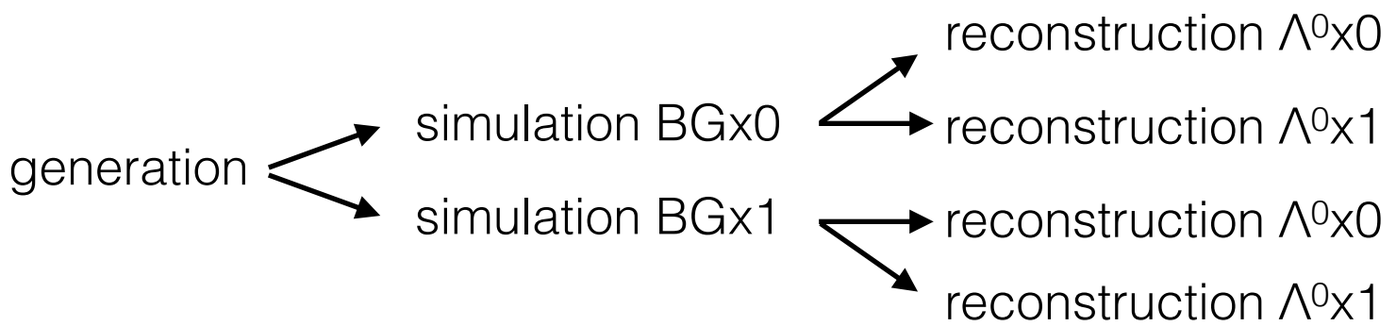
Λ^0 with V0Finder

Space/time consumption

☆ 10 files, 100 events each, generic e^+e^- → Y(4S), w/(o) bkg, w/(o) Λ^0, default cuts

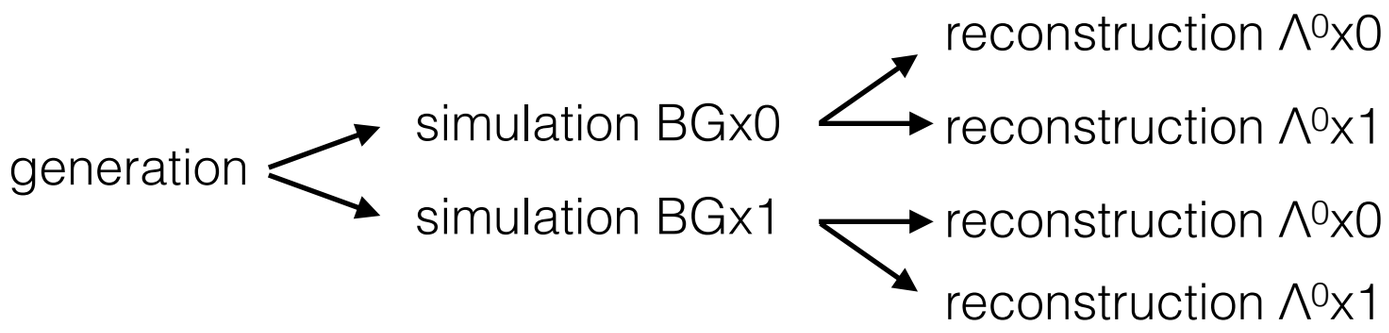


BKG x 0		
	Λ^0 x 0	Λ^0 x 1
RootFile size (M)	119	120
mdst size (M)	1.1	1.3
Time(ms)/call V0Finder module	127.05	266.27
Time(ms)/call total	2513.63	2582.40
#V0	373	4218

BKG x 1		
	Λ^0 x 0	Λ^0 x 1
RootFile size (G)	3.1	3.1
mdst size (G)	1.7	1.8
Time(ms)/call V0Finder module	132.38	298.81
Time(ms)/call total	4762.32	4994.72
#V0	488	3543

Space/time consumption

☆ 10 files, 100 events each, generic e^+e^- → Y(4S), w/(o) bkg, w/(o) Λ^0, default cuts



	BKG x 0		BKG x 1		
	Λ^0 x 0	Λ^0 x 1		Λ^0 x 0	Λ^0 x 1
RootFile size (M)					
mdst size (M)					
Time(ms)/call V0Finder module					
Time(ms)/call total					
#V0	373	4218	#V0	488	3543

