Module: Elective Advanced Lectures: Experimental Physics

Module No.: physics70a

Course: Platforms for Quantum Technologies (E)

Course No.: physics743

Category	Type	Language	Teaching hours	CP	Semester
Elective	Lecture with exercises	English	2 weeks fulltime	5	WT/ST

Requirements for Participation:

Preparation:
Major courses of the 1st MSc term, for example, "Advanced Atomic, Molecular and Optical Physics", "Quantum Optics", "Advanced Quantum Theory", "Theoretical Condensed Matter Physics"

Form of Testing and Examination:
written exam

Length of Course:
2 weeks

Aims of the Course:
Students receive an introduction into quantum technologies both theoretically and experimentally. Focus is on the theoretical foundations of quantum information processing, and experimental platforms primarily used in Bonn (Atomic, molecular and optical systems), Cologne (topological materials) and Aachen (spin & superconducting architectures) in the context of the Excellence Cluster ML4Q.

Contents of the Course:
1. Basics of quantum information processing
2. Atomic, molecular and optical platforms, quantum simulation
3. Solid-state platforms. Focus on quantum computation. Spin qubits, superconducting qubits;
4. Topological platforms, Topological materials, Topological architectures

Recommended Literature:
Nielsen & Chuang "Quantum information processing"
Pethick/Smith "Bose-Einstein condensation"
Lecture notes will be distributed for selected topics