Multi lepton

- Requested to in 1l, 2+l; 2 categories and fix filter.

  - now only for non-res, each 0.5M

  - generator choose lepton number as pt>7GeV

  - and not require from Higgs

  - 1l:2+l = 17:10

- May need additional work

Environment

- Keep in r21.9.0 solve the problem

- pt=10, 20, 100GeV single electron

  - As Et<5GeV may not interested;

  - No specific clusters selection in forward

    - since usually only 1 candidate left after Et cut.

Current cluster selection:
- Et>5GeV
- $|\frac{E_{t,had}}{E_t}| < 0.12$ in central;
- $\frac{E_{237}}{E_{277}} > 0.65$ in central;

100GeV electron brem Fit

45k, r21	All	Barrel	Trans	EndCap	Forward
Number of candidate tracks	**94720**	**9501**	**11288**	**29749**	**44173**
-candidates rejected score 0	2015	1	21	1719	265
-candidates rejected as double	0	0	0	0	0
candidates with good score	96146	9022	10184	28042	48898
+ recovered after brem refit	**37**	**1**	**5**	**28**	**3**
candidates rejected score 0	3015	11	71	1047	1886
+ rejected failed brem refit	28	0	1	19	8
+ rejected brem refit score 0	7525	101	495	5336	1593
number of normal fits	78332	8815	9727	23774	36016
+ 2nd brem fit for failed fit	292	6	40	226	20
normal brem fits for electrons	**2917**	**251**	**580**	**1869**	**217**
sum of successful fits	88880	9169	10826	31061	37824
sum of failed fits	212	3	23	153	33
Number of subtracks created	25939	78	514	9145	16202
Number of candidates excluded	29302	676	1701	7321	19604
Number of tracks accepted	**52651**	**8708**	**8977**	**14176**	**20790**
including number of brem fits	**1975**	**219**	**458**	**1197**	**101**

In total about 4% tracks would be brem fitted, and forward 0.5%.

Force Brem Fit

```
InDetFlags.doBremRecovery.set_Value_and_Lock(True);
InDetFlags.doCaloSeededBrem.set_Value_and_Lock(False);
```

45k, pt100GeV, force Brem Fit	All	Barrel	Trans	EndCap	Forward
Number of candidates	94382	9502	11291	29749	43831
+ recovered after brem refit	290	5	41	194	50
normal brem fits for electrons	3199	252	578	1811	558
Number of tracks accepted	51764	8696	8924	13342	20802
including number of brem fits	2140	221	457	1167	295

Forward brem fitted electrons would be 3 times if force brem fit. In total 4.8% are fitted. The sample is generated in old step 2.2. For Nick's result:

Latest, 500, pt100GeV, force Brem Fit	All	Barrel	Trans	EndCap	Forward
Number of candidates	647	116	130	177	224
+ recovered after brem refit	0	0	0	0	0
normal brem fits for electrons	20	0	8	12	0
Number of tracks accepted	529	105	104	129	191
including number of brem fits	14	0	7	7	0

Even we do not do the calo seeded Brem Fit, the default run would not run in the forward region. So the ratio could be improved. But need further study.

10GeV Fit

TopoClusters, r20, 50k, pt10GeV	All	Barrel	Trans	EndCap	Forward
Number of candidates	74428	11114	12075	18645	32578
+ recovered after brem refit	328	67	92	150	19
normal brem fits for electrons	4596	1242	1619	1648	87
Number of tracks accepted	48184	9031	8869	11192	19092
including number of brem fits	2392	615	813	904	60

TopoClusters, r21, 50k, pt10GeV	All	Barrel	Trans	EndCap	Forward
Number of candidates	74966	10490	11353	19163	33951
+ recovered after brem refit	252	52	64	120	16
normal brem fits for electrons	4582	797	1252	2304	229
Number of tracks accepted	50305	9489	9373	11713	19730
including number of brem fits	4197	850	1229	1964	154

Here the ratio (8.4%) is even larger.

GSF Fit

- Cluster/Track match algorithm is complex

  - layers, extrapolations……

- Replace the EtaBE(2) and PhiBE(2) to Eta() and Phi()

  - Could extend to eta 3.2; EMEC constrain;

- For Eta>3.2, directly match cluster/track eta and phi;

  - temporary method……

- Now GSF is in full range

  - about 1:0.98 : InDetTrackParticles vs GSF;

Number of reco tracks per event

About 6% sample would be vetoed and no tracks generated;
About 13% sample would have more than 1 track. (no preference for central or forward.)

NTracks per event

e, 45k, pt100GeV

InDetTrackParticles:1.17

GSFTrackParticles:1.15
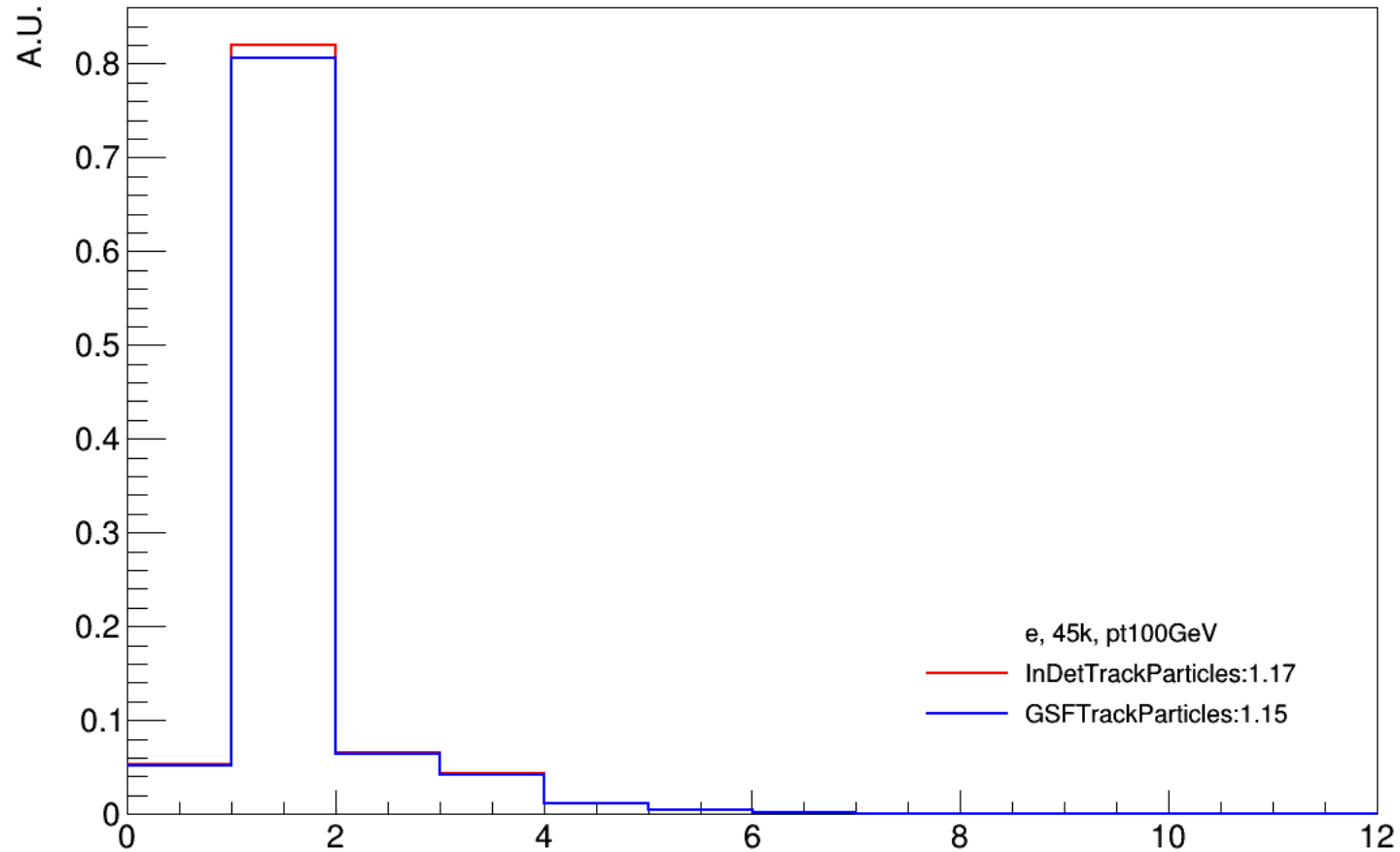
pt_vs_eta

Generally: 45k events
InDetTrackParticles: 49020;
GSFTrackParticles: 48504;

InDetTrackParticles
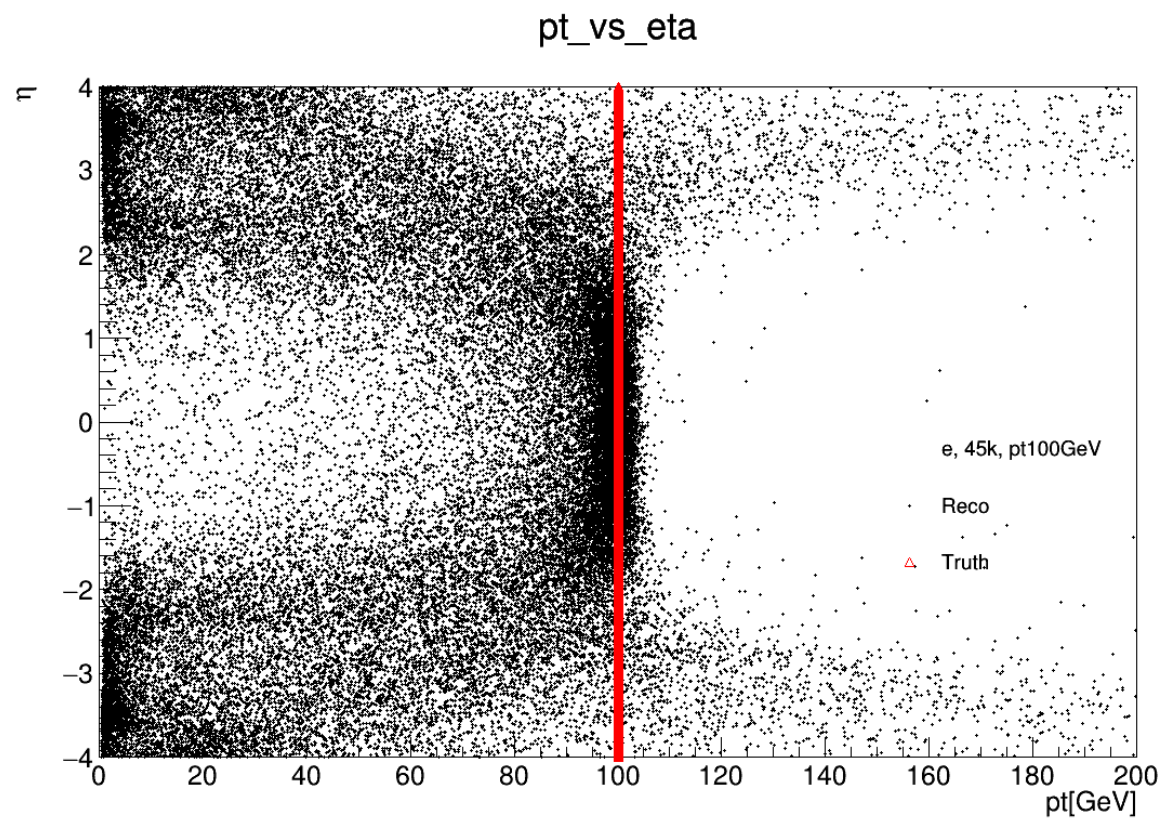
GSFTrackParticles
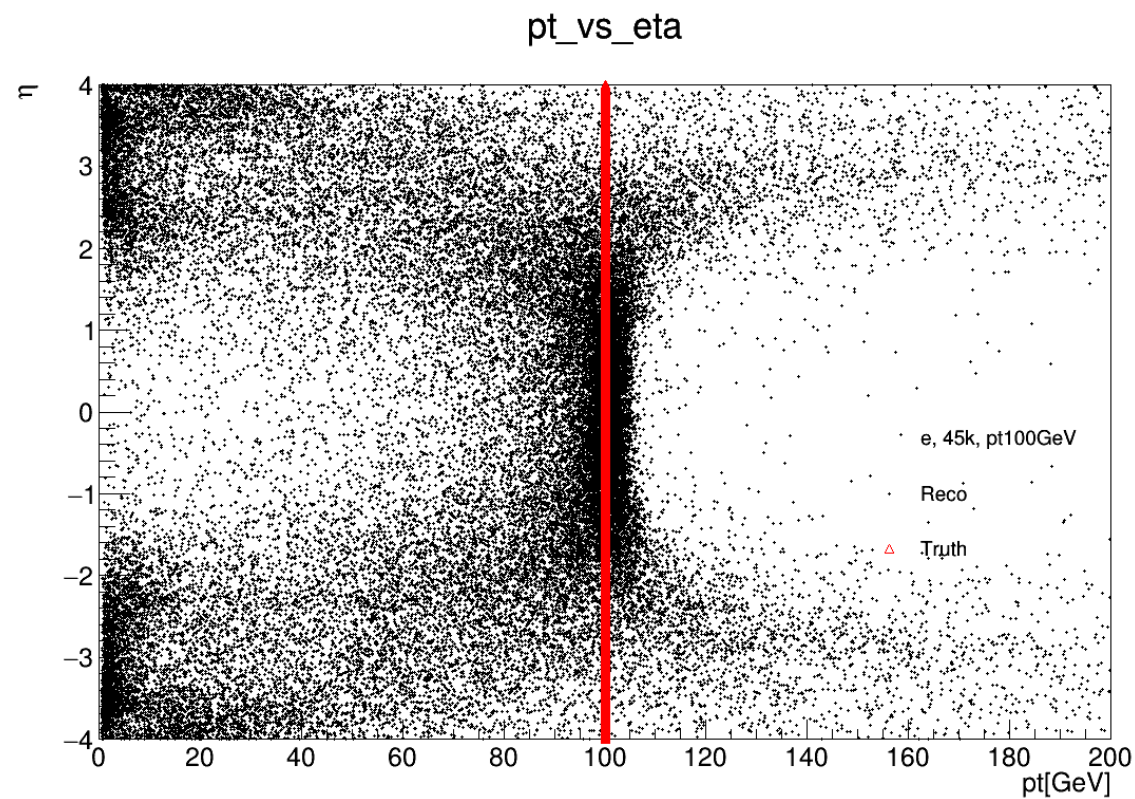
Forward region, the reco pt is not close to 100GeV.

