CASE STUDY 2: SCHOOL OF CHEMISTRY NUCLEAR MAGNETIC RESONANCE (NMR) SPECTROMETER:

Hazard - EMF Exposure From:	Risk to Any Person	Persons at Particular Risk	General Controls
Bruker UltraShield Plus 500 & Bruker Ultra Shield Plus 400: • Direct Effects: Static magnetic field • Indirect Effects: Interference with active and passive implanted medical devices • Indirect Effects: Interference with medical electronic equipment • Indirect Effects: Static magnetic field creating projectile risk from loose ferromagnetic objects	Staff, Students, Service Engineers, Domestic Staff	YES Persons working in close contact ie loading samples in the Plus 500 and working with probes at the base of both machines as potential for interference with Passive and Active Medical Implanted Devices (AMIDs) SEE BELOW	**Lab Workers** • ***See below for Persons at Particular Risk*** • Both NMRs have a fixed magnetic field and do not produce EMF • Shielded magnets are integral to the machines and cannot be accessed • Because of shielding, static magnetic field negligible outside the footprint of the NMRs (this is usually demarked by the 5 milli Tesla line) • Magnetic field strongest at the top of the NMRs and at their base where probes are located. Only trained Technicians access these areas • Diagrams of magnetic fields available (see below) • General Controls: ❖ Only trained Technicians load samples and carry out basic maintenance of machine eg cleaning probes, filling liquid nitrogen and helium ❖ Staff and students may only operate the NMRs following training from Technicians ❖ NMRs permanently fixed to floor in a dedicated laboratory ❖ Warning Notice regarding interference with AMIDs displayed on door (see below) ❖ Only non-magnetic tools used ❖ Information, instruction and training on risks provided to those working in the lab and which is also included in the School of Chemistry Staff and Student Handbook ❖ Staff and students instructed to inform a Technician if they have AMIDs etc that could be affected by the NMR. Individual Risk Assessment then undertaken on a case by case basis ❖ Technicians arrange formal maintenance with a competent contractor as required ❖ Technicians keep relevant records eg maintenance

CASE STUDY 2: NMR (continued)

Hazard - EMF Exposure From:	Persons at Particular Risk	ADDITIONAL CONTROLS: Persons at Particular Risk
• Indirect Effects: Static magnetic field could interfere with Passive and Active Medical Implanted Devices (AMIDs)	**Consider:** • As potential for interference with Passive and Active Medical Implanted Devices (AMIDs) consider: ❖ Persons working in close proximity to machine eg loading samples and working with probes at base	As General Controls above **PLUS** • **RESTRICT** persons fitted with medical implanted devices from: ❖ Loading samples ❖ Working at base • Person to seek advice regarding precautions from their Medical Consultant and advise their Line Manager / Supervisor if precautions recommended • Line Manager / Supervisor to prepare individual Risk Assessment if precautions recommended by Medical Consultant can be put into place • Line Manager / Supervisor to assess new NMR equipment, or if adjustments to the existing NMR machines are made with the person concerned • Person concerned to seek further advice from their Medical Consultant if necessary • Line Manager / Supervisor to review Risk Assessment and associated procedures eg Signs, Safe Operating Procedures as required

CASE STUDY 2: NMR (continued)

