2007 Run Update for STAR

Jeff Landgraf

For the STAR collaboration

STAR's BUR Goals

Expected RHIC performance

From W. Fischer Doc. Ver. 6/1/06

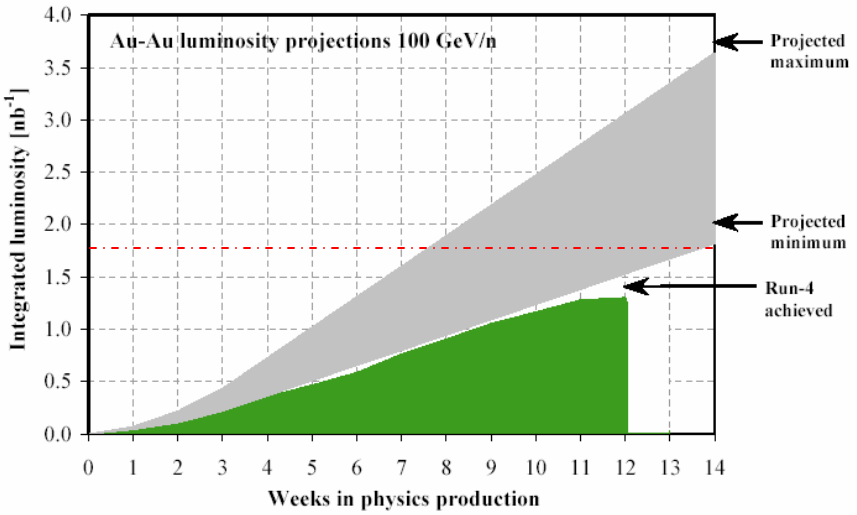

Figure 2: Projected minimum and maximum integrated luminosities for gold-gold collisions at 100 GeV beam energy, assuming linear weekly luminosity ramp-up in 4 weeks.

To meet our AuAu goals we anticipate needing ~1.8 nb^{-1} of Delivered luminosity

RHIC Multi-Year Beam Use Request
For Run7 – Run 9
The STAR Collaboration

August 24, 2006

Executive Summary

The STAR Collaboration, in order to achieve its spin and relativistic heavy ion physics goals on a timescale consistent with intense international interest and competition in these areas, as well as to utilize RHIC beams effectively taking full advantage of planned improvements in machine and detector capability as a function of time, makes the following 3 year beam use proposal:

Run	Energy	System	Goal
7	$\sqrt{s_{NN}}$ = 200 GeV	Au + Au	300 μb^{-1} sampled 60 Mevts usable (10 + 2 weeks)
	$\sqrt{s_{NN}}$ = 9 GeV	Au + Au	(1 + 1 weeks) (machine dev.)
	$\sqrt{s_{NN}}$ = 200 GeV	d + Au	(10 + 3 weeks) 15 nb^{-1} sampled
8	$\sqrt{s}$ = 200 GeV	$p_{\rightarrow}$ $p_{\rightarrow}$	20 + 3 weeks
	$\sqrt{s}$ = 200 GeV	$p_{\rightarrow}$ $p_{\rightarrow}$	1 week pp2pp
	$\sqrt{s}$ = 500 GeV	$p_{\rightarrow}$ $p_{\rightarrow}$	2 weeks commissioning
9	Low $\sqrt{s_{NN}}$	Au + Au	12 + 2 weeks
	$\sqrt{s_{NN}}$ = 200 GeV	Au + Au	3 weeks*
	$\sqrt{s}$ = 200 GeV	$p_{\rightarrow}$ $p_{\rightarrow}$	10+2 weeks

* Performance based, contingent on finishing QCD Critical Point Search

The primary physics goals of the proposed program are:

Run 7 — Definitive results on the saturation scale for the gluon distribution in relativistic heavy nuclei

Decisive test of gluon saturation as the origin of particle suppression at forward pseudorapidity

Qualitative advance in understanding the origin of the suppression of non-photonic electrons from D, B semi-leptonic decays

STAR's BUR Goals

300ub-1 → 600ub-1 because our measurement of sampled luminosity this year doesn't include a vertex

Expected RHIC performance

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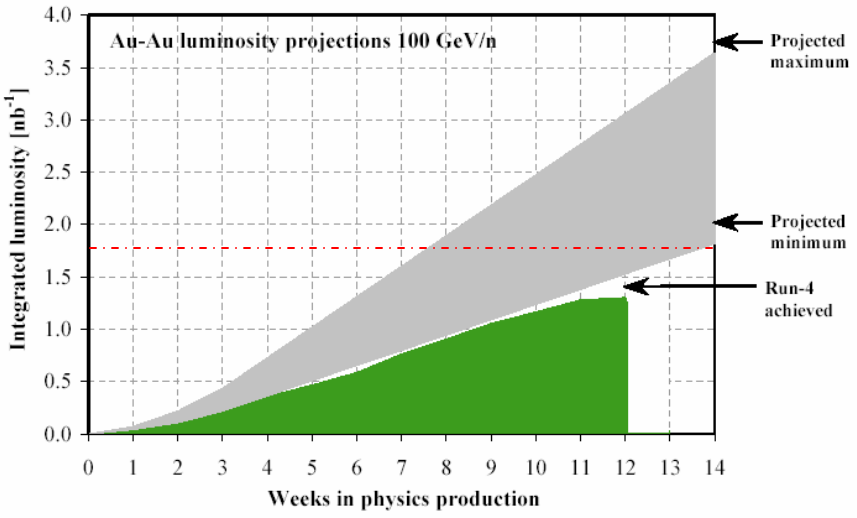

