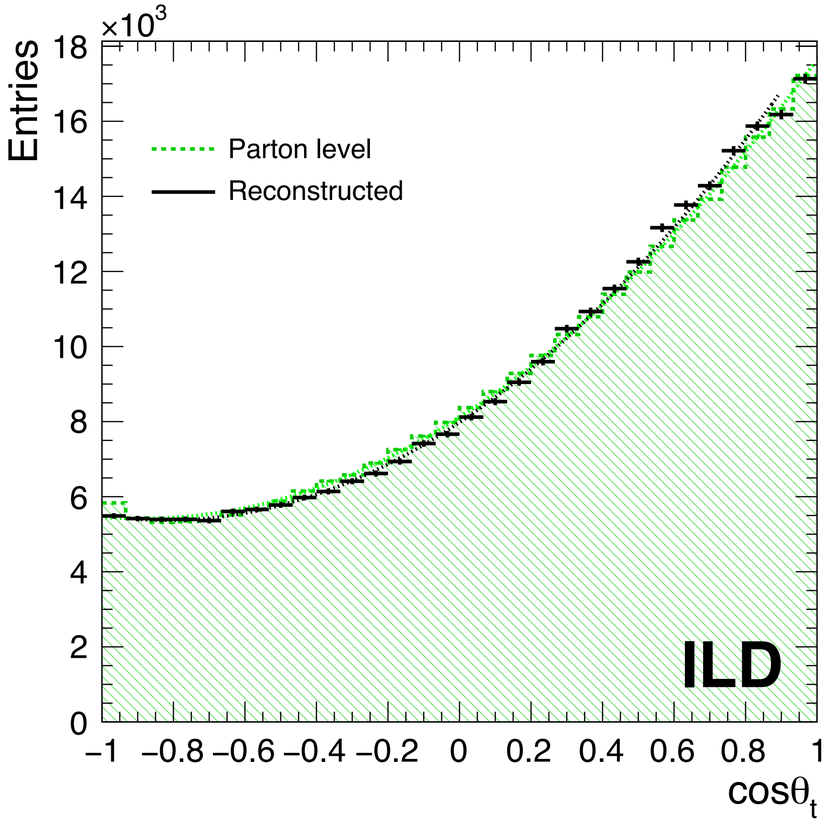
ILD Top/HF group meeting

Reconstruction bias in VTX x VTX and Missing Prongs

11/13/20

Yuichi Okugawa

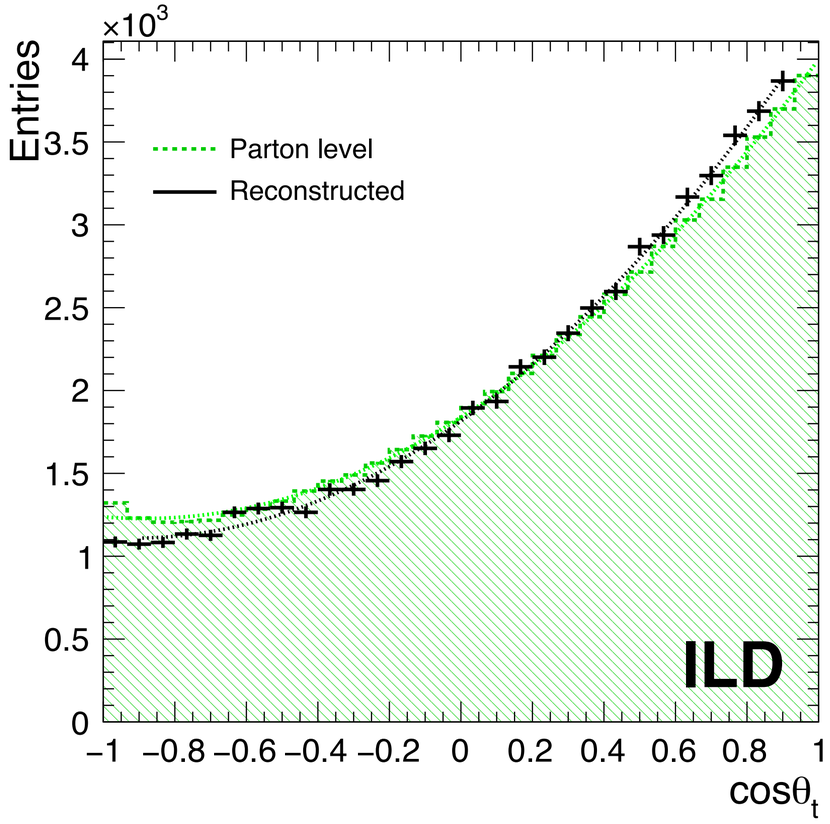
1. Introduction



- Polar angle distribution of top quark for all reconstructed events

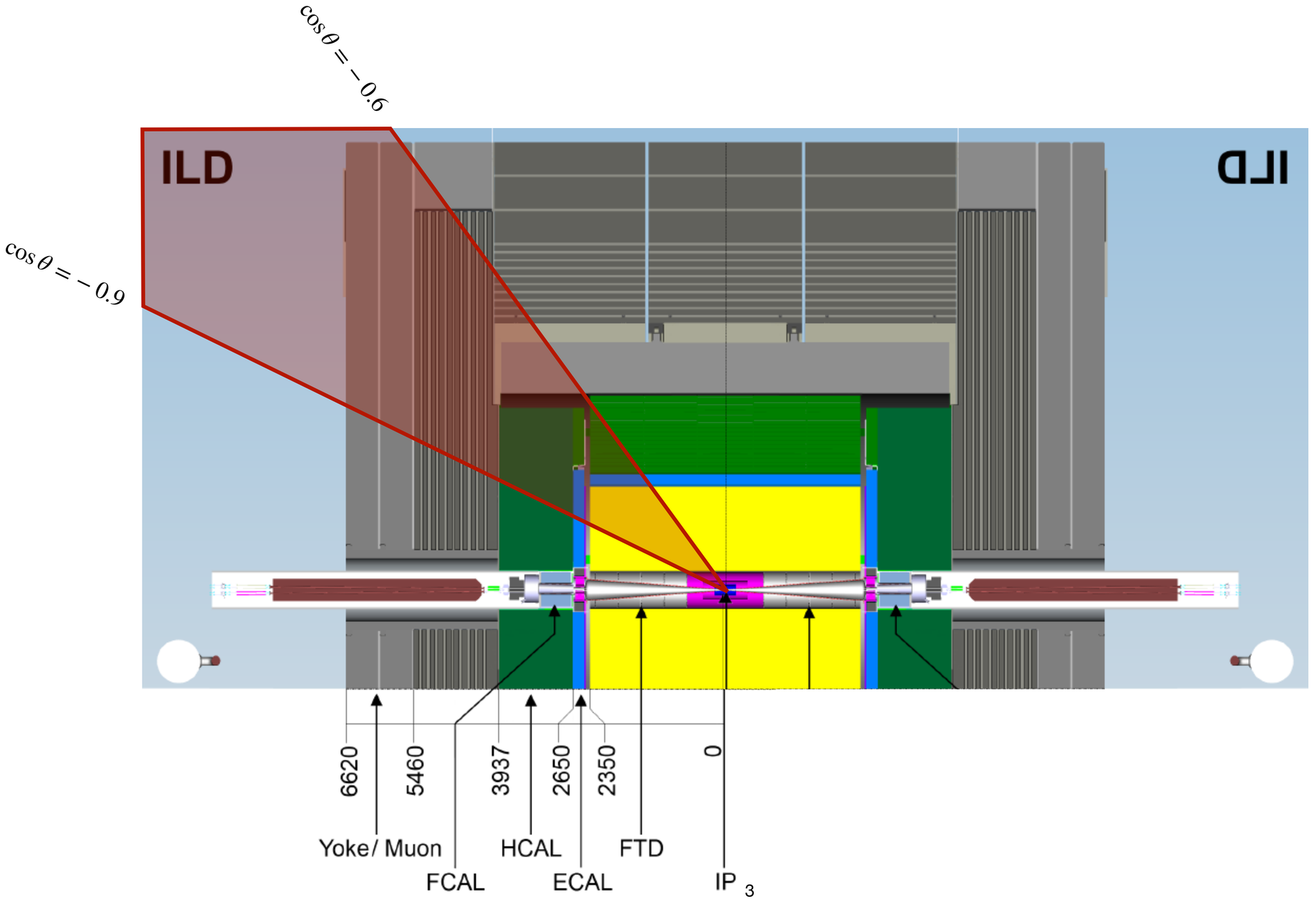
Background?

