

## Experiment Safety Review Form

### Review Number: AD-008-2014-MAR-28

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LIFE NUMBER: P7673

<b>Project Title:</b> Transient Noise of MCT Detector Array due to 70 MeV electrons.
<b>Location(s):</b> 0820
<b>Area(s):</b> BEAMLINe #1

**SIGNATURES:**

<b>Principal Investigator:</b> Wousik Kim	<b>Date:</b>
<b>Experiment Review Coordinator:</b> Peter Cirnigliaro	<b>Date:</b> 4/21/2014
<b>Co-PI or Alternate Contact (s):</b> Kusche, Karl	<b>Date:</b>
<b>Review/Approval (ERC) Comments:</b> 04/21/2014 10:03 AM	
<b>Walkthrough Signature:</b>	<b>Date:</b>
<b>Next Annual Review Date:</b> 6/16/2015	
<b>FUA Change Required?</b> No	
<b>Fire Rescue Run Card Changes Required?</b> No	
<b>Has a NEPA Review been Performed for this Project?</b> Don't Know	
<b>Required Approvals (i.e., IACUC, IBC, etc.):</b>	
<b>Project Termination Acceptance Signature:</b>	
<b>Comments:</b>	<b>Date:</b>

## I. Define the Scope of the Work

### A. Description

The Mercury Cadmium Telluride (MCT) based detector is one of leading technologies to support critical science observations in the 0.4 to 5  $\mu\text{m}$  wavelength range. During space missions, energetic particles interact with the semiconductor detector material, deposit energies, and produce electron-hole pairs. This mechanism creates spurious transient noises within the MCT detector which will reduce the signal-to-noise ratio of the science measurement. Without a proper mitigation method, the image quality will be seriously degraded. Accurately quantifying the transient noise allows us to optimize the shielding configuration.

The MCT detector will be installed inside of a dewar maintained at liquid nitrogen temperature (77 K) in vacuum, to be positioned at the end of beamline #1. The ATF's 70 MeV electron beam will be directed through the end flange Be window, through an evacuated adapter pipe (to comply with ATF SAD air activation requirement) and normal to the detector through a thin plate. Roughly 40K pulses of 50 picoCoulombs each are required. The transient noise data will be compared with simulations.

**Equipment manuals or procedures that are controlled documents:**

None.

**B. Human Performance Factors**

Not applicable.

**C. Waste Minimization/Pollution Prevention**

No wastes will be generated.

**D. Materials Used /Waste Generated**

Materials Used	Disposal Method	Amount per Use	Amount per Year	Comments
Liquid Nitrogen	Fugitive	50.00 ltr	500.00 ltr	

**II. Identify and Analyze Hazards Associated with the Work**

The following hazards were identified:

**Physical Hazards:**

- Cryogenics (any substance or device capable of producing temperatures  $\leq 170\text{K}$ ) (Area: BEAMLINe #1)

**Chemical Hazards:**

- Storage or use of Beryllium or Beryllium articles. Attach [Beryllium Use Review Form](#) if checked. (Area: BEAMLINe #1)

**Ionizing and Non-ionizing Radiation Hazards:**

- None (Area: BEAMLINe #1)

**Biological Hazards:**

- None (Area: BEAMLINe #1)

**Offsite Work:**

- None (Area: BEAMLINe #1)

**Other Issues (Security, Notifications, Community, etc.):**

- None (Area: BEAMLINe #1)

**Significant Environmental Aspects**

- None (Area: BEAMLINe #1)

