# STAR readiness for $\vec{p}-\vec{p}$ running

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The status of the STAR experiment concerning its readiness for polarized proton collisions is presented. The goals of STAR Spin for the first year of $\vec{p}-\vec{p}$ running include: to commission the accelerator and detectors for $\vec{p}-\vec{p}$ collisions, to measure spin asymmetries for the first time in a $\vec{p}-\vec{p}$ collider, to understand the limiting systematic uncertainties for the measurement of $A_{LL}$, and to collect 'minimum-bias' $p-p$ events for the use of the STAR heavy ion physics program. The primary focus of STAR Spin for this year is to measure single-spin transverse asymmetries, in particular one which is expected to be non-zero, namely, the inclusive production of $\pi^0$ mesons at low-$p_T$ and moderate $x_F$, concurrent with a single-spin asymmetry which is expected to be small, that is, the production of leading $h^{\pm}$ at high-$p_T$ and mid-rapidity.

One of the major efforts in recent months has been the installation and commissioning of the Forward Pion Detector (FPD), which detects daughter photons from the decay of $\pi^0$ mesons. The commissioning of the FPD with $Au-Au$ collisions so far has met with reasonable success. With cuts on the timing information from the STAR ZDC's, the data suggest that a significant fraction of the events seen at the FPD come from collisions at the STAR interaction region. This conclusion is further bolstered by the changes in the scaler rates observed in the detector during a van der Meer scan of the beams. A portion of these events exhibit features in the detector which, from simulation, are expected from highly energetic $\pi^0$ mesons.

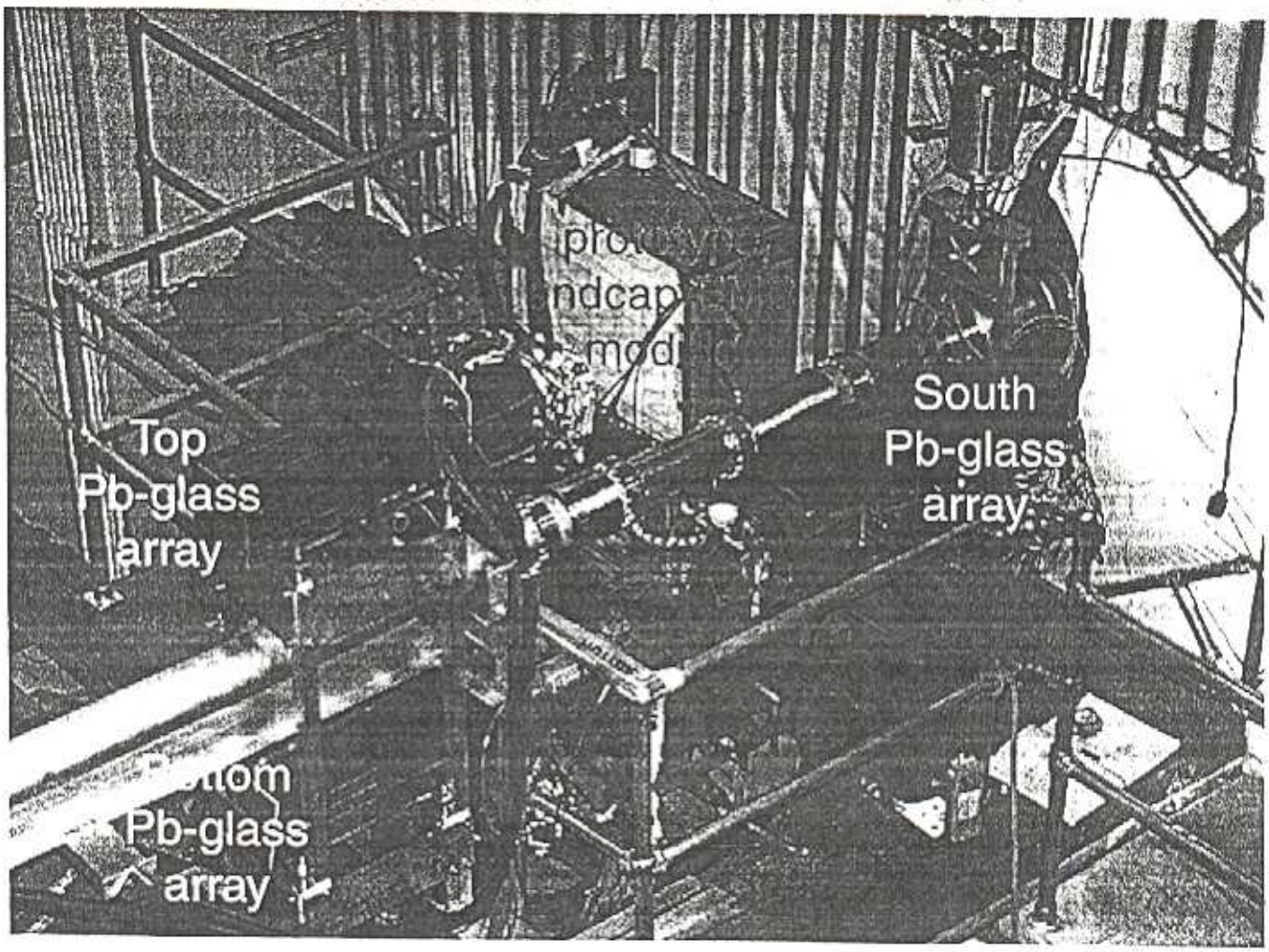
The Beam-Beam Counters (BBC) are currently under construction, and are expected to be installed during the shutdown just prior to the $\vec{p}-\vec{p}$ run. The BBC's will measure the rate of double-diffractive scattering events by detecting multiple MIP's coincident east and west of the STAR interaction region, and will be used to measure the relative luminosity between beam-crossings with different orientations of the polarization vectors.

