

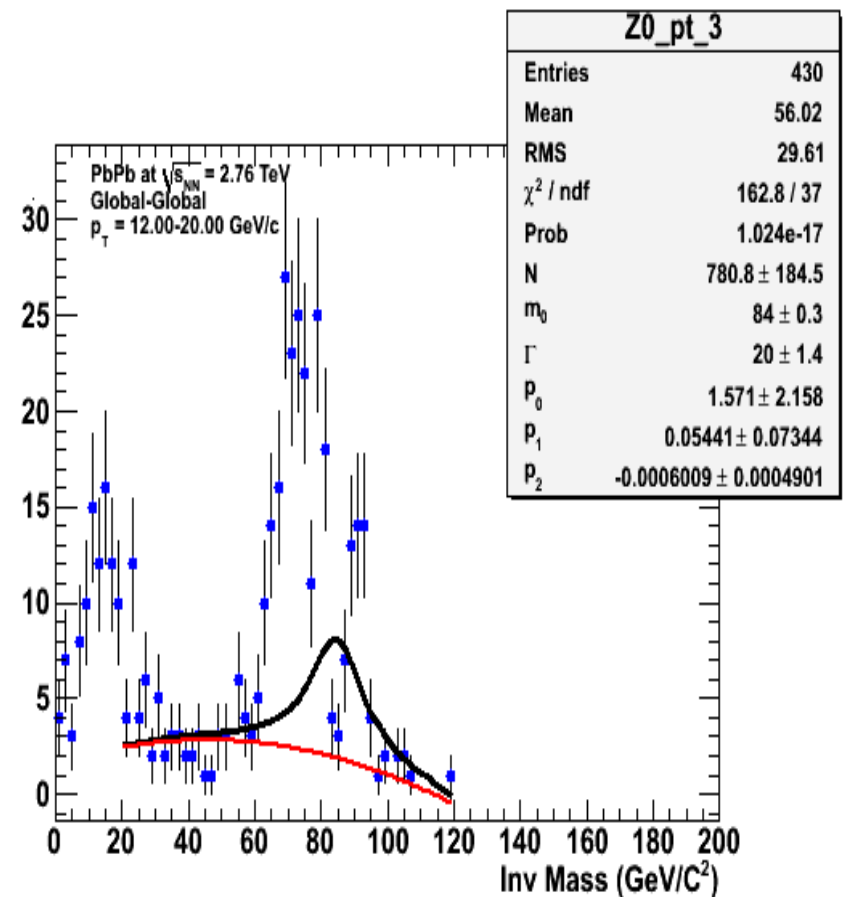
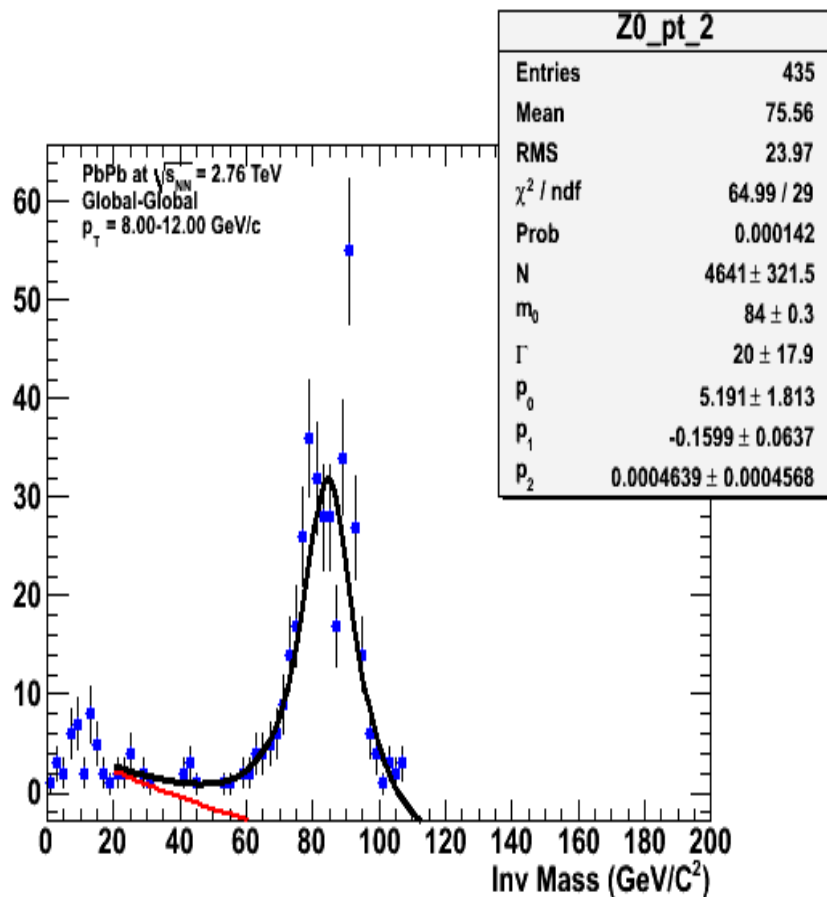
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The 'Twin Peaks'  
(mwwaahahahaha)

