



# TESTING OF THE EMCAL PbGI IN THE 1008 ASSEMBLY HALL

procedure name

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### Hand Processed Changes

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### Approvals

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REVISION CONTROL SHEET

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A	First Issue	6/15/1999	n/a	S. Bathe, W. Lenz, (1 unintelligible)	n/a
RETIRED	Test Completed	3/9/2007	n/a	D. Lynch, R. Pisani, P. Giannotti for PHENIX	D. Lynch

# Testing of the EMCal PbGl in the 1008 Assembly Hall

## 1.0 Purpose

The purpose of this document is to define the plan for limited operation of the PHENIX PbGl EMCal subsystem in the PEH (PHENIX Experimental Hall) assembling area, outside the collision hall. The limited PbGl operations will consist of several tasks. The primary task is to verify proper cabling and operation of the PbGl monitoring system located on the front surface of the PbGl, immediately following PbGl installation. The PbGl monitoring system will be inaccessible after installation of the ToF detector subsystem, and therefore must be tested prior to ToF installation. During the period prior to movement of the East Carriage into the PHENIX collision hall, tests of the PbGl high voltage system and Front-End readout electronics will also be performed.

This plan will ensure:

- A. the safety of all personnel ,
- B. the preservation and protection of the environment, and
- C. the preservation of BNL facilities and equipment.

## 2.0 Responsibilities

It is the responsibility of the Calorimeter Experts to maintain the PbGl Calorimeter subsystem in a safe operating condition. This includes:

- 2.1 operation of the PbGl monitoring system,
- 2.2 setting, adjusting, and checking the HV and LV power supplies,
- 2.3 posting any special instructions or notifications as required, and
- 2.4 carrying out any emergency actions.

## 3.0 Prerequisites

The Calorimeter Experts shall have training in the following areas:

- 3.1 RHIC Project Local Emergency Plan, RHIC-OPM 3.0,
- 3.2 BNL Electrical Safety I,
- 3.3 BNL Lock Out/Tag Out Authorized Training,
- 3.4 PHENIX Working at Heights (Fall Protection) Training,
- 3.5 PHENIX PbGl EMCal subsystem specific training,
- 3.6 geographical layout of the experimental area (routes of egress, location of emergency equipment, phones and controls)

The Calorimeter Experts shall train all PbGl personnel in the safe operation of the PbGl HV, LV, and monitoring systems.

## 4.0 Precautions

The safety of personnel is of primary importance. The Calorimeter Experts shall take great care to ensure that the PbGl subsystem will be operated in a way that does not place personnel or property at risk of physical harm.

### 4.1 *PbGl monitoring system*

The PbGl monitoring system consists of 384 individual reference systems mounted on the front surface of the 384 PbGl Supermodules. Each reference system comprises three LEDs, which provide reference light pulses when supplied with short voltage pulses, together with a photodiode and preamplifier to monitor the LED light intensity. The LED voltage pulsers and preamplifier power are supplied from modules located in the PHENIX electronics racks adjacent to the PbGl sectors. The preamplifiers operate with low power at +/-12V, and the photodiodes are biased at 40V with current limited to less than 50 milliamps. The same PbGl reference system and electronics was used during the period of 1994-1996 during operation of the PbGl system at CERN. Since the reference system voltages and currents are low, no special operation precautions are needed.

### 4.2 *HV system*

The High Voltage for the PbGl photomultipliers is generated on the active photomultiplier bases which are current limited to less than 7 milliamps per channel. All HV points are enclosed within the sector electronics enclosure in order to eliminate the danger to personnel. When the doors to the enclosures are closed, the HV points are inaccessible to personnel. Switching the HV on with the enclosure doors open is prevented by interlock switches directly wired to the interlock inputs of the PbGl HIVOC VME modules which request the demand HV, and to the 55V supplies which supply the voltage needed for generation of the HV on the bases. As a consequence – the HV system will not operate with any of the eight PbGl sector enclosure doors open.

### 4.3 *LV system*

The EMCal detector subsystems utilize high current low voltage (+/- 6V) power supplies to provide the power required to operate the Front-End Module (FEM) crates. This power is delivered from the LV power supplies located in the PHENIX electronics racks adjacent to the EMCal sectors and distributed to the FEM crates via fuse-protected terminal blocks installed on DIN-rails inside the sector enclosures. Because the voltage is low, the LV wires may stay energized while the doors are open to allow tests of the FEM crates.

