University of Nottingham
Precision Imaging

Deuterium metabolic imaging at ultra-high field

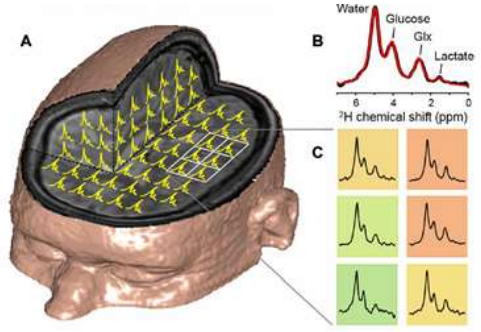
Supervisors: Richard Bowtell, Dorothee Auer, Poulam Patel.

Theme: Physiological and metabolic imaging and Next generation biomedical scanners

Project description: Deuterium metabolic imaging (DMI) is a new non-invasive method for three-dimensional mapping of metabolic activity in human subjects. It involves using spectroscopic ^{2}H magnetic resonance imaging to map the distribution of the ^{2}H-bearing metabolites that are generated following the infusion or injection of deuterium-labelled compounds (e.g. labelled glucose or heavy water). DMI potentially provides an alternative to FDG-PET for cancer detection through the identification of areas of elevated glucose metabolism, with the benefit of not requiring the use of radioactive tracers while providing information about metabolism that goes beyond just glucose uptake. Recent work at 4T has demonstrated that DMI following oral intake of ^{2}H-labeled glucose reveals pronounced metabolic differences between normal brain and tumour tissue in patients with high-grade brain tumours[1]. The main aim of this project will be to implement DMI on the Nottingham 7T scanner for application to brain cancer and to develop approaches that best exploit the increased intrinsic signal to noise ratio available at the higher field. The PhD student will need to develop and apply a good understanding of the magnetic resonance physics that underlie the evolution of ^{2}H MR signals, as well as learning about the metabolic pathways through which labelled compounds pass. In addition, the project will involve the student in the development of signal processing approaches that are targeted at maximising sensitivity to signals from ^{2}H- labelled compounds and the downstream metabolic products. The student will join a project team which includes radiologists, physicists, physiologists and cancer specialists.

Reference
Deuterium metabolic imaging (DMI) for MRI-based 3D mapping of metabolism in vivo. De Feyter et al. SCIENCE ADVANCES 4 eaat7314 2018

Lead school: School of Physics



DMI in human brain after oral [6,6'-$^{2}H_2$]glucose intake.

From De Feyter *et al., Sci. Adv.* 2018; 4 : eaat7314 22 August 2018

To apply for a place on the programme you will need to:

1. join the open day on **9 January** or contact a potential supervisor. If you wish to join the open day, please e-mail PI-Beacon@nottingham.ac.uk
2. apply online here by **17 January**
3. on submission send an email to PI-Beacon@nottingham.ac.uk stating your preferred project, application ref number and enclose a CV

For any enquiries please email PI-Beacon@nottingham.ac.uk