STL

STL St. Louis
13715 Rider Trail North
Earth City, MO 63045

Tel: 314 298 8566 Fax: 314 298 8757
www.stl-inc.com

July 26, 2007

U.S. Nuclear Regulatory Commission
Region III
ATTN: Materials Licensing Branch
c/o Karen Bernardino
Phone: 630-829-9848

Reference: Radioactive Materials License Number 24-24817-01
13715 Rider Trail North, Earth City, MO 63045
License Amendment Request
Request to Change Facility Name (as represented on License)
Request of NRC to approve Authorized User training program
Request to change number of approved Nickel-63 sources held at facility

Dear Commission:

We would like to request a few changes to our NRC Radioactive Materials License. These changes are in regards to the facility name, as represented by the License, our Authorized User policy (approved training program), and that our approved number of Nickel-63 sources be elevated from 15 plated sources to 21 plated sources (not to exceed 15 millicuries per source). We have the need to expand our capabilities and add instruments to our facility, thus needing additional sources.

The first change is in regards to the name of the facility. STL St. Louis was previously owned by Severn Trent Services and has now been acquired by Test America, Inc. The name change does not impact the facility other than simply changing the name. Please see **Attachment 1** for further details.

The second change request is to have the NRC approve our facility Authorized User training program so that we may add and remove employees being referred to as Authorized Users. We are experiencing growth and will need to add to the amount of Authorized Users we maintain at the facility. Also, as we experience turn over in employment, having the training program approved by the NRC will streamline the process of adding and removing individuals that are trained to be Authorized Users without needing a license amendment each time. Please see **Attachment 2** for training material.

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The third change is in regards to condition 6(L), that our approved limit be elevated to possessing 21 Nickel-63 plated sources, not to exceed 15 millicuries per source, opposed to 15 sources. Please see **Attachment 3** for formal request.

Lastly, we ask that the Commission please expedite the handling of these requests due to the name change, the need to remove currently named persons as Authorized Users on the license that no longer are employed by the facility, and to purchase new instruments upon addition of the Nickel-63 sources.

If you have any questions, please feel free to contact me at 314-298-8566. Thank you for your help and understanding to implement the required changes to the subject License and to provide written consent of the NRC.

Sincerely,

Michael J. Ridenhower
Radiation Safety Officer
Test America St. Louis (formerly STL St. Louis)

Attachment 1

Name change for Severn Trent Laboratories, Inc.

Submitted to Nuclear Regulatory Commission

STL

TestAmerica Laboratories, Inc
(formerly Severn Trent Laboratories, Inc)
455 Pennsylvania Avenue, Suite 205
Fort Washington, PA 19034
215.628.9601 / F: 215.628.9604
www.testamericainc.com www.stl-inc.com

Date

STL Client

RE: Name change for Severn Trent Laboratories, Inc.

Dear Valued Client:

In accordance with the legal agreement following the sale of the Company, the legal name for Severn Trent Laboratories Inc. has been changed to TestAmerica Laboratories, Inc. This name change became effective June 21, 2007, when the corporate charter amendment was filed with the State of Delaware, our state of incorporation.

Please note that this is a corporate name change only and the labs you are accustomed to dealing with are still part of the same legal corporate entity. The STL tax ID numbers and Dun & Bradstreet numbers have not changed but continue in the name of TestAmerica Laboratories, Inc.

The remit-to address for payments has not changed, although we would ask that when your systems can accommodate the change, that future payments be made out in our new name, TestAmerica Laboratories, Inc. In the meantime, the STL name can continue to be accepted on checks for some time.

All of your contracts and other agreements with STL are still valid and effective. A contract amendment is not legally necessary; however we will be happy to coordinate any such amendment you may require, in order to recognize our name change.

Please pass along this information to your accounting department as necessary.

Please feel free to contact me with any questions or requests. We look forward to continuing to work with you under our new name: TestAmerica Laboratories, Inc.

Sincerely,

Attachment 2

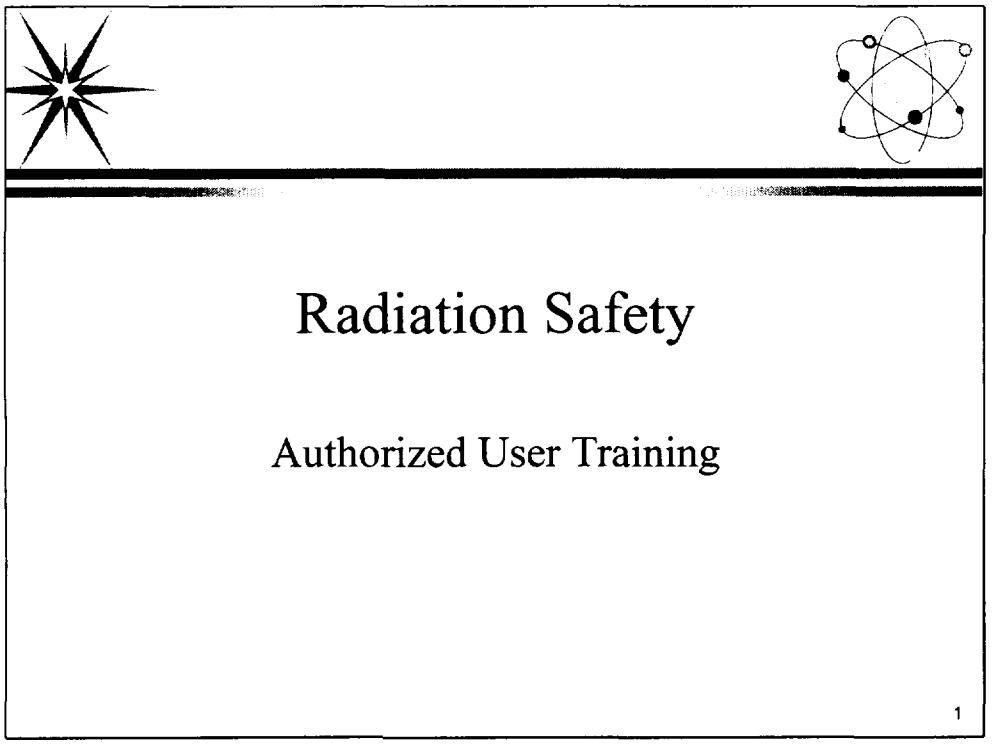
Authorized User Training Material

1. Authorized User responsibilities
2. Authorized User training packet #1: Radiation safety
3. Authorized User training packet #2: Advanced training
4. Authorized User training exercise #1 & #2

Authorized User Responsibilities

As an Authorized User on the Radioactive Material License, you will have additional authority and responsibilities for ensuring the proper handling of radioactive materials. These duties include:

1. Being within two hours driving distance when personnel in your group are handling radioactive materials. Radioactive materials means samples in Cat II or higher, radioactive standards, or radioactive shipments (whether being received or sent). If you are not on site, personnel must be able to contact you, or know another Authorized User who is covering for you.
   If the work is occurring on a back shift or on a weekend, there must be at least two radiation workers on site when handling radioactive materials. If radioactive materials are being opened, there must be two radiation workers in the immediate area.
2. Ensuring personnel assigned to work with radioactive materials do not exceed exposure limits.
3. Ensuring personnel are properly monitoring for contamination when exiting a RCA. It does not matter if the employee directly reports to you or not, anybody leaving any RCA must properly frisk. This includes removing sample or extract bottles and paperwork from the RCA. One way to minimize the amount of frisking required is not to allow unnecessary boxes and paperwork into an RCA.
4. Ensuring visitors who must enter a RCA are wearing a lab coat and safety glasses and follow all safety requirements. These visitors must be escorted at all times unless given access by the On-Site RSO. No visitor may handle radioactive material without the written approval of the On-Site RSO. Visitors must have the written approval of the On-Site RSO before bringing radioactive material (sources) on STL property. Visitors must also be prevented from accidentally entering a RCA.
5. Establishing temporary RCA to support work that requires a Special RWP. Authorized Users shall;
   - establish the RCA boundaries,
   - establish the step-off area,
   - post all required signs,
   - place required radiacs in the step-off area and ensure they are calibrated and operational,
   - ensure any required radioactive material supplies (such as swipes, bags, gloves) are available ,
   - and that personnel read and sign the RWP **prior** to beginning work.
6. Releasing RCA's back to general use. To release a RCA for general use, the Authorized User shall:
   - survey the RCA for fixed and loose surface contamination,
   - document survey results and submit them to the On-Site RSO,
   - return Special RWP to On-Site RSO,
   - return radiacs to proper storage location,
   - place radioactive waste in proper waste storage location
   - remove all barriers and signs,
   - and immediately report any unusual readings or occurrences to the On-Site RSO.
7. Provide assistance and guidance as directed by the On-Site RSO to decontaminate any areas that are radiologically contaminated.
8. Provide assistance and guidance as directed by the On-Site RSO to respond to a radiological incident such as a contaminated person or radiological spill.
9. Provide radiological assistance as directed by the Corporate or On-Site RSO.



Training Set-up:

Trainers notes

Attendance Roster

Handouts for trainee's –

Authorized User Responsibilities

STL-RP-0001 Section 4.6.6, "Rad Categories"

General-

- STL St. Louis is licensed by the Nuclear Regulatory Commission.
- Mike Ridenhower is the Radiation Safety Officer.
-Terry Romanko is the Technical Director.
-MO is not an "Agreement State", therefore regulated by the Federal Gov't. An Agreement State *may be licensed by the State or* other local branch of gov't.

Authorized User Training

- Responsibilities and Authorities
- Definitions
- Identify types and properties of radiation
- Units
- Exposures
- Exposure Limits
- Monitoring exposures

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What is covered with this training.

Authorized User Training

- Rad Zones
- Use of Survey Meter
- Waste Segregation
- Controlled Areas
- Methods of Protection
- Radioactive Material License and Procedures
- Emergencies

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Responsibilities

- Ensure that all uses of radioactive materials are performed safely and in accordance with license requirements.
- Advise co-workers in safe handling of radioactive materials.
- Report observed deviations from established requirements immediately to the RSO.

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Potential responsibilities of an Authorized User.

Authorities

- To stop work if a situation is unsafe or perceived to be unsafe.
- To assist the RSO in establishing Rad Zones or establishing a Rad Zone in the absence of the RSO.
- To assist the RSO in removing a Rad Zone or removing the rad zone in the absence of the RSO.

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Authorized User authority.

Definitions

- **Ionizing Radiation**
  - energy in the form of particles or electromagnetic waves released from unstable, or radioactive, atom.
- **Radioactivity**
  - the spontaneous decay or disintegration of an unstable atomic nucleus.

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Radioactivity – is the process of unstable atoms becoming stable.

Definitions

- **Radiation**
  - Energy of energetic particles emitted during the process of radioactive decay
- **Radioactive Material**
  - Any material which is made of either partially or entirely of radioactive atoms

Definitions

- **Contamination**
  - radioactive material in an undesirable area
- **Half-life**
  - Amount of time for one half of the radioactive atoms to decay
- **Dose**
  - The amount of energy from radioactive material absorbed in a given material

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Contamination – Important to note that exposure to radiation does not necessarily result in contamination of a radiation worker. Often "Contamination" and "Exposure" are incorrectly thought of as the same thing. This is not the case. Radiation is energy, contamination is a material. When properly contained, radiation may still be an external dose hazard but not a contamination hazard.

Types and Properties of Radioactivity

- **Alpha**
  - A charged particle consisting of two protons and two neutrons
- **Beta**
  - High speed electron
- **Gamma/X-ray**
  - Electromagnetic radiation
- **Neutron**
  - roughly equivalent to a proton plus an electron with no charge.

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Alpha – has a large mass, very short range.

Beta – has a small mass, relatively short range of 1" to 20'.

Gamma – has no mass, very high range.

Neutron – similar to Gamma radiation, not dealt with at this facility.

Types and Properties of Radioactivity

- **Alpha**
  - Stopped by paper or dead layer of skin. Major internal problem.
- **Beta**
  - Stopped by 1/8 inch of Al. Internal & external hazard.
- **Gamma/X-ray**
  - whole body penetrating. 2" of lead or 24 inches of water reduces radiation by 90%.
- **Neutron**
  - whole body penetrating.

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Alpha – deposits large amount of energy in a short distance. No external hazard. Internally, the source is in close contact with body tissue and can deposit large amounts of energy to a small body of living tissue.

Beta – Range and penetrating power depends greatly on the isotope,

tritium – range is only 1 inch.

Sr90 – range is about 20 ft.

May be an internal hazard due to short range and low penetrating power of certain isotopes, may be an external hazard to skin and eyes.

Gamma – Very high range that easily travels several hundred feet or more. Very high penetrating power due to zero mass and no charge.

Half-life

$$A = A_o * e^{-\lambda t}$$

$A =$	the activity present at time t
$A_o =$	the activity originally present
$e =$	the base of the natural logarithm (2.718)
$\lambda =$	the decay constant of the radionuclide $\ln(2)/t_{\frac{1}{2}}$
$t =$	the elapsed time

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Sources of radiation

- Cosmic radiation
  - varies with altitude
    - 31 mrem/y in St. Louis
    - 55 mrem/y in Denver
- Environment
  - Uranium, Argon
- Air
  - Radon

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Natural sources of radiation that everyone is vulnerable to.

Sources of radiation

- Human body
  - Potassium
- Water
  - Radium
- Fallout
  - Food
  - Cigarettes

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Consumer Products with Radioactivity/Radiation

- Smoke Detectors
- Luminous watch dials
- Lantern Mantles
- Uranium glass
- Tobacco
- Medical devices
- Television

Radiation Units

- The unit of activity is the Curie, Ci
  - SI unit is Becquerel, Bq
  - 1Ci = 3.7×10^{10} decays per second (dps)
  - 1Bq = 1 dps
- The unit of exposure is the Roentgen, R
  - SI unit is coulomb per kilogram of air, C/kg
  - 1 C/kg = 3876 R

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Standard units and Metric units.

