Jefferson Lab Thomas Jefferson National Accelerator Facility	TITLE:	**ES&H Manual**

DOCUMENT ID:	**3310 Appendix T2** **Operational Safety Procedure Form**	Click for OSP/TOSP Instructions

Serial Number: PHY-11-047-OSP / PHY-11-016-OSP
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[X] **OSP** [ ] **TOSP**
***Attach the Task Hazard Analysis (THA) related to this procedure**

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Issue Date: 12/12/2011 **(No more than three years from Issue Date except TOSP which is three months from issue date)**		**Expiration Date:**	**12/12/2014**
Title:	**Hall A Tungsten Calorimeter Operation**		
Location:	HALL A		
Risk classification (See *ESH&Q Manual Chapter 3210 Appendix T3 Risk Code Assignment*.)		**Without mitigation measures (3 or 4):**	3
		With mitigation measures in place (0, 1, or 2):	1
Document Owner(s):	Alexandre Camsonne	**Date:**	11/11/2011

Supplemental Technical Validations:

Hazard Reviewed (per ES&H Manual 2410-T1):	**Subject Matter Experts Signature:**	**Date:**
Radiation Hazards	Pavel Degtiarenko or Keith Welch	12/14/11
GENERAL ETHICS (BERT MANZLAK)	Bert Manzlak	12-14-11

Approval Signatures:	**Print**	**Signature**	**Date:**
Division Safety Officer:	Javier Gomez (Acting)		12/14/11
Department or Group Head:	Robert Michaels		12/14/11
Safety Warden of Area:	John Segal		12/13/11
Other Approval(s):	Arne Freyberger		2011-12-13

Document History:

Revision:	Reason for revision or update:	Serial number of superseded document
1	First revision	1

Distribution: Copies to: affected area, authors, Division Safety Officer, ESH&Q Document Control
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1. Purpose of the Procedure

The purpose of this document is to describe how operate the tungsten calorimeter in Hall A .

2. Scope – include operations, people, and/or areas where procedure applies

The Hall A beam calorimeter is a device to precisely calibrate the beam current monitors, so that the integrated charge may be known to better than 1% precision at low currents around 1 μA. This is needed to measure precise cross sections even in this current range, for measurements such as in the low Q measurements of g2p and ep elastic scattering.

3. Description of the Facility: (include floor plans and layout of a typical experiment or operation)

The heart of the Hall A beam calorimeter is a tungsten-copper slug 16 cm in diameter and 16 cm long. The beam enters the calorimeter along its central, symmetry axis, and is stopped. The beam energy is almost entirely absorbed by the calorimeter around 0.4% of the energy escapes in the form of photons and neutrons. The measured temperature rise of the calorimeter determines the total energy absorbed. Using the beam energy, the total beam charge can be calculated, and the Hall A beam current monitors (BCMs) calibrated to agree.
The calorimeter slug has three positions. First, it may be out of the beam on a cooling plate. Second, it may be out of the beam off the cooling plate; this position is used to monitor the slug temperature for an extended period, to determine the energy deposited in an exposure. Third, it may be in the beam. If the slug is moved when beam is on, it will trip the beam.
The calorimeter was relocated in the Hall A beam line for the g2p experiment, from the center of the superharp girder to about a foot after the slow raster which is itself 2 feet apart from the usual Hall A fast raster. Controlling electronics are located on the floor directly below the calorimeter. In ordinary use, the equipment uses only low voltage, low power electronics.

4. Authority and Responsibility:

4.1 Who has authority to implement/terminate

John Segal / Ed Folts

4.2 Who is responsible for key tasks

Alexandre Camsonne

5. Who analyzes the special or unusual hazards (See ES&H Manual Chapter 3210 Appendix T1 Work Planning,

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Control, and Authorization Procedure)

Pavel Degtiarenko

6. Personal and environmental hazard controls including:

6.1 Shielding

6.2 Interlocks

Interlocked with Fast Shut Down system

6.3 Other

7. Monitoring systems

Temperature with RTDs

8. Ventilation

9. List of safety equipment (i.e: personal protective equipment or special tools)

10. Associated administrative procedures

Hall A Calorimeter beam delivery procedure

11. Operating guidelines

The detailed normal operations of the calorimeter are precisely defined in Accelerator Division Operational Procedures and Safety Protocols, included as appendices to this document. A calorimeter expert or other authorized person will be present for all initial commissioning operations.

- Normal operations

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- Turning Off The Calorimeter

The calorimeter is turned "off" by MCC moving it to the cooling plate position or to the out of beam and off cooling plate position. In these positions, the calorimeter temperature is monitored, and the cooling water system continues to operate. Turning off the water cooler system requires access to the Hall, and

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should only be done if the system will not be used for an extended time.