~1 Ks per Y(4S) event

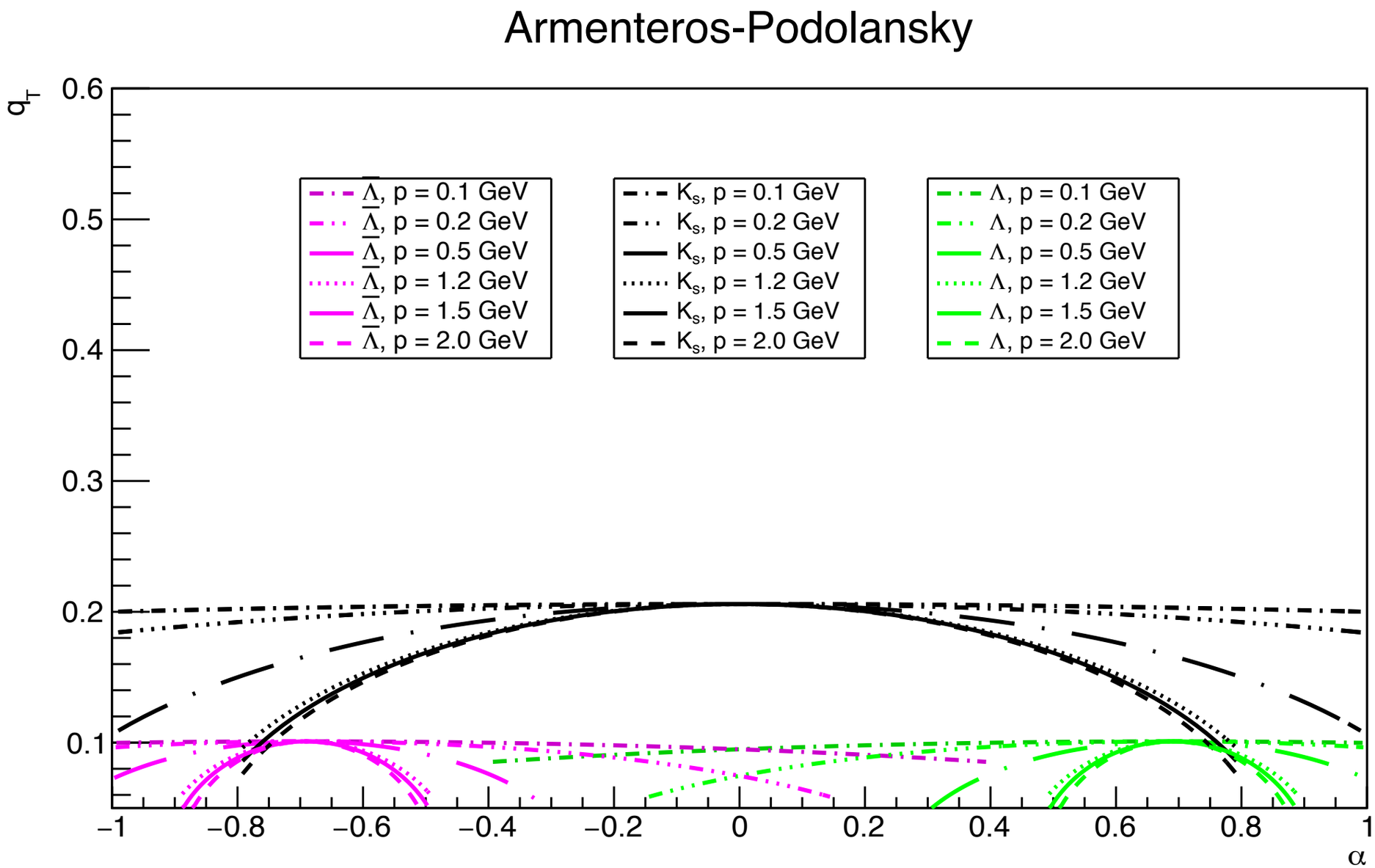
~ 0.02 Λ^0 per Y(4S) event

Armenteros-Podolanski plot

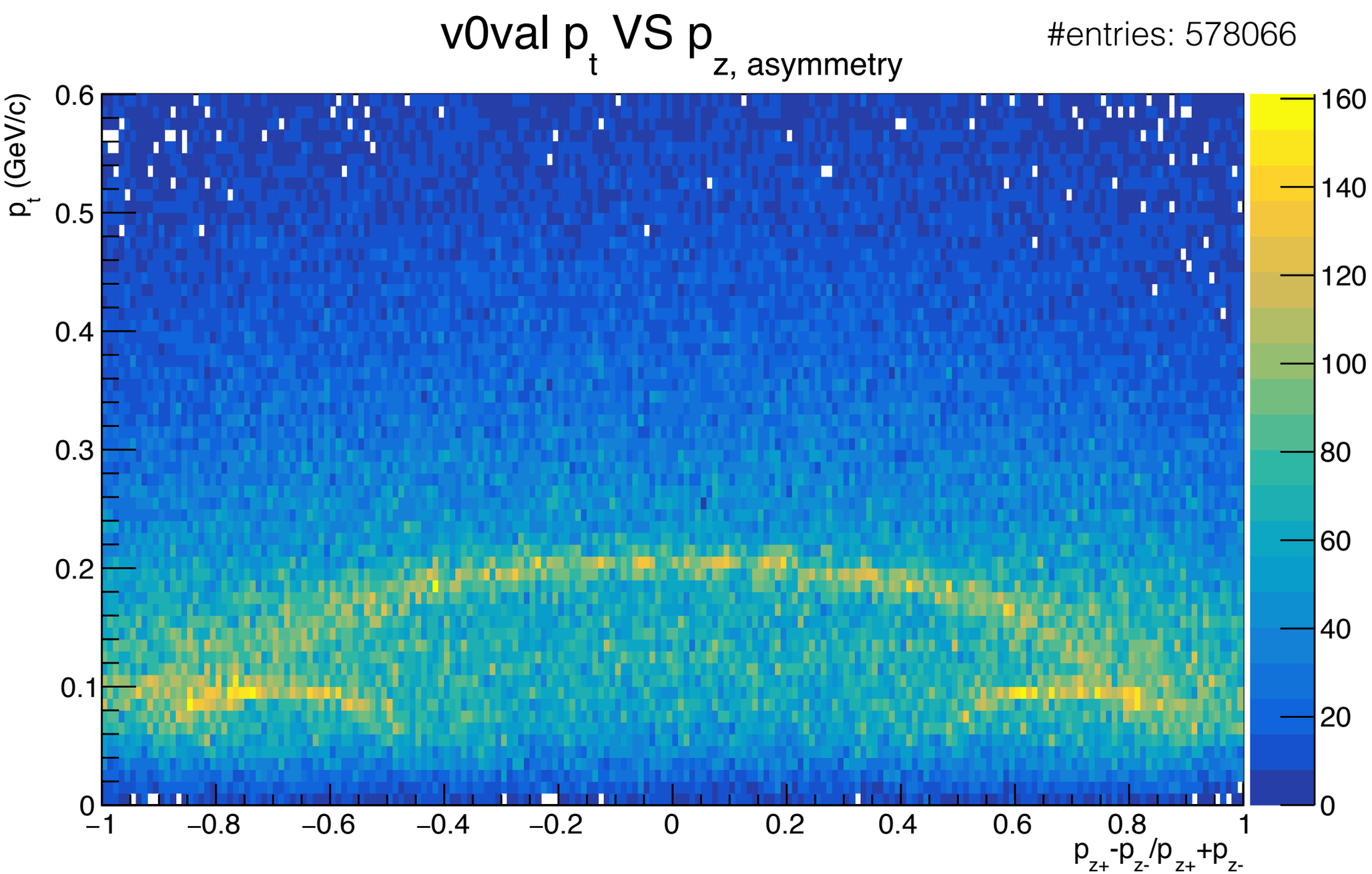
- ⭐ 10000 events, generic e^+e^- → Υ(4S) with at least 1 Λ^0, no bkg, no cuts (switched off the default ones)

- implemented some kinematic plots
- Armentero - Podolansky plot:
  - two dimensional plot
    - y-axis: transverse momentum of the oppositely charged decay products with respect to the mother
    - x-axis: longitudinal momentum asymmetry ($\alpha = p_{l^+} - p_{l^-} / p_{l^+} + p_{l^-}$)
- decay products of the Ks -> π π have the same mass and therefore their momenta are distributed symmetrically on average
- for Λ^0 -> p π the proton (antiproton) takes on average a larger part of the momentum and as a result the distribution is asymmetric

