Standard Operating Procedure for Liquid Scintillation Leak/Wipe Tests

(Leak test analyte #8080, wipe test beta analyte #8005, wipe test alpha analyte #8008, background beta analyte #8015, background alpha analyte #8018)

1.0 Location

This testing is done in the radiation laboratory room 310.

2.0 Purpose

The purpose of this testing is to assure that there is no contamination by radionuclides in the work place.

3.0 Scope and Applicability

Leak tests must be done on every Nickel 63 gas chromatograph detector once every six months. The detector is wiped with a piece of filter paper. The filter paper is counted with a blank and, if available, a standard. Limits for the wipe test are 200 dpm (disintegrations per minute) (0.00009 uCi) or 2-3 times the background cpm (counts per minute). Limits for the leak test are 0.005 uCi (11,000 dpm).

4.0 References

Packard 2500 TR Operating Manual

5.0 Sample Handling and Preservation

5.1 Wipe a 100 sq cm area of the detector with a slightly wet filter paper and place the filter paper in a glass 22 mL liquid scintillation vial.

5.2 Transport to the analysis laboratory.

6.0 Apparatus and Materials

6.1 Packard Liquid Scintillation Counter 2500 TR

6.2 CMS 22 mL glass liquid scintillation vial #267-459

6.3 10 mL dispenser or pipet

6.4 Instagel or other liquid scintillation cocktail with emulsifier (Packard)

6.5 Whatman glass microfibre filter pads, 2.1 cm diameter, #934-AH

6.6 Appropriate standard

7.0 Procedure

7.1 Calibration

A cassette labeled SNC/IPA and containing unquenched C-14, H-3, and a background vial is placed in the liquid scintillation counter (flagged) once per week. This normalizes the photo multiplier tubes. A background is counted. Efficiencies, figures of merit, and chi squares are calculated. Once per month these values are printed out for hard copy storage. These values must meet the specification listed in Chapter 1 of the Packard Operating Manual or the instrument manufacturer is called.

7.2 Analysis

7.2.1 A clean filter is added to a clean glass liquid scintillation vial for a blank or standards.

7.2.2 To the standard add approximately 0.005 uCi (this is the leak test cut off) and 0.001 uCi of standard (lower than leak test cutoff) if standards are available.

7.2.3 Add 10 mL of Instagel cocktail to all vials.

7.2.4 Shake for 5 seconds to equilibrate.

7.2.5 Place vials in a cassette with blank first as this protocol has a first vial subtract.

7.2.6 Place #1 (Ni-63 leak/wipe) protocol plug in cassette with switch on.

7.2.7 Press start to start the liquid scintillation counter.

8.0 Quality Assurance/Quality Control

When using 2 standards approximately 0.005 uCi and something less, the efficiencies of

each can be calculated {(cpm/dpm) x 100 = efficiency} and compared. They should be very similar.

9.0 Data Analysis

9.1 The net cpm are reported along with the background counts for wipe tests. The uCi per sample is reported for leak tests if results are over 0.005 uCi. If results are less than 0.005 uCi, the results are reported as less than 0.005 uCi.

9.2 To calculate efficiency of the counter:

Efficiency = {(cpm of standard)/dpm of standard) x 100}

uCi are converted to dpm by:

dpm = uCi x 1000000 x 2.22

9.3 To Calculate results in uCi:

uCi = {net cpm/(eff)(2.22)(1 x 10^6)}

where:

net cpm = sample counts per minute - background counts per minute

1 x 10^6 is used to convert pCi (picocuries) to uCi (microcuries)

2.22 is used to convert dpm to pCi

eff = efficiency

10.0 Documentation

10.1 When the leak/wipe tests are received thay are logged into the LIMS. Bench sheets are sent to the analyst.

10.2 Data is entered into the LIMS via worklist.

10.3 Final results are entered on bench sheets which are used to validate printed reports.

11.0 Records

11.1 Completed worklists, bench sheets, and a copy of the report are filed at the lab.

11.2 Reports are sent to the appropriate individual. Liquid Scintillation Leak/Wipe Tests