Eta:

We can directly see there are more tracks in forward region in reconstruction.
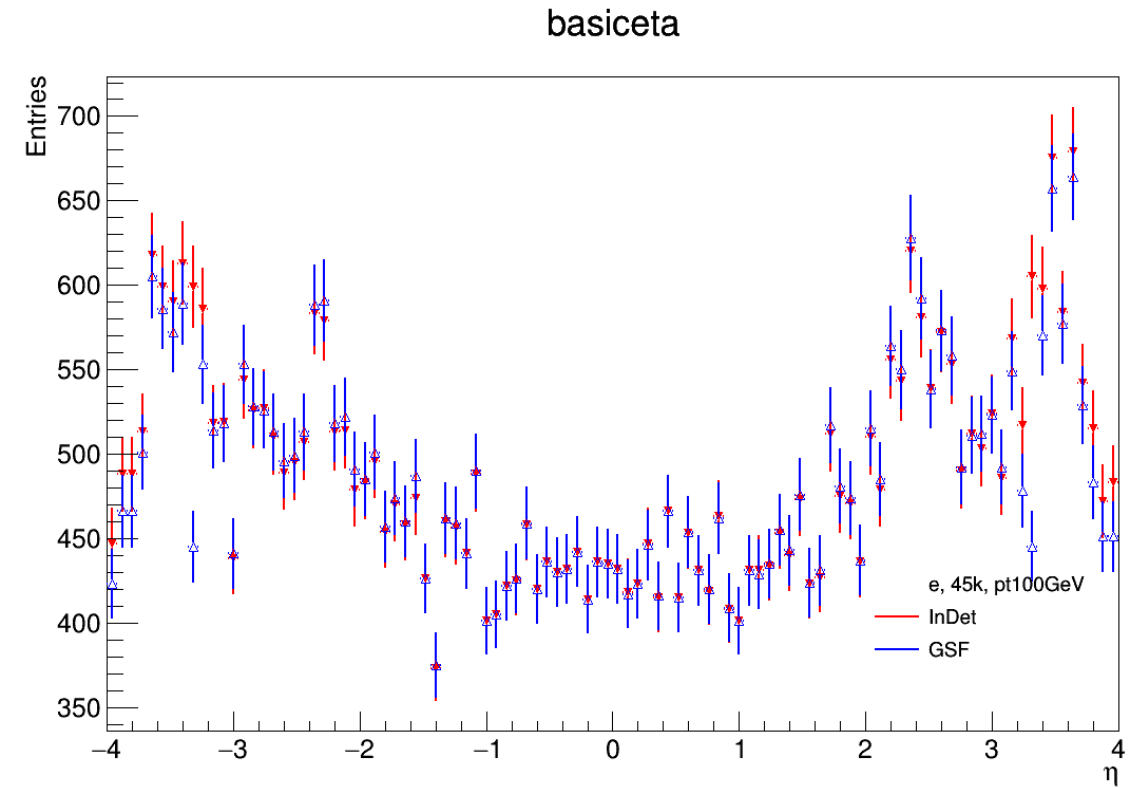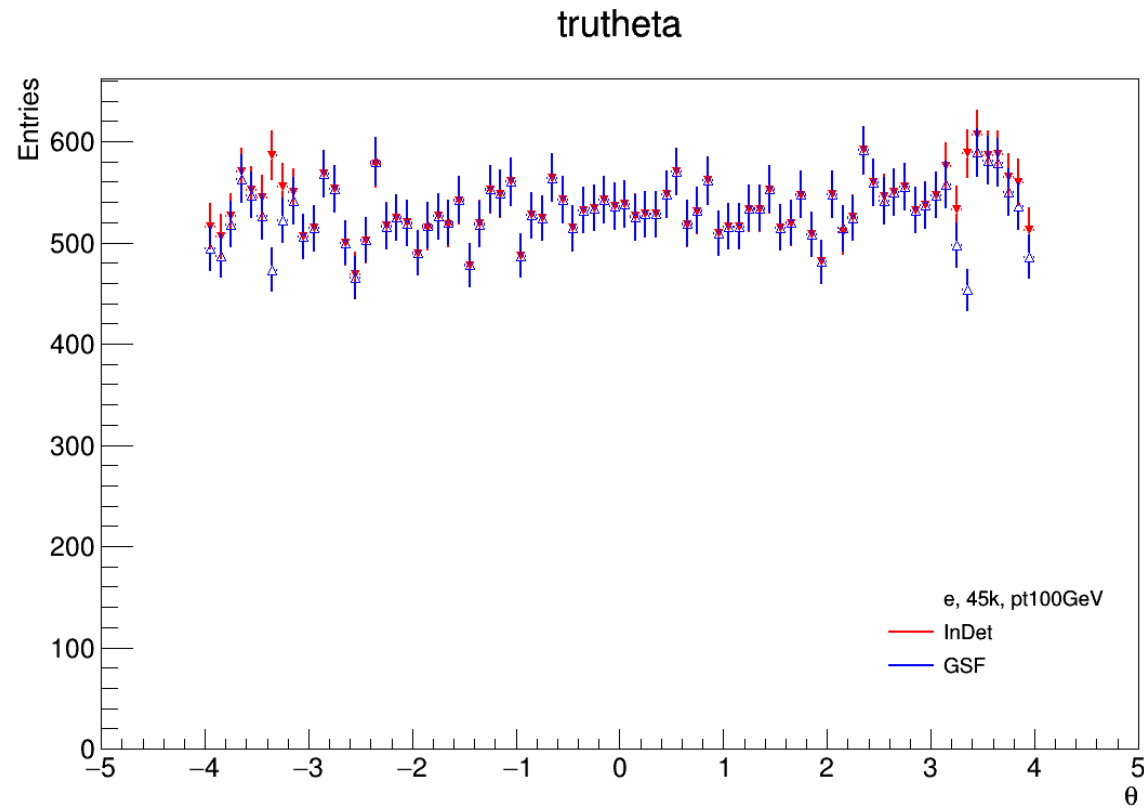
Efficiency_Eta

And GSF mainly failed in |Eta|>3.2 region. (3.2~3.6, 3.6~4.0)

trackeff_vs_eta

e, 45k, pt100GeV

InDet

GSF
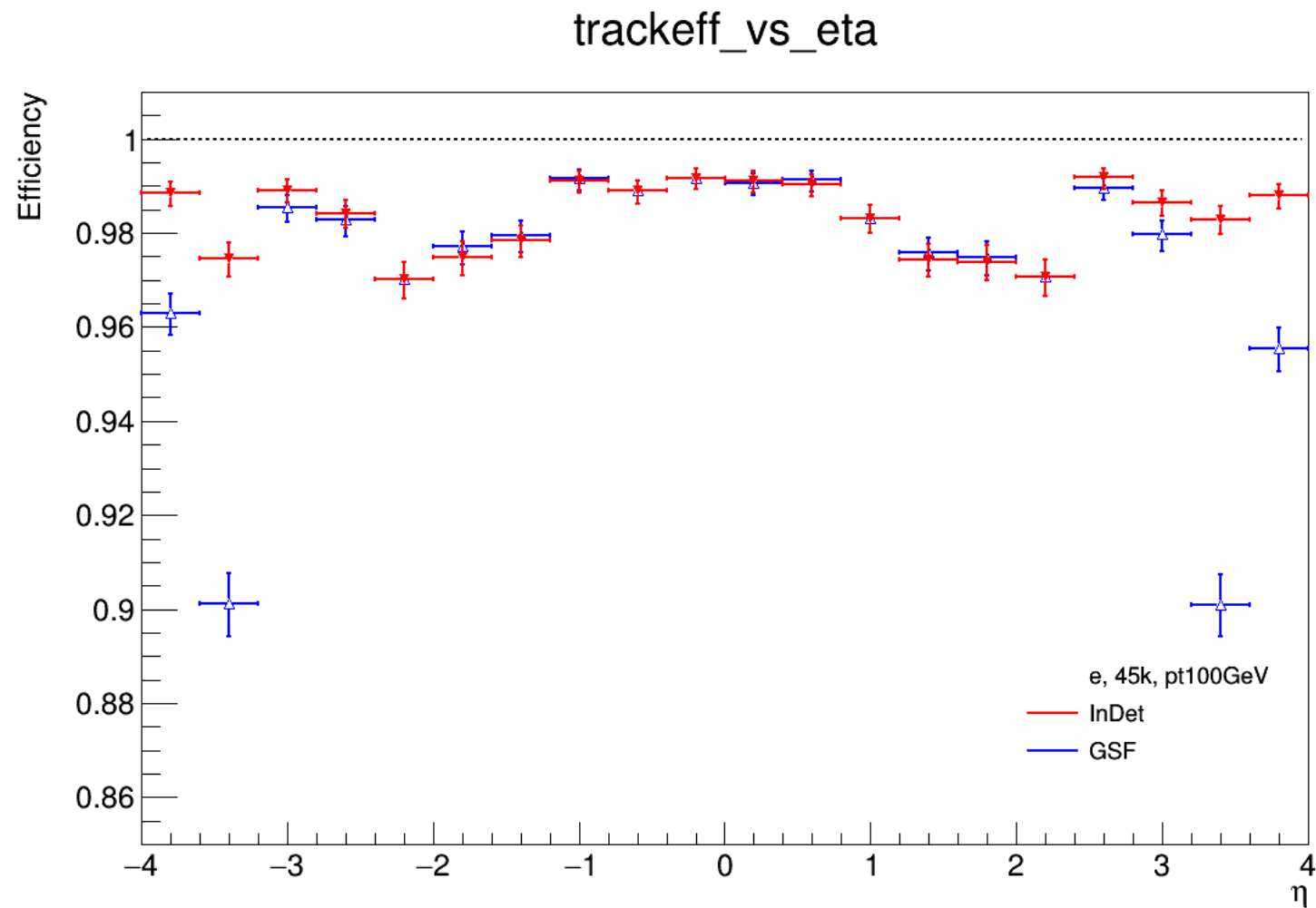
Phi:

Nearly uniform for Phi.

Theta:

Reco_Pt
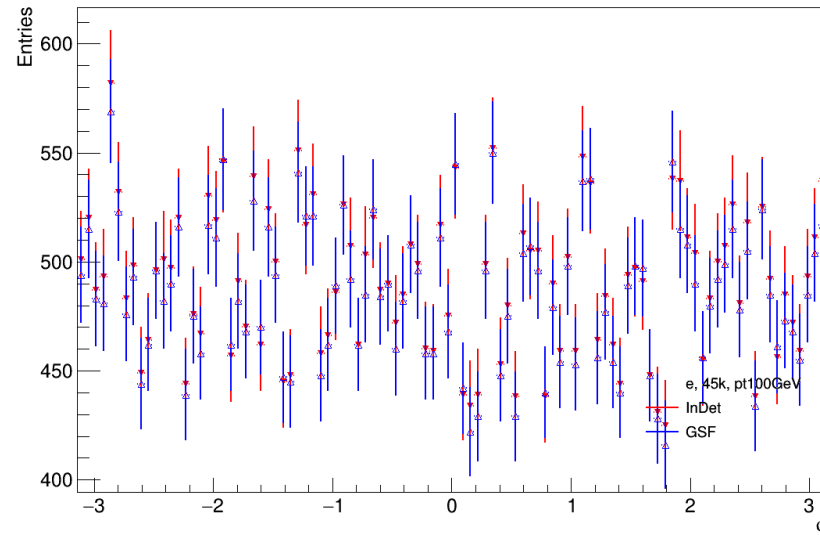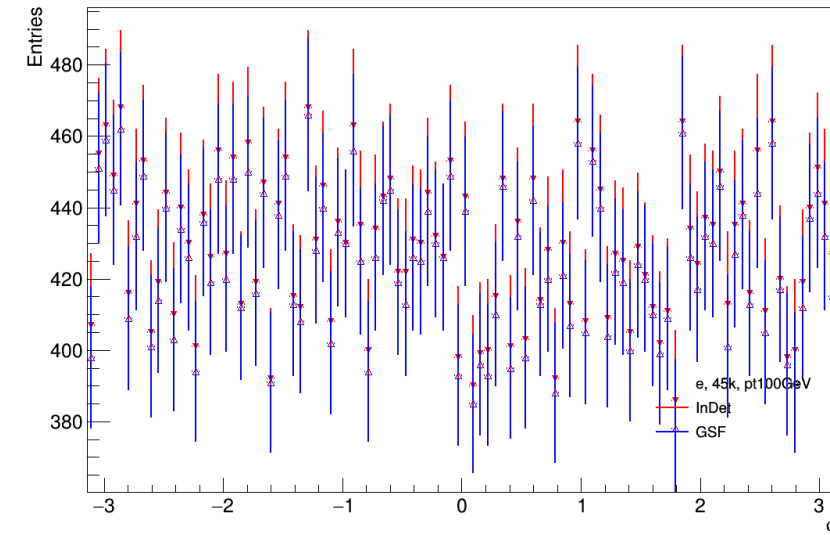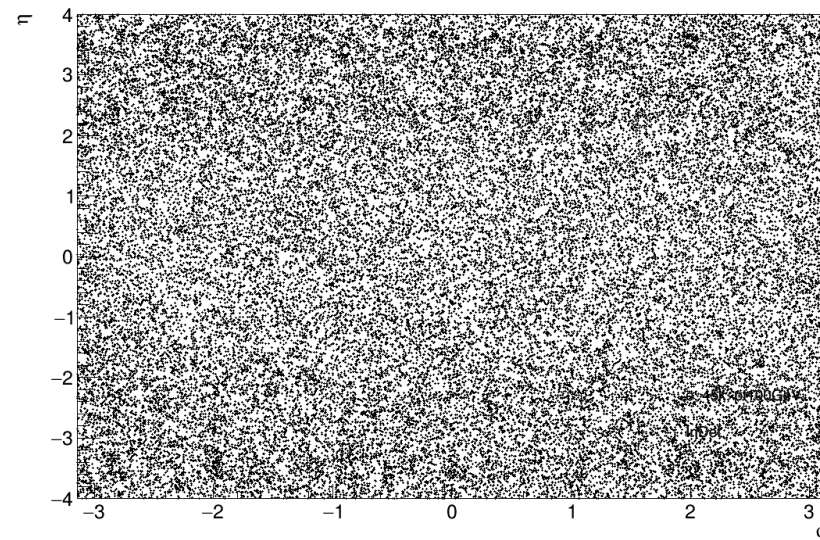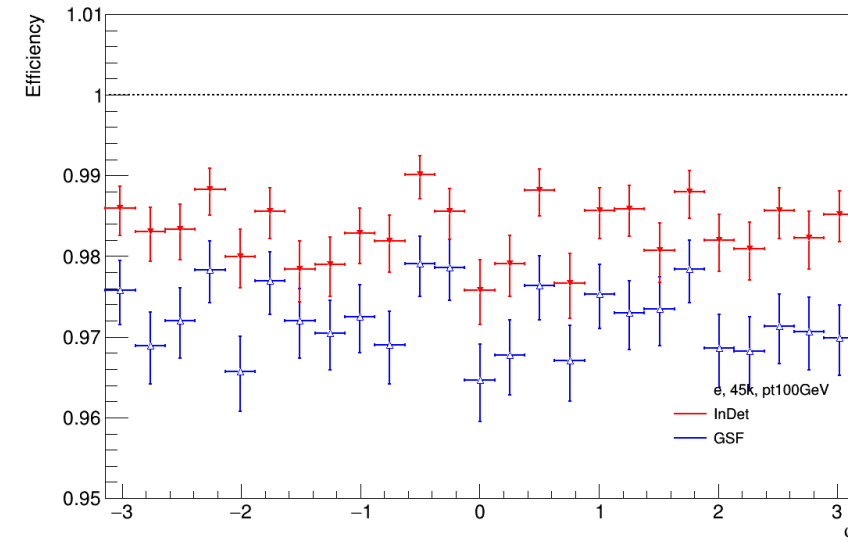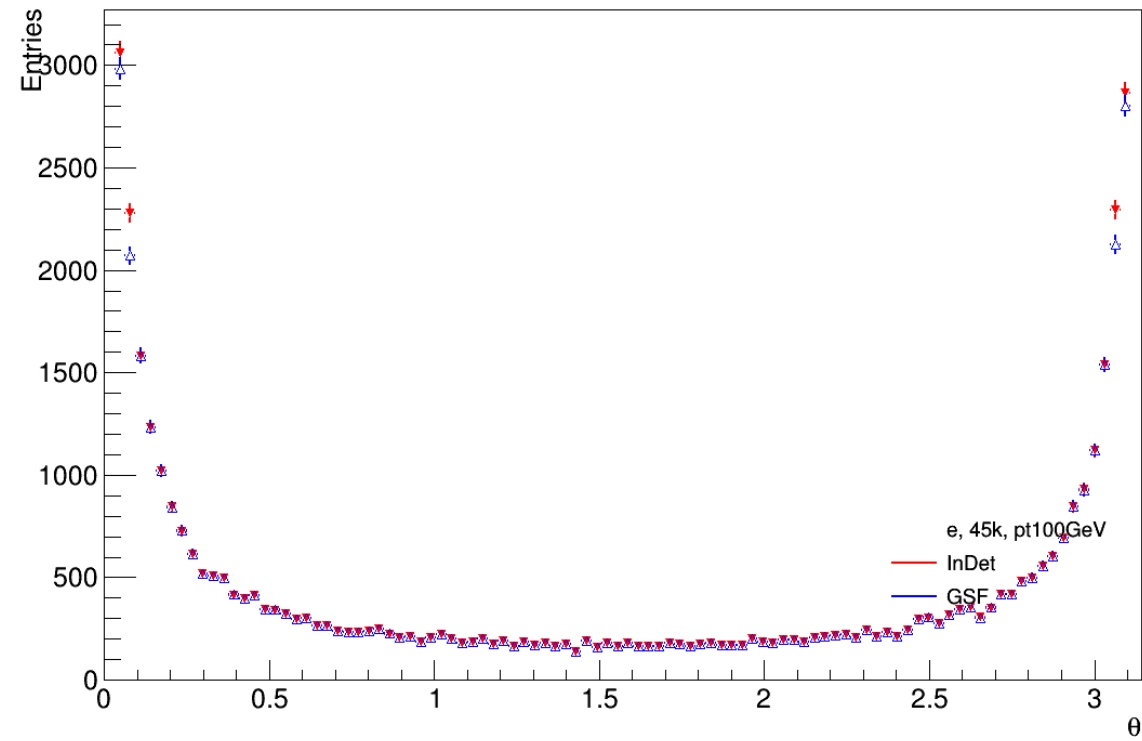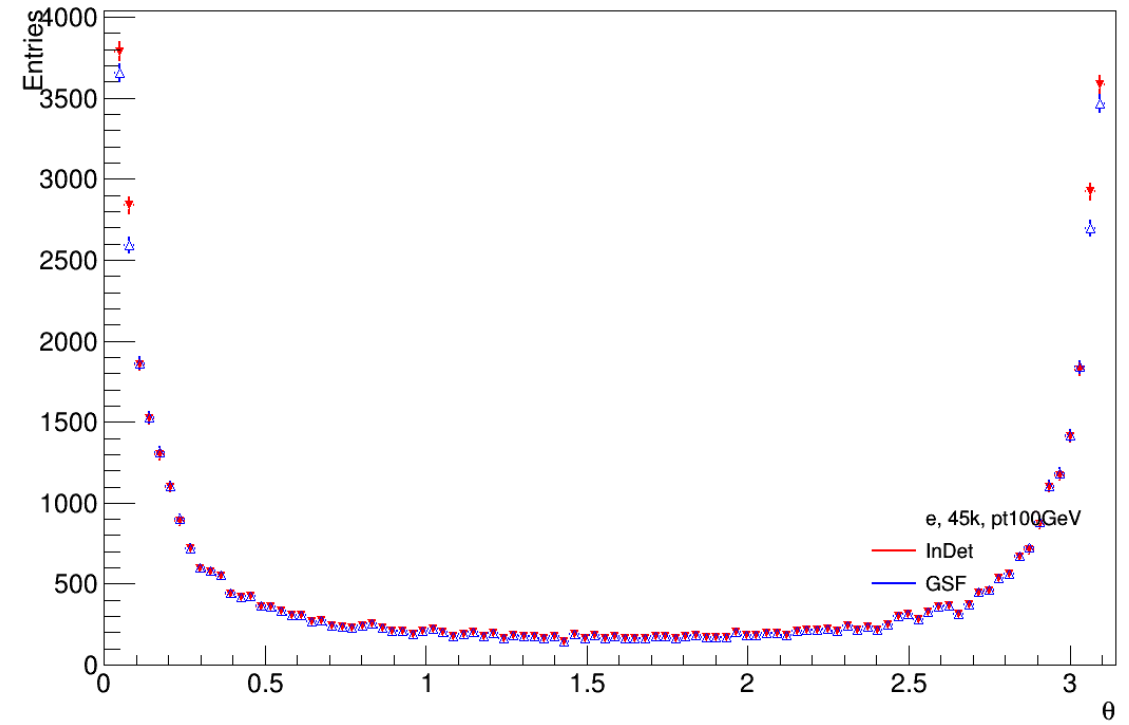
pt of selected reco tracks
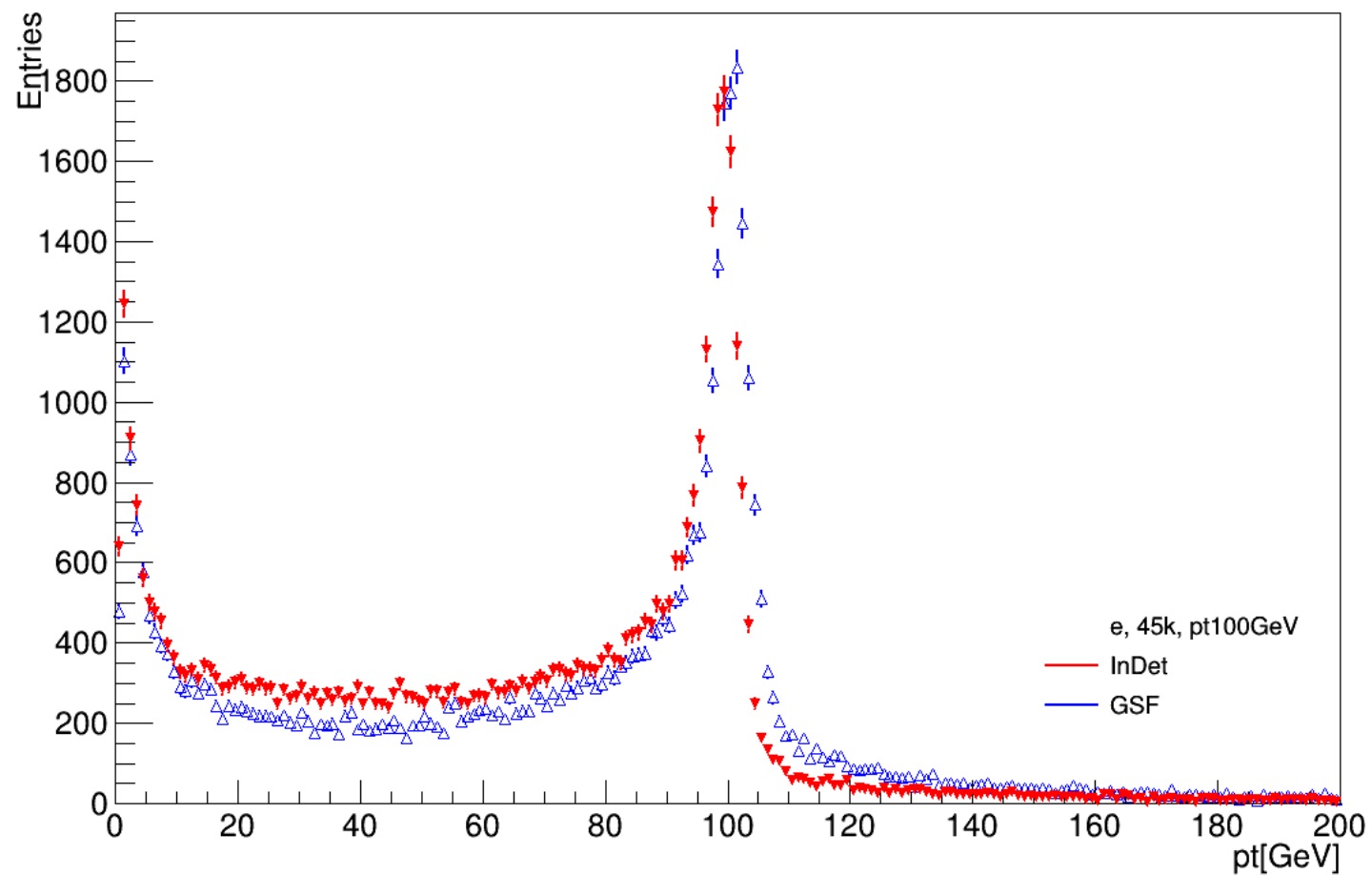
InDetTrackParticles
Mean: 63.89;
GSFTrackParticles
Mean: 71.46

Chi2 fit

IDPerformanceMon_Tracks_SelectedGoodTrackschi2ndof
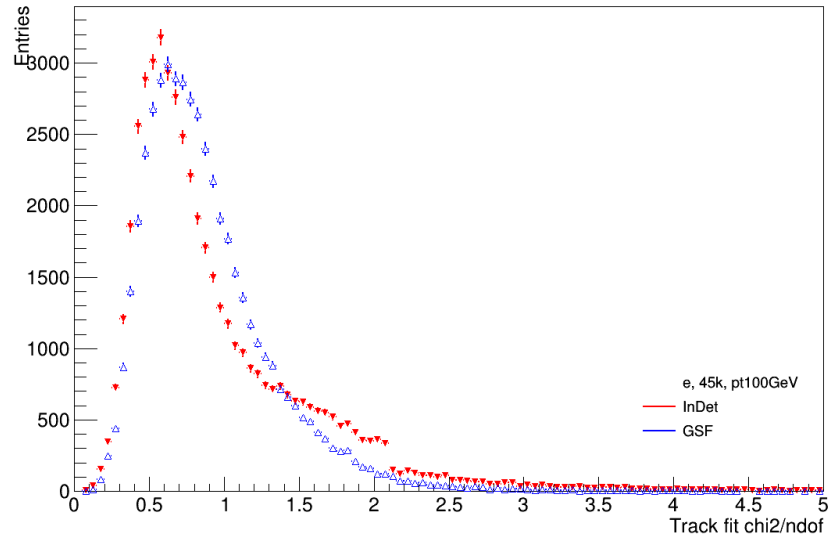
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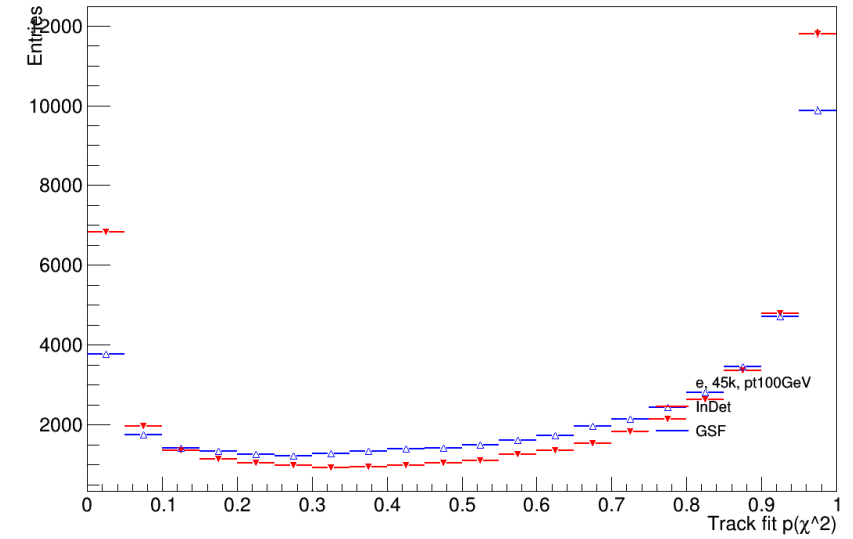
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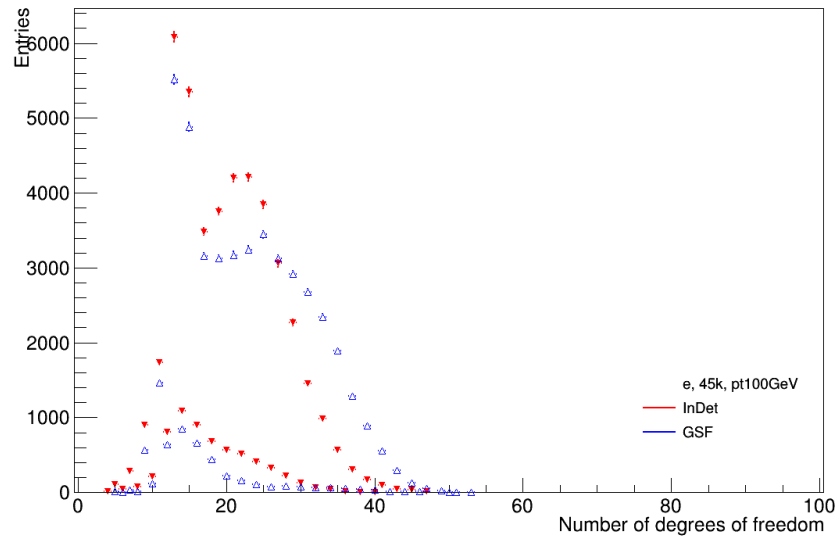
IDPerformanceMon_Tracks_SelectedGoodTrackstchi2

