Investigate momentum/dca reconstruction Ladder MAPS + TPC

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Setups

based on G4_Svtx_maps+tpc.C:

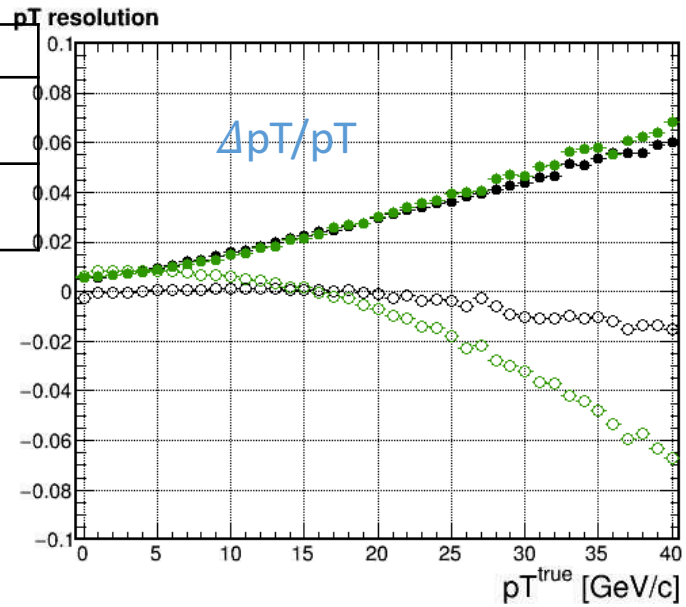
- PHG4CylinderSubsystem
- MAPS:
  - 2.3, 3.2 3.9 cm
  - 0.0050 cm
- TPC:
  - 60 layers
  - inner_readout_radius = 30. cm
  - outer_radius = 80. cm
  - delta_radius = 0.8333 cm
- Original results (no PHG4SvtxMomentumRecal) denoted as Alan.
- Added PHG4TrackKalmanFitter (GenFit), PHG4TrackFastSim (FastSim)
  - used mom(100,0,0) GeV and pos(0,0,0)cm as seed

