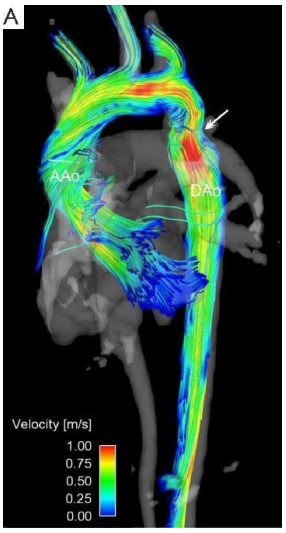
ulm university universität
uulm
Fakultät für Naturwissenschaften, Fachbereich Physik

Announcement

Physics of Medical Imaging

Prof. Dr. rer. nat. Volker Rasche, Dr. rer. nat. Tobias Speidel

Description



In contemporary medicine, the evaluation of internal body structures through medical imaging plays a crucial role in numerous diagnoses. Over the years, a diverse array of imaging modalities has been established, encompassing ultrasound, X-Ray, computed tomography, magnetic resonance imaging (MRI), as well as specialized techniques relying on radioactive sources such as positron emission tomography (PET) and single-photon emission computed tomography (SPECT). Each modality operates based on distinct physical principles and is suited for particular applications. In this lecture series, our focus will be to delve into the underlying physics of these widely used imaging methods. By examining the physical principles governing each technique, we will gain insights into their strengths and limitations. This understanding will allow us to discern the specific clinical applications to which each modality is best suited and explore potential advancements for the future.

Content

- Principles of nuclear magnetic resonance
- NMR spectroscopy
- Basics of MR imaging
- Fourier space: Encoding, acquisition and reconstruction
- X-Ray imaging & Computed tomography: Physical principle and contrast generation
- Nuclear Imaging (PET and SPECT): Physical principles and contrast generation
- Ultrasound: Basic principles and contrast generation
- General application of medical imaging methods including hands-on sessions

Prerequisites

Undergraduate courses in atomic physics and quantum mechanics

Literature

- Maier, Andreas, et al., *Medical imaging systems: An introductory guide*.
- Slichter, Charles P. *Principles of magnetic resonance*.
- Levitt, Malcolm H. *Spin dynamics: basics of nuclear magnetic resonance*.

Additional information

- Lecture (4 hours/week) with additional hands-on sessions
- Examination: Oral
- 5 ECTS Credits

Lecturer

Prof. Dr. Volker Rasche, Department of Internal Medicine II, ExCaVI, Universitätsklinikum Ulm
Dr. Tobias Speidel, Department of Internal Medicine II, ExCaVI, Universitätsklinikum Ulm