Update for run 17 diffractive EM-jet A_N

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Outline

❑Responses to the questions and suggestions last week

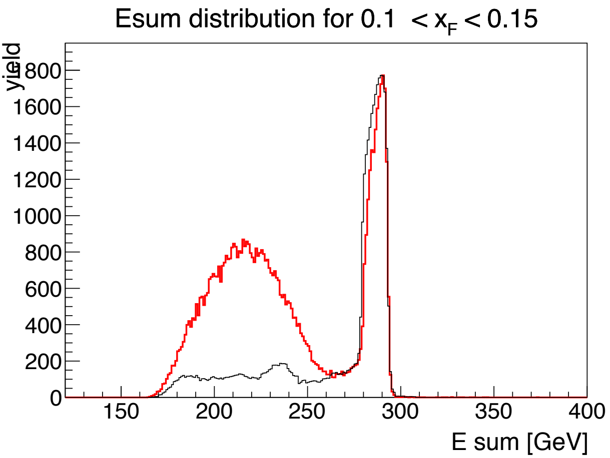
- 1. Check the west RP track momentum distribution for events by different x_F ranges
- 2. Study the fraction of west RP track energy to beam energy ($x_L = \frac{E_{proton}}{E_{beam}}$)

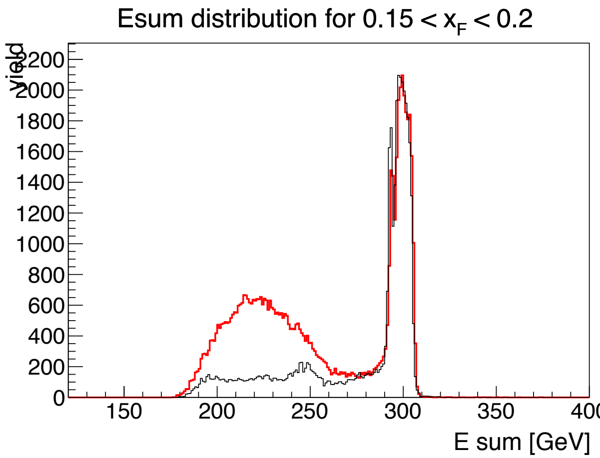
❑Preliminary plots

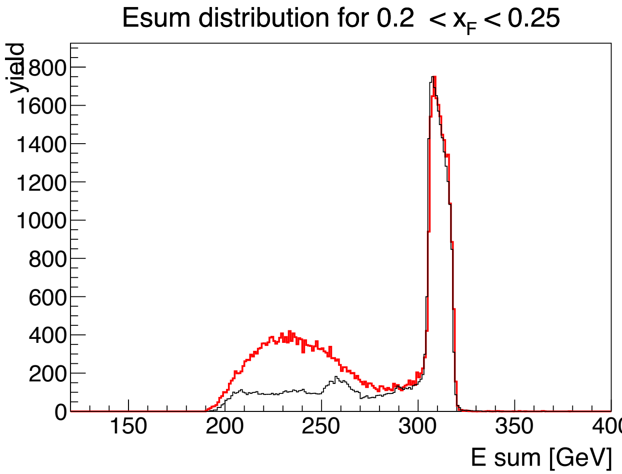
- Run 17 diffractive EM-jet A_N for all photon multiplicity, and 1 or 2 photon multiplicity EM-jets
- Comparison between inclusive and diffractive EM-jet for 1 or 2 photon multiplicity EM-jets

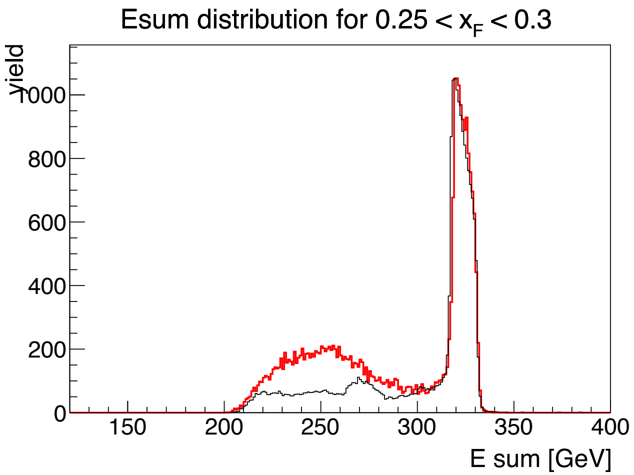
E sum spectrum based on different x_F ranges