Radiation Units

- The unit of absorbed dose is the RAD
  - SI unit is the Gray, Gy
  - 1Gy = 100 rad
- The unit of dose equivalent is the REM
  - SI unit is the Sievert, Sv
  - 1 Sv = 100 rem

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Biological effects of radiation

- Quality Factors

Beta	1
Gamma	1
X-rays	1
Fast Neutron	3
Thermal Neutron	10
Alpha	20

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Quality factors based on health risks of certain types of radiation.

Biological effects

- Chronic dose
  - small amount of radiation received over a long period of time
  - effects can be somatic or genetic
- Acute
  - large dose received over a short period of time

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Biological effects of acute radiation exposure

↗ 0 - 25 rem	Risk of leukemia is 2 in 100,000 No detectable injury
↗ 25 - 50 rem	Detectable blood changes
↗ 50 -100 rem	Mild radiation sickness Nausea, vomiting, fatigue
↗ 100 - 400 rem	Radiation sickness worsens

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Our facility limits must be figured into the risks associated with working with radioactive material.

This training covers our regulatory and facility limits later on, but are:

- Regulatory = no more than 5REM (5000 mrem) per year per employee.

- facility = no more than 500 mrem per year per employee allowed, as measured by external dosimetry.

This is commonly the "tight rope" that we walk when discussing the risks of working with radioactive material with employees. When worked with properly, there is very little risk involved. However, radioactive material can never be taken lightly and we must practice ALARA at all times, which states that whenever and wherever we can reduce exposure to radioactive material, we must. It is not only good enough to be below regulatory levels, we must always look for ways to reduce exposure where we can.

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Biological effects of acute radiation exposure

↗ 400 rem

LD_{50} Likely 50% of population will die in 30 days if untreated

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LD 50 = out of 100 people exposed, 50% will die.

Lifetime Risk of Fatal Cancer from Ionizing Radiation

	Risk per Million persons per rem*
↗ Leukemia	15-50
↗ Thyroid	10
↗ Breast	50
↗ Lung	25-50
↗ Stomach, liver, colon	10-15
↗ All cancers	100-250

At doses of 100 rem or more. Lower doses may carry lower risk.

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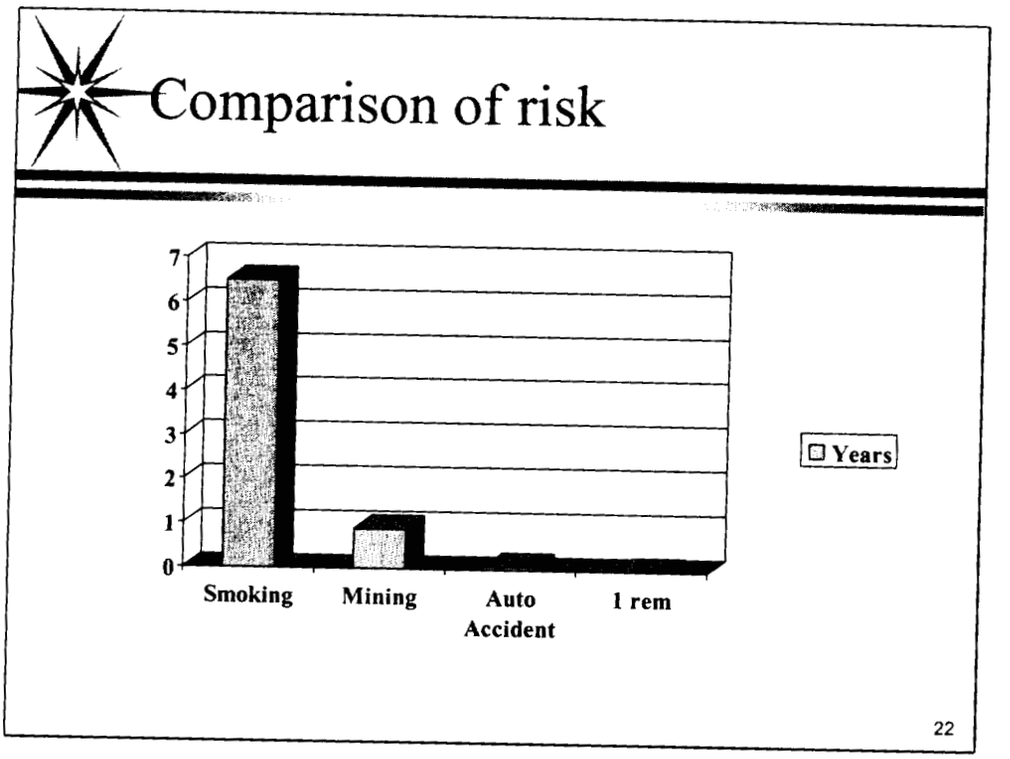

Risk in perspective (studies have increased these umbers):

Smoking one pack per day – 9 yrs.

Living in City vs. Country – 5 yrs.

Single vs. married – 5 yrs.

Desk job vs. field job – 5 yrs.

Obesity – 2 yr. (likely higher, also is relative to % of obesity)

Alcohol consumption – 1 yr. (again, relative to intake)

Cellular effects

- Radiation causes no effect
- Cell is damaged but repairs itself
- Cell is changed
- Cell can die

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These are the different levels at which radioactive material may cause cellular damage, depending on the dose level.

Exposures at St. Louis

- High Activity Samples from Hanford, Brookhaven and Nuclear Power Plants
- Store Lab Coats/Dosimeters away from samples when you are not wearing it.
- Highest exposure in 1998 was 60 mrem/y.
- Most personnel exposure was non detectable.

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Training material slightly dated, but to this day our highest levels still usually do not exceed 50 – 60 mrem/yr per employee.

Exposure Limits

- Legal Limits for Radiation Workers
  - 5000mrem/year (1250 mrem/quarter) whole body
  - 7500mrem/quarter for skin
  - 18,750 mrem for extremities
- STL Administrative Limits
  - 10% of legal limits
- Non-radiation worker
  - 500 mrem/year whole body

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Exposure Limits

- Air borne limits not usually applicable due to low activities
- Each nuclide listed in 10 CFR 20 Appendix B.
- ALARA
  - As Low As Reasonably Achievable

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ALARA – again, maintains that we do not only reduce levels to meet regulatory requirements, but that we always reduce exposure as much as possible.

Monitoring exposure

- Must wear dosimeter on trunk of body
- Changed quarterly by RSO
- Loss of dosimeter requires immediate notification of RSO
  - Remove from exposures while looking for dosimeter
  - If unable to find, person submits written report to RSO
  - Dose calculated from similar personnel exposures

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Bioassay

- Either performed annually or at interval otherwise determined to be needed
- Collect 24 hour urine specimen
- Can not be collected while at work
- Usually a gamma scan
- Detection of radionuclides can cause further testing

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Bioassay performed by all radiation workers upon hiring, thus establishing a baseline to compare to in case of potential contamination or over-exposure.

Sample taken over a 24-hour period, capturing all voids during that time.

Gamma scan as well as Alpha/Beta.

Further analyses may be deemed necessary depending on results. STL Richland may complete fecal for us.