The Barrel Electromagnetic Calorimeter (EMC) is currently being commissioned with $Au-Au$ collisions. The Barrel EMC will be used, amongst other things, for calorimetry in the measurement of inclusive $h^{\pm}$ at high-$p_T$ and mid-rapidity.

In addition to these detector subsystems, there has been work in development of the triggers that will be used for $\vec{p}-\vec{p}$ running. The largest open question is the bandwidth which will be devoted to each trigger type, and is currently under discussion within STAR. There has also been software development on the STAR spin-sorting database, which contains beam and detector information necessary for asymmetry analyses.

# Forward Pi0 Detector

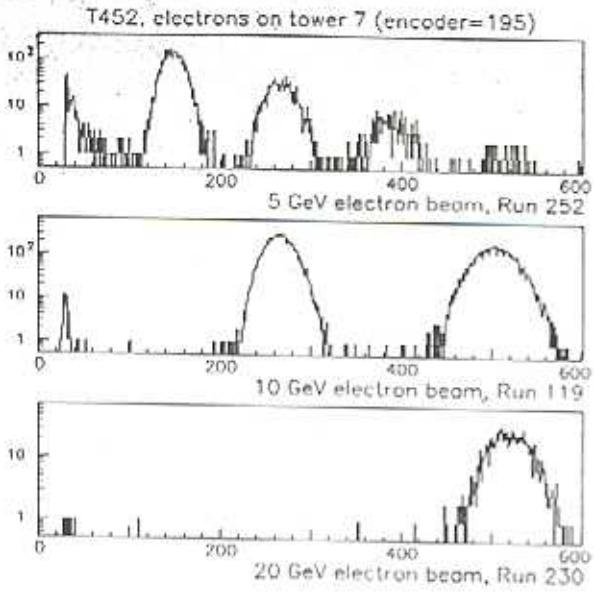
as seen from 3rd floor of south platform




East tunnel platform extension

- All components of the FPD are in position.
- Control, triggering and DAQ electronics are functional in 'stand-alone' mode.
- Detector commissioning during Au-Au collision run is underway.
- Hardware link to STAR level-0 trigger and software link to STAR DAQ is planned to be completed prior to the start of polarized proton running.

