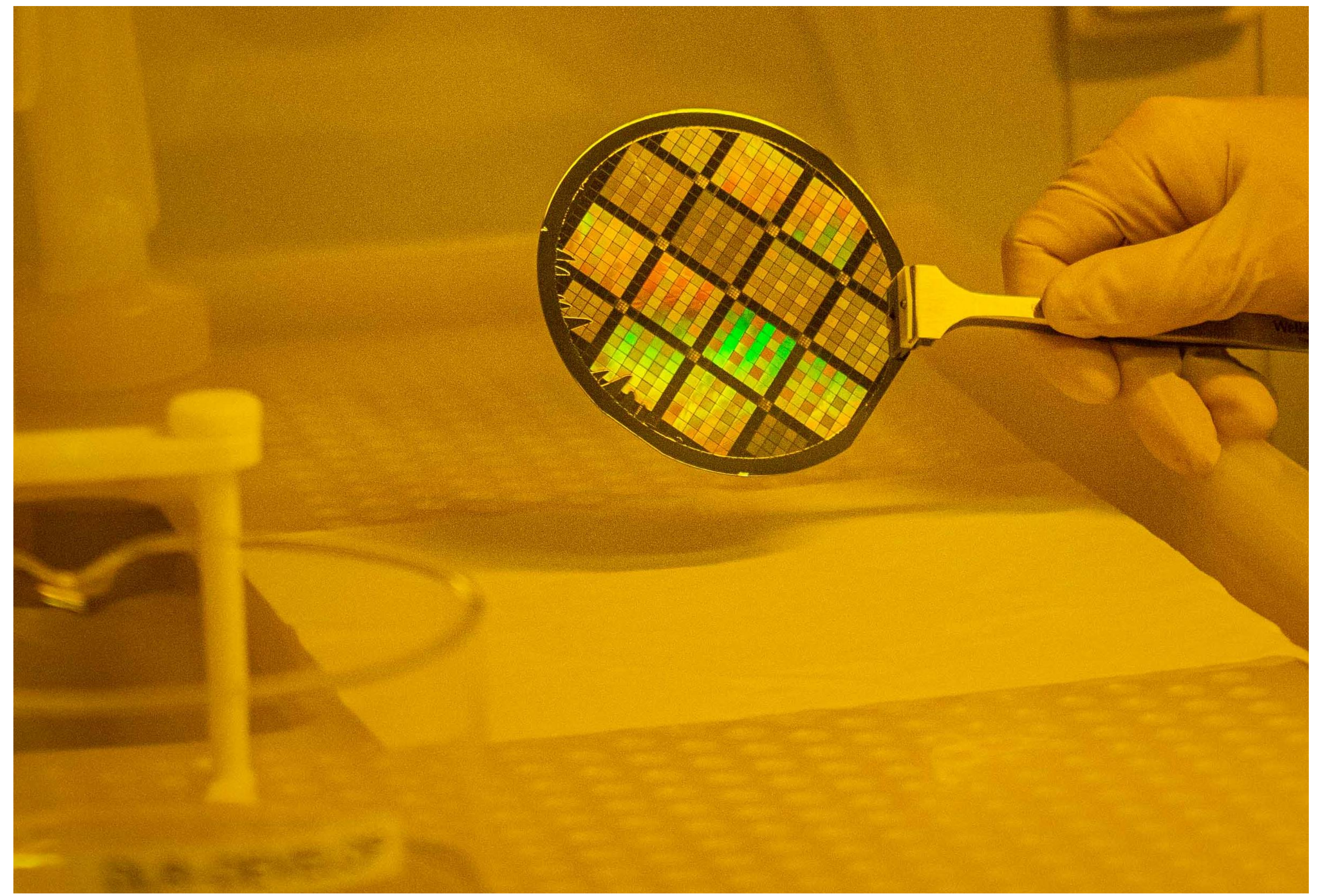


TeufIQ

Technologieentwicklung und -unterstützung für Ionenfallenbasierte Quantencomputer

The project provides a versatile support in microtechnologies ranging from processes to metrology. Besides providing first-hand process knowledge, today's research topics on surface ion traps are under investigation.

