DIS2023 report

Apr 25

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DIS2023

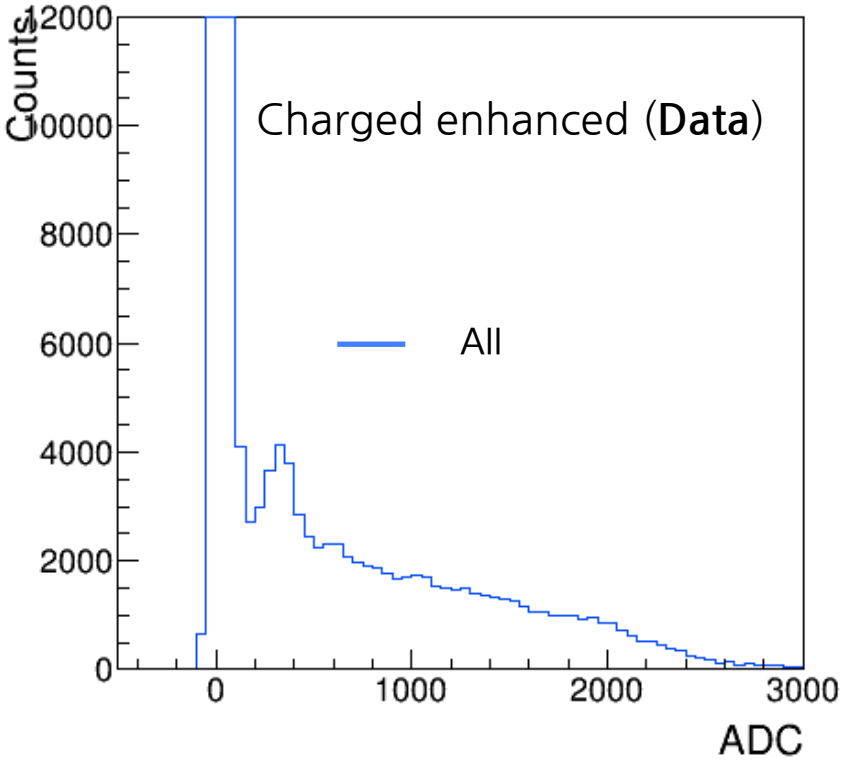
Conference Topics

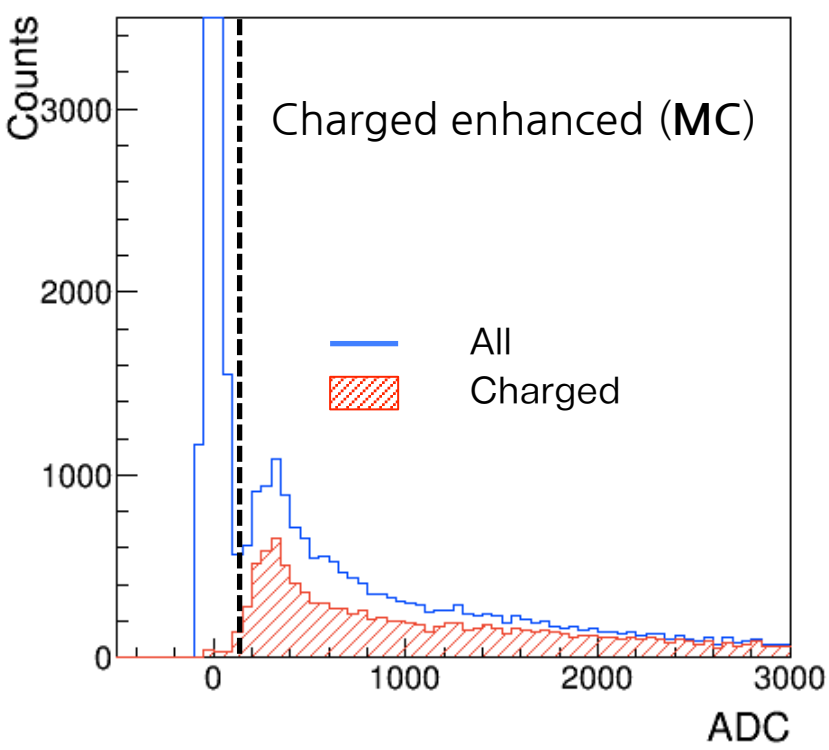
The DIS2023 conference includes particle physics, nuclear physics and computational physics; it usually covers (but is not limited to) following scientific topics:

- Structure Functions and Parton Densities
- Small-x, Diffraction and Vector Mesons
- Electroweak Physics and Beyond the Standard Model
- QCD with Heavy Flavours and Hadronic Final States
- Spin and 3D Structure
- Future Experiments

- DIS2023 was held at Michigan State University in East Lancing, MI, USA from March 27 to 31.
- 294 participants joined the conference and 311 talks were presented and discussed in 6 working groups.

