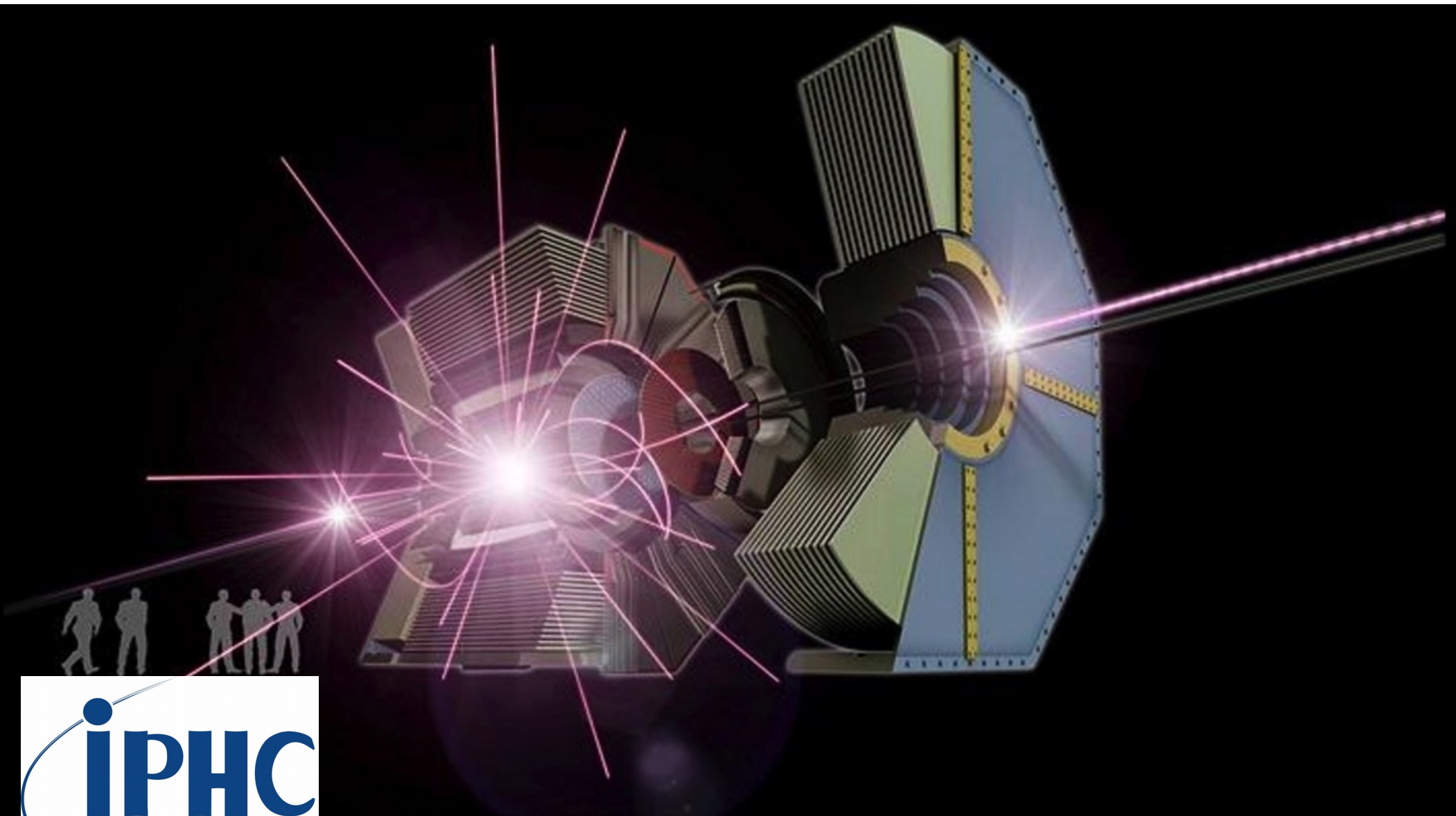


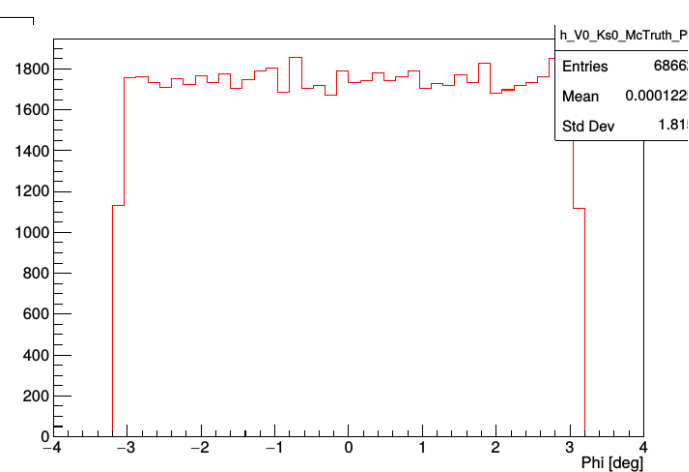
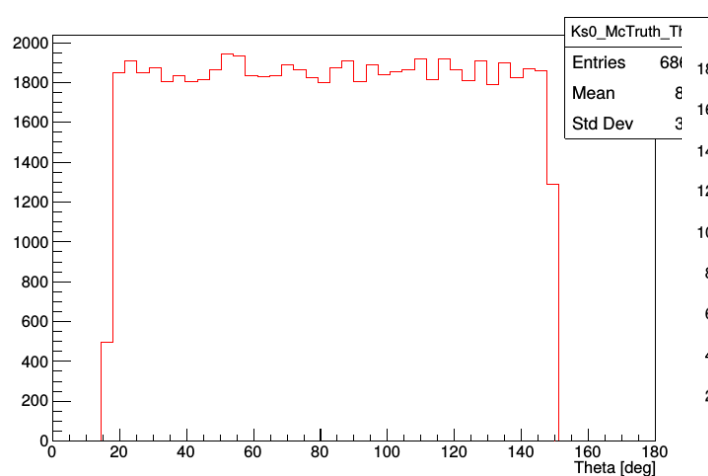
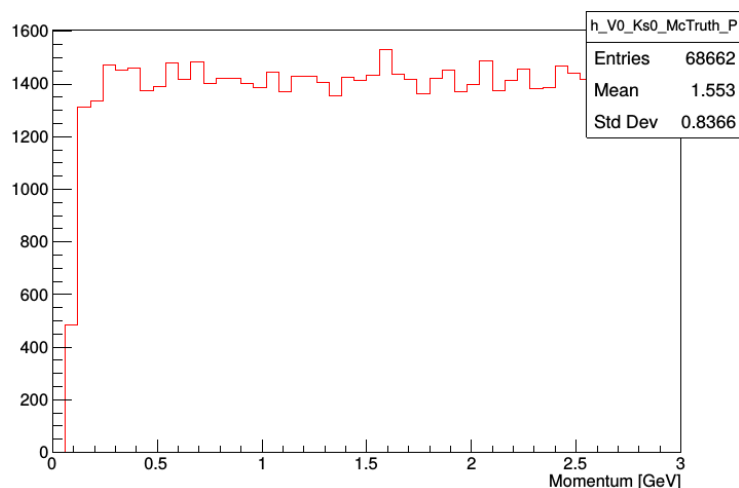
K0s reconstruction with V0 finder



Generated sample :

- **100K K0s**

- P [100 MeV, 3 GeV]
- Θ [17° , 150°] \rightarrow Full acceptance
- Φ [0° , 360°]



Work flow



```
4 from modularAnalysis import *
5 from stdCharged import *
6 from stdV0s import *
7
8
9 inputMdst('default', sys.argv[1])
10 fillParticleList('pi+:all', '', True)
11 # KShort from V0
12 fillParticleList('K_S0:V0', '', True)
13
14 # KShort from pi tracks
15 reconstructDecay('K_S0:RD -> pi-:all pi+:all', cut='', dmID=1)
16
17 # Merge both KShort lists (check if this is done intelligent)
18 copyList('K_S0:all', 'K_S0:V0')
19 copyList('K_S0:all', 'K_S0:RD')
20 matchMCTruth('K_S0:all')
21 #main_path.add_module('TagUniqueSignal', particleList='K_S0:all')
22
23 # Perform vertex fit
24 vertexKFit('K_S0:V0', 0.0, '', '')
25 vertexKFit('K_S0:RD', 0.0, '', '')
26 # applyCuts('K_S0:V0', '0.450 < M < 0.550')
27
28 fillParticleListFromMC('K_S0:gen', '', True, True)
29 matchMCTruth('K_S0:gen')
30 matchMCTruth('pi+:all')
31 matchMCTruth('K_S0:V0')
32 matchMCTruth('K_S0:RD')
33
```

Some Numbers



Generated K0s : 68662

V0 finder reconstructed K0s: 50727

Global efficiency (Acceptance*Tracking*V0) : **74 %**

Global efficiency (Signal) : 64 %

Tracking efficiency for Pions

Nb Events with at least 2 TM pions('Good Events')

= 54887

$54887/68662 = 80 \% \text{ of generated K0s can be reconstruct(Acceptance*Tracking)}$

V0 finder

V0 Finder reconstructed K0s/Nb Events with at least 2 TM pions

$= 50727/54887 = 92 \% : \text{V0 efficiency}$

Nb Pions in 'good events' > 2 * Nb 'good events' → 1 pions generated = 2 pions reco (TM)

It represent 6 % of the 'good events'

→ Thanks to Nils now we know why !!

