Update on EM Jet A_N with FMS and EEMC

Using Run 15 Dataset

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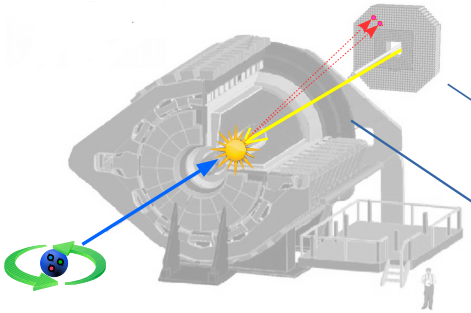
Outline

- **Follow-up on suggestions/comments from the last meeting**

EM Jet A_N with FMS and EEMC

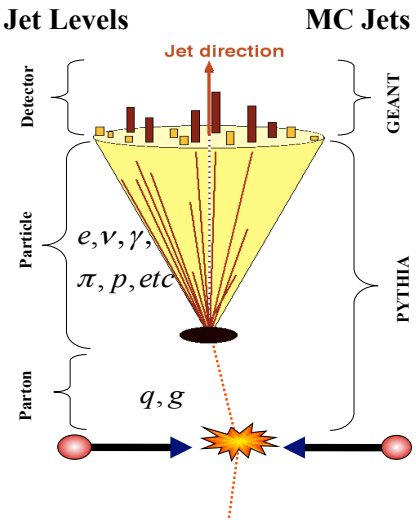
- $p^{\uparrow} + p \rightarrow$ EM-jet + X
- Extract A_N as a function of EM-jet p_T, energy and photon multiplicity.
- EM-jet in FMS and EEMC
- **Dataset:**
  Run 15(200 GeV pp trans)
- **Data-stream:**
  -FMS-stream (For FMS EM-jet)
  - Physics-stream (For EEMC EM-jet)



- **Triggers:**
  - Small BS, Large BS and FMS-JP Triggers (For FMS EM-jet)
  - EHT0, JP and MB triggers (For EEMC EM-jet)
  - Veto on LED and abort gap

Jet Reconstruction

- FMS hot channel masking before reconstruction.
- Fill-by-fill FMS hot/bad channel list
- Exclude highly bit-shifted FMS channels
- Vertex z priority: TPC, VPD, BBC
- Updated *StJetMaker* for FMS
- FMS points as input for Anti-k_T
- Anti-k_T with R = 0.7
- $E_\gamma > 2.0$ GeV (For FMS EM-Jet)
- Jet $p_T > 2.0$ GeV/c
- -80 cm $< V_z <$ 80 cm



EM Jet A_N Calculations

- Use Cross-ratio formula to calculate A_N.

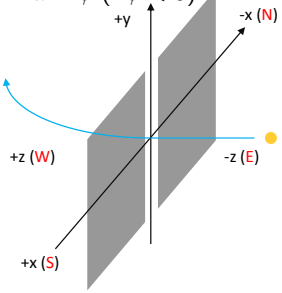
$$\epsilon = A_N \times P \times \cos(\phi)$$

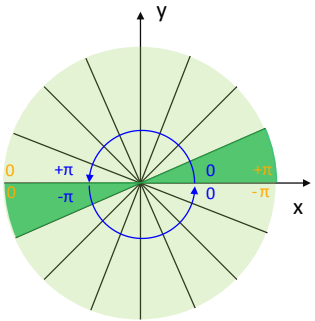
$$\epsilon \approx \frac{\sqrt{N_\phi^\uparrow N_{\phi+\pi}^\downarrow} - \sqrt{N_{\phi+\pi}^\uparrow N_\phi^\downarrow}}{\sqrt{N_\phi^\uparrow N_{\phi+\pi}^\downarrow} + \sqrt{N_{\phi+\pi}^\uparrow N_\phi^\downarrow}}$$

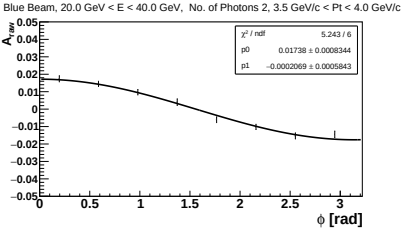
For yellow beam:

$\phi_y = \pi - \phi \ (if \phi >= 0)$

$\phi_y = -\pi - \phi \ (if \phi < 0)$







Major Comments From Last Week

- Include polarization.
- Include trigger dependent p_T cut.
- Compare with Zhanwen's result.
- Find out the most contributing source of systematic errors.

