# Expanding Quantum Frontiers with Superconducting Single-Photon Detectors


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ID Quantique SA



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# ID Quantique

Founded in 2001

Geneva, Switzerland
Seoul, South Korea
Boston, USA

By 4 quantum physicists from the University of Geneva

100+ employees, including 50 engineers/scientists

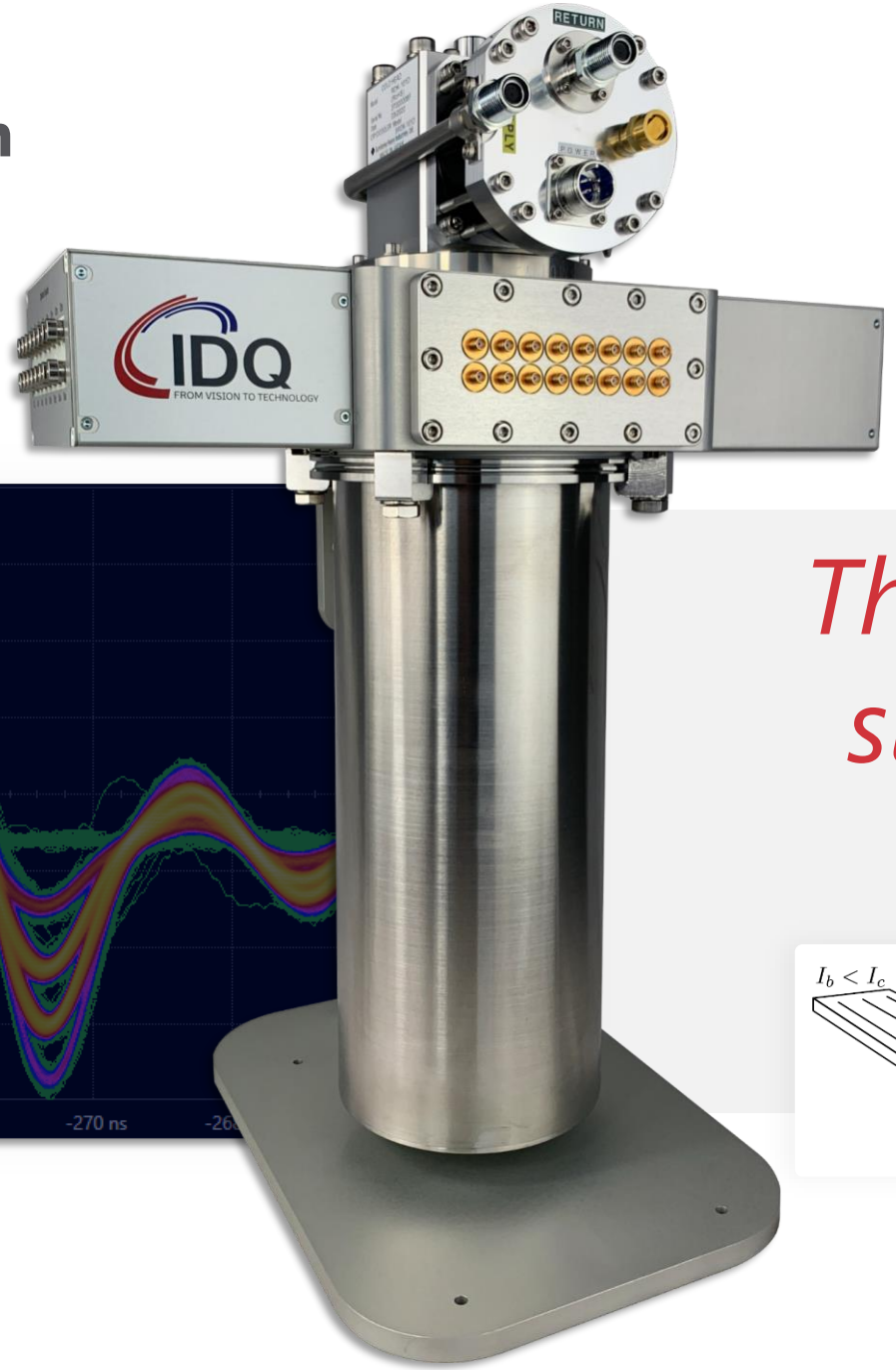
Investments in 2018 by SK Telecom & Deutsche Telekom

