Status / Plans
STAR polarized p+p program
Run 12

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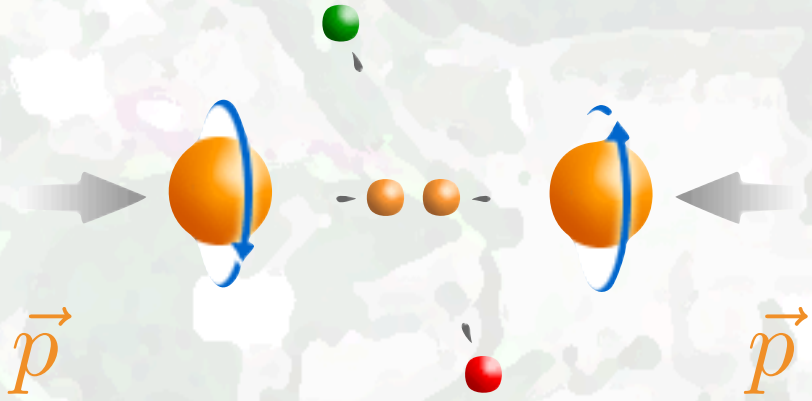
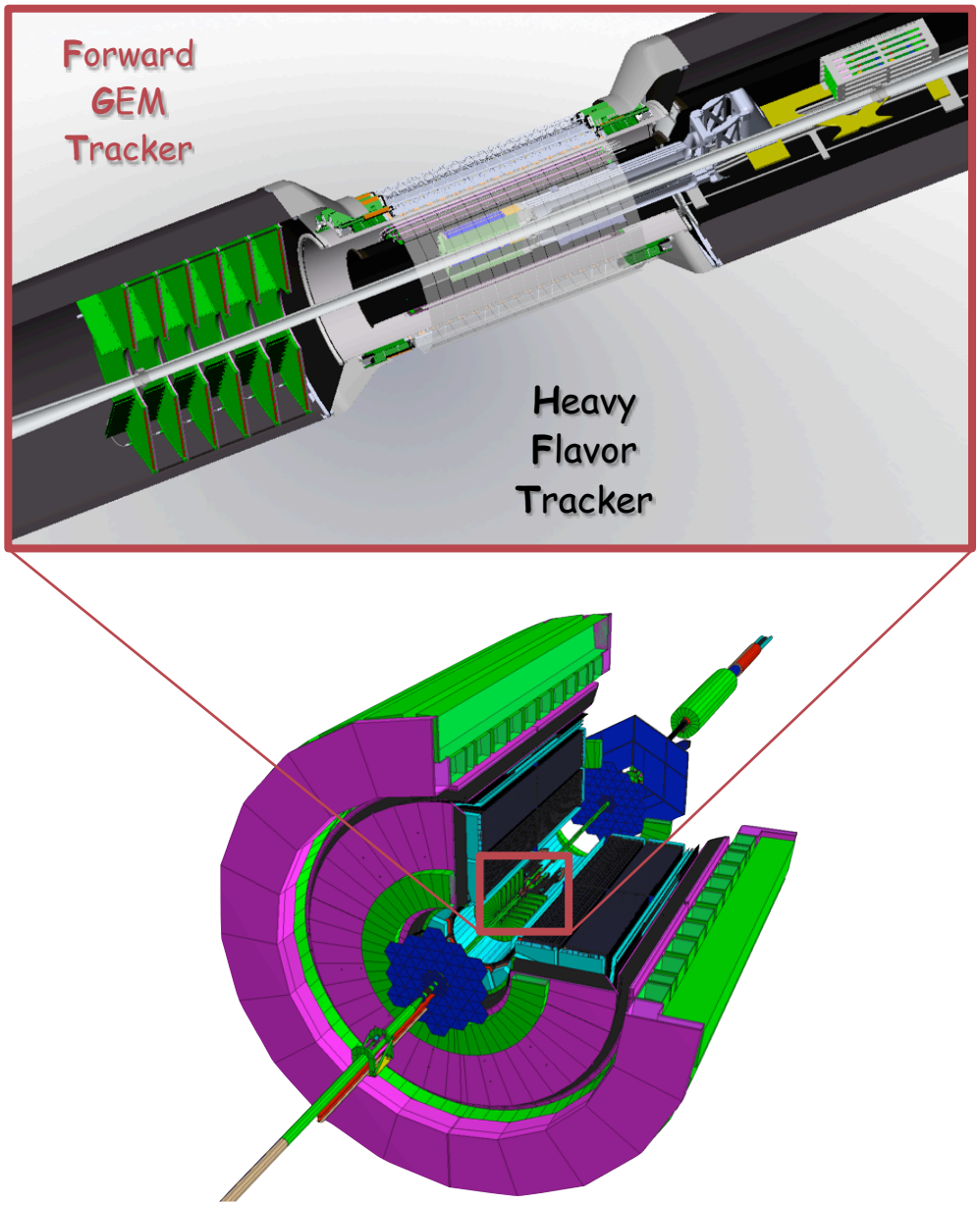


Outline

- Overview
- Upgrades / News
  - Overview
  - FGT
- Physics program
  - Assumptions
  - 200GeV transverse program
  - 500GeV longitudinal program
- Summary



Overview

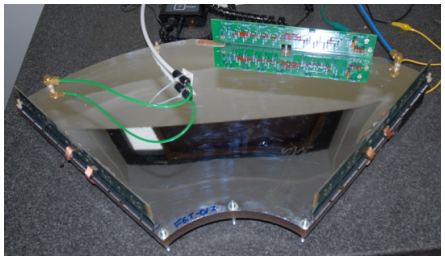
- STAR Preferred Run Plan (21 cryo-week scenario)
  - ~4 weeks of transverse/vertical p+p beam polarization at 200GeV
    - Mid-rapidity pion Collins asymmetry and IFF measurements
    - Forward photon A_N measurement
    - Heavy-Ion reference data sample
    - FGT commissioning
  - ~7 weeks of longitudinal p+p beam polarization at 500GeV
    - W A_L measurement / FGT data taking
    - Jet A_{LL} measurements
  - ~4 weeks 193GeV U+U program
    - v_2 measurements
    - R_{AA} measurements

Upgrades / News

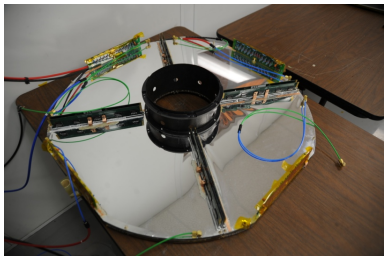
- Overview
  - Routine maintenance of other STAR sub-systems (TPC, Trigger, BEMC, EEMC, DAQ, TOF and FMS)
  - FTPC and PMD have been permanently removed from STAR
  - Partial installation of FGT with 14/24 quarter sections and new support structure
  - Partial installation of MTD (14 trays)
  - STAR will be ready for the proposed January 17, 2012 RHIC Cool down start!

