2017 EMTF pT Resolution

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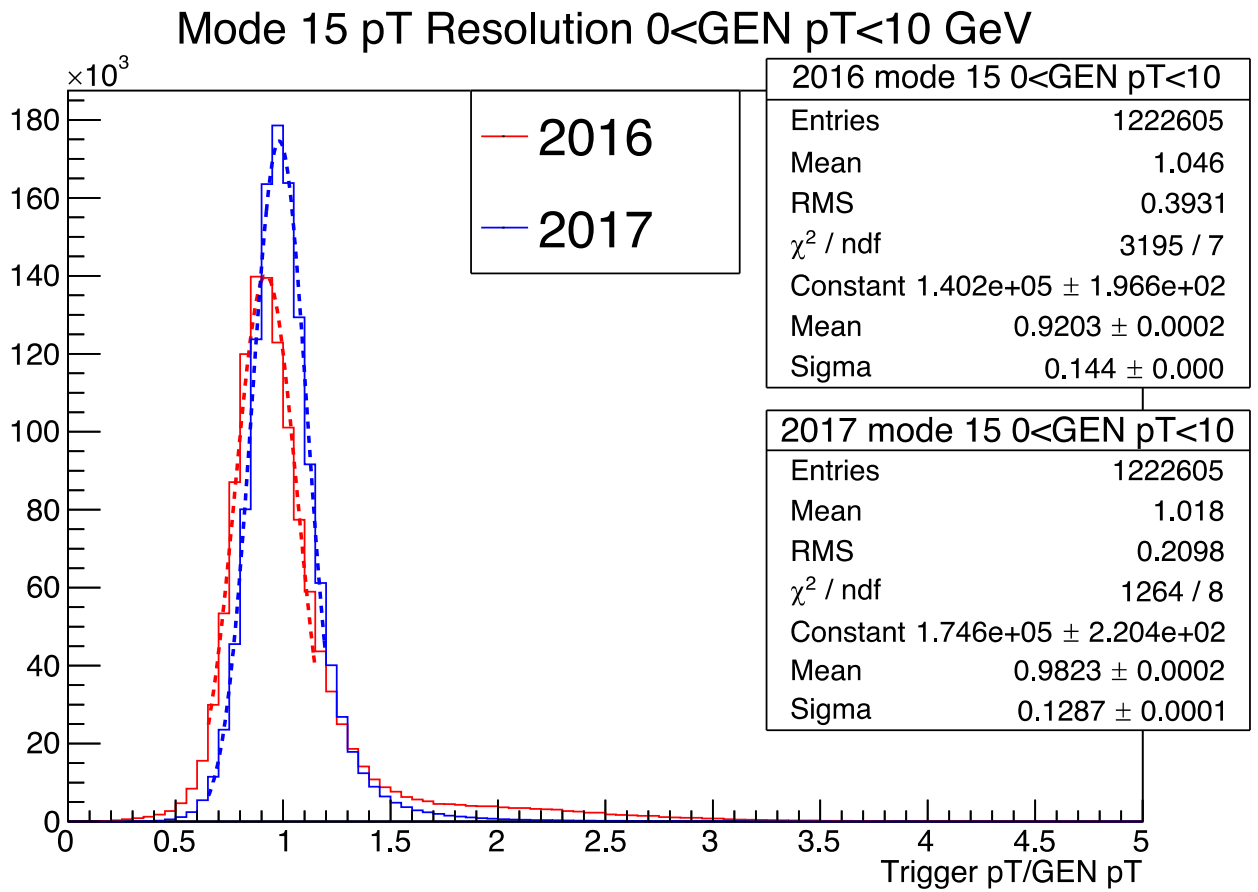
EMTF Working Meeting

Training Output Files

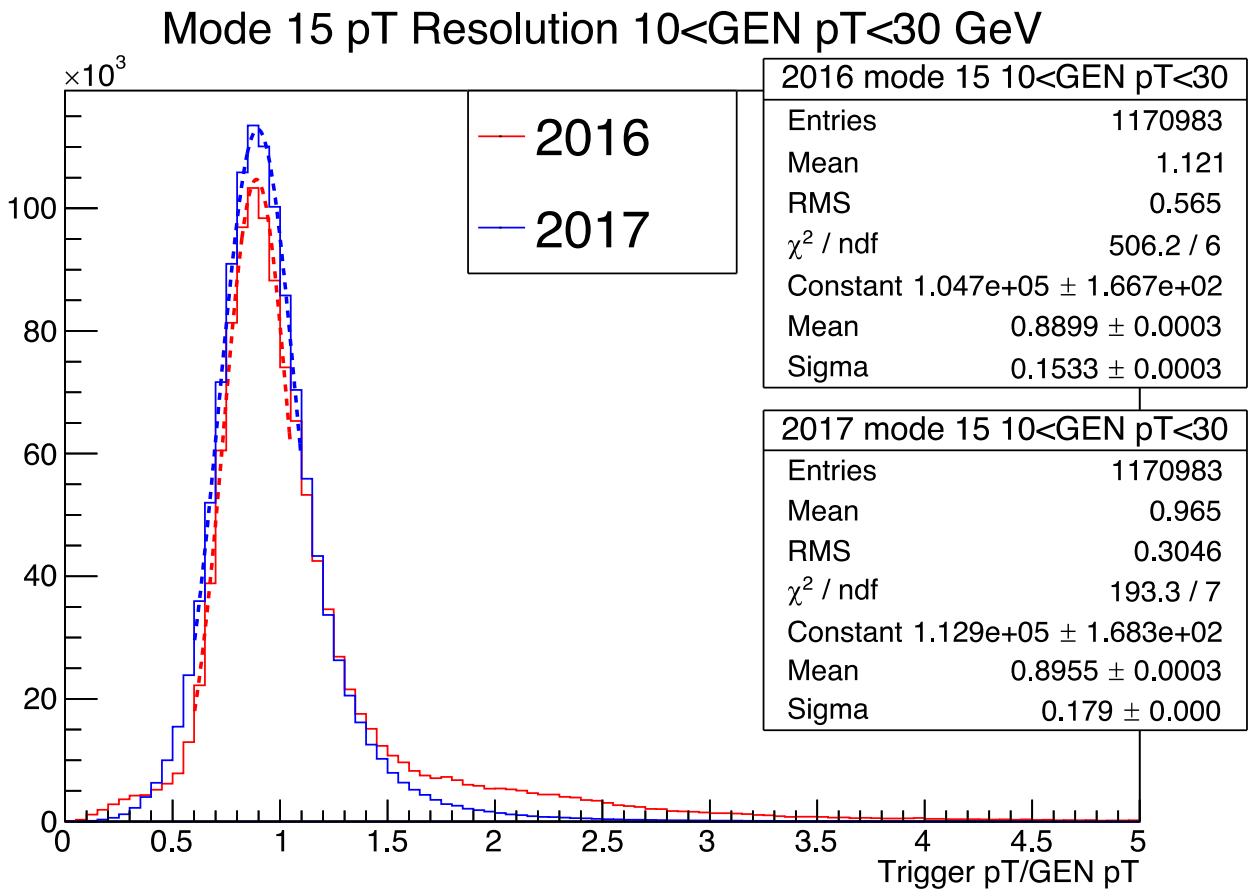
- All track modes
  - File directory: /afs/cern.ch/work/a/abrinke1/public/EMTF/PtAssign2017/files/*invPtTarg_invPtWgt_MODE*bitCompr_RPC.root
  - Missing mode 12 and mode 10 (empty files)
- Look at test trees for each mode
  - Look into four ranges: 0-10, 10-30, 30-100, 100-1000 GeV
  - Plot $\frac{Trigger\ pT}{GEN\ pT}$ for 2016 and 2017 trigger (2016 trigger pT divided by1.4)
  - Fit core distribution with gaussian function
  - Extract from fit function: sigma, mean
  - Use $\frac{Sigma}{mean}$ as the pT resolution metric

Four station track

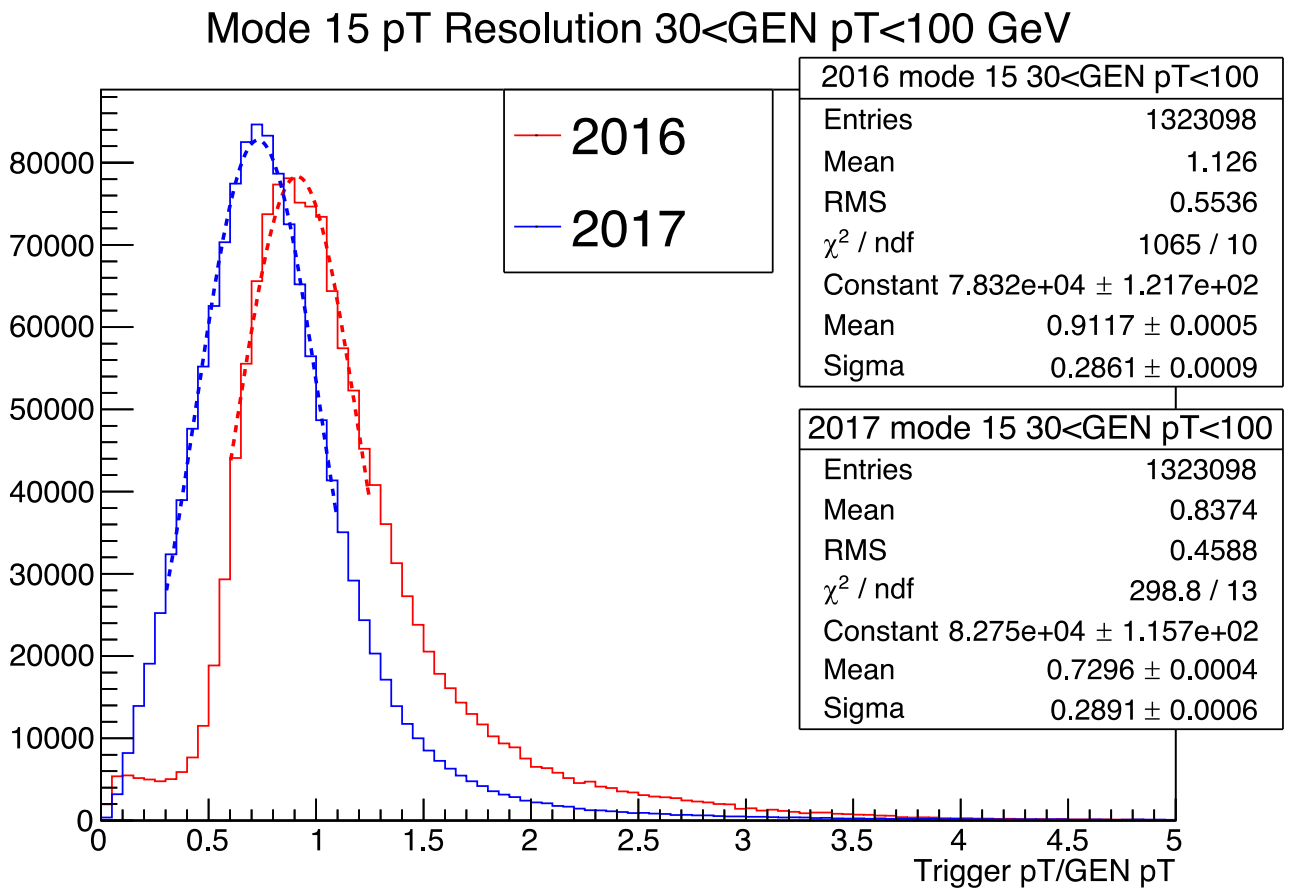
Mode 15 (station 1,2,3,4)



Mode 15 (station 1,2,3,4)