- Working on or Removing the Calorimeter

Since any exposure to beam makes the calorimeter radioactive, any work on the system subsequent to beam exposure must be coordinated with radcon. In particular, since the water in the cooler system might be activated, it should be treated as any potentially activated, contained water is treated.

12. Notification of Affected Personnel (How and Who)

Radiation Control Group if work on actual calorimeter

13. List of steps required to execute the procedure from start to finish.

1. Prerequisite
Current request must be less than 90% of Max Current I_{Limit} computed by the software.
2. Exposure time requested Δ_{tmax} must be less than maximum computed exposure time.
a. Determine beam delivery configuration by establishing requested current using the Hall A BCM and load golden orbit established during commissioning.
b. Secure beam to Hall A-Beam Sync/Close the Hall A slit.
c. Mask appropriate FSD
d. Enable Hall A Current lock
e. Disable Ramp Feature of Hall A Current Lock
f. Go to Empty target and set Fast and Slow Raster size to obtain 2mm × 2 mm surface at the calorimeter. Check with viewer.
g. Calculate current and time exposure limits using the following equations:

I_{Limit} (μA) =2500 (Watts) / E_{beam} (MeV)
Δ_{tmax}(s) =150, 000 J / (Ibeam (μA) · Ebeam (MeV)

2. Setup Procedure
a. Open Calorimeter Control Screen
b. Select the "In Beam" button on the Control Page
c. Verify that the Position Read back is "In Beam"
d. Unmask FSD masked in step 5 of the Prerequisites
e. Set/Verify Thermal Limit (50◦C)
f. Verify current limit has been entered into Max Juice and BLA system
g. Adjust target ion chamber as necessary to perform measurement
h. Set Timer with exposure time requested by hall.

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3. Exposure Procedure
The operator should manually discontinue beam delivery during this procedure
– If the current breaches the limit
– If any of the Resistive Temperature Devices (R. T. D.'s) reaches the thermal limit or fails. Note: The calorimeter will move to the cooling plate if piocha1 fails.
– When the countdown timer reaches zero
The current calibration software should send the limit to the BLA system and Max Juice
a. Establish beam to the calorimeter
p Software automatically starts timer. Timer should be paused for FSD trips.
b. Monitor current after establishing beam
4. Measurement Procedure
a. Secure beam to Hall A-Beam Sync/Close the Hall A slit.
b. Mask appropriate FSD
c. Select the "Equilibrate" button on the control screen
d. Verify position is "Equilibrate"
e. Unmask FSD and restore target ion chamber.
p Physics to Hall A may continue at this time.
5. Back Out procedure
a. Secure beam to Hall A-Beam, Sync/Close the Hall A slit.
b. Mask appropriate FSD
c. Select the "Cooling Plate" button on the control screen
d. Verify position is "Cooling Plate"
e. Unmask FSD
f. Make an e-log indicating that Hall A cal-cal measurement is complete or aborted

14. Back out procedures, i.e., steps necessary to restore the equipment/area to a safe level.

Move back to out of beam position

15. Special environmental control requirements:

Work on detector or disposal requires Radcon supervision

16. Environmental Impacts (See EMP-04 Project/Activity/Experiment Environmental Review

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17. Abatement Steps – Secondary Containment, or Special Packaging requirements
If detector is taken out it will have to be stored in a radiation area
18. Training requirements
Read and sign this OSP
19. Unusual/Emergency procedures e.g., Injury, Fire, Loss of power
20. Instrument calibration requirements, e.g., safety system/device recertification, RF probe calibration
21. Inspection schedules
22. References/Associated Documentation
23. List of Records Generated (Include Location / Review and Approved procedure)

Authorized/Trained Individuals

Print Name/Signature	Date
Alexandre Camsonne	
Arne Freyberger	
Mahmoud Ahmad	
Pengjia Zhu	

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Print Name/Signature	Date

ISSUING AUTHORITY	APPENDIX AUTHOR	APPROVAL DATE	EFFECTIVE DATE	EXPIRATION DATE	REV.	
ESH&Q Division	Harry Fanning	10/05/09	01/01/10	10/05012	0	