# Results with the prototype endcap EMC



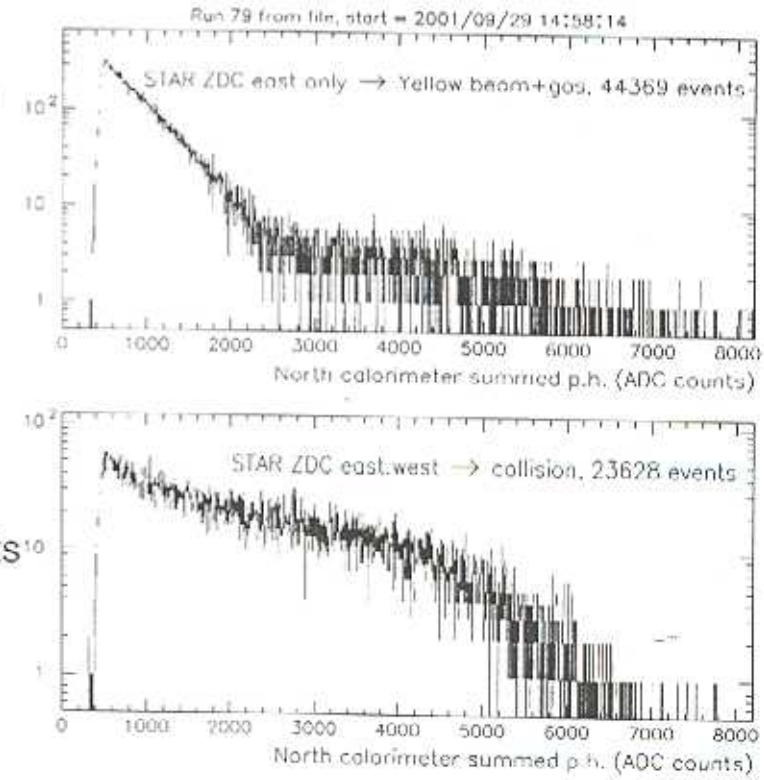

The prototype endcap EMC was calibrated at SLAC in January, 2001 during test-beam experiment T-452 using beams of 5, 10 and 20 GeV.

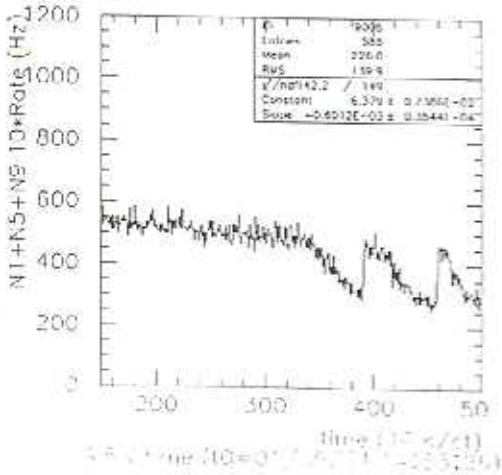
Shown in the figure are events with 0, 1, 2 and more high-energy electrons per beam pulse.

**Data at RHIC for Au beams with E = 100 GeV/nucleon**

The summed energy in the prototype endcap EMC is very different for Yellow ring beam-gas events versus collision events, as determined by conditions on the STAR ZDC's.

For Au-Au collisions, we see events with up to ~230 GeV electron-equivalent energy.