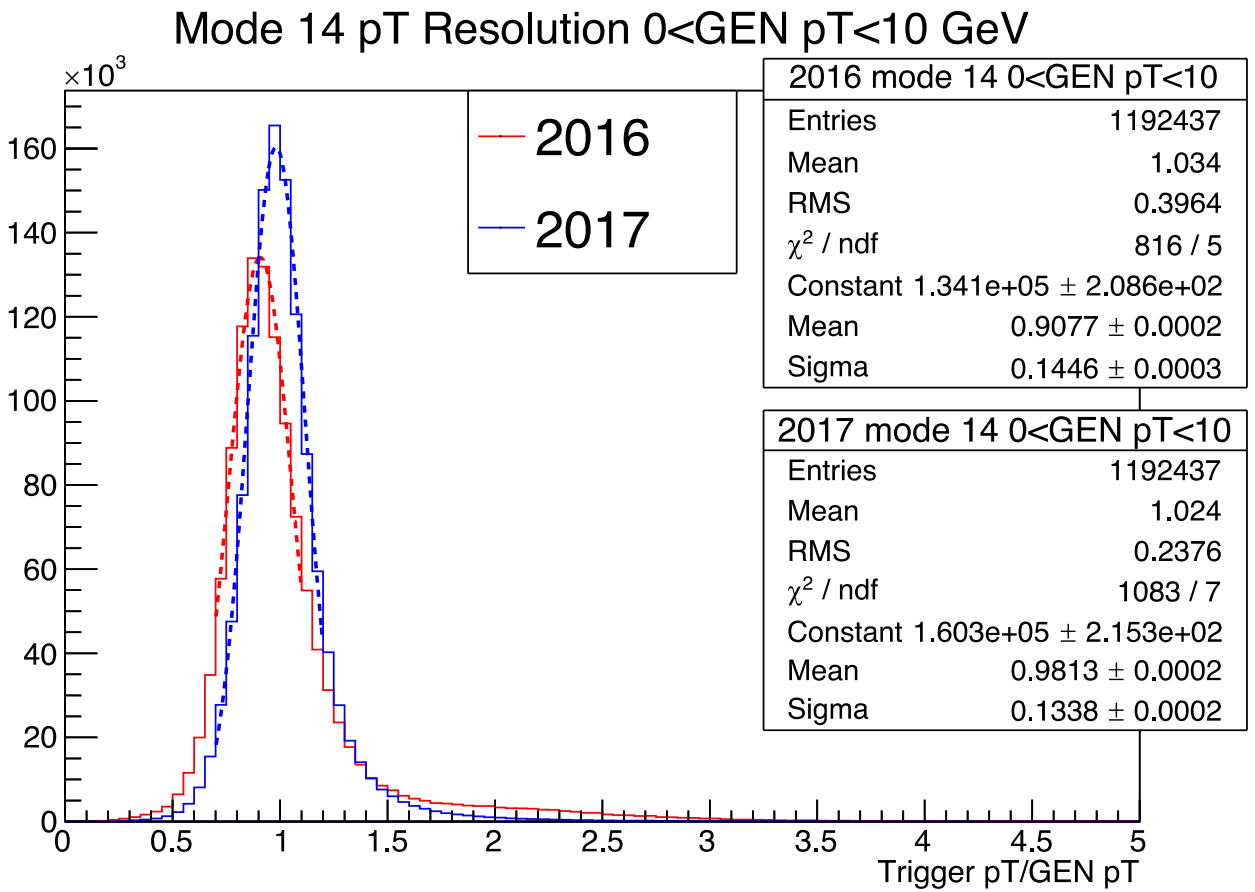
Mode 15 (station 1,2,3,4)



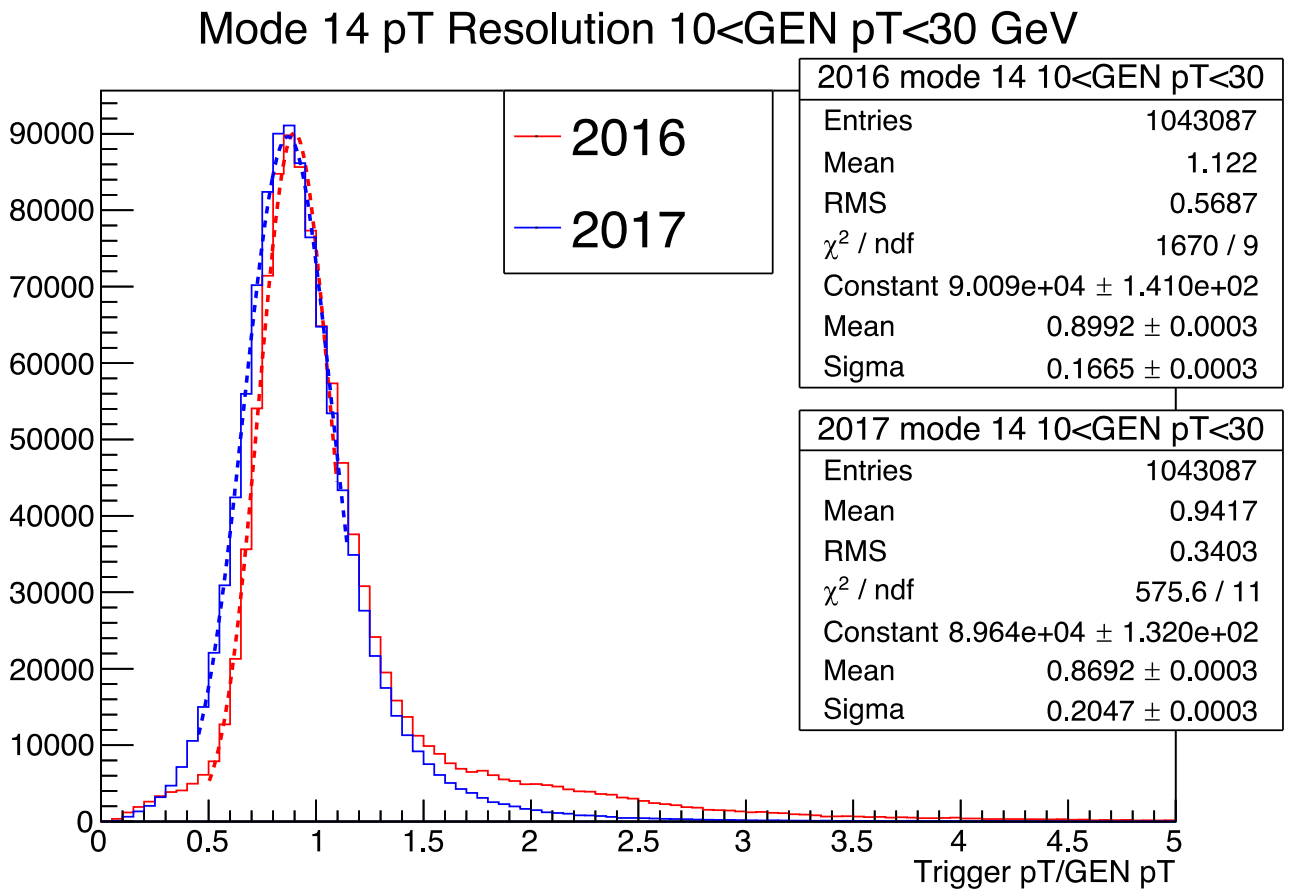
- 100 GeV and above see back up

Three station track

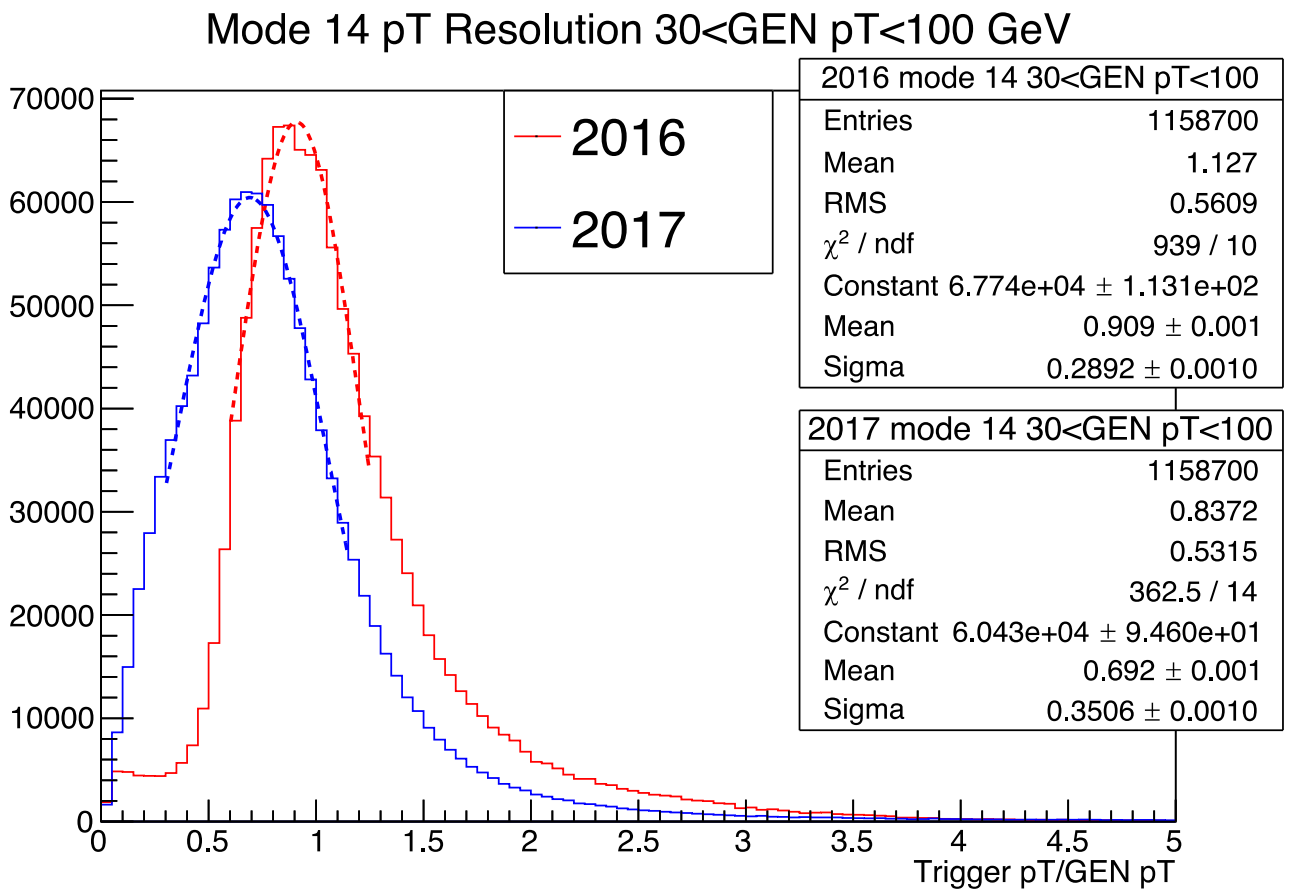
Mode 14 (station 1,2,3)