Upgrades / News

Forward GEM Tracker - Layout

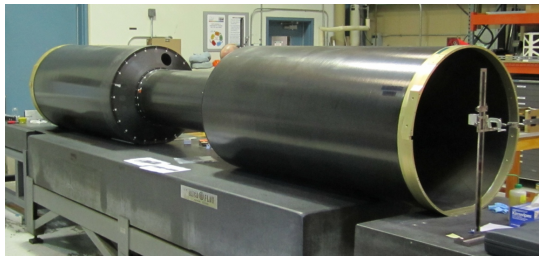


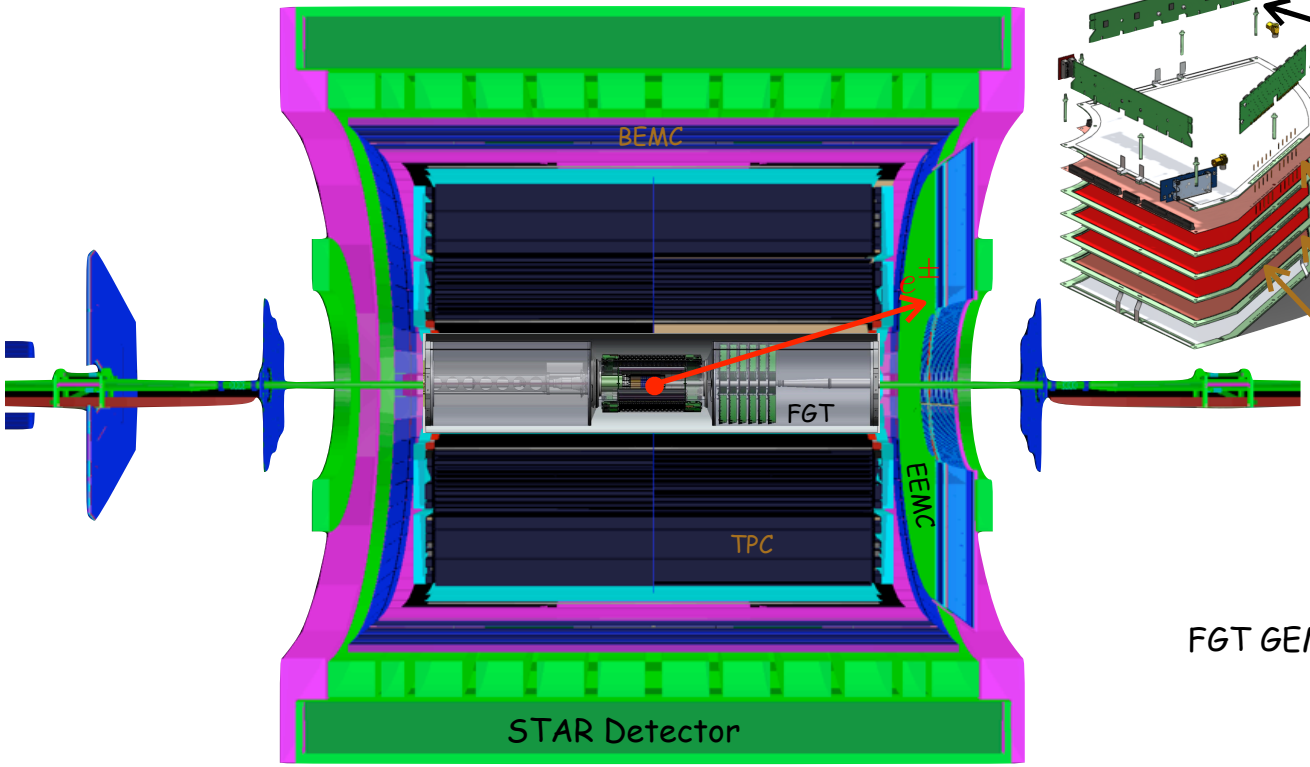
Quarter section

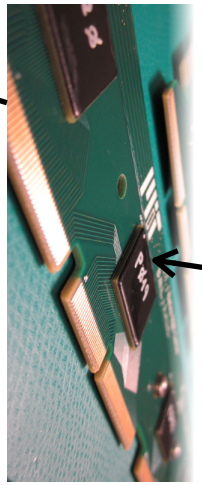


Disk

Quarter section







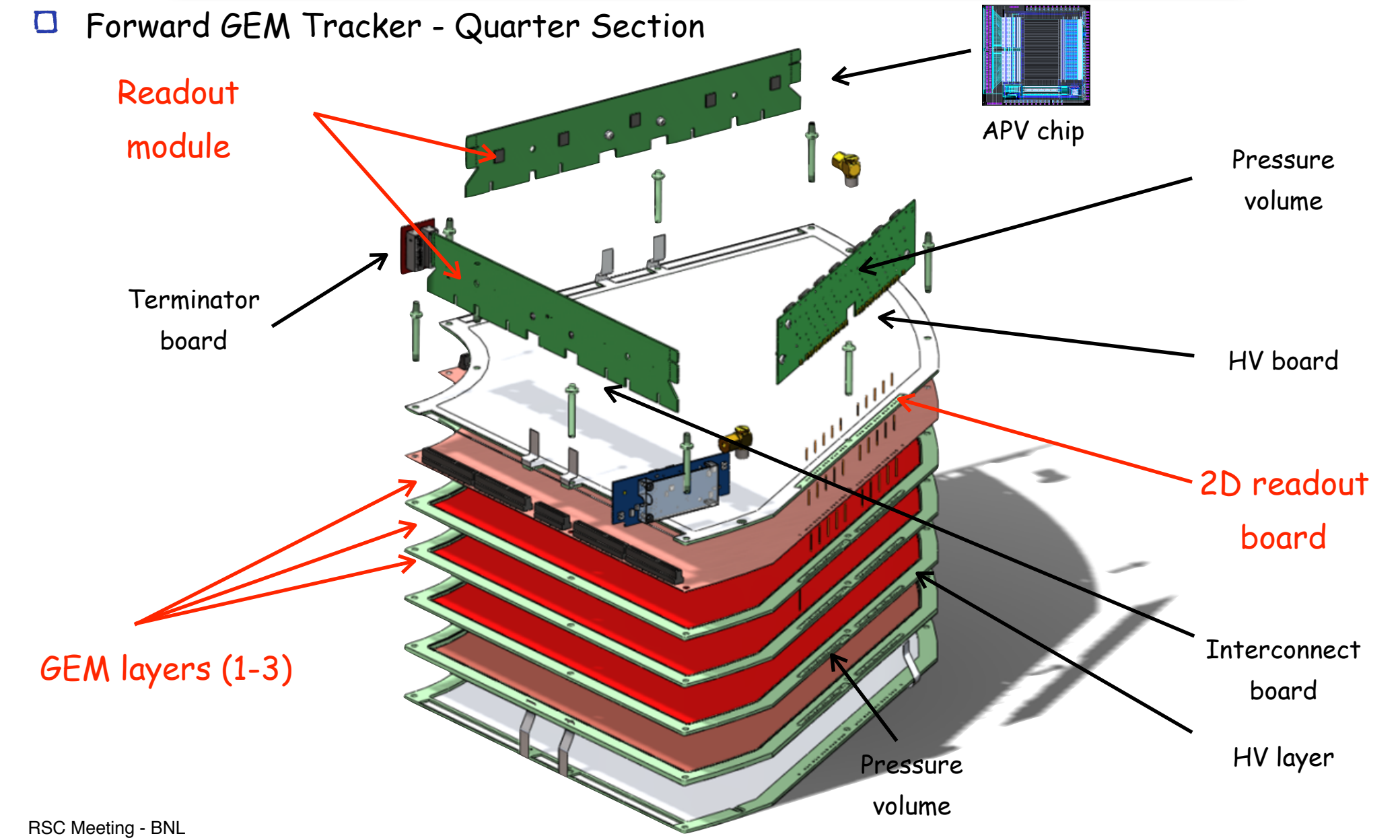
APV module

Packaged APV chip

FGT GEM foil

Upgrades / News

- Forward GEM Tracker - Quarter Section



Upgrades / News

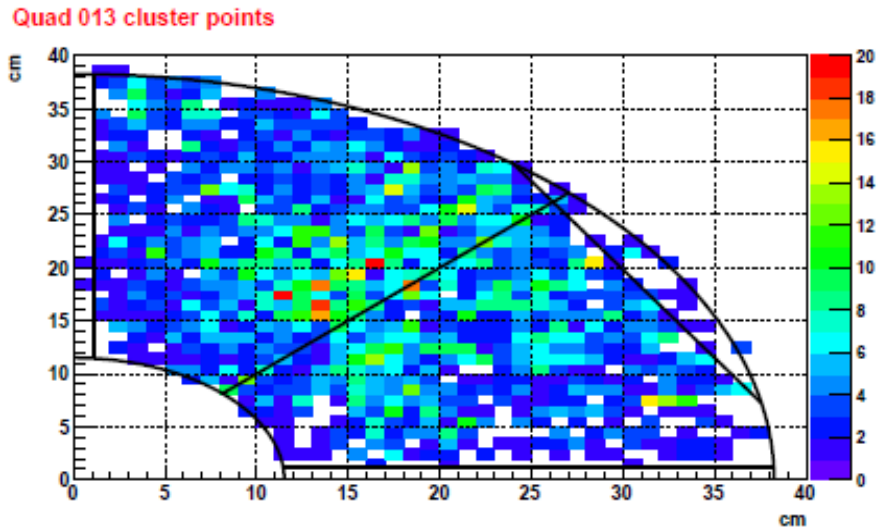
- FGT Cosmic-ray system test

  - Each quarter section was operated at nominal HV of 3600V under gas flow for several days undergoing cosmic-ray testing

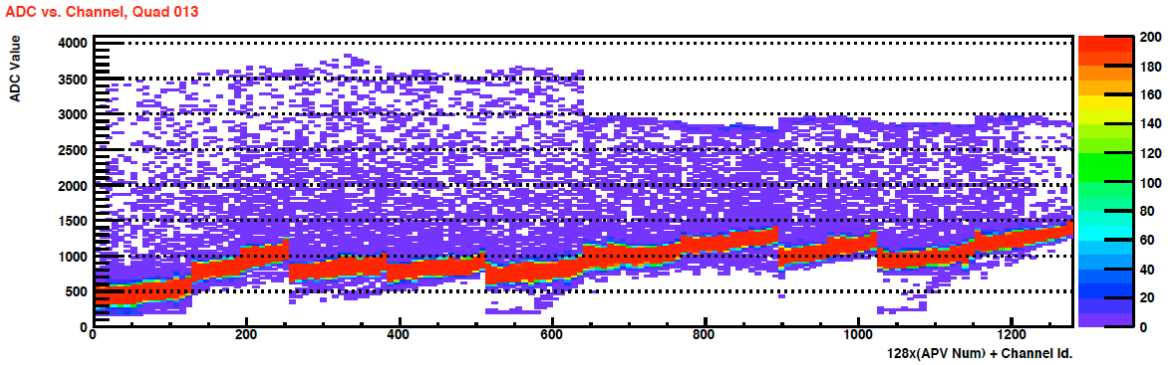
  - Test based on actual HV and DAQ system

  - System test data available in STAR software framework

  - Tracking analysis is ongoing!



