Summary of DIS-2025 Conference - A Biased View

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Apr 16, 2025

Getting to know some stalwarts in the field

Conference started with a homage to 'BJ'

Figure 1: James Daniel Bjorken
(Jun 22, 1934 – Aug 6, 2024)

- I had no idea Bjorken lived 90 years and passed away just last year
- Also given his surname, I did not expect his first name to be so mundanely American

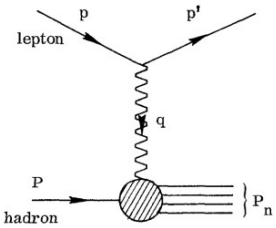
'Why do we do Physics? Because Physics is fun.'

A (limited) collection of the most influential papers by Bj	Year	#cits
J.Alexander et al Dark Sectors 2016 Workshop: Community Report	2016	654
R. Essig et al, Working Group Report: New Light Weakly Coupled Particles	2013	841
Bjorken, Essig, Schuster, Toro, New Fixed-Target Experiments to Search for Dark Gauge Forces	2009	795
J.Bjorken, Rapidity gaps and jets as a new physics signature in very high-energy hadron hadron collisions	1993	531
A Full Acceptance Detector for SSC Physics at Low and Intermediate Mass Scales: An Expression of Interest	1991	353
J.Bjorken et al, Search for Neutral Metastable Penetrating Particles Produced in the SLAC Beam Dump	1988	584
E.Riordan et al, A Search for Short Lived Axions in an Electron Beam Dump Experiment	1987	515
J.Bjorken, Highly Relativistic Nucleus-Nucleus Collisions: The Central Rapidity Region	1983	3737
Berman, Bjorken and Kogut, Inclusive Processes at High Transverse Momentum	1971	826
Bjorken, Kogut, Soper, Quantum Electrodynamics at Infinite Momentum: Scattering from an External Field	1971	520
J.Bjorken, Inelastic Scattering of Polarized Leptons from Polarized Nucleons	1970	763
Bjorken and Brodsky, Statistical Model for electron-Positron Annihilation Into Hadrons	1970	592
Bjorken and Paschos, Inelastic Electron Proton and gamma Proton Scattering, and the Structure of the Nucleon	1969	1857
J.Bjorken, Asymptotic Sum Rules at Infinite Momentum	1969	2092
J.Bjorken, Applications of the Chiral U(6) x (6) Algebra of Current Densities	1966	1667
J.Bjorken and S.Glashow, Elementary Particles and SU(4)	1964	800

- He had a wide variety of physics interests, never walked the well trodden path and was often ahead of his time

Ahead of his time

From: Asymptotic Sum Rules at Infinite Momentum (1968-69)



$$\frac{d\sigma}{d\Omega dE'} = \frac{\alpha^2}{4E^2 \sin^4 \frac{\theta}{2}} \left[W_2(q^2, \nu) \cos^2 \frac{\theta}{2} + 2W_1(q^2, \nu) \sin^2 \frac{\theta}{2} \right]$$

with $\nu = qP = M(E - E')$ and

$$\frac{1}{M^2}\left(P_\mu - \frac{P\cdot q\, q_\mu}{q^2}\right)\left(P_\nu - \frac{P\cdot q\, q_\nu}{q^2}\right) W_2(q^2,\nu) - \left(g_{\mu\nu} - \frac{q_\mu q_\nu}{q^2}\right) W_1(q^2,\nu)$$

$$= \frac{P_0}{M} \sum_n \overline{\langle P|J_\mu(0)|n\rangle \langle n|J_\nu(0)|P\rangle} (2\pi)^3 \delta^4 (P_n - P - q)$$

$$= \frac{P_0}{M} \int \frac{d^4x}{2\pi} e^{iq\cdot x} \langle P|\left[J_\mu(x), J_\nu(0)\right]|P\rangle$$

Formal manipulations of these relations, performed in the infinite-momentum frame ($E \to \infty$) with q^2/ν fixed, lead to

$$\nu W_2(\nu, q^2) \longrightarrow f_2\left(\frac{\nu}{q^2}\right)$$

$$W_1(\nu, q^2) \longrightarrow f_1\left(\frac{\nu}{q^2}\right)$$

where today we would label $x_{Bj} = q^2/2\nu$

$\Rightarrow$ Bjorken scaling

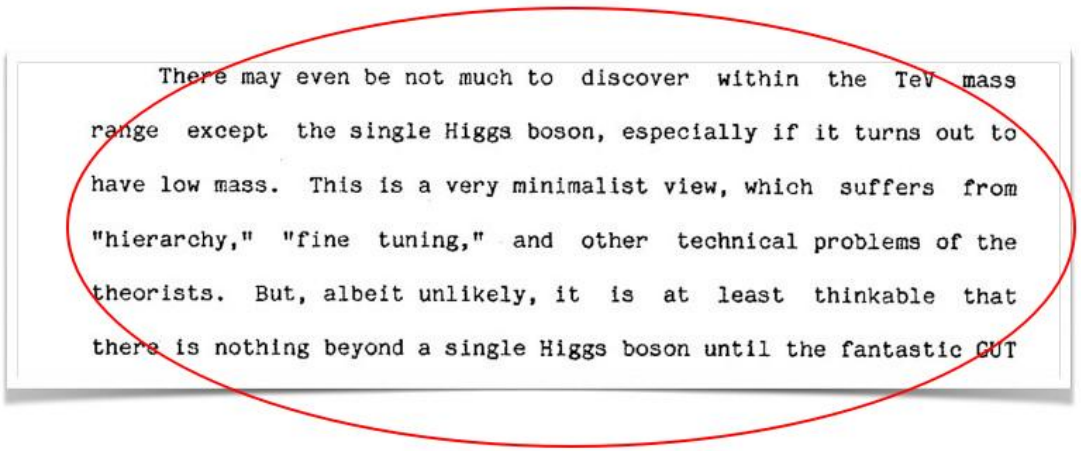
Today all of this is trivial and comes out automatically and easily once we accept that

$$j_\mu^{had} = \sum_i Q_i \bar{q}\gamma_\mu q$$

But ...

- His seminal work, of course, predicting that electron scattering off nucleons are like that from point like particles before Feynman's 'partons' were proposed

A visionary physicist



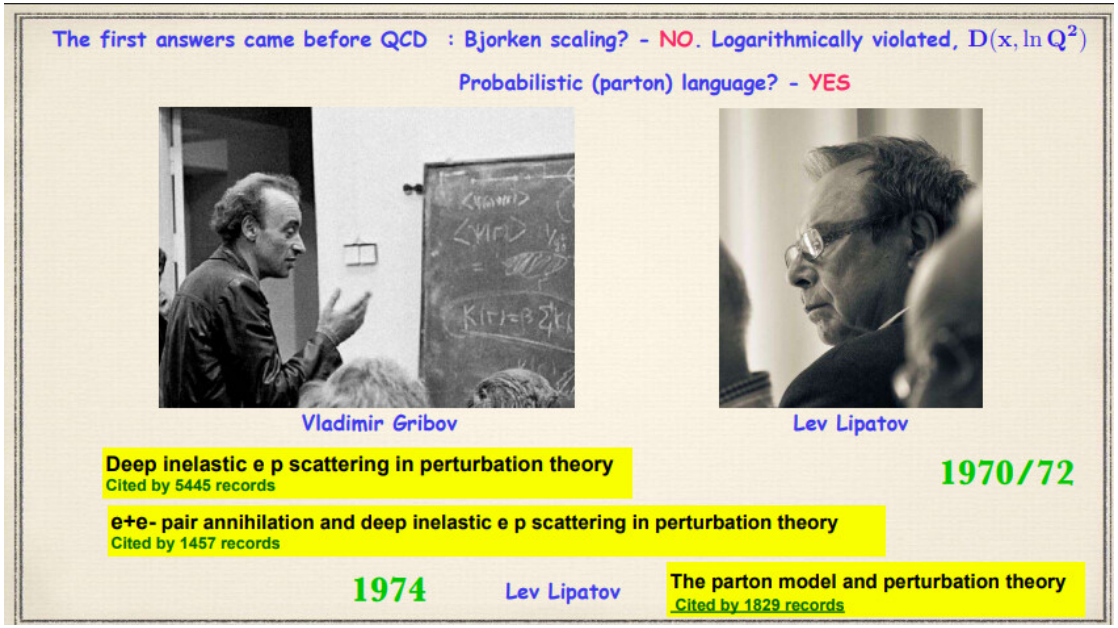
There may even be not much to discover within the TeV mass range except the single Higgs boson, especially if it turns out to have low mass. This is a very minimalist view, which suffers from "hierarchy," "fine tuning," and other technical problems of the theorists. But, albeit unlikely, it is at least thinkable that there is nothing beyond a single Higgs boson until the fantastic GUT

The standard model has been so successful that theorists have become rather arrogant and experimentalists have become rather intimidated about possibly getting an answer which is in disagreement with it. The standard model needs more testing. This can be done at all energy scales. And aside from the fundamental tests of the standard model, there are a lot of details and loose ends around. It is the kind of work that usually doesn't get on the front pages of newspapers but nevertheless forms the backbone of our subject.

- A stunning prediction of modern status of high energy particle physics field from 'BJ' in 1983
- Given that QED and QCD (pillars of SM) were being developed in his lifetime, he was amazingly fearless in curiosity for 'beyond standard model' physics

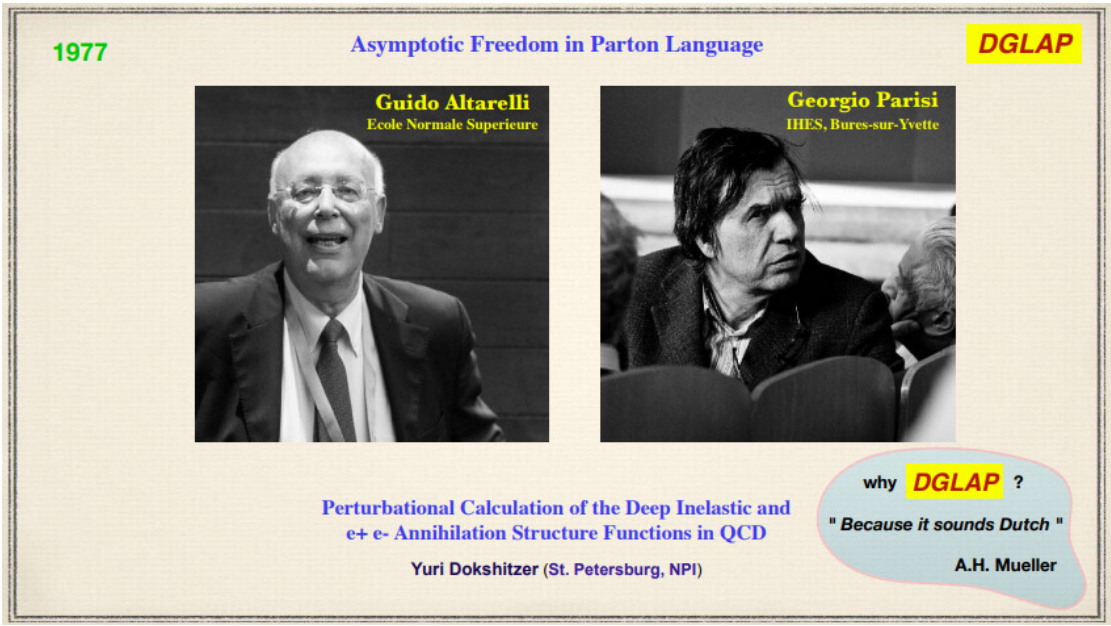
DGLAP : Dokshitzer, Gribov, Lipatov, Altarelli, Parisi

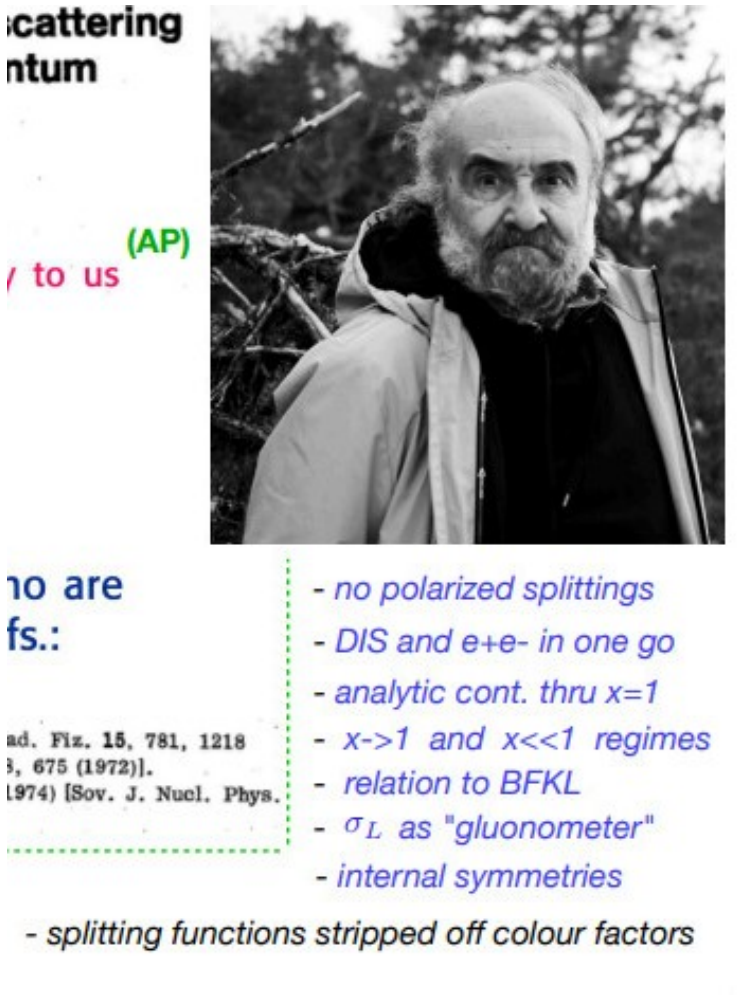
Altarelli and co.



