Research focus of the department of “Physics of Molecular Imaging Systems” (PMI) is on exploring the physical limits of current and future molecular imaging technologies. These areas range from simulations of new detector concepts, hardware prototypes, high speed data processing, image reconstruction algorithms and applications using our research imaging prototypes. Our group consists of students and researchers from different disciplines: physics, engineering, computer science and medicine. PMI is part of a large international network with a close link to industry, especially Philips Research.

Magnetic Particle Imaging on a micro scale

Magnetic Particle Imaging (MPI) is a new tracer based imaging technology, where a patient or an animal is injected with superparamagnetic iron oxide nanoparticles (SPIO). The SPIOs are excited by an external magnetic field and the response of the particles is recorded and is proportional to the concentration of the SPIOs. The spatial encoding of the particle is done by superimposing a magnetic gradient field with three orthogonal homogeneous fields so that the fields cancel out each other only at a single point in space (field free point) and all particles not contained in the FFP are saturated. Therefore, only the particles in the FFP contribute to the signal. This method allows a quantitative image of the tracer distribution inside the observed volume. The goal of our group is to understand the physical limitations of MPI on sensitivity and spatial resolution.

The candidate will work on a magnetic field generator with a suitable excitation field generator and receive coil for a 1-dimensional micro MPI scanner with a scanning volume of about 1 mm. Starting with initial simulations, the candidate will explore several parameters, like excitation field trajectory and frequency, gradient strength, etc., on spatial resolution and sensitivity. A good understanding of System Theory (LTI systems), good programming skills as well as of electrodynamics fields are preferred.

For more information please contact:
Physics of Molecular Imaging Systems (Univ.-Prof. Dr.-Ing. Volkmar Schulz)
Pauwelsstraße 19, D-52074 Aachen, MTZ, 2. Etage, Flur A
mstraub@ukaachen.de, +49/241/8085168

X-Space MPI, Goodwill and Conolly, IEEE TRANSACTIONS ON MEDICAL IMAGING, VOL. 29, NO. 11, Nov. 2010