

General Meeting

Yuichi Okugawa
December 2021

Problem

The problem was the fact that **double tag** was **not** applied to the leading kaon selection.

Meaning, in **single tag**:

- There are 2 leading PFOs
- Individually, each leading PFO will go through the cut mentioned in previous slides.
- If one of them satisfies the cut, this will fill the histogram.

This is of course not the correct way to implement in this analysis. One needs **double tag**, which is:

- 2 of leading PFOs should satisfy the cuts at the same time, in order for them to be identified as leading kaons.

Selections (ss)

Cut MC

ISR suppression

- $QQ \cos \text{sep} > 0.95$
- $120 < QQ \text{ mom} < 127$

Cut PFO

General PFO

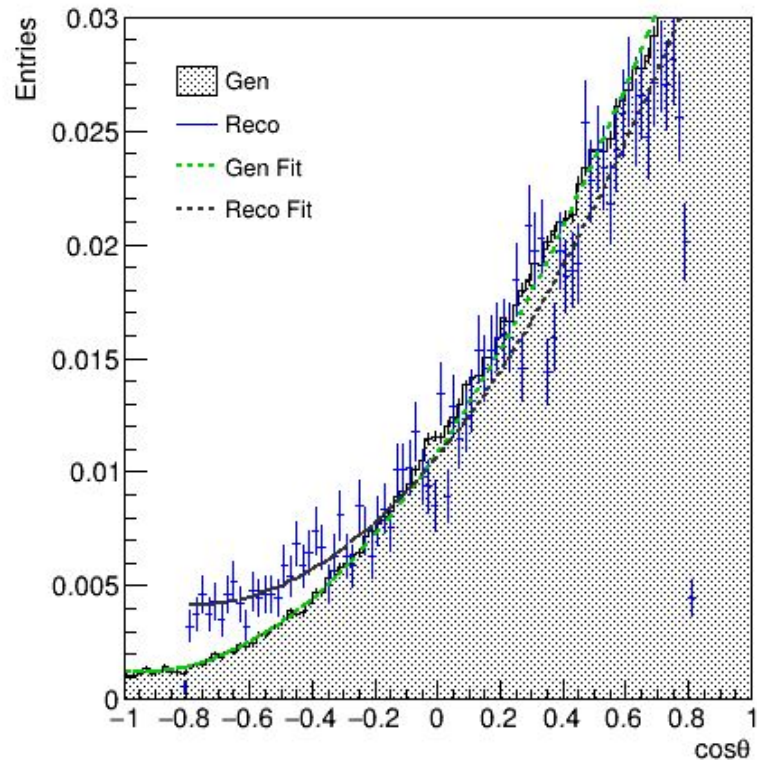
- PFO match (It should fall into either jet0 or jet1)
- # PFO tracks == 1 (more than 2 tracks cannot be associated to make 1 PFO)

Lead PFO (double tag)

- Both PFO should have momentum window $10 < \text{Lead PFO mom} < 60$
- Lead PFO charge \pm or $-+$
- # TPC hits **210 < Lead PFO hits**
- Offset cut < 1.0
- $\text{kdEdx_dist} < (\text{pdEdx_dist} \ \& \ \text{pidEdx_dist})$

Notes

- TPC hits -> changed from base
- Normalization changed (integrate from $-0.8 < \cos < 0.8$) because of cut in # TPC hits



Migration

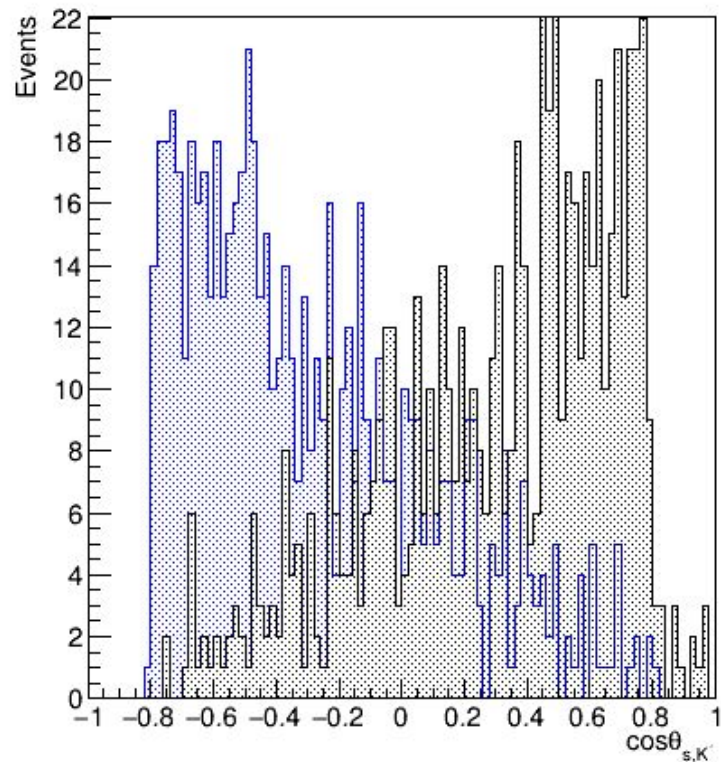
The discrepancy of distribution between the Gen and Reco for double tag is clearly migration.

