EIC Detector-1 Simulation, Production, QA - Planning

Working Group: SIDIS

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Synopsis

[Describe the main goals between now and CD-2/3a. Describe the overall strategy of your working group in its transition towards a single software stack.]

Main strategy toward CD2/3a:

- Revisit existing SIDIS studies on (SI)DIS kinematic variable resolutions, track changes with Detector configuration changes, try to optimize kinematic reconstruction even within a method (such as using either tracking or EMCal information for scattered lepton based method, etc)
- Single hadron A_{LL} and Sivers/Collins/unpol TMD studies using reweighting based on parameterizations from global fits. Keep demonstrating feasibility of main physics goals.
- Similar studies on di-hadrons for DiFFs, Gluon Sivers, di-hadrons for saturation

Longer term strategy:

- Proper treatment of radiative effects
- Study the variation of physics impact using different generators and different PDF/FF (both polarized and unpolarized) parameterizations
- Preparation of realistic unfolding for kinematic smearing and PID misidentification
- Gain understanding of dominant sources of systematic uncertainties to concentrate on reducing those

Software strategy:

- Assumption to continue with Fun4All given timeframe to CD2/3a but generally plan to work mostly agnostic of it (for analyzers) by using either TTrees from EventEvaluator (EE) output directly for analysis (similar to ECCE proposal for SIDIS group) or create interface to Chris Dilks' SIDIS framework. The latter would create TTrees including all (SI)DIS kinematic variables to enable easier start for students, etc. Perform several consistency tests for SIDIS variable reconstruction between framework and existing standalone codes based on EE output.

Current requests

This section includes your requests for the next three months. This should not be an exhaustive specification of what is needed, but should be sufficient for us to assess what computational and storage resources will be needed and what outstanding development is required.

1. Rerun existing pythiaeRHIC files used in YR and ECCE proposal (see also https://wiki.bnl.gov/eicug/index.php/ECCE_Simulations_Working_Group) through full Detector Simulation, reconstruction and EventEvaluator:

On rcf in: /gpfs02/eic/DATA/YR_SIDIS/ep_AxB/ for:

WG	Generator	energy	events	Q^2 range	comments
SIDIS	Pythia6	18x275	20 M	General Q^2	1st priority
SIDIS	Pythia6	18x275	20M	($1<Q^2<100$)	2nd
SIDIS	Pythia6	18x275	4 M	($Q^2>100$)	3rd
SIDIS	Pythia6	5x41	20 M	General Q^2	4th
SIDIS	Pythia6	5x41	20 M	($1<Q^2<100$)	5th
SIDIS	Pythia6	5x41	1 M	($Q^2>100$),	6th
SIDIS	Pythia6	18x100	20 M	($1<Q^2<100$)	
SIDIS	Pythia6	18x100	4 M	($Q^2>100$)	
SIDIS	Pythia6	10x100	20 M	General Q^2	
SIDIS	Pythia6	10x100	20 M	($1<Q^2<100$)	
SIDIS	Pythia6	10x100	2 M	($Q^2>100$)	

    a. Number of events: see above. Additionally corresponding 5x100, 10x275 configurations (i.e. same Q2 range and event counts, also already generated)
    b. Event generator to be used: already produced files in eic-smear format
    c. Geometry to be simulated: latest reference design
    d. Required reconstructed quantities: all central quantities: tracks, clusters, projections, PID/eID if available in some form

2. Comparison of physics performance with and without inclusion of radiative effect:
    a. Number of events: significant fractions of table in request 1 for highest and lowest energies
    b. Event generator to be used: Pythia6 w/o ISR/FSR (other settings as in request 1);
    c. Geometry to be simulated: latest reference design (same as in request 1)
    d. Required reconstructed quantities: all central quantities: tracks, clusters, projections, PID/eID if available in some form

3. Dedicated Lambda production:
    a. Number of events: eictest/ATHENA/EVGEN/SIDIS/Lambda (existing), 2M
    b. Event generator to be used: already produced
    c. Geometry to be simulated: latest reference design
    d. Required reconstructed quantities: all central quantities: tracks, clusters, projections, PID/eID if available in some form

Future requests

This section includes anticipated requests for the next year (which can be more vague). This should focus on larger efforts or those that are held-up by missing technical features.

1. Inclusion of radiative effects with dedicated generators Radgen or Djangoh comparable statistics to Pythia6/8 sample to request 1 or 2 w/ and w/o ISR/FSR;
2. Comparison of Request 1 with different MC generator and different PDF/FF sets:
    a. Number of events: significant fractions of table in request 1 for highest and lowest energies
    b. Event generator to be used: Pythia8
    c. Geometry to be simulated: latest reference design (same as in request 1)
    d. Required reconstructed quantities: all central quantities: tracks, clusters, projections, PID/eID if available in some form