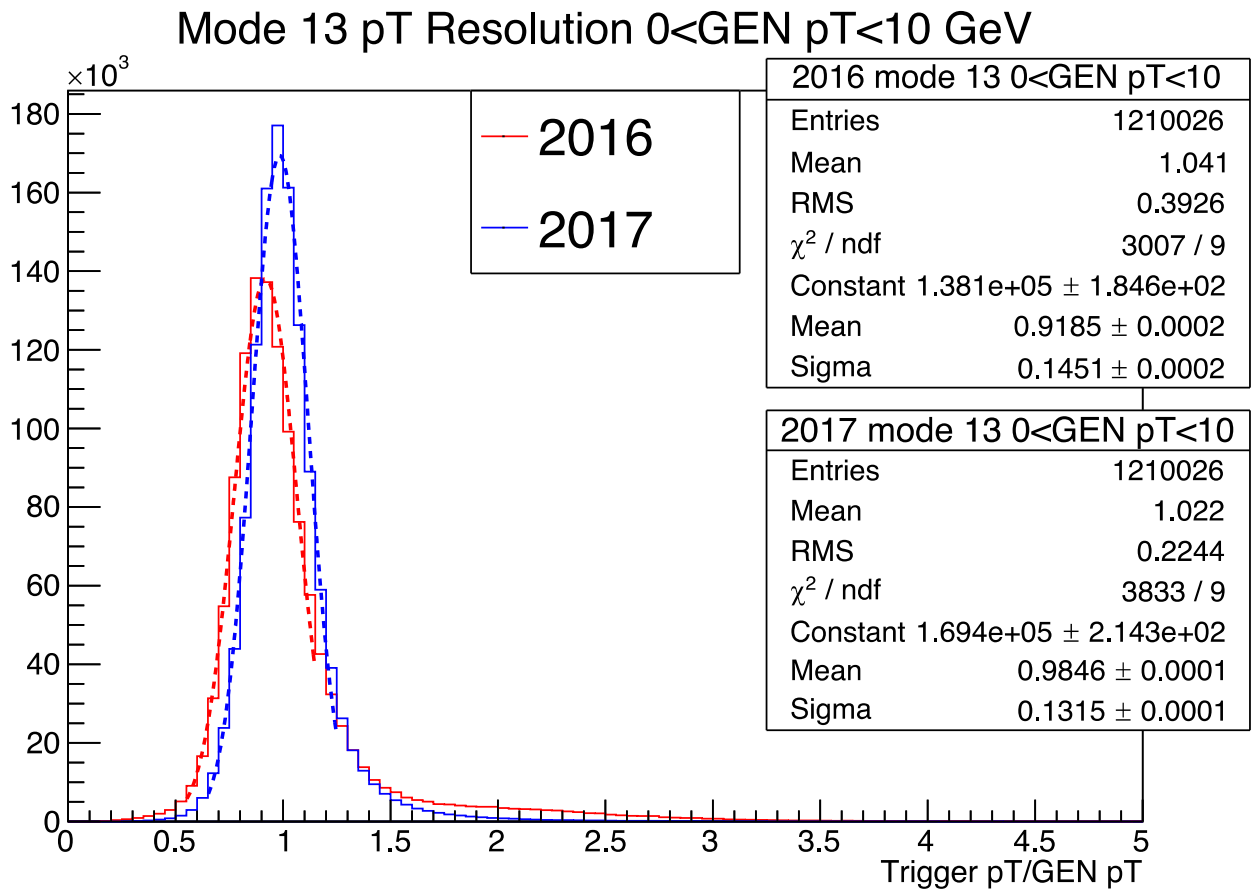
Mode 14 (station 1,2,3)



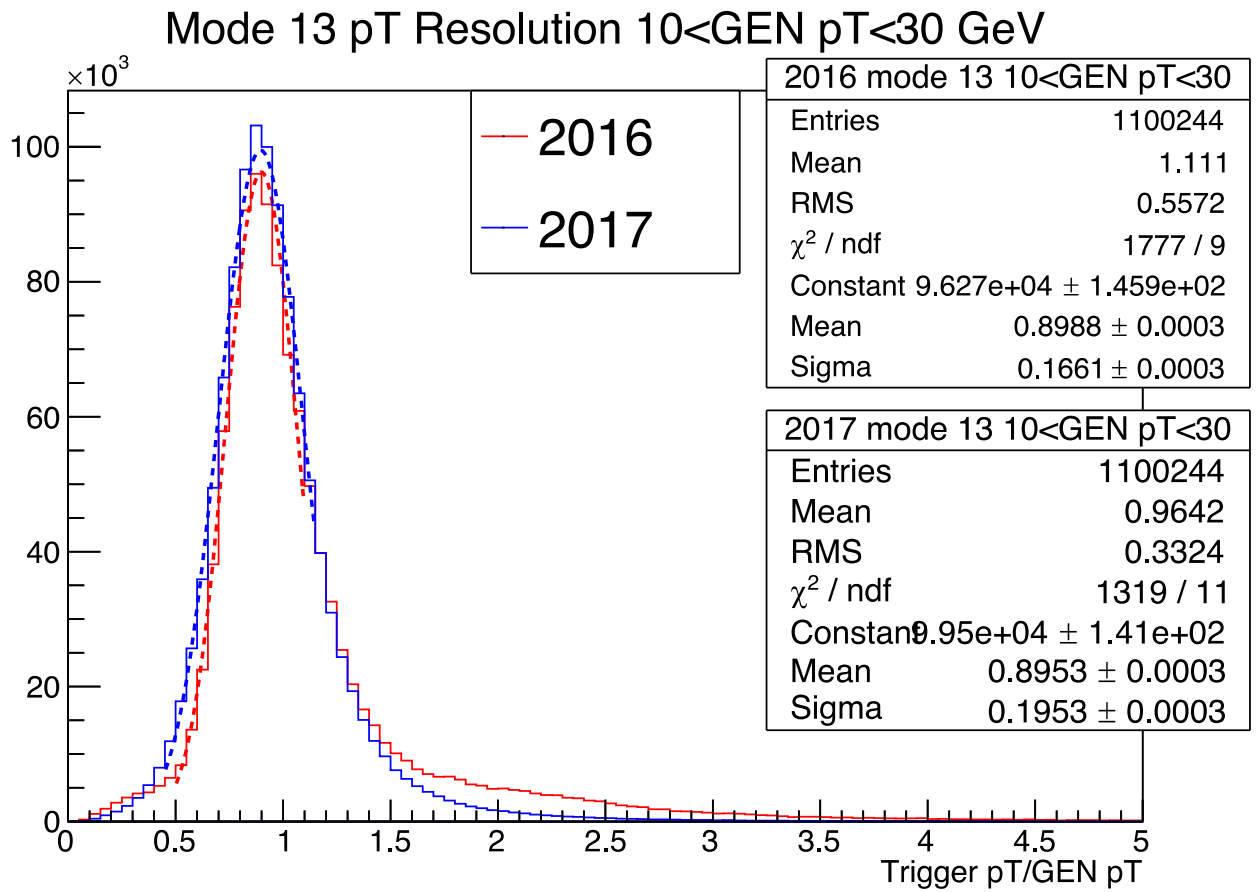
Mode 14 (station 1,2,3)



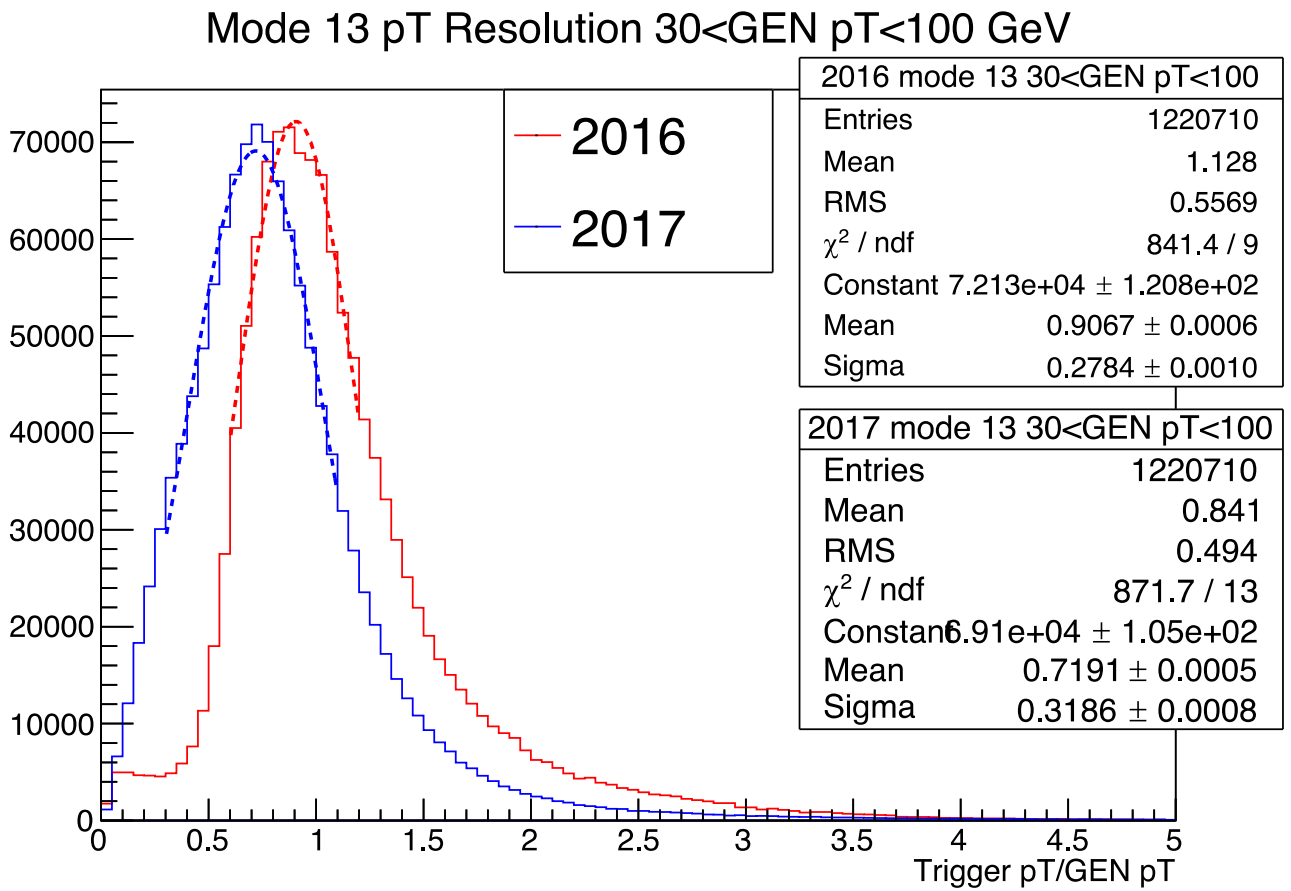
Mode 13 (station 1,2,4)



