**Fermilab**

**Radiological Work Permit No.** **AD-22-010**

**Area Name**

# MI Q309

| | |
|---|---|
| **Permit Type** | Job-Specific |
| **Issue Date** | Jan 13, 2022 |
| **Issue Time** | 12:31 PM |
| **Expiration Date** | Feb 28, 2022 |

**Description of Work**

MI Q309 magnet replacement & verifications. See Parts 1, 3 & 4 of attached job plan. IMPACT #19661 and worklist #21253.
Removal and replacement of Q309 and verification of magnet & LCW hoses/valves. Job involves cutting, brazing, welding, and transport of contaminated material. Transport permitted through Contamination Areas in 303 & 307 with specified contamination controls as this is safer than attempting to drive the magnet mover in reverse.

**Access Type**

- ○ *Controlled Access*
- ◉ *Supervised Access*
- ○ *Open Access*
- ○ *Other - Secured Area*
- ○ *N/A*

**Basic Work Area Conditions**

Contamination Area includes Be-7 which is hard to detect with Frisker

**Additional Work Area Conditions**

None

**Area Posting**

Radiation Area - entire enclosure

High Radiation Area - 30 region

Contamination Area - 30 region

**Time Limits**

None

**Dose Limits**

see Special Requirements

**Work Documents**

ALARA plan attached

**Dosimetry Requirements**

- ☐ None Required
- ☒ Dosimetry Badge
- ☒ Pocket Dosimeter
- ☐ Ring Badge
- ☐ Digidose
- ☐ See Special Requirements

**Basic Training Requirements**

Radiological Worker - Classroom
Radiological Worker - Practical Factors

**Other Training Requirements**

None

**Portable Survey Instruments**

- ☒ None Required
- ☐ LSM
- ☐ Ludlum 14C
- ☐ E140N/Portable Frisker
- ☐ Minimeter
- ☐ Teletector
- ☐ Bicron Analyst
- ☐ See Special Requirements

**Minimum Personal Protective Equipment**

- ☐ None Required
- ☐ Gloves
- ☐ Shoecovers
- ☐ Labcoats
- ☐ Coveralls
- ☐ Hood
- ☐ Eye Protection
- ☐ Respiratory Protection
- ☐ See attached instructions
- ☒ See special requirements

**Additional Instructions**

- ☒ Notify ESH&Q Prior to Work
- ☒ Rad Tech Coverage Required
- ☐ Review Survey Map
- ☒ Pre-Job Briefing
- ☒ Personal Frisk on Exit
- ☒ Survey & Label Materials on Exit
- ☐ Post-Job De-Briefing
- ☒ No Eating, Drinking, Smoking
- ☐ See Special Requirements

**SPECIAL REQUIREMENTS**

***- Specific PPE required for each step of this job is detailed on the ALARA plan. RCTs will hold non-disposable PPE upon completion of the work until confirmed clear of contamination.***
***- Personnel dose will be closely monitored by the RCT to ensure it stays <250 mrem for this job, and <350 mrem for the calendar quarter unless additional RSO approval is received. RCTs will monitor dose at the start of each individuals' tasks and periodically throughout the job.***
***- Specific radiological hold points are specified in bold/purple on the ALARA plan. Additional radiological controls are specified for each step on the attached ALARA plan.***
***- RCTs may require additional PPE and/or controls as deemed necessary & safe during the course of the work.***
***- Some work may happen in parallel or out of specified sequence, with Job Leader approval & RCT coverage.***
***- Internal dosimetry and respirators not required, see attached analysis.***

**Prepared By** Maddie Schoell

**RSO Authorization** Madelyn Schoell

**Permit No.** AD-22-010

## Names of Workers, Signatures, and Further Instructions

| Name of Worker | Fermi ID | Worker Signature and Date |
|---|---|---|
| J Fulgham | 9634 | 1-19-22 |
| FERNANDO JUAREZ | 13251 | 1-19-22 |
| Victor Ecker | 41789N | 1-19-22 |
| Marino Alvarado | 36534N | 1-19-22 |
| ANDREA STEWERT | 13178 | 1/19/22 |
| STEVE ROJOS | 41462 | 1-19-22 |
| Bryan Flanagan | 42359 | 1-19-22 |
| BOB DONAHUE | 42078 | 1-19-22 |
| | 4115 | 1/19/22 |
| David Kihlken | 9563 | 1/19/22 |
| BANHDANE ATHANAKAY | 42794N | 1/19/22 |
| Caleb M°Conde | 44404N | 1/19/22 |
| Kevin Duel | 14914N | 1/19/22 |
| KOIN BACINO | 42057N | 1/20/22 |
| | 40350N | 1-20-22 |
| Dexter Moore | 8194N | 1-20-22 |
| M Murphy | 11576 | 1-20-22 |
| Michael Wray | 15113 | 1-20-22 |
| PAUL SEDORY | 126370 | 1/22/22 |
| DOUGLAS SWANSON | 36903 | 1-22-22 |
| CRAIG BRADFORD | 8432 | 1/22/22 |
| DAN KNIGHT | 16125 | 1-22-22 |
| DAVE BULMANN | 6885 | 1-23-22 |
| ROB AINSWORTH | 30815 | |

## Further Instructions

*None*

**Permit No.** AD-22-010

## Names of Workers, Signatures, and Further Instructions

| Name of Worker | Fermi ID | Worker Signature and Date |
|---|---|---|
| John Anderson | 12886 | 1-23-22 |
| Jason Kubinski | 13724 | 1/20/22 |

## Further Instructions

*None*

# Post-Job Critique and Analysis

**Written by:** *Joel Fulgham*

**Reviewed by:** *Maddie Schoell*

Should include comments on such factors as:

Doses actually received versus anticipated doses,
whether ALARA goals were met,
whether work procedures and controls were adequate, and
suggestions for improvements

*An internal ground on Quad 309 required replacing of the magnet. In depth planning to place for this work because it is a HRA/Contamination Area. The work went well and all the technicians cooperated with the plan. The extended cool down significantly reduced the potential dose received for the job, the estimate was 1304.8 person-mrem and the actual received 573 person-mrem. Part 2 of this ALARA plan "Magnet repair at NTSB was covered under RWP AD-22-011. Total dose for that work was 143 person-mrem.*

*Concerns raised from this work:*
*Is it possible to move the tool boxes closer to the work area, inside the HRA postings?*
*The need for a different style PPE, flame resistant for hot work.*
*Possible use of potentially contaminated tool box.*

*Once the water system was restored one of the LCW jumper hoses ruptured, replacement added to the ALARA plan after approval received from the SRSO.*