- Mis-combination of b and W?
- Single Top Background?



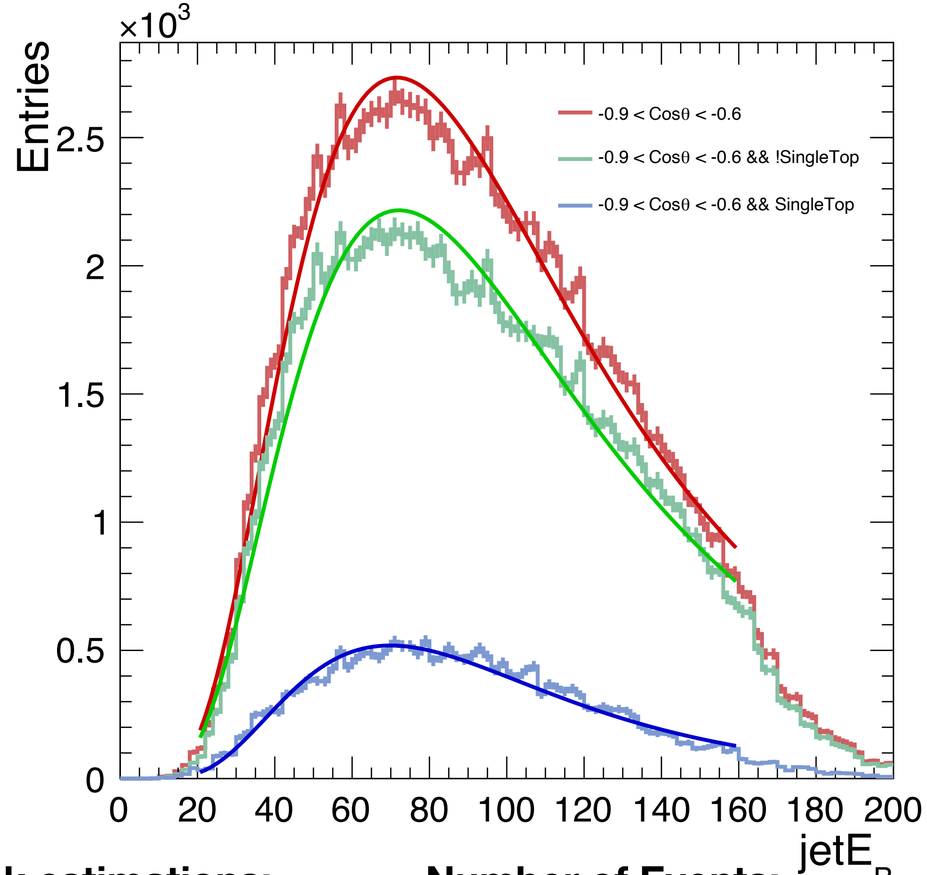
- Polar angle distribution of top quark only using vtx x vtx comparison.

1. Introduction



1. Introduction

jetEb for $-0.9 < \cos\theta_t < -0.6$



Peak estimations:

maxRed = 71.6 GeV

maxGreen = 72.2 GeV

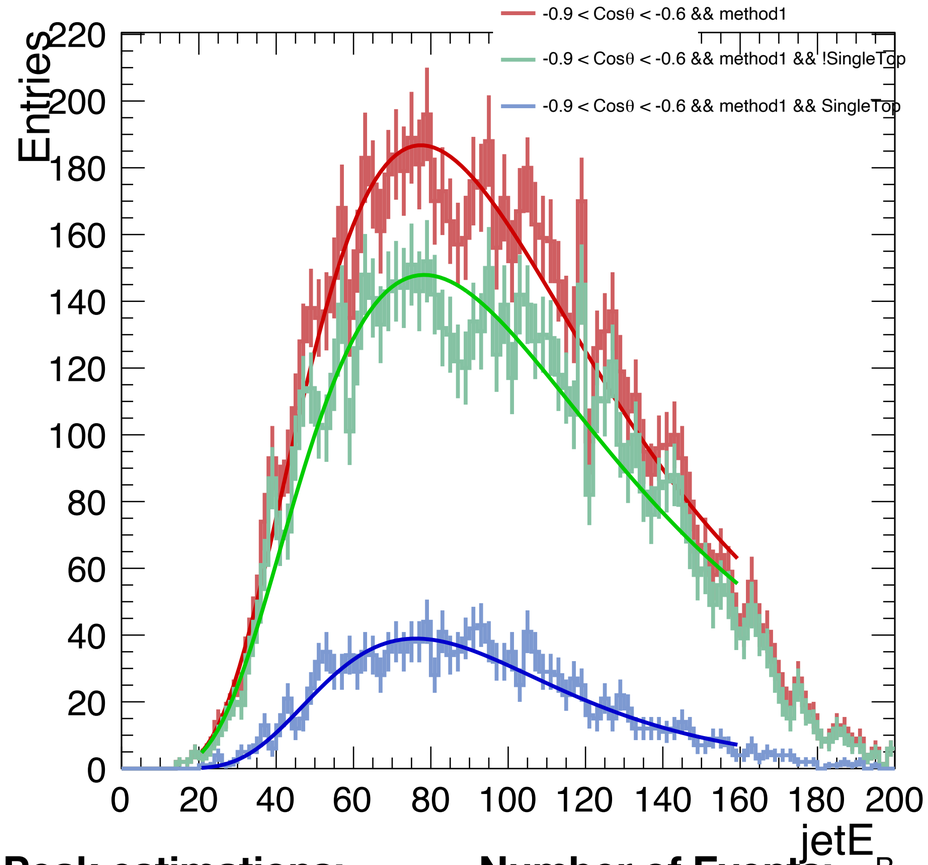
maxBlue = 69.8 GeV

Number of Events:

Red Events: 132855

Green Events: 109538

Blue Events: 23317



Peak estimations:

maxRed = 77.4 GeV

maxGreen = 78.3 GeV

maxBlue = 76.1 GeV

Number of Events:

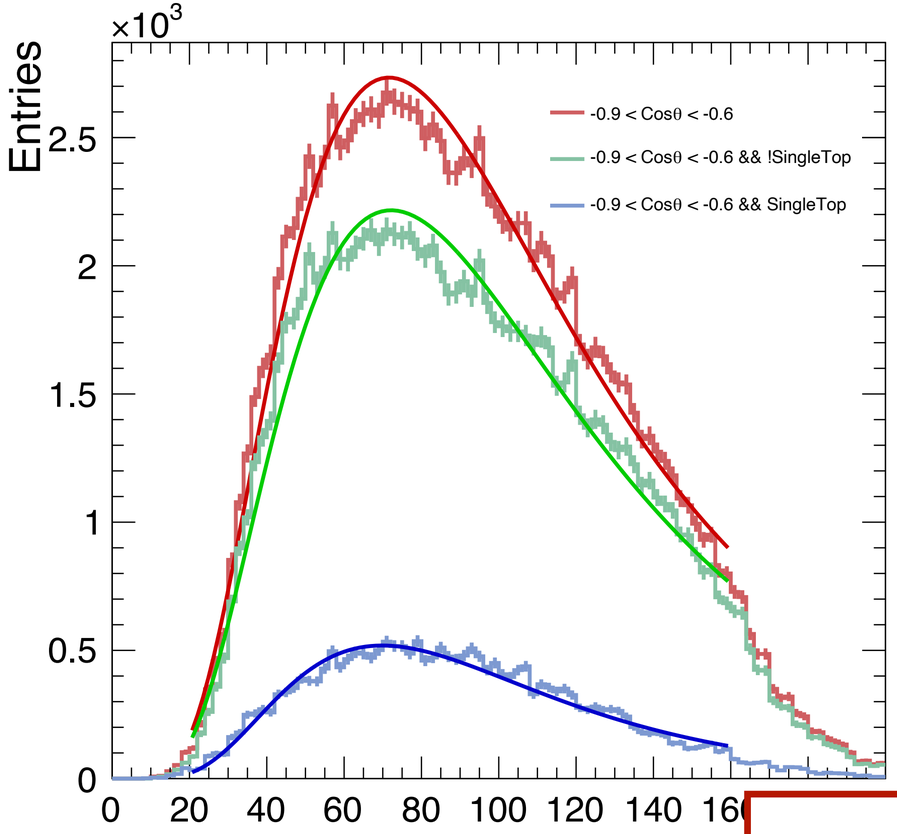
Red Events: 9818

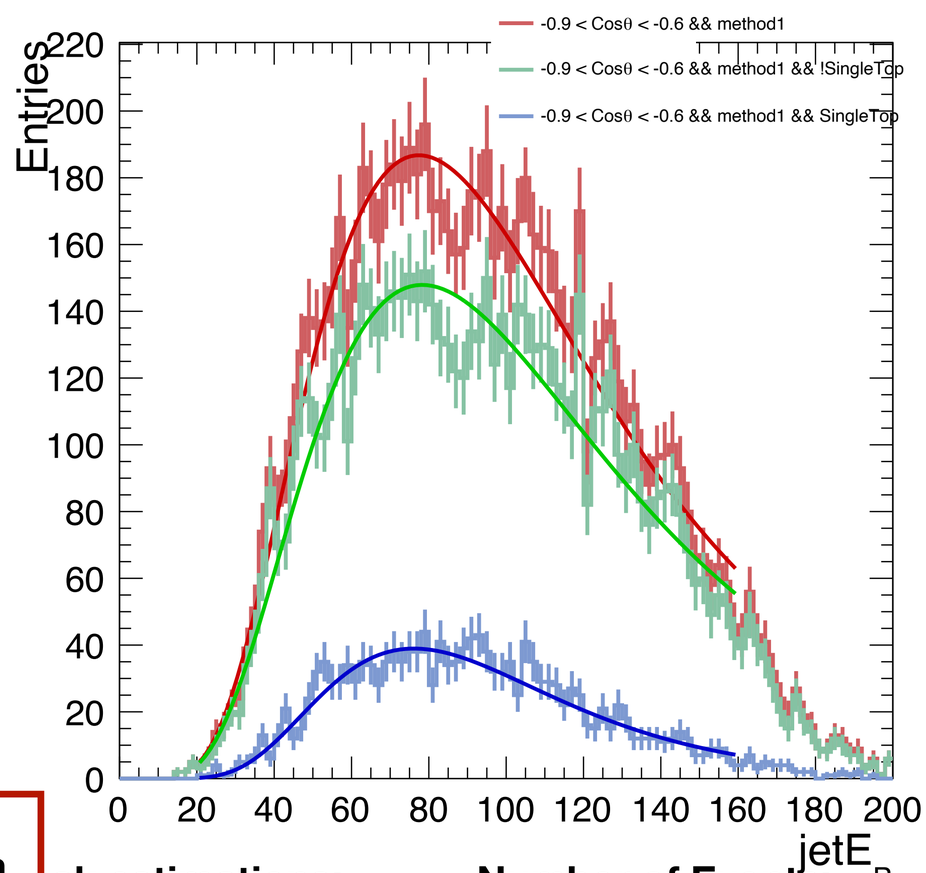
Green Events: 7319

Blue Events: 1599

1. Introduction

jetEb for $-0.9 < \cos\theta_t < -0.6$





Peak estimations:

maxRed = 71.6 GeV
maxGreen = 72.2 GeV
maxBlue = 69.8 GeV

Number of Events:

Red Events: 1
Green Events: 109538
Blue Events: 23317

Reconstruction bias in VTX x VTX selection?

