

Task Hazard Analysis (THA) Worksheet

(See [ES&H Manual Chapter 3210 Appendix T1](#)
[Work Planning, Control, and Authorization Procedure](#))

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For Word

| | | | | | |
|---|---|-----------------------|----------------|---------------------------------|-----------|
| Author: | | Date: | | Task #: If applicable | |
| Complete all information. Use as many sheets as necessary | | | | | |
| Task Title: | Hazard Analysis and Mitigation for LERF RF Operations - LCLS II | Task Location: | LERF | | |
| Division: | Accelerator | Department: | SRF Operations | Frequency of use: | As Needed |
| Lead Worker: | Joe Gubeli | | | | |
| Mitigation already in place: Standard Protecting Measures Work Control Documents | SAF143 | | | | |

| Sequence of Task Steps | Task Steps/Potential Hazards | Consequence Level | Probability Level | Risk Code (before mitigation) | Proposed Mitigation (Required for Risk Code >2) | Safety Procedures/ Practices/Controls/Training | Risk Code (after mitigation) |
|------------------------|--|-------------------|-------------------|----------------------------------|---|---|---------------------------------|
| | Cryomodule Installation/Removal | | | | | | |
| | Cryomodule Installation and Preparation for Testing: Hoist Failure while lifting the return U-tube into place | M | L | 2 | The hoist is rated for 5x the load. Hoist is load tested on an annual basis | <ul style="list-style-type: none"> SAF403 Overhead Crane Operator Qualification MED01 Medical Monitoring for Hazardous Work | 1 |
| | Excessive Noise Exposure | | | | | | |

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|----------------------------|---|--------------------------|--------------------------|---|---|---|--|
| | Cryomodule vacuum failure: <ul style="list-style-type: none"> • Implosion: puncture ear drum • Vacuum failure when cryomodule is full of cryogen will lead to cryogen release (refer to mitigation for oxygen deficiency) | H | L | 3 | <ul style="list-style-type: none"> • All vacuum windows are covered or contained in waveguide during normal operations. • All reliefs are located away from face level. | | 1 |
| Electrical Exposure | | | | | | | |
| | Cryomodule Installation and Preparation for Testing: Electric Shock Ion pump power supply Cold cathode gauge high voltage +/- 3kV at 5 mA | H | M | 4 | Only SHV connectors are used. This type of connector makes the ground connection first when plugging in and breaks it last when unplugging the connector | All voltage sources are “plug in “. Must unplug before servicing. Power-down procedures are in place. | 1 |
| | Cryomodule Installation and Preparation for Testing: Electric Shock Piezo element Power supply Up to 1 kV at 2 A. | H | M | 4 | Admin Lockout on power supply | SAF603 Electrical Safety Awareness | N |

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|------------------------|---|--------------------------|--------------------------|---|---|---|--|
| | Energizing 1500 MHz HPA 480 V Hazards Arc Flash from Disconnect | H | M | 4 | <ul style="list-style-type: none"> • Safety glasses • Hearing protection • Heavy duty leather glove • Long sleeve shirt and long pants both of a non-melting/non-flammable material | General Electrical Training <ul style="list-style-type: none"> • SAF603A Electrical Safety Awareness • SAF603N Basic NFPA-70E Training • SAF104 LOTO | 1 |
| | Magnetic Fields | | | | | | |
| | Static Magnetic Fields including: Fringe | H | L | 3 | | Training and administrative controls as specified in ES&H Manual Chapter 6420 Non-Ionizing Radiant Energy and specified in work control document | |
| | Static Magnetic Fields including: High | M | M | 3 | | Training and administrative controls as specified in ES&H Manual Chapter 6420 Non-Ionizing Radiant Energy and specified in work control document | |
| | Static Magnetic Fields including: Quench Effect | L | H | 3 | | Training and administrative controls as specified in ES&H Manual Chapter 6420 Non-Ionizing Radiant Energy and specified in work control document | |

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|---------------------------------|--|--------------------------|--------------------------|---|---|---|--|
| Non-ionizing Radiation | | | | | | | |
| | Non- Ionizing Radiation due to RF leakage from waveguide: RF burns, eye damage, tissue heating due to improperly assembled waveguide joints or component failure | M | M | 3 | <ul style="list-style-type: none"> • Bolt torque pattern (attached) to be followed for all waveguide connections upstream of the LOTO shutter located within the cave. • RF survey after assembly of joints upstream of the LOTO shutter located within the cave. • No personnel in cave during high power RF operations through the use of Personnel Safety Interlocks. | | 1 |
| | Non-ionizing Radiation-lasers (to incl. manufacture of lasers) | L | L | 1 | No Laser is being used during LCLS II Operations | Training and administrative controls as specified in ES&H Manual Chapter 6420 Non-Ionizing Radiant Energy | |
| Oxygen Deficiency Hazard | | | | | | | |