Some Numbers updated



All the events where 1 generated pion gives 2 TM pions have been skimmed in order to avoid a bias coming from the extra pion

An other generated sample has been produced in order to avoid acceptance effects and have a better picture of the tracking efficiency

Generated K0s (raw) : 68618

Generated K0s (W\o 'Extra pions' event)= 65272 (95 %'raw')

V0 finder reconstructed K0s: 51785

Global efficiency (Tracking*V0) : **80%**

Tracking efficiency for Pions

Nb Events with only 2 TM pions

= 56425

$56425/65272 = 86 \%$ **of generated K0s can be reconstruct**

Tracking efficiency = 93 %

V0 finder

V0 Finder reconstructed K0s/Nb Events with only 2 TM pions

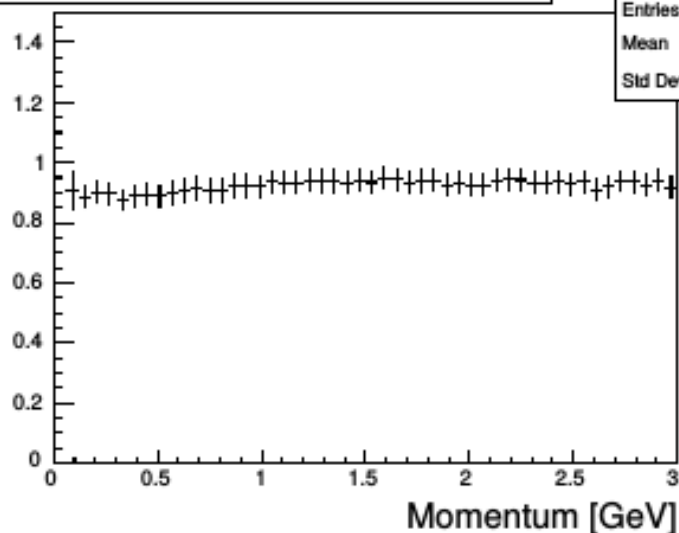
$= 51785/56425 = 92 \%$ **: V0 efficiency**

Extra pions seems to not affect the efficiency of the V0 finder

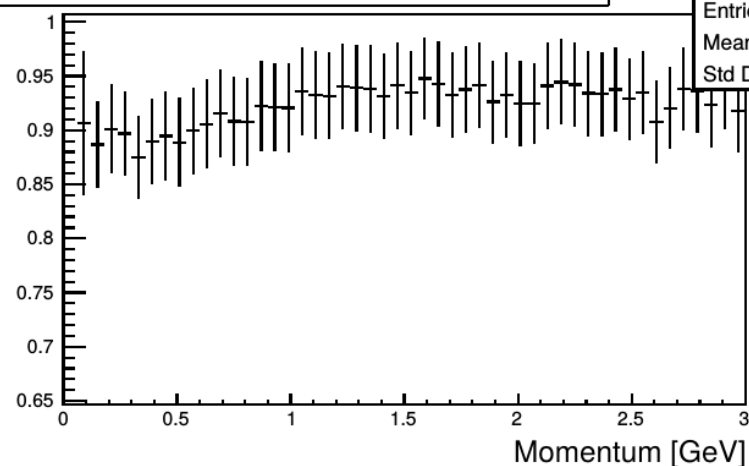
But they can induces a bias in a Pions distribution study

V0 efficiency study : K0s variables

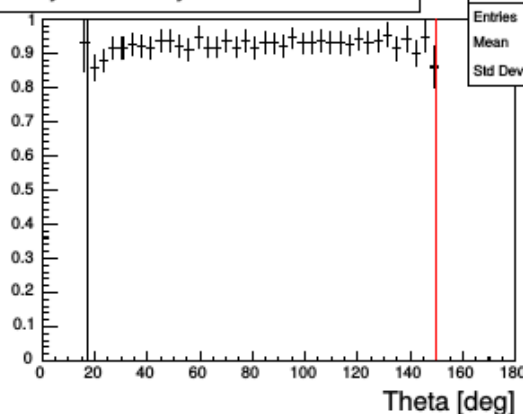
Efficiency: K0s reco by V0 Vs. Generated K0s



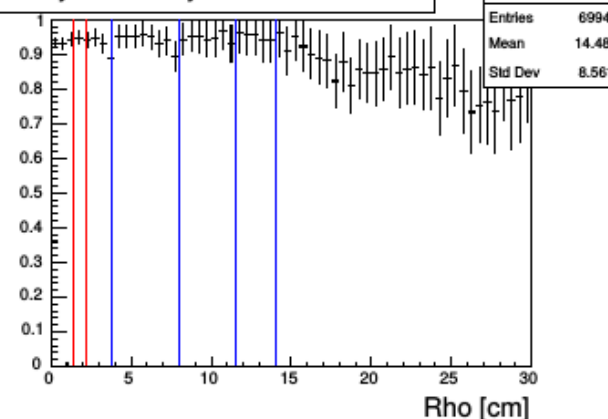
Efficiency: K0s reco by V0 Vs. Generated K0s



