



Joint Austrian-German DFG-FWF project is looking for applicants for Ph.D. positions on

“Next Generation Chemical Exchange Saturation Transfer (CEST) MRI”

Magnetic resonance imaging (MRI) is a noninvasive imaging technique that combines the best soft tissue contrast with high spatial resolution. However, many diseases are directly connected to cellular function and characterized by metabolic processes. CEST MRI uses the Chemical Exchange Saturation Transfer from metabolite molecules to tissue water with its high concentration and is able to enhance the metabolite sensitivity by factors of up to hundred or even more. However, for a broad practical application of CEST MRI some challenges still exist. These are long scanning times for image series used in CEST quantification, basic technical limitations for RF saturation, optimal molecular saturation for information encoding and a complex post-processing for quantitative extraction of molecular information.

This projects aims to combine new advanced methods in MR research and recent mathematical approaches to achieve a major step forward for fast and quantitative imaging of metabolic conditions. There are two major research areas, on the one hand the fundamental reduction of scanning time using **undersampling and compressed sensing** in spatial and frequency domain and on the other hand the improvement of the specific molecular saturation for sensitivity enhancement at whole body systems, which will be realized using **optimal rf control** methods.

If all aims are successfully achieved we can make a decisive contribution to the development of MRI to unique morphological, functional and metabolic imaging modality (see below) and prepare the way of MRI for a broader future clinical application in metabolic biomarker imaging and precision medicine.

To achieve such an improved CEST scan several PhD students in Graz and Erlangen will collaborate in a concerted manner and measure CEST on all available field strengths for humans: 3T, 7T and 9.4T.

Thus, we are looking for physicists, biomedical and related engineers or mathematicians, to apply for this international project in two strong MR labs. Your background should include either optimal control theory or experience in MRI pulse programming or data post processing. Please, send your application to Moritz.Zaiss@uk-erlangen.de and Rudolf.Stollberger@tugraz.at until mid-November 2020.

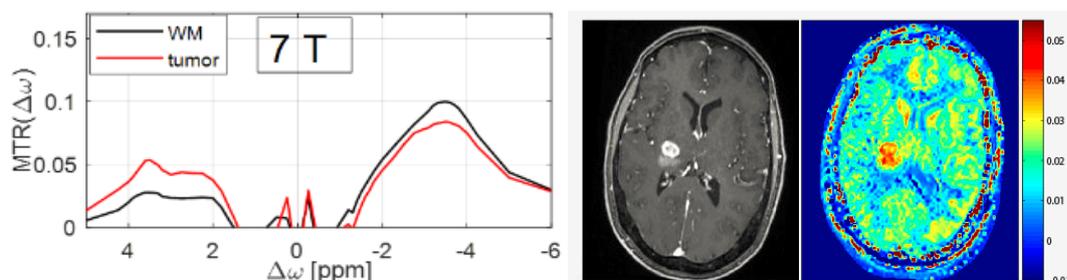


Figure 1: ROI CEST spectrum at 7T (left) shows differences between healthy and tumor tissue which can be exploited as **non-invasive metabolic MR imaging contrast** (right). The goal is to improve and drastically accelerate CEST MRI at different magnetic field strengths from 3T to 7T and 9.4T human scanners. <https://gepris.dfg.de/gepris/projekt/442377885>