First K^0 and Λ^0 Invariant Mass peaks with MIPP TPC and WC tracks

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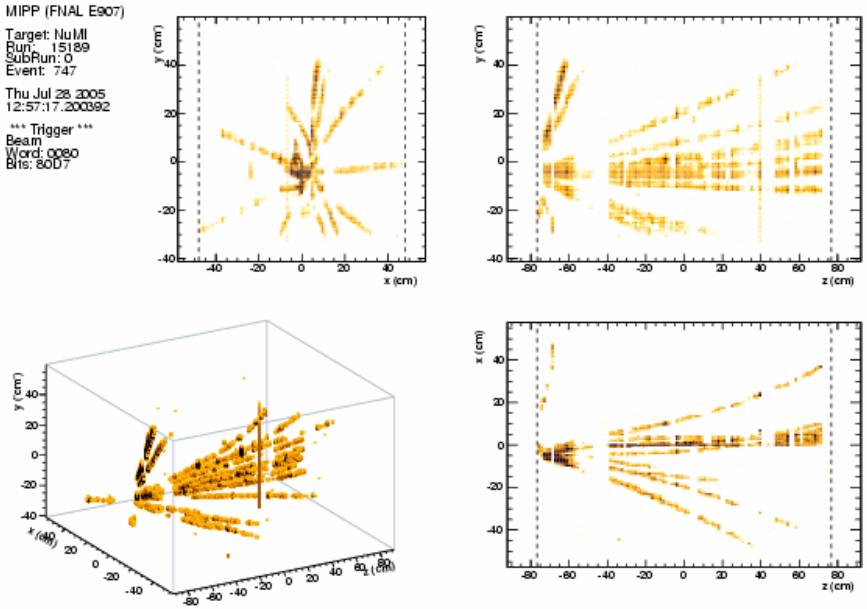
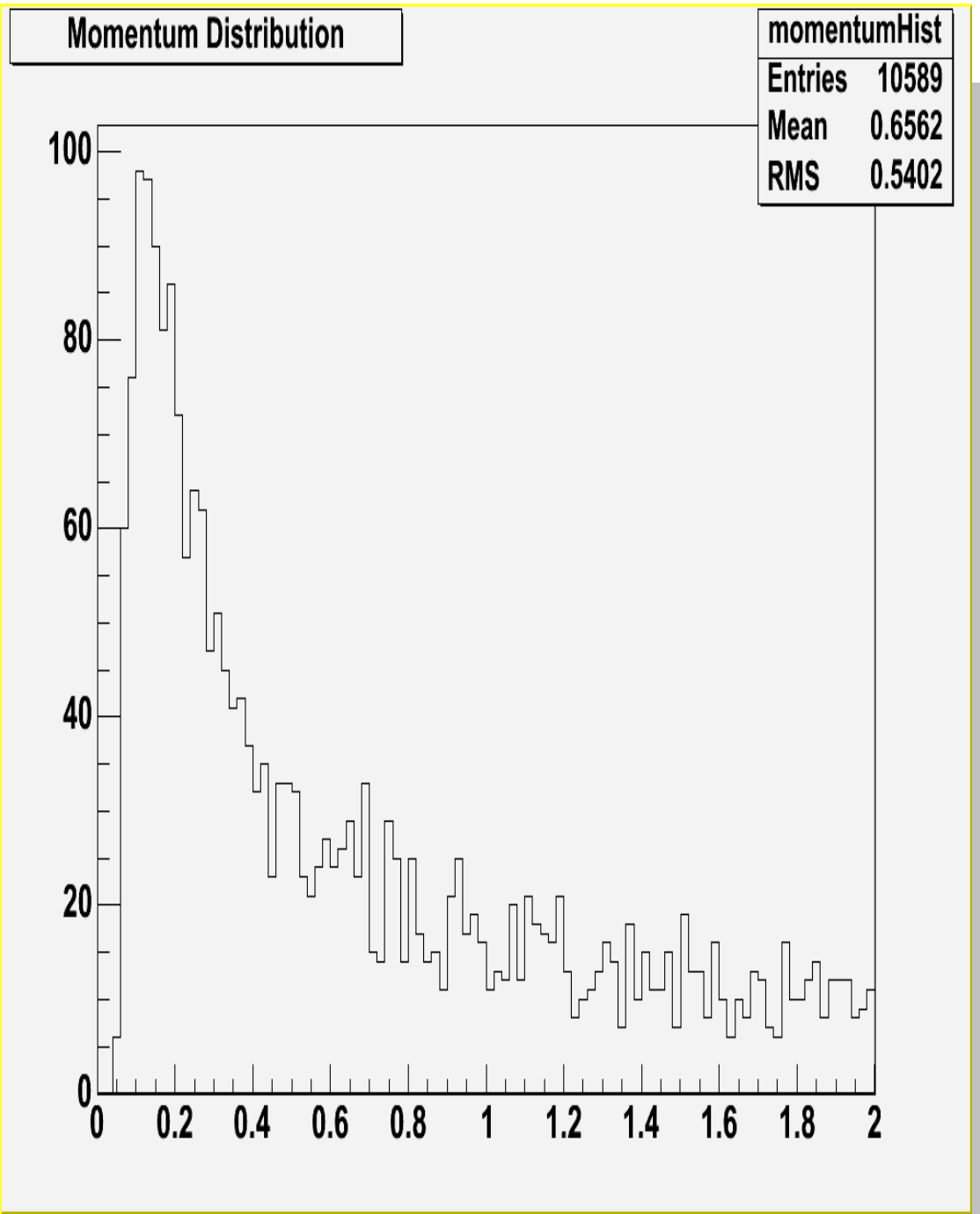
Events used:

- We used events with at least one negative track and and positive track but not more than 10 total tracks.
- Beam particles species were able to be selected from a run of +59 GeV on LH2 target.



TPC Track momentum



- Used tracks with 0.25 to 40 GeV/c momentum.
- The low momentum particles are dominated mostly by TPC tracking
- The stiff high momentum track rely on the long lever arm of the Wire Chambers.

Calculations:

- **Using the relativistic mass formula and known proton and pion PDG masses:**

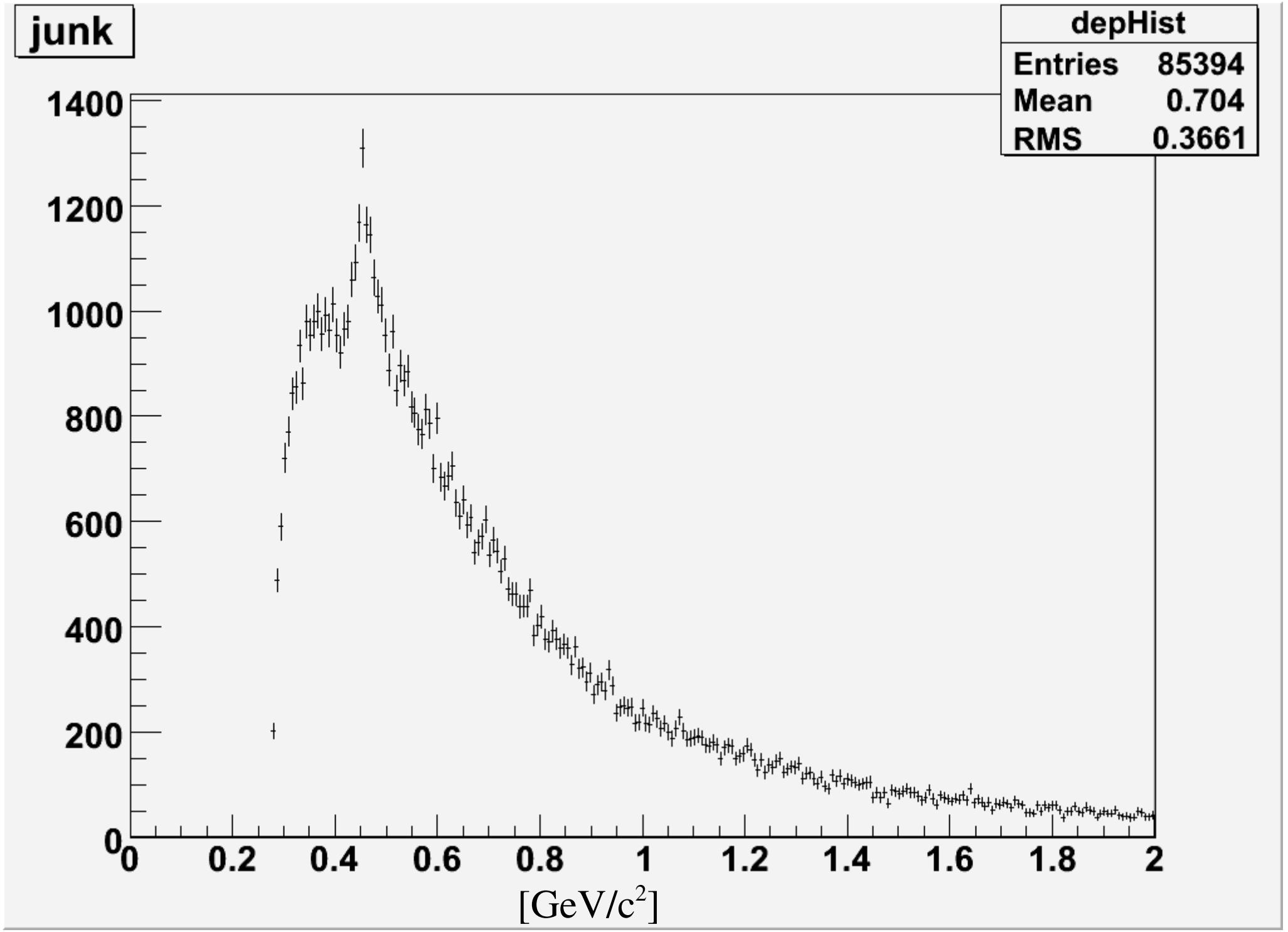
$$\text{Energy}(p\pi) = \sqrt{(m_{PDG}^2+p^2)_1 + (m_{PDG}^2+p^2)_2}$$