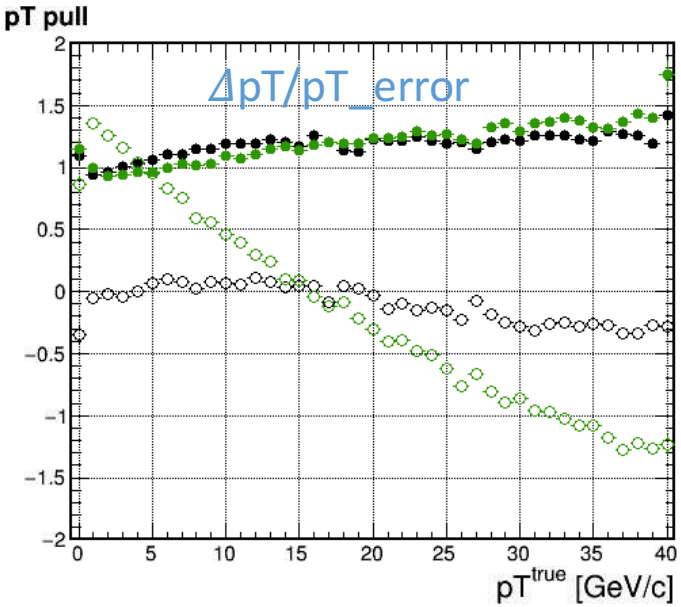
- Single pion simulation

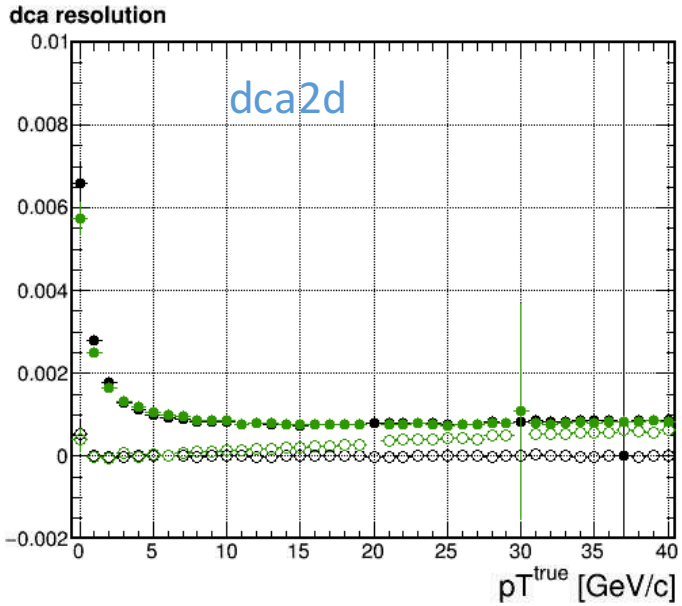
GenFit vs. Alan

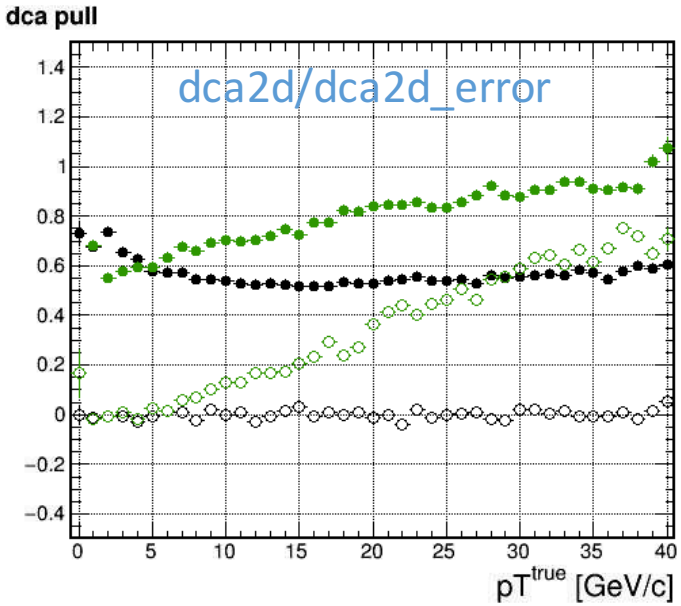
	sigma	mean
GenFit	Black dot	Black circle
Alan	Green dot	Green circle

