Relativistic Heavy Ion Collider

Brookhaven National Laboratory

RHIC/AP/167

Subject: **The ZCAL conceptual design review, Oct. 2 98**

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1 The Committee

The members of the committee are marked with a (*) in the lines above.

2 Agenda

The design review was held to discuss the status of the ZCAL[1] project and to present its employment as an accelerator diagnosis tool in RHIC. In addition safety issues have been addressed. The following topics were presented at the review:

	Topic	Speaker
1.	Project Overview	S.White
2.	Construction of the ZCAL	M.Murray
3.	Installation in RHIC	G.McIntyre
4.	PMT selection and readout scheme	E.Garcia
5.	RHIC Interface and HV control	A.Drees

[1] Zero Degree Calorimeter

3 The Topics

The copies of the transparencies are attached to the minutes and are referred to as [1] to [5].

3.1 Project Overview

The ZCAL consists of two detectors at either side of each experiment (BRAHMS, STAR, PHENIX, PHOBOS), about 20 m downstream and upstream from the interaction point respectively. The devices are placed between the blue and yellow beam pipes in the warm section between the DX and the D0 magnets. One detector is composed of three modules, each containing 27 tungsten plates, 26 optical fiber ribbons and one photo tube mounted at the top of each module for readout. All detectors are supposed to be identical. A project overview, the design of the ZCAL and test beam results from first proto types are presented in [6]. The item outlined during the review can be found in [1]. Items being discussed during the presentations were:

- The ZCAL is not designed for pp or uneven (pAu) collisions although geometrically possible.
- The energy resolution of the calorimeter has been successfully tested at CERN at two energies, 100 GeV and 160 GeV.
- The energy resolution does not change when the detector is extended from 3 to 4 modules (each having 2 interaction lengths).

The following installation schedule was agreed to:

- Two detectors will be installed at BRAHMS by end of Feb. 99.
- The six other detectors will be in place by end of May 99.

3.2 Construction of the ZCAL

Copies of the presented transparencies [2] are attached to the minutes. The safety issues concerning the weight of the modules and the lifting eyes were discussed during this presentation and are summarized in [7]. The appropriate action items are listed there as well.

3.3 Installation in RHIC

The copies of the transparencies [3] are enclosed. Each of the ZCAL modules has 6 alignment fiducials. The longitudinal position of the detectors is not a crucial issue and the requirements for the alignment are loose ($\mathcal{O}$(mm)). These

requirements will be easily met by the standard RHIC survey procedures. The detector stand design has started and will be done in close collaboration of W. Christie and Gary McIntyre. No problems are expected from this point.

3.4 PMT selection and readout scheme

Two options for photo tubes were discussed: XP2262B and RCA 8575. Two of each type were tested in a test setup. Results can be found in the copies of the transparencies [4]. The preferred type is RCA 8575. Texas A&M University has at least 12 tubes of this type available [2] and most likely enough to equip all IRs. A minimum of 24 tubes is needed plus a reasonable number of spares. The sample going to be used will be tested during January and February 1999. Drawings of the bases should be sent to Asher Etkin.

Three experiments agreed on a readout scheme[2], which can be found in [4]. These experiments are: BRAHMS, PHENIX and PHOBOS. The analog signals from the photo tubes will be transformed into 3 logical signals: single rates from either side and a coincidence rate. The electronics needed for that are under the responsibility of the experiments and will be transferred to RHIC controls. STAR will split the analog signal at the photo tubes[3] and not provide any logical signal to RHIC. The expected single beam neutron emission rate is about a factor of 10 higher than the coincident rate. The correlated signal is expected to be $\leq$ 10 kHz.

3.5 RHIC Interface and HV control

Copies of the transparencies [5] are attached. RHIC requests relative luminosities only. Responsibilities for the ZCAL project will be shared between the experiments and the RHIC accelerator division as follows:

- The experiments are in charge of the ZCAL maintenance, spares and any technical problem.
- The experiments are calibrating the HV settings of the PMTs. They have to notify the RHIC control room about any change in the HV settings.
- In case of solution A experimenters are fully responsible for adjusting and tuning the readout electronics.
- In case of solution A the experiments are obliged to make the logical signals (i.e. input for the scalers) available to RHIC at any requested time.

[2] solution A
[3] solution B

- RHIC provides the HV power supply and control. The HV control supports restricted access to the HV calibration and enforces the notification to the control room.
- RHIC provides the scaler including software and control.
- In case of solution B RHIC has to supply and adjust its own electronic readout chain.

The ZCAL working group agreed on a list of responsibles (see table 1) and a plan for the detector installation and maintenance beginning of this year [8]. The list of contact persons or responsibles respectively, which can be found in [8], still applies while the readout scheme chosen by the particular experiment changed in 2 cases, BRAHMS and PHOBOS, compared to [8]. While

Exp.	contact	scheme	PS		scaler	
			location	cabling	location	cabling
BRAHMS	M. Murray	A	trailer	exp.	trailer	exp.
STAR	W. Christie	B	1006 B	RHIC	1006 B	RHIC
PHENIX	S. White	A	1008 B	RHIC	ctrl. room	exp.
PHOBOS	E. Garcia	A	trailer	exp.	trailer	exp.
RHIC	A. Drees					

Table 1: *List of electronic locations and responsibles for the ZCAL project. The notation for the scheme refers to the memo [8].*

in three cases (BRAHMS, STAR, PHOBOS) the location of the power supply and the RHIC scaler is the same, this is different for PHENIX. The committee was concerned about the formation of severe ground loop problems due to the power supply being installed in the service building and the scaler being installed in the counting room. This problem has to be investigated by the PHENIX experiment and S. White. The STAR experiment requires an electrically isolated split for the analog signals from the ZCAL detector. The particular device which might be selected has still to be approved and confirmed by Hank Crawford. The logic transforming the analog signal into countable rates has to be applied by A. Drees. This crate will be located in the service building 1006B.

4 Action Items

- The responsibilities in the ZCAL project have to be made transparent to everybody involved. Details are outlined in the section above in this

memo.

- The RHIC installation group has to agree on all installation details.
- Define cable routes for HV and signal cables for each location with particular attention to ground loops.

5 Safety Issues

Safety issues are summarized in the safety subcommittee minutes [7] and are attached to this memo.

6 Conclusion

No further review meetings are necessary provided that the the action items listed above are resolved. The RHIC installation group does not see any particular problems with the ZCAL design. A list of names and responsibilities is available, but details should be worked out and made public. The experiments are in charge of the ground loop investigations.

References

[1] S. White, copies of transparencies, RHIC Zero Degree Calorimeter Review, Oct. 2 1998.

[2] M. Murray, copies of transparencies, Oct. 2 1998.

[3] G. McIntyre, copies of transparencies, "Installation outline", Oct. 2 1998.

[4] E. Garcia, copies of transparencies, "Photomultiplier tubes and readout", Oct. 2 1998.

[5] A. Drees, copies of transparencies, "ZCAL-RHIC interface", Oct. 2 1998.

[6] The ZCAL working Group, "Zero Degree Calorimeters for RHIC", http://www.rhic.bnl.gov/s̃white/proposal.ps, Apr. 21, 1998.

[7] Y. Makdisi, "Minutes of the RHIC Experiment Safety Subcommittee meeting", Oct. 2 1998.

[8] A. Drees, http://www.rhichome.bnl.gov/People/drees/, "A RHIC ZCAL interface proposal", Feb. 12, 1998.