MVA photon cuts update

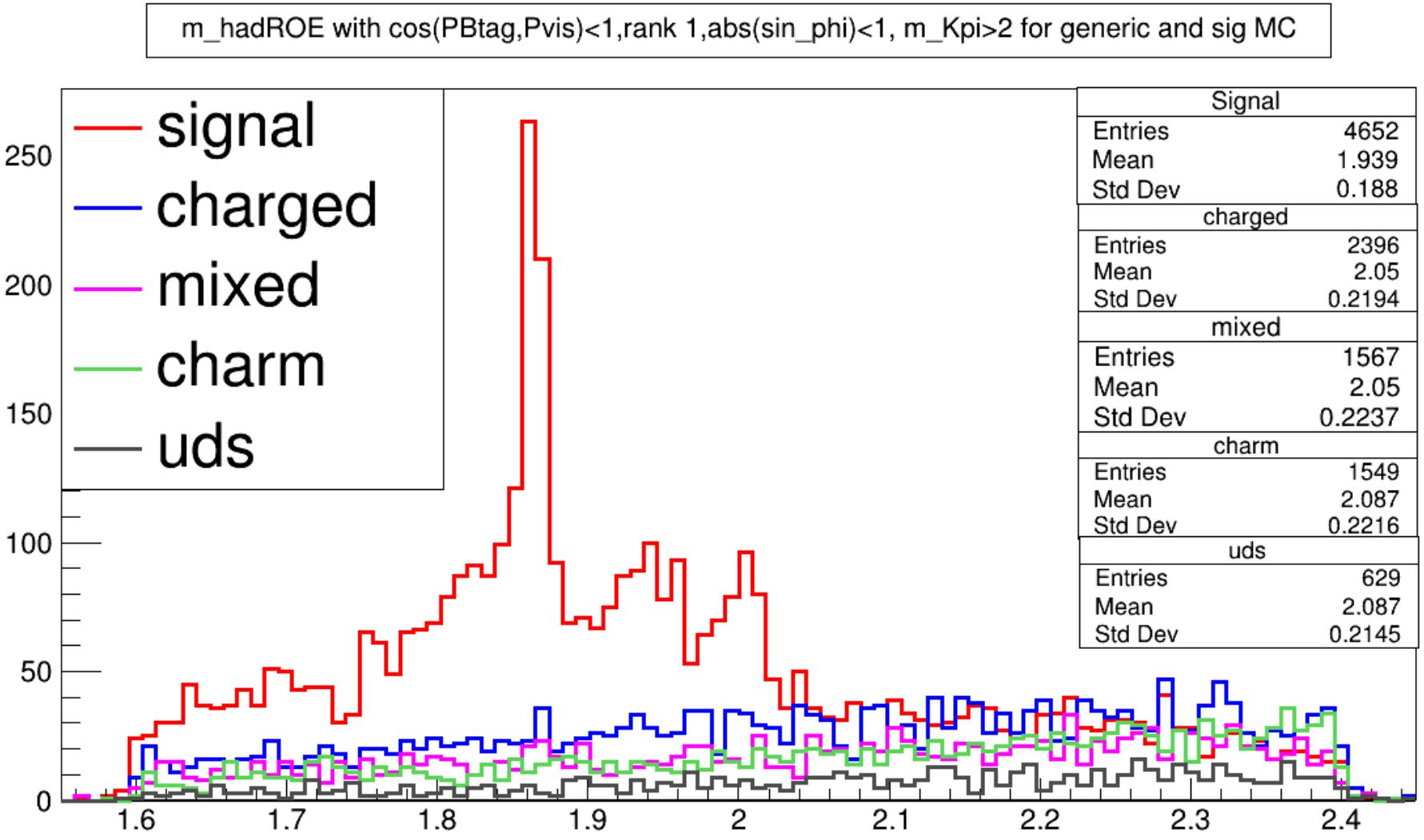
3.0 Streams of generic MC
and
1.0 M signal events

$B^+ \rightarrow K^+ \text{tau}^- \text{mu}^+$
$B^- \rightarrow$ generic

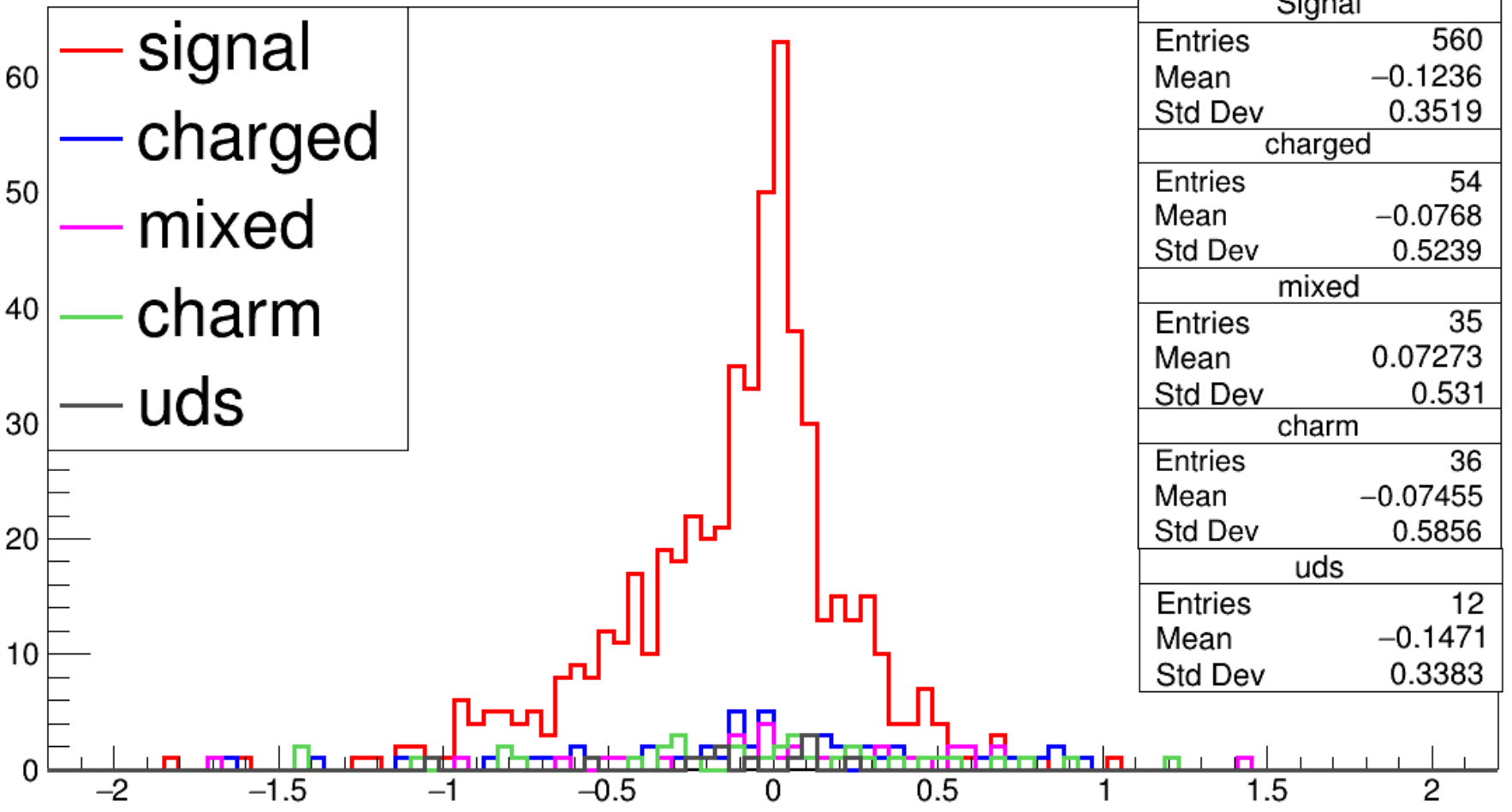
21 Nov. 2023

Cuts in the reconstruction program

- $M_{kpi} > 0.7$ GeV
- $abs(m_{lpi}-3.1) > 0.015$ GeV
- $1.6 < m_{hadronROE} < 2.4$ GeV
- $abs(cos(P_{Btag},P_{tag,vis}) < 2$
- $abs(sin(phi)) < 1.5$


m_hadROE with cos(PBtag,Pvis)<1,rank 1,abs(sin_phi)<1, m_Kpi>2 for generic and sig MC
signal
charged
mixed
charm
uds
Signal
Entries 4652
Mean 1.939
Std Dev 0.188
charged
Entries 2396
Mean 2.05
Std Dev 0.2194
mixed
Entries 1567
Mean 2.05
Std Dev 0.2237
charm
Entries 1549
Mean 2.087
Std Dev 0.2216
uds
Entries 629
Mean 2.087
Std Dev 0.2145
250
200
150
100
50
0
1.6
1.7
1.8
1.9
2
2.1
2.2
2.3
2.4