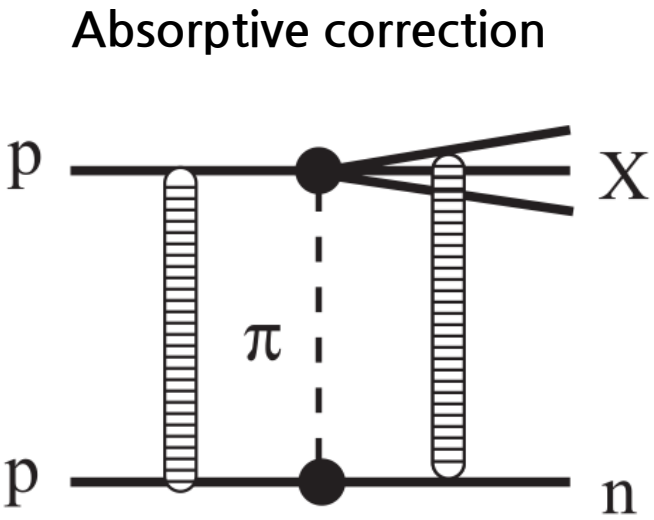
My talk

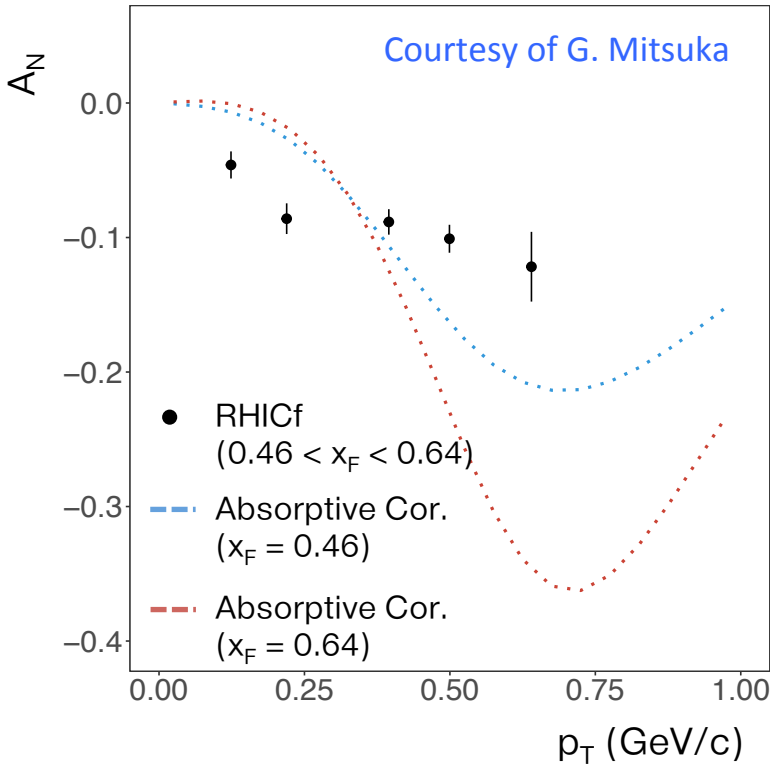




- MC well reproduces the charged hadron contamination.
- Charged contamination will be suppressed by applying for a threshold in the front counter ADC distribution.

