PHENIX Status and Plans

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PHENIX Status and Plans

Subsystem Readiness

- Tracking
- Calorimetry
- Luminosity Monitor
- DAQ/Level 2 Trigger
- Level 1 Trigger
- Slow Control
- Monitoring
- PRDF

Trigger Mix and Goals

Detector Configuration for pp

Central Arm Tracking
- Drift Chamber
- Pad Chambers
- Time Expansion Chamber

Muon Arm Tracking
- Muon Tracker

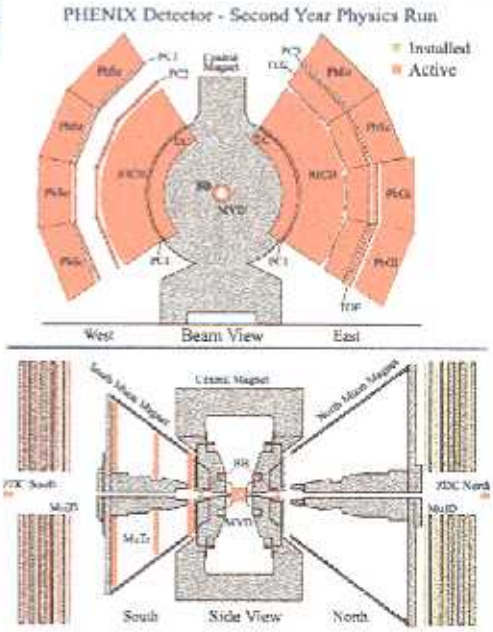
Calorimetry
- PbGl and PbSc (gain balance, level 1)

Particle Id
- Muon Identifier (level 1)
- RICH
- TOF
- TEC

Luminosity Counters/Vertex Detectors
- BBC
- ZDC
- NTC
- MVD

DAQ
- Bandwidth upgrade, event size/data volume

Trigger
- Level 2 (Bandwidth upgrade)
- Level 1 (GLTP,muid, EMC/RICH)



Central Arm Tracking

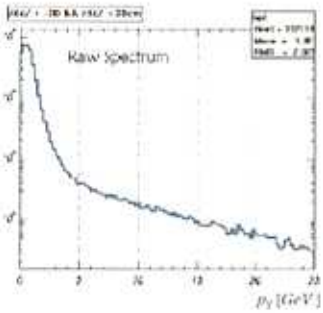
DC: West chamber re-build, gas additive, new high voltage configuration:

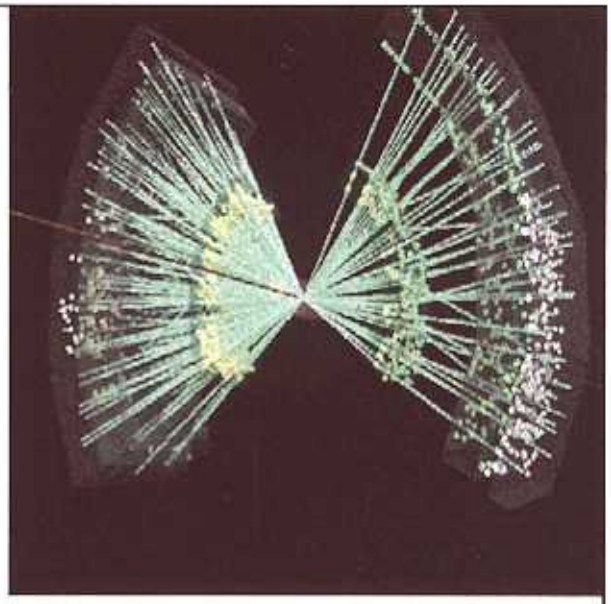
$\epsilon = 0.85 \div 0.97$ (single wire)

$\sigma = 120\ \mu m$ (design: $150\ \mu m$)

