

Master Thesis

Development of a localised heat source for MR-guided thermal ablation at low field



Topic

MRI has been increasingly employed for interventional applications such as thermal ablation in cancer patients. Fast and accurate mapping of temperature can help localise the position of a localised heat source with respect to a targeted organ and determine the intensity and extent of the delivered thermal dose. Low field MRI is an alternative to high field clinical scanners that could overcome the conventional constraints encountered at high Tesla range (magnetic compatibility, image artefacts, closed bore, etc).

This multidisciplinary hands-on project offers the possibility to work on the development of a localised heat source (i.e. ablation catheter) to reproduce the heating generated in real tissue during thermal therapies. MR temperature maps of developed tissue-mimicking phantoms will then be acquired and validated using a direct temperature monitoring system.

Your activities

Main tasks:

- identify and investigate the use of an ablation catheter in our low field MRI system(s);
- develop a polymer phantoms to replicate the catheterisation and heating of different types of tissue structures;
- implement a temperature monitoring system (e.g. fibre-optical thermometer) for real-time ground-truth feedback measurements;
- acquire and analyse temperature maps using existing MRI sequences, optimised according to the properties of the imaged object.

Other tasks:

- investigate the impact of the chosen catheter and ablation technique on the magnetic environment and on the acquired images;
- simulate heat distribution with a dedicated software;
- compare the developed method with alternative ablation techniques.

Your profile

- Master student with a background in Biomedical/Electrical Engineering, Physics, or similar
- Basic knowledge in MRI physics and hardware, electromagnetic principles
- Autonomous, precise, organised, motivated learner with critical thinking

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