Peak estimations:

maxRed = 77.4 GeV
maxGreen = 78.3 GeV
maxBlue = 76.1 GeV

Number of Events:

Red Events: 9818
Green Events: 7319
Blue Events: 1599

1. Introduction

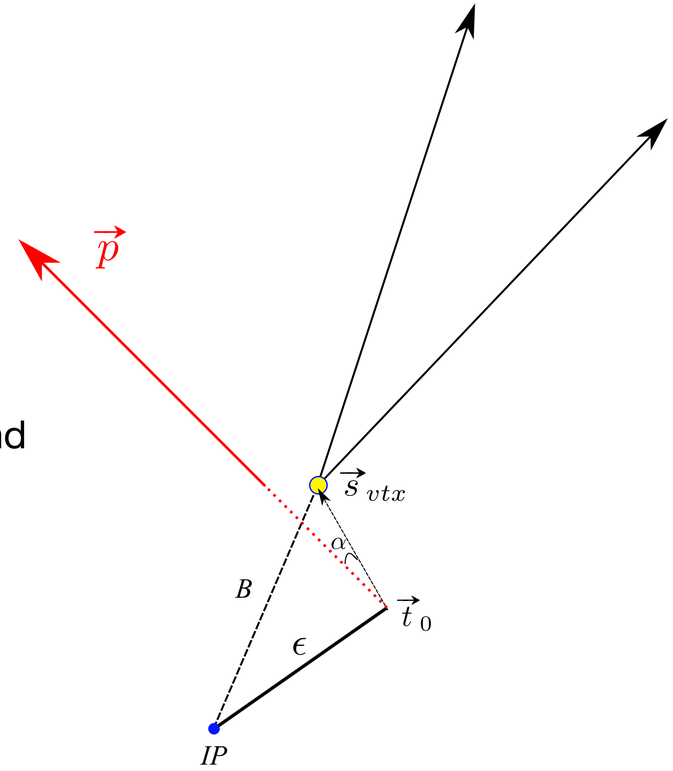
Track will not be associated to the secondary vertex

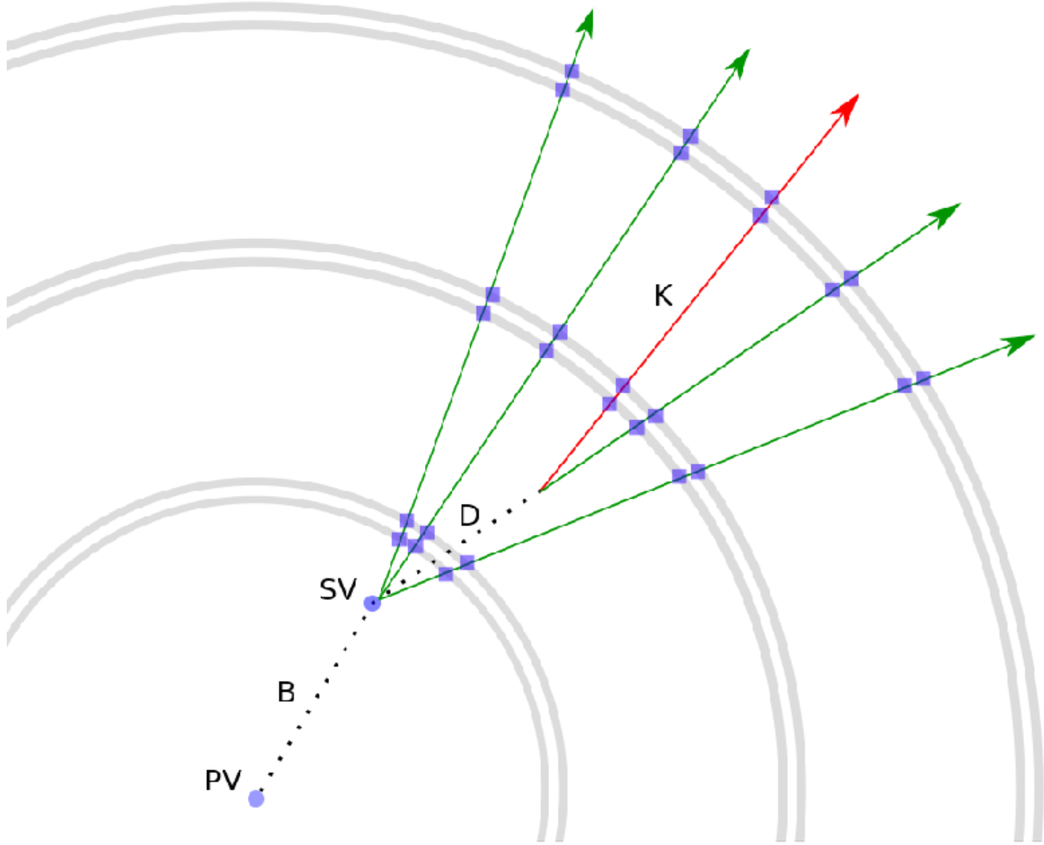
- Low momentum（$P_{trak} < 4$ GeV）
- Small offset（$\epsilon < 0.5$ mm）

Track Recovery

Applies the cut to ϵ and α and computes the SV parameters.

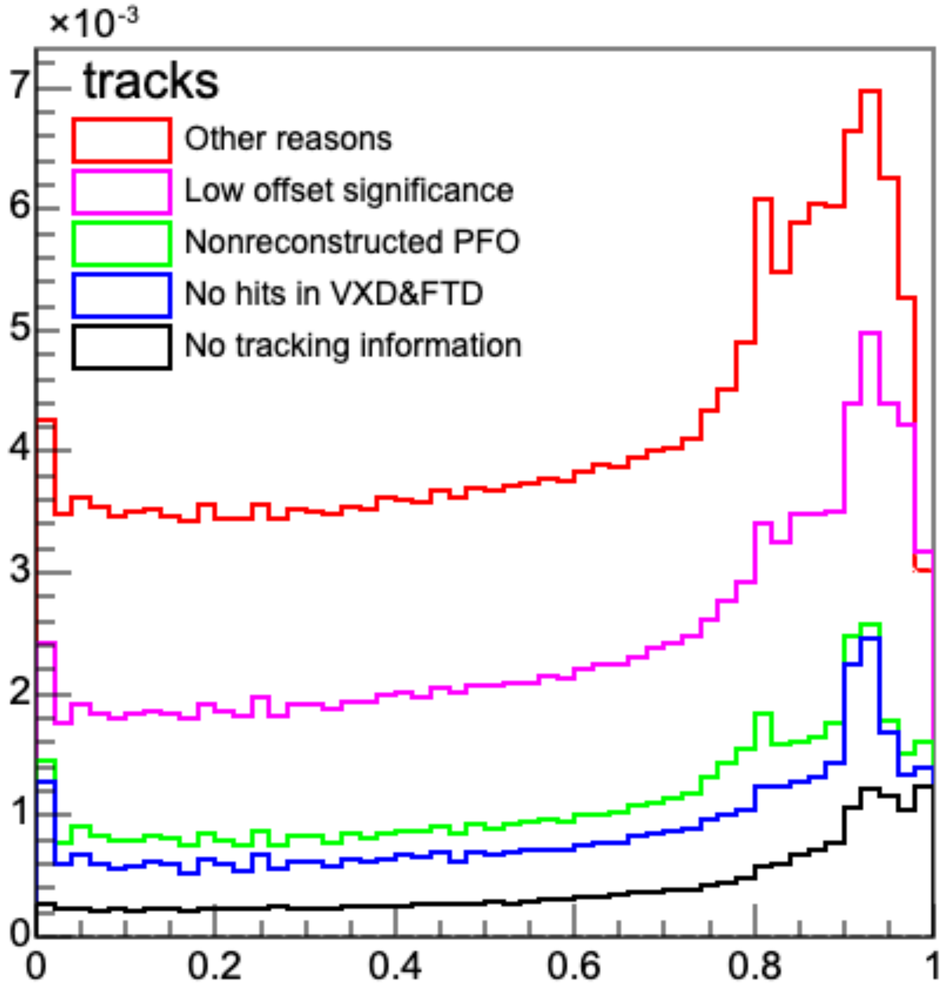
- $\epsilon/\sigma > 2 + 25\sqrt{\alpha}$
- $\alpha < 0.08$



