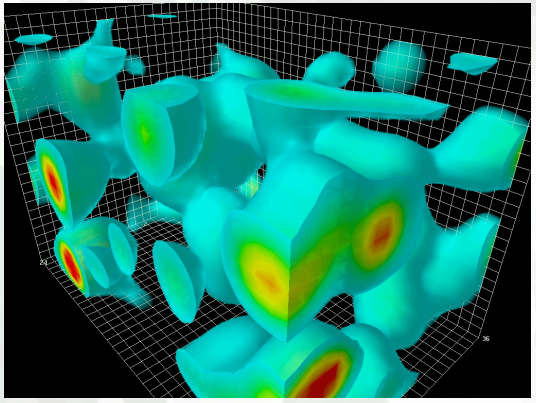
Future prospects of di-jet production at forward rapidity constraining $\Delta g(x)$ at low x in polarized p+p collisions at RHIC

Bernd Surrow

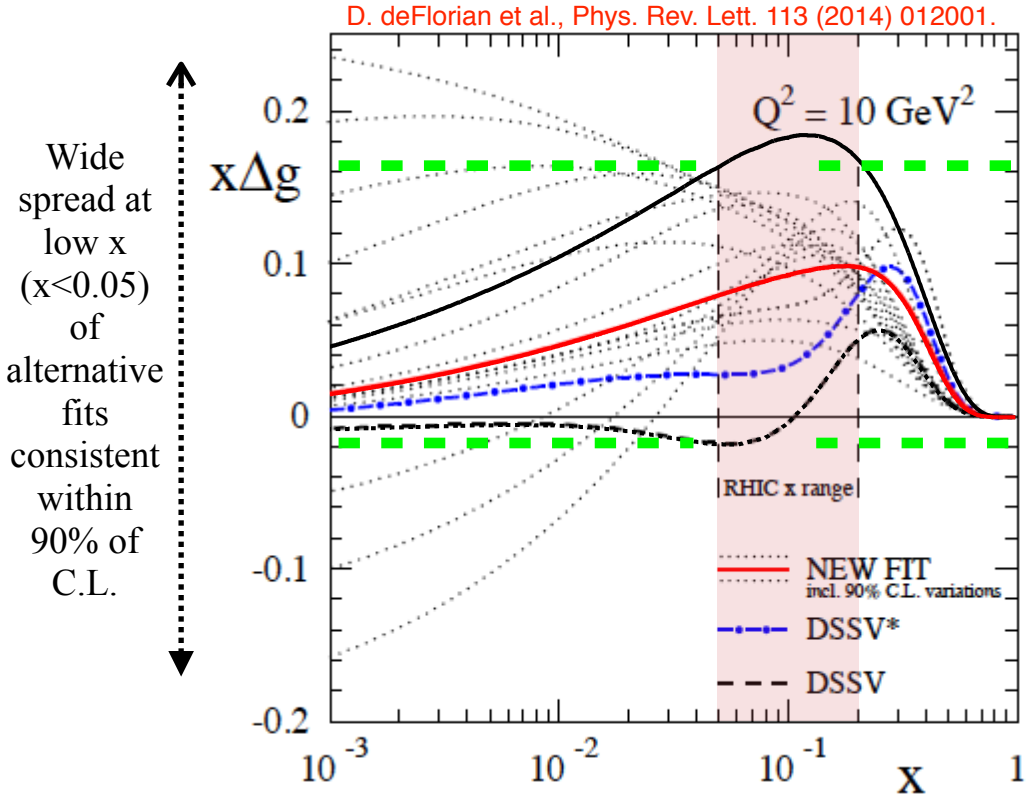
TEMPLE UNIVERSITY



Results / Status - Gluon polarization program

- Impact on Δg from RHIC data

D. deFlorian et al., Phys. Rev. Lett. 113 (2014) 012001.



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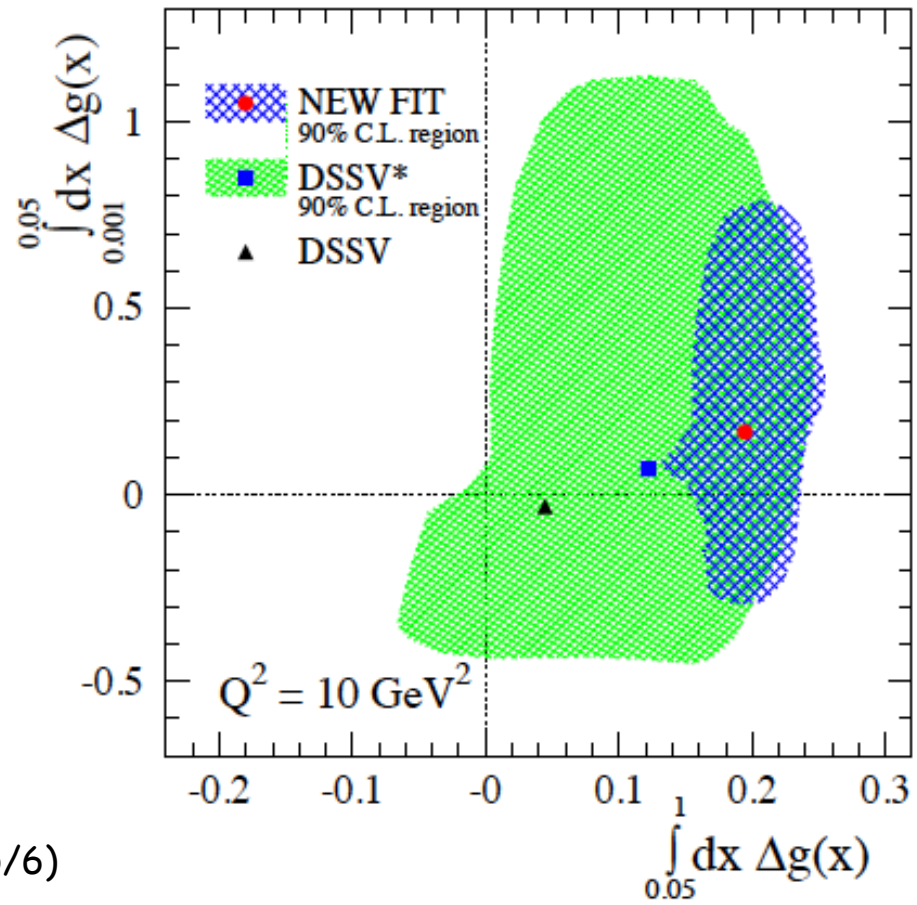


