



PhD Position: Composite Pulse and Optimal Pulse Control Strategies in EMR and DNP

In recent years there has been much effort to try and apply many of the powerful pulse methodologies commonly used in NMR to Electron magnetic resonance (EMR) experiments. This is experimentally challenging as EMR resonant frequencies are typically 600 times higher than NMR frequencies and have to cope with relaxation rates that can be 1,000,000 times faster. However, with the increasing speed and power of modern electronics and microwave technologies it is becoming technically possible to apply many of the new ideas to enhance sensitivity and resolution. One such methodology is the use of composite pulses or optimal control strategies, which have been applied with considerable success in NMR. In these methodologies, complex pulse sequences are applied in a controlled way to manipulate spins to compensate for field homogeneity and increase or control excitation bandwidths relative to single pulses. In principle this can provide much greater resolution and sensitivity and the goal of this project is to experimentally demonstrate their use across a wide range of applications.

The project will be carried out using a state-of-the-art high field EPR spectrometer developed under the UK Basic Technology Program, which allows considerable flexibility in adjusting the phase and amplitude of pulse sequences, whilst operating at power levels 3000 times greater than equivalent commercial systems.

The successful candidate will join the mm-wave and EPR group based at the St Andrews Magnetic Resonance Centre, which includes collaborators from Physics, Chemistry and Lifescience at St Andrews and Dundee Universities. Research within the group focuses on many aspects of pulse and high field EPR instrumentation and hardware development as well as on spectroscopy including a large range of biophysical projects related to PELDOR. This collaborative project will also be strongly linked with the Universities of Southampton, Nottingham, and Dundee.

For further information contact Graham Smith (gms@st-and.ac.uk) or imr.cdt@warwick.ac.uk

The Centre for Doctoral Training in Integrated Magnetic Resonance (*IMR*) is a collaboration between researchers at the Universities of Warwick, St Andrews, Southampton, Aberdeen and Nottingham.