WED-ID 2: Quantum Computers & Simulators

Time: Wednesday 14:45–16:45 Location: ZHG001

Invited Talk WED-ID 2.1 Wed 14:45 ZHG001
Trapped-Ion Quantum Computing at Infineon — •Clemens Rössler — Infineon Technologies Austria AG, Villach, Austria

Quantum computing opens new ways of tackling computational challenges in areas such as healthcare, cybersecurity, finance or logistics. Infineon, a leading semiconductor manufacturer, drives the industrialization of quantum computing from fundamental research into application for industries and partners worldwide. I will introduce trapped-ion quantum computing, its status and challenges and present Infineon's activities in the field.

5 min. break

Invited Talk WED-ID 2.2 Wed 15:10 ZHG001
Planck's Reluctant Constant and the Second Semiconductor Revolution — •Mark Mattingley-Scott — Quantum Brilliance, Stuttgart, Germany

In 1900, Max Planck introduced his quantum hypothesis not as a revolutionary breakthrough, but as a "purely formal assumption" to resolve the ultraviolet catastrophe. Like many contemporaries, Planck himself was skeptical of quantization's physical reality. Yet this reluctant mathematical convenience would fundamentally reshape our understanding of nature and enable technologies that seemed like science fiction to early 20th-century physicists.

Today, we face remarkably similar skepticism about mass deployment of quantum technologies. Critics argue that quantum computing, sensing, and communications will remain confined to specialized laboratories, pointing to decoherence challenges, manufacturing complexities, and infrastructure requirements.

These concerns echo arguments once made against semiconductors, lasers, and the internet, technologies that seemed impractical for widespread adoption until suddenly they weren't.

Mass deployment is not a question of if, but when. The question is whether we - commercially, geopolitically, socially - will lead or follow in its development. I will talk about how we intend to bootstrap the quantum revolution by transforming the engineering challenges into processes - by taking technologies which have the capability for mass deployment and kick start the second Semiconductor Revolution.

5 min. break

Invited Talk WED-ID 2.3 Wed 15:35 ZHG001
Quantencomputing: Von der universitären Forschung zum Startup neQxt — •Ferdinand Schmidt-Kaler — neQxt GmbH — QUANTUM, Johannes Gutenberg Univ. Mainz

Die aktuellen politischen Weichenstellungen führen zu Restriktionen beim internationalen Austausch für Hochtechnologie. Ein moderner Industrie- und Forschungsstandort Deutschland ist aber undenkbar ohne die zukünftigen Anwendungen von Quantencomputern bei chemischer bzw. Materialforschung, bei Optimierungsaufgaben im Logistik- und Finanzbereich, AI-Sektor und für sicherheitsrelevanten Anwendungen. Daher muss Deutschland eigene Anstrengungen zum Bau eines Quantencomputers verfolgen. Auch die Entwicklung von passender Anwendungssoftware benötigt Tests auf eigener Quantenhardware, denn deren Imperfektionen müssen mitberücksichtigt werden. Angestoßen durch den Start des EU-Quantum flagship hat die Bundesregierung die Initiative ergriffen, um Quantencomputing in die Anwendung zu überführen. Ansätze basierend auf Atomen und Ionen profitieren von Traditionen universitärer Forschung und nutzen vor Ort vorhandene Kompetenzen der Technologiefirmen. Neugründungen wie neQxt stehen nun vor der Aufgabe, den Vorsprung großer US Hersteller aufzuholen. Die neQxt GmbH zielt neben dem Verkauf von Quantencomputern darauf darauf Rechenzeit anzubieten, die am deutschen Standort eine hohe Datensicherheit gewährleist - ein besonders wichtiges Gut für industrielle Anwender. Die zukünftigen Herausforderungen liegen bei der Hochskalierung auf tausende von qubits, Quantenfehlerkorrektur und Anbindung an klassische Rechenzentren.

5 min. break

Invited Talk WED-ID 2.4 Wed 16:00 ZHG001
Building quantum computers, atom by atom — •Alexander Glätzle — planqc GmbH, Garching, Germany

This presentation introduces planqc, a quantum computing startup founded out of the Max Planck Institute of Quantum Optics. I will outline the company's origin story and share why we believe Germany provides a uniquely strong foundation - both scientifically and strategically - for building a globally competitive quantum technology venture. The talk will include a brief technical overview of neutral atom quantum computing, highlighting its key principles, current challenges, and opportunities. I will conclude with an outlook on planqc's development roadmap and our vision for advancing scalable quantum computing based on neutral atom platforms.

5 min. break

Invited Talk WED-ID 2.5 Wed 16:25 ZHG001
Progress on superconducting quantum processors at IQM — •Frank Deppe — IQM Quantum Computers, Georg-Brauchle-Ring 23-25, 80992 München, Germany

IQM is a European VC-funded company developing quantum computers based on superconducting circuits. Being part of a highly dynamic and competitive field, one faces significant entrepreneurial and technological challenges. In this context, a suitable balance between innovation and engineering is key. Currently, IQM supports two architectures, both based on transmon qubits and flux-tunable couplers. These are the square lattice with nearest neighbor configuration and the resonator-star with effective all-to-all connectivity. In this presentation, I will give an overview about the latest progress in these two directions.