Z0
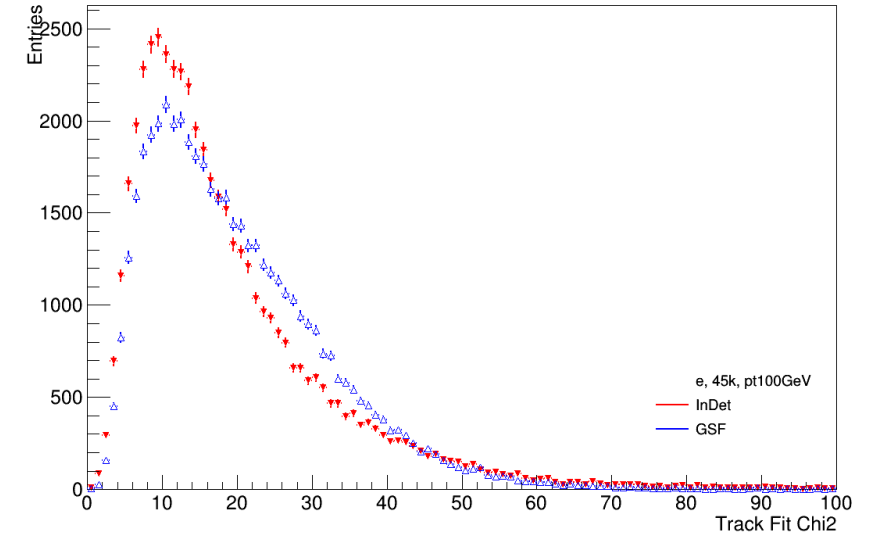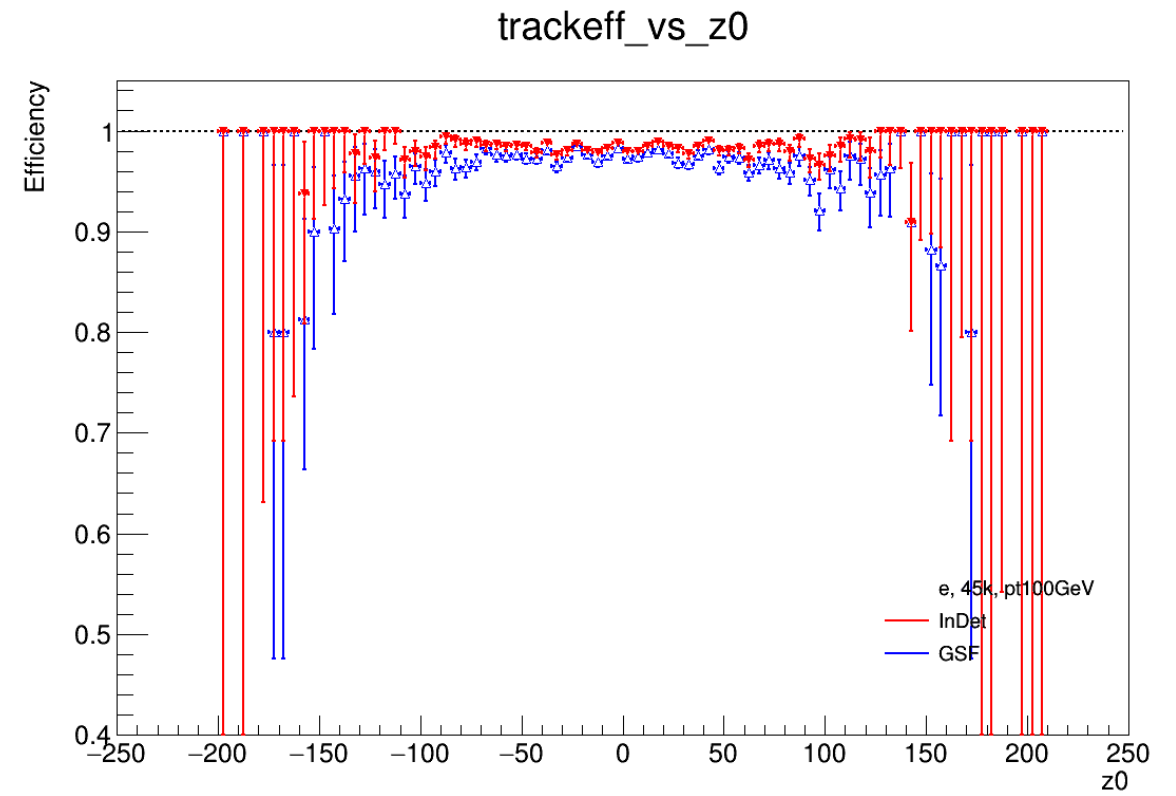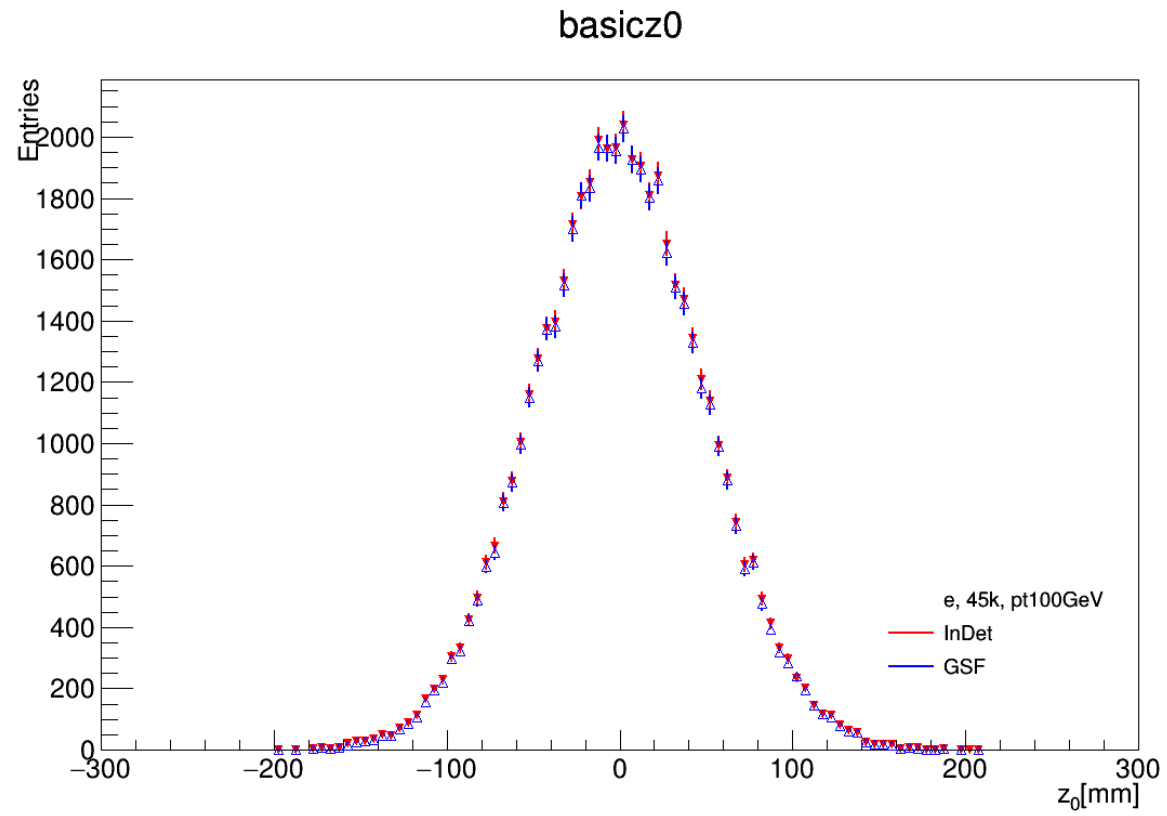
Q over Pt

qoverptmeanRMS_vs_eta
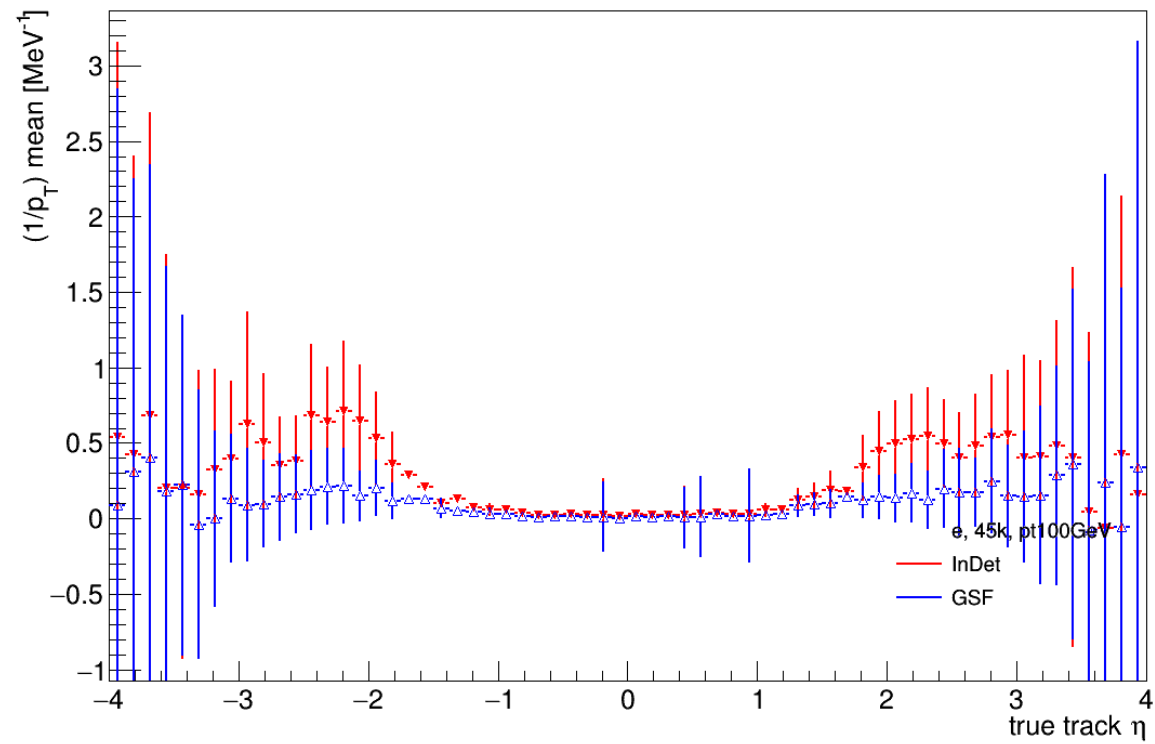
qoverptpullmeanRMS_vs_eta
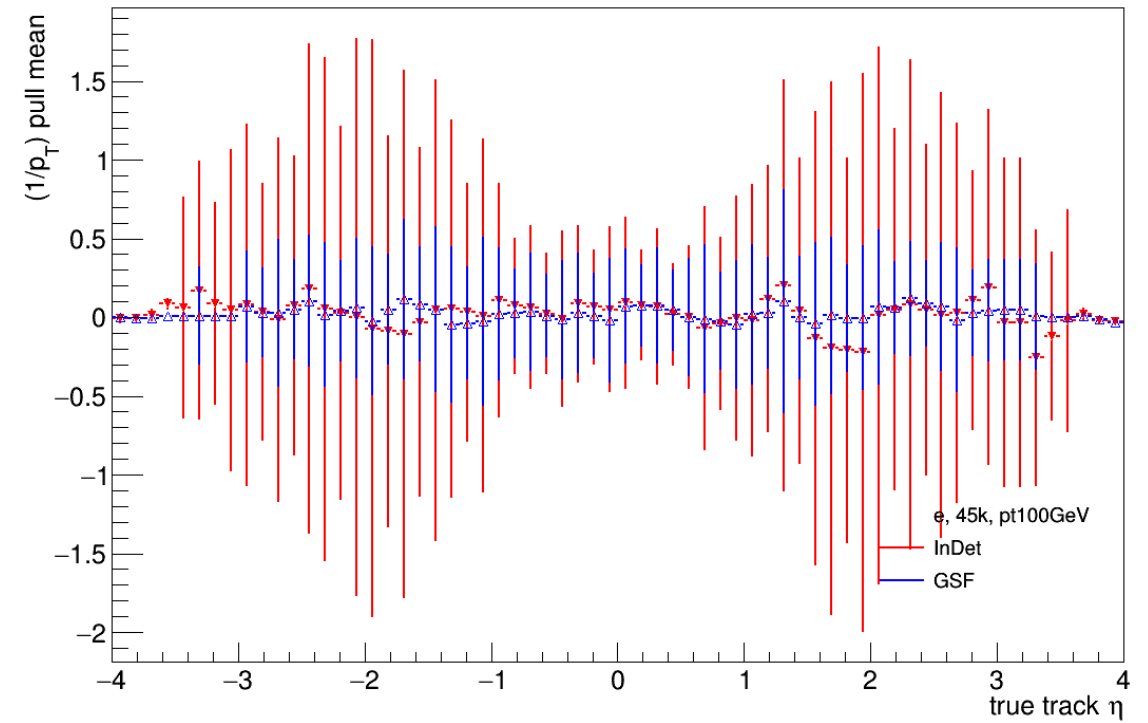
Q over Pt