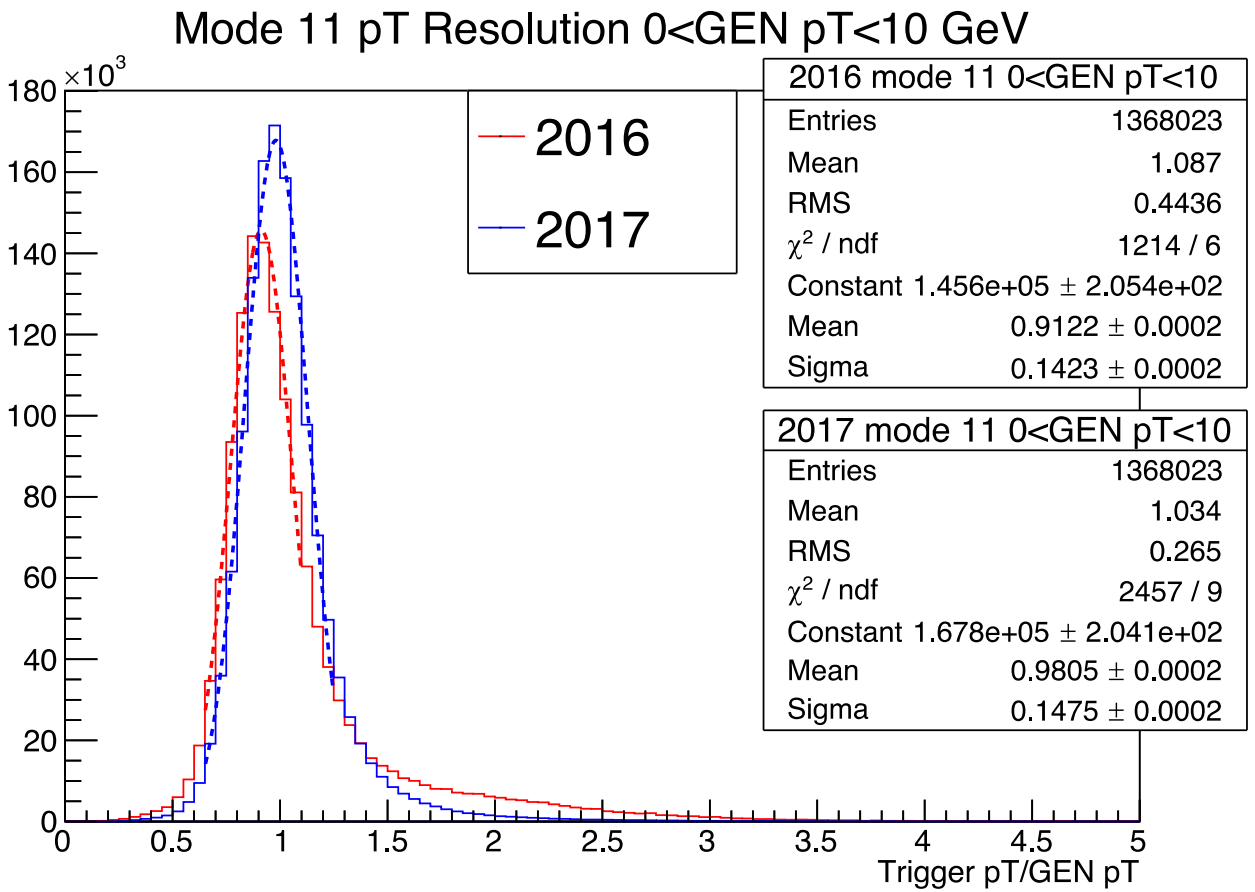
Mode 13 (station 1,2,4)



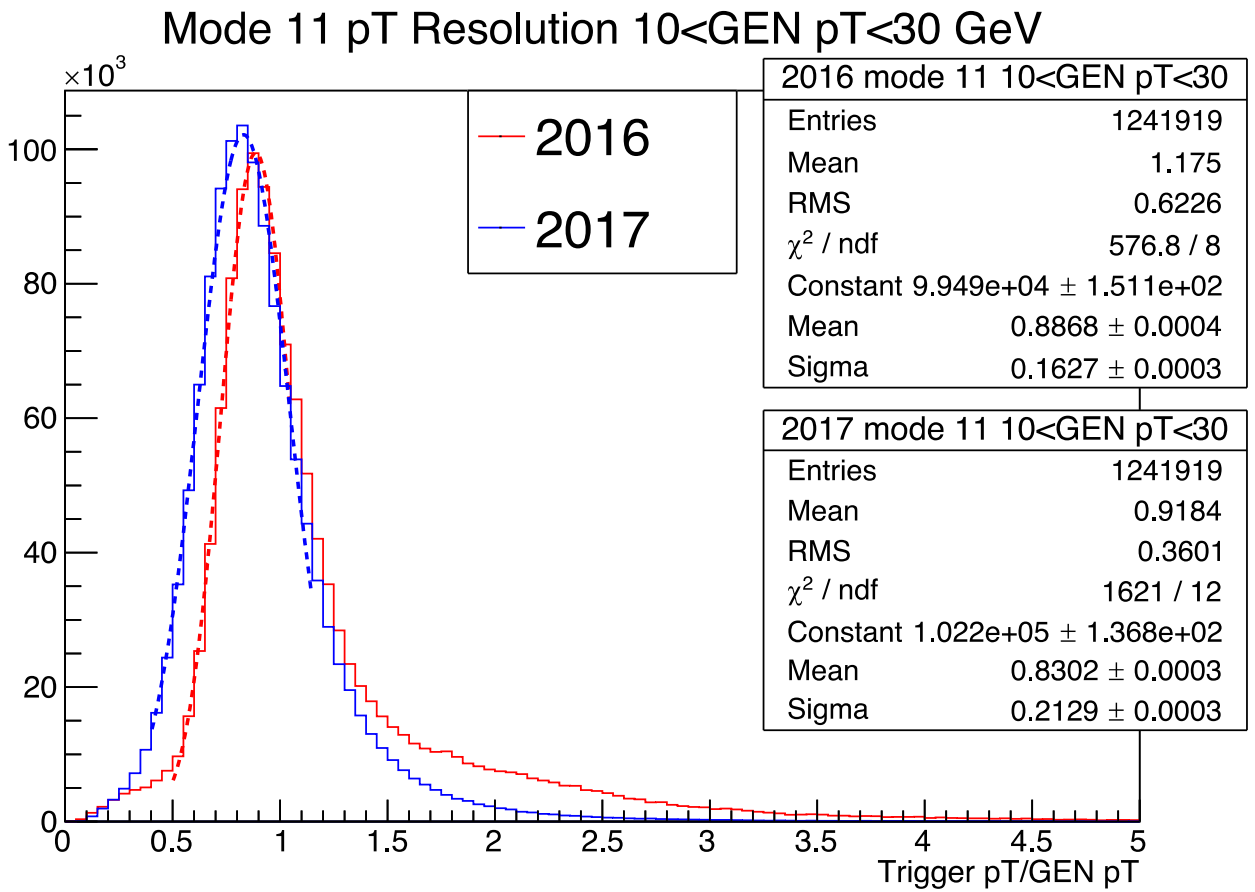
Mode 13 (station 1,2,4)



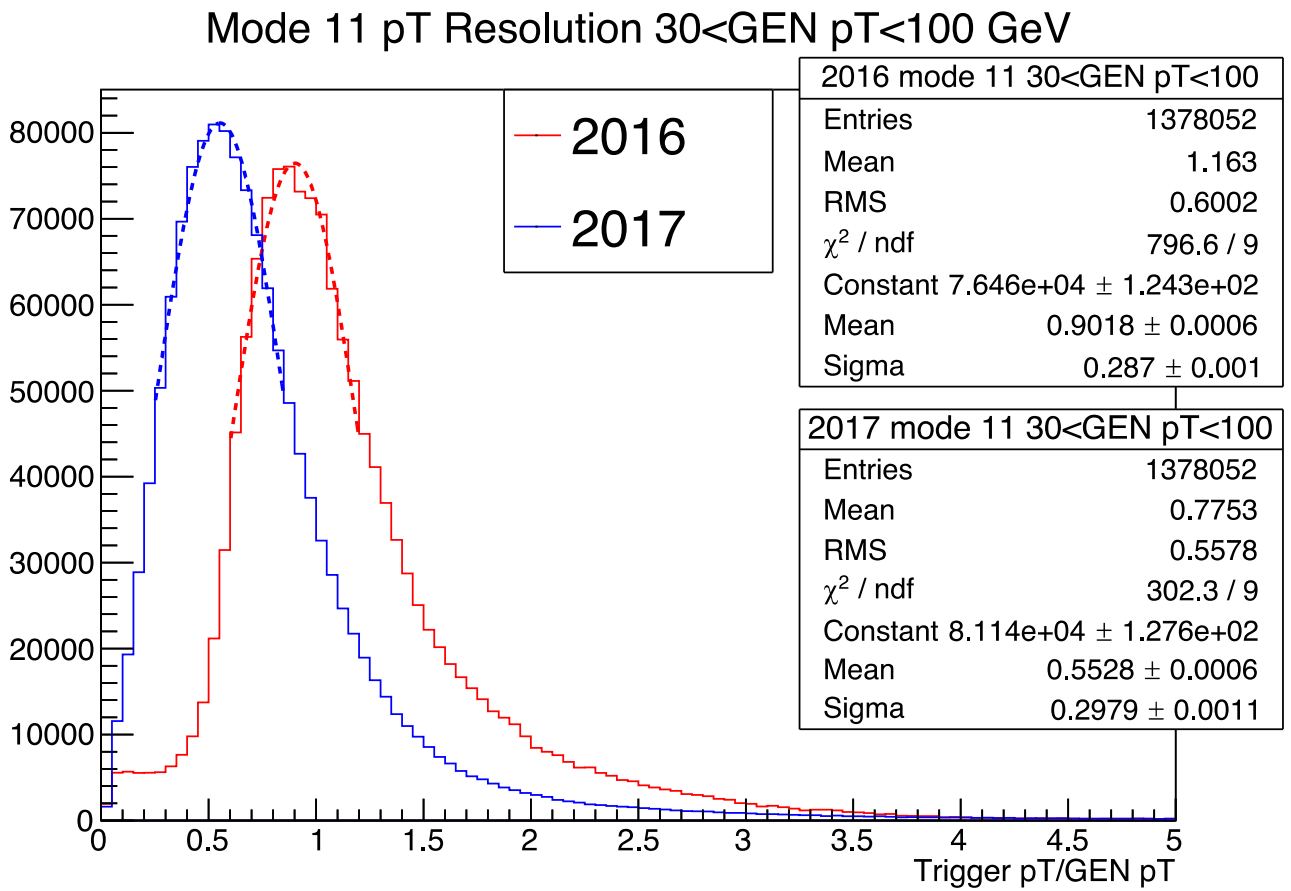
Mode 11 (station 1,3,4)



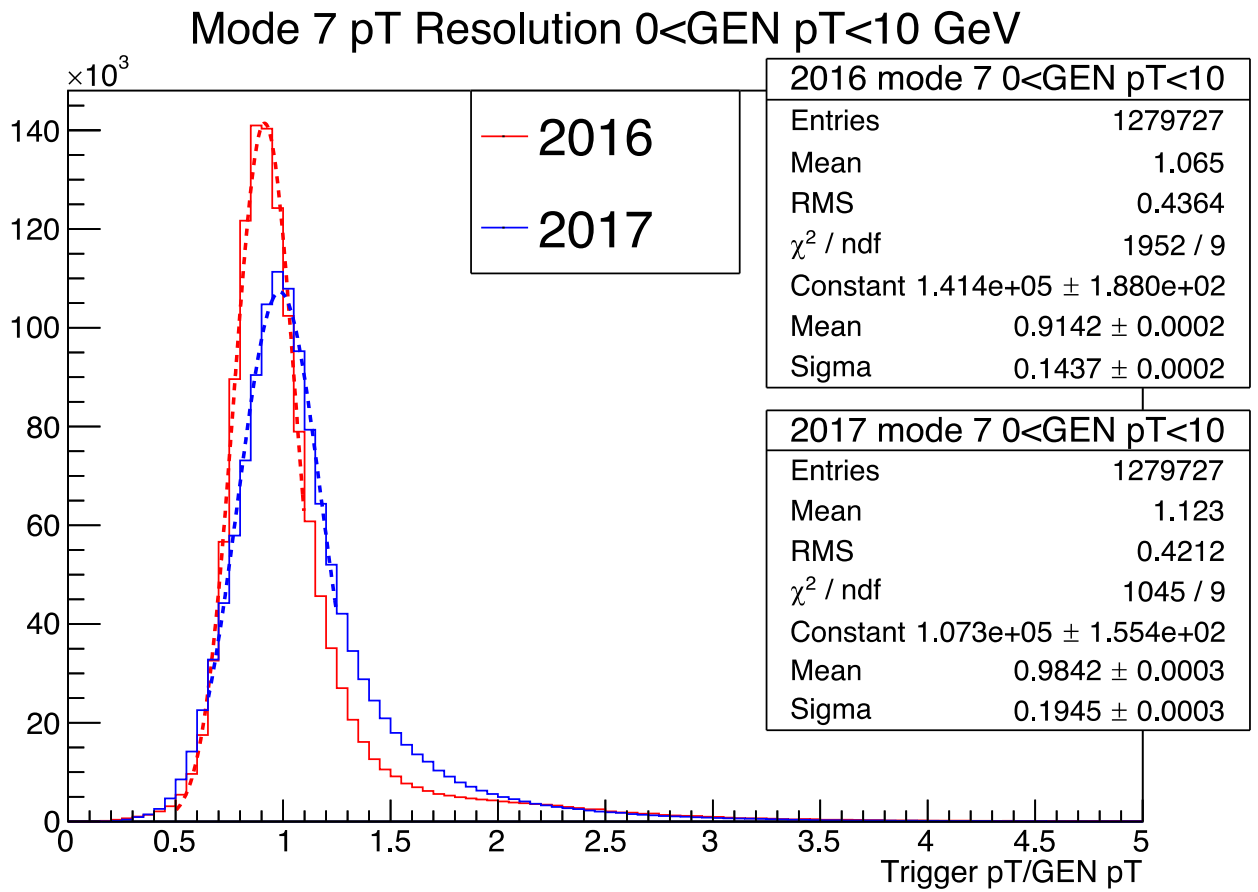
Mode 11 (station 1,3,4)