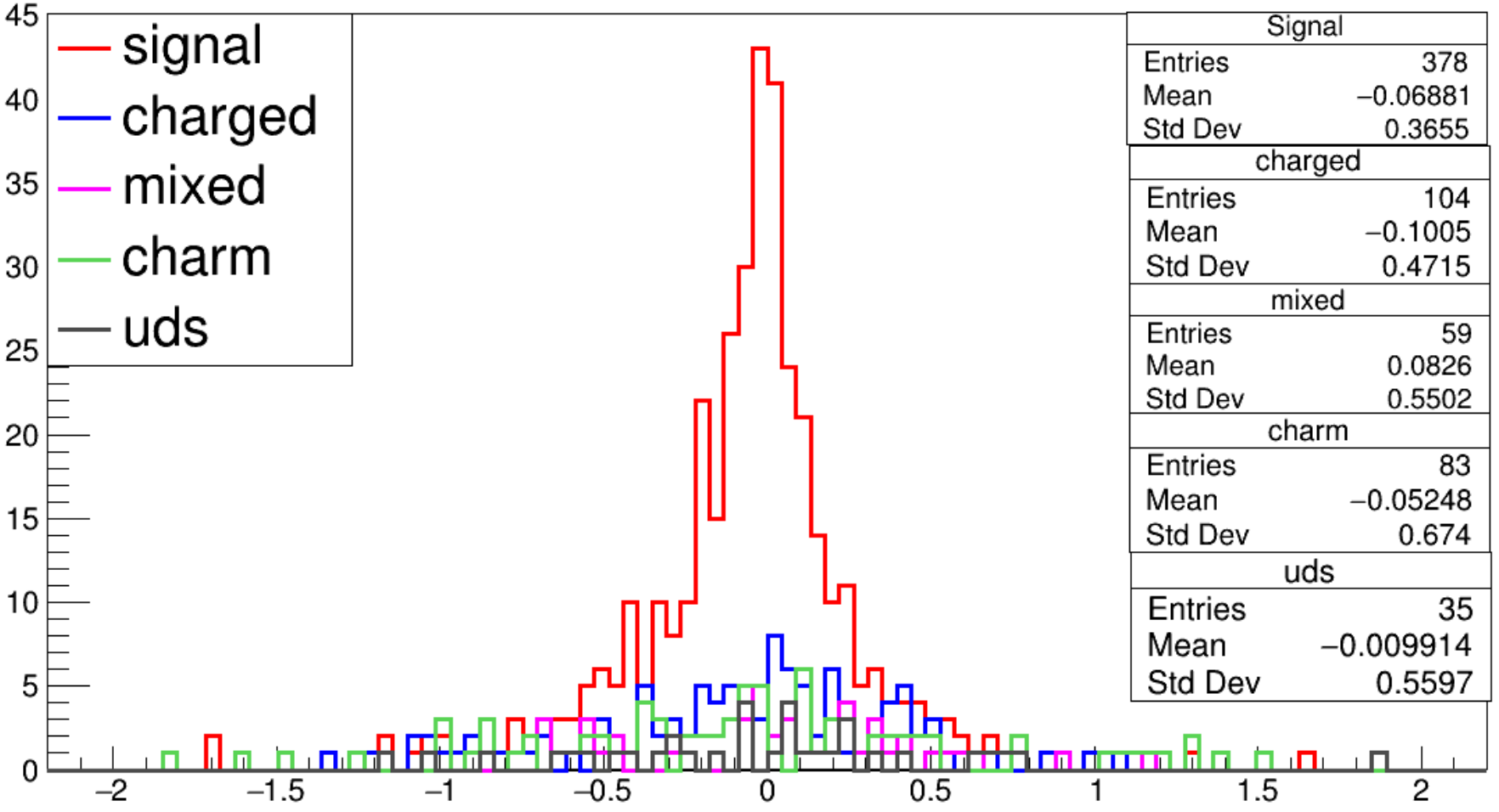
Best sum of cosine angles with cos(PBtag,Pvis)<1,rank 1,abs(sin_phi)<1,m_Kpi>2,abs(m_hadROE-1.86)<0.015,nLepton=2 for generic and sig MC



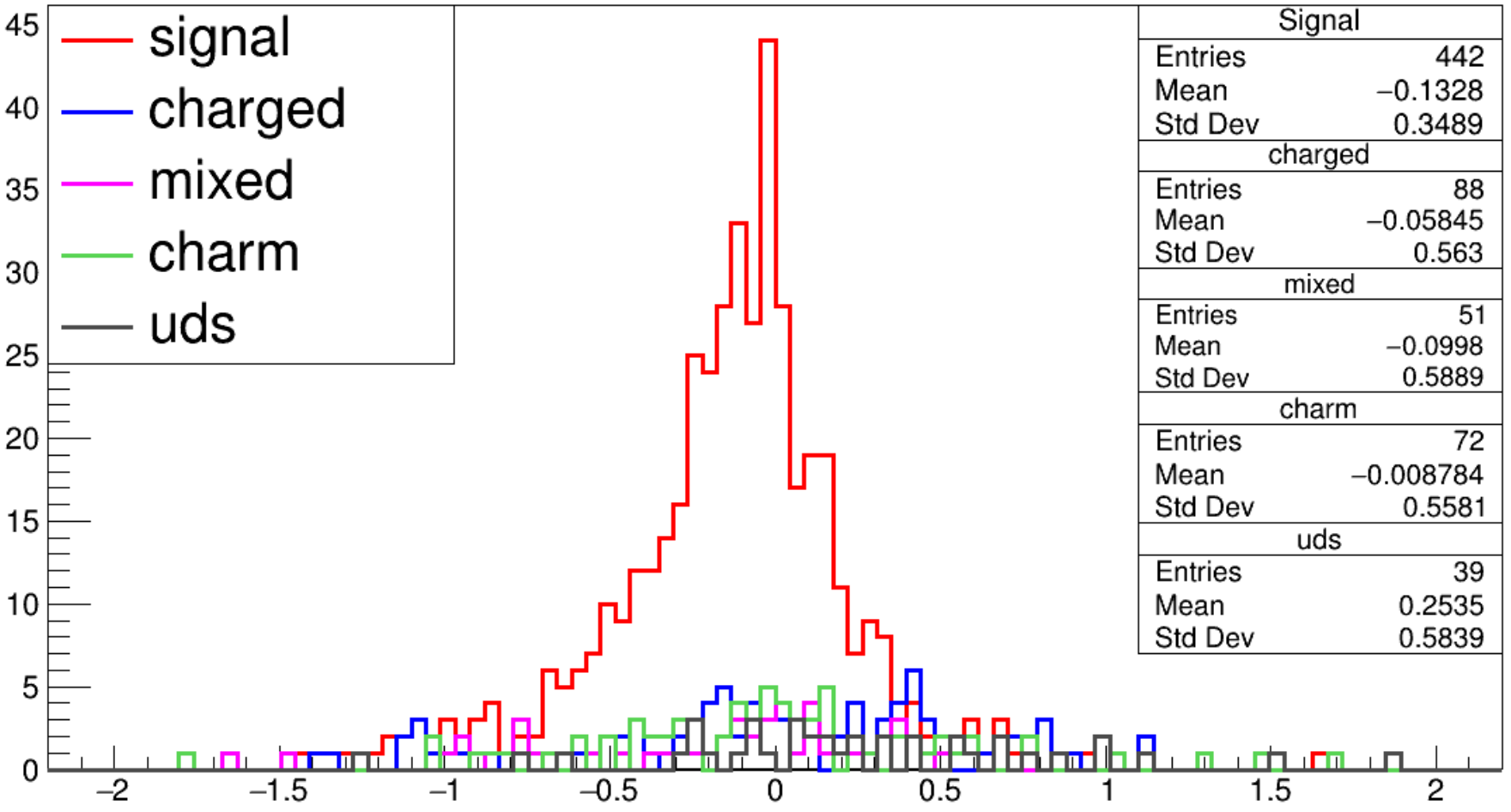
Signal	
Entries	560
Mean	−0.1236
Std Dev	0.3519
charged	
Entries	54
Mean	−0.0768
Std Dev	0.5239
mixed	
Entries	35
Mean	0.07273
Std Dev	0.531
charm	
Entries	36
Mean	−0.07455
Std Dev	0.5856
uds	
Entries	12
Mean	−0.1471
Std Dev	0.3383

