

# Initial discussion topics

## Proposed measurements

1. Spin physics with jets –  $A_{LL}$ , Sievers function [nucleon and nuclear structure]
  2. Inclusive jets and jet substructure, charge current reactions, EW structure functions [FF<sub>s</sub>, shapes]
  3. Jet+gamma, lepton-jet, di-jet correlations [TMD constraints, broadening in e+A]
  4. D and B meson cross sections, modification in e+A [energy loss, hadronization]
  5. Heavy flavor jet cross sections, modification and substructure in e+A, charm F<sub>2</sub> [transport properties of nuclei, charm content, QCD in matter]
  6. Angularities, n-jettiness [extraction of  $\alpha_s$ ]
- These are distributed along physics topics and expanded in the table below, thus some channels may appear in duplicate
  - Assignments, manpower and money plots are tentative – intended to start a discussion. Input and changes are welcome (very few explicit responses after last email. Contact us.) Coordination with other WG

# Measurements and physics channels

Physics measurement	Channel
Longitudinal, double longitudinal	Inclusive jet measurements
Sivers asymmetry, special focus on gluons	Jet, lepton-jet and di-jet measurements
Electroweak structure functions, charge currents	Jets, flavor separated jets, Longitudinally polarized reactions ep, parity violating
TMDs, nuclear broadening, energy loss	D-jets and photon/lepton tagged jets, ep, eA
Longitudinal and transverse (TMD) fragmentation, shapes and splitting functions	Inclusive jet measurements -> hadrons in jets, energy flow
Energy loss and hadronization	Heavy mesons cross sections in comparison to light mesons in ep, eA
Charm and beauty content of nucleons and nuclei	Heavy flavor-tagged jets, ep, eA
Flavor and mass dependence of parton showers	Heavy flavor-tagged jet substructure, ep, eA
Extraction of fundamental parameters, hadronization constants, $\alpha_s$	Global event shapes, thrust, angularities, N-jettiness

# Polarized reactions

Physics goals + channel	Workforce + overlaps	Money plots	Bonus plots	Detector requirements
Nucleon structure, helicity distributions Jet $A_{LL}$	Petriello, Page, Vogelsang, Huang, ... Calorimetry, Software	$A_{LL}$ vs jet $p_T$ and for various $\eta$ bins	$\Delta q$ and $\Delta g$ vs $x$ and $Q^2$	Polarimetry, Forward, central and backward coverage, Calorimetry, resolution
Nucleon structure, 3D, Sivers asymmetry, TMD evolution Jets, di-jets, lepton-jets	Page, Sichtermann, Arratia, Kang, Vogelsang, Yuan, Boussarie, Skokov, Boer, ... Semi-inclusive, Calorimetry, Software	Quark sivers function of $x$ , $k_T$ $Q^2$ dependence of the Sivers function	$A_N$ as a function of angle (away from back-to-back) Gluon Sivers function	Polarimetry, Forward, central and backward coverage, Calorimetry, resolution

# Unpolarized reactions, light flavor jets

Physics goals + channel	Workforce + overlaps	Money plots	Bonus plots	Detector requirements
TMD physics, Nuclear broadening Di-jets, photon/lepton-jet correlations	Petriello, Schiherman, Skokov, Arratia, Perpelitsa, Yuan, Li (Haitao), ... Calorimetry, Particle ID, Tracking, Software	Dijet angular distributions Lepton-jet angular distributions. Different rapidity, $p_T$ , bins	TEEC vs azimuthal angle Photon-jet correlations and asymmetries in eA, comparison to ep	Detector acceptance, Particle ID (lepton, photon)
Fragmentation (TMD, longitudinal), fundamental QCD splitting processes Inclusive jet substructure, hadron in jet	Cunqueiro, Vitev, Osborn, Ringer, Arratia, Perpelitsa, Li, ... Inclusive, Tracking, Calorimetry, Software	Hadron distribution in jets vs $k_T$ (relative to jet axis) and vs $z$	Light flavor jet momentum sharing distributions vs angle $r$ , splitting fraction $z$  Modification of shapes and fragmentation functions (vs $r, z$ )	Detector coverage, Calorimetry, Granularity, Tracking resolution

# Heavy Flavor

Physics goals + channel	Workforce + overlaps	Money plots	Bonus plots	Detector requirements
Hadronization and energy loss D, B meson production, modification in eA	Vitev, Li (Haitao), Li (Xuan), Liu, Wong, Perpelitsa Semi-inclusive, Tracking, Particle ID, Software	D, B meson and light h $R_{eA}$ vs $z_h$ D, B meson cross sections vs $p_T$	D, B meson and light h $R_{eA}$ vs $Q^2$ , $v$ Also vs $k_T$	Tracking, Forward coverage, spatial, timing resolution
Charm and bottom content of nucleons and nuclei Heavy-flavor tagged jet cross section	Vitev, Furletova, Olness, Nadolsky, Hobbs, Li, Durham, Wong, Sichtermann Inclusive, Tracking, Calorimetry, Software	Charm - tagged jet cross sections vs $p_T$ , Charm $F_2$ (vs $x Q^2$ )	Bottom tagged jet cross sections vs $p_T$ , Bottom $F_2$ (vs $x Q^2$ )	Tracking, Forward and backward coverage, Calorimetry
Mass dependence of parton showers Heavy flavor jet substructure	Reiten, Kang, Cunqueiro, Vitev, Morreale, Li, Wong, Perpelitsa Tracking, Software, Calorimetry	Heavy flavor splitting functions vs $r$ (angle) and $z$ Heavy flavor jet shapes vs $r$	Fragmentation in jets to heavy mesons vs $z$ and $p_T$ (relative to jet axis) Substructure modification in eA	Tracking, resolution, Calorimetry, granularity

# EW and Angularities

Physics goals + channel	Workforce + overlaps	Money plots	Bonus plots	Detector requirements
<p>Electroweak structure functions</p> <p>Parity violating reactions with jets,</p> <p>Charge currents</p>	<p>Sichtermann, Huang, Furletova, Deshpande, ...</p> <p>Inclusive, Semi-inclusive, Accelerator (<math>e^+</math>)</p> <p>Calorimetry</p> <p>Software</p>	<p>Charge current cross sections vs Jet <math>p_T</math>, rapidity</p> <p><math>F_1^{YZ}, F_3^{YZ}</math> vs <math>x</math> in bins of <math>Q^2</math> (polarized x polarized)</p> <p><math>g_1^{YZ}, g_5^{YZ}</math> vs <math>x</math> in bins of <math>Q^2</math> (unpolarized x polarized)</p>	<p><math>\sin^2\theta_W</math> vs scale <math>Q</math></p> <p>Present structure functions vs <math>x, Q</math></p>	<p>Particle ID, Calorimetry, Tracking</p>
<p>Extraction of <math>\alpha_s</math>, hadronization parameters</p> <p>Global event shapes</p>	<p>Cunqueiro, Petriello, Kang (Daekyoung), Lee, ...</p> <p>Calorimetry, Tracking, Software</p>	<p>Thrust distribution as a function of <math>\tau</math> for several <math>x</math> and <math>Q^2</math> bins</p> <p>Angularity vs <math>\tau</math> for several <math>\alpha</math> parameters</p>	<p><math>\alpha_s</math> and hadronization parameter <math>\Omega_1</math> scatter plot</p>	<p>Forward, central and backward coverage, Calorimetry, resolution</p>