PC: PC2 + PC3 inserted in west arm

TEC: Instrumented 2 additional sectors



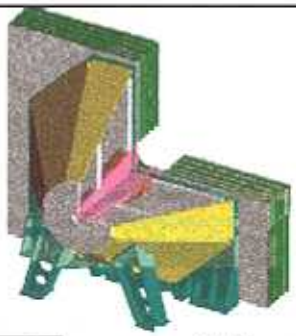


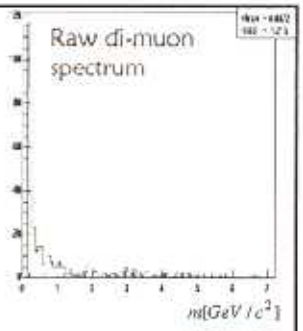
West Arm: DC+ PC1 + PC2 + PC3
East Arm : DC+ PC1 + PC3 +TEC

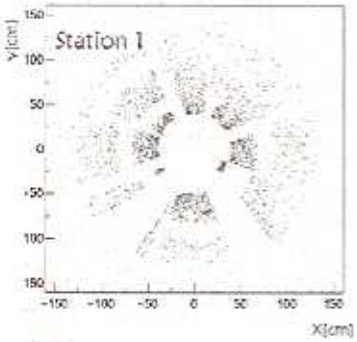
Muon Arm

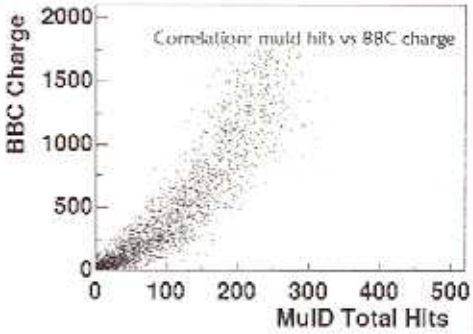
South Muon Tracker Installed

muID trigger



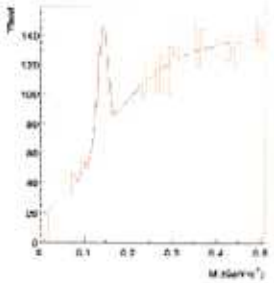


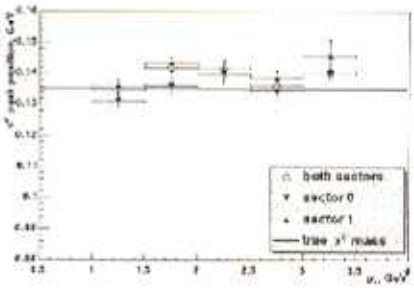




EMC

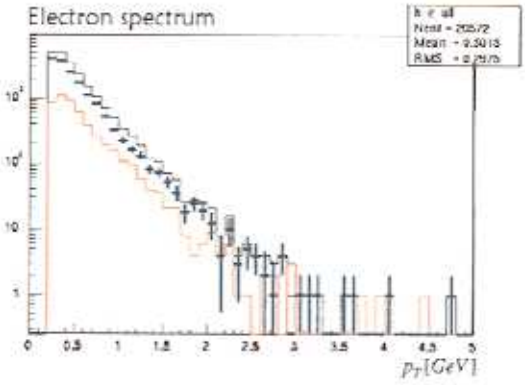
- Added 1 PbGl (E0) and 3 PbSC sectors (E2,E3,W2,W3)
- Trigger cards to be installed (5 days)
- All sectors calibrated and operational
- Level 1 trigger requires raw gain calibration





RICH

- Fully operational
- Trigger cards to be installed (1 day)



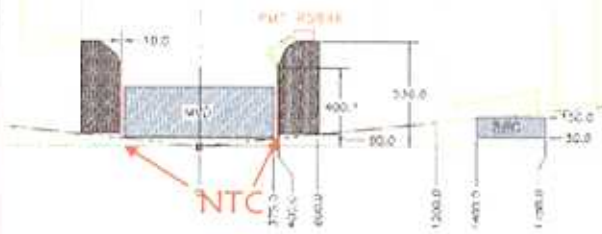
Luminosity Monitor

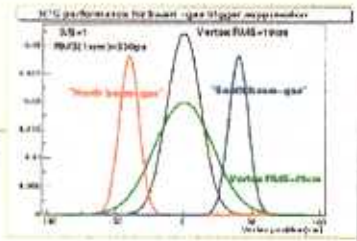
Monitor	$x \cdot \sigma_{tot}$
ZDC	1%
BBC	66%
NTC	85%
BBC||NTC	90%

Strategy:

GIIP: 4 event scalers/bunch crossing (inhibit from DAQ busy).