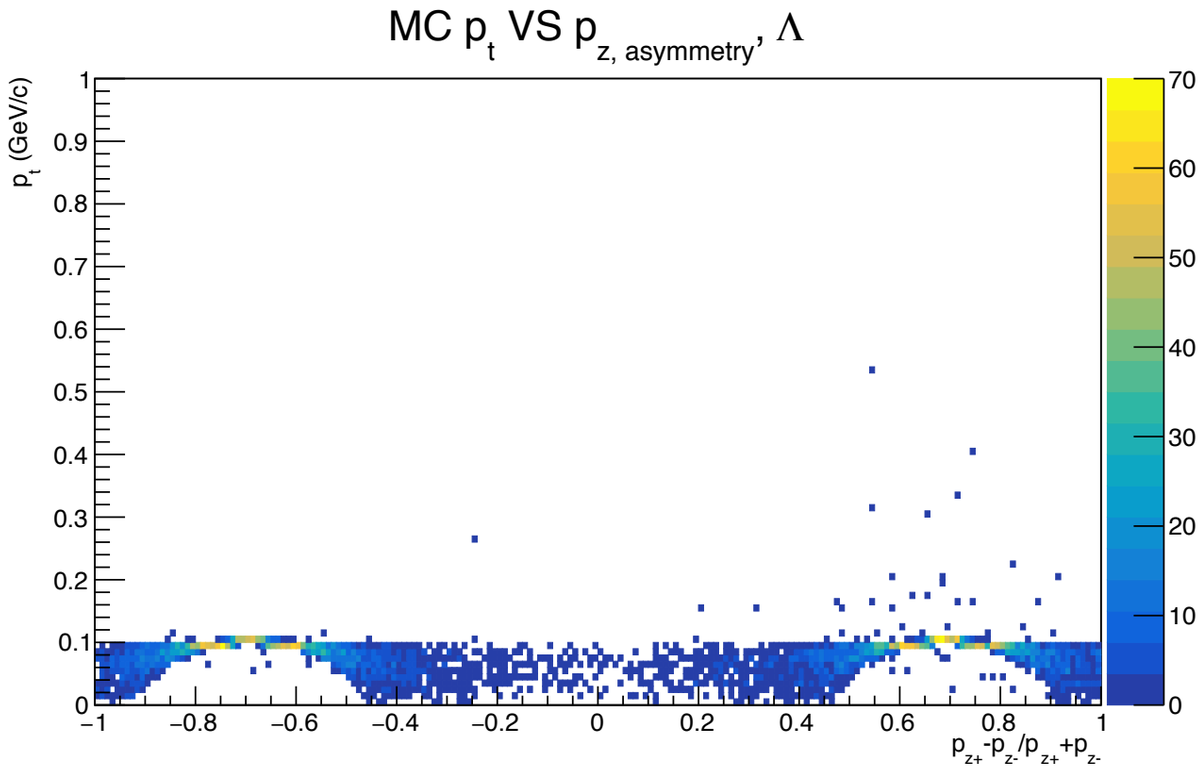
Armenteros-Podolanski plot



Armenteros-Podolanski plot

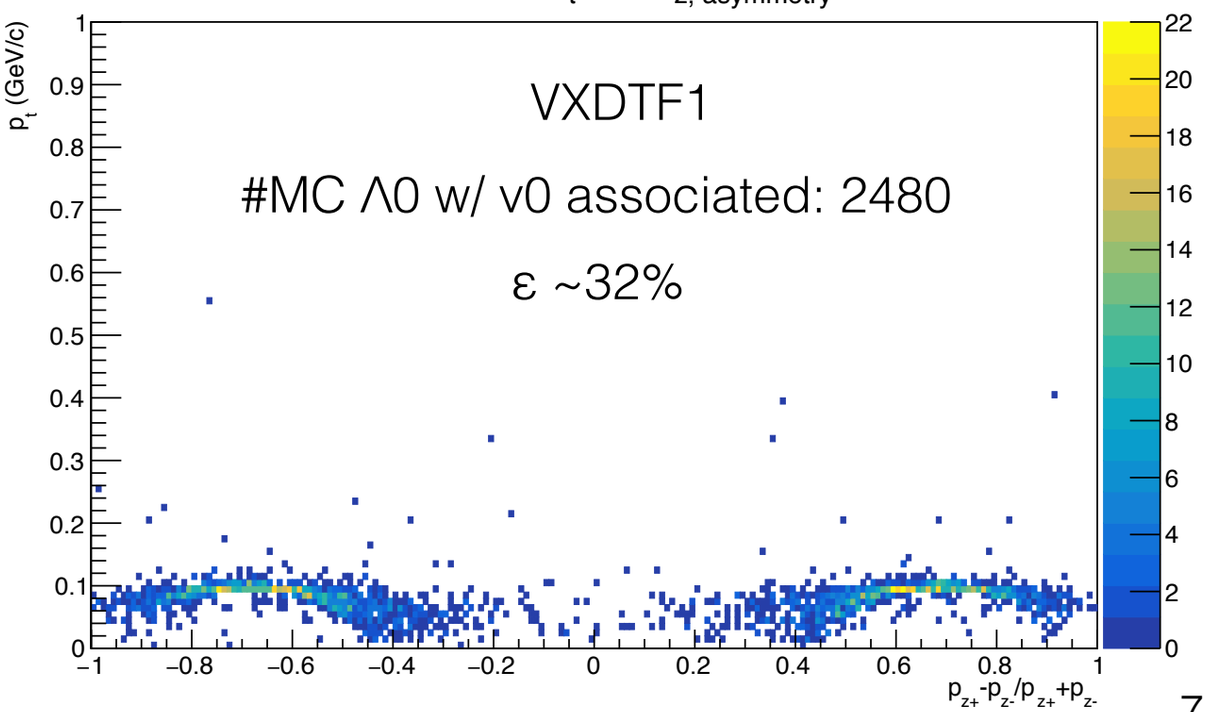


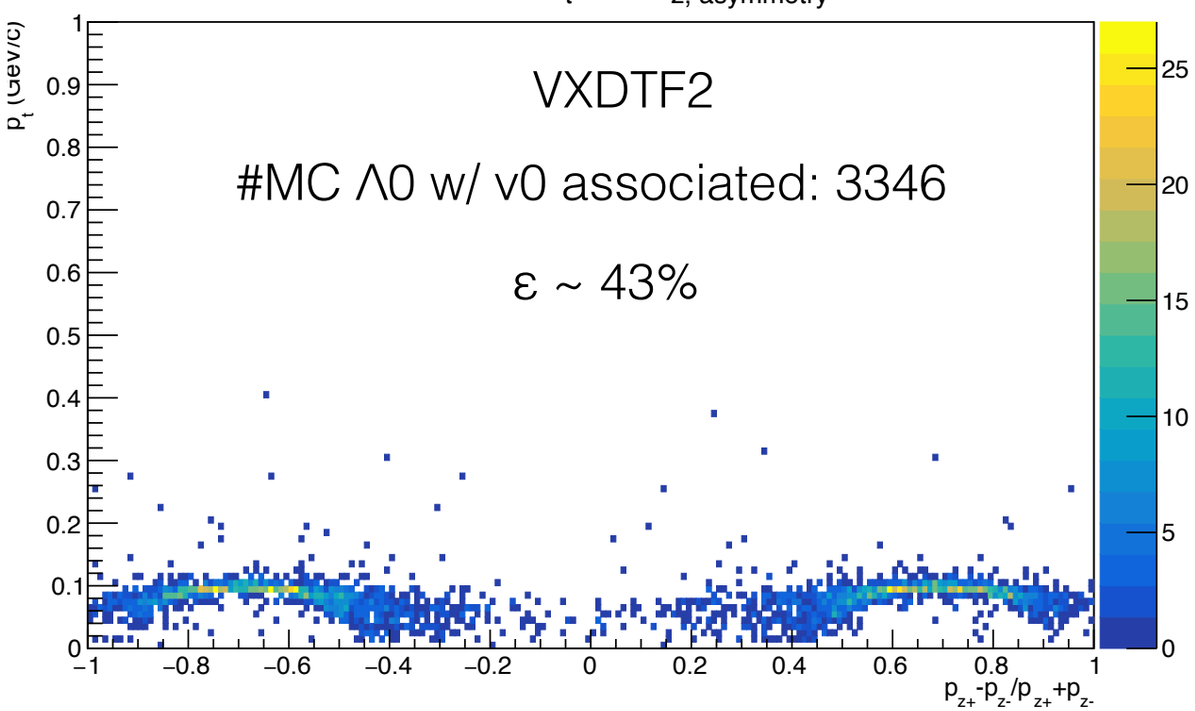
MonteCarlo Λ0



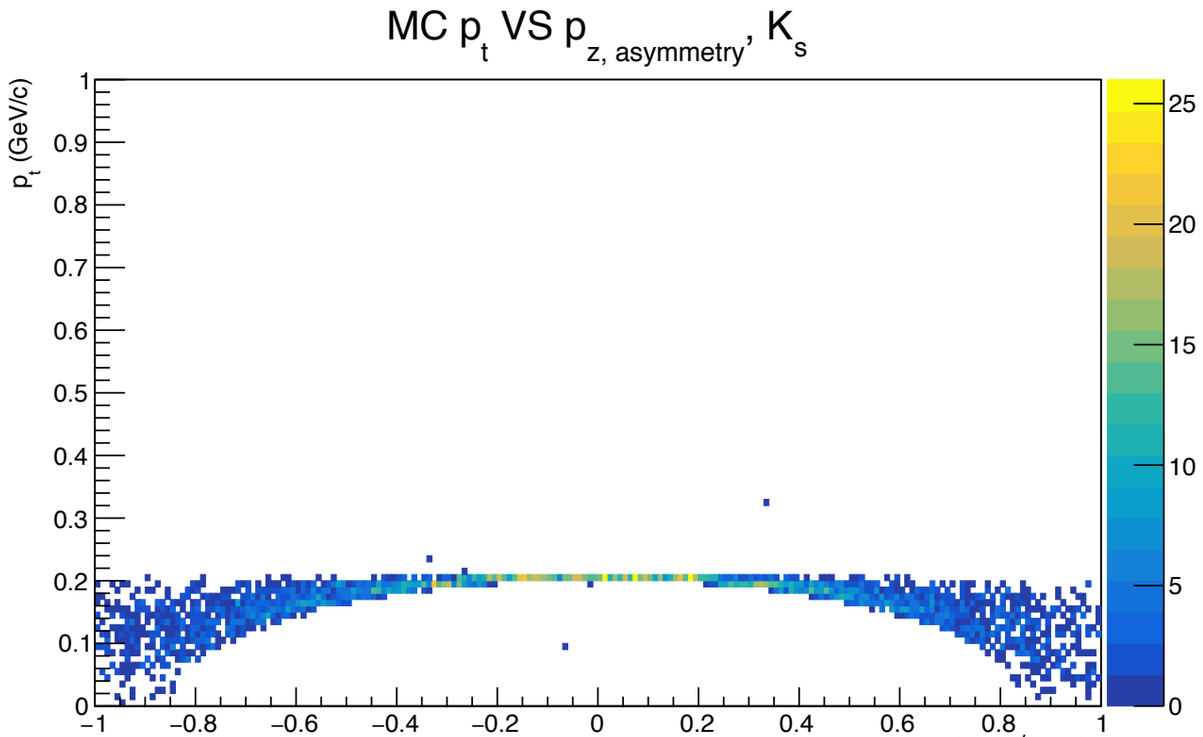
Λ0 → p π

#MC Λ0: 7759



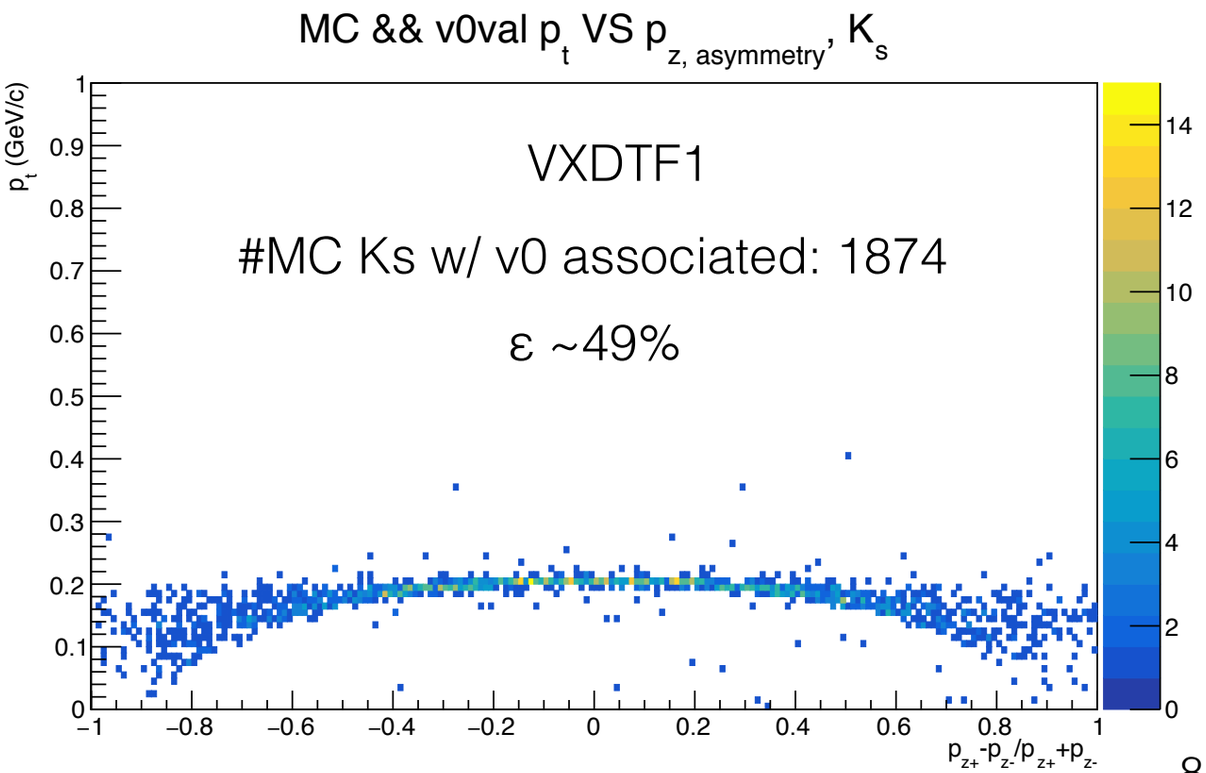


