AnDY : Overview and Plans

Feasibility Test of Large Rapidity Drell Yan Production at RHIC

Chris Perkins

UC Berkeley/Space Sciences Laboratory

Stony Brook University

DIS 2011

Newport News, VA

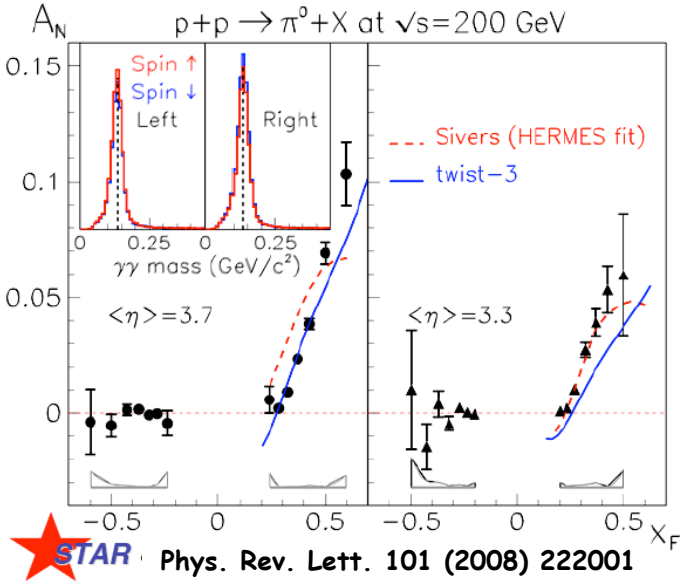
4/13/2011

Outline

- Motivation for Large Rapidity Drell Yan at a Collider
- Overview of AnDY Design
- Run 11 Progress So Far
- Conclusions and Outlook

Transverse Single Spin Asymmetry Data

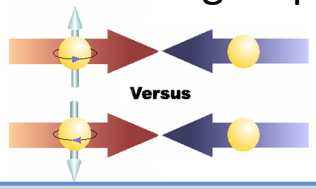
Inclusive π^0 at STAR



Phys. Rev. Lett. 101 (2008) 222001

- Large A_N persists to √s=200 GeV for high x_F pions
- Fits to SIDIS (HERMES) are consistent with p+p → π + X data
- Must go beyond collinear picture to explain A_N at high-x_F

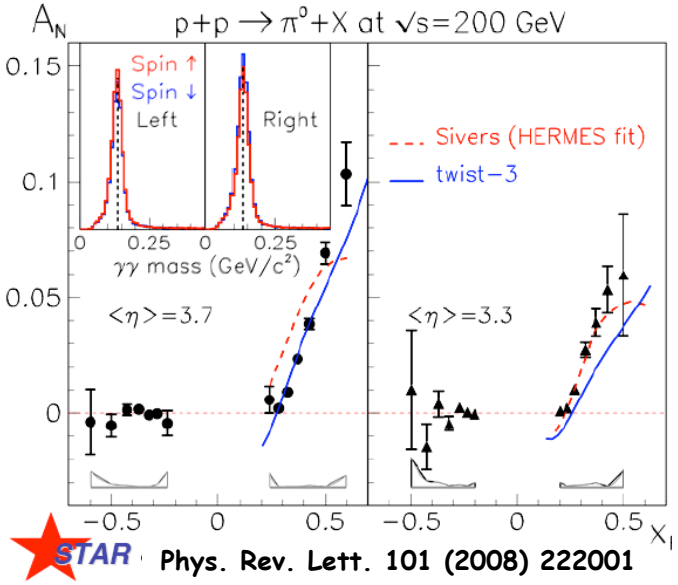
Transverse Single Spin Asymmetries



$$A_N = \frac{\sigma_\uparrow - \sigma_\downarrow}{\sigma_\uparrow + \sigma_\downarrow}$$

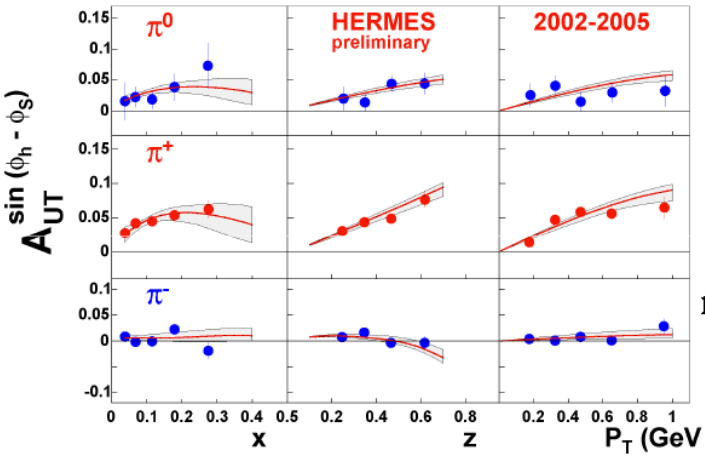
Transverse Single Spin Asymmetry Data

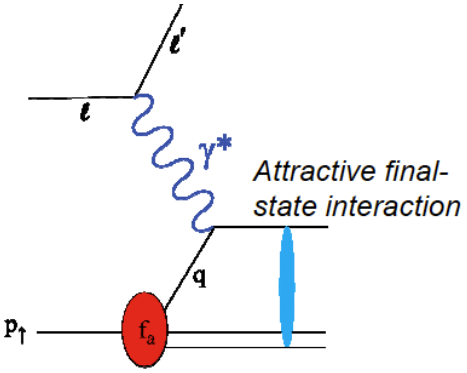
Inclusive π^0 at STAR



- Large A_N persists to √s=200 GeV for high x_F pions
- Fits to SIDIS (HERMES) are consistent with p+p → π + X data
- Must go beyond collinear picture to explain A_N at high-x_F

Sivers Effect at HERMES (Semi-Inclusive Deep Inelastic Scattering)

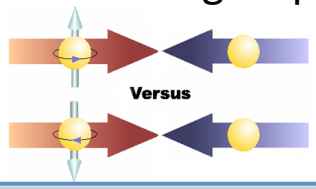




$$\hat{S}_T \bullet \left(\hat{P} \times \hat{k}_\perp\right) f_{1T}^{\perp}(x, k_\perp)$$

- Final HERMES data: PRL 103 (2009) 152002 [arxiv:0906.3918]
- Phenomenological fits: M. Anselmino et al. EPJ A39 (2009) 89 [arxiv:0805.2677]
- Final-state Interaction: S.J. Brodsky, D.S. Hwang, I. Schmidt PL B530 (2002) 99 [hep-ph/0201296]

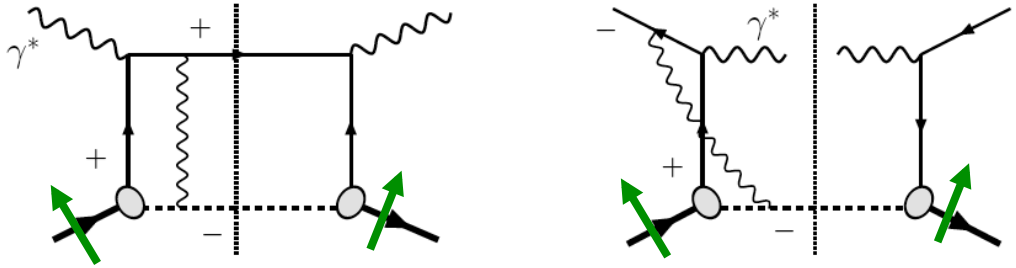
Transverse Single Spin Asymmetries



$$A_N = \frac{\sigma_\uparrow - \sigma_\downarrow}{\sigma_\uparrow + \sigma_\downarrow}$$

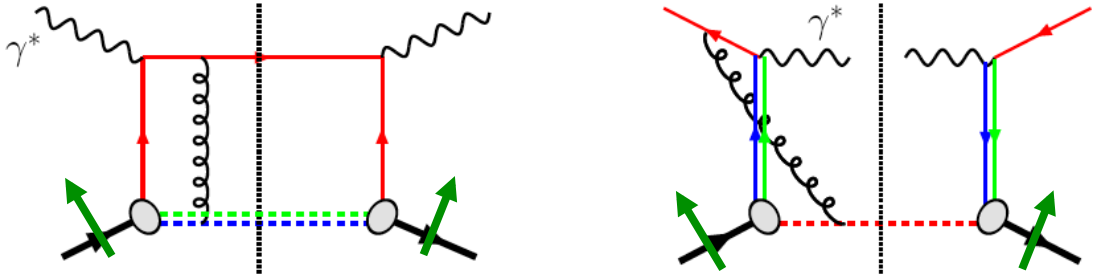
T-odd Spin Orbit Correlations

Simple QED example:



DIS: attractive | **Drell-Yan: repulsive**

Same in QCD:



As a result:

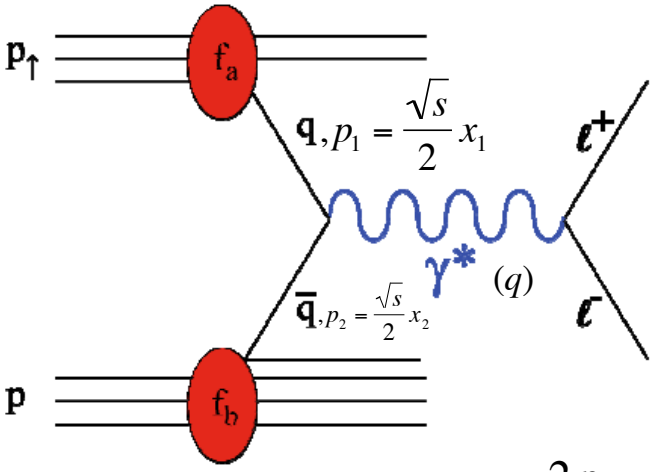
$$\text{Sivers}|_{\text{DIS}} = -\text{Sivers}|_{\text{DY}}$$

2015	HP13 (new)	Test unique QCD predictions for relations between single-transverse spin phenomena in p-p scattering and those observed in deep-inelastic lepton scattering

Report to NSAC from the *Subcommittee on Performance Measures (August, 2008)*
http://www.sc.dow.gov/np/nsac/docs/PerfMeasEvalFinal.pdf

- **Non-universality of Sivers Asymmetries: Unique Prediction of Gauge Theory !**
- **Measurement of sign change tests TMD Factorization**

e^+e^- Drell Yan Experiment



$$q^2 = Q^2 = M^2_{e^+e^-} = x_1 x_2 s \qquad x_F = \frac{2p_L}{\sqrt{s}} \approx x_1 - x_2$$

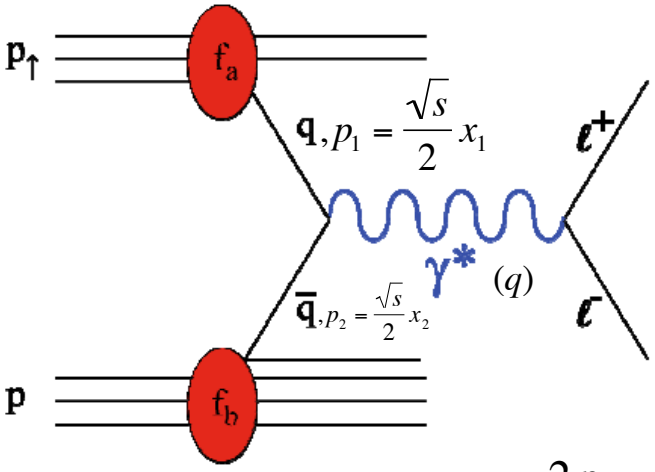
$$y_{\gamma^*} = \frac{1}{2}\ln\left(\frac{x_1}{x_2}\right)$$

$$x_{(1,2)} \approx \frac{M}{\sqrt{s}} e^{\pm y} \rightarrow \text{Large Rapidities}$$

- A_N proportional to Sivers Function
- Does not require knowledge of the fragmentation functions
- Factorization is still thought to be robust because of simple color structure.

- Want to test sign change of Sivers Function vs. SIDIS

e^+e^- Drell Yan Experiment



$$q^2 = Q^2 = M^2_{e^+e^-} = x_1 x_2 s \qquad x_F = \frac{2p_L}{\sqrt{s}} \approx x_1 - x_2$$

$$y_{\gamma^*} = \frac{1}{2}\ln\left(\frac{x_1}{x_2}\right)$$

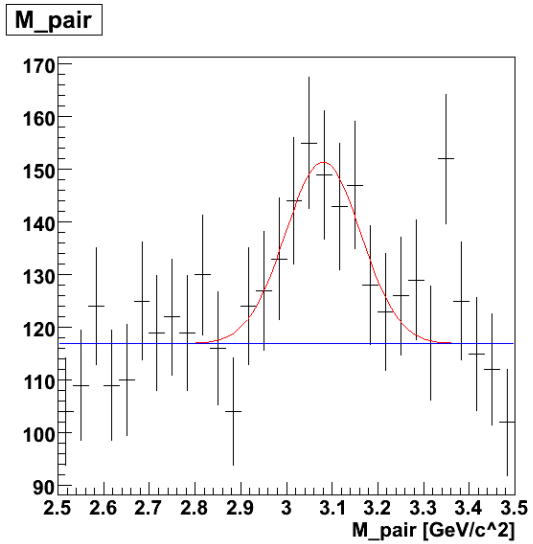
$$x_{(1,2)} \approx \frac{M}{\sqrt{s}} e^{\pm y} \rightarrow \text{Large Rapidities}$$

- A_N proportional to Sivers Function
- Does not require knowledge of the fragmentation functions
- Factorization is still thought to be robust because of simple color structure.

- Want to test sign change of Sivers Function vs. SIDIS

e^+e^- Drell Yan experiment enables the possibility of performing experiment with only calorimetry (if no tracking required)

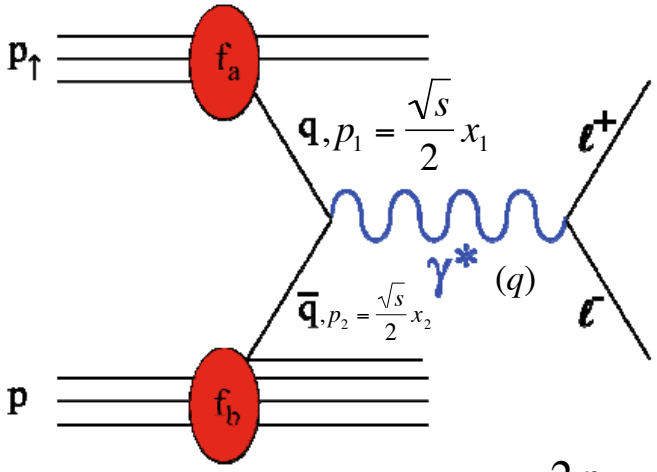
- This has been done before (UA2 [PLB275 (1992) 202] did not use magnet)



Observation of High-x_F J/Psi at STAR
[Nuc.Phys.A 830 (1-4) (2009) 231-234]

with only bare calorimeter response

e^+e^- Drell Yan Experiment



$$q^2 = Q^2 = M^2_{e^+e^-} = x_1 x_2 s \qquad x_F = \frac{2p_L}{\sqrt{s}} \approx x_1 - x_2$$

$$y_{\gamma^*} = \frac{1}{2}\ln\left(\frac{x_1}{x_2}\right)$$

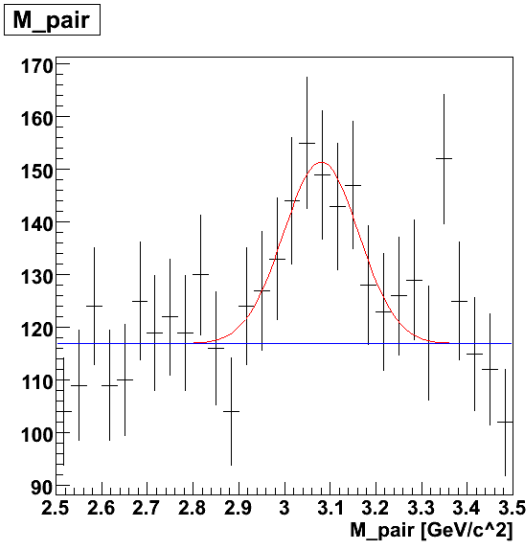
$$x_{(1,2)} \approx \frac{M}{\sqrt{s}} e^{\pm y} \rightarrow \text{Large Rapidities}$$

- A_N proportional to Sivers Function
- Does not require knowledge of the fragmentation functions
- Factorization is still thought to be robust because of simple color structure.