*Tools wiped and released under their own survey package.*

| *Name* | *Dose* |
|---|---|
| *Ainsworth* | *6* |
| *Morris* | *14* |
| *Murphy* | *12* |
| *Alvarado* | *97* |
| *Anderson* | *19* |
| *Athanaxay* | *4* |
| *Bacino* | *16* |
| *Ecker* | *24* |
| *Duel* | *3* |
| *Donahue* | *3* |
| *Delao* | *4* |
| *Rios* | *17* |
| *Kubinski* | *25* |
| *Flanagan* | *19* |
| *Juarez* | *42* |
| *Rocos* | *8* |
| *Seawert* | *8* |
| *Swanson* | *5* |
| *Bradford* | *5* |
| *Knight* | *5* |

**Permit No.** AD-22-010

# Post-Job Critique and Analysis - Page 2

**Written by:** *Joel Fulgham*

**Reviewed by:** *Maddie Schoell*

Should include comments on such factors as:

Doses actually received versus anticipated doses,
whether ALARA goals were met,
whether work procedures and controls were adequate, and
suggestions for improvements

| *Name* | *Dose* |
|---|---|
| *Bulman* | *4* |
| *Wren* | *1* |
| *Kilken* | *5* |
| *Klotz* | *3* |
| *Sedory* | *10* |
| *McChoncie* | *10* |
| *Fulgham* | *28* |
| *Rehr-Scarriot* | *32* |

*Total* *429 person-mrem*

**Fermilab**

**Radiological Work Permit No.** **AD-22-011**

**Area Name**

# NTSB

| | |
|---|---|
| **Permit Type** | Job-Specific |
| **Issue Date** | Jan 13, 2022 |
| **Issue Time** | 1:05 PM |
| **Expiration Date** | Feb 28, 2022 |

**Description of Work**

MI Q309 magnet replacement and new magnet prep. See Part 2 of attached job plan. IMPACT #19661 and worklist #21253.
Removal of old magnet and install of new magnet on cradle. Involves welding & brazing on activated and contaminated magnet.

**Access Type**

- ○ *Controlled Access*
- ○ *Supervised Access*
- ○ *Open Access*
- ◉ *Other - Secured Area*
- ○ *N/A*

**Basic Work Area Conditions**

Contamination Area includes Be-7 which is hard to detect with Frisker

**Additional Work Area Conditions**

None

**Area Posting**

Controlled Area/Radioactive Material Area - entire building
Contamination Area - local to work location
Radiation Area - local to work location

**Time Limits**

None

**Dose Limits**

50 mrem
see Special Requirements

**Work Documents**

ALARA plan attached

**Dosimetry Requirements**

- ☐ None Required
- ☒ Dosimetry Badge
- ☒ Pocket Dosimeter
- ☐ Ring Badge
- ☐ Digidose
- ☐ See Special Requirements

**Basic Training Requirements**

Radiological Worker - Classroom
Radiological Worker - Practical Factors

**Other Training Requirements**

None

**Portable Survey Instruments**

- ☒ None Required
- ☐ LSM
- ☐ Ludlum 14C
- ☐ E140N/Portable Frisker
- ☐ Minimeter
- ☐ Teletector
- ☐ Bicron Analyst
- ☐ See Special Requirements

**Minimum Personal Protective Equipment**

- ☐ None Required
- ☐ Gloves
- ☐ Shoecovers
- ☐ Labcoats
- ☐ Coveralls
- ☐ Hood
- ☐ Eye Protection
- ☐ Respiratory Protection
- ☐ See attached instructions
- ☒ See special requirements

**Additional Instructions**

- ☒ Notify ESH&Q Prior to Work
- ☒ Rad Tech Coverage Required
- ☐ Review Survey Map
- ☒ Pre-Job Briefing
- ☒ Personal Frisk on Exit
- ☒ Survey & Label Materials on Exit
- ☐ Post-Job De-Briefing
- ☒ No Eating, Drinking, Smoking
- ☐ See Special Requirements

**SPECIAL REQUIREMENTS**

***- Specific PPE required for each step of this job is detailed on the ALARA plan. RCTs will hold non-disposable PPE upon completion of the work until confirmed clear of contamination.***
***- Personnel dose will be closely monitored by the RCT to ensure it stays <250 mrem for this job, and <350 mrem for the calendar quarter unless additional RSO approval is received. RCTs will monitor dose at the start of each individuals' tasks and periodically throughout the job.***
***- Specific radiological hold points are specified in bold/purple on the ALARA plan. Additional radiological controls are specified for each step on the attached ALARA plan.***
***- RCTs may require additional PPE and/or controls as deemed necessary & safe during the course of the work.***
***- Some work may happen in parallel or out of specified sequence, with Job Leader approval & RCT coverage.***
***- Internal dosimetry and respirators not required, see attached analysis.***

**Prepared By** Maddie Schoell

**RSO Authorization** Madelyn Schoell

# Post-Job Critique and Analysis

**Written by:** *Paul Sedory*

**Reviewed by:** *Maddie Schoell*

Should include comments on such factors as:

Doses actually received versus anticipated doses,
whether ALARA goals were met,
whether work procedures and controls were adequate, and
suggestions for improvements

*ALARA goals met. We identified some conventional safety issues and worked to correct footing and tripping issues.All of the workers involved were very receptive to all rad safety instructions.*

*Dose received in person mrem*

*Juarez.....5*
*Duel.....4*
*Alvarado.....27*
*Eckler.....14*
*Sedory.....10*
*McConchie....7*
*Senehal.....3*
*Flanagan.....27*
*Saewert.....6*
*Rocos.....2*
*Bacino.....36*
*Klotz.....30*
*Kihlken.....5*
*Watkins.....5*
*TOTAL.....181*

**Permit No.** AD-22-011

# MI Q309 Quad change

All items presumed to be radioactively contaminated

Job Stop limit = 1631 mRem (incl. 25% contingency)