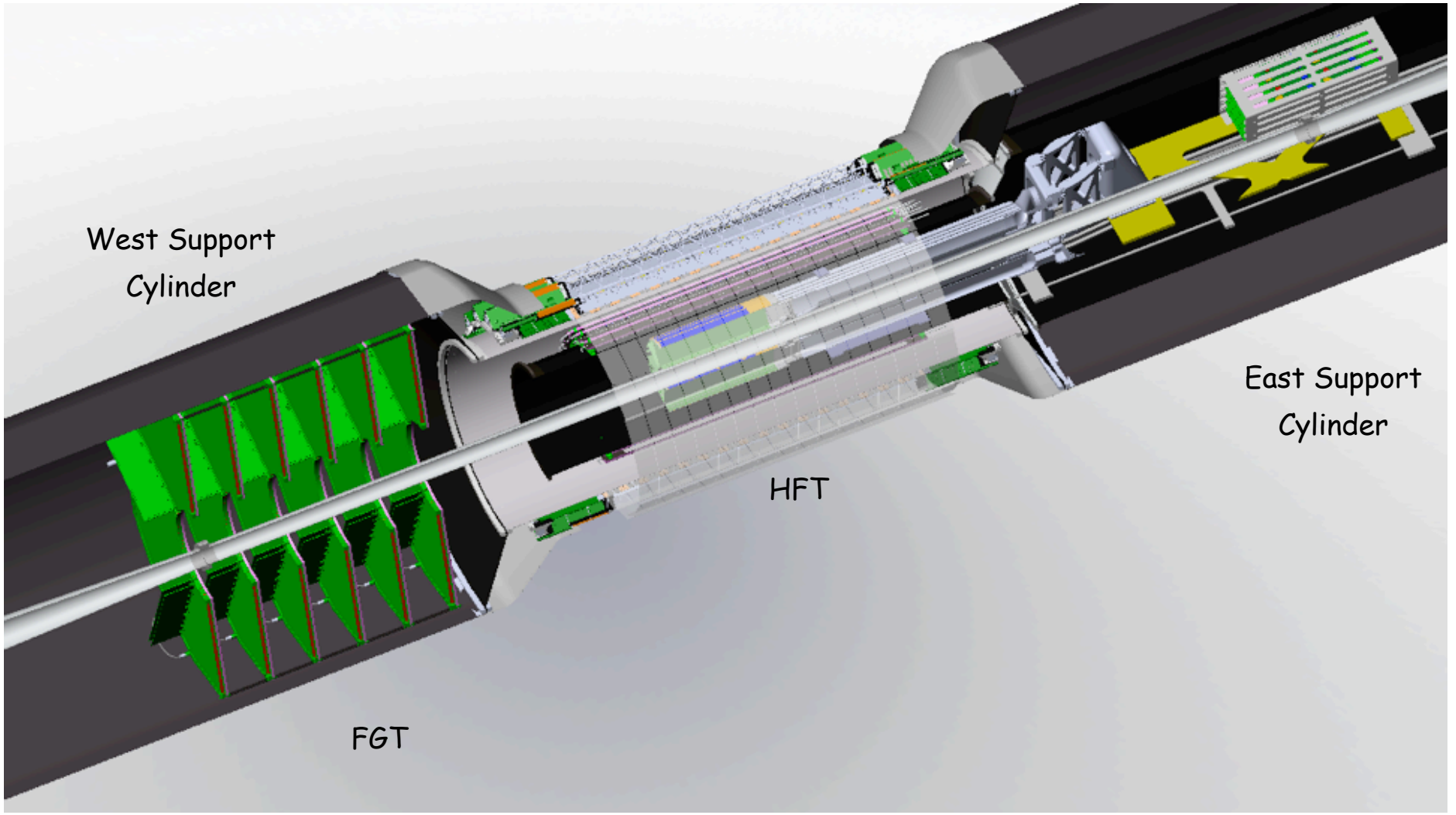
Custer hit distribution



Pedestal distribution

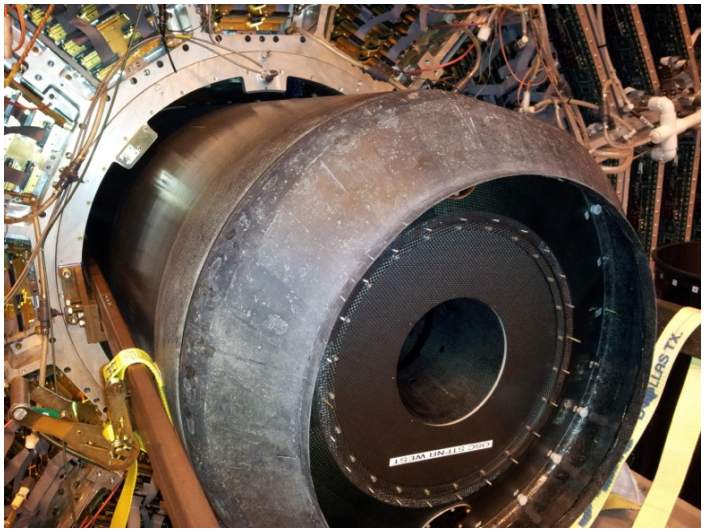
Upgrades / News

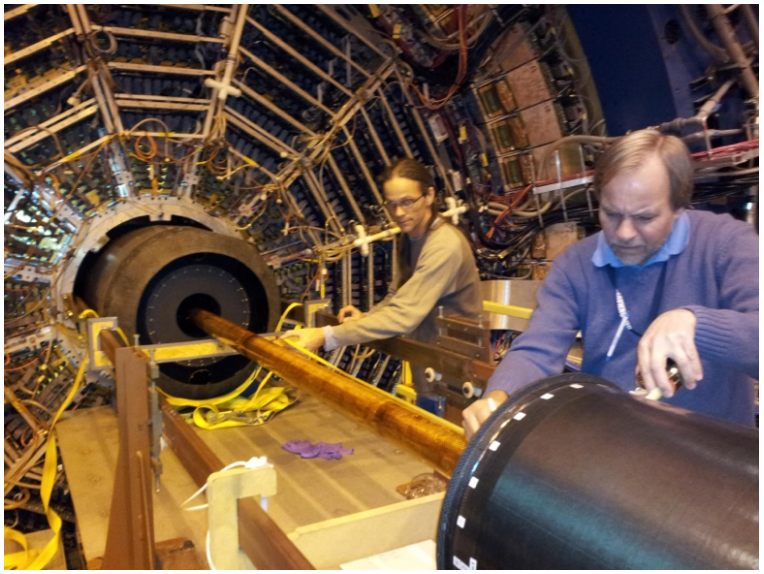
- Forward GEM Tracker - Installation (1)

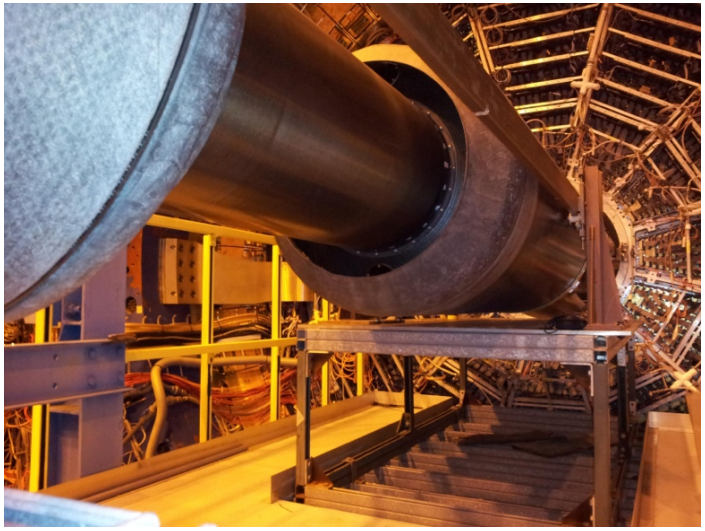


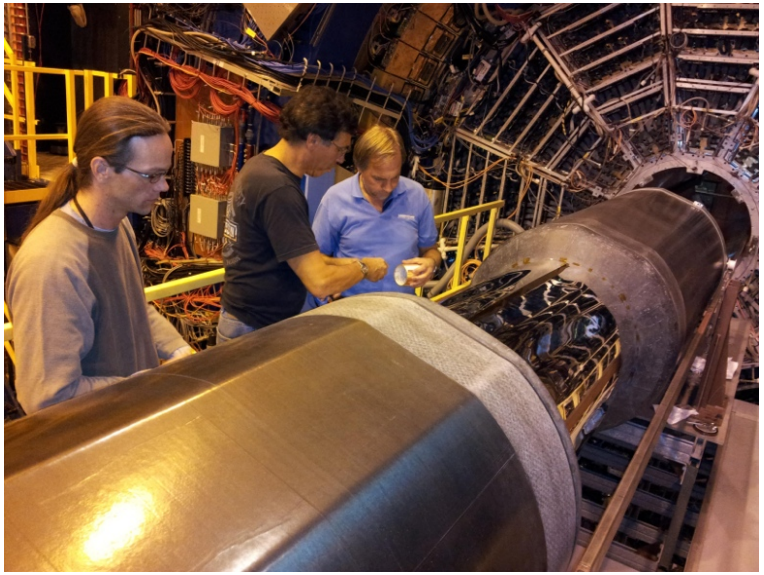
Upgrades / News

- Forward GEM Tracker - Installation (2)



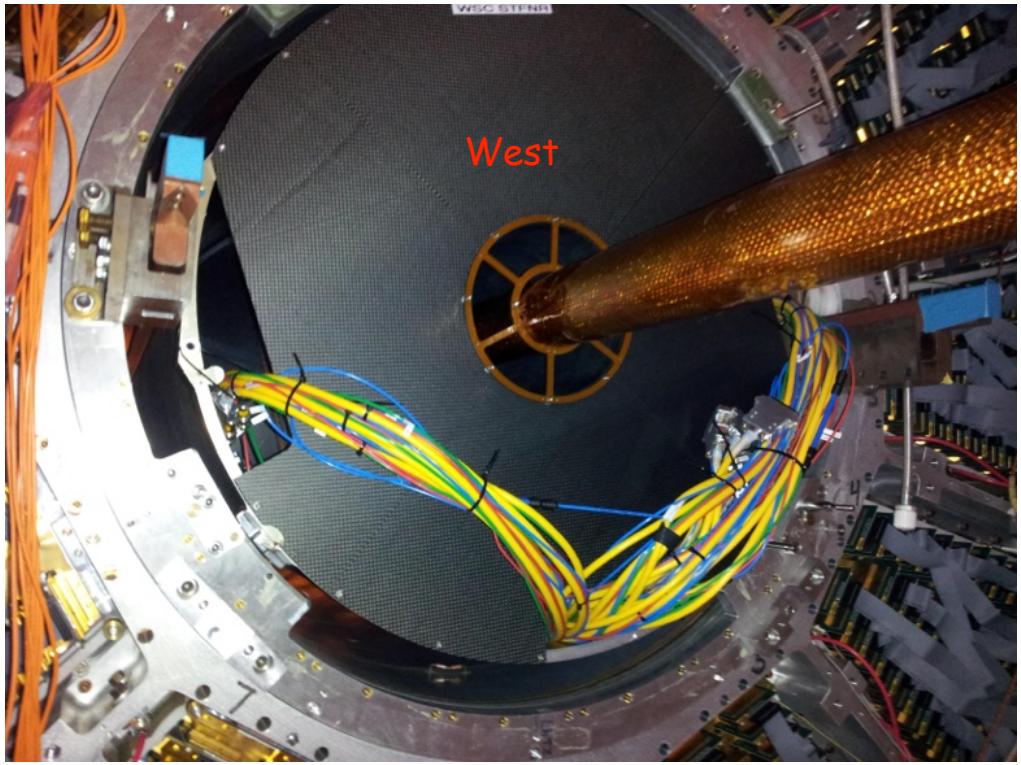






Upgrades / News

- Forward GEM Tracker - Installation (3)

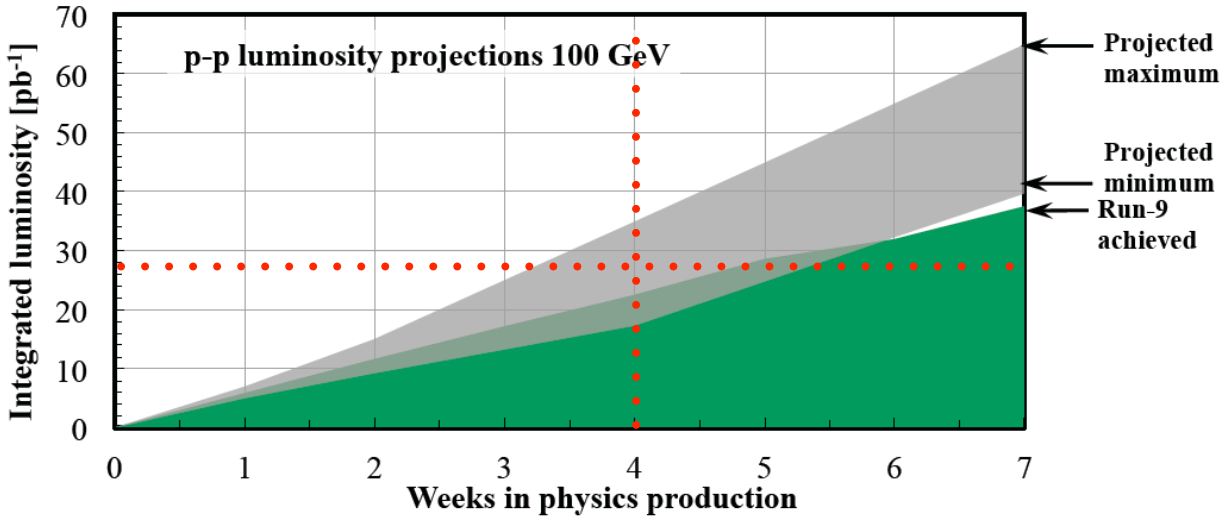


Upgrades / News

- Forward GEM Tracker - Commissioning Plan
  - Verify gas flow ($ArCO_2$) and HV operation without beam
  - Timing adjustment and APV chip parameter tuning
  - With overnight collisions and low background perform HV ramp to 3.6kV for all quarter sections
  - Study of working point (HV scan etc.)
  - Goal: Complete commissioning during 200GeV operation based on EEMC HT trigger
  - Goal: Participate in 500GeV data taking with L0/L2W trigger