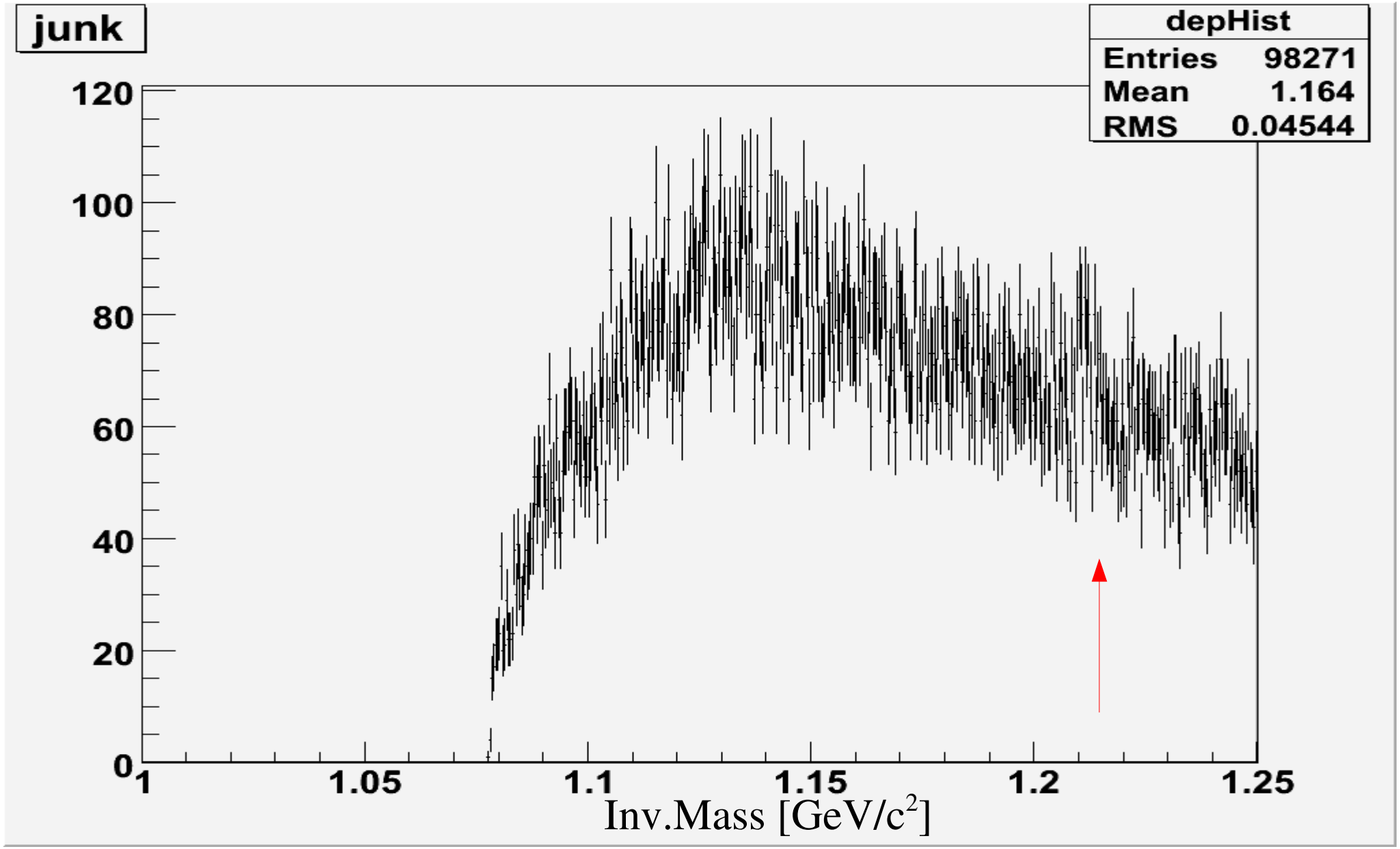
$$\text{InvMass}(p\pi) = \sqrt{(\text{Energy}(p\pi)^2 - (px_1+px_2)^2 - (py_1+py_2)^2 - (pz_1+pz_2)^2)}$$

1) All combinatoric pairs of negative and positive tracks in a single event searched.