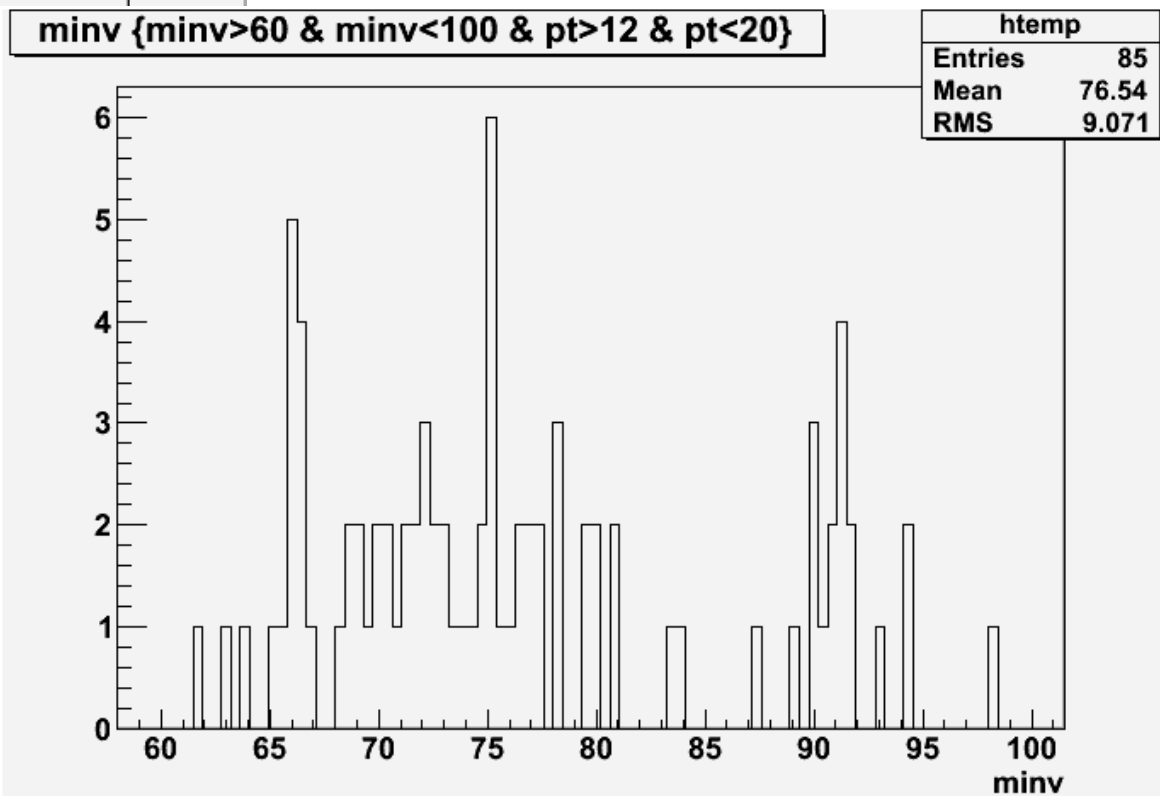
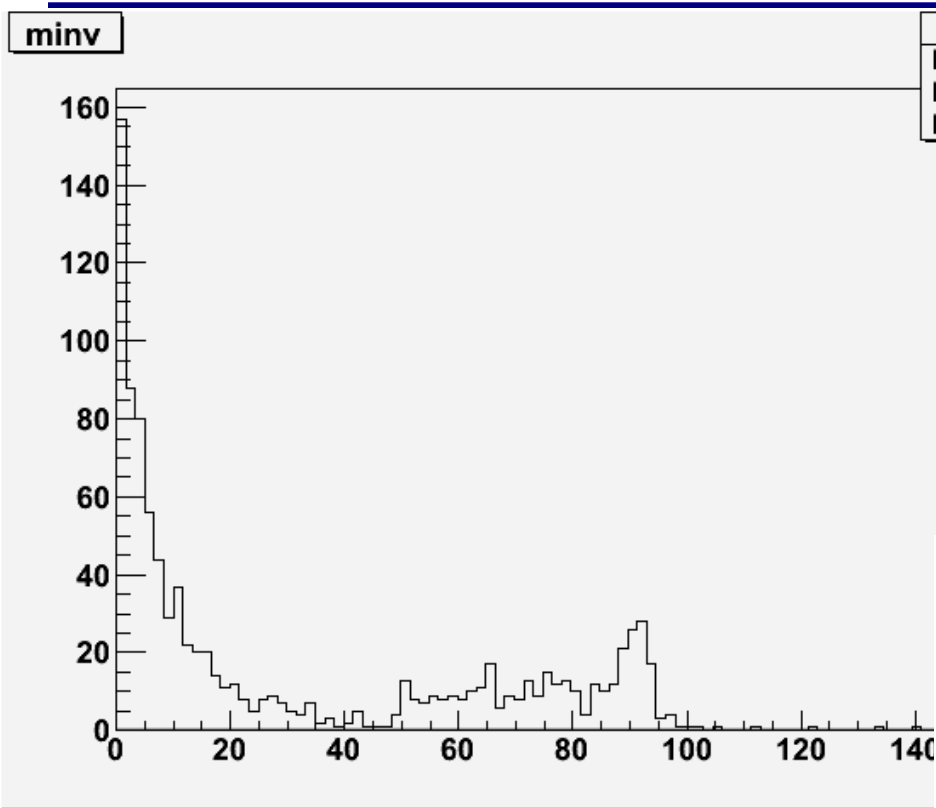
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# Problem:

<https://twiki.cern.ch/twiki/pub/Main/CommonAnalysisCodeForZ0/GlbGlb.png>

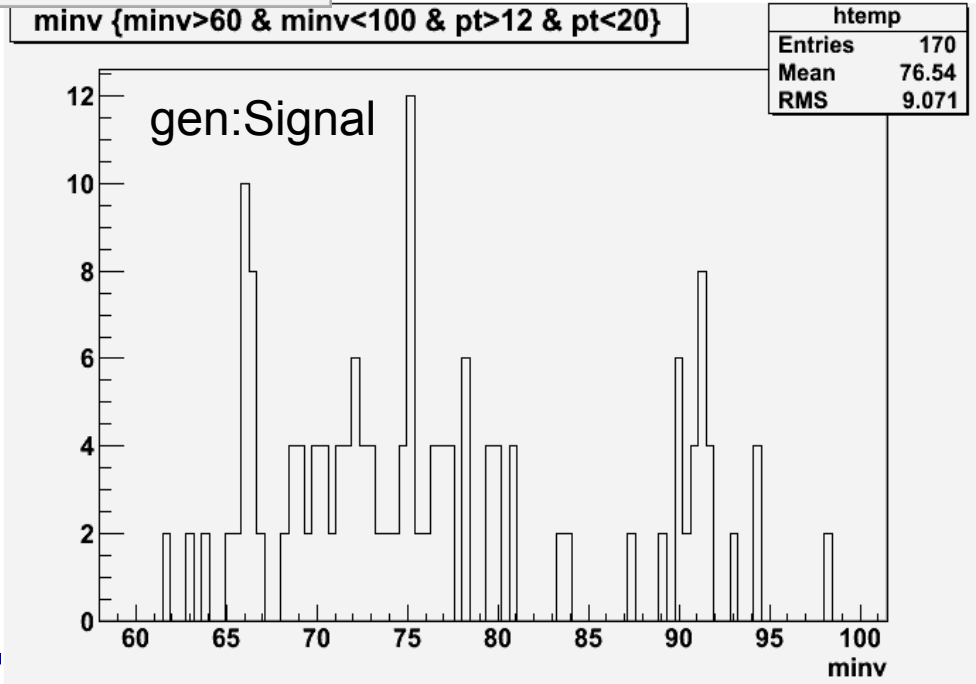
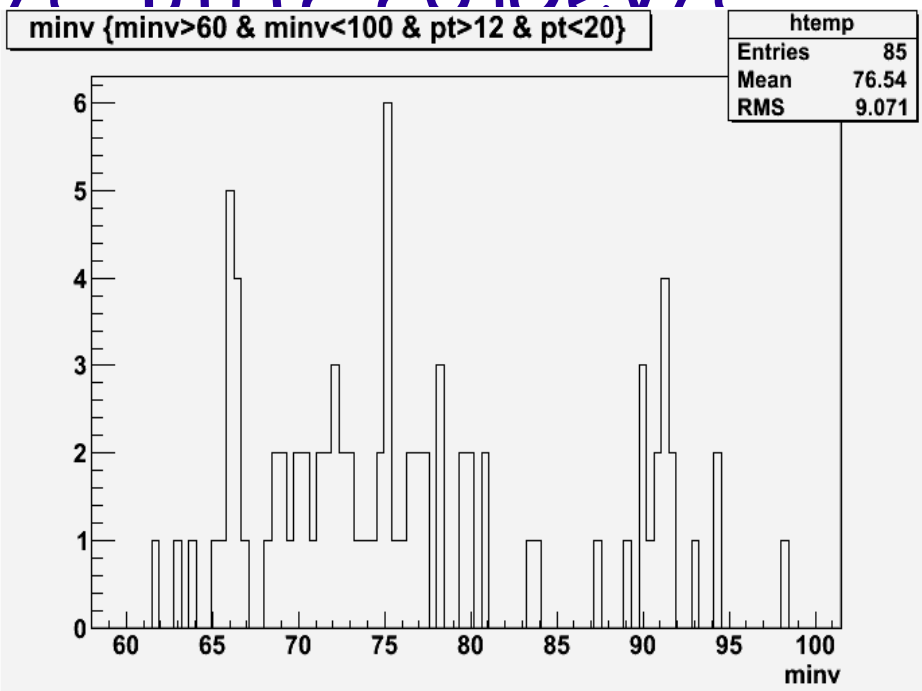


