

ACTS Integration for B0 Trackers

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```

src/global/tracking/tracking.cc
Viewed ...

@@ -33,14 +33,16 @@ void InitPlugin(JApplication *app) {
33 // Tracker hits collector
34 app->Add(new
35 JChainFactoryGeneratorT<TrackerHitCollector_factory>({
36 - {
37 - "SiBarrelTrackerRecHits", // Si
38 - tracker hits
39 "SiBarrelVertexRecHits",
40 "SiEndcapTrackerRecHits",
41 "TOFBarrelRecHit", // TOF
42 hits
43 "TOFEndcapRecHits",
44 - "MPGDBarrelRecHits", //
45 - "MPGDDIRCRecHits"},
46 "CentralTrackingRecHits")); // Output
47 collection name
48
33 // Tracker hits collector
34 app->Add(new
35 JChainFactoryGeneratorT<TrackerHitCollector_factory>({
36 + {
37 + "SiBarrelTrackerRecHits", //
38 + Si tracker hits
39 "SiBarrelVertexRecHits",
40 "SiEndcapTrackerRecHits",
41 "TOFBarrelRecHit", // TOF
42 hits
43 "TOFEndcapRecHits",
44 + "MPGDBarrelRecHits", // MPGD
45 + "MPGDDIRCRecHits",
46 + "B0TrackerRecHits" // B0TRK
47 + },
48 "CentralTrackingRecHits")); // Output
49 collection name

```

2) B0TrackerRecHits needed to be passed as input in tracking.cc

```

src/utilities/eicrecon/eicrecon.cc
Viewed ...

@@ -30,13 +30,13 @@ std::vector<std::string> EICRECON_DEFAULT_PLUGINS = {
30 "BHCAL",
31 "FHCAL",
32 "B0ECAL",
33 - "B0TRK",
34 "ZDC",
35
30 "BHCAL",
31 "FHCAL",
32 "B0ECAL",
33 "ZDC",
34

```

3) Make sure it's the list of default plugins or you can activate it during running

Test Run 1: Central Trackers + B0

[Detailed Code Instructions](#)

Custom ePIC Config File

```
ebeam: 18
pbeam: 275
features:
  beampipe:
  tracking:
    definitions:
      vertex_barrel:
      silicon_barrel:
      mpgd_barrel:
      silicon_disks:
      support_service_assembly:
      tof_barrel:
      tof_endcap:
  solenoid:
  far_forward:
    far_forward_brycecanyon:
```

Custom ePIC Steering File

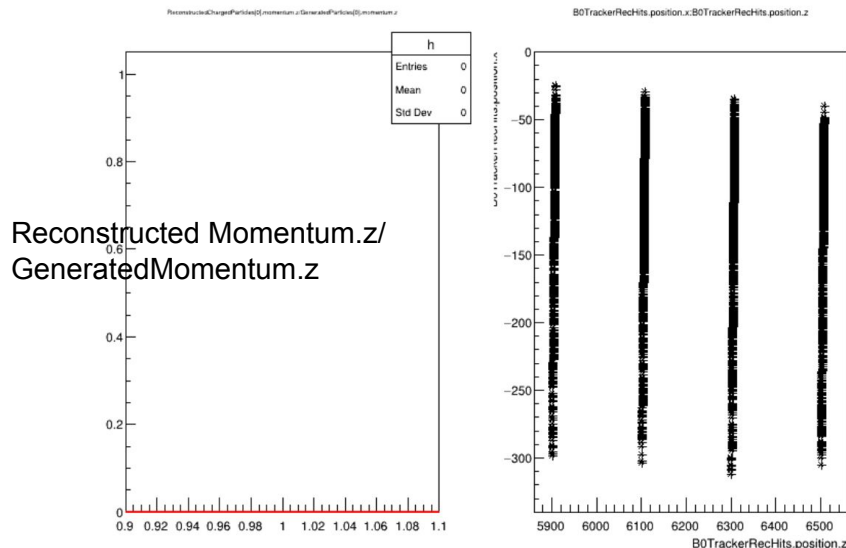
```
from DDSim.DD4hepSimulation import
DD4hepSimulation
from g4units import mm, GeV, MeV, mrad
SIM = DD4hepSimulation()

SIM.enableGun = True
SIM.gun.thetaMin = 6*mrad
SIM.gun.thetaMax = 22*mrad
SIM.gun.momentumMin = 275*GeV
SIM.gun.momentumMax = 275*GeV
SIM.gun.distribution = 'cos(theta)'
SIM.gun.particle = 'proton'
SIM.outputFile = 'sim_proton.edm4hep.root'
```

Test Run 1