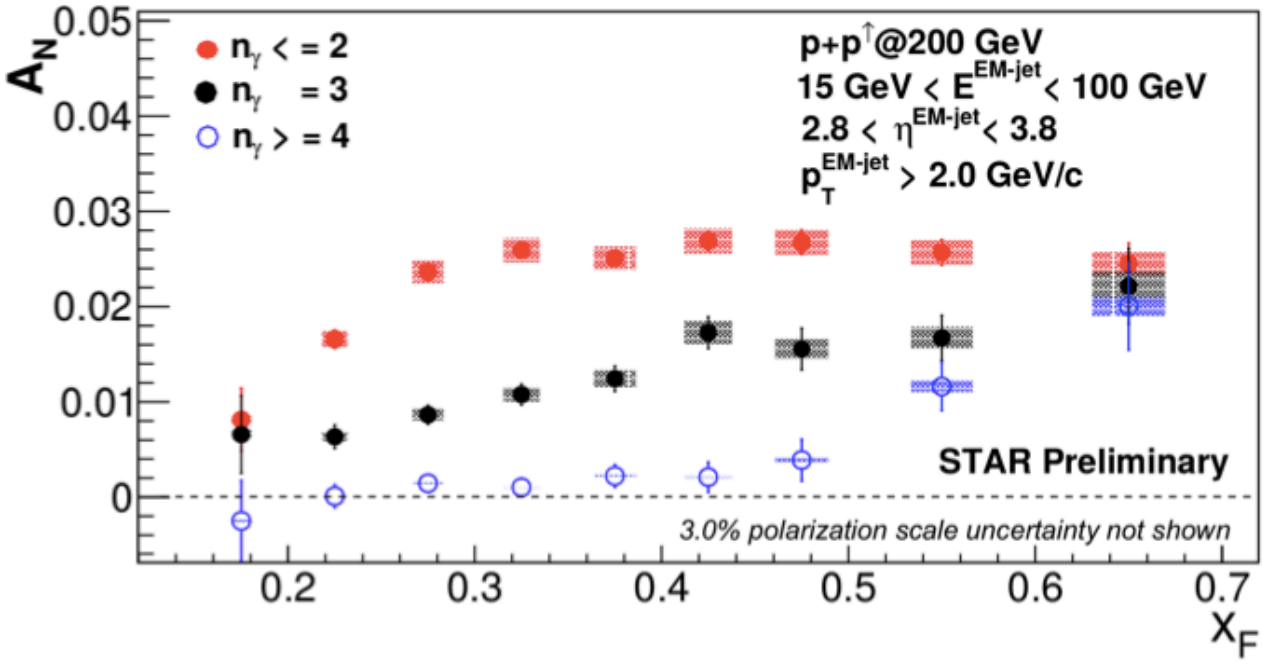
My talk





- Mitsuka-san calculated the neutron A_N by the absorptive correction (initial and final state elastic interactions) in the single pion exchange.
- Absorptive correction doesn't reproduce the RHICf data well but provides a possible origin of the x_F dependence.

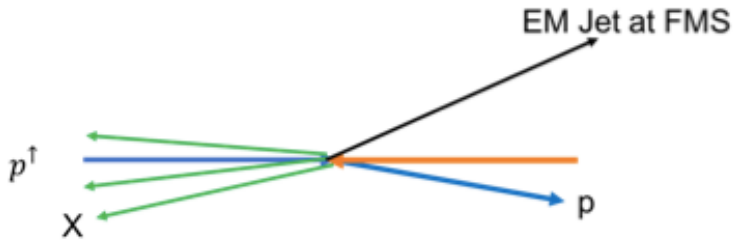
A_N of diffractive EM jet



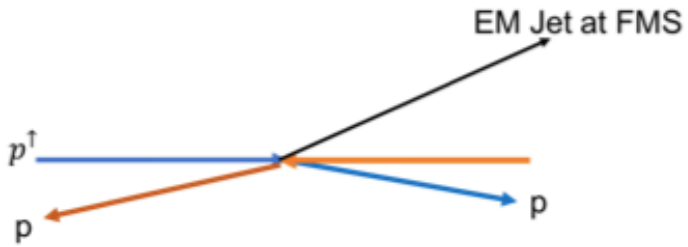
- EM jet is defined by a bunch of electromagnetic particles detected by STAR forward calorimeter.
- A_N of EM jet increases as the detected number of photons increases.
  → How does the A_N behave in the diffractive event condition?

A_N of diffractive EM jet

① Only 1 proton track on FMS side (west side) and no proton track on the away side (east side).

