

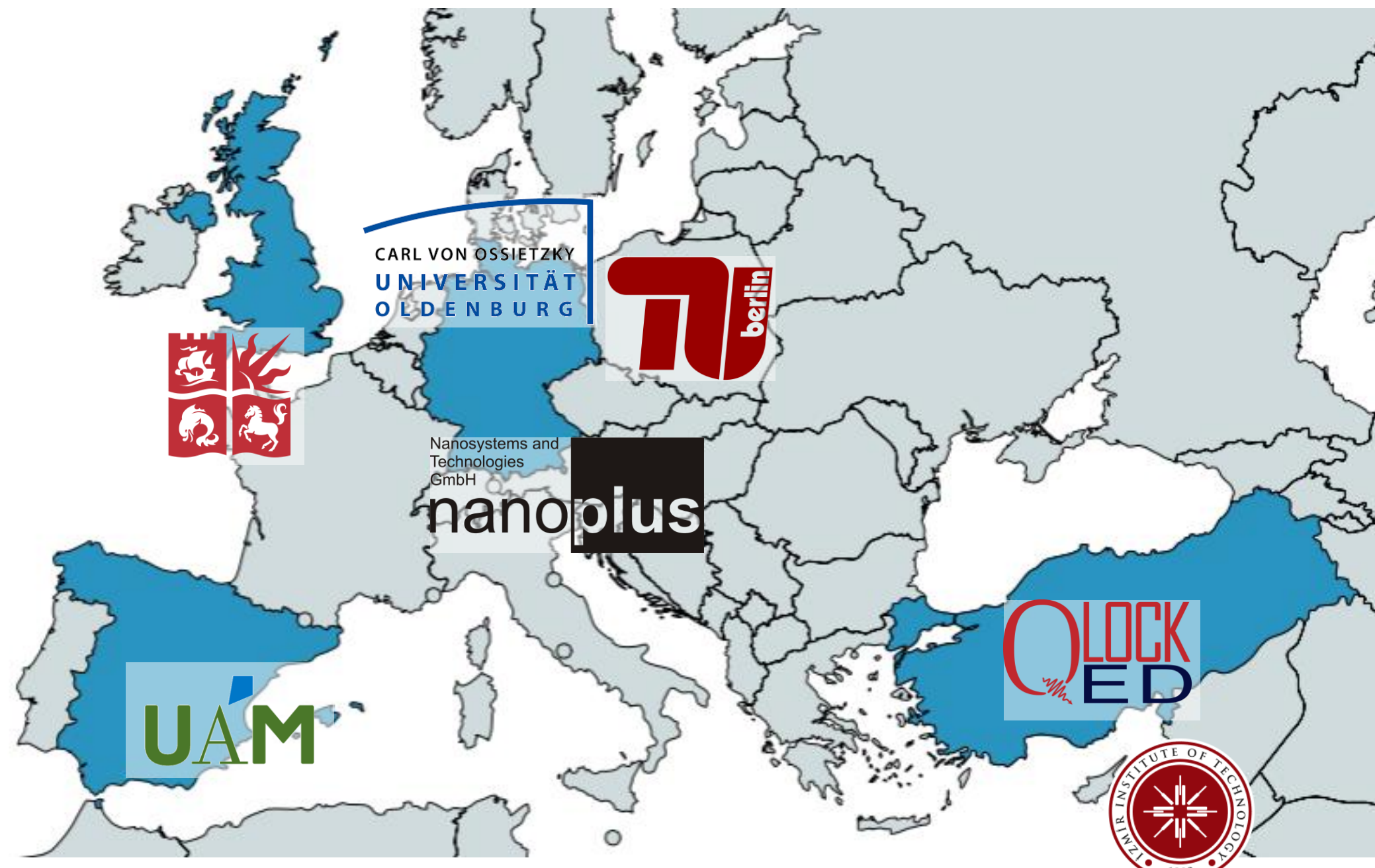


Consortium Mission

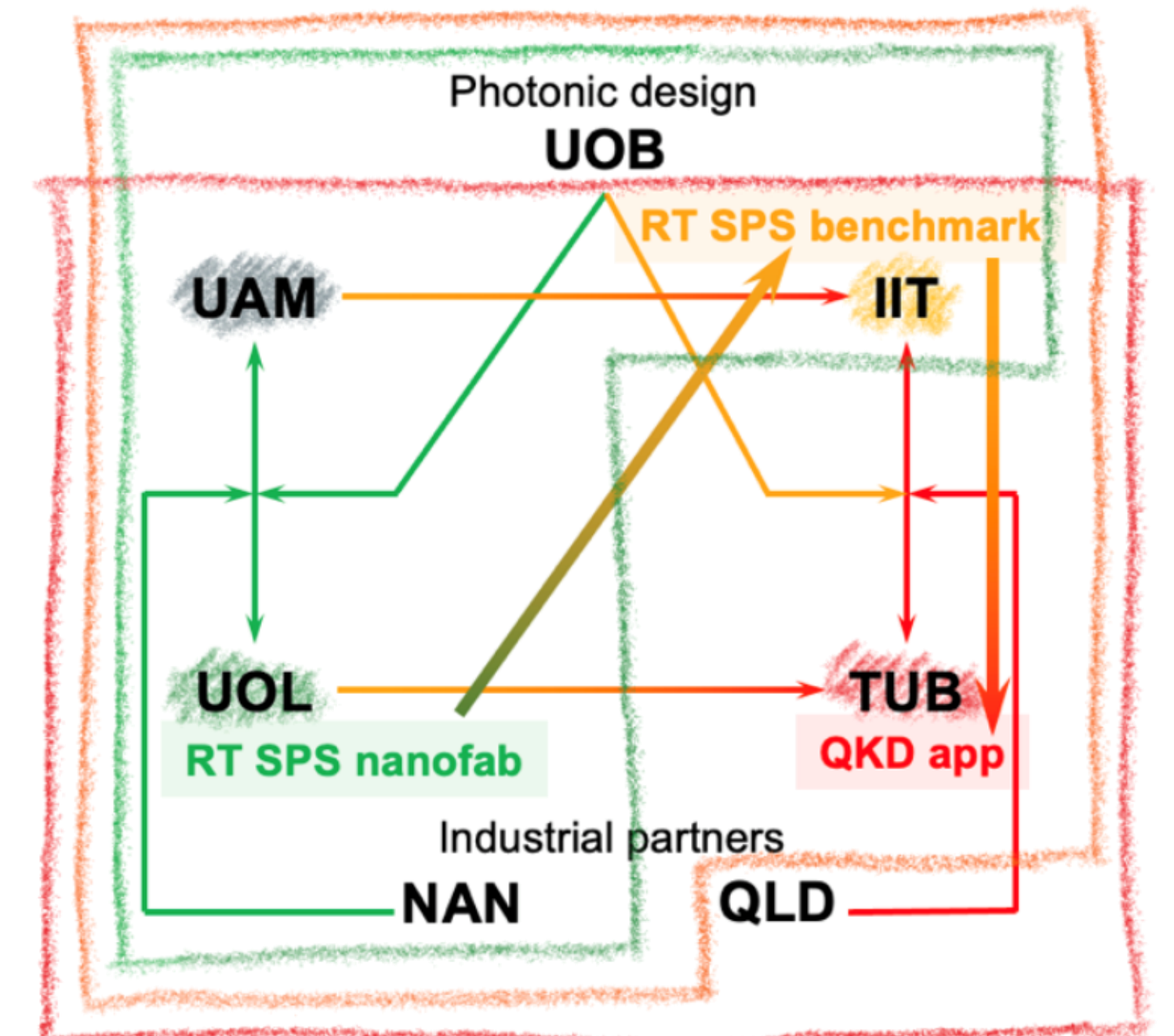
Demonstration of a bright single-photon source based on hexagonal boron nitride (hBN) at room temperature and integration in a metropolitan-scale quantum-secured link.