A large acceptance normalization trigger (BBC||NTC) will be used in low intensity runs to calibrate the ZDC and BBC coincidences as luminosity monitors.





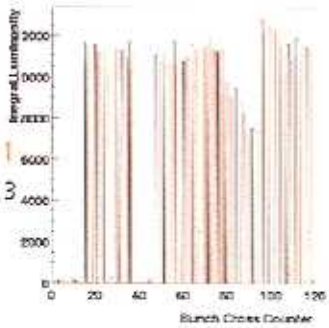
Asymmetries from HI-data

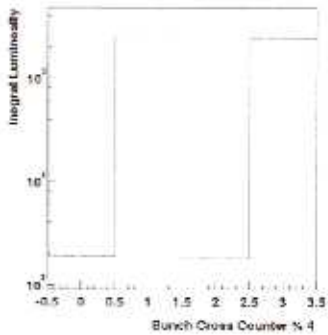
Sasha Bazilevsky, Jaranta Nandi

$L \approx$ number of triggers (BBC or ZDC)

BCC % 4 = 1

BCC % 4 = 3



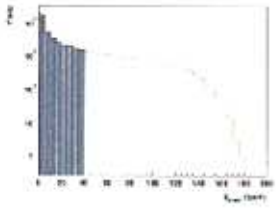


A = (red-black) / (red+black) = (1.86±0.14)%

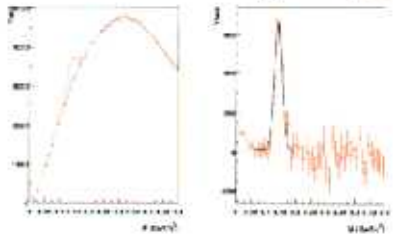
π^0 Asymmetries in Au + Au

Sasha Bazilevsky

Select peripheral events

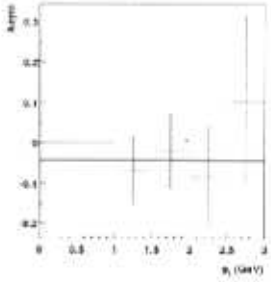


π^0s from event mixing technique



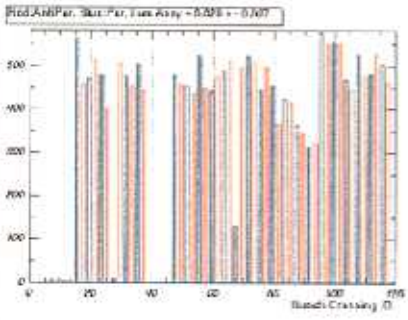
Runs 26180 and 26183
with 0.5Mevents:

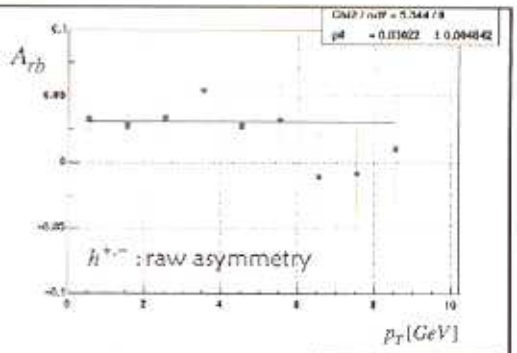
$$A = (-4.3 \pm 5.5)\%$$

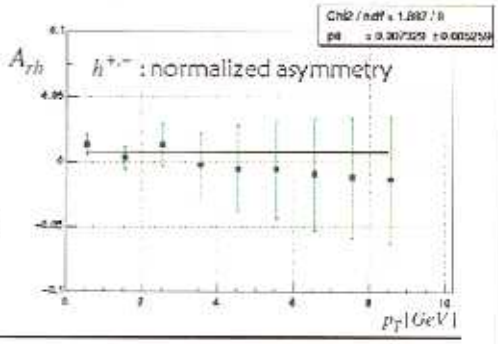


$h^{+,-}$ Asymmetries in Au + Au

Basanta Nandi





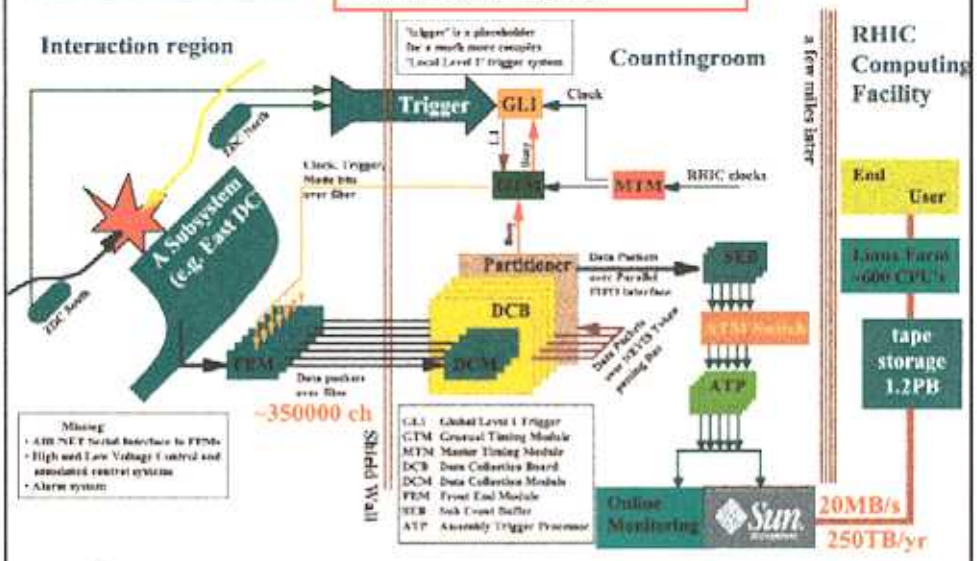


Run 26180 (no centrality selection)
with 0.1Mevents:

$$A = (0.7 \pm 0.5)\%$$

DAQ/Level 2

Current projection for pp (2kHz) into SEB
600Hz to tape (event size limitation)
⇒ level 2 rejection is required



Level 1 trigger

Muon Arm:

a) Custom FPGA board (muID-LL1) which finds horizontal and vertical roads pointing to the vertex in the muon identifier.

b) CAMAC based coincidence of muon identifier gaps. Resolution limited to quadrants, no vertex pointing, vulnerable to cosmics-> requires NTC.

Central Arm:

a) Custom LL1 which analyses and correlates threshold information from 172 trigger tiles in the EMC (4 thresholds) and 256 trigger tiles in the RICH (1 threshold).

b) CAMAC based trigger using coarse trigger tiles. 16 trigger tiles in the EMC (3 thresholds) and 16 triger tiles in the RICH.

Minimum Bias:

a) NTC||BBC

b) Clock

Slow Control/PRDF/Monitoring

Item	Objectivity	PRDF	Monitor
bunch pattern	yes	yes(header)	yes
beam currents	yes	yes(header)	yes
polarization pattern	yes	yes(header)	yes
polarimeter information	yes	yes(header)	yes
GL1 scalers vs bunch configuration	no	yes(event)	yes
GLTP scalers	no	yes(event)	yes
level 1 configuration, pre-scale factors	yes	yes(header)	yes
level 1 rates and rejection	no	no	yes
level 1 trigger bit information	no	yes	yes
level 2 configuration, pre-scale factors	yes	yes(header)	yes
level 2 rates and rejection	no	no	yes
level 2 scalers	no	yes(event)	yes
level 2 monitoring	yes	yes(header)	yes
detector performance vs bunch configuration	no	no	yes
NTC	yes	yes	yes

Assumptions

NTC and T0 detector installation time does not come out of the 8 weeks time.

3 weeks of polarized p-p beam setup.

Luminosity of 5×10^{30} cm^{-2} sec^{-1} (raw interaction rate of 250 Khz).

Greater than 50% beam polarization.

1 week of running with transverse spin polarization to get about 1 pb^{-1}.

4 weeks of running with longitudinal spin polarization to get about 4 pb^{-1}.

