

Slide 1



Australian Government

Australian Radiation Protection and Nuclear Safety Agency

Limits and Precautionary Measures for Reducing Exposure to Electric & Magnetic Fields — 0 Hz to 3 kHz

Magnetic Resonance Imaging Issues

Slide 2

MRI Issues - Static

- Very strong Static Field
 - 1.5 T common
 - 3 T now widespread – 10 in Australia
 - 4 – 10 T becoming available
 - Medical & other staff in static field – particularly in future interventional practices
 - Modulus of field may exceed nominal axis value
- Proven interaction mechanisms but little evidence of harmful effects
- Little epidemiological evidence to demonstrate safety or harm
- Unknown effect of long-term exposures.

MRI Issues - Static

- Overseas guidelines allow 4 – 8 T, or higher with special conditions
- IEC 60601-2-33 Amendment – Occupational limits same as for patients
 - What about pregnant workers?
 - Protection of unborn child as member of public is ethical decision, not reflection of special vulnerability.
 - Should there be health surveillance of MRI workers (particularly > 2T) to discover any long-term effects?

MRI Issues - Static

- Movement in Static Field causes equivalent ELF field inside body
 - Needs to be better addressed in standard
 - Is this direct effect of field or outside scope?
 - Self-regulating as people adjust behaviour if symptoms occur?

MRI Issues - ELF

- Strong ELF fields from gradient coils
 - Few hundred Hz upwards
 - Near limit of (or above?) peripheral nerve stimulation
 - Patient more highly exposed than worker and provides indicator
 - Safety margin for cardiac stimulation
 - In patient ~5 – 10
 - In worker ?
 - Screening of workers?

Exposed Groups

- Patients – excluded from scope of standard
- Carers (family) - same as patients?
- Carers (paid)
- Medical Staff
- Research Volunteers – excluded – ethics approval
- Other staff – occupational limits – training etc.
- Interventionists

Submissions - MRI

- Nearly 1/3 of all submissions concerned MRI – all concerned that proposed limits would interfere with important diagnostic technology
- All from professionals working in area or in equipment supply
- Different from most submissions in that authors are people professionally concerned with health matters and used to making decisions about patient safety.

Submissions

- 2 T limit will prevent current practices and stop development
- 283 mT average is probably OK at present but will prevent use of higher field systems
- Movement in static field means ELF limits will restrict use
- European directive already put on hold and being reconsidered
- Little evidence of any harm from static fields up to 14 T?
- Separate static “guidelines” from ELF “limits”
- Need to avoid diversion to more harmful imaging technologies
- Problems for pregnant workers

Options

- Exclude MRI from scope pending European decision – on what grounds?
- Allow limits to be exceeded (by anyone!) under certain conditions of:
 - Surveillance by skilled personnel (medical?)
 - Overall risk-benefit analysis (live-line workers?)
 - Reduce safety margin for higher frequency ELF
 - Review static guidelines in light of overseas decisions