

ESR Position Paper

Implications of Study by Professor Stuart Crozier ¹ (Assessment of electromagnetic fields around magnetic resonance imaging equipment, June 2007)

The European Society of Radiology welcomes the publication of the 'Crozier Study' which bears out the concerns of the MRI Community in respect of the impact of the EU Physical Agents Directive 2004/40/EC (EMF) on Magnetic Resonance Imaging (MRI). The results demonstrate that the exposure limits in the Directive are definitely exceeded in a variety of MRI work situations, and possibly in all situations.

The Crozier Study was commissioned by the UK Health and Safety executive to calculate and measure worker exposure around MRI equipment. The research used both computer models to calculate exposure, and volunteer studies to measure field strengths during normal working shifts, around 3 types of machines (1.5T, 4T and 7T).

The results demonstrate that:

1. Switched Gradient Fields

'Within a metre or so of the ends of the 3 MRI systems modeled the Exposure Limit Values of the EMF Directive could be exceeded by the switched gradient fields.'

Implications:

- **It will make it impossible for healthcare staff to care for patients, such as children, the elderly or those who are anaesthetized, who need help or comfort during scans. Some of these patients may be forced to use technologies with significant proven health risks, such as X-Rays.**
- **It will stop the use of MRI for interventional and surgical procedures.**
- **It will curtail cutting edge research in the field of MRI, denying patients innovative treatments in the future.**

2. Static Field

'Within a metre or so of the ends of the 3 MRI systems modeled, guidelines for occupational exposure could be exceeded by movement through the static field'.

'Faster movement through the static field than the modeled 1ms⁻¹ would exacerbate the exposure.'

'Although the size of the magnet does affect the compliance distance when movement through the static field is considered, it does not change the overall picture significantly'.

¹ Study Commissioned by the UK Health and Safety Executive
<http://www.hse.gov.uk/research/rrpdf/rr570.pdf>

*"There is likely to be a problem with this exposure situation for any clinical MRI system.
"Exposures to static fields can occur at any time"*

Implications:

All use of MRI equipment, as well as service and maintenance, is prohibited by the Directive

2. Additional conclusions

- *'Slower movement would mean that exposures would meet the ICNIRP restrictions at smaller distances.'*
- *'The dosimeter could be used to give an indication of which clinical practices might lead to over-exposures to the switched gradient field.'*

The Directive refers to movement of the head and torso. In order to comply with the Directive when working very close to the scanner, staff would need to walk and to move their bodies and heads at a fraction of a metre per second, slowing more and more the closer they came to the scanner. This suggestion is completely impractical, indeed risible, in the context of caring for patients, carrying out interventional procedures, cleaning or maintaining the scanner, or performing complex experiments. It follows that use of a dosimeter to promote compliance with this 'speed limit' would be of no benefit.

The ESR believes that any decision to severely curtail the use of MRI must be based on firm scientific evidence. The limits established in the ICNIRP Guidelines are based on hypothetical and incomplete information. Recent acknowledgement by the Chairman of ICNIRP and the European Commission of the uncertainty of the scientific basis of the limits in the intermediate frequency range (500-1000 Hz) has resulted in ICNIRP undertaking a review of its Guidelines for time-varying fields.

MRI has been safely used for over 25 years, with over 500 million patients exposed up to 100 times the occupational exposure limit set by the Directive, without evidence of harm to workers or patients.

It is essential that this major advance in health care technology is not threatened by burdensome legislation when concerns can be addressed through responsible guidance to medical and service personnel.