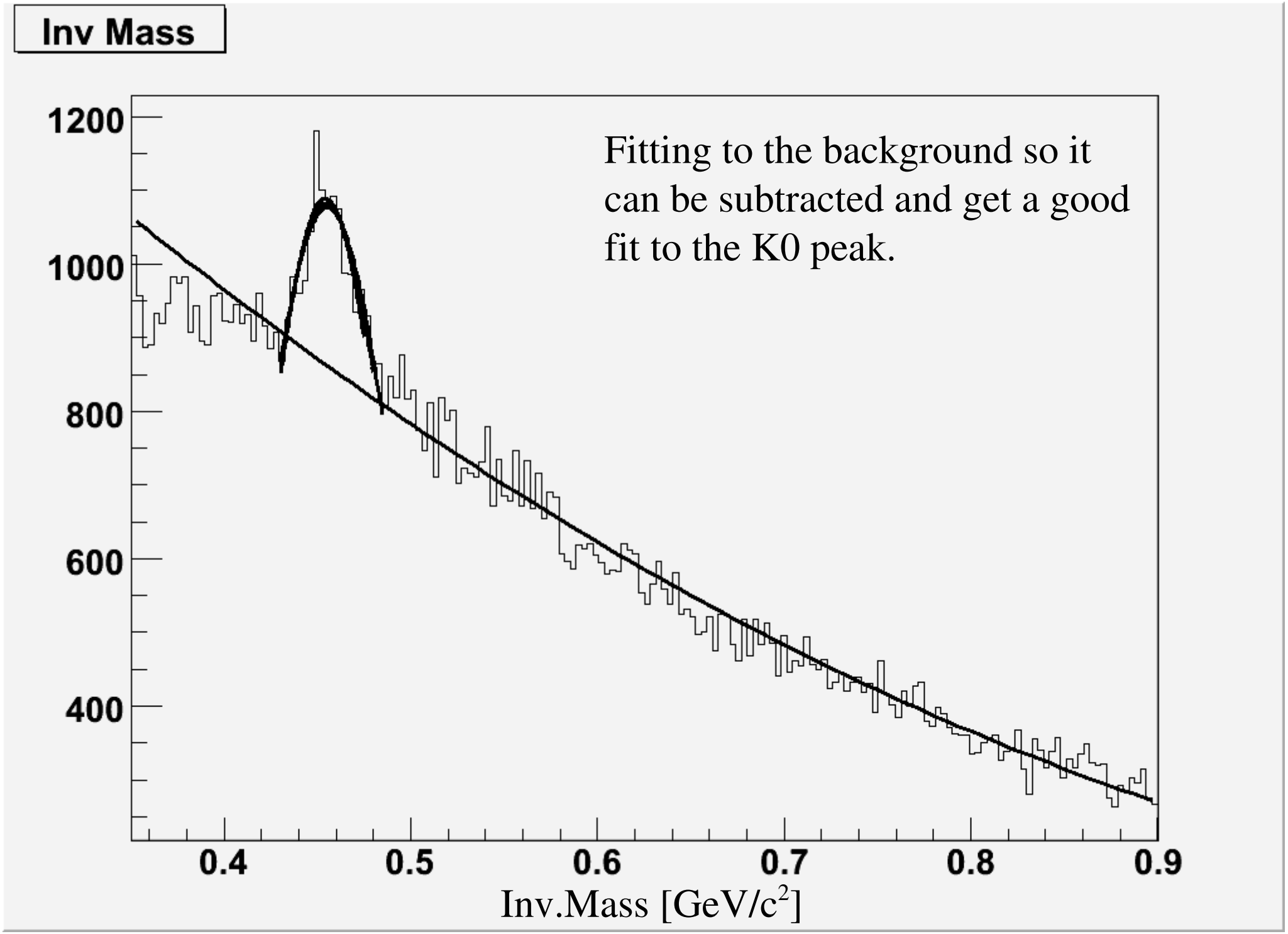
2) For K0 mass used $\pi^+\pi^-$ mass combination, and for L0 mass used p π^- masses.

