

Processing or shipping samples back home - how its done at NCNR

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Two general needs

Shipping sample back home (from NCNR)

- Form:
 - Material Transfer Request (Rm A134, A132, or B100)

Acquire or dispose of source @ NIST

- Forms:
 - Proposal to acquire a Radiation Source
 - Proposed change in Utilization of Radiation Source

How does "Need #1" get solved? →

MATERIALS TRANSFER REQUEST

SECTION I (Completed by Requestor)

Requester: Who are you? Date: _____ NCNR Contact/Phone: _____
 Material for transfer to: (Name, Organization, Address, Phone, E-Mail, FAX)
 Need complete name & address (or it won't be processed)

Material Description, Mass, Chemical/Elemental Composition, Source Term/Process Knowledge:
 This info is especially important for the activation calculation; we must have mass and composition for anything that was in the N beam (cell materials included), as complete as you can easily make it - cough it up!

Experiment Station: _____ Estimated Neutron Flux: _____ (n/cm²/sec)
 On Beam Time: _____ days / hrs Off Beam Time: _____ days / hrs or Date _____

TC, BT1, BT2, BT4, BT5, BT6, BT7, BT8, BT9, NG0, Rabbit Lab, NG-1 ANDR, NG-1 Reflector, NG-1 10m SANS, NG-1 NDP, NG-2 Backscatter, NG-3 30 M SANS, NG-4 DCS, NG-5 SPINS, NG-5 Spin Echo, NG-6 FCS, NG-6 Monochrom Beam, NG-6 U (Ultra Cold), NG-6 End Station, NG-7 30 M SANS, NG-7 Prompt Gamma, NG-7 Interferometer, NG-7 Reflector

Both date AND time are needed if nuclides are short lived.

The NCNR contact knows this, or HP can help... or use this internal URL: http://www-l.ncnr.nist.gov/beamline_operations/instrument_fluxes.html

Health Physics Assessment

(usually 1½ - 8 hours per sample, depending on work load and complexity)

- GM Survey**
quick β / γ determination
- Tool Monitor**
sensitive γ determination (better than GM)
- Smear survey**
removable contamination
- Gamma Spectrum Analysis**
identifies and quantifies γ (better than tool monitor)
- Activation Analysis**
identifies and quantifies β

1st test: Survey

- These give an immediate initial assessment of how to physically handle the sample...if one of these responds, it's definitely radioactive.



2nd test: Gamma Tool Monitor

- 16in X 16in X 18in (cavity size 4608 in³)
- 40keV to > 2MeV Gammas
- 6 plastic scintillation detectors 4 π shielding w/2 inches Pb
- Sensitivity is in low nCi range,
 - ⁶⁰Co ~47% efficient
 - ¹³⁷Cs ~27% efficient
- Typically scan is < 7 sec Static or 2in/sec feed-thru using 100 ms time slices



3rd test: Contamination Smears

- β / γ
 - 40 mm diameter paper disk (over 100 cm²)
 - Tennelec S5E Counter (Eff ~ 30% $\beta / 2\% \gamma$)
- Tritium**
 - 40 mm diameter polystyrene disk (over 100 cm²)
 - This technique also responds to α and other β 's
 - Packard Tri-Carb 2500TR Liquid Scintillation Counter (Eff typically ~ 40-52% for T)

* For shipping, exterior package smears are taken over 300 cm² (using a smear efficiency of .1, if the efficiency is not experimentally known).

4th test: Gamma Spectrum Analysis

- Four Ge Gamma Spectrometers**
 - Three stationary, one portable
 - Typical count time ~ 1 hour
 - ~100 keV to ~2KeV
 - Assumed geometry affects calculated activity
 - Point source at contact
 - Point source at 8 cm
 - Disk at contact
 - Disk at 8cm

One X-Ray Spectrometer (SiLi)

5th test: Activation Analysis

Excel* spreadsheet created at NIST

$${}^x\text{A} + {}^1_0\text{n} \rightarrow ({}^{x+1}\text{A})$$

- Inputs:**
- Mass of sample (grams)
 - Elemental mass % of isotopes
 - Neutron flux (neutrons/sec-cm²)
 - Time of exposure to neutrons (hours)
 - Time since exposure to neutrons (hours)
- Outputs**
 Expected products, & their Activities @ variables times (μCi)

* Microsoft® Excel

Health Physics Assessment

Possibilities

- Release for Unrestricted use (not radioactive)
- Release as an Exempt Quantity
- License Transfer
- Many beam samples have short-lived isotopes that significantly decay before transfer

TRANSFER NOTICE
 EXEMPT QUANTITIES OF RADIOACTIVE MATERIAL

The material identified below is exempt from the provisions of 10 CFR 20.11, 11.2, 11.3, 11.4, 11.5, 11.6, 11.7, 11.8, 11.9, 11.10, 11.11, 11.12, 11.13, 11.14, 11.15, 11.16, 11.17, 11.18, 11.19, 11.20, 11.21, 11.22, 11.23, 11.24, 11.25, 11.26, 11.27, 11.28, 11.29, 11.30, 11.31, 11.32, 11.33, 11.34, 11.35, 11.36, 11.37, 11.38, 11.39, 11.40, 11.41, 11.42, 11.43, 11.44, 11.45, 11.46, 11.47, 11.48, 11.49, 11.50, 11.51, 11.52, 11.53, 11.54, 11.55, 11.56, 11.57, 11.58, 11.59, 11.60, 11.61, 11.62, 11.63, 11.64, 11.65, 11.66, 11.67, 11.68, 11.69, 11.70, 11.71, 11.72, 11.73, 11.74, 11.75, 11.76, 11.77, 11.78, 11.79, 11.80, 11.81, 11.82, 11.83, 11.84, 11.85, 11.86, 11.87, 11.88, 11.89, 11.90, 11.91, 11.92, 11.93, 11.94, 11.95, 11.96, 11.97, 11.98, 11.99, 12.00, 12.01, 12.02, 12.03, 12.04, 12.05, 12.06, 12.07, 12.08, 12.09, 12.10, 12.11, 12.12, 12.13, 12.14, 12.15, 12.16, 12.17, 12.18, 12.19, 12.20, 12.21, 12.22, 12.23, 12.24, 12.25, 12.26, 12.27, 12.28, 12.29, 12.30, 12.31, 12.32, 12.33, 12.34, 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