# simTracks (gen+GEANT): M[60,100], M[60,80]



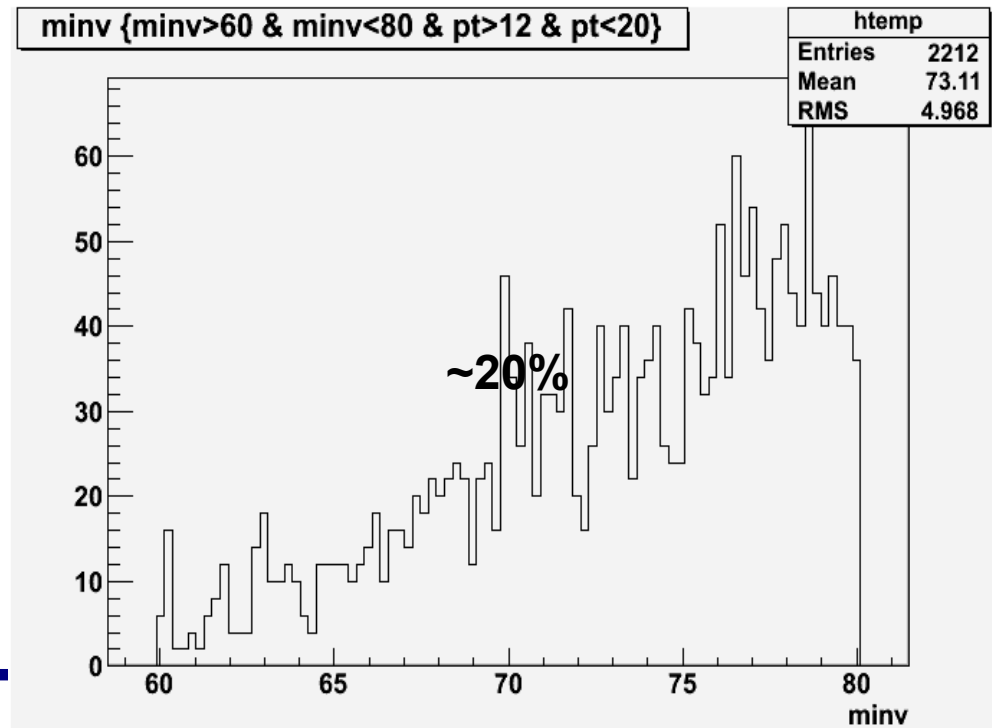
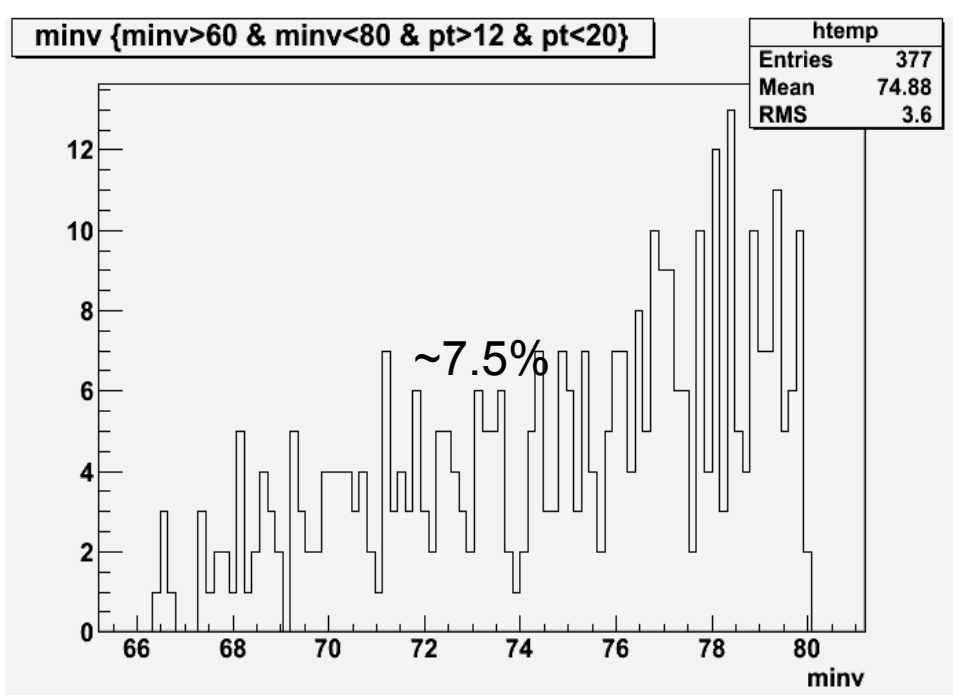
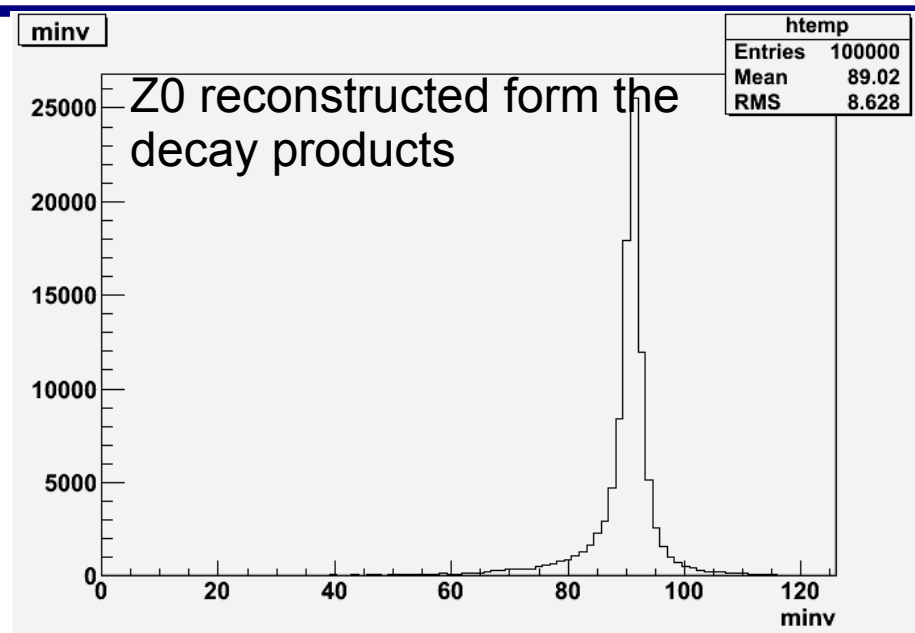
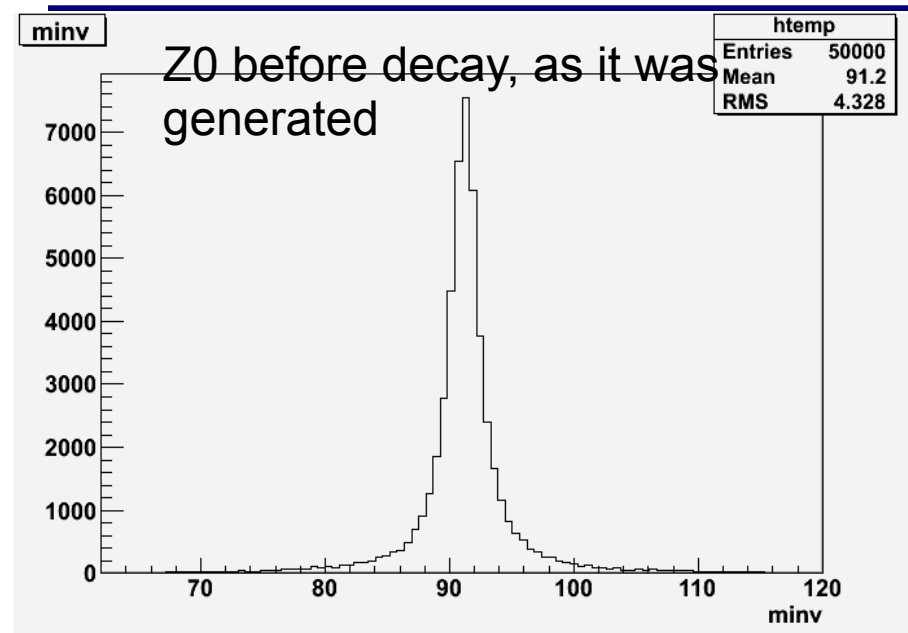
Gen: signal+background:

