



RADIATION REVIEW



UW - Madison Safety Department

Radiation Safety Program

30 N. Murray St.

262-8769

November 1998

<http://www.wisc.edu/safety>

CORD Holiday Hours

CORD will be closed for business the following days in November and December: November 26, 27; December 24, 1998 through January 3, 1999. Telephone orders will not be taken, however we will process orders received via our web page (wiscinfo.doit.wisc.edu/safety) and deliver the material when received. (Note that vendors will also be closed several of these seasonal days; e.g., shipments on 27 Nov, 24 Dec, 31 Dec are for following Monday).

Annex Holiday Hours

The Annex, Room 19 Biochemistry will be closed December 21 through December 31, 1998. Call 2-8769 to make an appointment.

Winter Training Schedule

The training schedule from 15 November through 1 March includes 2 morning (8 AM) classes at Union South (22 Jan, 2 Feb). The remainder of the classes are held at Union South beginning at 12:30 on November 10, 18, 30; December 9, 17, 28; January 5, 13, 20, 29; and February 4, 10, 16, 22. Please call Safety on the day of class to confirm.

Laser Safety

Lasers produce very narrow, intense monochromatic (i.e., one color) and coherent (i.e., in phase) beams of light. Today, laser devices are commonly found in many work areas. Properly emplaced and operated, laser devices can be of great benefit. Lasers are regulated by the Food & Drug Administration and OSHA. The FDA attempts to insure marketed lasers can be operated safely. However,



even when operated properly, some lasers are capable of causing injury. Chapter 14 in the

Radiation Safety for Radiation Workers manual addresses laser safety. We have a Health Physicist with special training in laser safety. If you have questions about the lasers in your lab, need special training in laser safety, etc., call Arne Jansen at 2-9608.

Don't Cover That GM

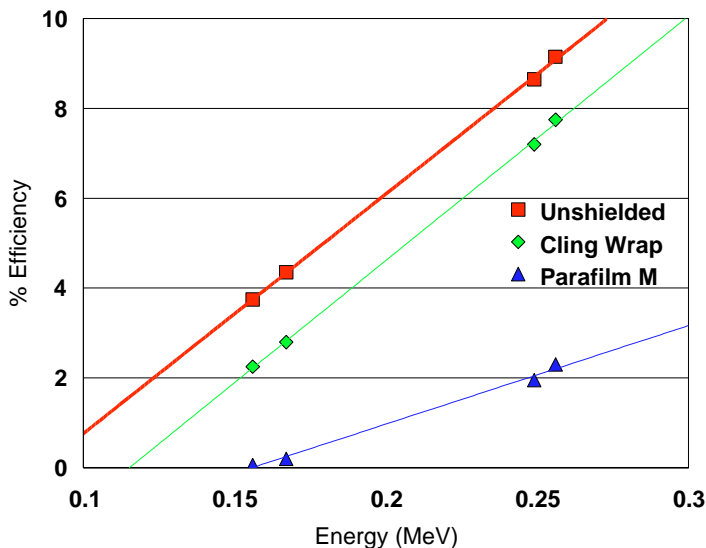
(Reference "Beta Particle Attenuation Properties of Laboratory Film" by Paul R. Steinmeyer, RSO Magazine, Jan/Feb, 1997)

The most common isotopes used at the UW are ³H, ¹⁴C, ³²P/³³P, ³⁵S, and ¹²⁵I. Excepting ¹²⁵I, all these isotopes are pure beta emitters. Labs that use these isotopes are required to have and use a thin-window GM detector to perform contamination surveys (except ³H which can not be detected by GMs). When Safety personnel walk through labs it is not uncommon to see these GM probes covered with parafilm M or plastic laboratory film in an effort to prevent the detector from becoming contaminated. While we can understand workers' concerns about contamination, most workers assume that such a thin membrane will have little effect on the detector efficiency.

This assumption is wrong. There is a significant reduction in detection efficiency from laboratory film for low energy betas (e.g., ¹⁴C, ³³P, ³⁵S, ⁴⁵Ca). What you must remember

Isotope	E _{max} (MeV)	Percent Efficiency		
		Unshielded	Cling Film	Parafilm M
¹⁴ C	0.156	3.75	2.25	0.06
³⁵ S	0.167	4.35	2.80	0.20
³³ P	0.249	8.65	7.20	1.95
⁴⁵ Ca	0.256	9.15	7.75	2.30
³² P	1.71	22.4	22.0	21.5

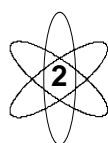
about betas is that physically they are particles. Additionally, the beta particles are emitted in a spectrum of energies up to the maximum energy possible (see Table 1) with the