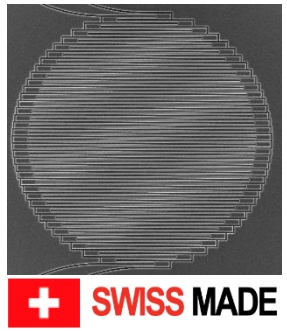
Worldwide Market Leader in Quantum Randomness, Quantum Encryption and Single-Photon Quantum Sensing

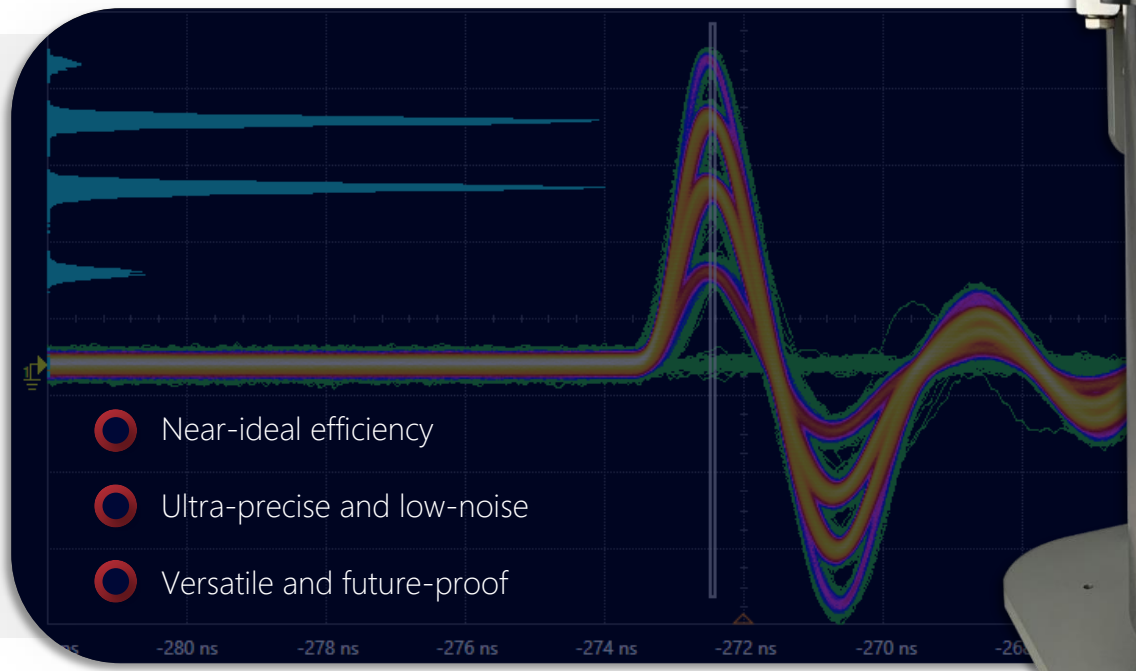
Performs R&D, production, professional services, integration, support

# The ID281 SNSPD system

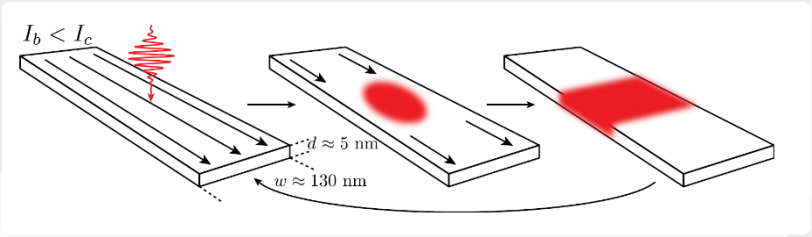
## Superconducting nanowire single-photon detectors



