

# **W mass combination discussion**

## **CDF smearing tuning and validation**

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LHC & Tevatron combination meeting  
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# Overview

Smearing functions uploaded to git and described in January 11 meeting

## Tuning histograms

Z mass: electron scale and resolution parameters

Z  $p_T$ : Pythia tune

Z  $p_T$ -recoil balance: recoil response

Z  $p_T$ -recoil balance spread: recoil resolution

## Validation histograms

W  $u_{\parallel}$

W  $u_{\perp}$

W  $m_T$

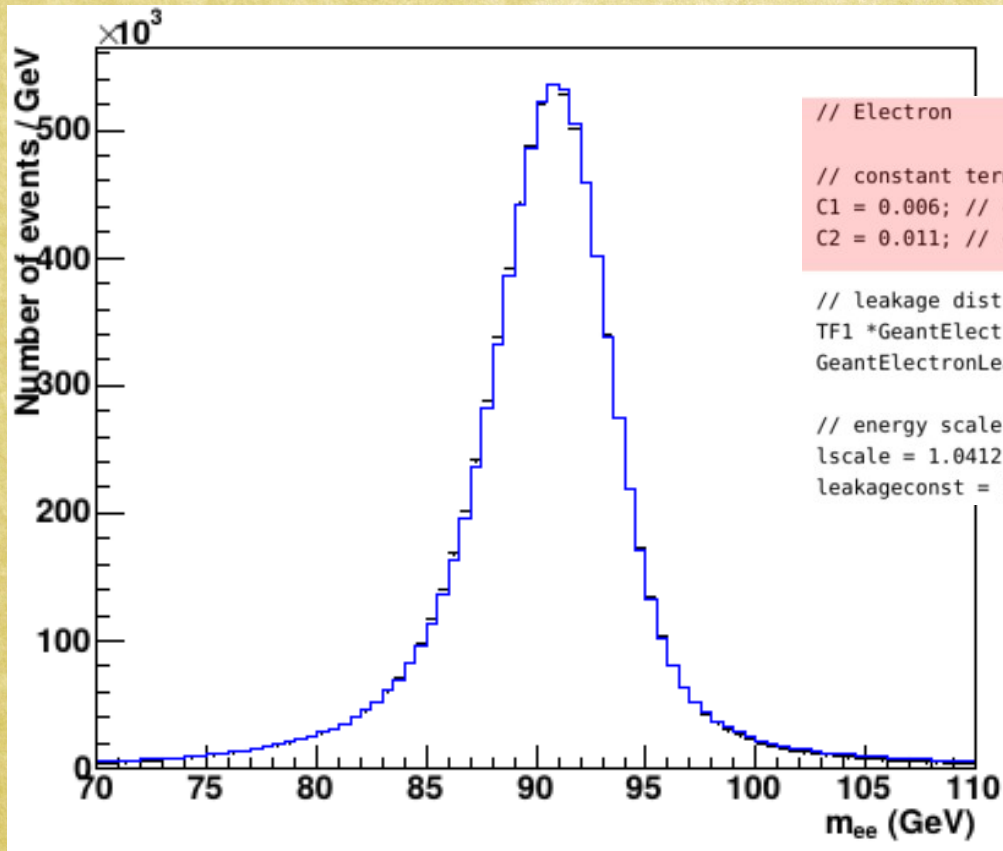
W  $p_T(e)$

W  $p_T(\nu)$

# Electron scale and resolution

Adjusted scale to better match simulation

1.0412 changed to 1.038



```
// Electron
```

```
// constant terms from PRD 89 072003 -- can adjust to absorb missing resolution from secondaries
```

```
C1 = 0.006; // constant term towers 1-8
```

```
C2 = 0.011; // constant term tower 0
```

```
// leakage distribution from NIM A729 25
```

```
TF1 *GeantElectronLeakage = new TF1("GeantElectronLeakage", "x*x*x*x*exp(-x)", 0, 15);
```

```
GeantElectronLeakage->SetNpx(10000);
```

