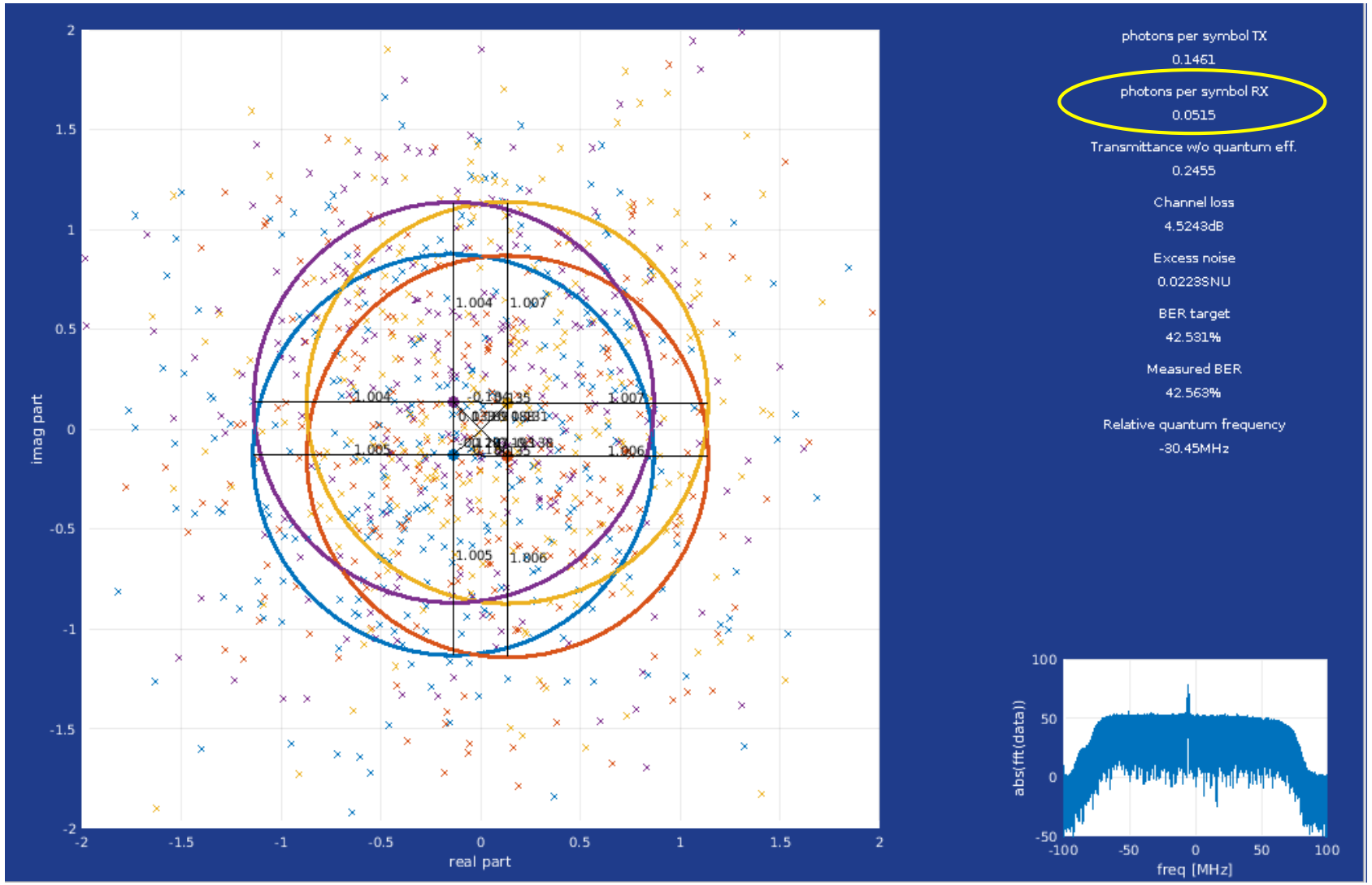
# CV-QKD received signal



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