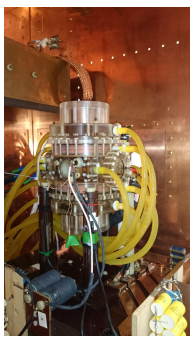
Research focus of the department of “Physics of Molecular Imaging Systems” (**PMI**) is on exploring the physical limits of current and future molecular imaging technologies. These areas range from simulations of new detector concepts, hardware prototypes, high speed data processing, image reconstruction 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.

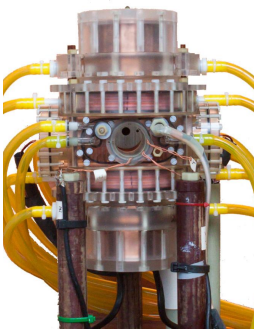
Acquisition of fluid flow dynamics with MPI

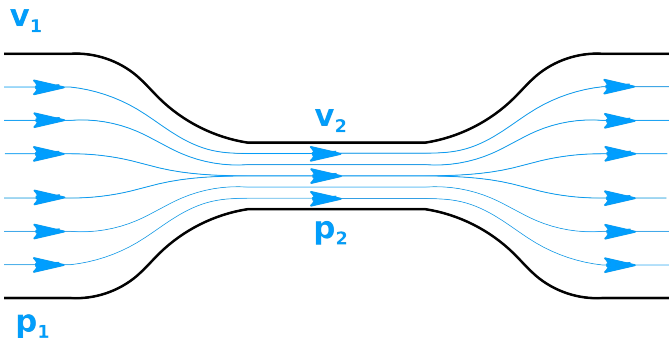
Magnetic Particle Imaging (MPI) is a new tracer based imaging technology, where a patient or an animal is injected with superparamagnetic iron oxide nanoparticles (SPIO). The SPIOs are excited by an external magnetic field and the response of the particles is recorded and is proportional to the concentration 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 as well as developing new applications.

Our group has the world’s first preclinical MPI scanner, which is still one of the scanners with the highest sensitivity for the tracer material. In addition to the high sensitivity it is one of the fastest scanners with a temporal resolution of 21.5 ms. The scanner is used for biological studies as well as for MPI system research.

The candidate will develop an acquisition sequence and analysis for MPI, which enables the measurement of the fluid dynamics of a tracer. Therefore, he or she has to develop a sequence, which allows the extraction of vectorial information. For the analysis the candidate has to implement an optical flow algorithm and discuss the limitations of this method. Since, the candidate will work with a data acquisition and processing environment, which is implemented in multi-threaded C/C++11, and with an analysis environment, which is implemented in Python, good programming skills are preferred as well as good understanding of the physical background.







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
marcel.straub@pmi.rwth-aachen.de
+49 241 80 85186