Polarization and Trigger Dependent p_T Cut

- Polarization calculated for every event accepted.
- $< P_{blue} >$ = 0.5365 RMS: 0.0403
- $< P_{yellow} >$ = 0.5614 RMS: 0.0380
- FMS Trigger Dependent p_T Cut:
  - Based Carl's suggestion in the spin pwg mailing list on 2019-11-22:
  - Use FMS trigger dependent p_T cut 15% above nominal threshold:
  - Adjusted η to $2.8 < \eta < 3.8$
- Other Cuts:
  - Exclude fills having bad spin pattern
  - Exclude sm-bs3 trigger for now to minimize ring of fire issue.

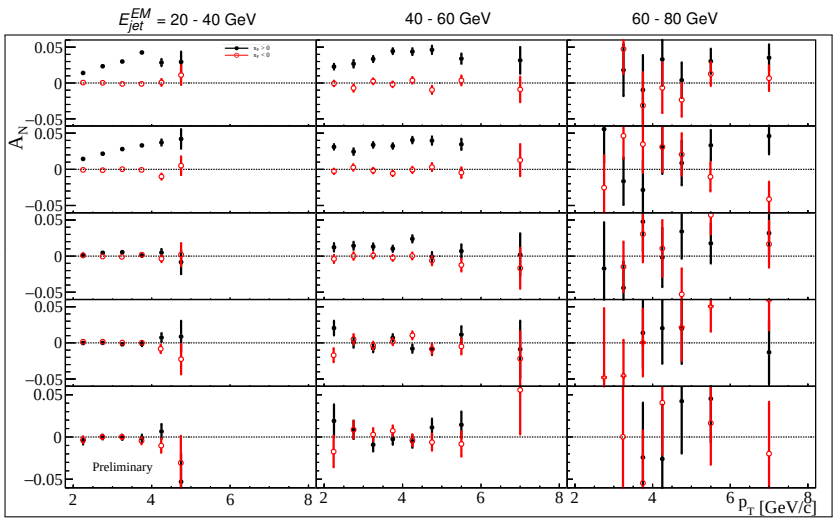
Trigger Dependent p_T Cut

Trigger	Id	E_T (GeV)	15% Higher
FMS-sm-bs1	480801	1.1	
FMS-sm-bs1	480821 / 480841	1.0	
FMS-sm-bs2	480802 / 480822	1.6	
FMS-sm-bs3	480803	2.2	
FMS-sm-bs3	480823 / 480843	1.9	
FMS-lg-bs1	480804	1.1	
FMS-lg-bs1	480824 / 480844	1.0	
FMS-lg-bs2	480805 / 480825	1.6	
FMS-lg-bs3	480806 / 480826	2.4	
FMS-JP0		1.6	
FMS-JP1		2.4	
FMS-JP2		3.2	

- For EEMC,
  -Trigger thresholds for EH0, JP1, JP2 are taken 3.05, 5.41, 7.28 GeV respectively.