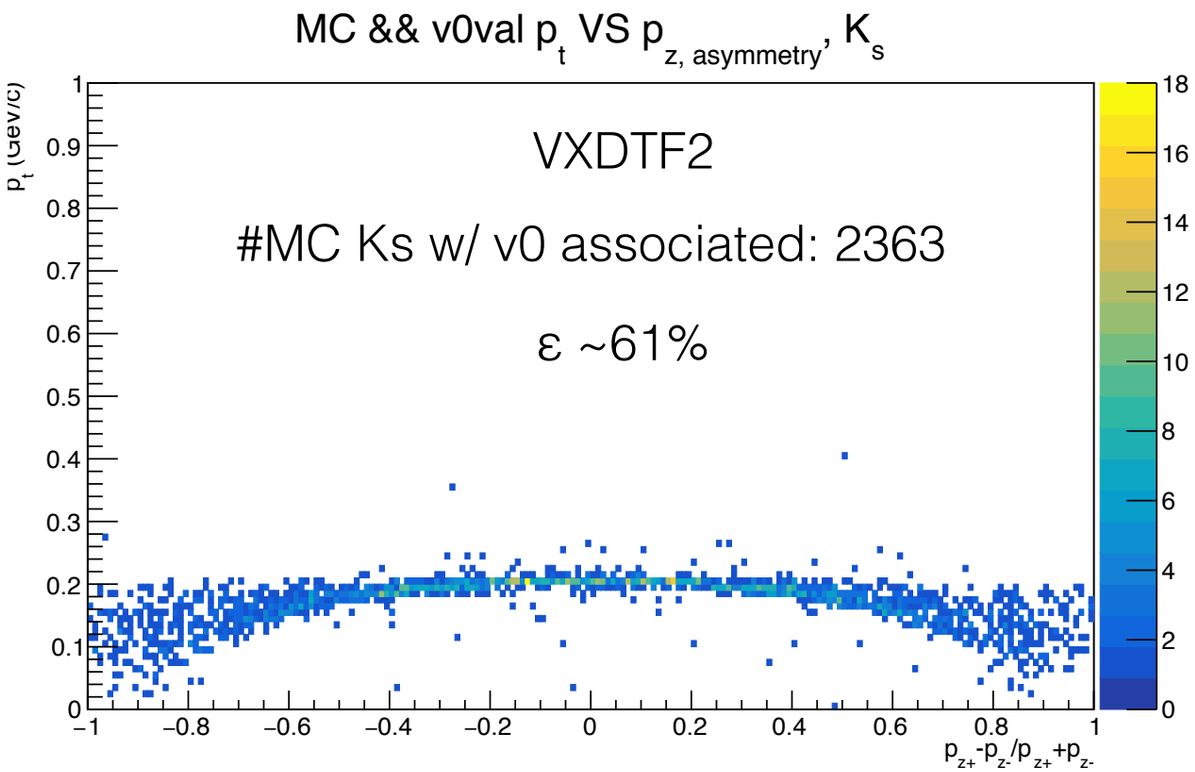
MonteCarlo Ks



Ks → π+ π-

#MC Ks: 3851

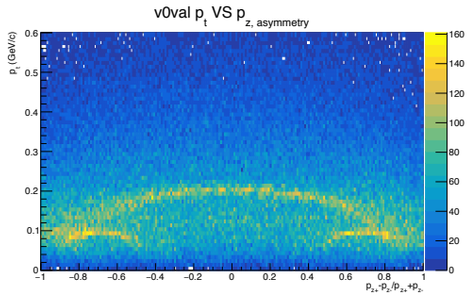




V0Validation, massWindow

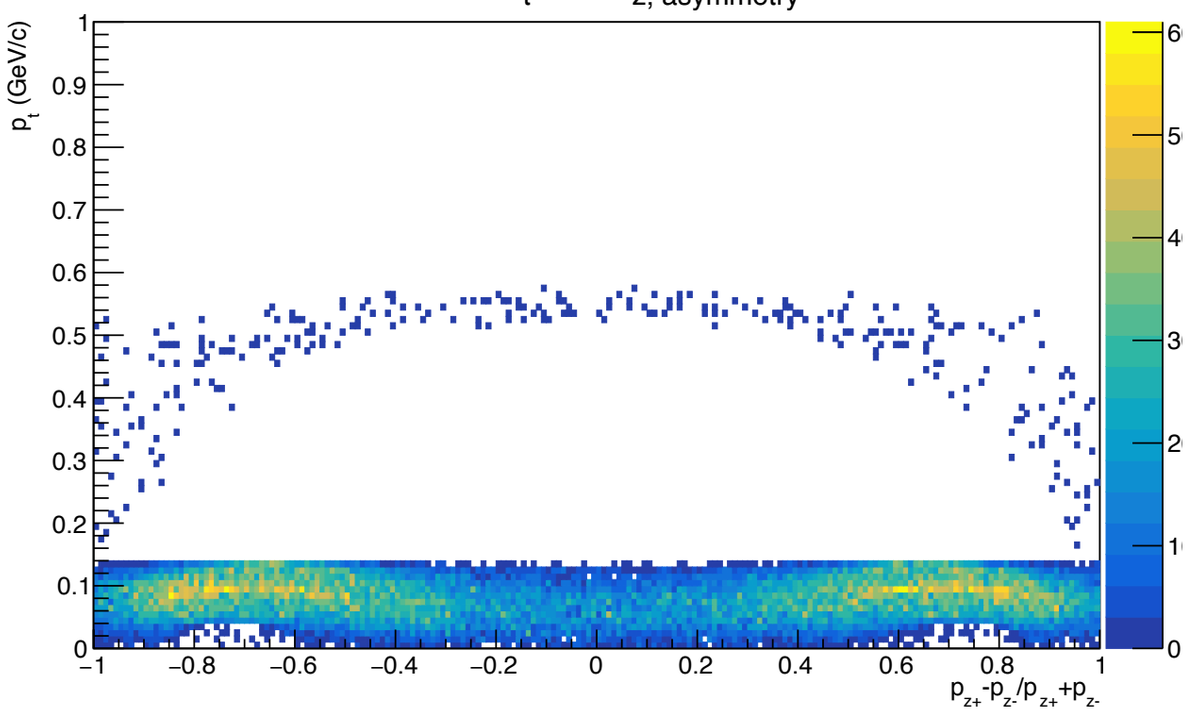
1.086 GeV < mV0 < 1.146 GeV

(= $m_{\Lambda 0}$ ± 30MeV)



0.468 GeV < m_{V0} < 0.582 GeV

(= m_{Ks} ± 30MeV)