- Want to test sign change of Sivers Function vs. SIDIS

e^+e^- Drell Yan experiment enables the possibility of performing experiment with only calorimetry (if no tracking required)

- This has been done before (UA2 [PLB275 (1992) 202] did not use magnet)



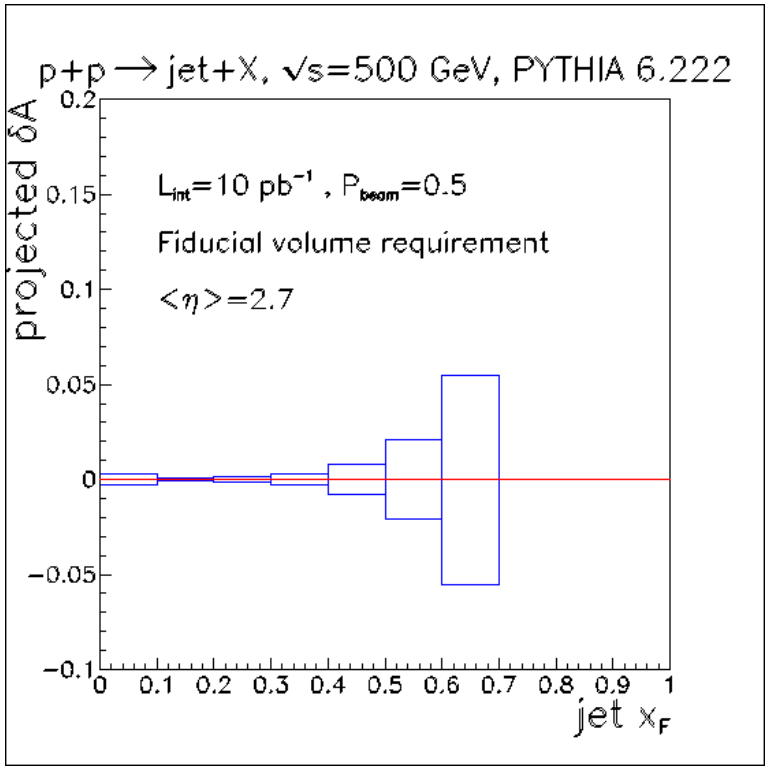
Observation of High-x_F J/Psi at STAR
[Nuc.Phys.A 830 (1-4) (2009) 231-234]

with only bare calorimeter response

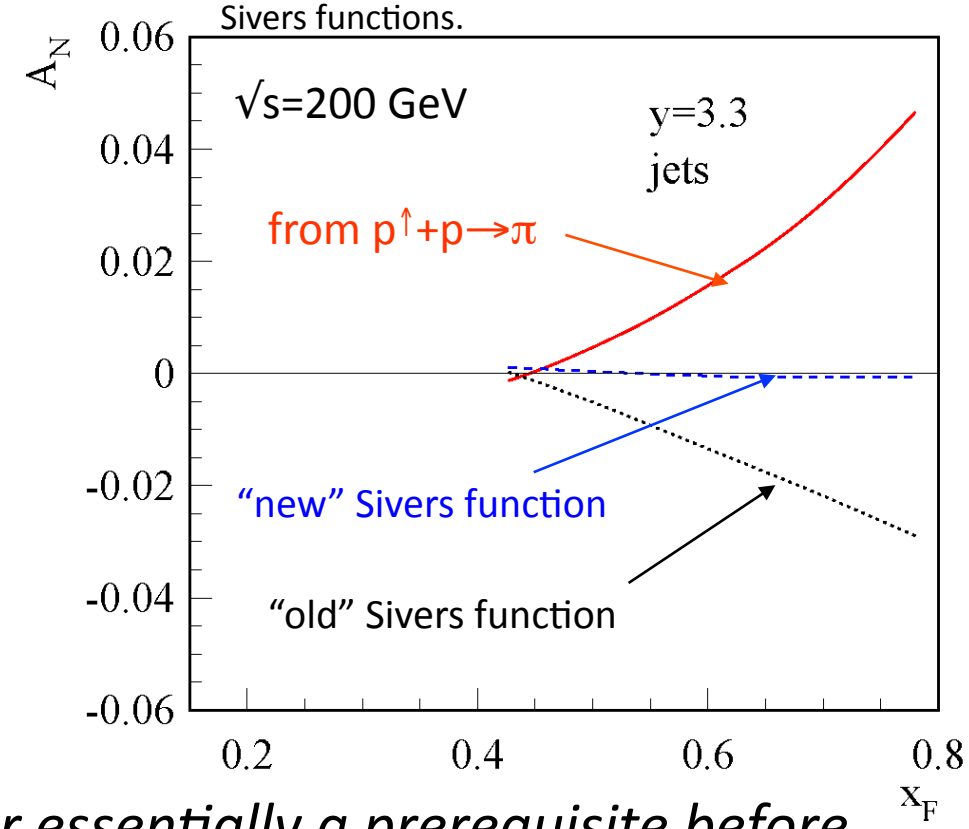
Establishing the requirements for a large x_F Drell Yan production experiment will provide the most robust test of theory for transverse spin, and lead to future avenues that provide the most robust interconnections between low-x probed at RHIC and low-x probed at eRHIC.

A_N(Jet)

- Siver's effect only (no collin's effect contribution)
- Need A_N(Jet) measurements before DY
- With ~10/pb & P=50%, AnDY run11 can measure A_N(Jet)



arXiv:1103.1591 jet A_N measurements are required to clarify signs of quark/gluon correlators related to Sivers functions.



Non-zero jet analyzing power essentially a prerequisite before proceeding to Drell Yan

A_NDY at IP2 at RHIC

"Feasibility Test of Large Rapidity Drell Yan Production at RHIC"

Letter of Intent submitted 24 May 2010

http://www.bnl.gov/npp/docs/pac0610/Crawford_LoI.100524.v1.pdf

PAC presentation: http://www.bnl.gov/npp/docs/pac0610/aschenauer_DY-collider_june10.pdf

- **Timeliness** – Run when STAR & PHENIX is doing W program (2012-13). DOE Milestone HP13 could be completed by 2015
- **Acceptance/background rejection** – Severe space constraints at STAR and PHENIX require major changes in the forward direction to do DY
- **Is charge sign a requirement?** – feed back to STAR/PHENIX forward upgrade plans

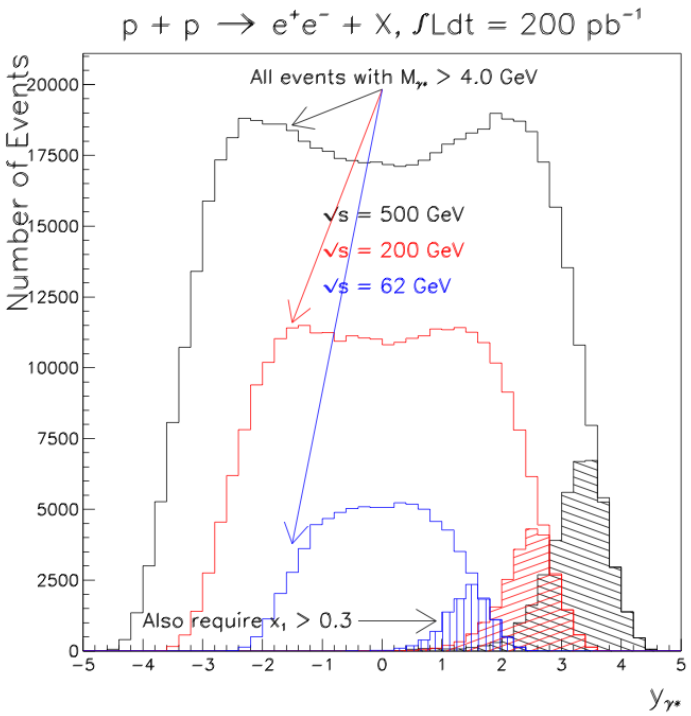
E.C.Aschenauer, A. Bazilevsky, L.C. Bland, K. Drees, C. Folz, Y. Makdisi, A. Ogawa, P. Pile, T.G. Throwe
Brookhaven National Laboratory
H.J. Crawford, J.M. Engelage, E.G. Judd
University of. California, Berkeley/Space Sciences Laboratory
C.W. Perkins
University of. California, Berkeley/Space Sciences Laboratory / Stony Brook University
A. Derevshchikov, N. Minaev, D. Morozov, L.V. Nogach
Institute for High Energy Physics, Protvino
G. Igo, S. Trentalange
University of California, Los Angeles
M. Grosse Perdekamp
University of Illinois
M.X. Liu
Los Alamos National Laboratory
H. Avakian
Thomas Jefferson National Accelerator Facility
E.J.Brash
Christopher Newport University and TJNAF
C.F.Perdrisat
College of William and Mary
V. Punjabi
Norfolk State University
Li, Xuan
Shandong University, China
Mirko Planinic, Goran Simatovic
University of Zagreb, Croatia

Primary Goals for Drell Yan at IP2 at RHIC

- Establish that large-x_F low-M dileptons from the DY process can be discriminated from background in √s=500 GeV $p_{\uparrow}$+p collisions.
- Provide sufficient statistical precision for the analyzing power A_N for DY production to test the theoretical prediction of a sign change compared to transverse single spin asymmetries for semi-inclusive deep inelastic scattering.
  - Meets HP13 milestone

- Objective of DY feasibility test is to establish the **requirements for future major forward upgrades at STAR and PHENIX** that would be used in a future p+Au or d+Au run that would emphasize Drell Yan production to probe low-x through scaling violations or virtual photon p_T dependence.

Requirements for e^+e^- DY at RHIC



High luminosity ~>150/pb (similar to W program)

Prefer 500GeV over 200GeV

Forward (eta ~ 4) detector

- Sizable A_N at high x_F
- Less charm & bottom backgrounds
- Less QCD backgrounds

Good background (e/h and gamma/e) separation

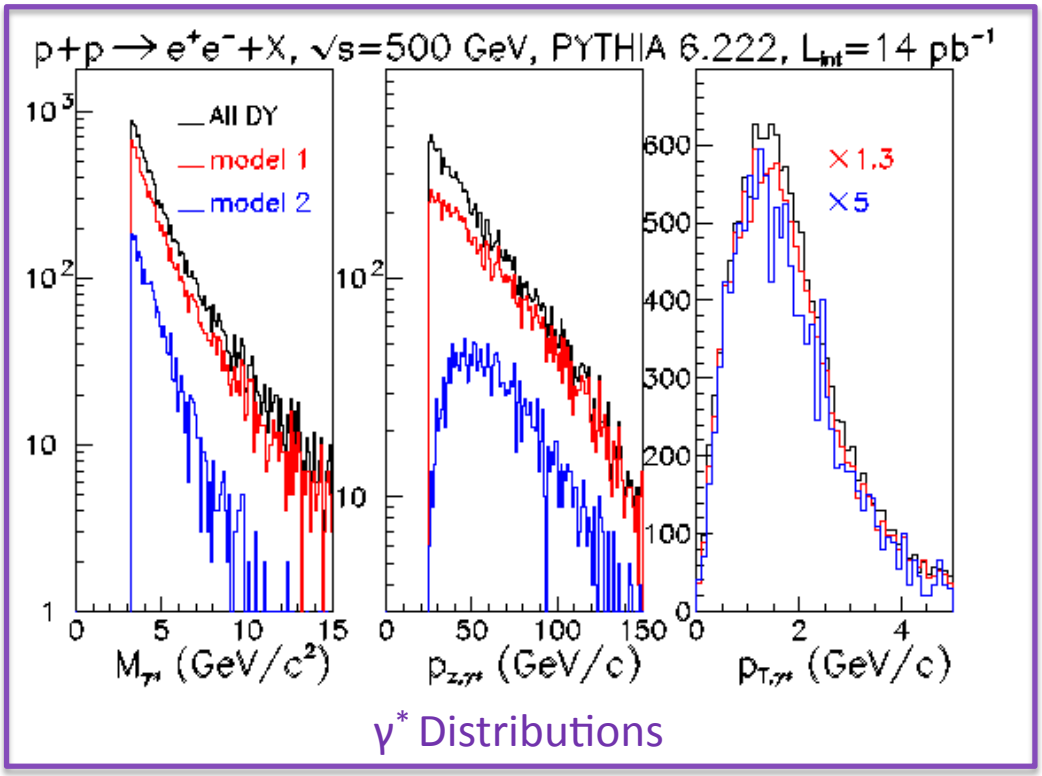
Is charge sign discrimination required for like-sign pair subtraction?

DY : ~7 x 10^{-5} mb @ 500GeV

10^6

Hadronic : ~30mb

Kinematic Distributions of γ^* and e^+e^- Daughters



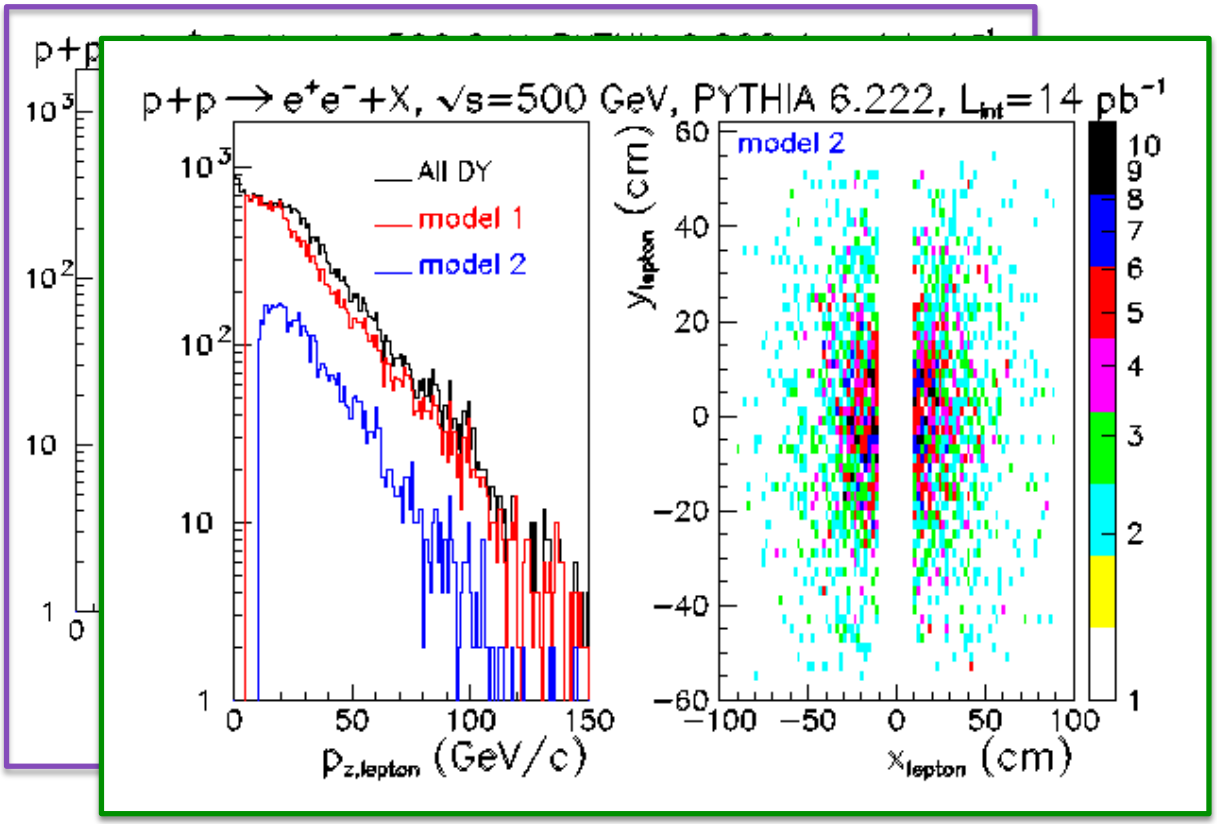
γ^* Distributions

Black = All DY

Model 1 = EMCal (2m x 2m), Beam Hole (0.2m x 0.2m) at 10m, No Magnetic Field (Future possible STAR/PHENIX Configuration)