Partner	PI
Univ. Autónoma de Madrid, Spain	Carlos Antón Solanas
Izmir Institute of Technology, Türkiye	Serkan Ates
University of Oldenburg, Germany	Christian Schneider
Technische Universität Berlin, Germany	Tobias Heindel
University of Bristol, UK	Ruth Oulton
Nanoplus Gerbrunn, Germany	Robert Weih
Qlocked, Izmir, Türkiye	Ömer S. Tapsin

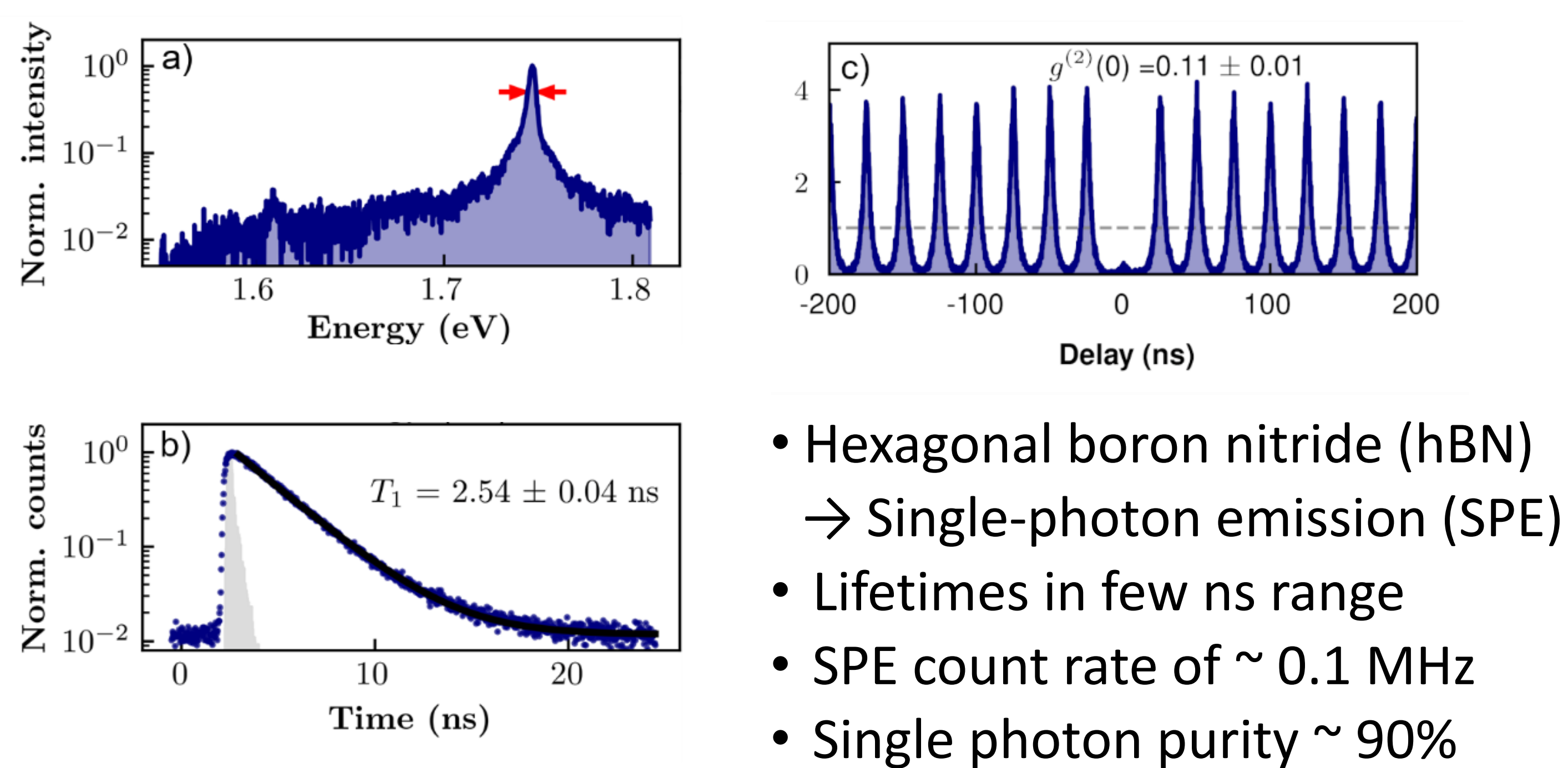
Geographical Distribution



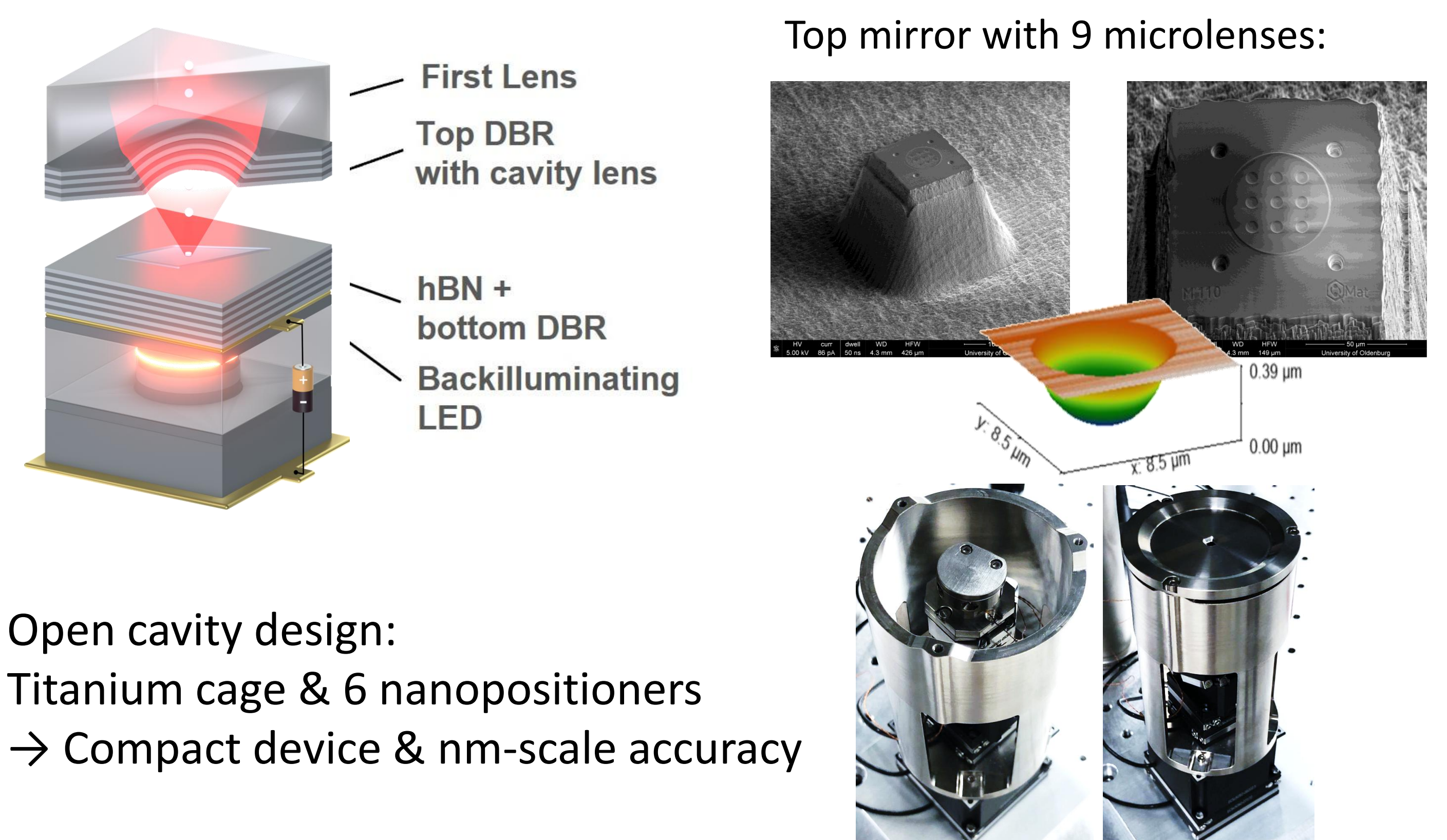
Crosslinks



Room-temperature Single-photon Source [1]

