Centre De Résonance Magnétique Biologique et Médicale – CRMBM

UMR 7339 - CNRS, Aix Marseille University, Marseille, France

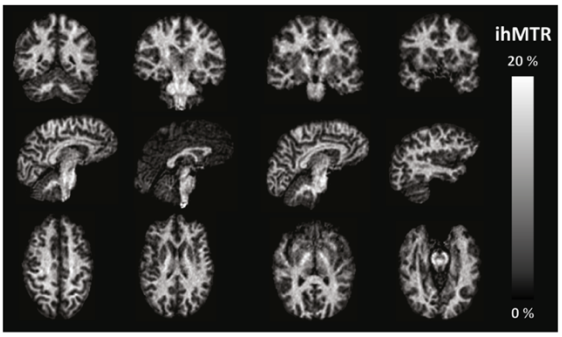
# *Post-Doctoral Position available in CRMBM, Marseille, France*

***Starting February 2022***

## *Development of inhomogeneous Magnetization Transfer (ihMT) for short T1D-components MR Imaging – Application on the Purkinje network of the Cardiac Conduction System (CCS)*

### Rationale

Large macromolecules exhibit a wide dipolar-broadened NMR spectrum, which can be selectively saturated and visualized by MRI following magnetization transfer (MT) to the free water pool. Recently an important characteristic of dipolar-broadened macromolecular lines has been observed using MRI through the discovery of inhomogeneous magnetization transfer (ihMT). ihMT, is a refinement of MT that provides different contrast between tissues than MT by highlighting *dipolar order* effects within motion restricted molecules that are weighted by the corresponding longitudinal dipolar relaxation time *T1D*. Because dipolar order relaxation is longer in myelinated tissues of the central nervous system than any other tissue observed, it is uniquely sensitive to myelin (Figure). More broadly, the addition of a new relaxation mechanism for MRI that reflects the macromolecular structure and mobility and with clearly different properties from T1 and T2 opens the possibility of heightened sensitivity to pathology.




Of importance, recent successful applications of ihMT outside the brain demonstrated great promise to extend its applicability to tissue associated with short T1D components (e.g., collagen – a major component of the Purkinje network). It is expected that a refined ihMT technique optimized to short T1D components will thus allow characterizing the CCS.

### Objectives

The proposed project aims at developing an ihMT acquisition methodology for imaging the short T1D Purkinje fibers. More precisely, the goal is to implement and develop a high resolution (75 µm isotropic) 3D ihMT sequence (on a Bruker 7T scanner equipped with a cryoprobe), optimized for components associated to short T1D values (< 1 ms). Sequence parameter optimization based on numerical simulations will first be developed and tested *in vitro* on fantoms made of short T1D components before validation on *ex vivo* samples containing free running PF. The successful candidate will have in charge the conduct of the numerical simulations and experiments including experiment planning, sample handling, MRI sequence development and optimization, data acquisition, analysis, and statistics.

### Qualifications

We are looking for a motivated candidate with a PhD in biomedical engineering, medical imaging, MR physics or related topic. Prior experience with numerical simulations, MRI techniques developments would be advantageous. Good writing and communication skills in English are required. The successful candidate will work in the ihMT team of CRMBM composed of two senior scientists and a PhD student and in collaboration with the team of IHU Liryc, Bordeaux University (PI: Julie Magat), our partner in this project. The duration of the project (ANR funding) is 12 months (+12 months renewable) with a salary and benefits corresponding to usual Aix-Marseille University conditions.


### Environnement

The CRMBM laboratory is located in the center of Marseille, within La Timone university hospital.

### How to apply?

Interested candidates should send their detailed CV and a cover letter by email to the attention of Guillaume Duhamel (guillaume.duhamel@univ-amu.fr ), and Olivier Girard (olivier.girard@univ-amu.fr)