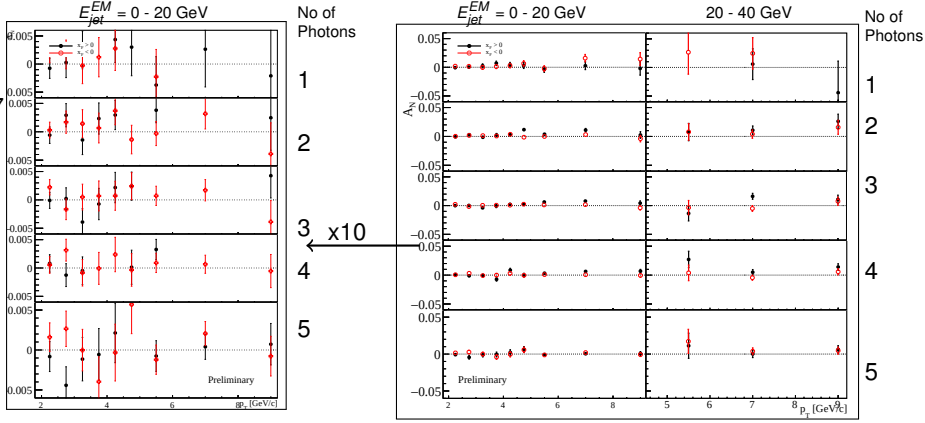
FMS EM-Jet A_N

- Small BS, Large BS and FMS-JP Triggers except Small BS3
- Anti-k_T with R = 0.7
- $E_\gamma > 2.0$ GeV
- Jet $p_T > 2.0$ GeV/c
- Trigger dependent p_T cut
- Error bars statistical only

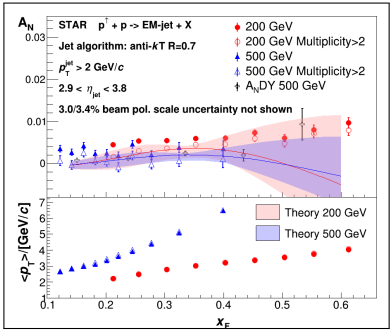


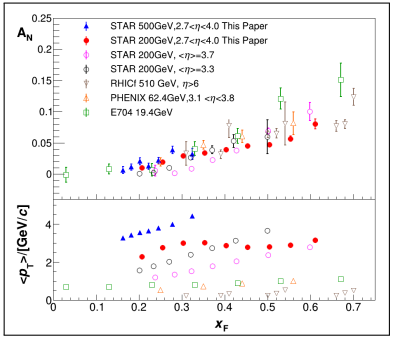
EEMC EM-Jet A_N

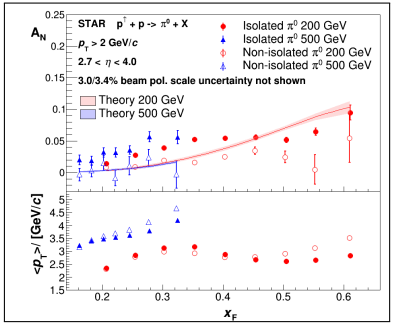
- EHT0, JP and MB triggers
- Anti-k$_T$ with R = 0.7
- Jet p_T > 2.0 GeV/c
- Trigger dependent p_T cut
- Error bars statistical only