- DSSV: Original global analysis incl. first RHIC results (Run 5/6)
- DSSV*: New COMPASS inclusive and semi-inclusive results in addition to Run 5/6 RHIC updates
- DSSV - NEW FIT: Strong impact on $\Delta g(x)$ with RHIC run 9 results ⇒ Positive for $x > 0.05$!

"...better small-x probes are badly needed."

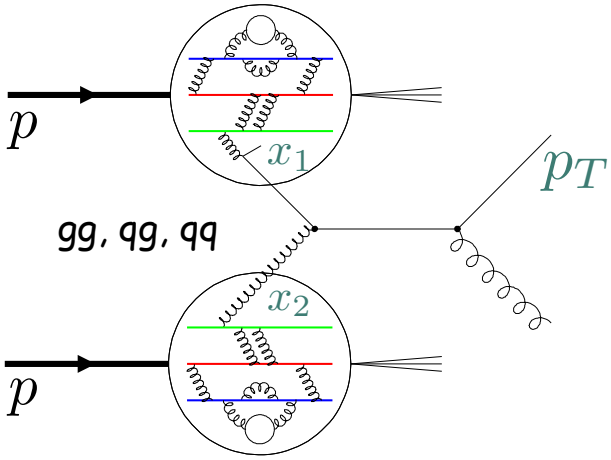
D. deFlorian et al., Phys. Rev. Lett. 113 (2014) 012001.

