

# **Cryogenic link for Quantum Local Area Networks**

A team of researchers from the <u>Bavarian Academy of Sciences and Humanities (BAdW)</u>, the <u>Technical University of Munich (TUM)</u>, <u>VTT Finland</u>, <u>Rohde&Schwarz GmbH & Co. KG</u>, Germany, and <u>Oxford Instruments NanoScience</u>, UK, have developed a cryogenic link for Quantum Local Area Networks (QLAN), serving as a backbone for distributed superconducting quantum computing.

Quantum communication in the microwave regime is set to play an important role in distributed quantum computing and hybrid quantum networks. To this end, WMI has developed the foundations of microwave-based quantum local area networks (QLAN) for more than a decade. Now, we have reached an important milestone by demonstrating a cryogenic microwave link connecting two dilution fridges over a distance of 6.6 m. We demonstrate the successful distribution of quantum entanglement through this QLAN. The corresponding results have been published in <u>npj Quantum Information</u>. The system was set up within the EU flagship project <u>QMiCS</u> and the BMBF project <u>QUARATE</u>.



*Figure 1:* **a** Schematic of the experimental setup in the cryogenic link. **b** Wigner function of an exemplary squeezed state at the hybrid ring input for  $T_{center} = 110 \text{ mK}$ . **c** Wigner function of the respective squeezed state at the hybrid ring output. **d** Wigner function of the respective transferred squeezed state at the Bob cryostat. **e**–**g** Exemplary Wigner functions for the identical sequence of squeezed states as in panels (**b**–**d**) for the elevated center temperature,  $T_{center} = 1 \text{ K}$ . **h** Squeezing levels S of different states as a function of the pump power at the JPA sample holder. The vertical dashed line denotes the exemplary squeezed states that are displayed in panels (**b**–**g**).

## Publication:

### Cryogenic microwave link for quantum local area networks

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Links:

- Munich Center for Quantum Science and Technology (MCQST): <u>https://www.mcqst.de</u>
- Munich Quantum Valley: <u>https://www.munich-quantum-valley.de/</u>
- EU Quantum Flagship Projekt QMiCS: <u>https://qmics.wmi.badw.de</u>
- WMI: <u>https://www.wmi.badw.de</u>
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