Physics program

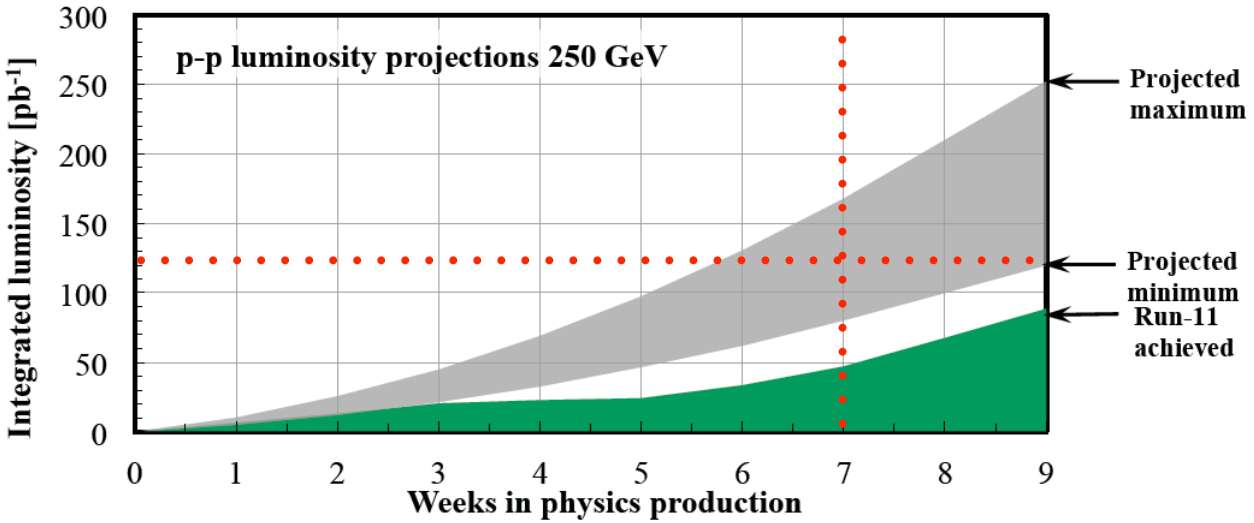
- Assumptions : 200GeV trans. / 500GeV long. programs



~ 4 weeks of vertical / transverse beam operation at 200GeV:

Expect ~16pb^{-1} recorded luminosity at 60% beam polarization

~60% data taking efficiency!



~ 7 weeks of longitudinal beam operation at 500GeV:

Expect ~75pb^{-1} recorded luminosity at 50% beam polarization

Transverse program

- Overview of selected topics

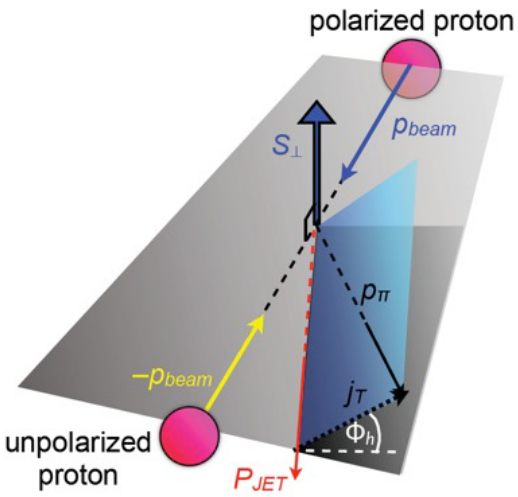
Sivers	Collins / IFF (Transversity)
A_N for jets in FMS	Pion azimuthal distribution in jets
A_N for direct photons in FMS	Interference fragmentation / Two hadron
A_N for J/Psi	

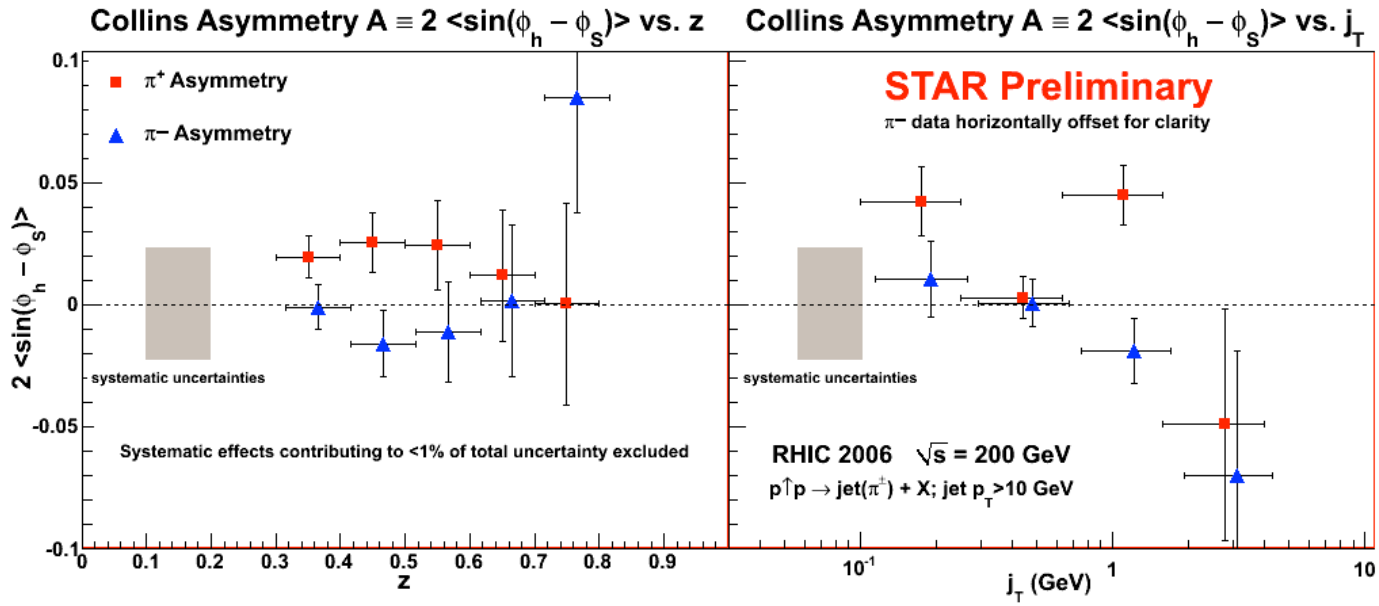
A_N for π^0 and η in FMS with increased p_T coverage

➪ Powerful transverse data sets of 2011 200GeV and 2012 500GeV to enhance understand of A_N!

Transverse program

- A_N - Collins / Run 6 measurement





$$d\sigma \approx d\sigma^{UU}\left(1 + A_N \sin(\phi_h - \phi_s)\right)$$

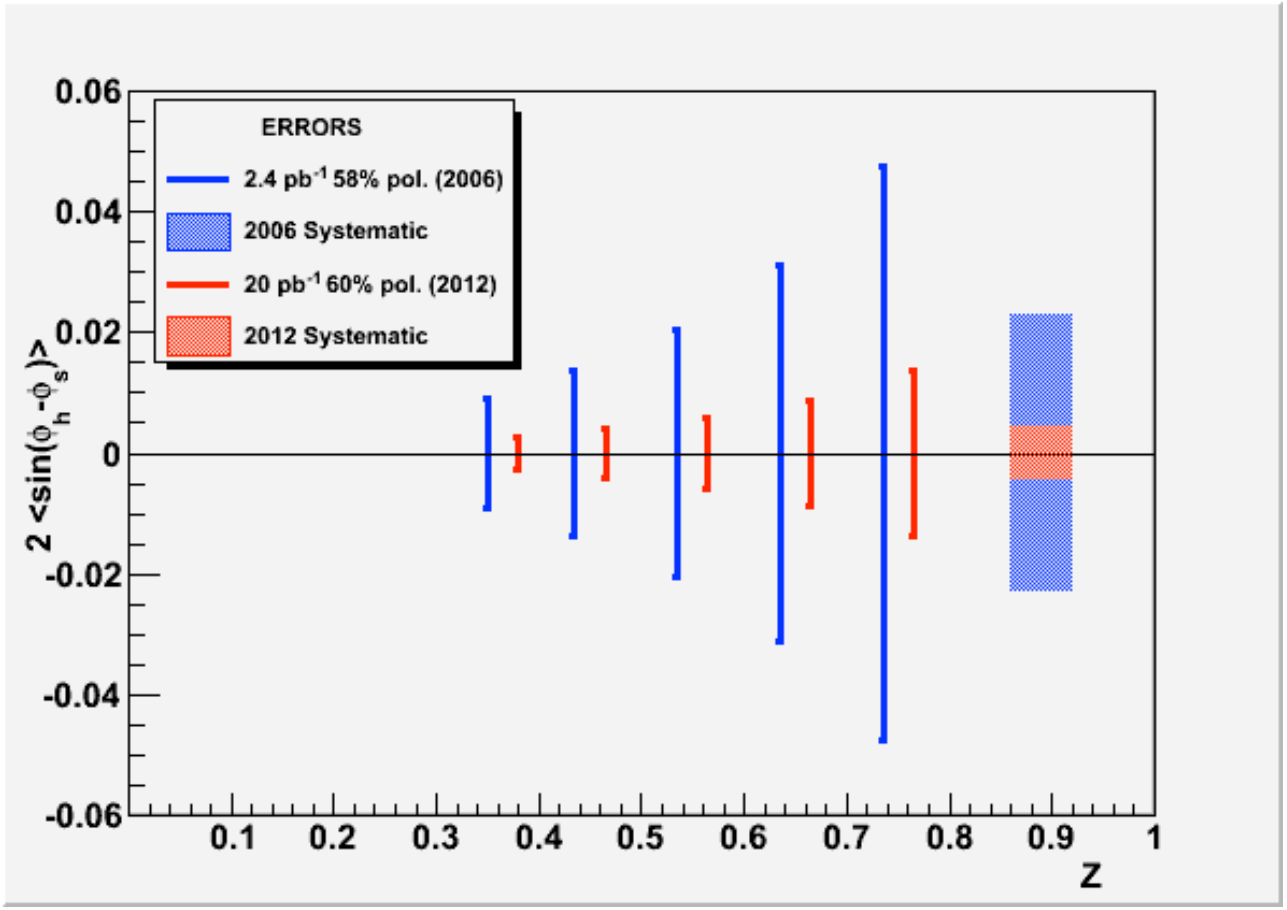
Average π^+ asymmetry = 0.02082 +/- 0.0064 +/- 0.02306