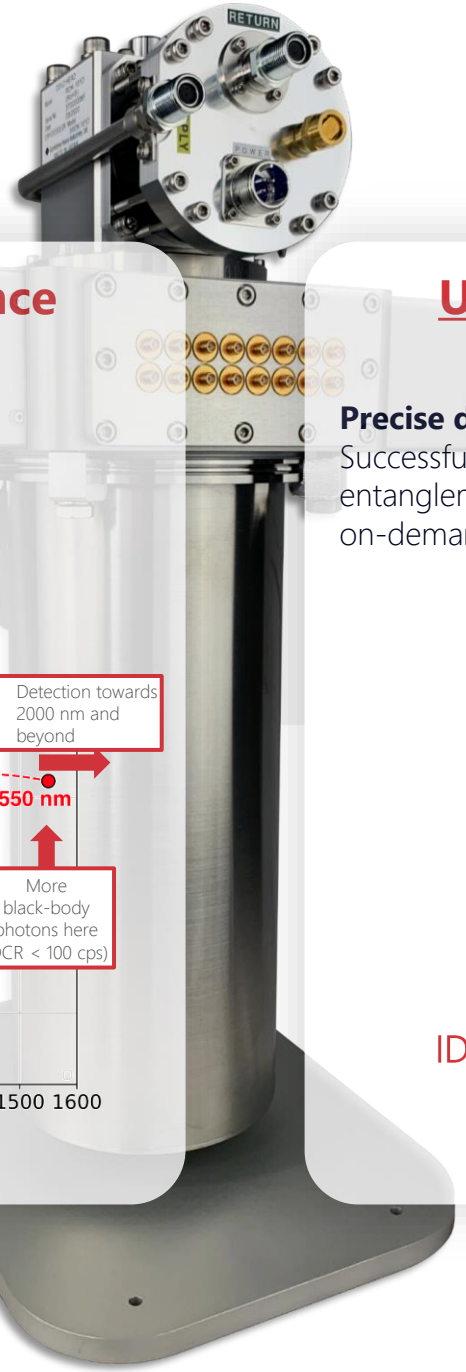




*The very best in single-photon detection*

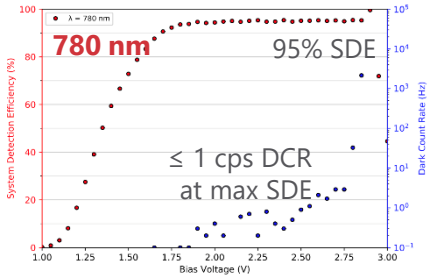


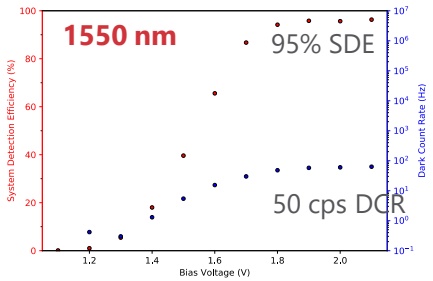
# The ID281 SNSPD system

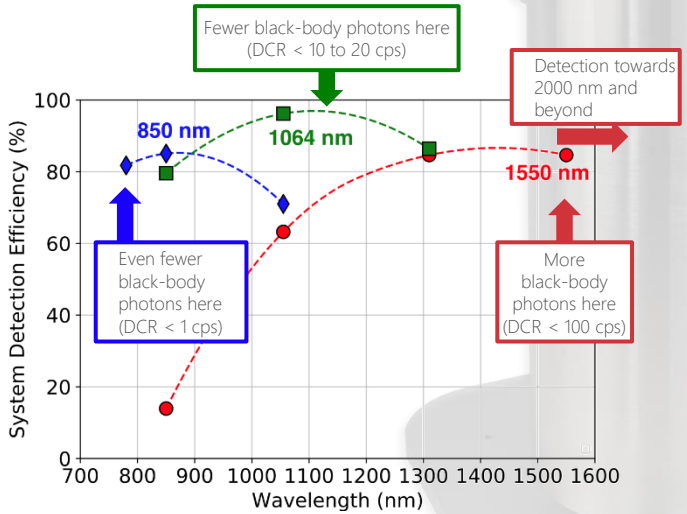


## Near-ideal efficiency and noise performance

**High efficiency:** 95% and above
**Low noise:** Dark counts < 1 Hz to < 100 Hz