Backup

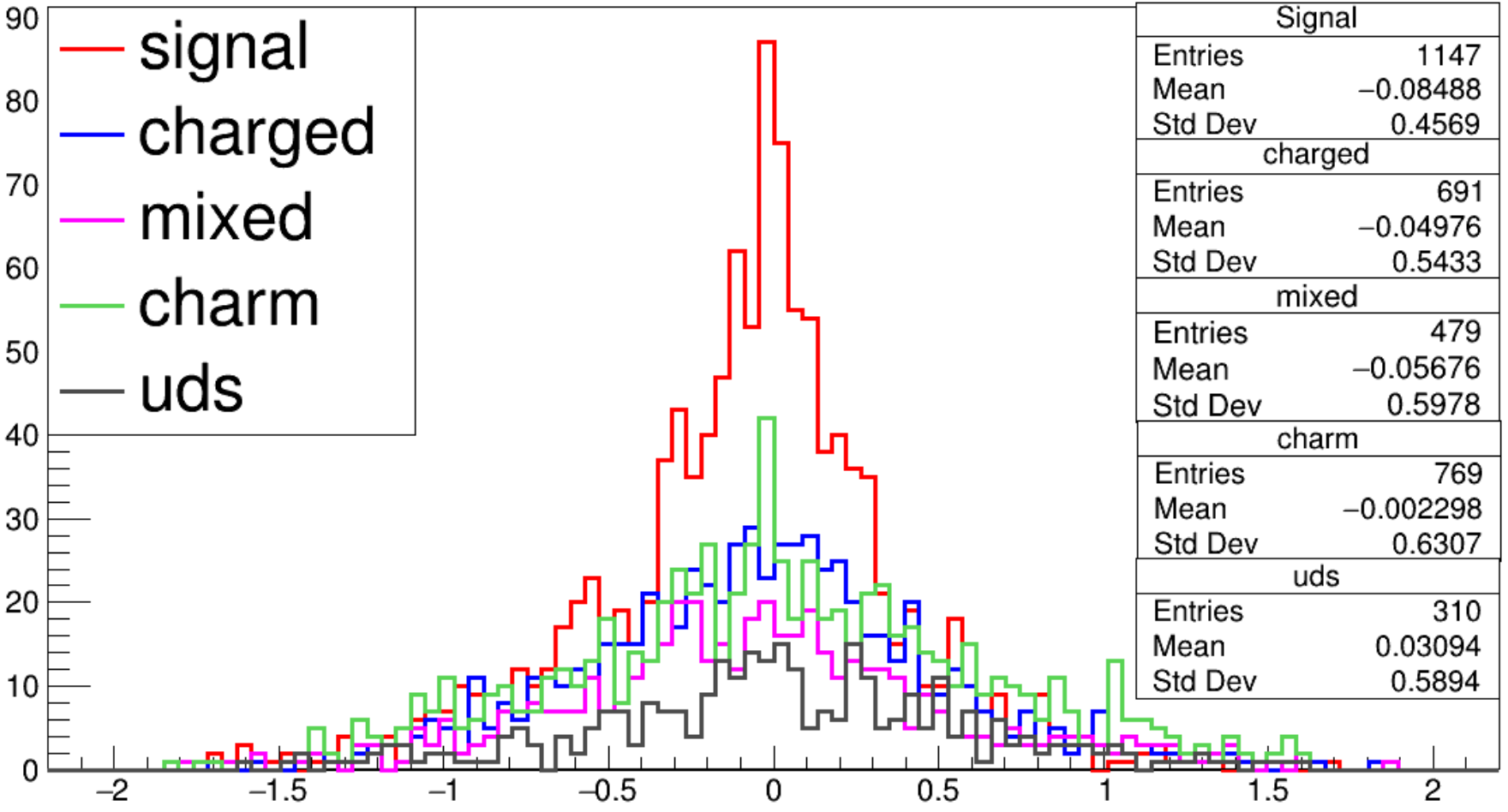
Best sum of cosine angles with cos(PBtag,Pvis)<1,rank 1,abs(sin_phi)<1,m_Kpi>2,abs(m_hadROE-2.006)<0.03,nLepton=2 for generic and sig MC



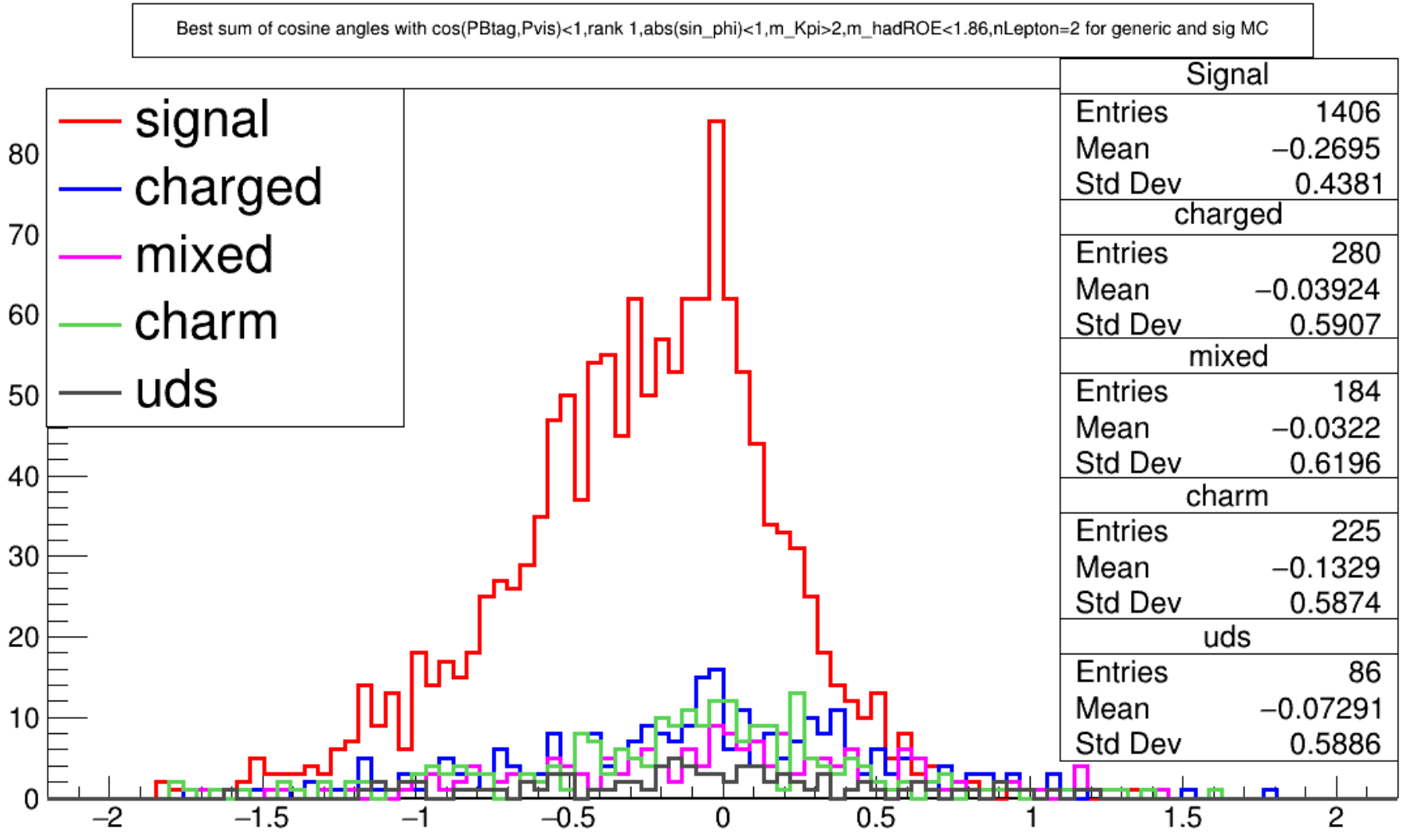
Best sum of cosine angles with cos(PBtag,Pvis)<1,rank 1,abs(sin_phi)<1,m_Kpi>2,abs(m_hadROE-1.96)<0.03,nLepton=2 for generic and sig MC