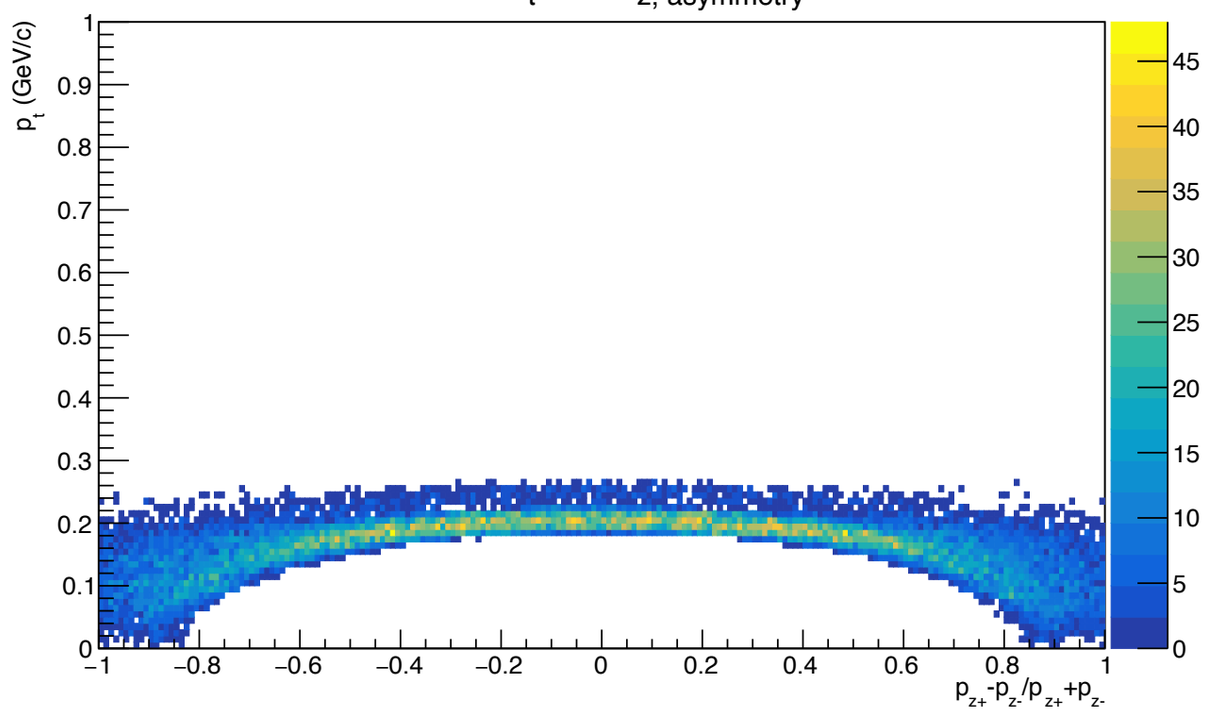
#entries VXDTF1: 56424

(#entries VXDTF2: 71334)

#MC Λ0 w/ v0 associated: 2480

(#MC Λ0 w/ v0 associated: 3346)

#MC Λ0: 7759



#entries VXDTF1: 27686

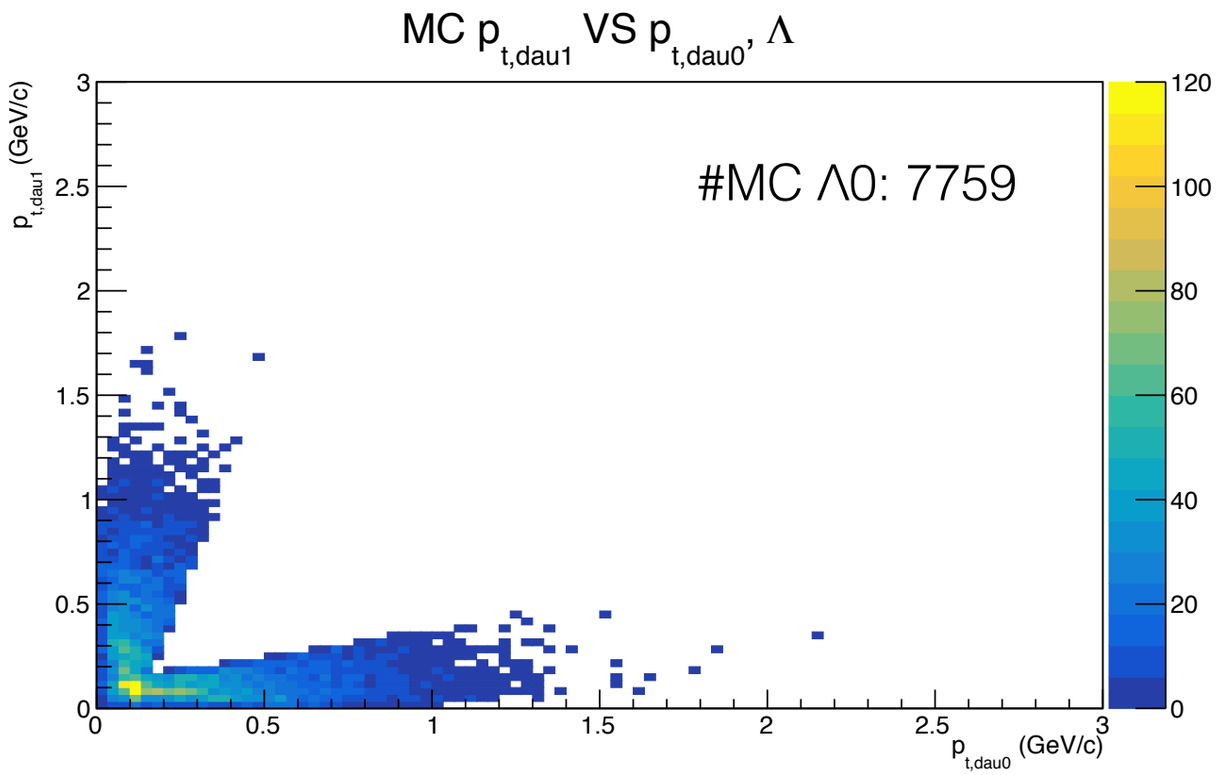
(#entries VXDTF2: 32191)

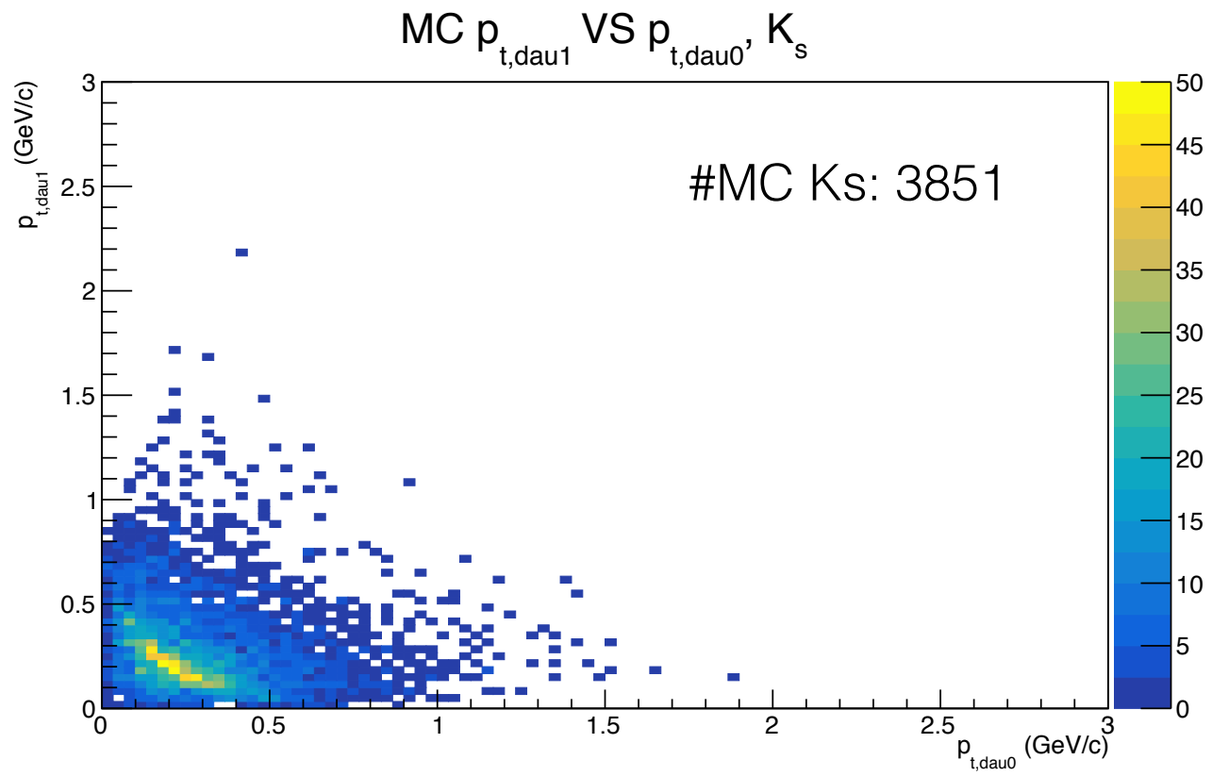
#MC Ks w/ v0 associated: 1874

(#MC Ks w/ v0 associated: 2363)