Results / Status - Gluon polarization program

RHIC Gluon polarization - Correlation Measurements

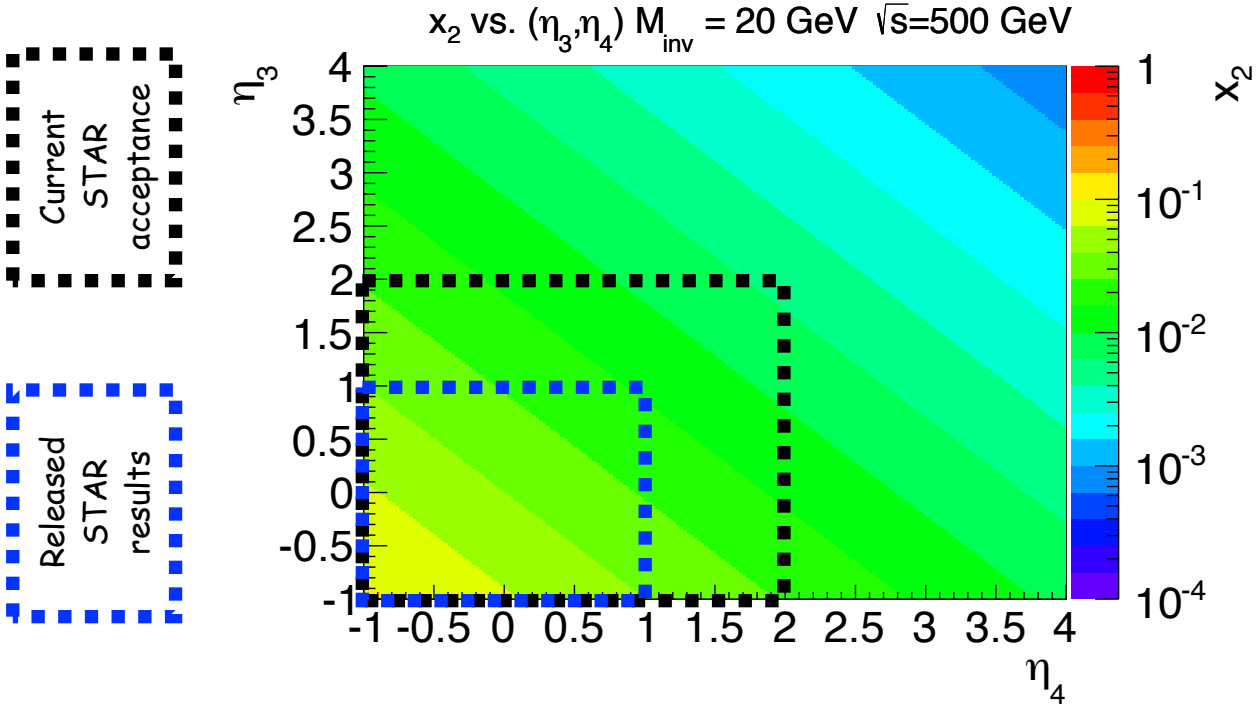
- Correlation measurements provide access to partonic kinematics through Di-Jet/Hadron production and Photon-Jet production:

$$x_{1\,(2)} = \frac{1}{\sqrt{s}}\left(p_{T_3} e^{\eta_3(-\eta_3)} + p_{T_4} e^{\eta_4(-\eta_4)}\right)$$



Di-Jet production

- Bjorken x-coverage:



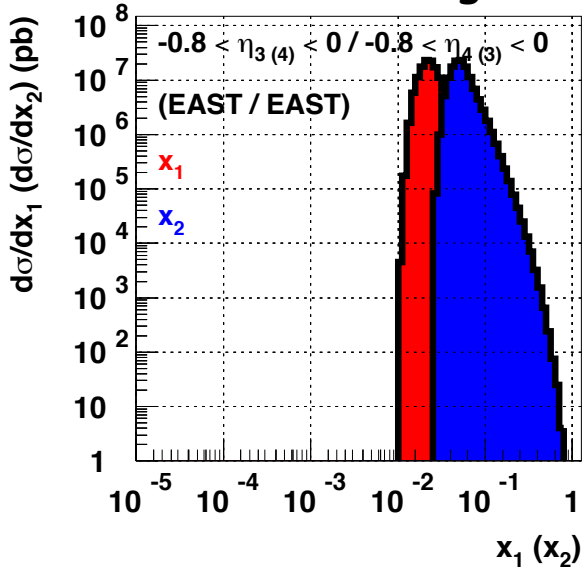
$$\eta_3 + \eta_4 = \ln\frac{x_1}{x_2}$$

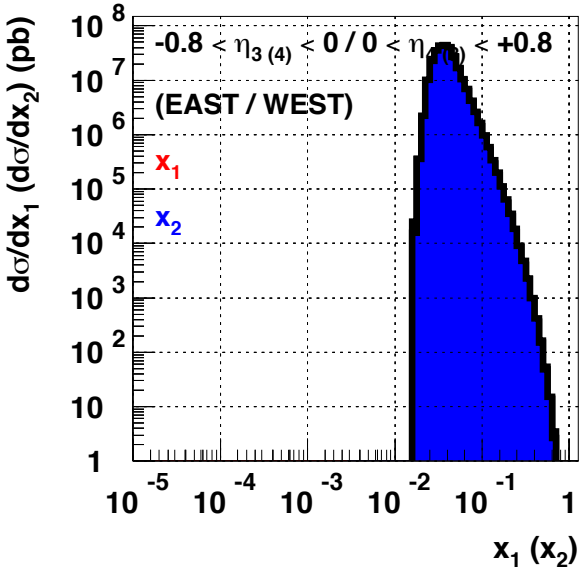
$$M = \sqrt{s}\sqrt{x_1 x_2}$$

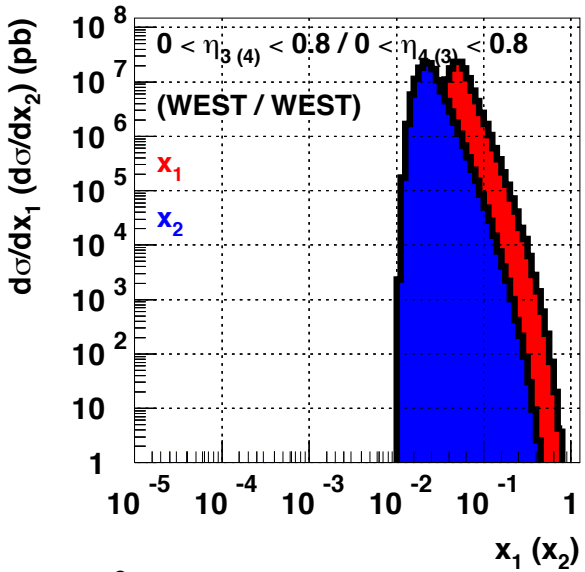
Future prospects - Gluon polarization program

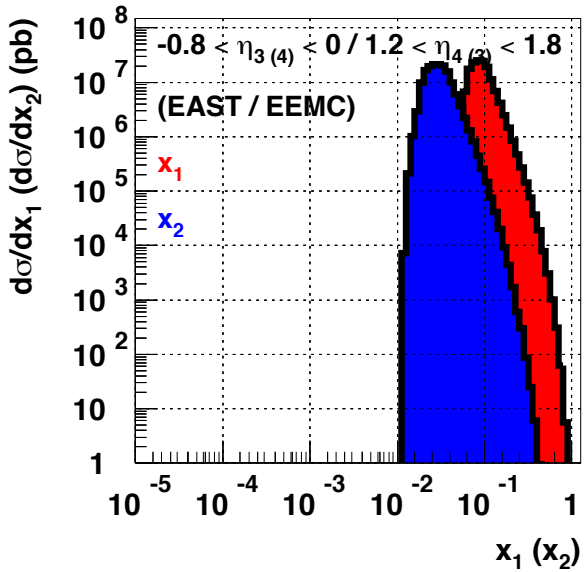
Kinematic coverage - Simulations / Central