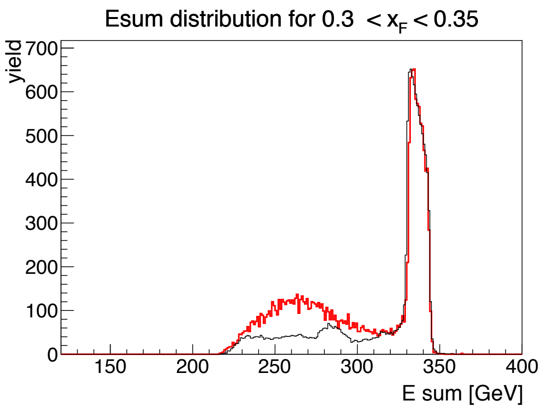
- Data: FMS stream data with **no** east BBC cut , but west BBC cut **<250**.
- All photon multiplicity
- Black curve (Background) is mixed events from zerobias events (scaled to data).
- Red curve is the FMS stream data

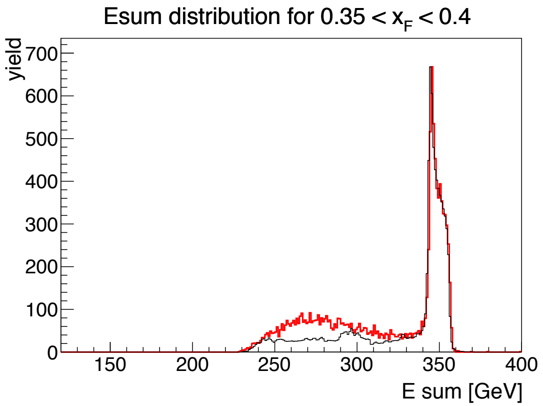


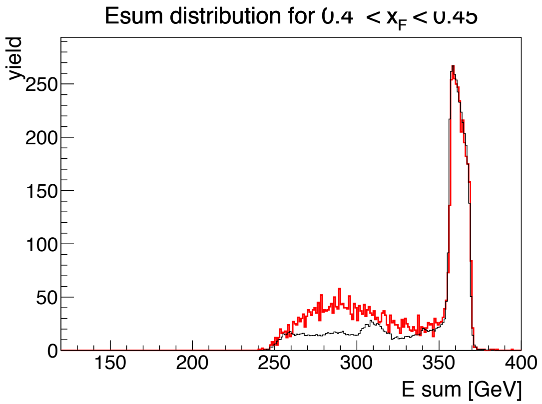






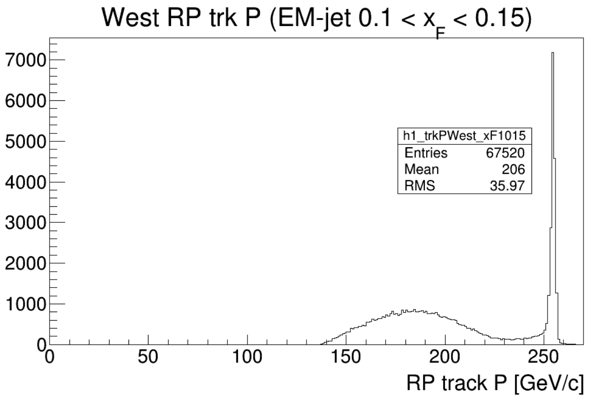