To confirm this, I:

- compared the Gen QQ **direction** with Reco leading PFO direction, which satisfied the cuts.
- Then, I compared the **charges** of leading PFOs to see if they match with Gen QQ charges.

Plot on the right shows their polar angle.

(Gray: Gen, Blue: Reco)



of events

Table on the right shows the # of events after each cuts. (note: # of polar angle histogram entry is **x2**)

Cut MC

ISR suppression

- $QQ \cos \theta > 0.95$
- $120 < QQ \text{ mom} < 127$

Cut PFO

General PFO

- PFO match (It should fall into either jet0 or jet1)
- # PFO tracks == 1 (more than 2 tracks cannot be associated to make 1 PFO)

Lead PFO (double tag)

- Both PFO should have momentum window $10 < \text{Lead PFO mom} < 60$
- Lead PFO charge \pm or $-\pm$
- # TPC hits **210 < Lead PFO hits**
- Offset cut < 1.0
- $k dE_{dx_dist} < (p dE_{dx_dist} \& \text{pid} dE_{dx_dist})$

# Total Events	1215036
# after Gen sel	181296
# after PFO sel	181295
# Events after LeadK sel (double tag)	
Charge check	97720
Momentum check	64906
TPC hit check	35487
Offset check	33708
dEdx dist min check	3766
Migration	336

Selections (ss)

Cut MC

ISR suppression

- $QQ \cos \text{sep} > 0.95$
- $120 < QQ \text{ mom} < 127$

Cut PFO

General PFO

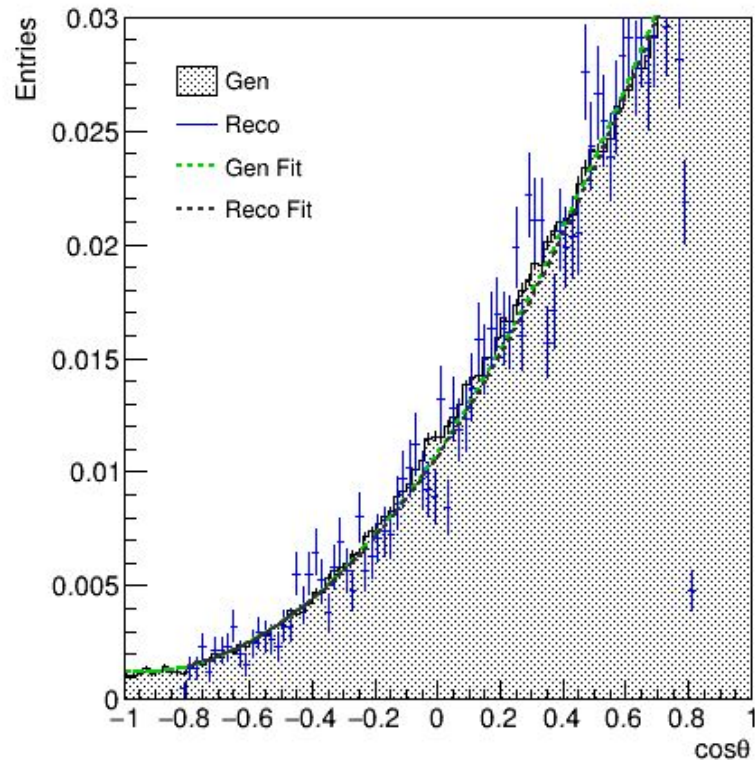
- PFO match (It should fall into either jet0 or jet1)
- # PFO tracks == 1 (more than 2 tracks cannot be associated to make 1 PFO)

Lead PFO (double tag)

- Both PFO should have momentum window $10 < \text{Lead PFO mom} < 60$
- Lead PFO charge \pm or $-+$
- # TPC hits **210 < Lead PFO hits**
- Offset cut < 1.0
- $\text{kdEdx_dist} < (\text{pdEdx_dist} \ \& \ \text{pidEdx_dist})$

Notes

- TPC hits -> changed from base
- Normalization changed (integrate from $-0.8 < \cos < 0.8$) because of cut in # TPC hits
- **Ignore migrations (cheat)**



Migrated Event Analysis

Migration

Right plot shows the PDG of leading PFOs for the migrated events.

Config	#Events	%
K-K	126	37.5
Pi-Pi	34	10.1
Pi-K	138	41.0
Pi-p	11	3.2
p-K	27	8.0
p-p	0	0