*pT_error_Alan is now using pT_error_GenFit







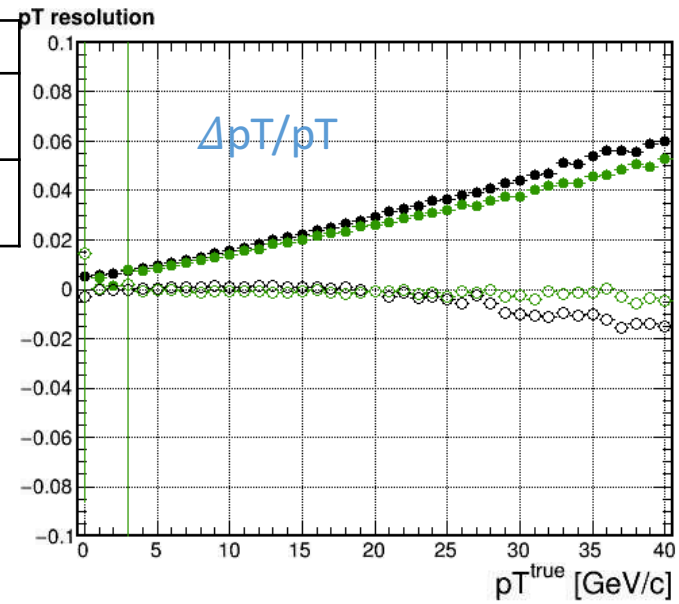


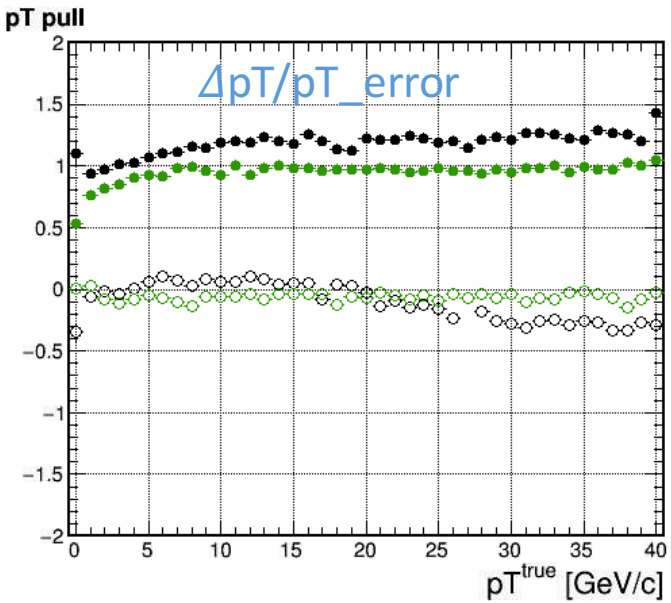
GenFit vs. FastSim

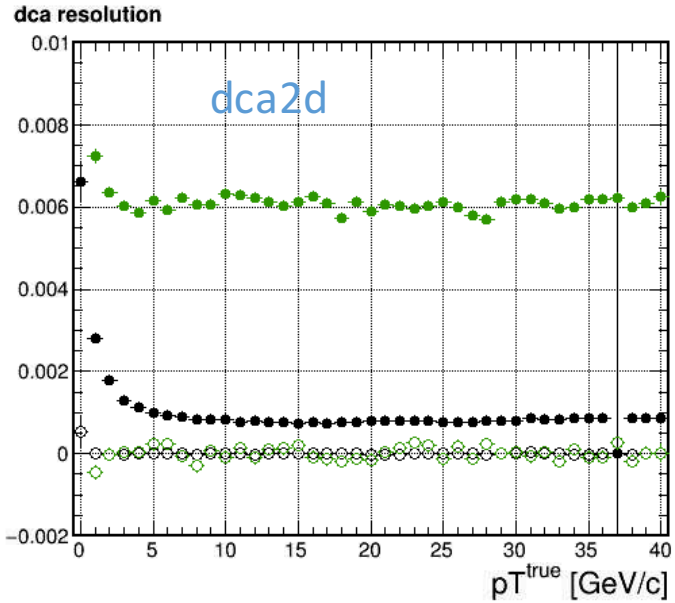
	sigma	mean
GenFit	Black dot	Black circle
FastSim	Green dot	Green circle

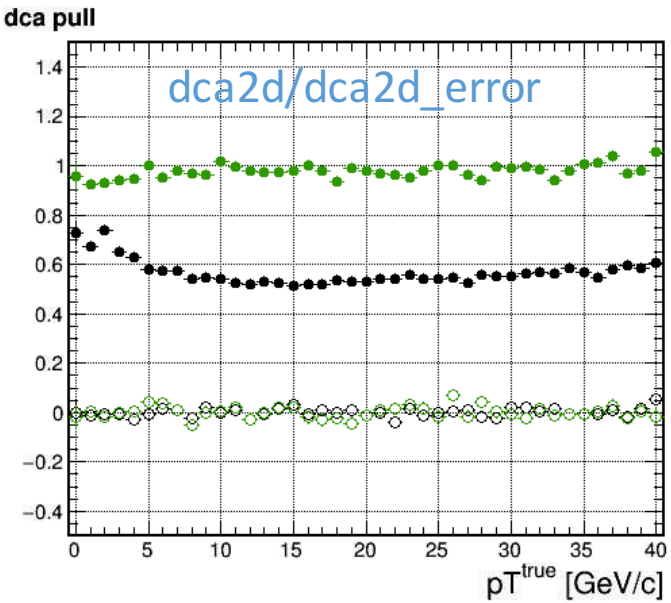
FastSim Setup:

- Takes both MAPS and TPC PHG4Hits
- Assign 100 micron resolution to both r*phi and z resolution
  - All the absolute resolutions don't reflect true detector performance
  - Offsets and pull distributions still make sense
- The reconstructed pT offset is 0.
- The dca2d pull σ is close to 1.