Methods of Protection

- Time, Distance, Shielding
  - Good for External Radiation
  - Waste storage area usually has highest levels
  - Amount of exposure is directly proportional to duration of exposure
    - Alpha - 1/4" in air
    - Beta - 10' in air
    - Gamma - inversely proportional

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Time, distance, shielding is your #1 method of protection from radioactive material. Time spent away from material, distance from material, and shielding from highest emitters.

Waste storage is highest area for dose concerns, therefore no continual work is performed there. No one works an 8-hr. shift in that area.

Methods of Protection

- Ventilation
- PPE (Removal techniques)
- Good Housekeeping
- Good Personal Hygiene

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Ventilation = fume hoods

PPE = not only wearing of proper equipment but scanning, removing, and disposing properly of contaminated items.

Good housekeeping = clean up after working with known sources of contaminated samples, proper clean up and monitoring of spill areas.

Personal hygiene = washing after working with material, especially before consumption of food or drinks, applying cosmetics, using restroom, chewing gum, etc.

Rad Zones

- Permanent Zones in the labs and rad prep labs.
- Checked monthly for contamination.
  - Checked for contamination
  - Checked for radiation
  - Surveys posted
- Rad samples and 3* to other areas with approval by RSO.

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Rad Zones

- Requirements
  - Frisk out every time
  - Admin staff stay out
  - Segregate Waste
  - Notify RSO when finished working on samples requiring a temporary rad zone.

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Waste Segregation

- Segregate all waste from Category 2 and 3 samples (frisk waste before disposing).
- Segregate all Category 2 and 3 Samples
- Return as much as possible to sample container and then to client
- Costly to Dispose of Radioactive Material ($5000+ per drum)

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Cost comparative to ~ $150 for same drum of non-radioactive material.

Controlled Areas

- Rad Prep Labs, TCLP, VOA, Inorg Prep, Org Prep, Sample Control
  - Must have dosimeter for entry
  - Must Frisk out every time
  - Monthly survey with meters
  - Monthly wipe tests
- RWP not required to receive samples

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Signs

- Radiation Area
  - 5 mrem/hr
  - 2 mrem/hr at building perimeter
- Radioactive Materials Area
  - radioactive material used or stored above 10CFR40 Appendix B exempt quantities

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Types of radiacs

- Beta/Gamma Frisker
  - Battery check prior to use
  - Calibrated every twelve months
  - GM tube detector
- Alpha Frisker
  - Battery check prior to use
  - Calibrated every twelve months
  - Scintillation detector

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Friskers also receive daily calibration to a check source, as well as overall check that all parts work and function properly.

Types of radiacs

- MicroR dose meter
  - Battery check prior to use
  - Calibrated every twelve months
  - GM tube detector
- RO2 dose meter
  - Battery check prior to use
  - Calibrated every twelve months
  - GM tube

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Use of Survey Meter

- When checking self:
  - Highest background is 200 cpm beta/gamma, 10 cpm alpha
  - First check gloves. Place close (1/2 inch), go slow.
  - Remove gloves and check hands.
  - Check lab coat and head.
  - Check bottom and top of shoes.

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Use of Survey Meter

- When checking coolers/samples:
  - Hold as close as possible without touching.
  - Start with lowest scale and move upward.
  - Go slow.
  - Listen for response above background. (Use audio).
  - Record reading from lowest available setting.
  - Limits - 100cpm beta/gamma 20cpm alpha (above background)

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Use of Dose Meter

- When checking coolers/samples:
  - Hold as close as possible without touching or waist high for area survey.
  - Start with lowest scale and move upward.
  - Go slow.
  - Listen for response above background. (Use audio)
  - Record reading from lowest available setting

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Use of Swipes

- Use paper disk
- Cover 100 cm^2 (4" x 4")
- Allow reading to stabilize ~ 2 minutes
- Detects loose surface contamination
- Limits - 100cpm beta/gamma 20cpm alpha (above background)

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Radioactive Material License

- See attachment, "St. Louis Radioactive Material License"

EH&S Procedures

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Radioactive Material Categories at St. Louis/Richland

↗ See attachment, STL-RP-001, Section 4.6.6

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Section 4.6.6. = Categorization of samples that the facility receives.

Emergency Procedures

- Spills
  - Put on PPE
  - Limit spread of radioactive material
  - Restrict Area
  - Notify RSO
  - Begin cleanup
  - Observe boundaries
  - Survey area

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Emergencies

- Contaminated person
  - First aid/Medical treatment override contamination control
  - Call RSO immediately
  - Do not use hot/cold water
  - Start with mild soap and water
  - If unable to decon, get medical help

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Emergencies

- Fire
  - Evacuate area and take survey meter. Do not frisk out in building.
  - Avoid other personnel
  - Remember route
  - Notify RSO
  - Stay upwind to avoid inhalation of rad material
  - Consider environmental impact of water

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Conclusion

- If in doubt, ask supervisor or RSO
- Always frisk self when leaving rad zone.
- Notify RSO when finished working on samples requiring RWP and zones
- Segregate and Return when possible

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Advanced Authorized User Training

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Training Set-up:

Trainers notes

Attendance Roster

Exercise 1 Answer Key

Exercise 2 Answer Key

Handouts for all trainee's –

- Exercise 1 & 2
- Copy of Radioactive Material License
- STL-RP-0031 "Radiation Work Permits"
- Example of Yearly Work Group RWP
- Example of Lot Specific RWP
- Training RWP for Exercise # 3

Model 177 Radiac

Model 3 Radiac

Signage –

- Caution – Radioactive Materials
- Caution – Film Badge Required

Material for RCA set up –

- Pylons, rope, step-off pad, radiacs, Training RWP, rad trash bags.
- Have vendor "tools" for Exercise # 4.

Authorized User Training

- Exercise 1

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Provide handouts.

Exercise 1

1. By referring to ^{235}U, the 235 signifies the number of
   a. protons
   b. neutrons
   c. protons and neutrons
   d. electrons

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Exercise 1

1. By referring to ^{235}U, the 235 signifies the number of
   a. protons
   b. neutrons
   c. protons and neutrons
   d. electrons

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Exercise 1

2. Rank these forms of radiation as to their penetrating ability (1 = most, 5 = least)

_____ alpha particles

_____ x-rays

_____ beta particles

_____ gamma rays

_____ neutrons

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Exercise 1

2. Rank these forms of radiation as to their penetrating ability (1 = most, 5 = least)

_____5_____	alpha particles
_____2_____	x-rays
_____4_____	beta particles
_____1_____	gamma rays
_____3_____	neutrons

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Exercise 1

3. Is everyone that is exposed to radiation (even everyday environmental exposure) at risk to cell damage from this exposure?

T or F

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Exercise 3

3. Is everyone that is exposed to radiation (even everyday environmental exposure) at risk to cell damage from this exposure?

