

Radioactive Material Use at the EMSL Radiochemistry Annex

The EMSL Radiochemistry Annex, located in the 3410 Material Science and Technology Building, is authorized to work with small to moderate amounts of radioactive material. In order to work within 3410 facility radiological limits, potential users must provide detailed information about the type and quantity of radioactive material, the form and packaging of the material and the type of work that will be performed at the EMSL Radiochemistry Annex.

Radioactive material includes both purchased radioactive material and samples that contain concentrations of radioactive material in excess of normal background levels. Please realize that some samples that may not be considered to be radioactive material at your institution will be managed as radioactive material at PNNL.

Step 1 – Identify radioactive material inventory on EMSL Proposal

On the EMSL Proposal, you must describe the radioactive material you wish to use. The description should include the specific radionuclides, the maximum quantity of each, and the form in which the radioactive material will be used at the EMSL Radiochemistry Annex. At this stage in the process, you do not need to know exactly how much radioactive material will be sent for each scheduled experiment/analysis, but it is critical that you state the maximum quantity so that we can evaluate whether it will meet our facility limits.

Note that while the EMSL Radiochemistry Annex has broad capabilities for sample preparation, EMSL strongly prefers that you prepare your samples for analysis before sending them to the EMSL Radiochemistry Annex. By minimizing sample handling and preparation at EMSL, you will also minimize your training and the time required to perform the work. The preferred sample configurations for instruments in the EMSL Radiochemistry Annex may be found on page 4 of this guide. Please consider this when preparing your EMSL proposal.

If your proposal requires hands-on work with radioactive material at the EMSL Radiochemistry Annex, additional training and procedural documentation will be required as part of your visit.

Step 2 – Obtain approval to send radioactive material to the Radiochemistry Annex

You must request approval to send radioactive material to the EMSL Radiochemistry Annex by completing the EMSL Radioactive Material Authorization Request form in the [User Portal](#) (see page 3 for required details). The authorization request form should be submitted at least 10 days before shipment, and in no case should shipment occur prior to receiving approval from EMSL. Be sure to include a full description of the material you intend to ship to EMSL, with particular attention to the quantity and composition of the radioactive material and how it is packaged.

If you are shipping from another country, please allow more time for approval. Export requirements from the country of origin and import requirements to the U.S. can take considerable time.

When approved, you will be sent an authorization number (BRM#), which must be included in the shipping address, as described in Step 3.

Step 3 – Prepare and ship radioactive material

Radioactive material must be prepared in accordance with the approved EMSL proposal. As described previously, EMSL strongly prefers that samples be configured for analysis (see page 4) before shipment

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whenever possible. The radioactive material must then be placed in inner packages that will prevent radioactive contamination during transportation. Dispersible radioactive material must be placed in rigid, leak-tight inner containers (e.g., durable screw-top sample jars). Non-dispersible radioactive material may be packaged in a rigid, leak-tight container or in a sealed plastic bag (minimum 3 mil thickness). Inner packaging must be sufficient such that EMSL staff will not encounter radioactive contamination when they open the shipping container.

The radioactive material then must be packaged in shipping containers that meet the applicable US Department of Transportation (DOT) and/or International Air Transport Association (IATA) regulations. You must mark and label the package and prepare shipping papers as required by these regulations. You will also need to prepare and include a return shipping label and, in some cases, packaging (see Step 4). Please obtain help from your institution's hazardous material shipping coordinator as needed.

Address the package as follows:

Battelle for the US DOE
Attn: BRM#___/Tom Wietsma/3410/1604
790 6th Street
Richland, WA 99354

When you receive a tracking number for your shipment, please forward the tracking number to EMSL.rm.coordinator@pnl.gov.

Step 4 – Perform work at the EMSL Radiochemistry Annex

Staff at the EMSL Radiochemistry Annex will generally perform all hands-on work with radioactive material and samples. Remote workstations are available where EMSL users can observe the instrumentation and analysis results while in communication with EMSL staff operating the equipment. On some instruments, the EMSL user may be present while EMSL staff operate the equipment and handle samples.

Additional training and work planning will be required if the EMSL user must perform hands-on work with the radioactive material. The user will be notified of these requirements prior to arrival. The EMSL user must be accompanied by an EMSL staff member and radiation protection staff at all times when performing hands-on work.

Step 5 – Authorize return shipment of excess sample

If you have radioactive sample material left over after completing your research, EMSL will ship the samples back to your institution. For radioactive material that is not regulated under DOT/IATA regulations, please provide a FedEx return label (or alternate carrier). For regulated shipments, you will need to provide a shipping address, shipping contact, and any authorizations required by your institution. If the radioactive material requires special packaging (e.g., shielding, a Type A liquids package, etc.), you will need to provide a package for return shipment. Prior to shipment, you will need to provide your institution's radioactive material license (or equivalent authorization) to the EMSL radioactive material coordinator.