**Broadband operation:** Detection < 700 nm to > 2 µm

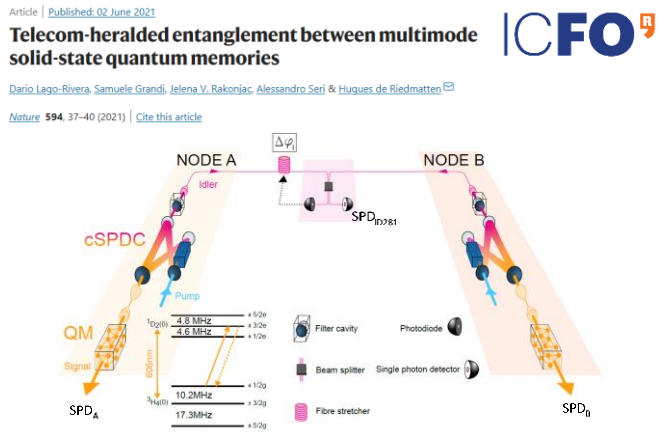



## Use Case: Towards a Quantum Repeater

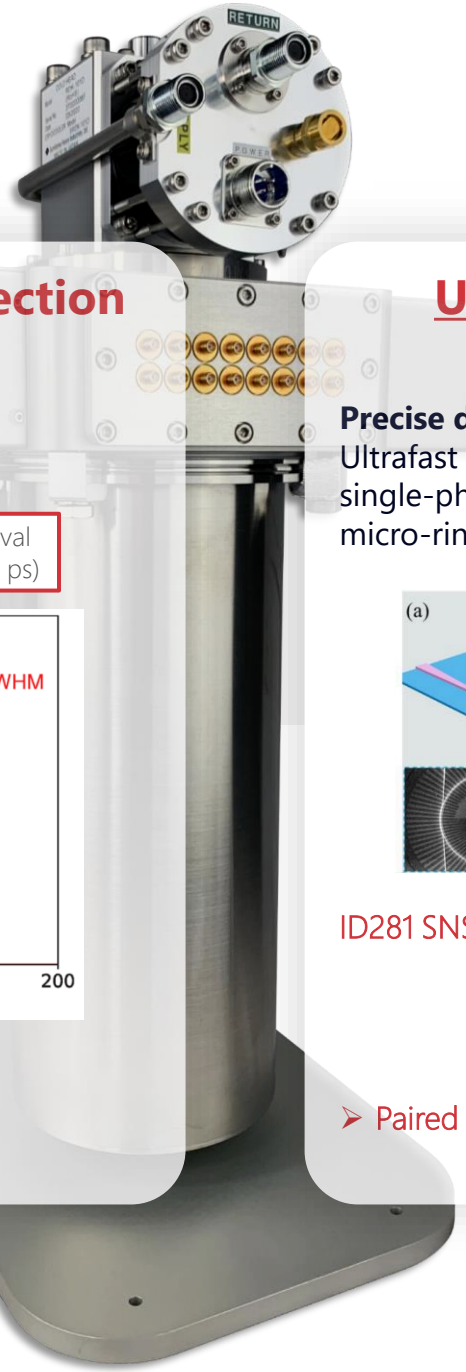
**Precise detection for entanglement generation**
Successful entanglement of remote quantum memories, and entanglement between a telecom-wavelength photon and an on-demand multimode quantum memory.