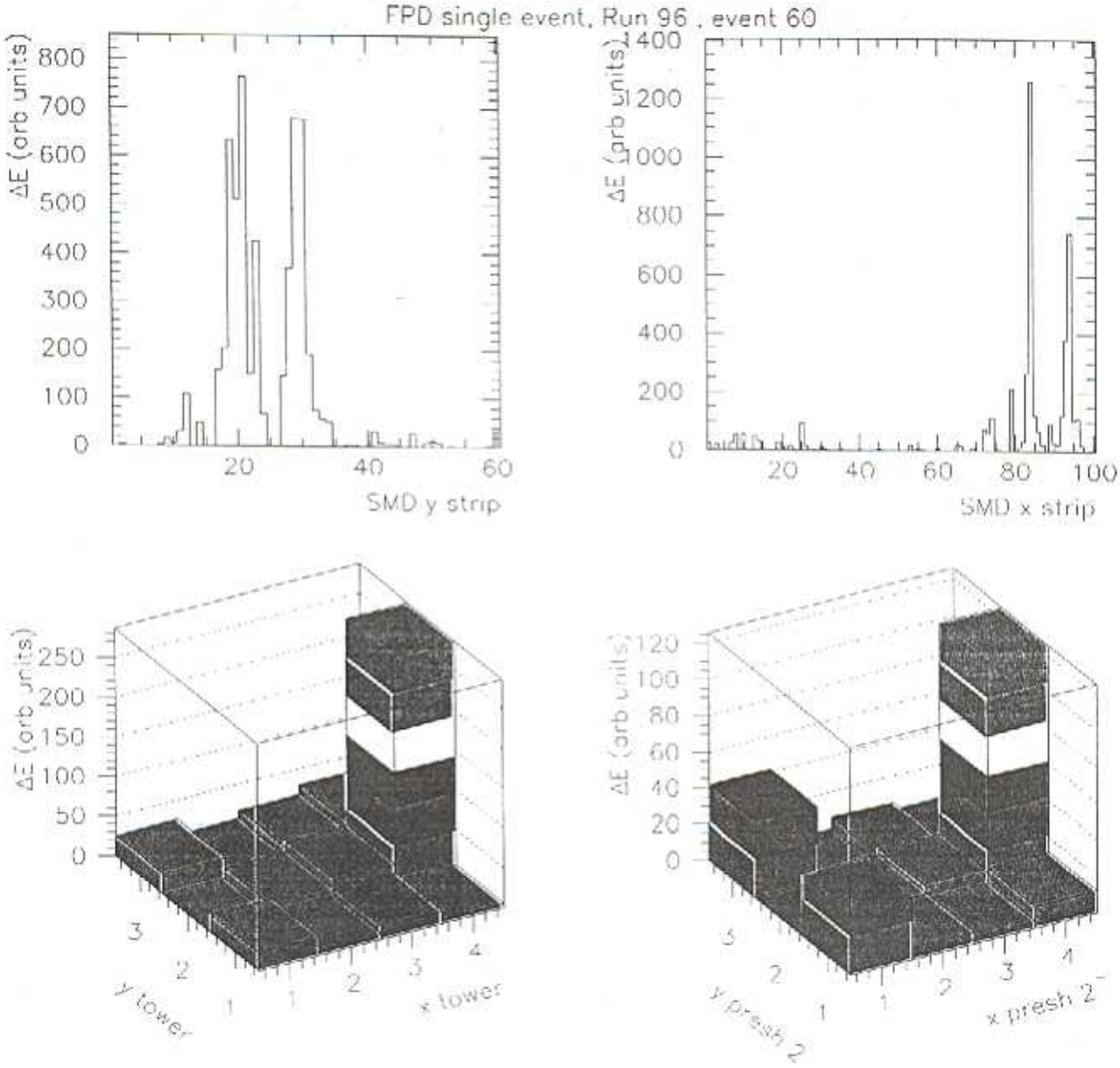


The count rate of pulses with electron equivalent energy >20 GeV is sensitive to collisions, as evidenced by measurements during a van der Meer scan at the STAR interaction region.