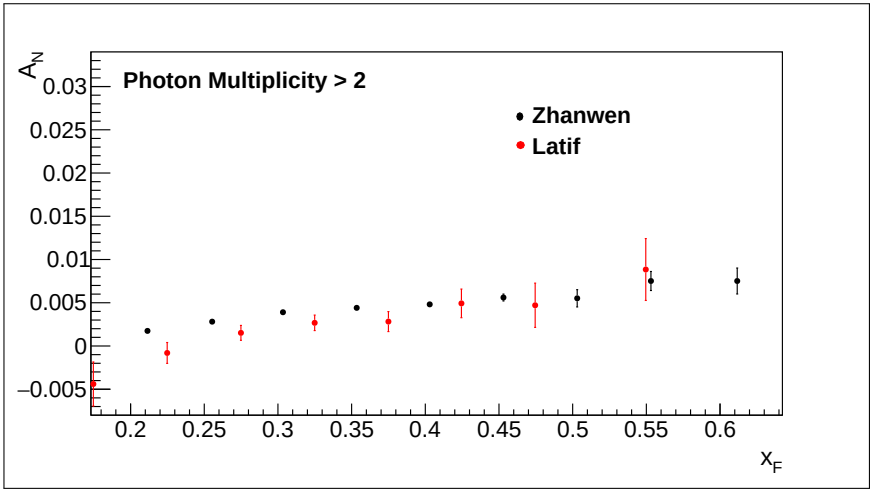
Zhanwen's Results







Comparing With Zhanwen's Results



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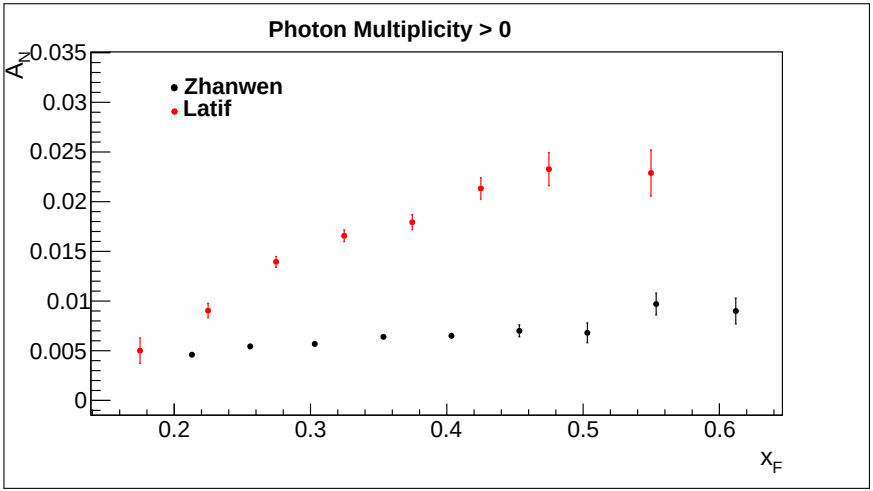
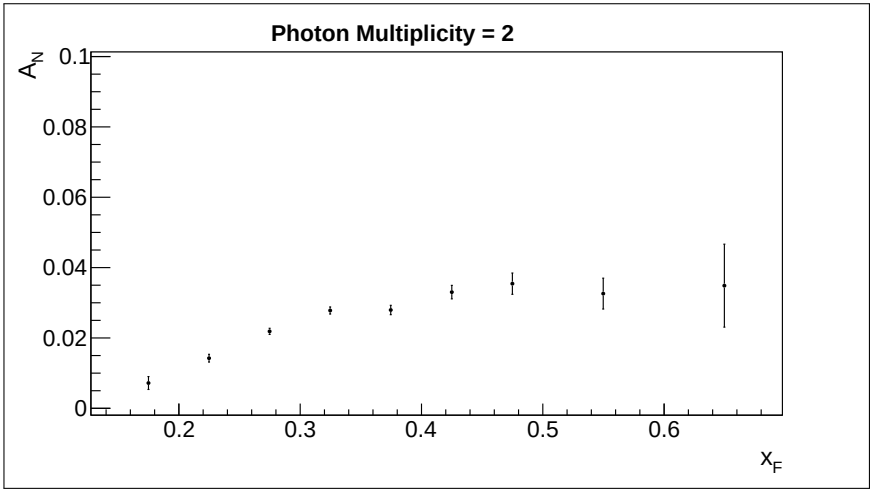
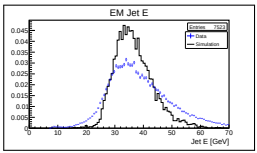


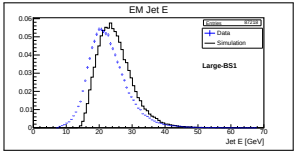
A_N for Jet Photon Multiplicity = 2



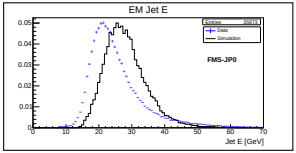
FMS Jet: Data (Blue) Vs Simulation (Black)



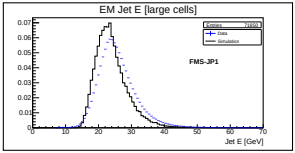
Small-BS1



Large-BS1



FMS-JP0



FMS-JP1

Summary

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