M[60,80]GeV/c nt[12,20]GeV/c



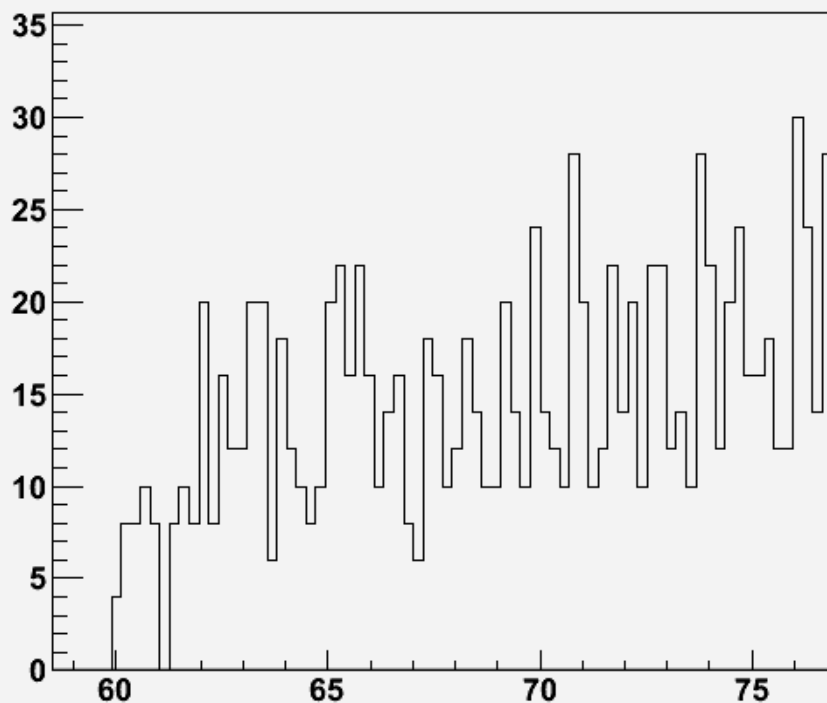
gen:Background

# PYTHIA gun: flat pT generation



# Feature or bug in PYTHIA?

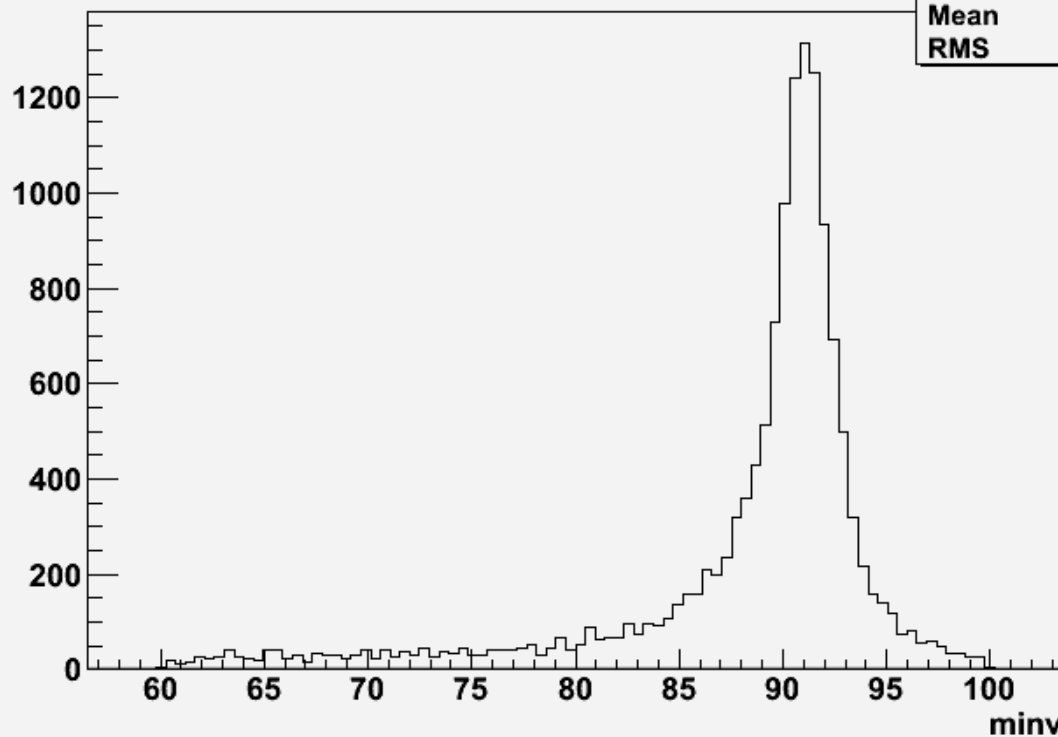
minv {minv>60 & minv<80 & pt>12 & pt<20}



htemp	
Entries	1388
Mean	71.36
RMS	5.661

Regular generated (pt[10,20],y[-2.4,2.4])  
PYTHIA Z0 events (50K events)