Model 2 = L/R Modular EMCal (0.9m x 1.2m) at 5m, No Magnetic Field (Feasibility Test Configuration)

Kinematic Distributions of γ^* and e^+e^- Daughters



Black = All DY

Model 1 = EMCal (2m x 2m), Beam Hole (0.2m x 0.2m) at 10m, No Magnetic Field (Future possible STAR/PHENIX Configuration)

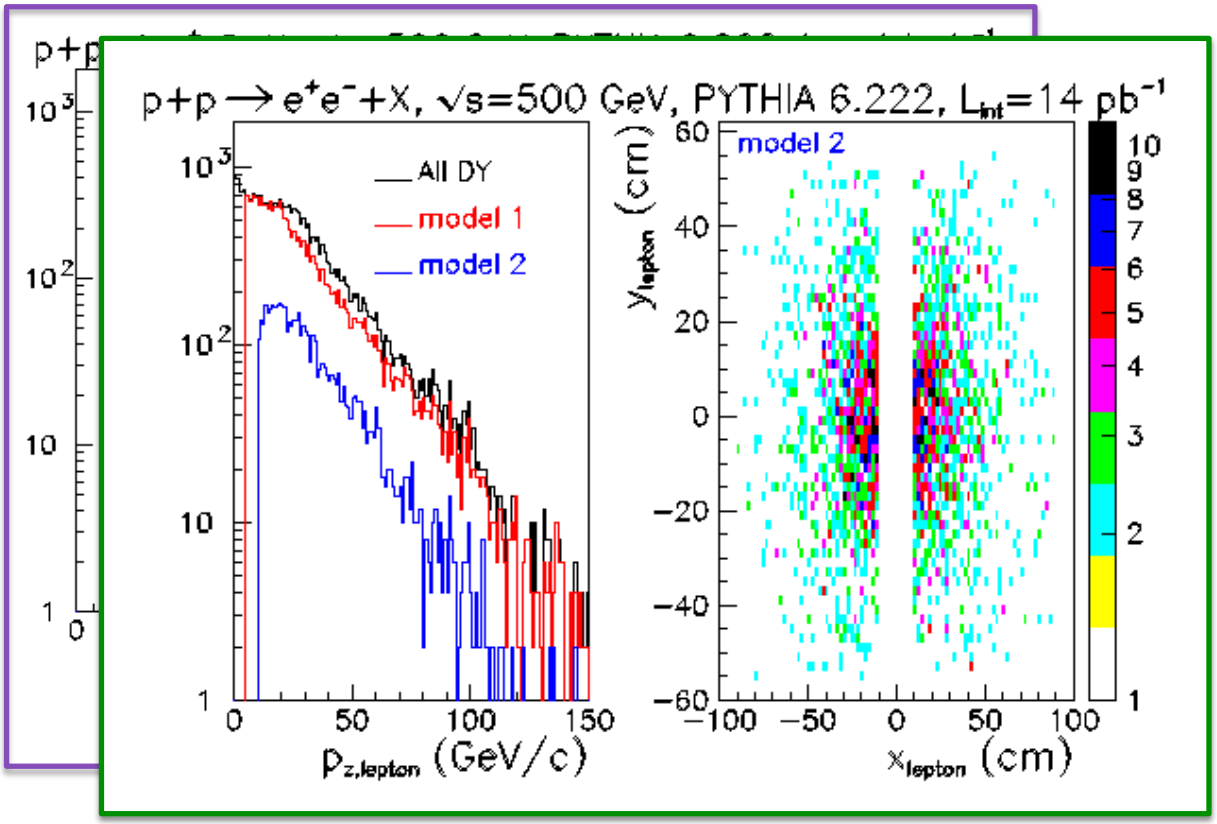
Model 2 = L/R Modular EMCal (0.9m x 1.2m) at 5m, No Magnetic Field (Feasibility Test Configuration)

Lepton Daughter Distributions

Most important contributions for γ^* at $x_F > 0.1$ at $\sqrt{s}$=500 GeV :

- High energy electrons and positrons (E > 10 GeV)
- Require detection at very forward angles
- e^+e^- from γ^* little affected by "modest" isolation (20mr half-angle cone)
- Best solution for charge sign would be a dipole magnet (difficult for any collider)

Kinematic Distributions of γ^* and e^+e^- Daughters



Black = All DY

Model 1 = EMCal (2m x 2m), Beam Hole (0.2m x 0.2m) at 10m, No Magnetic Field (Future possible STAR/PHENIX Configuration)

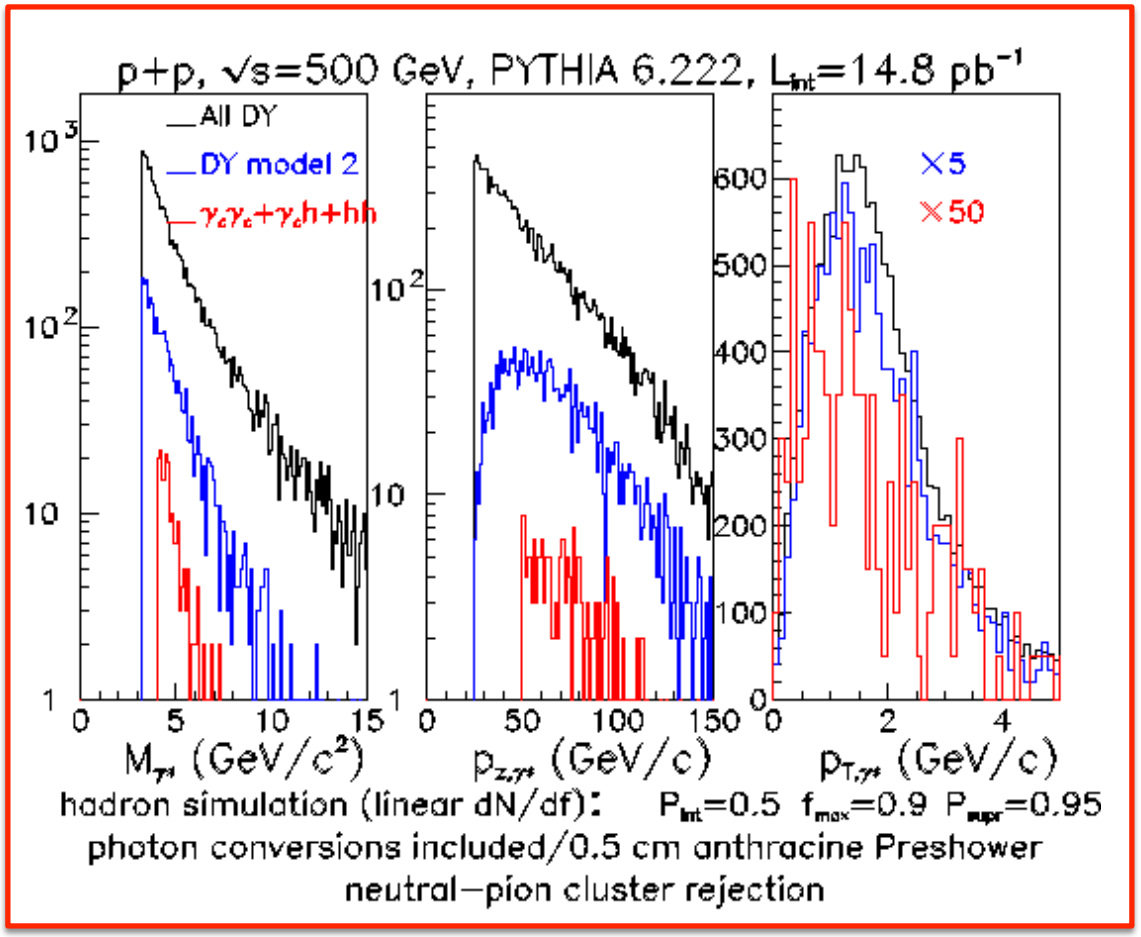
Model 2 = L/R Modular EMCal (0.9m x 1.2m) at 5m, No Magnetic Field (Feasibility Test Configuration)

Lepton Daughter Distributions

Most important contributions for γ^* at $x_F > 0.1$ at $\sqrt{s}$=500 GeV :

- High energy electrons and positrons (E > 10 GeV)
- Require detection at very forward angles
- e^+e^- from γ^* little affected by "modest" isolation (20mr half-angle cone)
- Best solution for charge sign would be a dipole magnet (difficult for any collider)
- Reasonable efficiency can be obtained for large-x_F DY with existing equipment

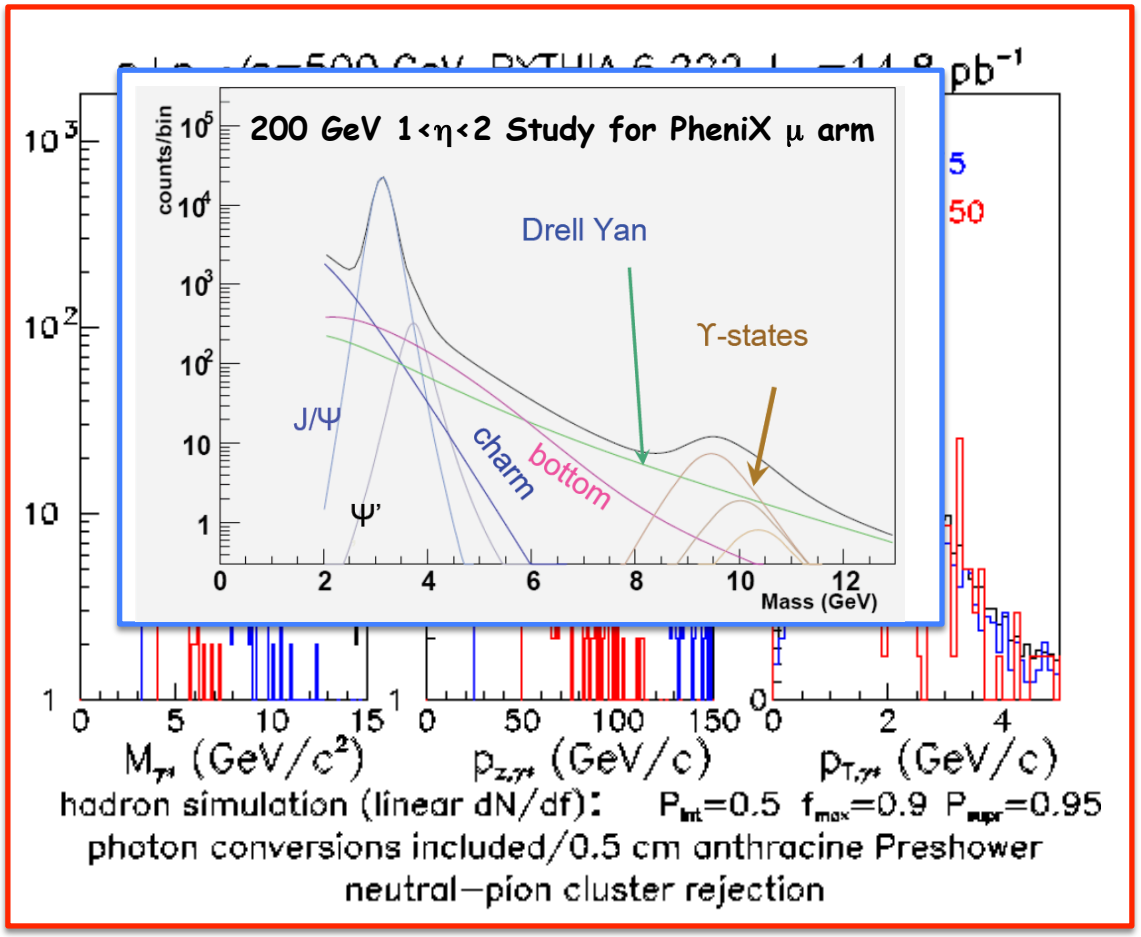
Summary of Background Estimates



Hadrons and Conversion Photons:
Simulation with PYTHIA + fast detector response simulation (tuned by GEANT)

- Conversion photons significantly reduced by $\pi^0 \rightarrow \gamma\gamma$ reconstruction in ECAL / veto
- 2 layer Pre-shower detector for e/h and e/gamma identification
- Hcal veto for e/h identification

Summary of Background Estimates

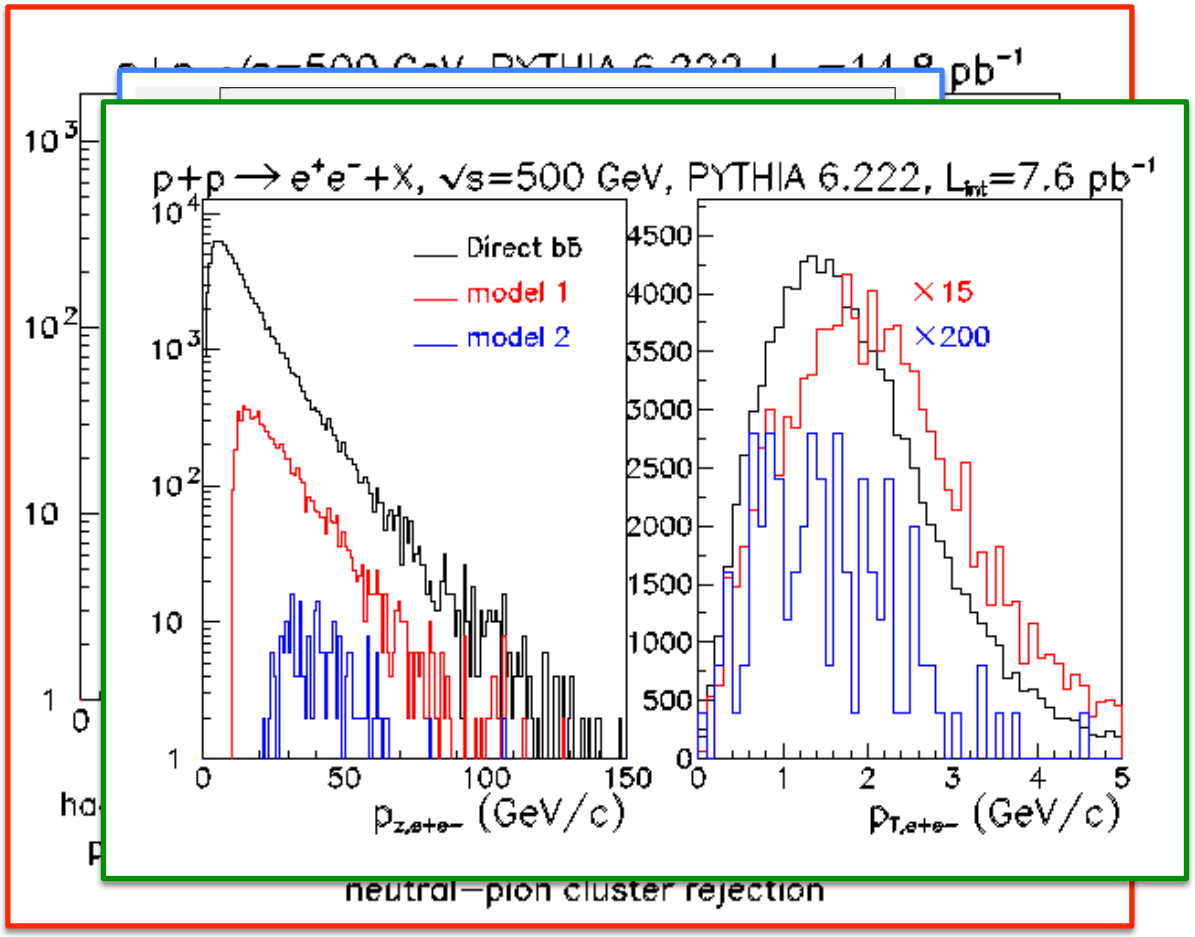


Hadrons and Conversion Photons:
Simulation with PYTHIA + fast detector response simulation (tuned by GEANT)