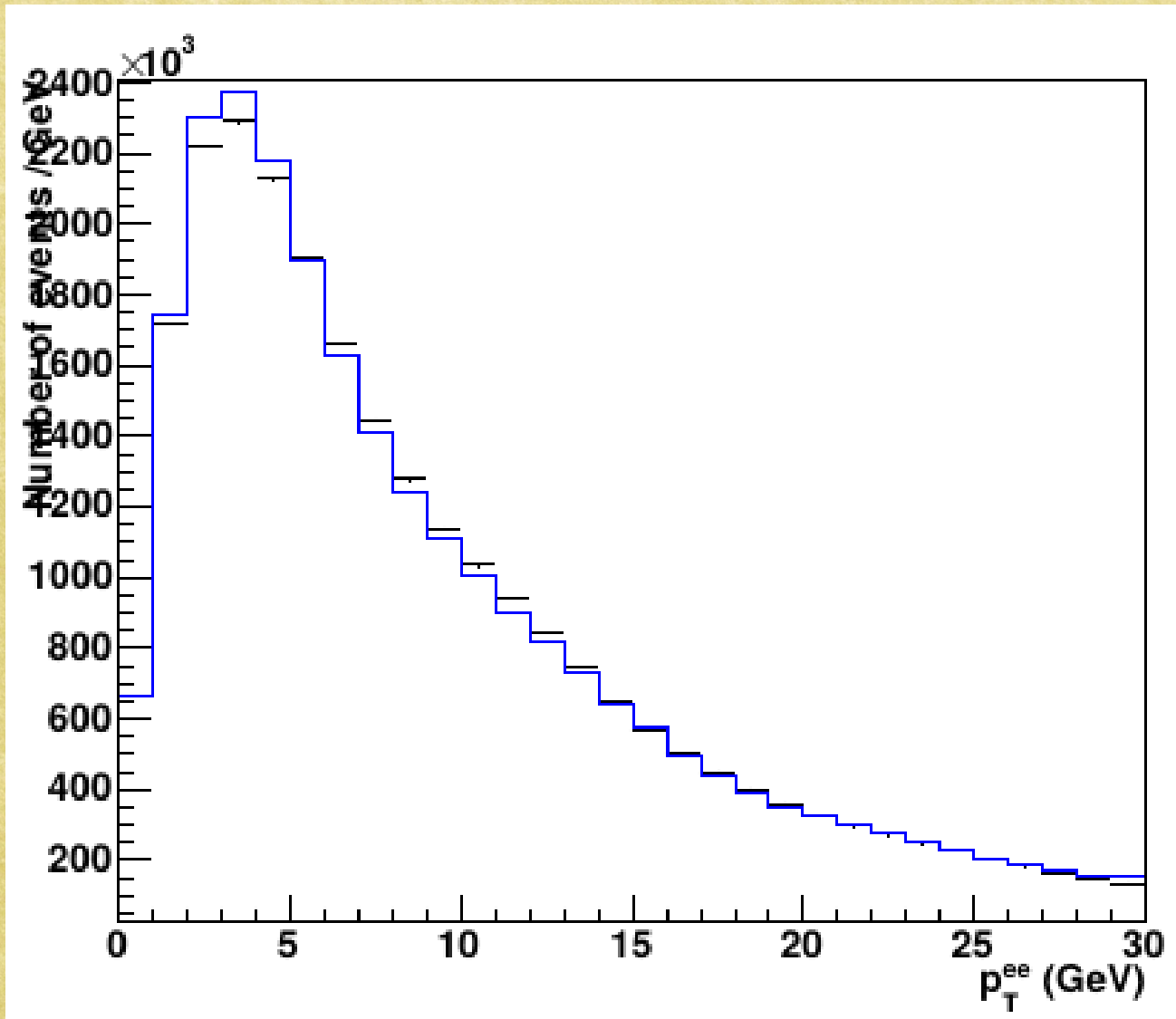
```
// energy scale correction accounting for leakage
```

```
lscale = 1.0412; // approximate
```

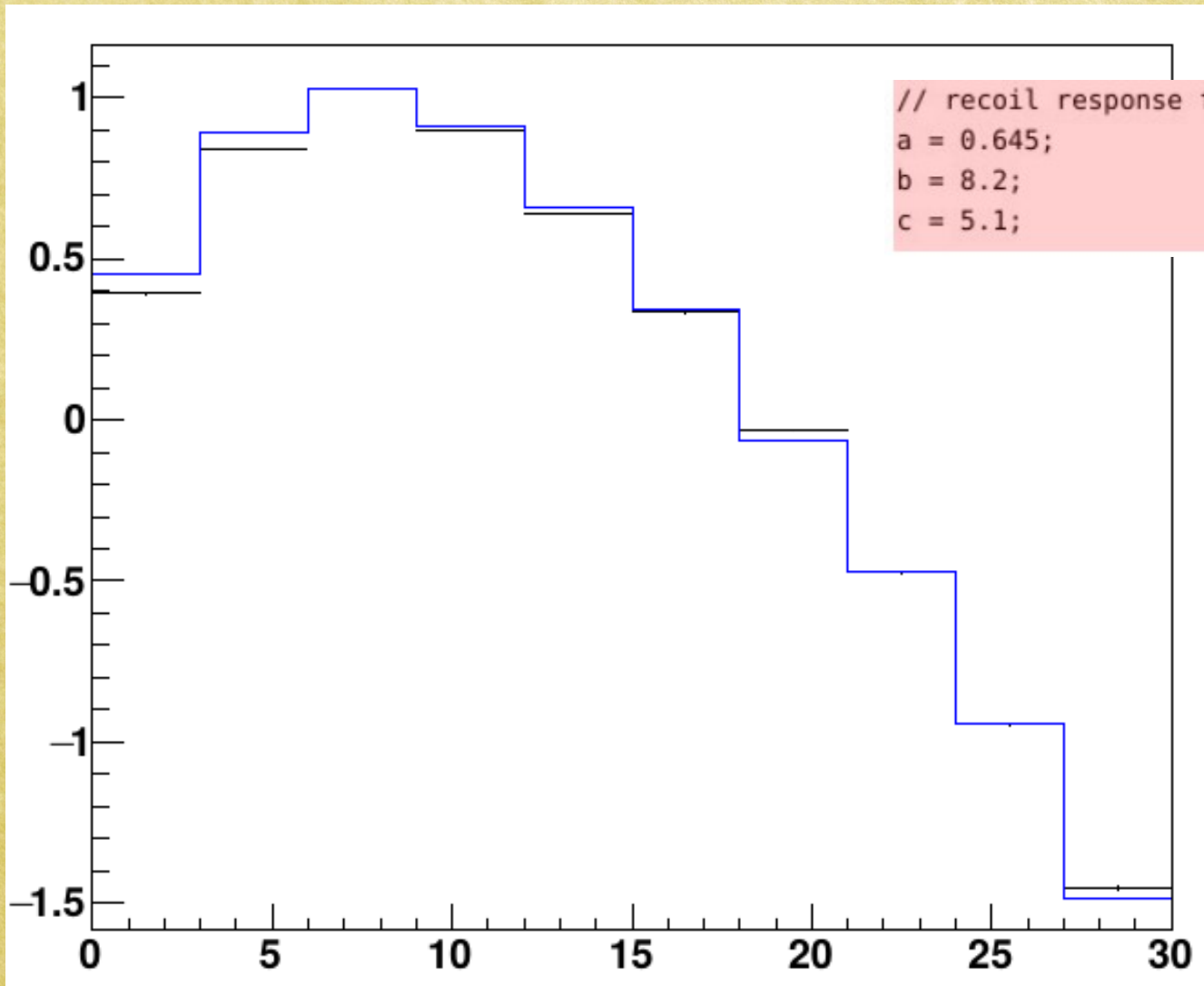
```
leakageconst = 1.8;
```

Increased resolution to cover  
missing term from secondaries:  
C1 = 0.013 and C2 = 0.013