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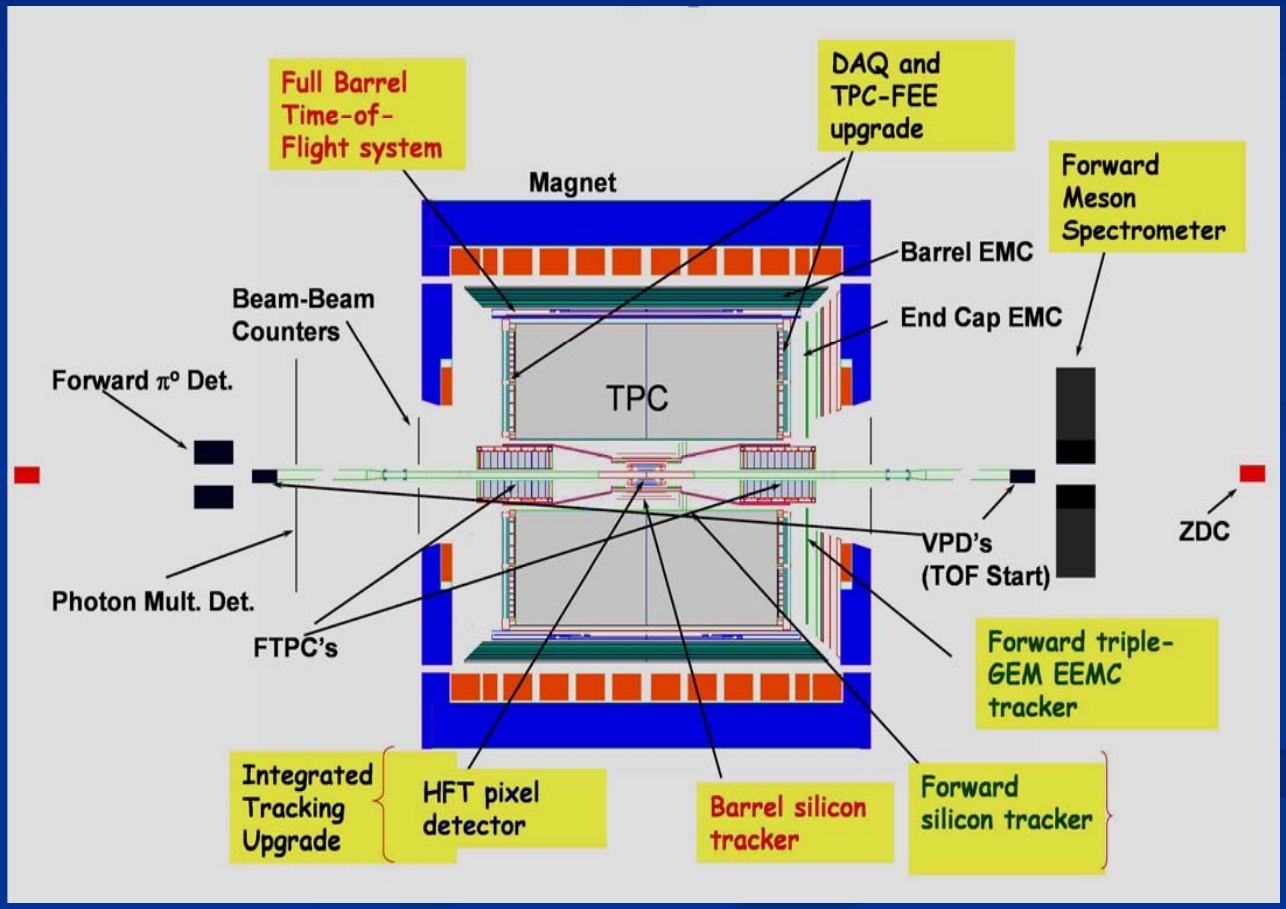
Additional Goals

- Progress on Detector Upgrade Prototypes
  - Improved Vertex Detector (VPD)
  - TPC DAQ upgrade (DAQ1000)
  - Forward Meson Spectrometer (FMS)
  - Muon Tracking Detector (MTD)
  - Heavy Flavor Tracker (HFT) → (PIXEL)
- Prepare for an eventual Low Energy Au-Au Run
  - Collider Commissioning
  - Explore STAR's Triggering Capabilities

Advances in STAR since the 2004 AuAu Run:

- The Full Barrel EMC is now installed
- The full SSD is now installed which enhances the capabilities of the SVT
- Improved capability to trigger on a narrow vertex using the new vertex position detector (VPD)
- Shielding was added to remove backgrounds from the Barrel EMC
- L2 Trigger System



Revisiting the BUR:

future QCD critical point search. The primary physics goal of the $\sqrt{s_{NN}}$ = 200 GeV Au+Au run will be to make a significant advance in understanding the origin of the suppression of non-photonic electrons, and the response of the medium to penetrating high pt probes. It is anticipated that improved vertex selection using an upgraded vertex

These goals are reflected in several specific programs:

- A Minimum Bias program to Measure D's using the SSD / SVT vertex to remove background
- A trigger on high Pt electrons to find B's through their displaced vertex.
- Multi-particle correlations using high Pt Gammas
- First steps towards precision measurements of direct Gammas

In addition there were several secondary physics goals which include:

- To measure the upsilon using the L2 trigger
- A ultra-peripheral collision program

The requirements for each program were condensed to the following list of triggers before the RHIC run began:

Trigger Name	Trigger Definition	Rate
MinBias (D's)	ZDC_pre + VPD@5cm + (L2 monitoring)	~30 hz
BHT2-mb (gamma)	ZDC + BHT2@~6GeV	5 hz
BHT1-mb (B's)	ZDC + BHT1@4.5GeV + VPD@5cm	5 hz
Upsilon	ZDC + BHT1@4.5GeV + VPD@30cm + L2	~40 hz L0/ 1 hz L2
UPC	UPC (5<zdcsum<240) (6<ctbsum<200)	1 hz
UPC-jpsi	UPC + JPsi	1 hz
Commissioning Triggers		
Muon	ZDC + Muon	.1 hz
FMS	FMS	

In practice, we add triggers to monitor backgrounds, to help bootstrap luminosities, and to mark events for priority reconstruction to the final running configuration:

RUNNING **8131051** *2007Production2* [PHYSICS]

Destination: "RCF"