- A prize in experiment and theory in Guido Altarelli's name
- Yuriy Dokshitzer reminisced over zoom (only one allowed) from somewhere in St Petersburg

And he makes 'five'



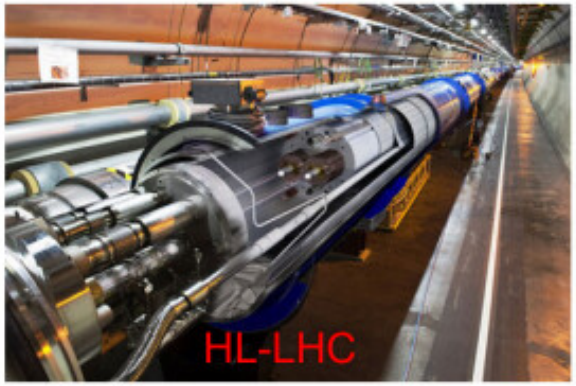


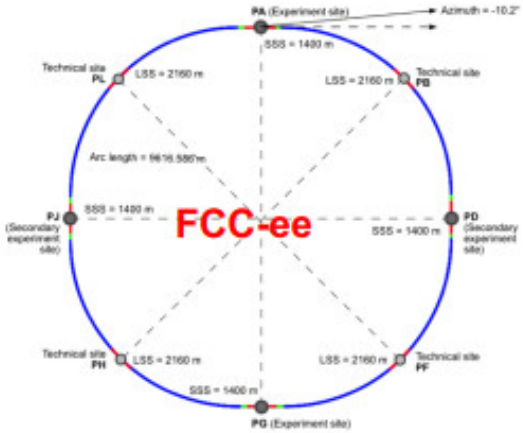
He said they ended up with that particular combination of acronym 'because it sounded Dutch'

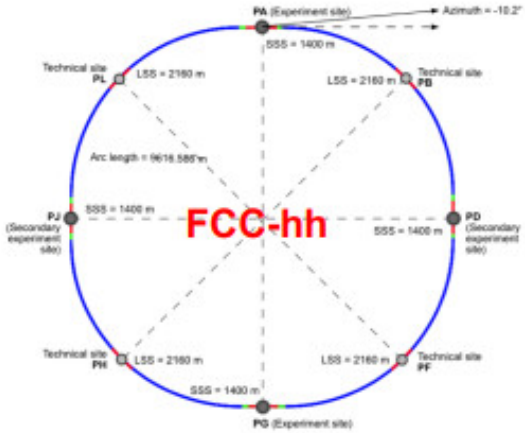
Getting to the important stuff

- Plenary session talks covered all aspects of the physics involved : PDF calculations/extractions, QCD calculations and their precision, MC event generators
- There was an overall push to improve accuracies in QCD calculations as exp precisions at LHC caught up the theory uncertainties
- Same goes for MC generators, push to ever higher order of accuracies
- Also heard the typical theoretical scale variation (factor of 2) is looking dated, but heard no specific substitute

Europe is looking ahead





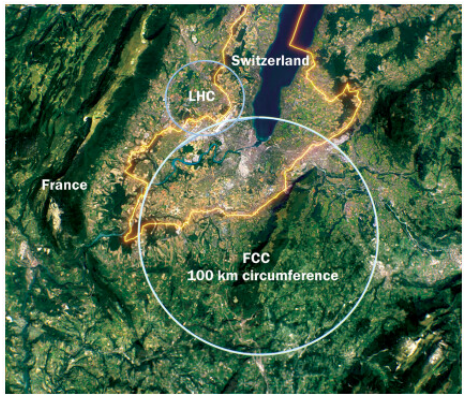


2029 - 2041 | 2048 - 2063 | 2074 -

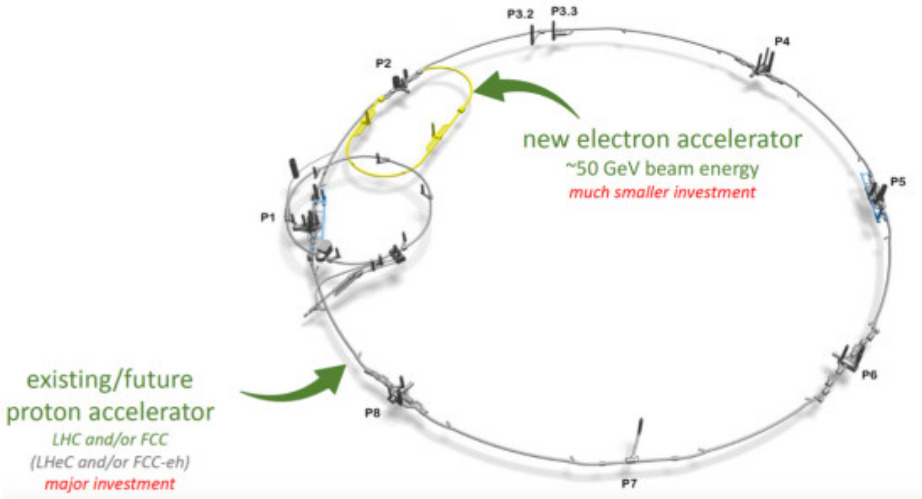
- Stage 1: FCC-ee : e^+e^- Higgs, electroweak & top factory at highest luminosities [91 GeV → 365 GeV]
  Build on large progress made at circular e^+e^- colliders over the past decades → reach luminosities beyond 10^{34} cm^{-2} s^{-1}
- Stage 2: FCC-hh : 100 TeV pp collider, energy frontier machine (in addition: eh and ion options)

Figure 2: Long term plans in Europe

FCC-ee : to do or not to do



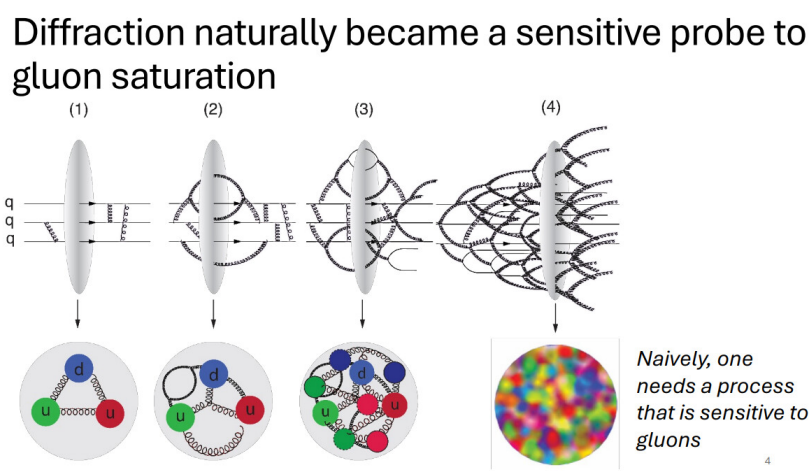
LHeC (> 50 GeV electron beam)
E_{CM} = 0.2 – 1.3 TeV (Q^2,x) range beyond HERA;
Bridge between HL-LHC and future large facility

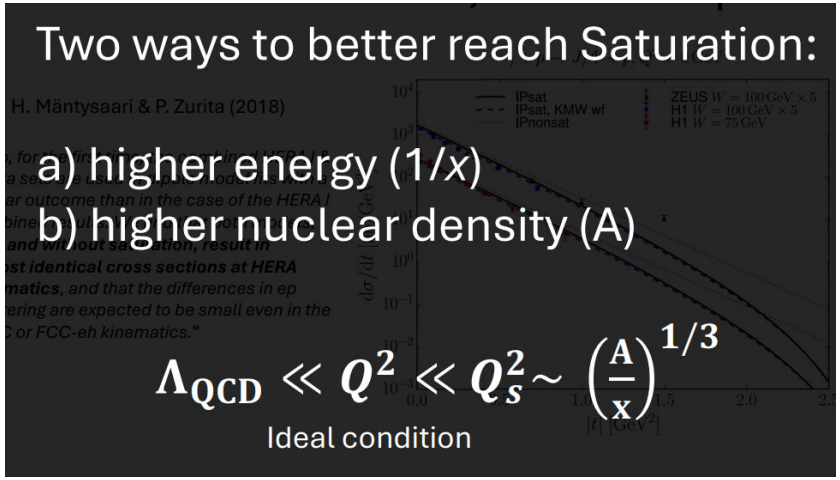


- FCC feasibility study ongoing, big decisions by end of 2025
- China also has plans for CEPC - circular electron-positron collider
- In that case, Europe will skip to FCC-hh, may be with a bridge e-p collider program
- My two kopecks : China is singlehandedly planning two major projects : EICc and CEPC - an excellent opportunity for Russian particle physics community - and saw an email yesterday about a seminar today on JINR joining CEPC ☺

Finally, some physics

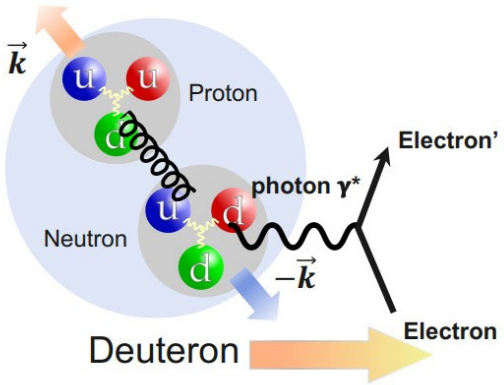
Diffractive physics

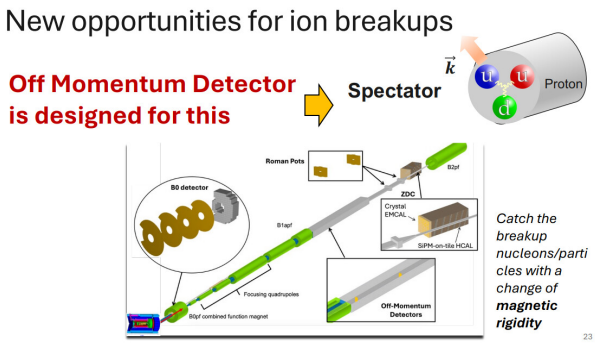


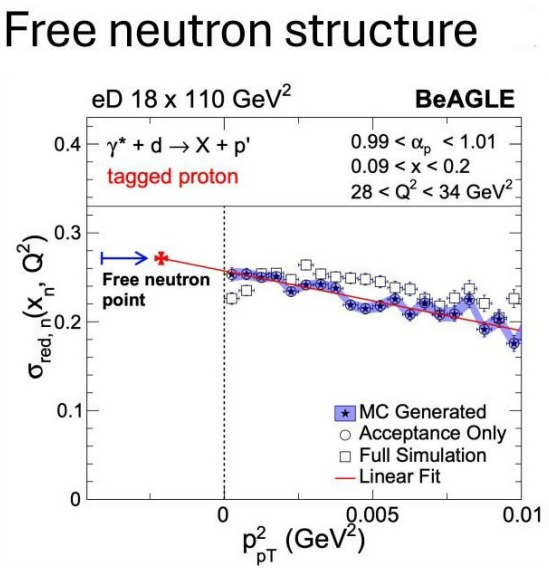


Kong Tu from BNL gave a very nice talk on forward/diffractive physics - in the context of EIC of course, but the technique he mentioned reminded me of Yuriy Uzikov's proposal and the related simulation I am working on

Diffractive physics







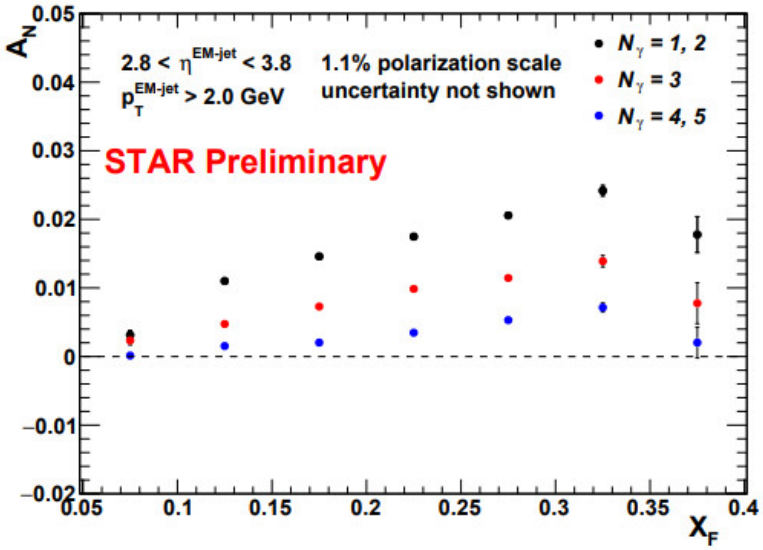
Spectator proton tagged events to probe neutron structure in deuteron - does that sound familiar?

Roman pots to grab spectator protons - may be as an upgrade to SPD in future? Something to think about.

EM jet at STAR

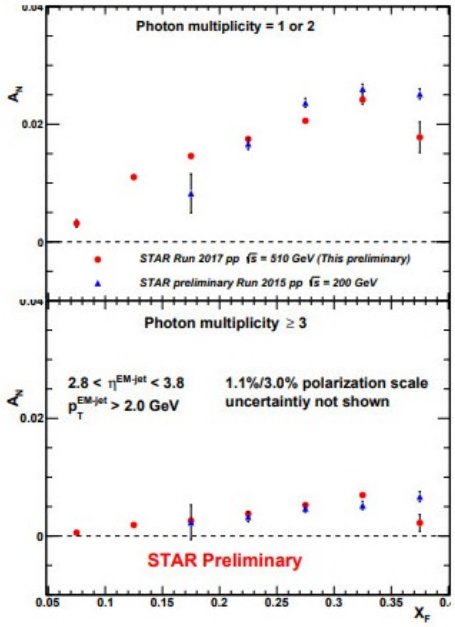
Inclusive: A_N vs x_F at pp $\sqrt{s} = 510$ GeV

- A_N increases with x_F (except the last x_F bin)
- A_N decreases with photon multiplicity



Inclusive: pp $\sqrt{s} = 510$ GeV vs 200 GeV

- Inclusive process shows similar A_N at $\sqrt{s} =$ 510 GeV and 200 GeV
- At both $\sqrt{s} = 510$ GeV and 200 GeV, A_N primarily arises from low photon multiplicity EM-jets

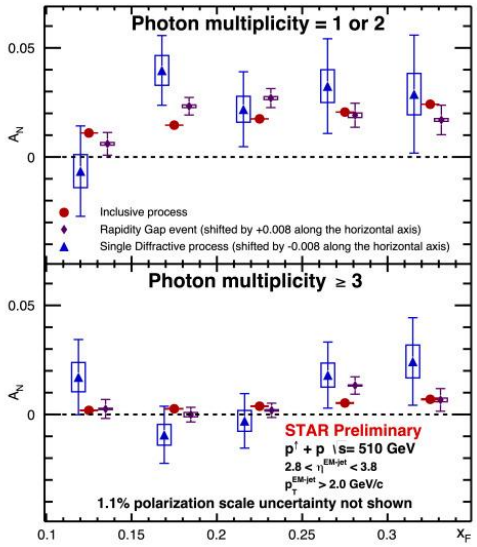


Photon jet TSSA to 'explore potential source of large A_N in diffractive processes' : 1) independent of energy, 2) diminishes with photon multiplicity

EM jet at STAR

A_N vs x_F at pp $\sqrt{s} = 510$ GeV

- Rapidity gap event and single diffractive process exhibit similar A_N to inclusive process
- In all three processes, EM-jets with large photon multiplicity (≥ 3) display very small A_N

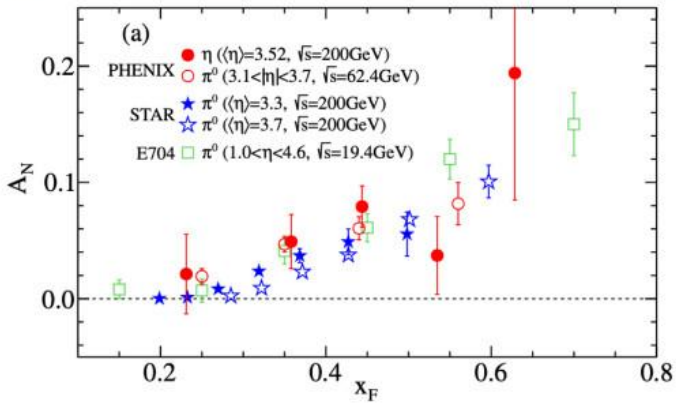


- Multiple studies recent and future to probe spin effects in diffractive processes
- A very interesting result, brand new, not much theoretical explanations quite yet
- Unfortunately, he could not travel and it was a recorded video (only exception besides Dokshitzer's zoom), so could not ask questions

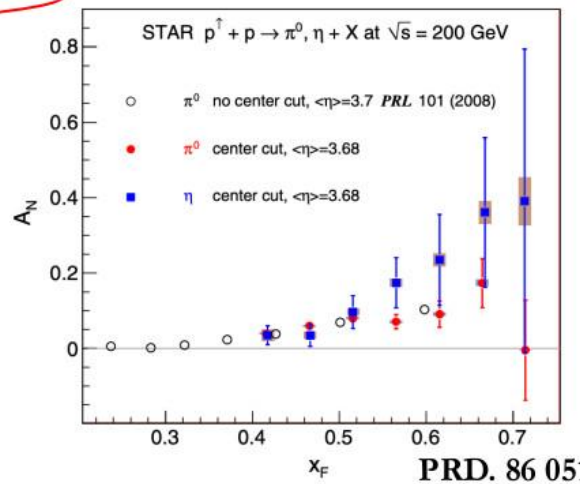
Forward η at PHENIX

The forward η meson TSSA

- At forward rapidity, $p^{\uparrow} + p \rightarrow \eta + X$ accesses high x_F region where large asymmetries have previously been measured
  - Mostly valence quark interactions → probe of twist-3 qgq multiparton correlator
  - Still trying to disentangle initial- and final-state contributions
  - Recent phenomenological work suggests the TSSA for inclusive light mesons is dominated by final-state Collins-like correlator [PRD 89, 111501(R) (2014)]
- Potential hint of difference in TSSA between η and π^0?