### 4.4 *Work at heights*

The PbGl consists of two sectors, one located upon the other. The lower sector resides about 1.3m above ground level, the upper one about 3.8m.

During the testing of the PbGl monitoring system minor repair work might be necessary at the front plane of the sectors. In that case safe access will be provided by a manlift.

The PHENIX electronics racks adjacent to the sectors reside on platforms mounted at the East Carriage. These platforms also allow personnel to safely access the electronics racks.

Access to the rack platforms and to the back plane of the PbGl sectors will be provided by scaffolding.

## 5.0 Standard Operating Procedures

It is expected to operate all of the three systems of the PbGl detector in the PEH staging area prior to movement of the East Carriage into the PHENIX collision hall. The three systems are the PbGl

monitoring system, the PbGI HV system, and the PbGI FEM readout electronics. The three systems may be operated alone or simultaneously. Furthermore, each system may be operated in a partial configuration using only a portion of the PbGI detector. The output signals from the PbGI monitoring system and from the FEM readout system will at times be viewed directly with an oscilloscope for diagnostic purposes. Monitoring system data and FEM data will be acquired with the PHENIX data acquisition system, and possibly also with an approved small data acquisition system suitable for test measurements. Operation of any of these PbGI systems requires power, appropriate cooling, and appropriate safety interlocks to the PHENIX PbGI electronics racks located on the platforms adjacent to the PbGI sectors.

5.1 PbGI Monitoring System Operating Procedure:

- 5.1.1 Switch on preamplifier power and bias at preamplifier distribution box (from one to four boxes) located in PbGI electronics rack.
- 5.1.2 Switch on pulser fanout NIM crate (from one to eight crates) located in PbGI electronics rack.
- 5.1.3 Supply pulser signal to pulser fanouts. Pulser signal might be from NIM pulser module in special test setup, or from PHENIX programmable pulse module.
- 5.1.4 Readout photodiode with amplifier and ADC for special test setup, or with PHENIX FEM and data acquisition, or verify signals via oscilloscope.

5.2 HV System Operating Procedure: The HV ramp up rate is fixed by the HIVOC VME control modules and is not under user control. Also, the PbGI HV bases cannot generate more than 2000 Volts.

- 5.2.1 Check that PbGI sector smoke and temperature interlock systems are in operation.
- 5.2.2 Check that the HV interlock system is connected and that the PbGI sector doors are closed.
- 5.2.3 Turn on the key interlock at the PbGI +5V and +55V supply interface module. The voltage supply interface is located in the PbGI electronics racks.
- 5.2.4 Switch on voltage at the supply interface module to supply +5V and +55V to photomultipliers in proper sequence.
- 5.2.5 Check that the demand voltage for each photomultiplier is appropriate (<2000 volts).
- 5.2.6 Turn on HV via software control.
- 5.2.7 Verify that the actual voltages correspond to demand voltages.
- 5.2.8 Disable photomultiplier channels (set demand HV=0) which have bad readback voltages.
- 5.2.9 PbGI calorimeter is then operational.
- 5.2.10 Reverse procedure to turn off the PbGI HV system.

5.3 PbGI FEM System Operating Procedure:

- 5.3.1 Check that PbGI sector smoke and temperature interlock systems are in operation.
- 5.3.2 PbGI sector doors must remain closed when operating FEMs except for debugging purposes.
- 5.3.3 Switch on the Low Voltage power supplies located in the PbGI electronics racks.
- 5.3.4 Readout FEMs via PHENIX data acquisition system or with FEM mini-DACQ system.

## 6.0 Other Documentation

- 6.1 None.

## 7.0 References

- 7.1 RHIC-OPM 3.0, "Local Emergency Plan for the Relativistic Heavy Ion Collider Project."
- 7.2 BNL ES&H Health Standard, December 18, 1991.

- 7.3 BNL Occupational Health and Safety Guide (Interim).
- 7.4 PHENIX Emergency Plan

## 8.0 Appendix 1

### 8.1 Call list for the PbGI subsystem experts.

8.1.1	Terry Awes	x4279
8.1.2	Stefan Bathe	x7219
8.1.3	Sergei Belikov	
8.1.4	Damian Bucher	x7219
8.1.5	Henner Buesching	x7219
8.1.6	Sasha Nyanin	x3912
8.1.7	Paul Stankus	x4279
8.1.8	Sasha Vinogradov	x3912
8.1.9	Maxim Volkov	x3912