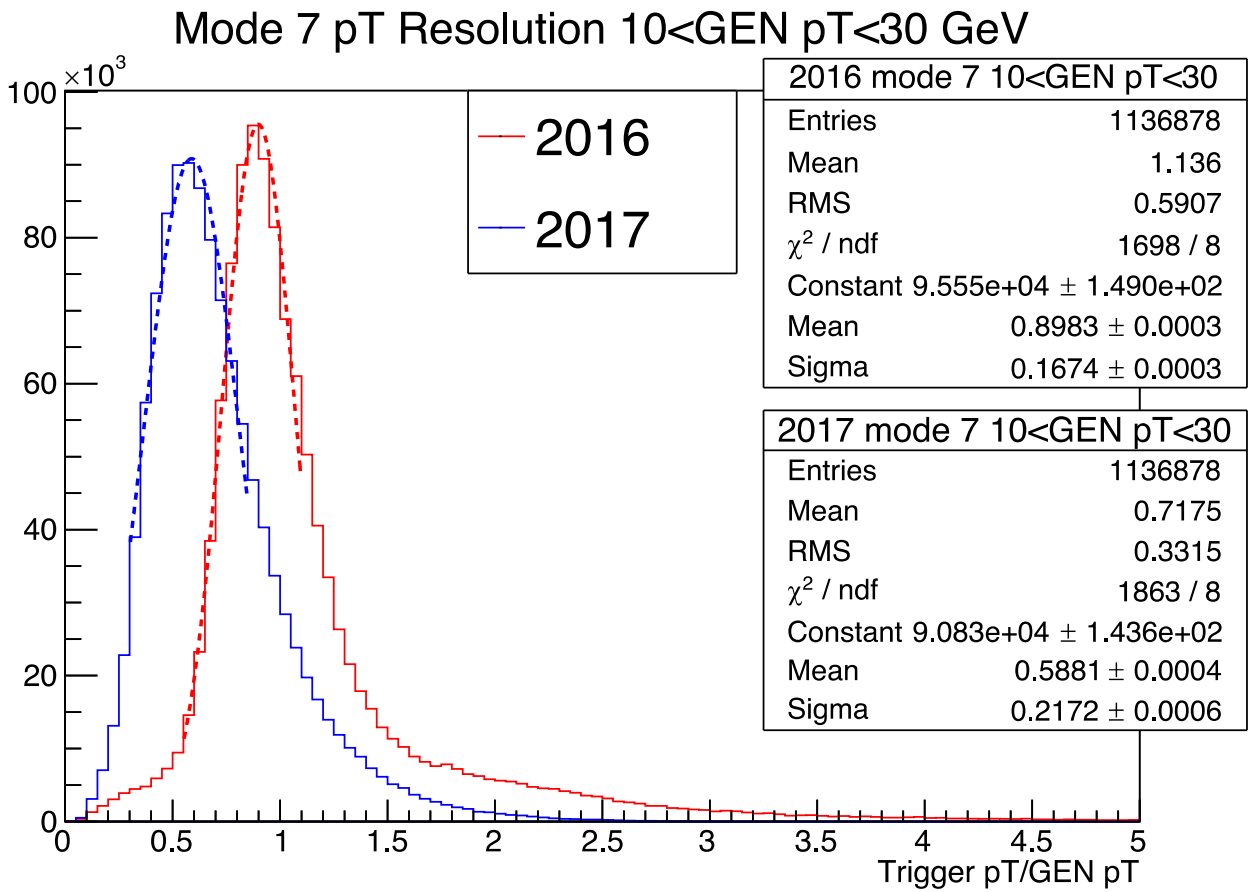
Mode 11 (station 1,3,4)



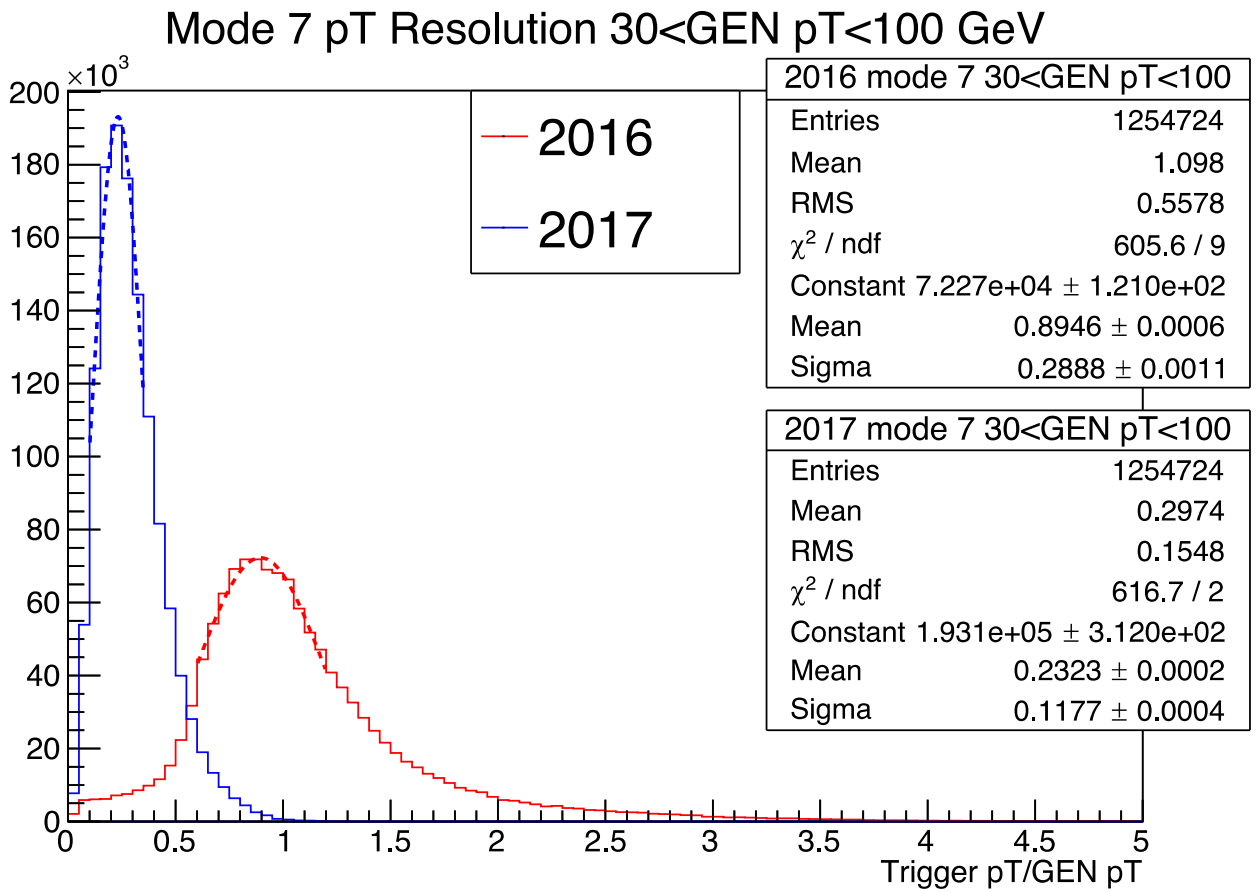
Mode 7 (station 2,3,4)



Mode 7 (station 2,3,4)



Mode 7 (station 2,3,4)



- Two station track in back up

Fit Parameter Summary

Four station track

===Mode 15

GEN pT Range[GeV]	2016 Mean	2017 Mean	2016 Sigma	2017 Sigma	2016 Sigma/Mean	2017 Sigma/Mean
(0, 10]	0.92	0.982	0.144	0.129	0.156	0.131
(10, 30]	0.89	0.896	0.153	0.179	0.172	0.2
(30, 100]	0.912	0.73	0.286	0.289	0.314	0.396
(100, 1000]	0.2	-5.8	0.378	1.26	1.89	-0.216

- Use $\frac{Sigma}{mean}$ as the pT resolution metric
- Mode 15
  - pT resolution ~2.5% better in low pT

Three station track

===Mode 14

GEN pT Range[GeV]	2016 Mean	2017 Mean	2016 Sigma	2017 Sigma	2016 Sigma/Mean	2017 Sigma/Mean
(0, 10]	0.908	0.981	0.145	0.134	0.159	0.136
(10, 30]	0.899	0.869	0.167	0.205	0.185	0.235
(30, 100]	0.909	0.692	0.289	0.351	0.318	0.507
(100, 1000]	0.142	-5.89	0.394	1.2	2.76	-0.204

===Mode 13

GEN pT Range[GeV]	2016 Mean	2017 Mean	2016 Sigma	2017 Sigma	2016 Sigma/Mean	2017 Sigma/Mean
(0, 10]	0.918	0.985	0.145	0.132	0.158	0.134
(10, 30]	0.899	0.895	0.166	0.195	0.185	0.218
(30, 100]	0.907	0.719	0.278	0.319	0.307	0.443
(100, 1000]	0.157	-5.85	0.394	1.23	2.5	-0.211

===Mode 11

GEN pT Range[GeV]	2016 Mean	2017 Mean	2016 Sigma	2017 Sigma	2016 Sigma/Mean	2017 Sigma/Mean
(0, 10]	0.912	0.981	0.142	0.147	0.156	0.15
(10, 30]	0.887	0.83	0.163	0.213	0.183	0.256
(30, 100]	0.902	0.553	0.287	0.298	0.318	0.539
(100, 1000]	0.113	-4.5	0.424	0.915	3.73	-0.204

===Mode 7

GEN pT Range[GeV]	2016 Mean	2017 Mean	2016 Sigma	2017 Sigma	2016 Sigma/Mean	2017 Sigma/Mean
(0, 10]	0.914	0.984	0.144	0.194	0.157	0.198
(10, 30]	0.898	0.588	0.167	0.217	0.186	0.369
(30, 100]	0.895	0.232	0.289	0.118	0.323	0.507
(100, 1000]	-0.0102	-0.64	0.451	0.195	-44.4	-0.305

- Three station track mode shows ~2% better pT resolution at low pT
- Two station track in back up