Efficiency: K0s reco by V0 Vs. Generated K0s



Efficiency: K0s reco by V0 Vs. Generated K0s

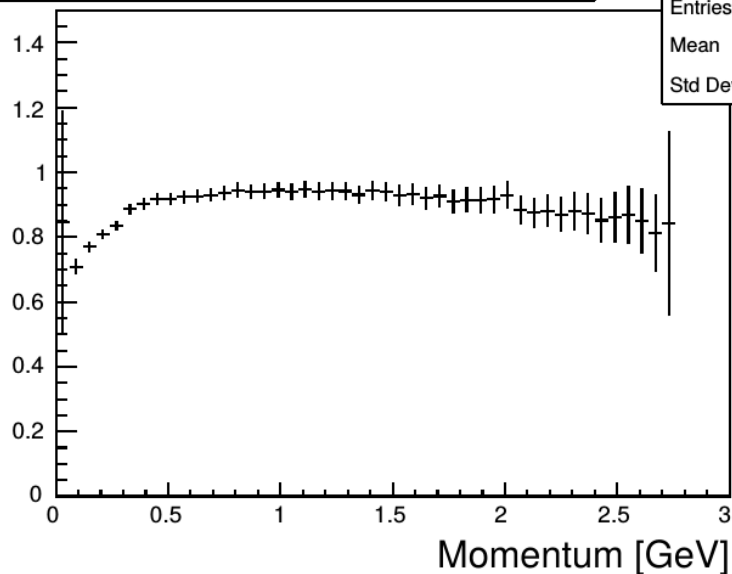


V0 Finder works properly even if there is a small dip for K0s with less than 1 GeV

V0 efficiency study : Pions variables

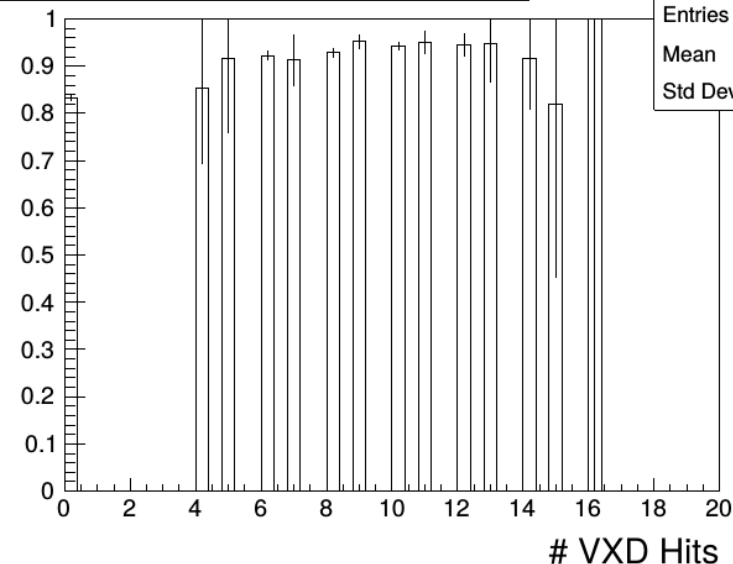


Efficiency: Pions From K0s reco by V0 Vs. reco pions TM



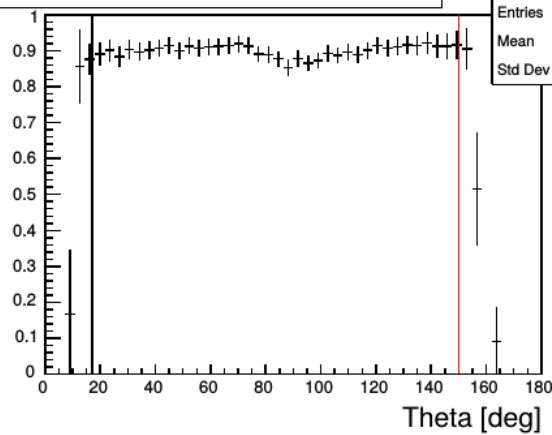
h_V0OnReco_P	
Entries	5876
Mean	1.38
Std Dev	0.7791

V0 Pions Vs. TM Pions: VXD Hits



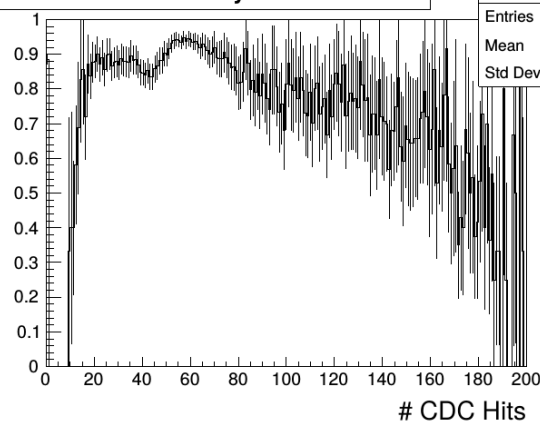
h_V0OnReco_VXDHits	
Entries	136
Mean	9.506
Std Dev	4.351

