

Radiation Dosimeter Badge Usage

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Introduction

This section is intended to provide additional information for those people who have been issued or are interested in being issued radiation monitoring badges.

How the Dosimeter Badges Work [\(top\)](#)

Luxel Body Badges

The [Luxel](#) body badge contains a sheet of radiation-sensitive aluminum oxide sealed in a light and moisture proof packet. When atoms in the aluminum oxide sheet are exposed to radiation, electrons are trapped in an excited state until irradiated with a specific wavelength of laser light. The released energy of excitation, which is given off as visible light, is measured to determine radiation dose.



The packet contains a series of filters designed so that the energy and type of radiation can be determined. In order for the radiation type and energy to be determined, the dosimeter must be worn so that the front of the dosimeter faces towards the source of radiation.

Luxel body dosimeters are among the most sensitive dosimeters available. The minimum detectable dose is 1 millirem for x-rays and gamma rays and 10 millirem for energetic beta radiation.

Ring Badges

The ring dosimeter contains a small radiation-sensitive lithium fluoride crystal. When atoms in the crystal are exposed to radiation, electrons are trapped in an excited state until the crystal is heated to a very high temperature. The released energy of excitation, which is given off as visible light, is measured to determine radiation dose. This phenomenon is called thermo luminescence and dosimeters that use this principle are often referred to as TLDs (thermoluminescent dosimeters).



TLD dosimeters are slightly less sensitive than Luxel dosimeters. The minimum detectable dose for TLD ring dosimeters is 30 millirem for x-rays and gamma rays and 40 millirem for energetic beta radiation.

Badge Limitations

Both the body and ring badges do not detect radiation from beta emitters with energies less than 250 keV. Consequently, dosimetry is not issued for persons using H-3, C-14, P-33 and S-35.

Wearing Dosimeter Badges [\(top\)](#)

Body Badge

If you are issued a Luxel body badge, you will receive a gray plastic badge holder and a badge packet sealed inside a cellophane-type plastic bag. Remove the badge from the bag and snap it into the gray holder.

Wear your body badge on the part of the body between your neck and waist most likely to be exposed to the greatest amount of radiation. Wear it so that the name tag faces toward the source of radiation.

Ring Badge

Your ring badge should be worn so that the label is facing out from the side of the hand most likely to receive a radiation exposure. In most cases, such as when performing radioactive labeling experiments in a biology lab, this means that the label will face out from the palm side of your hand. To avoid contaminating your ring badge when using open sources, wear your ring under the glove. Additionally, take care not to dispose of the ring in the trash when you remove your gloves.

Guidelines for Use [\(top\)](#)

- Never share your badges or wear another person's badges. Each badge is intended to be worn by only the designated person.
 - Do not intentionally expose badges to radiation. Intentional tampering with badges is a very serious matter.
 - If you discover that your badges are contaminated, notify The RSO promptly and request replacement badges.
 - No matter how curious you are, do not wear your badges when you receive a medical x-ray or other medical radiation treatment. Your badges are intended to document occupational dose, not medical dose.
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Storage [\(top\)](#)

Store your badges in a safe place, at work rather than at home. Be sure to store badges away from sources of radiation. Be careful to consider all sources of radiation. For example, if you store your badges clipped to your lab coat, make sure that your lab coat (or any other lab coat near it) is not contaminated.

Store your badges away from sources of heat (some badges such as TLDs show some sensitivity to environmental factors like heat). For example, badges left in cars over hot summer weekends may give false exposure readings.

Lost or Damaged Badges [\(top\)](#)

If you lose, damage, or contaminate your badge, call the Radiation Safety Office immediately for a replacement. RSO staff can generally provide you with a replacement badge within 24 hours of your request. Do not borrow anyone else's badge. You must also fill out the following form:

Lost Dosimeter Dose Estimate Form (RSO-31) [\(Word\)](#)

Badge Exchange and Processing [\(top\)](#)

Badges are exchanged **quarterly** (except for Declared Pregnant Workers whose badges are exchanged monthly). You should expect to receive your new badges a day or two before the start of each calendar quarter. Snap the old Luxel body badge out of the gray holder and return just the badge itself. Keep the gray holder so that you can snap the new badge into it. Make sure that your old badges are available for collection on the first working day of each quarter. Ask your lab manager or your lab radiation safety contact person about how to return your badges.