minv {minv>60 & minv<100 & pt>12 & pt<20}

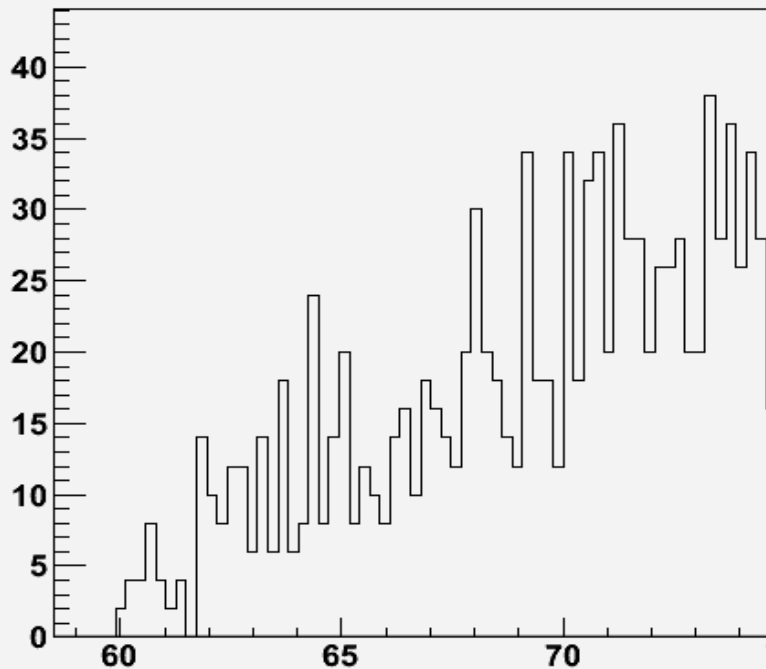


htemp	
Entries	13954
Mean	88.4
RMS	6.631

~10%

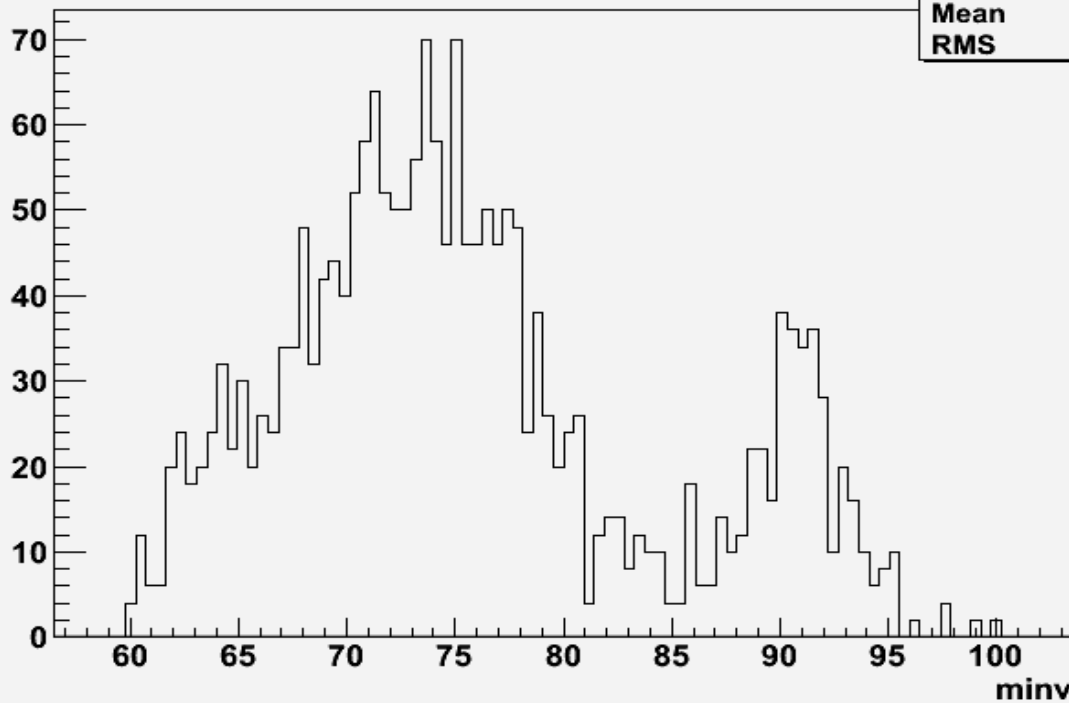
# PYTHIA gun: non flat Z- pT distribv(falling spectrum eff)