Average π^- asymmetry = -0.0040 +/- 0.0068 +/- 0.02306

Expected asymmetry from global analysis ~ +/- 0.07

Transverse program

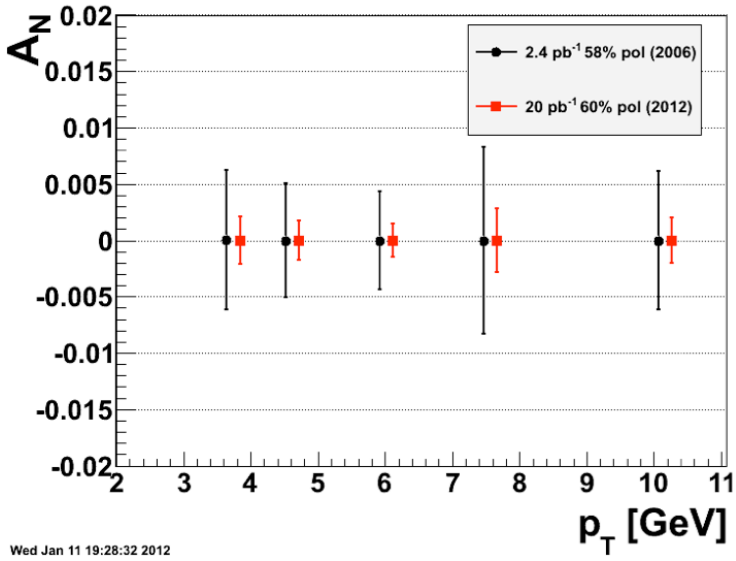
- A_N - Collins / Projections

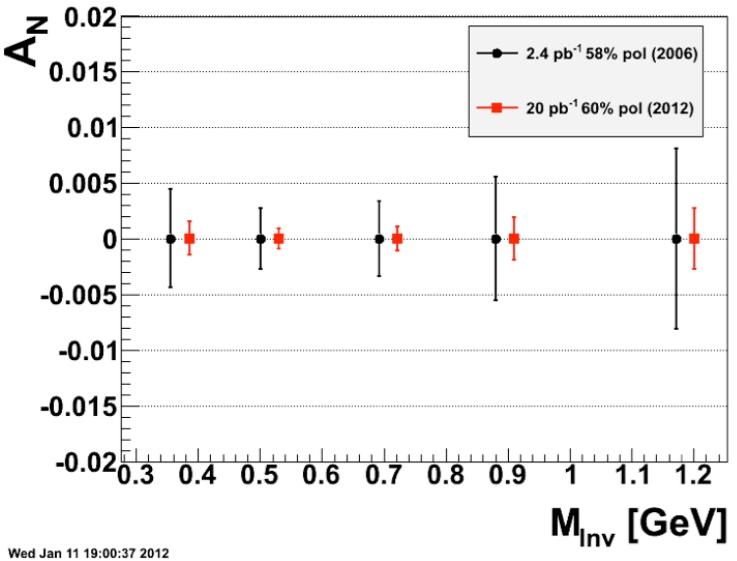


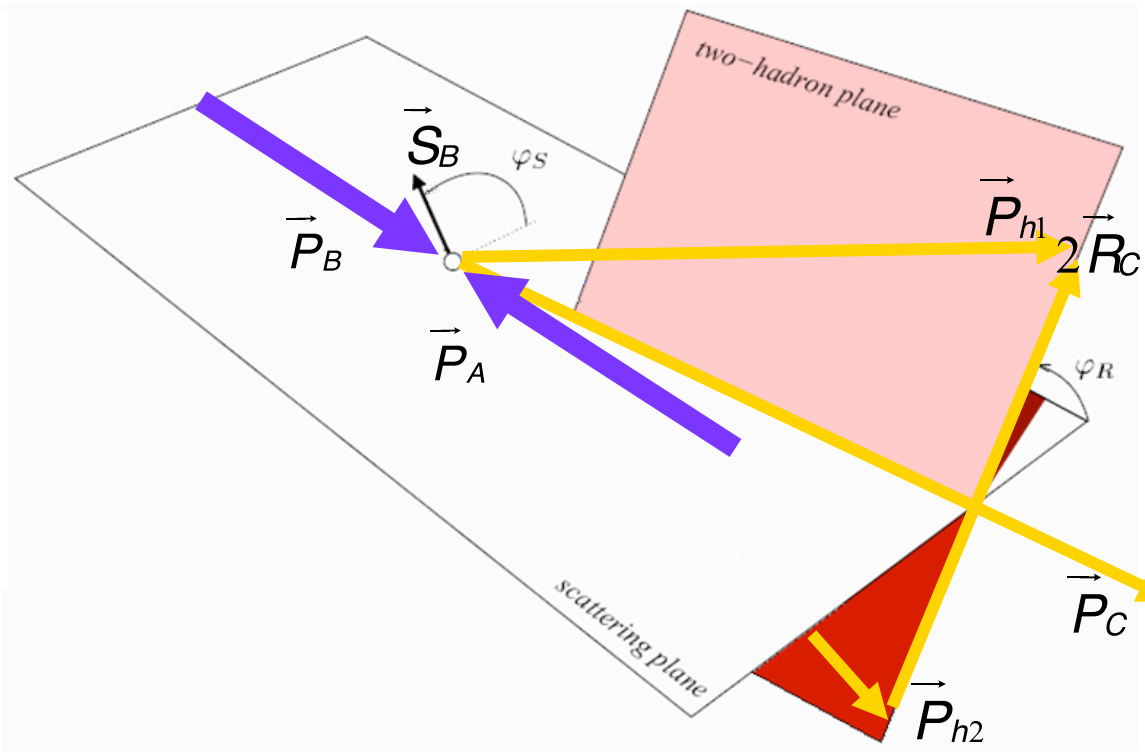
- Statistical error estimates shown are for 20pb^{-1} / 60% beam polarization (16pb^{-1} yield ~10% larger uncertainties)

Transverse program

- A_N - IFF / Projections







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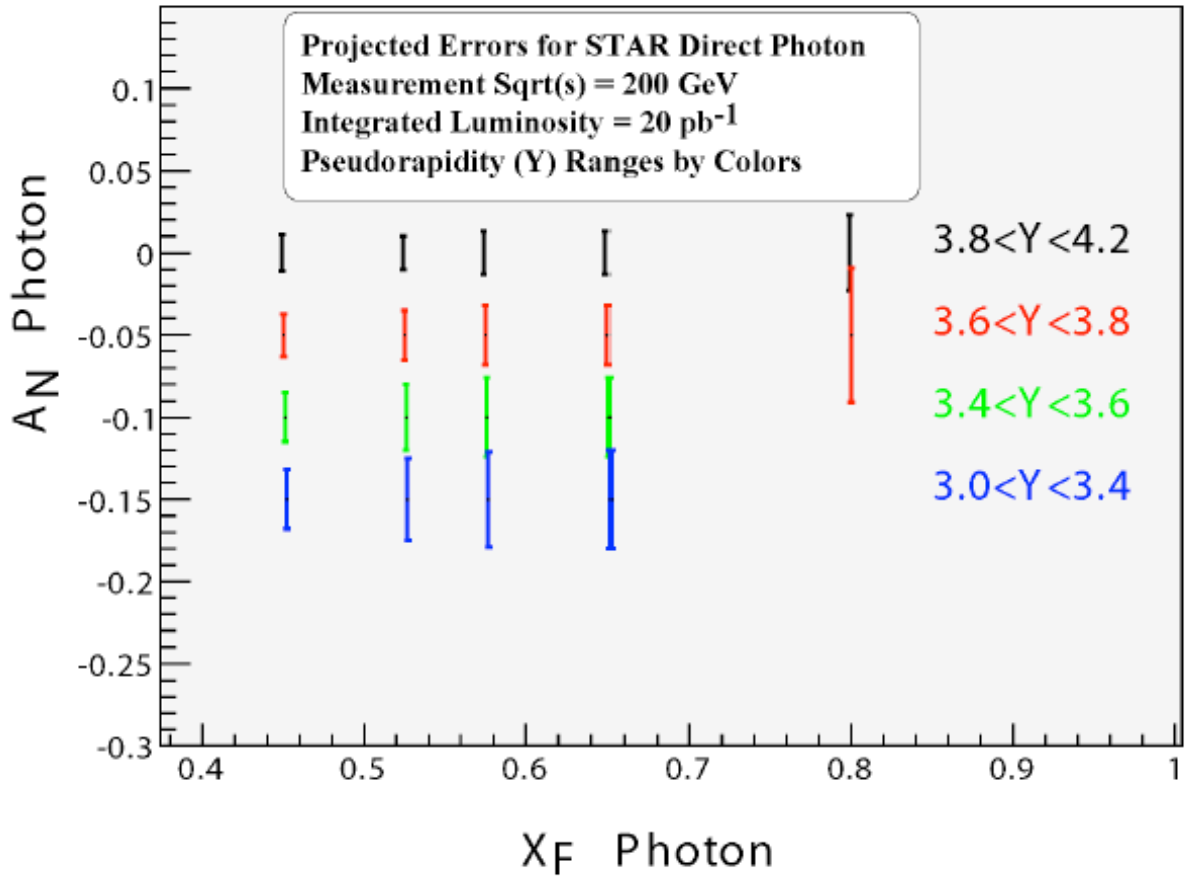
Transverse program

- A_N photons / Projections



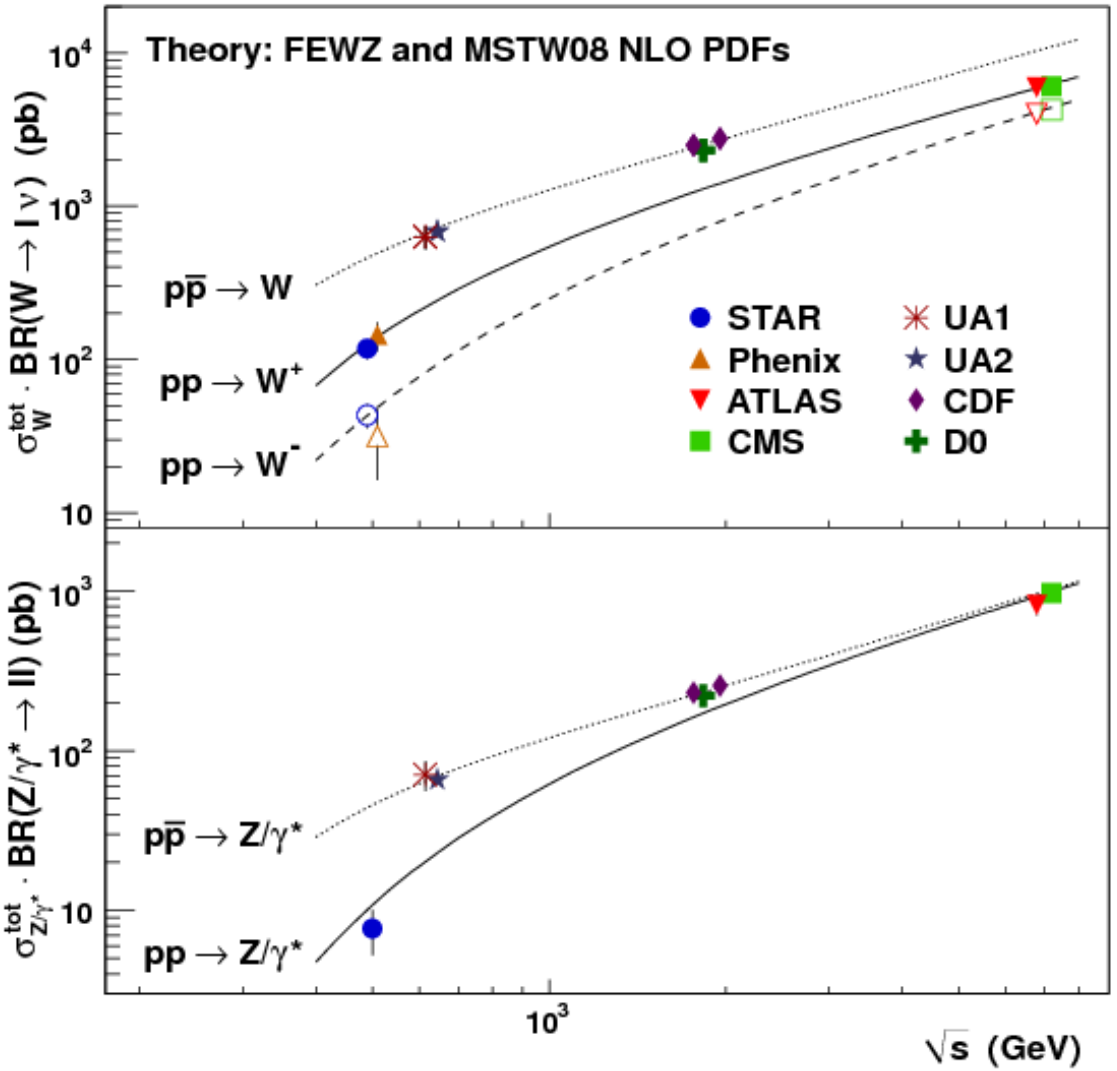
- Statistical error estimates shown are for 20pb^{-1} / 60% beam polarization (16pb^{-1} yield ~10% larger uncertainties)