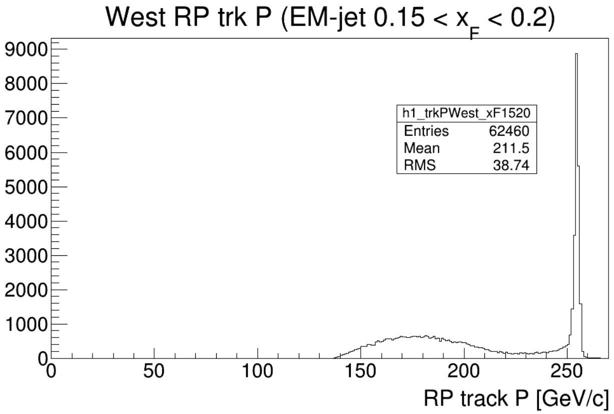


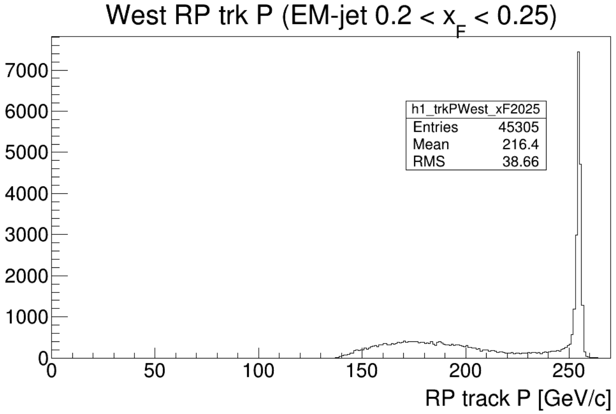


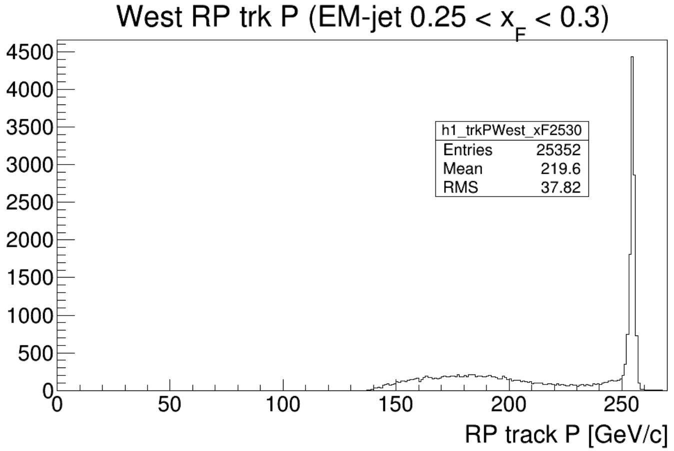
West RP track momentum for events with different EM-jet x_F

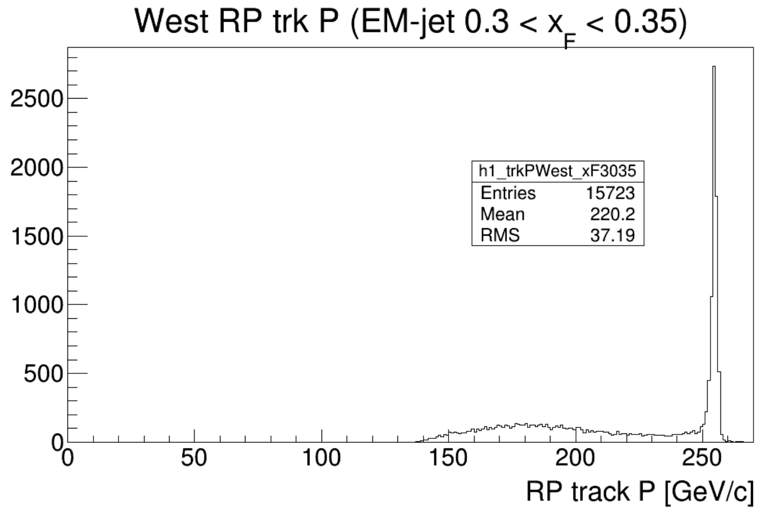
- The west RP P for events with EM-jet at different x_F distribute similarly.
- Their peaks at low P region are within 160 – 190 GeV, regardless of EM-jet energy (x_F)

