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Fakultät für Naturwissenschaften, Fachbereich Physik

Announcement

Application NMR/MRI

Dr. Raiker Witter, Prof. Volker Rasche

Description

In the lecture, the basics for NMR (Nuclear Magnetic Resonance) and MRI (Magnetic Resonance Imaging) are given. Both methods are presented in a practice-oriented manner using biomedical applications and the example of neurodegenerative diseases, and the specifics of each are worked out. Five exercise sheets (NMR I/II, MRI I/II and application) are handed out, which are solved by the students and worked through in the seminars. In addition, the students are given the opportunity to give talks. The lecture is rounded off with a practical course and a (written) examination is taken.

Schedule

	Tue	Lecture: 2x45 min	Thu	Lecture: 2x45 min	Wen	Seminar: 2x45 min
		Introduction				
1	20.4.	Spin concept and B-field	22.4.	Fundamentals of QM		
		NMR				
2	27.4.	QM of spin systems, magnetisation	29.4.	NMR interaction	28.4.	Exercises NMR I
3	4.5.	Experimental setup (excitation, detection, time signal and spectrum)	6.5.	Experiments (single pulse and echo experiments)		
4	11..5	Relaxation	13.5.	Vector image and Bloch equations	12.5.	Exercises NMR II
		MRI				
5	18.5.	Classical magnetic moment and concept	20.5.	Gradient and space-encoding		
6	25.5.	Hardware	27.5.	Echo experiments	26.5.	Exercises MRI I
7	1.6.	Signal localisation	03.6.	Image reconstruction		
8	8.6.	Image contrast	10.6.	Resolution, noise, artifacts	9.6.	Exercises MRI II
9	15.6.	Fast scan imaging	17.6.	Constrained Reconstruction		
		Application				
10	22.6.	Biomedical MRI	24.6.	Neurodegenerative diseases MRI I	22.6.	Exercises Application
11	29.6.	Neurodegenerative diseases MRI II	1.7.	Biomedical NMR		
12	06.7.	Neurodegenerative diseases NMR I	8.7.	Neurodegenerative diseases NMR II		
		Lab				
13	13.7.	Lab MRI/NMR	15.7.	Lab MRI/NMR	14.7.	Lab MRI/NMR
14	20.7.	Lab MRI/NMR	22.7.	Lab MRI/NMR	21.7.	Lab MRI/NMR
15	27.7.		29.7.		28.7.	

Instruction language

German or English

Teaching methods

Lecture (4 hours per week) and Exercise/Lab (1 hour per week)

Additional information

The course is for bachelor and master students.

6 ECTS

Lecturers

Dr. Raiker Witter (Institute of Quantum Optics), Prof. Volker Rasche (Experimental Cardiovascular Imaging (ExCaVI), Universitätsklinikum Ulm)