```
npsim --steeringFile steeringFiles/proton.py -G -N 1000 --compactFile ${DETECTOR_CONFIG}.xml  
mv sim_proton.edm4hep.root $RESULT_DIR/
```

```
./eicrecon -Pplugins=janadot  
-Ppodio:output_include_collections=B0TrackerRecHits,ReconstructedChargedParticles,GeneratedParticle  
s -Ppodio:output_file=${RESULT_DIR}/sim_proton.edm4eic.tree.root  
${RESULT_DIR}/sim_proton.edm4hep.root
```



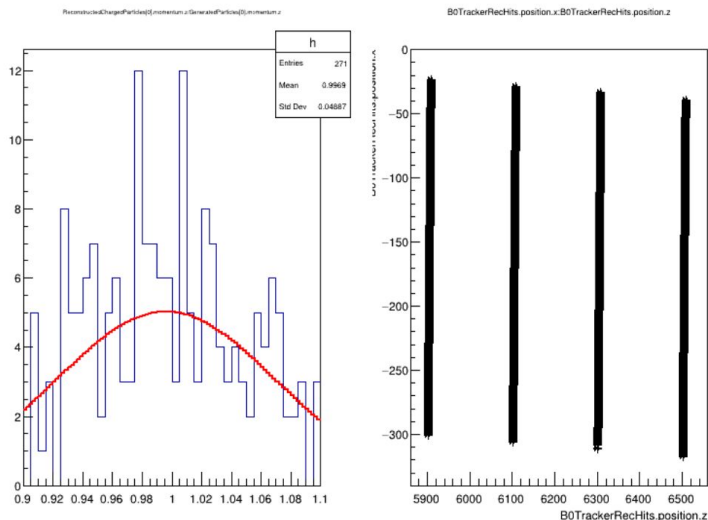
B0TrackerRecHits
were registering but
no reconstructed
momentum output

Test Run 1

Run eicrecon with the max eta forward limit limited to 6 (by default it's 4)

```
./eicrecon -Pplugins=janadot -Pacts_init:LogLevel=trace -Pacts:InitLogLevel=trace  
-Pacts:LogLevel=trace -Ptracking:InitTrackParams:LogLevel=trace  
-Ptracking:InitTrackParams:MaxEtaForward=6  
-Ppodio:output_include_collections=B0TrackerRecHits,ReconstructedChargedParticles,GeneratedPart  
ticles -Ppodio:output_file=${RESULT_DIR}/sim_proton.edm4eic.tree.root  
${RESULT_DIR}/sim_proton.edm4hep.root
```

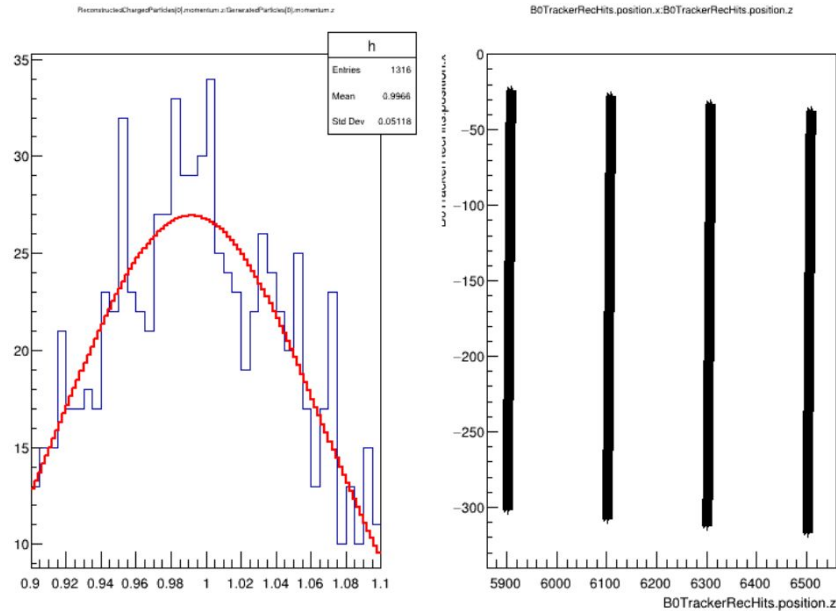
1000 total events
run.
Reconstruction
passes for 271.
~4.9% resolution
on z-momentum



Note: This wasn't working before. Navigation seemed to give up after vertex barrel and we would get no reconstructed momentum. Trying to pin down what changed but no definite clues yet

Test Run 2

Run with higher statistics (5000 events) as a consistency check



5000 total events
run.
Reconstruction
passes for 1316.
~5.1% resolution
on z-momentum

Test Run 3 (Only B0 Tracker)

Custom Config File

ebeam: 18

pbeam: 275

features:

beampipe:

tracking:

definitions:

solenoid:

far_forward:

far_forward_brycecanyon:

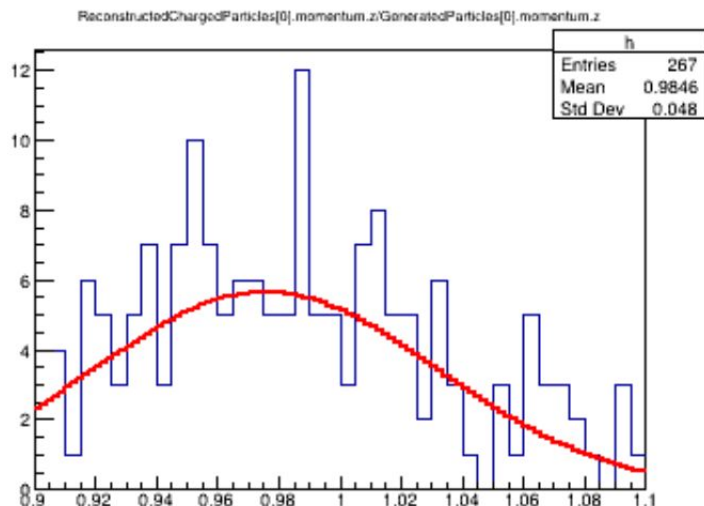
Modify tracking.cc file

