MR Systems Engineering: Siting the System

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Highlights

- Think of all the activities you will be performing in and around the system
- Where will the 5 Gauss line fall - is it practical to keep the general public out this region
- Large, moving, metal objects close to the scanner will affect your images
- Electrical items introduce noise into your images so think about shielding and filtering

Planning is the key

There are many details to be considered when siting the system, but in all the detail it can be easy to miss something critical to the day-to-day use. It is therefore essential to start the siting process by thinking about how the system will actually be used. Questions to ask include:

- What kind of scanning is happening - high throughput clinical; research studies; fMRI?
- Does your patient group have specific needs - clinical environment for critically ill; non-clinical environment for research studies; hoists; trolly access?
- How many patients or subjects will be waiting at one time? How many staff will be around and what will they be doing?
- What might you want to do in the future?
- Can the system be replaced or upgraded in the future? Is there room for helium dewars to enter?

Keeping everyone safe

Most regulators require keeping the public outside the 5 Gauss (0.5 mT) fringe field of the magnet. This is usually done by arranging the room layout to create a 'controlled area', secured in some way. If it is not possible to contain the 5 Gauss field within the layout then it is possible to incorporate steel shielding in the walls of the magnet room to contain the field. It is important to remember that the fringe field will also extend above and below the magnet, so consideration needs to be given to what the impact will be on other floors.

Magnet siting arrangements

Other things that need to be considered in the magnet siting include:

- Large, moving, metal items will affect the homogeneity of the field - how close is the scanner to car parks, lifts, hoists or other scanners?
- What other equipment needs to function in the fringe field - will is work?
- How will electrical (RF) interference be prevented from introducing noise into the images - is there appropriate shielding and filtering?
- Is the building construction able to carry the weight of the scanner? Will the stability of the images be affected by building vibrations?
- Will the acoustic noise generated by the scanner affect those working nearby?

More general siting questions to ask

Modern scanners have quite high electrical power and chilled water requirements. If you are replacing an old system it is possible that the existing facilities are not sufficient. Other questions you might want to ask include:

- How is access to controlled areas managed? - RFID cards or key locks are preferable to magnetic swipe cards.
- Are there enough electrical and network sockets? Is there space to store coils, phantoms and other equipment?
- Is the magnet room lighting MR compatible?
- Is there access for visual presentation to subjects, if required?