

UC DAVIS NMR FACILITY

SAFETY RULES FOR WORKING IN LARGE MAGNETIC FRINGE FIELDS

The following are rules for working in magnetic fields.

- 1) **People with medical implants should check with Facility personnel before entering the NMR Facility.**
- 2) **All magnetic objects should be kept outside the 5 gauss line of each magnet.; This includes keys, wallets, pocket knives, tools, etc. ASSUME ANY PIECE OF METAL IS MAGNETIC UNTIL PROVEN OTHERWISE.**
- 3) **Keep electronics outside of the 5 gauss line.**
- 4) **Use only non-magnetic tools inside the 5 gauss line.**
- 5) **When in doubt, ask NMR Facility personnel. Each NMR system costs at least \$500,000. Do not risk damage to the instruments or harm to your self. If you have any questions, get assistance from Facility Staff.**
- 6) **No one is to be present in the NMR Facility unless they have read and signed this form AND are present with the knowledge and explicit approval of NMR Facility Staff.**

Magnetic fields can generate large attractive forces on ferromagnetic objects. Such objects include, but are not limited to, most tools, high pressure gas cylinders, pocket knives, key rings, perfusion apparatus, mechanical ventilators, and most electronics. Any such object which gets too close to the magnet will be drawn towards the magnet with great force. A best case scenario is simply lost time and expense of removing the object from the magnet. Worst case is the death of the user or innocent bystanders which could occur in two ways. First, an object pulled with great acceleration towards the magnet could strike someone, causing injury or death. Second, the object striking the magnet could cause the magnet to *quench* (i.e., become resistive). This vaporizes the magnet cryogenics (helium, nitrogen), which displace air and can result in asphyxiation.

The most common danger from an object impacting a magnet is a quench. A quench can result in severe and expensive damage to the magnet, in addition to the dangers of asphyxiation. **If a quench occurs, evacuation of the building should start immediately. A developing quench can be detected by visible (and/or audible) emission of cryogenic gas from the magnet.**

Should any metallic object strike the magnet, get Facility Staff immediately. Do NOT attempt to pull the object off yourself.

In summary, **keep all magnetic objects outside the 5 gauss lines, which are clearly marked with yellow plastic chains or marked by tape on the floor. If you are in doubt, get clearance from Facility Staff.** The Facility has special non-magnetic tools for working in magnetic fields. Note that since people work around the magnets the yellow safety chains may frequently be moved aside; thus strict attention should be paid to the tape markings on the floor. **All** of Room 18D (7T room) is approximately within the 5 gauss line, as is the south half of Room 15, the west half of Room 19, and the south half of Room 25.

Definitions:

Medical implants, electronic - Medical implants which have electronics (such as pacemakers) are set and/or reset through the use of magnetic fields. Thus exposure to magnetic fields can cause such devices to operate in an unintended manner or stop working altogether. People with such implants should ***never*** enter the NMR Facility. Signs are posted at all entrances to that effect.

Medical implants, non-electronic - Medical implants such as pins, surgical clips, etc. may be magnetic and maybe subject to the same forces described above. People with such implants should stay outside the 5 gauss line described above.

Wallets, credit cards, watches, magnetic media - While not strictly a safety issue, large magnetic fields can wipe out the magnetic information on ATM and credit cards and magnetic media like computer discs. Keep your ATM and credit cards and magnetic media outside the 5 gauss line. Mechanical watches may also be permanently affected by large fields and thus should also be kept outside the 5 gauss line. Digital watches are usually okay within high magnetic fields, although some may have magnetic material. Each user is responsible for knowing if their watch is magnetic.

I HAVE READ AND UNDERSTOOD THE ABOVE WARNINGS. I HAVE BEEN SHOWN THE WARNING SIGNS IN THE FACILITY, WHERE EACH MAGNET IN THE NMR FACILITY IS, AND WHERE THE 5 GAUSS LINE AROUND EACH MAGNET IS.

PRINT NAME

SIGNATURE & DATE

EMAIL ADDRESS