PHENIX Physics Goals

I) Obtain p-p reference data for comparison with the data from the HI runs.

II) Place first constraints on the gluon polarization in the proton through pion production in the central arms.

III) Establish the first measurement of spin asymmetries in J/Psi production in the muon arm.

IV) Search for any transverse spin effects.

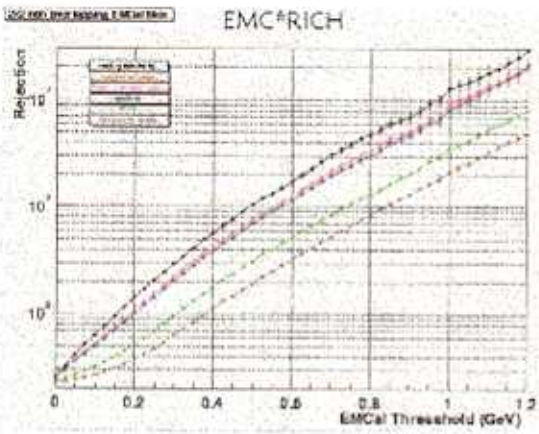
Level 1: Trigger Mix

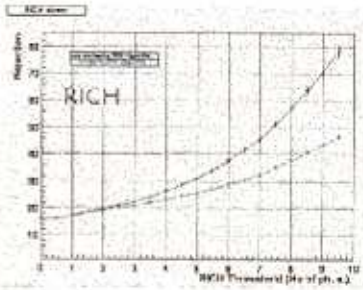
	Spin	HI - comparison	trigger	rate
Central arm	$A_{LL}^{\pi^0}$	$\pi^0 - p_t$ - spectrum	EMC 4x4 tiles > 2 and 3 GeV	0.2kHz
	$A_{LL}^{h^{+-}}$	$h^{+-} - p_t$ - spectrum	EMC 2x2 tiles > 0.9 GeV	1.4kHz
	$A_{LL}^{e^{+-}}, A_{LL}^{\pi^{+-}}$	single e^{+-}, J/ψ	EMC 2x2 tiles > 0.9 GeV ⊗ RICH	0.1kHz
	NA	ϕ	2xRICH+30	0.1kHz
Muon arm	$A_{LL}^{J/\psi}$	J/ψ	1 deep muon (last muid gap)	0.2kHz
	Clock	min bias		0.5kHz
	NTC||BBC	min bias		0.5kHz

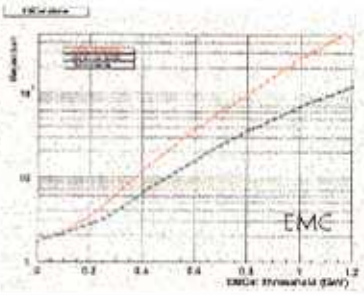
Total 3.0kHz?

Need charged hadron level 2 trigger

Trigger Rejection (EMC-RICH)



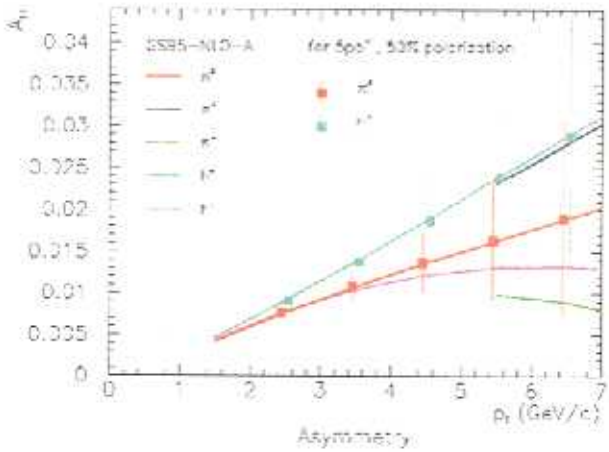




Trigger Bandwidth allocation will be finalized from data

Sensitivities

Yuji Goto



Conclusion

Balance between HI comparison running and spin is possible.

NTC, trigger, DAQ and spin specific data+monitoring need to be finalized.

Requires 1 week of access between Au and p run.