Efficiency: Pions From K0s reco by V0 Vs. reco pions TM



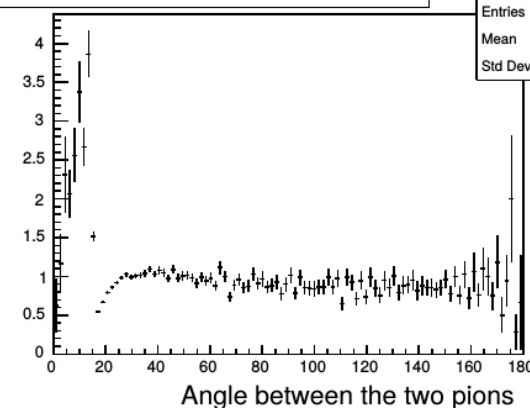
h_V0OnReco_Theta	
Entries	12565
Mean	83.93
Std Dev	42.54

Pions from K0s reco by V0 / All Pions



h_V0OnReco_CDCHits	
Entries	2777
Mean	94.7
Std Dev	51.56

Efficiency: K0s reco by V0 Vs. Generated K0s

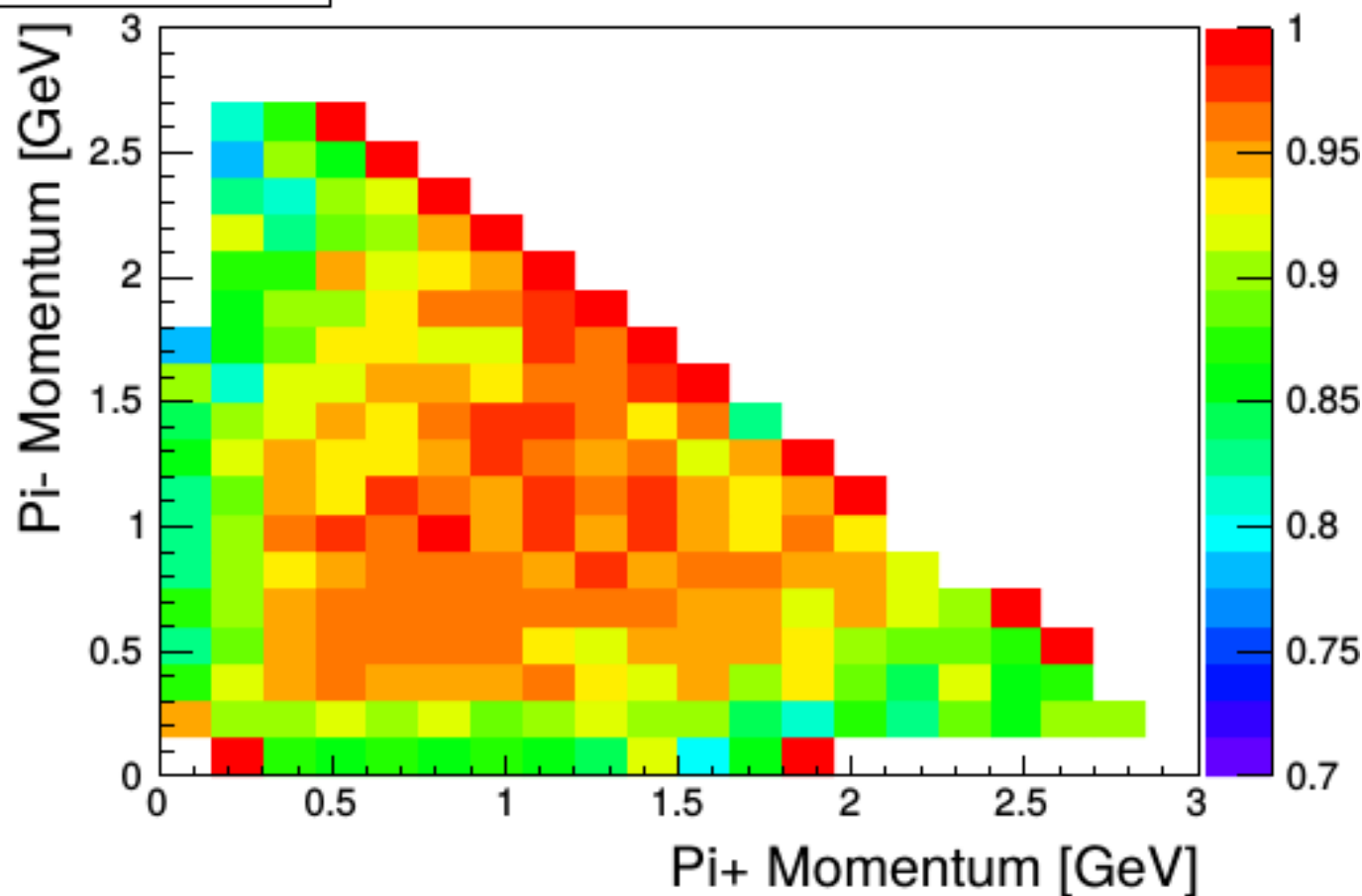


h_Pions_V0OnGen_Angle	
Entries	3183
Mean	79.92
Std Dev	54.94

V0 efficiency study : K0s



V0 efficiency



If one of the Pions is a low momentum one then the efficiency drops

Signal Study



Sample generated :

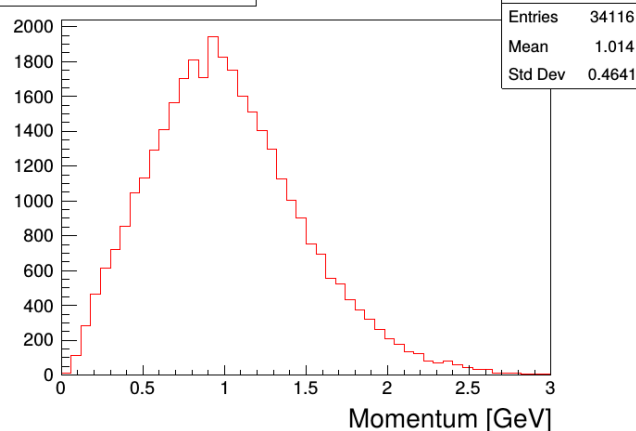
Upsilon(4s) → B0 B0 → K1 gamma

K1 → K0s rho

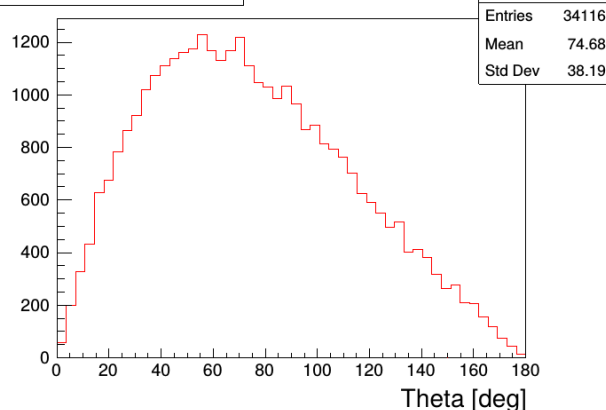
K0s → pi+ pi-

For my study I will also take into account the Kshorts coming from the other B.

