MULTICHARGED ION RESEARCH FACILITY PROCEDURE

MIRF HIGH VOLTAGE PLATFORM SAFETY-RELATED INTERLOCK TESTING AND TEMPORARY DISABLEMENT

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REVIEWED		
REVIEWED		

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MIRF HIGH VOLTAGE PLATFORM SAFETY-RELATED INTERLOCK TESTING AND TEMPORARY DISABLEMENT

1. APPLICABILITY

1.1 This procedure applies to the periodic testing and temporary disablement of Multicharged Ion Research Facility (MIRF) High Voltage (HV) Platform safety-related interlocks.

2. DEFINITIONS

2.1 Safety-related interlock: An interlock whose principal function is the protection of the health or safety of personnel.

2.2 Interlock disablement: An action which prevents the interlock in question from performing its intended function.

2.3 Potential rad exposure: Possible exposure to an x-radiation field of 2 mR/hr or more.

2.3 Authorized person: A person who has successfully completed training and has been authorized by the Atomic Physics Group Leader or his designee to access the MIRF HV Platform in accordance with MIRF Procedure *Safety Requirements for Access to the MIRF HV Platform*

2.3 Responsible Authorized Person: An authorized person who serves as the primary line of communication between authorized personnel and the present platform owner. The responsible authorized person has administrative control of the key to the Platform 250 kV supply breaker lock.

2.4 Platform Owner: An authorized person who has administrative control of the MIRF HV Platform access door lock keys.

3. REVIEW PERIOD

3.1 This procedure shall be reviewed by the Atomic Physics Group Leader or his designee every two years, or whenever major configuration changes to the MIRF High Voltage platform have occurred.

4. REVIEWED COPY AND DISTRIBUTION LIST

4.1 The reviewed copy of this procedure and its distribution list shall be kept in the MIRF Platform Work Control Document notebook in B101, 6000B.

5. REQUIREMENTS FOR INTERLOCK TESTING

5.1 Only responsible authorized persons or personnel under their direct supervision shall test MIRF Platform safety-related interlocks.

5.2 All safety-related interlocks shall be tested for proper functioning on a quarterly basis. Affected interlocks shall also be tested after repair, replacement, or modification. The MIRF HV Platform Interlock Test Checklist (Appendix A) shall be used to document interlock testing. Completed checklists shall be maintained in the MIRF Platform Work Control Document Notebook in B101 of 6000B. Interlock test results shall also be documented in the MIRF platform log book at the MIRF control console.

5.3 Any safety-related interlocks found not to work properly during the periodic testing addressed in this procedure or in the course of normal operations must be repaired and retested before normal platform operations can resume.

5.4 Testing the electrical interlocks on the platform enclosure access doors:

5.4.1 With the Platform 250 kV power supply energized to 5 kV, it shall be verified that opening each access door independently causes:

(a) the red "DISABLE" light to be lit on the control unit of the 250kV power supply,

(b) the 250kV supply output voltage to read zero,

(c) the MIRF control system readback voltage for the 250kV supply to read zero,

(d) the MIRF control system display to indicate "DISABLED" status for the 250kV supply, and

(e) the MIRF control system display to indicate an open access door status for the platform enclosure.

Since each access door is protected by two interlocks connected in series, this test shall be carried out separately for each interlock on both doors.

5.5 Testing the software interlocks of the MIRF HV platform control system:

5.5.1 With the ECR source and Einzel lens power supplies energized to 5 kV, the Extractor power supply energized to 1 kV, the biased disk power supply energized to 100V, and the Traveling Wave Tube (TWT) amplifier output power set to 10

W, it shall be verified that opening each access door independently:

(a) disables all four of the above power supplies and the TWT, as indicated by zero voltage readbacks, and zero output power, respectively, via the MIRF control system, and

(b) causes the MIRF control system display to indicate "DISABLED" status for all four power supplies and TWT amplifier.

5.6 Testing the two mechanical interlocks (grounding arms) on the platform enclosure access doors:

5.6.1 As each access door is opened, it shall be verified that the mechanical grounding arm makes physical contact with the platform structure within the first 12 inches of door travel.

5.6.2 With platform grounding via only the grounding arm being tested, it shall be verified that the platform resistance to ground does not exceed 1 ohm, using a digital multimeter that indicates less than 0.2 ohms when the two leads are shorted together.

5.7 Testing the four grounding hooks:

5.7.1 With platform grounding via only the hook being tested, it shall be verified that resistance to ground on both door hooks does not exceed 1 ohm, using a digital multimeter that indicates less than 0.2 ohms when the two leads are shorted together.

5.7.2 With ECR source grounding to platform potential via only the hook being tested, it shall be verified that resistance between (a) the ECR source and the platform and (b) Instrument Cabinet S-1 and the platform does not exceed 1 ohm, using a digital multimeter that indicates less than 0.2 ohms when the two leads are shorted together.

