Progress Report on the Design of the RHIC Pion Inclusive Polarimeter

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- Existing data (D.L. Adams et al., PL *B264*, 462 (1991) and W.H. Dragoset et al., PR *D18*, 3939 (1978) and preliminary data from BNL E925) suggest sizeable π^+ inclusive asymmetries at large x_F. Both $\vec{p}p$ and $\vec{p}C$ reactions show these asymmetries.
- A revised pion inclusive polarimeter design is required by financial limitations. A carbon ribbon target, five dipole magnets, and scintillator hodoscopes will be used. The first three magnets will move for different beam momenta.
- The polarimeter design will cover beam momenta in the range 23 - 100 GeV/c, $x_F \geq 0.5$, and $P_T \geq 0.7$ GeV/c.
- It is suggested to record all scaler data for each bunch in both beams for use by RHIC experiments.
- The schedule is tight to complete the installation of the polarimeter hardware. The first polarized beam runs are expected to occur after Oct. 1999, but hardware from BNL E925 will not be available until after Feb. 1999.

Components of the Pion Inclusive

Polarimeter

- Carbon Ribbon Target.
  5 - 10 μgm/cm^2 0.02 mm wide
  plus a thin window in the vacuum box for pions to exit

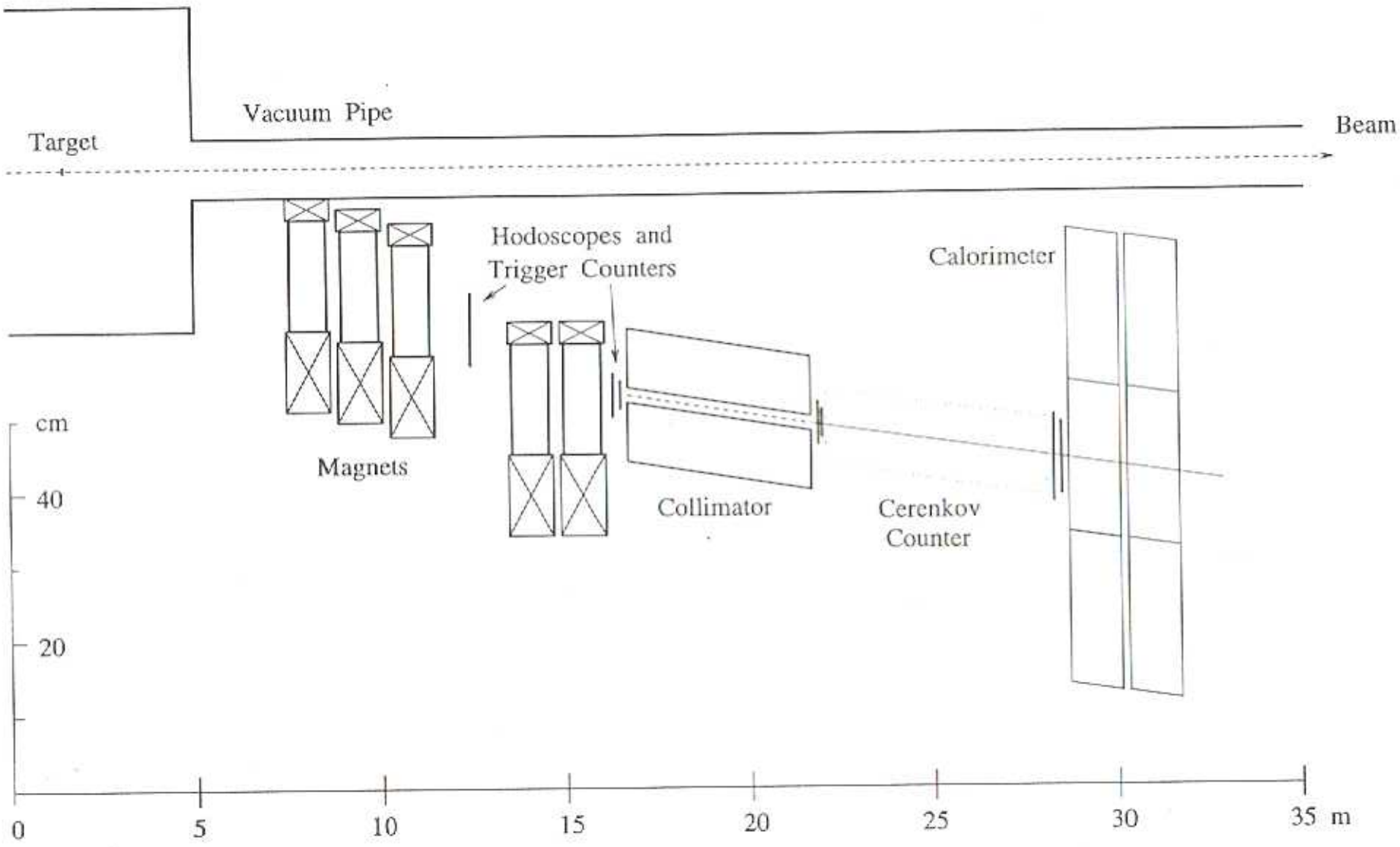
- Five Dipole Magnets.
  first three are movable, others are fixed

- Four Scintillator Hodoscopes.
  modified from BNL E925 and FNAL E704
  6 mm wide scintillators and 2 mm wide segments

#1	X plane	8-10 cm × 4 cm
#2	X,Y planes	3-4 cm × 5 cm
#3	X,Y planes	3-4 cm × 7 cm
#4	X,Y planes	10 cm × 10 cm

perhaps U and/or V planes in one or more hodoscopes

- ~5 m Long Collimator.
- Three Trigger Scintillators Near Hodoscopes #2-4.
- Optional Cerenkov Counter.
  to identify pions from kaons and protons
- Hadron Calorimeter.
  (borrow existing modules?)
- Luminosity Monitor Telescopes.
  (three small scintiliation counters per telescope, mounted above and below the beam looking at the carbon ribbon target)
- Cables, HVPS, Electronics.
- Data Acquisition Hardware.
  including computer and associated software


Vacuum Pipe
Target
Beam
Hodoscopes and
Trigger Counters
Calorimeter
cm
40
20
Magnets
Collimator
Cerenkov
Counter
0
5
10
15
20
25
30
35 m

Suggested Information Available

to RHIC Experiments

It is suggested to record in a file the following scalers for *each bunch and beam* whenever a polarimeter measurement is made:

- Luminosity monitor coincidences and accidentals.
- Coincidences and accidentals for each polarimeter arm.
- Duration of the measurement.

From this information, the expected average product of beam polarizations at each RHIC detector, weighted by the luminoisities measured at the polarimeters, can be calculated and made available. However, each experiment may wish to calculate this product using luminosities measured in their intersection region or eliminating data from certain bunches. The data recorded in the file should allow such a calculation.

Schedule

The short-term schedule is:

- Feb. 1999 E925 run with liquid hydrogen
- Mar., April 1999 install some polarimeter hardware
- Mar.–Aug. 1999 modify E925 hodoscopes
- Aug., Sept. 1999 install additional polarimeter hardware
- after Oct. 1999 first polarized runs in one beam

After the first polarized runs, the polarimeter performance will need to be evaluated and perhaps changes or improvements made. A polarimeter in the other beam will need to be constructed before the first data taking with both beams polarized.

perhaps put down survey lines, install cables late 1998