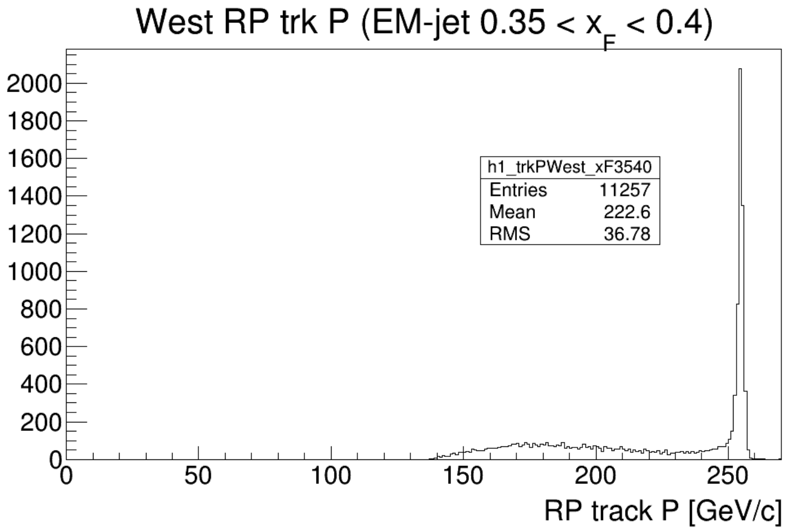


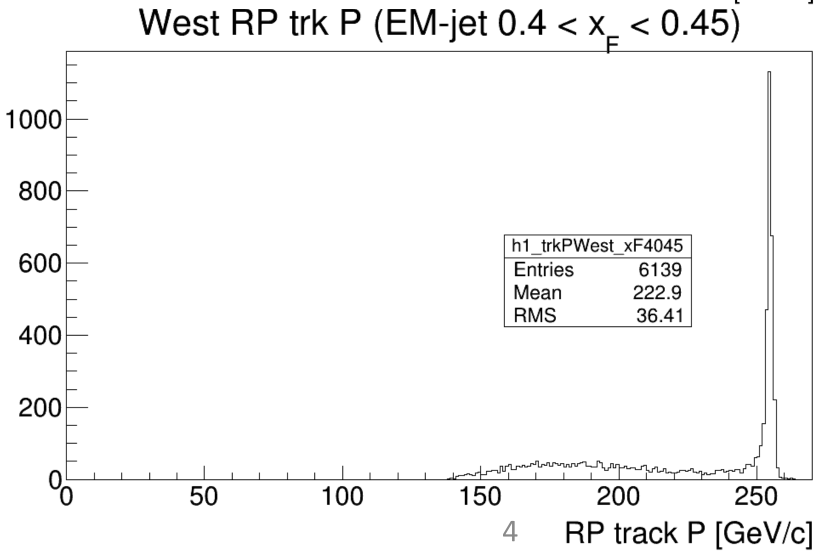






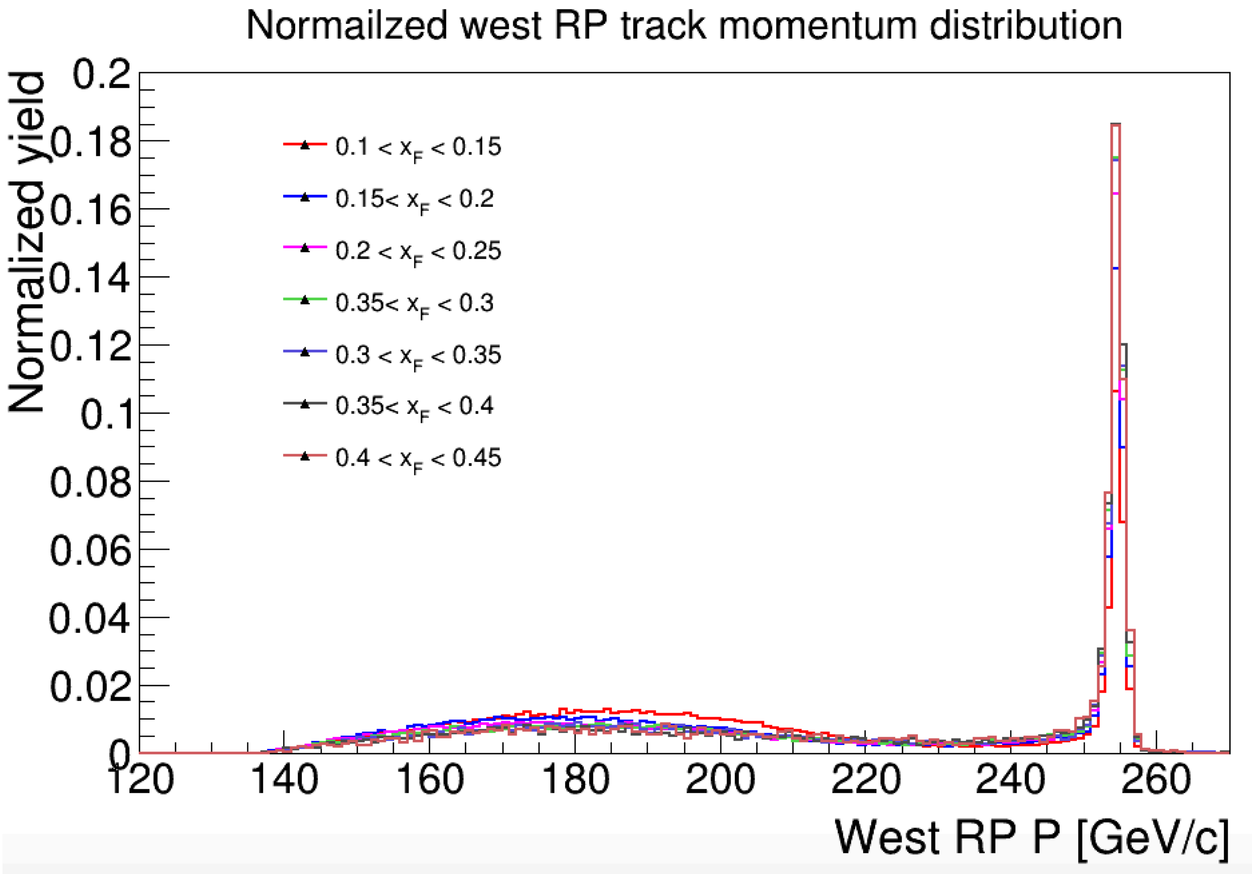