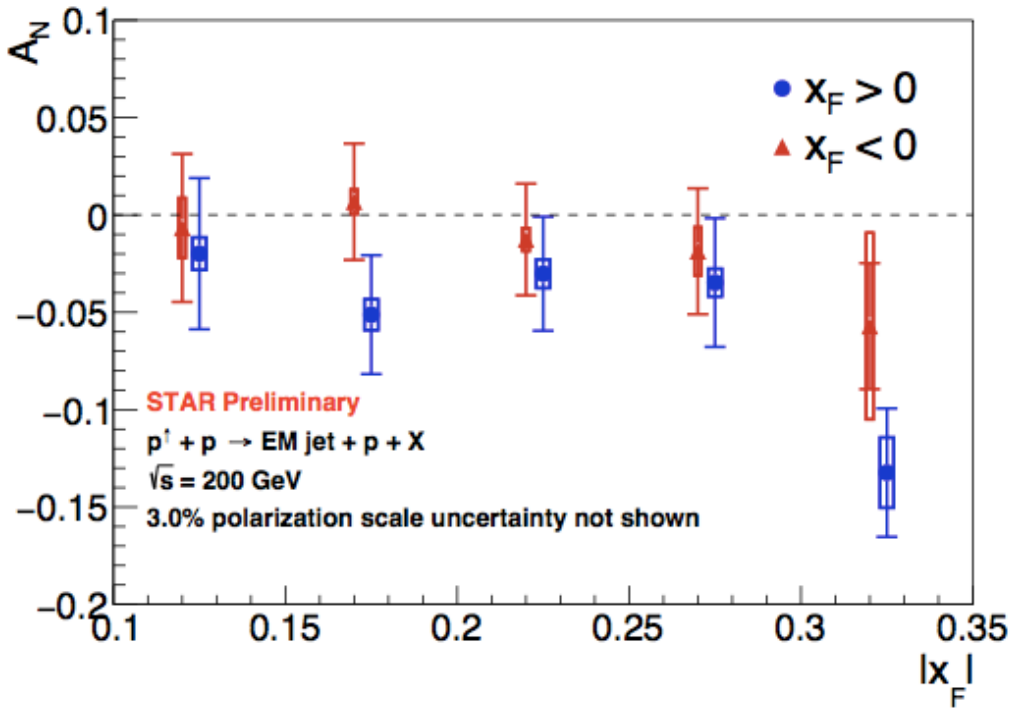


② Only 1 proton track on FMS side (west side) and only 1 proton track on away side (east side).



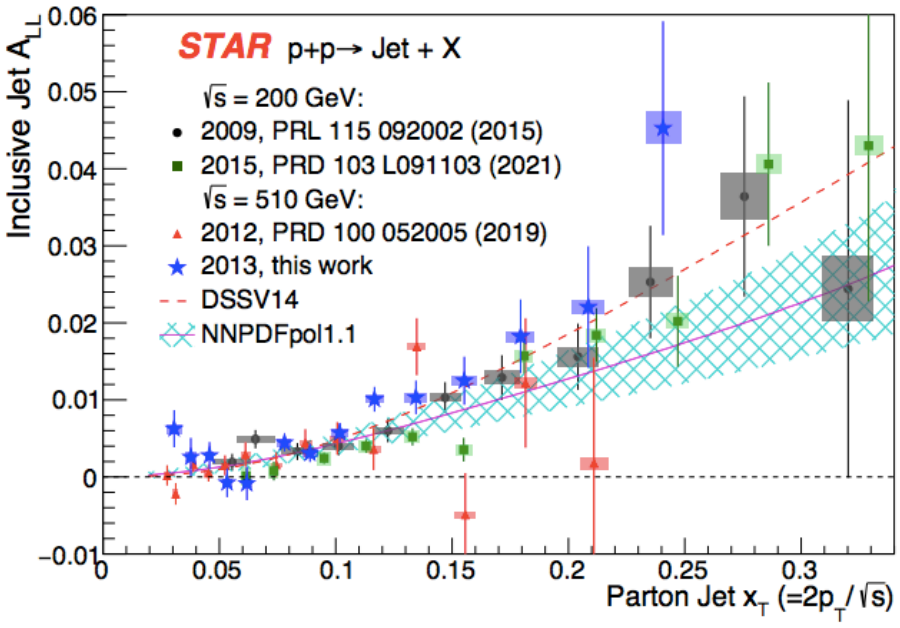
- STAR studied A_N of EM jet with two diffractive channels: (1) Only one proton in the West side Roman pot and (2) two protons in each side Roman pot.
- How about only one proton in the East side Roman pot?

