RADIATION PROCEDURES MANUAL
PROCEDURE COVER SHEET

Procedure Title: Radiation Safety for Production of Copper-67
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Contents

1. INTRODUCTION ...................................................................................................................... 3

2. PURPOSE .................................................................................................................................. 3

3. SCOPE ....................................................................................................................................... 3

4. ROLES AND RESPONSIBILITIES ......................................................................................... 3

5. REQUIRED MATERIAL(S) ....................................................................................................... 4

6. PROCEDURE ............................................................................................................................. 4

   6.1. Accelerator Hall Preparation for Cu-67 Production ......................................................... 4

   6.2. Cell Entry Post Activation ................................................................................................. 4

   6.3. Cu-67 Target Handling and Processing .......................................................................... 4

       6.3.1. Required Dosimetry ................................................................................................ 4

       6.3.2. PPE Requirements .................................................................................................. 4

       6.3.3. Preparation and Loading of Cu-67 Target ............................................................. 5

       6.3.4. Unloading of Cu-67 Target Post-Activation ........................................................ 5

       6.3.5. Cu-67 Lab Operations ............................................................................................. 6

7. FORMS ..................................................................................................................................... 6
1. INTRODUCTION

This procedure specifies instructions for radiation safety when production Copper-67 (Cu-67) and operating radiation producing machines at the Idaho Accelerator Center (IAC), particularly the Main Hall and White Room accelerators. It specifies safety measures for accelerator operation and target handling. The irradiation of targets in the accelerator halls and experimental cells have the potential to create removable and/or fixed contamination and excess dose rates. The targets must be properly handled, monitored, and controlled to prevent the spread of contamination and unnecessary radiation exposure to personnel entering the accelerator halls or experimental cells.

2. PURPOSE

This procedure provides steps for keeping radiation exposures and the spread of contamination ALARA when producing Cu-67.

3. SCOPE

This procedure applies to all Radiation Workers when working on the production of copper-67 in the accelerator halls or laboratories at the Idaho Accelerator Center.

4. ROLES AND RESPONSIBILITIES

All IAC Radiation Workers producing Cu-67 have the responsibility to read, understand, and follow this procedure.

Accelerator operators are responsible for directing authorized visitors and ensuring their safety.

The Radiation Safety Department staff have the responsibility of providing radiological support and ensuring they have the proper PPE, instruments, etc. to safely perform their work.

The Radiation Safety Officer has the responsibility to oversee the radiation safety program.
5. **REQUIRED MATERIAL(S)**

- Ta Whole-body dosimeter (for Radiation Workers who have been issued a Ta dosimeter)
- Electronic dosimeter
- Extremity dosimeter (when applicable)
- Ion chamber beta/gamma dose rate instrument
- Neutron dose rate instrument
- GM Survey instrument

6. **PROCEDURE**

6.1. **Accelerator Hall Preparation for Cu-67 Production**

6.1.1. Prepare the accelerator hall as specified in IAC-RP-102, Section 6.2.

6.2. **Cell Entry Post Activation**

6.2.1. Enter the hall/cell as specified in IAC-RP-102, Section 6.3.

6.2.2. After all machine shutdown procedures are complete, activate the target retrieval system. Verify by remote ion chamber that target is in the pig.

6.3. **Cu-67 Target Handling and Processing**

6.3.1. **Required Dosimetry**

   - The following dosimetry is required for this operation: Whole-body dosimeter, extremity dosimeter, electronic dosimeter. Record the electronic dosimeter results on the Accelerator Log Form.

6.3.2. **PPE Requirements**

   - Safety glasses
   - Lab coat
   - Two pairs of gloves (first pair taped to the lab coat)
   - Shoe covers or segregated hall shoes (not street shoes) in White Room Control, White Room Hall, and Main Hall. Shoe covers may be discontinued in the front section of Main Hall after survey demonstrates no contamination above RSM Table 7.
6.3.3. **Preparation and Loading of Cu-67 Target**

6.3.3.1. Remove bagged Zn-68 target from Cu-67 lab safe and transfer to target preparation/unloading table. Enter target data into activation run traveler.

6.3.3.2. Remove old graphite gasket from target holder lid and replace with new. Dispose of graphite gasket in rad waste.

6.3.3.3. Using clean gloves, place ¾” graphite gaskets from QC released inventory into Zn-68 target until up to but not above rim of target.

6.3.3.4. Place Zn-68 target into target holder, verify centered, place one 1 1/8” graphite gasket on top of target and one 1 1/8” alumina washer on top of graphite gasket. Screw on target holder lid.

6.3.3.5. Tighten target lid to 75–80-inch pounds in vise using torque wrench.

6.3.3.6. Using micrometer, verify length of target holder from holder lid gasket to end of holder is <2”.

6.3.3.7. Place target in pig and transfer to accelerator area for insertion into end station.

6.3.3.8. Don additional PPE as required by RWP for target insertion.

6.3.3.9. Enter cave area with target, insert into end station and using manual retraction method, verify target is held in place and removed by extraction system.

6.3.3.10. Exit loading area in accordance with RWP.

6.3.3.11. Verify target collection pig is in place on automatic target extraction system.

6.3.4. **Unloading of Cu-67 Target Post-Activation**

6.3.4.1. Move collection pig with target to the target separation table.

6.3.4.2. Remove lid of collection pig. Handle the target with tongs and transfer to the target unloading jig.

6.3.4.3. Behind the lead shielding, separate the target from the aluminum holder and transfer the target to the transfer pig. Place aluminum holder in the target collection pig.

6.3.4.4. Measure the closed-window dose rate 30-cm from the target in the pig using an ion chamber. Handle the pig with clean gloves and transfer to the Cu-67 lab.

6.3.4.5. Post Cu-67 lab as a high radiation area if indicated by the measurement in 6.3.4.4. After starting sublimation, verify at demarcated area around copper lab that dose rate is < 100 mRem/hr at 30 cm from the lab wall and that dose rate at the boundary is < 5 mrem/hr.
6.3.4.6. Record the dose rate measurements and area postings on the Cu-67 Target Radiation Safety Log.

6.3.5. Cu-67 Lab Operations

6.3.5.1. Follow contamination control and PPE measures specified in the applicable RWP and all copper process specifications.

6.3.5.2. Handle crucibles and vials in plastic bags from the top or with tongs to the extent feasible.

6.3.5.3. Remain behind lead glass shielding when able and maximize distance from radiation sources.

6.3.5.4. Store materials in pigs to minimize dose rates.

6.3.5.5. Transfer ICP samples in a clean bag from the Cu-67 lab to the Chemistry Lab.

6.3.5.6. After Cu-67 processing is complete perform an immediate use area survey using Masslin dusting cloth on the floor and fume hold sashes. Note contamination levels in the project log. If greater than 10,000 cpm notify radiation safety or decontaminate and repeat.

6.3.5.7. Contact radiation survey to perform a map survey of the Cu-67 lab area and control area at the frequency specified in the permit.

7. FORMS

Cu-67 Target Radiation Safety Log