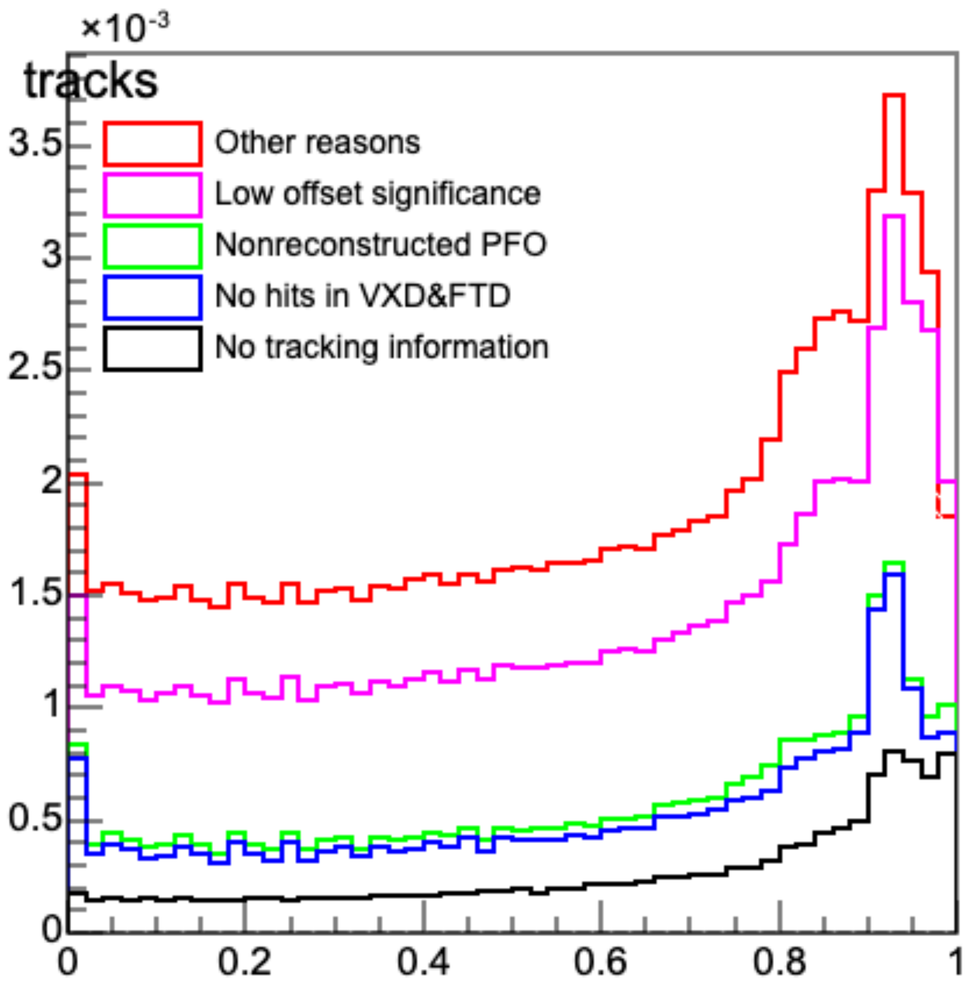


2. Before/After Recovery

- **Polar angle distribution of the missing prongs**



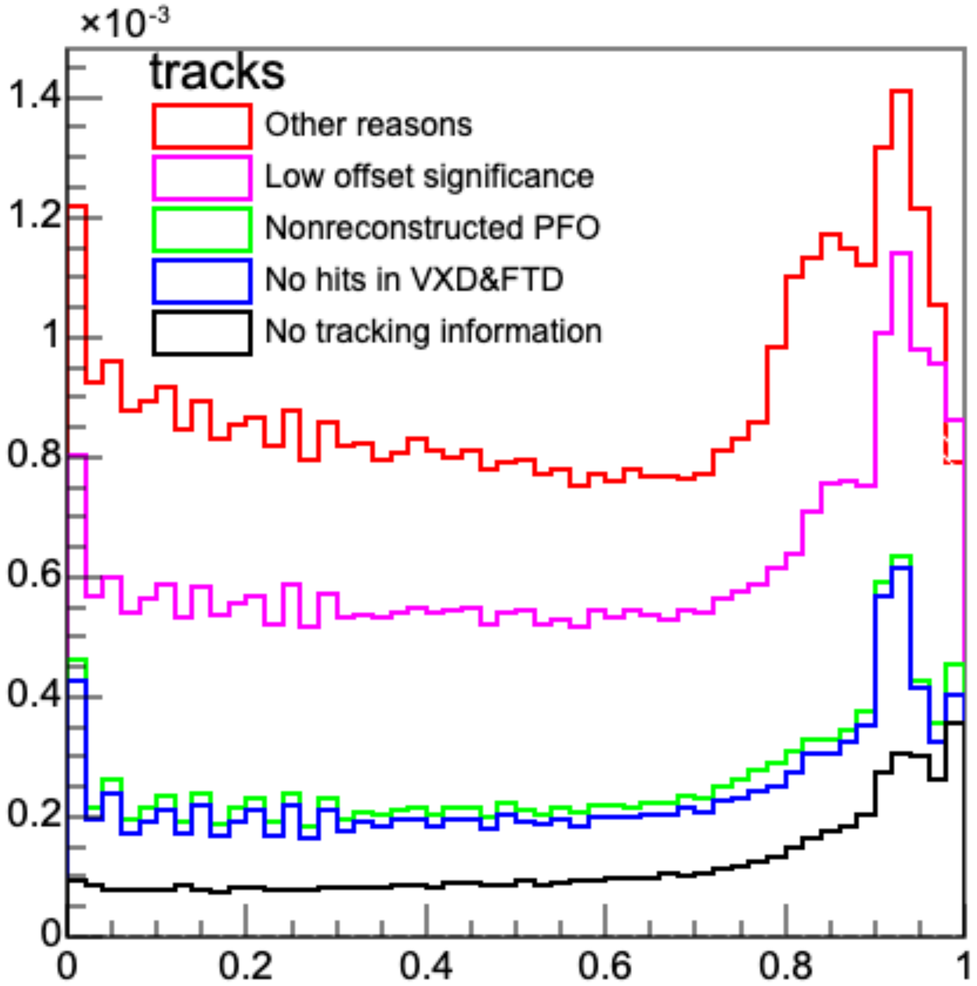
- **Before Vertex Recovery**



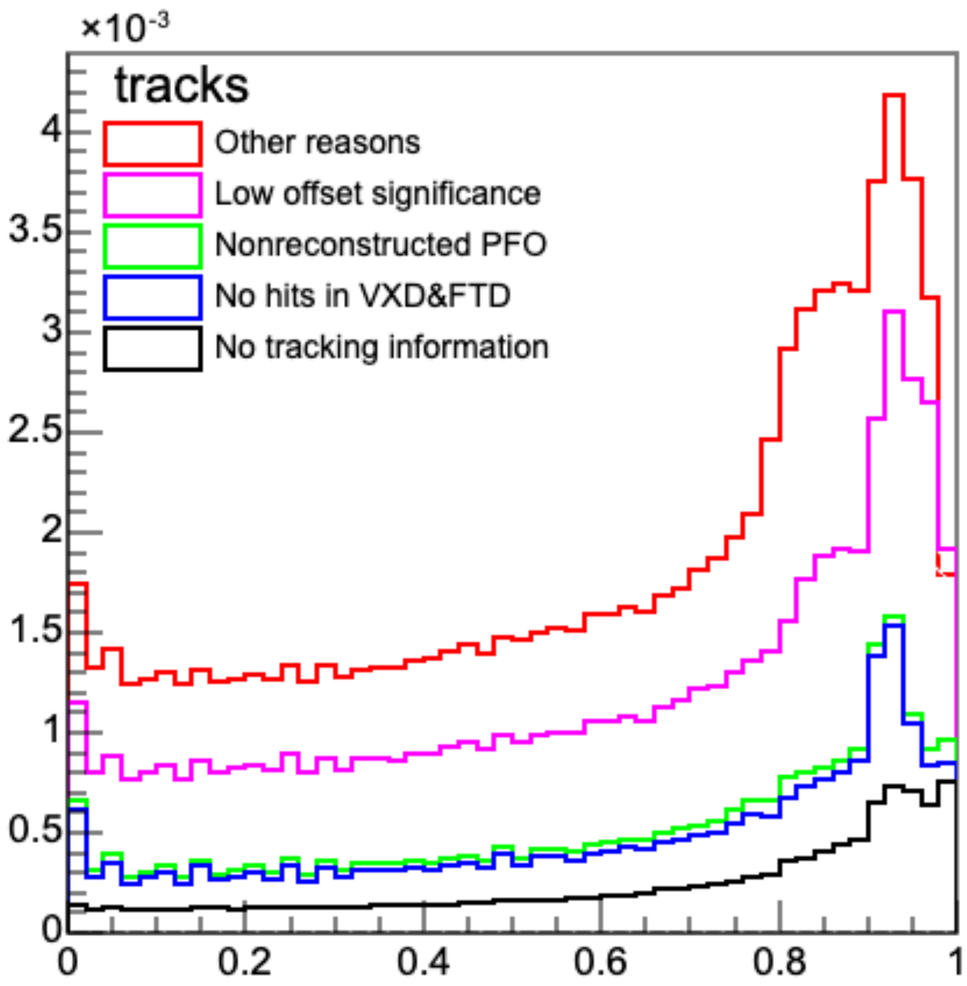
- **After Vertex Recovery**

2. After Vertex Recovery

- **Polar angle distribution of the missing prongs for (cosθ_Gen t < 0) and (cosθ_Gen t > 0)**



