Simulation Planning Exercise Discussion

May 18th, 2022

Jet and Heavy Flavor Working Group Meeting

ECCE Simulation Productions

HF & Jets	HF	Pythia8	5x41 ep	5M	4.92M		BNL
HF & Jets	HF	Pythia8	10x100 ep	5M	4.86M		BNL
HF & Jets	HF	Pythia8	5x41 ep	5M	4.94M	Q2 > 1	BNL
HF & Jets	HF	Pythia8	10x100 ep	5M	4.87M	Q2 > 10	BNL
HF & Jets	Jets	Pythia8	10x100 ep	20M	19.51M	1 < Q2 < 100	BNL
HF & Jets	Jets	Pythia8	10x100 ep	2M	1.93M	100 < Q2	BNL
HF & Jets	Jets	Pythia8	18x275 ep	20M	19.45M	1 < Q2 < 100	BNL
HF & Jets	Jets	Pythia8	18x275 ep	4M	3.81M	100 < Q2	BNL

ATHENA Simulation Productions

- NC and CC DIS generated using PYTHIA8 with beam effects included

- 5M events per Energy x Q2 bin (5x41 Q2 > 1000 kinematically excluded and not simulated)
  - Energy Bins: 18x275, 10x275, 10x100, 5x100, 5x41
  - Q2 Bins: Q2 > 1, Q2 > 10, Q2 > 100, Q2 > 1000

- Sample also used for SIDIS and some Inclusive studies

EIC Detector-1 Simulation, Production, QA - Planning

Working Group: [your working group name]

Contact Person: [name and individual email address]

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.]

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.[Request 1]:
    1. Number of events: [e.g. 10M]
    2. Event generator to be used: [e.g. Pythia8]
    3. Geometry to be simulated: [e.g. reference design + ZDC]
    4. Required reconstructed quantities: [e.g. forward tracks + central photons]
2.[Request 2]:
    1. Number of events: [e.g. 10M]
    2. Event generator to be used: [e.g. Pythia8]
    3. Geometry to be simulated: [e.g. reference design + ZDC]
    4. Required reconstructed quantities: [e.g. forward tracks + central photons]

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.[Request 1]:
2.[Request 2]:

Synopsis

- Main goals between now and CD2/3A
  - (Obvious) Be able to do full jet reconstruction in whatever software framework is implemented
  - (Obvious) Be able to do heavy flavor reconstruction using realistic tracking / displaced vertex information
  - Have a reasonable, workable version of an energy-flow type algorithm to avoid double counting energy
  - Benchmark the detector performance using a series of physics measures which ‘span the space’ of potential jet and HF analyses

- Overall strategy in transition to single software stack
  - Work with software group(s) to ensure both Fun4All and DD4Hep frameworks contain the tools / algorithms we need to do analyses
  - To best of our ability, ensure these tools are as similar as possible between the frameworks
  - Where possible, work with reconstructed final state particles as stored in (flat) tree outputs from either framework -> push details of reconstruction upstream

Current Request

- What simulation will we need over the next ~3 months: Must be able to evaluate the reference detector design

- Number of Events
  - 5-10 M per energy / Q2 bin?
  - Energies: 5x41, 10x100, 18x275, 10x275?
  - Q2 Bins: >1, >10, >100. Higher Q2? Different divisions?
  - Do we want a CC DIS sample right away?

- Event Generator
  - NC / CC DIS Samples from PYTHIA8 (PYTHIA6 likely still needed for future photoproduction samples)
  - Need to coordinate steering file settings

- Geometry to be simulated
  - Full central detector

- Required Reconstructed Quantities
  - Central (-4<eta<4) tracks, photons, neutral hadron clusters, and secondary vertices. PID

Future Requests

- What else will we need longer term?
- Photoproduction
  - Likely needs to be filtered to get a reasonable sample of jets
  - PYTHIA6
- Further Charged Current
- Dedicated HF simu looking at specific channels / final states?