Open Heavy Flavor

- Conversion photons significantly reduced by $\pi^0 \rightarrow \gamma\gamma$ reconstruction in ECAL / veto
- 2 layer Pre-shower detector for e/h and e/gamma identification
- Hcal veto for e/h identification
- Charm reduced even further going to $\eta > 3$

Summary of Background Estimates



Hadrons and Conversion Photons:
Simulation with PYTHIA + fast detector response simulation (tuned by GEANT)

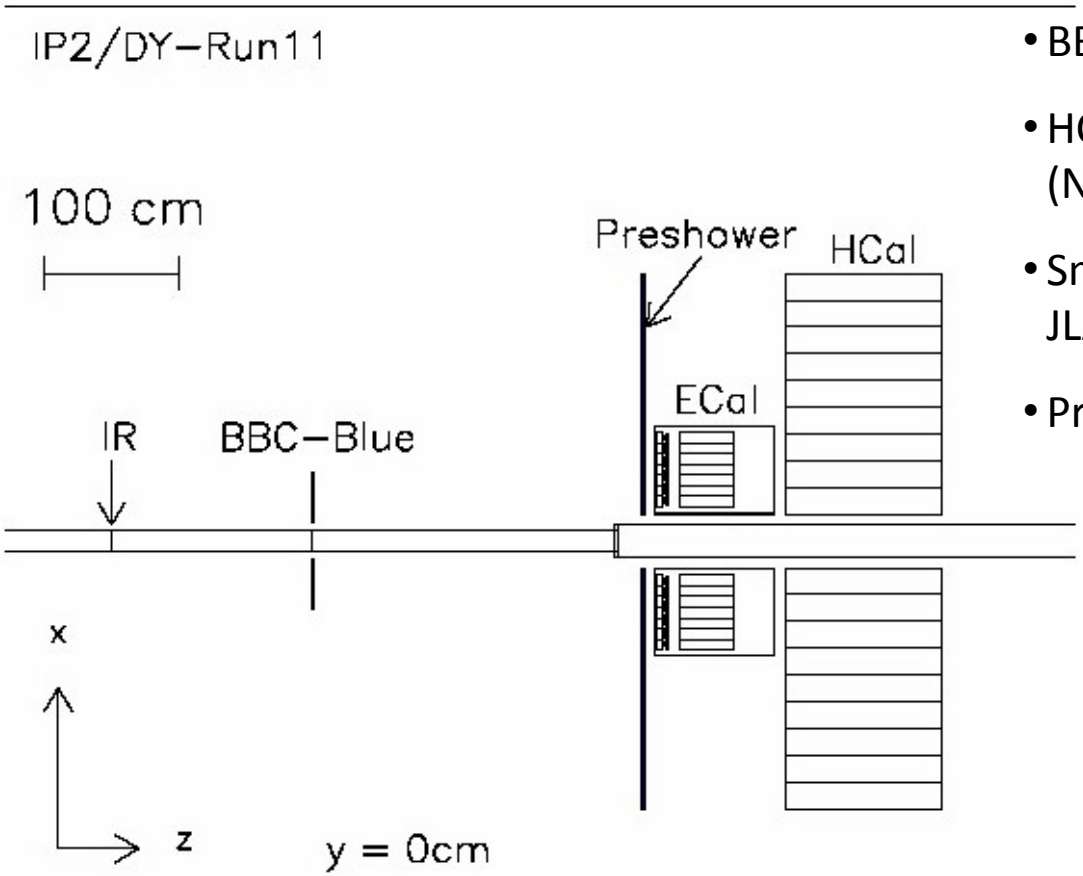
Open Heavy Flavor

Simulation of open bottom

- Conversion photons significantly reduced by $\pi^0 \rightarrow \gamma\gamma$ reconstruction in ECAL / veto
- 2 layer Pre-shower detector for e/h and e/gamma identification
- Hcal veto for e/h identification
- Charm reduced even further going to $\eta > 3$
- Direct production of open bottom results in ~15% background at large x_F

Schematic of detector for Run-11

Happening right now



- BBC (from PHOBOS) and ZDC/ZDC-SMD
- HCal is existing 9x12 modules from E864 (NIM406,227)
- Small (~120 cells) Ecal from BigCal at JLAB
- Pre-shower detector

Goals:

1. Establish impact of 3 IR operation on PHENIX and STAR luminosity

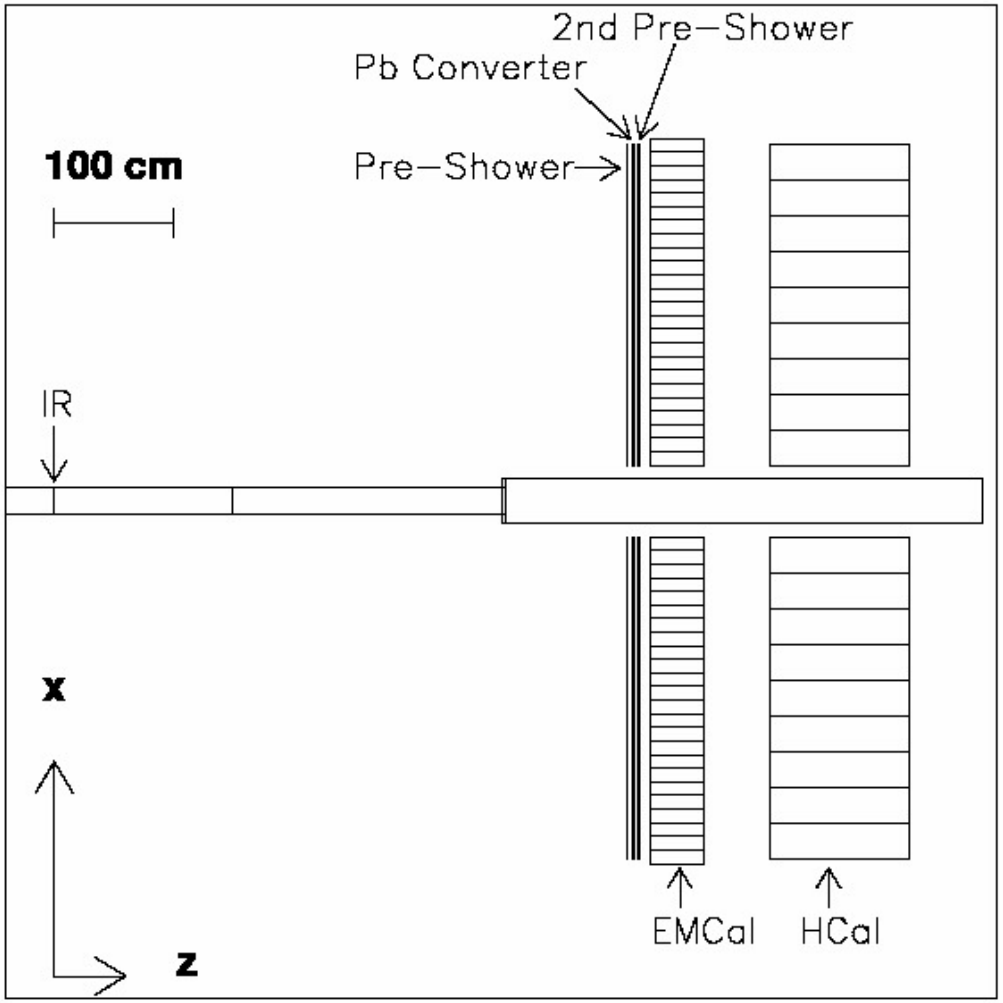
2. Calibrate HCal absolute energy scale with ρ, relative scale with cosmics

3.Measure hadronic background to benchmark MC further

4. A_N for jet (L_{int} ~ 10 / pb, P=50%)

Schematic of detector for Run-12

(PHOBOS split-dipole expected to be in place, but not used)



- BBC and ZDC/ZDC-SMD
- HCal is existing 9x12 modules from E864 (NIM406,227)
- Full Ecal wall (lead glass)
- Pre-shower detector (construct 2nd Layer)

Goal:

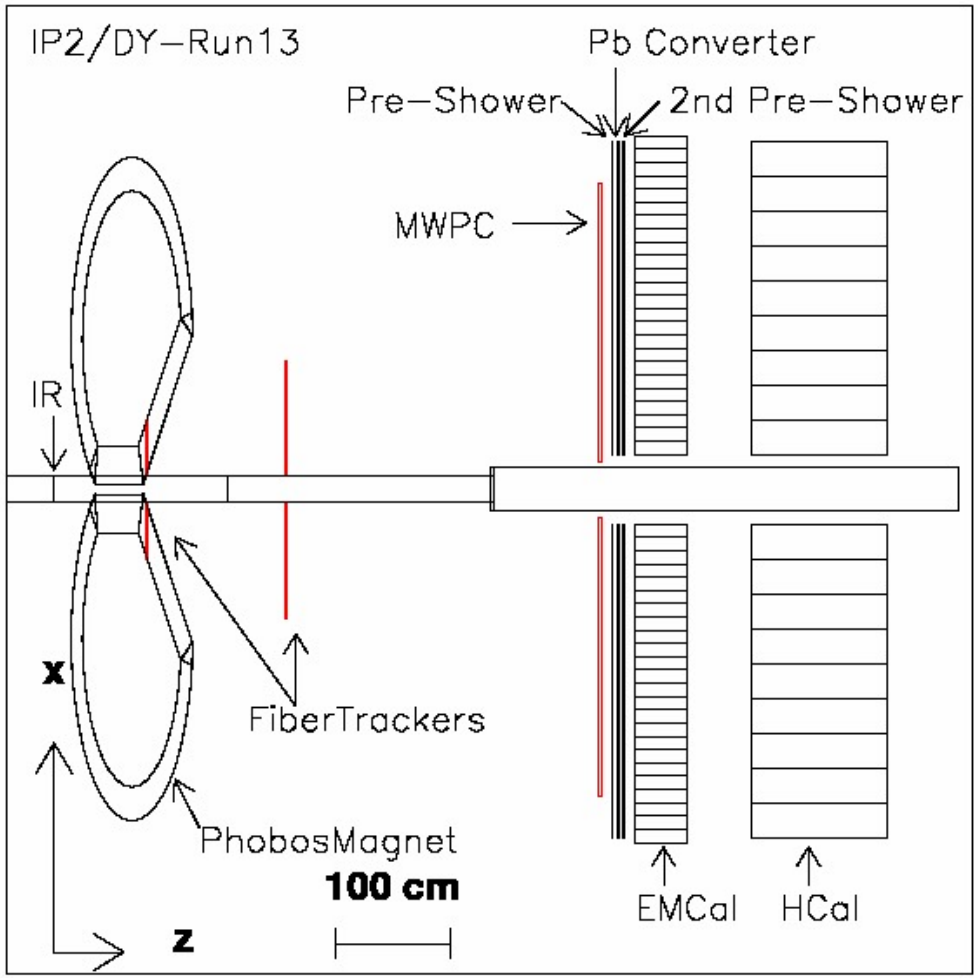
1. Reconstruct J/ψ and Y
2. Measure continuum between them
3. Integrate 150 pb^{-1} recorded to see if we can measure A_N(DY) without magnet

9400 DY-events

$|A_N| \sim 0.1$ $\delta A_N \sim 0.02$

Schematic of detector for Run-13

(Uses PHOBOS Split Dipole for charge sign)



- BBC and ZDC/ZDC-SMD
- Hcal is existing 9x12 modules from E864 (NIM406,227)
- Ecal (lead glass)
- Pre-shower detectors
- PHOBOS split-dipole magnetic field in GEANT model
- Fiber tracker stations and MWPC require construction

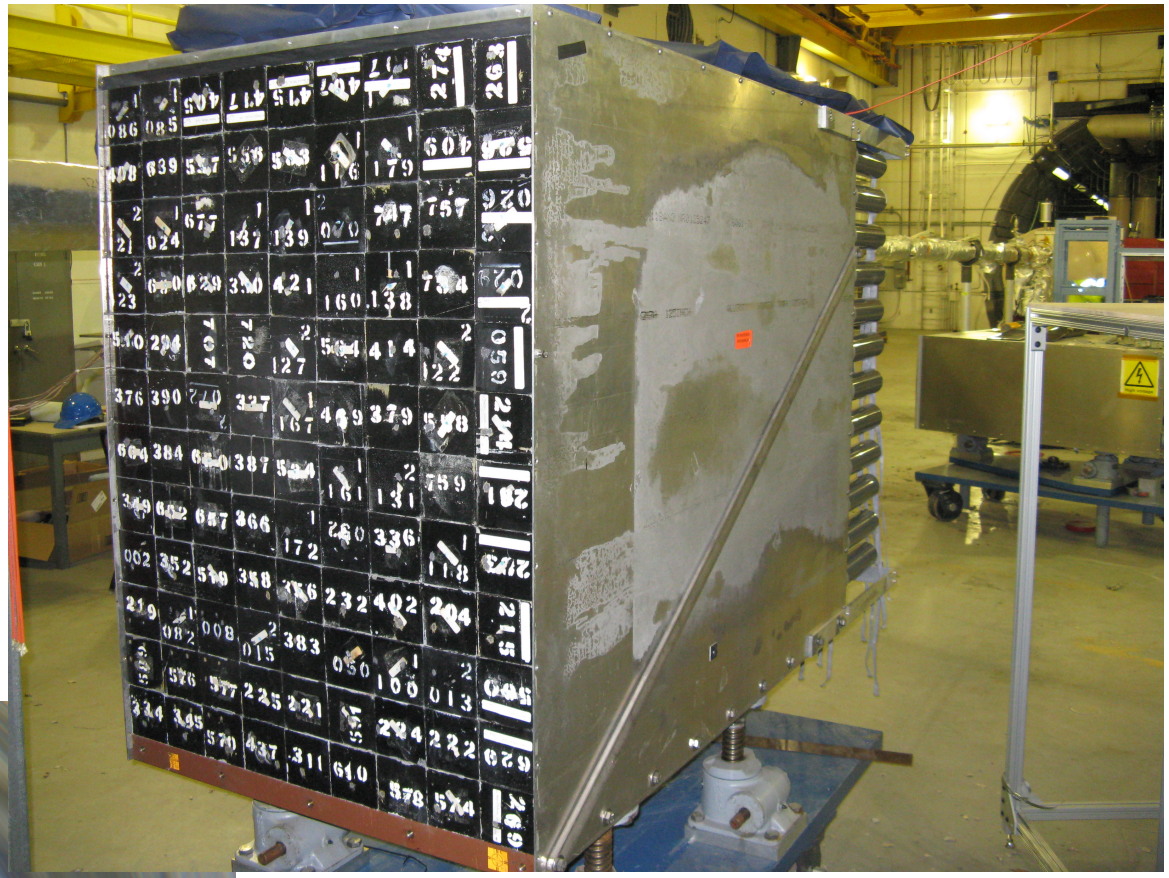
Goal:

Integrate 150 pb-1 recorded to see whether tracking significantly improves signal/background for A_N(DY)

