



Thesis subject :
High resolution cardiac MRI at high magnetic field for the analysis of cardiac structure and function

A PhD position is available at the “LIRYC” led by Pr Michel Haissaguerre. The main research of the institute is based on the diagnosis and treatment of cardiac electrical dysfunctions. These electrical disorders can be identified in several pathologies by a local cardiac structure modification. Cardiac conduction system is organized through a fast connective system called Purkinje Network (PN). 3D imaging of its architecture is therefore of high importance to better understand propagation patterns in cardiac arrhythmias and improve their diagnosis and treatment. The aim of the study is to exploit high field (9.4T) MRI to acquire high resolution images of PN and develop new tool modulating contrast between tissues.

The objective of the PhD research is to develop methodological experiments using high field MRI to obtain very high resolution 3D of PN structure imaging (isotropic resolution of 30 μm). Several sequences will be developed in 3D with different contrasts (T1/T2* weighting, diffusion, magnetization transfer). In order to improve temporal resolution of experiments, fast 3D acquisition and reconstruction pipeline will be implemented. Algorithms of images processing (filtering, 3D segmentation) will be developed.

The imaging team led by Dr Bruno Quesson is equipped with a 9.4T wide bore (30 cm) dedicated to methodological acquisition (sequence development and data processing) and applied cardiovascular research (3D cardiac structure). In collaboration with Bruker, a dedicated volume coil with 7 elements in transmit/receive has been developed (diameter of 16 cm) to image the structure of large sample.

The successful candidate will develop MRI acquisition and program acquisition sequences and reconstruction methods on Bruker MRI and then will validate protocols on cardiac experimentations.

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