minv {minv>60 & minv<80 & pt>12 & pt<20}



htemp	
Entries	1582
Mean	71.58
RMS	4.789

minv {minv>60 & minv<100 & pt>12 & pt<20}

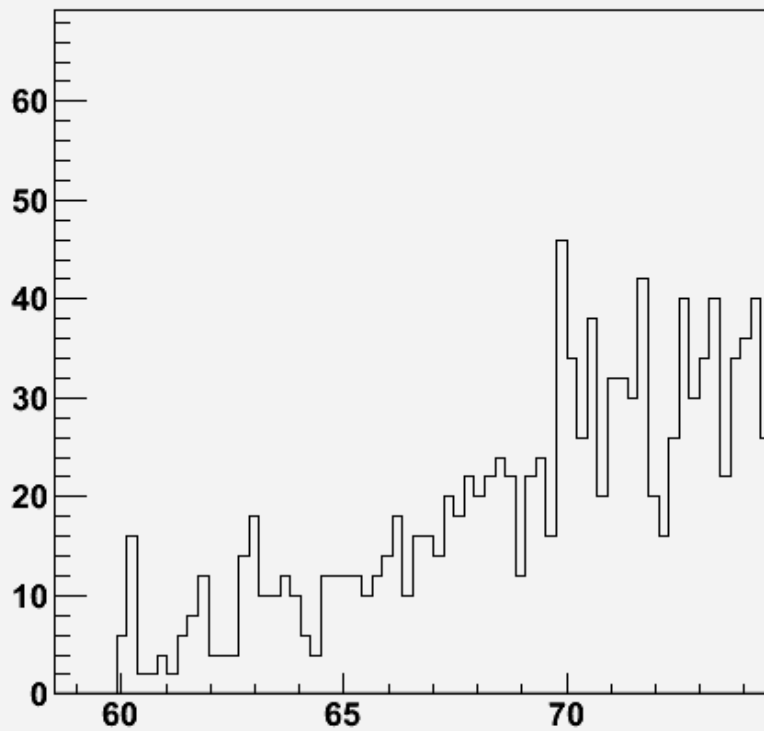


htemp	
Entries	2112
Mean	75.82
RMS	8.702

~75%

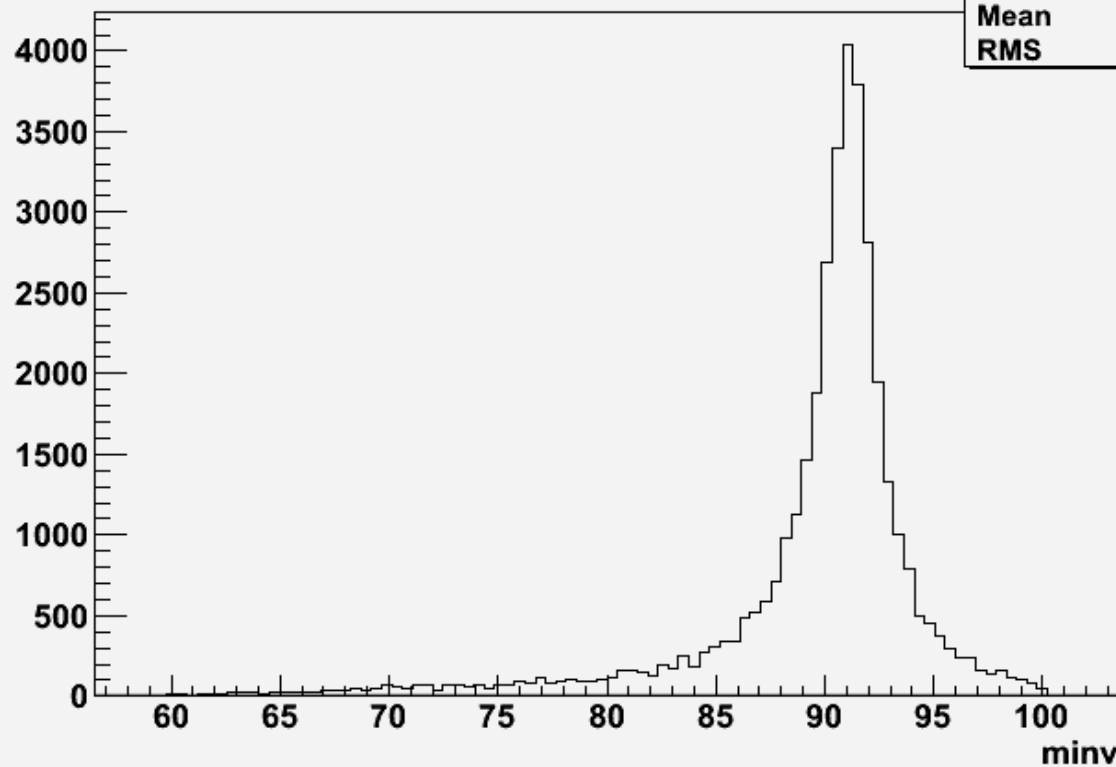
# PYTHIA gun: flat pt-Z0 distrib

minv {minv>60 & minv<80 & pt>12 & pt<20}



htemp	
Entries	2212
Mean	73.11
RMS	4.968

minv {minv>60 & minv<100 & pt>12 & pt<20}

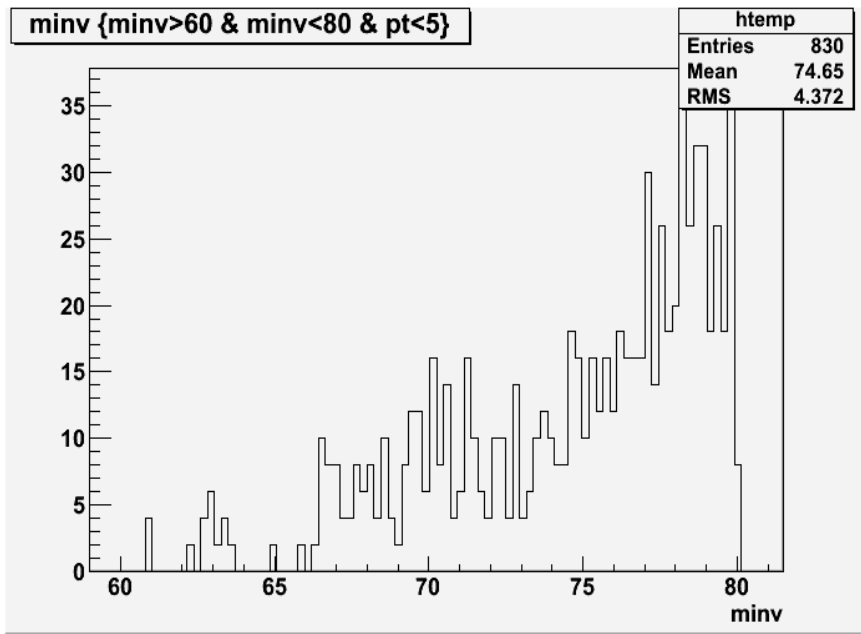


htemp	
Entries	37486
Mean	89.57
RMS	5.203

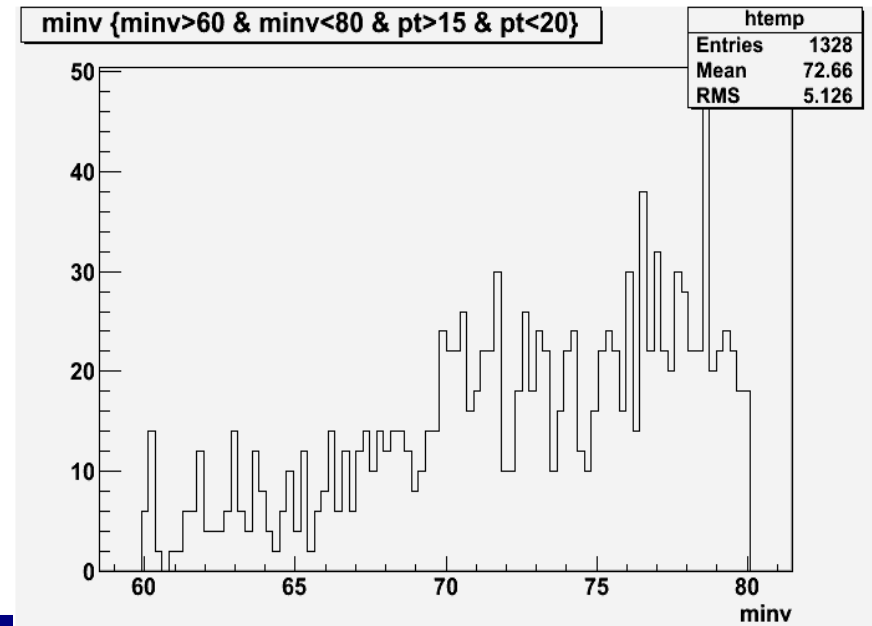
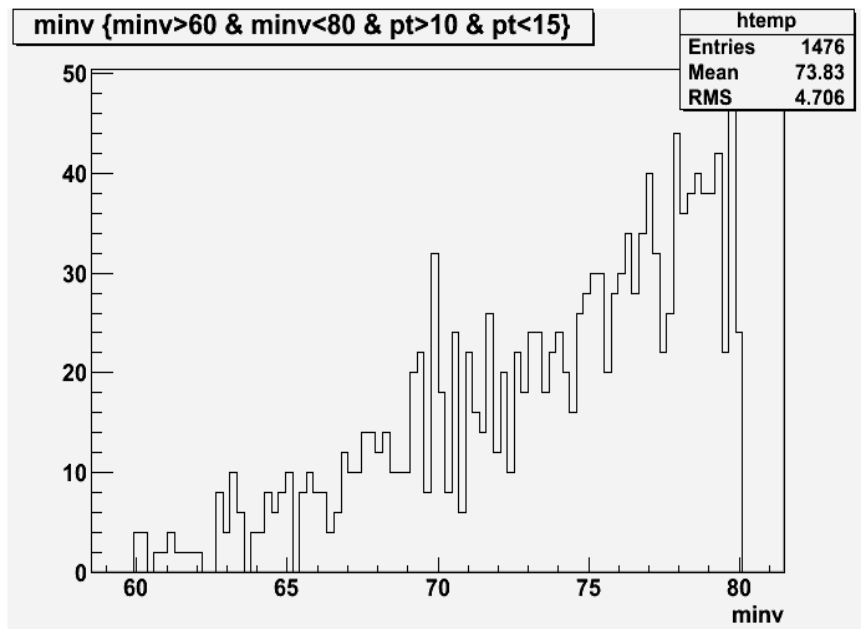
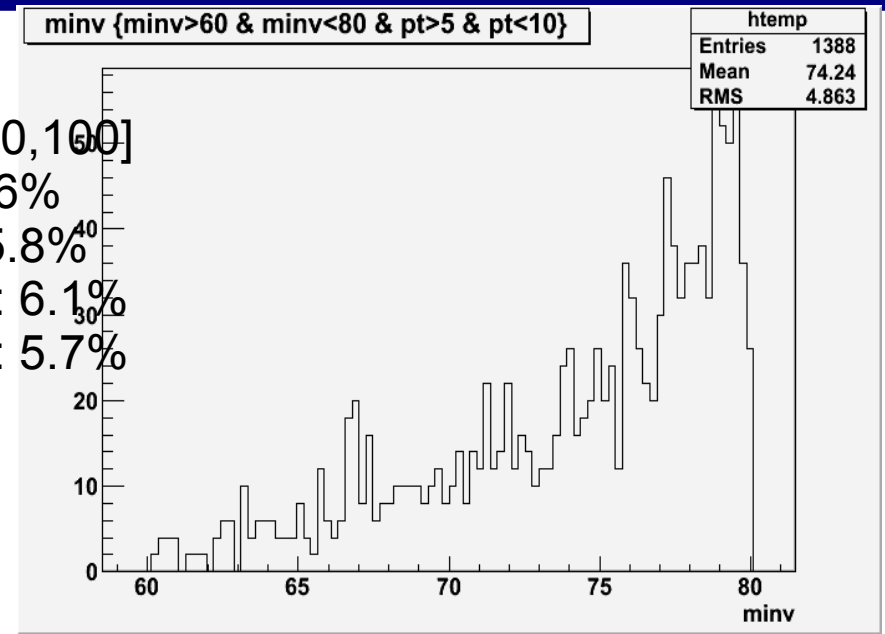
~6%