qoverptpullresolutionRMS_vs_eta
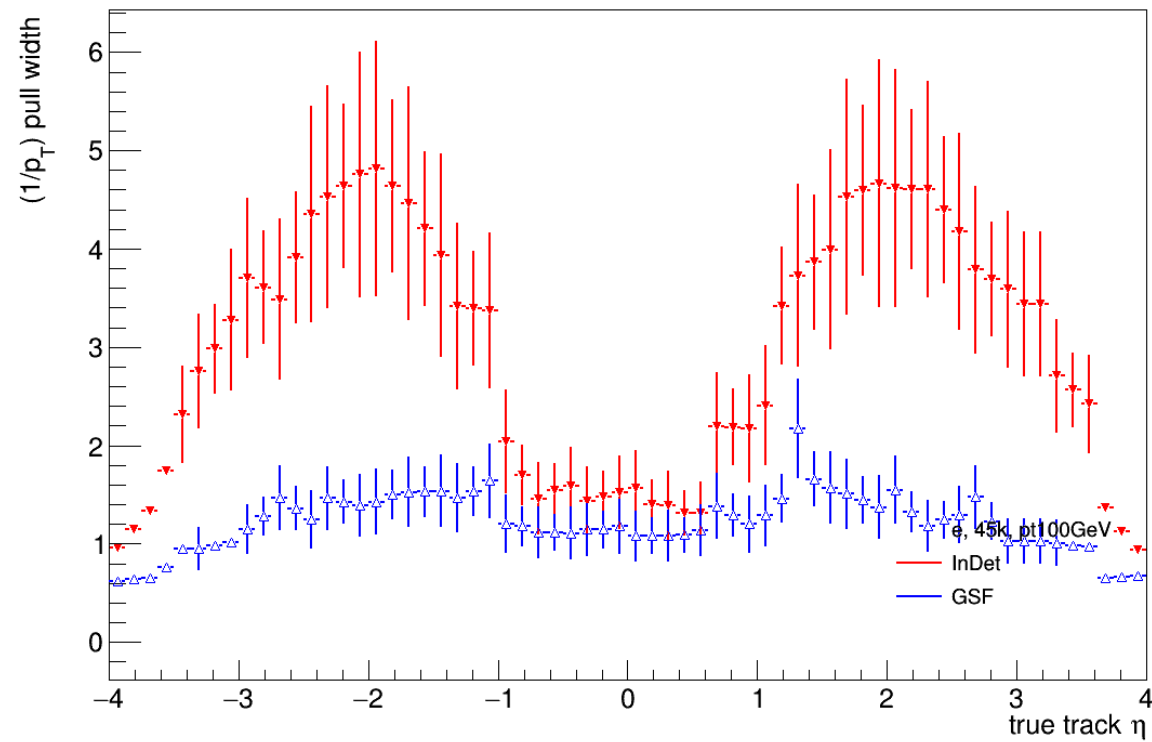
qoverptresolutionRMS_vs_eta
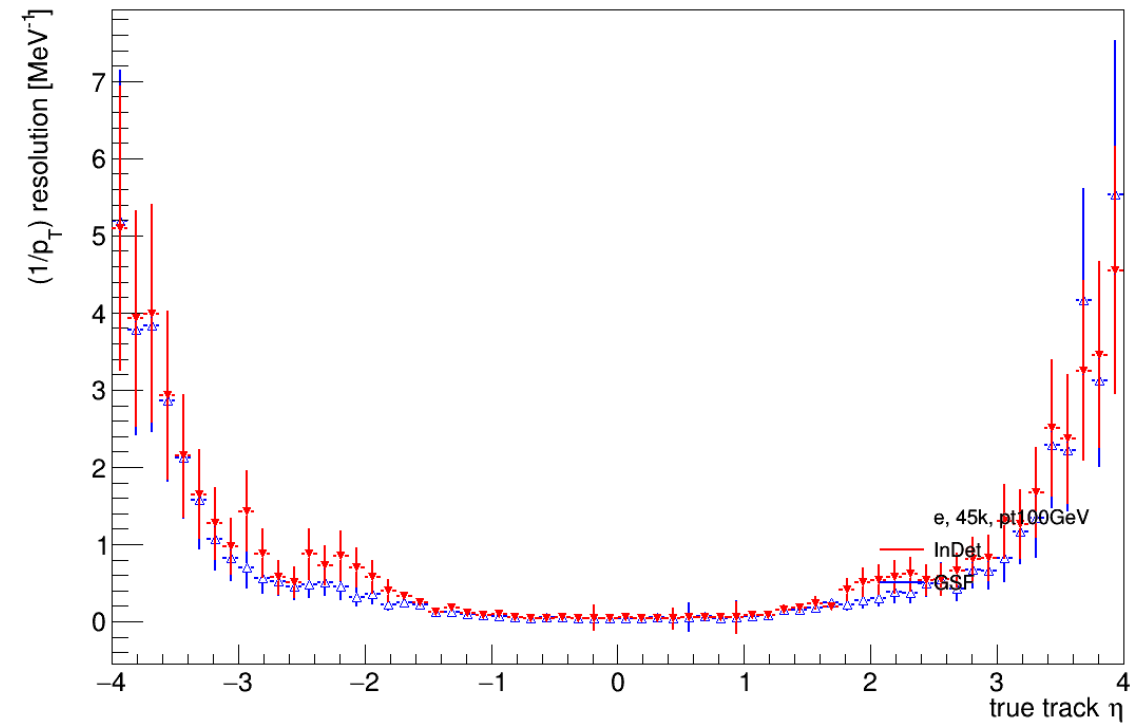
Q over P

qoverpmeanRMS_vs_eta
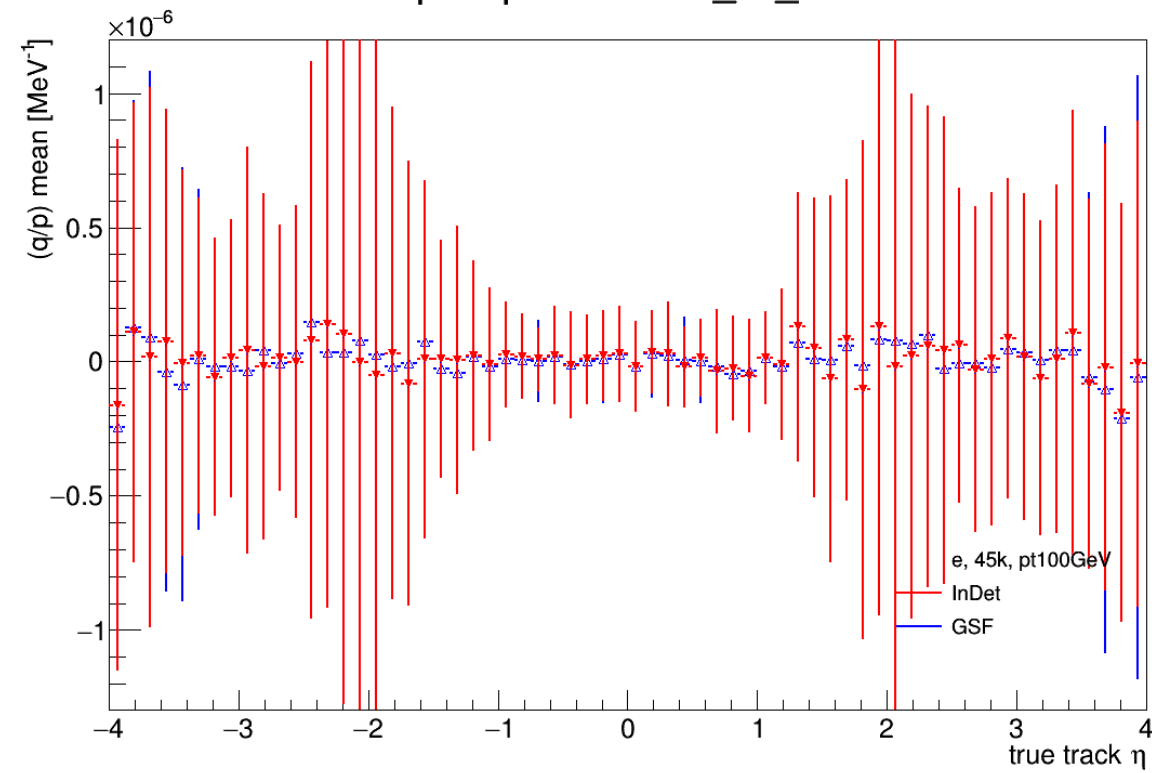
qoverppullmeanRMS_vs_eta

Q over P

Pt
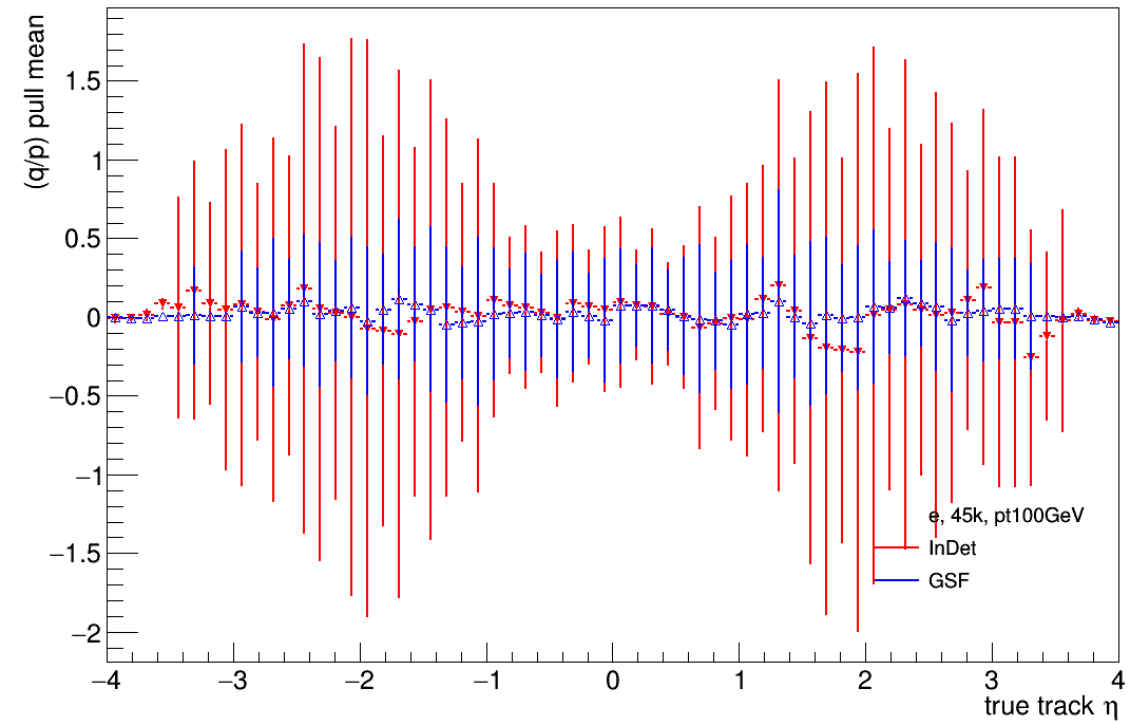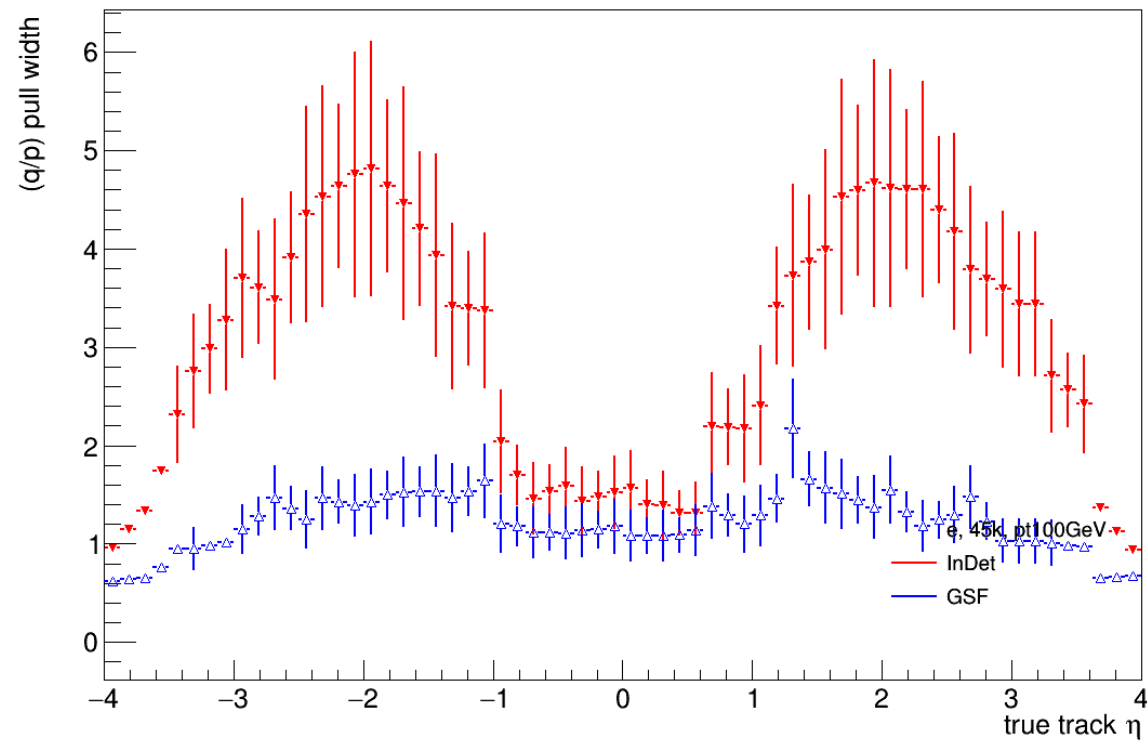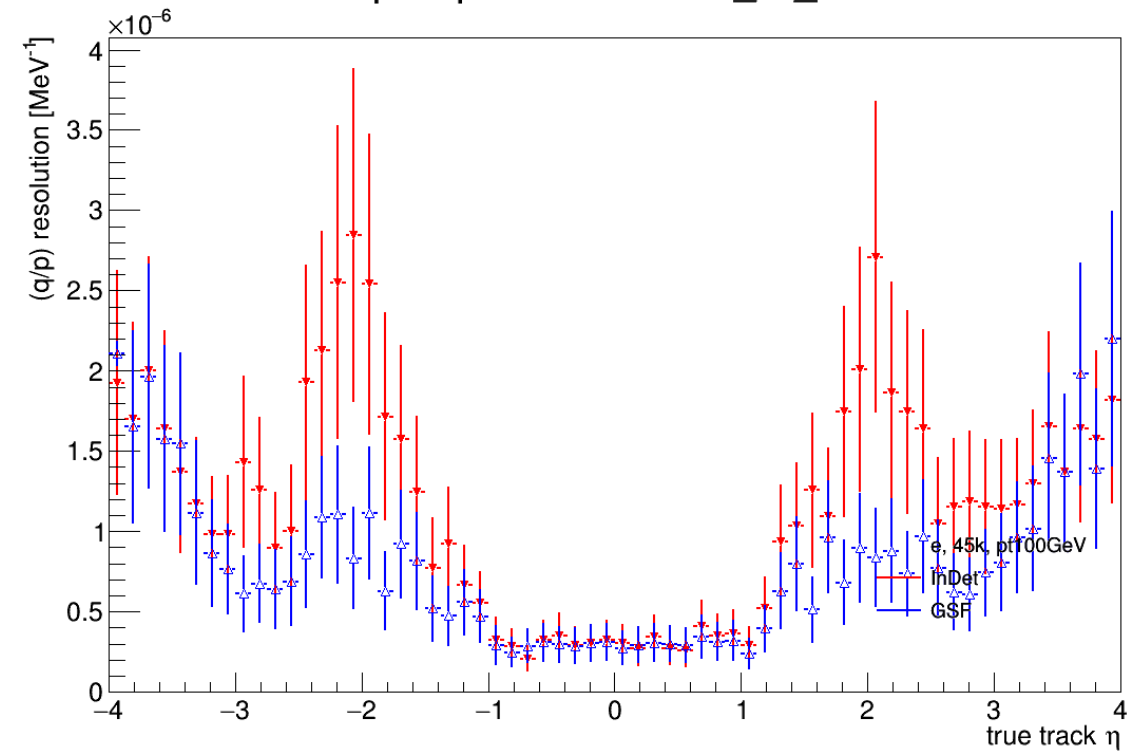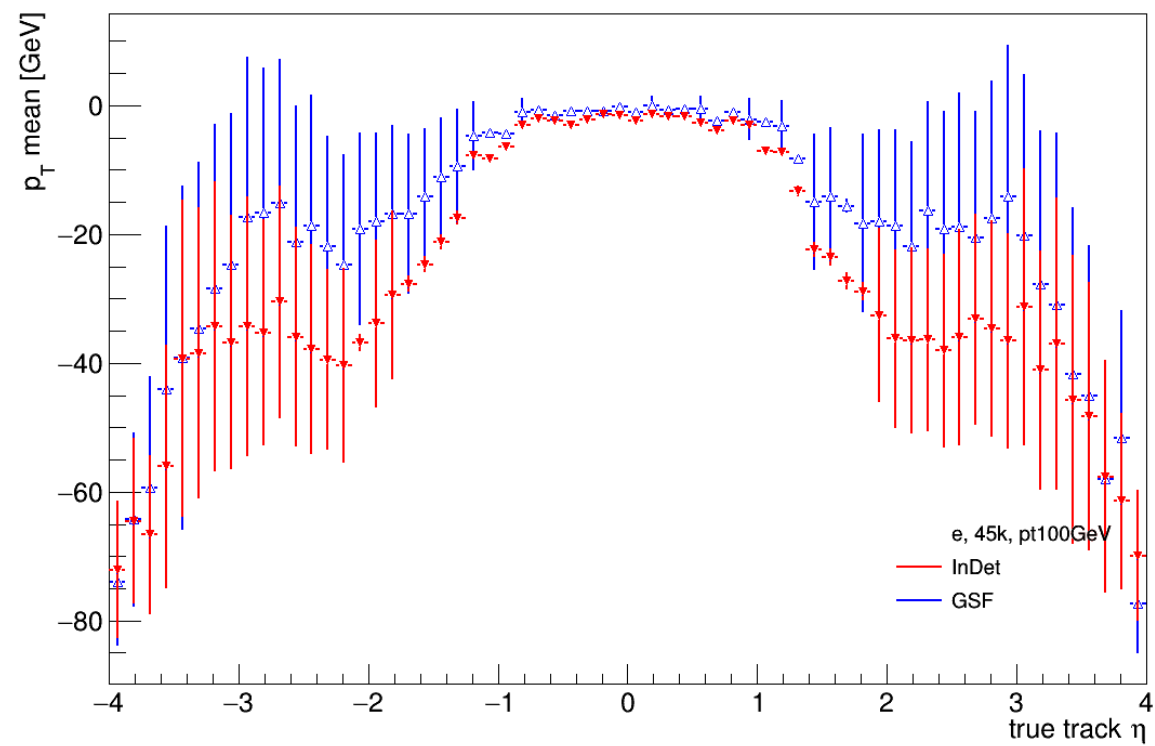
ptmeanRMS_vs_eta