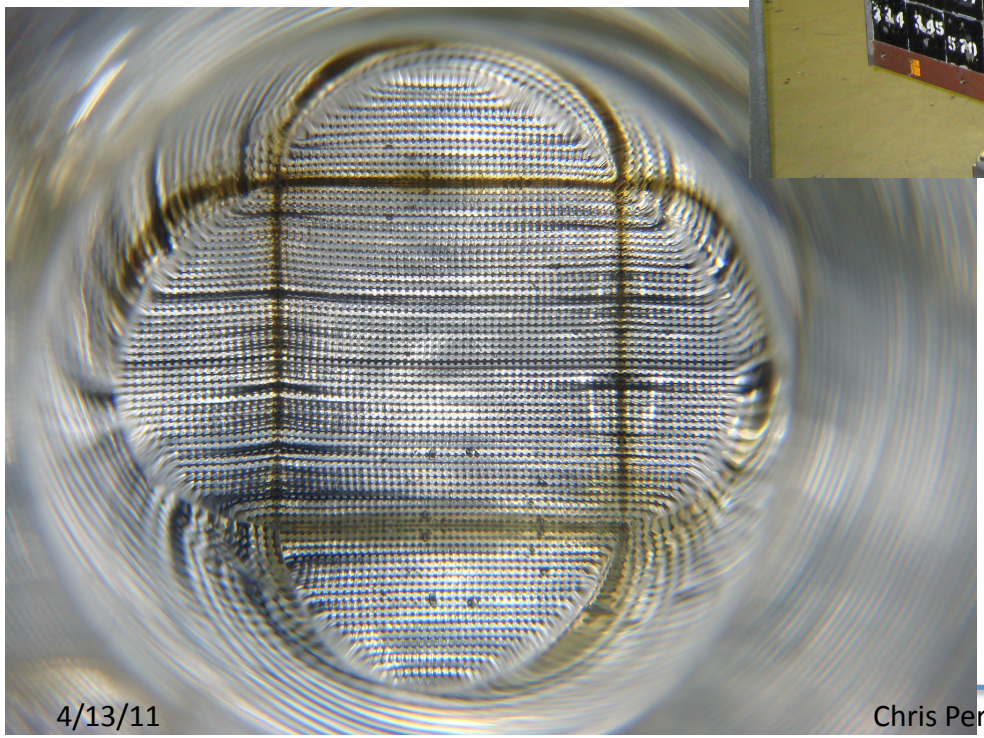
AnDY Progress (so far)

Commissioning with colliding beams ($p_{\uparrow}+p_{\uparrow}$ at $\sqrt{s}$=500 GeV)

AnDY Hcal from AGS -864



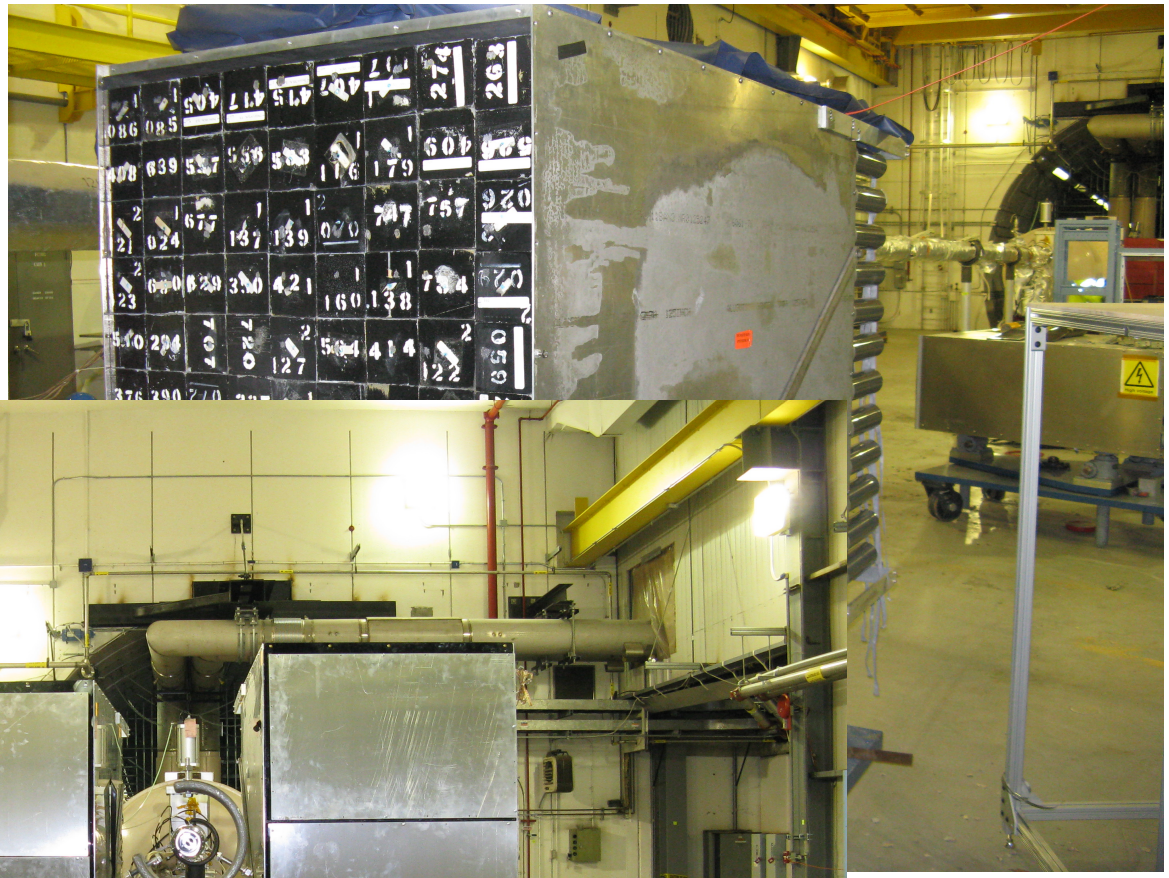
9x12 Hcal module

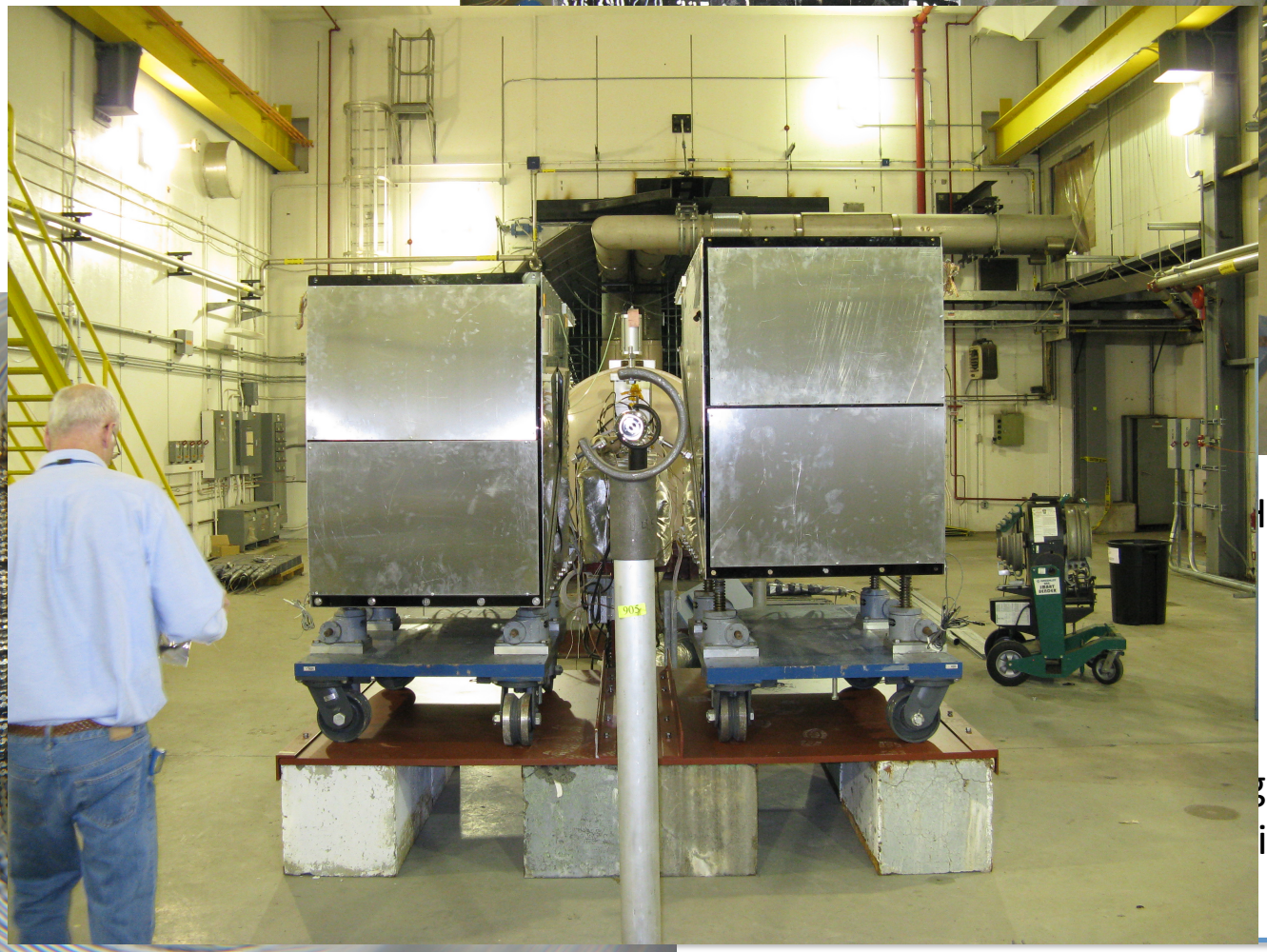


View of single cell through light guide.
47x47 fiber scinti. array matrix in Pb.

AnDY Hcal from AGS -864

Steel beam pipe removed
Be Beam pipe has been installed

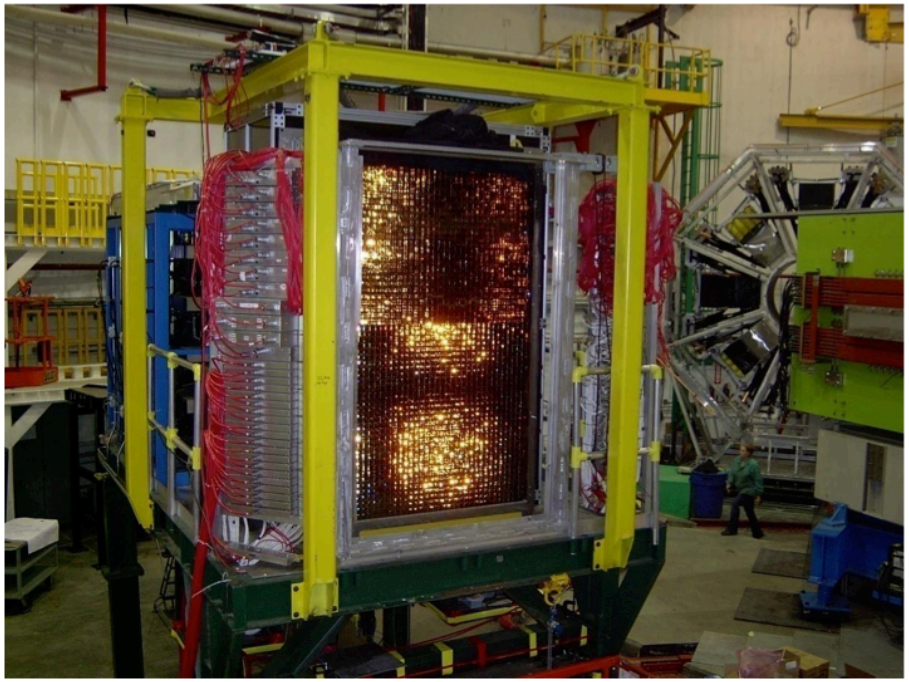




Hcal module

ght guide.
ix in Pb.

BigCal @ JLAB to BNL

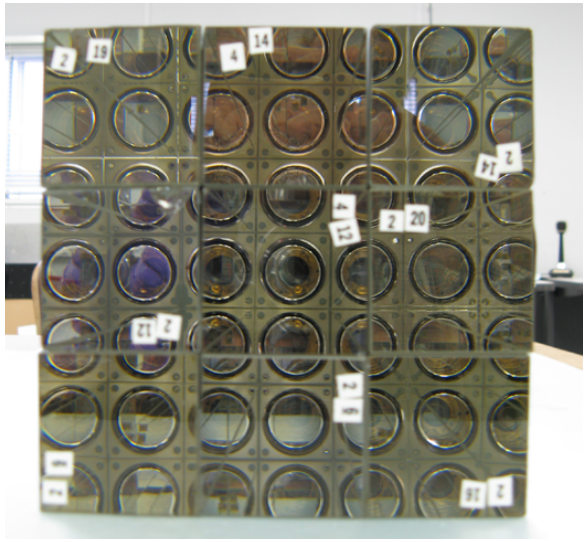


This is a picture of BigCal from a talk by Vina Punjabi at the Hall A collaboration meeting in June, 2010.

Some people from BigCal have joined AnDY!

Protvino Glass
32 column × 32 row submatrix
38mm × 38mm ×45cm
TF1 glass from IHEP

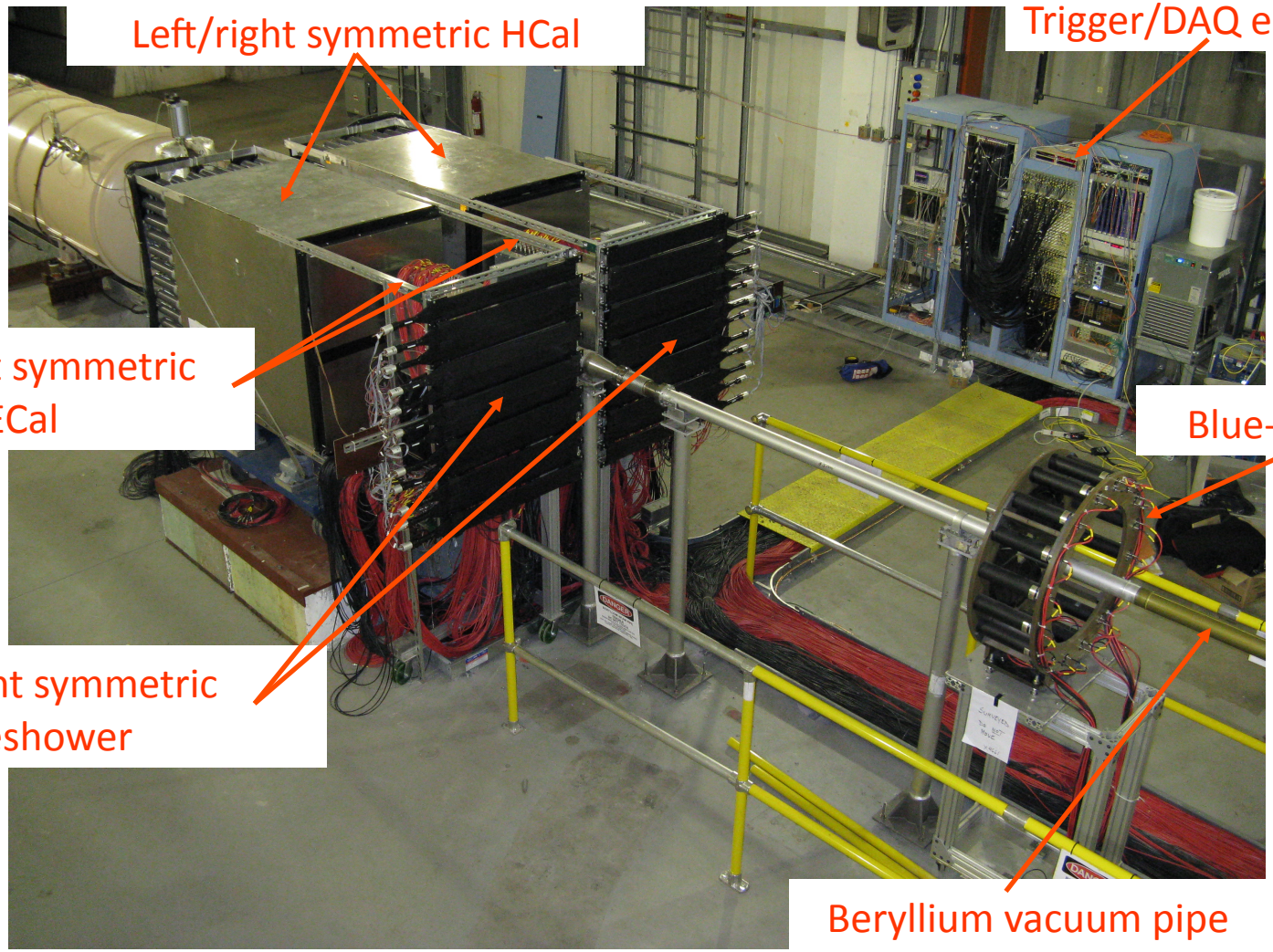
Yerevan Glass
30 column × 24 row submatrix
40mm × 40mm × 40cm
TF1 glass from Yerevan Physics Institute.



