

Standard Operating Procedures for Tritium

- 1) Tom Massey is the license holder for all radioactive material in the lab. Tom Massey is also the appointed Tritium Safety Officer as required by Appendix 24 of the Radiation Safety handbook. There are 3 training certificates available for tritium operations: Tritium Gas Handling, Solid Tritium Handling, and Tritium Awareness. The RSO issues certifications for gas handling, the Tritium Safety Officer issues certifications for solid tritium handling, and tritium awareness.
- 2) All operations with a tritium targets shall be performed only with either the licensed user or operator with a solid tritium handling certificate. Operations include storing the target in the fume hood and removing the tritium target from storage, mounting and dismounting target in chambers or beam lines, and initial pump down of the target
- 3) An operator will be awarded a "tritium awareness certificate" to their operator license following a safety orientation for the safe use of a target. All operators should have this certification before taking shifts with a tritium target.
- 4) A placard must be prominently placed indicating the amount, the type, location, and activity of the tritium target.
- 5) The tritium target should have air cooling. If this is not possible, the maximum beam current should be reduced to a level which will keep the target spot below 100° C.
- 6) The tritium monitor shall be configured to sniff the area in use. Consideration should be given to the location of the sniffer port with respect to the most likely point for tritium escape. e.g., above pump exhaust location.
- 7) **The maximum current allowed to be run on a stationary solid target with 0.5-MeV or lower-energy deuterons is 1 microampere.** The preferred setting is 800 nA to allow for a safety margin. Running at higher deuteron energies is expected to be infrequent and in these cases the maximum current will determined in consultation with the licensed tritium user.
- 8) The slits before the swinger cup are set using OUALDAQ system to prevent a sharp focusing of the beam.
 - A) The programs to set the slits are:
 - I) "zero" -for the angle zero degrees
 - II) "i" - for the angles of 0 to35 degrees
 - III) "ii" for the angles of 36 to 70 degrees
 - IV) "iii" for the angles of 70 to 155 degrees
 - V) "iv" for the angles greater than 155 degree
- 9) These choices of slits should result in some beam on the ¼ inch collimator for the beam line used. **This collimator should have at least 10% of the beam current.**
- 10) When running a beam on a tritium target on the 45 degree leg the current on the final collimator should be at least 2/3 of the current on the target. This collimator is usually

tantalum 0.010 inches thick.

- 11) The surfaces in the vicinity of a tritium target including the outside of the chamber containing it and the fume hood in the source room are considered contaminated until the area is swiped and the results are returned by the Radiation Safety Office. **Gloves shall be worn when working in these areas. Dispose of all gloves in the radioactive waste container.**
Any beam line that has been used with solid tritium targets is to be treated as contaminated with tritium on the inside. Beam line components exposed to vacuum are to be considered contaminated until swipe tested and proven free of contamination. This includes but is not limited to beam pipe hardware, cryopumps, rotary pumps, and vacuum measurement devices. Such components shall not leave the lab area unless they are proven to be clean of contamination. Such components shall be cleaned if possible, repaired on site if possible, or decommissioned and labeled as radioactive waste.
- 12) The emergency procedures in case of a tritium monitor alarm are given in the first page of Appendix 24 of the Radiation Safety Manual located in the Control Room.
- 13) The rotary pumps on a tritium beam line are **permanently contaminated** and special considerations must be applied to change the oil in these pumps as the used oil is also contaminated. This work requires a **certificate for solid tritium handling**.
 - A) The used oil shall be captured and stored in a quality polyethylene gallon jug. Jugs that originally contained chemicals, antifreeze, or windshield washer fluid work well when rinsed and dried. Glass is not recommended due to possibility of breakage.
 - B) All operations done with gloves and sufficient kimwipe drop cloths to catch any contaminated oil.
 - C) Shut down and vent the pump. Remove from piping connections and place on stand of sufficient height for the following:
 - I) Place a disposable large plastic funnel in the mouth of the jug and place beneath the oil drain.
 - II) Remove the drain plug and catch the used oil with the funnel.
 - III) Seal the pump drain.
 - IV) Dispose of the funnel and gloves in radioactive waste.
 - V) Change gloves and add clean oil to pump. Re-install pump and connect piping. Dispose of gloves and drop cloths in radioactive waste.
 - VI) Determine the volume of oil collected in jug and have Radiation Safety Office sample the oil to determine the total activity of the used oil.
 - VII) Label the jug with the collection date and total activity and store in the source room until the next waste pick up.