# Pythia tuning



# Recoil response



```
// recoil response function parameters from PRD 89 072003  
a = 0.645;  
b = 8.2;  
c = 5.1;
```

Modified parameters:

$a = 0.632$

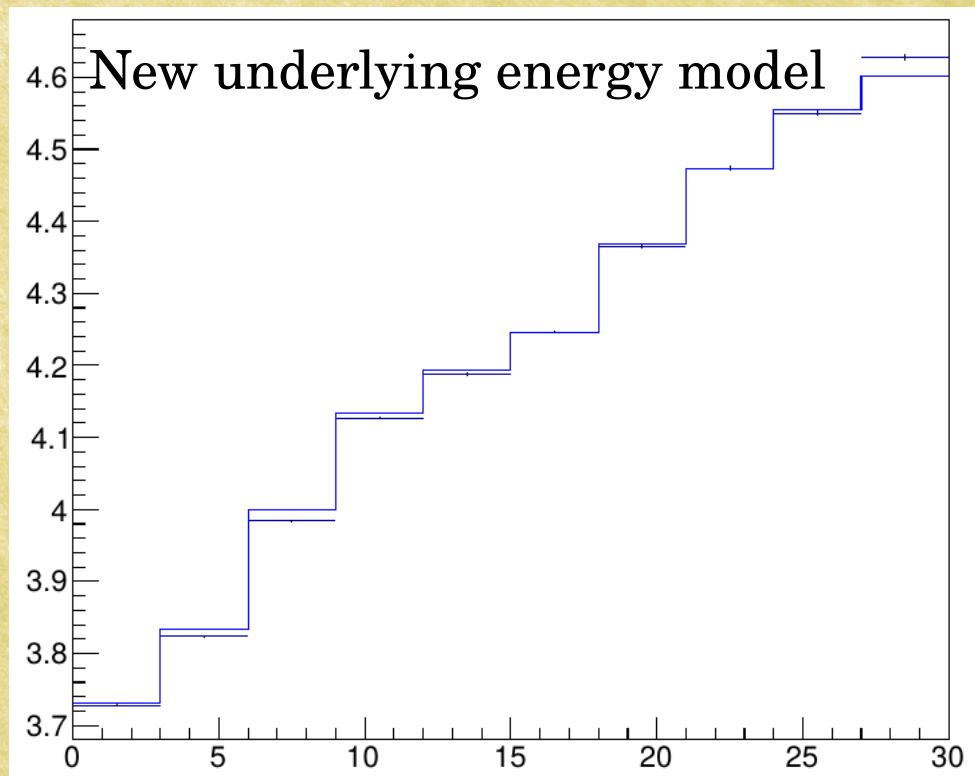
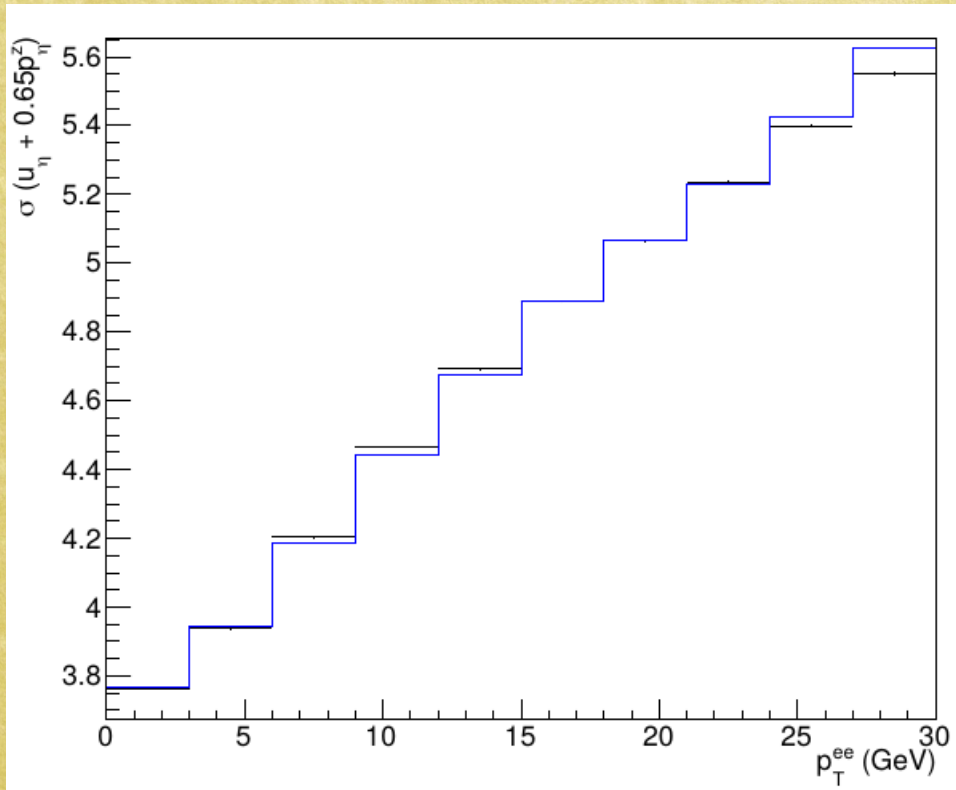
$b = 17$