T or F

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Exercise 1

4. Which of these radiations are particles?
   a. Alpha
   b. Beta
   c. Gamma
   d. Neutrons
   e. All the above

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Exercise 1

4. Which of these radiations are particles?
   a. Alpha
   b. Beta
   c. Gamma
   d. Neutrons
   e. All the above

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Exercise 1

5. The elemental property of radioactivity can be affected by heat and chemical reactions.

T or F

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Exercise 1

5. The elemental property of radioactivity can be affected by heat and chemical reactions.

T or F

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Exercise 1

6. Alpha radiation is considered
   a. An internal hazard
   b. External hazard
   c. Both an internal and external hazard

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Exercise 1

6. Alpha radiation is considered
   a. An internal hazard
   b. External hazard
   c. Both an internal and external hazard

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Exercise 1

7. Beta radiation is considered
   a. An internal hazard
   b. External hazard
   c. Both an internal and external hazard

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Exercise 1

7. Beta radiation is considered
   a. An internal hazard
   b. External hazard
   c. Both an internal and external hazard

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Exercise 1

8. Gamma radiation is considered
   a. An internal hazard
   b. External hazard
   c. Both an internal and external hazard

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Exercise 1

8. Gamma radiation is considered
   a. An internal hazard
   b. External hazard
   c. Both an internal and external hazard

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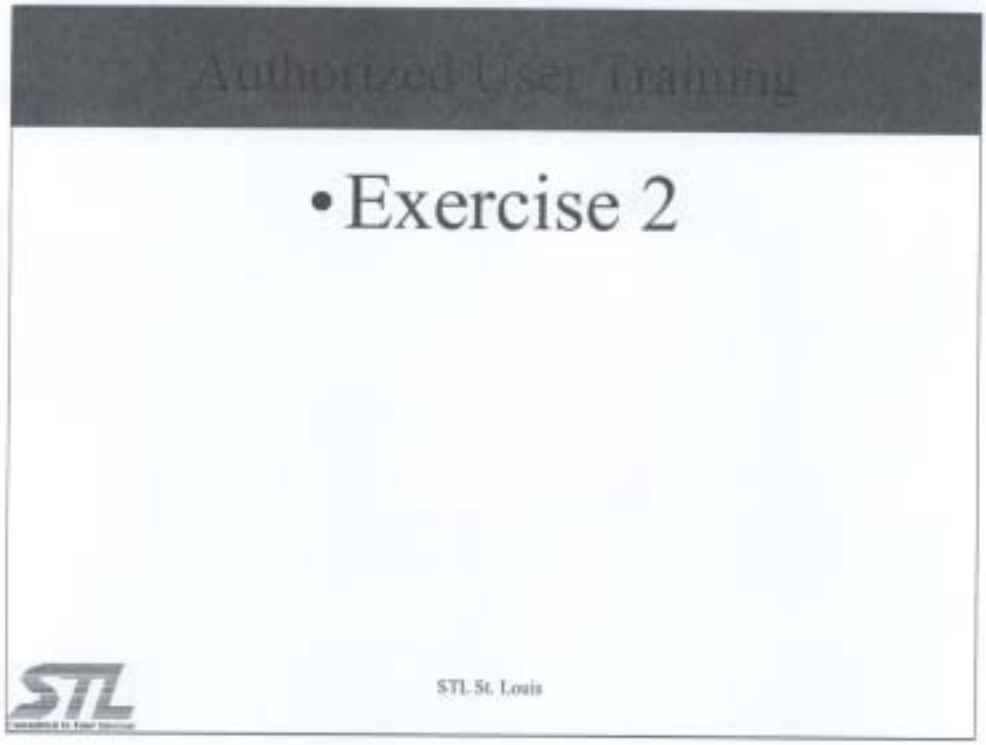

Provide handouts.

Exercise 2

9. What is the exposure cutoff for sample storage in the walk-in coolers?
   a. 2 R/h
   b. 2 rem/h
   c. 2 mrem/h
   d. 200 mR/h

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Exercise 2

9. What is the exposure cutoff for sample storage in the walk-in coolers?
   a. 2 R/h
   b. 2 rem/h
   c. 2 mrem/h
   d. 200 mR/h

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Exercise 2

10. The TLD can be properly placed (circle best answer)
    a. on the shirt collar
    b. on the lab coat pocket
    c. on the belt loop
    d. on the outside of the front side of the torso between the neck and the waist

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Exercise 2

10. The TLD can be properly placed (circle best answer)
    a. on the shirt collar
    b. on the lab coat pocket
    c. on the belt loop
    d. on the outside of the front side of the torso between the neck and the waist

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Exercise 2

11. Disposable items (paper, plastic,glass) that touches radioactive material should be
    a. surveyed
    b. placed in rad trash
    c. decon
    d. put in regular trash

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Exercise 2

11. Disposable items (paper, plastic,glass) that touches radioactive material should be
    a. surveyed
    b. placed in rad trash
    c. decon
    d. put in regular trash

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Exercise 2

12. If you spill or break a liquid radioactive sample, what order should the following actions being taken?

_____ Clean it up with absorbent wipes and dispose as radioactive waste

_____ Determine the activity involved (sample or source number)

_____ Survey the extent of contamination (by instrument)

_____ Notify persons in the area that a spill has occurred

_____ Insure that drains are protected

_____ Notify RSO

_____ Don PPE

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Exercise 2

12. If you spill or break a liquid radioactive sample, what order should the following actions being taken?

__7___ Clean it up with absorbent wipes and dispose as radioactive waste

__4___ Determine the activity involved (sample or source number)

__6___ Survey the extent of contamination (by instrument)

__1___ Notify persons in the area that a spill has occurred

__3___ Insure that drains are protected

__2___ Notify RSO

__5___ Don PPE

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Exercise 2

13. Which of the following units are used to express exposure to radiation?
    a. rad
    b. rem
    c. R
    d. Gray

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Exercise 2

13. Which of the following units are used to express exposure to radiation?
    a. rad
    b. rem
    c. R
    d. Gray

The SI Unit is sieverts (100 rem = 1 sievert)

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Exercise 2

14. To reduce a person's exposure to radiation, which method is most effective
    a. Time
    b. Distance
    c. Shielding

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Exercise 2

14. To reduce a person's exposure to radiation, which method is most effective
    a. Time
    b. Distance
    c. Shielding

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Exercise 2

15. The "pancake probe" used during routine surveys is what type of detector?
    a. GM
    b. Scintillation
    c. Inorganic Scintillator
    d. Ion Chamber

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Exercise 2

15. The "pancake probe" used during routine surveys is what type of detector?
    a. GM
    b. Scintillation
    c. Inorganic Scintillator
    d. Ion Chamber

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New Radioactive Materials License

- License, current amendment.

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Handout copy of license to trainees.

Page #1:

Top right hand corner states current Amendment #.

Paragraph 3 states license #.

Paragraph 4 states expiration date of license.

Paragraph 6 states each isotope we are allowed to have in inventory.

Paragraph 7 states what form that material may be in.

Paragraph 8 states the maximum amount of that material may be inventoried.

Page #2:

Paragraph 9 states the authorized use of the material in the license.

Below that are the conditions of the license

11. RSO for facility,
12. Authorized Users listed,

Rest of license is general specific requirements of the license…

Authorized User Responsibilities

- Coordinate Radioactive material work
- Exposure control
- Contamination control
- Visitor escort/control
- Establish/Remove RCAs
- Decontaminate areas and personnel
- Assist Corporate and On-Site RSOs

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Responsibilities of Authorized Users (refresher).

