STAR Plans
- RUN 9 -

Bernd Surrow

Massachusetts Institute of Technology

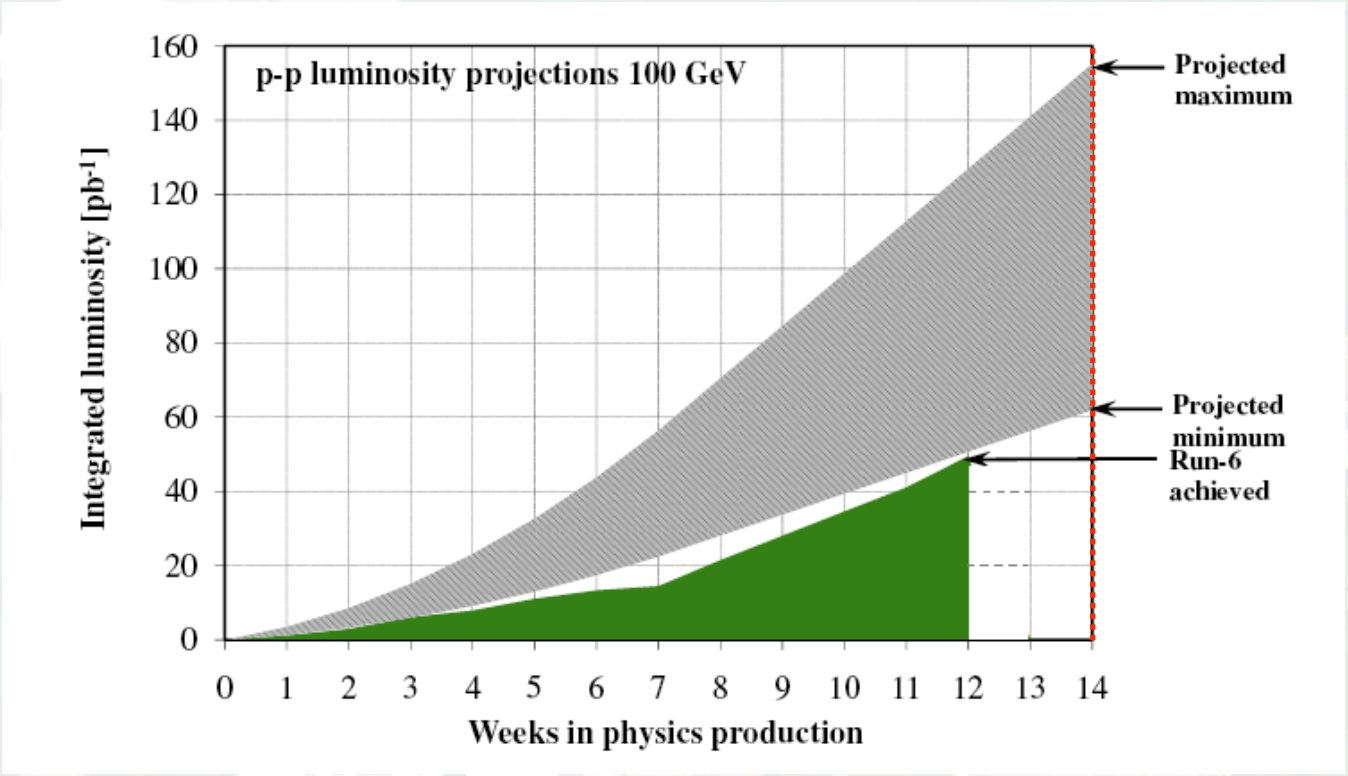
On behalf of the STAR SPIN PWG

Outline

- Goals remain as documented in the BUR document
- Current detector status / upgrade programs presented at PAC and S&T review (No further discussion here!) / No discussion here of STAR internal trigger development and preparation
- Primary goal: Constrain $x\Delta g(x)$: $50pb^{-1}$ / 60% beam polarization at 200GeV
- Development and running of 500GeV
- Current plan:
  - 5 weeks (Physics mode): 500GeV with cooldown 02/01/2009
  - Contingent on further funding: 10 weeks (Physics mode) at 200GeV

Run 9 Beam Use Request

- Assumed Run 9 projected performance for STAR BUR planing process (1)



Projections following RHIC retreat: P = 0.60 - 0.65 / L_{ave} = $40 \cdot 10^{30}$ $cm^{-2}s^{-1}$