$c = 3$

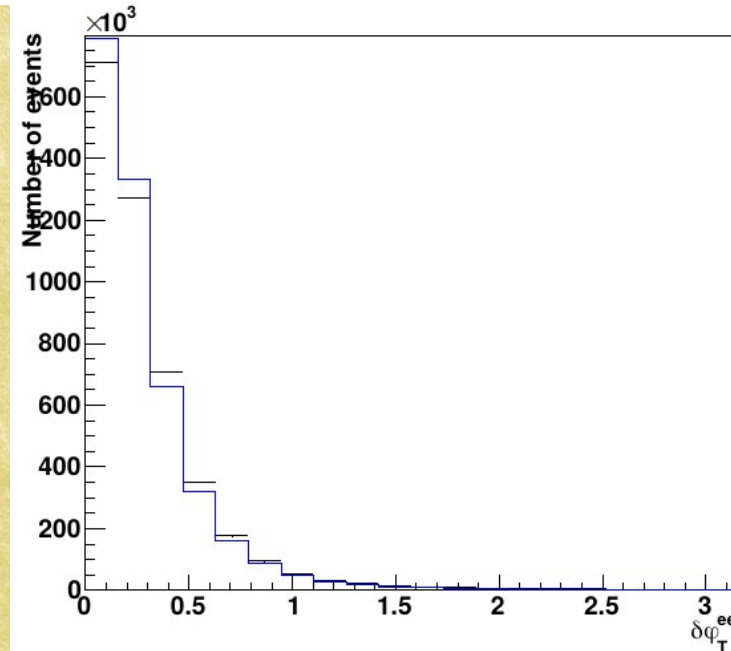
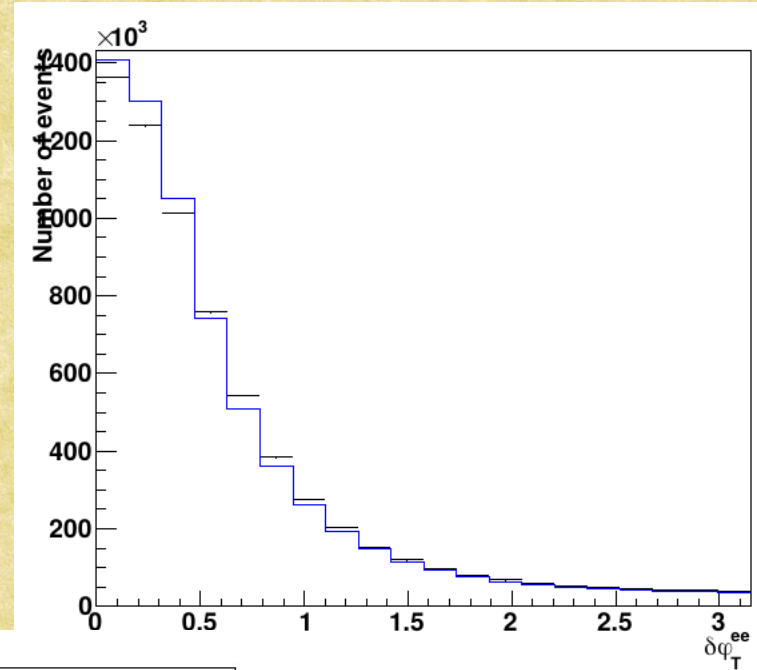
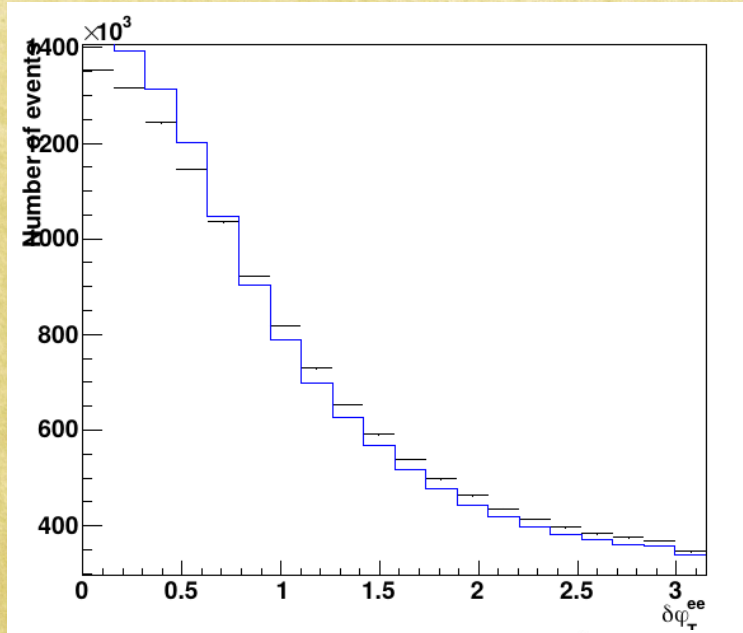
# Recoil resolution

```
// recoil resolution
recoil_res = 0.82; // sampling
underlying_energy = 5.2; // extracted from eta-xi balance plots (Fig 31 of PRD 89 072003) -- needs tuning
lepton_hole = 0.185; // needed for upar comparisons

// Angular smearing functions, adjusted using Fig 31 of PRD 89 072003 -- need tuning
angular_turn = 18.;
angular_start = 0.44;
angular_decrease = 0.30;
```

