

Prof. Dr. Peter van Loock  
Institut für Physik  
loock@uni-mainz.de

JOHANNES GUTENBERG  
UNIVERSITÄT MAINZ



Dr. Lars von der Wense  
Institut für Physik  
lars.vonderwense@uni-mainz.de

# Seminar über Quanten-, Atom- und Neutronenphysik (QUANTUM)

July 13, 2023 at 2 p.m.  
IPH Lorentzraum 05-127

Asst. Prof. Tracy Northup  
Universität Innsbruck

## **Entanglement of trapped-ion qubits separated by 230 meters**

Entanglement-based quantum networks hold out the promise of new capabilities for secure communication, distributed quantum computing, and interconnected quantum sensors. However, only a handful of elementary quantum networks have been realized to date.

I will present results from our prototype network, in which two calcium ions are entangled with one another over a distance of 230 m, via a 520 m optical fiber channel linking two buildings. The ion-ion entanglement is based on ion-photon entanglement mediated by coherent Raman processes in optical cavities. I will discuss the advantages of trapped ions for quantum networks and the role that cavities can play as quantum interfaces between light and matter at network nodes. After examining the key metrics for remote entanglement, we will consider the necessary steps to extend this work to long-distance networks of entangled quantum processors.

Contact:  
Andrea Graham  
Institut für Physik  
graham@uni-mainz.de