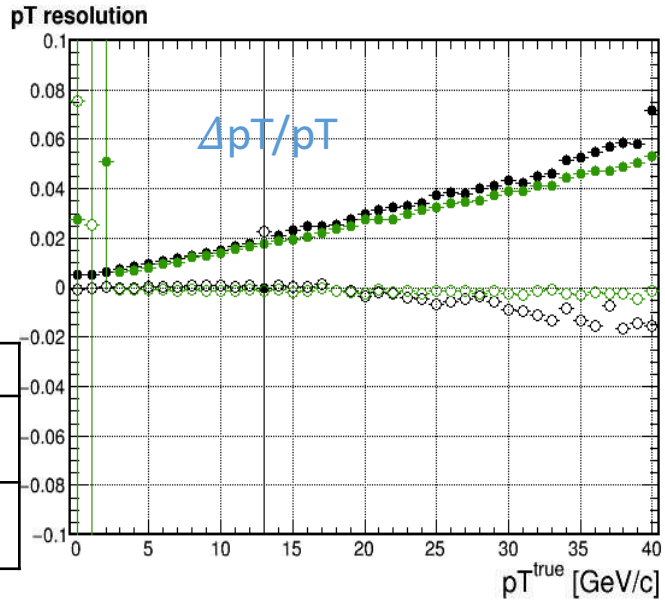


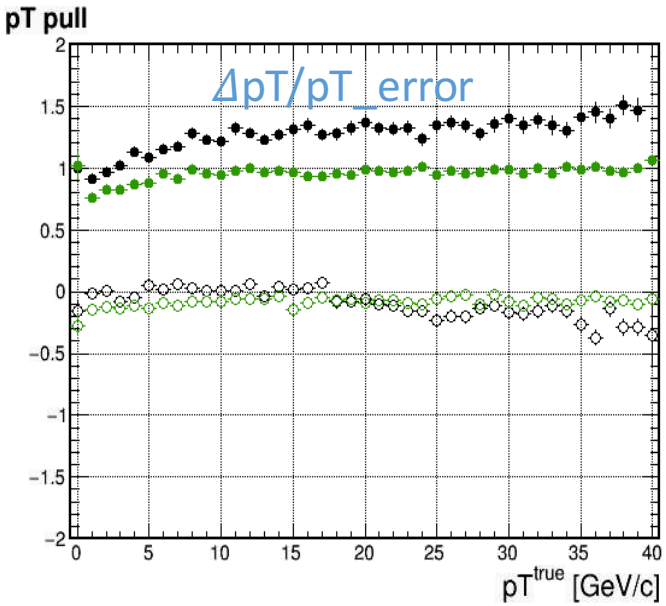


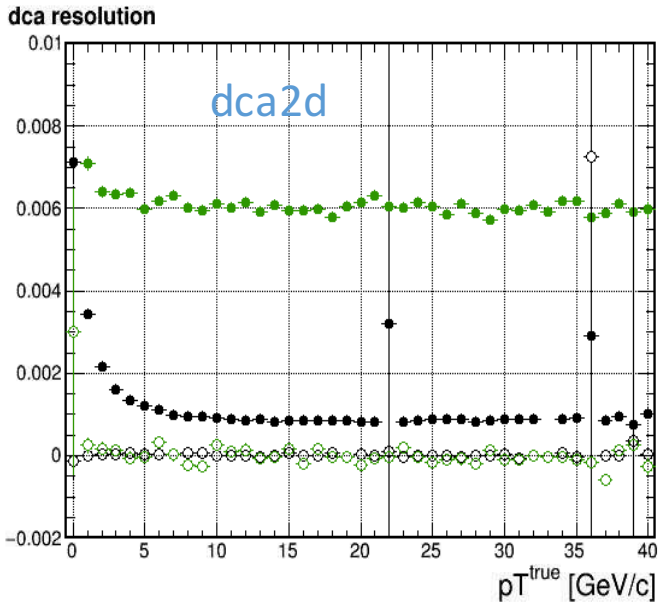


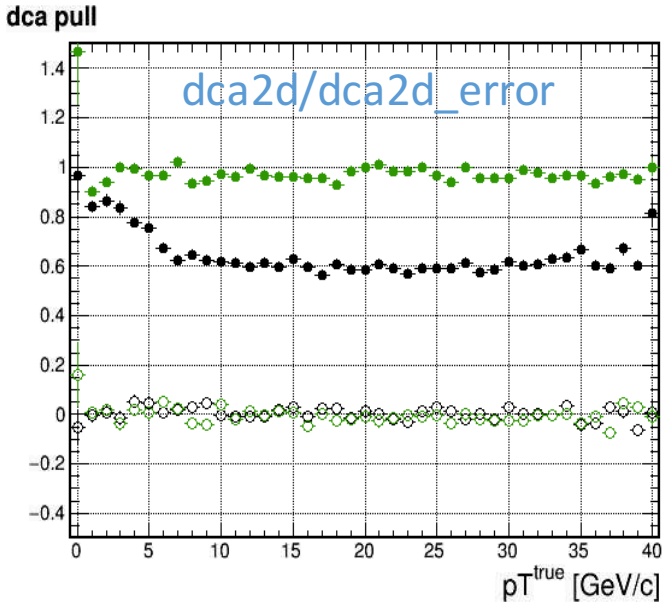
GenFit vs. FastSim cluster radii manually shifted