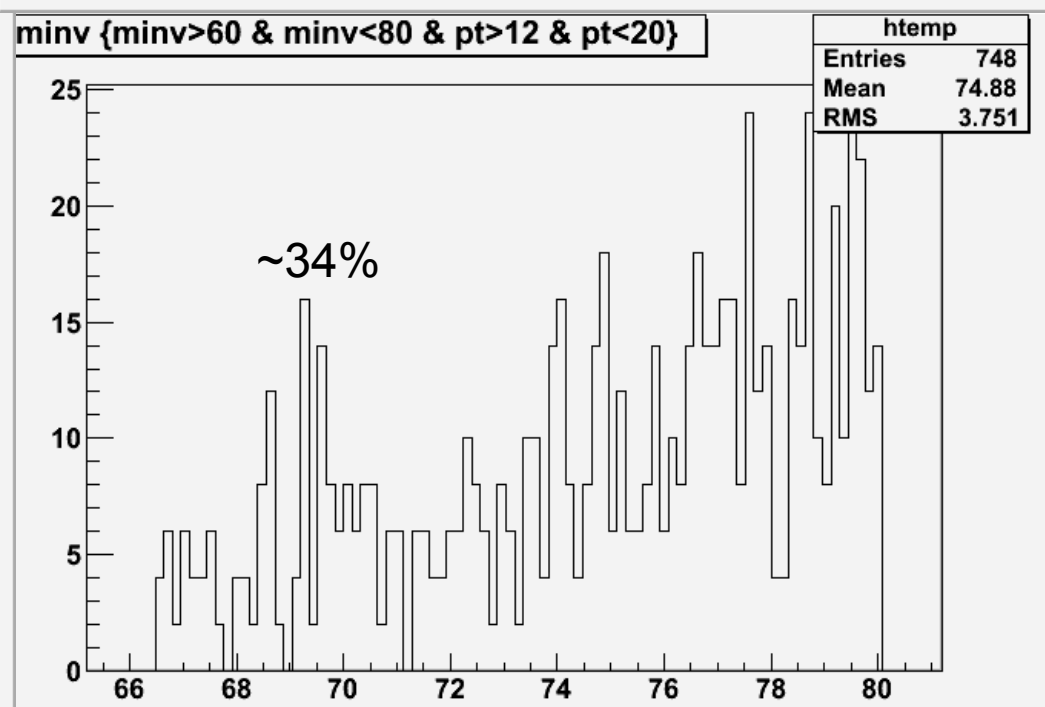
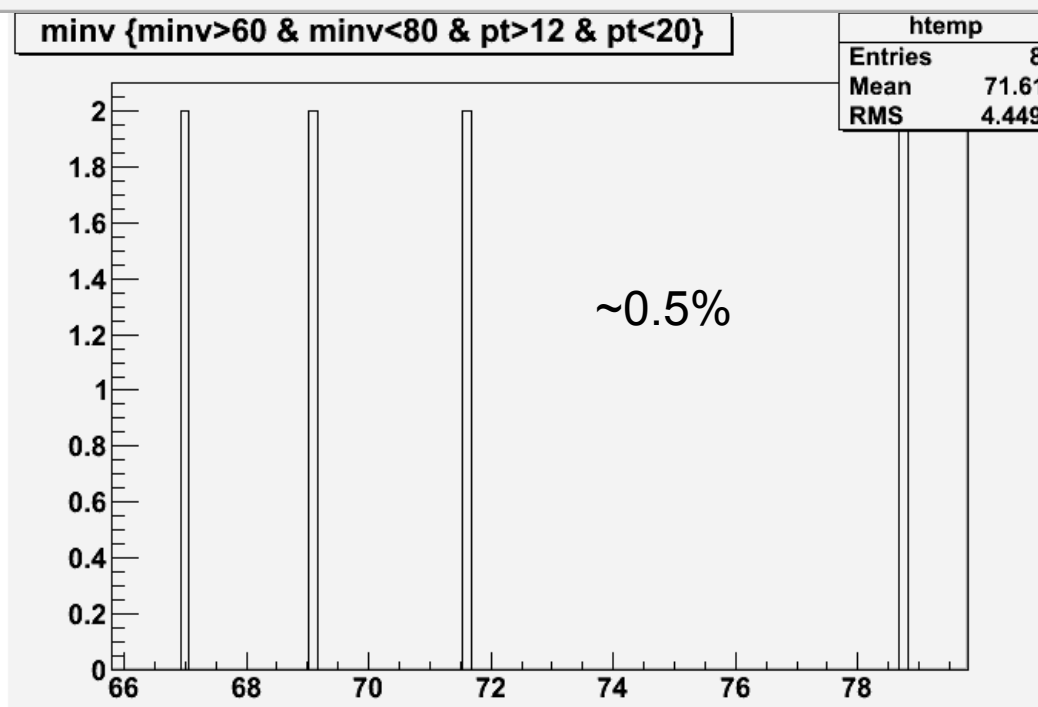
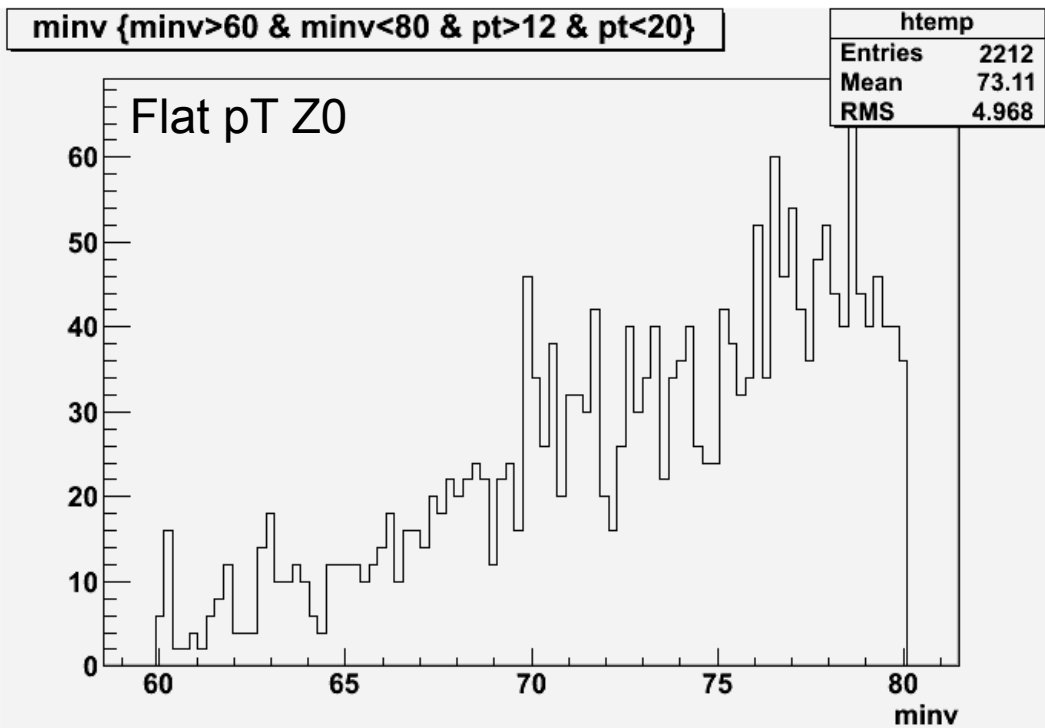
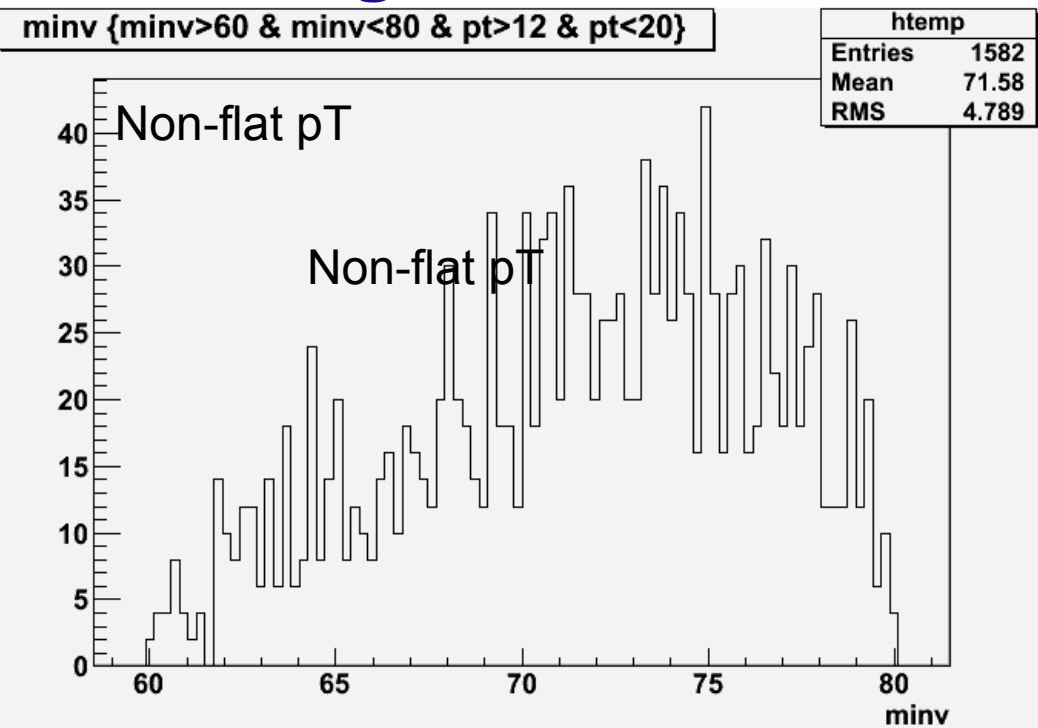
# PYTHIA gun, flat pT: effect present at all pT



