

Quantum Information Network Ulm

The Quantum Information Network Ulm currently enables QKD between different DLR facilities and the University of Ulm. Three fiber-based links are currently available, but an increase in the number of nodes is foreseen. The network might be expanded to other facilities within the Science City and the City of Ulm. Moreover, we aim at testing and demonstrating capabilities of future entanglement-based quantum information networks which contain e.g. quantum memories and repeaters as additional components.

A: Brief Information

Testbed Title	Quantum Information Network Ulm
Contact	Prof. Dr. Joachim Ankerhold (Uni Ulm): joachim.ankerhold@uni-ulm.de
	Dr. Matthias Zimmermann (DLR - Ulm): Matthias.Zimmermann@dlr.de
	Dr. Laiho Kaisa (DLR - Ulm): Kaisa.Laiho@dlr.de
Status	Active

B: Technical Information

Start Point	End Point	Length [km]	Losses [dB]	Supported Wavelengths [nm]	Type of Deployment
Uni Ulm	DLR Institute of Quantum Technologies - Ulm	2x 2,5	5 (in loop)	1310, 1550	Underground
DLR Institute of Quantum Technologies - Ulm	DLR Institute of Quantum Technologies - Ulm	1	2	1310, 1550	In-house (Combined)
Polarization Stabilization	No				
Type of Transmission	Dark fiber				
Type of Fiber	Single mode				
Quantum Communication Infrastructure	From-lab-back-to-lab deployed dark fiber network. Running within the same fiber patchfields next to optical fiber internet at the campus.				
Available Infrastructure for external Parties	Upon (reasonable) request				

C: Additional Information

Linked Projects	<ul style="list-style-type: none">• Q-IRENA• RoGloQuaN
Press Release and Publications	<ul style="list-style-type: none">• Abhörsichere Kommunikation dank Quantenverschlüsselung Erfolgreicher Startschuss für Teststrecke auf dem Oberen Eselsberg - Universität Ulm• Quantenverschlüsselung: Abhörsichere Kommunikation startet in Ulm Regio TV• Start für abhörsichere Quantenkommunikation in Ulm• Quanten, Space und Einstein – das DLR beim Quantenfestival in Ulm
Demonstrated Milestone	<ul style="list-style-type: none">• 27.01.2025. Quantum-secured exchange of keys at Uni Ulm, loop configuration Uni Ulm & DLR• 09.10.2025. Technology demonstration: Quantum-secured object authentication at DLR (participating entities: Bosch Secure Authentication GmbH, Bundesdruckerei GmbH, ThinkQuantum), loop configuration Uni Ulm & DLR
Outlook	<p>Future endeavors include:</p> <ul style="list-style-type: none">• Further technology demonstrations• Additional nodes in the Science City and the City of Ulm• Entanglement distribution and entanglement-based quantum network protocols• Coherent connection of distant quantum devices (quantum processors, sensors, memories, ...)• Embedding into a larger quantum network with links to Stuttgart, Karlsruhe, Munich• Hybrid terrestrial-space networks
Suggested Use Cases	<ul style="list-style-type: none">• Technology demonstrations• Pilot projects with industry and public authorities• Experimental research and tests in regard to quantum information networks• Educational purposes
Other Comments/ Information	