ptpullmeanRMS_vs_eta

Pt

d0
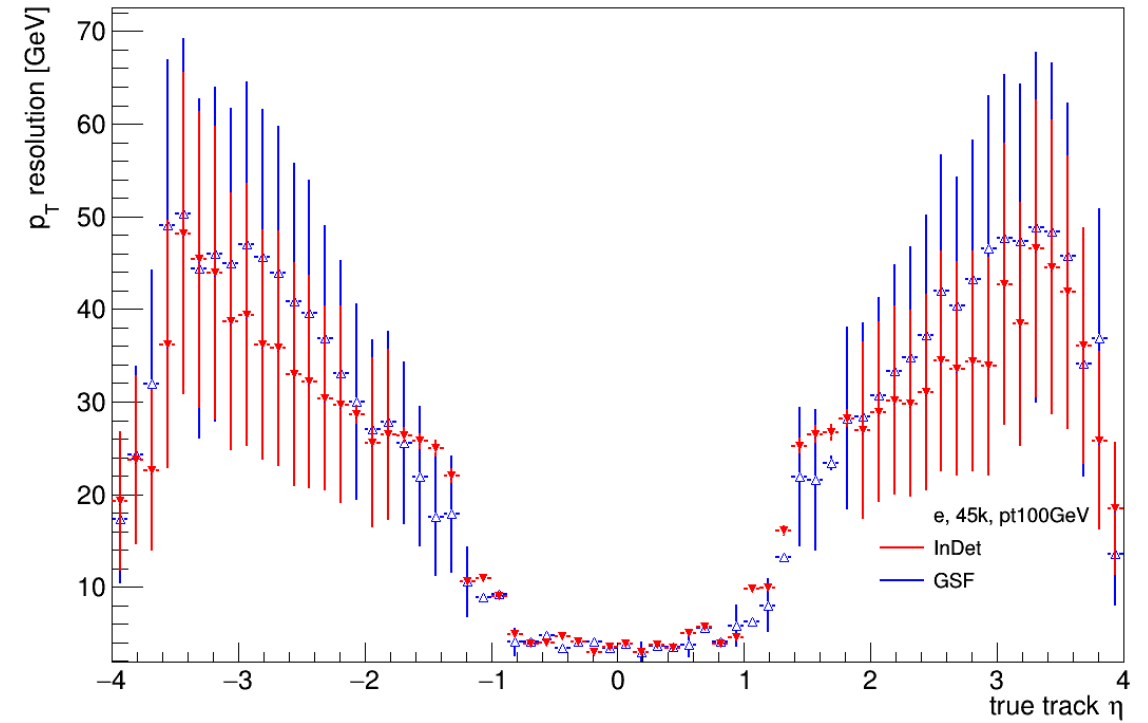
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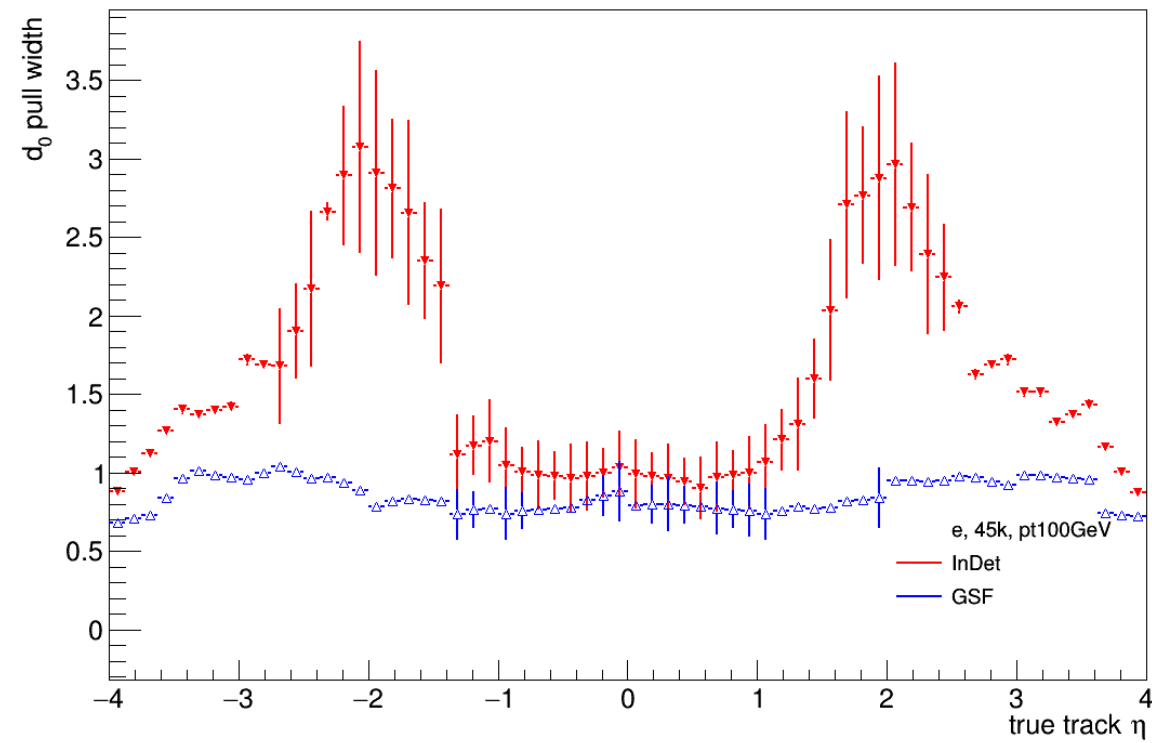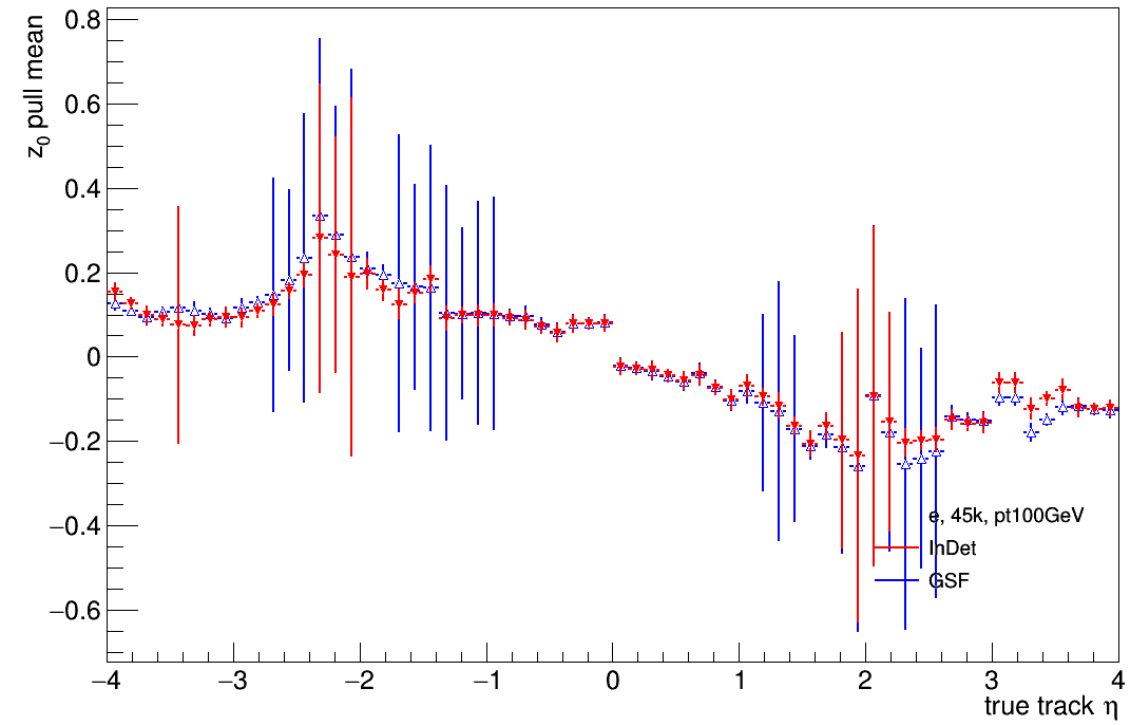
d0resolutionRMS_vs_eta