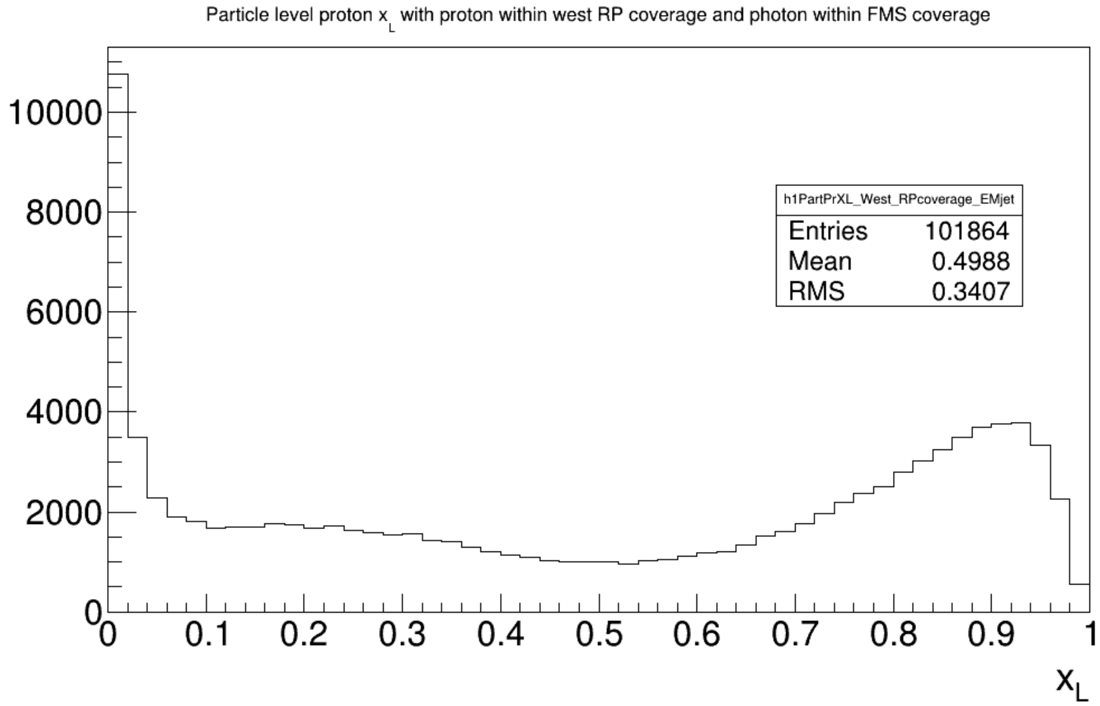
West RP track momentum for events with different EM-jet x_F

