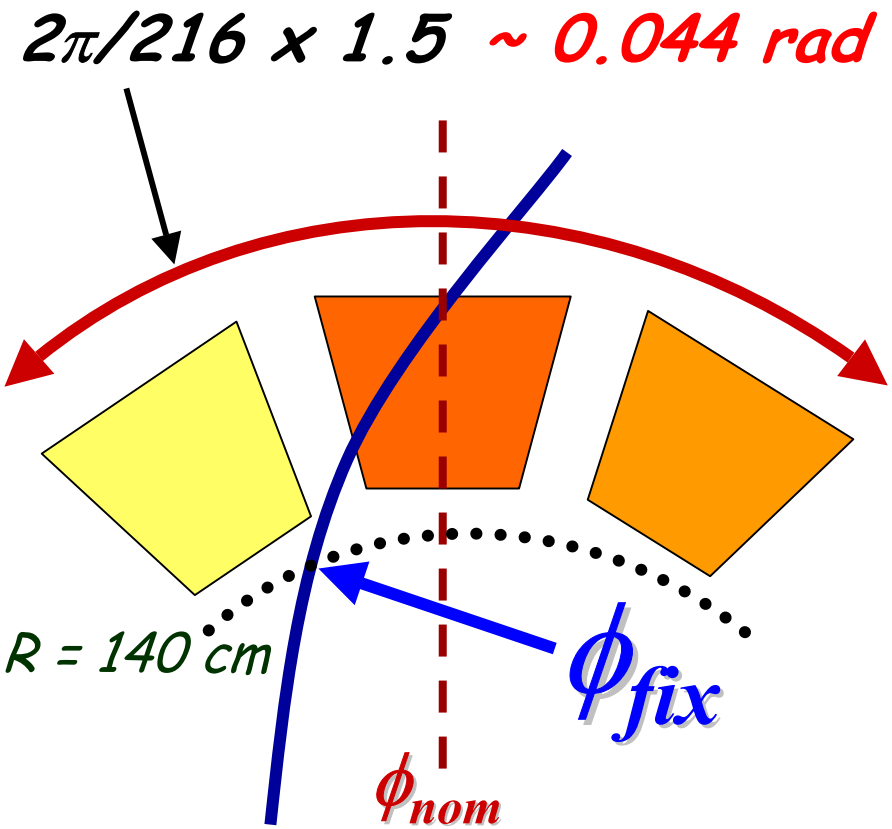
TOF alignment

use TOFD + CdfTrack (L3) *ONLY*
no TOF reconstruction
COT: Nhits > 50, Nhits in SL8 > 8

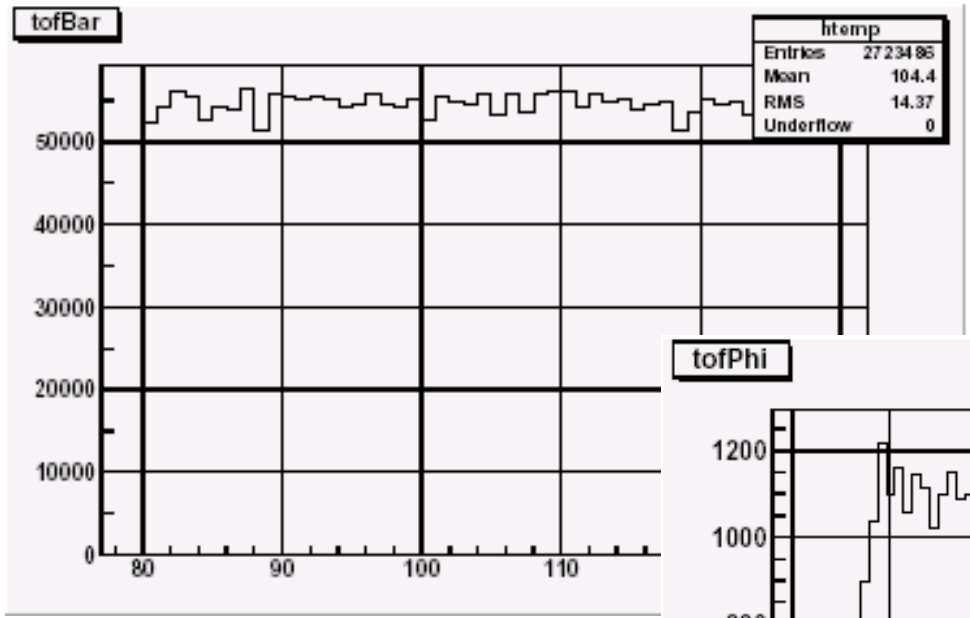
- *about 1 600 K events for Bar [80,180]*
- *about 100 K events for Bar [0,215]*