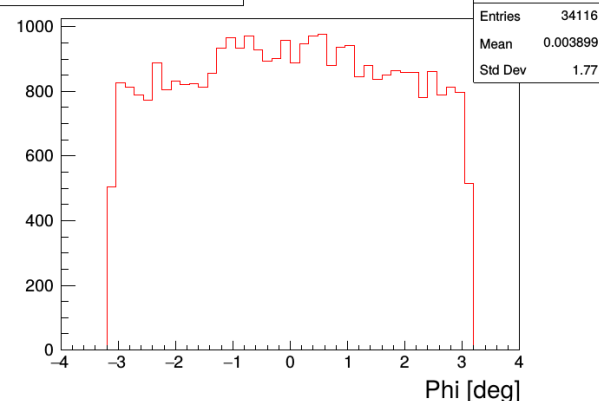
MC truth K0s from V0



MC truth K0s from V0



MC truth K0s from V0



Very preliminary numbers on signal



Generated K0s = 73411

V0 finder reconstructed K0s(TM) = 20764

Global efficiency = 28%

V0 finder efficiency

Nb of K0s reconstructible = Sum(int(NbOfPionTM/2) by event)
= 25237

Nb of K0s TM = 20764

V0 Efficiency = 82 %

Extra Pions Study

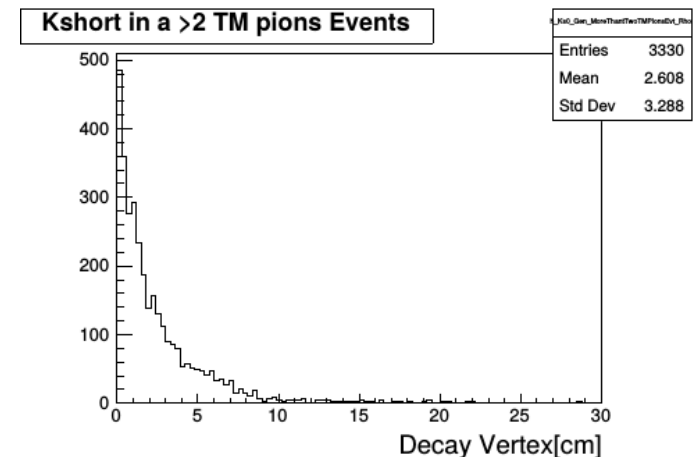
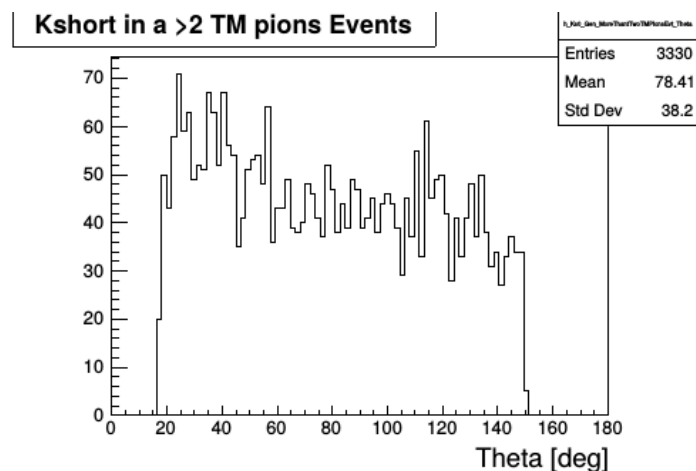
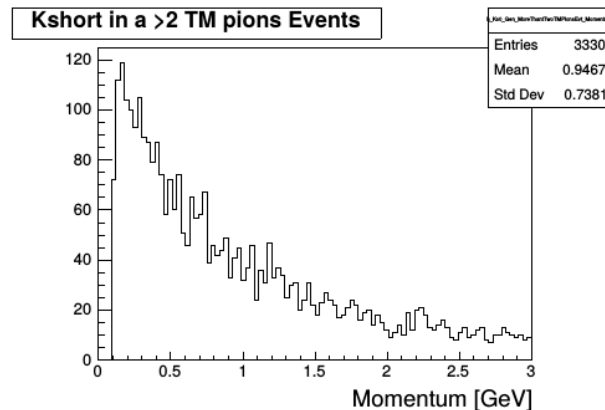
« Clone Pions »

Extra pion issue : Generated K0s