#MC Ks: 3851

MonteCarlo, $p_{t,dau1}$ VS $p_{t,dau0}$



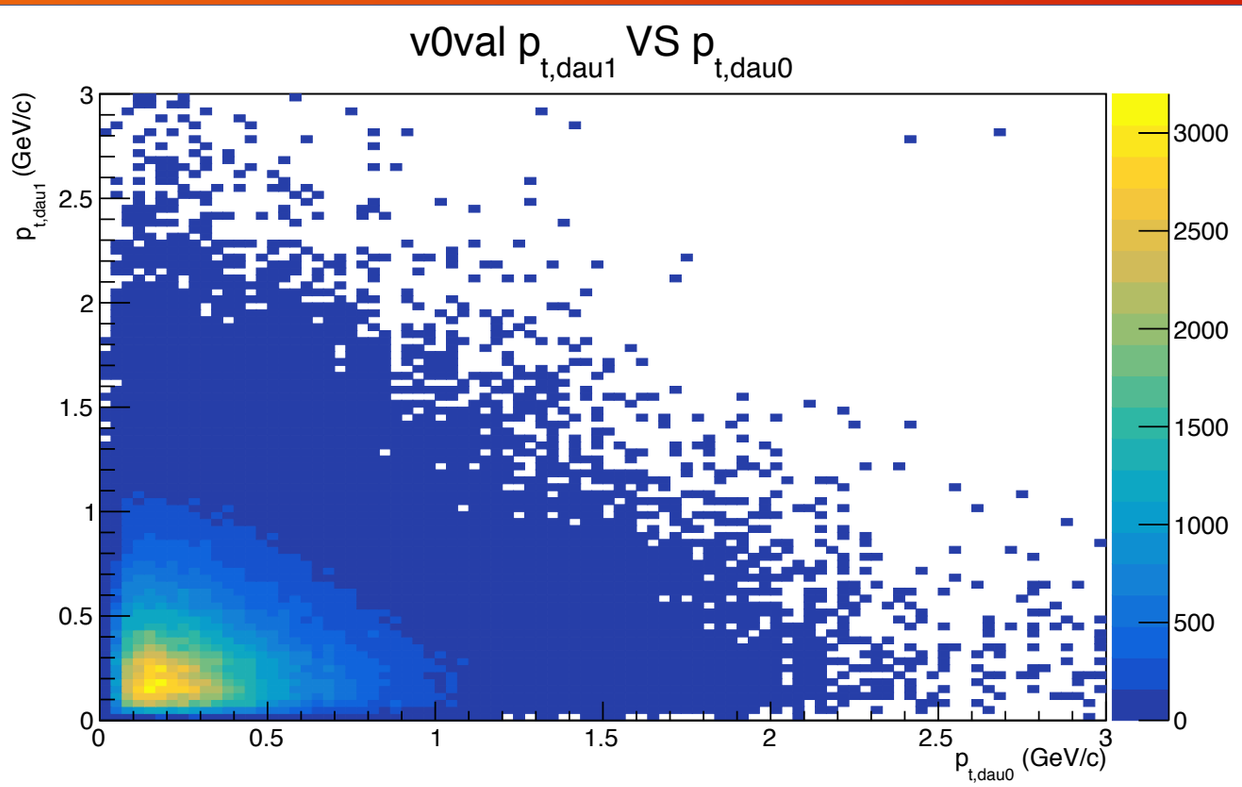


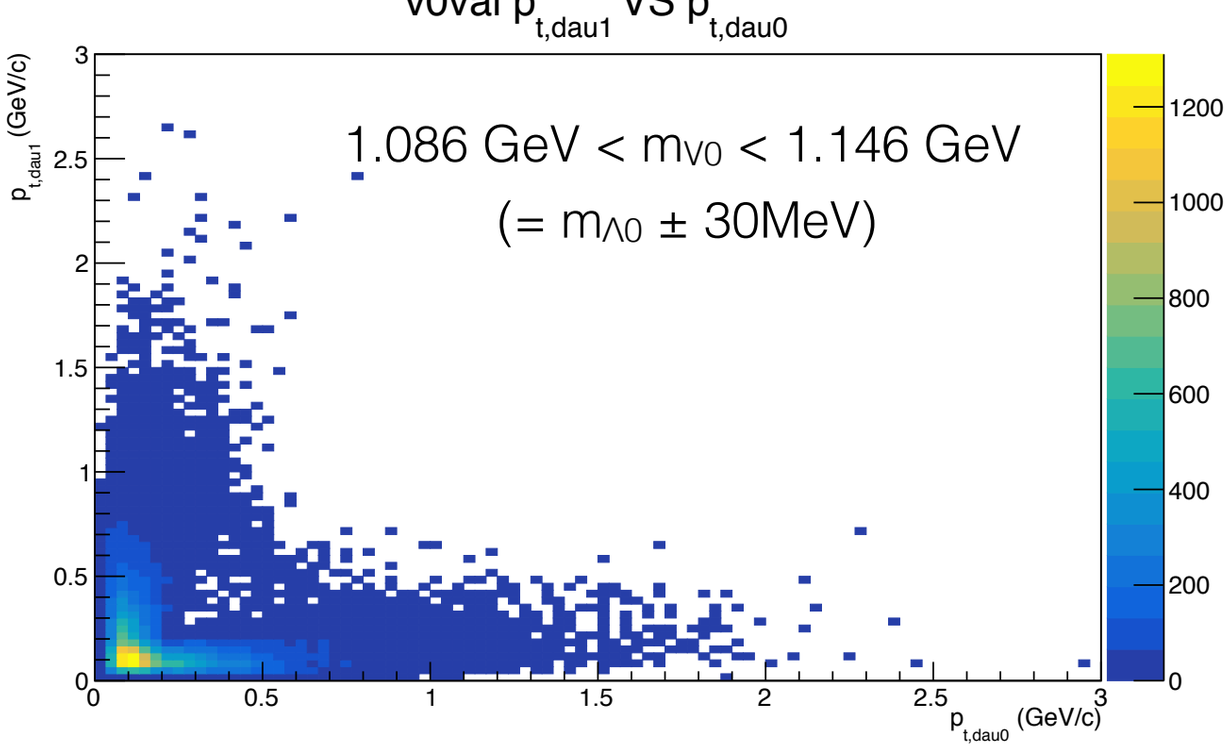
Λ0 → p π

Ks → π+ π-

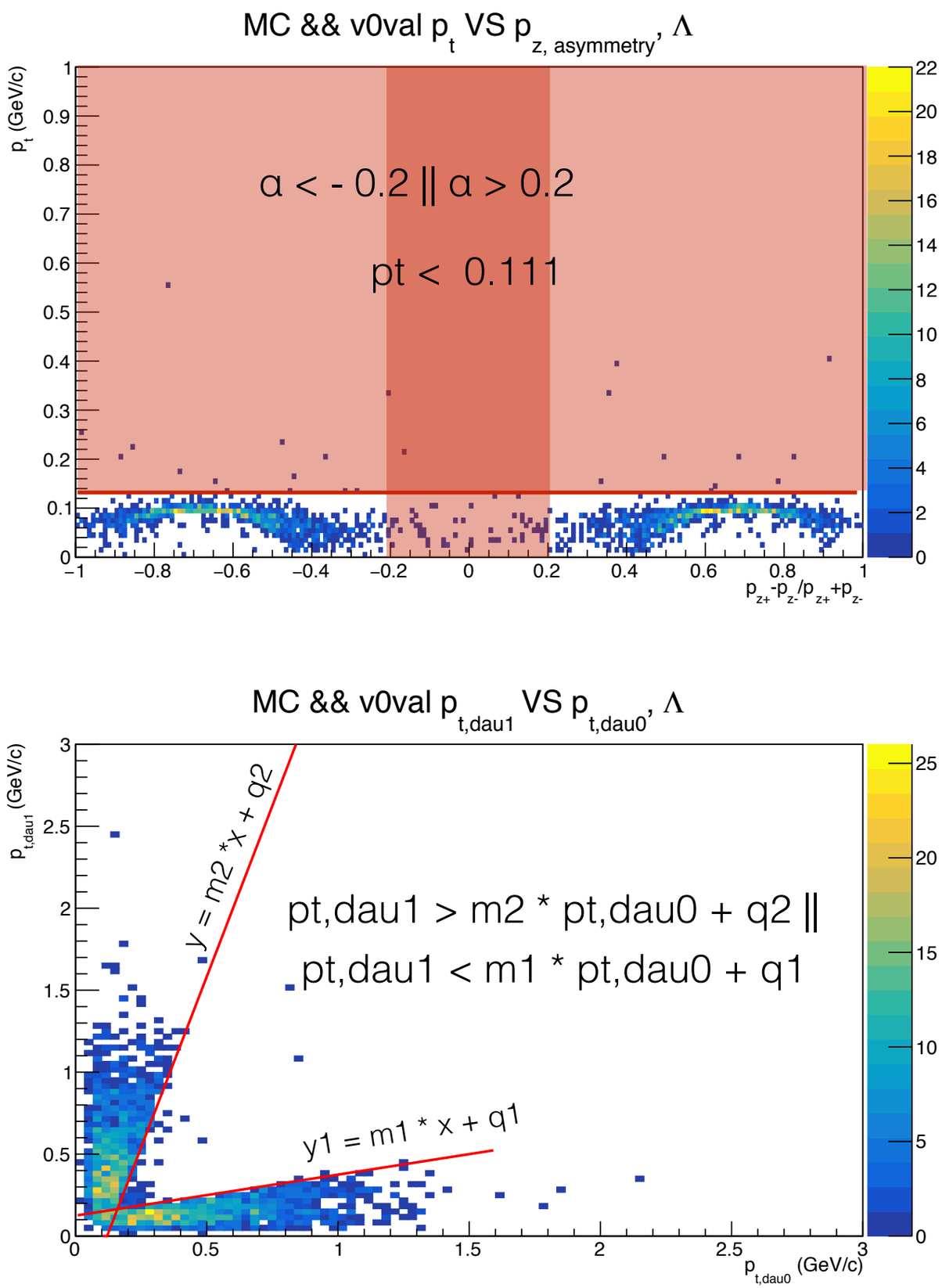
by definition of V0objects: dau0 charge = +1, dau1 charge = -1