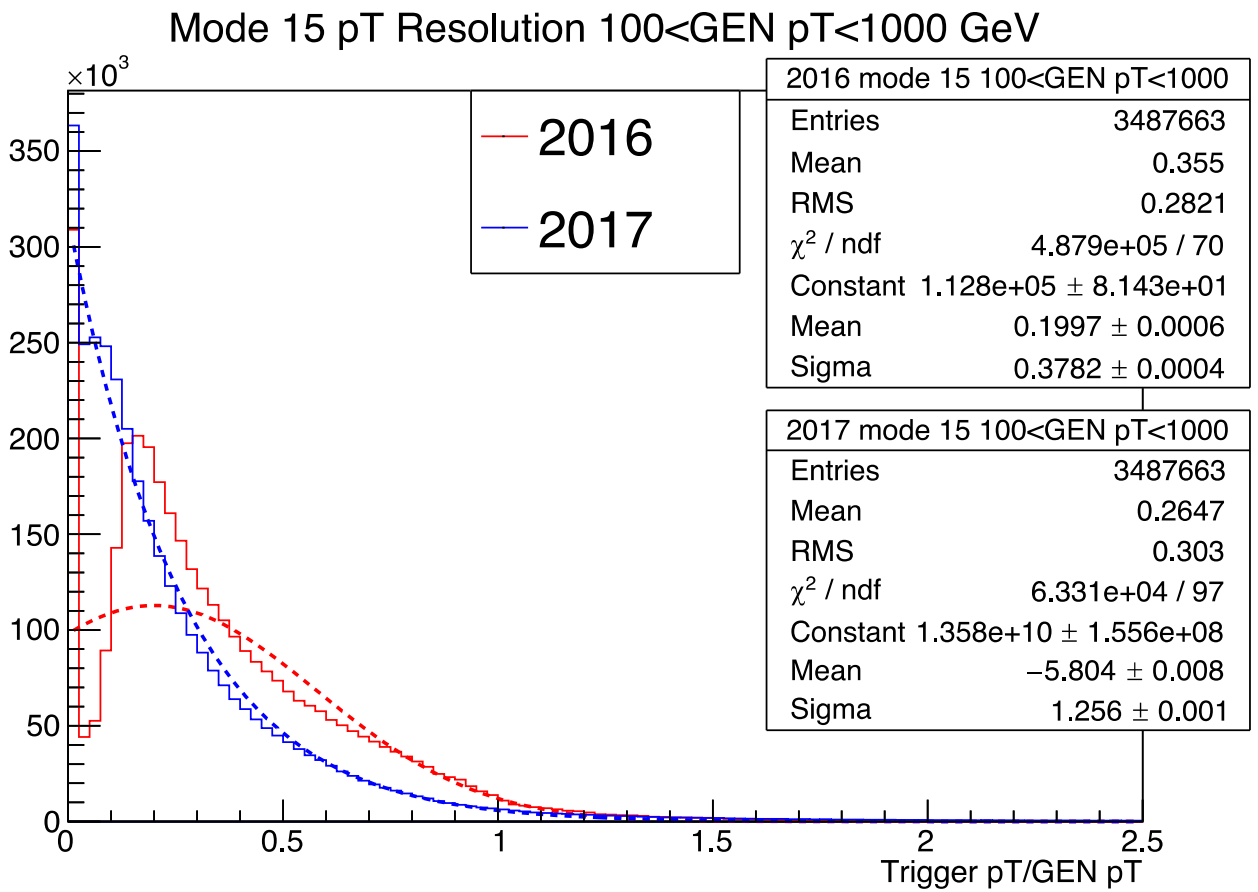
Conclusion

- 2017 EMTF pT resolution is good
  - Almost every 4-track and 3-track mode has better pT resolution in low pT range (~2% better)
  - ~13% in low pT (0, 10] GeV
  - ~20% in pT (10, 30] GeV
  - ~40%-50% in pT (30, 100] GeV
  - pT resolution in intermediate and high pT ranges didn't outperform last year
    - Training focused on low pT (using 1/pT target and 1/pT weight)
    - Fitting has uncertainties

BACK UP

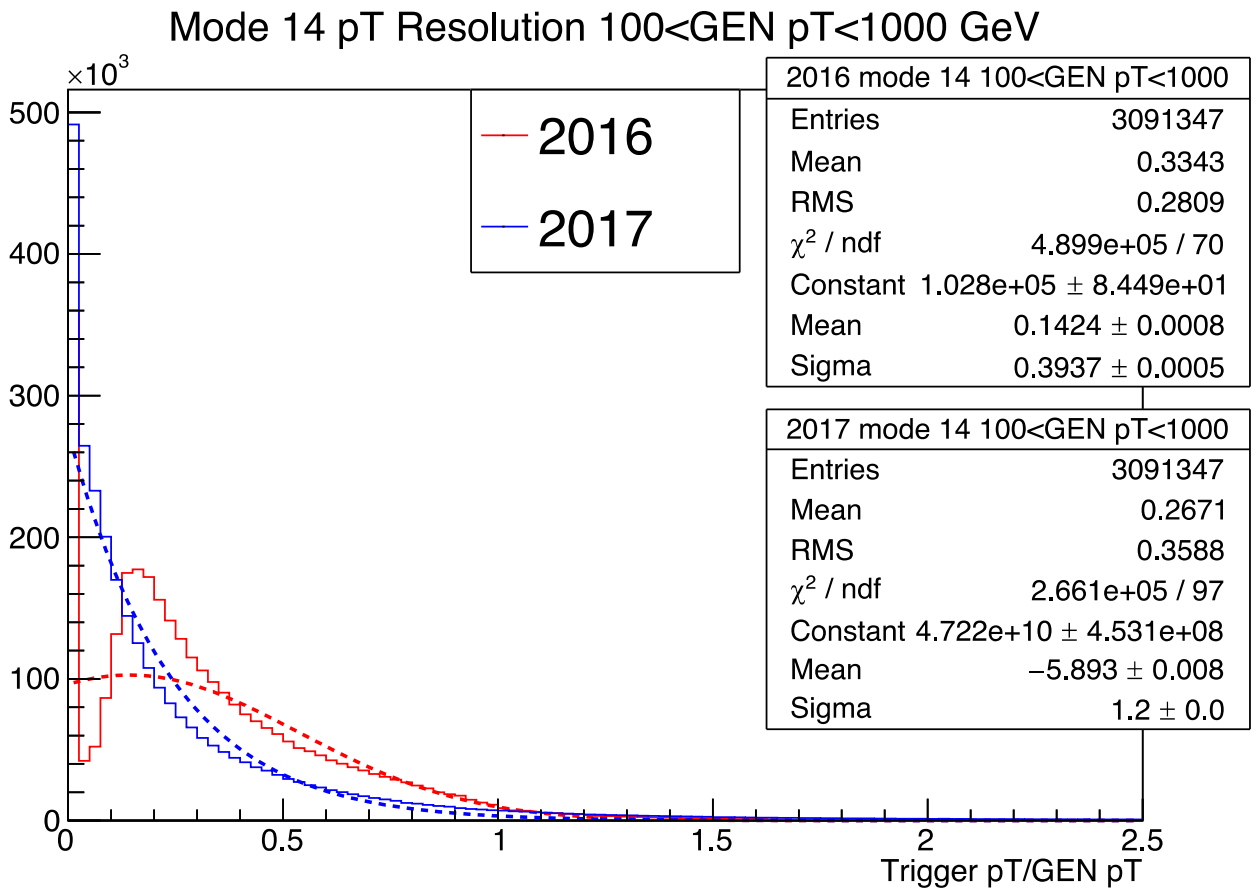
Four station track

Mode 15 (station 1,2,3,4)