Nb Generated K0s : 68662

Nb Generated K0s giving an extra pions : 3330 \rightarrow 3330/68662 \sim 5 %



Those K0s are mostly 'low momentum'

\rightarrow Skimming those events may induced a small bias on momentum efficiency

Extra pion issue : Generated Pions Vs Reco Pions

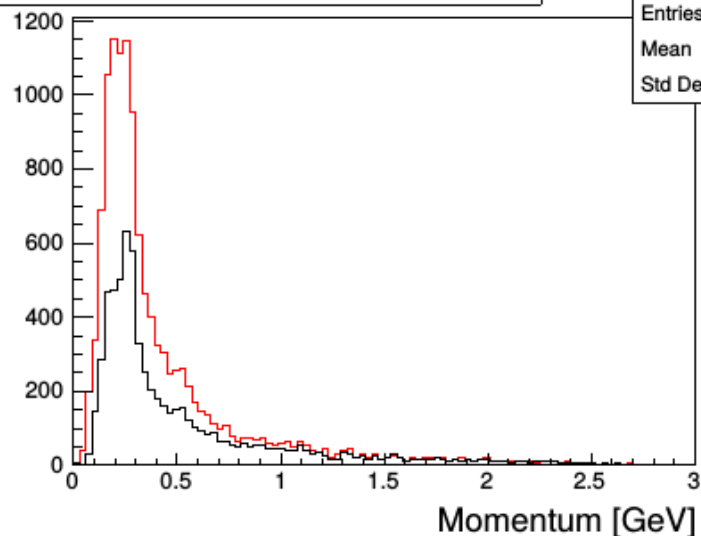


Nb Generated Pions in those events : $2 \times 3330 = 6660$

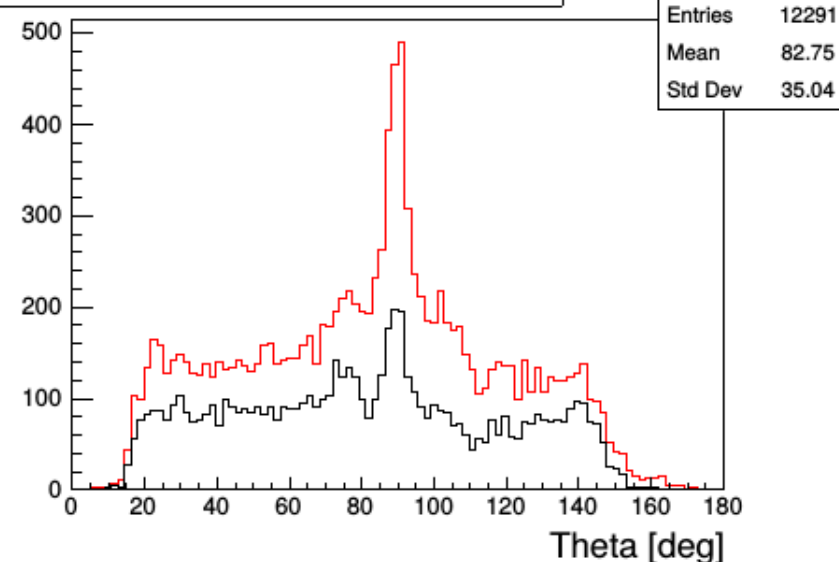
Nb Reco Pions in those events : $12291 \rightarrow 12291 - 6660 = 5631$ extra pions if all generated pions get reconstructed