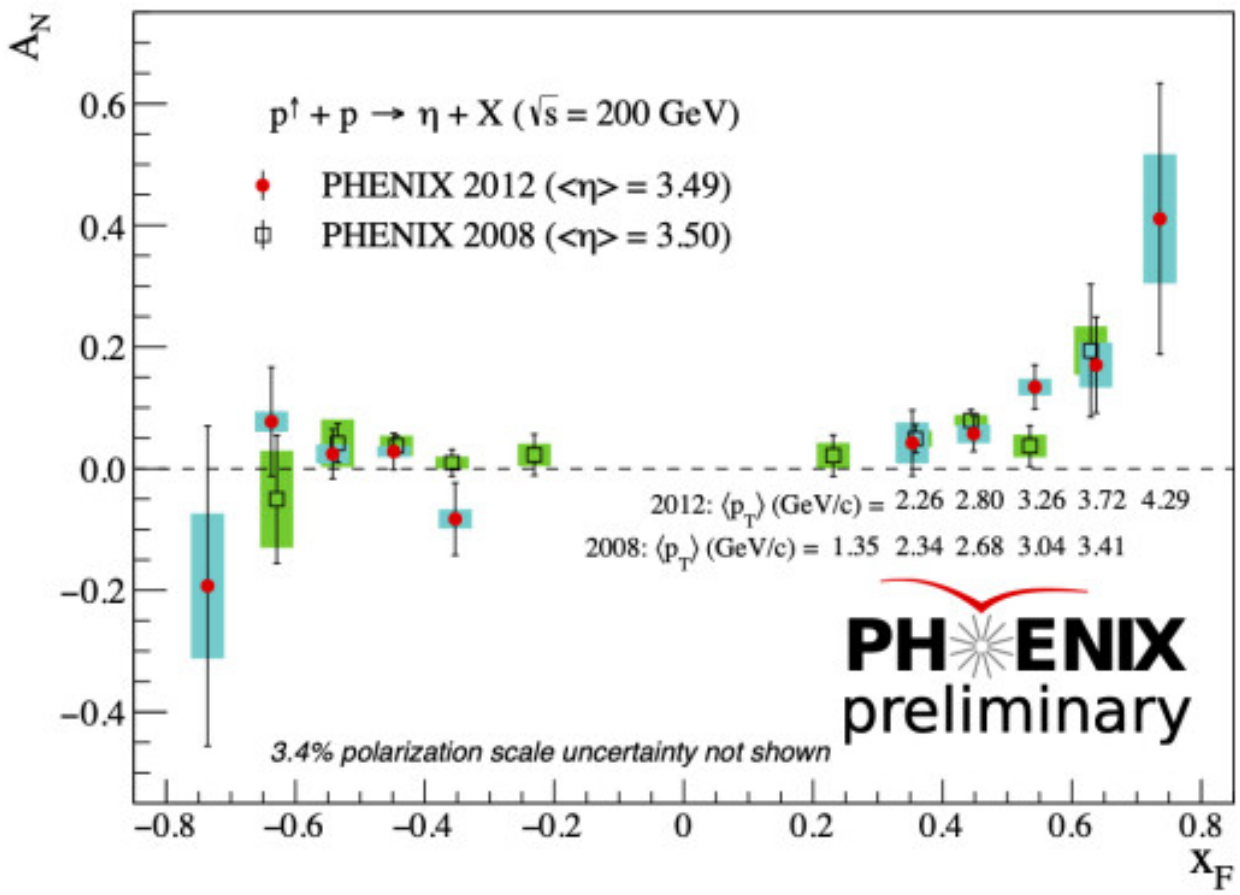


PRD. 90 072008 (2014)



PRD. 86 051101(R) (2012)

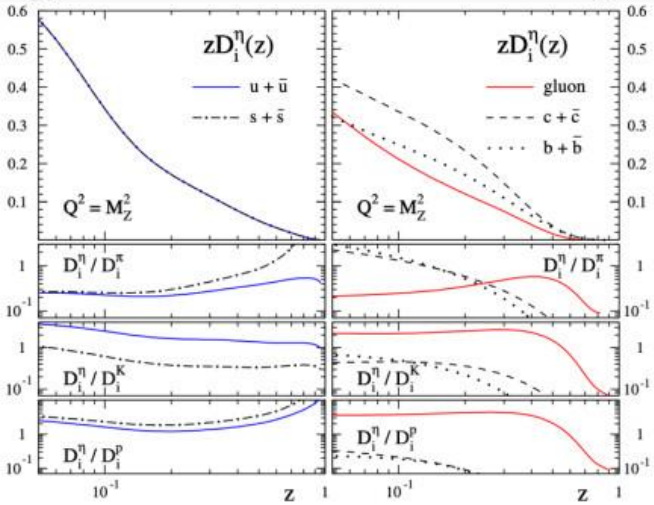
Forward η at PHENIX



200 GeV transverse data, could be one of the last physics results from PHENIX data

Forward η at PHENIX

- Only one available global η meson fragmentation function fit [PRD 83 034002 (2011)]
  - Large uncertainties on flavor-separated quark (20%) and gluon (15%) fragmentation



New inputs for updated η FF fit

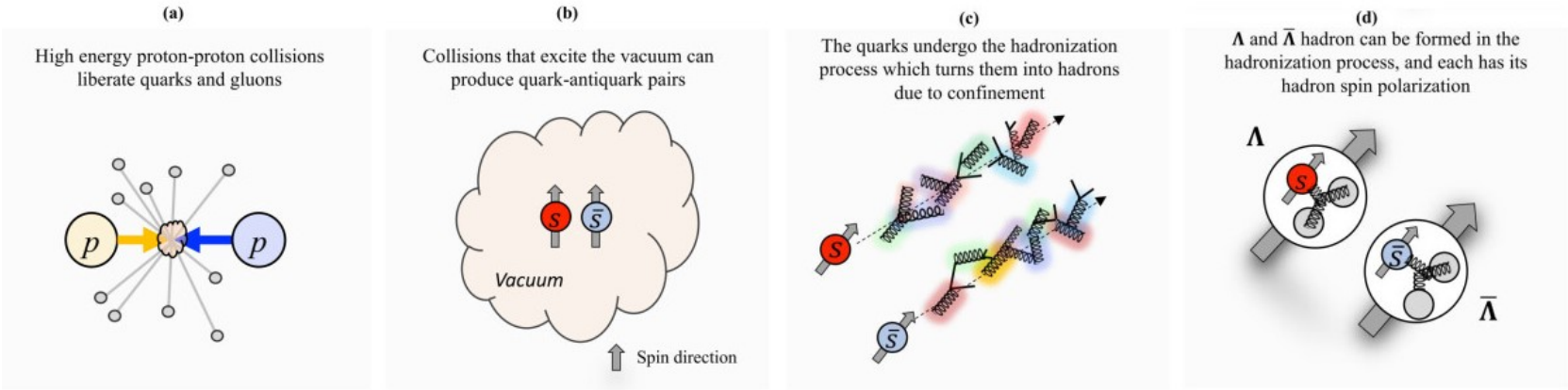
Experiment	*Observable*	$\sqrt{s}$ *(GeV)*
PHENIX	$d\sigma_{pp\to\eta X}$ (Forward)	200
PHENIX	$d\sigma_{pp\to\eta X}$ (Forward)	500
PHENIX	$d\sigma_{pp\to\eta X}$	200
PHENIX	$d\sigma_{pp\to\eta X}$	510
ALICE	$d\sigma_{pp\to\eta X}$	2760
ALICE	$d\sigma_{pp\to\eta X}$	7000
ALICE	$d\sigma_{pp\to\eta X}$	8000
STAR	η/π^0	0.2
BELLE	$d\sigma_{e^+e^-\to\eta X}$	10.58

500 GeV p+p data, cross-sections being used by Rudolfo Sassot and his group to improve fragmentation functions - a worthy goal, SPD should start to think too where we can provide high precision data for FF calculations - we typically think only about impact on PDF/TMD

STAR Λ spin

NEW EXPERIMENTAL APPROACH

- **Λ^0 hyperon pair spin-spin correlations in p+p collisions:**



- **We use the spin-spin correlation of $\Lambda^0\overline{\Lambda}^0$ hyperon pairs measured in p+p collisions to study the hadronization of the entangled $s\bar{s}$ quark pairs from the QCD vacuum**

Jan Vanek, DIS 2025 25. 3. 2025 4

A test of quantum coherence

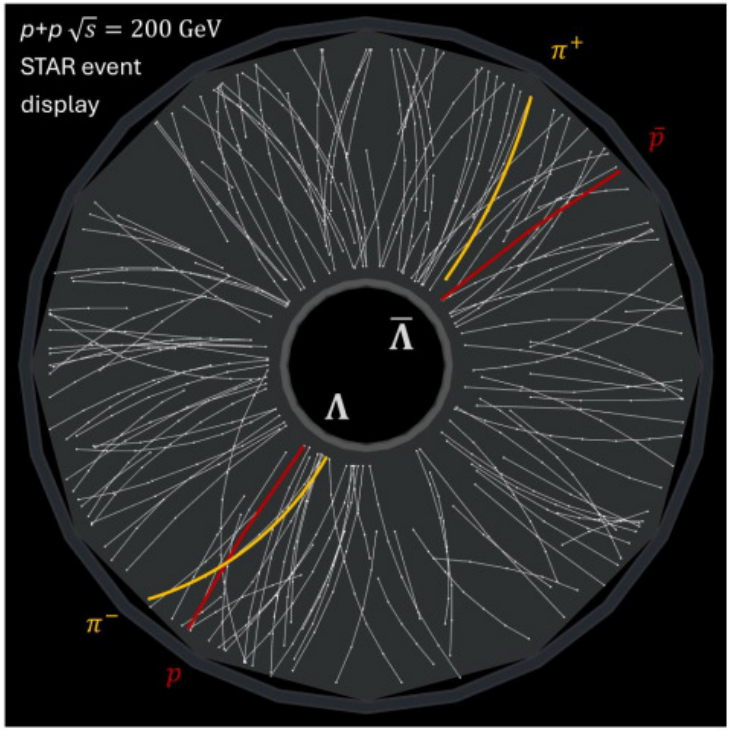
STAR Λ spin

EXPERIMENTAL METHOD

- Find a Λ^0 hyperon pair (any combination) in one event
  - Decay channel $\Lambda^0 \to p\pi^+$ and charge conjugate
- Boost (anti-)proton from decay of the corresponding Λ^0 ($\bar{\Lambda}$) to **rest frame of its mother**
- Measure angle θ^* between the two **boosted protons**
  - The distribution of pair angle is given by:

$$\frac{1}{N}\frac{\mathrm{d}N}{\mathrm{d}\cos(\theta^*)} = \frac{1}{2}\left[1 + \alpha_1\alpha_2 P_{\Lambda_1\Lambda_2}\cos(\theta^*)\right]$$

  - α_1 and α_2 are weak decay parameters of Λ^0 or $\bar{\Lambda}^0$ (α_- or α_+)
- **A non-zero $P_{\Lambda_1\Lambda_2}$ would indicate spin correlation between the two Λ^0 ($\bar{\Lambda}^0$) hyperons**
  - No global single Λ^0 hyperon polarization expected at STAR at mid-rapidity



A neat event display

STAR Λ spin

- **Expected maximum for $\Lambda^0\bar{\Lambda}^0$ pairs** in our dataset based on models and feed-down from decay of heavier hyperons:
  - $P_{\Lambda_1\Lambda_2,\mathrm{SU(6)}} = 0.096 \pm 0.004$
  - $P_{\Lambda_1\Lambda_2,BJ} = 0.015 \pm 0.002$
- Model prediction has two components:
  - Single Λ^0 ($\bar{\Lambda}^0$) polarization depending on its mother particle from two models:
    - Non-relativistic SU(6) quark model and Burkardt-Jaffe (BJ) model
  - Feed-down mixture for $\Lambda^0\bar{\Lambda}^0$ pairs from PYYHIA 8 + Geant simulation

Single Λ^0 ($\bar{\Lambda}^0$) polarizations depending on its mother particle from SU(6) and BJ models

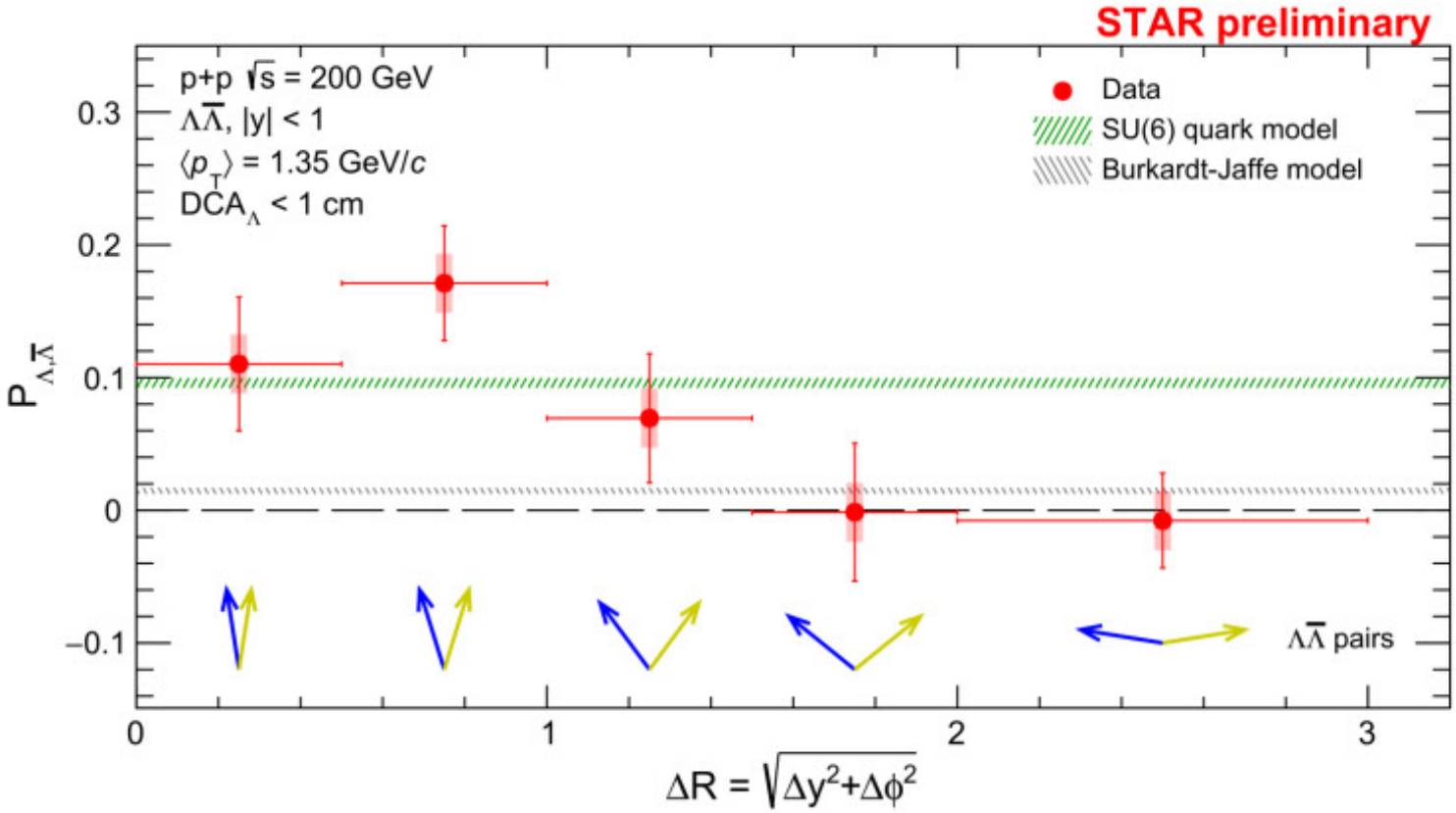
Λ's parent	SU(6)	BJ model
Primary	1	0.63
Σ^0	1/9	0.15
Ξ^0	0.6	−0.37
Ξ^-	0.6	−0.37
Σ^*	5/9	N/A