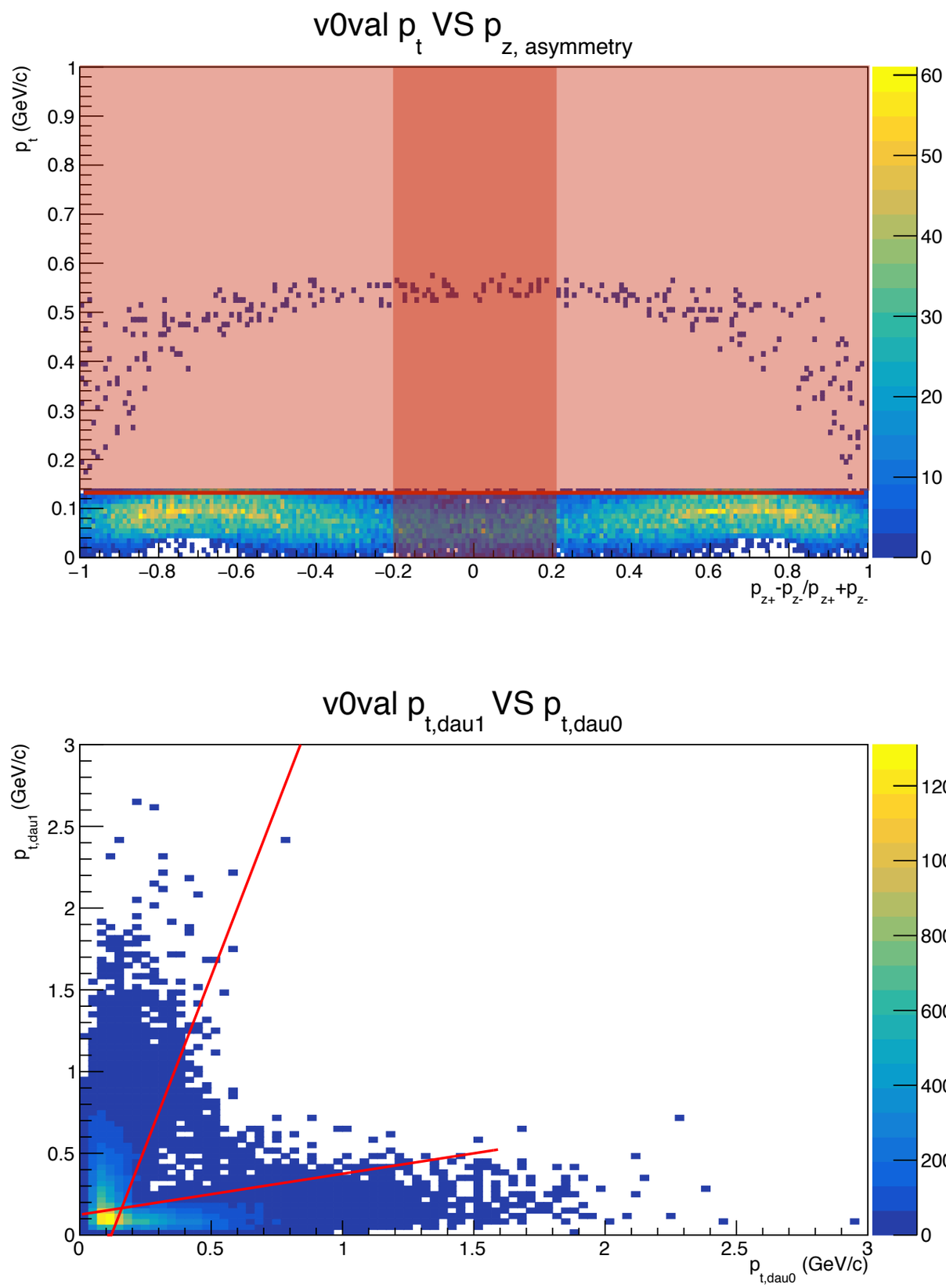
V0Validation, $p_{t,dau1}$ VS $p_{t,dau0}$





Cuts


MC && v0val p_t VS p_z, asymmetry, Λ
p_t (GeV/c)
α < - 0.2 || α > 0.2
pt < 0.111
p_z+ -p_z- /p_z+ +p_z-


v0val p_t VS p_z, asymmetry
p_t (GeV/c)
p_z+ -p_z- /p_z+ +p_z-

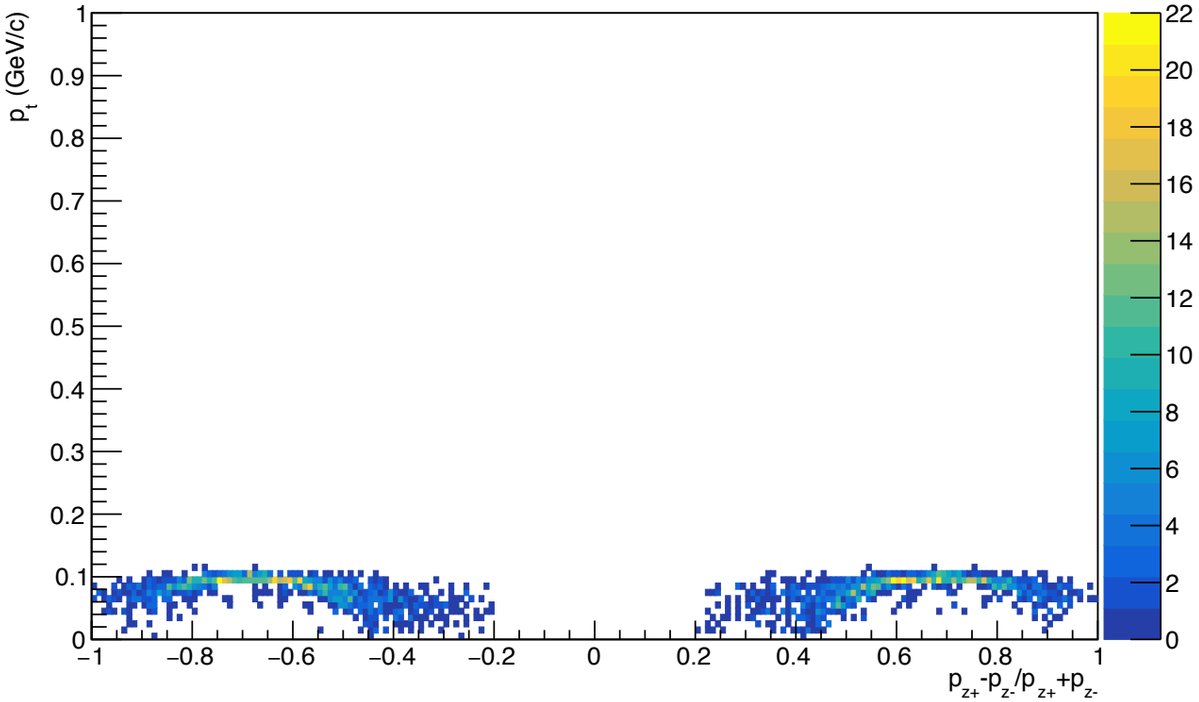
MC && v0val p_t,dau1 VS p_t,dau0, Λ
p_t,dau1 (GeV/c)
y = m2 * x + q2
y1 = m1 * x + q1
pt,dau1 > m2 * pt,dau0 + q2 ||
pt,dau1 < m1 * pt,dau0 + q1
p_t,dau0 (GeV/c)

v0val p_t,dau1 VS p_t,dau0
p_t,dau1 (GeV/c)
p_t,dau0 (GeV/c)