```
// Tracker hits collector
app->Add(new
JChainFactoryGeneratorT<TrackerHitCollector_factory>
(
    {
        "B0TrackerRecHits"           // B0TRK
    },
    "CentralTrackingRecHits")); // Output
collection name
```

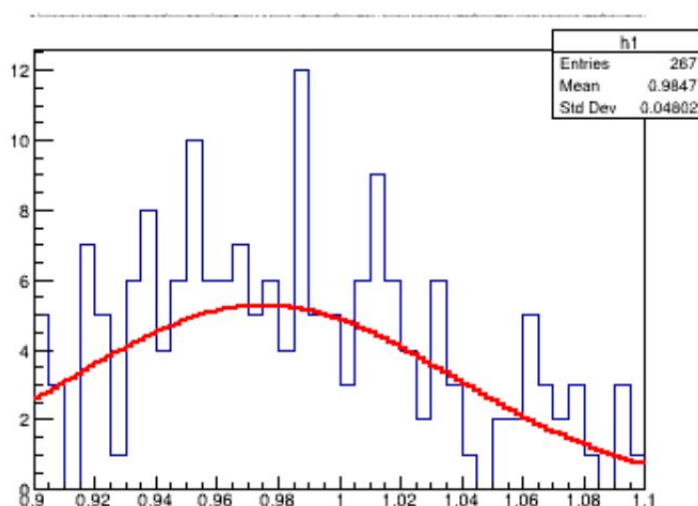
Run with different truth smearing settings