STAR BUR is based on: P = 0.6 / ~100pb^{-1} - 50pb^{-1} recorded

BUR Goal: FOM ~ 6.5pb^{-1}

Run 9 Beam Use Request

- Assumed Run 9 projected performance for STAR BUR planing process (2)

pp weeks*	Delivered L (pb^{-1})	Recorded L (pb^{-1})	Polarization (%)	FOM** (0.65)	FOM** (0.6)
8	50	25	65/60	4.5	3.2
9	60	30	65/60	5.4	3.9
10	70	35	65/60	6.2	4.5
11	80	40	65/60	7.1	5.1
12	90	45	65/60	8.0	5.8
13	100	50	65/60	8.9	6.5
14	110	55	65/60	9.8	7.1

*Number of weeks in physics running mode

**FOM = $L \cdot P^4$

Run 9 Beam Use Options for 19 cryo weeks

- 19 cryo-week running scenario: 10 / 4 week scenario for 200/500GeV running
  - 1 1/2 weeks cool-down and 1/2 week warm-up
  - 2 weeks p-p setup
  - 1 week p-p ramp-up
  - Total Physics weeks: 14 weeks

BUR Goal: FOM ~ 6.5pb^{-1}

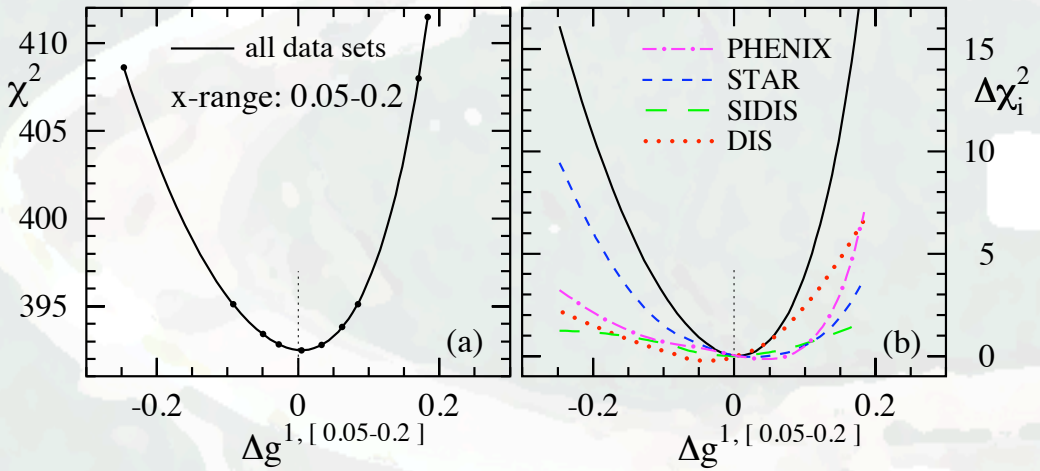
  - 10 weeks for 200GeV at mid-range approx.: 60% beam polarization
    - 70pb^{-1} (delivered) / 35pb^{-1} (recorded): FOM 4.5 / 6.2
  - 3 weeks at 500GeV (long. polarization) at mid-range approx.: 50% beam polarization
    - 25pb^{-1} (delivered) / 10pb^{-1} (recorded)
  - 1 week at 500GeV (trans. polarization)