Radiacs

- Storage location
- Must be approved by On-Site RSO or designee

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Radiac and radioactive standard storage location is pictured.

All radiacs used must be approved by the RSO or designee, such as the Authorized Users.

Radiacs

- Calibration
  - Changed with new license
    - Not every six months
    - in accordance with manufacturer's recommendation

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Calibration of radiacs:

- Daily calibration as listed in SOP STL-RP-0032 "Instrumentation and Surveillance".
- Yearly calibration and certification by outside vendor.

Radiacs – Model 177

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Radiacs - Model 177

- **INDICATED USE:** Multi purpose radiation monitoring; frisking
- **COMPATIBLE DETECTORS:** G-M, scintillation
- **METER DIAL:** 0 - 500 cpm, 0 - 1.5 kV, BAT TEST
- **MULTIPLIERS:** X1, X10, X100, X1k
- **LINEARITY:** Reading within plus or minus 10% of true value with detector connected
- **AUDIO:** Built in unimorph speaker with volume control (*greater than 60 dB at 2 feet full volume*)
- **ALARM:** Indicated by a red lamp and full volume audible tone
- **HIGH VOLTAGE:** Adjustable from 200 - 1500 volts (*can be read on meter*)
- **THRESHOLD:** Adjustable from 10 - 100 mV
- **RESPONSE:** Toggle switch for FAST (4 seconds) or SLOW (22 seconds) from 10% to 90% of final reading

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Radiacs - Model 177

- **RESET:** Push-button to zero meter
- **POWER:** 95 - 135 VAC (*178 - 240 VAC available*), 50 - 60 Hz single phase (*less than 100 mA*), 6 volt sealed lead acid rechargeable battery (*built in*)
- **BATTERY LIFE:** Typically 50 hours (*battery condition can be checked on meter*)
- **BATTERY CHARGER:** Battery is continuously trickle charged when instrument is connected to line power and turned on

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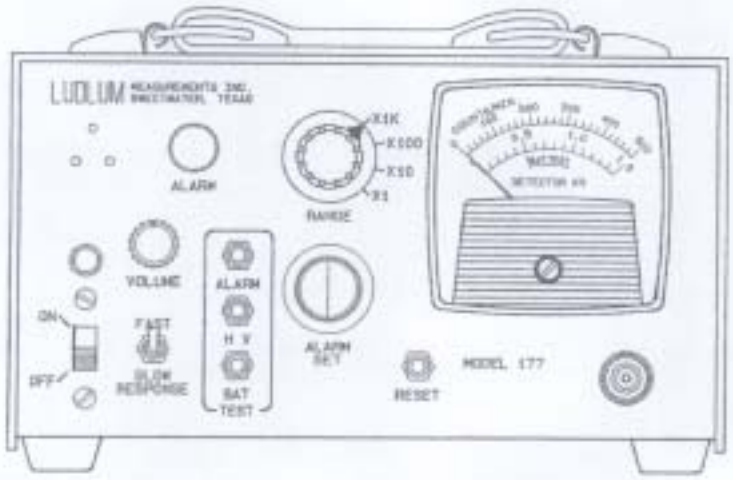
Radiacs - Model 177



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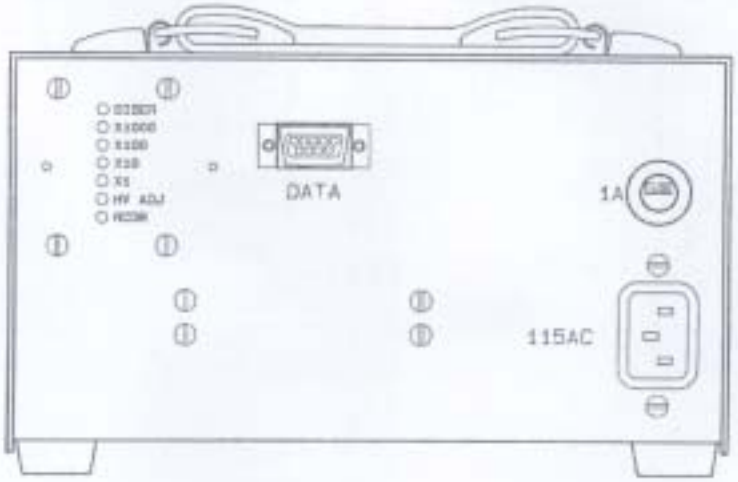
Radiacs - Model 177



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Radiacs - Model 3

STL St. Louis

Radiacs - Model 3

STL St. Louis

Radiacs - Model 3

- **METER DIAL:** 0 - 2 mR/hr, or 0 - 5k cpm, BAT TEST (*others available*)
- **MULTIPLIERS:** X0.1, X1, X10, X100
- **LINEARITY:** Reading within plus or minus 10% of true value with detector connected
- **AUDIO:** Built in unimorph speaker with ON/OFF switch (*greater than 60 dB at 2 feet*)
- **HIGH VOLTAGE:** Adjustable from 200 - 1500 volts
- **RESPONSE:** Toggle switch for FAST (4 seconds) or SLOW (22 seconds) from 10% to 90% of final reading
- **RESET:** Push-button to zero meter
- **POWER:** 2 each "D" cell batteries (*housed in sealed compartment that is externally accessible*)
- **BATTERY LIFE:** Typically 2000 hours with alkaline batteries (*battery condition can be checked on meter*)

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Radiac -Model 14C

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Radiac -Model 14C

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Radiac - Model 14C

- METER DIAL:Typically 0 - 2 mR/hr and cpm, BAT TEST (others available)
- MULTIPLIERS: X0.1, X1, X10, X100, X1000
- LINEARITY: Reading within plus or minus 10% of true value with detector connected
- INTERNAL DETECTOR: Energy compensated G-M (used with X1000 scale only)
- ENERGY RESPONSE: Within plus or minus 15% of true value between 60 keV - 3 MeV (internal detector only)
- AUDIO: Built in unimorph speaker with ON/OFF switch (greater than 60 dB at 2 feet)
- CALIBRATION CONTROLS: Accessible from front of instrument (protective cover provided)
- HIGH VOLTAGE:900 volts
- THRESHOLD: 30 mV plus or minus 10 mV
- RESPONSE: Toggle switch for FAST (4 seconds) or SLOW (22 seconds) from 10% to 90% of final reading
- RESET: Push-button to zero meter
- POWER: 2 each "D" cell batteries (housed in sealed compartment that is externally accessible)
- BATTERY LIFE: Typically 600 hours with alkaline batteries (battery condition can be checked on meter)

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Radiacs - Model 44-9 Pancake Probe

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Radiacs - Model 44-9 Pancake Probe