120 Yerevan cells from BigCal are now at BNL/IP2

3x3 test stack of fully assembled cells
Two 7x7 modules installed at IP2 for run11

IP2 in January, 2011 - AnDY

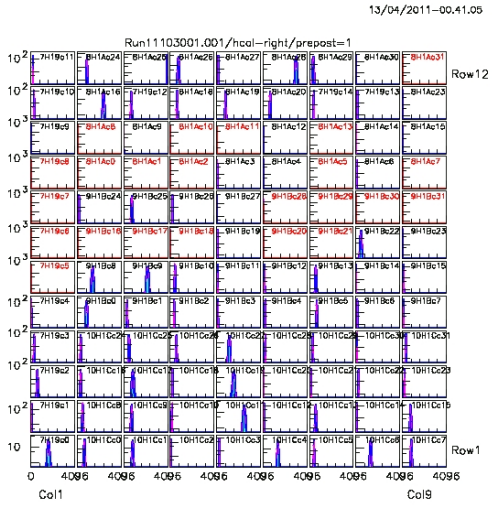


Full Trigger/DAQ System

- A Full Trigger/DAQ system was built using custom-designed electronics that can be programmed with user defined algorithms for triggering
- The system is capable of looking at every RHIC crossing for a trigger (~9.4 MHz), ie nearly zero deadtime
- The DAQ system can record typical events at a rate of ~ 2.4 kHz (depends on occupancy of detector)
- The following triggers have been developed so far and can be interleaved with each other during data-taking:

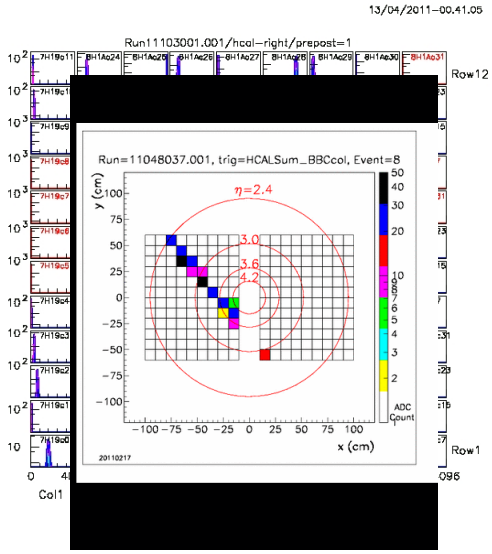
Full Trigger/DAQ System

- A Full Trigger/DAQ system was built using custom-designed electronics that can be programmed with user defined algorithms for triggering
- The system is capable of looking at every RHIC crossing for a trigger (~9.4 MHz), ie nearly zero deadtime
- The DAQ system can record typical events at a rate of ~ 2.4 kHz (depends on occupancy of detector)
- The following triggers have been developed so far and can be interleaved with each other during data-taking:
  - LED (for monitoring detector stability/gains)



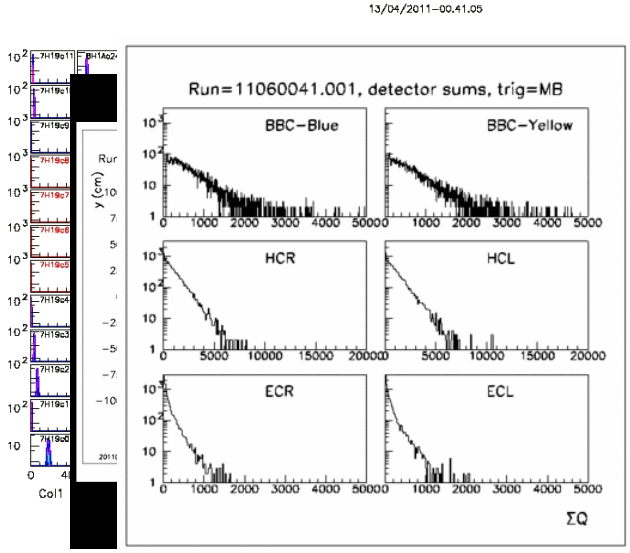
Full Trigger/DAQ System

- A Full Trigger/DAQ system was built using custom-designed electronics that can be programmed with user defined algorithms for triggering
- The system is capable of looking at every RHIC crossing for a trigger (~9.4 MHz), ie nearly zero deadtime
- The DAQ system can record typical events at a rate of ~ 2.4 kHz (depends on occupancy of detector)
- The following triggers have been developed so far and can be interleaved with each other during data-taking:
  - LED (for monitoring detector stability/gains)
  - Cosmic-rays (for relative calibration of Hcal)



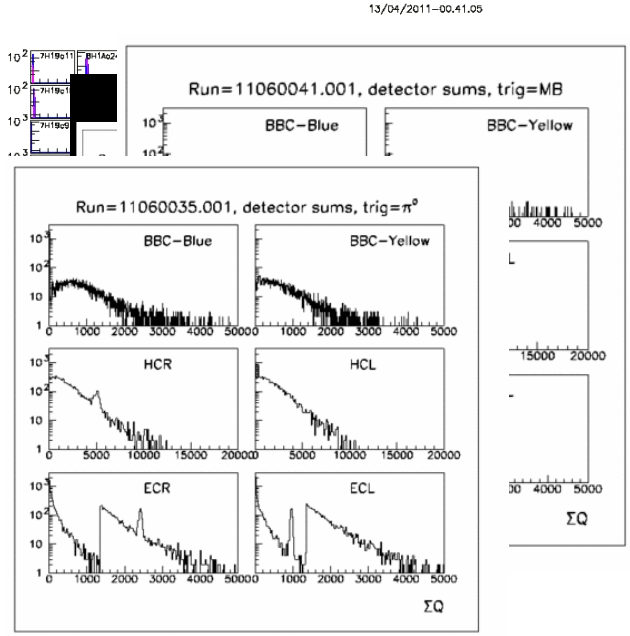
Full Trigger/DAQ System

- A Full Trigger/DAQ system was built using custom-designed electronics that can be programmed with user defined algorithms for triggering
- The system is capable of looking at every RHIC crossing for a trigger (~9.4 MHz), ie nearly zero deadtime
- The DAQ system can record typical events at a rate of ~ 2.4 kHz (depends on occupancy of detector)
- The following triggers have been developed so far and can be interleaved with each other during data-taking:
  - LED (for monitoring detector stability/gains)
  - Cosmic-rays (for relative calibration of Hcal)
  - Minimum-bias (based on BBC)



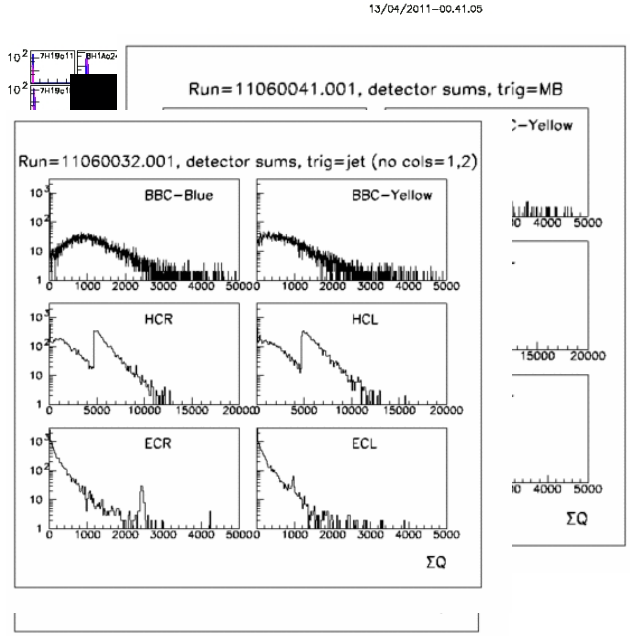
Full Trigger/DAQ System

- A Full Trigger/DAQ system was built using custom-designed electronics that can be programmed with user defined algorithms for triggering
- The system is capable of looking at every RHIC crossing for a trigger (~9.4 MHz), ie nearly zero deadtime
- The DAQ system can record typical events at a rate of ~ 2.4 kHz (depends on occupancy of detector)
- The following triggers have been developed so far and can be interleaved with each other during data-taking:
  - LED (for monitoring detector stability/gains)
  - Cosmic-rays (for relative calibration of Hcal)
  - Minimum-bias (based on BBC)
  - ECal Sum (for triggering on π^0)



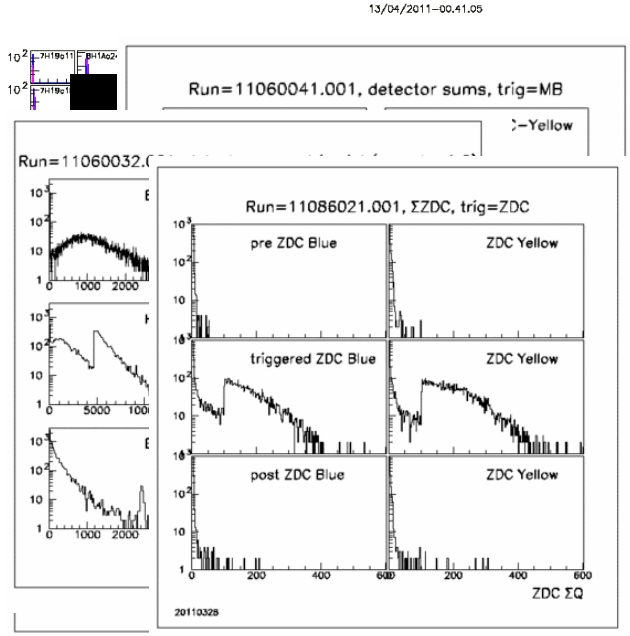
Full Trigger/DAQ System

- A Full Trigger/DAQ system was built using custom-designed electronics that can be programmed with user defined algorithms for triggering
- The system is capable of looking at every RHIC crossing for a trigger (~9.4 MHz), ie nearly zero deadtime
- The DAQ system can record typical events at a rate of ~ 2.4 kHz (depends on occupancy of detector)
- The following triggers have been developed so far and can be interleaved with each other during data-taking:
  - LED (for monitoring detector stability/gains)
  - Cosmic-rays (for relative calibration of Hcal)
  - Minimum-bias (based on BBC)
  - ECal Sum (for triggering on π^0)
  - HCal Sum (for triggering on jets)

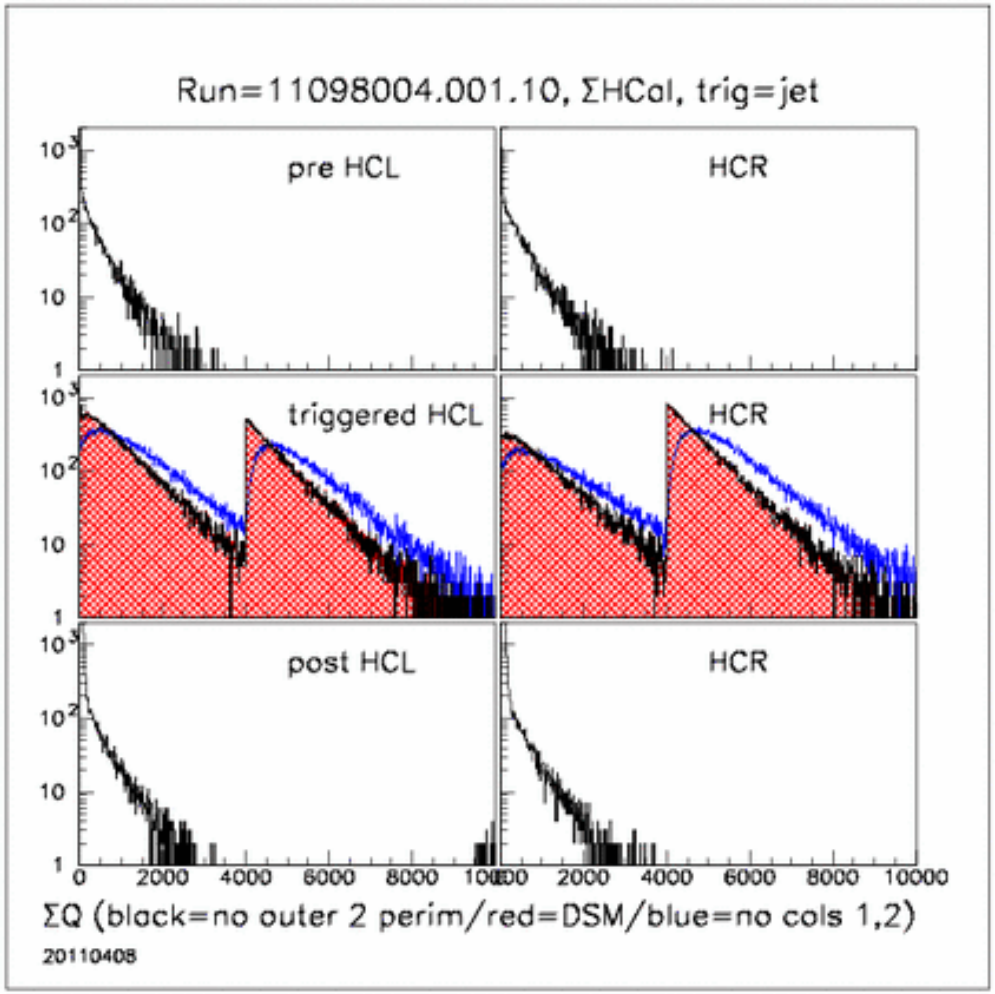


Full Trigger/DAQ System

- A Full Trigger/DAQ system was built using custom-designed electronics that can be programmed with user defined algorithms for triggering
- The system is capable of looking at every RHIC crossing for a trigger (~9.4 MHz), ie nearly zero deadtime
- The DAQ system can record typical events at a rate of ~ 2.4 kHz (depends on occupancy of detector)
- The following triggers have been developed so far and can be interleaved with each other during data-taking:
  - LED (for monitoring detector stability/gains)
  - Cosmic-rays (for relative calibration of Hcal)
  - Minimum-bias (based on BBC)
  - ECal Sum (for triggering on π^0)
  - HCal Sum (for triggering on jets)
  - ZDC (for local polarimetry)



