SCIENTIFIC AND METHOD MODULES

Module name	From Molecules to Materials: Solid State Quantum Systems
Number	2022-T4
Aims	This module links molecular sciences and materials science, teaches how materials with optimized catalytic activity and adjustable magnetic, electronic, or optical properties are obtained from molecules, and provides an understanding of the properties and applications of these materials.
Basics	covered in basic modules
Contents	Production and application of Quantum systems in solids - requirements to produce single qubits - methods and challenges of ion beam technology - an introduction to quantum optics. - an introduction to quantum technology, quantum computers and quantum sensors. Topics: Atom-Light-WW, Laser, Photostatistics, Antbunching, Fockstate, Coherentstate, Squeezed light, Atom in cavities, Entangled states, Quantum cryptography Qubits, basics of computers, quantum computers, quantum terror correction, adiabatic QC (D-WAVE), quantum sensors, practical realization.
Methods	Confocal microscope, Quantum optics techniques: ODMR, HTB, single Photons. Single ion beam implantation, doping, annealing methods, single molecule spectroscopy, single molecule NMR, Hyperpolarization,
Type	Two-day block course
Date	15./16.09.2022
Time	10:00-18:00, 10:00-16:00
Work load	15 hours presence/ 45 hours self-study
Examination	As module exam one of the invited talks is summarized with a few references and the discussion after the presentation reproduced. Typical length of this work (in English) is 2 pages. The paper will be graded.
Credit points	2
Responsible scientists	Prof. Jan Meijer
International guest lecturers	
Industrial partners	
Recommendations for literature, e-learning	J.-M. Spaeth, H. Overhof: ”Point Defects in Semiconductors and Insulators”; Susan Shannon (Editor): “Trends in Quantum Computing Research”; M.A. Mielsen and I. L.Chuang: “Quantum Computation and Quantum Information”

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