- INDICATED USE: Alpha beta gamma survey; Frisking
- DETECTOR: Pancake type halogen quenched G-M
- WINDOW: 1.7 plus or minus 0.3 mg/cm squared mica
- WINDOW AREA: Active - 15 cm squared
  Open - 12 cm squared
- EFFICIENCY(4pi geometry): Typically 5%-C-14; 22%-Sr-90/Y-90; 19%-Tc-99; 32%-P-32; 15%-Pu-239
- SENSITIVITY: Typically 3300 cpm/mR/hr (Cs-137 gamma)
- ENERGY RESPONSE: Energy dependant
- DEAD TIME: Typically 80 microseconds
- OPERATING VOLTAGE: 900 volts
- CONNECTOR: Series "C" (others available)
- CONSTRUCTION: Aluminum housing with beige polyurethane enamel paint
- TEMPERATURE RANGE: 5 degrees F(-15 degrees C) to 122 degrees F(50 degrees C)

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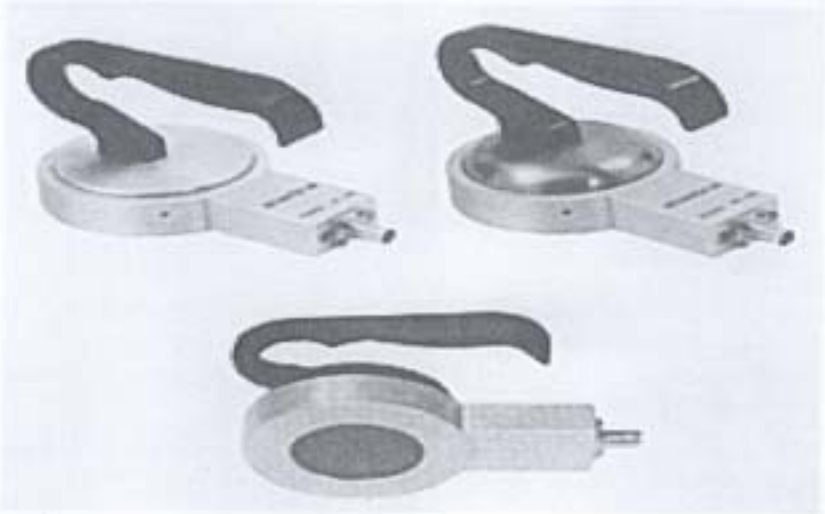
Radiacs - HP240



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Radiues – HP210

- Application: Beta/Gamma surveys
- Detector Type: GM, non energy compensated
- Operating Voltage: 900 V ± 50V
- Dead Time: 50 μs nominal
- Mica Window Size: 1.75 diameter (4.4 cm)
- Mica Window Thickness: 1.4 to 2.0 mg/cm^2
- Background Sensitivity: ~3,600 cpm/mR/h (^{137}Cs)
- Beta/Gamma Efficiency: ~22% ^{137}Cs, ~16% ^{60}Co
- Beta Efficiency (4 Pi): ~ 32% ^{90}Sr90Y, ~ 15% ^{99}Tc, ~ 6% ^{14}C
- Alpha Efficiency (4 Pi): ~ 25% ^{241}Am

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Radiacs - Model 43-5 Alpha Probe

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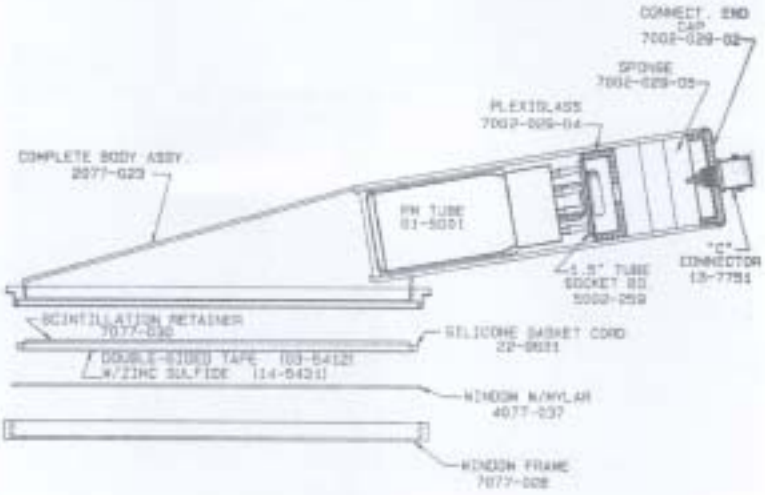
Radiacs - Model 43-5 Alpha Probe



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Radiacs - Model #43-5 Alpha Probe

- **SCINTILLATOR:** ZnS(Ag)
- **WINDOW:** Typically 0.8 mg/cm squared aluminized mylar (*1.2 mg/cm squared recommended for outdoor use*)
- **WINDOW AREA:** Active - 76 cm squared
  Open - 50 cm squared
- **EFFICIENCY (4pi geometry):** Typically 13% - Pu-239
- **NON-UNIFORMITY:** Less than 10%

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Radiacs - Model 19 (μR)

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Radiacs - Model 19 (μR)

STL St. Louis

Radiacs – Model 119 (μR)

- **INDICATED USE:** Low level (microR) gamma survey
- **DETECTOR:** 1" X 1" sodium iodide (NaI)Tl scintillator
- **SENSITIVITY:** Typically 175 cpm/microR/hr (*137Cs gamma*)
- **ENERGY RESPONSE:** Energy dependant
- **METER DIAL:**0 - 25 microR/hr, 0 - 50 microR/hr, BAT TEST
- **RANGE SELECTIONS:** 0 - 25, 0 - 50, 0 - 250, 0 - 500, 0 - 5000 microR/hr
- **LIGHT:** Push-button to activate
- **LINEARITY:** Reading within plus or minus 10% of true value
- **AUDIO:** Built in unimorph speaker with ON/OFF switch (*greater than 60 dB at 2 feet*)
- **RESPONSE:** Toggle switch for FAST (4 seconds) or SLOW (22 seconds) from 10% to 90% of final reading
- **RESET:** Push-button to zero meter
- **POWER:** 2 each "D" cell batteries (*housed in sealed compartment that is externally accessible*)
- **BATTERY LIFE:** Typically 600 hours with alkaline batteries (*battery condition can be checked on meter*)

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Radiacs - ASP1

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Radiacs - ASP1

DISPLAY

- Upper scale: 0 to 1.0, 50 divisions
- Lower scale: 0 to 2,500 V, 50 divisions
- Range: Determined by detector used
- Scale length: 3" (7.6 cm)

EXTERNAL CONTROLS

- 9 position rotary switch for: Off, Battery check, High voltage check and 6 ranges
- Range positions: Read any six consecutive ranges between x0.1 to x10M
- 3 position toggle switch for: Integrate/Fast response/Slow response
- 2 position toggle switches for: Speaker On/Off and Light/Meter Reset

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Radiac -SPA8

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Radiac -SPA8

- Application: Gamma sensitive measurements
- Detector Type: 1" diameter by 1" thick NaI(Tl) (2.5 x 2.5 cm)
- Operating Voltage: 1,000 V nominal
- Dead Time: 36 μs nominal
- Background Sensitivity: ~ 300 kcpm/mR/h (137Cs)
- Energy Range: 40 keV to 1.3 MeV

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Radiacs – RO2

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Radiacs - RO2

FEATURES
- Measures Gamma or X-ray Exposure Rate
- Large Backlit Display
- Long Battery Life
- Mechanical Range Switching
- Temperature Compensated Measurements