Started: Fri May 11 13:28:25 2007 *[00:05:23 hr ago...]*

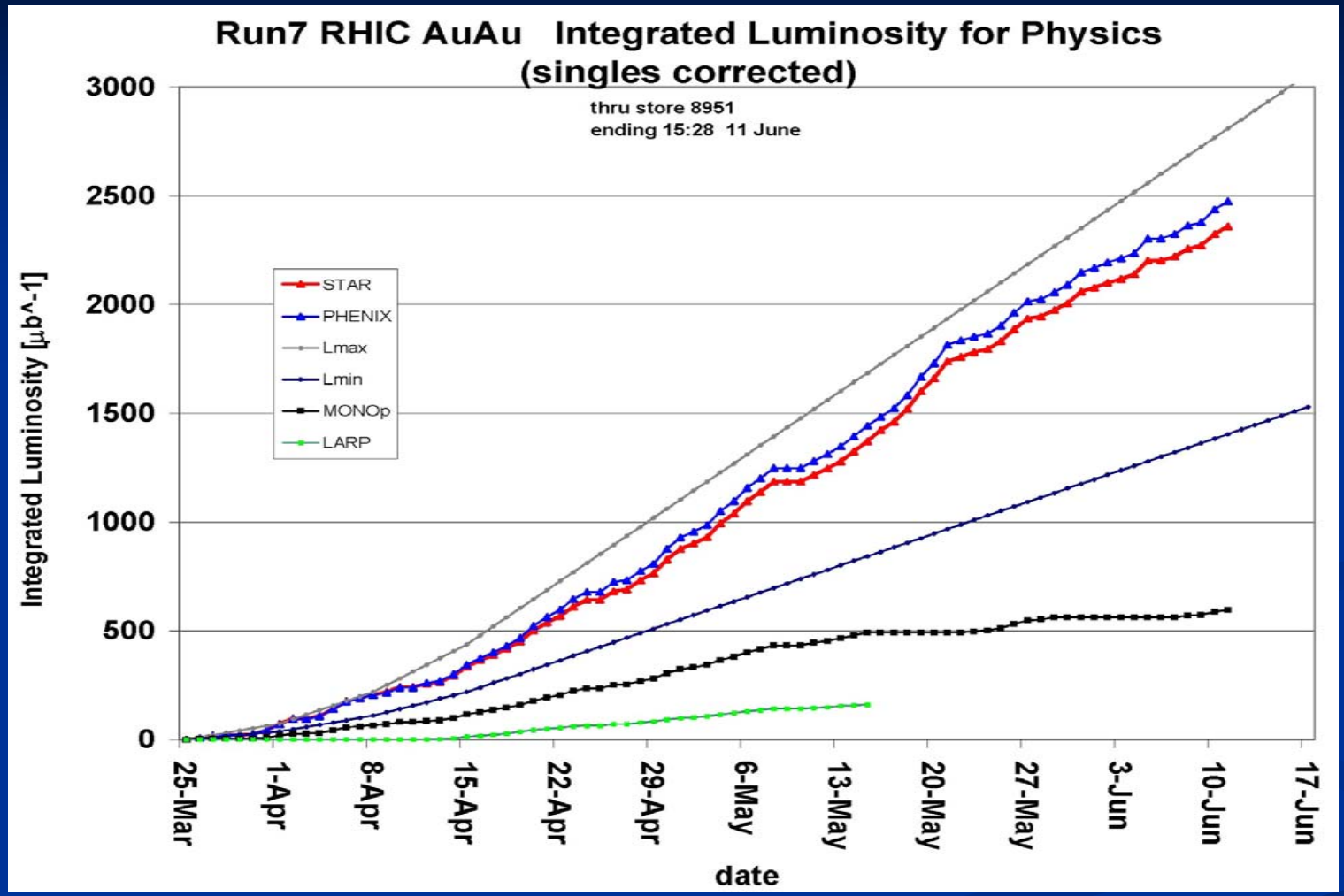
Stopped: *in progress...* *[00:05:23 hr]*

Last Status: In progress...

Trigger	DAQ Input	DAQ Rate (Hz)	L0 Input	L0 Rate (Hz)	Scaler Rate(Hz)	Built	Xpress	Aborted	Rls'd (GB/L2.5)	Error
bht2-mb	1267 [12.1%]	2 [5.1%]	1268	5	6.0	1222 [12.0%]	0 [0.0%]	0 [0.0%]	0/0	45 [3.6%]
L2-gamma	412 [3.9%]	0 [0.0%]	1268	5	6.0	398 [3.9%]	0 [0.0%]	855 [67.4%]	0/0	14 [3.4%]
mb-zdc	335 [3.2%]	1 [2.6%]	334	1	634.2	327 [3.2%]	0 [0.0%]	0 [0.0%]	0/0	8 [2.4%]
upc	533 [5.1%]	3 [7.7%]	532	2	15.5	511 [5.0%]	0 [0.0%]	0 [0.0%]	0/0	21 [3.9%]
upc-jpsi	2 [0.0%]	0 [0.0%]	2	0	0.0	2 [0.0%]	0 [0.0%]	0 [0.0%]	0/0	0 [0.0%]
btag	637 [6.1%]	2 [5.1%]	637	4	3.8	615 [6.0%]	0 [0.0%]	0 [0.0%]	0/0	22 [3.5%]
L2-upsilon	1719 [16.4%]	2 [5.1%]	3234	18	14.7	1694 [16.6%]	0 [0.0%]	1514 [46.8%]	0/0	25 [1.5%]
zb	203 [1.9%]	1 [2.6%]	202	1	1.0	199 [1.9%]	0 [0.0%]	0 [0.0%]	0/0	4 [2.0%]
bht2	180 [1.7%]	0 [0.0%]	180	0	9.0	175 [1.7%]	0 [0.0%]	0 [0.0%]	0/0	5 [2.8%]
mb-vpd	6280 [59.9%]	27 [69.2%]	6267	17	32.6	6119 [59.9%]	0 [0.0%]	0 [0.0%]	0/0	159 [2.5%]
zdc	84 [0.8%]	0 [0.0%]	84	0	12683.0	84 [0.8%]	0 [0.0%]	0 [0.0%]	0/0	0 [0.0%]
vpd0	4 [0.0%]	0 [0.0%]	4	0	660.8	4 [0.0%]	0 [0.0%]	0 [0.0%]	0/0	0 [0.0%]
vpd1	26 [0.2%]	1 [2.6%]	26	1	3405.7	26 [0.3%]	0 [0.0%]	0 [0.0%]	0/0	0 [0.0%]
upsilon-mb	95 [0.9%]	1 [2.6%]	95	1	2973.7	95 [0.9%]	0 [0.0%]	0 [0.0%]	0/0	0 [0.0%]
mtd	120 [1.1%]	0 [0.0%]	120	0	6.6	119 [1.2%]	0 [0.0%]	0 [0.0%]	0/0	1 [0.8%]
ALL	10482 [100.0%]	39 [100.0%]	11510	45	9383207.6	10220 [100.0%]	0 [0.0%]	1046 [9.1%]	0/2	257 [2.5%]

The result is a mix of triggers which is optimized and focused towards our physics goals.

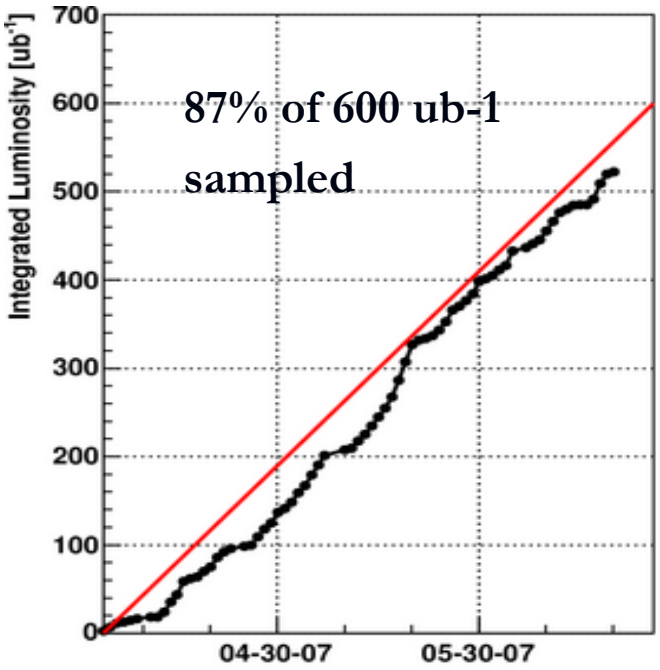
Collider Performance:

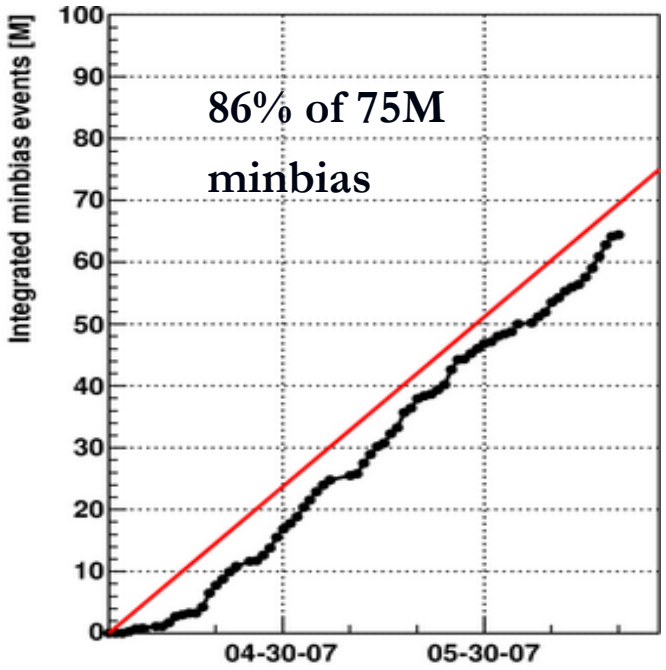


The Collider has provided nearly the maximum projected integrated luminosity.

STAR Performance

STAR Data recorded as of June 20th, 8am





Which puts STAR very close to obtaining our minbias and integrated luminosity goals.

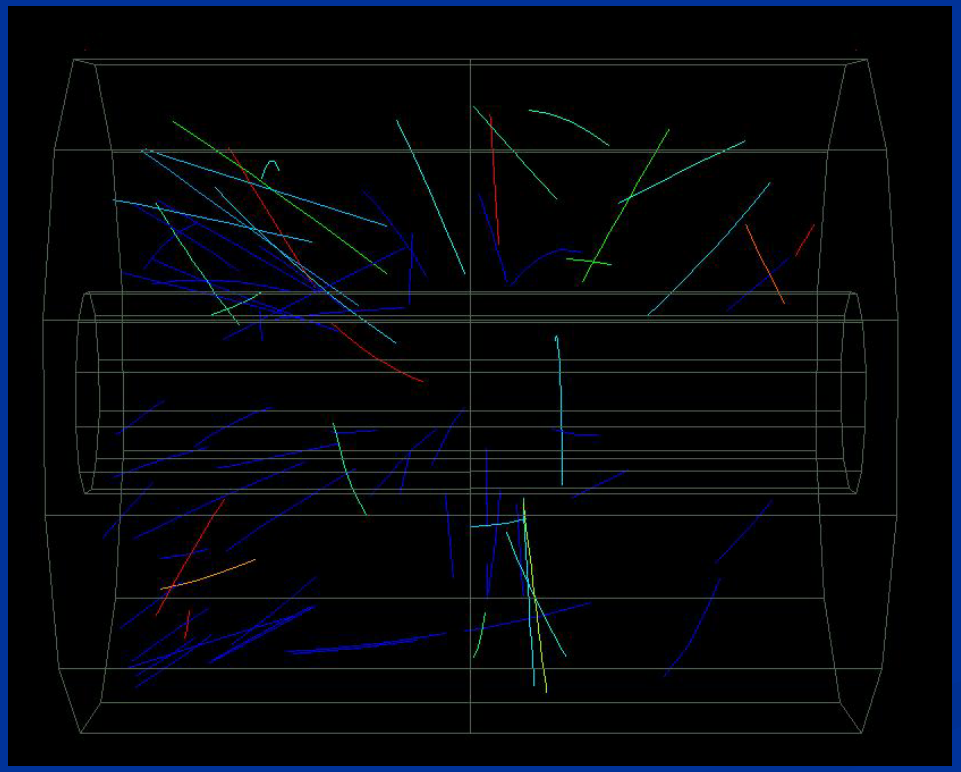
The integrated luminosity translates to a factor of 20 or more increase in statistical significance for rare probes, due to the increased acceptance and stability of the EMC, the improved vertex, and increased delivered luminosity.

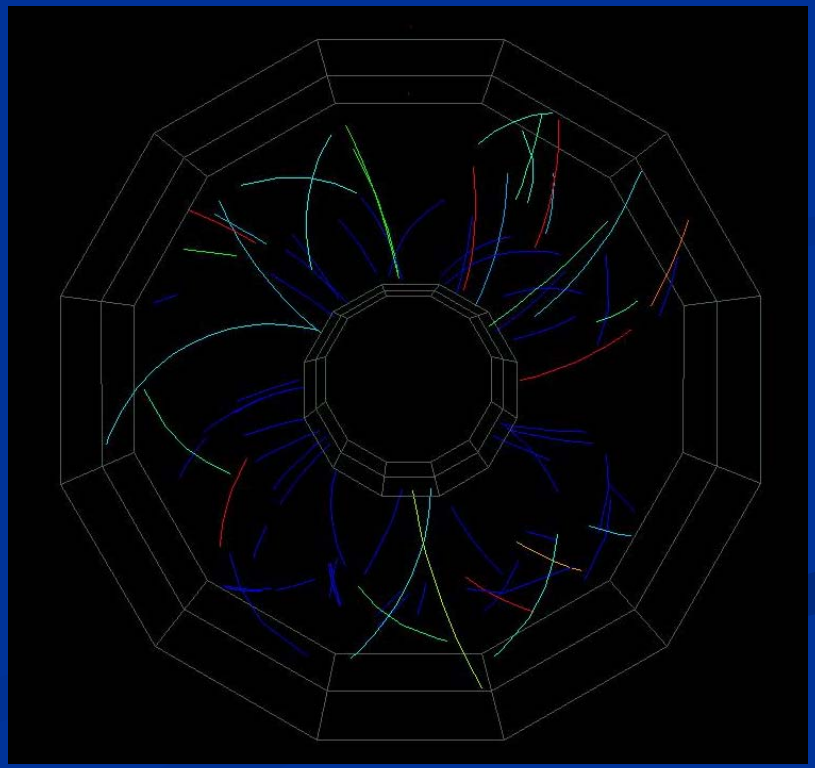
RHIC did a one day Low Energy Commissioning Run.

Star commissioned triggers and took a small amount of data

STAR TPC image of root(s) = 9.91 GeV AuAu Collision

Taken June 7, 2007.