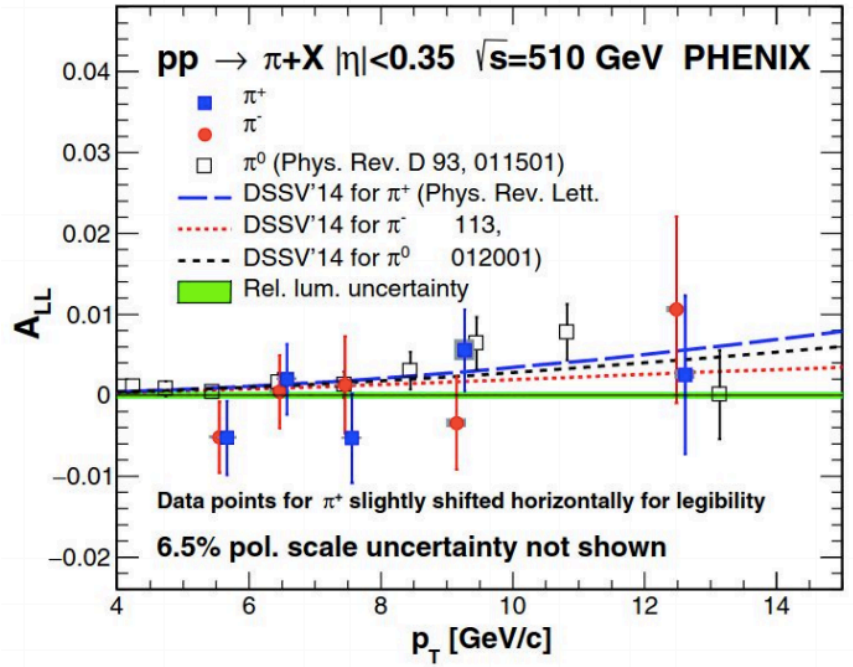
A_N of diffractive EM jet



- A_N of diffractive EM jet shows negative value.
- Diffractive channel seems not related with the A_N enhancement in the isolated condition.

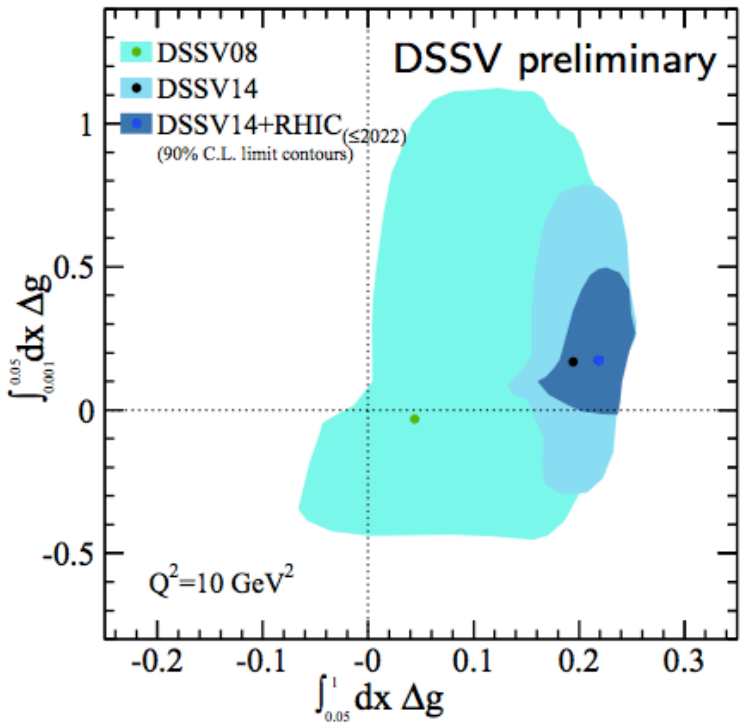
WG5: Longitudinal spin





- STAR reported several new jet A_{LL} results at mid-rapidity using data collected in 2012, 2013 and 2015.
- PHENIX reported the A_{LL} results for direct photon, jet and charged pions at mid-rapidity using data collected in 2013.
- Recent results show good agreement with the previous measurements and next-to-leading-order global analyses.

