

MRI Magnets - Design and Construction

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How does your MRI magnet work? Why does it need to operate at the temperature of outer space, be strong enough to lift a jumbo jet, and be manufactured to the tolerance of a human hair?

This course is directed at all users of MRI systems, both clinical and research. Although knowledge of the internal structure and operation of an MRI magnet is not essential to operating a system, an awareness of its internal technology can assist in removing the mystery, and to understanding its capabilities and limitations. Research users, in particular, will benefit from understanding some of the design limits, and interactions within a magnet and how this may influence their work.

Attendees will gain an appreciation of magnet technology, and the way in which it operates and interacts with other parts of the MR system, and its environment.

The approach will be non mathematical, and will offer a descriptive review of how magnets work from the 'magic' of superconductivity through electromagnetism and cryogenics, to traditional mechanical engineering. The different technologies and geometries available to the MRI magnet designer will be reviewed comparing cylindrical and open magnets, permanent and electromagnets, whole body and dedicated magnets

The presentation will focus on the design and construction of superconducting MRI magnets highlighting the technology at work, and how these technologies are used to deliver the high strength, stable and homogeneous field required for MRI.

A short pictorial tour of a magnet manufacturing facility will give an insight into the reality of manufacture and some future trends in MRI magnet technology will be discussed.

Content Summary

Magnet geometries and technologies

The anatomy of a superconducting magnet

Technology and construction of a superconducting MRI magnet
 Superconductivity and superconducting wires
 Electromagnetism
 Cryogenic Design

Magnet Manufacturing, A virtual tour of a magnet factory

Future trends in MRI magnets