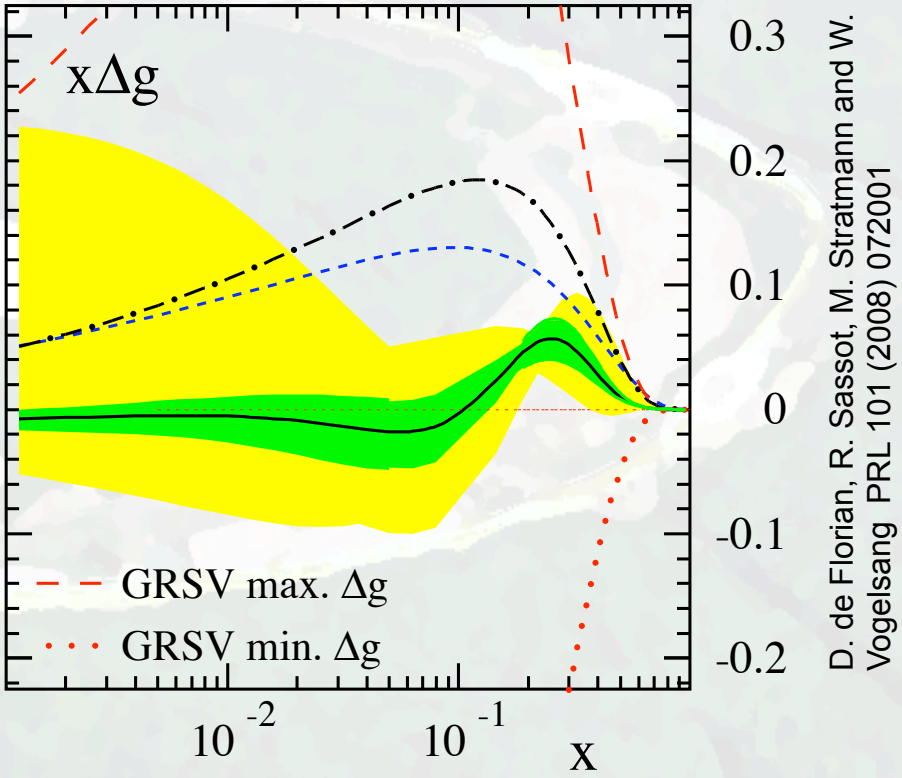
Run 9 Beam Use Options for 10 cryo weeks

- 10 cryo-week running scenario 5 physics weeks for 500GeV running
  - 1 1/2 weeks cool-down and 1/2 week warm-up
  - 2 weeks p-p setup
  - 1 week p-p ramp-up
  - Total Physics weeks: 5 weeks
  - START with: 2 weeks at 500GeV (trans. polarization): Critical for local polarimetry and spin rotator setup at 500GeV
  - 3 weeks at 500GeV (long. polarization) at mid-range approx.: 50% beam polarization
    - $25pb^{-1}$ (delivered) / $10pb^{-1}$ (recorded)

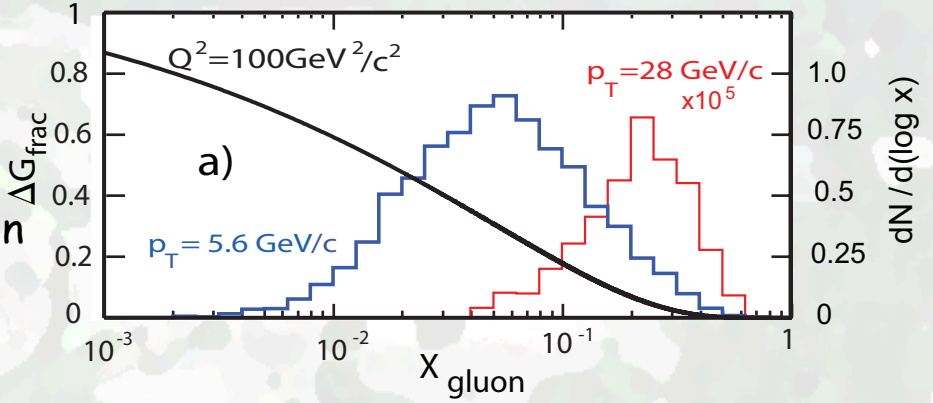
Highlights of recent results - Gluon polarization