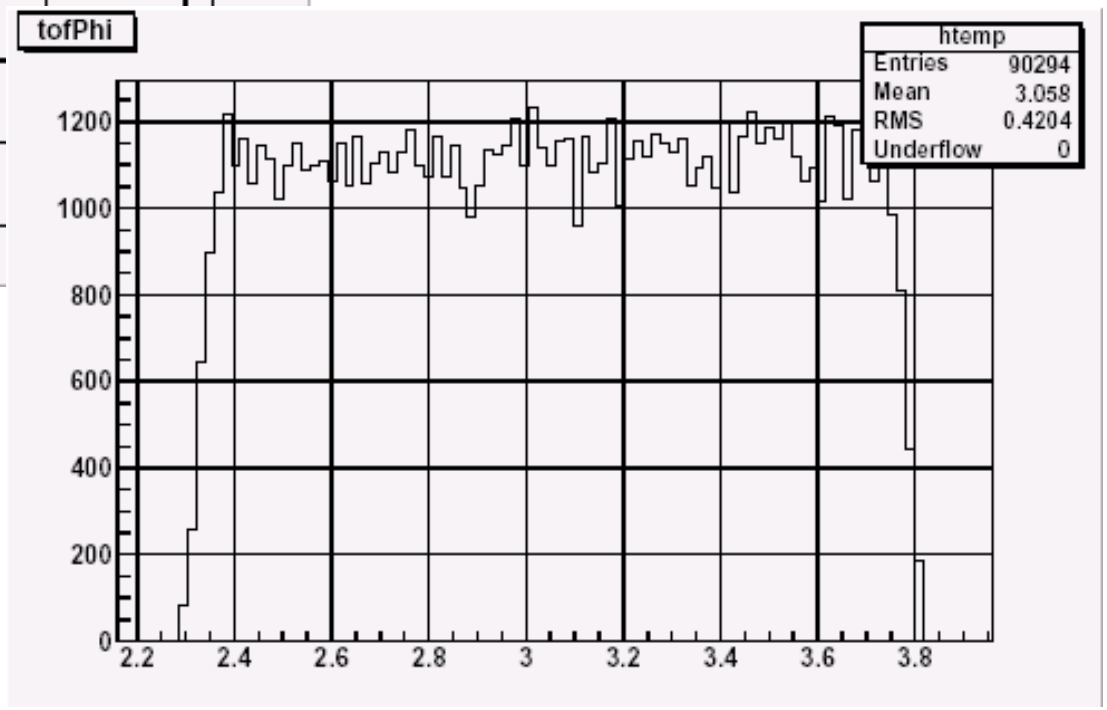
Algorithm



- Find TOF bar with 2 PMT (TDC counts >100)
- Calculate
  $\phi_{nom} = 2\pi(\frac{1}{2} + i)/216$
- Find ϕ range :
  $\pm\ 2\pi/216 \times 1.5$
- For all CdfTrack calculate ϕ_{fix} from Helix at R = 140 cm
- Save all CdfTracks within range

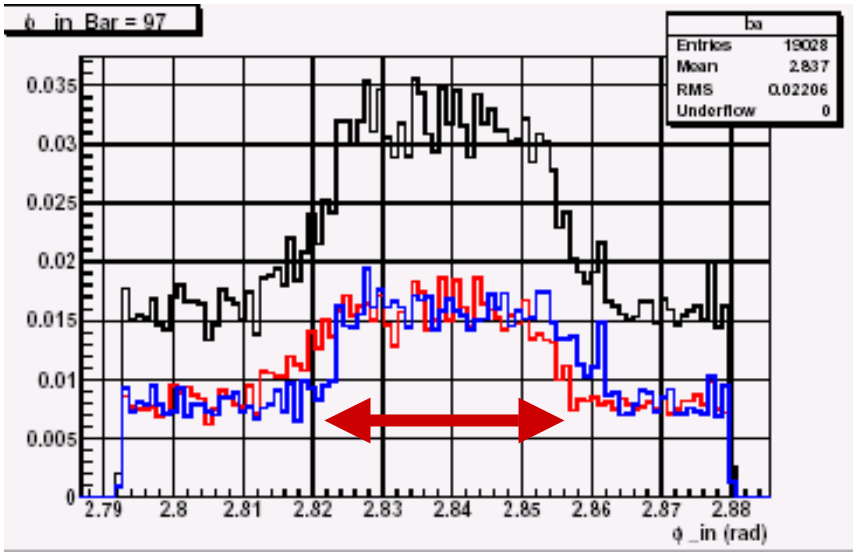
Bar & ϕ distributions are flat

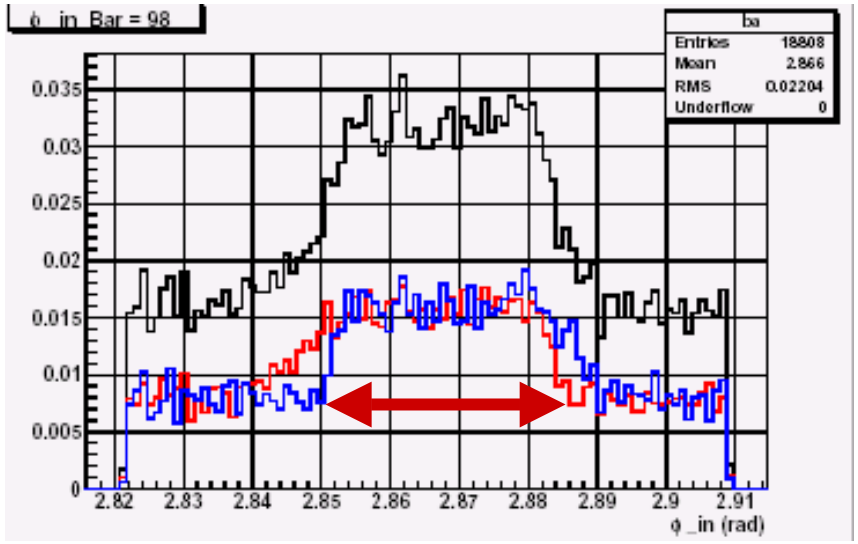


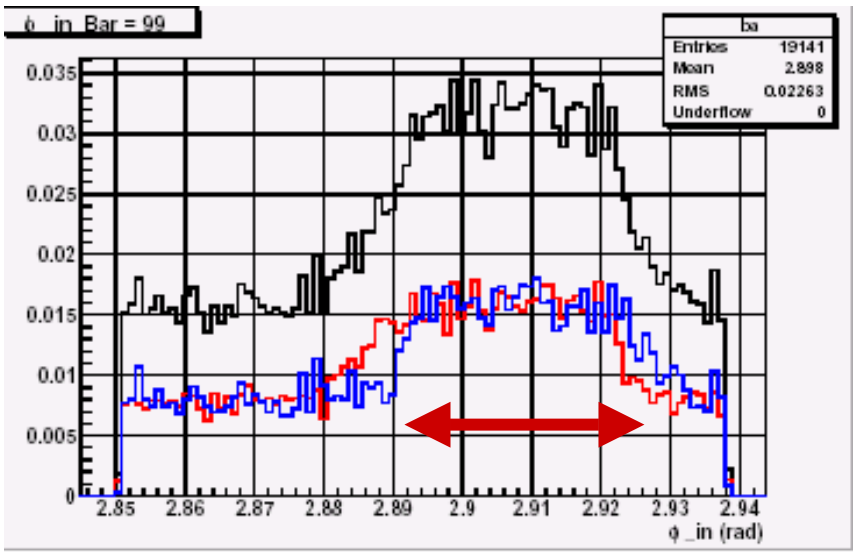


Bars [80,130]