Individual checkpoint = See RWP Special Requirements

| | Time (hours) | Number of People | Dose Rate (mrem/hr) | Estimated Collective Dose (person-mrem) | PPE Required | Other Rad Controls Required | Actual Dose Received (person-mrem) | Comments |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| RPO Review of current dose in GetDose | | | | | | | | |
| | | | | | | | | |
| 303 & 307 herclutie installation | 0.5 | 2 | 25 | 25.0 | | | 10 | |
| | | | | | | | | |
| Decon Manget and + 50 ft and -50 ft | 0.25 | 3 | 40 | 30.0 | | | 10 | |
| | | | | | | | | |
| Job oversight Rad | 0.5 | 3 | 15 | 22.5 | | | 57 | Dose higher due to training new RCTs |
| Job Over sight MI | 0.5 | 4 | 15 | 30.0 | | | 28 | |
| | | | | | | | | |
| PART 1 - 309 MAGNET REMOVAL | | | | | | | | |
| RWP AD-22-010 | | | | | | | | |
| ensure RCT(s) present to provide coverage for all steps in Part 1 | | | | | | | | |
| all personnel read/sign RWP, pre-job brief with RCT | | | | | | | | |
| don PPE prior to entering the Contamination Area | | | | | gloves, shoecovers & coveralls (hood if performing work overhead) | | | |
| Stage equipment | 0.5 | 4 | 5 | 10.0 | | | 0 | |
| Isolate LCW (closing valves) | 0.1 | 2 | 40 | 8.0 | | | 2 | |
| Cutting Bus for Quad | 0.25 | 2 | 40 | 20.0 | Eye protection. Place cut resistant gloves over nitrile gloves. RCT will hold non-disposable PPE until confirmed clear of contamination. | contamination control for cutting, rad vac for debris | | accomplished under RWP ? |
| Disconnect power correctors ( sextuple and dipole trim) | 0.25 | 2 | 40 | 20.0 | | | 1 | |
| Disconnect instrumentation (BPM)/klixons | 0.25 | 2 | 40 | 20.0 | | | 6 | |
| Vent vacuum sector (313location is cooler) | 0.5 | 2 | 10 | 10.0 | | | 1 | |
| Cut beam pipe (1 cut) | 0.25 | 2 | 40 | 20.0 | Eye protection. Place cut resistant gloves over nitrile gloves. RCT will hold non-disposable PPE until confirmed clear of contamination | contamination control for cutting, rad vac for debris | 2 | |
| beam pipe inspection | 0.25 | 2 | 40 | 20.0 | | | 15 | |
| Unflange upstream gate valve flange | 0.25 | 1 | 40 | 10.0 | | | 3 | |
| As-found magnet | 0.25 | 2 | 40 | 20.0 | | | | Not done, AD used an older as found |
| pause for RCTs to lay herculite on carts prior to moving magnet | | | | | | | | |
| Anchor installation (aisle side) | 0.17 | 2 | 40 | 13.3 | | Contamination control for drilling into walls, rad vac for debris | 2 | |
| Rig magnet and move to aisle | 2 | 4 | 40 | 320.0 | | herculite on carts for contamination control. | 8 | |
| Anchor installation (magnet side) | 0.17 | 2 | 40 | 13.3 | | Contamination control for drilling into walls, rad vac for debris | 2 | |
| RCTs Wrap magnet and girder in herculite | 0.1 | 2 | 40 | 8.0 | | magnet wrapped/taped in herculite for contamination control | 2 | |
| doff PPE when exiting Contamination Area and dispose of in Rad Waste bag when exiting Contamination Area | | | | | | | | |
| RCTs will hold non-disposable PPE and tools that entered the Contamination Area until cleared of contamination via gamma spec analysis at RAF. | | | | | | | | |
| Transport Magnet from 309 to MI60 via 10 and 20 (past the RR collimators) | 0.3 | 2 | 2 | 1.2 | | | 1 | |
| pause at 305 to don PPE, continue with transport | | | | | gloves & shoecovers | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| pause at 307 to ensure herculite/tape/sticky pads are in correct orientation for magnert mover direction, continue with transport | | | | | | | | |
| pause at 230 to doff PPE and dispose of in Rad Waste bag | | | | | | | | |
| pause at 230 for RCTs to take contamination wipes of tires, proceed with transport. Wipes will be submitted to RAF for gamma spec analysis. | 0.1 | 2 | 2 | 0.4 | | | 1 | |
| Attach slings to girder and crane hook, guide slings as hook is raised | 0.1 | 2 | 30 | 5.0 | | | 1 | |
| Strap magnet to truck/unstrap magnet from truck | 0.2 | 1 | 30 | 6.0 | | | 1 | |
| | | | | | | | | |
| Magnet Transport from MI-60 to NTSB Following FRCM 423.5 Requirements (attached) | | | | | | | | |
| | | | | | | | | |
| PART 2 - MAGNET REPAIR WORK AT NTSB | | | | | | | | |
| RWP AD-22-011 | | | | | | | | |
| ensure RCT(s) present to provide coverage for all steps in Part 2 | | | | | | | | |
| all personnel read/sign RWP, pre-job brief with RCT | | | | | | | | |
| don PPE prior to beginning work | | | | | gloves, shoecovers, coveralls | | | |
| Disassemble and remove corrector | 0.2 | 2 | 30 | 10.0 | | | 15 | |
| Clamp bellows and cut upstream beam tube, vacuum chips | 0.1 | 2 | 30 | 5.0 | Eye protection. Place cut resistant gloves over nitrile gloves. RCT will hold non-disposable PPE until confirmed clear of contamination. | contamination control for cutting, rad vac for debris | 3 | |
| Unfasten BPM | 0.0 | 2 | 30 | 2.0 | | | 4 | |
| Pull out beam tube | 0.2 | 2 | 30 | 10.0 | | | 10 | |
| File and clean beam tube ends 2x | 0.1 | 2 | 30 | 5.0 | | | 5 | |
| Sling magnet and crane off cradle | 0.0 | 2 | 30 | 2.0 | | | 1 | |
| Unbraze fittings from old magnet | 0.3 | 2 | 30 | 20.0 | Brazing PPE appropriate. RCTs will hold non-disposable PPE upon completion of job until confirmed clear of contamination | contamination control for brazing, rad vac for any debris | 3 | |
| File and clean gate valve beam tube | 0.1 | 2 | 30 | 5.0 | | | | Bellow had to be replaced not done here |
| Sling and crane new magnet onto cradle | 0.1 | 2 | 5 | 0.8 | | | 0 | |
| Braze fittings on new magnet | 0.3 | 2 | 30 | 20.0 | Brazing PPE appropriate. RCTs will hold non-disposable PPE upon completion of job until confirmed clear of contamination | contamination control for brazing, rad vac for any debris | 2 | |
| Pressure test (setup/take down test, test can run unattended) | 0.3 | 2 | 30 | 20.0 | | | 2 | |
| Insert beam tube into new magnet | 0.2 | 2 | 30 | 10.0 | | | 6 | |
| Connect BPM | 0.0 | 2 | 30 | 2.0 | | | 2 | |
| Weld beam tube | 0.5 | 2 | 30 | 30.0 | Welding PPE appropriate, RCTs will hold non-disposable PPE upon completion of job until confirmed clear of contamination | contamination control for welding, rad vac for any debris | 30 | |
| Swab beam tube | 0.1 | 2 | 30 | 5.0 | | | 5 | |
| Replace bellows | 0.5 | 2 | 15 | 15.0 | Approved by SRSO | | 7 | |
| Leak check weld | 0.2 | 1 | 30 | 5.0 | | | 3 | 2 personnel, only one close to magnet |
| Reassemble corrector | 0.3 | 2 | 30 | 20.0 | | | 36 | |
| RCTs Wrap magnet and girder in herculite | 0.1 | 2 | 15 | 3.0 | | | 3 | |
| doff PPE and dispose of in Rad Waste bag | | | | | | | | |
| RCTs will hold non-disposable PPE and tools that entered the Contamination Area until cleared of contamination via gamma spec analysis at RAF. | | | | | | | | |
| Strap magnet to truck/unstrap magnet from truck | 0.2 | 1 | 30 | 6.0 | | | 6 | |
| | | | | | | | | |
| Magnet Transport from NTSB to MI-60 Following FRCM 423.5 Requirements (attached) | | | | | | | | |
| | | | | | | | | |
| PART 3 - REINSTALL Q309 | | | | | | | | |
| RWP AD-22-010 | | | | | | | | |
| ensure RCT(s) present to provide coverage for all steps in Part 3 | | | | | | | | |
| all personnel read/sign RWP, pre-job brief with RCT | | | | | | | | |
| Sling girder and crane down hatch and onto dollies | 0.1 | 2 | 30 | 5.0 | | | 2 | |
| Transport Magnet to from mi60 to 309 via 10 and 20 (past the RR collimators) | 0.3 | 2 | 2 | 1.2 | | | 0 | |
| pause at 230 to don PPE, continue with transport | | | | | gloves & shoecovers | | | |
| pause at 307 to ensure herculite/tape/sticky pads are in correct orientation for magnert mover direction, continue with transport | | | | | | | | |
| pause at 305 to doff PPE and dispose of in Rad Waste bag | | | | | | | | |
| pause at 305 for RCTs to take contamination wipes of tires, proceed with transport. Wipes will be submitted for gamma spec analysis at RAF. | | | | | | | | |
| don PPE prior to entering Contamination Area | | | | | gloves, shoecovers & coveralls | | | |
| RCTs unwrap herculite | | | | | | | | |
| Rig magnet from Aisle to magnet stands | 2 | 4 | 30 | 240.0 | | | 120 | |
| Align magnet in place | 0.25 | 2 | 30 | 15.0 | | | 15 | |
| pause to doff contamination PPE and don welding PPE | | | | | | | | |