ID281 SNSPDs @1450 nm with
> 80% Quantum efficiency, and
< 10 Hz Dark Count Rate

D Lago-Rivera *et al.*, Nature **594**, 37–40 (2021)

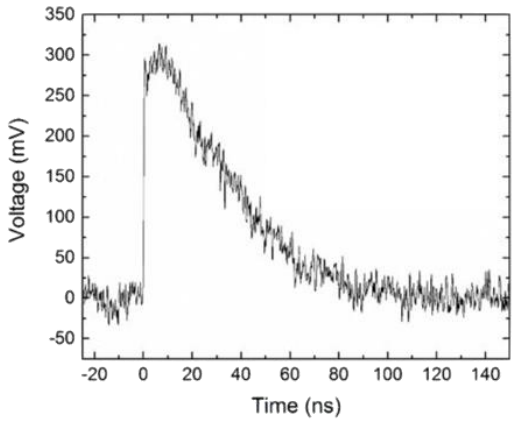
# The ID281 SNSPD system



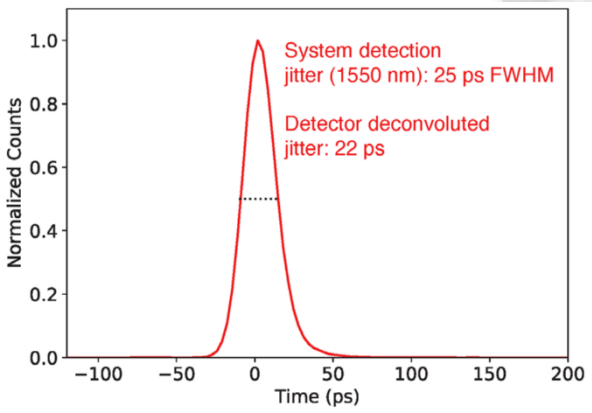

## Precise and well-resolved Single-Photon Detection

**Precise timing:** Timing jitter below tens of picoseconds
**High speed:** Recovery times below ten nanoseconds

Oscilloscope signal: very short detector pulses (recover times < 10 ns possible)

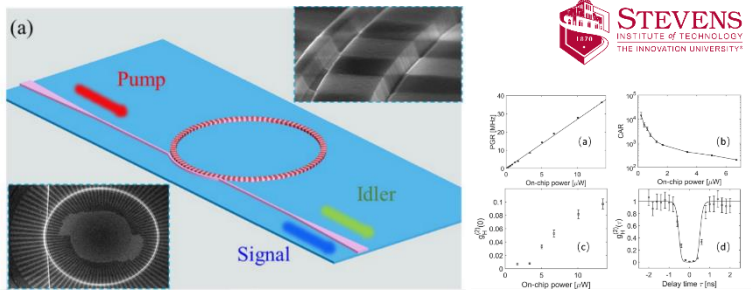



Time Controller signal: low timing interval error on the rising pulse edge (typ. <30 ps)




## Use Case: On-chip ultra-bright single-photon sources

**Precise detection for Integrated Quantum Photonics**
Ultrafast measurements of the quantum statistics of heralded single-photons, generated by a state-of-the-art on-chip micro-ring resonator.