- Global analysis incl. RHIC pp data



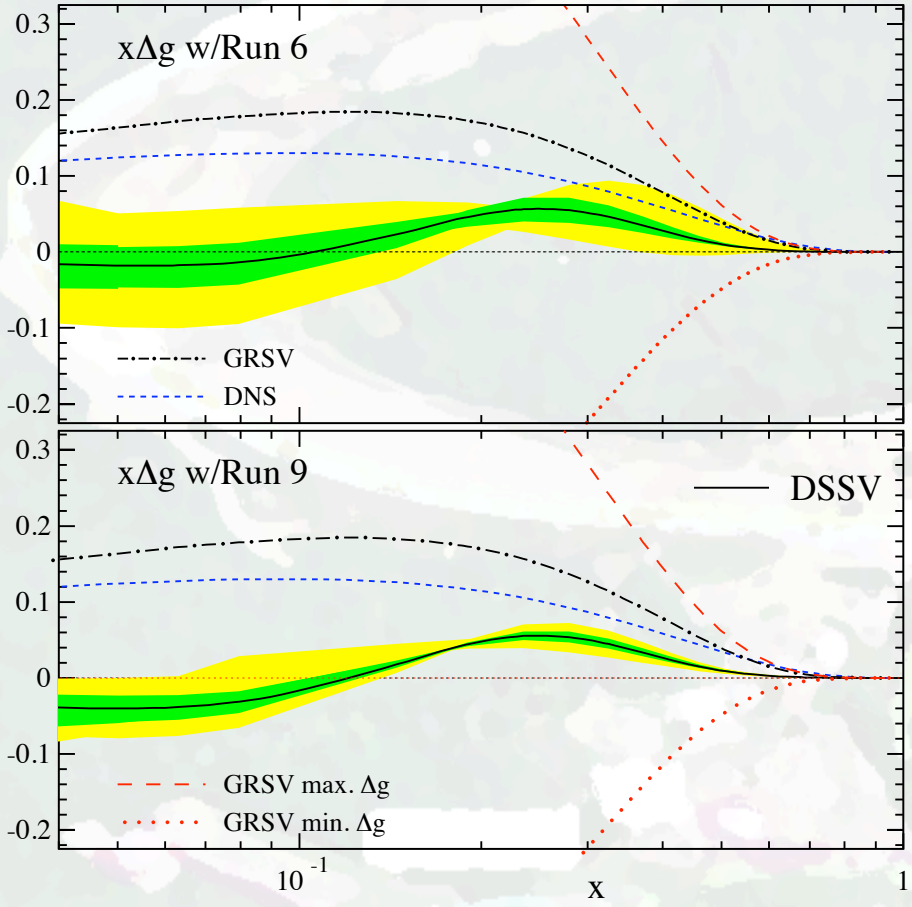


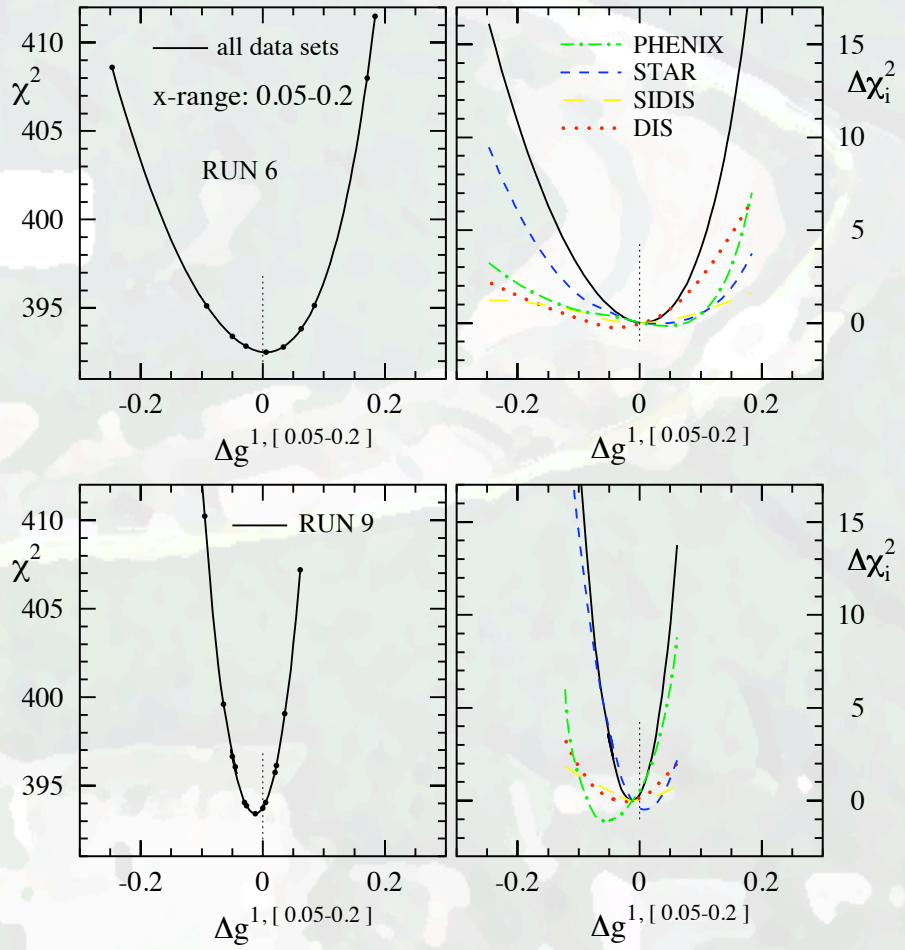
- Strong constraint on the size of Δg from RHIC data for 0.05<x<0.2
- Evidence for a small gluon polarization over a limited region of momentum fraction
- Important: Mapping x-dependence and extension of x-coverage needed!



