SIDIS
working group – task priorization

SIDIS – physics conveners meeting
May 17

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Key SIDIS physics measurements (must-do)

- Quark Sivers function as a function of x, k_t for valence and sea flavors: A_{UT} $\sin(\phi_S-\phi_h)$ moments for IDed pions and kaons (Golden channel)

- Tensor charges for valence and sea quarks A_{UT} $\sin(\phi_S+\phi_h)$ moments for IDed pions and kaons (silver channel)

- Unpolarized TMD PDFs and its QCD evolution (silver channel, implicit requirement for Sivers)

- Sea quark helicities via SIDIS A_1 (A_{LL}) measurements for IDed pions and kaons (golden channel)

- Gluon Sivers function via di-jet or HF pair A_{UT}s $\rightarrow$ Jet/HF group?

Other measurements (can-do)

- Boer-Mulders function measurements via IDed pion and kaon $\cos(n\phi_h)$ moments (likely most acceptance sensitive)

- Fragmentation function FF measurements and nFF measurements for light hadrons

- Unpolarized sea quark PDF meausurements using FFs

- Various other single and di-hadron azimuthal moments related to tensor charge, higher twist function e, and others

- XYZ production measurements (mostly photo-production, not SIDIS but part of SIDIS YR, could also be in HF group

- Other Jet related TMD measurements →HF/Jet group?

RIKEN

Main figures for the report

- 4D (x-Q^2-P_{hT}-z) kinematical + PID coverage figure similar to YR
  - Concentrate for the most part on certain x-Q2 ranges due to simulation cost
- Closely related: z, P_{hT} and ϕ_s, ϕ_h smearing figure for different ECCE configurations
- Simulations can start from the YR Pythiaerhic/eic-smear files

Fig. 8.29
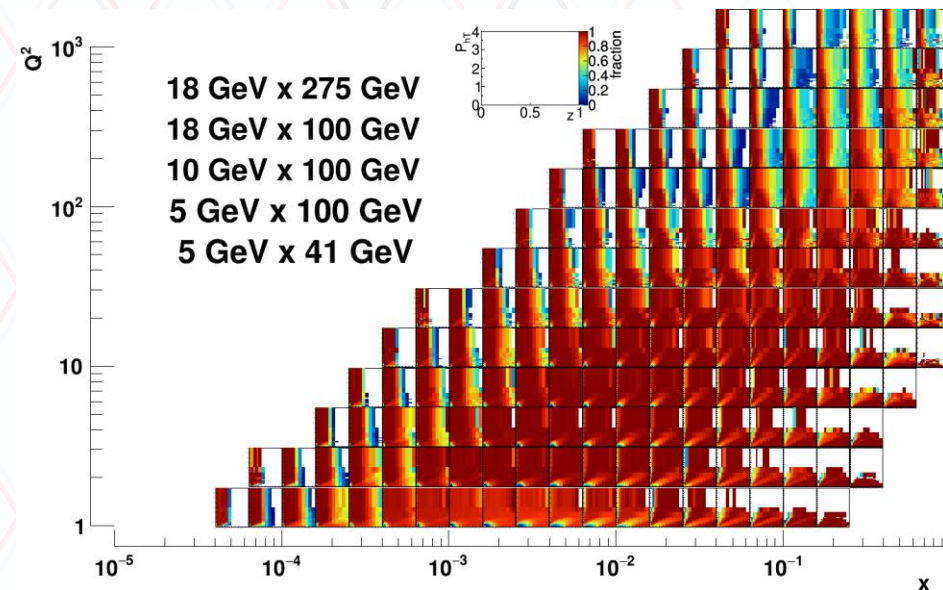
➔Already prepared for the most part

Sivers/Collins/unpol TMD figures

- Redo these YR analyses (AUTs require reweighting of events in truth kinematics+parton flavor)

- Need to take into account crossing angle and related acceptance/smearing effects

- Similar to YR guess systematics via variation between perfect and smeared options