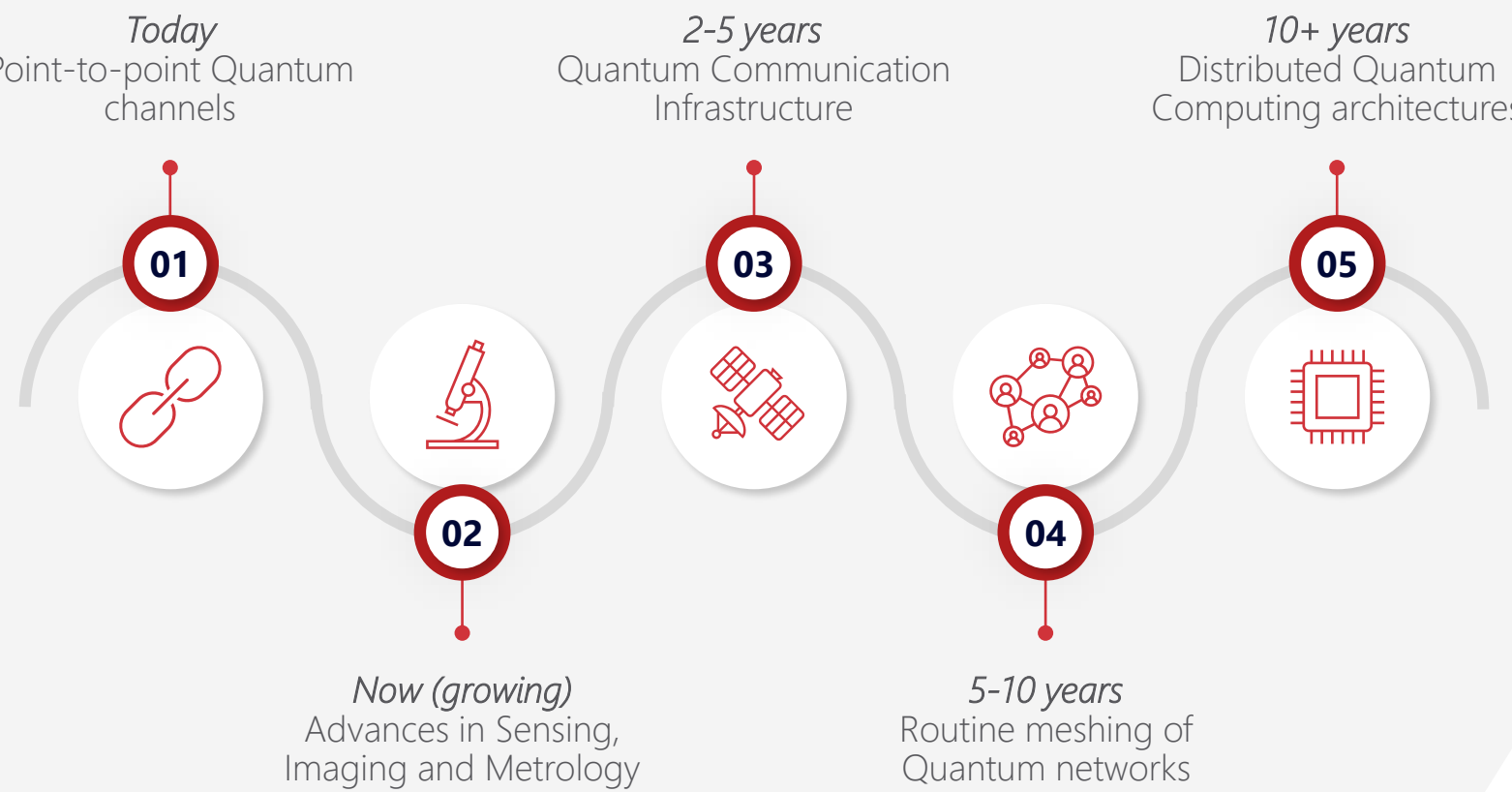

ID281 SNSPDs @1550 nm with
80-90% Quantum efficiency,
< 25 ps jitter, and
< 40 Hz Dark Count Rate

➢ Paired with the ID900 Time Controller

Zhaohui Ma *et al.*, Phys. Rev. Lett. 125, 263602 (2020)