	sigma	mean
GenFit	Black dot	Black circle
FastSim	Green dot	Green circle



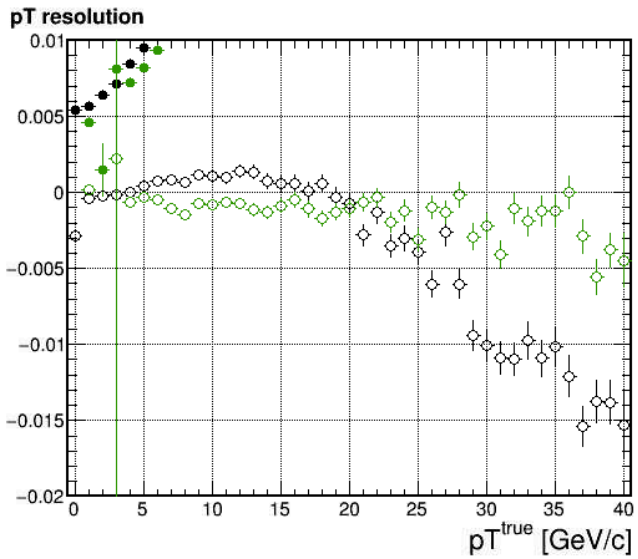


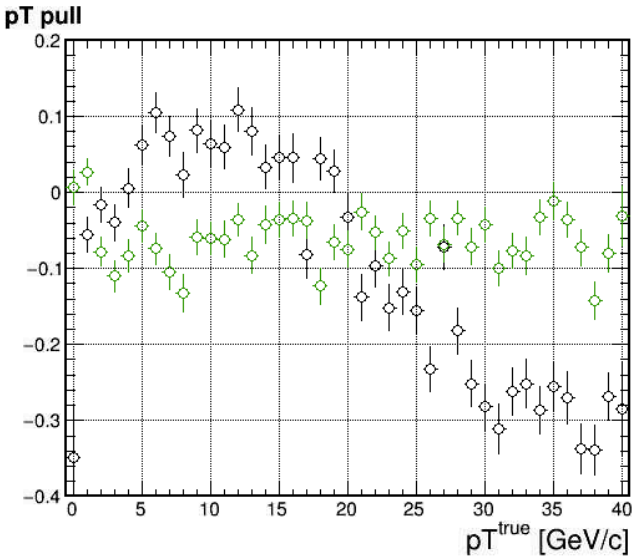




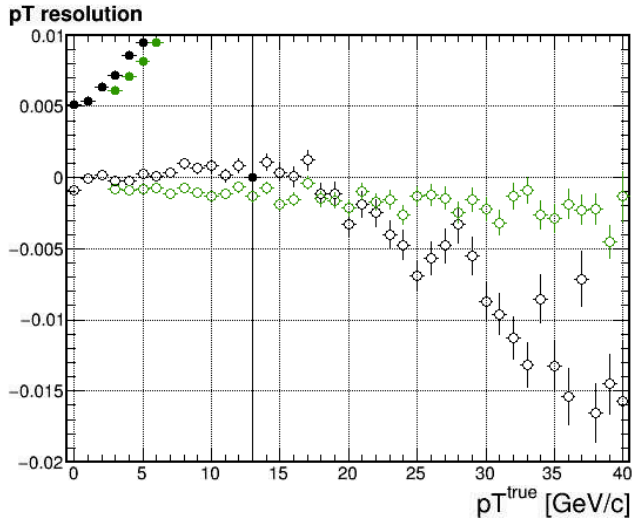
Zoom in