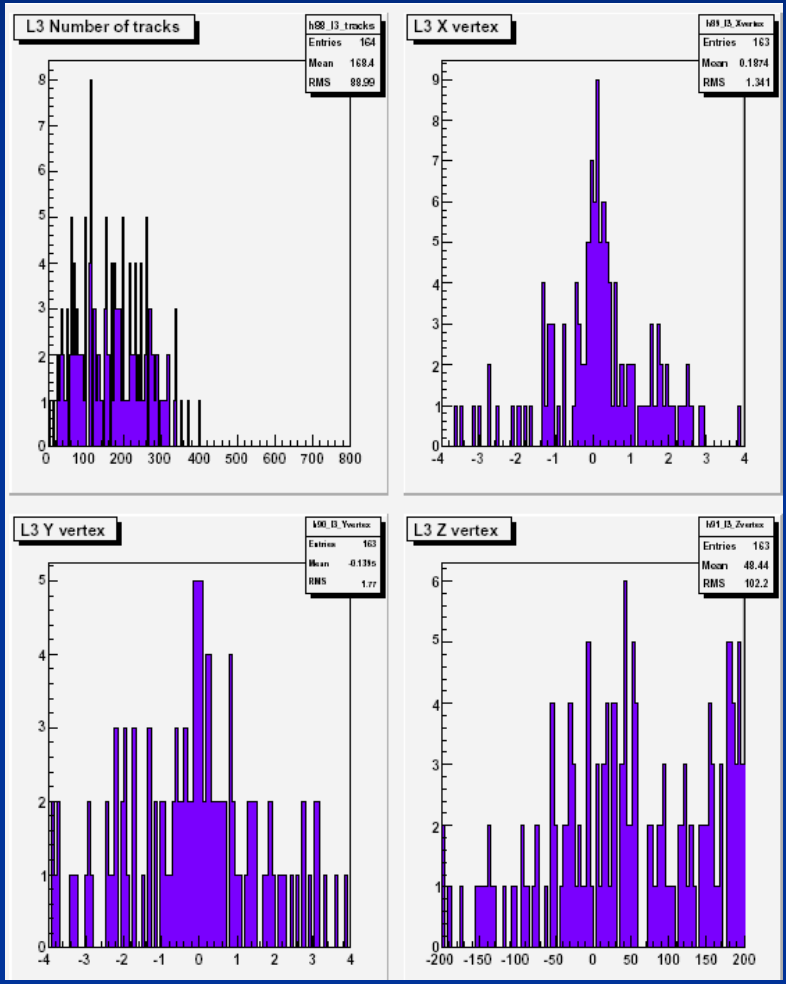


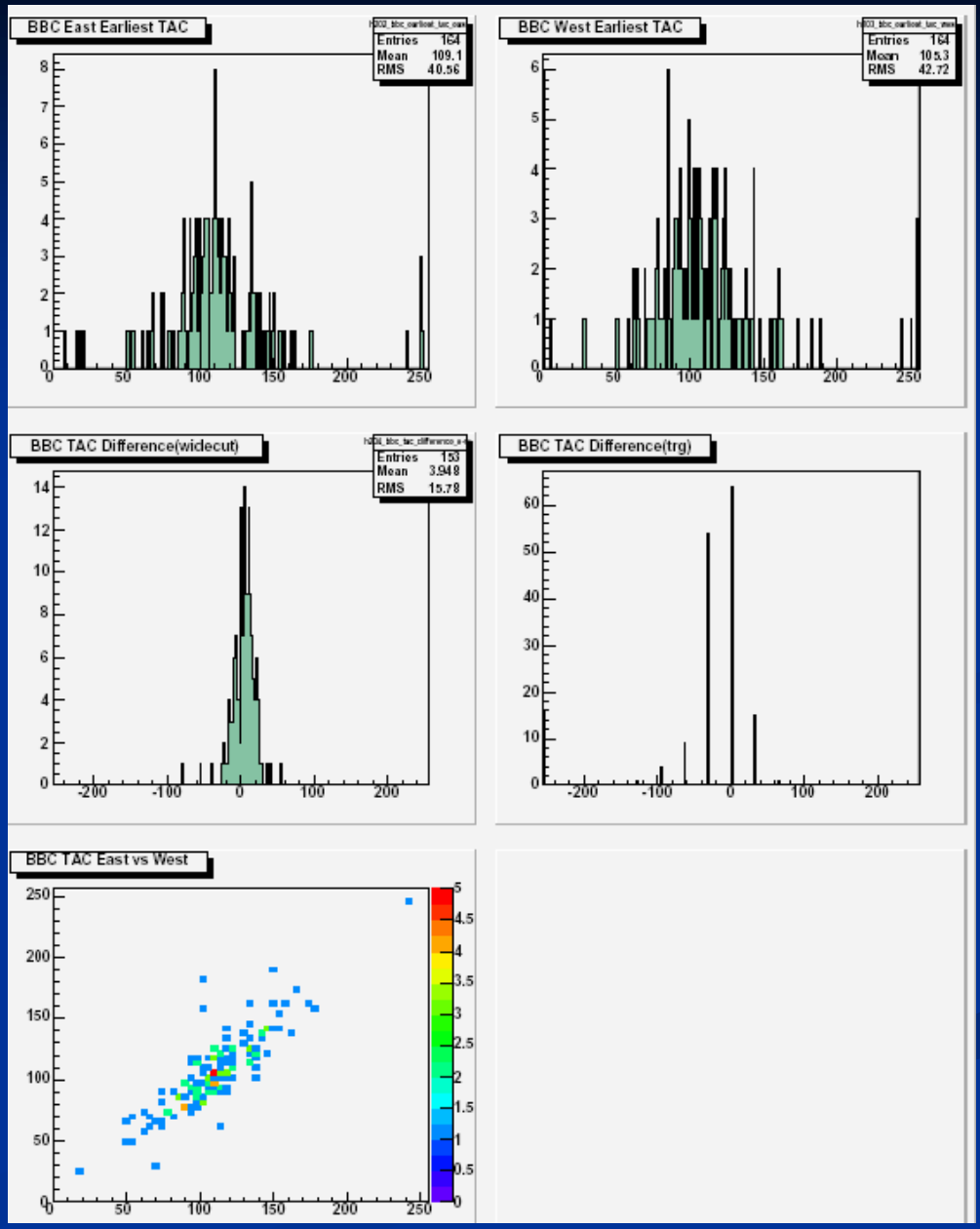


Run 8158119, Evt 44

Run 8158119: (Low Energy Run)

- 2288 BBC-small triggers
- 403 BBC-large triggers
- 214 both BBC small & large
- 1 VPD trigger