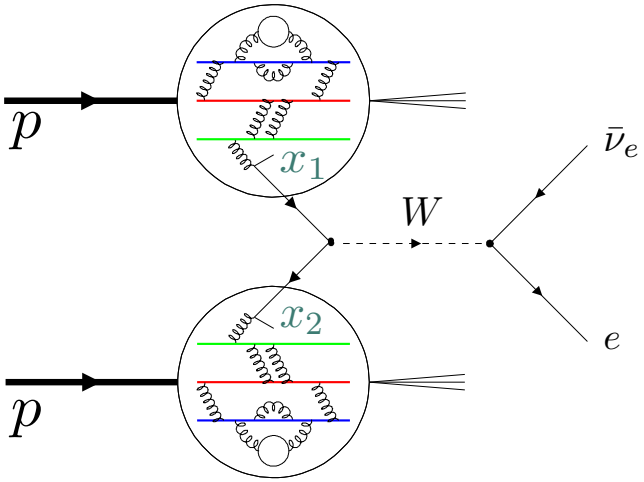
Longitudinal program

- Overview of selected topics
  - W A_L at mid-rapidity and forward rapidity (Depending on FGT commissioning progress!)
  - A_{LL} Jet production, in particular inclusive jet production
  - A_{LL} Hadron production

Longitudinal program

- $W^{\pm}$ / Z production - Run 9 cross section results





- Measurement of $W^{\pm}$ and Z/γ^* cross sections
- Measured and theory evaluated cross-sections agree within uncertainties

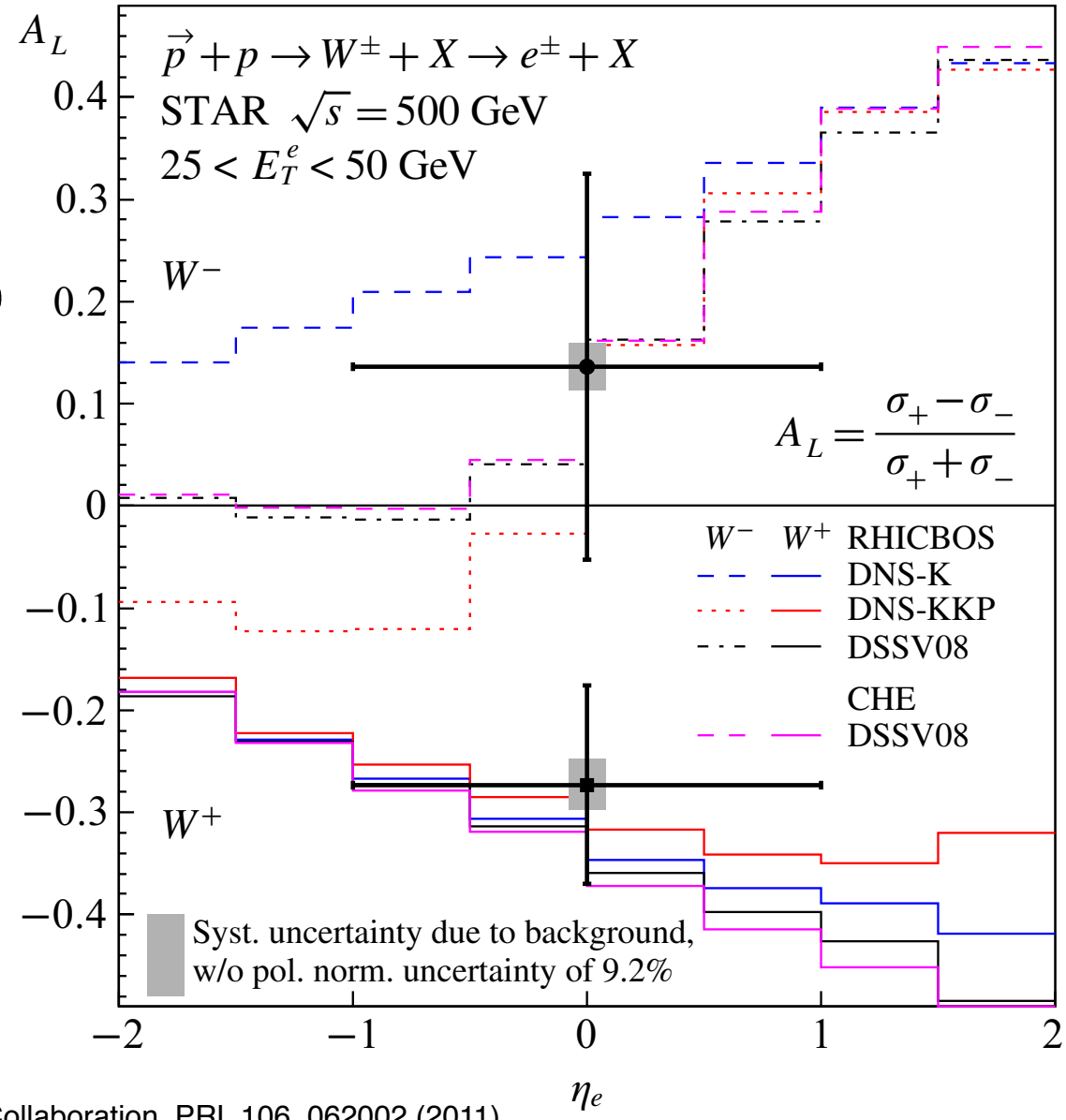
STAR Collaboration, arXiv:1112.2980

Longitudinal program

- W production - Run 9 A_L result

$$A_L^{W^-} = 0.14 \pm 0.19\ (\text{stat.}) \pm 0.02\ (\text{syst.}) \pm 0.01\ (\text{norm.})$$

$$A_L^{W^+} = -0.27 \pm 0.10\ (\text{stat.}) \pm 0.02\ (\text{syst.}) \pm 0.03\ (\text{norm.})$$



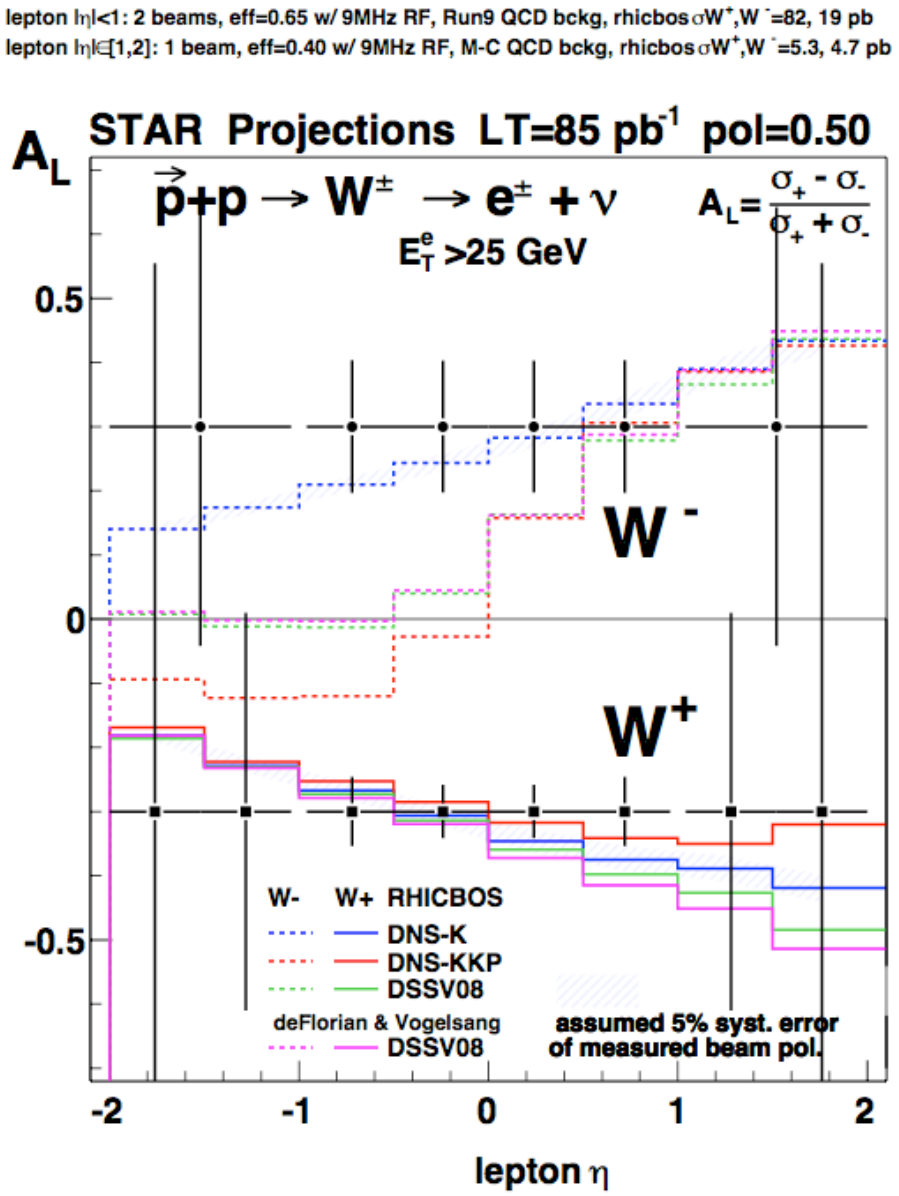
- $A_L(W^+)$ negative with a significance of ~3σ
- $A_L(W^-)$ central value positive
- Measured asymmetries are in agreement with theory evaluations using polarized pdf's (DSSV) constrained by polarized DIS data

  ⇒ Universality of helicity distr. functions!