Bars from 97 to 99

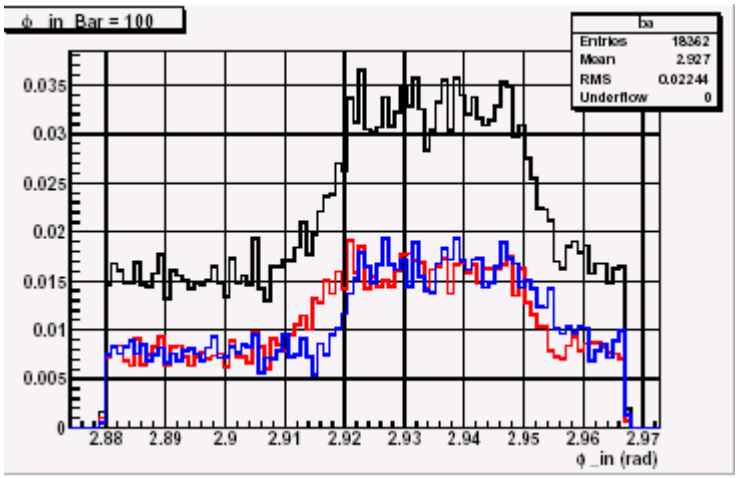


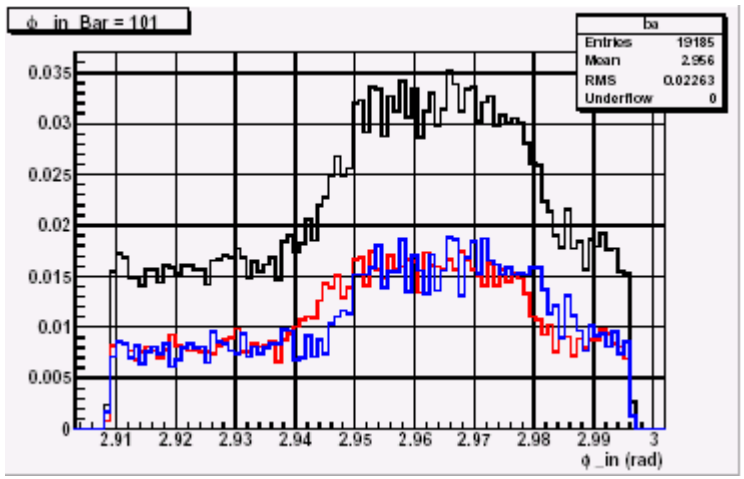


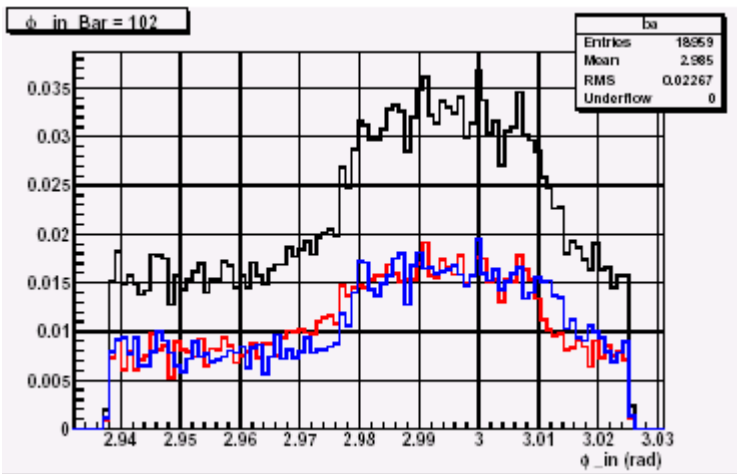


All have the same width ~ 0.03 rad

Bars 100 to 102





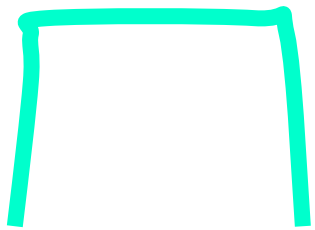


- *Accumulate more statistics*
- *Fit with sum of error functions*
- *Create new alignment table*
- *Check Z dependence*

Fit function

$$\text{Fit} = p_2 + p_3 \cdot \left[\text{Erf}\left(x - \{p_0 - p_1\} \right) / \text{const} + \text{Erfc}\left(x - \{p_0 + p_1\} \right) / \text{const} \right]$$