```
./eicrecon -Pplugins=janadot -Ptracking:InitTrackParams:MaxEtaForward=6  
-Ptracking:InitTrackParams:MomentumSmear=0.1  
-Ppodio:output_include_collections=B0TrackerRechHits,ReconstructedChargedParticles,GeneratedParticles,CentralTrackingRechHits -Ptracking:InitTrackParams:LogLevel=trace  
-Ppodio:output_file=${RESULT_DIR}/sim_proton_smear_0.1_nevents=1000.edm4eic.tree.root  
${RESULT_DIR}/sim_proton_nevents=1000.edm4hep.root
```

Longitudinal

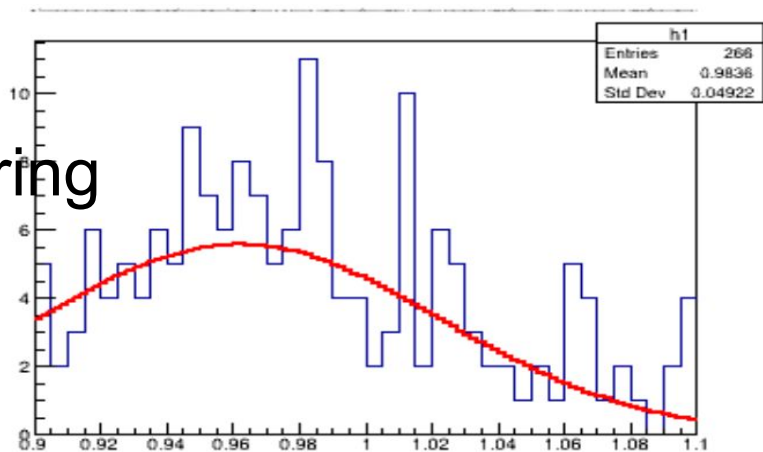
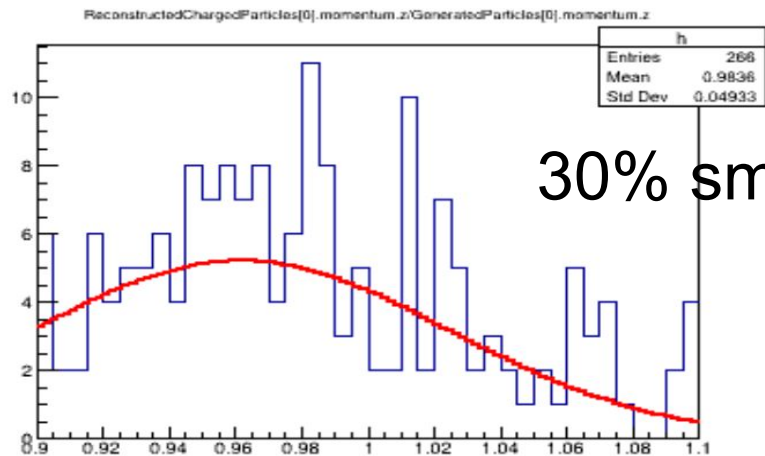
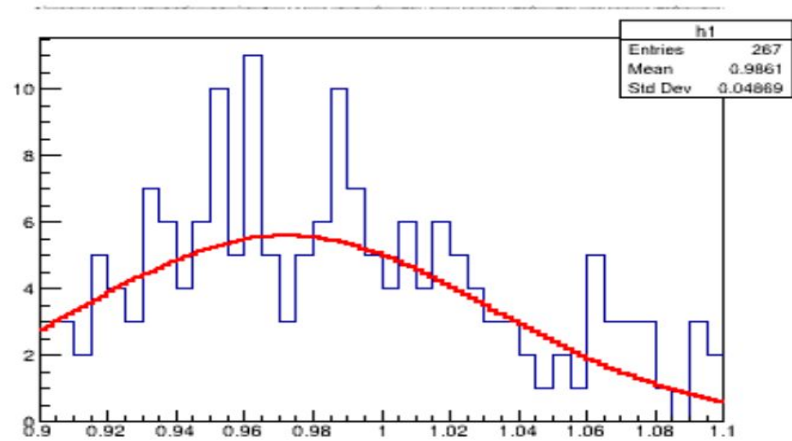
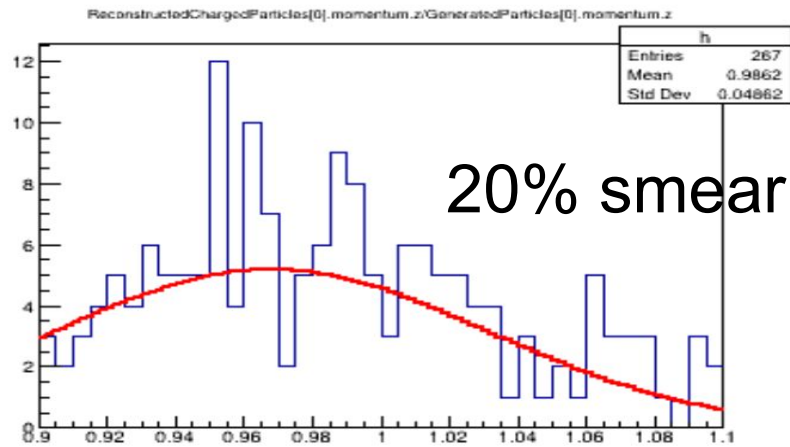


Transverse



Reconstructed/
Generated

10% smearing



To Do

- 1) Understand what changed that's making navigation to B0 work apparently. Make sure that this is not an eicrecon artifact.
- 2) Only about 20% of generated events give reconstructed momentum. Can this be improved?
- 3) Test with realistic seeder