M. Burkardt and R. L. Jaffe, Phys. Rev. Lett. 70, 2537 (1993)

Predictions from different phenomenological models

STAR Λ spin

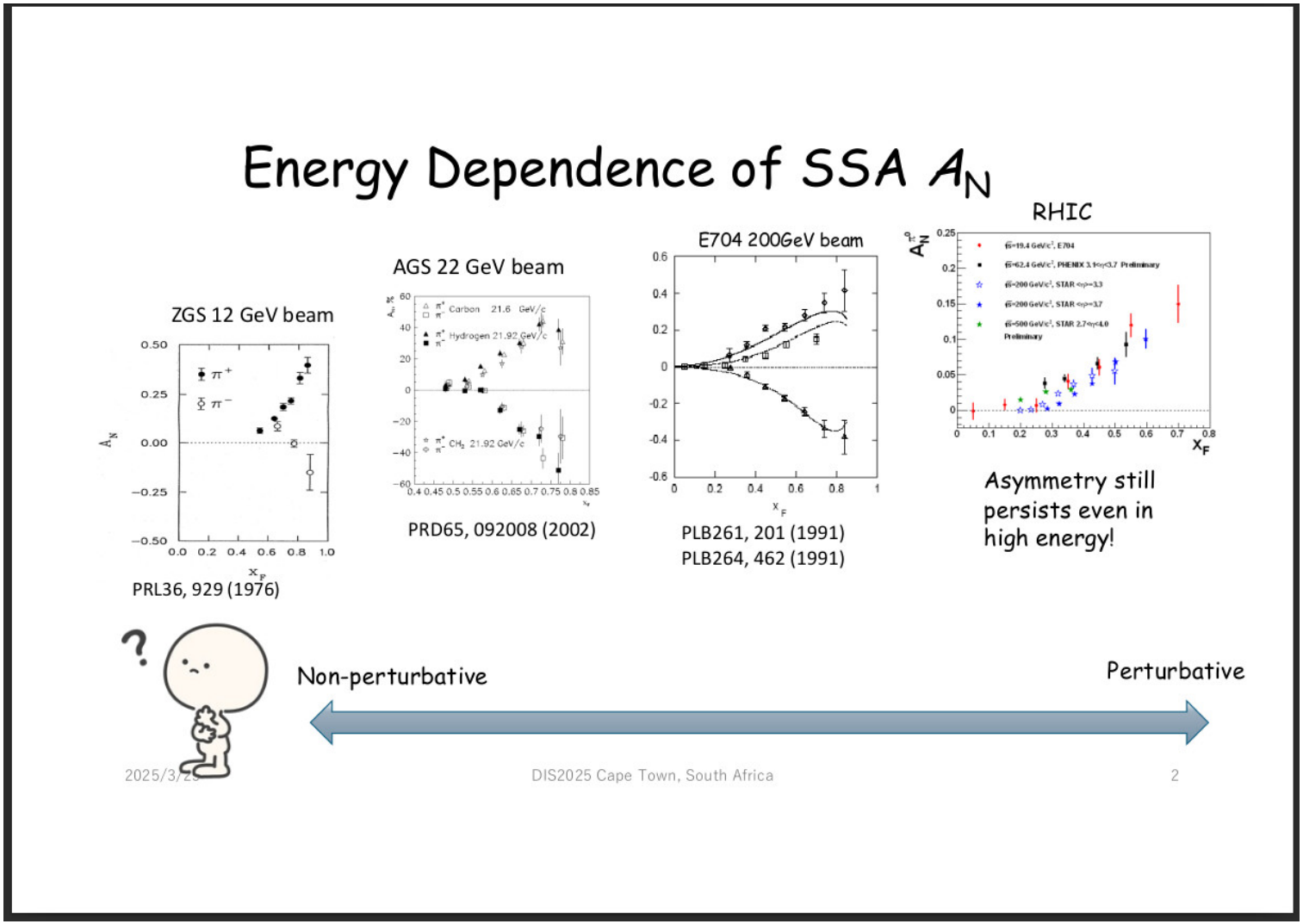
1) Measurments support SU(6) model at highest coherence/small angle
2) Decoherenece of $s\bar{s}$ correlated with angle between two Λs



SPD aims to replicate this (in diff. kinematic zone) very nice measurement, I guess

More diffraction and probably the most interesting of them all

RHICf (at STAR) forward TSSA

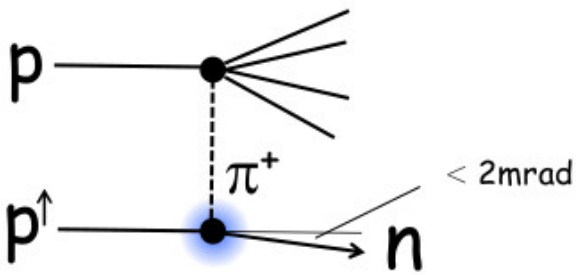


TSSA seen over a large range of energies - explanations include both initial state and final state effects

RHICf (at STAR) forward TSSA

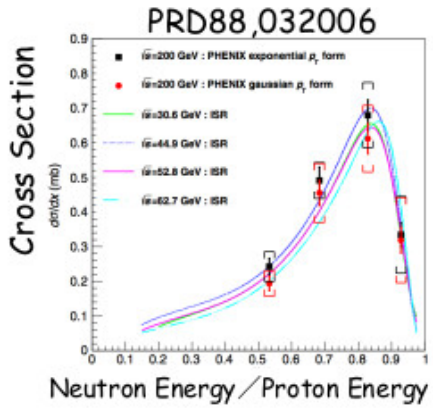
Production Mechanism of Forward Neutron

Cross Section



Momentum Transfer ~ 100MeV/c

Well Explained by
One-Pion Exchange



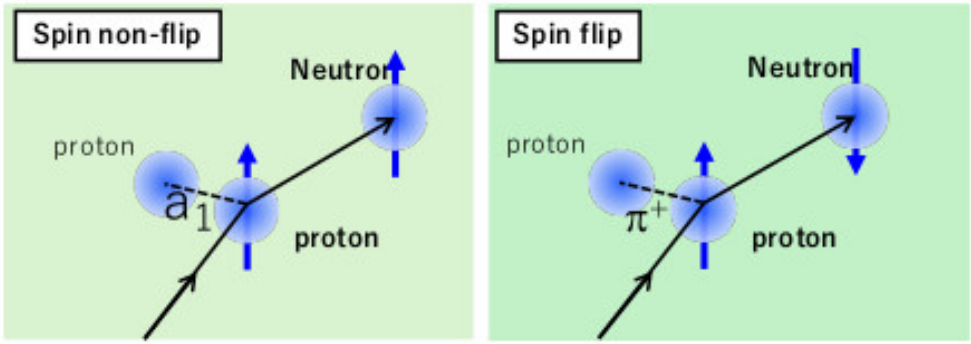
Large fraction of proton energy is carried by neutron

2025/3/25 DIS2025 Cape Town, South Africa

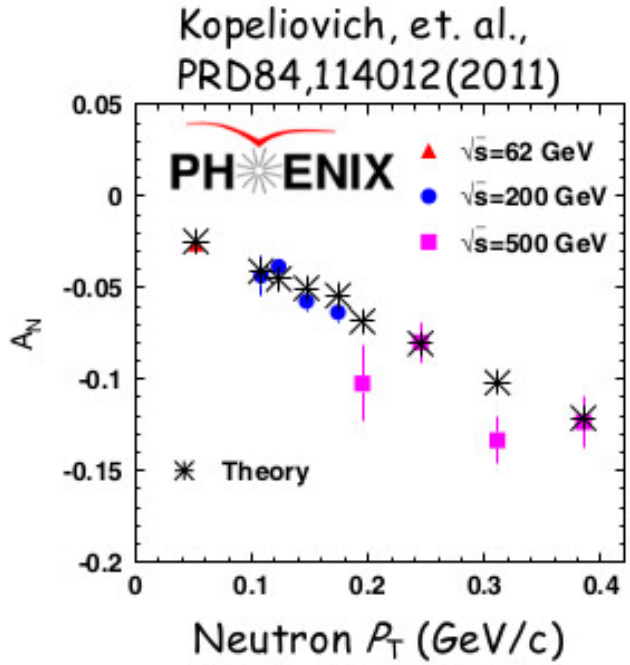
Very forward measurements probe diffractive processes - RHICf measured n, π^0 TSSA - keyword : 'pion-cloud model'

RHICf (at STAR) forward TSSA

$p^{\uparrow}$+p Forward Neutron A_N



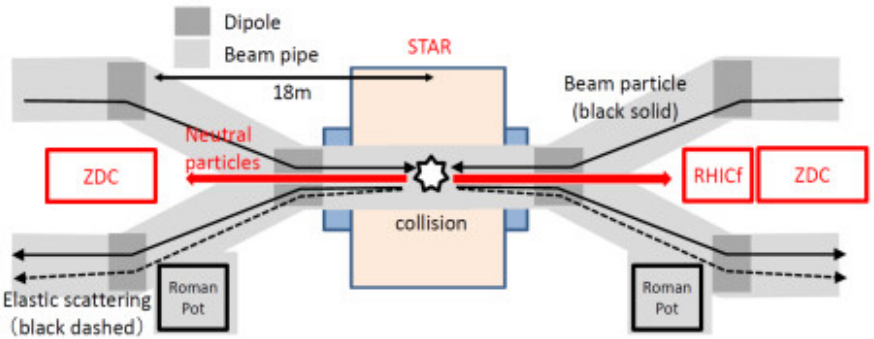
$$A_N \approx \frac{\left(\phi^*_{non-flip}\phi_{flip}\sin\delta\right)}{\left|\phi_{non-flip}\right|^2 + \left|\phi_{flip}\right|^2}$$



Asymmetries are well reproduced by the interference between π and a_1 Reggeon.
However, the coupling between π and a_1 is model dependent assumption

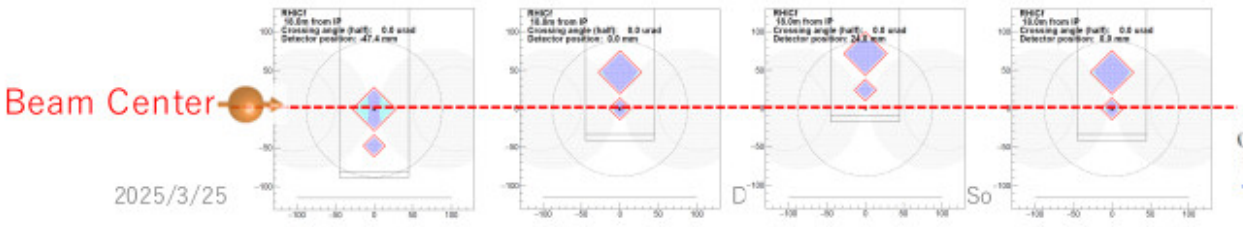
RHICf (at STAR) forward TSSA

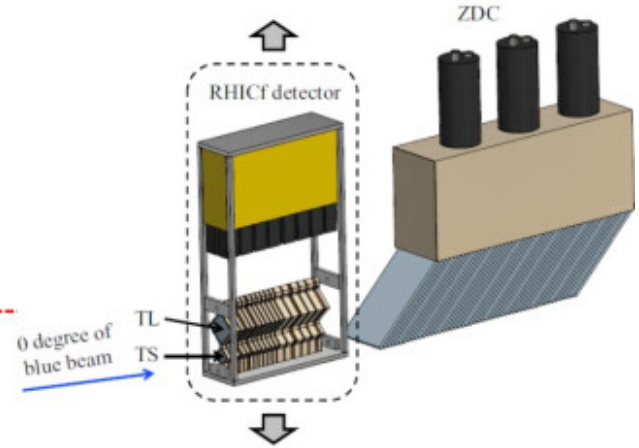
RHICf Experiment at STAR in 2017



RHICf	ZDC+SMD
Sampling (λ_I=1.7)	Total Absorption (λ_I=5.1)
S=4cm × 4cm + 2cm × 2cm	S=10cm × 10cm
ΔE_n~35%	ΔE_n~18%
Δx_n~0.1cm	Δx_n~1cm

- June 24 - 27, 2017 physics data acquisition
- β^* = 8m, radial polarization
- 27.7 hours, ~110M events, ~700 nb^{-1}
- 3 detector positions
  - TL center / TS center / Top position



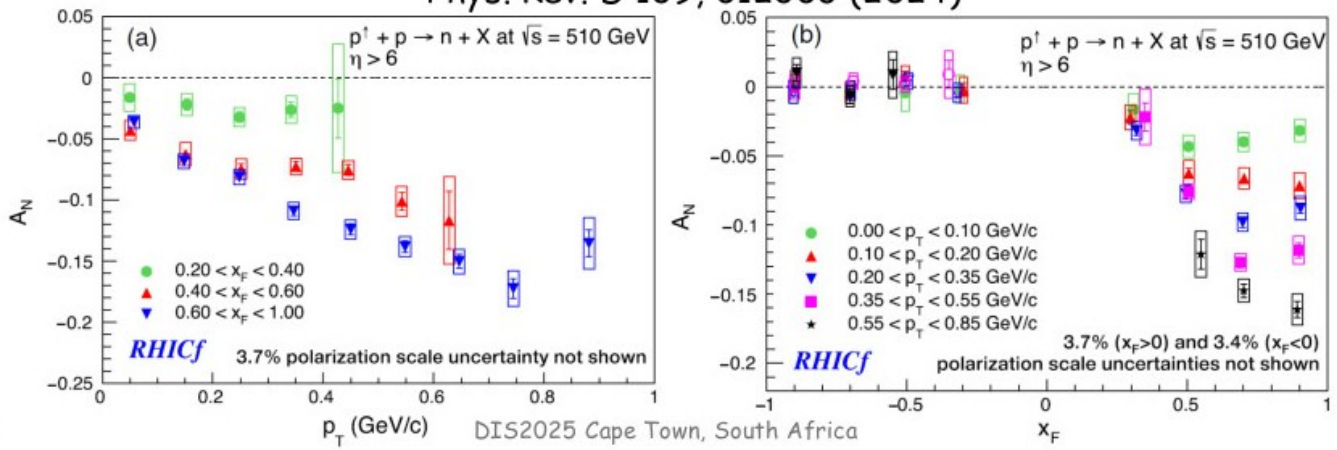


RHICf (at STAR) forward TSSA

Neutron asymmetry at RHICf (1)

- In the low x_F range, the neutron A_N reaches a plateau at low p_T
- In the high x_F range, the plateau does not seem to be reached yet while the absolute valu of the A_N explicitly increases in magnitude with p_T
- The backward A_Ns are all consistent with zero
- In the low p_T range < 0.20 GeV/c, the forward A_N reaches a plateau of low A_N at low x_F (about 0.5) with little x_F dependence
- In the high p_T range > 0.20 GeV/c, the asymmetries appear to be leveling off at higher x_F (about 0.7), showing a clear x_F dependence
- The x_F dependence in the high p_T range was observed for the first time by the RHICf experiment

Phys. Rev. D 109, 012003 (2024)



2025/3/25 DIS2025 Cape Town, South Africa 13

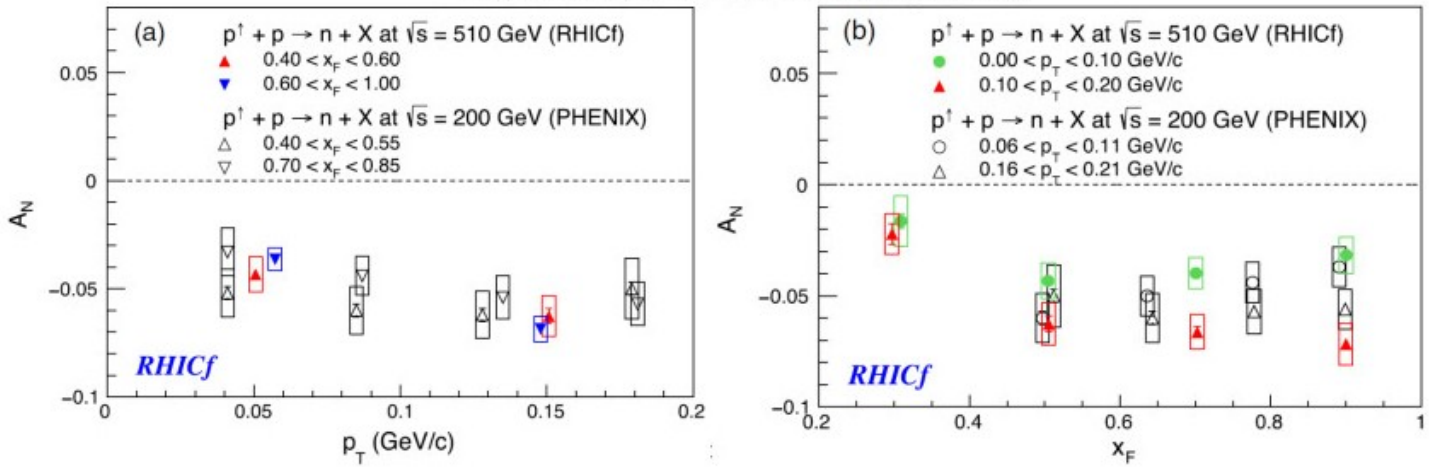
Neutron TSSA at $\sqrt{s} = 510$ GeV

RHICf (at STAR) forward TSSA

Neutron asymmetry at RHICf (2)