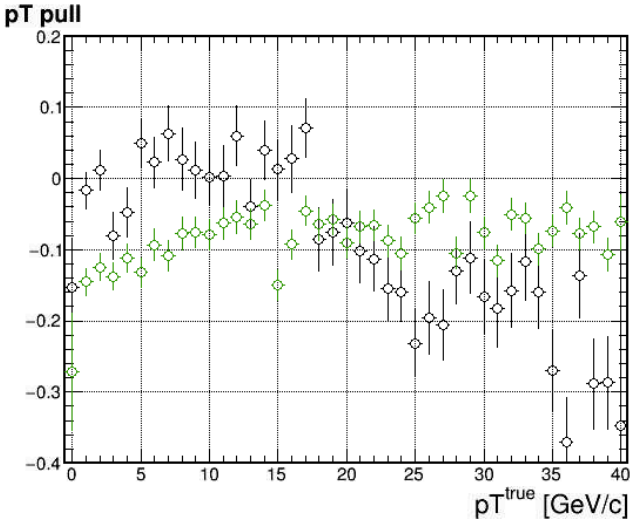
Original





Manually shift

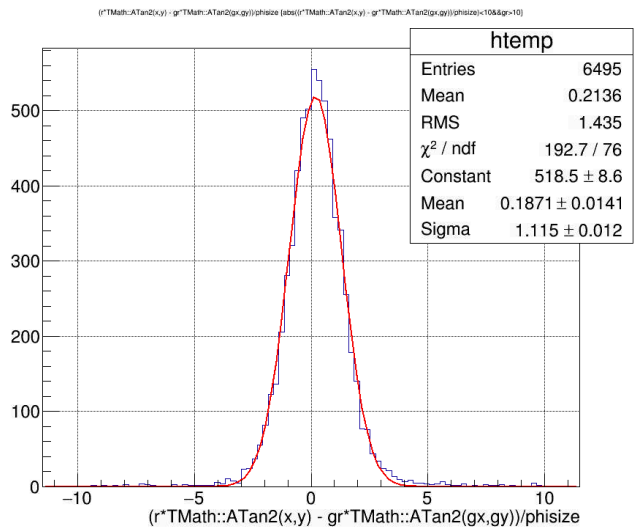




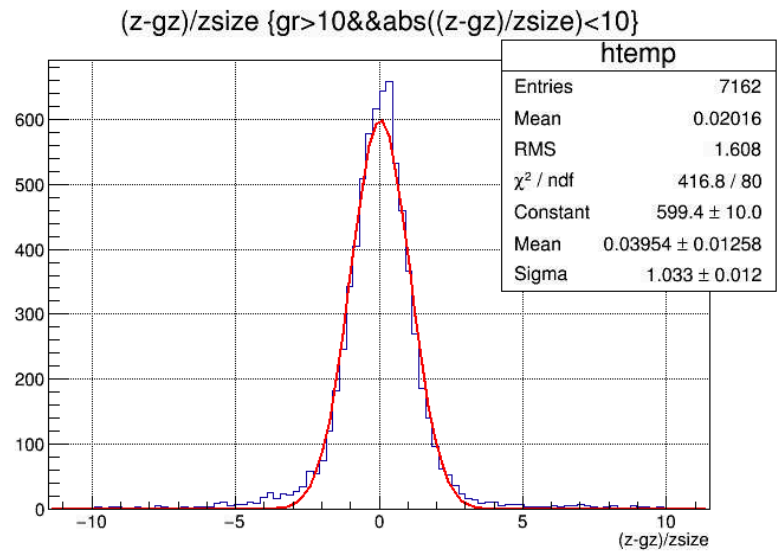
Cluster pulls using Mike's evaluator:ntp_cluster