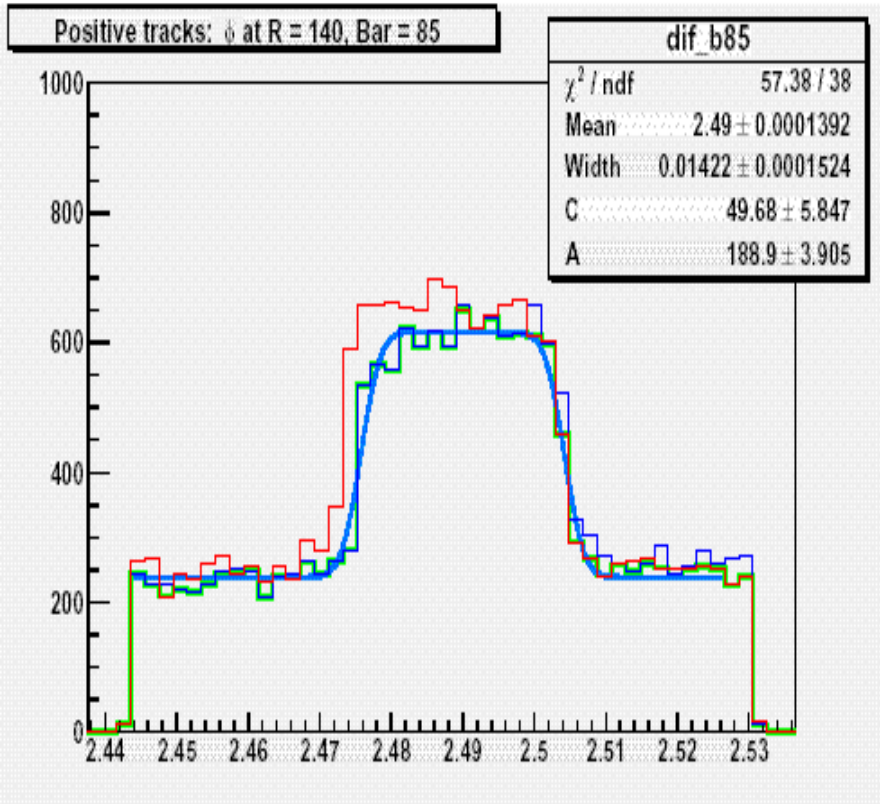
Const = 0.005

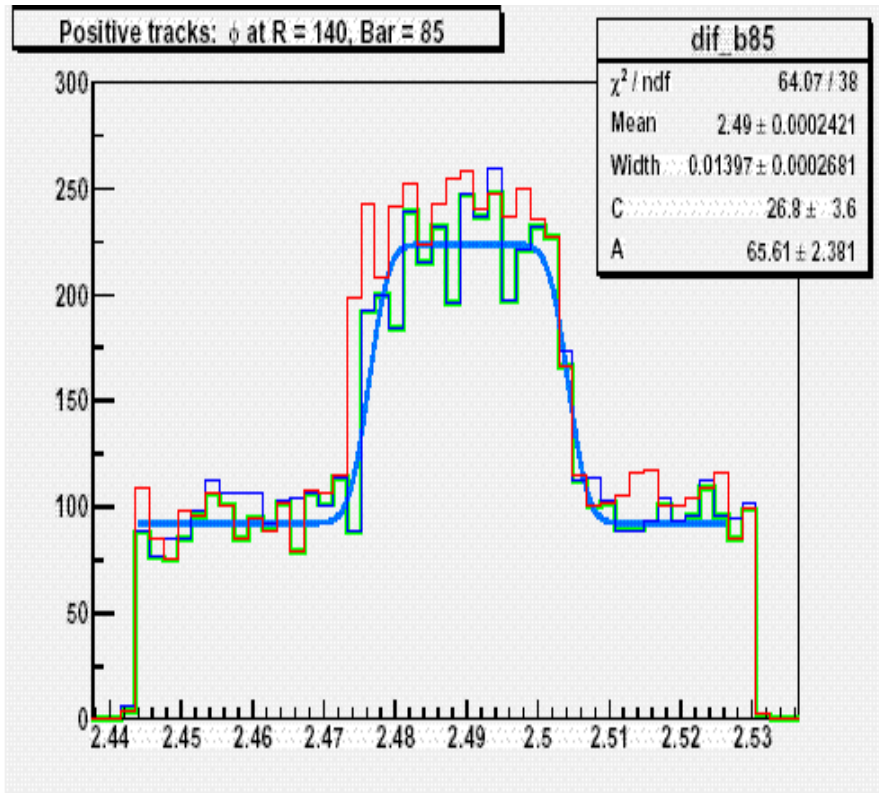


Const = 0.001

```
Double_t ErfncTof5(Double_t *x, Double_t *par)  {
  Double_t fitval = par[2] +
    (  TMath::Erf( (x[0]-(par[0]-par[1]))/0.003 ) +
       TMath::Erfc( (x[0]-(par[0]+par[1]))/0.003))*par[3];
  return fitval;
}
```

How it works...

