7.U-18.8.1
Procedure for Sample Removal on ARCS

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Contacts: D. Abernathy (ARCS Lead Instrument Scientist)
M. Loguillo (ARCS Scientific Associate)
SNS-OPM Editor

1. Purpose

This procedure provides instructions on how to remove a sample that has been exposed to the neutron beam on ARCS. It assumes that the staff member/user has been trained on the use of the IPPS System (SNS-OPM 3.A-1.5.18.1 for Staff Operation of the ARCS IPPS System or SNS-OPM 3.A-1.5.18.2 for User Operation of the ARCS IPPS System). Additional instructions via a JHA (Job Hazard Analysis) may be needed specific to the current sample environment equipment containing the sample.

2. Responsibilities

2.1 The **ARCS Lead Instrument Scientist** or designee is responsible for ensuring that personnel performing sample changes on ARCS read, understand, and follow this procedure.

3. Prerequisites

3.1 ARCS Instrument Staff must read SNS-OPM 3.A-1.5.18.1, "Procedure for Staff Operation of the ARCS IPPS System". Users must be trained in SNS-OPM 3.A-1.5.18.2, "Procedure for User Operation of the ARCS IPPS System".

3.2 Staff must meet the qualification of Radiological Worker I. Users must successfully complete the training "Radiological Worker Training for Neutron Scattering Users at the High Flux Isotope Reactor (HFIR) and Spallation Neutron Source (SNS)".

4. Precautions

4.1 **Assess the Activation**

The level of residual activation in the sample and sample environment equipment must be assessed and appropriate safeguards must be followed. Failure to follow or complete this procedure may result in the unintentional release of activated material to non-designated areas. This could lead to the termination of the experiment or beamline operation. The activation level of the sample at the time of removal can be reduced by closing the shutter (as required by the procedure to enter the Sample Room) some time before the sample removal.

NOTE:
This procedure does not qualify a staff member or user to open the sample container

Note that an aluminum sample holder may require up to 15 minutes to decay below the level that requires assistance by an RCT.

4.2 **All samples are required to have a neutronics analysis as part of the experimental review process before they can be exposed to neutrons.**
All samples and experiments must have supporting neutronics data that predict the expected level of activation. If the data is missing, or the measured activation levels are higher than expected, contact the lead instrument scientist or designee.

4.3 **Complete training on Sample Environment Equipment**
Before removing a sample, training appropriate to the sample environment equipment present in the Sample Room is required.

4.4 **Check and Obey Signage**
In normal operation, the Sample Room may have specific sample hazards such as chemical hazards. Signage associated with these hazards is variable and subject to frequent change. Staff and users entering this area must read and obey all signage.

5. Procedure

Step Number	Procedure/Actions to be performed
5.1	**If not yet completed, follow procedures to enter the Sample Room as described in SNS-OPM 3.A-1.5.18.1 or SNS-OPM 3.A-1.5.18.2:** • **Close the primary shutter** • **Release Ss key and obtain an Ik key** • **Place the Ik key into the IPPS mezzanine panel** • **Change the "SWEEP" selector to "ACCESS", and open the sample room door**
5.2	**Acquire Geiger-Muller Detector** If the predicted dose rate from the activated sample is below 2 mrem/hr, the portable G-M detector can be used to verify the activation and allow staff or users to remove the sample. The detectors are located in the vicinity of beamlines 17 and 18 on the mezzanine level. If the predicted dose rate is above 2 mrem/hr, contact an RCT to support the removal and handling of the sample.
5.3	**Inspect** • Visually check the detector for obvious problems, valid calibration date, and initials for the source check on the current date. • With the knobs set so that the range is "x100", the response is "Slow", and audio is "On" (See Figure 2), verify that a background ticking sound can be heard. If no sound can be heard, contact an RCT (574-6588 or 574-6590) for a replacement.  Figure 1. Portable G-M detector properly prepared for use

Step Number	Procedure/Actions to be performed
5.4	**Gain access to Sample** • Follow the appropriate JHA(s) to remove the sample, sample container or sample environment equipment from the beam, and gain access to the sample for the activation check. **Note**: At appropriate steps in the removal process, use the G-M detector to check for activation as equipment and shields are removed. **If the needle stays within the x100 scale,** continue the removal process. **If the needle exceeds the scale**, leave the sample and equipment in the Sample Room, exit the room, and immediately contact an RCT to support the removal and handling of the sample. • Wear protective gloves when handling the sample, sample container or potentially activated sample environment components.
5.5	**Measure Sample** Hold the G-M detector head as close as possible to the sample without touching:  Figure 2. An example of the proper use of G-M detector for a sample on a sample stick. **If the needle stays within the x100 scale,** the sample may be removed from the sample environment equipment. **If the needle exceeds the scale**, leave the sample in the Sample Room, exit the room, and immediately contact an RCT to survey and handle the sample. **NOTE:** Radiological Control Technicians are the only staff at SNS who can release potentially radioactive or radioactive samples from posted areas.

Step Number	Procedure/Actions to be performed
5.6	**Label Sample** If you remove the sample container from the sample environment, attach a label to the sample container (See Figure 3). If an RCT is called to measure the sample, provide a filled out label and ask the RCT to attach it. **BL-18 Sample Tag** Exposed to neutron beam. Do not open at ORNL unless authorized. **Proposal ID: _____** **Owner: _____** **Formula: _____** **Sample can ID: _____** **Mass :_____** **Time in beam: _____ hours** **Out of beam on: ___/___/_____** **Special instructions: _____** _____ _____ Figure 3. Label for exposed samples
5.7	**Handle Removed Sample** **Attention! This procedure does not qualify a staff member or user to open the sample container.** **If a sample is surveyed and measured within the scale in step 5.5,** it may be removed from the sample environment equipment, but it must remain in the area posted as 'Radioactive Material Area'. The Sample Room is the only Radioactive Material Area on ARCS. Any item inside a Radioactive Material Area cannot be carried out across the boundary unless it either • has been cleared or appropriately labeled by an RCT. (see description of yellow tags below) • was carried into the area after the shutter was last open and hence has never been in the Sample Room while the neutron beam was on. **If a sample is surveyed, measured and given a yellow Radioactive Material tag by an RCT** (see Figure 4), it may transported to and from Radioactive Material Areas, in a dedicated box available at the ARCS instrument. Only staff

Step Number	Procedure/Actions to be performed
	with ORNL Radiation Worker I training may relocate yellow-tagged samples between Radioactive Materials Areas. Once a radioactive materials tag has been applied, it can only be removed by an RCT.  Figure 4. Yellow Tag
5.8	**Return Geiger-Muller Detector** When finished with the sample removal process, turn off the G-M detector and return it to the appropriate location.

6. Documentation

- NONE

7 References

- SNS-OPM 3.A-1.5.18.1, Procedure for Staff Operation of the ARCS IPPS System. https://neutrons.ornl.gov/x/operations/SNS-OPM/03-A-01-05-18-01.pdf
- SNS-OPM 3.A-1.5.18.2, Procedure for User Operation of the ARCS IPPS System. https://neutrons.ornl.gov/x/operations/SNS-OPM/03-A-01-05-18-02.pdf
- SBMS Guidance on Radiation Safety Training: http://sbms.ornl.gov/sbms/sbmsearch/subjarea/radtrain/sa.cfm
- SBMS Guidance on Radiological Posting: http://sbms.ornl.gov/sbms/sbmsearch/subjarea/plcrm/pro1.cfm

8. Attachments

- NONE