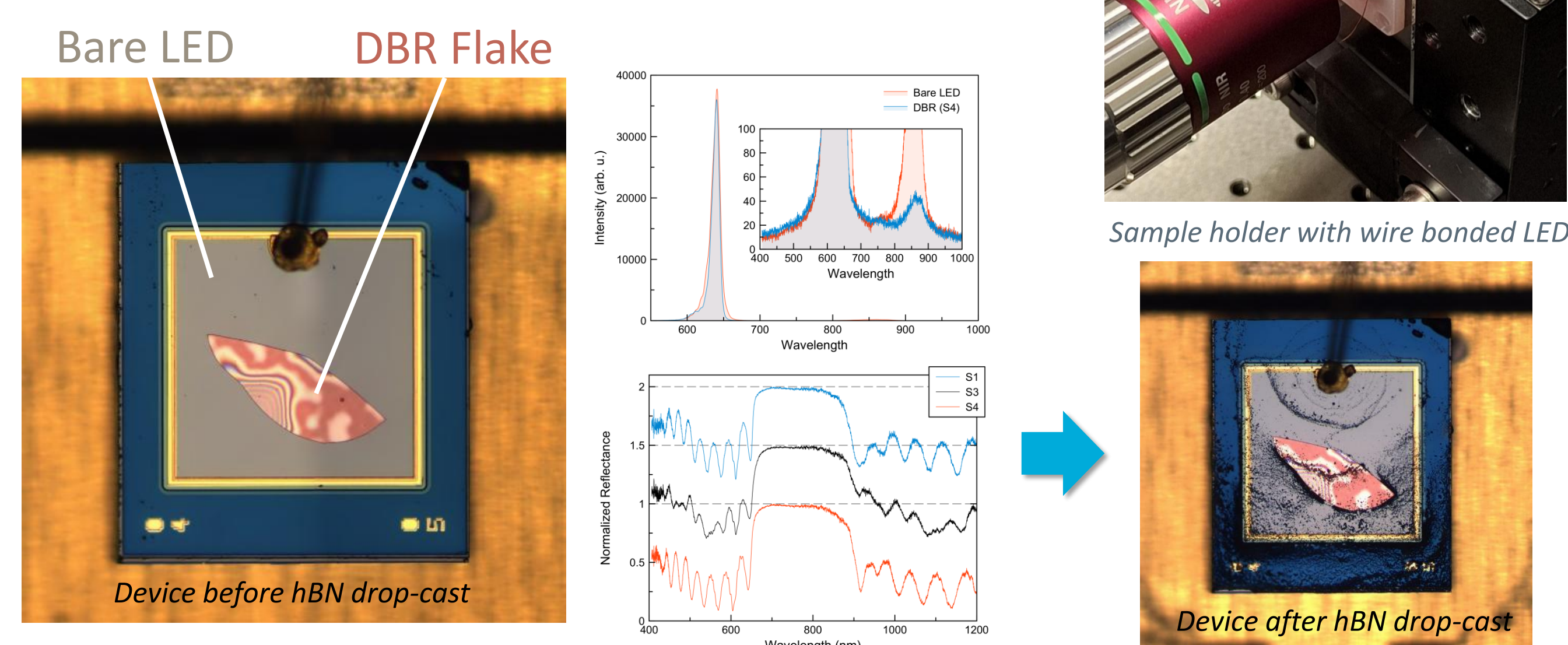


Implementation of Open Cavity Concept



Towards Back-illuminated hBN Devices

Micro-fabricated LED + DBR Mirror
→ Efficient integrated optical pumping