- Draw all the West RP track momentum distribution (normalized)for different EM-jet x_F regions in the same canvas.
- The lower momentum peaks look very close among different EM-jet x_F.



Particle level proton x_L

- Particle level proton x_L with proton within west RP coverage and photon within FMS coverage.
  - $x_L = \frac{E_{proton}}{E_{beam}}$
- In simulation, we can see high x_L is preferred with west RP coverage.
  - (Low x_L can not be detected by RP)



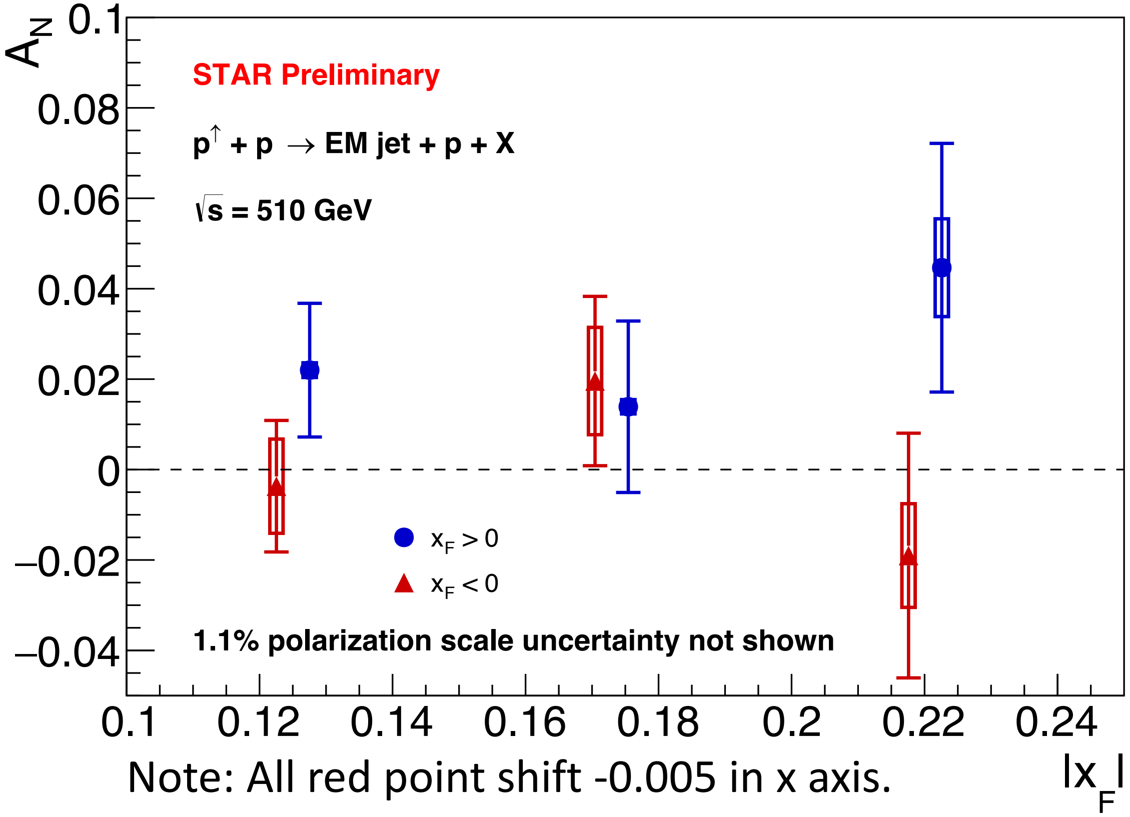
Simulation: 2M hard diffraction simulation events with pp510.