# Towards a Quantum Internet

**Quantum technologies are set to revolutionize the world we live in.**




# ID Quantique

*Quantum.*
*Trust enabled for the future*

**Q & A**

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**ID Quantique**

**Founded in 2001**

**3 Product lines:**

1. Quantum Random Number Generation
2. Quantum-Safe Security
3. Quantum Sensing

**High-quality engineering**

**Best-in-class performance**

**Trust**

**Operational simplicity**

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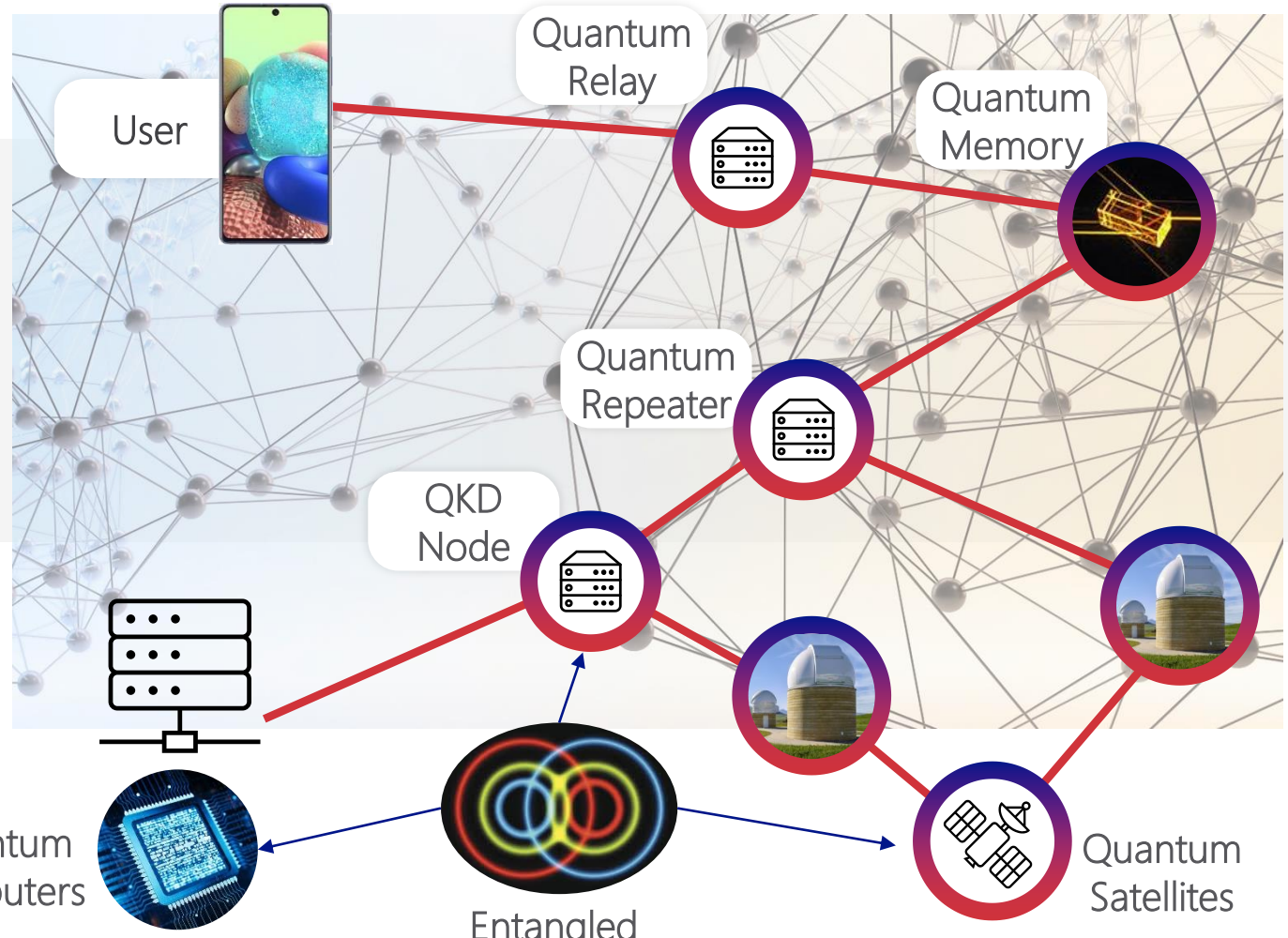


**Connecting global quantum devices with photons**