Real nb Extra pions : 5602

Pions in at least 2 TM pions Events



Pions in at least 2 TM pions Events



Black : Generated Pions

Red : Reco pions

Generated pions are mostly 'low momentum' and produce in the longitudinal plane

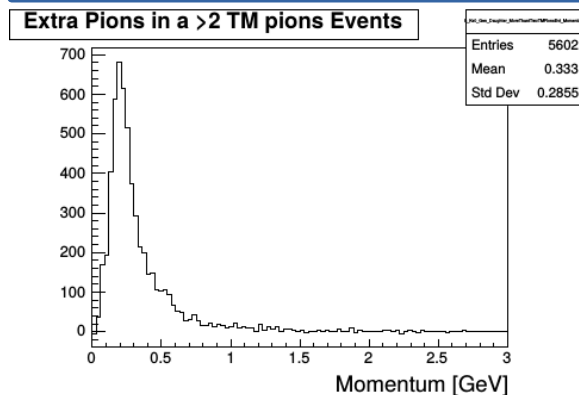
Extra pion issue : Extra Pions



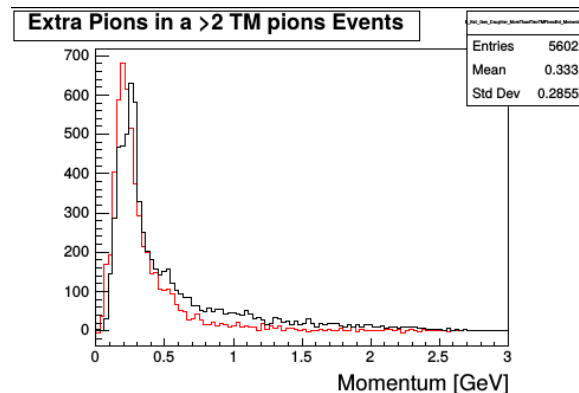
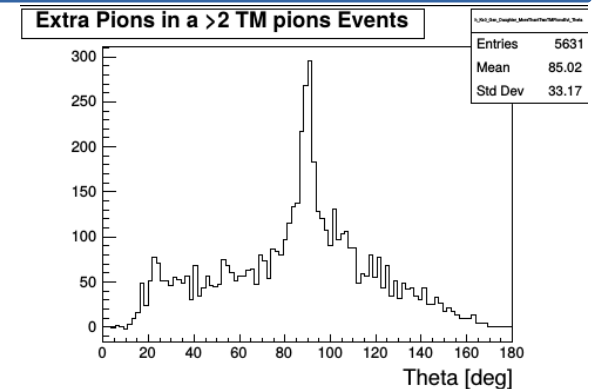
Nb Generated Pions in those events : $2 \times 3330 = 6660$

Nb Reco Pions in those events : $12291 \rightarrow 12291 - 6660 = 5631$ extra pions if all generated pions get reconstructed

Real nb Extra pions : 5602

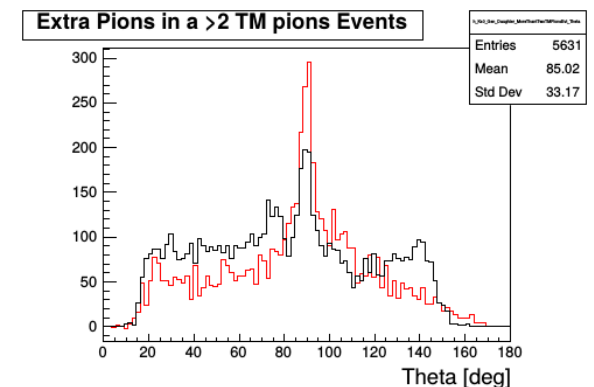


Black : Extra Pions



Red : Extra pions

Black : Generated Pions



Extra pions have mostly the same proprieties as the generated ones

Conclusion :

- V0 finder works properly :

→ Some uneficiencies when one of the pions get below 500 MeV but is not clear that we can improve a lot

Outlooks :

- **Play with χ^2 cuts inside V0 finder**
- **Add Beam Background**