Wearing a monitoring badge is a serious matter, as it can reflect on your lifetime recorded dose. Therefore, it is important for the RSO to be able to account for any missing or damaged badges. If your badges are not turned in on time or are lost, RSO is required to conduct an investigation to estimate your dose and will ask you to provide an accounting of your activities involving radioactive sources during the period in which the badges should have been worn.

Emergency Processing [\(top\)](#)

If you believe that you may have received an unusual dose (if you may have placed your hand in an x-ray beam, for example), notify the RSO immediately. Your badges will be returned for rapid emergency processing.

Dose Reports and How To Read Them [\(top\)](#)



The image shows a sample dose report form from Landauer. The form is titled 'LANDAUER' and contains a grid of data. The grid has columns for 'Date', 'Location', 'Dose Rate', 'Dose', and 'Remarks'. The data is organized into rows for different monitoring periods and locations. The form also includes a section for 'Remarks by licensee or user' and a section for 'Remarks by RSO'.

After you return your monitoring badges, the badges are sent out to the badge service company for processing. The RSO receives the dose reports several weeks after the end of a monitoring period and reviews the dose reports. The RSO has established investigational levels at doses that are 10% or less of the federal and state dose limits. If a dose is reported that exceeds the investigational level, The RSO will contact you to determine whether the reported dose is likely to be

accurate and to investigate the causes of the dose in an effort to minimize dose in the future.

After the RSO finishes its review, a copy of the dose report is forwarded to each Authorized User. Since the dose reports contain names, birthdates and social security numbers, we do not recommend that the reports be posted in the lab. Contact your Authorized User or lab manager to find out how the information from the monitoring reports is made available. A summary of your badge results can also be obtained by calling the RSO.

In the case of body badges, doses are reported as deep or shallow or as doses to the lens of the eye. Deep dose is due to penetrating radiations such as x- or gamma radiation. Deep doses are applied against the whole body dose limit. Shallow dose is due to less penetrating radiations such as beta radiation and low energy x-rays. Shallow doses are applied against the skin dose limit. Dose to the lens of the eyes is due to an intermediate range of radiations and energies and is applied against the lens of the eye dose limit. In the case of ring badges, dose is only reported as shallow dose and is applied against the extremities dose limit.

Doses are reported in millirem. The minimum reportable dose for body badges is 1 millirem for x-rays and gamma rays or 10 millirem for energetic beta radiation, and for ring badges is 30 millirem for x-rays and gamma rays or 40 millirem for energetic beta radiation. If a dose of "M" is reported, the total dose received was minimal, i.e., less than the minimum reportable dose.

Contact the RSO if you change your name, if your name is misspelled, or if any other information on the dose report is incorrect.

Exposure History [\(top\)](#)

Contact the RSO for a copy of your radiation exposure history. The RSO maintains radiation exposure records indefinitely.

If you terminate employment with the University, your radiation exposure history will be provided to you or your new employer upon request. A signed release statement must accompany any request from your new employer. Requests for radiation exposure histories should be mailed to: The Office of Environmental Health & Safety, Box 1914, 164 Angell St. Providence, RI 02912 Attn: Tom Hasselbacher, RSO

Monitoring Badge Use at Other Institutions [\(top\)](#)

Do not take Brown badges to any other institution. Brown University badges are intended solely to measure the radiation dose you receive while working at Brown University. If you perform radiation work at another institution, it is the responsibility of that institution to provide you with monitoring badges.

However, Brown University must still control the dose you receive while working at Brown so that your total occupational dose does not exceed the state and federal dose limits. If you are issued radiation monitoring badges at any other institution, notify The RSO immediately. The RSO will contact that institution and request copies of your dose records.