**III. Develop and Implement Hazard Controls and Assess Risk**

**A. Physical Hazards, Tasks and Controls**

Hazard, Default Controls, Task Specific Info	Risk Level
<p><b>Hazard:</b> Cryogenics (any substance or device capable of producing temperatures <math>\leq</math> 170K)</p> <hr/> <p><b>Default Controls:</b>            General Requirements:</p> <ul style="list-style-type: none"> <li>• Evaluate location oxygen deficiency</li> <li>• Store/transport only in approved containers (i.e. DOT/ASME or BNL LESHG)</li> <li>• Never pour from above chest level</li> <li>• PPE: Long Sleeve Shirt (or Lab Coat), long pants (or skirt covering ankles) and closed shoes</li> </ul> <p>Pressurized transfer to open (vented) container; Or-Pouring &gt; 5 liter volumes of LN2 between open containers:</p> <ul style="list-style-type: none"> <li>• Face shield along with either Safety Glasses (w/side shields) or Goggles</li> <li>• Gloves (Cryo or Heavy Leather)</li> </ul> <p>Pouring small (5 liters or less) volumes of LN2 between open containers:</p> <ul style="list-style-type: none"> <li>• Safety Goggles (face shield recommended if possible)</li> <li>• Gloves (Cryo or Heavy Leather)</li> </ul> <p>Work with samples immersed in LN2 in small (~1 liter) dewars:</p> <ul style="list-style-type: none"> <li>• Use Tongs (tools) to manipulate/handle cryogenic samples (do not touch with gloves)• Use insulated non-absorbent gloves with dexterity (cotton/nylon gloves under disposable nitrile gloves)</li> <li>• Safety Goggles</li> </ul> <hr/> <p><b>Task Specific Info:</b></p> <p>Initial dewar cool-down with LN2 (requires 50 liters) will be performed in 820 highbay. Total dewar volume for holding cryogenics is 9 liters. Only trained personnel wearing PPE will perform filling procedure.</p> <p>Dewar is IRLabs model HDL-10.</p>	Negligible (0-20)

**B. Chemical Hazards, Tasks and Controls**

Hazard, Default Controls, Task Specific Info	Risk Level
<p><b>Hazard:</b> Storage or use of Beryllium or Beryllium articles. Attach <a href="#">Beryllium Use Review Form</a> if checked.</p> <hr/> <p><b>Default Controls:</b>            Engineering Controls</p> <p>Administrative Controls</p> <ul style="list-style-type: none"> <li>• Complete the Beryllium Use Review Form.</li> <li>• Machining of beryllium prohibited</li> </ul> <p>Training:</p> <ul style="list-style-type: none"> <li>• Beryllium Use at BNL (TQ-BERYLLIUM1)</li> </ul> <p>PPE: Nitrile glove            Comply with the SBMS Subject Area: "Beryllium".</p> <hr/> <p><b>Task Specific Info:</b></p> <p>The 250 um thick Be window is mounted in a 2 3/4" Conflat flange, is not touched directly, is inspected for oxidation when in use, is stored in a sealed/labeled container when not in use. The window is never modified in any way, and falls under the definition of a "Be article" as per SBMS. If a window breaks, the ES&amp;H Coordinator and Industrial Hygiene will be notified to assist in cleanup and monitoring. BURF attached.</p>	Negligible (0-20)

**C. Environmental Hazards, Tasks and Controls (include on/off site transportation and products/services)**

None

**D. Radiation Hazards, Tasks and Controls**

None

**E. Biological Hazards, Tasks and Controls**

None

**F. Offsite Work Hazards, Tasks and Controls**

None

**G. Other Issues (Security, Notifications to Other Organizations, Community Involvement, etc.)**

None

**H. Recommended Exposure Monitoring**

- None (Area: BEAMLINER #1)

**Description or comments:****I. EPHA Determination**

Chemical Name	Quantity (lbs, gal)	Location (Bldg/Room#)
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**IV. Perform Work Within Controls****A. Recommended Training and Medical Surveillance Summary**

- ATF User JTA (GE-53A)

**B. Personnel Training, Qualification, and Authorization List**

Employee/Guest Name	Life/Guest#	Dept	Required Training Course(s)	Signed
Karl Kusche	19960	AD	(HP-OSH-025) [ EXPIRES: NEVER ] ATF User JTA (GE-53A) [ COURSE NOT FOUND ] (TQ-BERYLLIUM1) [ EXPIRES: 5/6/2015 ]	6/12/2014 3:24:42 PM
Mikhail Fedurin	23594	AD	ATF User JTA (GE-53A) [ COURSE NOT FOUND ]	
Wousik Kim	P7673	DB	ATF User JTA (GE-53A) [ COURSE NOT FOUND ]	
Elliott Liggett	P7771	DB	ATF User JTA (GE-53A) [ COURSE NOT FOUND ]	

**C. Emergency Procedures**

ATF linac operator will follow existing procedures for linac operations and local emergency plan. ATF linac operator acts as LEC.

**D. Transportation**

None

**E. Logistical Interactions**

None

**F. Termination/Decommissioning**

Items directly exposed to electron beam require activation check prior to release from experimental hall.

**V. Provide Feedback**

None

**VI. Attachments**

ALso, see BURF attached to existing experiment AD-007-2014-FEB-3.

**Attached Files:**

[Attachment for AD-008-2014 \(MCT\).docx](#)