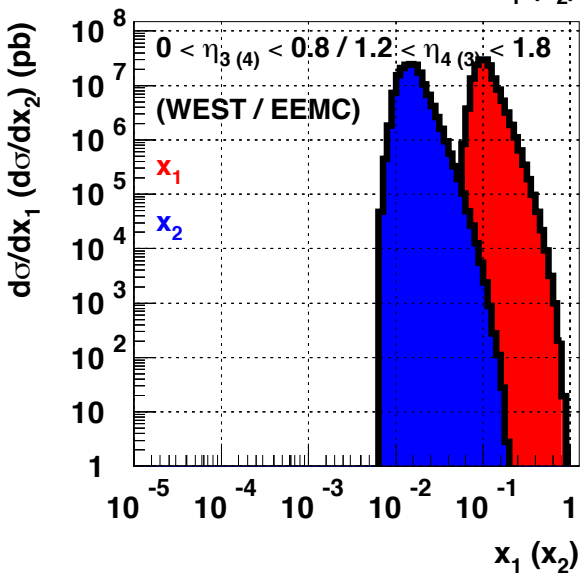
Cone alg. (R=0.7) / $E_{T3} > 5$GeV $E_{T4} > 8$GeV

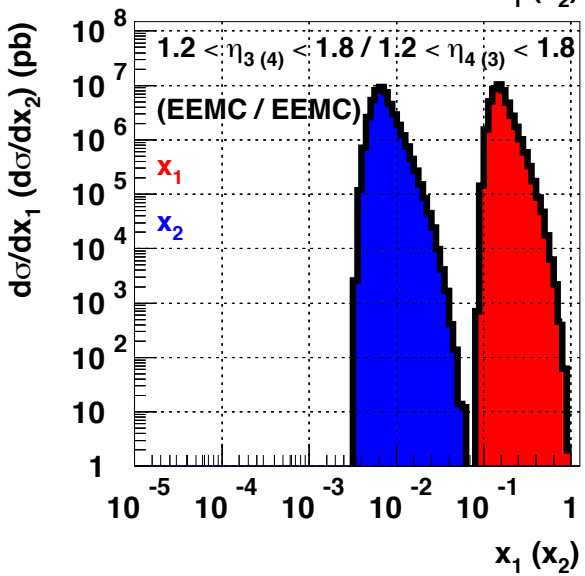