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Radioactive Material Authorization Request
Example Only — Requests must be submitted via the [User Portal](#)

EMSL user name:

Institution:

Contact phone:

Email address:

Requested Experiment Date(s):

Institution's radioactive material
license number (unless exempt):

General description (source of
material, physical state, composition):

Total mass/volume:

Radionuclides/quantity:

Contact dose rate (mrem/hr):

Additional hazards (flammable,
corrosive, etc.):

Describe how material is packaged:

Describe special handling instructions,
if required:

Anticipated shipment date:

Method of shipment (FedEx, etc.):

Return shipment method (include
shipper account number if applicable):

Institution Name (if returned to
another location):

Receiving institution license number,
if applicable:

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Sample Configuration for EMSL Instruments

It is strongly preferred that radioactive samples be shipped to the EMSL Radiochemistry Annex already prepared for analysis whenever possible. The following table describes the final sample configuration needed for analysis with each of the EMSL instruments. Please contact the EMSL Instrument Scientist for additional information or to identify other possible sample configurations if needed.

Instrument and Contact List							
XPS (X-ray photoelectron spectroscopy) Model: Kratos Axis DLD Spectrometer							
EMSL Scientist	Mark Engelhard	(509) 371-6494	mark.engelhard@pnnl.gov				
Sample Configuration	<p>Sample preparation and mounting for XPS surface analysis is a complex topic and will vary depending on type and form of the samples. Proper sample preparation and mounting is essential for successful experiments, and users are encouraged to contact Mark Engelhard to discuss sample handling and preparation.</p> <p>In general, the sample should be fixed onto a clean, flat, conductive surface capable of being mounted onto a 15mm diameter sample stub. The sample should be sealed inside a sample container to keep the sample as clean as possible. A recommended sample container includes the VWR borosilicate TraceClean type sample containers.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="background-color: #d9d9d9;">Quality-Assured® (QA) Vials</td> <td style="background-color: #d9d9d9;">20 mL</td> <td style="background-color: #d9d9d9;">Solid-Top</td> <td style="background-color: #d9d9d9;">89093-838</td> </tr> </table> <p>We also recommend users become familiar with the following ASTM and ISO guides and standards:</p> <p>ASTM- 1829-09 Standard Guide for Handling Specimens Prior to Surface Analysis This guide covers specimen handling and preparation prior to surface analysis.</p> <p>ASTM-E1078-09 Standard Guide for Specimen Preparation and Mounting in Surface Analysis This guide covers specimen preparation and mounting prior to, during, and following surface analysis.</p> <p>ISO Surface Chemical Analysis, Guide to sample handling, preparation and mounting – Part 1 Guide to handling of specimens prior to analysis.</p> <p>ISO Surface Chemical Analysis, Guide to sample handling, preparation and mounting – Part 2 Guide to preparation and mounting of specimens for analysis. ISO Surface Chemical Analysis, Guide of sample handling, preparation and mounting - Part 3 Guide for Biomaterials.</p> <p>ISO Surface chemical analysis, Guide to sample handling, preparation and mounting – Part 4 – Guide and Standard for reporting information related to the history, preparation, handling and mounting of nanomaterials prior to surface analysis.</p>			Quality-Assured® (QA) Vials	20 mL	Solid-Top	89093-838
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JEOL EMP			
EMSL Scientist	Bruce Arey	(509) 371-6485	bruce.arey@pnnl.gov
Sample Configuration	Samples must be polished with maximum dimensions of 1¼” (diameter) x ¾” (height). Samples must be non-dispersible.		
Quanta 3D FEG-FIB			
EMSL Scientist	Bruce Arey	(509) 371-6485	bruce.arey@pnnl.gov
Sample Configuration	Samples must be in a form that is not dispersible. Will need to talk about the samples geometry and size before sending material.		
NMRs			
<ul style="list-style-type: none"> • Bruker 750 MHz NMR • Tecmag 100 MHz NMR 			
EMSL Scientist	Nancy Washton	(509) 371-7094	nancy.washton@pnnl.gov
Sample Configuration	Several methods for containing solid and liquid samples are available, depending on sample mass, radioisotopes, and desired NMR measurements. Contact Nancy Washton for recommendations on sample preparation.		

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Checklist for Radioactive Material Sample Shipment

During the proposal phase:

- Describe radioactive material fully on EMSL Proposal
- Discuss sample preparation methods with EMSL Instrument Scientist if needed
- Verify your proposal is active using the start dates in your approval letter.

At least 10 days prior to sample shipment:

- Complete online EMSL radioactive material authorization request ([User Portal](#)).

When ready to ship:

- Verify that you have received EMSL's shipment authorization.
- Prepare samples as specified in your proposal.
- Package samples in a shipping container that meets the applicable US DOT or IATA regulations (obtain help from your institution's shipping coordinator if needed).
- Perform required radiological surveys and include a copy in the shipping container.
- Label the package as required by US DOT or IATA regulations.
- Address package as follows, using the BRM# assigned to your shipment when you received your shipment authorization.
Battelle for the US DOE
Attn: BRM#_____/Tom Wietsma/3410/1604
790 6th Street
Richland, WA 99354
- Provide package to carrier (e.g. FedEx).
- Email the shipment Tracking Number to EMSL.rm.coordinator@pnnl.gov.

For return shipment of samples:

- Provide your institution's radioactive material license number to the EMSL RM Coordinator (if you haven't already done so in the online request form).
- For exempt quantity samples, provide a FedEx return label (or provide alternate carrier arrangements).
- If samples require special packaging (e.g. shielding, Type A liquid packaging), provide sample shipping package and package closure instructions.