

## Introduction

For public safety in the general vicinity of an MRI scanner, a controlled area is usually defined as the 0.5 mT (5 Gauss) line. The general public should not be allowed in areas with magnetic fields higher than 0.5 mT.

Further reduction of the fringe magnetic fields to 0.1 mT or even 0.05 mT (less than 1 Gauss) may be necessary to safeguard the performance of sensitive equipment, such as computer monitors, image amplifiers and other medical equipment.

Where it is necessary or desirable to reduce the stray magnetic fields from the MRI, magnet shielding is usually required.

## Designing the magnetic field shielding for an MRI system

In modern MRI systems, highly homogeneous fields must be produced by the magnet system, which can be modelled precisely by electromagnetic analysis software such as finite element and finite difference time domain methods. These modelling packages are also used to specify the scope and thickness of a magnetic field shield needed to contain the 5 Gauss field line, (or lower levels if required), in a public area.

It should be noted that modelling results must be compared with known and measured results to ensure sensible and practical magnetic shield design.

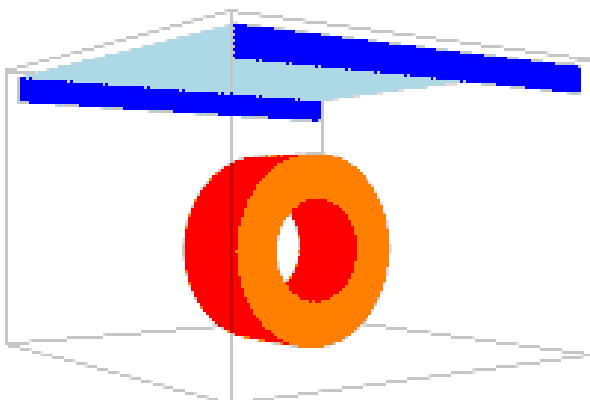
## Example

Magnetic field shielding needed to protect the room on a floor above an MRI room.

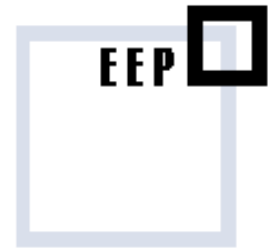
Layout:

MRI magnet in the centre of room 6 mL x 4mW, see schematic below.

Distance to the ceiling from the magnet axis: 1.5 meter

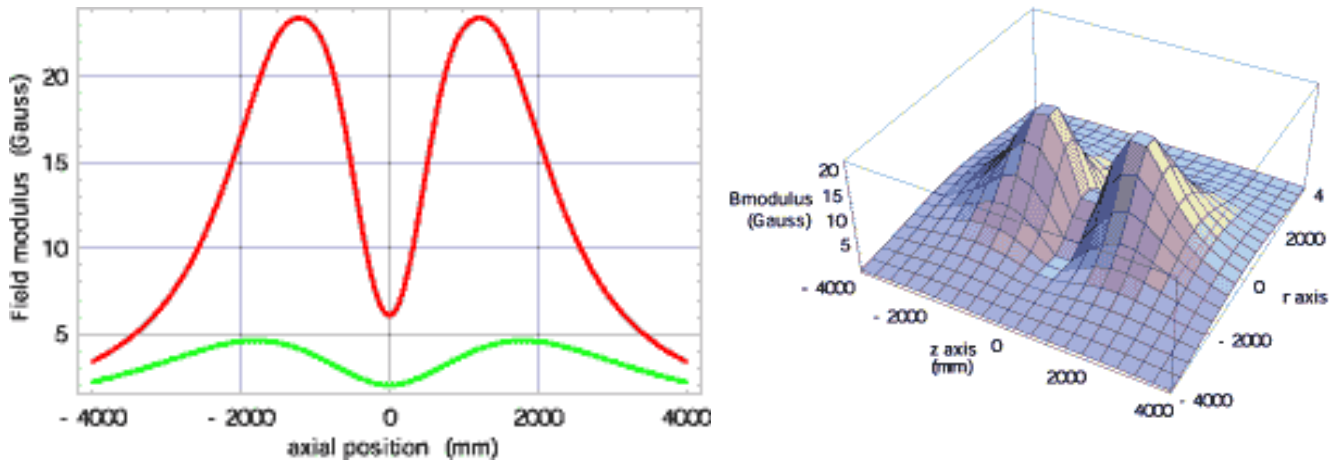


**Figure 1:** MRI room schematic with magnetic field shielding layout



**Magnetic Field Modelling**

Results of the fields in the room above the MRI magnet **WITHOUT** shielding

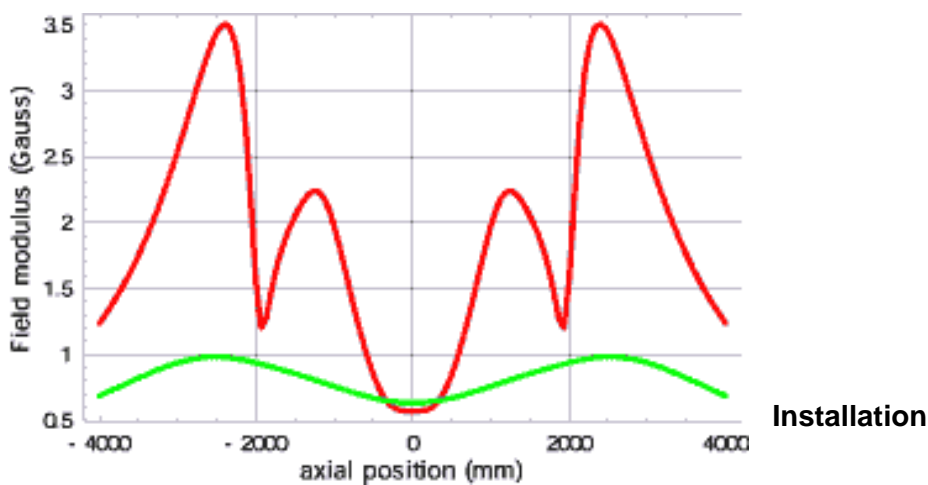


Results of the fields in the room above the MRI magnet **WITH** shielding

Shielding material specified: High permeability electrical steel.

Thickness: 8 mm on the ceiling of the MRI room and extending down 2 walls by 500 mm, see figure 1.

Results show the magnetic field in the room above the MRI does not exceed 0.5 mT (5 Gauss).



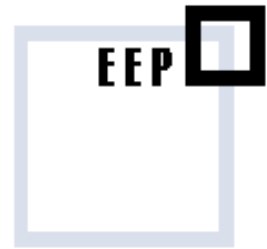
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Views of magnetic field shield fixed to the ceiling slab below MRI scanners. Designed to contain the 5Guass line from the MRI extending into the room below.



## EEP Capability

European EMC Products can help in all aspects of magnetic field shielding, from design and modelling to supply and installation of suitable material.

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