OPERATING ~~AND EMERGENCY~~ PROCEDURES FOR THE ENGINEERING RUN PbSc SUBSYSTEM OF THE PHENIX EMCal DETECTORS

procedure name

PHENIX Procedure No. PP-2.5.2.9-05

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PbSc EMCal in the PEH for the Engineering Run of 1999

1.0 Purpose

The purpose of this document is to define the plan for operation of the PHENIX PbSc EMCal subsystem in the PEH (PHENIX Experimental Hall) during the Engineering run of 1999. This plan will ensure:

A. the safety of all personnel from risks associated with the operation of the high voltage systems required to power PbSc EMCal supermodules in the columns 3 and 4 of the W0 Sector,
B. the implementation of the appropriate emergency approaches,
C. prompt notification of the appropriate RHIC and S&EP specialists,
D. the maintenance of appropriate RHIC emergency status,
E. the preservation and protection of the environment, and
F. the preservation of BNL facilities and equipment.

2.0 Responsibilities

During the ER, there will be two levels of responsibility for the oversight of the PbSc EMCal subsystem.

The first level of responsibility will be the PHENIX Shift Crew. Prior to data taking, there will be a period of calorimeter commissioning when calorimeter is tested at high voltage before the IR is closed and the calorimeter is inaccessible. During this commissioning phase the calorimeter HV&LV systems will be monitored by the team of Calorimeter Experts every eight hours, at 8:00, 16:00 and 24:00. A record of the performance of the calorimeter system will be kept by the Calorimeter Experts.

During data taking, it will be the responsibility of the PHENIX Shift Crew to:

2.1 Monitor the status and alarms for the EMCal HV system according to a prescribed check off list at least once a shift (eight hours).
2.2 In the event of an alarm or irregularity, contact an expert from the Expert Call List given in Appendix A.

The second level of responsibility is the Calorimeter Experts. It is the responsibility of the Calorimeter Experts to:

2.3 Maintain the PbSc Calorimeter subsystem in a safe operating condition. This includes:
2.3.1 setting, adjusting, and checking the Hv and LV power supplies,
2.3.2 setting, adjusting, and checking the Laser intensity,
2.3.3 posting any special instructions or notifications as required, and
2.3.4 carrying out any emergency actions, as prescribed in the Procedures section of this document.

3.0 Prerequisites

The Calorimeter Experts shall have read or 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 PbSc EMCal subsystem specific training,
3.5 PHENIX PbSc EMCal Laser awareness 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 personnel involved in the EMCal running in the safe operation of the EMCal HV&LV system.

4.0 Precautions

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

4.1 *HV system precautions*
The HV power supplies are current limited at less than 12 milliamp per channel. All HV points are enclosed within the sector electronics enclosure in order to eliminate the danger to personnel. When doors to the enclosures are closed the HV points are inaccessible to personnel. Switching HV on with enclosure doors open is prevented by the opened magnetic end-switched directly wired to the HV crate hardware interlocks. As a consequence – the HV system will not operate with any of the six enclosure doors open.

4.2 *LV system precautions*
PbSc EMCal utilizes high current low voltage (+/- 6V) power supplies to provide power required by FEM crates to operate. This power is delivered from the LV power supply rack to the detector and distributed among the crates via fuse-protected terminal blocks installed on the DIN-rails inside sector enclosure. Because the voltage is low, LV wires may stay energized while doors are open to allow test-work on FEM crates.

5.0 Standard Operating Procedures

5.1 HV System Procedures: In normal operations the experimental hall will be closed to personnel making access to any HV point impossible. Under such conditions, follow this procedure for turning on the HV:
5.1.1 Check that the appropriate current limits are in place for the power supply. The EMCal subsystem Operation manual includes hardcopies of the HV snap-shot files where the operating parameters of the HV settings are recorded. Included are the current limits, target voltages, ramp rates, operating voltages and currents, and trip tolerances.
5.1.2 Check that the target voltage for each HV output line is appropriate (<2000 volts).
5.1.3 Check that the ramp up rate for each HV supply is appropriate (<400 volts per step).
5.1.4 Check that the EMCal HV crate (which is common to both EMCal and Trigger scintillators) is ON.
5.1.5 Enable the HV channels which are connected to calorimeter. Enabling the channel will result in voltage ramp starting immediately. If any of the HV supplies trips, disable that channel until the reason for the trip is understood. Unfortunately EPICS response time is too slow to observe the current ramp. The only remedy available to shift personal in case of current trip is to