Future projections - Gluon polarization

Gluon polarization - Projection Run 9





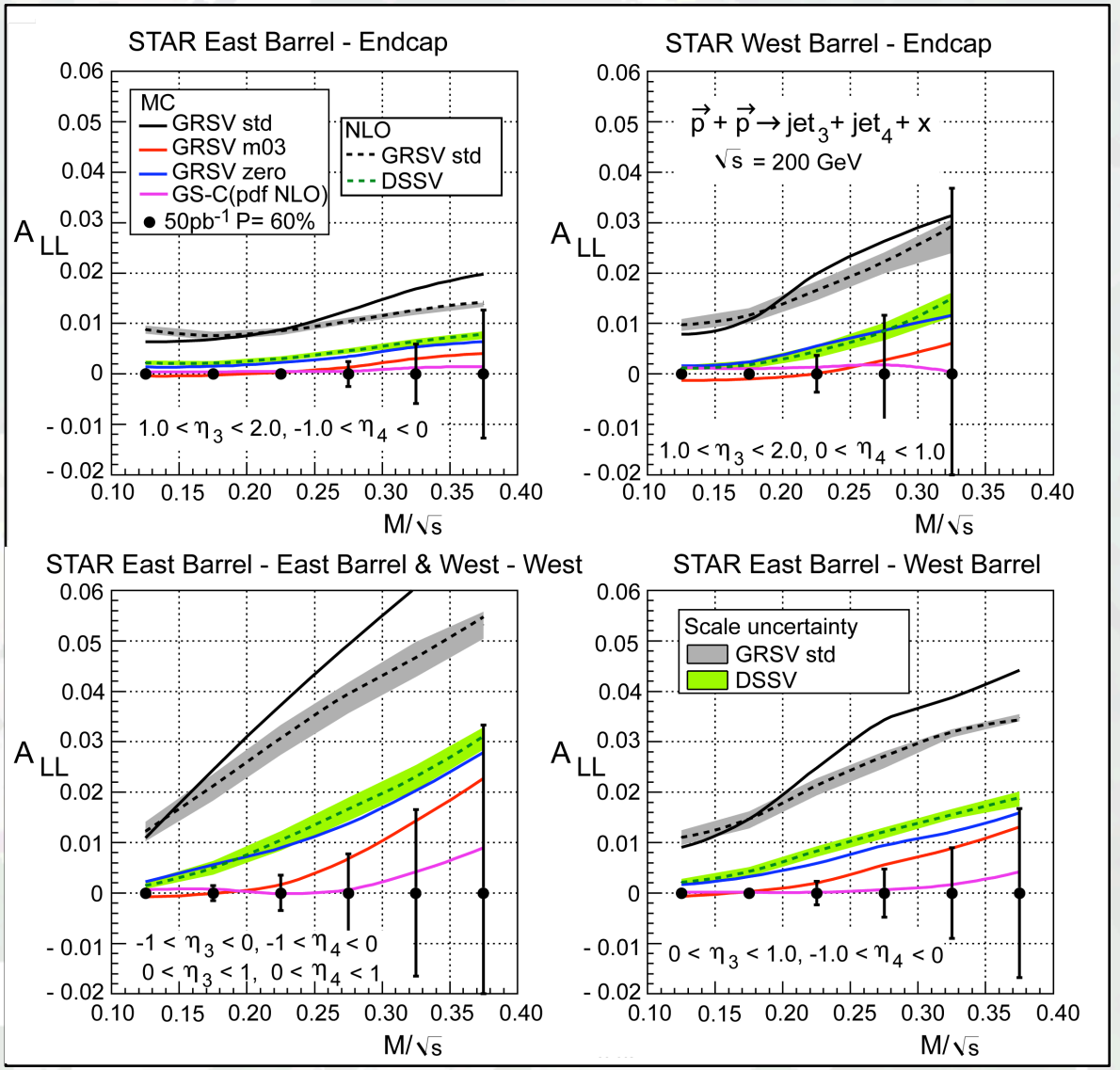
- Substantial improvement on gluon polarization from inclusive measurements
- Complementary information from STAR and PHENIX