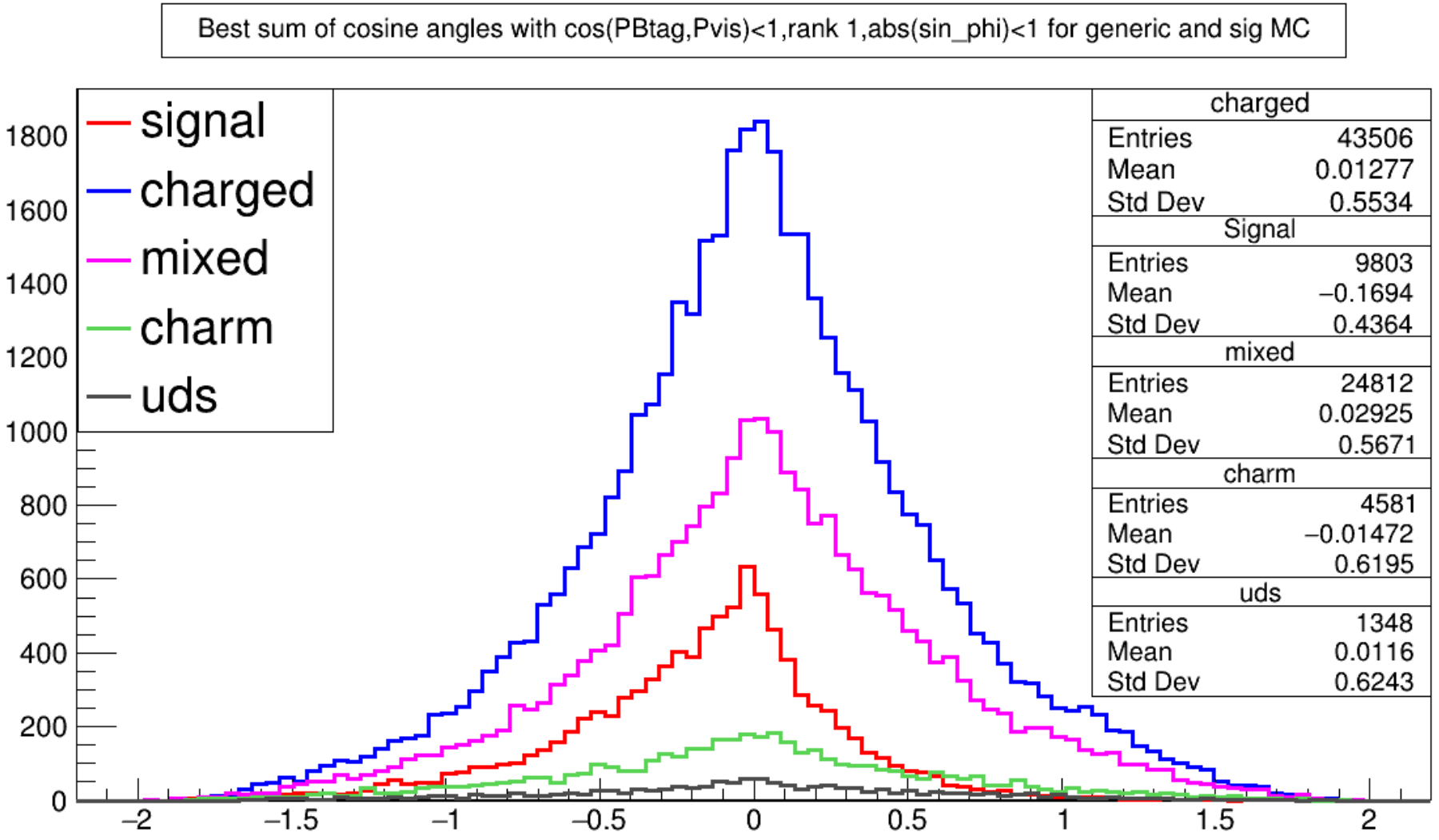


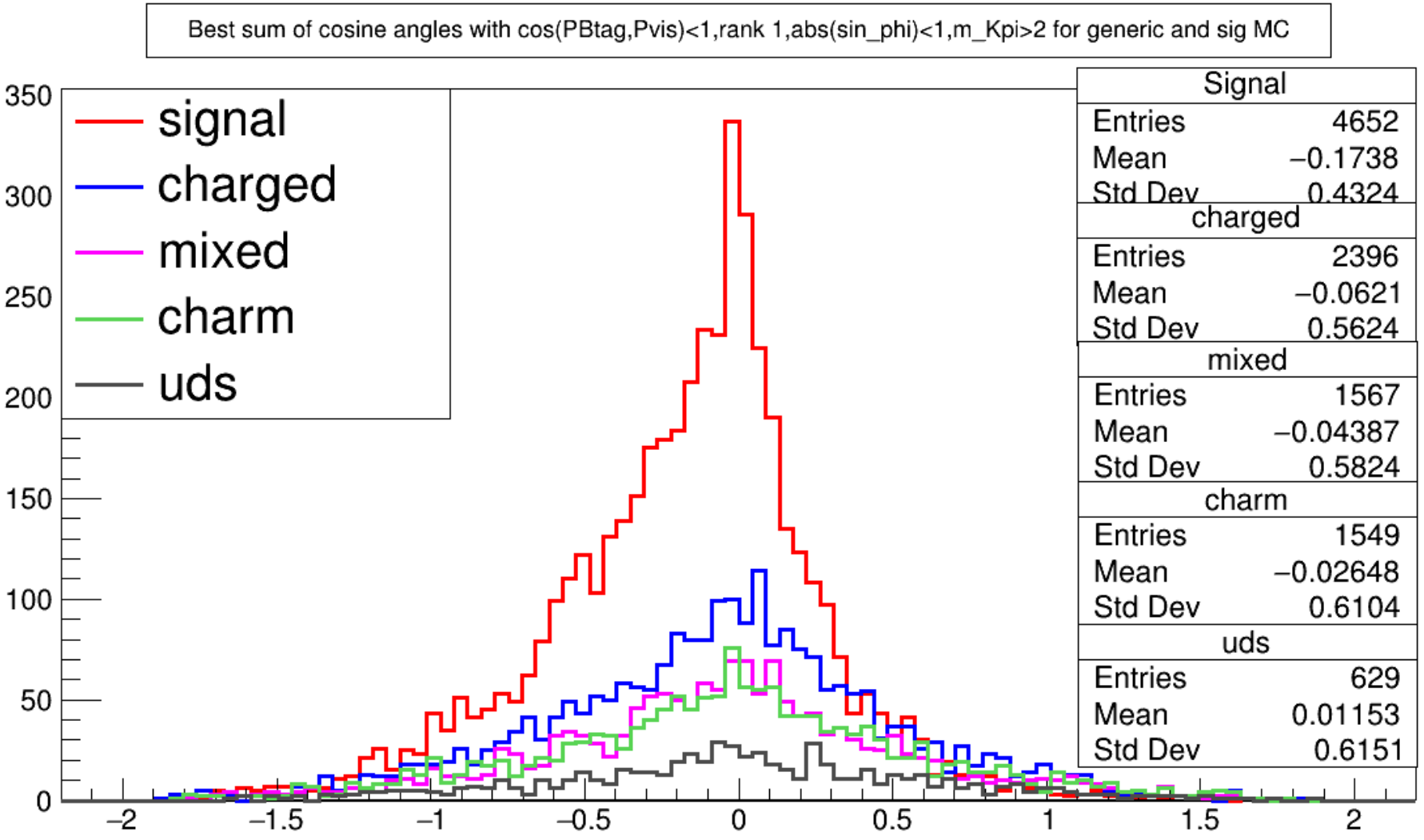
Best sum of cosine angles with cos(PBtag,Pvis)<1,rank 1,abs(sin_phi)<1,m_Kpi>2,m_hadROE>2.006,nLepton=2 for generic and sig MC