attempt voltage ramping once again (No more then ones!!!!) and call experts if run conditions call for calorimeter to be on and nobody of the EMCal crew of experts is around.
5.1.6 When reasons for HV trips are remediated, begin the procedure again from 5.5.1
5.1.7 When ramping is complete, verify that the operating currents are appropriate, as given in the operating log for each channel.
5.1.8 HV is ready for calorimeter testing.

5.2 HV System Procedures: Turning off high voltage to PbSc calorimeters:
5.2.1 Disable calorimeter channels and the system will automatically begin ramping down the HV.
5.2.2 Verify by the read back that the HV is off the system.

6.0 Documentation

6.1 None.

7.0 References

8.1 RHIC-OPM 3.0, "Local Emergency Plan for the Relativistic Heavy Ion Collider Project."
8.2 BNL ES&H Health Standard, December 18, 1991.
8.3 BNL Occupational Health and Safety Guide (Interim).

8.0 Appendix 1

8.1 Call list for the EMCal subsystem experts.

8.1.1	Sebastian White	x5488
8.1.2	Edouard Kistenev	x7502
8.1.3	Craig Woody	x2752
8.1.4	Sergei Belikov	
8.1.5	Evgeniy Melnikov	
8.1.6	Arthur Durum	

9.0 Appendix 2

HV settings for EMCal Sector W0 for Engineering Run 1999

SM #	SM Id	HV Group	E Range		
			5 GeV	16 GeV	80 GeV
0	41	1	1.356	1.211	1.036
		2	1.388	1.239	1.058
		3	1.402	1.251	1.07
1	53	1	1.369	1.225	1.051
		2	1.395	1.247	1.067
		3	1.625	1.454	1.248
2	43	1	1.62	1.45	1.243
		2	1.616	1.444	1.236
		3	1.581	1.418	1.22
3	42	1	1.584	1.419	1.219
		2	1.612	1.437	1.225
		3	1.578	1.412	1.211
4	54	1	1.553	1.39	1.192
		2	1.561	1.396	1.196
		3	1.546	1.383	1.185
5	49	1	1.541	1.377	1.178
		2	1.524	1.364	1.17
		3	1.521	1.359	1.164
6	50	1	1.521	1.359	1.163
		2	1.5	1.344	1.154
		3	1.505	1.345	1.152
7	47	1	1.507	1.348	1.155
		2	1.43	1.282	1.101
		3	1.5	1.342	1.15
8	51	1	1.494	1.339	1.15
		2	1.494	1.336	1.144
		3	1.497	1.337	1.144
9	37	1	1.499	1.343	1.152
		2	1.5	1.341	1.148
		3	1.498	1.339	1.146
10	46	1	1.488	1.331	1.141
		2	1.497	1.338	1.146
		3	1.478	1.322	1.133
11	38	1	1.499	1.34	1.149
		2	1.499	1.339	1.146
		3	1.493	1.334	1.142
12	48	1	1.459	1.305	1.118
		2	1.465	1.31	1.122
		3	1.458	1.302	1.112
13	52	1	1.457	1.3	1.11
		2	1.449	1.294	1.107
		3	1.442	1.288	1.103
14	45	1	1.42	1.271	1.09
		2	1.431	1.278	1.093
		3	1.425	1.275	1.094

15	44	1	1.386	1.25	1.084
		2	1.434	1.282	1.097
		3	1.553	1.401	1.216
16	30	1	1.456	1.3	1.111
		2	1.439	1.298	1.125
		3	1.54	1.39	1.206
17	26	1	1.511	1.363	1.182
		2	1.453	1.311	1.138
		3	1.473	1.329	1.154