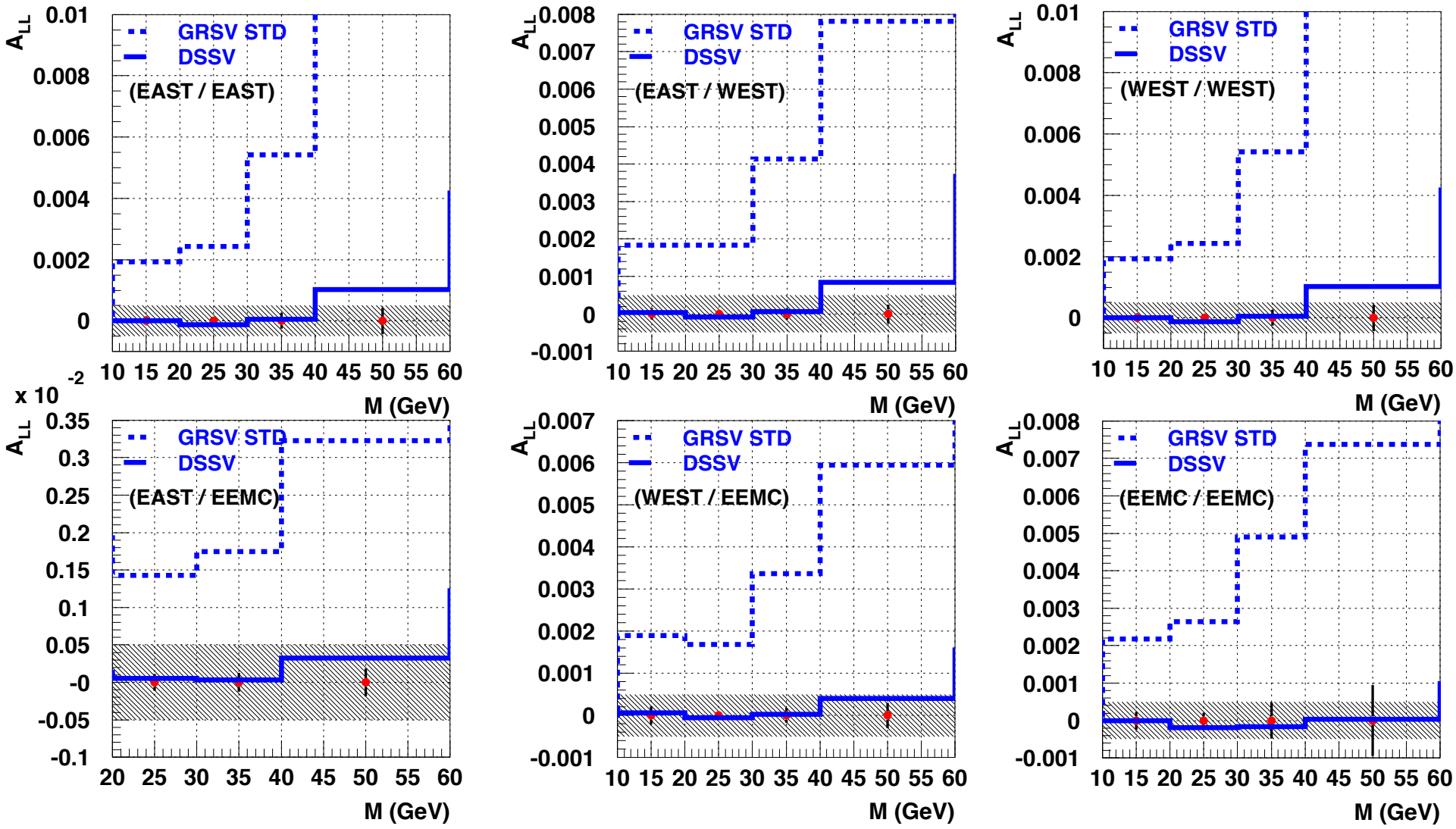
Future prospects - Gluon polarization program