- Extrapolate from some x-Q2 bins to all and give to Alexey Vladimirov (Sivers, unpol TMD) or Daniel Pitonyak (Tensor charge) for impact studies
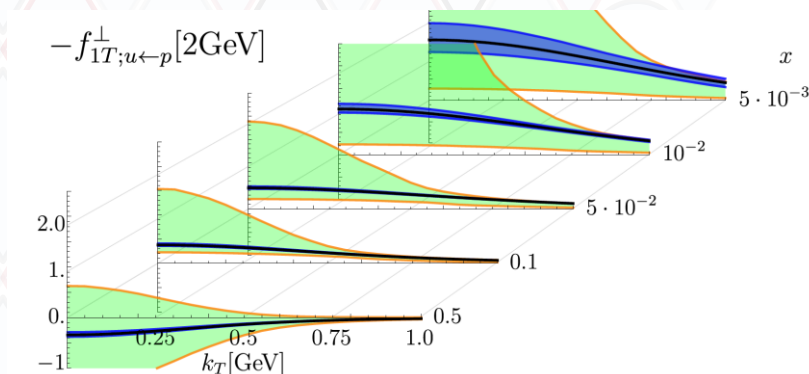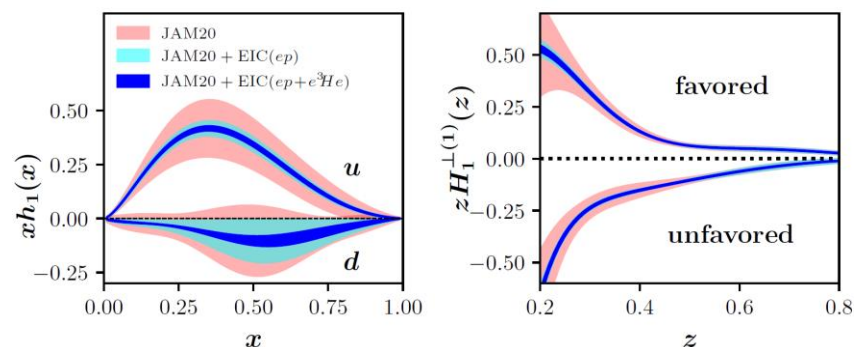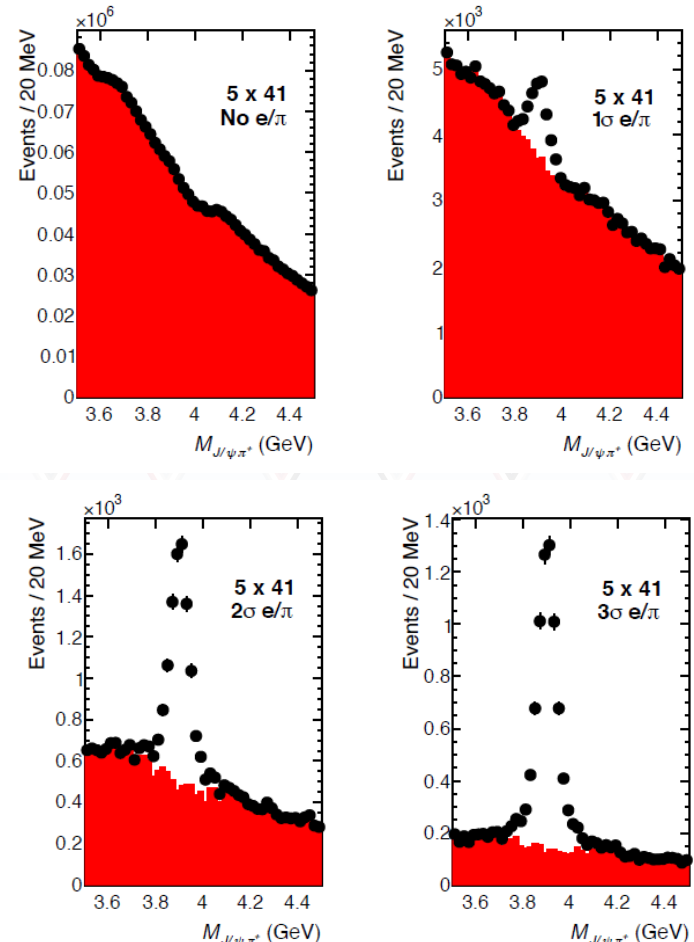
Fig. 7.53: Sivers

Fig. 7.54: Transversity

➔feasible using EventEvaluator, reweighting machinery still to be transferred from eic-smear based work

Some spectroscopy along X/Y/Z states

- Spectroscopy could be interesting as mostly photoprodution at forward rapidities

Fig. 8.38

→Not started (requires Spectroscopy expert, potentially Cameron?)

Key physics channels SIDIS group

Ralf Seidl (RIKEN), Justin Stevens (William&Mary),Alexey Vladimirov (Regensburg), Anselm Vossen (Duke), Bowen Xiao (Central Normal University)

Physics channels	Detector requirements
Quark Sivers, 3D momentum structure, TMD evolution	eta acceptance for hadrons, angular resolution, granularity of the detector (central to forward -1 to 4),pi/K/p identification
Gluon Sivers via di-jets/di-hadrons	acceptance for back-to-back dihadrons
Spectroscopy possibilities	Particle ID, Vertex (open charm),
Sea quark helicity measurements	hadron momentum and energy resolution in forward direction (2-4) for CC events
FFs/nFFs/nPDFs via single hadron FF	
Di-hadron correlations in eA →low x	backward hadron acceptance, granularity
Di-hadron FF for Tensor charge/Boer-Mulders	likely similar to quark Sivers, coverage to low momenta (for partial wave decomposition)
Lambda related spin measurements	Vertex requirements? proton ID, low momentum coverage, mass resolution (feed down)
Hadron in jet measurements	
Heavy flavor pair measurements for gluon Sivers	

From 2020 YR report SIDIS group slides