

# Status of Zero Degree Calorimeters

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September 9, 1999

## Abstract

The ZDCs worked during the summer run and are ready for beam in December, once they are repositioned. The HV supplies will be replaced soon. It is important that a first look at the data taken this summer should be done at Texas and the Monte Carlo ported to GBRAHMS.

## 1 Performance

Figure 1 on page 2 shows an ADC spectrum obtained from the right ZDC. It would appear that 3 or 4 11GeV neutrons are hitting the calorimeter for some events.

- What was checked out and working properly.

The connections for each ADC and HV were checked. The software for controlling the HV was written by Angelika Drees and worked well. The ZDC was able to see the beam in each ring and give a measure of its intensity to the RHIC controls group.

- Problems with detector and operations.

When there had been no beam for several days the discriminators of both calorimeters fired at  $\approx 5$ /minute due to cosmics. However the calorimeters showed some activation during after beam and the “no beam” rate of ZDC triggers would increase by up to factor of 10 for the calorimeter that had seen the beam.

- Status of remote control, identification of problems.

The HV control works reasonably well. Everything else can be done in the FE Hut or the counting room.

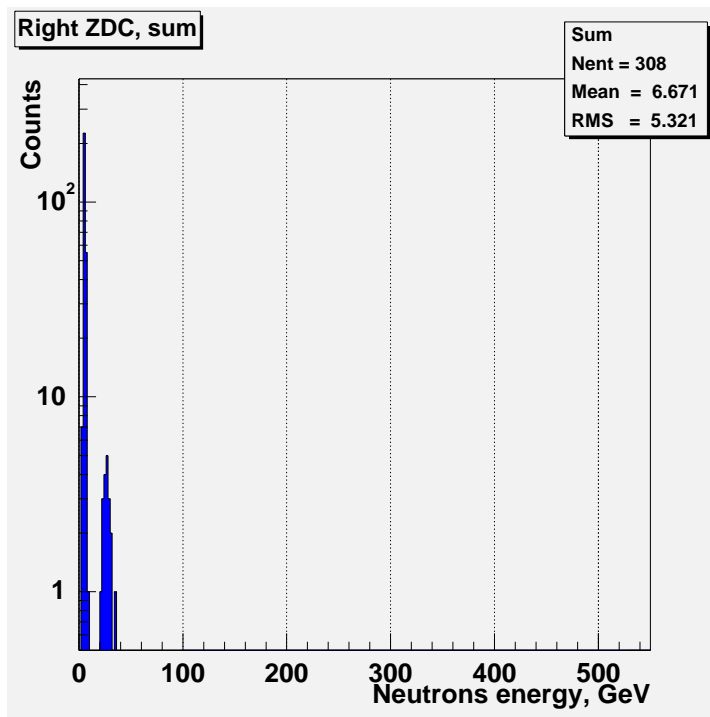


Figure 1: Right ZDC ADC distribution. The beam energy was 11GeV/A

## 2 Preparations for November Running

The HV supplies will be replaced and a new TDC should be installed. Gary McIntyre will reinstall the modules before close up. Ideally scintillators should be installed to tag muons.

- Work that is needed for detector.

The detectors are basically ready to run in November. Angelika Drees will install new high voltage supplies in before the end of September.

- Modifications.

No modifications are planned at this time. The TDCs were set to be 100ps/channel. This allowed us to see events in which the beam went through the blue and yellow calorimeters.

- Completion of construction, installation. Manpower, schedule.

Construction and installation are complete. However the ZDCs were dismantled and placed on the floor at the end of the run to allow for the baking out of the DX magnet. Their reinstallation should be scheduled with Gary McIntyre in November. It takes about 1/2 an hour.

- Needed and desirable upgrades/changes.

Ideally two small scintillators would be added front and back to tag muons. This would be a very nice calibration.

- Required additional hardware etc.

The most important hardware addition for the ZDC is to get the RHIC V124 modules working correctly. Currently we still have prototypes. When beam lifetimes are of order 1 minute we can time in the "bucket 1" counter in order to know when we should expect beam. To monitor the long term stability of the ZDC it would be useful to have a few percent of random and pulser triggers in each run. Ideally the TDC should have a wide enough range to see events that hit both ZDCs, ie 96ns apart and have a bin size small compared to the resolution. The Phillips 7186 TDC meets these requirements. It has 4000 channels and if set at 50ps/channel would give a range of 200ns.

### 3 Documentation

Some documentation already exists on the web, [1]. Also a NIM paper is being prepared by the ZDC group. Michael and Andrei will publish "ZDCs for Dummies" by mid-october.

- Drawings and specifications

Dana and Yosif Makdisi both have complete sets of drawings.

- Operating procedures.

The high voltage is controlled by a GUI on the RHIC x-terminal in the counting room. One can set the high voltage for each module by hand or load a file. Currently there are two files, in .../brahms/config, regular.hv ( $\approx 1450V$ ) and decreased.hv ( $\approx 800V$ ). The first is used when the beam is relatively stable and the second the the ZDC is being hit by a lot of beam.

- Safety approval status.

Yosif Makdisi has approved the ZDC for operation. One point is that no one in BRAHMS has the right to access the left ZDC since it is behind a gate. It would be helpful if a few members of BRAHMS were allowed to go up to the left ZDC.

- **Monitoring and other software**

There exist two monitoring programmes: One written by Kris runs under BRAT, like other tasks it tends to hang for some reason; a second written by Andrei is a standalone programme. It hangs much less often. Both programmes would benefit by showing a correlation of beam-beam and ZDC and multiplicity and beam-beam.

Michael has to finish porting the ZDC monte-carlo to run under GBRAHMS. Andrei will write a module to do a TDC clock calibration. He will analyse special runs in which a precision delay was used to generate spikes in the TDC spectrum exactly 10ns apart. This will also be useful for the Beam-Beam and multiplicity counters.

## 4 **C**onclusions

The ZDCs are basically ready for beam in December. The existing runs should be analysed offline. Events in which both ZDCs are hit allow us to calibrate the different cable delays in the left and right ZDCs and so should allow us to deduce a z positions of the vertex when we get real collisions. An urgent task is to work with the other global detector groups to derive ways of deciding when we have good interactions and ultimately to look at physics.

## References

- [1] [www.rhich.bnl.gov/~swhite/zcal/index.htm](http://www.rhich.bnl.gov/~swhite/zcal/index.htm)