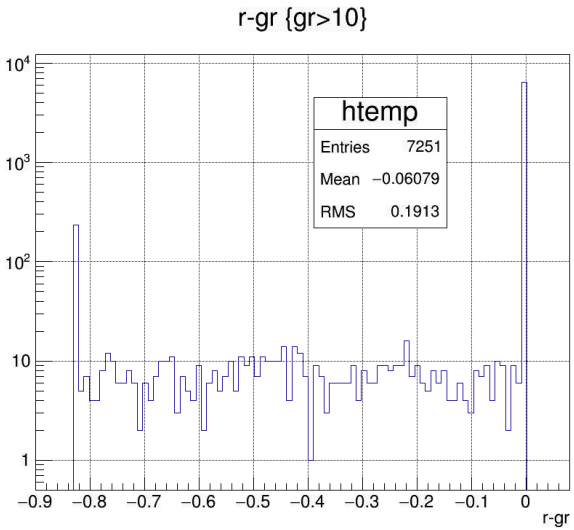
40GeV pions

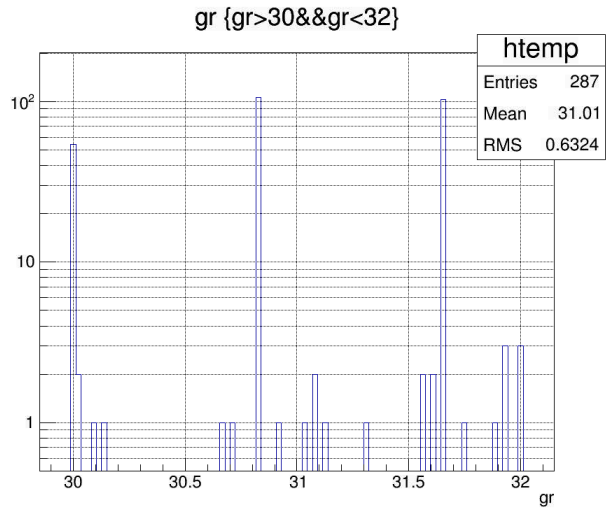
r*phi pull

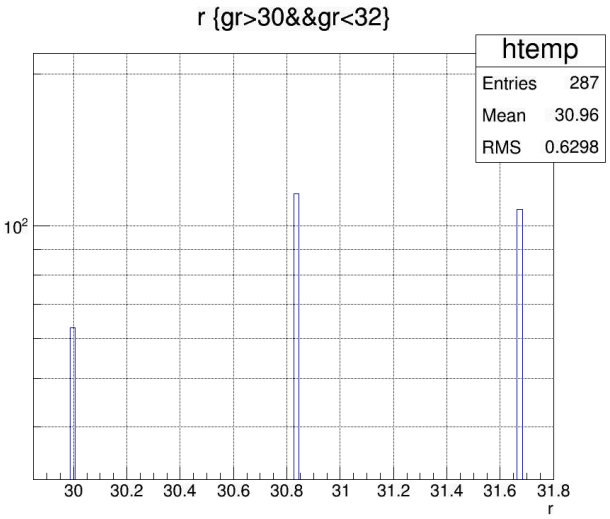


z pull





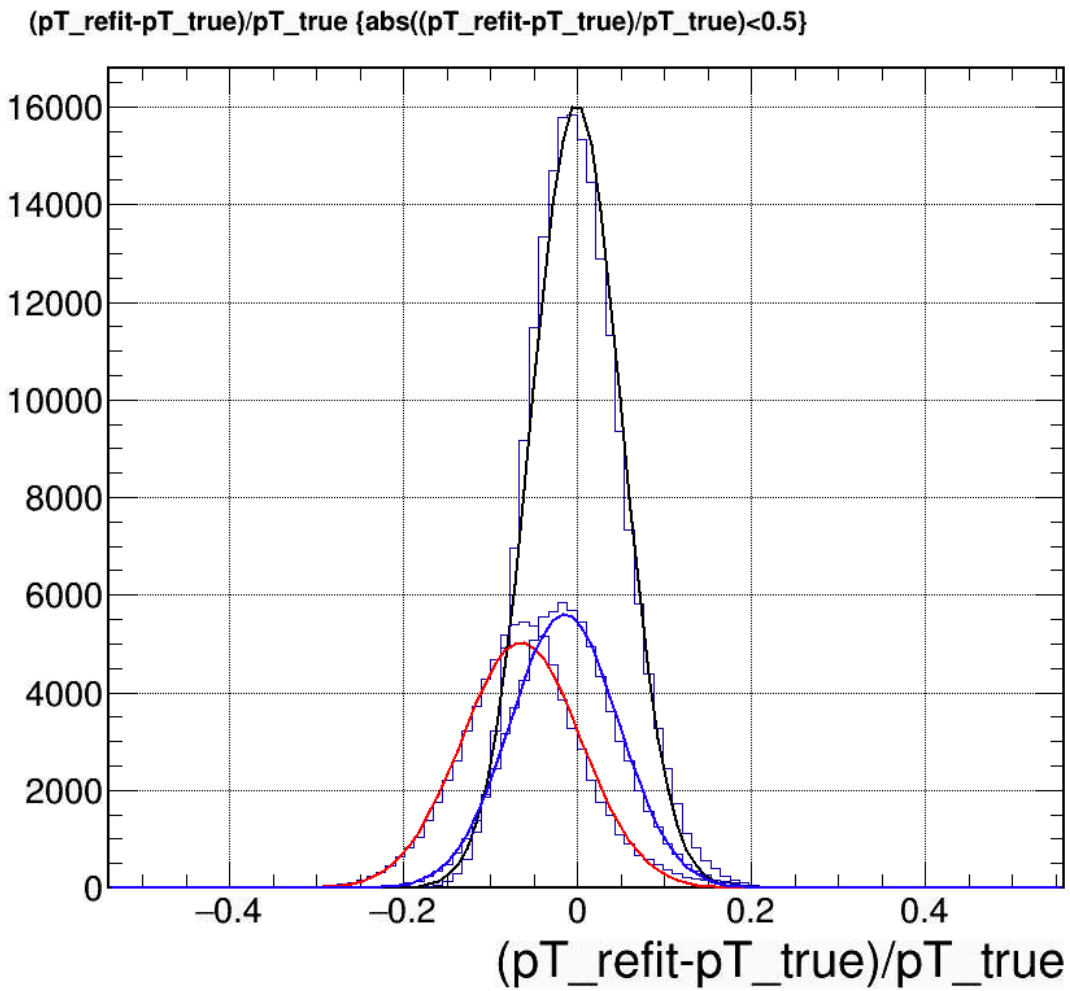




Backups:

40GeV pion after shift

	mean	sigma
FastSim	-0.15e-2	5.2e-2
GenFit	-1.5e-2	6.2e-2
Alan	6.5e-2	6.8e-2



original

```
   1 |          0       4e-06

Cluster: Plane 0 radius: 3.9
event: 1 : measurement: 2
genfit::AbsMeasurement, detId = -1. hitId = 0
Raw hit coordinates:
Vector (2)  is as follows

     |        1  |
------------------
   0 |0
   1 |0

Raw hit covariance:
2x2 matrix is as follows

     |      0    |      1    |
-------------------------------
   0 |   0.000121           0
   1 |          0      0.0009

Cluster: Plane 0 radius: 40
event: 1 : measurement: 3
genfit::AbsMeasurement, detId = -1. hitId = 0
Raw hit coordinates:
Vector (2)  is as follows

     |        1  |
------------------
   0 |0
   1 |0

Raw hit covariance:
2x2 matrix is as follows

     |      0    |      1    |
-------------------------------
   0 |   0.000121           0
   1 |          0      0.0009

Cluster: Plane 0 radius: 40.8333
event: 1 : measurement: 4
genfit::AbsMeasurement, detId = -1. hitId = 0
Raw hit coordinates:
Vector (2)  is as follows

```

```
     |      0    |      1    |
-------------------------------
   0 |     0.0001           0
   1 |          0      0.0001

PHG4Hit: Plane 0 radius: 3.90251
event: 1 : measurement: 3
genfit::AbsMeasurement, detId = -1. hitId = 0
Raw hit coordinates:
Vector (2)  is as follows

     |        1  |
------------------
   0 |0
   1 |0

Raw hit covariance:
2x2 matrix is as follows

     |      0    |      1    |
-------------------------------
   0 |     0.0001           0
   1 |          0      0.0001

PHG4Hit: Plane 0 radius: 30.4117
event: 1 : measurement: 4
genfit::AbsMeasurement, detId = -1. hitId = 0
Raw hit coordinates:
Vector (2)  is as follows

     |        1  |
------------------
   0 |0
   1 |0

Raw hit covariance:
2x2 matrix is as follows

     |      0    |      1    |
-------------------------------
   0 |     0.0001           0
   1 |          0      0.0001

PHG4Hit: Plane 0 radius: 31.245
event: 1 : measurement: 5
genfit::AbsMeasurement, detId = -1. hitId = 0
```

cluster radiii manually shifted

```
     |      0    |      1    |
------------------------------
   0 |  3.999e-06           0
   1 |          0       4e-06

Cluster: Plane O radius: 3.2025
 : measurement: 2
genfit::AbsMeasurement, detId = -1. hitId = 0
Raw hit coordinates:
Vector (2)  is as follows

     |        1  |
------------------
   0 |0
   1 |0

Raw hit covariance:
2x2 matrix is as follows

     |      0    |      1    |
------------------------------
   0 |  3.999e-06           0
   1 |          0       4e-06

Cluster: Plane O radius: 3.9025
 : measurement: 3
genfit::AbsMeasurement, detId = -1. hitId = 0
Raw hit coordinates:
Vector (2)  is as follows

     |        1  |
------------------
   0 |0
   1 |0

Raw hit covariance:
2x2 matrix is as follows

     |      0    |      1    |
------------------------------
   0 |   0.000121           0
   1 |          0      0.0009

Cluster: Plane O radius: 30.4166
 : measurement: 4
```

```
------------------------------
   0 |     0.0001           0
   1 |          0      0.0001

PHG4Hit: Plane O radius: 3.2025
 : measurement: 2
genfit::AbsMeasurement, detId = -1. hitId = 0
Raw hit coordinates:
Vector (2)  is as follows

     |        1  |
------------------
   0 |0
   1 |0

Raw hit covariance:
2x2 matrix is as follows

     |      0    |      1    |
------------------------------
   0 |     0.0001           0
   1 |          0      0.0001

PHG4Hit: Plane O radius: 3.90251
 : measurement: 3
genfit::AbsMeasurement, detId = -1. hitId = 0
Raw hit coordinates:
Vector (2)  is as follows

     |        1  |
------------------
   0 |0
   1 |0

Raw hit covariance:
2x2 matrix is as follows

     |      0    |      1    |
------------------------------
   0 |     0.0001           0
   1 |          0      0.0001

PHG4Hit: Plane O radius: 30.4117
 : measurement: 4
genfit::AbsMeasurement, detId = -1. hitId = 0
Raw hit coordinates:
```