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Fakultät für Mathematik, Informatik und Physik

THEORIE ZU ANWENDUNGEN DER QUANTENINFORMATION (§ 99 Abs.4 UG)

Mittwoch, den 19. Juli 2023 um 10 Uhr	
Wolfgang DÜR	
Hörsaal D	**Forschungsvortrag und Diskussion:** ***"Quantum networks – design and applications"*** *We consider quantum networks, i.e. the communication between remote quantum devices. We discuss different methods and protocols how to achieve this, ranging from entanglement purification and quantum repeaters to establish long-distance entanglement, over state certification to the development of novel design principles for quantum networks. In the latter case, pre-shared multipartite entangled states serve as a resource to fulfill network requests on demand. Such entanglement-based quantum networks offer new possibilities and features such as speeding up network requests, and network optimization independent of the underlying physical structure. We show how to design and optimize such entanglement-based networks, and study their performance under noise. Finally, we discuss how to make quantum networks genuine quantum by providing them with the possibility of handling superposed tasks. This allows one e.g. to prepare superposition of different target states, or to send information among a superposition of different paths. We discuss applications of this principle in networks, but also as a tool in quantum computation where performing gates and whole circuits in coherent superposition leads to noise reduction. We also consider quantum sensing networks as a possible application of distributed entanglement, where quantities with specific spatial dependence can be measured directly with enhanced precision, despite the influence of spatially correlated noise.*
Mittwoch, den 19. Juli 203 um 11 Uhr	
Wolfgang LECHNER	
Hörsaal D	**Forschungsvortrag und Diskussion:** **"Quantum computing beyond classical capabilities"** *A main goal of current efforts in quantum technology is the development of quantum computers that can perform certain tasks more efficiently compared to classical computers. Quantum algorithms, like Shor's algorithms, have been theoretically demonstrated to be exponentially faster compared to their classical counterparts. However, these algorithms have not been realized yet in scale, due to engineering and fundamental limits in the experimental limitations. In my research, I am trying to close the gap between experimental feasibility and theoretical possibility. This co-design approach is a synergy of quantum information and quantum technology.*

*) Die Veröffentlichung von Namen und Titel erfolgt nur auf Zustimmung der Vortragenden.