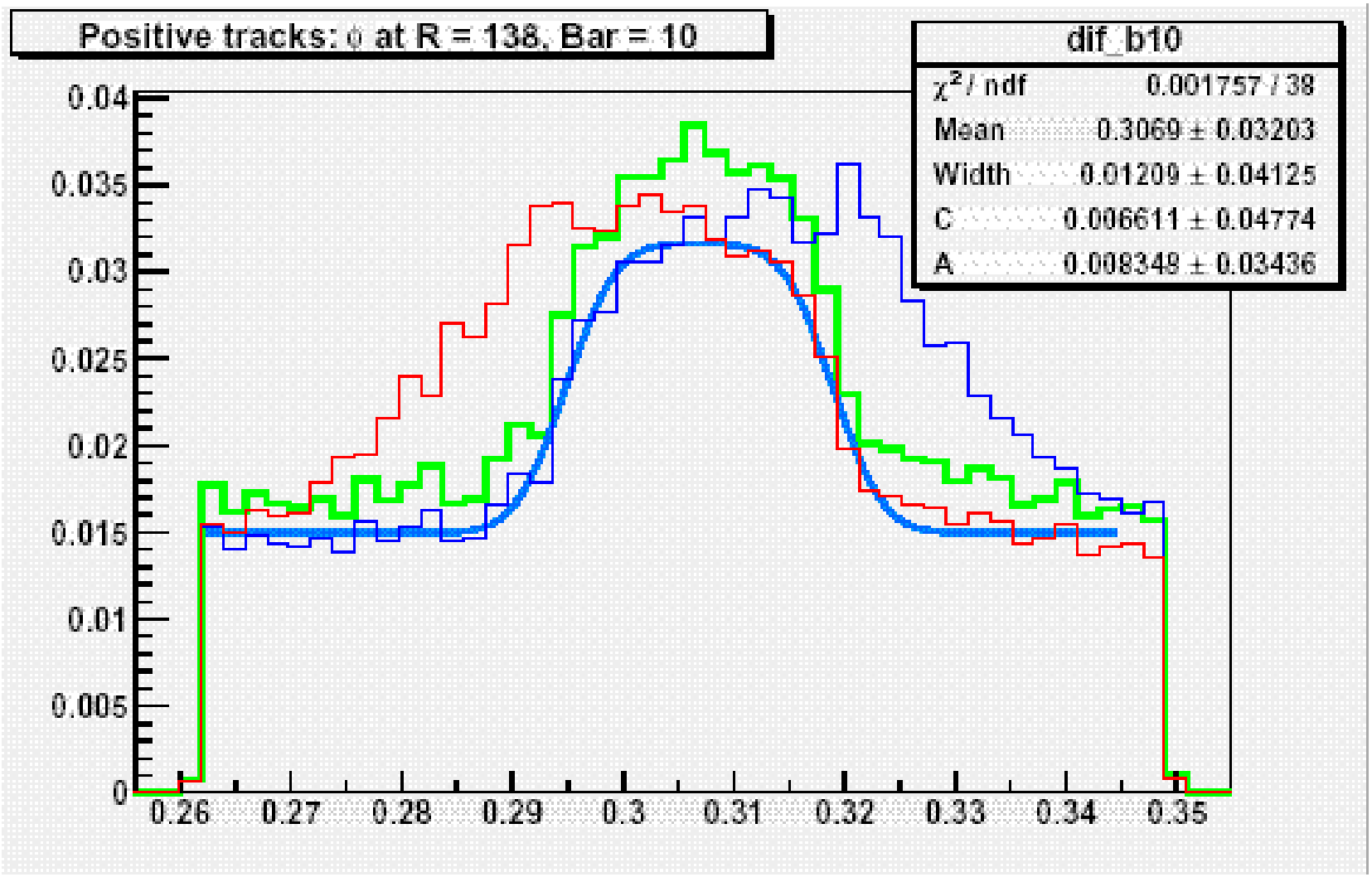


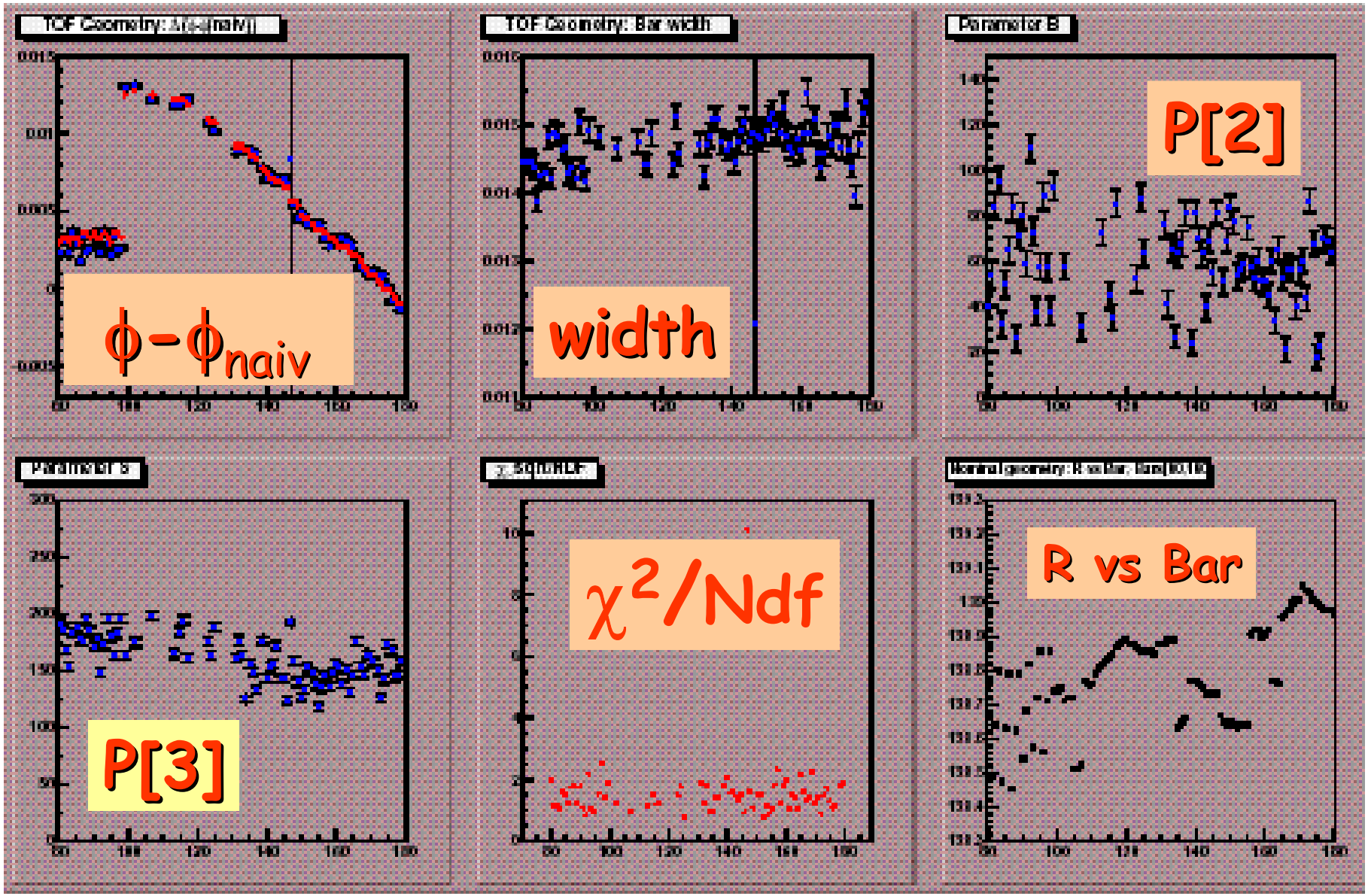


Pt > 2 GeV/c

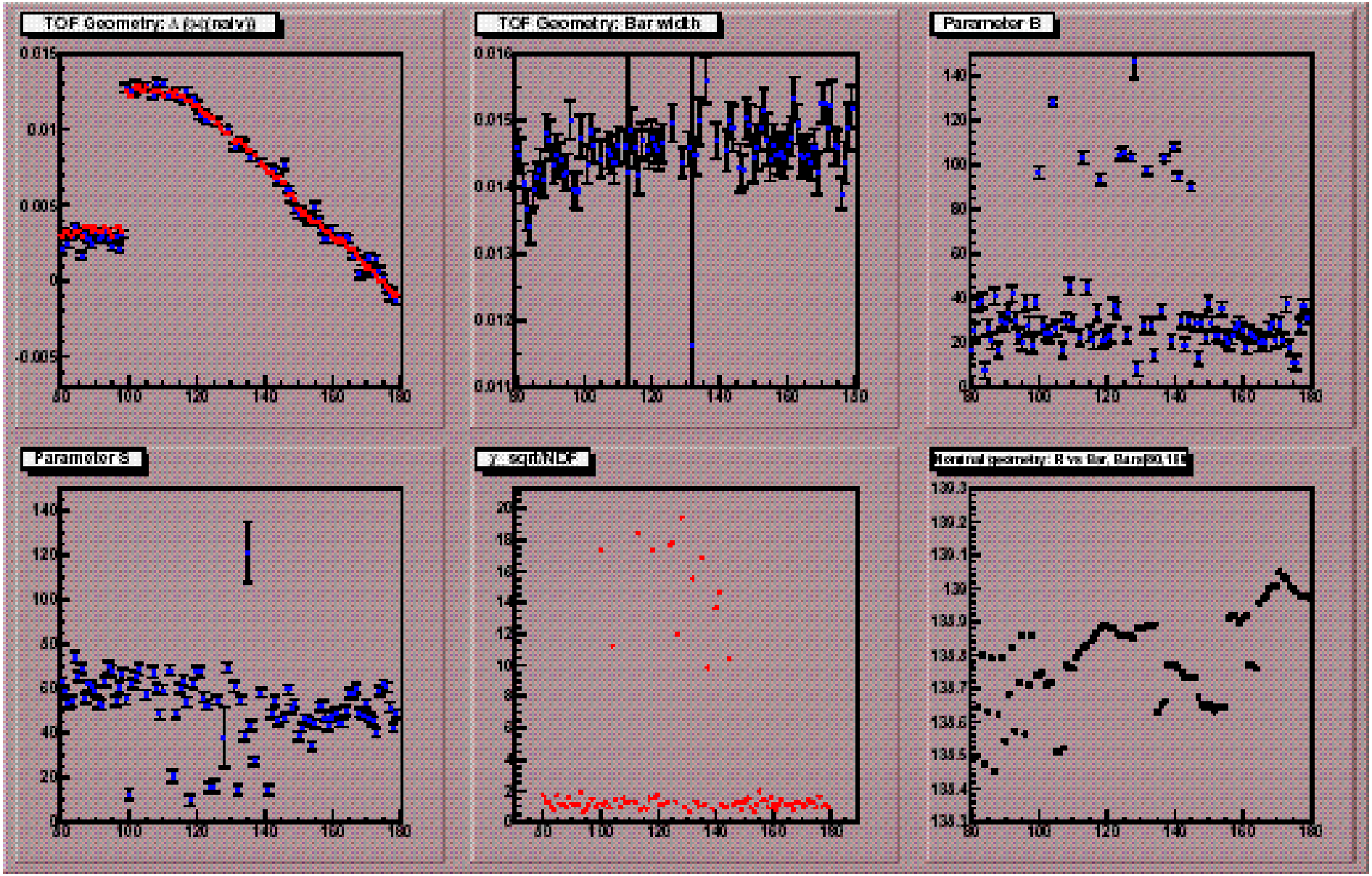
Pt > 3 GeV/c

Pt > 1.5 GeV/c

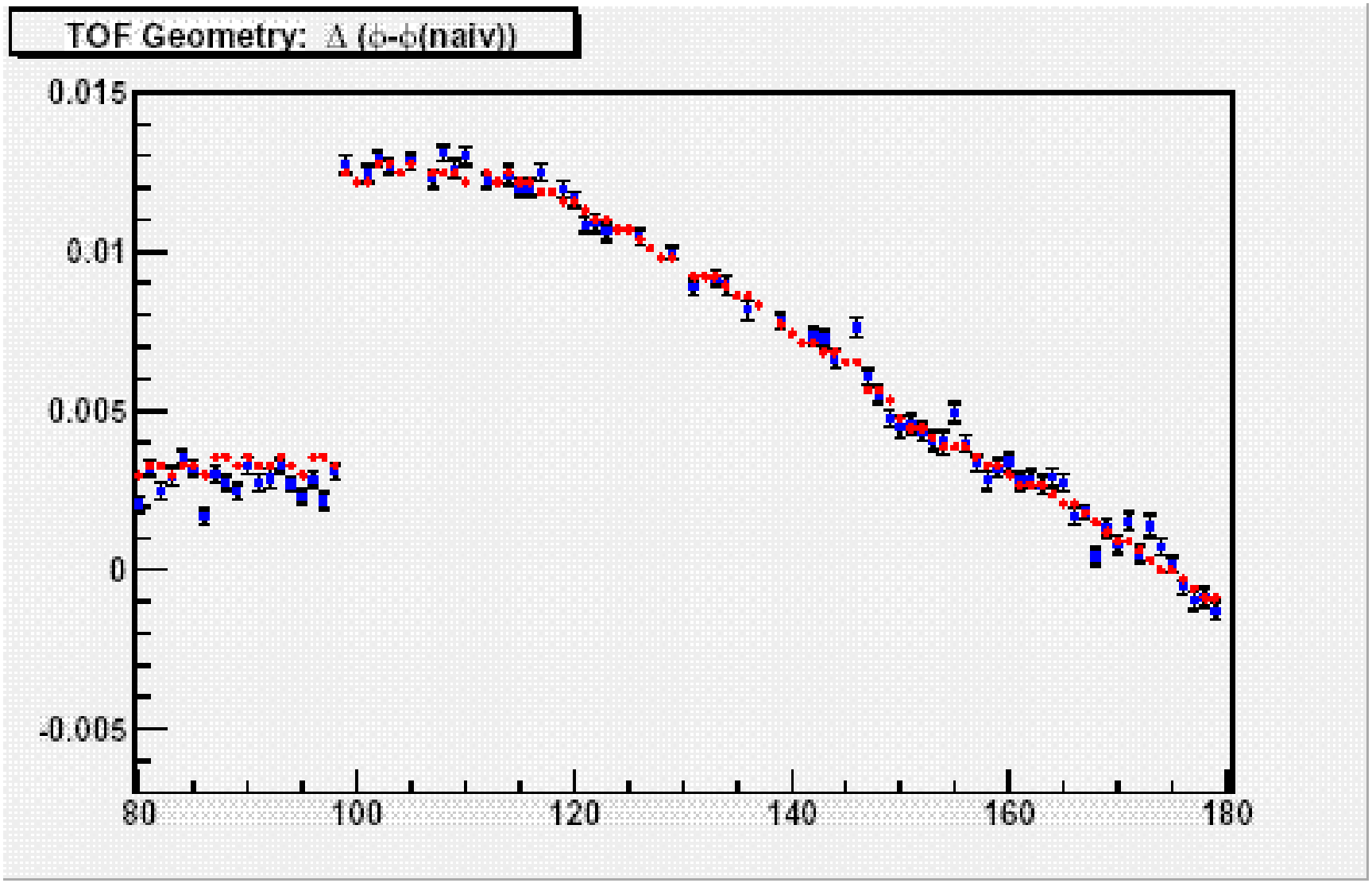

Positive tracks: φ at R = 138, Bar = 10
dif_b10
χ² / ndf 0.001757 / 38
Mean 0.3069 ± 0.03203
Width 0.01209 ± 0.04125
C 0.006611 ± 0.04774
A 0.008348 ± 0.03436
0.04
0.035
0.03
0.025
0.02
0.015
0.01
0.005
0
0.26
0.27
0.28
0.29
0.3
0.31
0.32
0.33
0.34
0.35