DETECTOR
- Four linear ranges:
- 0-5, 0-50, 0-500, 0-5000 mR/hr
- Air filled ionization chamber vented to atmosphere
- Detector volume 13.4 in3
- 1,000 mg/cm2 walls
- Chamber window 7 mg/cm2
- Beta shield 1,000 mg/cm2
- ±30% from 8 keV to 6 MeV
- ±15% from 33 keV to 6 MeV

EXTERNAL CONTROLS
- Rotary switch for Off, Battery 1 check, Battery 2 check, Zero, 5, 50, 500, 5000 mR/hr
- Zero knob

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Radiation Work Permits (RWP)

- RWP SOP and format, see handouts.
  - STL-RP-0031, "Radiation Work Permits".
  - Hardcopy format for *yearly work group* RWP's.
  - Electronic format for *lot specific* RWP's.
- RWP usage

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Key points of interest in STL-RP-0031:

Page 5, Section 4.10 – Unescorted workers that work inside of RCA must have completed Radiation Safety Training, must wear dosimeter, must participate in the bioassay program.

Note – "Unescorted" is the key word here, otherwise follow Section 4.11 for persons who do not meet these requirements. Such persons could be new employees that have not completed all requirements as of yet, or potential clients or auditors or other types of visitors to the facility.

Section 4.11 states that visitors must comply with all requirements of the RWP, the escorting employee verify that the visitor properly surveys out of the RCA, and that the visitor may not handle or work directly with the rad material.

Section 4.12 – Covers Yearly Work Group RWP's.

Section 4.13 – Covers Lot Specific RWP's.

Section 4.15 – Covers RCA's.

Exercise 3

- A team has been selected to establish a RCA.
- Information provided on RWP.
- 5 minutes to establish RCA.
- If you are not involved in setup, write down observations (both good and bad) for discussion afterwards.

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Provide handout of "Training RWP".

This exercise makes use of all applicable RCA material, such as radiacs, step-off pads, signs, etc.

Exercise 3 Comments/Observations

- Comments from observation group?

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Checklist for Setting up RCA

- Remove unnecessary supplies and equipment,
- establish the RCA boundaries, (minimize, but don't crowd)
- establish the step-off area,
- post all required signs,
- place required radiacs in the step-off area and ensure they are calibrated and operational,
- ensure any required radioactive material supplies (such as swipes, bags, gloves) are available,
- ensure personnel read the RWP prior to beginning work.

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Exercise 4

- You have been assigned as an escort for a vendor repairman. You are meeting him at the receptionist desk.
- Equipment to be repaired is in a RCA. Equipment needed to meet TAT on a critical project.
- If you are not involved as an escort, write down observations (both good and bad) for discussion afterwards.

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Exercise 4 Comments/Observations

- Comments from observation group?

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Exercise 4 - Escort Duties

- Ensure vendor/visitor understands and signs visitor sheet.
- Minimize equipment taken into RCA.
- Ensure vendor under observation/control at all times.
- If removing equipment for shipping off-site, contact On-Site RSO.
- Assist vendor when frisking out of RCA.

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Trainer acts as vendor.

Take instrument "tools" into RCA.

End

- Questions/Comments?

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Name:_____Date:_____
Signature:_____
Name of Proctor:_____
Signature of Proctor:_____

Exercise 1

1. By referring to ^{235}U, the 235 signifies the number of
   a. protons
   b. neutrons
   c. protons and neutrons
   d. electrons

2. Rank these forms of radiation as to their penetrating ability (1 = most, 5 = least)
   _____ alpha particles
   _____ x-rays
   _____ beta particles
   _____ gamma rays
   _____ neutrons

3. Is everyone that is exposed to radiation (even everyday environmental exposure) at risk to cell damage from this exposure?
   T or F

4. Which of these radiations are particles?
   a. Alpha
   b. Beta
   c. Gamma
   d. Neutrons
   e. All the above

5. The elemental property of radioactivity can be affected by heat and chemical reactions.
   T or F

6. Alpha radiation is considered
   a. An internal hazard
   b. External hazard
   c. Both an internal and external hazard

7. Beta radiation is considered
   a. An internal hazard
   b. External hazard
   c. Both an internal and external hazard

8. Gamma radiation is considered
   a. An internal hazard
   b. External hazard
   c. Both an internal and external hazard

Name:_____Date:_____
Signature:_____
Name of Proctor:_____
Signature of Proctor:_____

Exercise 2

1. What is the exposure cutoff for sample storage in the walk-in coolers?
   a. 2 R/h
   b. 2 rem/h
   c. 2 mrem/h
   d. 200 μR/h

2. The TLD can be properly placed (circle best answer)
   a. on the shirt collar
   b. on the lab coat pocket
   c. on the belt loop
   d. on the outside of the front side of the torso between the neck and the waist

3. Disposable items (paper, plastic, glass) that touches radioactive material should be
   a. surveyed
   b. placed in rad trash
   c. decon
   d. put in regular trash

4. If you spill or break a liquid radioactive sample, what order should the following actions be taken?
   _____ Clean it up with absorbent wipes and dispose as radioactive waste
   _____ Determine the activity involved (sample or source number)
   _____ Survey the extent of contamination (by instrument)
   _____ Notify persons in the area that a spill has occurred
   _____ Insure that drains are protected
   _____ Notify RSO
   _____ Don PPE

5. Which of the following units are used to express exposure to radiation?
   a. rad
   b. rem
   c. R
   d. Gray

6. To reduce a person's exposure to radiation, which method is most effective?
   a. Time
   b. Distance
   c. Shielding

7. The "pancake probe" used during routine surveys is what type of detector?
   a. GM
   b. Scintillation
   c. Inorganic Scintillator
   d. Ion Chamber

Attachment 3

As referred to in our cover letter, Test America-St. Louis (formerly STL-St. Louis, would like to request a change to our license # 24-24817-01, condition 6(L). As our business continues to grow we have the need for expansion to meet the needs of our clients. We would like to bring on line additional instrumentation, each potentially having room for 2 sources a piece. We request that the approved limit for Nickel-63 plated sources be elevated to 21 (not to exceed 15 millicuries each) from the current 15 sources as stated in the license.

FedEx | Ship Manager | Label

From: Origin ID: ALNA (314)787-8248
STL ST. LOUIS
STL St. Louis
13715 RIDER TRAIL NORTH

EARTH CITY, MO 63045

FedEx Express

Ship Date: 26JUL07
ActWgt: 1 LB
System#: 3102719/INET7061
Account#: S *********

Delivery Address Bar Code

Ref #
Invoice #
PO #
Dept #

SHIP TO: (630)829-9648 BILL SENDER

Nuclear Regulatory Commission Mater
Nuclear Regulatory Commission
2443 Warrenville Road
Suite 210
Lisle, IL 605324352

TRK# 0201 7925 2863 8945

FRI - 27JUL A2
STANDARD OVERNIGH

NY-BDFA

ORD
IL-US
60532

61052-1605

RT 163 A1 0 7/27
FZ

Press Here. Peel Here. Press Here.

This punch is notarizable.