- $\sqrt{s}$ dependence
- In the range of low $p_T < 0.2$ GeV/c and $x_F > 0.4$ that is overlapping with the PHENIX data at $\sqrt{s} = 200$ GeV (Phys. Rev. D 105 (2022) 032004)
- The asymmetries are consistent with those by RHICf at $\sqrt{s} = 510$ GeV
- The asymmetries are again consistent at both energies and show a flat x_F dependence
- There is no or only a weak $\sqrt{s}$ dependence

Phys. Rev. D 109, 012003 (2024)

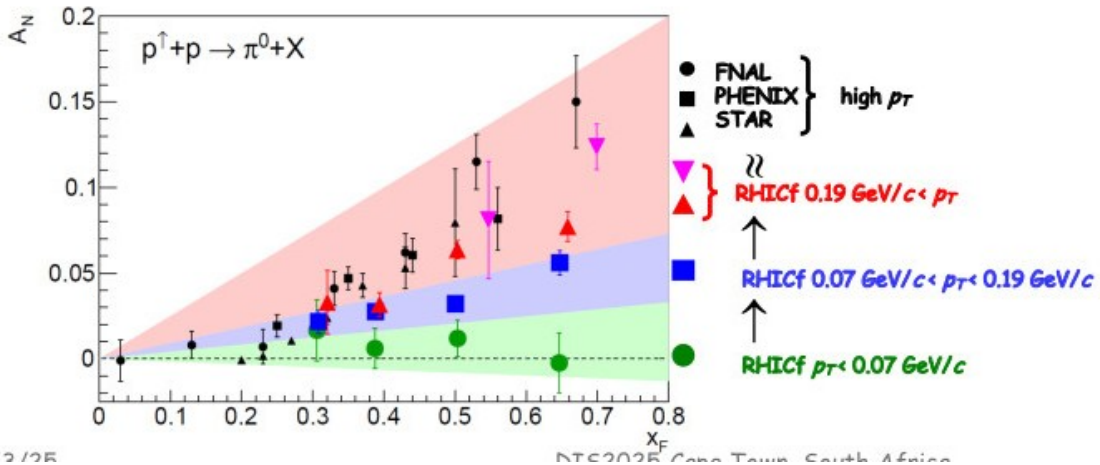


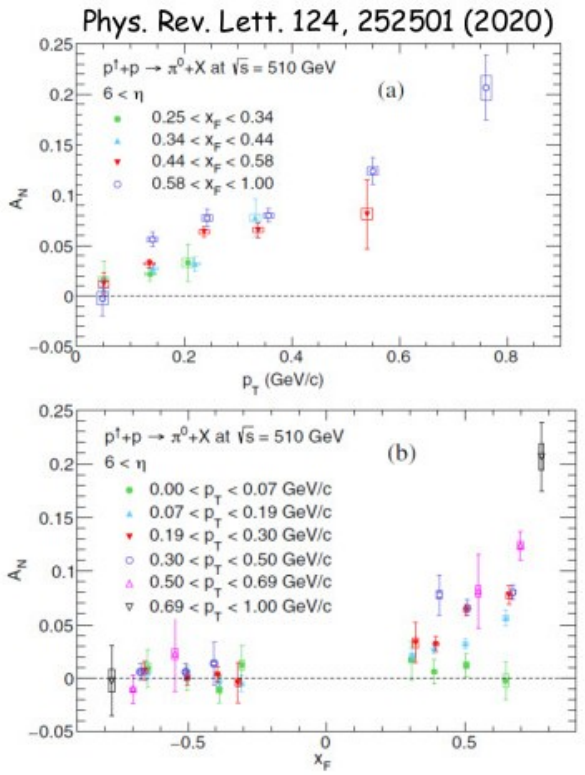
Similar neutron TSSA at $\sqrt{s} = 200$ GeV : very little energy dependence

RHICf (at STAR) forward TSSA

π^0 asymmetry at RHICf

- Asymmetry ~ 0 backward & forward $p_T < 0.07$ GeV/c
- Comparison with high $p_T > 0.5$ GeV/c data of the past experiments
- Same sign and nearly the same large asymmetry is reached at low $p_T < 0.2$ GeV/c
- Contribution of other mechanisms, diffraction and resonance, may provide a hint to the mystery



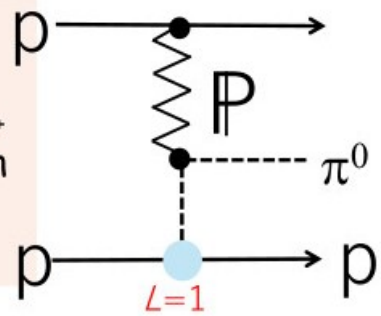


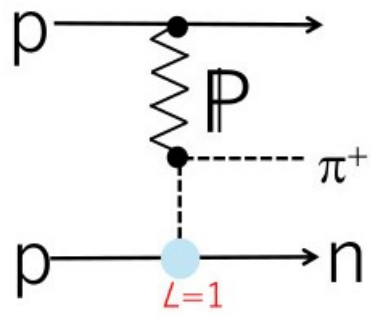
π^0 TSSA at $\sqrt{s} = 510$ GeV

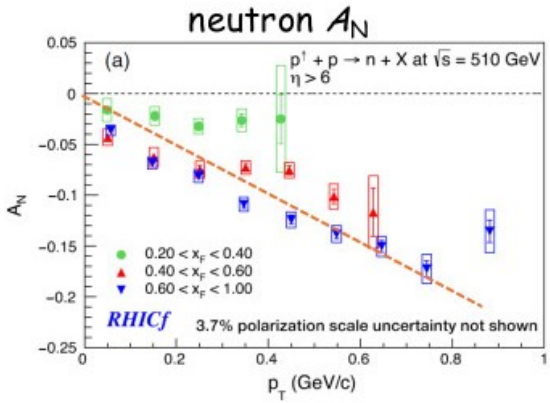
RHICf (at STAR) forward TSSA

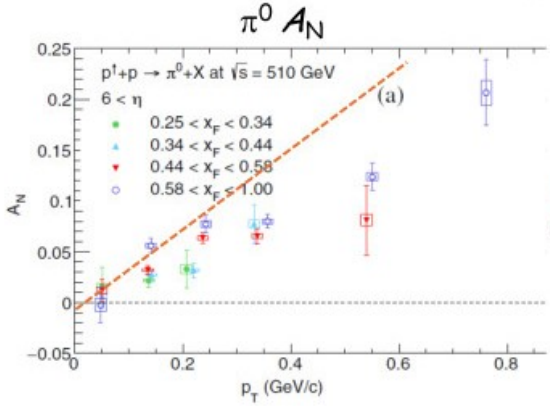
Neutron vs π^0 A_N

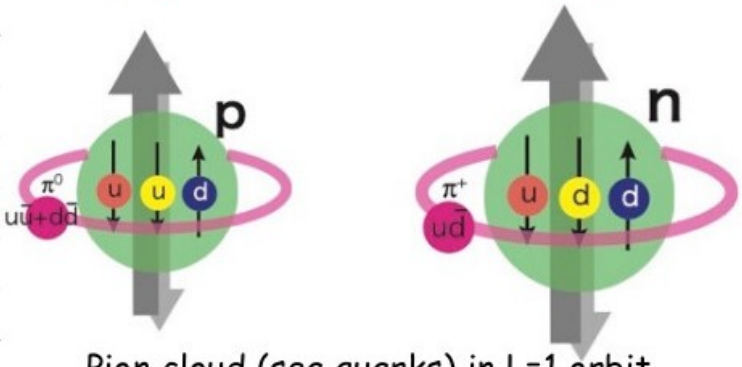
- Similar asymmetries, but opposite sign
- Strictly speaking, the slope as a function p_T seem steeper for neutron than π^0
- Does the sign be consistent with π^0 if we measure π^+ asymmetry? So as proton if the asymmetry is driven by two body decay?
- The underlying processes may not be that simple.









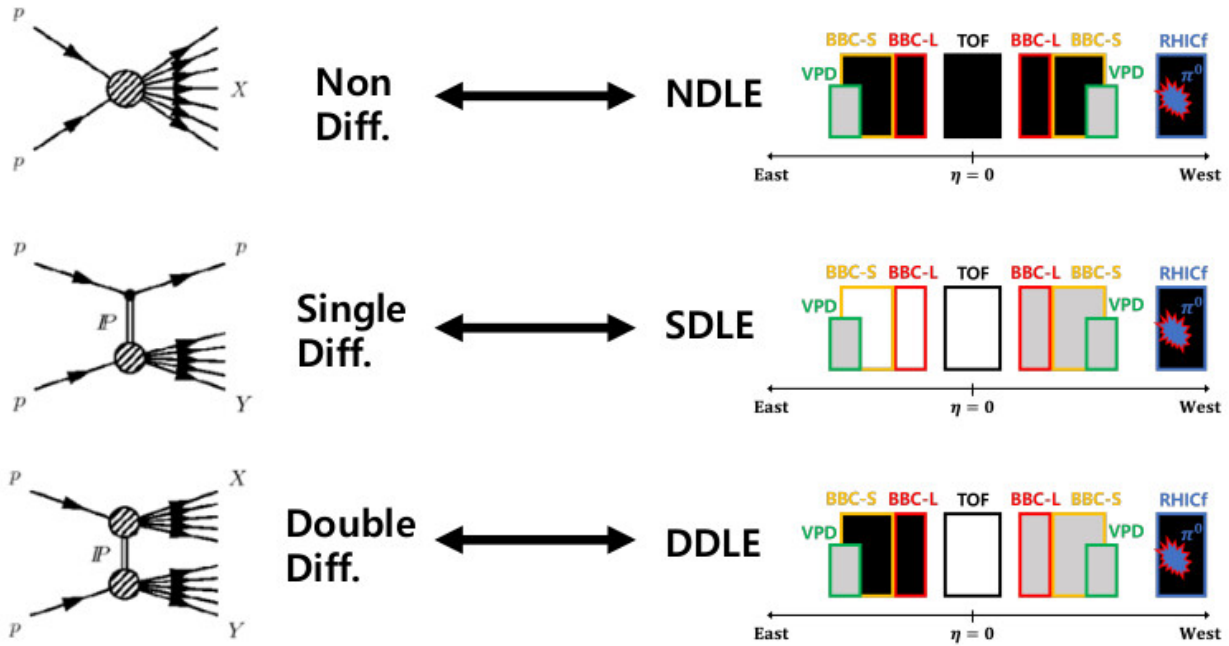


Pion cloud (sea quarks) in L=1 orbit

π^0 and n TSSA : opposite signs

RHICf (at STAR) forward TSSA

Breakdown of inclusive asymmetries (2)



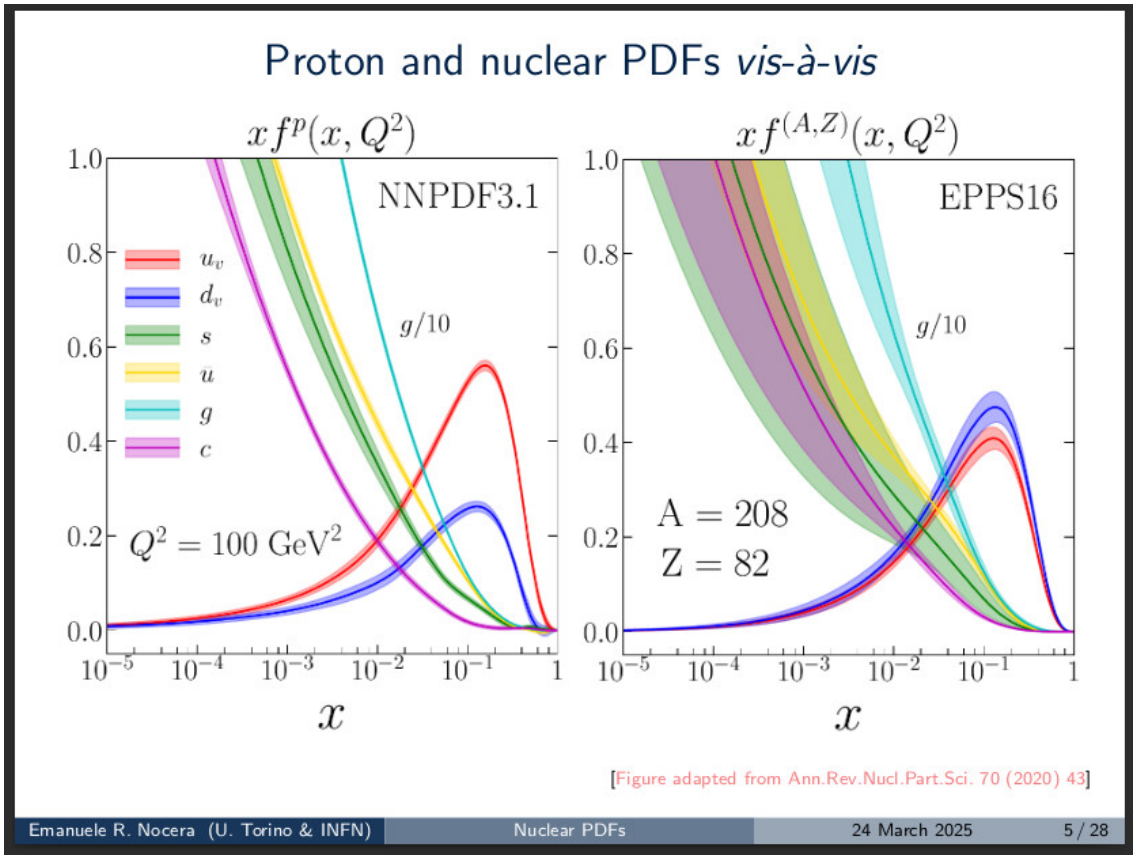
We will pin down the origin of the asymmetries depending on the reaction mechanism.
The results will be released soon. Please stay tuned!