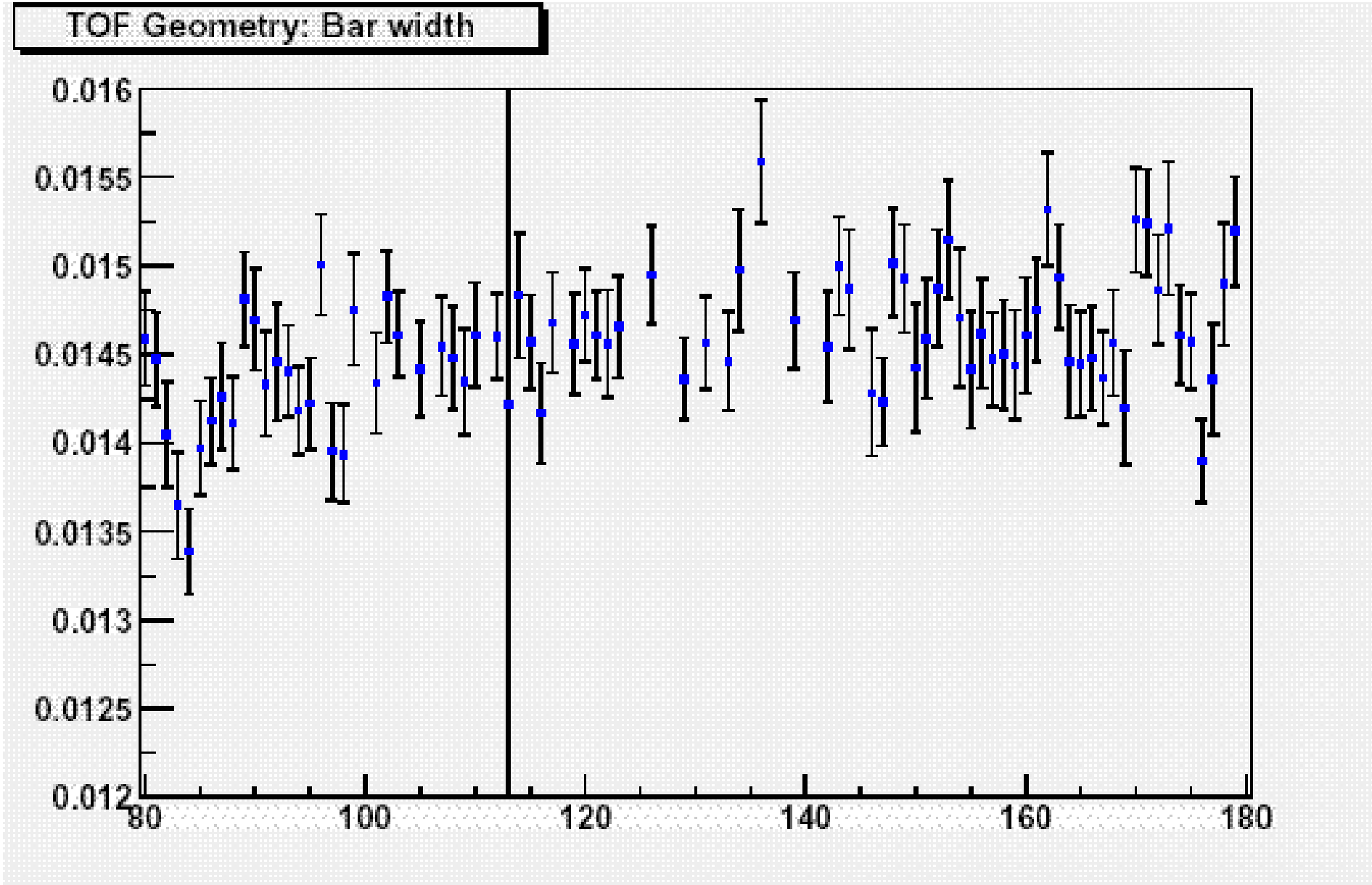

TOF Geometry: Bar width
Parameter B
$\phi-\phi_{naiv}$
width
P[2]
P[3]
χ^2/Ndf
R vs Bar