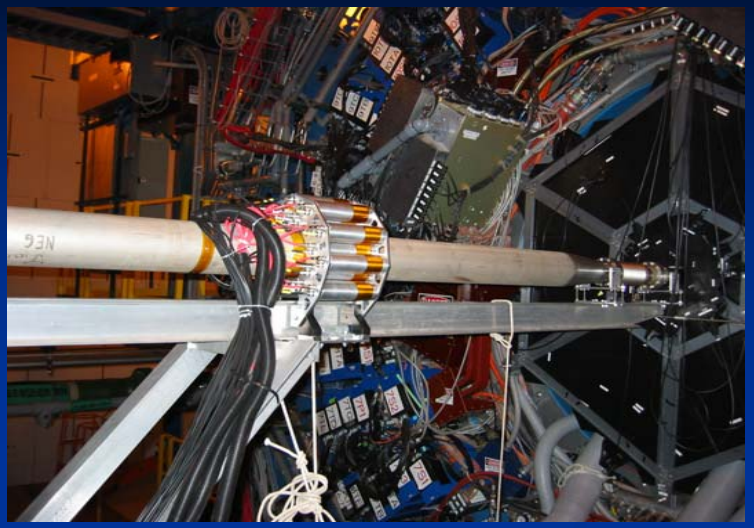


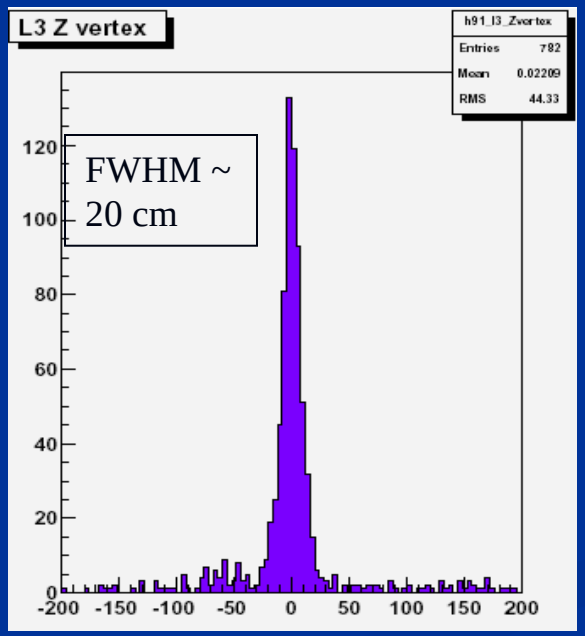


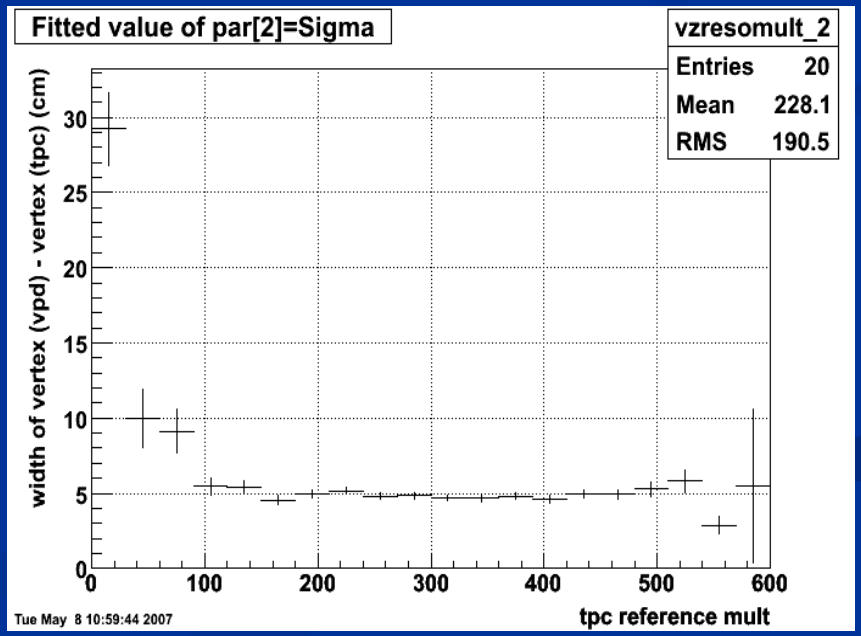
Detector Upgrades

- → VPD
- → DAQ1000
- → FMS
- → MTD
- → HFT

The VPD was Commissioned during the first few weeks of the RHIC run and its operation was critical to the physics program.