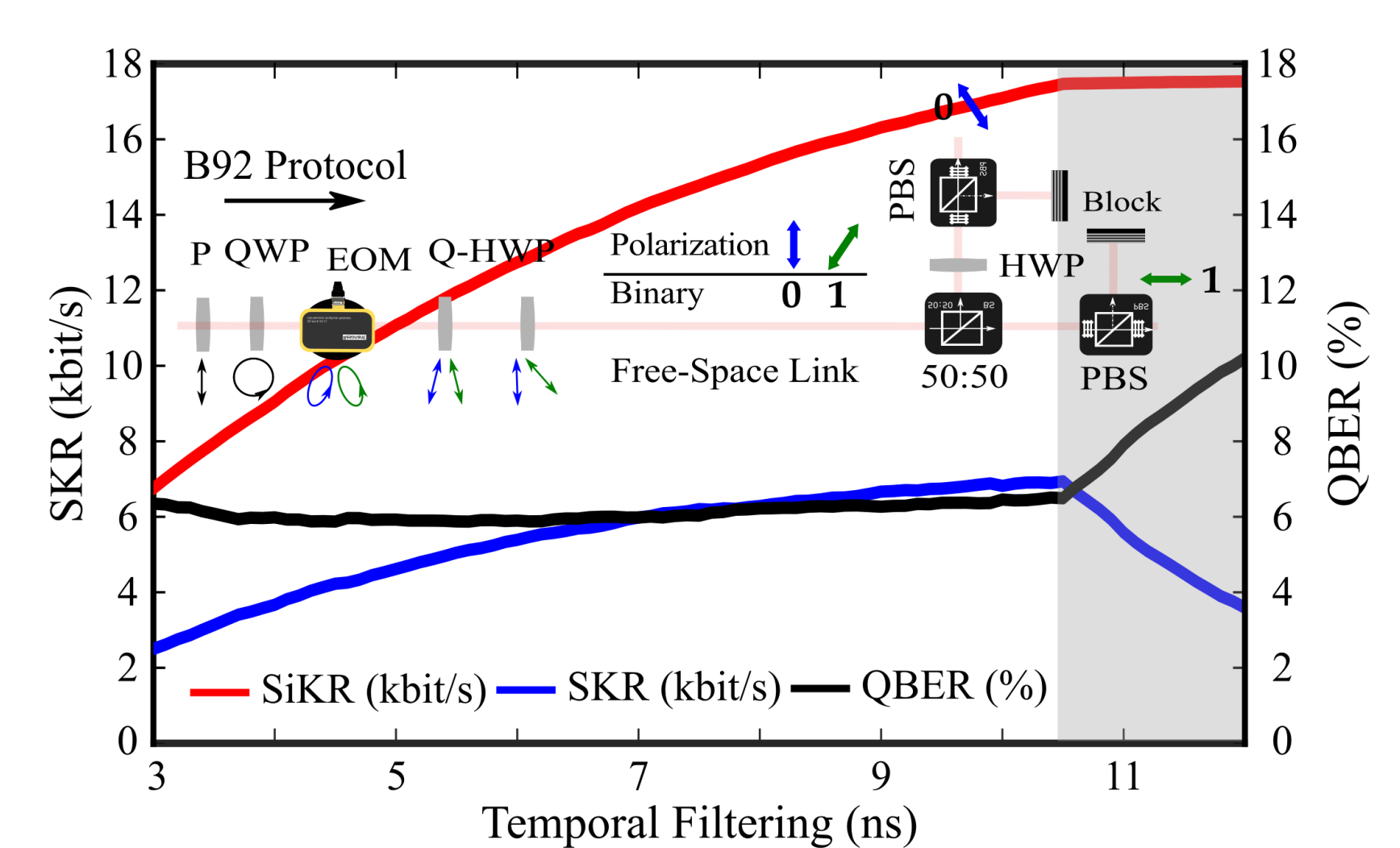
- 10 pairs (SiO₂ / TiO₂)
 - Stopband centered @ 750 nm
 - Transfer via PDMS-stamping
- Quantum-optical activation:
- Drop-cast hBN solution
 - Single emitter signatures