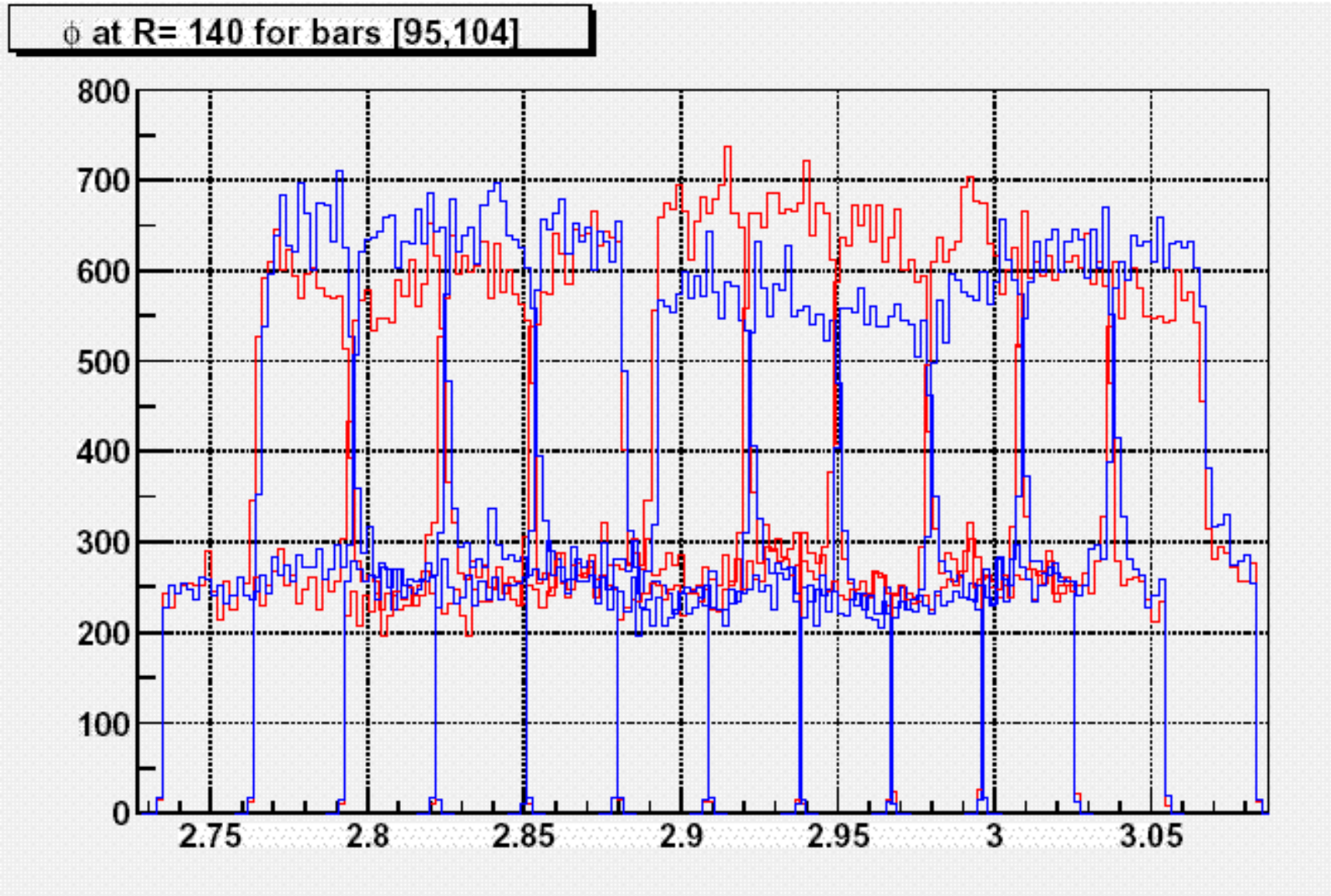
Pt > 2 GeV/c

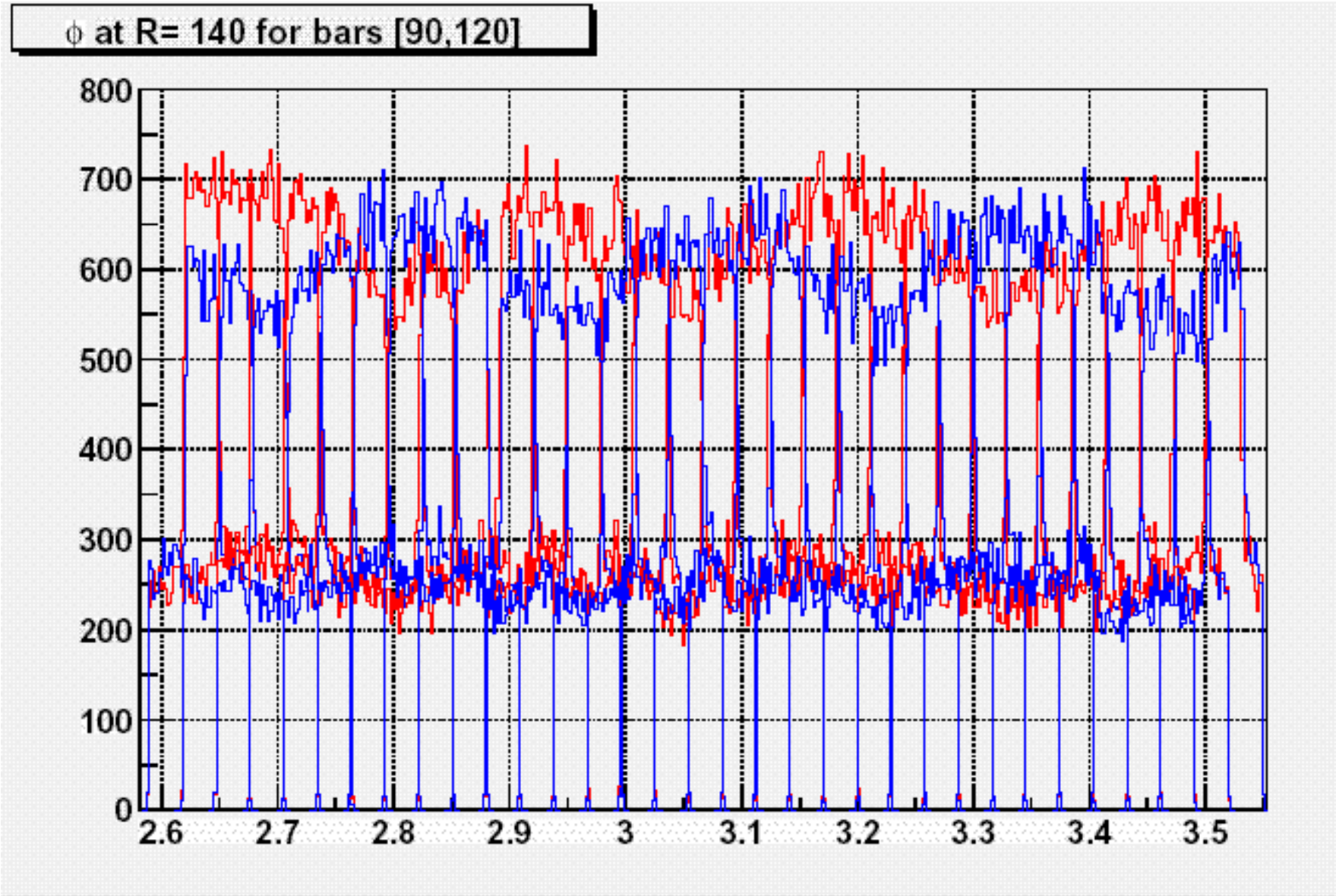


Pt > 3 GeV/c


TOF Geometry: Δ (ϕ-ϕ(naiv))
0.015
0.01
0.005
0
-0.005
80
100
120
140
160
180


TOF Geometry: Bar width
0.016
0.0155
0.015
0.0145
0.014
0.0135
0.013
0.0125
0.012
80
100
120
140
160
180


ϕ at R= 140 for bars [95,104]
800
700
600
500
400
300
200
100
0
2.75
2.8
2.85
2.9
2.95
3
3.05


ϕ at R= 140 for bars [90,120]
800
700
600
500
400
300
200
100
0
2.6
2.7
2.8
2.9
3
3.1
3.2
3.3
3.4
3.5