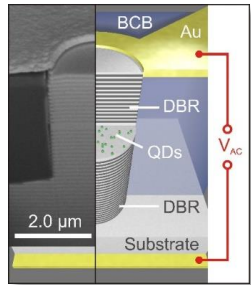


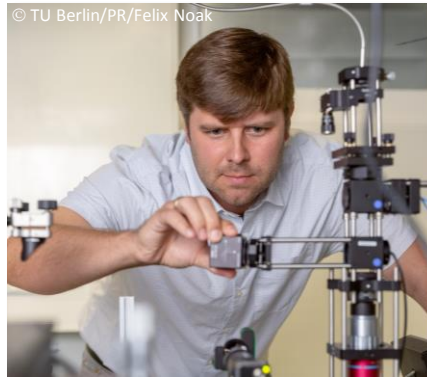
Gruppe QuCom - Quantenkommunikations Systeme

Quantenlichtquellen QKD



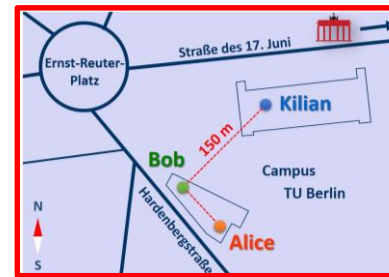
BB84
supraleitende
Detektoren

kryogene
Temperaturen



© TU Berlin/PR/Felix Noak

Ein Quantennetzwerk im Herzen Berlins?

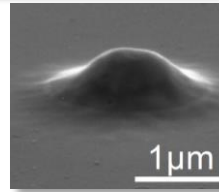
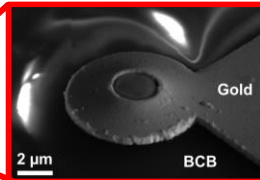
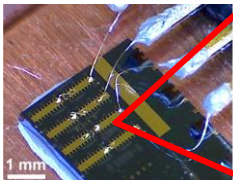
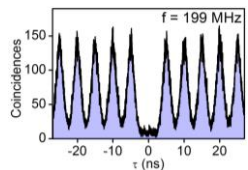


Berlin Quantum Network

...sei Teil der Vision!

**KOMM VORBEI und sichere dir
DEIN WUNSCHTHEMA!**

Photonen



EURE Projekte – EURE Herausforderungen...

- Fasergekoppelte Einzelphotonenquellen – Design/Bau → Lucas Rickert, EW 251)
- Receiver-Modul für Telekom O-Band – Bau/Analyse → Timm Kupko, EW 250)
- QKD Teleskop Link – Design/Bau → Timm Kupko, EW 250)

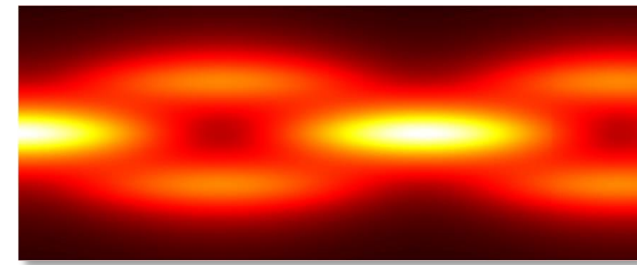
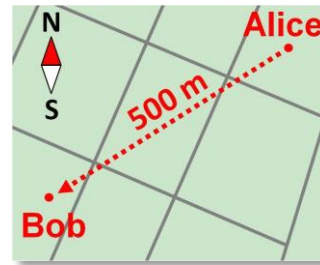
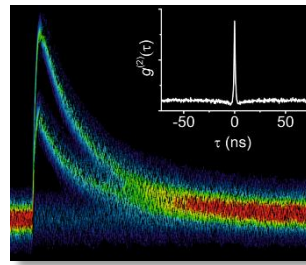
➡ Wir freuen uns auf Euer Interesse – einfach vorbeischaun...

