

**Images and Networks of the Brain 2018**  
University Medical Center Hamburg-Eppendorf  
April 24-25 2018

**Fast Field-Cycling (FFC) MRI: Biomarkers through  $T_1$ -Dispersion**

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Much of the contrast in MRI arises from differences in  $T_1$  between normal and diseased tissues. Studies on small tissue samples have shown that extra information could be obtained from  $T_1$ -dispersion measurements ( $T_1$  versus magnetic field), but this information is invisible to standard MRI scanners, which operate only at fixed magnetic field (e.g. 1.5 T, 3.0 T). We have developed Fast Field-Cycling Magnetic Resonance Imaging (FFC-MRI) to exploit  $T_1$ -dispersion as a potential biomarker, with the aim of increasing diagnostic potential.

In FFC, the magnetic field is switched rapidly between levels during the pulse sequence. In this way, a single instrument can be used to measure  $T_1$  over a wide range of magnetic field strengths. FFC-MRI obtains spatially-resolved  $T_1$ -dispersion data, by collecting images at a range of evolution fields. We have built a range of FFC-MRI equipment, including a whole-body human sized scanner, operating at a detection field of 0.2 T.

Our lab is investigating a range of applications of FFC relaxometry and FFC-MRI. We have recently begun exploring clinical applications and have imaged patients who have had an ischaemic stroke; the stroke-affected brain tissues are seen as hyper-intense regions in ultra-low-field (200  $\mu$ T) FFC images.

This presentation will cover the main techniques used in FFC-MRI and will summarise current and potential bio-medical applications of the methods. Information on FFC-MRI and copies of publications are available at [www.abdn.ac.uk/research/ffc-mri](http://www.abdn.ac.uk/research/ffc-mri).

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 668119 (project "IDentIFY").