

The **Theoretical Quantum System Design group** at the **Chair of Theoretical Information Technology** of the Technical University of Munich announces a

PhD position (w/m/d), full-time TVL-E13 Theoretical Foundations of Quantum Communication System

Starting within 2020, the position is fully funded by a BMBF Research grant for a period of 3 years. The successful candidate will be enrolled in the graduate program of Technical University of Munich. We offer the possibility to work on the theoretical foundations of quantum communication system design. The group applies analytical methods to answer questions that are motivated from practical system design and deployment, and develops the quantum network simulator QuNetSim as a tool for testing the interplay between novel algorithms. Interdisciplinary work, especially the collaboration and contact with research groups focusing on classical system design or experimental research on quantum systems and with the TUM Entrepreneurship center are encouraged. The research agenda evolves around the following four major topics:

- Message transmission and entanglement generation in noisy environments, including the development of new modulation techniques.
- Quantum system design, especially the inter-operation of the various resources that can be used to ensure high data rates and reliable communication
- Study of new potential use cases that can be enabled by adding quantum communication resources to current communication systems.

The successful candidate is expected to focus on communication models based on the physical properties of photonic cluster states. The tasks will include mathematical modelling of these states as part of a quantum communication system, including generation and storage. Quantum communication algorithms need to be developed which are tailored to this particular model. These algorithms should, among others, cover well-known use cases like e.g. quantum key distribution and entanglement generation. The impact of uncertainties in the system parameters need to be investigated on a theoretical basis and then matched with current hardware. The applicant is expected to maintain a close connection to experimental research partners, and to contribute to the development of the physical layer of the network simulator QuNetSim, for example by implementing the newly derived system models.

The ideal candidate brings with him a deep interest in quantum information theory, as well as a good background in physics, mathematics and programming in at least one language. We welcome enthusiastic, creative, and curious applicants that enjoy the challenges and unpredictability of interdisciplinary research on the borderline between strict theory and concrete industrial implementation. Openness to changes in directions as well as initiative in formulating research questions and goals and the capability to develop independent strategies to proving mathematical results are expected.

Applicants should submit a CV together with a cover letter and names and E-Mail addresses of two potential referees by E-Mail to jobs.tti@ei.tum.de. For further information about this position please contact

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General Information

TUM is aiming to increase the number of women employees, and applications from women are expressly welcomed. People with disabilities, with essentially the same suitability and qualification, will be preferred. As you apply for a position at the Technical University of Munich (TUM), you provide personal data. Please note our data protection information according to Art. 13 Data Protection Basic Regulation (DSGVO) on the collection and processing of personal data in connection with your application <http://go.tum.de/554159>. By submitting your application, you confirm that you have taken note of the data protection information of the TUM.