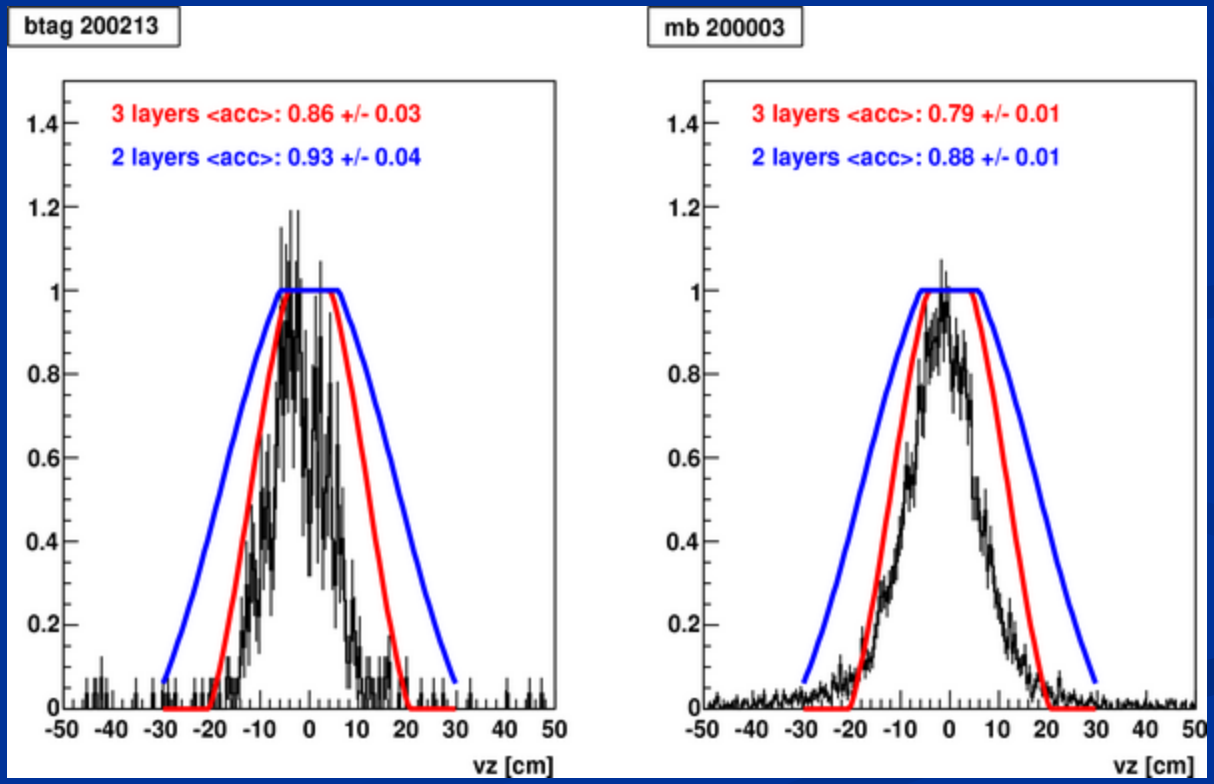




Detector Upgrades

- → VPD
- → DAQ1000
- → FMS
- → MTD
- → HFT

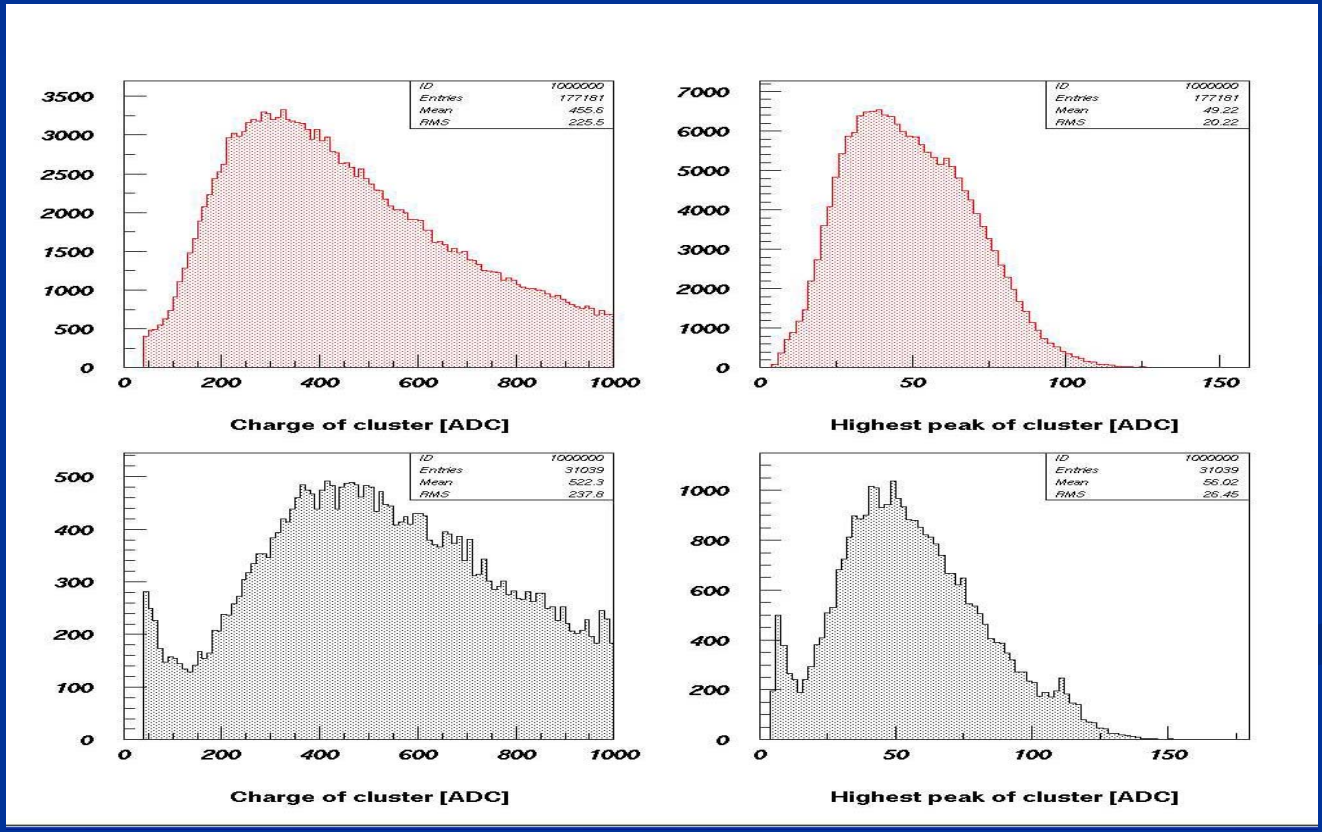
In fact, if you superimpose the vertex distributions as triggered by the VPD with the acceptance for crossing all 3 layers of the SVT, the VPD is almost the perfect detector for the job.



Detector Upgrades

- → VPD
- → DAQ1000
- → FMS
- → MTD
- → HFT

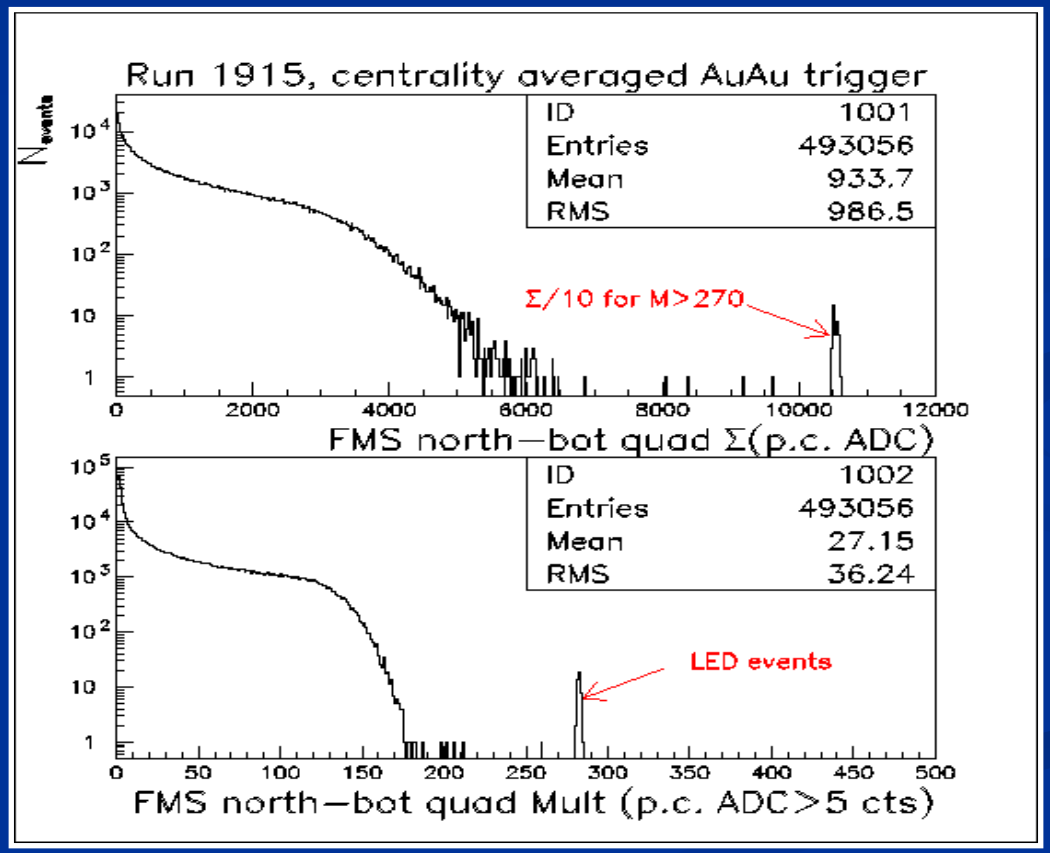
There is a TPC electronics upgrade to increase the maximum TPC event rate to a kilohertz while virtually eliminating the deadtime. A single receiver board prototype was installed and is taking data. (In red: data from DAQ1000 prototype. In Black: current TPC)