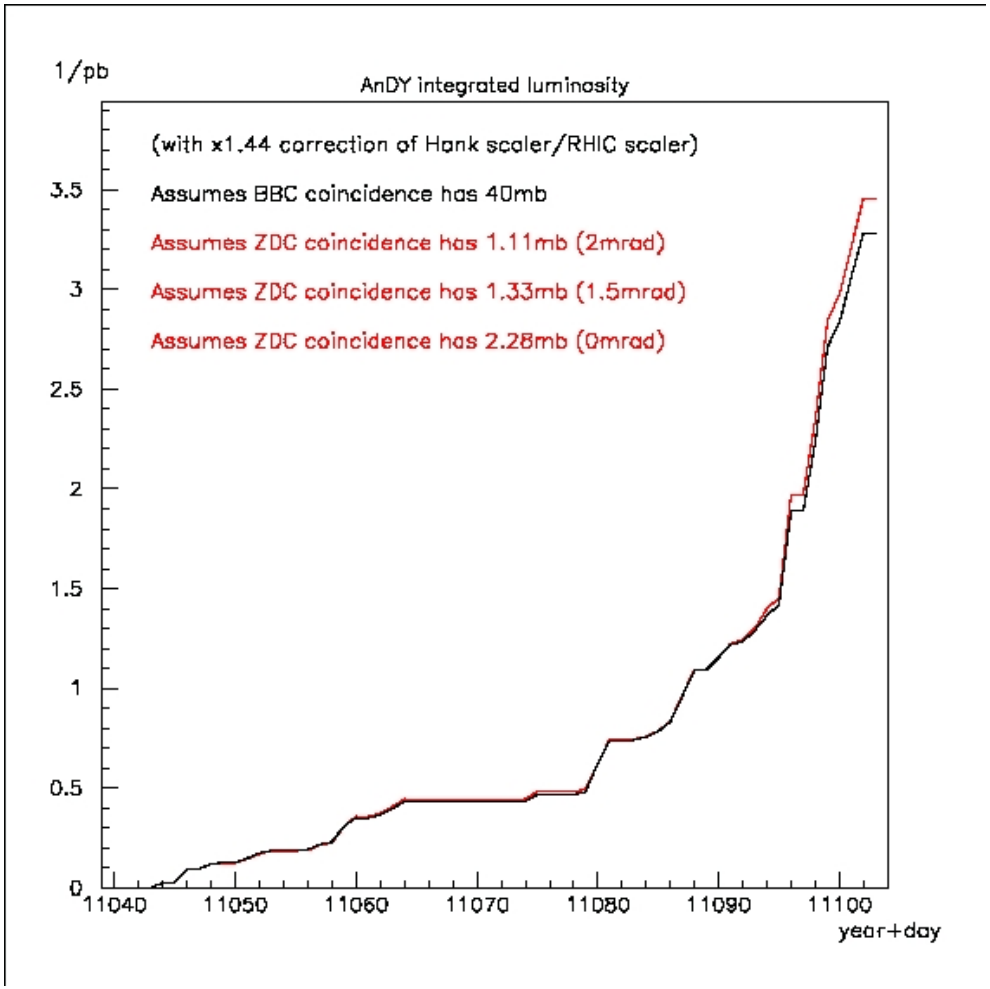
Jet Trigger



- Jet Trigger = Threshold on HCal Sum with BBC collision requirement
- Crossings before and after Jet trigger are relatively clean
- We are currently in "production" running, collecting jet-triggered data
- > 660 M Jet events recorded
- Absolute energy scale still to be determined

- Delivered luminosity is fully recorded, with minimal impact from livetime

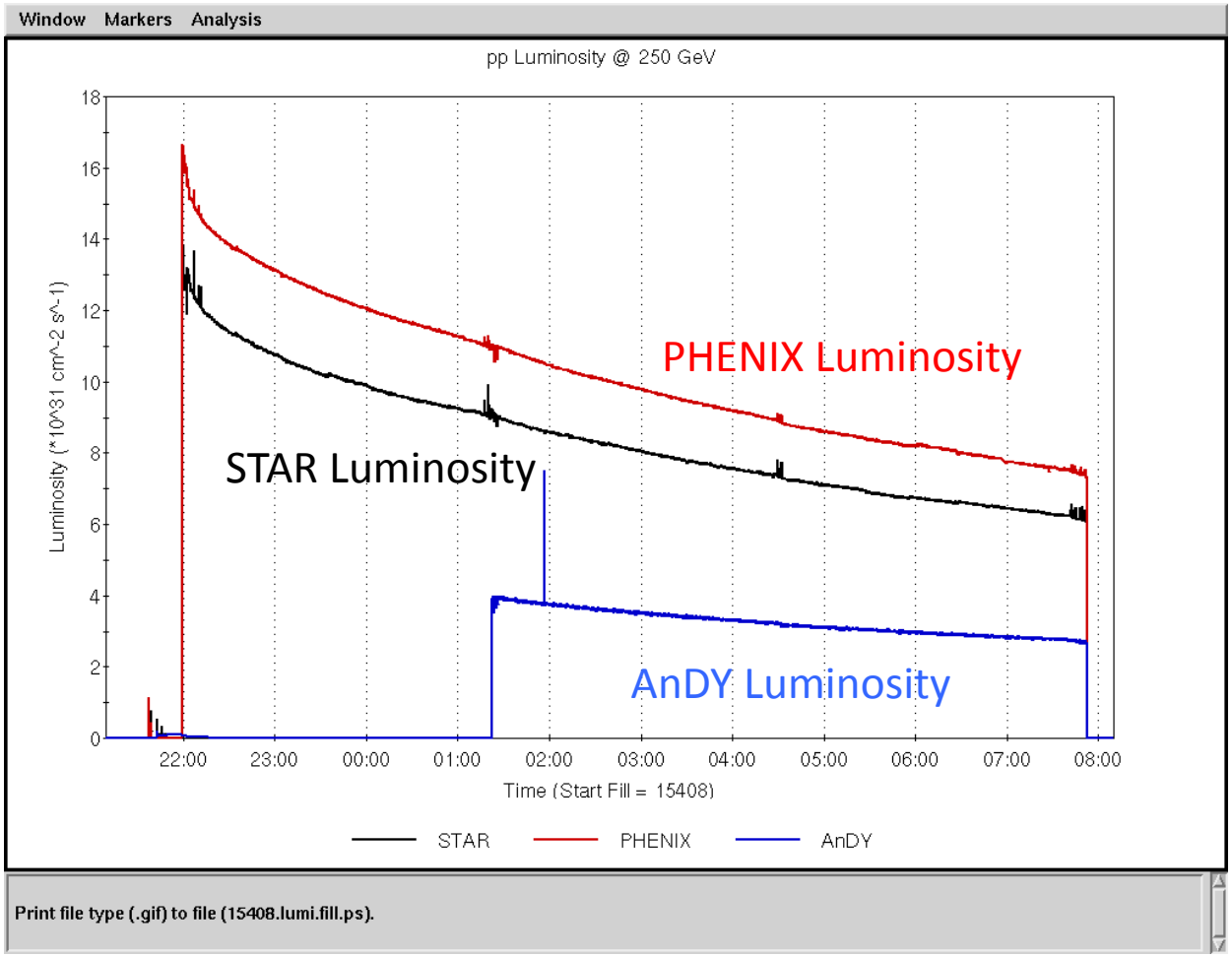
Integrated Luminosity Estimate to Date



- Beam crossing angle was reduced at IP2 around March 12, 2011
- Threshold on bunch intensity for putting IP2 into collisions has been increasing starting around March 29, 2011
- Need Vernier Scan to determine cross section
- Can further increase luminosity by reducing β* at IP2 (~ factor of 2 increase)

- Need L_{int} = ~10 pb^{-1}, P=50% to obtain A_N(jet)

Impact of 3 IR Operation at RHIC



- RHIC Fill = 15408 starting on April 6, 2011
- IP2 put into collisions when there were < 1.4 x 10^{11} ions/bunch for this fill
- Some fills were not as clean before separation bump removal was scripted by MCR
- It was found that if a small tune shift was not performed after putting STAR/PHENIX into collisions, beam loss was high regardless of AnDY collisions and removal of separation bumps at IP2 looked particularly bad

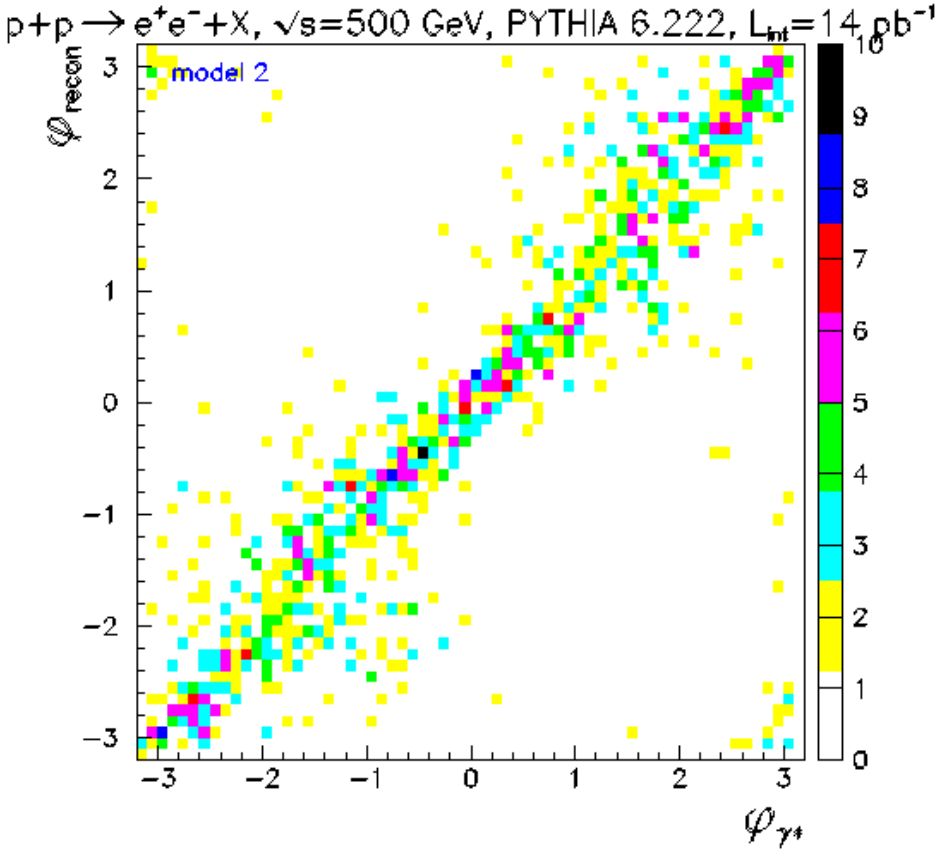
- Impact of collisions at IP2 on STAR/PHENIX Luminosity is small so far when separation bump removal is done properly
- Need to continue increasing threshold for putting IP2 into collisions to determine impact of collisions at a third IR at RHIC

Conclusions and Outlook

- Measuring A_N for large x_F Drell-Yan production is a critical and robust check of current theoretical understanding
  - Establishing requirements for large x_F Drell-Yan at RHIC through a feasibility test is needed for future major forward upgrades at STAR and PHENIX and can be done concurrently with other measurements at these experiments
  - A large x_F Drell-Yan measurement is critical to make contact with potential low-x measurements at a future eRHIC
  - Simulations show that reasonable efficiency can be obtained with the proposed design
- The detector at IP2 for Run-11, as proposed in our Letter of Intent, has been built (plus more!) and is working as planned
  - AnDY is in "production" running, collecting mostly jet-triggered data
  - More luminosity is needed in Run-11 to verify we can integrate enough luminosity in Runs 12/13 for A_N(DY) measurements and to obtain sufficient statistics for A_N(jet) measurement in Run 11

Backup

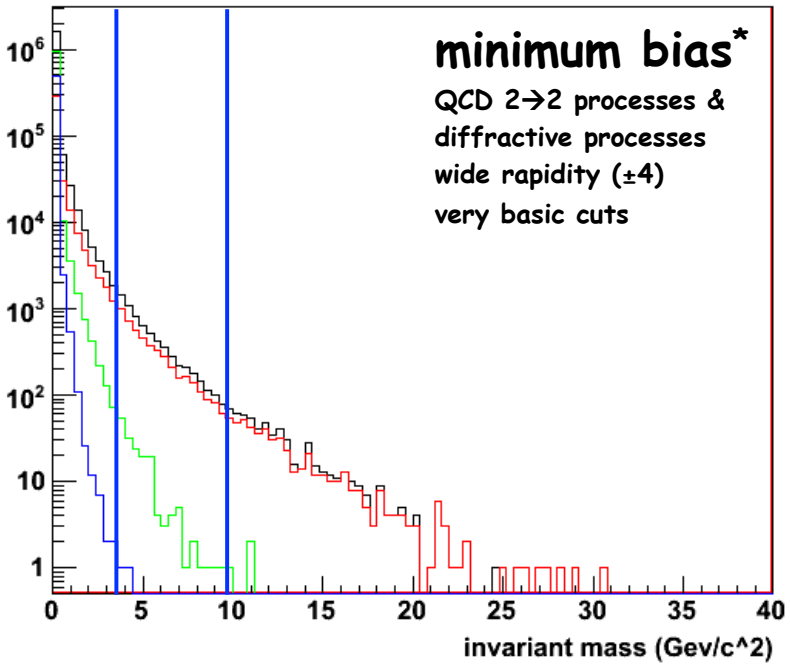
Azimuthal Angle for DY Dileptons

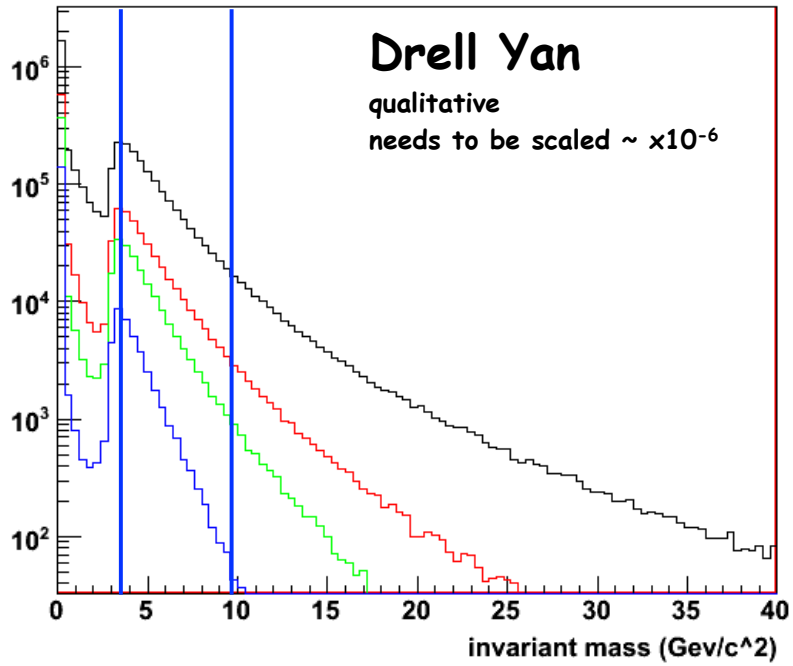


- e^+ and e^- in separate modules except when γ* has large p_T
- Azimuthal angle required for analyzing power measurement
- Resolution is primarily from measuring energies of e^+ and e^-
- Model 2 covers full azimuth despite modular coverage

Electron Pairs at Different Rapidities

All, central (|y| < 1), forward (|y| > 2), very forward (|y| > 3)



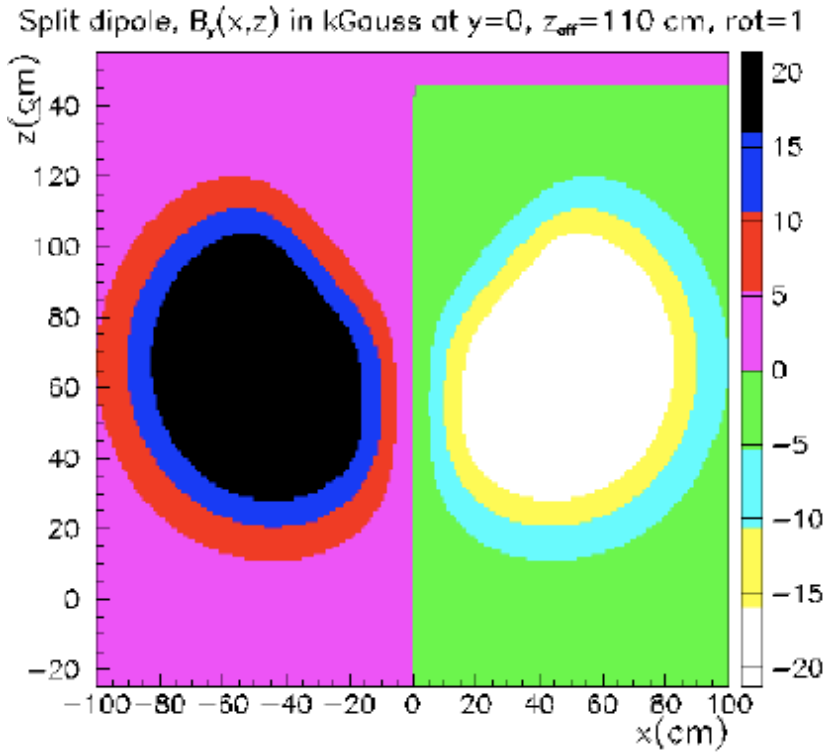


- Background decreases faster than signal at forward rapidities.