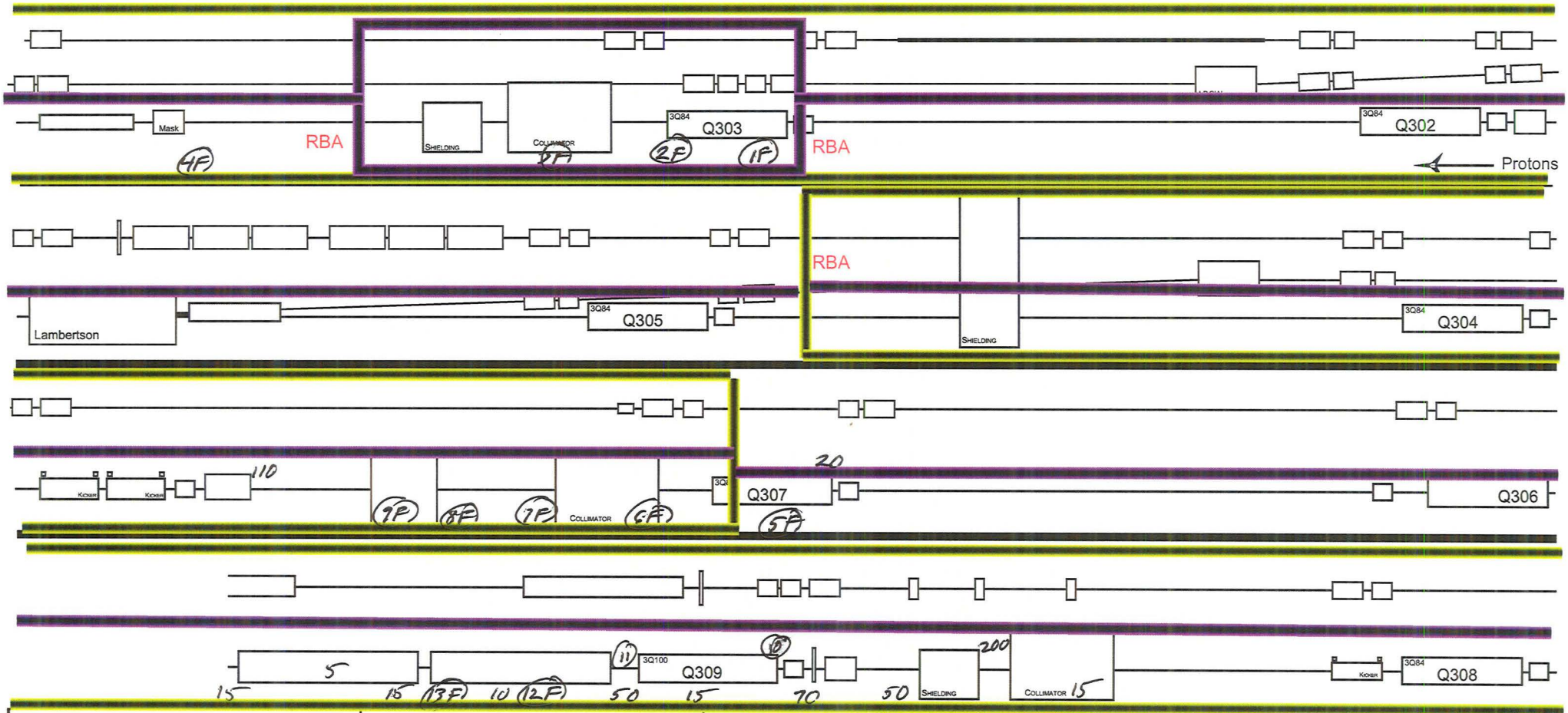
| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Weld vacuum beam pipe back into place (1 weld) | 0.5 | 2 | 30 | 30.0 | Welding PPE appropriate, RCTs will hold non-disposable PPE upon completion of job until confirmed clear of contamination | contamination control for welding, rad vac for any debris | 15 | |
| pause to doff welding PPE and give to RCTs for contamination checks, don contamination PPE | | | | | gloves, shoecovers & coveralls | | | |
| Bolt flange to gate valve | 0.5 | 1 | 30 | 15.0 | | | 40 | Took 3 ties to seal |
| Pump down Leak check | 0.5 | 2 | 30 | 30.0 | | | 27 | |
| pause to doff contamination PPE and don brazing PPE | | | | | | | | |
| Braze LCW buss and magnet | 1 | 2 | 30 | 60.0 | Brazing PPE appropriate. RCTs will hold non-disposable PPE upon completion of job until confirmed clear of contamination | contamination control for brazing, rad vac for any debris | 10 | |
| pause to doff brazing PPE and give to RCTs for contamination checks, don contamination PPE | | | | | gloves, shoecovers & coveralls | | | |
| Connect correction elements | 0.25 | 2 | 30 | 15.0 | | | 21 | |
| Connect instrumentation (BPM)/Klixon | 0.25 | 2 | 30 | 15.0 | | | 4 | |
| doff PPE when exiting Contamination Area and dispose of in Rad Waste bag when exiting Contamination Area | | | | | | | | |
| RCTs will hold non-disposable PPE and tools that entered the Contamination Area until cleared of contamination via gamma spec analysis at RAF. | | | | | | | | |
| Remove Equipment from tunnel | 0.5 | 4 | 5 | 10.0 | | | 8 | |
| | | | | | | | | |
| | | | | | | | | |
| PART 4 - 309 & 307 LCW VALVE AND HOSE REPAIRS & VERIFICATION | | | | | | | | |
| RWP AD-22-010 | | | | | | | | |
| ensure RCT(s) present to provide coverage for all steps in Part 4 | | | | | | | | |
| all personnel read/sign RWP, pre-job brief with RCT | | | | | | | | |
| don PPE prior to entering the Contamination Area | | | | | gloves, shoecovers & coveralls | | | |
| 309 secondary manifold drain valve replacement (while magnet is gone) | 0.5 | 2 | 20 | 20.0 | | | 2 | |
| 307 area hose replacement verification & valve replacement | 0.5 | 2 | 20 | 20.0 | | | 4 | |
| Replace ruptured hose at 307 mask. | 0.1 | 1 | 40 | 4.0 | Approved by RSO | | 2 | |
| doff PPE when exiting Contamination Area and dispose of in Rad Waste bag when exiting Contamination Area | | | | | | | | |
| RCTs will hold non-disposable PPE and tools that entered the Contamination Area until cleared of contamination via gamma spec analysis at RAF. | | | | | | | | |
| Final decon | | | | | | | 7 | |
| | | | **Total** | **1304.8** | | | **573.0** | |