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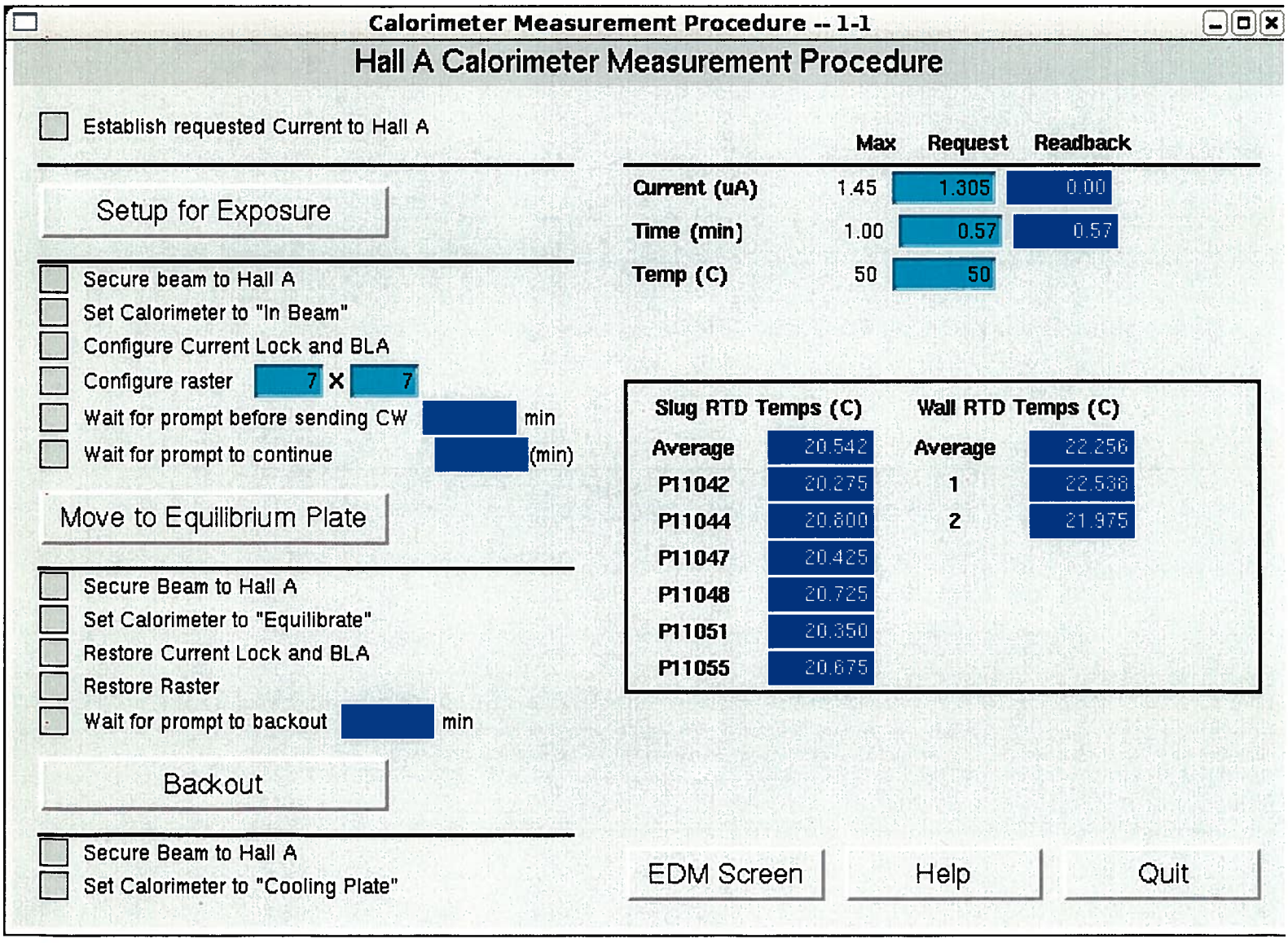
Calorimeter Measurement Procedure -- 1-1
Hall A Calorimeter Measurement Procedure
Establish requested Current to Hall A
Setup for Exposure
Secure beam to Hall A
Set Calorimeter to "In Beam"
Configure Current Lock and BLA
Configure raster
7
X
7
Wait for prompt before sending CW
min
Wait for prompt to continue
(min)
Move to Equilibrium Plate
Secure Beam to Hall A
Set Calorimeter to "Equilibrate"
Restore Current Lock and BLA
Restore Raster
Wait for prompt to backout
min
Backout
Secure Beam to Hall A
Set Calorimeter to "Cooling Plate"
Max
Request
Readback
Current (uA)
1.45
1.305
0.00
Time (min)
1.00
0.57
0.57
Temp (C)
50
50
Slug RTD Temps (C)
Average
20.542
P11042
20.275
P11044
20.600
P11047
20.425
P11048
20.725
P11051
20.350
P11055
20.675
Wall RTD Temps (C)
Average
22.256
1
22.538
2
21.975
EDM Screen
Help
Quit