RHYBUDD
CAUTION

MAES MAGNETIG CRYF
STRONG MAGNETIC FIELD

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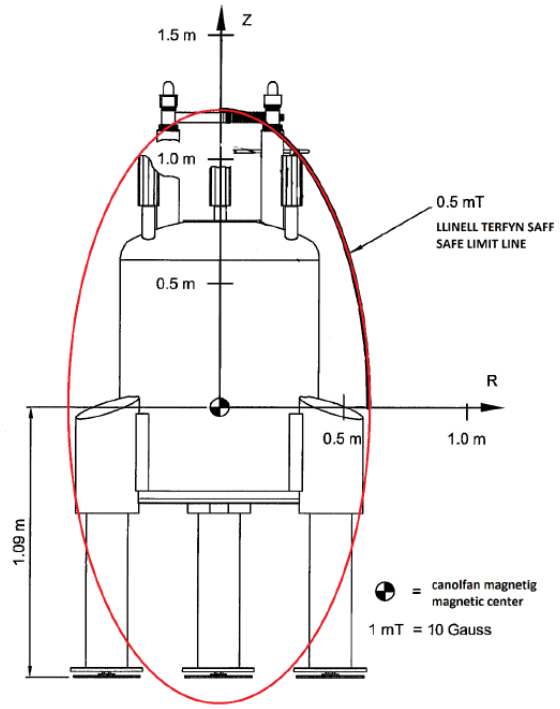
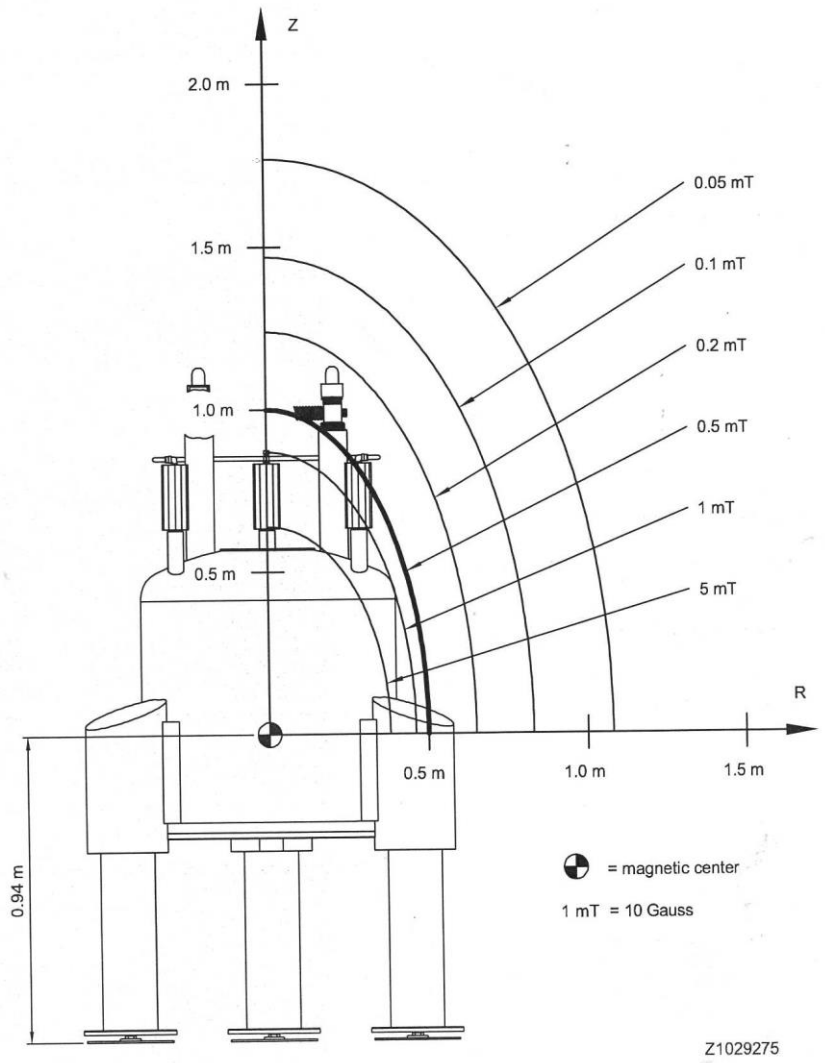
PERSONS WITH PACEMAKERS OR METALLIC IMPLANTS ARE ADVISED TO STAY WITHIN THE SAFE LIMIT AREA (SEE IMAGE BELOW)



CASE STUDY 2: NMR (continued)

NMR Magnet System — UltraShield™ 400 MHz / 54 mm

3.15 Stray Field Plot — UltraShield™ 400/70H PLUS



NMR Magnet System — UltraShield™ 500 MHz / 54 mm

3.16 Stray Field Plot — UltraShield 50/70D PLUS