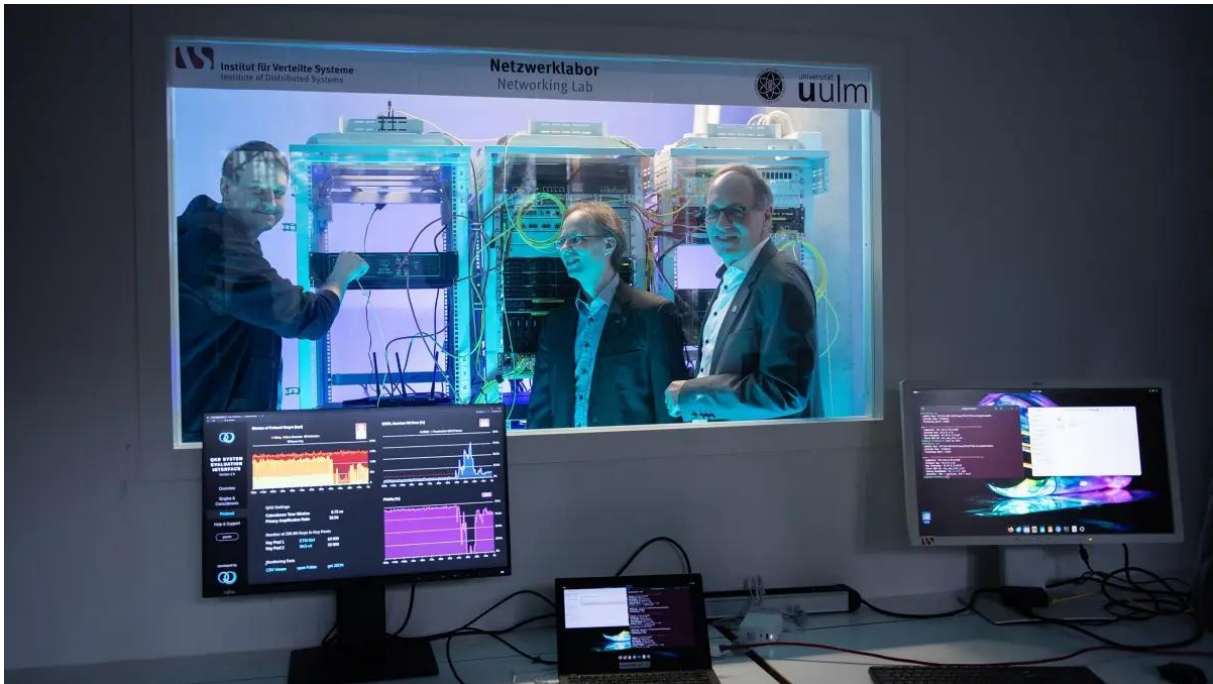


Fig1: QKD-demo 1 - Kevin Füchsel (left), CEO of Quantum Optics Jena, bends the fiber optic cable leading to one of the receiver modules in the laboratory to simulate a hacker attack. Dr Matthias Zimmermann from DLR (center) and Prof. Dr Joachim Ankerhold from Ulm University (right) observe the demonstration (photo: Elvira Eberhardt / University of Ulm)

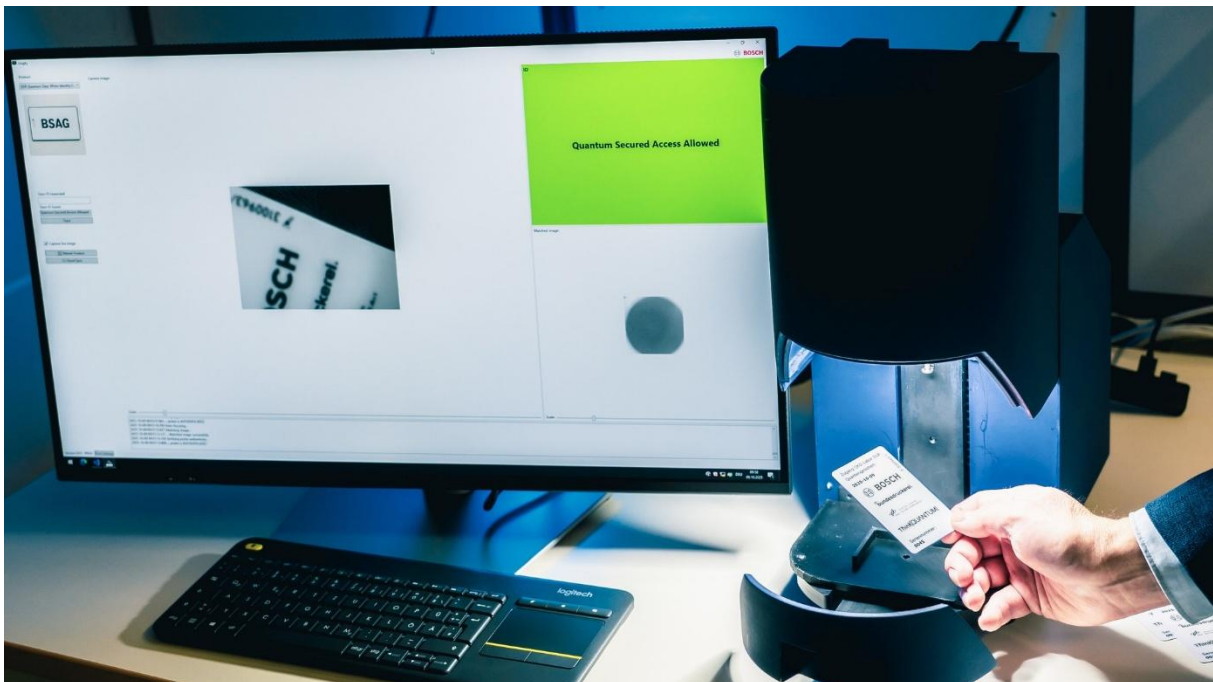


Fig.2: QKD-demo 2- In a technology demonstration, the DLR, together with companies, presented quantum technologies for tamper-proof authentication. Individual light quanta form a so-called quantum key, which can be used to secure communication and data transfer, for example, when authenticating identity documents. Credit: © DLR. Alle Rechte vorbehalten