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| | Cold cryomodule ODH hazard Blocked egress due to equipment around cryomodule impedes evacuation during an ODH event | H | L | 3 | <ul style="list-style-type: none"> Staff advised via this OSP to maintain egress path around the cryomodule. Do not install equipment where egress path is compromised. | | 1 |
| | Cold cryomodule ODH hazard Pressure relief due to cryogenic failure | H | L | 3 | <ul style="list-style-type: none"> ODH Monitoring system turns on Static Vent Exhaust Fan. Non – vent penetrations sealed. | <ul style="list-style-type: none"> ODH assessment and rating of cave. ODH2 training required for all CMTF personnel. Personal escape packs and oxygen monitors required for ODH2 | 1 |
| | ODH Hazard in Control Room due to cryogenic failure in the Cave | M | L | 2 | Penetrations that connect the control room and the cave are sealed. | <ul style="list-style-type: none"> ODH Risk Assessment, LERF ODH training Required for LERF Personnel | 1 |
| | cryogenic gas leaks | H | L | 3 | | Training and administrative controls as specified in ES&H Manual Chapter 6550 Cryogenic Safety Program | |
| | cryogenic liquid leaks | H | L | 3 | | Training and administrative controls as specified in ES&H Manual Chapter 6550 Cryogenic Safety Program | |

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|------------------------|--|--------------------------|--------------------------|---|--|--|--|
| | Cryogenic materials - gas and liquids | H | L | 3 | | Training and administrative controls as specified in ES&H Manual Chapter 6550 Cryogenic Safety Program | |
| | Ionizing Radiation | | | | | | |
| | Ionizing Radiation Inherent hazard from operating high gradient cavities in vacuum. | H | H | 4 | <ul style="list-style-type: none"> • Shielding in place (including the roll up equipment doors). • Personnel Safety System ensures that high voltage is not permitted on the high power RF sources when the switching network permits the RF to enter the cave and the cave can be occupied. • Radiation surveys by trained staff or fixed monitoring equipment at turn on and at regular power increase intervals. • Area radiation monitors are interlocked to RF power. | Personnel excluded from the cave during high power ops (anything above 1W RF power delivered to input coupler of device under test). SAF800 GERT SAF801 Rad Worker I | 1 |
| | Occupational Radiation Exposure | H | M | 4 | | Follow ES&H Manual Chapter 6310 Protection from Ionizing Radiation | |

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|------------------------|---|--------------------------|--------------------------|---|---|---|--|
| | Storage and Handling of Radioactive Materials | H | L | 3 | | Radiation Worker Training requirements and ES&H Manual Chapter 6310 Protection from Ionizing Radiation implementation and specified in work control document. | |
| | Sources of Radiation: Prompt, Induced | H | M | 4 | | JLab Beam Containment and Access Control Policy. Safety Concern SC-2017-0926-2. Work control document specifying use of LERF Access Control System. | |
| | Emergency Response | | | | | | |
| | | | | | | Conduct of operations in work control document | |
| | RF | | | | | | |
| | | H | H | 4 | | Follow EH&S Manual Chapter 6420 Non-Ionizing Radiant Energy, waveguide pressure interlocks as defense-in-depth | |

Highest Risk Code before Mitigation:

4

Highest Risk Code after Mitigation:

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When completed, if the analysis indicates that the [Risk Code](#) before mitigation for any steps is “medium” or higher ($RC \geq 3$), then a formal [Work Control Document](#) (WCD) is developed for the task. Attach this completed Task Hazard Analysis Worksheet. Have the package reviewed and approved prior to beginning work. (See [ES&H Manual Chapter 3310 Operational Safety Procedure Program](#).)

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Form Revision Summary

Periodic Review – 08/13/15 – No changes per TPOC

Revision 0.1 – 06/19/12 - Triennial Review. Update to format.

Revision 0.0 – 10/05/09 – Written to document current laboratory operational procedure.

| ISSUING AUTHORITY | TECHNICAL POINT-OF-CONTACT | APPROVAL DATE | REVIEW DATE | REV. |
|-------------------|-------------------------------|---------------|-------------|------|
| ESH&Q Division | Harry Fanning | 08/13/15 | 08/13/18 | 0.1 |

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