5.8 Testing the ECR source plexiglass enclosure interlock:

5.8.1 With the ECR source power supply energized to 5 kV, it shall be verified that when the ECR source enclosure is lifted to open the interlock:

(a) the ECR source 30 kV supply is disabled, as indicated by zero voltage readback via the MIRF platform control system, and

(b) a "DISABLED" status is indicated on the control system display for the ECR source 30 kV supply.

6. TEMPORARY DISABLEMENT OF MIRF HV PLATFORM SAFETY-RELATED INTERLOCKS

6.1 MIRF Platform safety-related interlocks shall only be temporarily disabled by responsible authorized persons.

6.2 MIRF Platform safety-related interlocks shall only be temporarily disabled with the written approval of the platform owner.

6.2 MIRF Platform safety-related interlocks shall only be temporarily disabled with the written approval of the Atomic Physics Group Leader or his/her designee. (Authorization for a Line Manager designee to approve interlock disablements must be written and on file.)

6.3 If disablement of a MIRF Platform safety-related interlock has the potential to result in radiation exposure, written approval of the Division Radiological Control Officer or his/her designee shall be required. (The Physics Division Research Support Group Leader or the Radiological Support Services Complex Leader are authorized to sign for the Radiological Control Officer.)

6.4 The MIRF Platform safety-related interlock disablement shall be documented on a MIRF HV Platform Safety-Related Interlock Disablement form (Appendix B), which shall be displayed in the MIRF Platform logbook on the current entry page until termination of the disablement, and by an entry in the MIRF Platform logbook.

6.5 MIRF Platform safety-related interlocks shall be disabled and restored in such a way that only the intended interlocked function is defeated.

6.6 Termination of interlock bypasses shall be documented by an entry in the MIRF Platform logbook.

6.7 Completed MIRF HV Platform Safety-Related Interlock Disablement forms shall be filed in the MIRF Platform Work Control Document Notebook in B101 of 6000B.

Appendix A

MIRF HV PLATFORM SAFETY-RELATED INTERLOCK TEST CHECKLIST

5.4 Testing the electrical interlocks on the platform enclosure access doors

5.4.1 With 250 kV power supply at 5 kV	West Door Switch 1	West Door Switch 2	East Door Switch 1	East Door Switch 2
Red disable light on 250 kV control unit lights				
250 kV output voltage zero				
MIRF control system readback for 250 kV zero				
MIRF control system indicates 'disabled' for 250 kV				
MIRF control system indicates open door status				

5.5 Testing the software interlocks of the MIRF HV platform control system

5.5.1 With ECR source and Einzel lens power supplies energized to 5 kV, extractor power supply energized to 1 kV, biased disk power supply energized to 100 V, and TWT output set to 10 W	West Door Open	East Door Open
MIRF control system readback for ECR source zero		
MIRF control system readback for Einzel lens zero		
MIRF control system readback for Extractor zero		
MIRF control system readback for Biased disk zero		
MIRF control system readback for TWT power zero		
MIRF control system indicates disabled for ECR source		
MIRF control system indicates disabled for Einzel lens		
MIRF control system indicates disabled for Extractor		
MIRF control system indicates disabled for biased disk		
MIRF control system indicates disabled for TWT		

5.6 Testing the two mechanical interlocks (grounding arms) on the platform doors

After verification of <0.2 ohms reading of multimeter with leads shorted	West Door Open	East Door Open
Grounding arm makes physical contact with platform structure within the first 12 inches of door travel		
Resistance from platform to ground <1 ohm		

5.7 Testing the four grounding hooks

After verification of <0.2 ohms reading of multimeter with leads shorted	West Door Grounding Hook	East Door Grounding Hook	ECR Grounding Hook	S-1 Grounding Hook
Resistance platform to ground <1 ohm			NA	NA
Resistance ECR source to platform <1 ohm	NA	NA		NA
Resistance S-1 to platform < 1 ohm	NA	NA	NA	

5.8 Testing the ECR source plexiglass enclosure interlock

5.8.1 With ECR source power supply energized to 5 kV	ECR source plexiglass enclosure open
MIRF control system voltage readback for ECR source zero	
MIRF control system indicates disabled for 30 kV supply	

Responsible Authorized Person _____ Date _____

NOTES:

Appendix B

MIRF HV PLATFORM SAFETY-RELATED INTERLOCK DISABLEMENT FORM

Interlock(s) to be disabled: _____

_____

Reason: _____
(troubleshooting, testing purposes, etc.)

Restrictions: _____

_____

_____

Time initiated: _____ Date: _____

_____
Responsible Authorized Person

_____
Platform Owner

_____
Group Leader (or designee)

if potential for rad exposure

_____
Radiological Control Officer

Time terminated: _____ Date: _____

_____
Responsible Authorized Person

NOTE: The disabled interlock shall be restored to normal operation as soon as practical, and all pertinent information documented in the MIRF platform Log book. (File in MIRF Platform Work Control Document notebook)