They claim to be able to separate single, double and non-diffractive components in near future

Phenomenology and fits : mostly NNPDF

Nuclear PDF : nPDF

Assumption:
fundamental interactions are the same in the vacuum and in the medium,
but PDFs are different, *i.e.* nuclear effects are reabsorbed into nPDFs

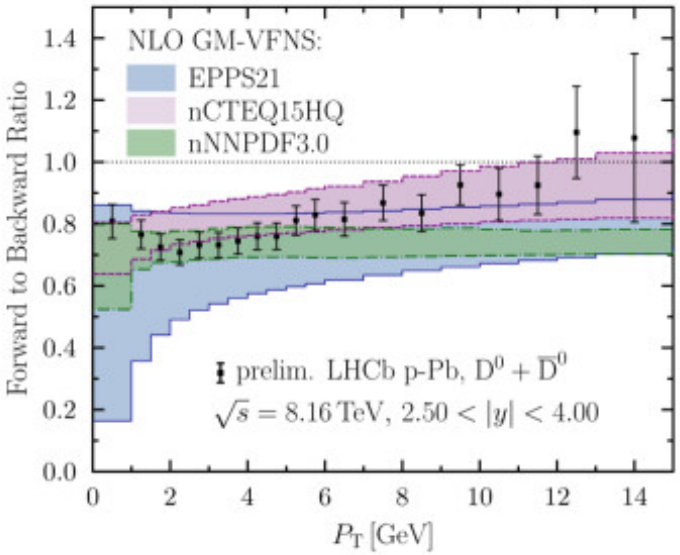


nPDFs : relatively poorly known

nPDF : effect of new data

D^0 mesons in pPb/pp at 5.02 TeV

LHCb [JHEP 10 (2017) 090]



Drastic reduction of nPDF uncertainties

Important constraint for the gluon nPDF

nNNPDF3.0: POWHEG+PYTHIA

large scale uncertainty, only forward data

EPPS21: S-ACOT-M_T GM-VFNS

large scale uncertainties not seen

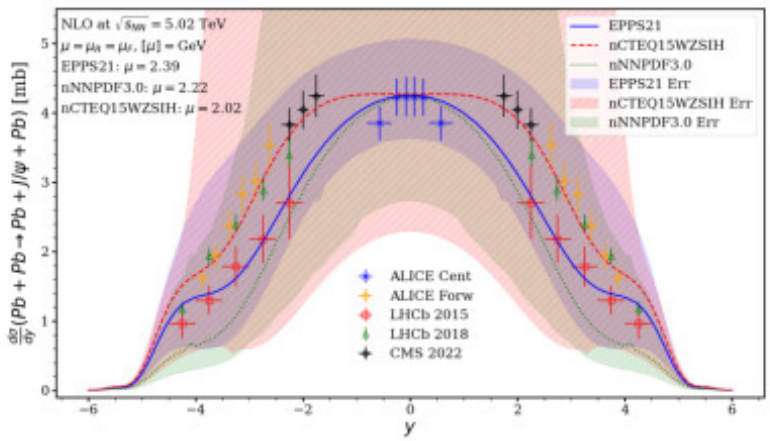
[Importance of mass schemes: V. Bertone WG1 Tue. morning]

Quarkonia: B, J/Ψ, Υ

ALICE, LHCb, CMS

quarks enter at NLO

$$\mathcal{M}^{\gamma A \to J/\psi A} \sim f^A_{\text{gluon}}(\mu) \otimes T_g(\mu) + f^A_{\text{quark}}(\mu) \otimes T_q(\mu)$$



[PRC 106 035202; ibid. 107 044912]

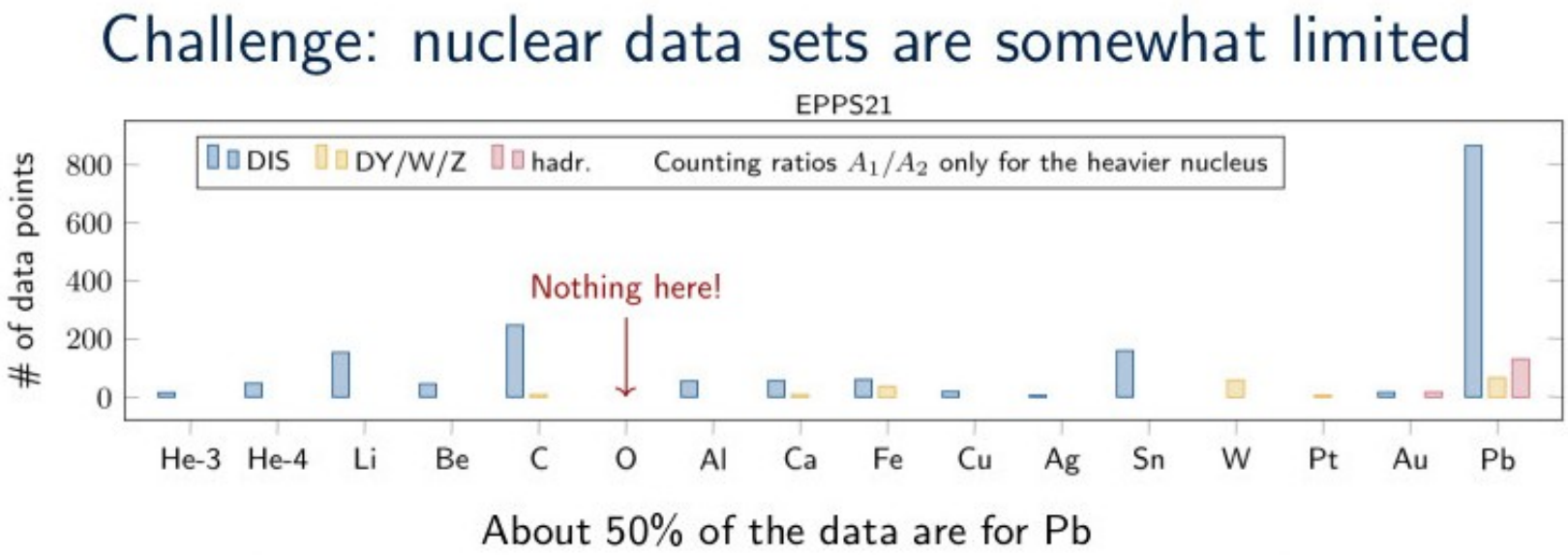
Quadratic dependence of PDFs

Large scale dependence at NLO

Only gluons at LO, quarks dominate at NLO

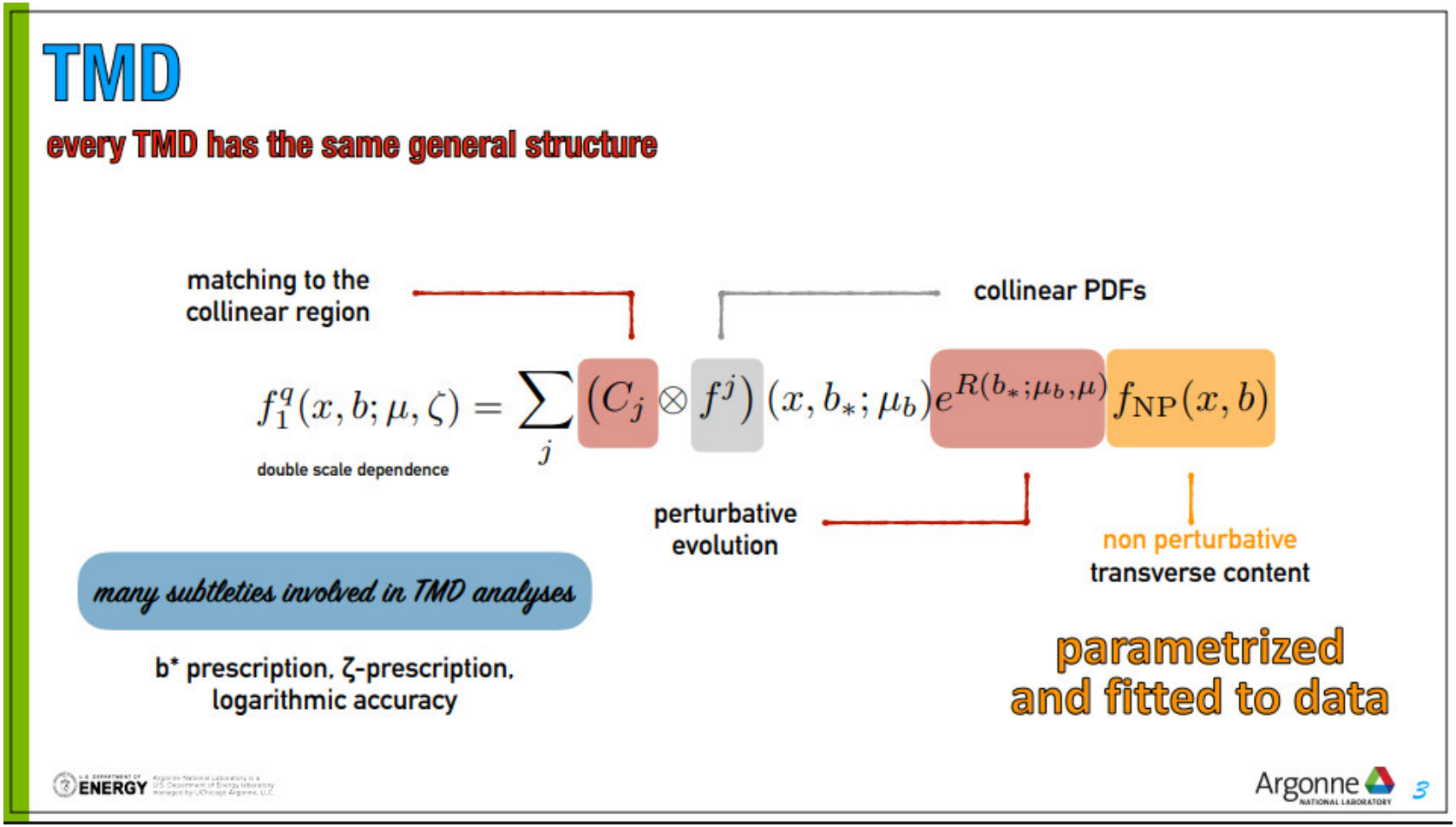
nCTEQ15WZSIH reproduces the shape thanks to its hugely enhanced strange PDF

nPDF : can SPD contribute



We have the ability for NN collisions, but at much lower enegies - not sure if our data can be much useful, but may be for species for which data is practically non-existent - looking at $O + O$ 😀

NNPDF in the TMD business



Flavour neutral part extracted from NNPDF technique

NNPDF in the TMD business

b* prescription and definition of $f_{\rm NP}$

perturbative

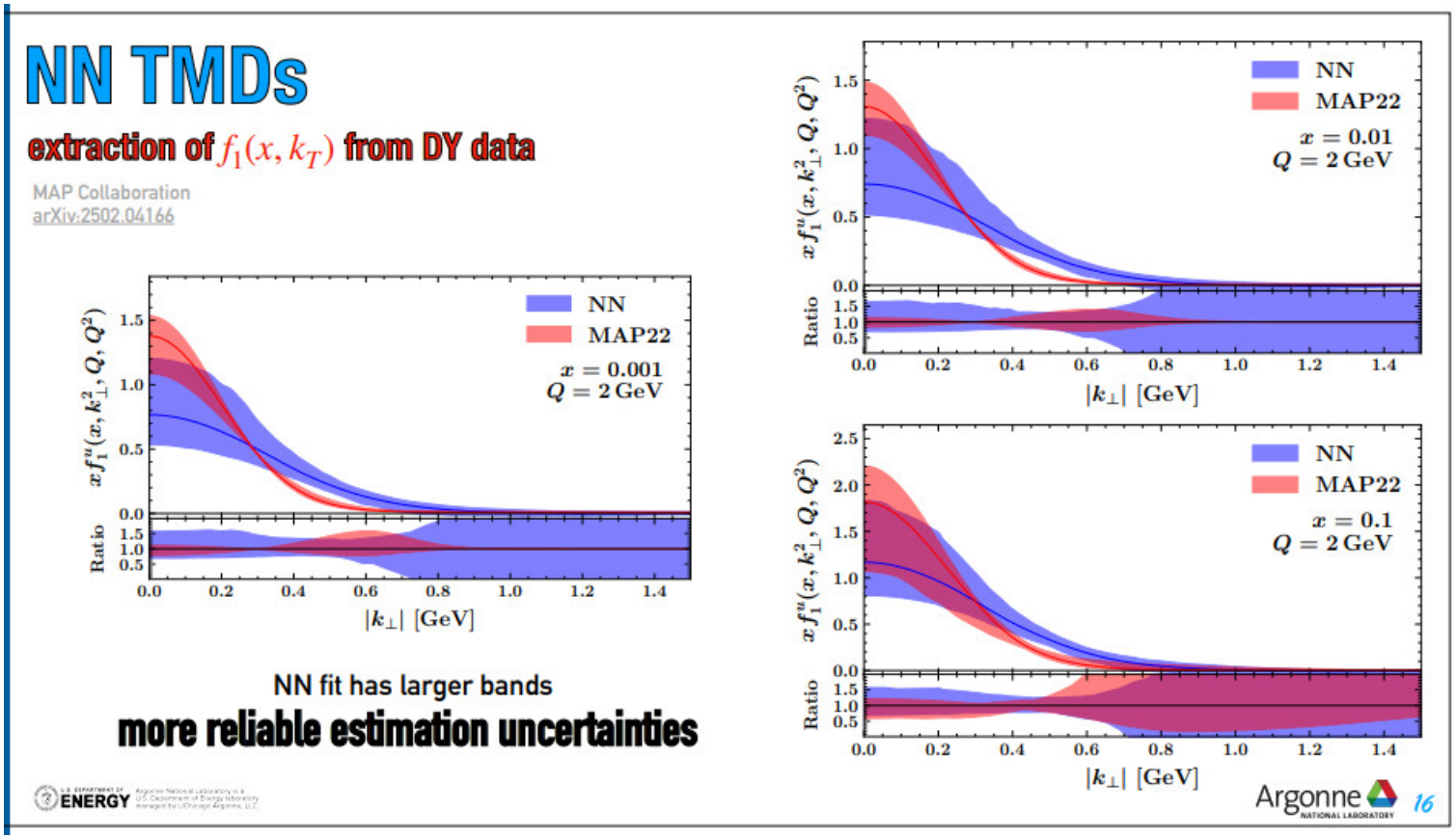
$$f(x,b;\mu,\zeta) = \left[\frac{f(x,b;\mu,\zeta)}{f(x,b_*(b);\mu,\zeta)}\right] f(x,b_*(b);\mu,\zeta)$$

non perturbative

$f_{\rm NP}(x,b,\zeta)$ → fit to data

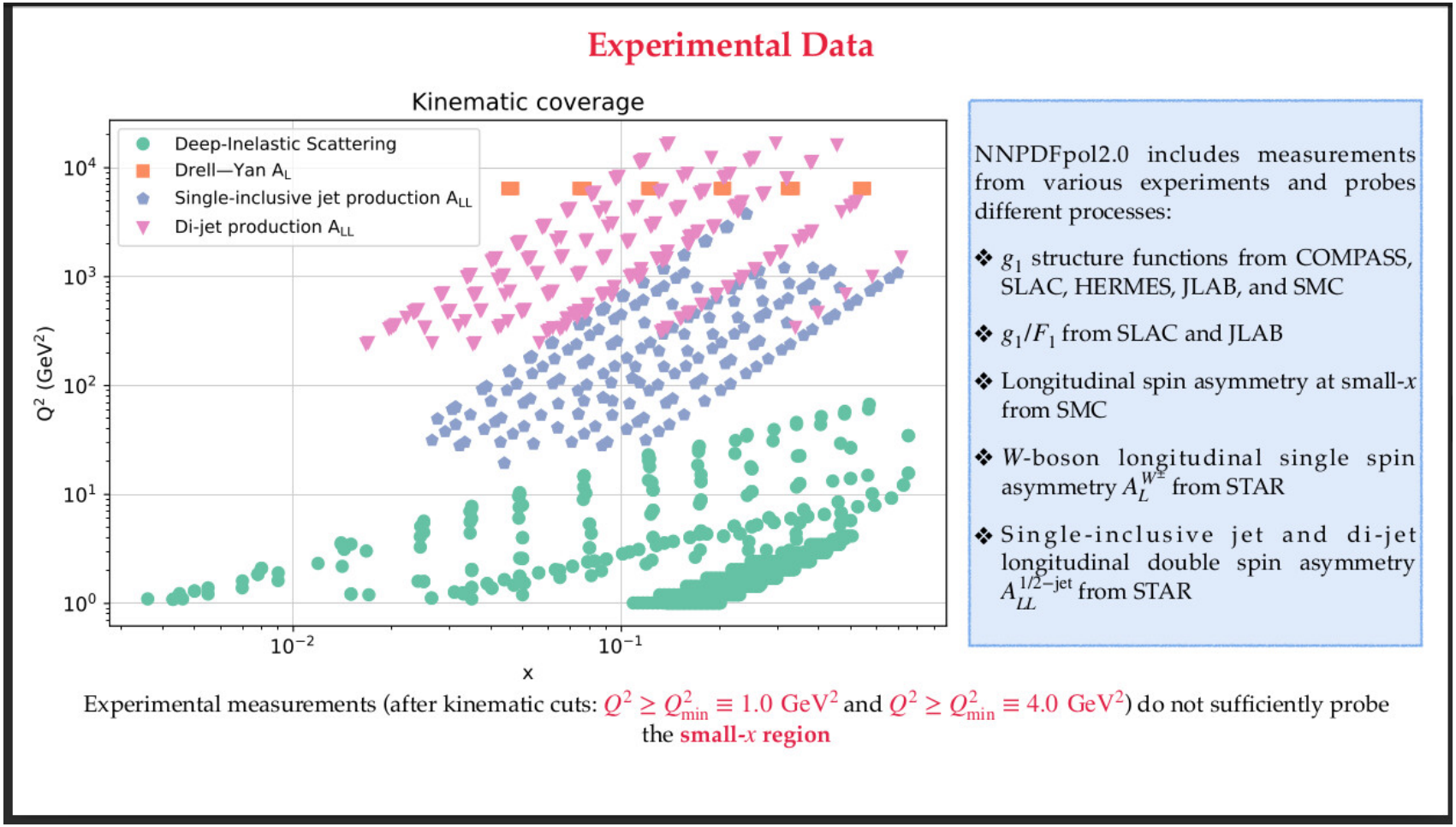
Non perturbative function depends on the choice of b*-prescription