Cuts

Λ0 → p π

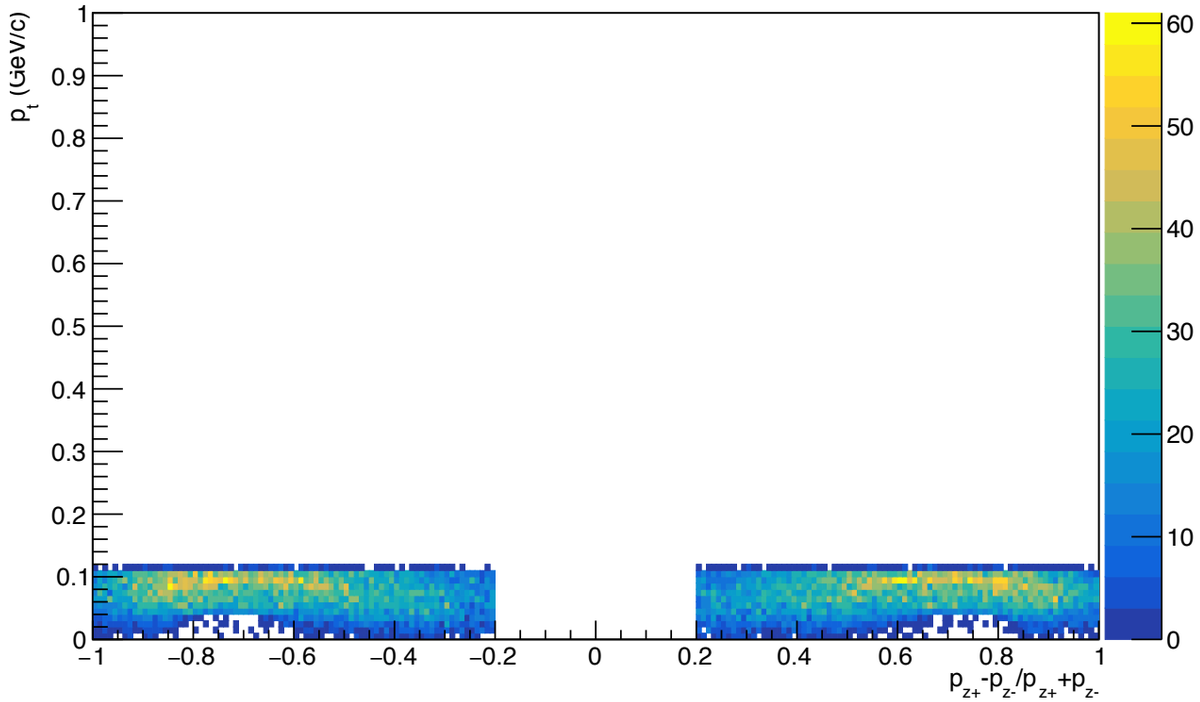
MC Λ0 after cuts



#entries: 2412

(#MC L0 w/ v0 associated: 2480)

V0objects after cuts



#entries: 39543

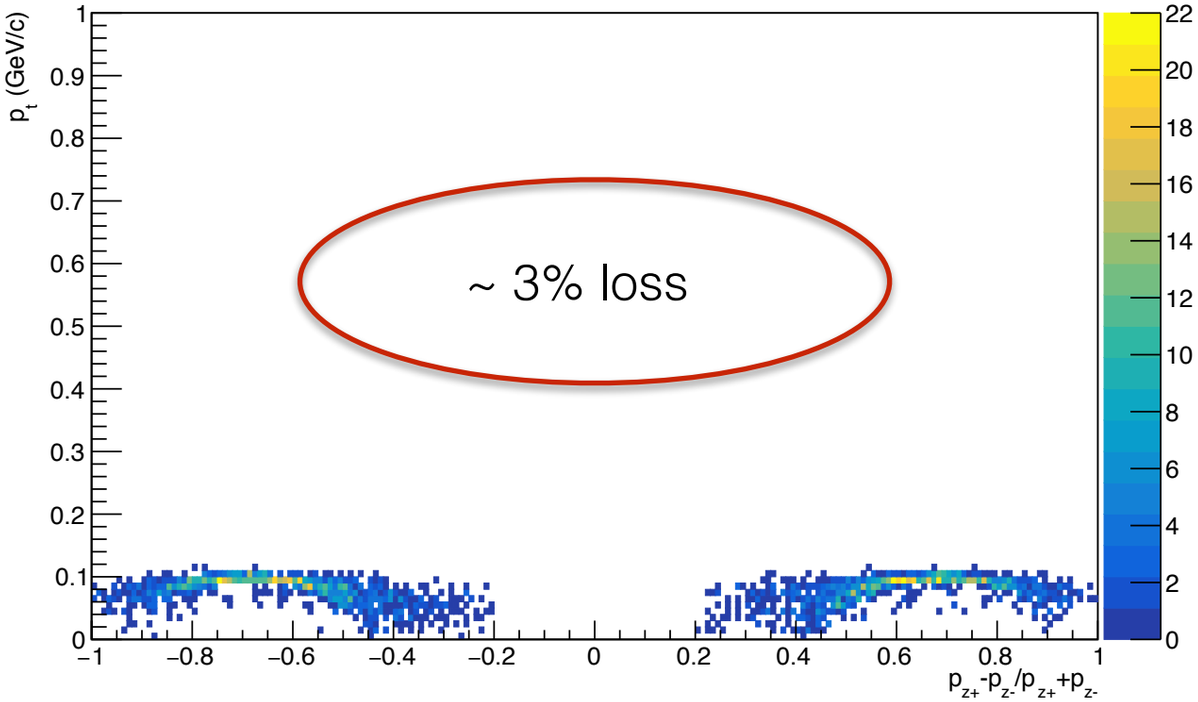
(#V0objects in L0 mass window: 56424)

(#V0objects: 578066)

Cuts

Λ0 → p π

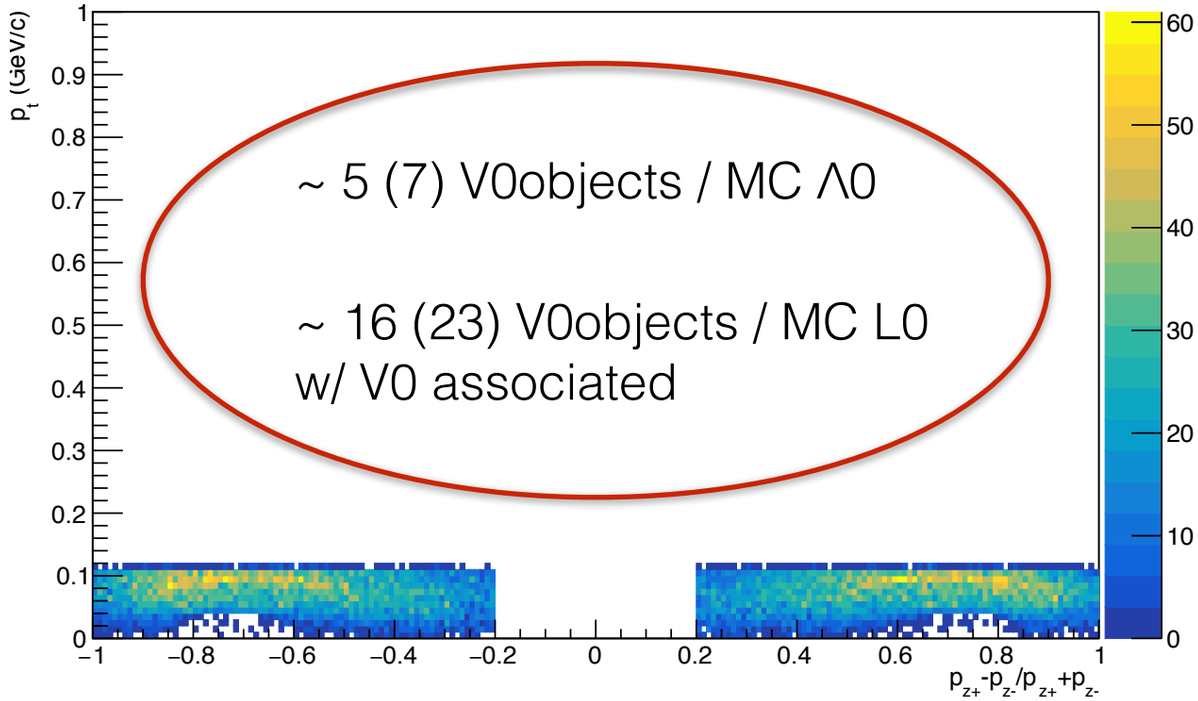
MC Λ0 after cuts



#entries: 2412

(#MC L0 w/ v0 associated: 2480)

V0objects after cuts



#entries: 39543

(#V0objects in L0 mass window: 56424)

(#V0objects: 578066)

Summary and short term plans

- module that produces some kinematics plots in the tracking package (in the branch), I can make it available eventually with the pull request if you think it could be useful

- appears necessary to apply a cut outside Λ0 mass window

- need to check if the other cuts presented are all independent
  - number of V0 objects sensitively reduced

- need a closer look to numbers using VXDTF2

- need to check the effects of bg

- need to try out the cuts on a generic sample $e^+e^- \rightarrow \Upsilon(4S)$ w/(o) bg, repeat the studies of space/time consuming