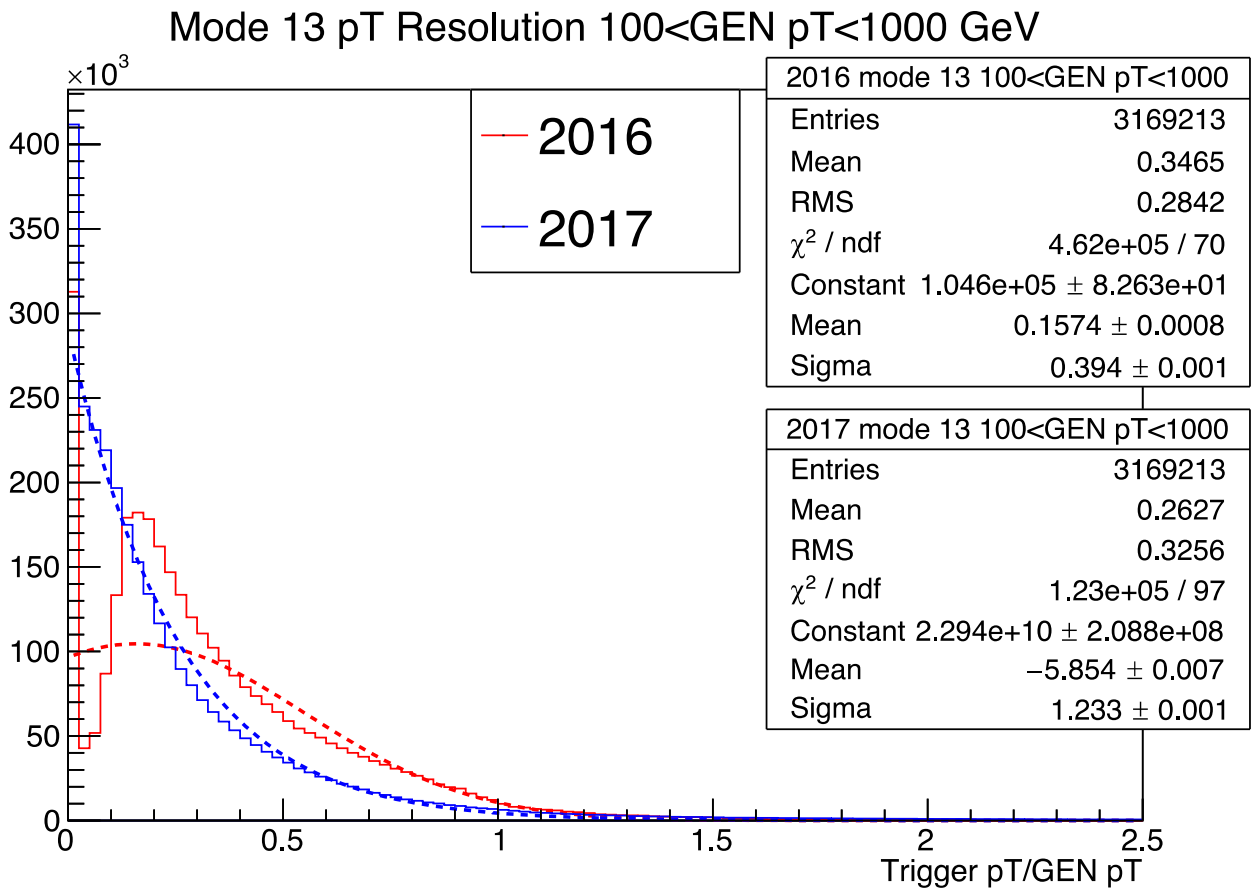


Three station track

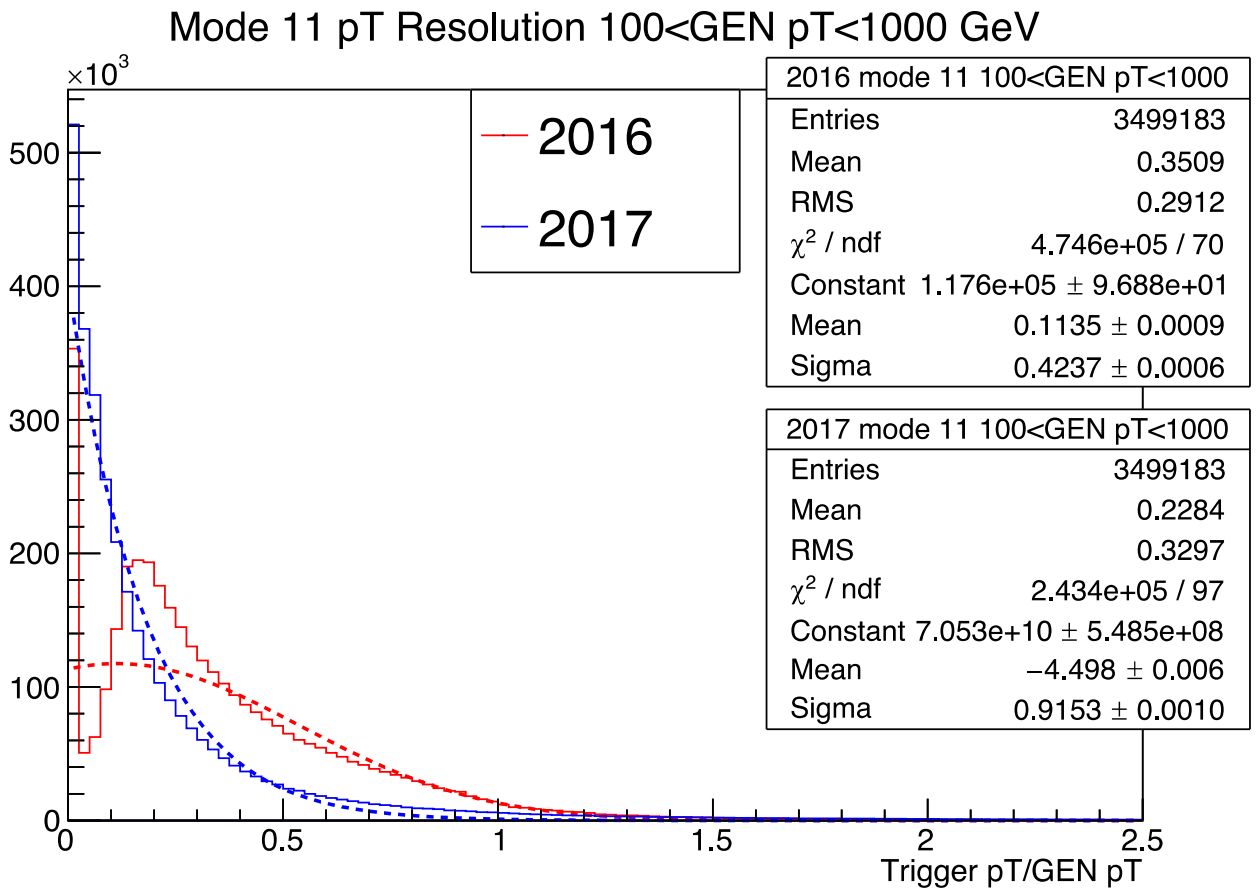
Mode 14 (station 1,2,3)



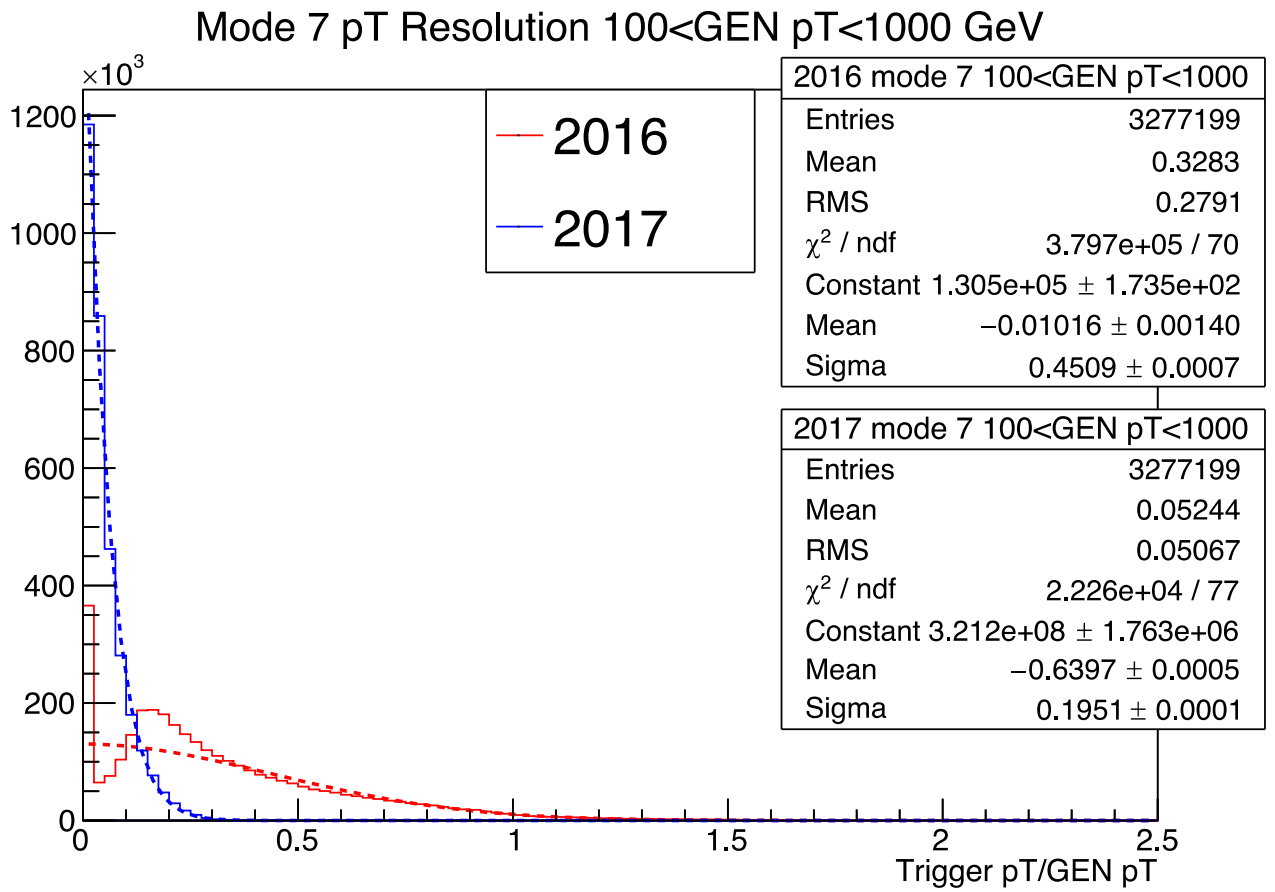
Mode 13 (station 1,2,4)



Mode 11 (station 1,3,4)

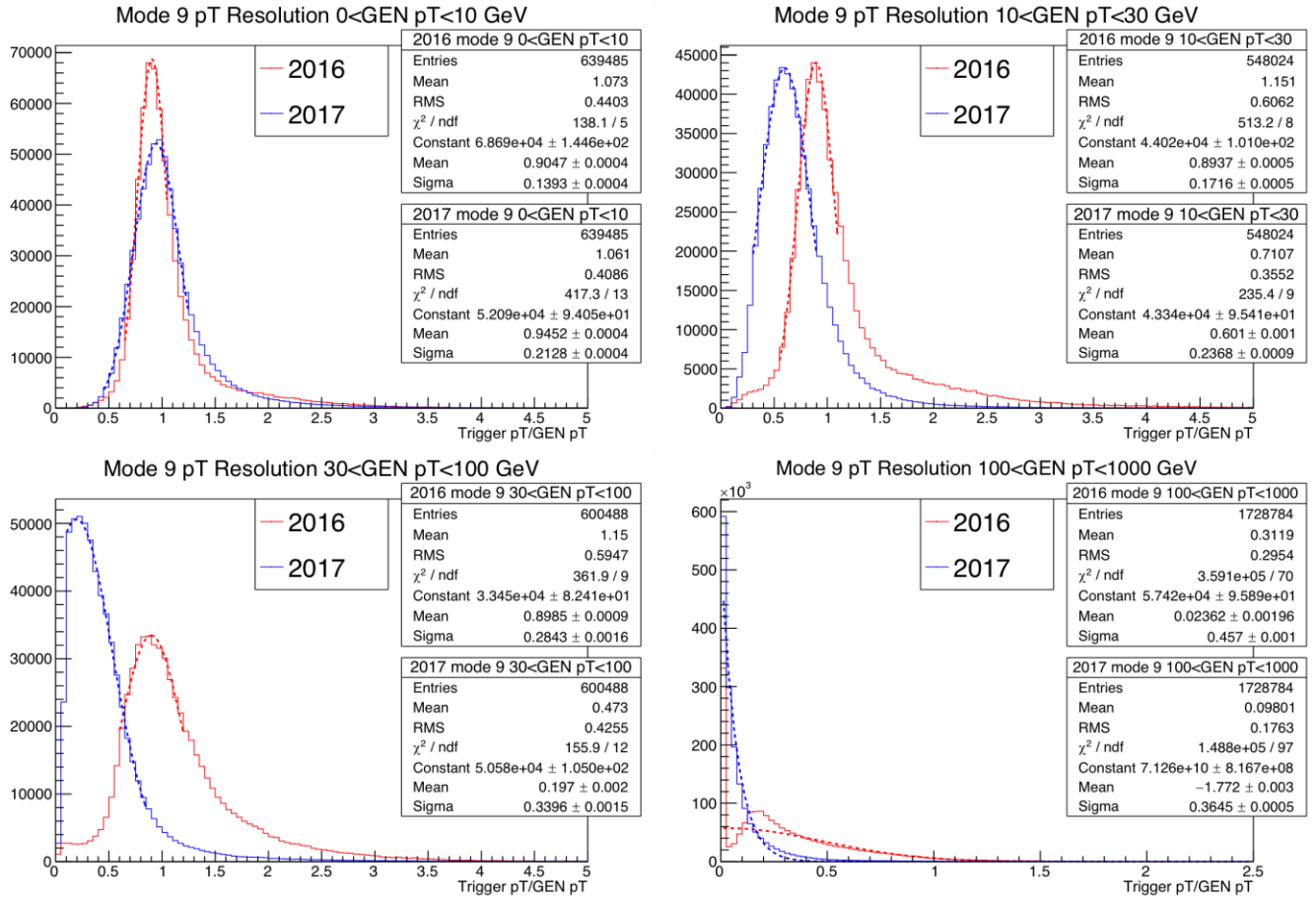


Mode 7 (station 2,3,4)