NNPDF in the TMD business



1) u quark for three different x values
2) flavour dependence to be included at next attempts

NNPDF polarized : update



Version 2 of NNPDFpol : kinematic coverage of data included

NNPDF polarized : update

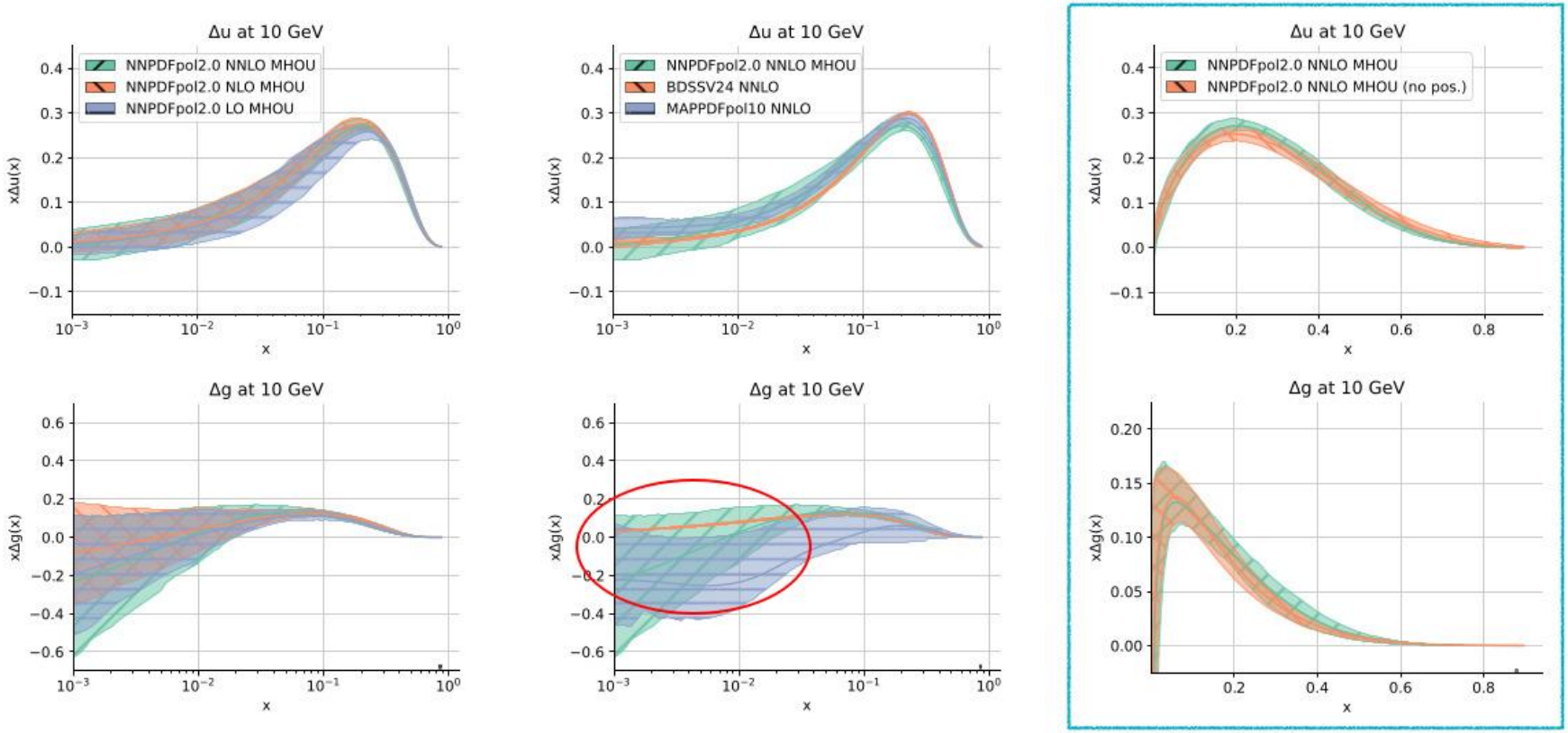
- They do not include any of the high precision PHENIX π^0 asymmetries - flagship results from PHENIX
- I asked : essentially NNPDF do not want to deal with fragmentation function and that extra source of uncertainty
- There remains the question : are they missing useful info : they claim no - next slide

NNPDF polarized : update

NNPDFpol2.0 PDFs: Effect of Positivity

CLAIM: **W/o being enforced**, Gluon Positivity only satisfied by inclusions of **RHIC SI jet** and **JLab DIS** [arXiv:2201.0207]

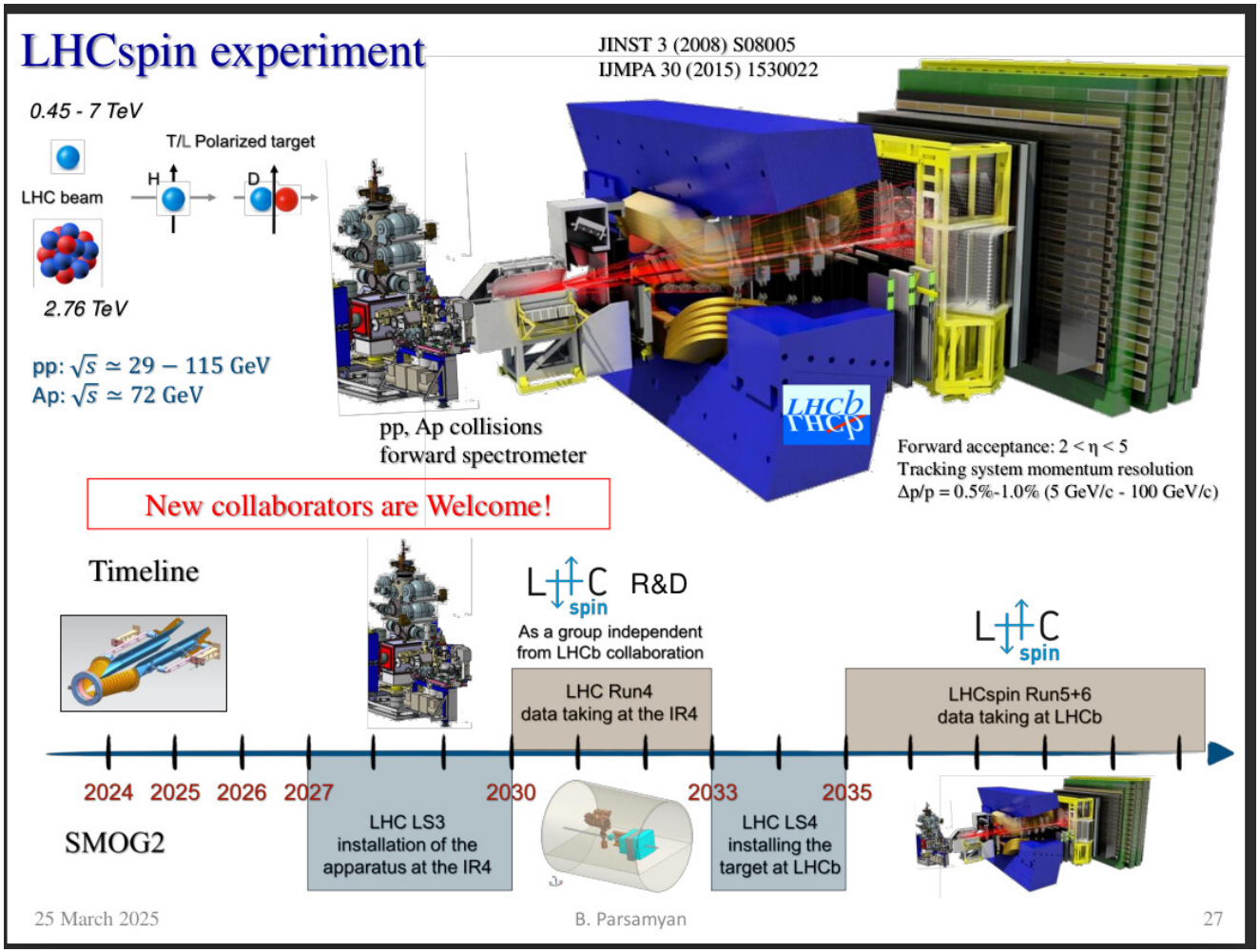
NOT QUITE TRUE: Positivity is immaterial to the sign of the Gluon $\Longleftrightarrow$ reduce large-x uncertainties



They make is it a point to refute claim about gluon positivity by the DSSV group

Other interesting upcoming experiment : LHCSpin

LHCSpin



Fascinating feature : polarized gas target AND regular beam beam collisions : 'buy one get one free' offer

LHCSpin

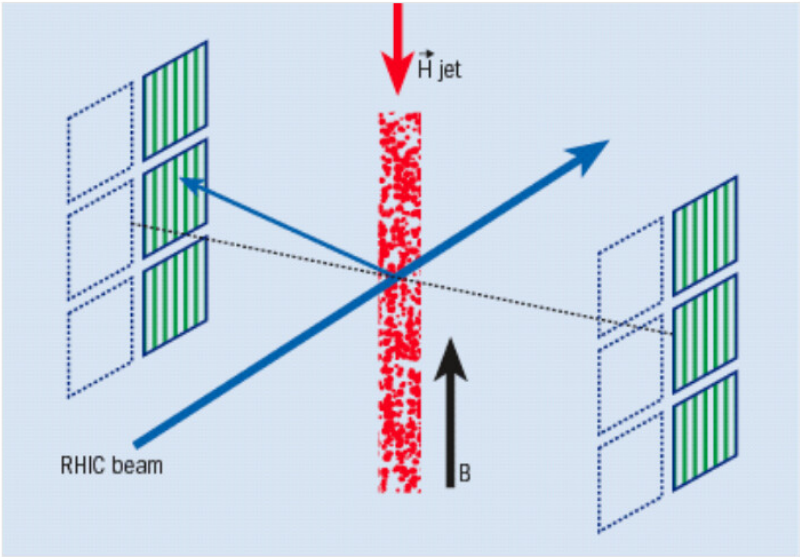


Fig. 2. Six 70 × 64 mm silicon-strip recoil detectors with 16 strips each are located near 90° with respect to the RHIC beam, at a distance of 80 cm from the interaction point.

Figure 3: LHCSpin polarized target reminded me of PHENIX H-jet polarimeter

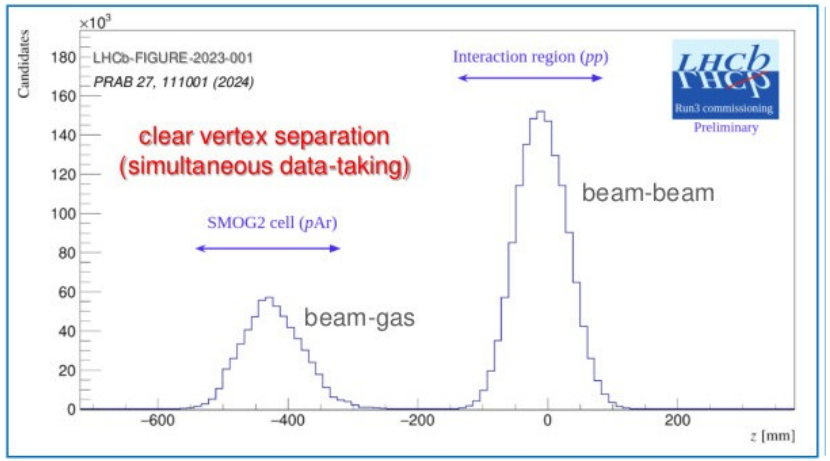
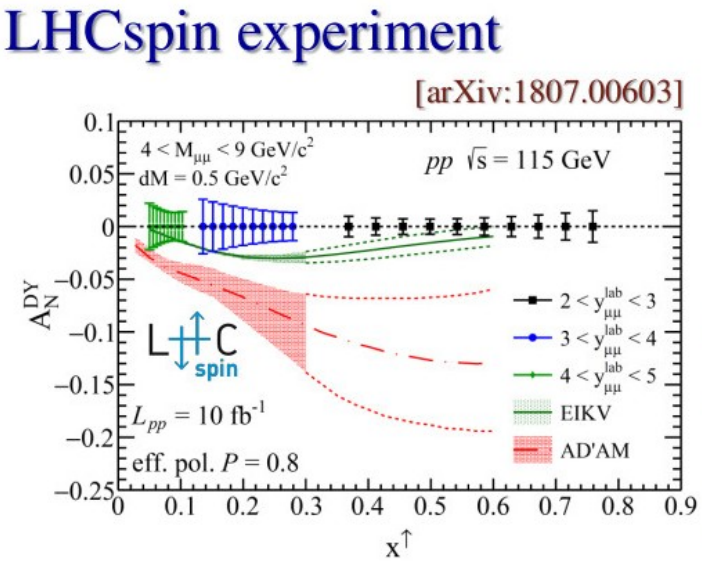


Figure 4: LHCSpin demontrate they can separate fixed-target and collider collisions nicely

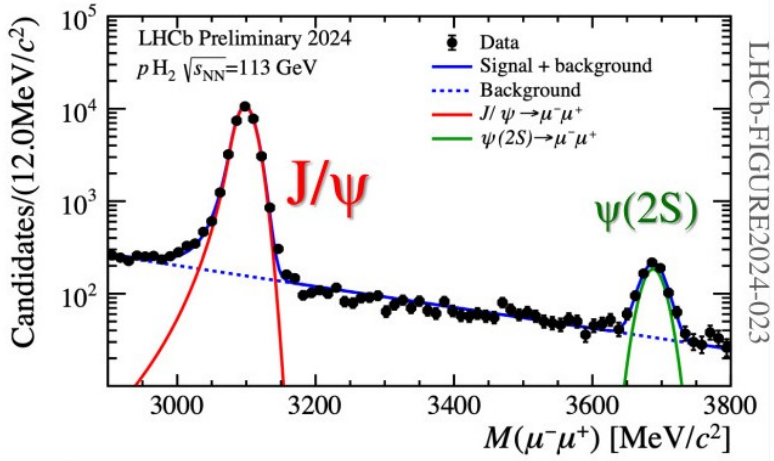
LHCSpin



Channel	Events / week	Total yield
$J/\psi \to \mu^+\mu^-$	1.3×10^7 !!	1.5×10^9
$D^0 \to K^-\pi^+$	6.5×10^7	7.8×10^9
$\psi(2S) \to \mu^+\mu^-$	2.3×10^5	2.8×10^7
$J/\psi J/\psi \to \mu^+\mu^-\mu^+\mu^-$ (DPS)	8.5	1.0×10^3
$J/\psi J/\psi \to \mu^+\mu^-\mu^+\mu^-$ (SPS)	2.5×10^1	3.1×10^3
Drell Yan ($5 < M_{\mu\mu} < 9$ GeV)	7.4×10^3	8.8×10^5
$\Upsilon \to \mu^+\mu^-$	5.6×10^3	6.7×10^5
$\Lambda_c^+ \to pK^-\pi^+$	1.3×10^6	1.5×10^8

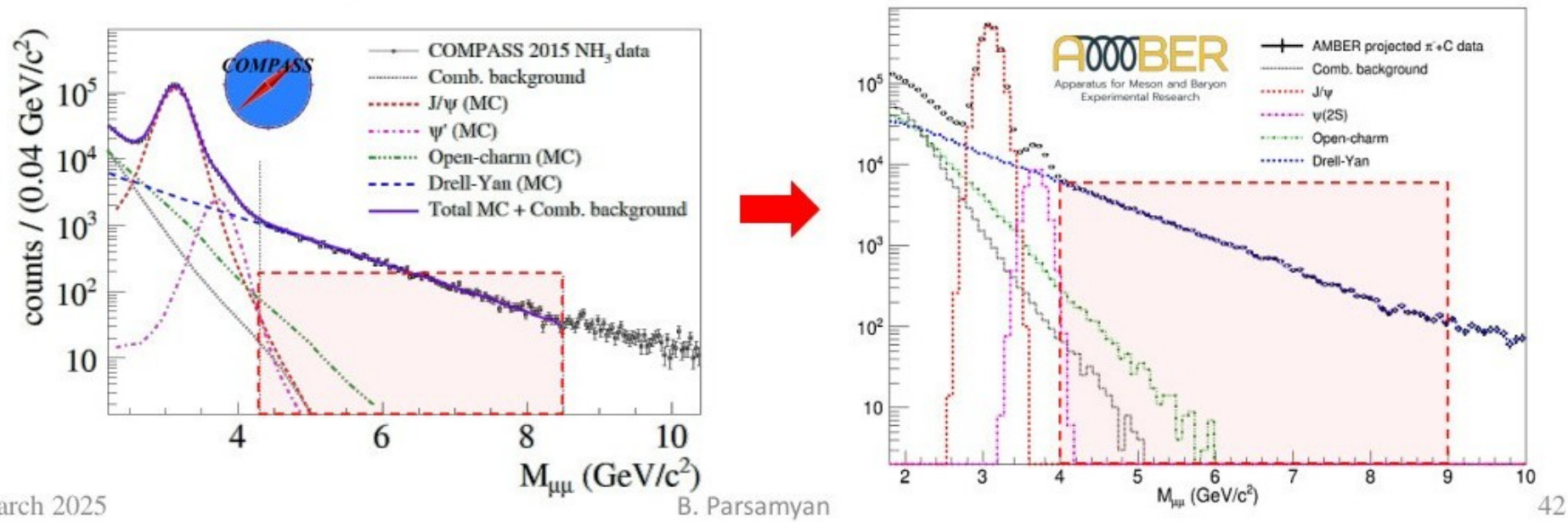
- Precise *spin asymmetry* on $J/\Psi \to \mu^+\mu^-$ and $D^0 \to K^-\pi^+$ for $pH^{\uparrow}$ collisions in just few weeks
- Inclusive quarkonia production in (un)polarized pp interactions - ideal observable to access gTMDs
- Flavor separation using H/D, EMC effect
- Spin physics in heavy-ion collisions and a lot more!