- A_{LL} projections / Central

Cone alg. (R=0.7) / $E_{T3} > 5$GeV $E_{T4} > 8$GeV

Delivered Luminosity = 1000pb^{-1}

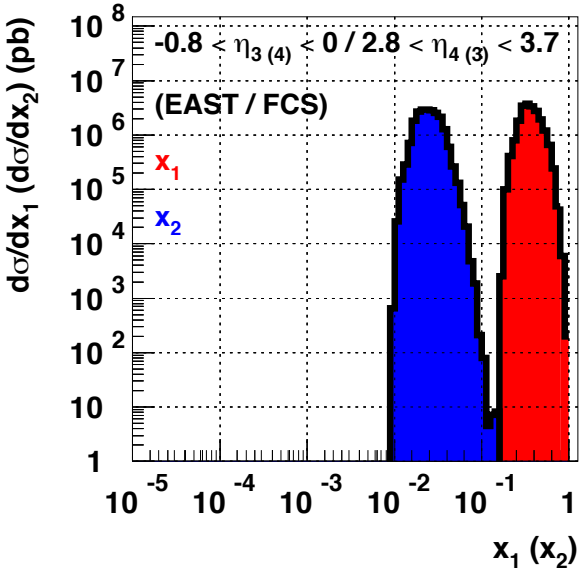
Polarization = 60%

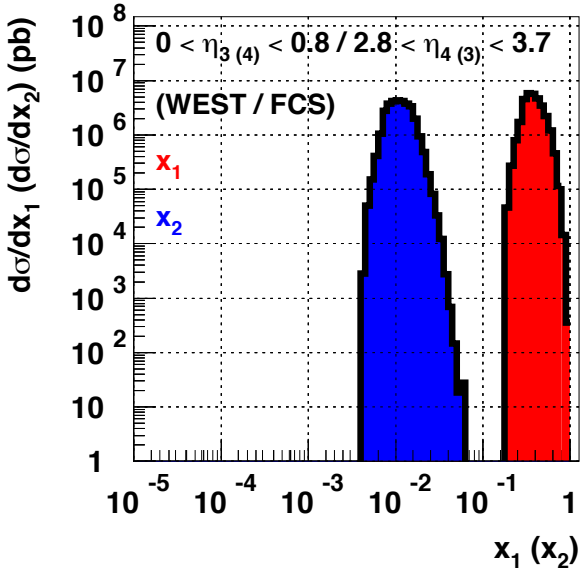


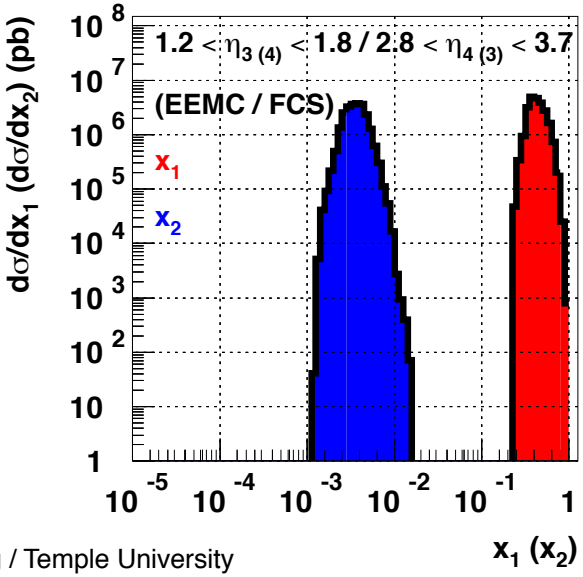
Future prospects - Gluon polarization program

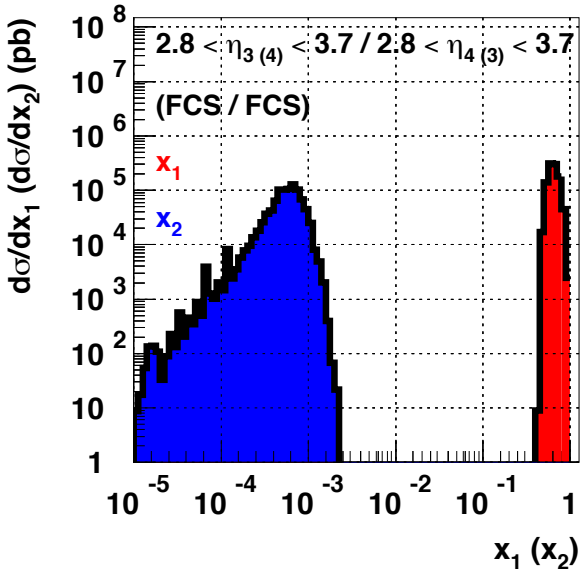
- Kinematic coverage - Simulations / Forward