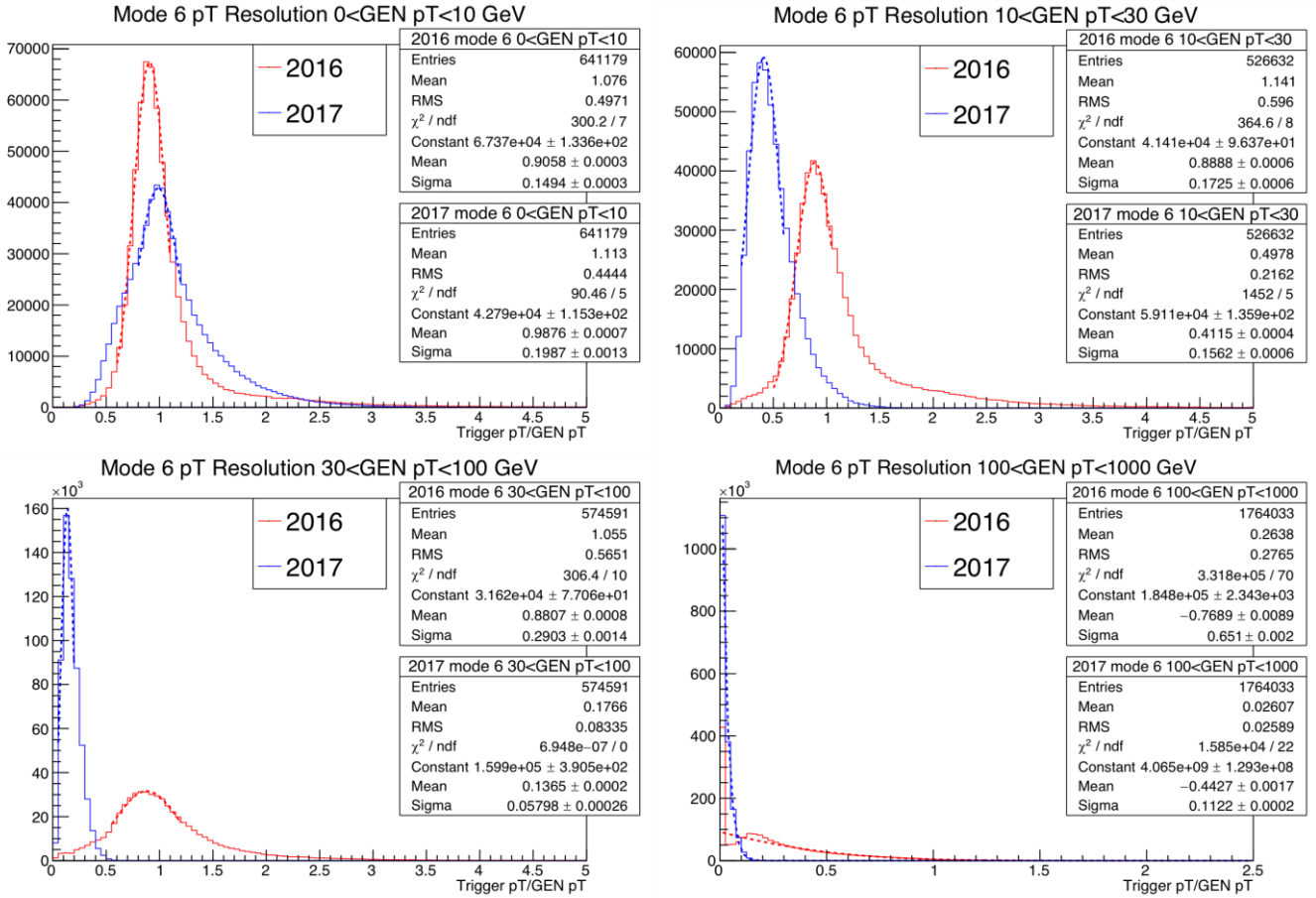


Two station track

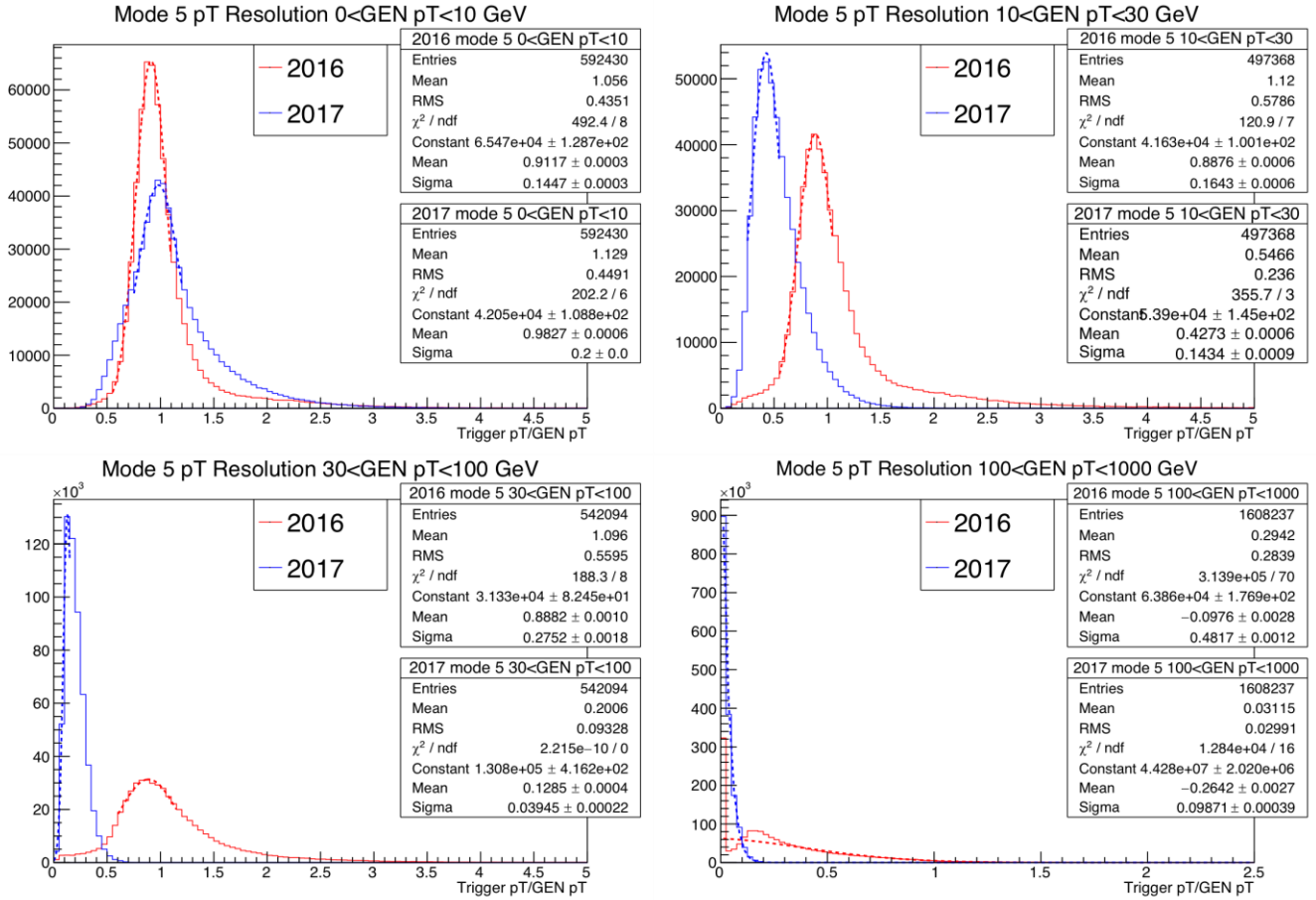
Mode 9 (station 1,4)



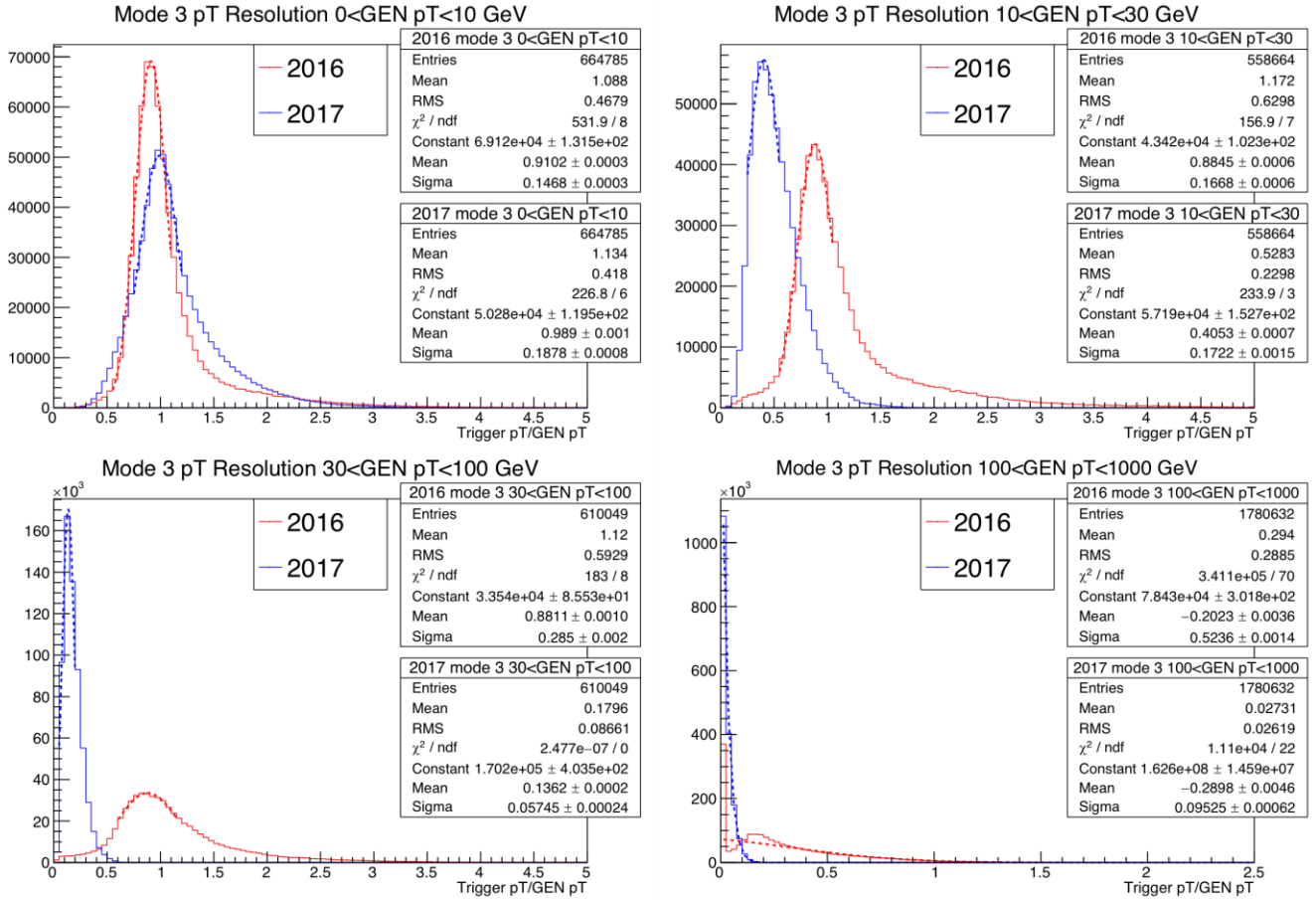
Mode 6 (station 2,3)



Mode 5 (station 2,4)



Mode 3 (station 3,4)



Two station track

===Mode 9

GEN pT Range[GeV]	2016 Mean	2017 Mean	2016 Sigma	2017 Sigma	2016 Sigma/Mean	2017 Sigma/Mean
(0, 10]	0.905	0.945	0.139	0.213	0.154	0.225
(10, 30]	0.894	0.601	0.172	0.237	0.192	0.394
(30, 100]	0.899	0.197	0.284	0.34	0.316	1.72
(100, 1000]	0.0236	-1.77	0.457	0.365	19.3	-0.206

===Mode 6

GEN pT Range[GeV]	2016 Mean	2017 Mean	2016 Sigma	2017 Sigma	2016 Sigma/Mean	2017 Sigma/Mean
(0, 10]	0.906	0.988	0.149	0.199	0.165	0.201
(10, 30]	0.889	0.411	0.172	0.156	0.194	0.38
(30, 100]	0.881	0.136	0.29	0.058	0.33	0.425
(100, 1000]	-0.769	-0.443	0.651	0.112	-0.847	-0.253

===Mode 5

GEN pT Range[GeV]	2016 Mean	2017 Mean	2016 Sigma	2017 Sigma	2016 Sigma/Mean	2017 Sigma/Mean
(0, 10]	0.912	0.983	0.145	0.2	0.159	0.204
(10, 30]	0.888	0.427	0.164	0.143	0.185	0.336
(30, 100]	0.888	0.128	0.275	0.0395	0.31	0.307
(100, 1000]	-0.0976	-0.264	0.482	0.0987	-4.94	-0.374

===Mode 3

GEN pT Range[GeV]	2016 Mean	2017 Mean	2016 Sigma	2017 Sigma	2016 Sigma/Mean	2017 Sigma/Mean
(0, 10]	0.91	0.989	0.147	0.188	0.161	0.19
(10, 30]	0.884	0.405	0.167	0.172	0.189	0.425
(30, 100]	0.881	0.136	0.285	0.0575	0.323	0.422
(100, 1000]	-0.202	-0.29	0.524	0.0952	-2.59	-0.329