10.0 Appendix 2

An example .snap file with HV settings for one particular HV-station connected to PbSc Supermodule W0_SM03

```
--- Start BURT header
Time:     May 1999
Login ID: phoncs (ONCS Group Account)
Eff  UID:
Group ID:
Comments: Changed header -- RR
Type:     Absolute
Directory $MY_ADL
Req File:
--- End BURT header
PBSC_W0_SM03_0.CEO 1 0.000000              // Channel enable Flag
PBSC_W0_SM03_0.CZO 1 10.000000             // Current dead-zone
PBSC_W0_SM03_0.TCO 1 -9000.000000          // Current trip limit
PBSC_W0_SM03_0.DVO 1 -1490.000000          // Set voltage
PBSC_W0_SM03_0.VZO 1 5.000000              // Voltage dead-zone
PBSC_W0_SM03_0.RUO 1 75.000000             // Rump-up voltage (V/sec)
PBSC_W0_SM03_0.RDO 1 75.000000             // Rump-down voltage (V/sec)
PBSC_W0_SM03_1.CEO 1 0.000000
PBSC_W0_SM03_1.CZO 1 10.000000
PBSC_W0_SM03_1.TCO 1 -9000.000000
PBSC_W0_SM03_1.DVO 1 -1505.000000
PBSC_W0_SM03_1.VZO 1 5.000000
PBSC_W0_SM03_1.RUO 1 75.000000
PBSC_W0_SM03_1.RDO 1 75.000000
PBSC_W0_SM03_2.CEO 1 0.000000
PBSC_W0_SM03_2.CZO 1 10.000000
PBSC_W0_SM03_2.TCO 1 -9000.000000
PBSC_W0_SM03_2.DVO 1 -1515.000000
PBSC_W0_SM03_2.VZO 1 5.000000
PBSC_W0_SM03_2.RUO 1 75.000000
PBSC_W0_SM03_2.RDO 1 75.000000
```

PHENIX PbSc EMCal subsystem for Engineering Run 1999

Version 1.1

Edouard Kistenev
BNL

Revisions: None

Purpose

The purpose of this document is to describe the PHENIX PbSc EMCal subsystem as used in the Engineering Run 1999 in building 1008A (PHENIX Counting House) and 1008 (PHENIX Experimental Hall).

Elements of the Setup

1. PbSc Calorimeters

The PHENIX PbSc calorimeters are constructed of individual structurally independent supermodules held together inside the common load-bearing frames. Each calorimeter comprises 18 supermodules forming 3(high)x6(wide) solid matrix. This matrix of 18 supermodules is commonly identified as a PHENIX PbSc Sector.
Each PbSc supermodule is built of 36 modules (see ..\..\construction\module.ps), each module consists of four optically independent readout towers packaged together using thin stainless steel plates tack-welded to the front and back plates.
Each readout tower is viewed with PM115M Russian-made photomultiplier coupled to the bundle of penetrating wave shifting fibers. The range of High Voltages used to operate the photomultipliers is 1-2 kV (see ..\..\..\emcal\photoreadout\hv_system.doc). The potentials are distributed to the photomultiplier dynods via passive resistive voltage divider (see ..\..\..\emcal\photoreadout\q-bases\postscript\emc-tube-base-A.ps).

2. PbSc EMCal configuration for Engineering Run 1999

2.1 Calorimeter

The calorimeter configuration approved for Engineering Run 1999 includes

- PbSc supermodules in the columns 3&4 of the PbSc sector W0;
- Two wide area scintillation counters (to track beam-like penetrating particles) installed on the north/south faces of the W0 sector.

2.2 Electronics

The following electronics equipment is needed for the operation of the PbSc EMCal during engineering run of 1999

- Two crates of the PHENIX custom made electronics (installed directly on the W0 sector);
- One HV crate with 3 LeCroy ???? and 1 LeCroy ????? HV power supply stations;
- One LV crate with power supply stations providing power to electronics inside sector enclosure;
- PHENIX DAQ;
- Standard NIM logic to build coincidence between scintillation counters.

2.3 Other equipment

- N2 Laser in the laser room (1008A);
- YAG Laser in the Laser room (1008A)