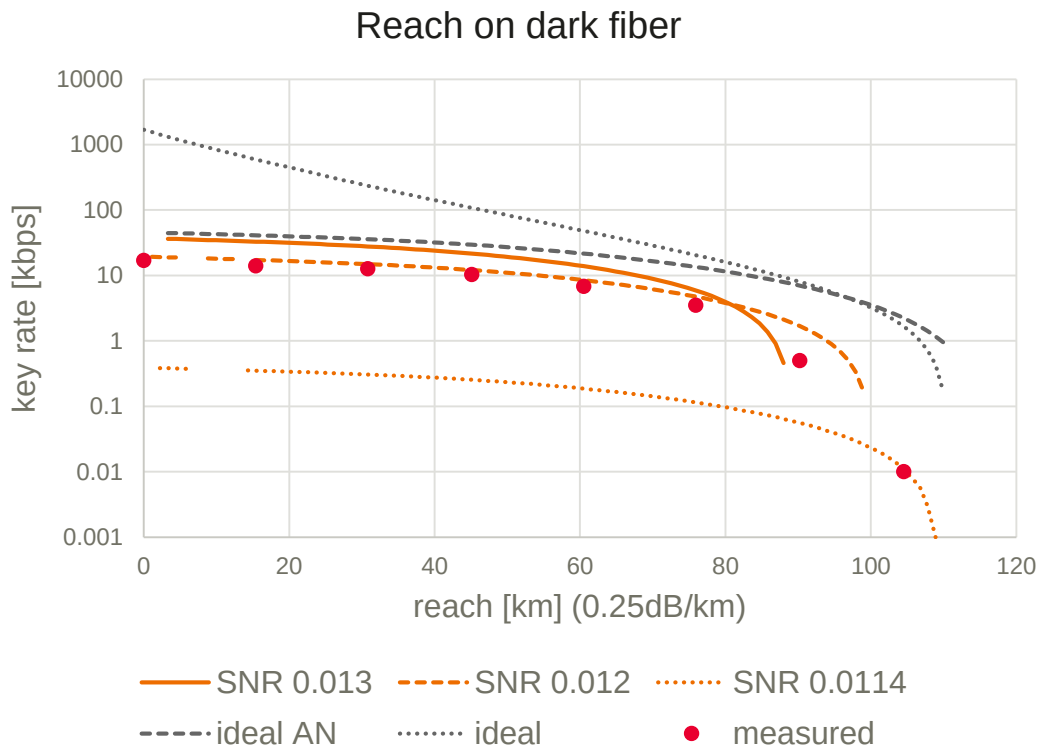
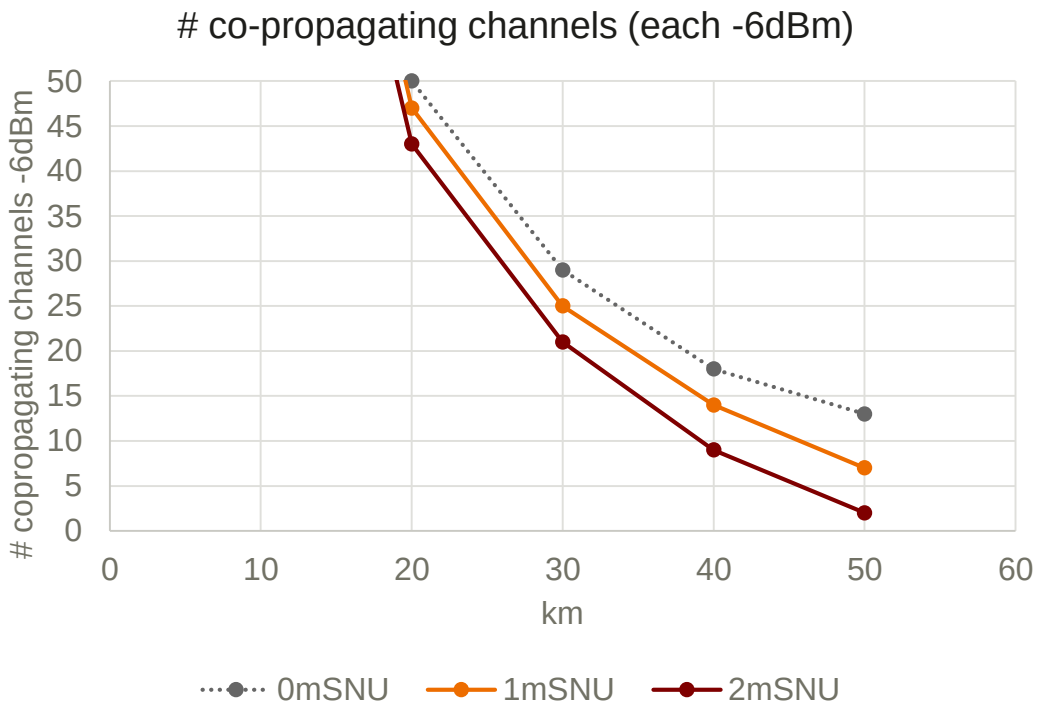
# Reach and co-propagation