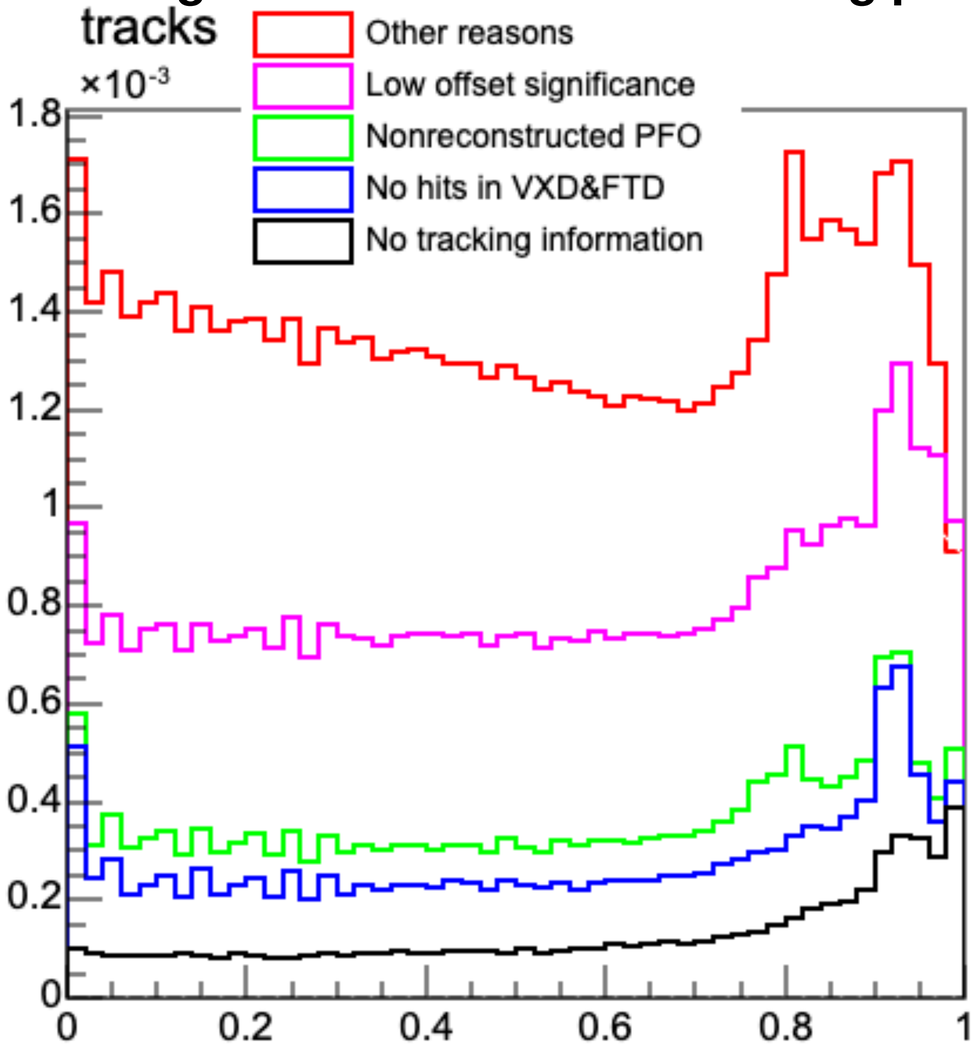
- **cosθ_Gen t < 0**



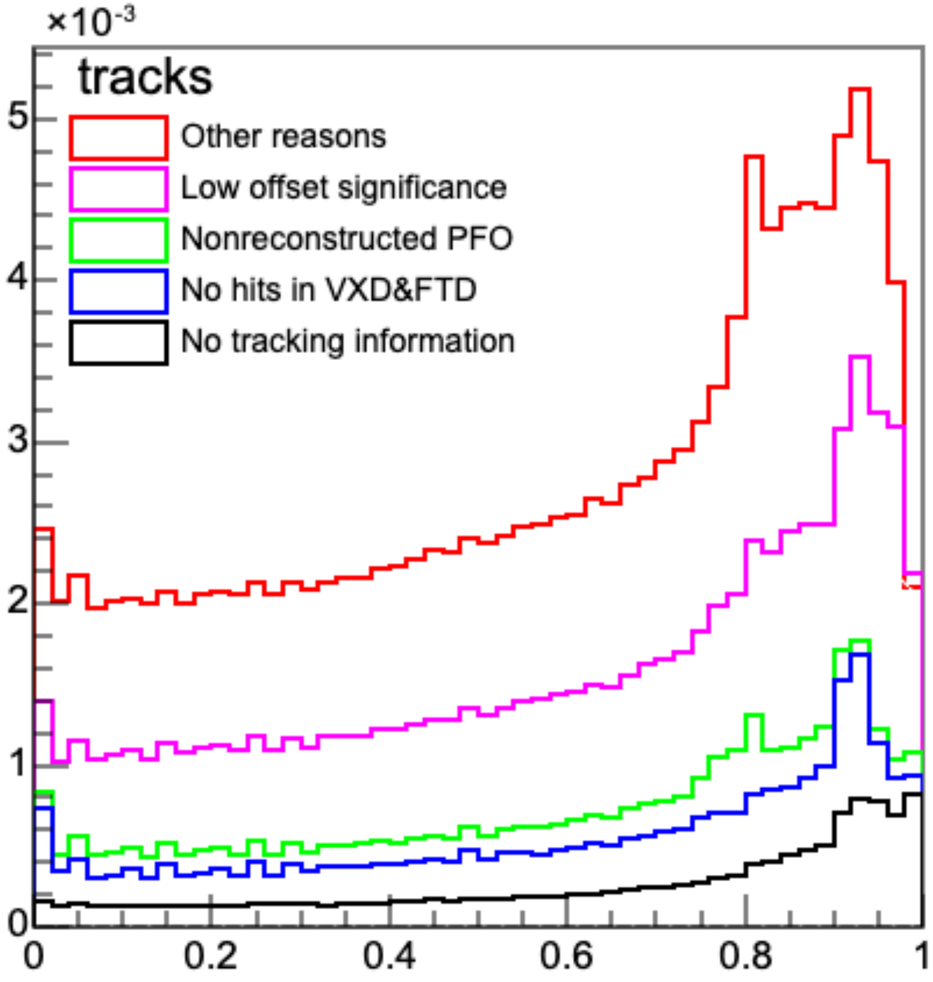
- **cosθ_Gen t > 0**

3. Before Vertex Recovery

- **Polar angle distribution of the missing prongs for (cosθ_Gen t < 0) and (cosθ_Gen t > 0)**



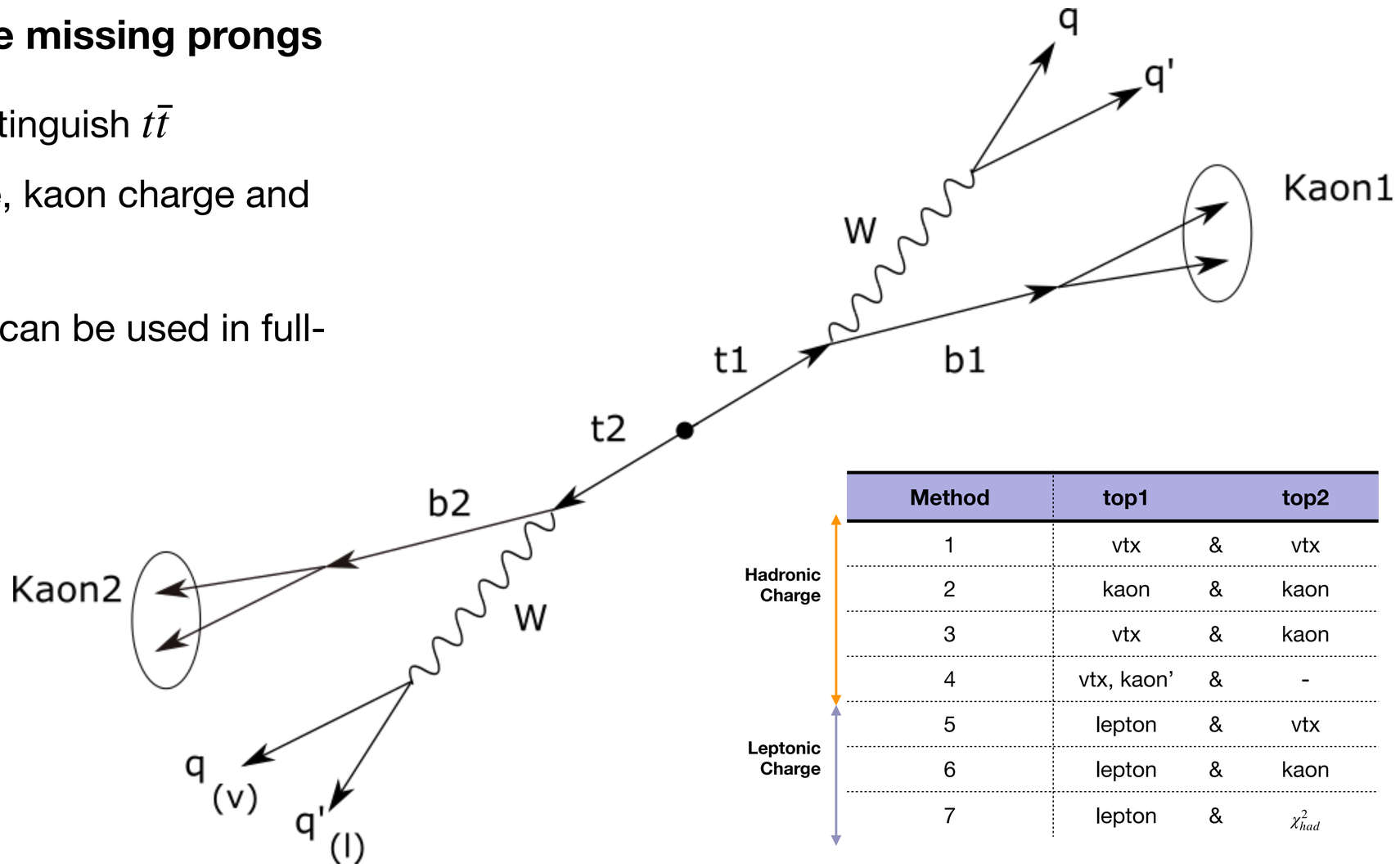
- **cosθ_Gen t < 0**



- **cosθ_Gen t > 0**

4. Charge Comparison

- **Polar angle distribution of the missing prongs**
  - Electric charges are used to distinguish $t\bar{t}$
  - Comparison uses vertex charge, kaon charge and lepton charge
  - vertex charge and kaon charge can be used in full-hadronic channel