STAR spin

# Prototype endcap EMC event

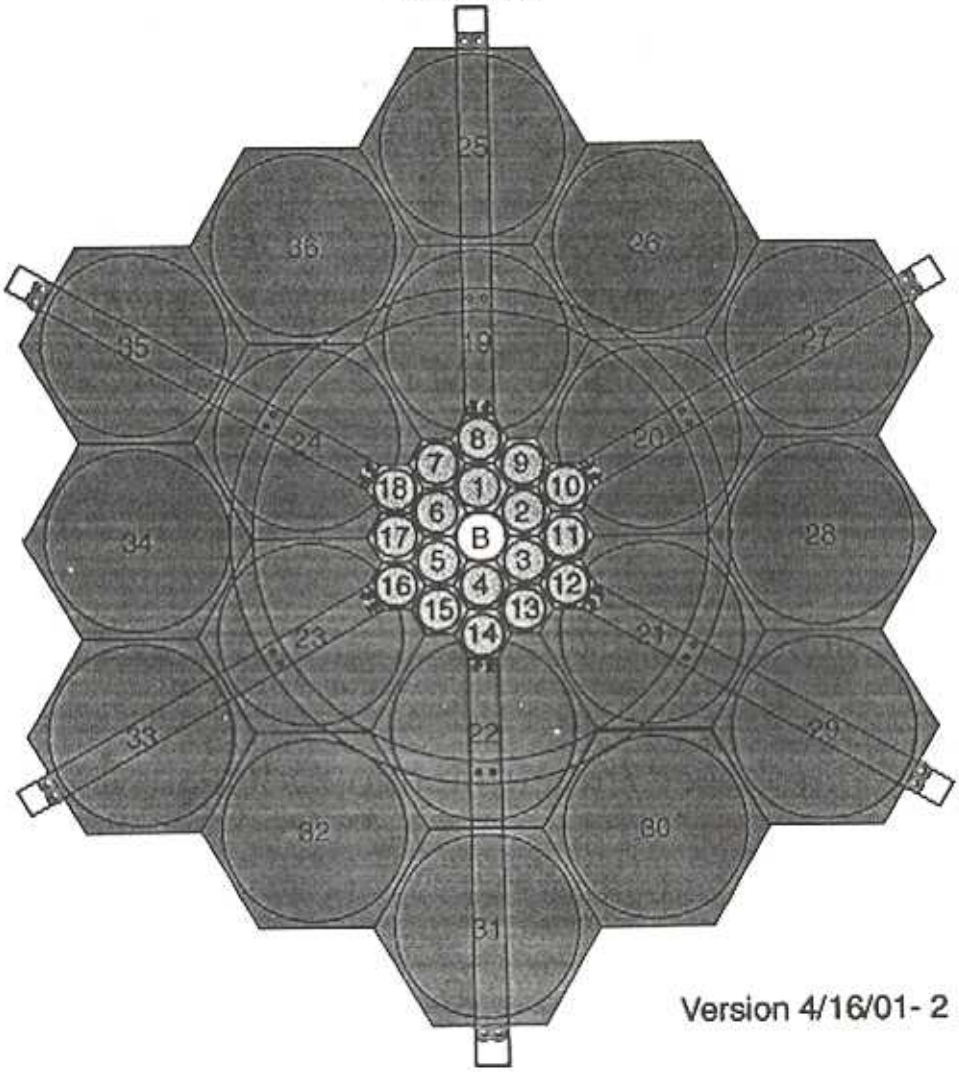



We observe single evidence that are similar to those expected for $\pi^0 \rightarrow \gamma\gamma$ decay for Au-Au collision events. These events are rare, but have the expected signatures:

- a significant fraction of the energy deposited into a single calorimeter tower.
- two peaks in both the x,y shower-maximum detector planes.
- large energy deposition (~5 MIP's) in the preshower tile of the high tower.

# STAR Beam-Beam Counter

Front View




## STATUS

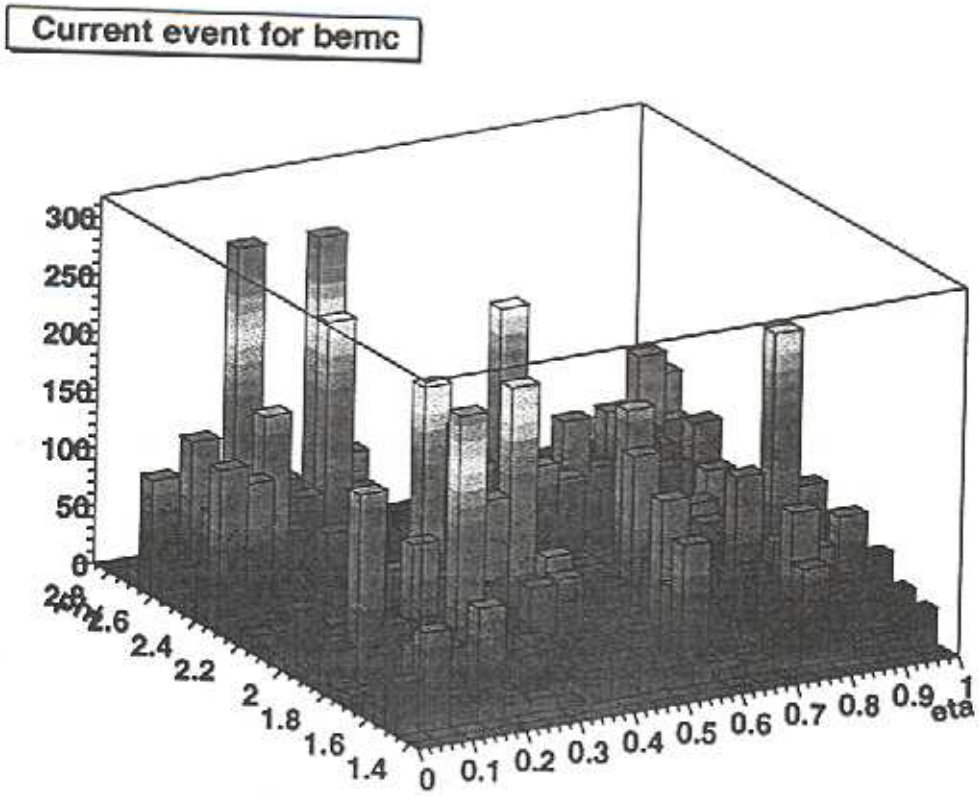
- Mechanical support frame manufacturing complete.
- Photomultiplier tubes and magnetic shields on hand.
- PMT light-tight box manufacturing completed by ~10/15
- Scintillator machining completed by ~10/18.
- Tests of triggering electronics underway.

# High-$p_T$, mid-rapidity

Primary detectors:

- Time-Projection Chamber
- Barrel Electromagnetic Calorimeter (EMC) patch

Currently commissioning Barrel EMC....

Coverage: $0 < \eta < 1$; $1.4 < \varphi < 2.8$ rad (12 modules)

Typical $Au-Au$ 'central event' from Sept. 2001: 25-50% tower occupancy