d0
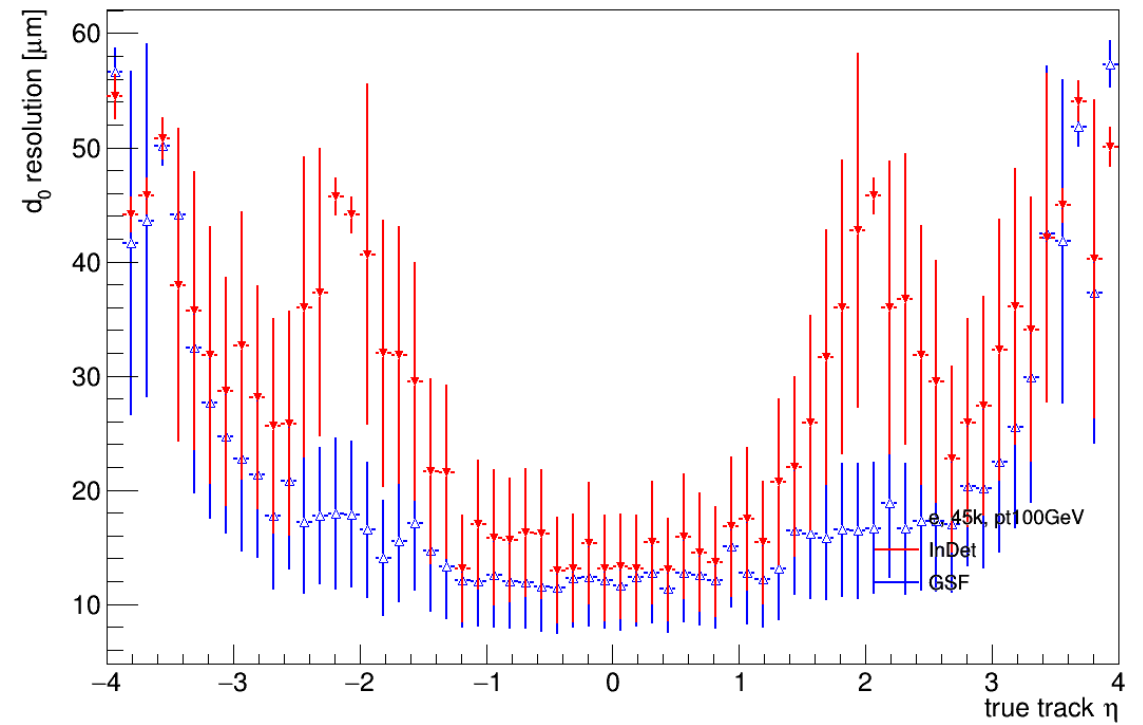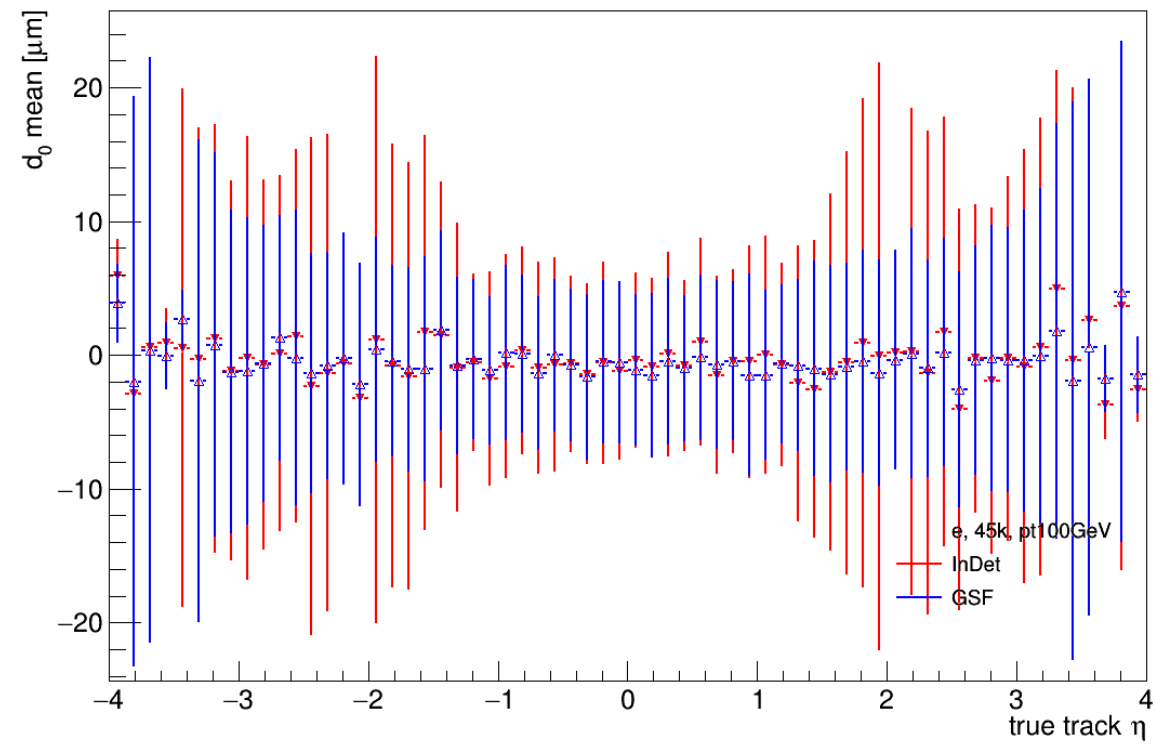
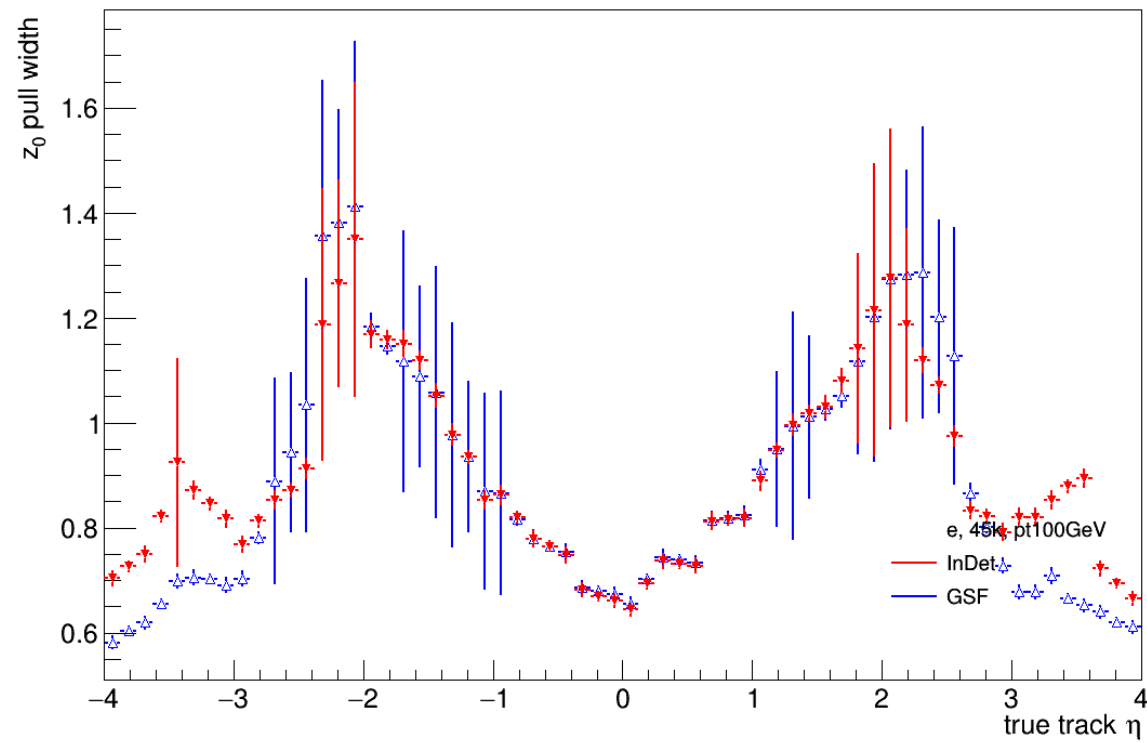d0meanRMS_vs_eta

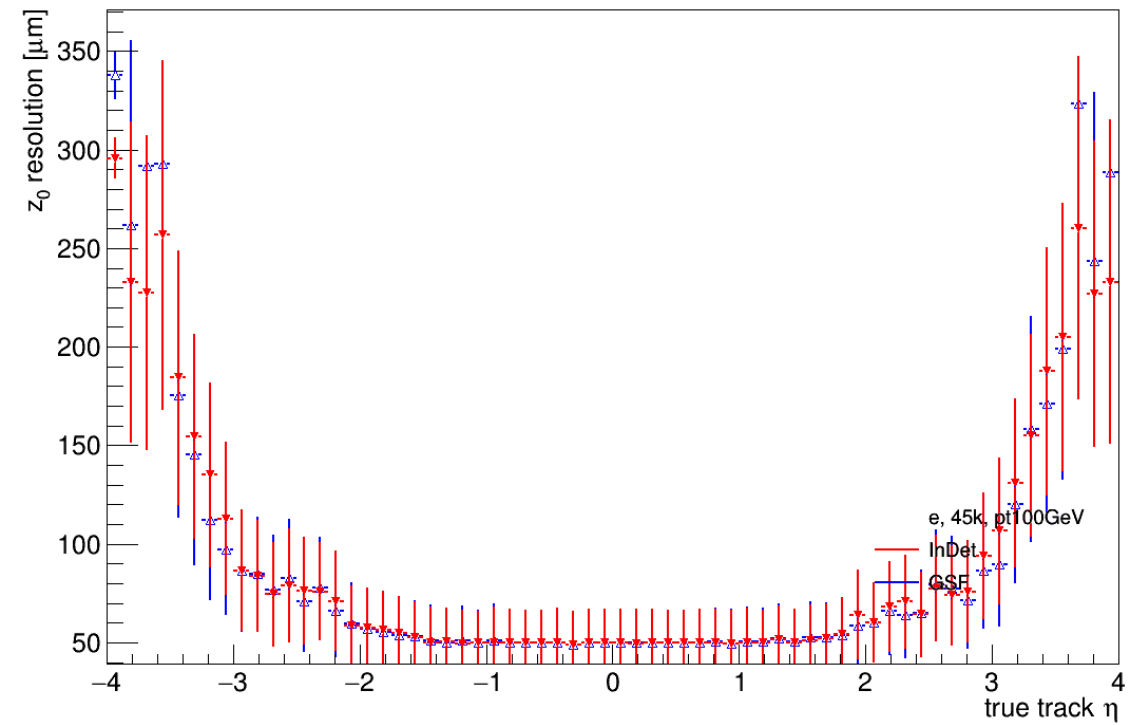d0pullmeanRMS_vs_eta
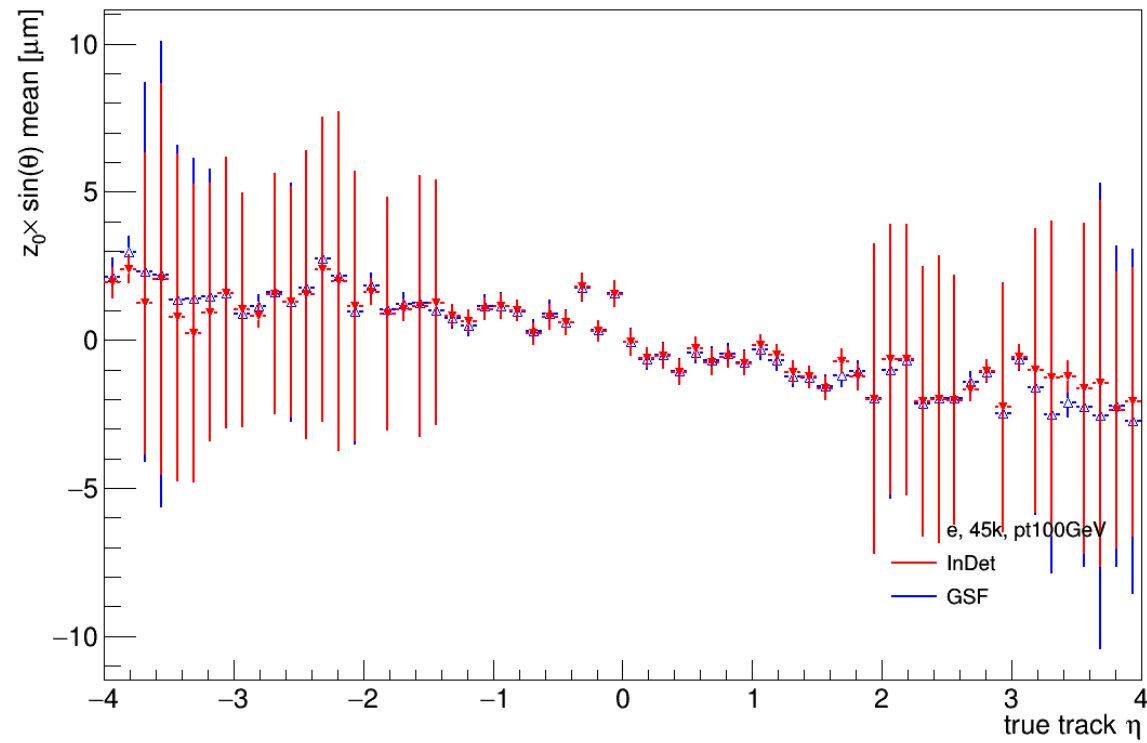
z0
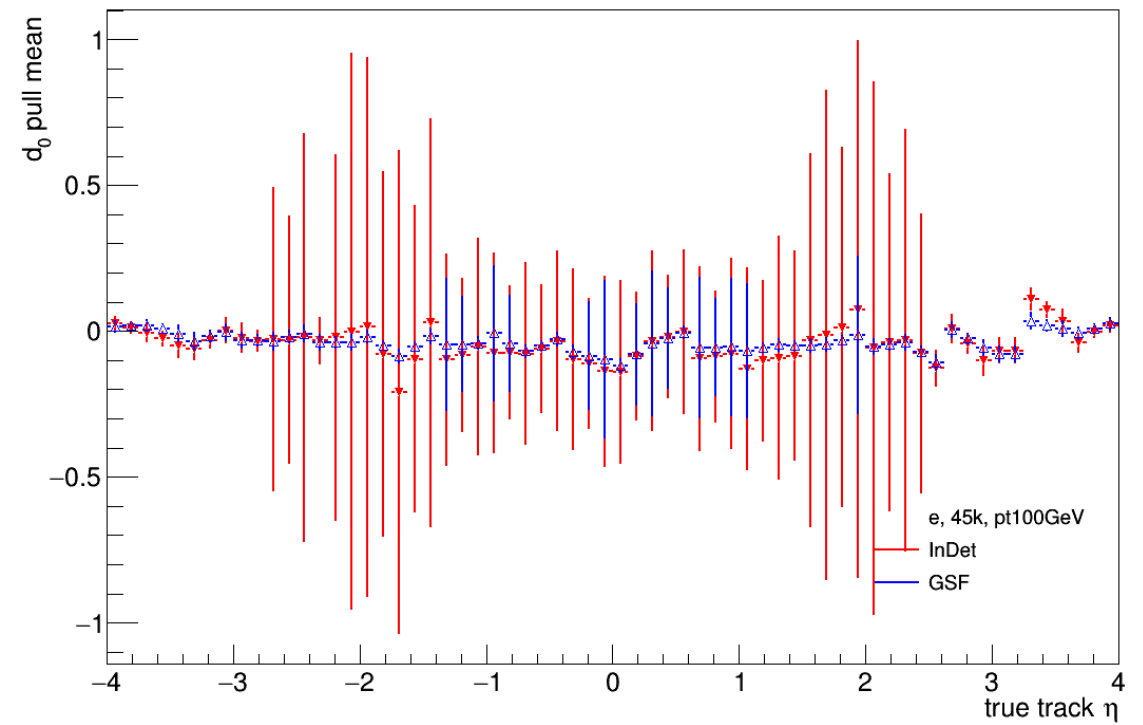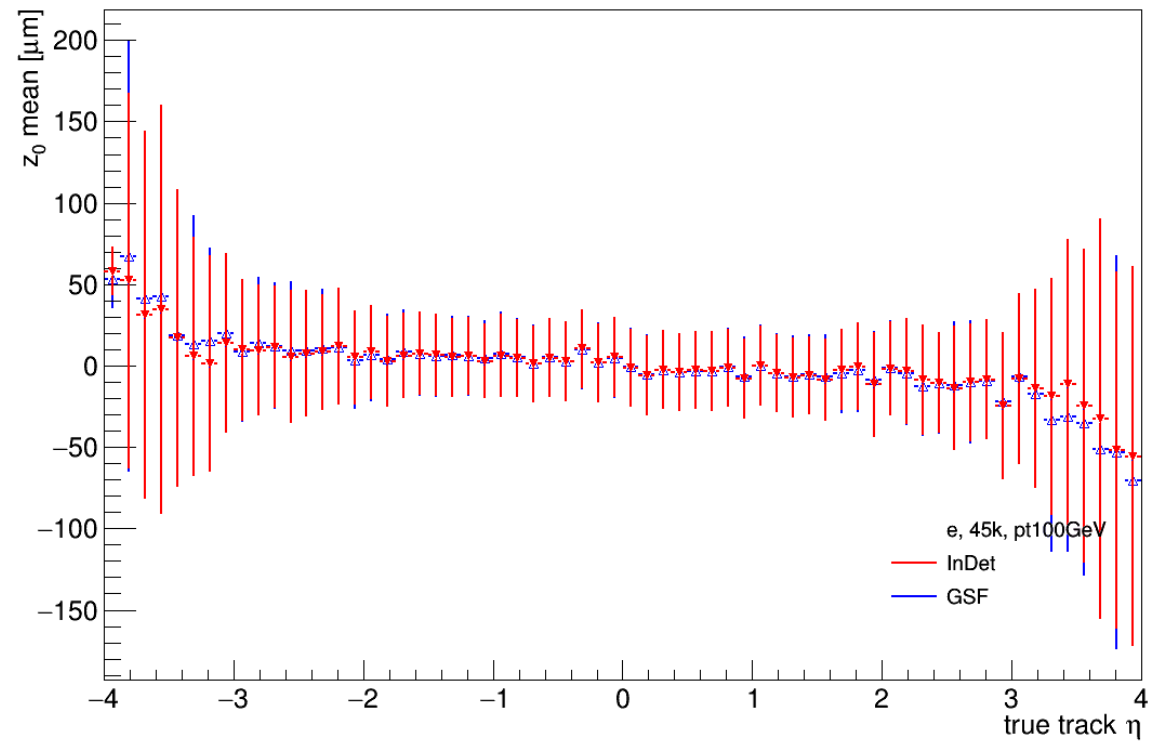
z0meanRMS_vs_eta

