

LabTAU - Unité de recherche U1032

Applications des ultrasons à la thérapie

Cyril LAFON, Directeur de Recherche

Post doctoral position – 1 – 2 Years

Development of an endoscopic ultrasound-guided HIFU probe for treatment of cardiac arrhythmias

Context of the study

Cardiac arrhythmias are related to a dysfunction of the electrical conduction pathway in the cardiac tissue. When drugs become inefficient, thermal ablation by catheterization is commonly applied. In an attempt to respond to the limitations of these treatments (incomplete lesions, lack of motion compensation and real-time imaging), the CHORUS project aims at developing a transesophageal ultrasonic probe for image-guided thermal ablation. Preliminary in vivo data allowed demonstrating the feasibility of the concept but, before a clinical evaluation, major technological and methodological improvements remains to be done for facilitating the procedure, compensating cardiac motion and improving image guidance for online prediction of lesion assessment. More specifically, the project will result in the design a MR compatible dual mode (imaging and therapy) matrix of ultrasonic transducers, high speed ultrasound imaging for characterizing stiffer thermally ablated zone and electro mechanical coupling and tracking solutions for treatment planning.

Project objectives

The probe combines a multi element HIFU transducer for electronic beam steering and an ultrasound imaging probe for assessing thermal damage and cardiac electrical activity.

The candidate will work on the control of the transesophageal procedure in imaging and treatment modes. Both modes will be performed with a Verasonics Vantage scanner. The position of the probe will be tracked with a magnetic localization system. The performance of the software and the probe will then be evaluated in vitro on biological tissues samples and in vivo. From an imaging point of view, one wishes as well to monitor cardiac electrical activity with high speed elastography. These experiments will be performed in collaboration with the IHU Liryc in Bordeaux that developed an ex vivo beating heart model.

Project tasks

- Operate a multi-element HIFU transducer (Vantage Verasonics)
- Operate an imaging ultrasound transducer for elastographic measurements and image processing
- Operate a magnetic localization system
- Perform tests ex vivo on biological samples and in vivo
- Report on the results through communications at international conferences and journal articles

Skills

- The candidate must be PhD in one of the following fields: Acoustic instrumentation, System and Image, Robotic
- Programming skills: C++, Matlab
- Acoustics
- Medical Ultrasound

Contacts

Send a CV and a motivation letter to Cyril LAFON (cyril.lafon@inserm.fr)

Expected start of the position: January 2018