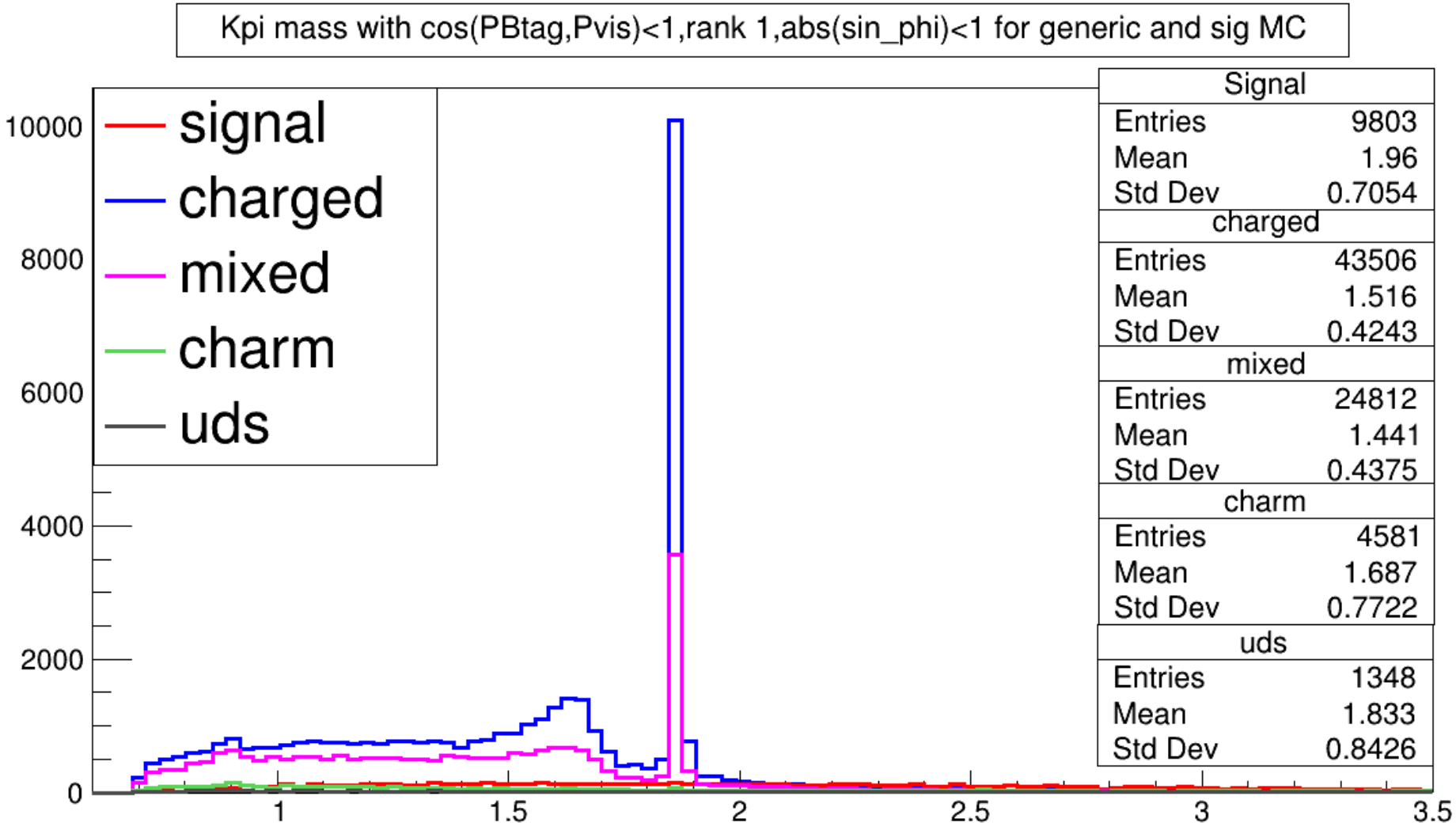


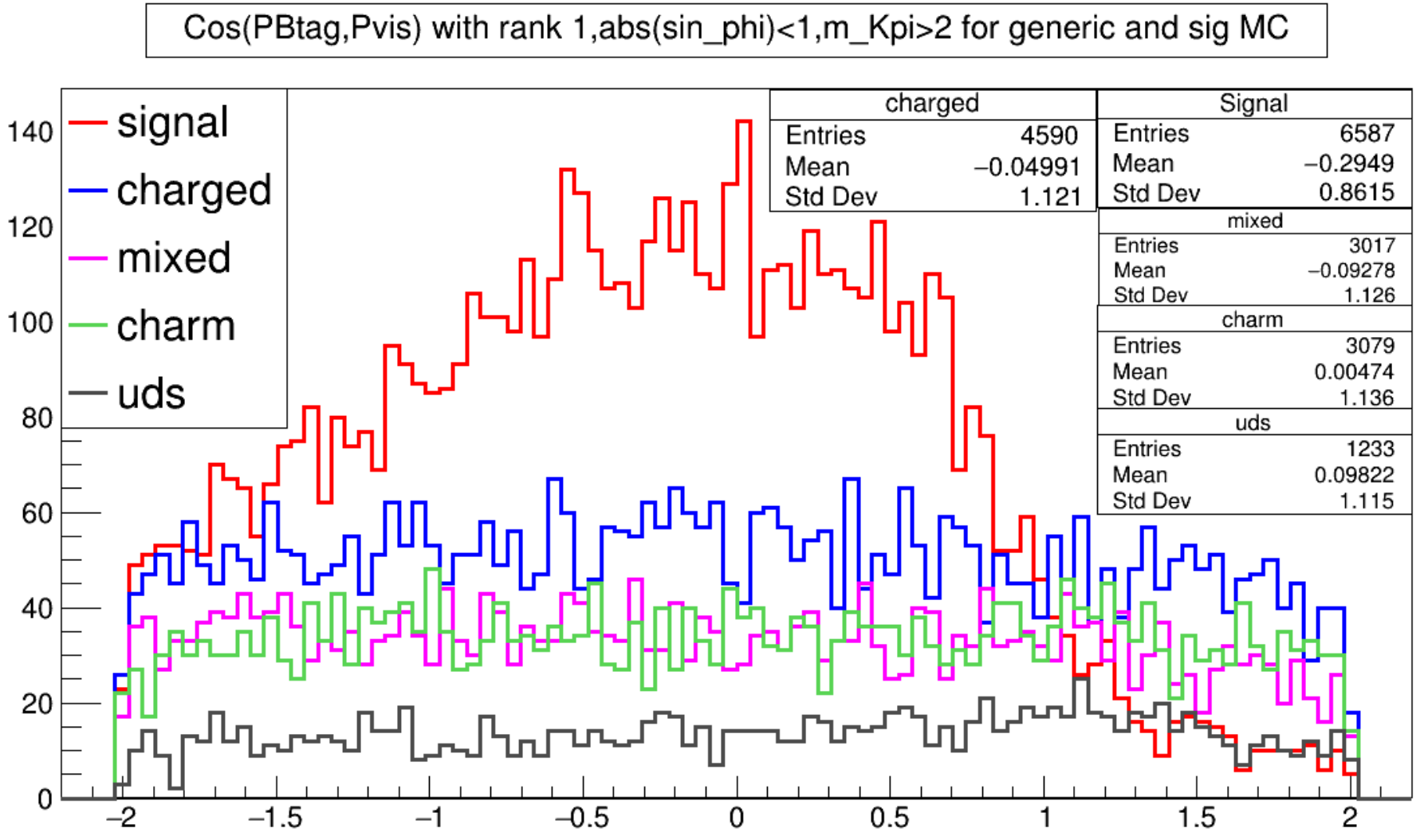
Signal	
Entries	1147
Mean	−0.08488
Std Dev	0.4569
charged	
Entries	691
Mean	−0.04976
Std Dev	0.5433
mixed	
Entries	479
Mean	−0.05676
Std Dev	0.5978
charm	
Entries	769
Mean	−0.002298
Std Dev	0.6307
uds	
Entries	310
Mean	0.03094
Std Dev	0.5894


Best sum of cosine angles with cos(PBtag,Pvis)<1,rank 1,abs(sin_phi)<1,m_Kpi>2,m_hadROE<1.86,nLepton=2 for generic and sig MC
signal
charged
mixed
charm
uds
Signal
Entries 1406
Mean −0.2695
Std Dev 0.4381
charged
Entries 280
Mean −0.03924
Std Dev 0.5907
mixed
Entries 184
Mean −0.0322
Std Dev 0.6196
charm
Entries 225
Mean −0.1329
Std Dev 0.5874
uds
Entries 86
Mean −0.07291
Std Dev 0.5886
0
10
20
30
40
50
60
70
80
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2