**Fermilab ES&H**

| DATE: 1-7-22 | TIME: 1500 | PURPOSE: Informational survey of MI309 area | RWP # 40-22-003 |
|---|---|---|---|

☐ This Survey is part of the **MI 20-62** survey package. See attached cover sheet for surveyor, instrument, and review information.

# MI 302-309




| Beam Off Date: | Beam Off Time: | Intensity: | Highest Dose Rate Found: _____ mR/hr @ 1foot |
|---|---|---|---|

**Radiation Instruments Used**

| | | | |
|---|---|---|---|
| Inst Type: | LSM | | |
| Inst No: | 18 | | |
| Batt/Source Chk: | SAT | | |
| Cal. Due Date: | 4-22 | | |

All Areas < _____ mR/hr@1foot (Unless otherwise indicated)

**LEGEND:** Numbers appearing on map are mR/hr @ 1 ft readings unless denoted with symbols below. * = mR/hr @ contact

A = Air Sample (#) = Wipe (F#) = Floor wipe

Bkgd _____ cpm

| Wipe # | Reading | | Wipe # | Reading | |
|---|---|---|---|---|---|
| ____ | ____ | ccpm | ____ | ____ | ccpm |
| ____ | ____ | ccpm | ____ | ____ | ccpm |
| ____ | ____ | ccpm | ____ | ____ | ccpm |
| ____ | ____ | ccpm | ____ | ____ | ccpm |
| ____ | ____ | ccpm | ____ | ____ | ccpm |
| ____ | ____ | ccpm | ____ | ____ | ccpm |

Comments:
HRA
Contamination Area
RBA=Radiological Buffer Area

Surveyed By: Fulgham / Rehr-Scarriot / McChonchie

Reviewed By: _____

Fermilab
Environment, Safety and Health Section

# Radionuclide Analysis Facility
## Gamma Analysis Report
Issued by Meka E. Francis

Report Date: January 14, 2022
Work Request #: 22-004
Submitted by: Joel Fulgham on 1/10/22
Workbook: HPGe#3-11, page(s) 122

## Main Injector

The ESH Section/RPO/RCT Team submitted 13 radcon cloth wipe samples on Work Request# 22-004 for analysis of accelerator produced radionuclides. Each sample was counted on detector HPGe#3. The following table lists the radionuclides detected in the samples along with the corresponding specific activities. If a sample activity was reported, it has been corrected to the time of sampling.

| SampleID# | Sample Time | Location | Container | Count Info | Unit | Count Date | Radionuclide | Activity (pCi/Sample) |
|---|---|---|---|---|---|---|---|---|
| 220107JF01 | 15:00 | MI-30 Region | Glassine Envelope | 3600sec @ 4cm | Wipe | 1/11/2022 9:16 | Be-7 | 170 ± 50 |
| 220107JF02 | 15:00 | MI-30 Region | Glassine Envelope | 3600sec @ 4cm | Wipe | 1/11/2022 11:20 | Be-7 | 220 ± 50 |
| 220107JF03 | 15:00 | MI-30 Region | Glassine Envelope | 3600sec @ 4cm | Wipe | 1/11/2022 12:37 | Be-7 | 350 ± 60 |
| 220107JF04 | 15:00 | MI-30 Region | Glassine Envelope | 3600sec @ 4cm | Wipe | 1/11/2022 14:50 | Be-7 | 240 ± 60 |
| 220107JF05 | 15:00 | MI-30 Region | Glassine Envelope | 3600sec @ 4cm | Wipe | 1/11/2022 15:58 | Be-7 | 230 ± 40 |
| 220107JF06 | 15:00 | MI-30 Region | Glassine Envelope | 3600sec @ 4cm | Wipe | 1/11/2022 17:29 | Be-7 | 120 ± 40 |
| 220107JF07 | 15:00 | MI-30 Region | Glassine Envelope | 3600sec @ 4cm | Wipe | 1/11/2022 18:36 | Be-7 | 140 ± 50 |
| 220107JF08 | 15:00 | MI-30 Region | Glassine Envelope | 3600sec @ 4cm | Wipe | 1/12/2022 8:52 | Be-7 | 150 ± 40 |
| 220107JF09 | 15:00 | MI-30 Region | Glassine Envelope | 3600sec @ 4cm | Wipe | 1/12/2022 10:29 | Be-7 | 110 ± 50 |

| SampleID# | Sample Time | Location | Container | Count Info | Unit | Count Date | Radionuclide | Activity (pCi/Sample) |
|---|---|---|---|---|---|---|---|---|
| 220107JF10 | 15:00 | MI-30 Region | Glassine Envelope | 3600sec @ 4cm | Wipe | 1/12/2022 11:33 | Be-7 | 5,700 ± 600 |
| | | | | | | | Co-56 | 100 ± 10 |
| | | | | | | | Co-57 | 150 ± 20 |
| | | | | | | | Co-58 | 80 ± 20 |
| | | | | | | | Cr-51 | 1,000 ± 200 |
| | | | | | | | Mn-52 | 80 ± 10 |
| | | | | | | | Mn-54 | 900 ± 100 |
| | | | | | | | Na-22 | 510 ± 60 |
| | | | | | | | Sc-46 | 350 ± 30 |
| | | | | | | | V-48 | 340 ± 30 |
| 220107JF11 | 15:00 | MI-30 Region | Glassine Envelope | 3600sec @ 4cm | Wipe | 1/12/2022 12:43 | Be-7 | 1,500 ± 200 |
| | | | | | | | Co-57 | 25 ± 4 |
| | | | | | | | Co-58 | 33 ± 7 |
| | | | | | | | Mn-54 | 80 ± 10 |
| | | | | | | | Na-22 | 80 ± 20 |
| | | | | | | | Sc-46 | 47 ± 7 |
| | | | | | | | V-48 | 43 ± 9 |
| | | | | | | | Zn-65 | 60 ± 20 |
| 220107JF12 | 15:00 | MI-30 Region | Glassine Envelope | 3600sec @ 4cm | Wipe | 1/12/2022 13:48 | Be-7 | 160 ± 40 |
| 220107JF13 | 15:00 | MI-30 Region | Glassine Envelope | 3600sec @ 4cm | Wipe | 1/12/2022 15:47 | Be-7 | 210 ± 40 |

cc: ESH/RPO/RCT Distribution List
ESH/RPS/RAF Distribution List

Fermilab
ES&H

| DATE: 1-19-21 | TIME: 1500 | PURPOSE: MI 309 Replacement | RWP # AD-22-010 |
|---|---|---|---|

✓ This Survey is part of the MI 20-62 survey package. See attached cover sheet for surveyor, instrument, and review information.