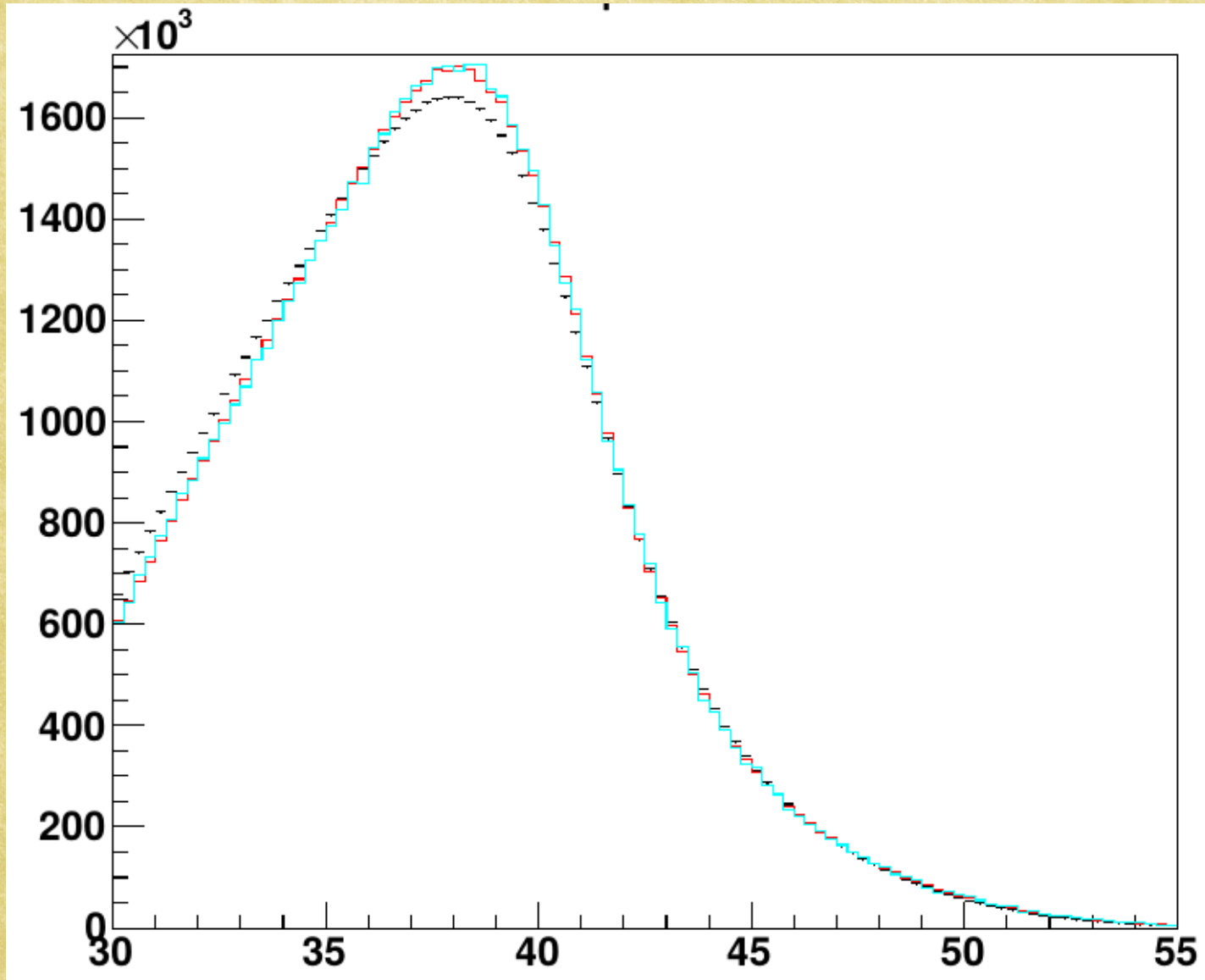


# Recoil angular resolution



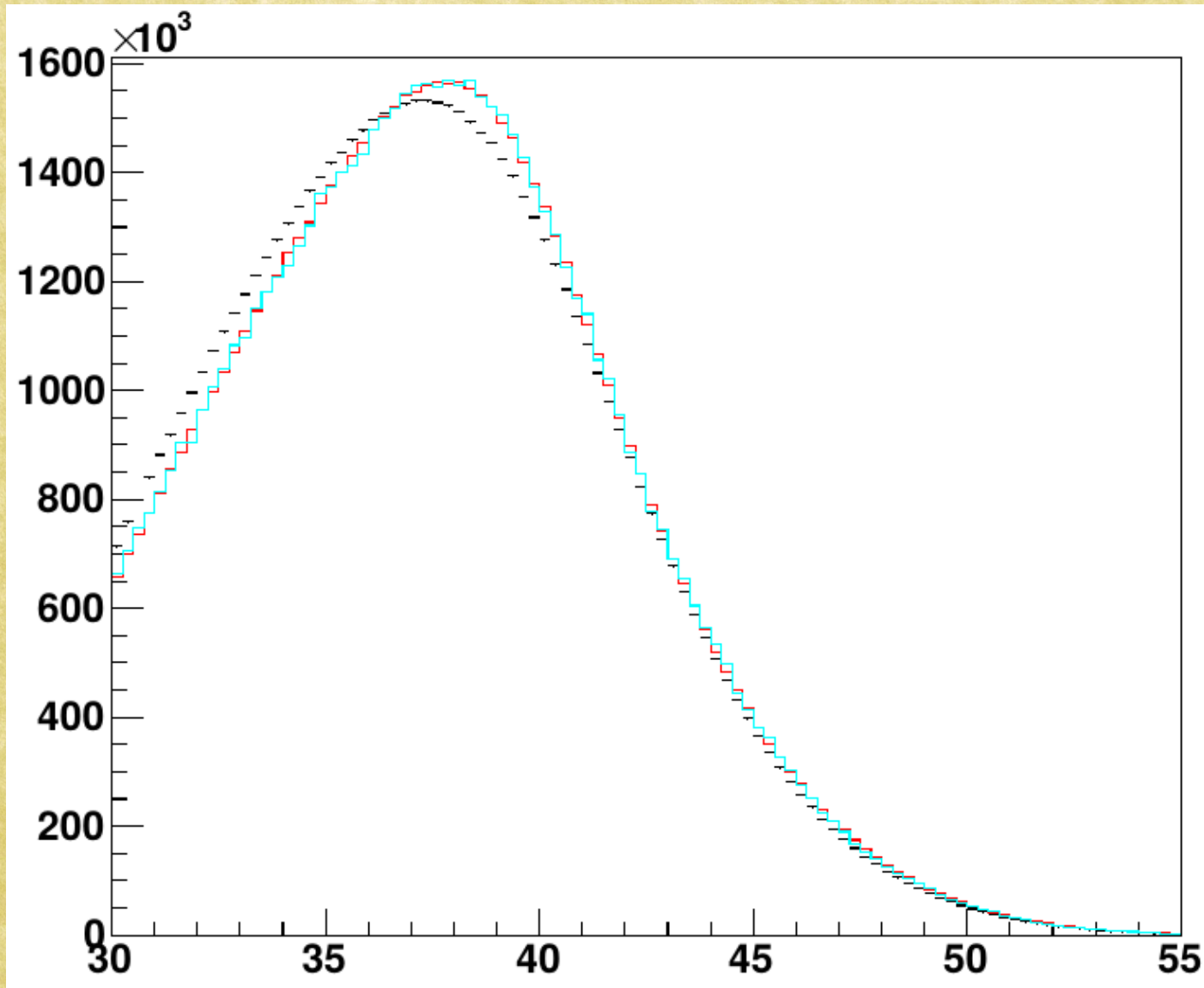
Angular smearing:  
 $\alpha = 0.31$   
 $\beta = 0.195$   
 $\gamma = 0.15$