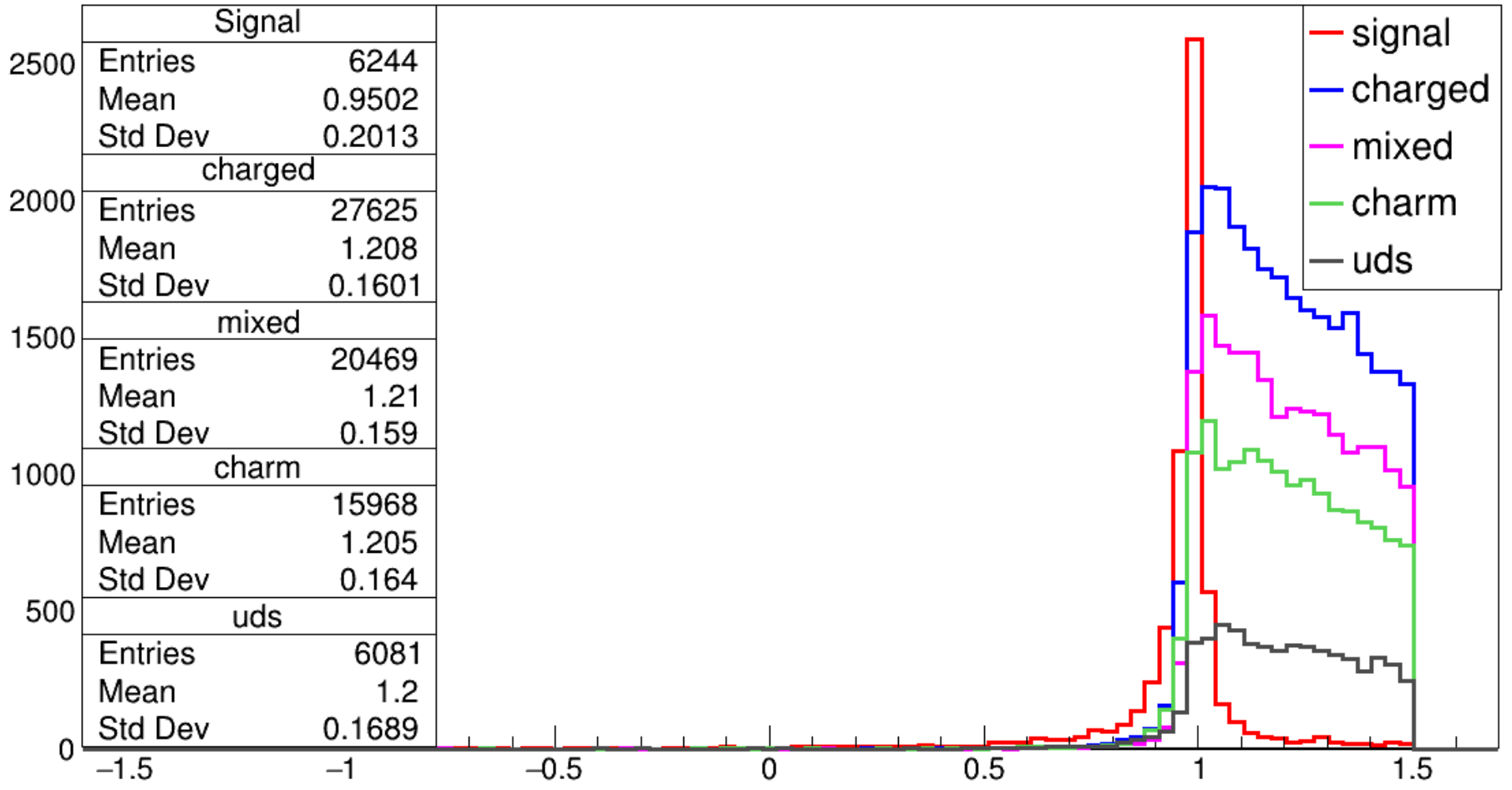

Best sum of cosine angles with cos(PBtag,Pvis)<1,rank 1,abs(sin_phi)<1 for generic and sig MC
signal
charged
mixed
charm
uds
charged
Entries 43506
Mean 0.01277
Std Dev 0.5534
Signal
Entries 9803
Mean −0.1694
Std Dev 0.4364
mixed
Entries 24812
Mean 0.02925
Std Dev 0.5671
charm
Entries 4581
Mean −0.01472
Std Dev 0.6195
uds
Entries 1348
Mean 0.0116
Std Dev 0.6243
1800
1600
1400
1200
1000
800
600
400
200
0
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2


Best sum of cosine angles with cos(PBtag,Pvis)<1,rank 1,abs(sin_phi)<1,m_Kpi>2 for generic and sig MC
signal
charged
mixed
charm
uds
Signal
Entries 4652
Mean −0.1738
Std Dev 0.4324
charged
Entries 2396
Mean −0.0621
Std Dev 0.5624
mixed
Entries 1567
Mean −0.04387
Std Dev 0.5824
charm
Entries 1549
Mean −0.02648
Std Dev 0.6104
uds
Entries 629
Mean 0.01153
Std Dev 0.6151
350
300
250
200
150
100
50
0
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2

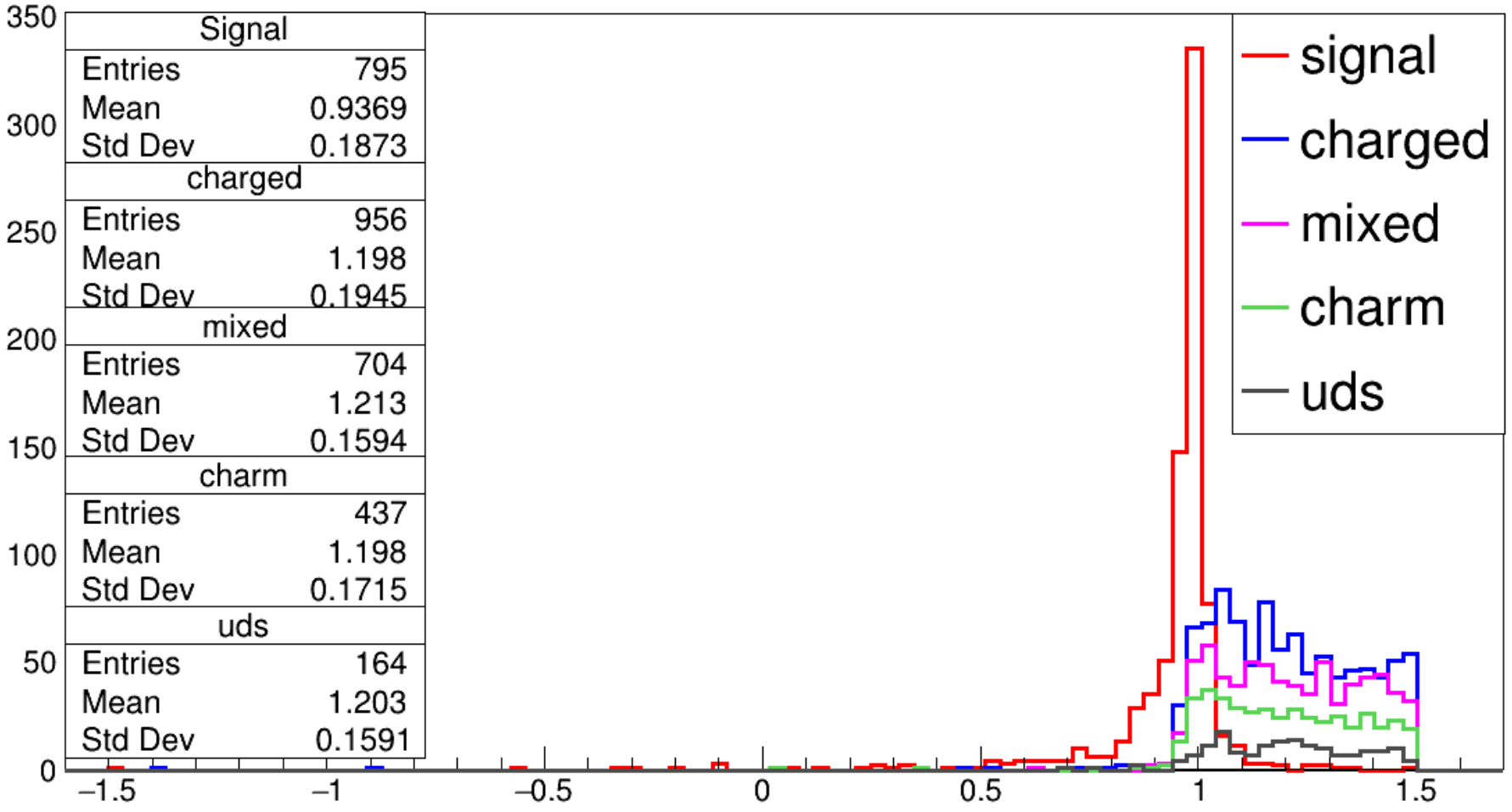

Kpi mass with cos(PBtag,Pvis)<1,rank 1,abs(sin_phi)<1 for generic and sig MC
signal
charged
mixed
charm
uds
10000
8000
6000
4000
2000
0
1
1.5
2
2.5
3
3.5
Signal
Entries 9803
Mean 1.96
Std Dev 0.7054
charged
Entries 43506
Mean 1.516
Std Dev 0.4243
mixed
Entries 24812
Mean 1.441
Std Dev 0.4375
charm
Entries 4581
Mean 1.687
Std Dev 0.7722
uds
Entries 1348
Mean 1.833
Std Dev 0.8426


Cos(PBtag,Pvis) with rank 1,abs(sin_phi)<1,m_Kpi>2 for generic and sig MC
signal
charged
mixed
charm
uds
charged
Entries 4590
Mean −0.04991
Std Dev 1.121
Signal
Entries 6587
Mean −0.2949
Std Dev 0.8615
mixed
Entries 3017
Mean −0.09278
Std Dev 1.126
charm
Entries 3079
Mean 0.00474
Std Dev 1.136
uds
Entries 1233
Mean 0.09822
Std Dev 1.115
140
120
100
80
60
40
20
0
−2
−1.5
−1
−0.5
0
0.5
1
1.5
2