[60,80]/[60,100]  
Pt[0,5]: 3.6%  
Pt[5,10]: 5.8%  
Pt[10,15]: 6.1%  
Pt[15,20]: 5.7%



# PYTHIA gun: radiation ON/OFF



# PYTHIA gun, flat pT: all pT, Radiation ON/OFF

[60,80]/[60,100]	(mu,mu)	Z0	(mu,mu)	Z0
pT	Rad ON (%)		Rad OFF (%)	
[0,1]	58/2096 2.8	57/2461 2.3	57/2423 2.4	57/2393 2.4
[1,2]	71/2238 3.2	54/2365 2.8	57/2423 2.4	57/2423 2.4
[2,5]	286/7204 4	164/7442 2.2	135/7333 1.8	135/7333 1.8
[5,10]	694/11998 5.8	269/12092 2.2	237/12123 2	237/12123 2.
[10,15]	738/12001 6.1	263/12077 2.1	229/12125 1.9	229/12125 1.9
[15,20]	664/11572 5.7	221/12103 1.8	240/12166 2	240/12166 2.

# So ...

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<https://twiki.cern.ch/twiki/bin/view/Main/Z0InvMass>

Really detail investigation:

A2: printing all descendents for a found Z0, and all parents for a given muon (which is in the descendents list),

2 things are noticed:

- +++ a gamma (final state radiation) is always among the TP Z0 descendents – saw the effect of this

- +++ a '94' comes out all the time!

A3: the '94' is not present in any of the other cases: pythia, gun+radiation\_OFF; only in gun+radiation\_ON

==> the PYTHIA particle gun has a bug in it, in the way it deals with accounting for generated final state radiation -> send email to Generator hypernews and cc Yulia Yarba

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Extras

# Single mu parent info: with and without fsr