Quantum Communication

Evaluation in applications for quantum key distribution (QKD)

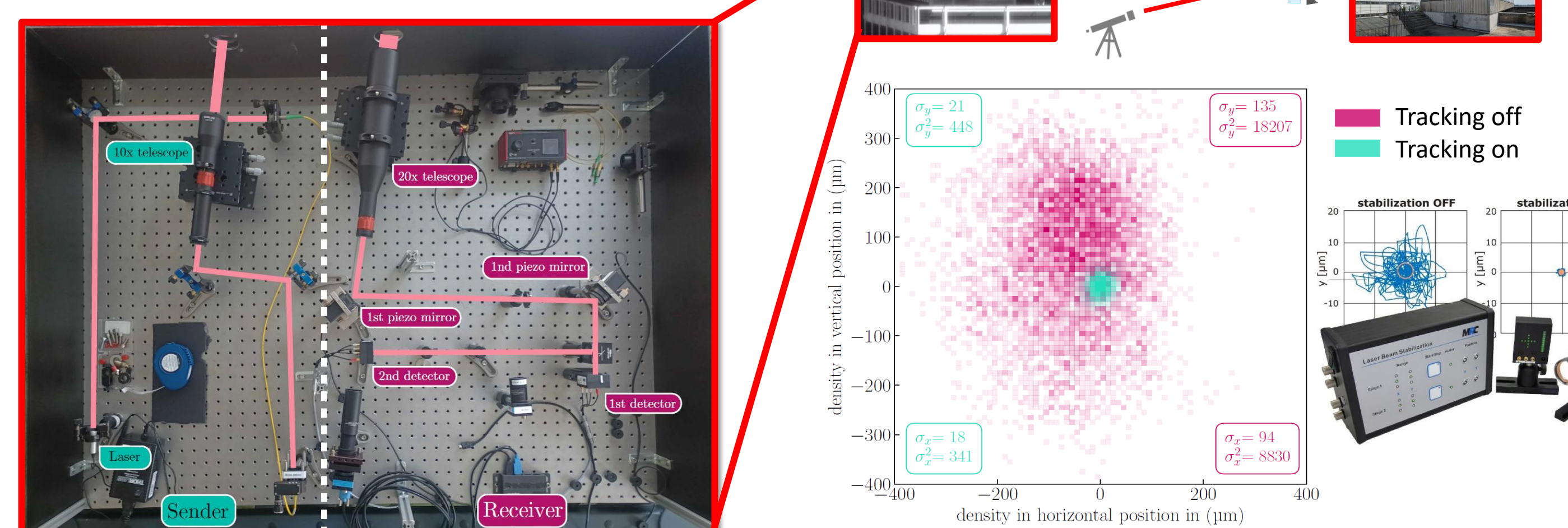
Lab-scale QKD [2]:

- BB92 protocol
- SPE from hBN at room temperature
- 2-state polarization encoding



Towards QKD field experiments in Berlin city [3]:

- BB84 protocol
- 4-state polarization encoding



References

- [1] M. Esmann, et al., Solid-State Single-Photon Sources: Recent Advances for Novel Quantum Materials, *Adv. Funct. Mater.*, 34, 2315936 (2024)
- [2] O.S. Tapsin et al. Quantum key distribution using hBN single-photon emitters at a 40 MHz clock rate, *Quantum Sci. Technol.* 11 025058 (2026)
- [3] T. Gao, et al. Atomically-thin single-photon sources for quantum communication, *npj 2D Mater Appl.*, 7, 4 (2023)

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