# MI 302-309


| Beam Off Date: | Beam Off Time: | Intensity: | Highest Dose Rate Found: _____ mR/hr @ 1foot |
|---|---|---|---|

**Radiation Instruments Used**

| | | | |
|---|---|---|---|
| Inst Type: | Fidler Eberline | LSM | |
| Inst No: | 7 | 81 | |
| Batt/Source Chk: | ✓ | ✓ | |
| Cal. Due Date: | 3-22 | 3-22 | |

All Areas < _____ mR/hr@1foot (Unless otherwise indicated)

**LEGEND:** Numbers appearing on map are mR/hr @ 1 ft readings unless denoted with symbols below. * = mR/hr @ contact

A = Air Sample (#) = Wipe (F#) = Floor wipe

Bkgd 40 cpm

| Wipe # | Reading | | Wipe # | Reading | |
|---|---|---|---|---|---|
| 1 | 20 | ccpm | 7 | 0 | ccpm |
| 2 | 20 | ccpm | 8 | 0 | ccpm |
| 3 | 20 | ccpm | 9 | 0 | ccpm |
| 4 | 20 | ccpm | 10 | | ccpm |
| 5 | 20 | ccpm | | | ccpm |
| 6 | 0 | ccpm | | | ccpm |

Comments: mag + beam pipe 50
HRA
Contamination Area
RBA=Radiological Buffer Area
3,4,5 after cutting
6-9 on wheels

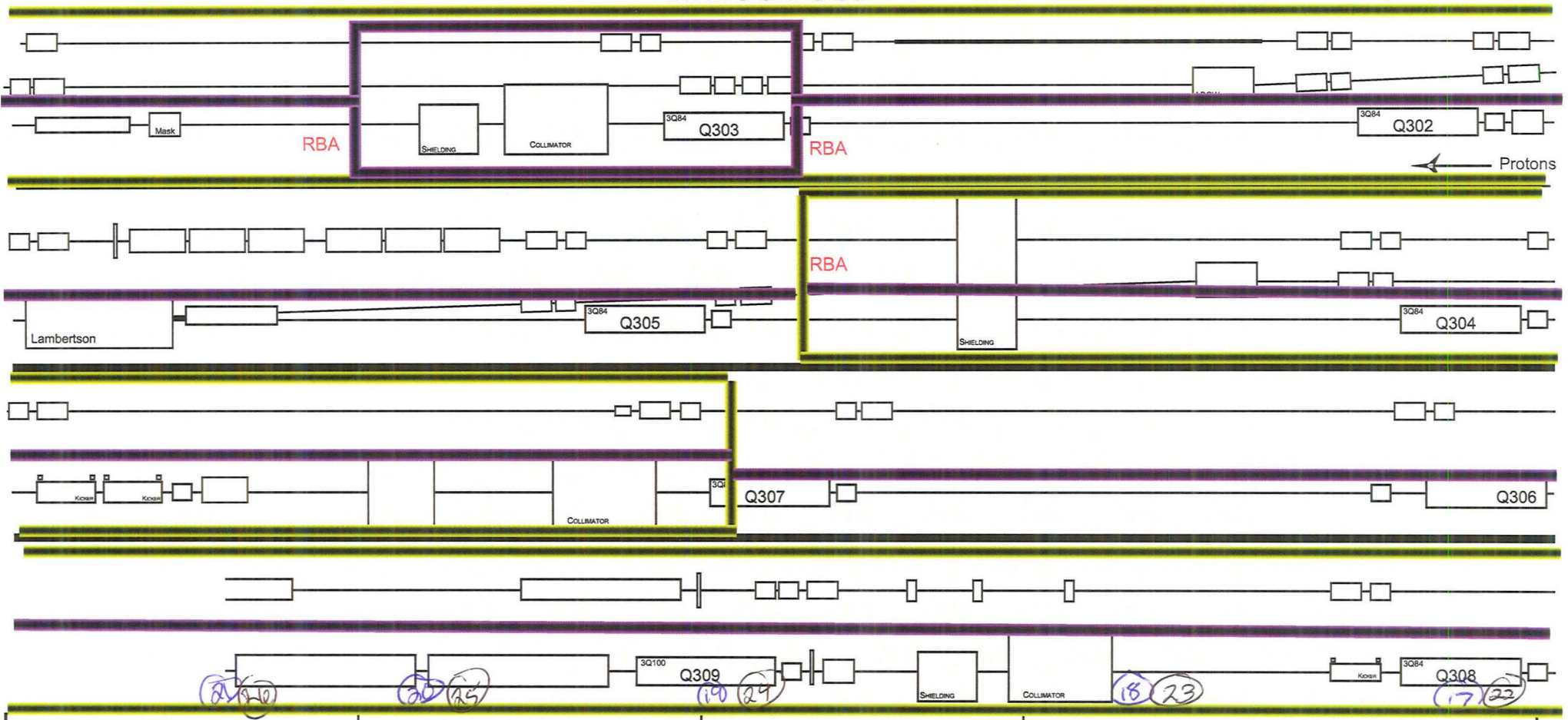
Surveyed By: mcclanahan/Rider-Scarrid / Fidler
Reviewed By: _____

**Fermilab ES&H**

| DATE: 1-27-22 | TIME: 1500 | PURPOSE: Post work Evaluation | RWP # AD-22-010 |
|---|---|---|---|

☐ This Survey is part of the **MI 20-62** survey package. See attached cover sheet for surveyor, instrument, and review information.