# $p_T(e)$ in $W$ events

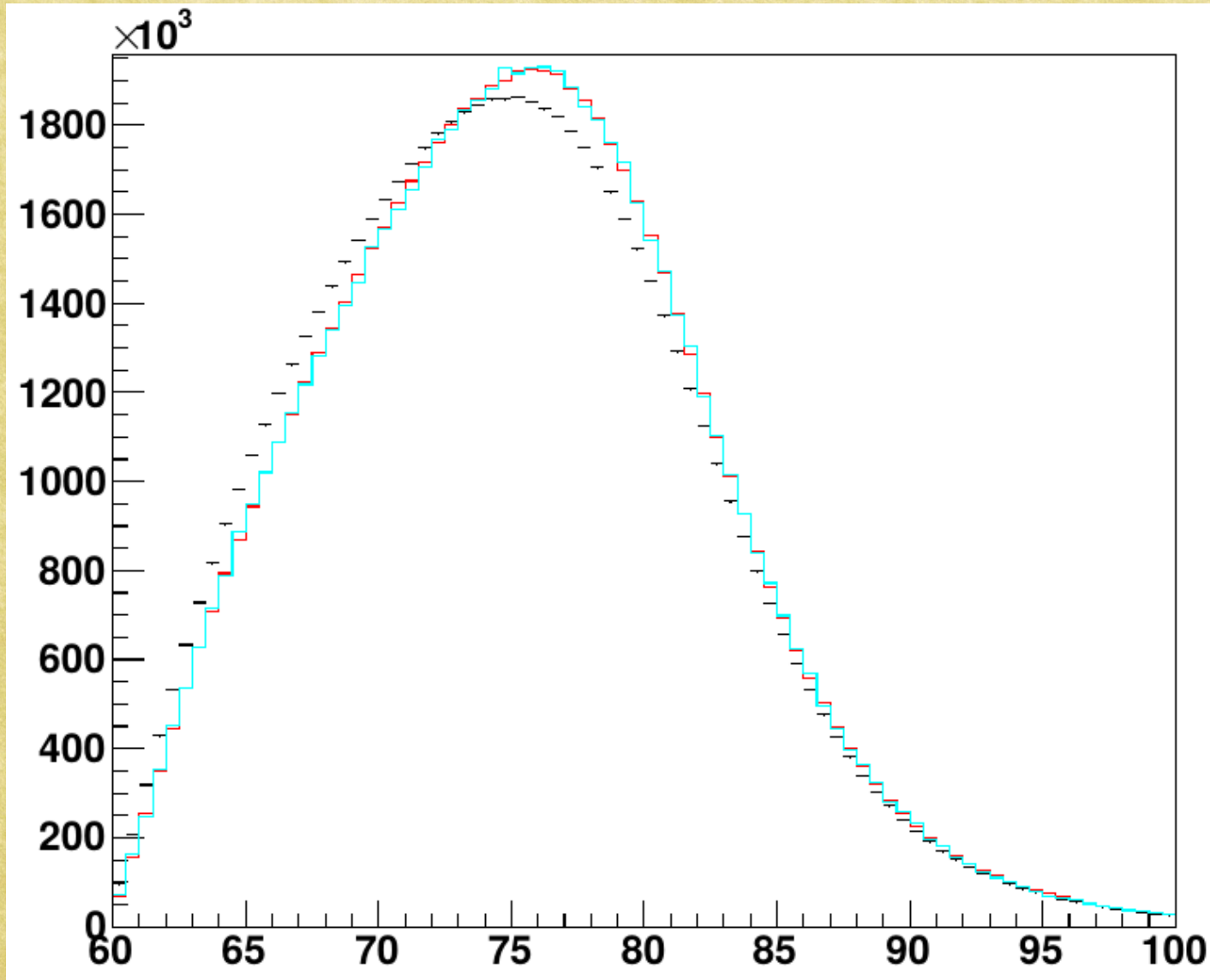




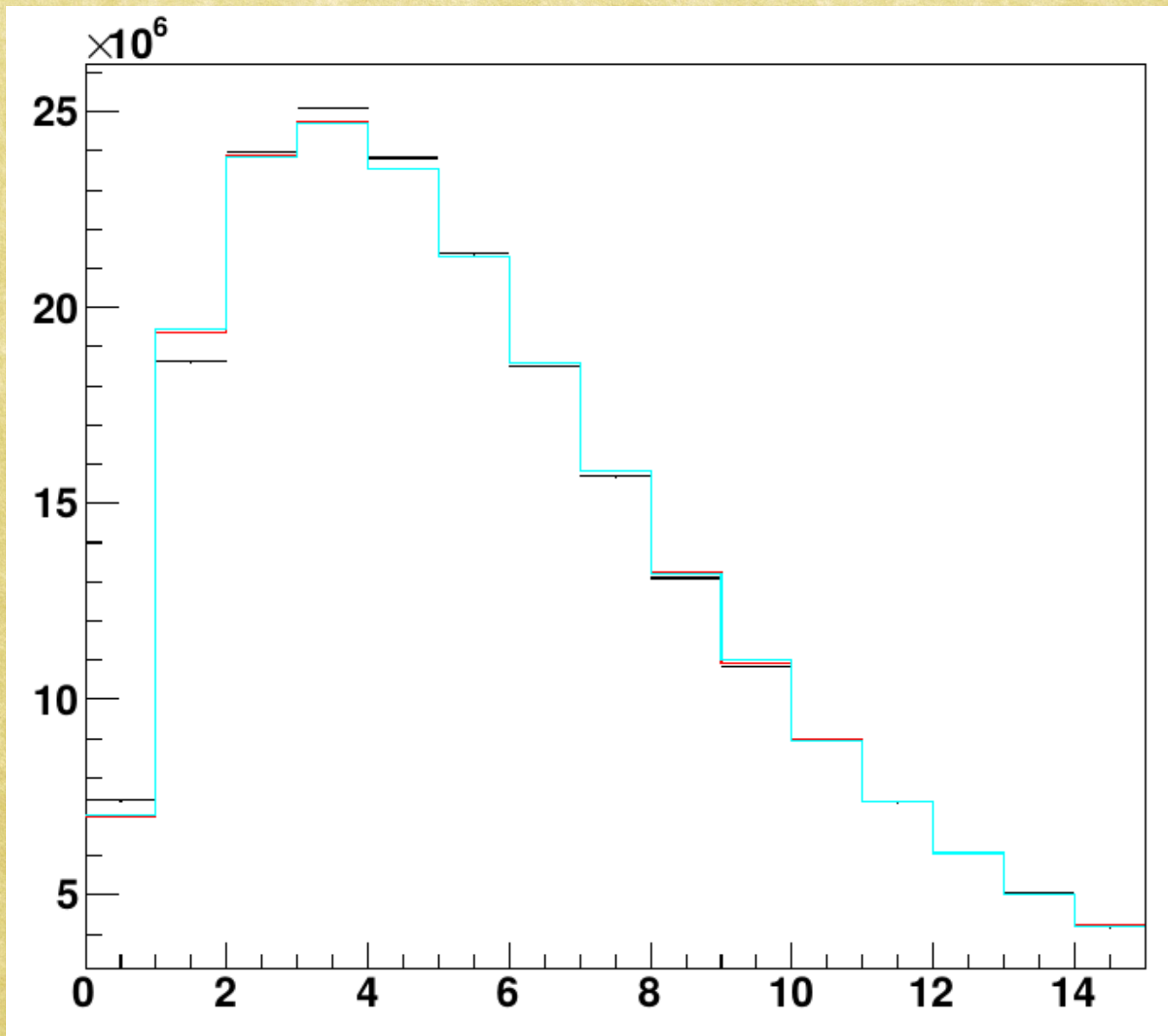
