Jefferson Lab
Thomas Jefferson National Accelerator Facility

Task Hazard Analysis (THA) Worksheet

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

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Author:	M. Poelker	Date:	February 11, 2019	Task #: If applicable	

Complete all information. Use as many sheets as necessary

Task Title:	QCM Operation at the Upgraded Injector Test Facility (UITF)	Task Location:	UITF, High Bay Area of Test Lab
Division:	Accelerator	Department: Center for Injectors and Sources	Frequency of use: Approximately three times per year
Lead Worker:	M. Poelker		

Mitigation already in place:
Standard Protecting Measures
Work Control Documents

Ionizing Radiation Engineered Controls

- Below 7' height inside Cave 1, the walls provide concrete shielding of at least 55". Above 7', the East wall thickness is 27"
- The ceiling in the keV section of UITF is made of concrete at least 30" thick. Iron plate 3" thick is placed below cable penetrations.
- The ceiling of MeV section of UITF is made of 22" concrete.
- The main entrance to UITF is a labyrinth with walls 36" concrete and ceiling 22" concrete.
- Lead shielding at the trenches, and a grating that prevents UITF access via the helium vent at Cave2 – these are credited controls
- During the QCM commissioning procedure, the valves on either side of the QCM will be closed, preventing field emitted electrons from leaving the QCM vacuum space
- The RF system can only be turned ON when UITF is swept and armed with Personnel Safety System (all doors are locked)

Oxygen Deficiency Hazard
An ODH assessment was performed that considers cryogenic nitrogen and helium, and gaseous nitrogen for the entire UITF enclosure and considering MeV beam production using the SRF ¼ cryomodule, and installation of the HDIce target. In this assessment, the UITF enclosure was assigned a rating of ODH0 for areas below 9'. Above 9' the enclosure is considered ODH1. During u-tube operations, the enclosure is considered ODH2. Signage clearly indicates these conditions. Fixed oxygen monitoring systems will be used to detect and alert for OHD conditions. Sensors are located in appropriate areas. The assessment can be found at: https://misportal.jlab.org/railsForms/oxygen_deficiency_reviews/74180/edit

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

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1	Exposure to Ionizing Radiation	M	M	3	See Mitigations already in place	A Personnel Safety System (PSS) has been designed and implemented to protect individuals from ionizing radiation during QCM commissioning with high power RF. Radiation Control Department has approved the UITF shielding and installed CARM radiation monitors outside the enclosure, that trip OFF the RF power when radiation levels exceed specified amounts. All shielding will be verified in place, in particular the Cave2 ceiling tiles that are designed to be removable. A sweep will be done prior to closing the UITF entrance door using the procedure referenced in the UITF OSP.	1
3	RF non-ionizing radiation	L	L	1	See Mitigations already in place	A Personnel Safety System (PSS) has been designed and implemented to protect individuals from non- ionizing radiation during operation of the buncher and the ¼ cryomodule. A sweep will be done prior to closing the UITF entrance door using the procedure referenced in the UITF OSP.	1

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4	ODH (GN2)	M	L	3	Restricted flow orifices and automatic valve closure at power outage	Personnel will exit UITF when ODH alarms sound. All personnel entering the area must have ODH1 training and follow procedures based on EH&S signage.	1
5	ODH (LHe and LN2)	M	M	3	UITF enclosure is designated as ODH 0 unless u-tubes are being removed or stabbed, and for people working on ladders at elevations > 9' (The OSP and THA will be revised when HDIce equipment is brought to the UITF enclosure)	The ¼ cryomodule has piping to vent gaseous helium through a hole in the wall to the high bay area, and a shroud to vent cryogenic gases upward and through penetrations in the Cave 1 roof, to the high bay area. On the roof of the cave there are 7' tall chimneys attached to two open penetrations that ensure that the released gases are well above the head level of any personnel working on the roof. The remaining penetrations used to pass cables are filled with foam to restrict the flow of gas to occupied areas. Cryo u-tube operations will be performed following the guidelines described in the OSP "CRY-15-54131-OSP Bayonet Installation and Removal"	1
6	Pressure / Vacuum	L	M	2	Category 2 vacuum system, QCM designed with appropriate relief system, required when cryogenic fluids are used	Review by Design Authority	1

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7	Material Handling as it relates to u-tube operation	L	M	2	A chain hoist attached to the Cave1 roof will be used to remove/stab the heavier return-side u-tubes	Review by Cryo Group	1
8	SF6	L	EL	1	Contents of gun HV power supply SF6 tank does not constitute ODH hazard. Pressure gauge on SF6 tank provides visible alarm when pressure falls to specified level Commercial SF6 transfer/recovery system	Equipment specific training when transferring SF6 from the High Voltage tank to the Dilo recovery system Access to the floor is restricted when ventilation fan inoperative, or when there is a known leak on the SF6 tank	1

Highest Risk Code before Mitigation:	3	**Highest Risk Code after Mitigation:**	1

When completed, if the analysis indicates that the Risk Code before mitigation for any steps is "medium" or higher (RC≥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 –

ISSUING AUTHORITY	TECHNICAL POINT-OF-CONTACT	APPROVAL DATE	REVIEW DATE	REV.
ESH&Q Division	Harry Fanning			

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