

SIDIS working group key measurements and status

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Key physics channels

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 \rightarrow 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	

Organizational stuff

- Wiki page will soon be available (we are told)
- Bi-weekly meetings on BNL Indico (for the time being 8:30 EST/14:30 CET/22:30 JST): <https://indico.bnl.gov/category/289/>
- Active discussions via Mattermost at https://chat.sdcc.bnl.gov/signup_user_complete/?id=s8orgebicb8eumxajpdxkfkogr, channels for main physics channels available

Points for the Temple meeting

- joint session with the Jet-HF WG, as there seems to be considerable overlap with our processes
- Session or discussion with PID section of the Detector WG?
- What CMS energies and luminosities can we agree on in the Physics WG for projections?
- Discussion about Q^2 dependence of TMD measurements
- (another) Hands-on software tutorial during the meeting?

Quark Sivers, 3D momentum structure, TMD evolution

Channel	Workforce (responsible co-convener in red)	Goals	Money plot	Detector requirements	Comments /strategy	bonus plots
quark Sivers/other TMD measurements using single hadrons: quark Sivers, TMD evolution, 3D momentum structure, Tensor charge	Alexey Vladimirov , Miguel Echevarria, Xiaqing Li, RCS, Alexei Prokudin, Elke, Harut, Andrea Signori, Filippo Delcarro, Daniel Pitonyak, Pavia group, JAM, Calgiari, Osvaldo, Leonard, Elena, Ted Rogers, Hayan	3D image (x,kt) of the Sivers Function, Evolution test of Sivers at intermediate x	pseudo-3D Sivers function as a function kt for various x bins, Value of Tensor charge uncertainties + plot vs x, Q ² dependence of Sivers function or AUT at fixed x	eta acceptance for hadrons, angular resolution, granularity of the detector (central to forward -1 to 4), pi/K/p identification	start with Sivers function, then Collins, also need unpolarized TMDs, combined fits for unpol and pol TMDs/FFs	extraction of Qiu/Sterm an function and uncertainties

Gluon Sivers via di-jets/di-hadrons

Channel	Workforce (responsible co-convener in red)	Goals	Money plot	Detector requirements	Comments /strategy	bonus plots
Gluon Sivers via di-hadron/di-jet measurements () --> check overlap with jet/HF group	Bowen , JH Lee, Elke, Pavia gluon Sivers model, Cagliari, Zhongbo	Probing the size of the gluon Sivers function	Size of the asymmetry as a function of x	acceptance for back-to-back dihadrons	Likely model independent, could use generic generator	

Spectroscopy possibilities

Channel	Workforce (responsible co-convener in red)	Goals	Money plot	Detector requirements	Comments /strategy	bonus plots
<p>Representative spectroscopy channel : $X, Y \rightarrow J/\psi \pi \pi$, $DD^* \rightarrow$ check with exclusive and HF groups</p>	<p>Justin, JLab, FSU, JPAC, Indiana, Edinburgh/Glasgow</p>	<p>Demonstrate opportunities in spectroscopy</p>	<p>Kinematic coverage for decay particles in representative channels</p>	<p>Particle ID, Vertex (open charm),</p>	<p>Generator, EICsmear for mass resolution etc., bkgd. estimation</p>	<p>Expected limits on coupling vs mass for $J/\psi \pi \pi$, DD^* final states</p>

Sea quark helicity measurements

Channel	Workforce (responsible co-convener in red)	Goals	Money plot	Detector requirements	Comments /strategy	bonus plots
Sea quark helicity measurements via SIDIS (and CC DIS)	RCS + Elke's group, Rodolfo Sassot, Ignacio Borsa, other fitters, Yuxian Zhao	flavor separated (anti)quark helicity distributions over wide range of x	Update of previous sea quark helicity PDF uncertainty plots	hadron momentum and energy resolution in forward direction (2-4) for CC events	Combined fits of PDFs/FFs/helicities?	

FFs/nFFs/nPDFs via single hadron FF

Channel	Workforce (responsible co-convener in red)	Goals	Money plot	Detector requirements	Comments /strategy	bonus plots
Single hadron fragmentation functions for ep and eA for FFs, nFFs, nPDFs ()	Valerio Bertone, Pia Zurita, Elke+Charlotte, Will Brooks, Kawtar, RCS		nPDF uncertainty expectation, (n)FF expectation			

Di-hadron correlations in eA \rightarrow low x

Channel	Workforce (responsible co-convener in red)	Goals	Money plot	Detector requirements	Comments /strategy	bonus plots
Di-hadron correlations in eA for onset of saturation effects \rightarrow WW gluons	Bowen , JH Lee, Elke, etc	Probing the onset of saturation phenomenon	decorrelation plot as in white paper	backward hadron acceptance, granularity		

Di-hadron FF for Tensor charge/Boer-Mulders

Channel	Workforce (responsible co-convener in red)	Goals	Money plot	Detector requirements	Comments /strategy	bonus plots
Di-hadron fragmentation related Tensor charge/ Boer Mulders measurements	Anselm , Chris Dilkes,+Duke Grad, Marco Radici, Alessandro Bacchetta,Valerio Bertone		Tensor charge uncertainties for dihadron extraction, BM asymmetry projections based on MC	likely similar to quark Sivers, coverage to low momenta (for partial wave decomposition)		

Lambda related spin measurements

Channel	Workforce (responsible co-convener in red)	Goals	Money plot	Detector requirements	Comments /strategy	bonus plots
<u>Lambda related spin structure measurements</u>	Chris Dilks, Jinlong, Daniel Boer, Werner, Feng, Leonard, Schlegel, Anselm	Twist 3 function, TMD, but also D_{LL}, D_{TT}	Uncertainty estimates for polarization dependent variables	Vertex requirements? proton ID, low momentum coverage, mass resolution (feed down)	Λ vs anti Λ ratio (fragmentation check)	

Hadron in jet measurements

Channel	Workforce (responsible co-convener in red)	Goals	Money plot	Detector requirements	Comments /strategy	bonus plots
Hadron in jet and jet only measurements for TMDs (in close collaboration with jet/HF working group)	Miguel Arratia, Alexei Prokudin, Zhongbo, Felix, Nobuo, HF/jet working group	possibility of cleaner Sivers extraction, substructure measurements				

Heavy flavor pair measurements for gluon Sivers

Channel	Workforce (responsible co-convener in red)	Goals	Money plot	Detector requirements	Comments /strategy	bonus plots
HF pairs to access gluon Sivers	HF/jet working group, Cagliari, Alessandro,	Gluon Sivers function				

Other considerations

- In addition to detector requirements, luminosities, CMS energies, spin orientation and species need to be also considered
- Covered by other working groups but requiring close coordination:
 - Exclusive VM channels
 - Di-jet/heavy flavor channels overlapping with jet/HF group
- There are many more interesting channels and you are encouraged to work on them, but unless they lead to substantially different/additional requirements they likely will not feature prominently in the YR (→ individual papers?)
- Try to work on simulations, detector response, statistical and syst. uncertainty evaluation, extraction within each channel, have updates at bi-weekly meetings