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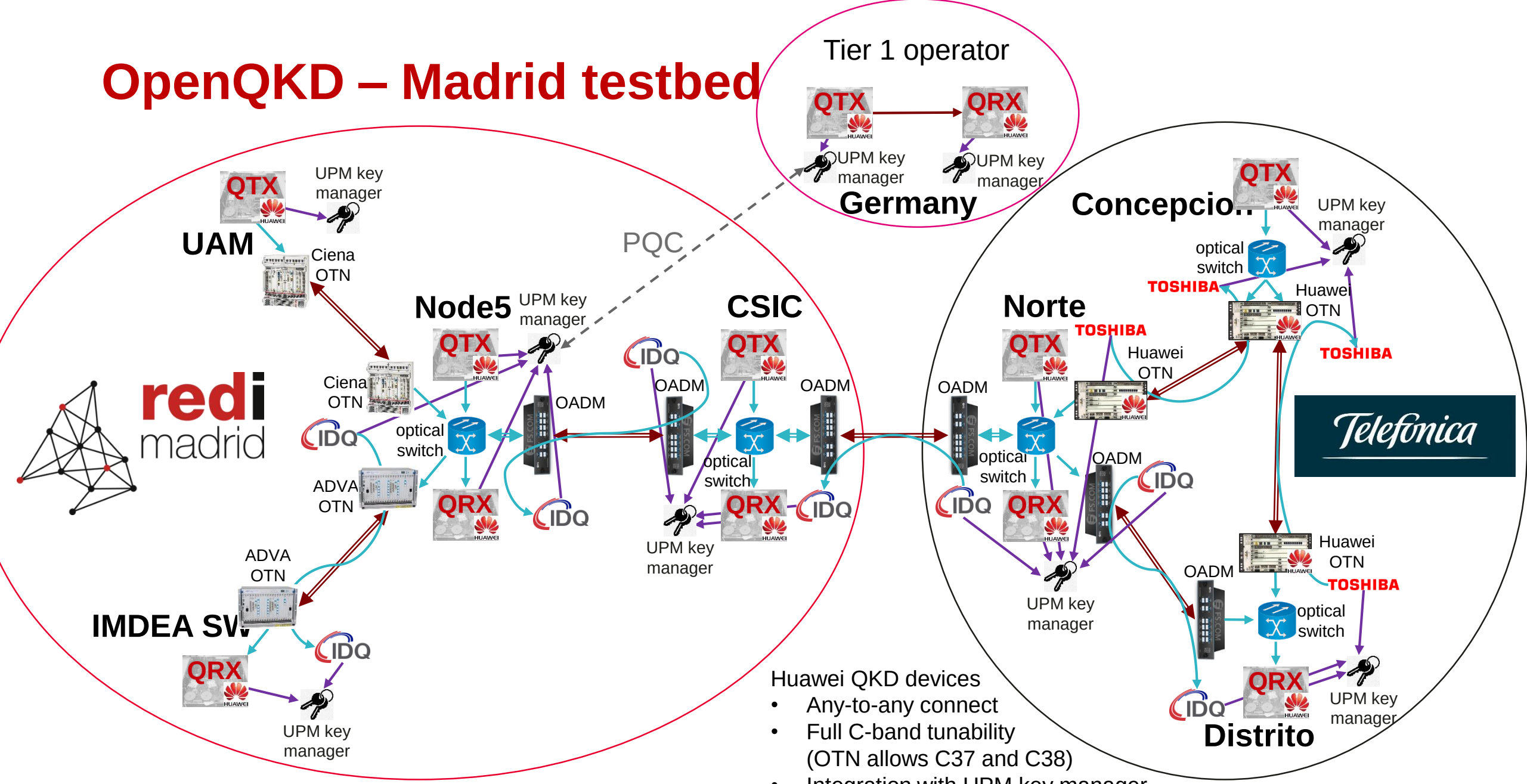
# OpenQKD – Madrid testbed




Huawei QKD devices

- Any-to-any connect
- Full C-band tunability (OTN allows C37 and C38)
- Integration with UPM key manager and configuration controller
- Zero-touch integration in existing OTN



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# Benefits of Huawei QKD

- Thoroughly investigated and robust QKD implementation
- Software defined for maximal flexibility and centralized configuration
- Low-cost implementation with a clear road for full integration and high volume
- Reach and key rate optimal for metro environment
- High tolerance to co-propagation of classical channels (10x more than DV-QKD)
- Possibility of zero-touch integration (plug into existing OTN without modification)
- Field deployment and integration with existing hardware has been demonstrated
- Any-to-any connectivity with ~N devices in N-node networks

➔ **Scalable towards simpler, cheaper, smaller implementation**



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# Thank you !

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