- Applications:
- Quantum computers
 - Quantum sensors
 - Process development
 - Material research



Abstract

Aim of the TeufIQ project is to support the industrial partners of QC-I in developing and manufacturing prototypes of ion-trap based quantum computers. The project framework encompasses a wide range of research services for the QC-I partners placed at the Innovation Center Hamburg (IZHH). The project's foundation is the expertise and the experience in micro- and nanotechnology of the DLR division QT-IMN in Ulm. We particularly address close collaboration working on open research questions and the development of related technological solutions to facilitate the production of ion-trap based quantum computers in future.

Interposer-Technology for Ion-trap QC

- Development of optical interfaces, in particular high power waveguides
- Development electrical interfaces, e.g. vias

Atom sources for Ion-trap QC

- Development of atom sources
- Ion reservoir and controlled atom release for trap loading in high density surface traps

Magnetic structures for Ion-trap QC

- Development of on-chip magnetic microstructures
- Magnetic fields exhibiting strong gradients
- Coupling of ion states

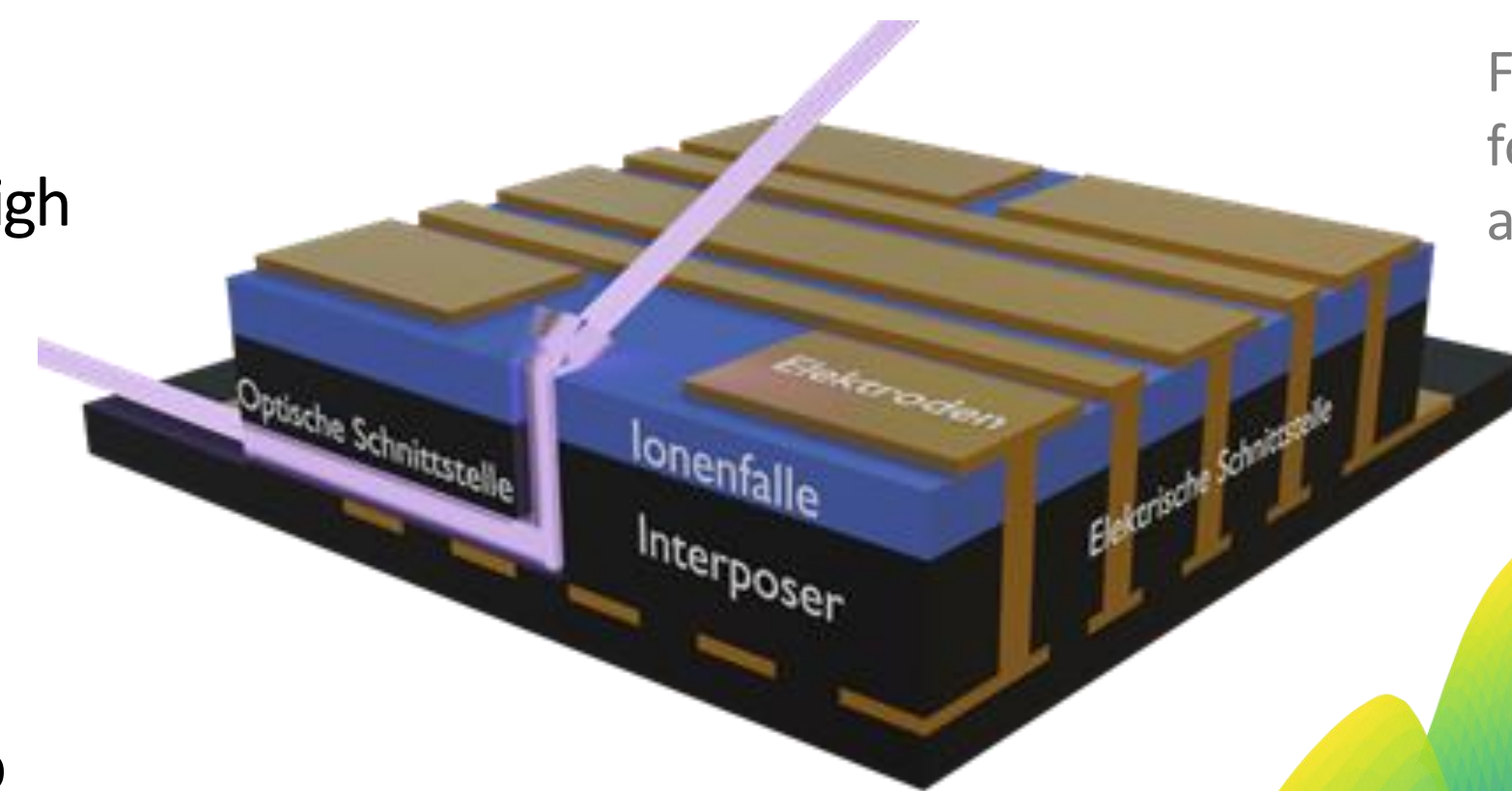


Fig. 2: Scheme of interposer for surface trap with electrical and optical interfaces.