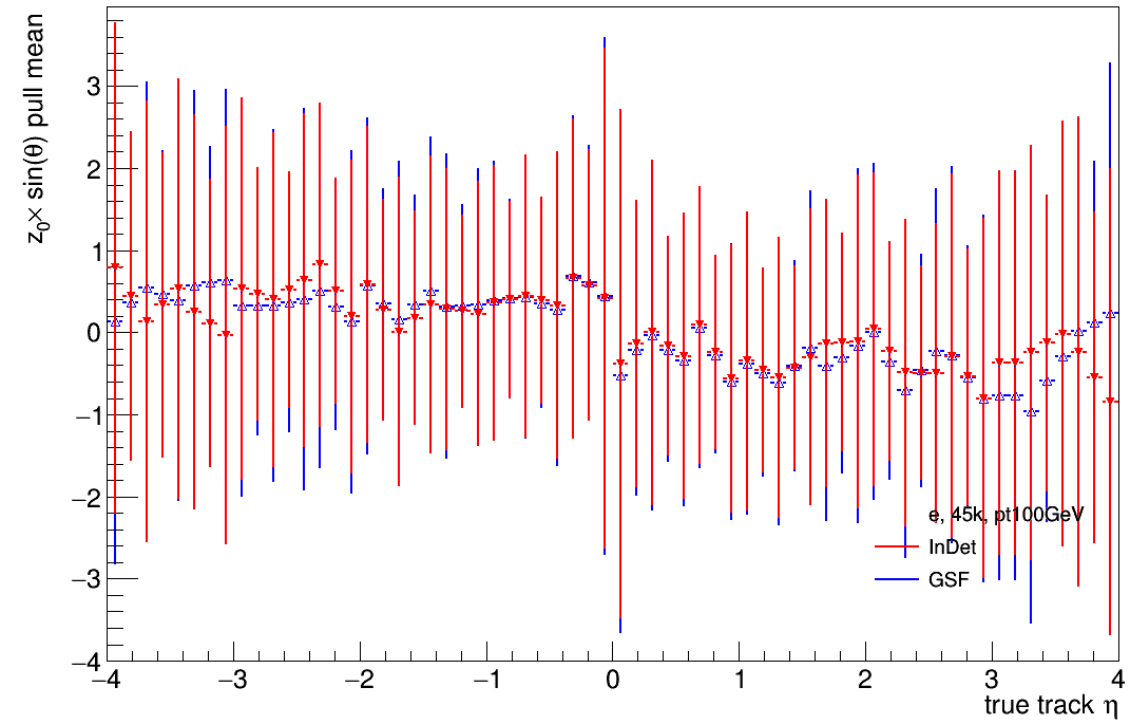z0pullmeanRMS_vs_eta

z0

z0pullresolutionRMS_vs_eta
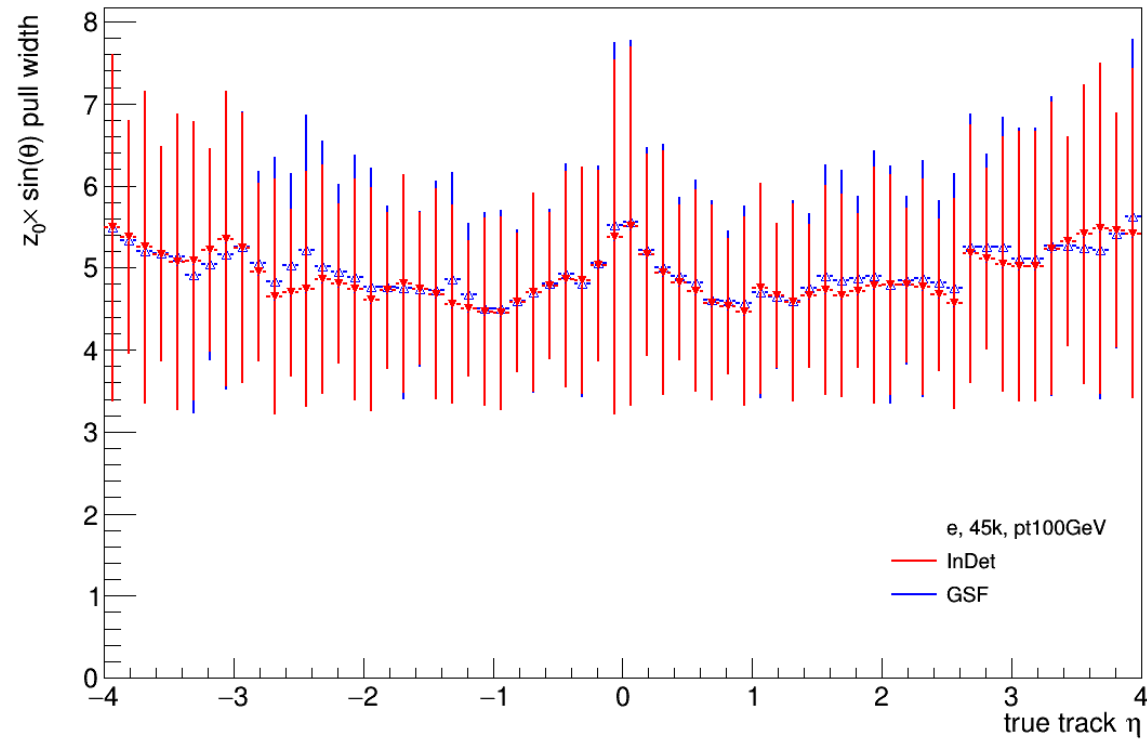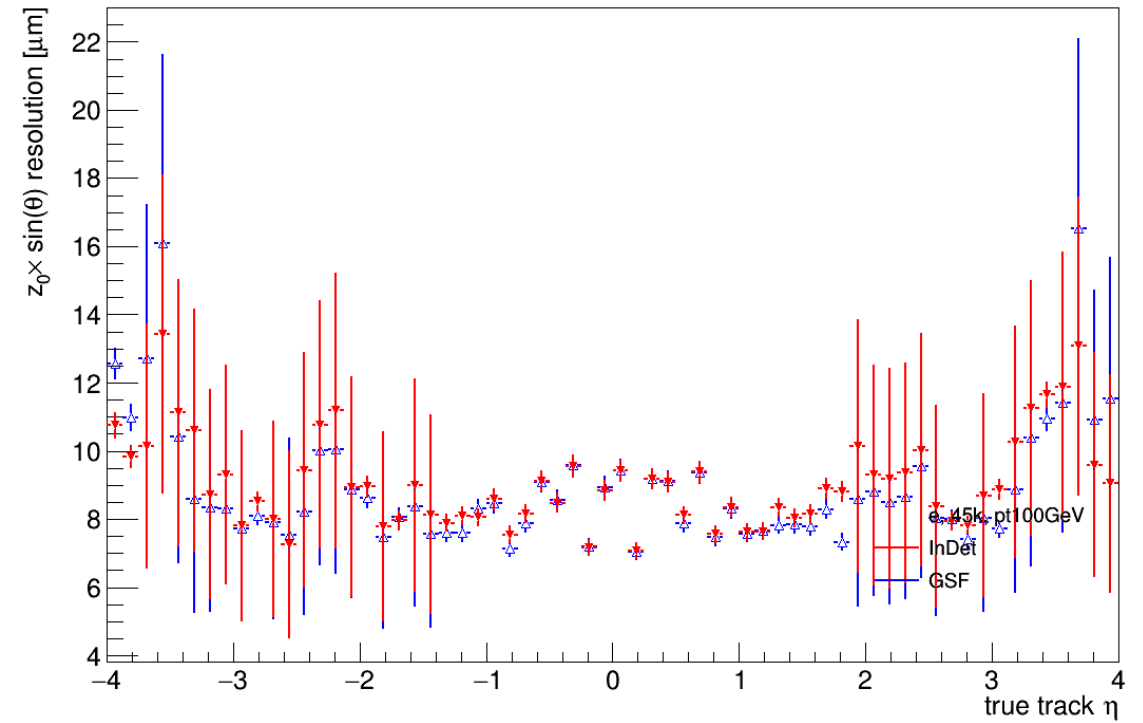
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z0sin

z0sin
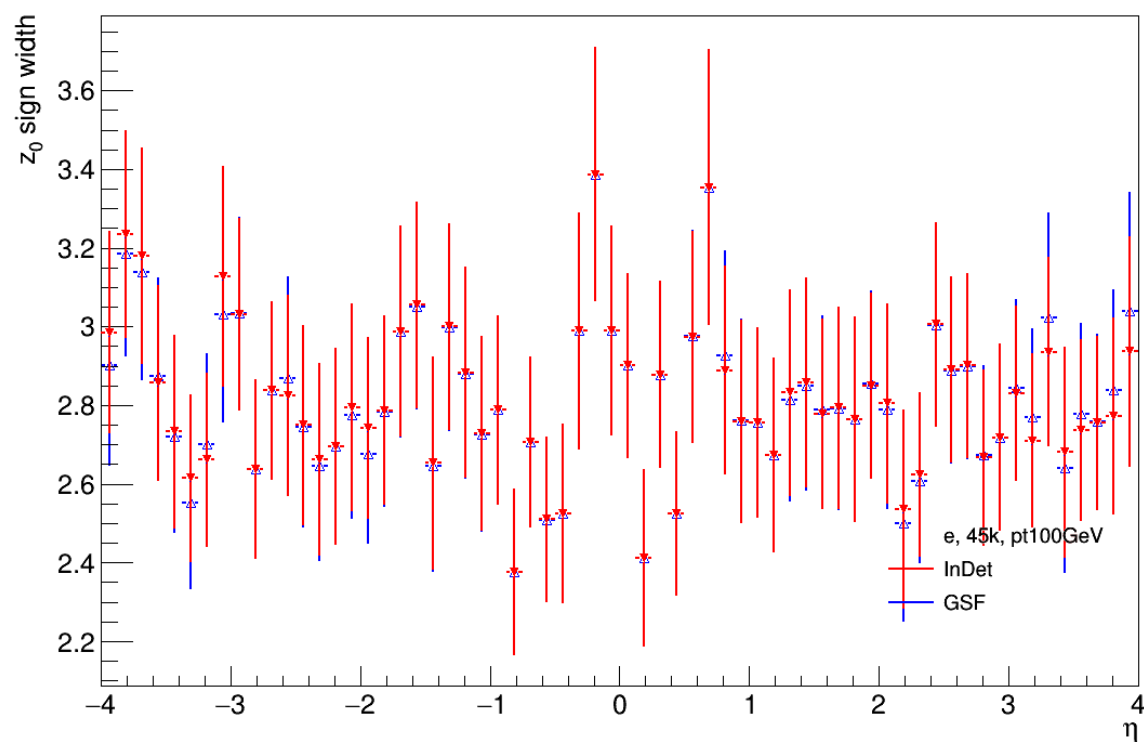
Significance

z0 significance with w.r.t pv

significance_d0_vs_eta