It's LHC, so luminosity and event rates will be eye-watering



- SMOG : System for Measuring Overlap With Gas
- SMOG2 test data : look at the separation of J/Ψ and $\Psi(2S)$

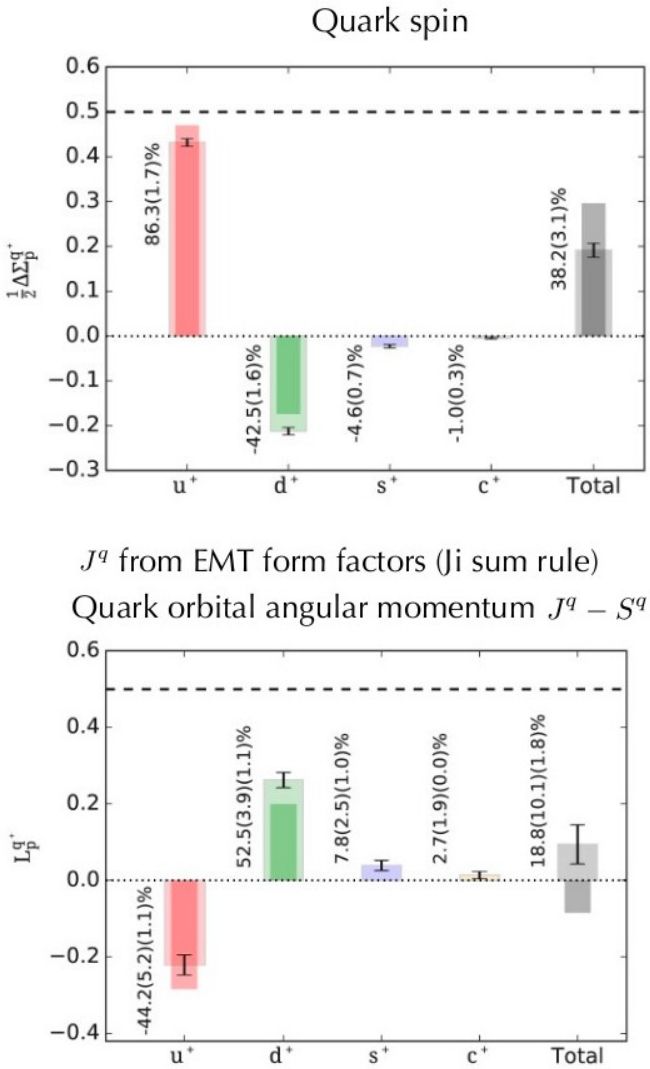
That J/Ψ and $\Psi(2S)$ separation



Same person talked about COMPASS and AMBER - which I am skipping here of course

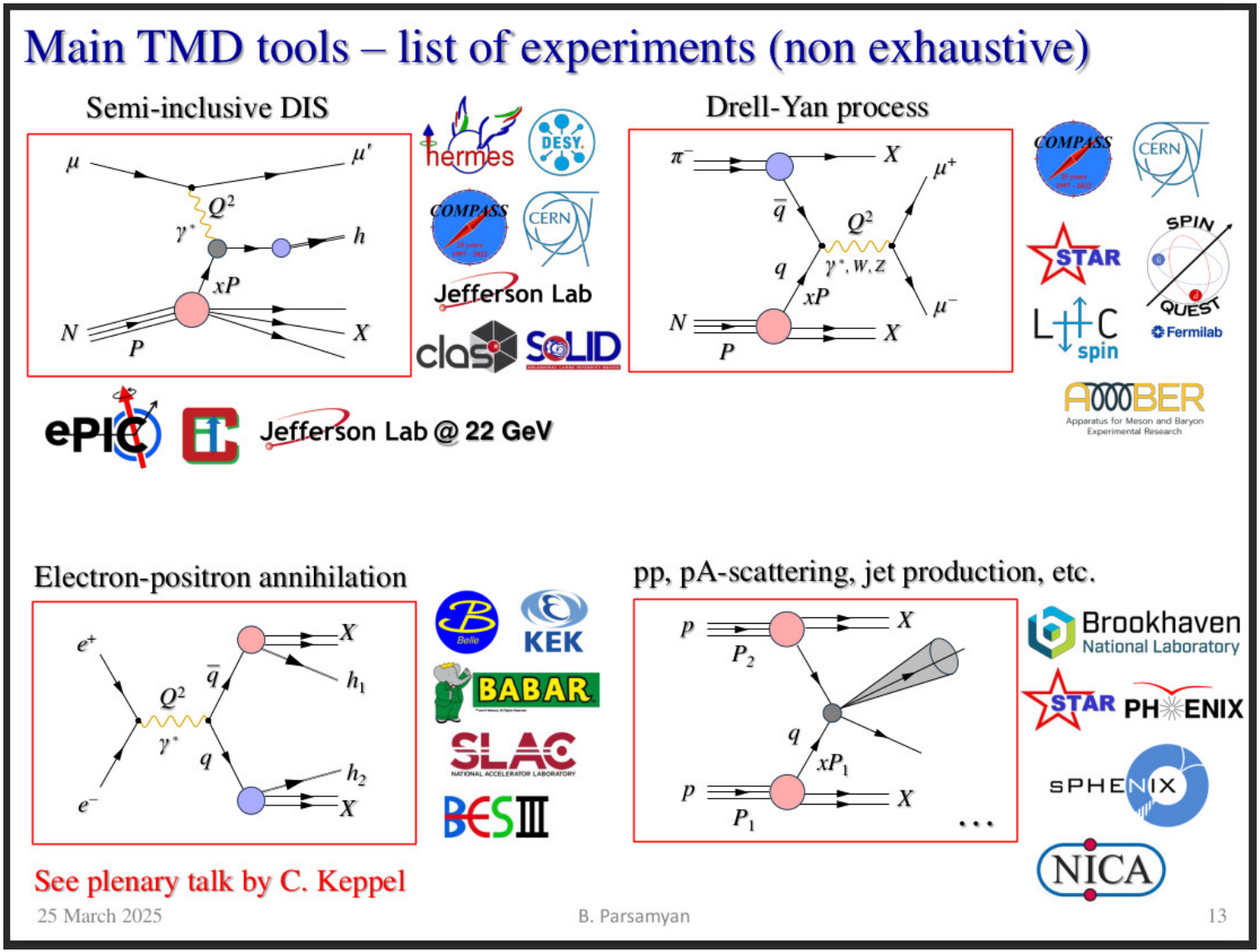
Notice the J/Ψ and $\Psi(2S)$ separation in COMPASS and AMBER

Summary of my summary



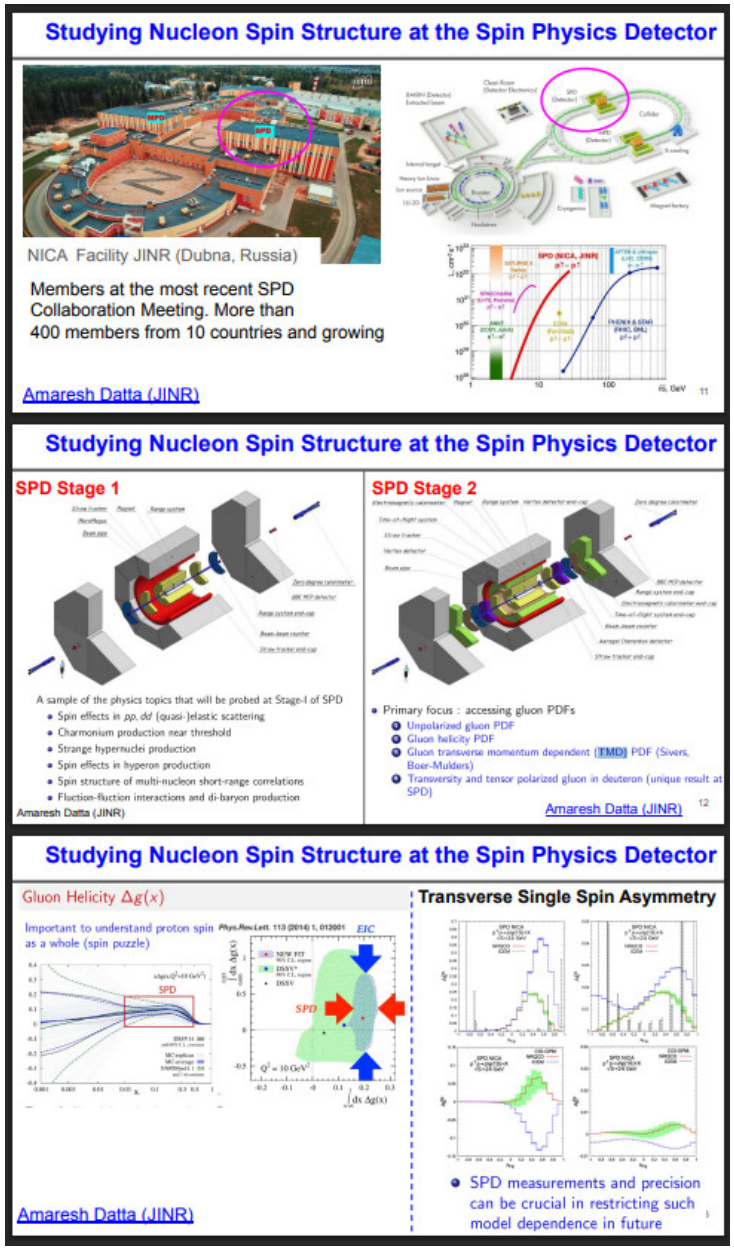
- Plenary talk on MC event generators : but no good news on a polarized generator : I asked
- Lots of nice results from COMPASS and JLAB experiments - that I could not attend or cover here
- EIC is undoubtedly the next big thing in spin physics and DIS community
- Lattice QCD talk showed their estimate of quark orbital angular momentum
- Besides NNPDF, heard a lot of mention of MSHT PDF sets (MSHT Link) and of MAP collabortaion for TMD (MAP Github)
- Exciting physics is being done right now and more coming in near and far future in the niche field of nucleon (spin) structure

Who does what



I just liked this summary slide

SPD got a shout-out



- SPD talk was well recieved
- Convener of spin physics parallel group was really excited to hear of a new experiment
- He included 3 slides from my talk in his summary talk on the last day, gave a shout out to SPD and recently reached out to invite an SPD talk at SPIN-2025 - so that was a nice outreach for SPD overall
- Alexey Zhevlakov and Andrej Arbuzov from BLTP also gave nice talks

Beautiful Cape Town

Figure 5: From the balcony of my hotel room

Beautiful Cape Town

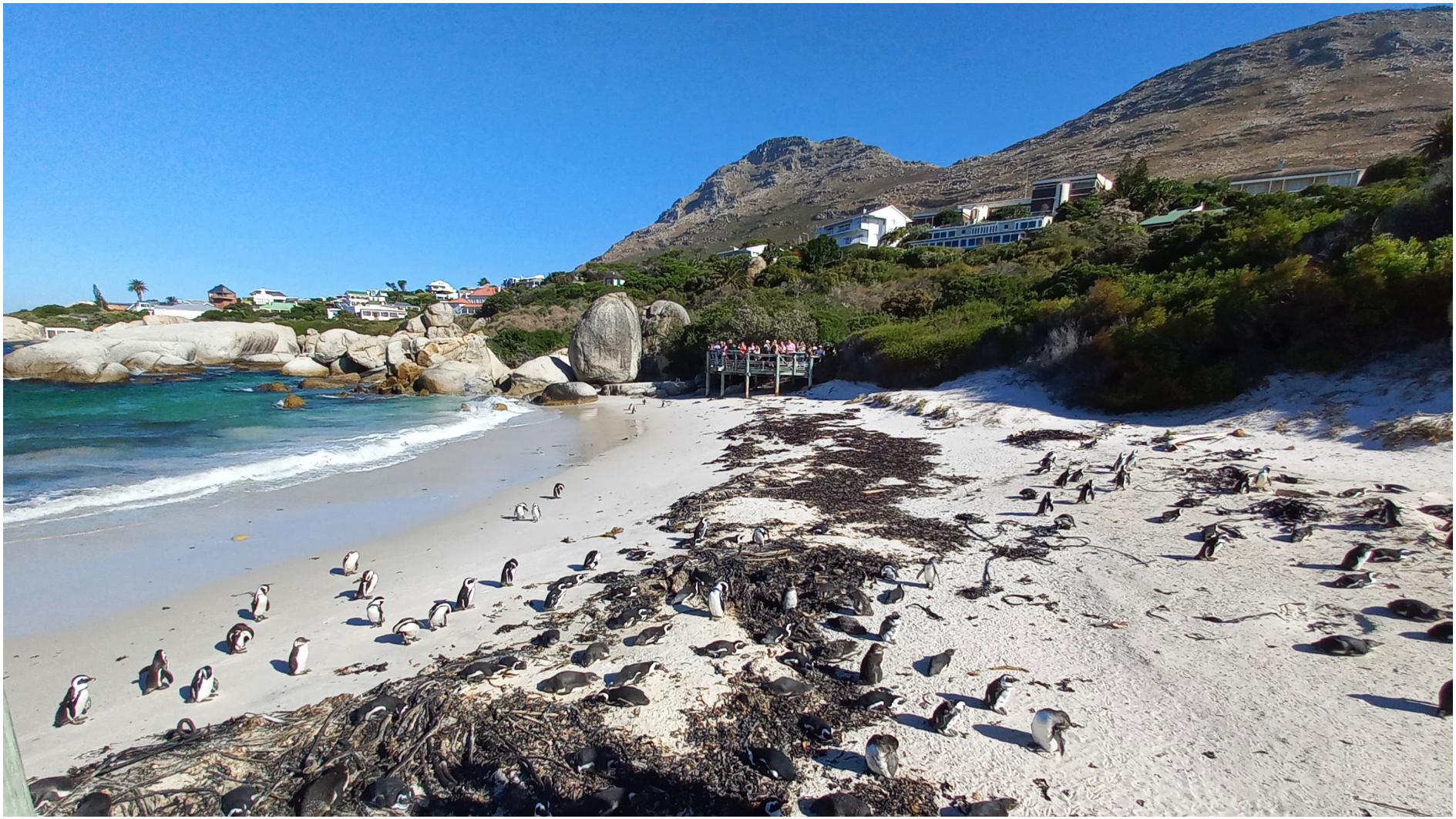


Figure 6: A unique penguine species that survives outside Antarctica

Beautiful Cape Town

Figure 7: Quintessential African bird

Beautiful Cape Town

Figure 8: I could see why the Cape of 'Good Hope' was dreaded by the sailors of olden times - windy and stormy as two currents of different temperature collide there

Thank You