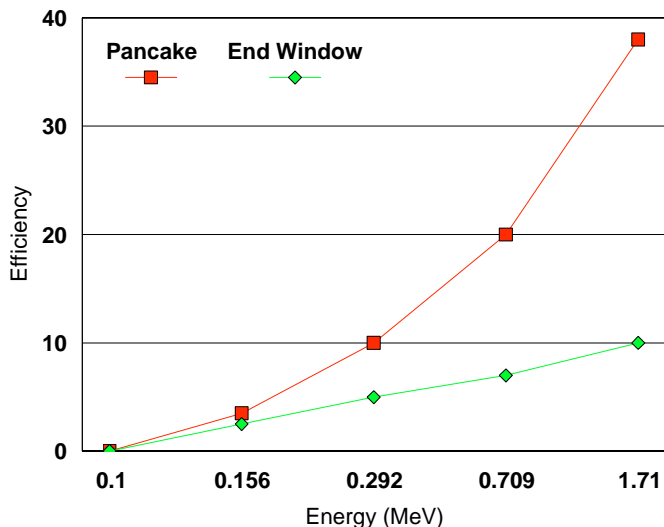
average (or most probable) energy being approximately $\frac{1}{4}$ of the maximum. As particles emitted with finite kinetic energy, these betas have a definite range in matter. The maximum range for the low energy betas is approximately 5 - 7 cm in air and significantly less in any solid, even a thin solid like Parafilm M or laboratory film. Table 1 summarizes the author's results, showing the change in efficiency for each major beta energy used for both the unshielded, cling film,

and Parafilm M. The attenuation effect of both the self-clinging wrap and Parafilm M on low energy betas is graphically portrayed in Figure 1.

Obviously, detection of ³²P is never an issue. If you use a meter, you will be able to detect contamination. The impact of covering the end of the GM tube is negligible. However, there is substantial attenuation of the low energy beta particles from ¹⁴C, ³³P, ³⁵S,



and ^{45}Ca . The Parafilm M attenuated more than 95% of the betas from ^{14}C and ^{35}S . The laboratory self-clinging wrap shielded more than 35% at these energies. As the E_{max} increases, the attenuation of beta particles becomes less; being only about 75% and 16%, respectively for ^{33}P and ^{45}Ca .



Remember, placing any material between a detector and a beta-emitting radionuclide will affect the observed efficiency. The magnitude of this effect will vary significantly based upon the thickness and density of the material and the E_{max} of the beta. The Safety Department recommends that detectors not be covered. However, if you must cover the detector while certain procedures are under way, laboratory film is preferable over Parafilm M and remember to remove the film before performing your final surveys.

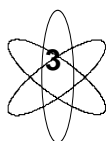
Additionally, if you are in the market to upgrade your GM system, we recommend using a pancake type GM rather than an end window GM. The graph compares end-window GM efficiencies to pancake type efficiencies. In all instances, the pancake detector is approximately twice as sensitive as the end-window type.

Contaminated Centrifuges

Many labs have contamination inside their centrifuges which requires several hours to clean and decontaminate. This contamination tends to come from contamination on the outside of the tubes which is thrown onto the walls when the centrifuge spins. One way to reduce the contamination and save time is to wipe the outside of your tubes with Kimwipes before placing them into the centrifuge. This may remove much of the contamination on the outside of the tube which arises from frequent handling with contaminated gloves.

Winter Waste Reminder

Winter in Wisconsin is cold. Although some of our waste cabinets are inside buildings, several of our waste cabinets are still located outside. Aqueous liquids freeze rapidly below 32°F (0°C) and we often experience -20°F (-29°C) temperatures. To prevent your liquid waste from freezing and breaking the container, fill containers only ¾ full and place liquid wastes in outside cabinets between 11:30 AM and 12:30 on the pick-up day (Monday and Wednesday).



Dosimeters

TLDs are issued only if you will work DIRECTLY with radioactive materials. Radiation levels in labs are negligible and you will not receive any radiation exposure unless you are actually handling radioactive materials. TLD badges are NOT issued for the following uses: 3H, 14C, 35S, 63Ni, RIA kits. These isotopes are either not an external exposure hazard (i.e., $E_{max} < 200$ keV) or the quantities of radiation emitted are too small to be measured. If you had dosimeters at one time and then ceased using high energy betas (i.e., $E_{max} > 200$ keV) or α -ray emitters, please contact Sharon Johnston at 2-7530 to have your TLD discontinued. The UW's dosimetry contract currently costs \$50,000 annually and, except for the UW Hospital, is funded from overhead (i.e., 150) monies. Having a TLD when there is no exposure is wasteful.

Shipping Radioactive Material

Shipping radioactive material is complicated. Depending upon where the material is going, different Federal and State agencies are involved. If shipped improperly, the material may be returned by the commercial shipper several days later (and it may be not viable any longer), or you may be subject to fines or other investigations by the DOT or FAA. The Safety Department has a good record of shipping hazardous materials safety. If you need to send a radioactive sample off campus, the Safety Department will package and ship it for you free of charge and adjust your CORD balance. To pay for shipping fees, we can use your FedEx shipping account. Call Leola DeKock (2-9180) for shipping questions.

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