Run 9 goals

- Overview
  - Higher sensitivity : Luminosity / DAQ 1000
  - Sensitivity to shape of $x\Delta g(x)$: Correlation measurements
  - Sensitivity to low x : Forward calorimetry
  - Large impact for: $50pb^{-1}$ at 200GeV
  - At 500GeV: Observe first W signal / First inclusive jet/ hadron and di-jet measurements (Longitudinal beam polarization) / First A_N measurement (Transverse beam polarization)

BUR Di-Jet production: 50pb^{-1} / 60% (FOM=6.5)

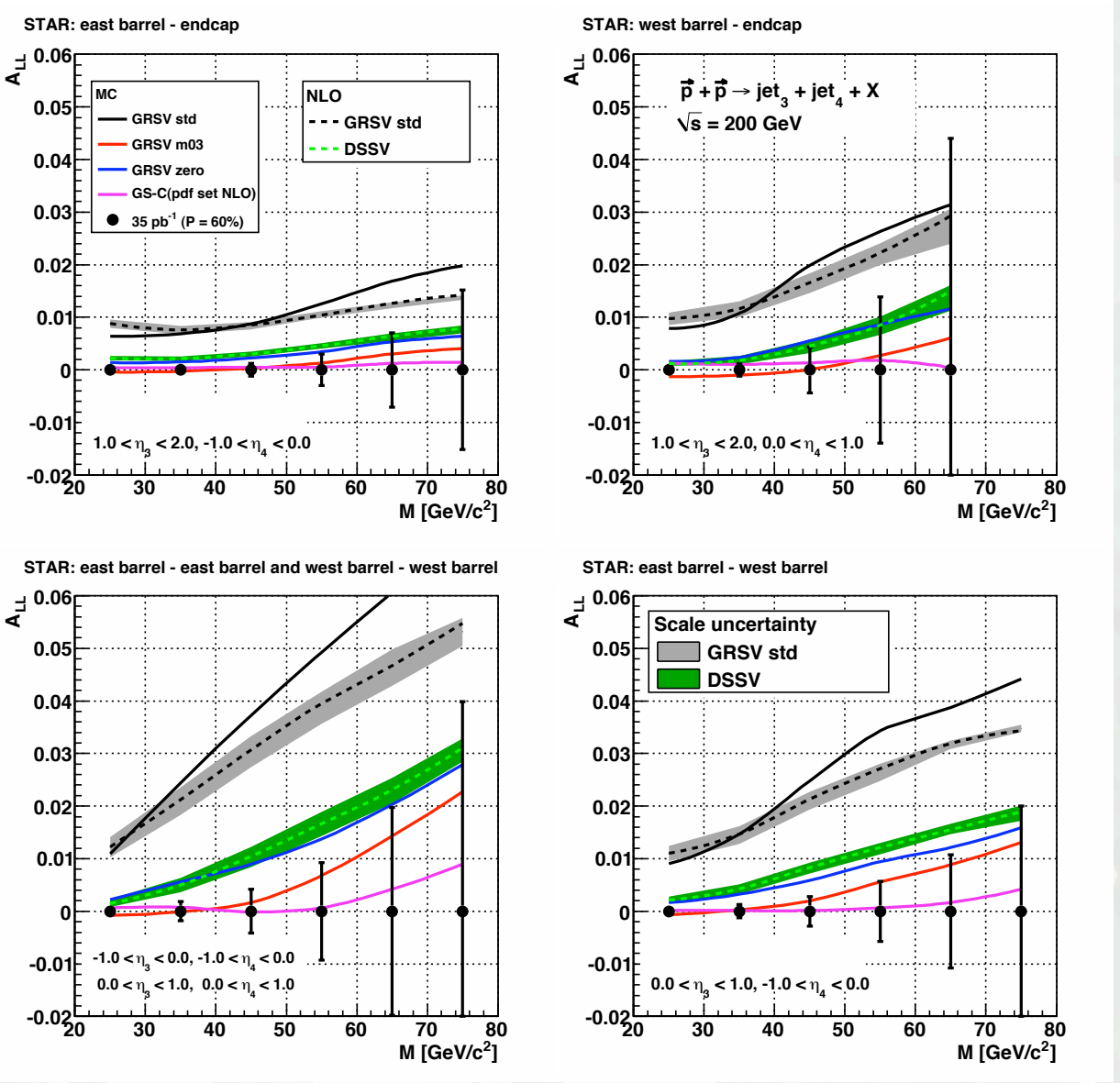
- Gluon polarization - Di-Jets
  - Substantial improvement in Run 9 from Di-Jet production
  - Good agreement between LO MC evaluation and full NLO calculations