GEFÖRDERT VOM



Bundesministerium
für Bildung
und Forschung





Metrology of Quantum-Light Sources and Applications in Quantum Communication

Tobias Heindel



SPONSORED BY THE



Federal Ministry of Education and Research

BMBF Junior Research Group
Quantum Communication Systems

Institute of Solid State Physics
Technische Universität Berlin





Quantum Information Technology

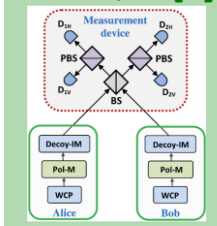
Secure data communication

- Challenge in society as a whole
 - Quantum computer capable of breaking RSA-2048 could be built by 2030 [1]
- [1] L. Chen et al., NIST Interagency Report 8105, <http://dx.doi.org/10.6028/NIST.IR.8105>

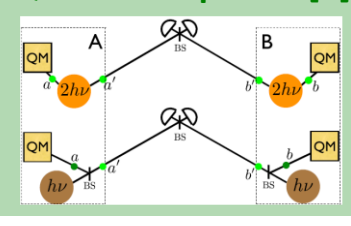
Solution: 'Quantum Communication'

- Quantum key distribution (QKD) exploiting single-photons or entangled photon pairs
- Provable secure (also in 'post quantum' world)
- Communication possible at a global scale:

MDI-QKD [2]



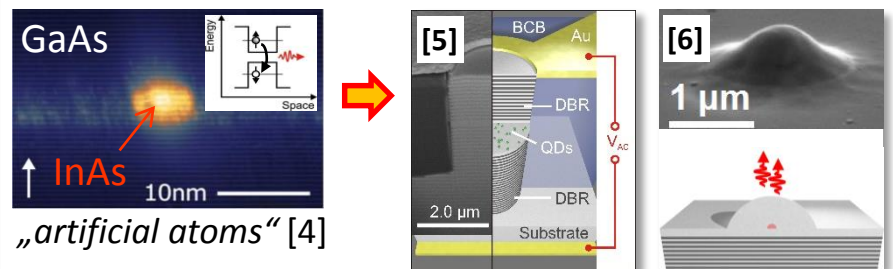
Quantum repeater [3]



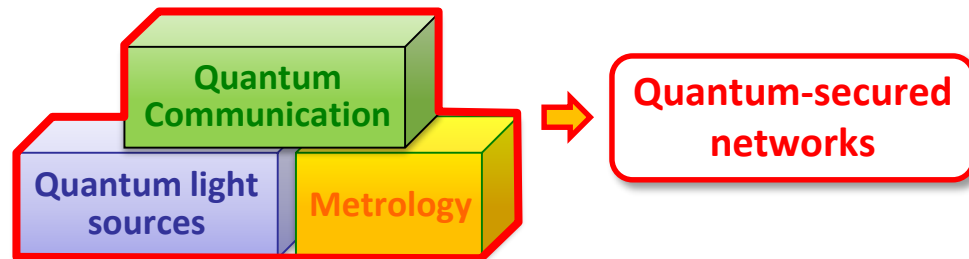
- [2] H.-K. Lo et al., *Phys. Rev. Lett.* **108**, 130503 (2012)
 [3] N. Sangouard et al., *Phys. Rev. A* **76**, 050301 (2007)

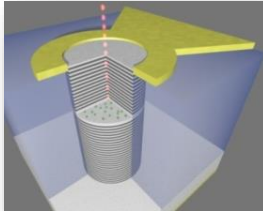


Quantum light sources based on quantum dots (QD)

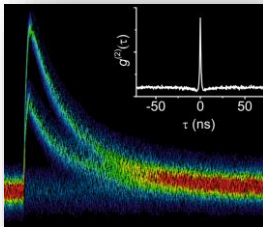


- [4] P. Michler et al., *Science* **290**, 2282 (2000)
 [5] T. Heindel et al., *Appl. Phys. Lett.* **96**, 011107 (2010)
 [6] T. Heindel et al., *Nat. Commun.* **8**, 14870 (2017)

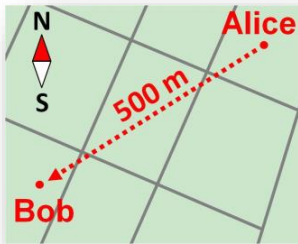




Metrology of Quantum Light Sources I
Electrically Triggered Single-Photon Sources



Metrology of Quantum Light Sources II
Twin-Photon Generation using Quantum Dot Microlenses



Quantum Communication
Quantum Key Distribution – Proof-of-Concept



What's next?
Towards Quantum Communication Networks