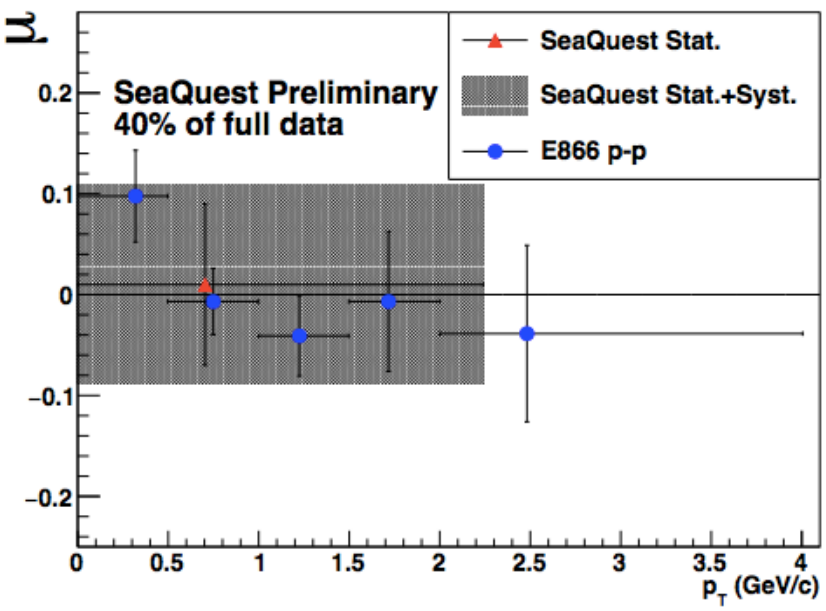
WG5: Longitudinal spin

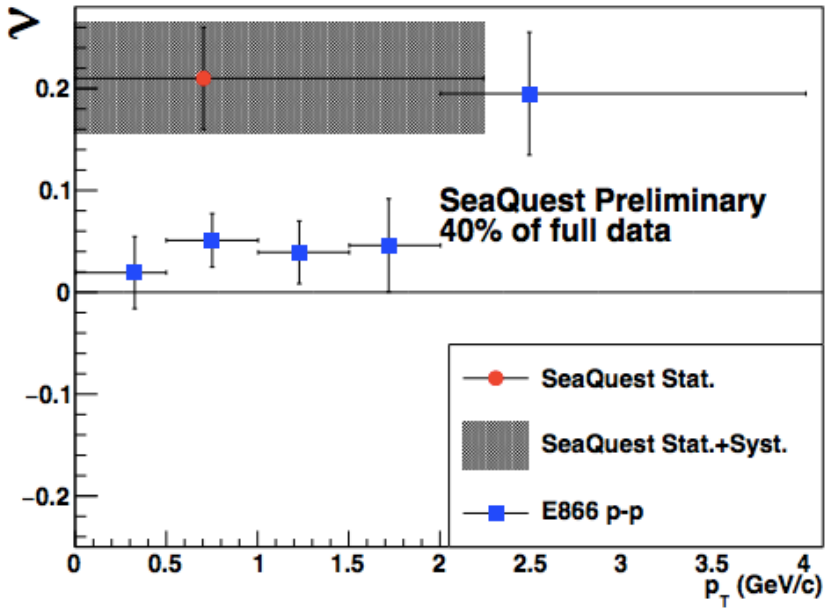


- Recent results including 510 GeV can better constrain Δg(x), especially down to x ~ 0.01.
- Sky blue: RHIC data up to 2009
  Thick blue: Recent results are included.

