



OP-PRO-033MVF

REVISION 0

Performing Leak Tests and Analysis

Effective Date: TBD

Periodic review frequency; At least every four years from effective date or upon revision.

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1. PURPOSE

This procedure describes the leak test (LT) process for any source or gauges containing a sealed radioactive source(s). This procedure provides instructions for the collection, analysis, and entry of data collected in performing a leak test (LT) on any gauge, source or source location. This process complies with 10 CFR and NUREG-1556 Vol. 18 Rev. 1.

2. SCOPE

2.1 This procedure applies to a device containing RAM or sealed RAM source that requires leak testing. To provide a standard format for the collection, analysis, and documentation of the leak test data to ensure a timely, consistent and accurate record is generated.

3. EQUIPMENT/MATERIALS TO CONDUCT LEAK TEST

3.1 Equipment and PPE that will be used for leak tests are:

1. One or more of the following; Ludlum Model 3030 (Dual Channel Scalers), WBJ DSM-525, SEI Inspector, Ludlum 2200 (gas flow proportional), Bicorn Electra Count Rate Meter w/DP-6 Probe or similar equipment that can measure below the 0.005 uCi reportable limit.
2. Energy appropriate alpha and beta reference sources for analytical purposes (can include but not limited to Cs-137, Am-241, Pu-239, Sr-90, Cl-36, H-3, Ni-63, and/or Tc-99)
3. Gloves
4. Leak test record

4. RESPONSIBILITIES

4.1 RSO ensures that:

- 4.1.1 Best and appropriate safety practices, as identified in SP-PRO-008, are followed throughout the procedure,
- 4.1.2 That the technician performing the leak test analysis is trained and qualified to operate the test equipment,
- 4.1.3 That leak testing is performed in a manner that meets all current standards and operating procedures,
- 4.1.4 Reviews and approves all recommendations made on the test results. Contacts RSO to communicate positive results [$>L_c$ (critical level)].

4.2 Rad Tech. ensures that:

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- 4.2.1 Performs the leak test analysis in accordance with this procedure, training authorization, and associated Operator Aid (See Attachment A).
- 4.2.2 Takes all necessary precautions to avoid the spread of possible contamination.
- 4.2.3 Verify that all equipment and instrumentation is calibrated, has efficiency values for radionuclides of interest, and is working properly by performing daily background and efficiency checks (form 800.420).
- 4.2.4 Notifies RSO of loss of wipe test capability.
- 4.2.5 Immediately contacts RSO to communicate positive results [$>L_c$ (critical level)].

5. LT FREQUENCY

5.1 Portable and Fixed Gauges

Frequency is determined by SSDR frequency or regulatory agency requirements.

5.2 Sources/Devices

LTs on all devices and/or sources or source locations must be performed according to license condition which includes SSDR frequency or regulatory requirement.

5.3 All Client Gauges/Sources shipments

If the client does not provide a copy of a current leak test certificate for sealed source(s) (i.e. devices/sources) that will still be valid upon arrival at the QTA MVF, a LT must be performed and documented prior to shipment.

NOTE: *LTs are not required if the source(s)/device(s) only contain H-3 (tritium), only contain radioactive gas, their half-life is less than 30 days, they do not contain more than 100 μCi of beta and/or gamma emitting material or aggregate in a source location, or not more than 10 μCi of alpha emitting material.*

6. PROCEDURES/INSTRUCTIONS

6.1 Ensure that the meter system has a current calibration sticker.

6.2 Turn on meter system and allow to run diagnostic and warm up.

NOTE: *3030 scalers need 5 minute warm up.*

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- 6.3 Perform a daily QA/QC meter check and record on form 800.420 to verify scaler and/or count rate meter is operational prior to use, as applicable.
 - 6.4 Ensure metering system is free of contamination before use. Ensure you are in a low background area (i.e. no sources in the area).
 - 6.5 Record one (1), one (1) minute background count.
 - 6.5.1 Record the current background for both the metering system in use on either form 800.420.
 - 6.5.2 Use the average background to determine the beta and alpha Lc and MDA for the counting system and record on either form 800.420.
 - 6.6 Record one (1), one (1) minute source count (i.e. alpha and beta check source) to ensure operating within +/- 20% of expected check source reading on Form 800.420.
 - 6.7 Samples are taken utilizing a standard wipe or a cotton-tipped swab.
 - 6.7.1 Sample wipes and/or cotton swabs shall not be touched directly or come in contact with any other object which may alter the sample result or result in the spread of contamination.
 - 6.7.2 Put on gloves before performing or analyzing Leak Test
 - 6.8 Perform representative sample wipe of device/source per manufacturer instructions. Use light pressure on Window sources.
- NOTE: Do not wipe electro plated or surface evaporated sources directly.
- 6.9 Count the sample swipe on the radionuclide appropriate metering system. Ensure same background test parameters (i.e. location, time of day, probe orientation, etc.).
 - 6.10 Enter the results in mEyeCal for certification generation and record retention.
 - 6.10.1 If the activity is less than 0.005 μCi then there is no regulatory notification required by QTA RSO.
 - 6.10.2 If the net cpm exceeds the metering system Critical Level (Lc), perform another one (1) minute count. If still above the Lc, call the Site RSO.
 - 6.10.3 If the activity of the wipe is 0.005 μCi or more the source is considered to have leaked radioactive contamination above regulatory limits and the following actions must be followed:
 - A. Recount the wipe to confirm the results

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- B. Stop work immediately
- C. Secure the immediate area to limit access to prevent exposure, while avoiding any spread of contamination
- D. Contact the Site RSO to mitigate situation.

7. RECORD MANAGEMENT

All QTA and client leak test data are recorded and stored in the mEyeCal system and issued at the clients or regulators request. Retention for QTA LT records is 3 years.

8. REFERENCES

NUREG-1556, Vol. 18. Rev. 1

9. APPENDIX

Appendix A

Alternate Calculation Method

NOTE: *An alternate calculation method that could be used if applicable and more efficient.*

CALCULATIONS

Calculate the final Alpha count using the following formula:

$$\alpha = \text{Alpha}$$

$$\beta = \text{Beta}$$

$$\alpha \text{ sample swipe count (minus) } \alpha \text{ background count} = \text{net } \alpha \text{ count}$$

NOTE: *If net alpha count is less than "Lc," then final alpha count is "0." If > Lc, 95% confidence its real.*

Calculate the final Beta count using the following formula:

$$\beta \text{ sample swipe count (minus) } \beta \text{ background count} = \text{net } \beta \text{ count}$$

NOTE: *If net beta count is less than "Lc," then beta final count is "0." If > Lc, 95% confidence its real.*

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Decision Level: $L_c = \frac{2.32 \sqrt{B}}{T}$

B = Background Counts per minute

T = *Count Time (1 minute)*

Action Limits:

Regulatory reportable limit is $> 0.005 \mu\text{Ci}$

QTA Notification Limit:

Alpha Net Count ***shall not exceed L_c***

Beta Net Count ***shall not exceed L_c***

If the above limits are exceeded, re-wipe to confirm, then contact the Site RSO immediately.

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