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

Run 9 goals - 200GeV running

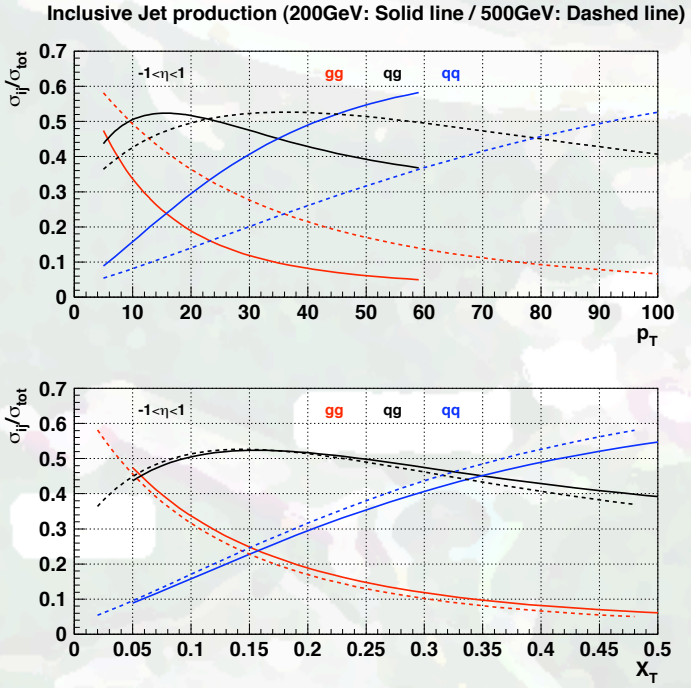
- Di-Jets: 10 weeks
  - FOM = 4.5
  - Polarization = 60%
  - Luminosity: 35pb^{-1}