Fig. 3: Simulated magnetic quadrupole field for addressing ion quantum states

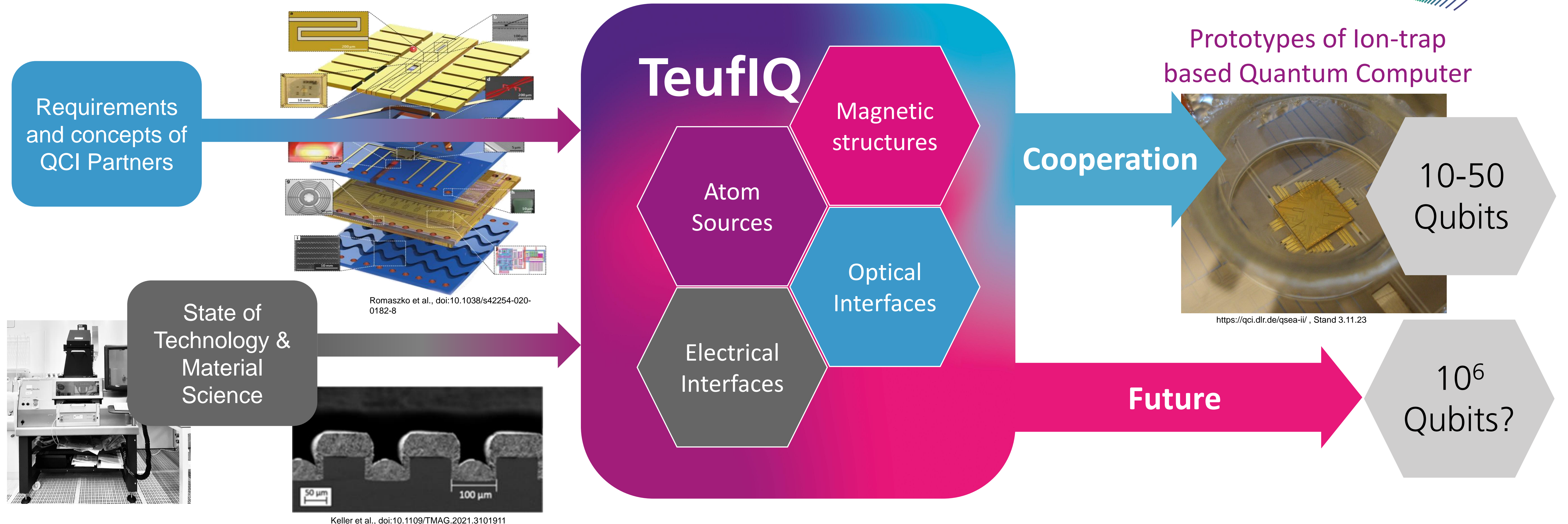
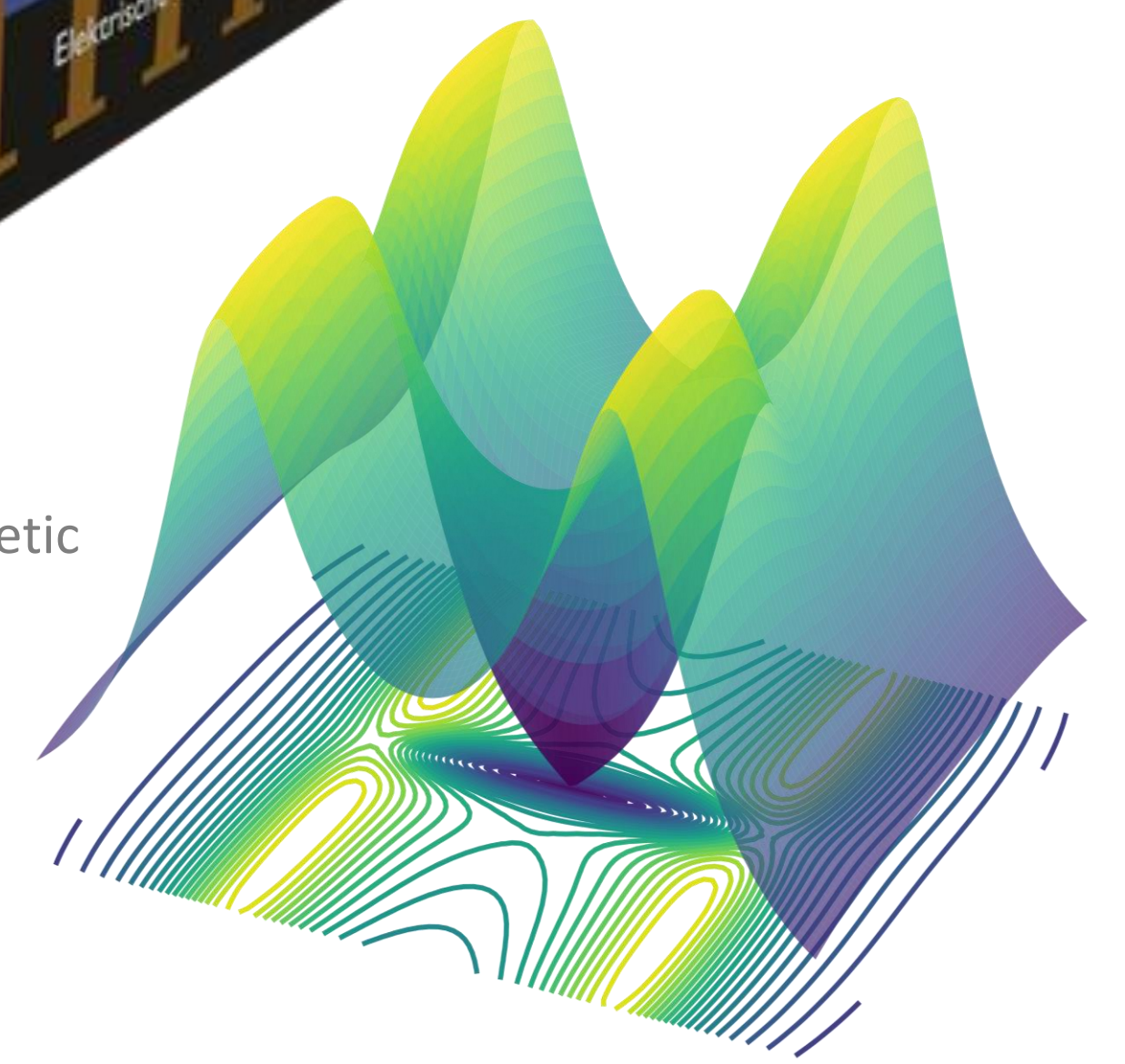
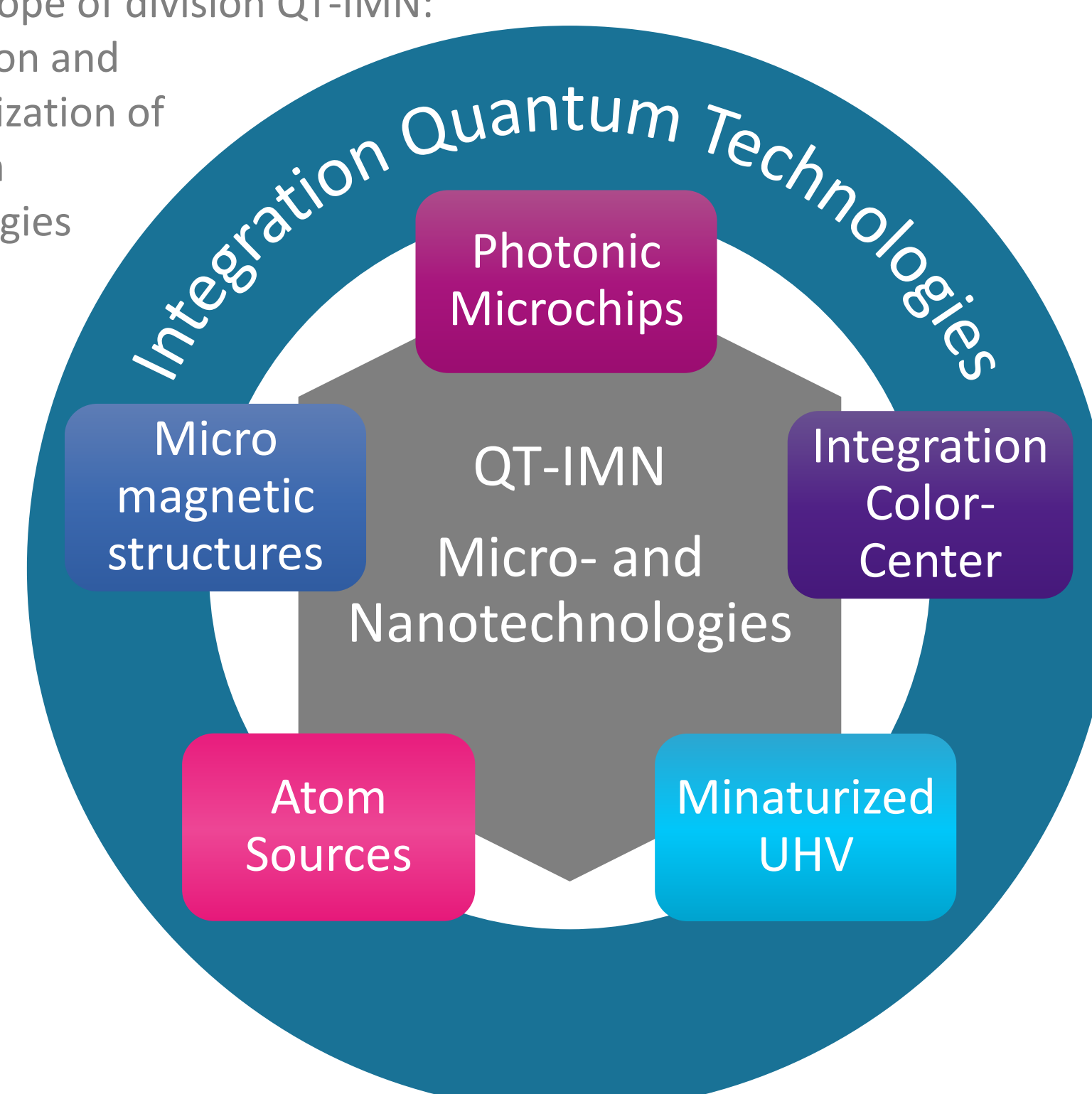


Fig. 1: Overview of TeufIQ project scope

Goal of Project TeufIQ

Next to the explicit goals of the QCI-Industry-Projects to build prototypes of quantum computers, there still remains unsolved problems regarding the production. This "day after tomorrow problems" are the scope for this project. As part of the QCI program TeufIQ will get in touch to QCI project partners and search for topics in the domain of microsystem technology where no solution is available or is out of scope. The type of cooperation strongly depends on the requirements of the partners and ranges from close collaboration in technological facilities over scientific discussions to easy specification issuing. TeufIQ provides a group leader, three scientists and a technician at the innovation center (IZHH) – a clean room facility at NXP site in Hamburg with latest microsystem technology machines and knowledge-based support from QT-IMN in Ulm.

Fig. 4: Scope of division QT-IMN: Integration and miniaturization of quantum technologies



Goal of Division QT-IMN

The research of the department "Integration of Micro- and Nano systems" (IMN) is mainly focused on the miniaturization and implementation of quantum physical systems. Herein, the crucial steps are the technological integration and process development (so called "enabling technologies") bringing these concepts into real world applications. Therefore QT-IMN is a key player for realizing and enabling quantum-technologies.

Find more information here