Electron/Hadron/Photon Discrimination

- Electron/Hadron
  - cut on ratio of energy in EMCal vs combined EMCal + Hcal
    - Can reject most hadron while retaining most electrons
    - Most of the remaining hadrons deposit a high fraction of their energy in EMCal
  - Pre-shower detector composed of 1cm Pb converter sandwiched between two 0.5cm scintillation plastic counters can reject most remaining hadrons (e+e- start to shower in converter).
  - Possibly use PHOBOS magnet as spectrometer with tracking prior to EMCal
- Electron/Photon
  - Photon conversions: Use Pre-shower to separate 2MIP response from 1MIP response
  - Neutral Pion decays: reconstruct neutral pions in EMCal offline
  - Use tracking in Run 13 to identify conversion pairs

Charge Sign Discrimination

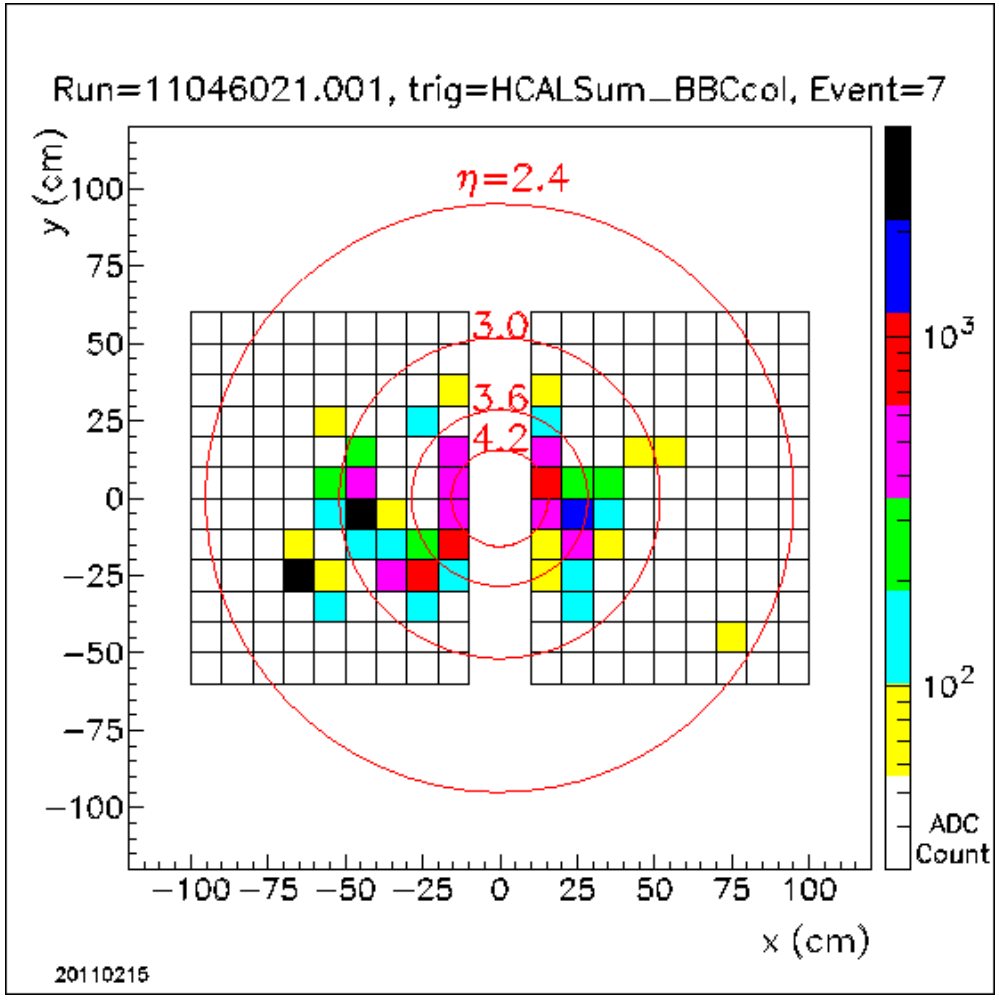


Vertical component of B versus x,z at y=0 from PHOBOS split-dipole magnet

- Use PHOBOS split-dipole magnet and measure deflections
- Minimal field close to beam
- Large e^+e^- mtm -> small deflections
- Need small vertex diamond to minimize distance along beam line when they cross beam pipe
- Simulation of tracking e^+e^- through field indicates charge sign discrimination is feasible

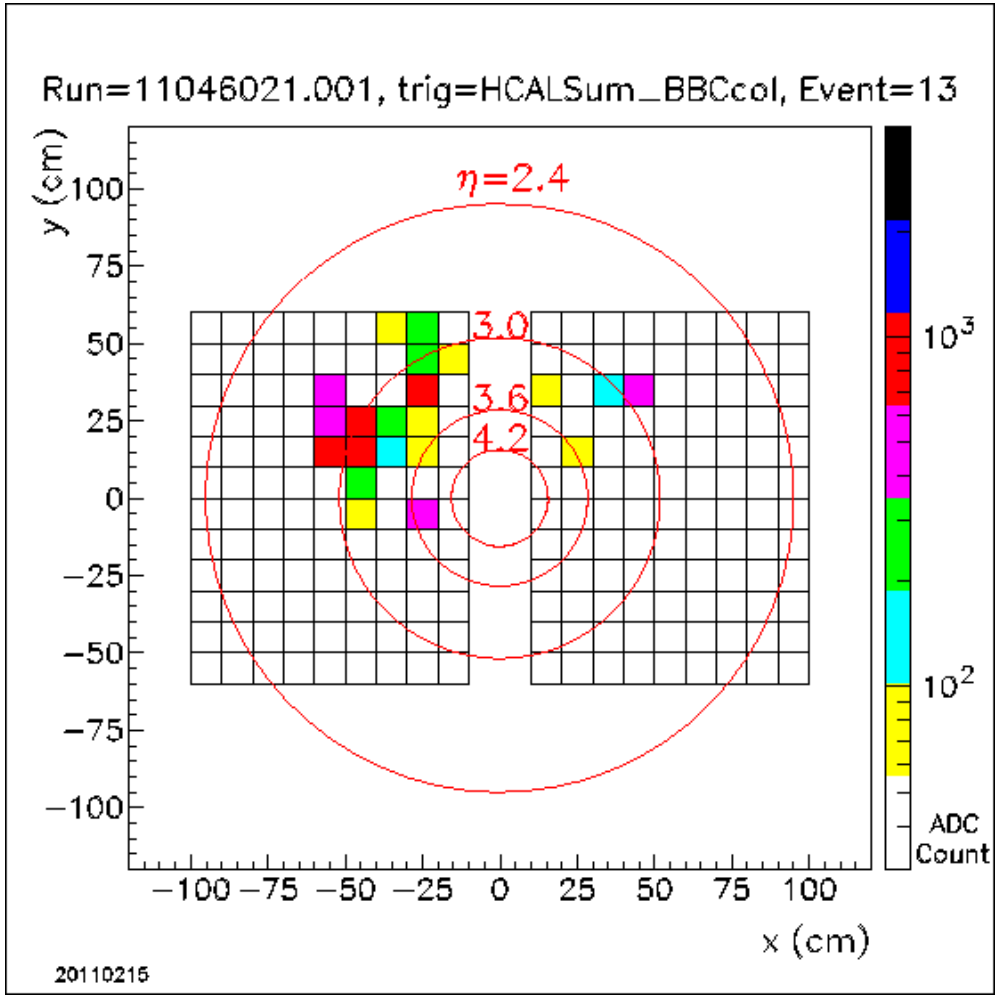
- Need 3 space points for charge sign
  - Accurate z vertex can be one (associated charged hadrons can provide this)
- 3 tracking stations proposed:
  - First two = as close to vertex as possible, planes of scintillating fibers
  - Third = 470cm from IP, multi-wire proportional chambers

Jet Trigger Events



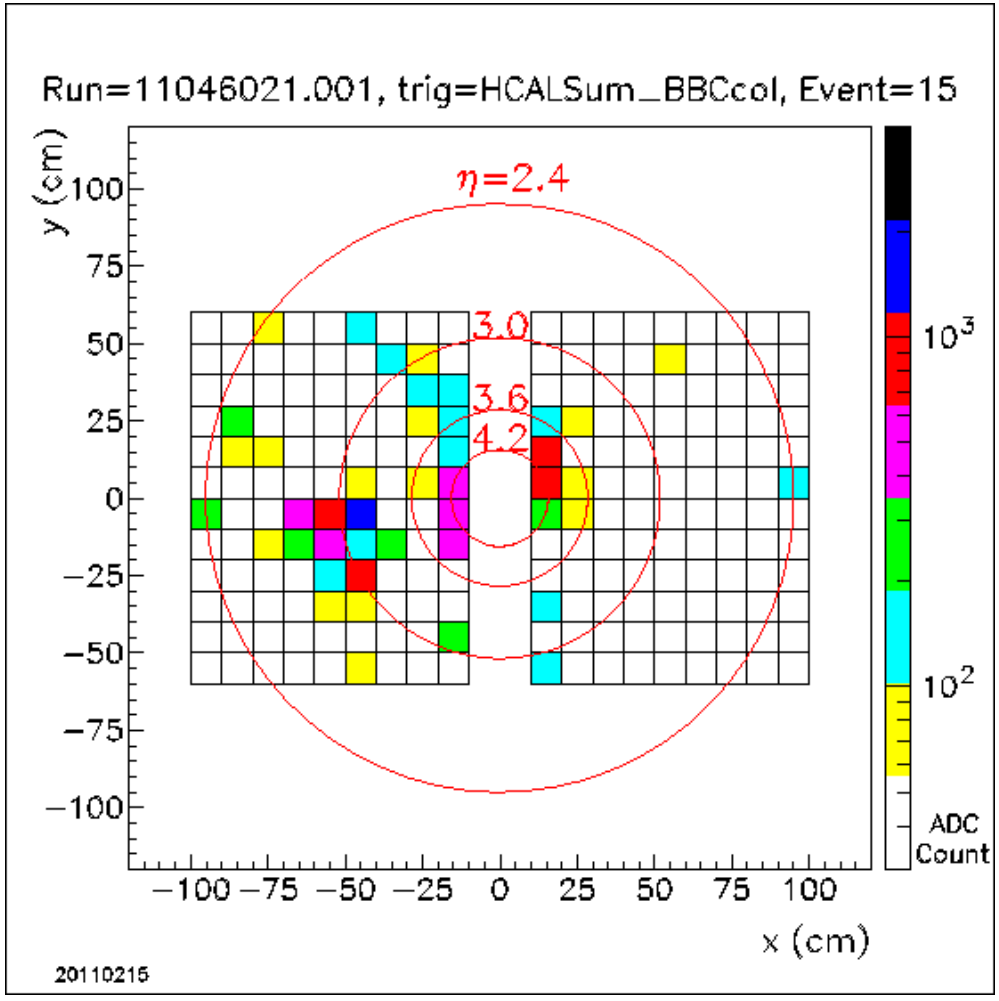
- Select from jet-trigger events for HCal "high-tower" to be centered in module
- Display for each detector of each module the ADC count as color scale (black=greatest count →yellow=lowest count)
- Events look "jetty", as expected

Jet Trigger Events



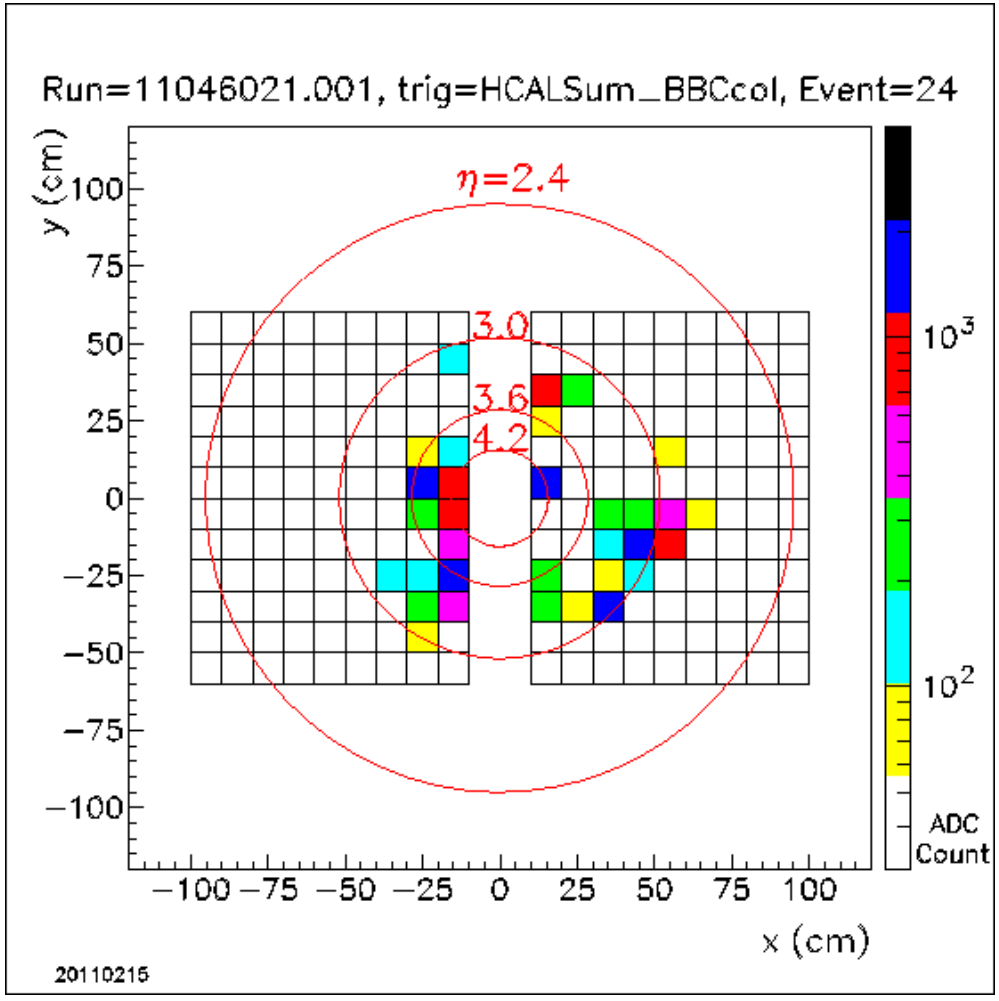
- Select from jet-trigger events for HCal "high-tower" to be centered in module
- Display for each detector of each module the ADC count as color scale (black=greatest count →yellow=lowest count)
- Events look "jetty", as expected

Jet Trigger Events



- Select from jet-trigger events for HCal "high-tower" to be centered in module
- Display for each detector of each module the ADC count as color scale (black=greatest count →yellow=lowest count)
- Events look "jetty", as expected

Jet Trigger Events



- Select from jet-trigger events for HCal "high-tower" to be centered in module
- Display for each detector of each module the ADC count as color scale (black=greatest count →yellow=lowest count)
- Events look "jetty", as expected