Status of background simulations

Barak Schmookler

Local simulation production

- We have simulated events for three configurations:
  1. 18x275 GeV setting with single DIS collision ($Q^2 > 1$ GeV^2) in each 2us long window (event): 1000 events with backgrounds (**18x275_Forced**) and without backgrounds (**18x275_noBG**).
  2. 10x275 GeV setting with single DIS collision ($Q^2 > 1$ GeV^2) in each 2us long window (event): 1000 events with backgrounds (**10x275_Forced**) and without backgrounds (**10x275_noBG**).
  3. 18x275 GeV setting with only backgrounds processes (i.e. no e-p collision) in each 2us long window (event): 1000 events (**18x275_BGOnly**).

- These files were run with the latest ePIC release and can be found here: */gpfs02/eic/baraks/epic/running/condor/backgrounds*.

- I have communicated these details to the ePIC production group, and requested the above sets be included as part of the official simulation running.

How to run background simulations – npsim:

- To run the background particles through the simulation, we need to tell DD4HEP to recognize the background status codes as final-state particles:

```
#Run DIS events through npsim
npsim --compactFile $DETECTOR_PATH/epic_craterlake.xml \
--numberOfEvents ${NEVENTS} \
--skipNEvents ${START} --inputFiles ${INPUT_HEPMC} \
--physics.alternativeStableStatuses="2001 3001 4001 5001 6001" \
--physics.alternativeDecayStatuses="2002 3002 4002 5002 6002" \
--outputFile output.edm4hep.root
```

- To just use the DIS signal particles in the Geant simulation, we can turn off the "alternativeStable[Decay]Statuses" options.

- The simulation is quite slow for 10x275 GeV – 3 hrs for npsim and EICRecon for 10 events of SDCC Condor farm. The npsim output file is about 14 MB/event. In addition, for 10x275 GeV, I had to submit 100 jobs with 10 events each in order to keep the memory consumption manageable.

How to run background simulations – EICRecon:

- For EICRecon, the reconstruction will not work unless we disable the default timeout:

```
#Run reconstruction
eicrecon -Ppodio:output_file=eicrecon_out.root \
-Pjana:nevents=${NEVENTS} \
-Pdd4hep:xml_files=epic_craterlake.xml \
-Pjana:warmup_timeout=0 -Pjana:timeout=0 \
output.edm4hep.root
```

- The EICRecon file is again quite large for 10x275 GeV – it is about 41 MB/event.

Conclusions

- We were able to run 1,000 events each for three different settings. The output is stored on SDCC.

- We are performing some tracking studies this week. We will begin some physics studies.

- I will put an outline of our work into the relevant pTDR section on Overleaf.