Progress On Detector Upgrades

The Forward Meson Spectrometer is a large extension of the Forward Pion Detector which was commissioned during the gold run and is now ready for production running in 2008

- → VPD
- → DAQ1000
- → FMS
- → MTD
- → HFT

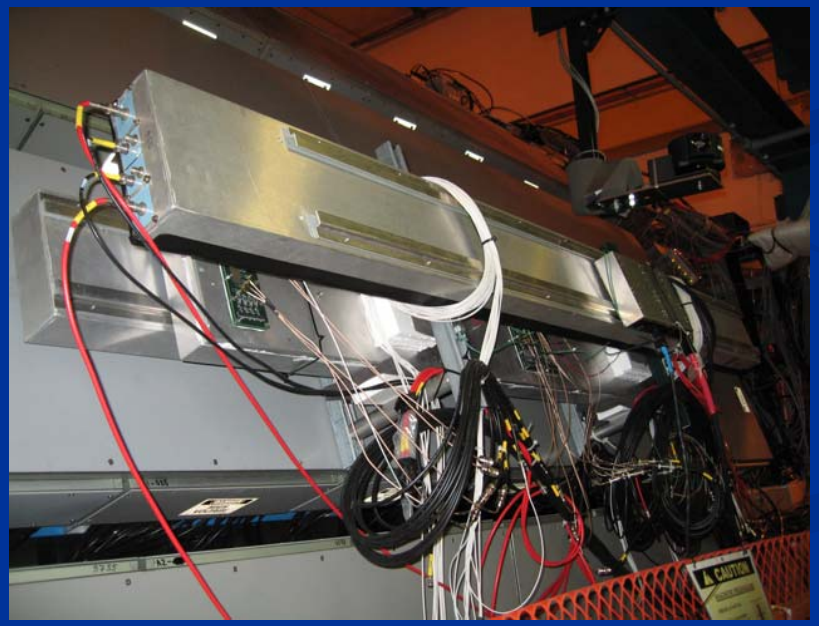


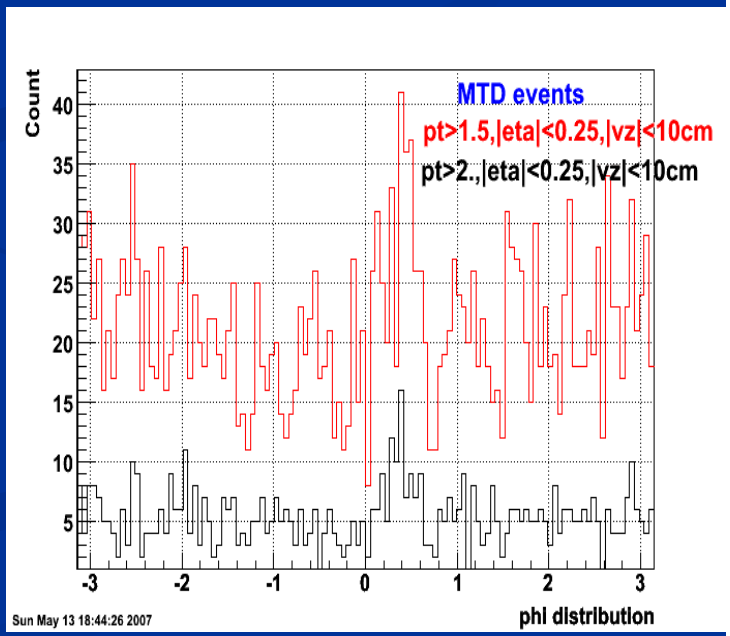
Progress On Detector Upgrades

- → VPD
- → DAQ1000
- → FMS
- → MTD
- → HFT

The Muon Tracking Detector uses the metal in the star magnet to clean up the Muon signal. One module was installed and incorporated into the STAR trigger during data taking.

2 LMRPC modules
From fastoffline tracking
Au+Au collisions
No track-hit matching yet



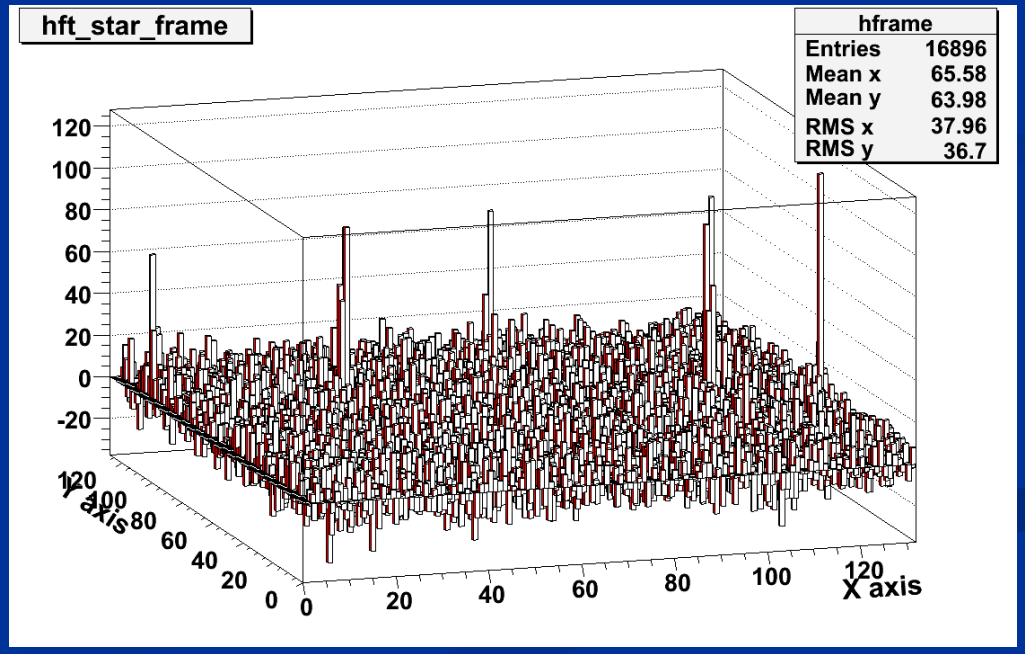


Progress On Detector Upgrades

A very small (4mm x 4mm) prototype of the PIXEL detector electronics was installed to at r=5cm to study the background near the beampipe.

- → VPD
- → DAQ1000
- → FMS
- → MTD
- → HFT

Pixel proto in STAR, measured track density at r = 5cm, z = 145cm



Summary

- STAR is nearing the end of a successful run.
- The STAR trigger is strongly focused towards meeting the collaborations physics goals.
- STAR participated in the Low Energy test run and was able to obtain data.
- There is significant progress installing and testing new sub-systems and upgrade prototypes.