# MI 302-309




| Beam Off Date: | Beam Off Time: | Intensity: | Highest Dose Rate Found: _____ mR/hr @ 1foot |
|---|---|---|---|

**Radiation Instruments Used**

| | | | |
|---|---|---|---|
| Inst Type: | | | |
| Inst No: | | | |
| Batt/Source Chk: | | | |
| Cal. Due Date: | | | |

All Areas < _____ mR/hr@1foot (Unless otherwise indicated)

**LEGEND**: Numbers appearing on map are mR/hr @ 1 ft readings unless denoted with symbols below. * = mR/hr @ contact

A = Air Sample (#) = Wipe (F#) = Floor wipe

Bkgd _____ cpm

| Wipe # | Reading | | Wipe # | Reading | |
|---|---|---|---|---|---|
| ____ | ____ | ccpm | ____ | ____ | ccpm |
| ____ | ____ | ccpm | ____ | ____ | ccpm |
| ____ | ____ | ccpm | ____ | ____ | ccpm |
| ____ | ____ | ccpm | ____ | ____ | ccpm |
| ____ | ____ | ccpm | ____ | ____ | ccpm |
| ____ | ____ | ccpm | ____ | ____ | ccpm |

Comments:
HRA
Contamination Area
RBA=Radiological Buffer Area
17-21 Pre Decon
22-26 Post Decon
10-11 rigging equip
12-16 hydraulics

Surveyed By: _____

Reviewed By: _____

Fermilab

# RAF Wipe Count Request Form

Date Submitted 1-24-22

General Location of Wipes MI 309 Replacement

Who Took Wipes Fulgham Ext. 6525

Number of Wipes 26 Date Wipes Taken 1-23-22

Count Comments or Requests gross alpha Beta, if flagged submit for API

Results To: (Full Name)

Joel Fulgham

- *Place all wipes in numerical order in a ziplock bag.*
- *Attach Count Request Form to outside of bag.*
- *DO NOT use staples.*
- *Include no more than 80 wipes per Count Request.*

1 min. Count

RAF USE ONLY

Received By [signature] Quantity 26 Date/Time 1/24/22 11:00

R.P. Form # 43
Revised January 2013

C-132

Fermilab
ES&H Section/RAF

# *Accelerator Div. Wipe Report*

Wednesday, January 26, 2022

**Location:** **Taken By:** **Date:** **Counted By:** **CC:**

**Batch ID:** Wipes - AD - 20220126130201 **Count Time :** 1.0 min. **Count Mode :** Simultaneous **Operating Volts :** 1425

**Count Date:** 1/26/2022 **Daily Bkgd Count Time:** 10 min. **Geometry :** Swipe/Smear **Plateau Set :** 44

**FNAL Alpha Eff :** 11.43 **Alpha Bkgd Rate :** 0.00 ± 0.00 CPM **Alpha Count Ld =** 2.72 CPM **Device :** S5-XLB

**FNAL Beta Eff :** 15.43 **Beta Bkgd Rate :** 1.30 ± 0.36 CPM **Beta-Gamma Count Ld =** 6.67 CPM **Beta-Gamma Ld =** 43.23 DPM

| Wipe # | Carrier # | Alpha Gross CPM | Beta-Gamma Gross CPM | Alpha Net CPM | Beta-Gamma Net CPM | Alpha Net DPM | Beta-Gamma Net DPM | Alpha Net nCi | Beta-Gamma Net nCi | Flags |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 132 | 0.0 | 16.0 | 0.0 | 14.7 | 0.0 | 95.3 | 0.00 | 0.04 | <==== |
| 2 | 92 | 0.0 | 8.0 | 0.0 | 6.7 | 0.0 | 43.4 | 0.00 | 0.02 | <==== |
| 3 | 56 | 0.0 | 8.0 | 0.0 | 6.7 | 0.0 | 43.4 | 0.00 | 0.02 | <==== |
| 4 | 23 | 0.0 | 3.0 | 0.0 | 1.7 | 0.0 | 11.0 | 0.00 | 0.00 | |
| 5 | 27 | 0.0 | 5.0 | 0.0 | 3.7 | 0.0 | 24.0 | 0.00 | 0.01 | |
| 6 | 122 | 0.0 | 8.0 | 0.0 | 6.7 | 0.0 | 43.4 | 0.00 | 0.02 | <==== |
| 7 | 73 | 1.0 | 5.0 | 1.0 | 3.7 | 8.7 | 24.0 | 0.00 | 0.01 | |
| 8 | 43 | 0.0 | 3.0 | 0.0 | 1.7 | 0.0 | 11.0 | 0.00 | 0.00 | |
| 9 | 30 | 0.0 | 3.0 | 0.0 | 1.7 | 0.0 | 11.0 | 0.00 | 0.00 | |
| 10 | 8 | 0.0 | 5.0 | 0.0 | 3.7 | 0.0 | 24.0 | 0.00 | 0.01 | |
| 11 | 19 | 0.0 | 12.0 | 0.0 | 10.7 | 0.0 | 69.4 | 0.00 | 0.03 | <==== |
| 12 | 58 | 0.0 | 2.0 | 0.0 | 0.7 | 0.0 | 4.5 | 0.00 | 0.00 | |
| 13 | 89 | 0.0 | 17.0 | 0.0 | 15.7 | 0.0 | 101.8 | 0.00 | 0.05 | <==== |
| 14 | 111 | 1.0 | 4.0 | 1.0 | 2.7 | 8.7 | 17.5 | 0.00 | 0.01 | |
| 15 | 114 | 0.0 | 7.0 | 0.0 | 5.7 | 0.0 | 36.9 | 0.00 | 0.02 | |
| 16 | 101 | 0.0 | 13.0 | 0.0 | 11.7 | 0.0 | 75.8 | 0.00 | 0.03 | <==== |
| 17 | 120 | 0.0 | 2.0 | 0.0 | 0.7 | 0.0 | 4.5 | 0.00 | 0.00 | |
| 18 | 5 | 0.0 | 2.0 | 0.0 | 0.7 | 0.0 | 4.5 | 0.00 | 0.00 | |
| 19 | 102 | 0.0 | 7.0 | 0.0 | 5.7 | 0.0 | 36.9 | 0.00 | 0.02 | |
| 20 | 113 | 0.0 | 3.0 | 0.0 | 1.7 | 0.0 | 11.0 | 0.00 | 0.00 | |
| 21 | 46 | 0.0 | 7.0 | 0.0 | 5.7 | 0.0 | 36.9 | 0.00 | 0.02 | |
| 22 | 117 | 0.0 | 3.0 | 0.0 | 1.7 | 0.0 | 11.0 | 0.00 | 0.00 | |
| 23 | 3 | 0.0 | 4.0 | 0.0 | 2.7 | 0.0 | 17.5 | 0.00 | 0.01 | |
| 24 | 94 | 0.0 | 2.0 | 0.0 | 0.7 | 0.0 | 4.5 | 0.00 | 0.00 | |
| 25 | 24 | 0.0 | 3.0 | 0.0 | 1.7 | 0.0 | 11.0 | 0.00 | 0.00 | |
| 26 | 67 | 0.0 | 3.0 | 0.0 | 1.7 | 0.0 | 11.0 | 0.00 | 0.00 | |

**Reviewed by:**

Rev. 1/13/10 skb

C:\ProgramData\Canberra\Eclipse\Sample Report - AD.rpt

**Batch Key # :** 12,109 **Group Plate:** C

Printed: 1/26/2022 3:02:23PM

Fermilab
Environment, Safety and Health Section

# Radionuclide Analysis Facility
## Gamma Analysis Report
Issued by Meka E. Francis

Report Date: February 7, 2022
Work Request #: 22-050
Submitted by: Joel Fulgham on 1/27/22