# $p_T(\nu)$ in $W$ events



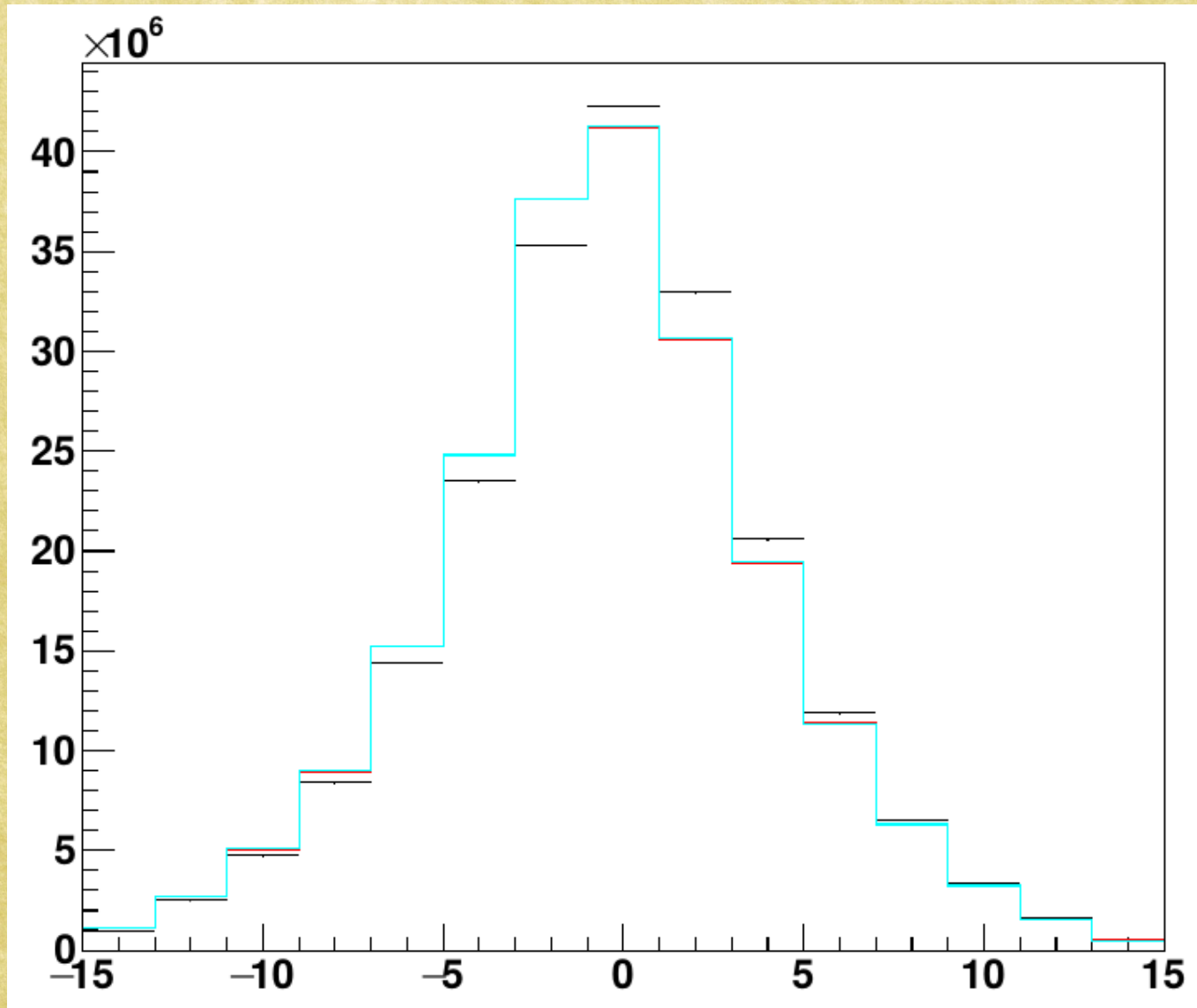
# $m_T$ in $W$ events



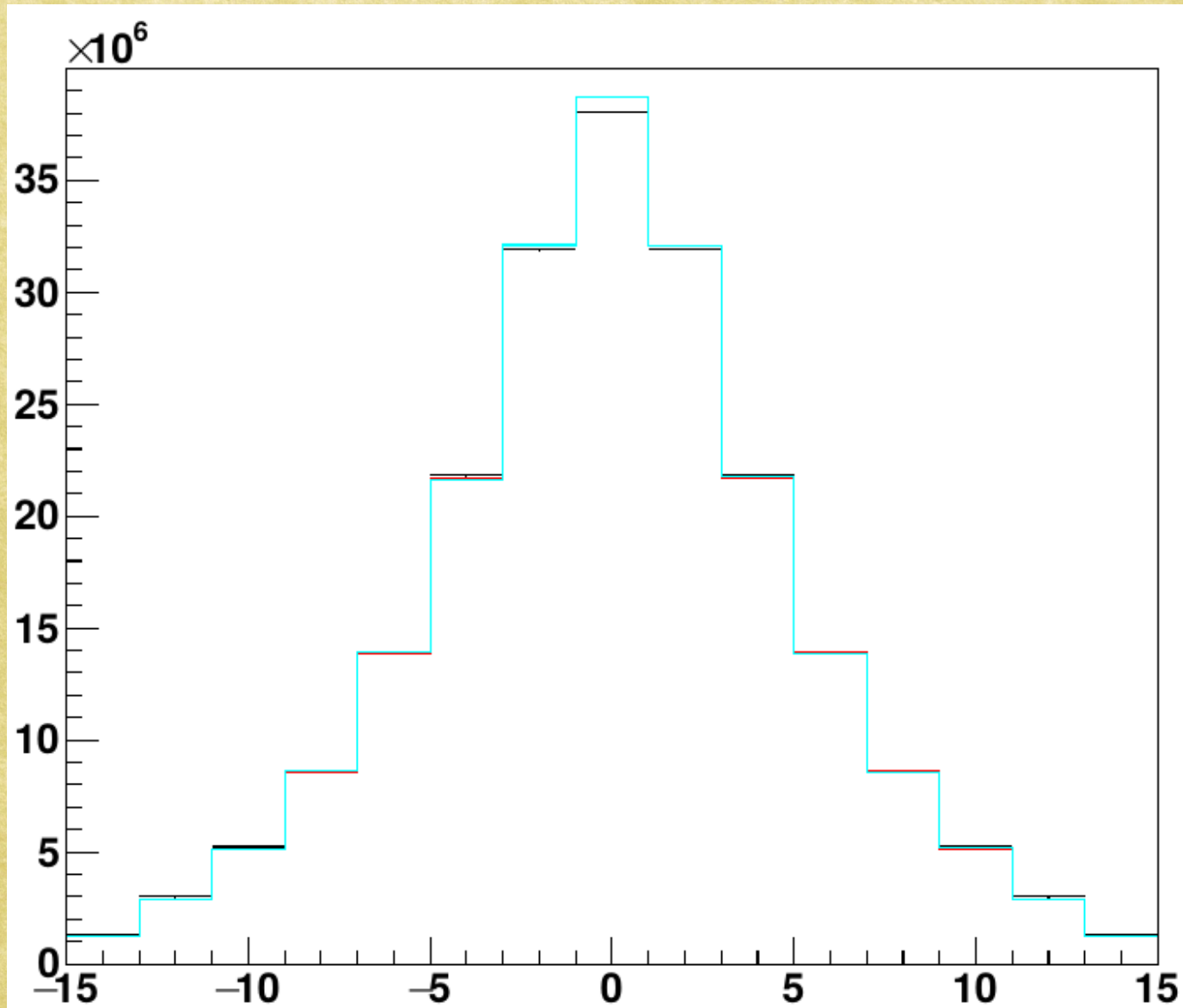
# $u_T$ in $W$ events



# $u_{||}$ in W events



# $u_{\perp}$ in W events



# $\cot\Theta$ in W events

