EUROfusion
TECHNOLOGY TRANSFER PROGRAMME

Modular High-Field Superconducting Magnets with Demountable Joints

The development of modular high temperature superconducting magnets offer significant benefits to fusion by reducing the risk of failure while facilitating the maintenance and enabling the construction of very large complex components. University of Durham and CCFE have worked on the soldered joints which are essential components of this concept. This technology could open new possibilities in existing and promising applications of superconductivity such as : Magnets for Magnetic Resonance Imaging (MRI), Low and high field magnets for Nuclear Magnetic Resonance (NMR), low and high field magnets for physical sciences and research, Accelerators for high-energy physics, Industrial magnets for materials magnetic separation, Superconducting Sensors, Power Cables

Description of the technology

Demountable superconducting magnet coils would offer significant benefits to commercial nuclear fusion power plants. Whether large pressed joints or large soldered joints provide the solution for demountable fusion magnets, a critical component or building block for both will be the many, smaller-scale joints that enable the supercurrent to leave the superconducting layer, cross the superconducting tape and pass into the solder that lies between the tape and the conductor that eventually provides one of the demountable surfaces. University of Durham and CCFE have worked on the electrical and thermal properties of this essential component part of demountable high temperature superconducting (HTS) joints by considering the fabrication and properties of jointed HTSs consisting of a thin layer of solder (In52Sn48 or Pb38Sn62) sandwiched between two rare-earth-Ba2Cu3O7 (REBCO) second generation HTS coated conductors (CCs).

Innovation and advantages of the offer

The properties of HTS materials can help mitigate the costs of replacing toroidal field (TF) coils, by enabling demountable joints. Demountable joints offer the opportunity to: eliminate the single point failure of a monolithic TF coil structure; enable the modular construction of very large complex superconducting magnets; improve reactor maintenance by improving access; increase the availability of the equipment; enable simplified materials component testing; and open the possibility of novel topologies of tools.

Non-fusion Applications

This technology could open new possibilities in existing and promising applications of superconductivity such as : Magnets for Magnetic Resonance Imaging (MRI), Low and high field magnets for Nuclear Magnetic Resonance (NMR), low and high field magnets for physical sciences and research, Accelerators for high-energy physics, Industrial magnets for materials magnetic separation, Superconducting Sensors, Power Cables

EUROfusion Heritage

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