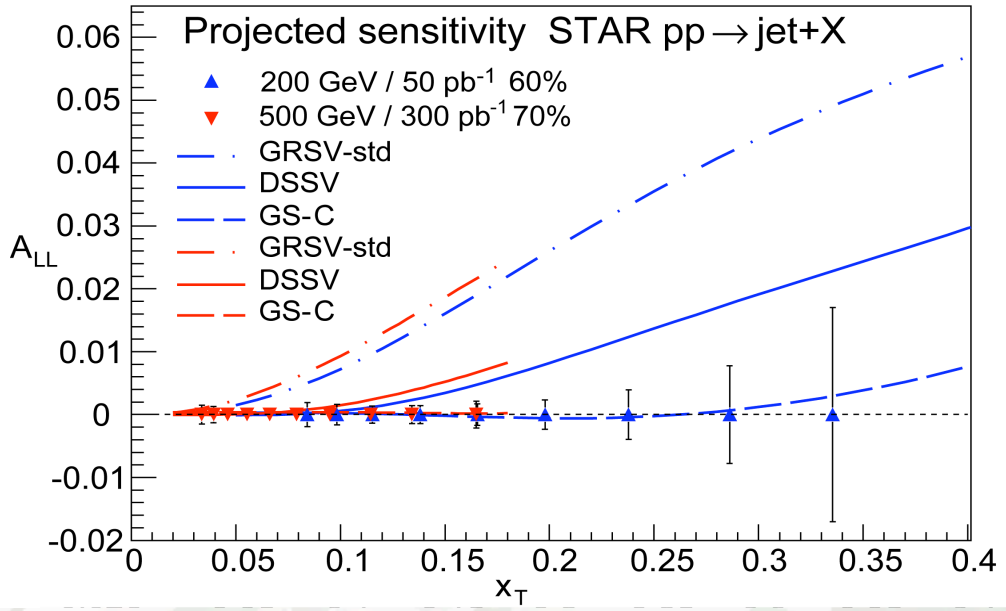


$$M = \sqrt{x_1 x_2 s} \qquad \eta_3 + \eta_4 = \ln \frac{x_1}{x_2}$$

Run 9 goals - 200 / 500GeV running

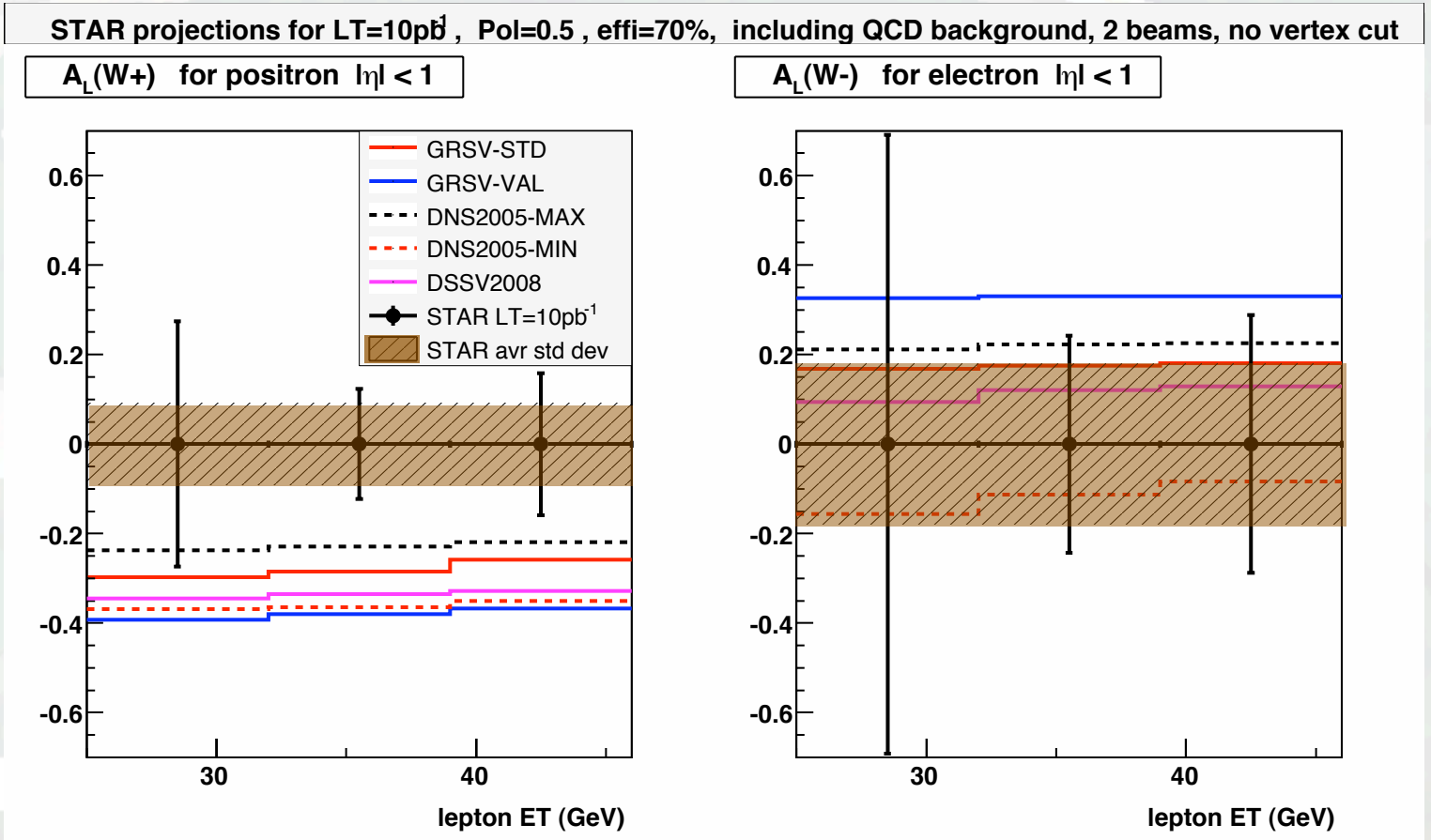
- Inclusive measurements / Di-Jet measurements
  - Improved precision at 200GeV for established inclusive channels of inclusive jet and hadron production
  - 500GeV running: Extension to low x-region with larger gg contribution at fixed p_T compared to 200GeV





Run 9 goals - 500GeV running

- W production: 3 weeks
  - FOM = 2.5
  - Polarization = 50%
  - Luminosity: $10pb^{-1}$



- 500 GeV running in Run 9 focus at mid-rapidity integrated [-1,+1]
- Demonstrate W production at mid-rapidity and first A_L measurement at STAR