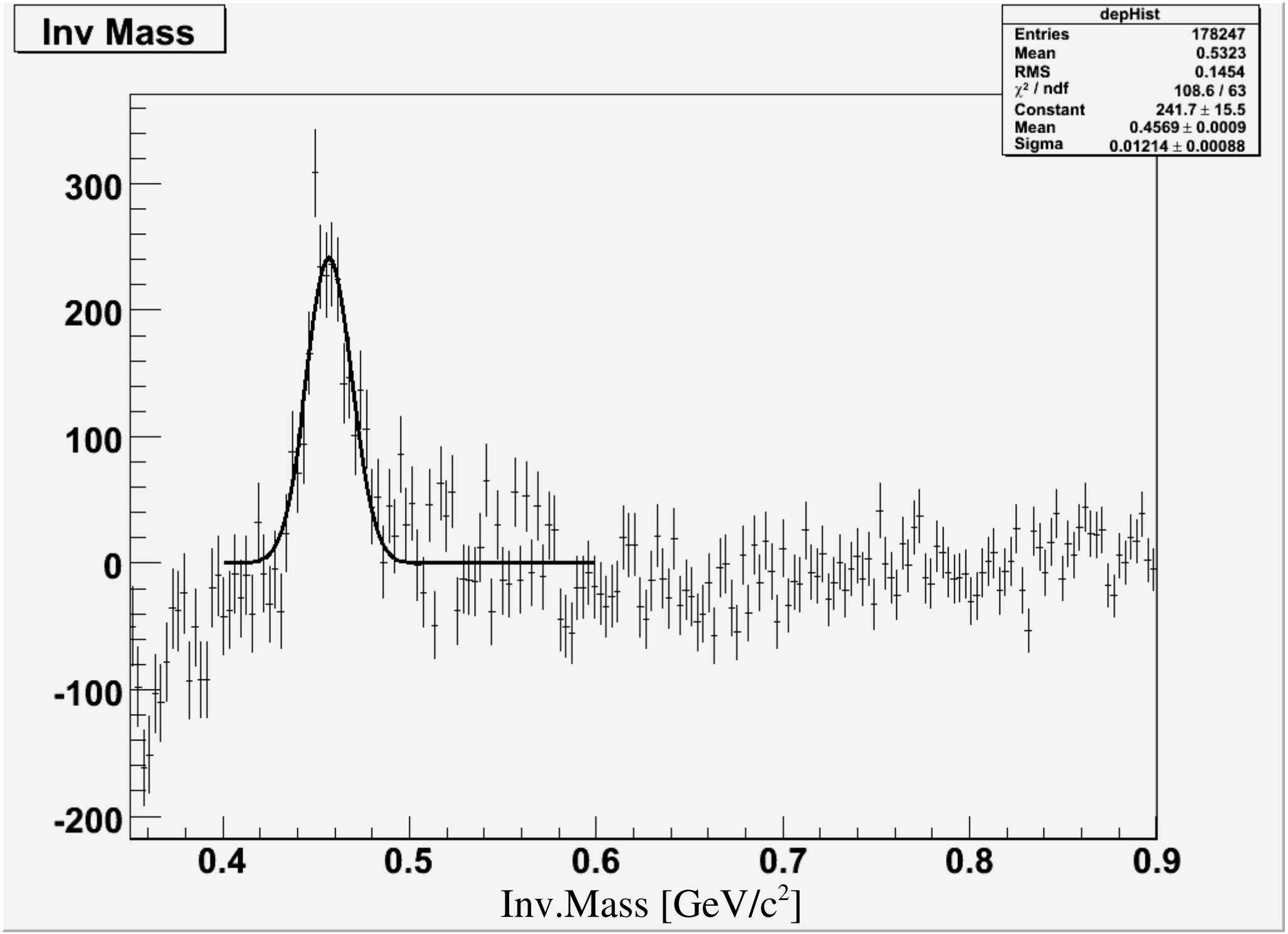
- **This method relies only upon track momentum reconstruction, not vertexing.**

