Gas Tracking Detectors Working Group

RHIC Detector Workshop, BNL, November 13-14, 2001

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1 General guidelines

For each proposed new detector, this working group shall try to address the following questions:

- What physics topic does the new detector address?
- What are the system specifications to perform that physics?
- What is/are the technological choices?
- Is there need for an R&D phase? If yes:
  - What are the goals of the R&D?
  - Give an estimate of the time and cost of the R&D phase
- Give an estimate of the time table and cost for the implementation of the new detector
- Does the new detector or its associated physics have any impact on the collider? For example any special requirement on beam intensity or integral luminosity? Or can the proposed new detector cope with an increase of the RHIC luminosity by one order of magnitude?
- How does the proposed detector fit into the existing experiment that it will be used for? What is the additional data volume of the new detector? Does it impact on the DAQ?

A similar set of questions will be asked concerning the front-end electronics:

- What are the system specifications for the front-end electronics?
- Is there need for an R&D or prototyping phase? If yes:

  - What are the goals of the R&D?
  - Give an estimate of the time and cost of the R&D phase

- Give an estimate of the time table and cost for construction, test and installation of the front-end electronics

2 Proposed New Detectors

So far this working group is considering two new detectors:

1. Hadron Blind Detector

This detector is proposed by the PHENIX Collaboration. The main goal is to allow the measurement of low-mass electron-positron pairs. The detector should provide excellent electron identification close to the vertex to allow recognition of the overwhelming yield of pairs from π^o Dalitz decay and γ conversions with the highest efficiency possible, thereby suppressing the combinatorial background which hinders such a measurement with the present PHENIX configuration.

Preliminary studies on this detector are at a relatively advanced stage. Answers exist to many of the basic questions listed above. In particular there are detailed Monte Carlo simulations at the principle level which lead to definition of the system specifications. Possible realizations of this detector have been considered. In particular various options of the key elements (gases, detector configuration and readout chambers) have been analyzed. The choice that emerges is a windowless Cherenkov detector, operated with pure CF_4 in a special proximity focus configuration, with CsI photocathode and GEM readout chambers. A number of questions and issues are uncertain and those form the basis for a comprehensive R&D programme. All this is documented and summarized in the PHENIX Technical Note 391.0: "Proposal for a Hadron Blind Detector for PHENIX" which can be found at :
http://www.phenix.bnl.gov/phenix/WWW/forms/info/view.html

2. Inner TPC

Both STAR and PHENIX have an interest in a small TPC located close to the vertex, extending radially out to 50-60 cm from the beam axis. Such a TPC could operate at high rates and allow to track particles down to very low momentum.

The TPC is also been considered for the measurement of low-mass electron-positron pairs. A key question is whether such a TPC could be an alternative to the HBD. If not, could the TPC help the HBD by providing addtional rejection?

This project is at a much earlier stage of development compared to the HBD and much work is needed to answer the questions listed above.

A very interesting and challenging idea that is also being considered is to couple the HBD and the TPC into one single detector.

3 List of Interested People

In preparation.
If you are interested to participate in, contribute to the work of, or make a presentation to, this working group please send e-mail to the convenor.

4 Agenda

Tuesday Nov. 13
17:00 – 18:30
In preparation

Wednesday Nov. 14
9:30 – 13:00
In preparation