

PHYSICS 433, Safety Precautions in the Laboratory

It is required that you **READ THIS ENTIRE HANDOUT** before doing any of the 433 lab work.

NEVER WORK ALONE IN THE LAB. At least one other person must be present in the lab for you to work on any experiment or exercise.

I. HIGH VOLTAGE SAFETY & Electronics Equipment Considerations

Most of the exercises and experiments in this course involve the use of high voltage. To ensure your own safety and to prevent damage to equipment in the lab, certain precautions must be followed.

1. All of the high voltage (SHV) connectors at the ends of cables are marked with red to distinguish them from signal (BNC) connectors.
2. Before connecting or disconnecting any high voltage cable, make sure that the high voltage power supply is in the **STANDBY** mode. **NEVER connect or disconnect a high voltage cable with the high voltage applied.**
3. All of the devices in this laboratory requiring high voltage use POSITIVE high voltage (center connection positive with respect to ground), except for the photomultiplier tubes on the muon lifetime experiment. The high voltage power supplies have polarity switches for reversing the polarity of the high voltage output. The polarity switches should remain in the POSITIVE position (except on the muon lifetime experiment). **Under no circumstances change the polarity with the high voltage on, as this will damage the power supply.**
4. In this course you will be assembling photomultiplier tube (PMT)/detector combinations and then wrapping them with light tight material. Do not apply high voltage to a photomultiplier tube unless the tube and attached detector have been completely wrapped with light blocking material to prevent exposure to ambient light. If a PMT is exposed to room light with the high voltage applied, it will be ruined.
5. Throughout this course you will be plugging and unplugging electronics modules from NIM crates. The modules are powered from the crate through the connector at the rear of the module. Before plugging or unplugging any module, make sure that the crate power is OFF. It is possible to damage the electronics in the modules by plugging or unplugging them with the crate power on.
6. When you have finished your exercise or experiment, remove all modules from the crate and return them to the bench top storage area.
7. **Keep all cable ends and connectors off the floor.** If cable ends or connectors get stepped on, they get out of round, and not only become useless themselves, but damage other connectors when you attempt to put them together. Connectors and cables cost anywhere from \$10 to \$70 each -- the damage bill adds up quickly!

II. RADIATION SAFETY

The radioactive sources used in this lab are of relatively low activity and it is not necessary to have a film badge to monitor your exposure. However, this is not a license to throw common sense out the window. Some common sense rules to follow when handling or using radioactive sources in the lab:

1. The radioactive sources used in this laboratory are stored in the lead-lined box on top of the safe. **WHEN YOU HAVE FINISHED USING A SOURCE, PUT IT BACK IN THE LEAD-LINED BOX.** Do not leave any source lying around the lab unattended.
2. Do not handle the sources any more than necessary. Before doing an exercise or experiment, think about how to configure the equipment with the goal in mind of keeping the maximum practicable distance between yourself and the source. This will help reduce the amount of time you spend in the proximity of the source.
3. For some of the sources (Fe55, for example) the radioactive material is on a thin foil at the "front" of the source. Be careful not to touch this exposed foil. (Why is this source configured this way?).
4. If you suspect that there is radioactivity where you aren't expecting it, there are two survey meters (Geiger counters) in the lab for checking out this kind of situation. They are normally found on top of the safe next to the lead hut.
5. If you wish to use them, lead bricks are available to provide shielding between yourself and the sources while you perform the experiments. These bricks have been carefully taped to avoid having lead come in contact with the table surfaces. **Please place the bricks on the table so as to avoid any contact between the lead and table surfaces, and to avoid any marring or denting of these nice tables.** To avoid getting any lead on your hands, use the gloves provided in the lab while handling the bricks, or any other lead in the lab.