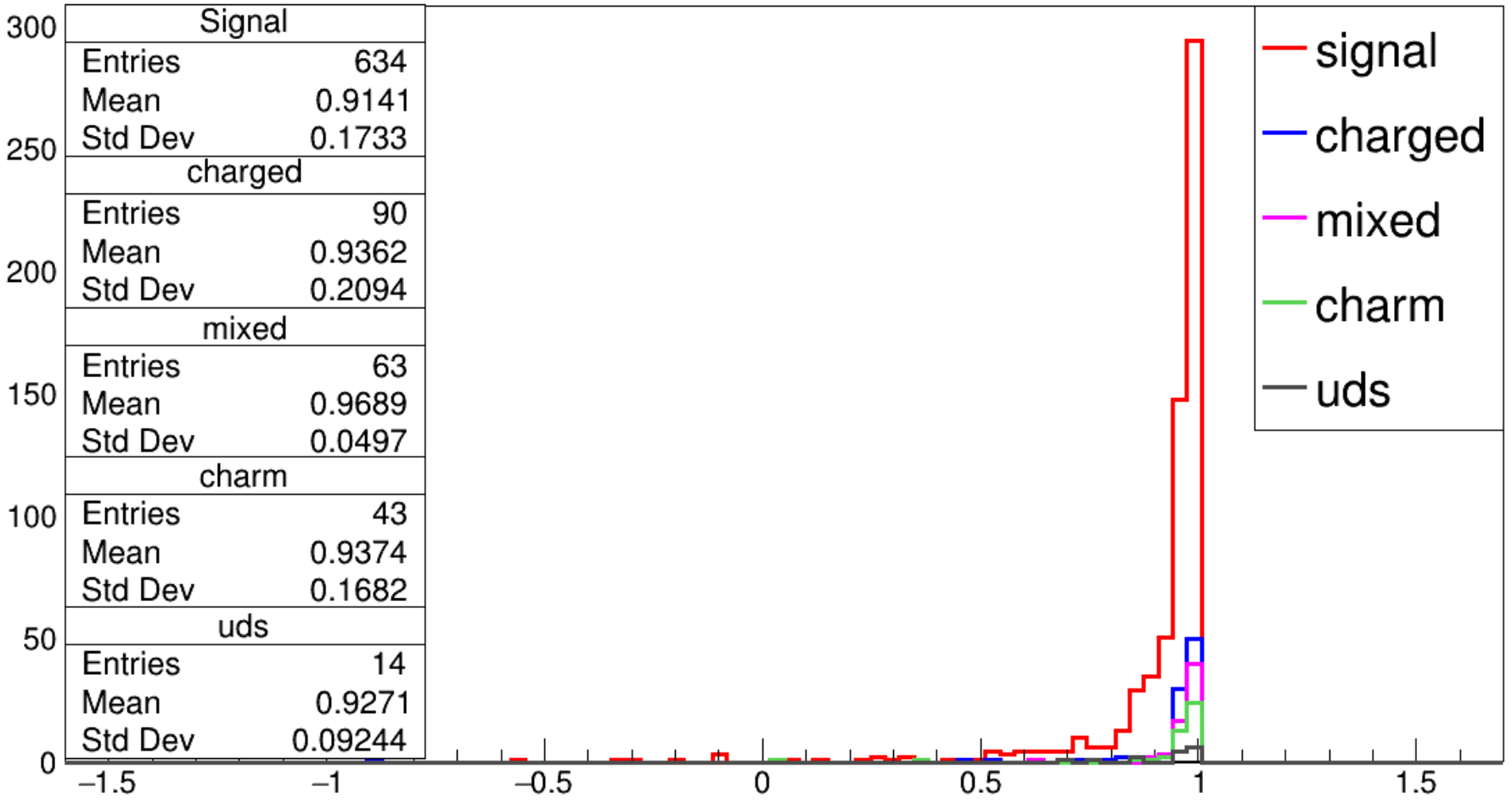
Sin_phi with abs(Cos(PBtag,Pvis))<1,rank 1,m_Kpi>2 for generic and sig MC

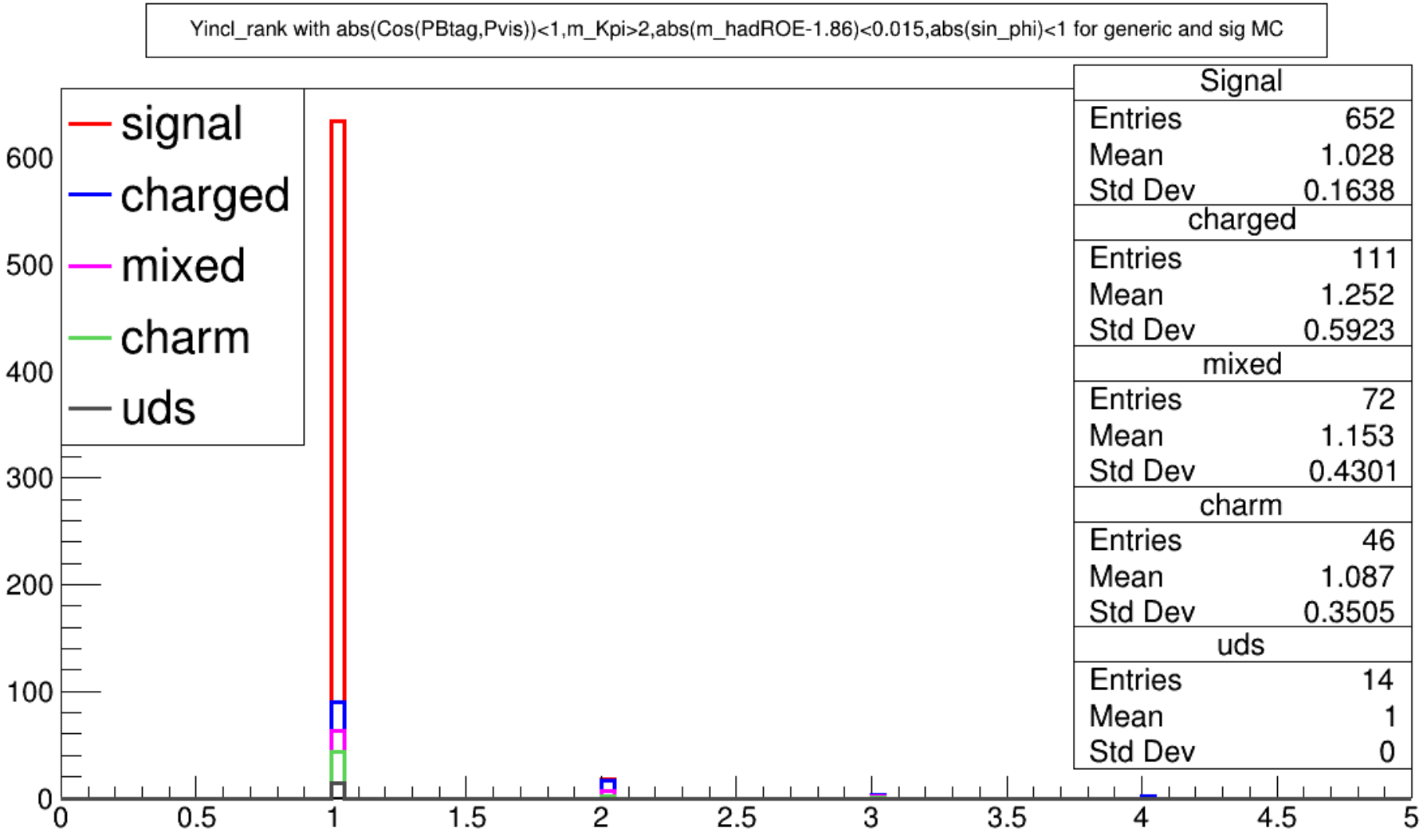


Sin_phi with abs(Cos(PBtag,Pvis))<1,rank 1,m_Kpi>2,abs(m_hadROE-1.86)<0.015 for generic and sig MC