Cone alg. (R=0.7) / $E_{T3} > 5$GeV $E_{T4} > 8$GeV



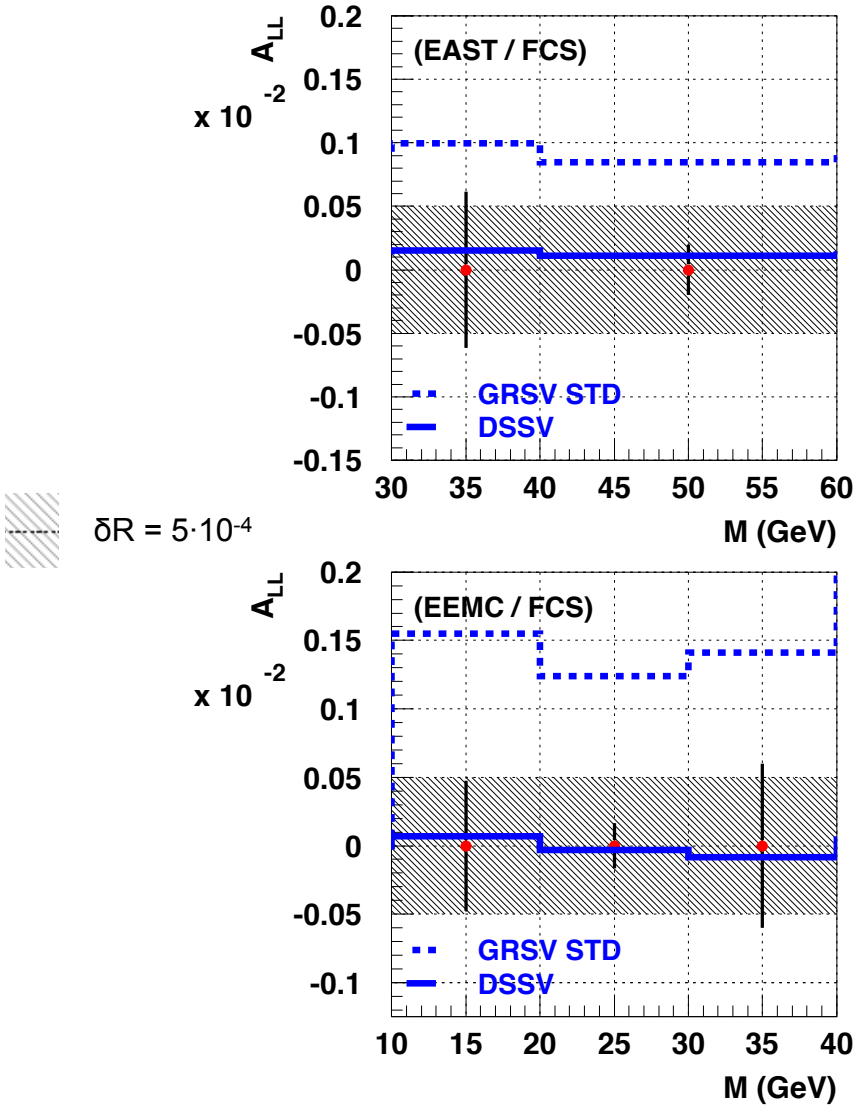






Future prospects - Gluon polarization program

- A_{LL} projections / Forward



Summary

- Status: Gluon polarization program:
  - First Di-Jet measurement opens the path to constrain the shape of Δg
  - Run 9 results: Precise A_{LL} measurement suggesting non-zero ΔG
- New global analysis by DSSV:
  - Non-zero $\Delta g(x)$ for $x > 0.05$
  - Larger uncertainties for $x < 0.05$, i.e. below current RHIC kinematic region!
- Run 14 STAR BUR request:
  - 6 weeks with $L_{delivered} = 75 pb^{-1}$ and 60%
- Forward jet production:
  - Extend jet measurements at forward rapidity probing $\Delta g(x)$ as low as 10^{-3} in x
  - Good control of sys. uncertainties important (Assume ~ 1 long RHIC run!)
  - Additional probes to be studied: π^0-jet correlations!
  - Important step prior to a future Electron-Ion Collider (EIC) ~2025!

LOI for forward STAR upgrade focusing on forward pp/pA program