STAR Collaboration, PRL 106, 062002 (2011)

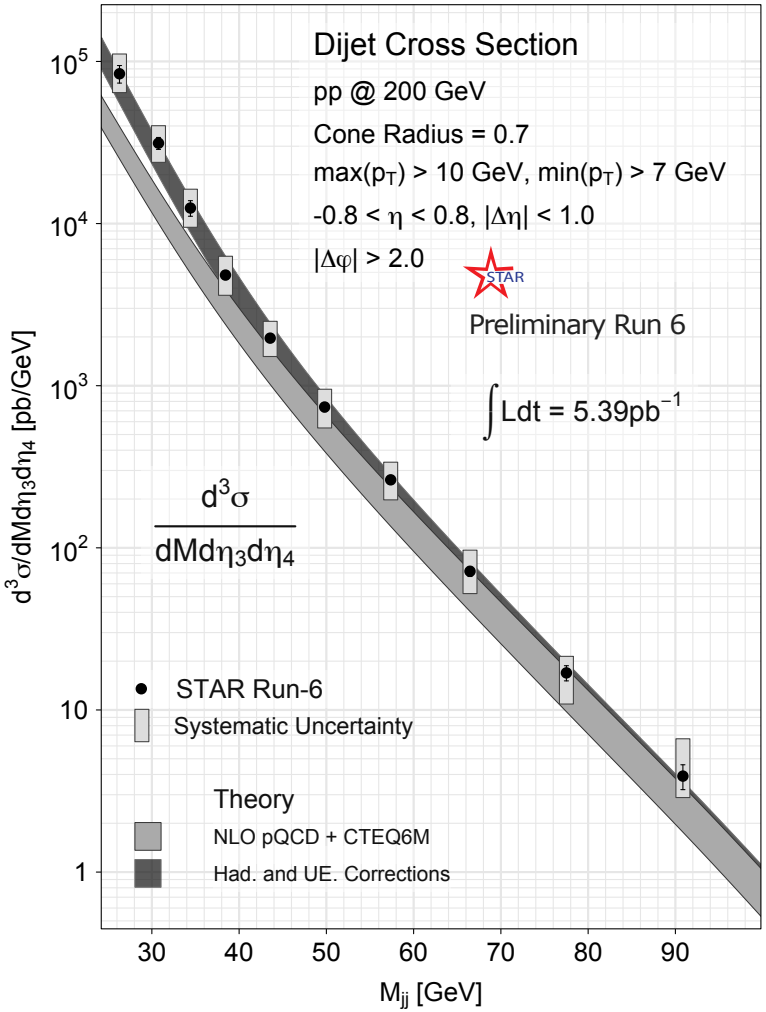
Longitudinal program

- W A_L / Run 12 projections
  - Crucial: Measurement of A_L as a function of lepton η
  - Mid-rapidity η: Significant improvement over first measurement
  - Forward / backward η: Proof-of-principle measurement, depending on FGT commissioning progress
  - Statistical error estimates shown are for 85pb^{-1} / 50% beam polarization (75pb^{-1} yield ~5% larger uncertainties) / Including limited FGT coverage



Longitudinal program

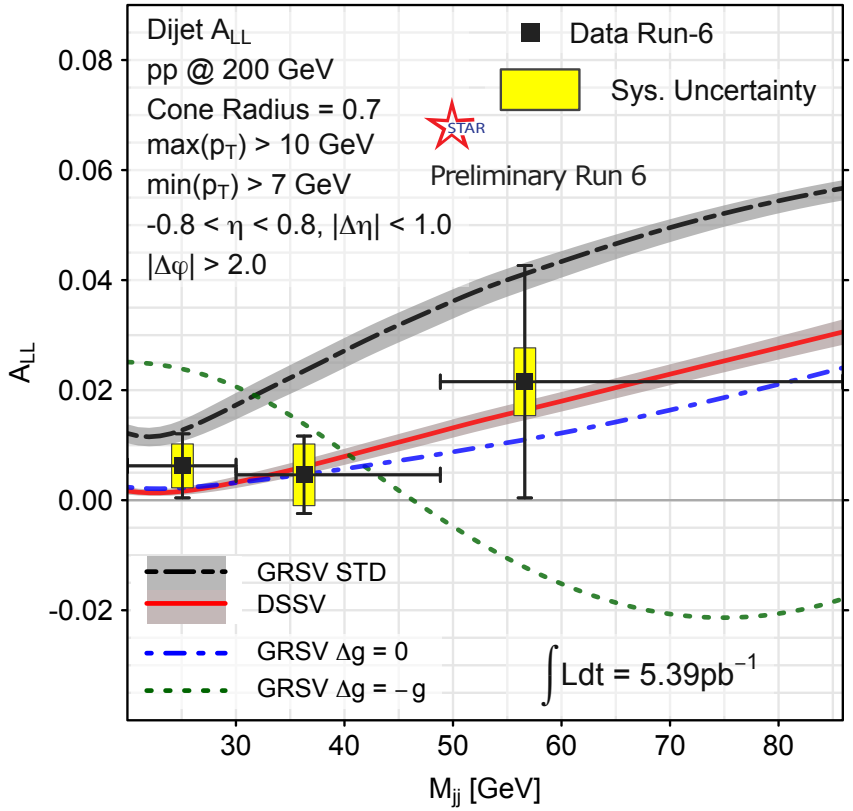
Di-Jet - Run 6 results



- Data are well described by NLO pQCD plus hadronization and underlying event corrections

$$M = \sqrt{x_1 x_2 s}$$

$$\eta_3 + \eta_4 = \ln \frac{x_1}{x_2}$$

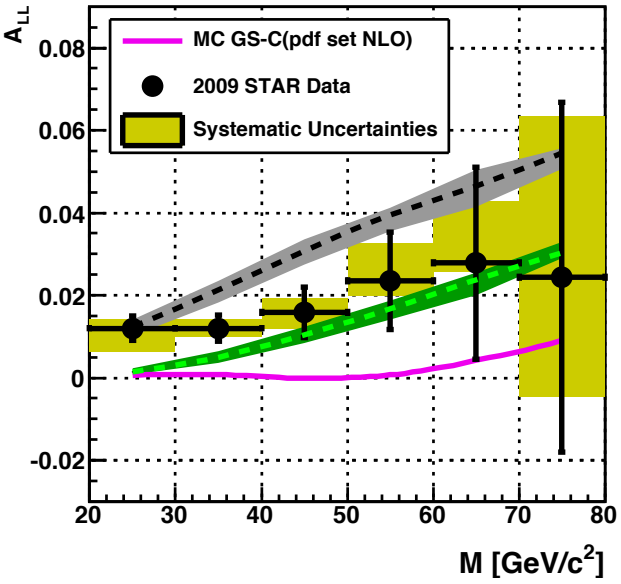


- First Di-Jet A_{LL} measurement in agreement with Δg constrained by previous inclusive jet result!