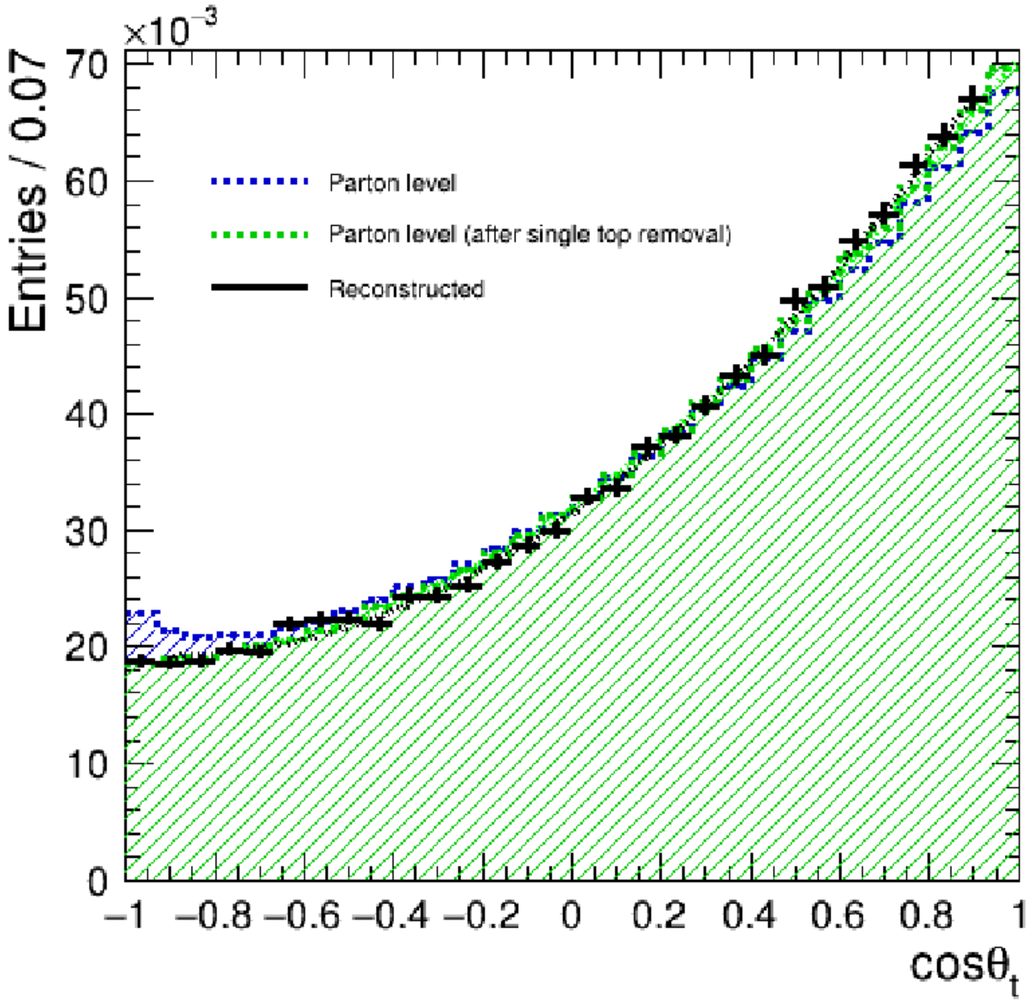


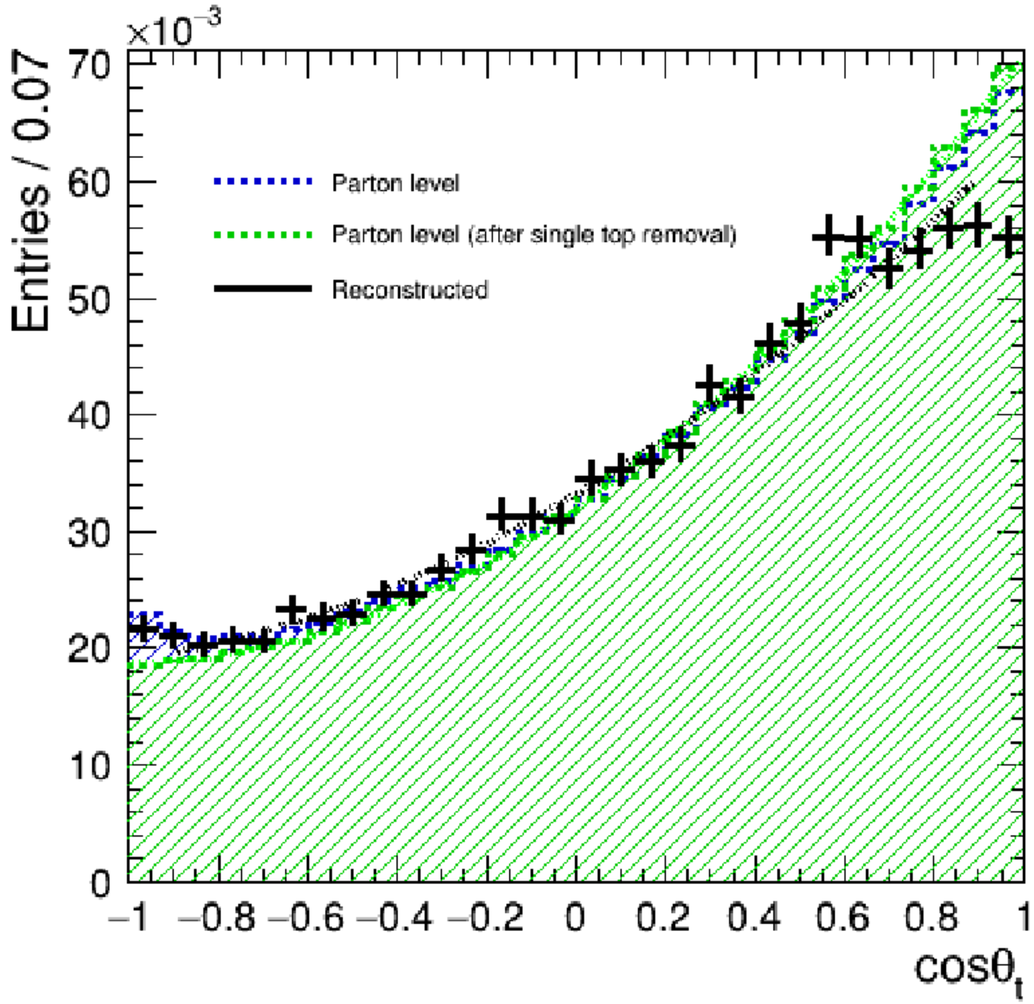
	Method	top1		top2
Hadronic Charge	1	vtx	&	vtx
	2	kaon	&	kaon
	3	vtx	&	kaon
	4	vtx, kaon’	&	-
Leptonic Charge	5	lepton	&	vtx
	6	lepton	&	kaon
	7	lepton	&	χ^2_{had}

$$\chi^2_{had} = \frac{\gamma_t^{had} - 1.435}{\sigma_{\gamma_t}} + \frac{\cos\theta_{Wb} - 0.23}{\sigma_{\cos\theta_{Wb}}} + \frac{p_b^* - 68}{\sigma_{p_b^*}}$$

4. Charge Comparison

- **Polar angle distribution after kaon x kaon**





- **VTX x VTX**
- **Kaon x Kaon**