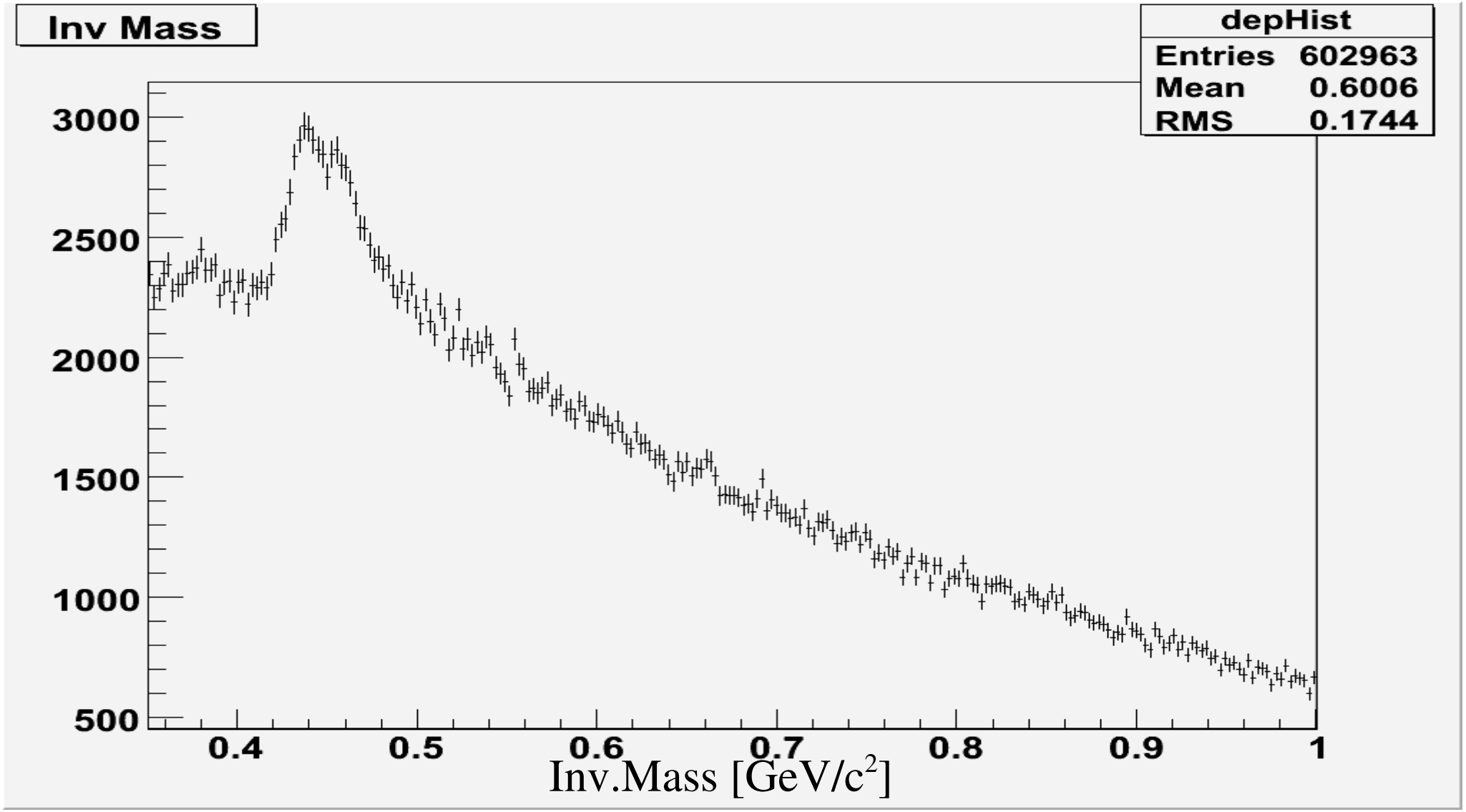

junk
depHist
Entries 85394
Mean 0.704
RMS 0.3661
1400
1200
1000
800
600
400
200
0
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
[GeV/c^2]



Red arrow shows maybe a Λ^0 peak at 1.21 GeV/c^2. The data used is K^+ on Liquid Hydrogen which has a highly supressed Λ^0 production, our negative beam data does not have Bckov working due to a bug found this week.


Inv Mass
1200
1000
800
600
400
0.4
0.5
0.6
0.7
0.8
0.9
Inv.Mass [GeV/c^2]
Fitting to the background so it can be subtracted and get a good fit to the K0 peak.


Inv Mass
depHist
Entries 178247
Mean 0.5323
RMS 0.1454
χ² / ndf 108.6 / 63
Constant 241.7 ± 15.5
Mean 0.4569 ± 0.0009
Sigma 0.01214 ± 0.00088
300
200
100
0
-100
-200
0.4
0.5
0.6
0.7
0.8
0.9
Inv.Mass [GeV/c²]



Adding more data by using +59 GeV/c beam on Carbon target I noticed the K^0 mass peak shifted upwards. Have to study if this is related to the short in JGG analysis magnet.

Problems:

- Learning Root while doing this analysis is making it go slower than normal.
- Found K^0 and maybe Λ^0 mass peak are off.
- Found -59 GeV/c Bckov PID tagging is not working.

Future:

- Goodness of fit cuts.
- Select tracks that come from the same vertex.
- More runs, not all +59 GeV/c beam with LH target processed yet.