WG5: TMD PDFs

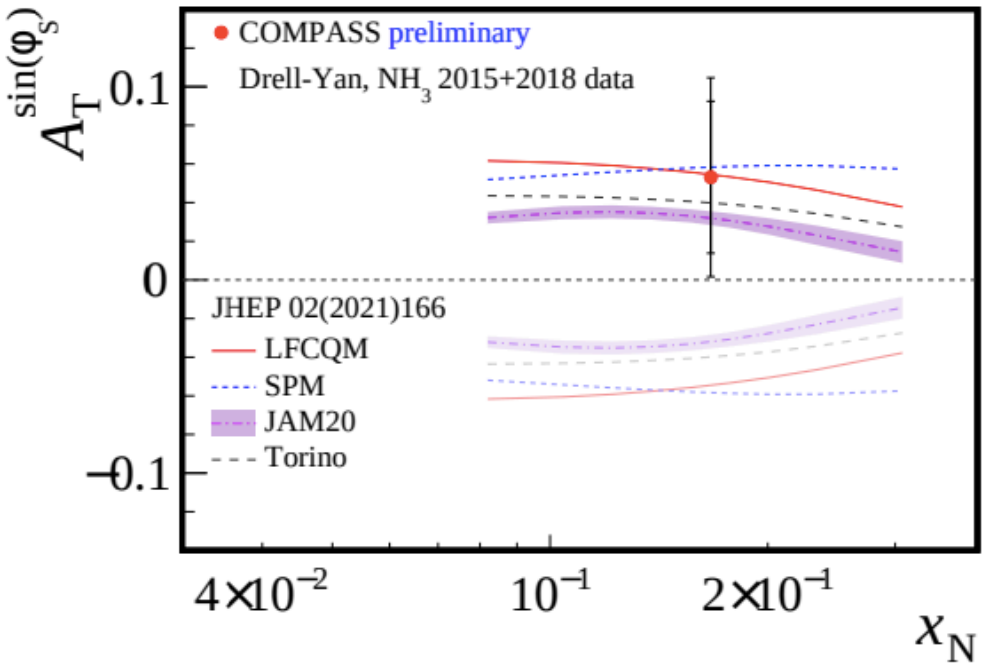
$$\frac{d\sigma}{d\Omega} \propto 1+\lambda\cos^2\theta+\mu\sin 2\theta\cos\phi+\frac{\nu}{2}\sin^2\theta\cos 2\phi$$





- SeaQuest estimated μ and ν parameters in the azimuthal angular distribution of the Drell-Yan process to extract the Boer-Mulders function.
- μ is consistent with zero but ν is larger than that of E866 (different beam energy and kinematics).

WG5: TMD PDFs



- Theory predicts that the Sivers distributions measured in Drell-Yan production, and in SIDIS are equal in magnitude but opposite in sign.
- The asymmetry is positive with ~ 1σ significance, favors the sign change scenario.

WG5: FFs

- $h_1^q(x)$ can be studied by measuring the azimuthal correlation asymmetry of di-hadron production because it can be coupled with an interference FF.

STAR

- $\pi^+\pi^-$ azimuthal correlation asymmetry (A_{UT})

LHCb

- TMD jet FFs for identified charged pions, kaons and protons

Belle

- Azimuthal asymmetries for pairs of back-to-back $\pi^{\pm}$ in one hemisphere, and π^0 and η in the opposite hemisphere.
- Transverse momentum dependent production cross section of charged pions, kaons and protons

Other WGs

WG1: Structure functions and partons densities

- Measurements of jet, Drell-Yan and charmonium productions constrained the PDFs and strong coupling.

WG2: Small-x, diffraction and vector mesons

- Heavy quarkonium productions from threshold to ultra-peripheral heavy ion collision were measured to probe the gluonic structure inside the nucleon.
- Observables by elastic (proton cross section) and diffractive(-like) (jets separated by a large η gap) scatterings were compared with model prediction.

WG3: Electroweak and BSM physics

- Various properties of Higgs (coupling, cross section and rare decay channel) were studied.
- Rare processes in the SM are being searched to investigate new physics.

Other WGs

WG4: QCD with heavy flavors and hadronic final state

- Cross sections of various final states were reported and compared with the NLO and NNLO theoretical predictions.

WG6: Future experiments

- WG6 focused on the upgrades of existing facilities (JLAB and LHC) and anticipated future facilities (EIC).
- JLAB introduced the tagged deep inelastic scattering (mesonic content of the nucleon) and Solenoidal Large Intensity Detector (SoLID, 3D momentum imaging of the nucleon).
- Detector upgrades of ATLAS, CMS and ALICE to deal with harsher conditions and higher luminosity.