## MI-309 Replacement

The ESH Section/RPO/RCT Team submitted 7 radcon cloth wipe samples on Work Request# 22-050 for analysis of accelerator produced radionuclides. Each sample was counted on detec HPGe#4. The following table lists the radionuclides detected in the samples along with the corresponding specific activities and the k=1 uncertainty. If a sample activity was reported, it has b corrected to the time of sampling.

| SampleID# | Sample Time | Location | Container | Count Info | Unit | Count Date | Radionuclide | Activity (pCi/Sam |
|---|---|---|---|---|---|---|---|---|
| 220127JF01 | 15:00 | MI-309 Wipe #1 | Glassine Envelope | 3,600sec @ 4cm | Wipe | 2/3/2022 13:41 | Be-7 | 150 ± 50 |
| 220127JF02 | 15:00 | MI-309 Wipe #2 | Glassine Envelope | 3,600sec @ 4cm | Wipe | 2/3/2022 14:51 | --- | None Detected |
| 220127JF03 | 15:00 | MI-309 Wipe #3 | Glassine Envelope | 3,600sec @ 4cm | Wipe | 2/3/2022 16:43 | --- | None Detected |
| 220127JF04 | 15:00 | MI-309 Wipe #6 | Glassine Envelope | 3,600sec @ 4cm | Wipe | 2/3/2022 19:08 | --- | None Detected |
| 220127JF05 | 15:00 | MI-309 Wipe #11 | Glassine Envelope | 3,600sec @ 4cm | Wipe | 2/4/2022 8:59 | Be-7 | 160 ± 50 |
| 220127JF06 | 15:00 | MI-309 Wipe #13 | Glassine Envelope | 3,600sec @ 4cm | Wipe | 2/4/2022 10:16 | --- | None Detected |
| 220127JF07 | 15:00 | MI-309 Wipe #16 | Glassine Envelope | 3,600sec @ 4cm | Wipe | 2/4/2022 11:25 | Be-7 | 160 ± 50 |

ESH/RPO/RCT Distribution List
ESH/RPS/RAF Distribution List

# Fermilab CHAIN-OF-CUSTODY RECORD

Need-by Date:

Project Name: Mag replacement MI315 | Group/Section: ESH | ☐ Waste Characterization ☐ Environmental Sample ☐ QA/QC ☑ Other | Procedure | Analysis | Work Request # 22-019

Sampler (pnnt & sign): JM Fulghum JM Fulghum

| # | Sample ID# | Date | Time | GRAB | COMP | Location | Number, Size & Type of Containers (i.e., 1 - 125 ml poly) | APT | Sample Description, Remarks, etc. | Return to Submitter |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 220112JF02 | 1-2-22 | 1630 | ✓ | | Tugger wheels | wipe | ✓ | | |
| 2 | 220112JF03 | | | ✓ | | | | ✓ | | |
| 3 | 220112JF04 | | | ✓ | | | | ✓ | | |
| 4 | 220112JF05 | | | ✓ | | | | ✓ | | |
| 5 | 220112JF06 | | | ✓ | | | | ✓ | | |
| 6 | 220112JF07 | | | ✓ | | | | ✓ | | |
| 7 | 220112JF08 | | | ✓ | | | | ✓ | | |
| 8 | 220112JF09 | | | ✓ | | | | ✓ | | |
| 9 | 220112JF10 | | | ✓ | | | | ✓ | | |
| 10 | 220112JF11 | | | ✓ | | | | ✓ | | |
| 11 | | | | | | | | | | |
| 12 | | | | | | | | | | |
| 13 | | | | | | | | | | |
| 14 | | | | | | | | | | |
| 15 | | | | | | | | | | |

| Relinquished By (Signature) | Date | Time | Received By (Signature) | RAF Remarks Only |
|---|---|---|---|---|
| JM Fulghum | 1/13/22 | 0930 | [signature] | |
| [signature] | 1/13/22 | 0950 | [signature] | |
| | | | | |
| | | | | |
| | | | | |

R.P. Form # 33
Revised February 2020

Fermilab
Environment, Safety and Health Section

# Radionuclide Analysis Facility
## Gamma Analysis Report

Issued by Jayson Hext

Report Date: February 1, 2022
Work Request #: 22-019
Submitted by: Joel Fulgham on 1/13/22

## MI-315 Magnet Replacement

The ESH Section/RPO/RCT Team submitted 10 radcon cloth wipe samples on Work Request# 22-019 for analysis of accelerator produced radionuclides. Each sample was counted on detector HPGe#2. The following table lists the radionuclides detected in the samples along with the corresponding specific activities. If a sample activity was reported, it has been corrected the time of sampling.

| SampleID# | Sample Time | Location | Container | Count Info | Unit | Count Date | Radionuclide | Activity (pCi/Samp |
|---|---|---|---|---|---|---|---|---|
| 220112JF02 | 16:30 | Tugger Wheels Wipe | Glassine Envelope | 3600sec @ 4cm | Wipe | 1/21/2022 8:55 | --- | None Detected |
| 220112JF03 | 16:30 | Tugger Wheels Wipe | Glassine Envelope | 3600sec @ 4cm | Wipe | 1/21/2022 10:03 | --- | None Detected |
| 220112JF04 | 16:30 | Tugger Wheels Wipe | Glassine Envelope | 3600sec @ 4cm | Wipe | 1/21/2022 11:07 | Be-7 | 140 ± 30 |
| 220112JF05 | 16:30 | Tugger Wheels Wipe | Glassine Envelope | 3600sec @ 4cm | Wipe | 1/21/2022 12:18 | Be-7 | 90 ± 30 |
| 220112JF06 | 16:30 | Tugger Wheels Wipe | Glassine Envelope | 3600sec @ 4cm | Wipe | 1/21/2022 13:21 | --- | None Detected |
| 220112JF07 | 16:30 | Tugger Wheels Wipe | Glassine Envelope | 3600sec @ 4cm | Wipe | 1/21/2022 14:24 | Be-7 | 110 ± 30 |
| 220112JF08 | 16:30 | Tugger Wheels Wipe | Glassine Envelope | 3600sec @ 4cm | Wipe | 1/21/2022 16:14 | --- | None Detected |
| 220112JF09 | 16:30 | Tugger Wheels Wipe | Glassine Envelope | 3600sec @ 4cm | Wipe | 1/21/2022 17:45 | Be-7 | 100 ± 30 |
| 220112JF10 | 16:30 | Tugger Wheels Wipe | Glassine Envelope | 3600sec @ 4cm | Wipe | 1/24/2022 13:41 | --- | None Detected |
| 220112JF11 | 16:30 | Tugger Wheels Wipe | Glassine Envelope | 3600sec @ 4cm | Wipe | 1/24/2022 15:53 | --- | None Detected |

ESH/RPO/RCT Distribution List
ESH/RPS/RAF Distribution List