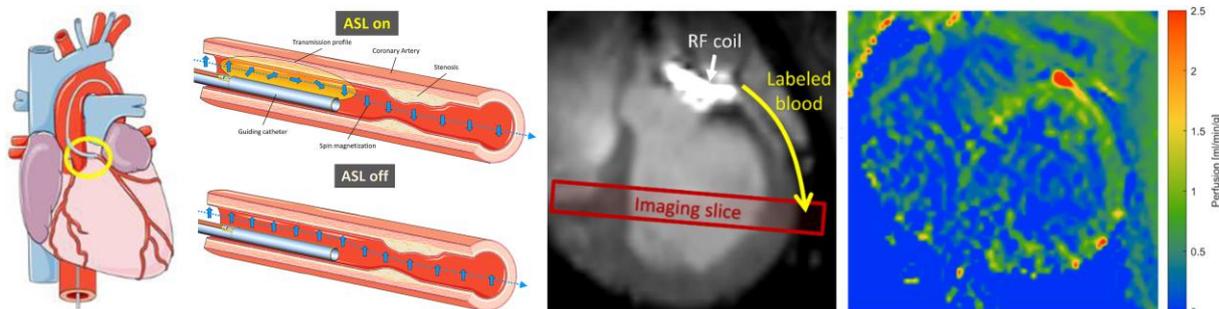


The Department of Diagnostic and Interventional Radiology - Medical Physics, University Medical Center Freiburg is looking for a **PhD Student in Physics** (or a related field) for a research project on

## Intra-Arterial Spin Labeling with Catheter-based Coils for Myocardial Perfusion Quantification

Percutaneous coronary interventions (PCI) for the treatment of ischemic heart disease are the most common cardiac intervention worldwide. So far, PCI are performed solely under X-ray guidance, which provides only limited imaging contrast and uses hazardous radiation. Magnetic resonance imaging (MRI) on the other hand does not use ionizing radiation, and it provides structural and functional cardiovascular information with excellent soft tissue contrast. MRI can be acquired and reconstructed in real time to guide cardiovascular interventions and was shown to be feasible for the guidance of PCI in preclinical studies.



The proposed iASL technique uses intravascular coils attached to coronary guiding catheters to create spin labeling within the coronary artery. Initial measurements during an MR-guided PCI study in pigs have demonstrated iASL to be feasible (right).

See also: Heidt T, Reiss S, et al. Sci Rep. 2019 Jun 17;9(1):8663

In this project a novel method will be developed that uses intra-arterial spin labeling (iASL) to measure myocardial perfusion during MR-guided PCI without the need for exogenous contrast agents.

Quantifying myocardial perfusion plays a key role in the diagnosis and treatment of ischemic heart disease. In MR-guided PCI, perfusion can be measured already during the intervention which is not possible with X-ray guidance. So far, perfusion measurements during MR-guided interventions require the injection of gadolinium-based contrast agents. However, the use of these contrast agents comes with certain disadvantages including the alteration of the imaging contrast which negatively affects the perfusion quantification and contraindications in patients with impaired kidney function. Arterial spin labeling (ASL) is an alternative technique that uses blood as an endogenous contrast agent for perfusion measurements but is limited in the signal-to-noise ratio (SNR). The proposed iASL technique utilizes intravascular coils attached to coronary catheters to label the blood within the coronary arteries. We envision that this technique creates a strong labeling contrast that is not achievable with conventional ASL and can therefore be used to quantify perfusion during MR-guided PCI with high SNR.

**The successful candidate will work on implementing and optimizing the iASL technique via**

- novel intravascular coil designs
- radiofrequency labeling pulses
- perfusion imaging sequences
- post-processing algorithms

**The successful candidate should have an interest (and, preferably, some experience) in:**

- Medical physics and electromagnetics
- Interventional cardiovascular MRI
- Programming (C++, Matlab)

We provide a multi-disciplinary team with strong experience in interventional MRI, access to clinical MRI systems, and sequence programming environments. Please submit your application and documents by email to:

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