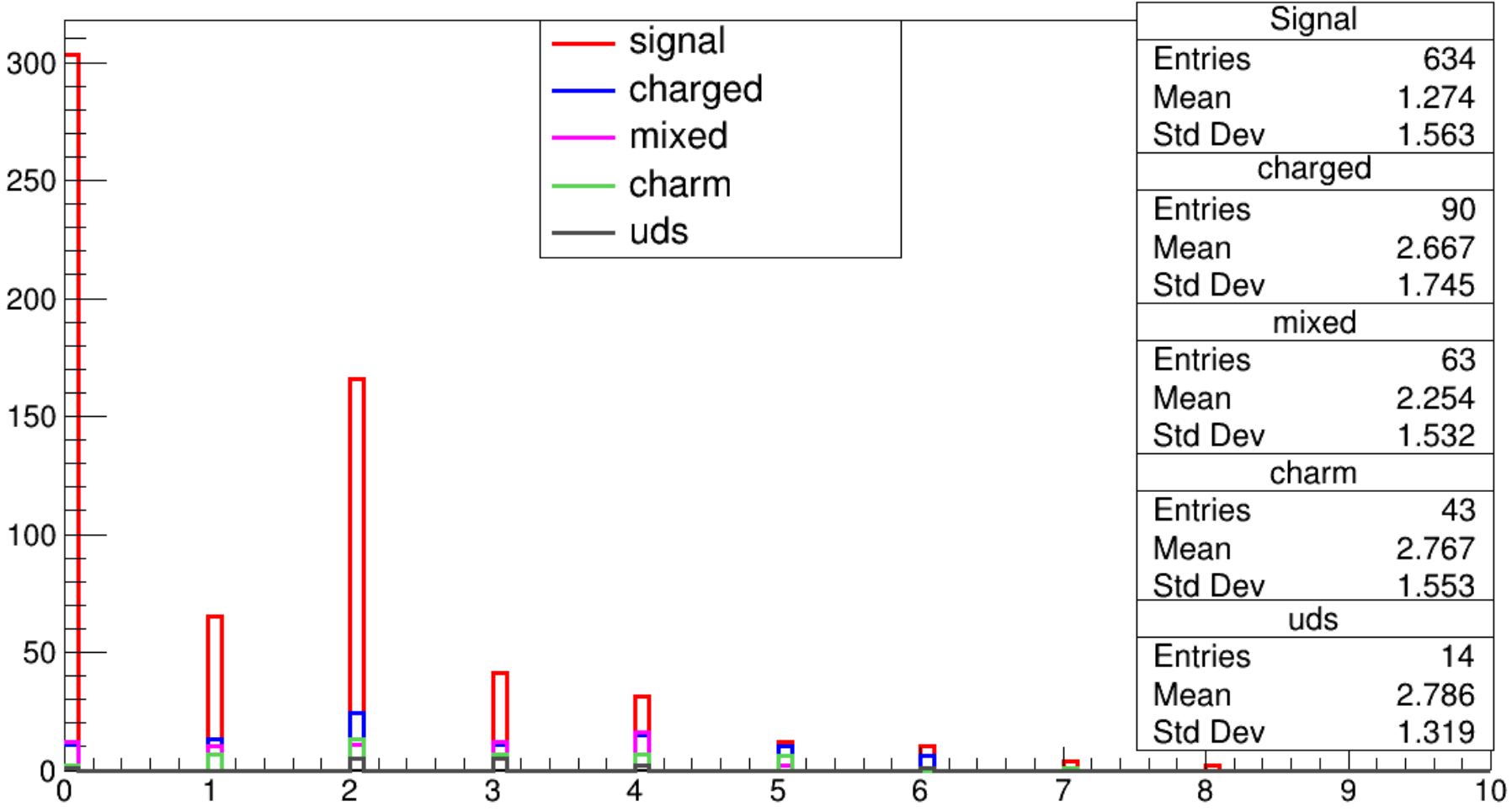


Sin_phi with abs(Cos(PBtag,Pvis))<1,rank 1,m_Kpi>2,abs(m_hadROE-1.86)<0.015,abs(best_sum_cosine)<2 for generic and sig MC



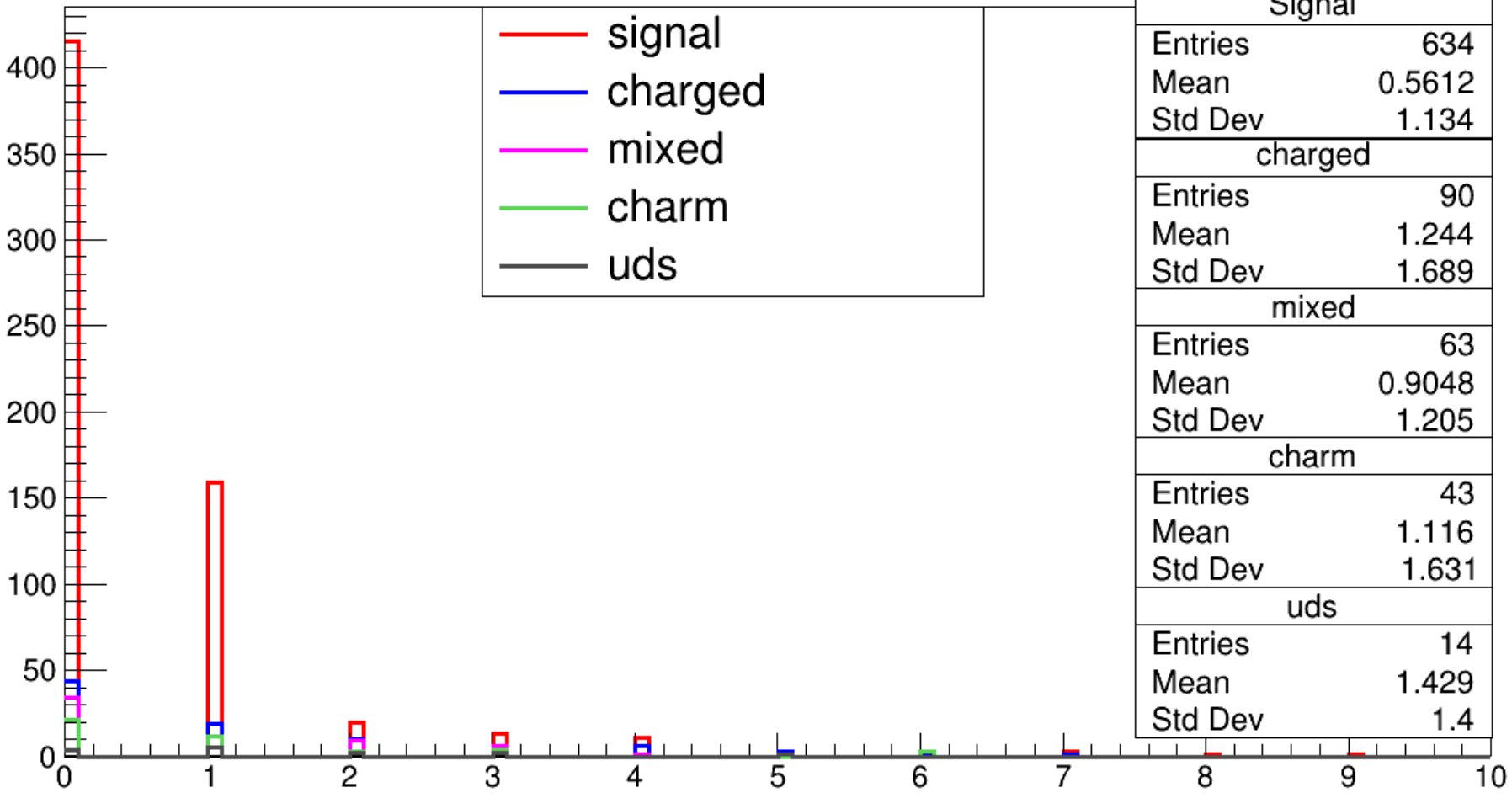

Yincl_rank with abs(Cos(PBtag,Pvis))<1,m_Kpi>2,abs(m_hadROE-1.86)<0.015,abs(sin_phi)<1 for generic and sig MC
signal
charged
mixed
charm
uds
Signal
Entries 652
Mean 1.028
Std Dev 0.1638
charged
Entries 111
Mean 1.252
Std Dev 0.5923
mixed
Entries 72
Mean 1.153
Std Dev 0.4301
charm
Entries 46
Mean 1.087
Std Dev 0.3505
uds
Entries 14
Mean 1
Std Dev 0
0
100
200
300
400
500
600
0
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5

Number of photons with abs(Cos(PBtag,Pvis))<1,m_Kpi>2,abs(m_hadROE-1.86)<0.015,abs(sin_phi)<1,rank1 for generic and sig MC



Signal	
Entries	634
Mean	1.274
Std Dev	1.563
charged	
Entries	90
Mean	2.667
Std Dev	1.745
mixed	
Entries	63
Mean	2.254
Std Dev	1.532
charm	
Entries	43
Mean	2.767
Std Dev	1.553
uds	
Entries	14
Mean	2.786
Std Dev	1.319

Number of pi0 with abs(Cos(PBtag,Pvis))<1,m_Kpi>2,abs(m_hadROE-1.86)<0.015,abs(sin_phi)<1,rank1 for generic and sig MC



Signal	
Entries	634
Mean	0.5612
Std Dev	1.134
charged	
Entries	90
Mean	1.244
Std Dev	1.689
mixed	
Entries	63
Mean	0.9048
Std Dev	1.205
charm	
Entries	43
Mean	1.116
Std Dev	1.631
uds	
Entries	14
Mean	1.429
Std Dev	1.4