Possible idea for preliminary results for run 17 diffractive EM-jet A_N

- From the previous slide, high x_L is preferred with west RP coverage. We can consider to allow $x_L > 0.75$.
- Therefore, the EM-jet x_F should be less than 0.25. (Note: only one EM-jet allowed.)
  - $x_F = \frac{E_{EM-jet}}{E_{beam}}$
- If yes, we only consider 3 x_F bins: [0.1, 0.15], [0.15, 0.2], [0.2, 0.25]

Signal A_N results for **all photon multiplicity**

- A_N results with 3 x_F bins only
  - **3 x_F bins.** ([0.1, 0.15], [0.15, 0.2], [0.2, 0.25])
- The A_N data point values and statistical / systematic uncertainty are same as last week.
- **Preliminary plot** request for diffractive EM-jet A_N for all photon multiplicity EM-jets



Note: All red point shift -0.005 in x axis.

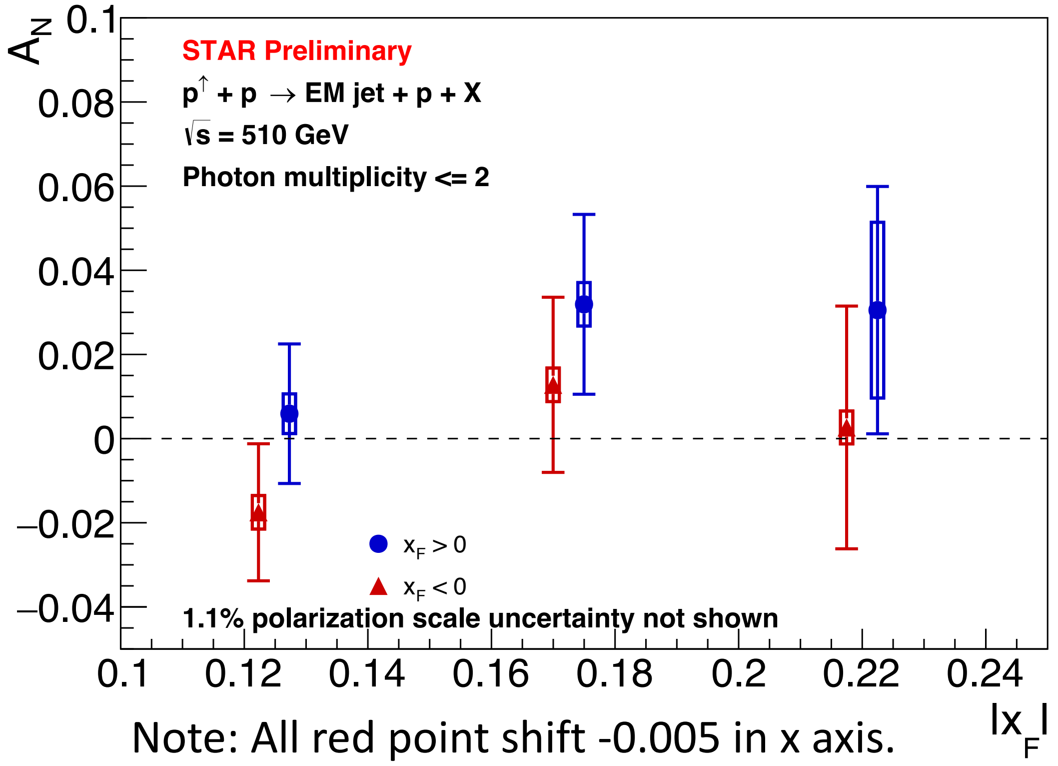
$$A_N(sig) = \frac{A_N(measured) - frac(bkg) * A_N(bkg)}{frac(sig)}$$