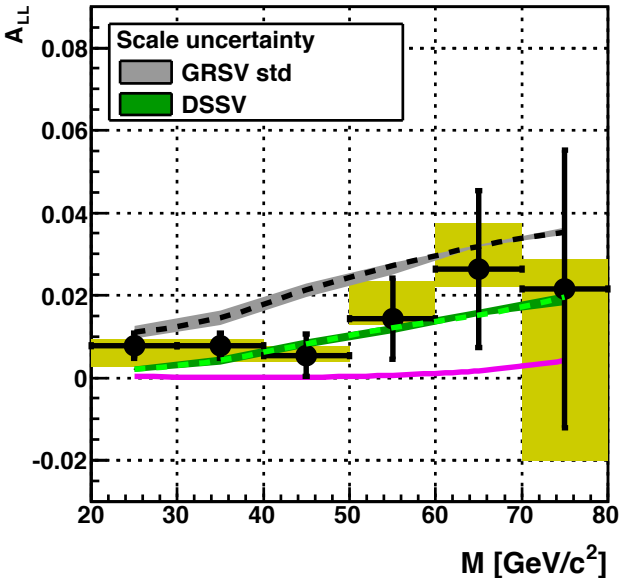
Longitudinal program

Di-Jet - Run 9 results

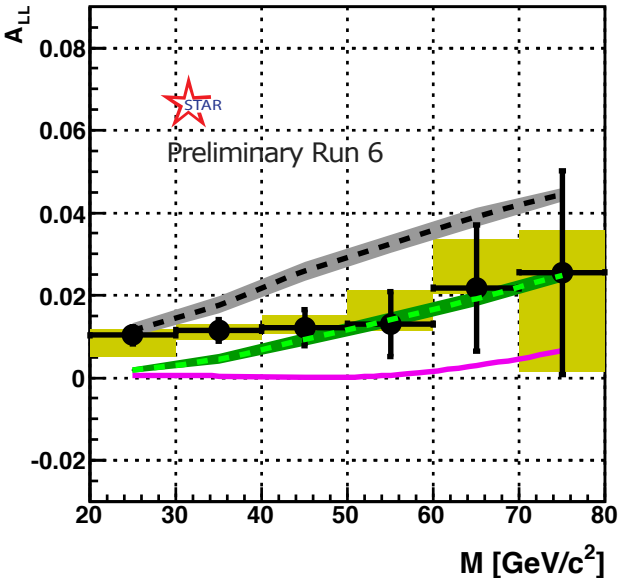
East - East and West - West Barrel

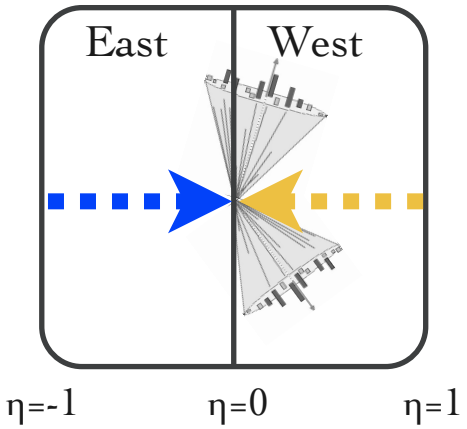


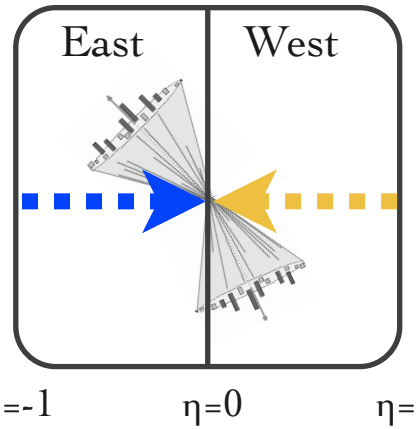
East Barrel - West Barrel



Full Acceptance







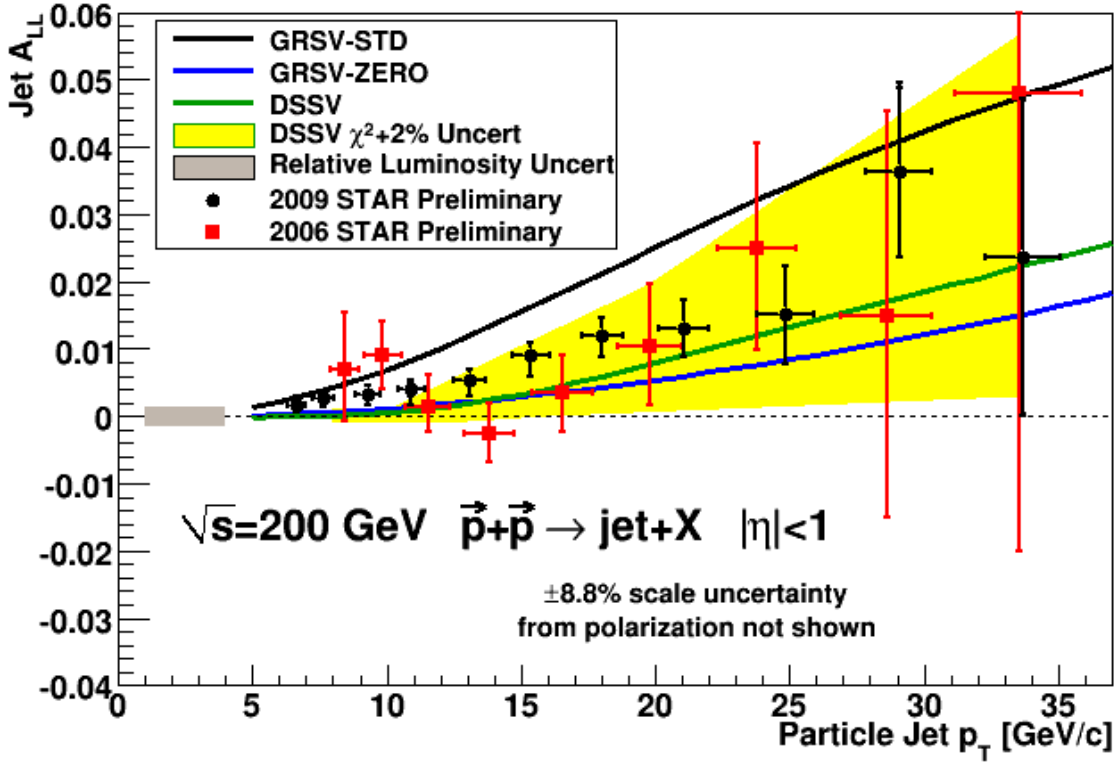
$$M = \sqrt{x_1 x_2 s} \qquad \eta_3 + \eta_4 = \ln \frac{x_1}{x_2}$$

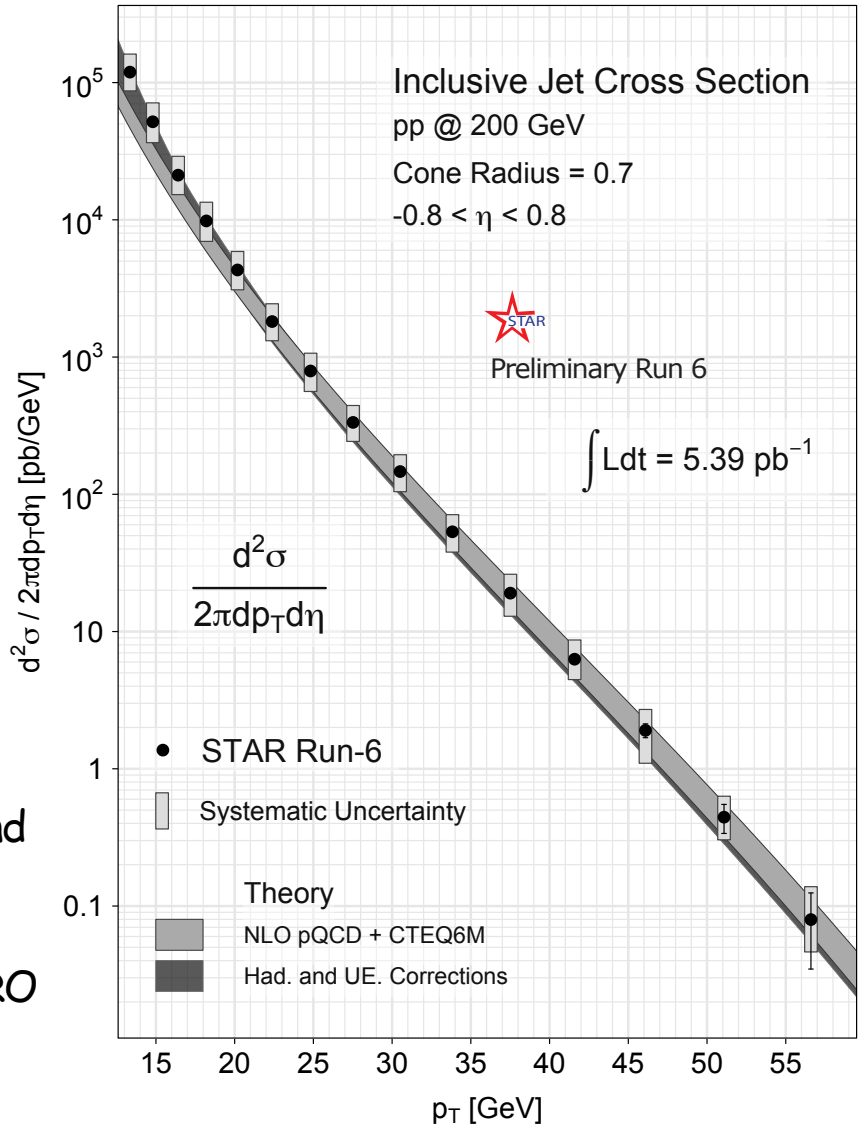
- ALL measurements tend to fall in-between GRSV-STD and DSSV
- Run 9 data: First rapidity dependent di-jet measurement

  ⇒ Constrain x dependence!

Longitudinal program

- Inclusive Jet - Run 6/9 results

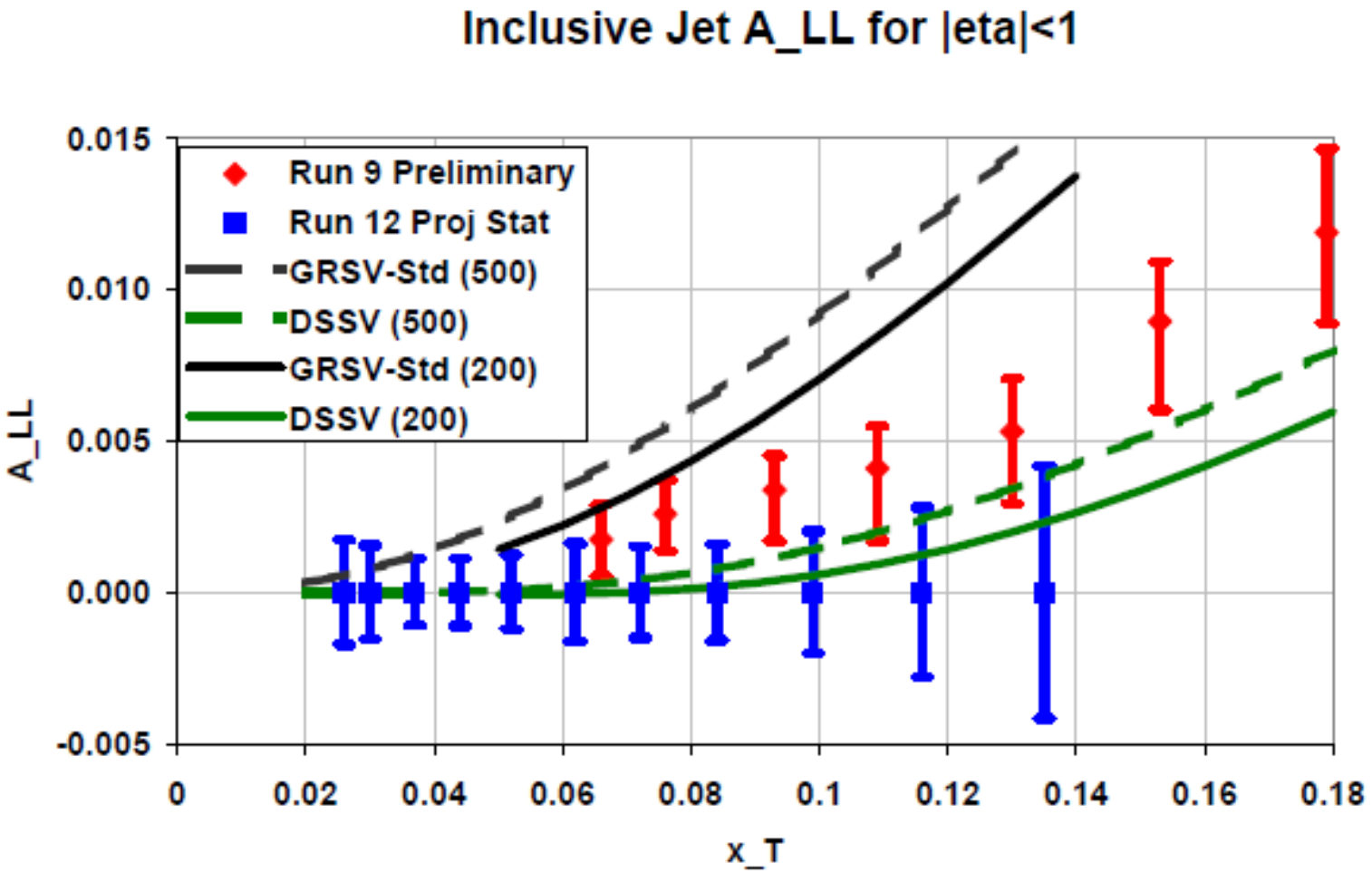




- Data are well described by NLO pQCD plus hadronization and underlying event corrections
- Run 6 A_{LL} measurement between GRSV-STD and GRSV-ZERO
- Run 9 A_{LL} measurement between GRSV-STD and DSSV

Longitudinal program

- Inclusive jet A_{LL} / Run 12 projections



- Statistical error estimates shown are for 75pb^{-1} / 50% beam polarization

Summary

- Physics program
  - Rich 200GeV transverse program complementing 2011 500GeV transverse program
  - Crucial: Measurement of A_L as a function of lepton η
  - First measurement of A_{LL} at 500GeV for jet production (Lower x)
- New detector capabilities
  - Partial installation of FGT
  - Commissioning during initial 200GeV transverse running period
  - Goal: Participate in 500GeV data taking with L0/L2W trigger