Title: Fatigue Characterisation of Composites at Cryogenic Temperatures

Type of award PhD Research Studentship

Department Bristol Composites Institute, Aerospace Engineering

Scholarship Details Scholarship covers full UK/EU PhD tuition fees and a tax-free stipend at the RCUK rate (£15,009 in 2019/20, £15,285 in 2020/21) plus, an industrial top-up of £5,000 p.a. subject to contracts.

Duration 4 years

Eligibility Home/UK

Start Date 21 September 2020

PhD Topic Background/Description
The materials and design techniques used in superconducting whole-body Magnetic Resonance Imaging (MRI) magnets have been refined over time and now make more extensive use of composite materials than previously.

Material combinations in use include Glass Fibre Reinforced Polymers (GFRP), electrical insulation, encapsulation resin and superconducting wire. Because of the high precision of the magnetic field required in MRI systems, and the high electromagnetic forces that are induced, this requires a unique combination of GRP composite and coil windings. The composites constituents and adhesive joints are subjected to very high loads during operation and also transportation, that lead to stress states that may be critical drivers for design and structural integrity. Thus, the design and management of the thermal mismatch of the constituents and the residual stresses induced by these, as well a detailed understanding of operational and transport conditions are crucial for the development of reliable and safe MRI magnets.

The overarching objective of this project is to assess the transportation induced fatigue behaviour and fatigue life of composite cylinder/superconducting coil assemblies used for MRI magnets, taking into account the unique combination of materials and the complex interactions existing in the MRI magnet construction and operational lifecycle. The project aims and objectives are:

1. Identification and characterisation of the critical load and failure mode for fatigue of composite cylinder/superconducting coil assemblies used for MRI magnets during transportation
2 Characterisation of the fatigue behaviour and strength of MRI magnet specific materials, and composite cylinder/superconducting coil assemblies used for MRI magnets, for the identified failure modes including the development of suitable predictive modelling tools and experimental characterisation techniques

3 Formulation of suitable design rules for application of the MRI magnet fatigue strength data measured

URL for further information: https://www.siemens-healthineers.com/en-uk/magnetic-resonance-imaging/siemens-magnet-technology

Further Particulars
Doing research at the University of Bristol
The quality of research at the University of Bristol places it within the top five Universities in the UK based on the Research Excellence Framework and Times higher Education rankings 2014-15. The PhD candidate will be a part of a friendly and diverse community. The University has a Doctoral College (BDC) which offers approximately 200 courses, interactive workshops and seminars as a part of the University’s Personal and Professional Development Programme for PGR students. The BDC organises University-wide events and provides a hub of information, guidance and resources to help researchers to get the most of their time at Bristol.

Candidate Requirements
Applicants must hold/achieve a minimum of a master’s degree (or international equivalent) in a science, mathematics or engineering discipline.

Basic skills and knowledge required
Basic understanding and experience with mechanics and design of composite materials, finite element analysis, experimental characterisation of materials

Informal enquiries
Please email Prof Ole Thomsen (o.thomsen@bristol.ac.uk)

For general enquiries, please email came-pgr-admissions@bristol.ac.uk

Application Details
To apply for this studentship submit a PhD application using our online application system [www.bristol.ac.uk/pg-howtoapply]

Please ensure that in the Funding section you tick “I would like to be considered for a funding award from the Aerospace Engineering Department” and specify the title of the scholarship in the “other” box below with the name of the supervisor.

Closing date for applications: 15 June 2020

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