Constant fit to check n-sigma to be non-zero:

- Blue beam: 0.022 +/- 0.011. (2.05 σ)
- Yellow beam: 0.0010 +/- 0.013. (0.79 σ)

Signal A_N results for **photon multiplicity <= 2**

- A_N results with 3 x_F bins only
  - **3 x_F bins.** ([0.1, 0.15], [0.15, 0.2], [0.2, 0.25])
- The A_N data point values and statistical / systematic uncertainty are same as last week.
- **Preliminary plot** request for diffractive EM-jet A_N for 1 or 2 photon multiplicity EM-jets



Note: All red point shift -0.005 in x axis.

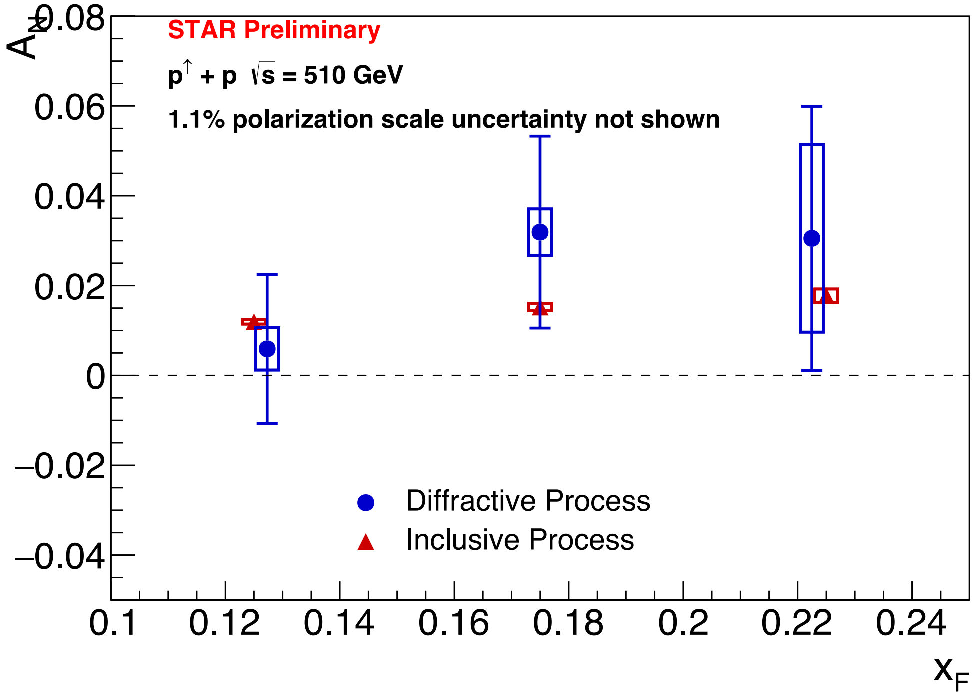
$$A_N(sig) = \frac{A_N(measured) - frac(bkg) * A_N(bkg)}{frac(sig)}$$

Constant fit to check n-sigma to be non-zero:

- Blue beam: 0.018 +/- 0.013. (1.38 σ)
- Yellow beam: -0.0044 +/- 0.012 (0.36 σ)

Comparison between run 17 inclusive and diffractive EM-jet A_N

- Compare the A_N results between inclusive and diffractive process.
  - 1 or 2 photon multiplicity EM-jets are considered.
- Both inclusive and diffractive EM-jet A_N are with the same sign ($A_N > 0$)
- Diffractive process could have some contribution on large A_N for inclusive process at high x_F regions. However, their values are still covered with uncertainties.



Conclusion

- Particle level simulation on proton x_L study shows that high x_L is preferred with west RP coverage in pp collisions.
- Updated preliminary results with only 3 x_F regions.
- Comparison between inclusive and diffractive processes A_N shows that diffractive process could have some contribution on large A_N for inclusive process at high x_F regions.
  - However, if counting the error bars, the inclusive and diffractive processes A_N are still
- Analysis details on preliminary request [slide]