2021 Data Reconstruction: SVT Wire Target Analysis

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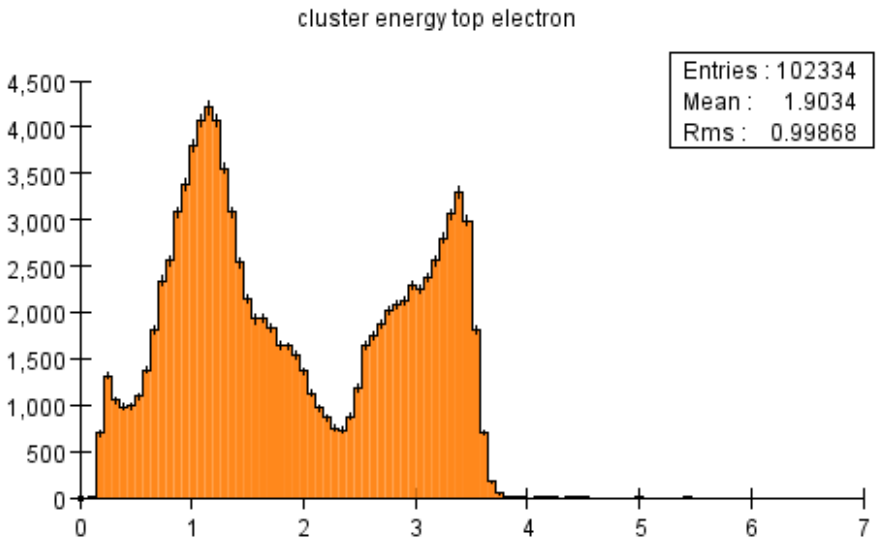
Pass0 Analysis

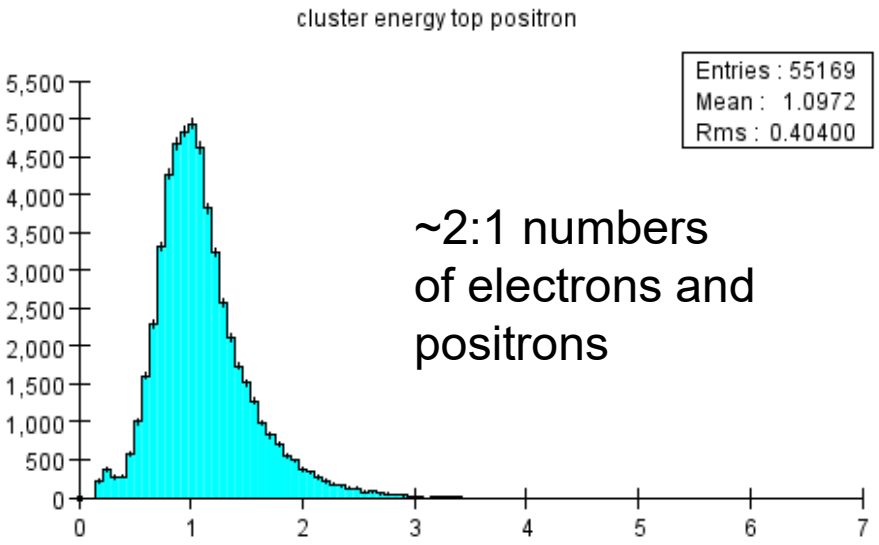
November 17, 2022

What's New? Tracker

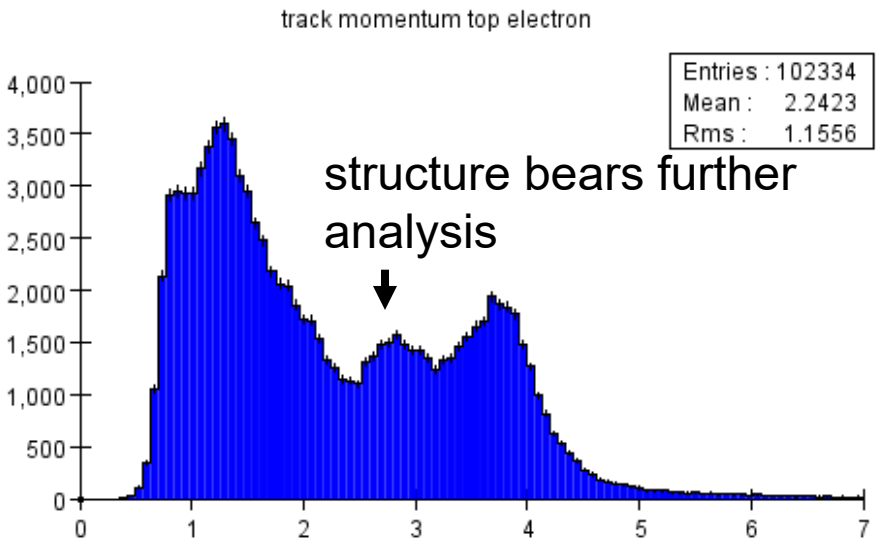
- Pass0 has been finalized.
- A new detector was released
  - HPS_Run2021Pass0_v1_1pt92GeV
- A new release hps-java 5.2 was made.
- Have reconstructed the two runs which used the SVT positioning wires as targets
  - 014753 SVT bottom wire at z=34.544 mm
  - 014754 SVT top wire at z=20.600 mm
- Use both electron and positron tracks when fitting to a common vertex. Opposite sign should reduce systematics and improve resolution of the vertex determination.
- Previous analysis reported results using an older alignment.

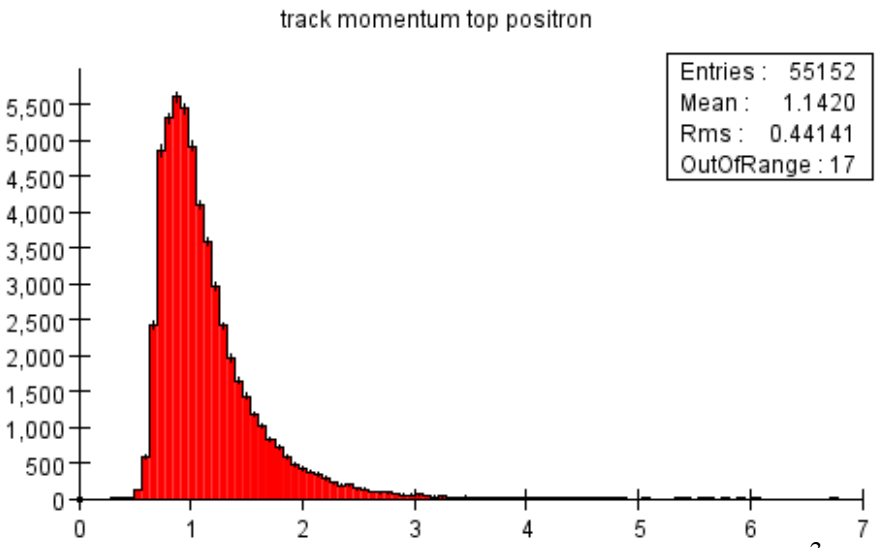
Bottom wire E & p (old)



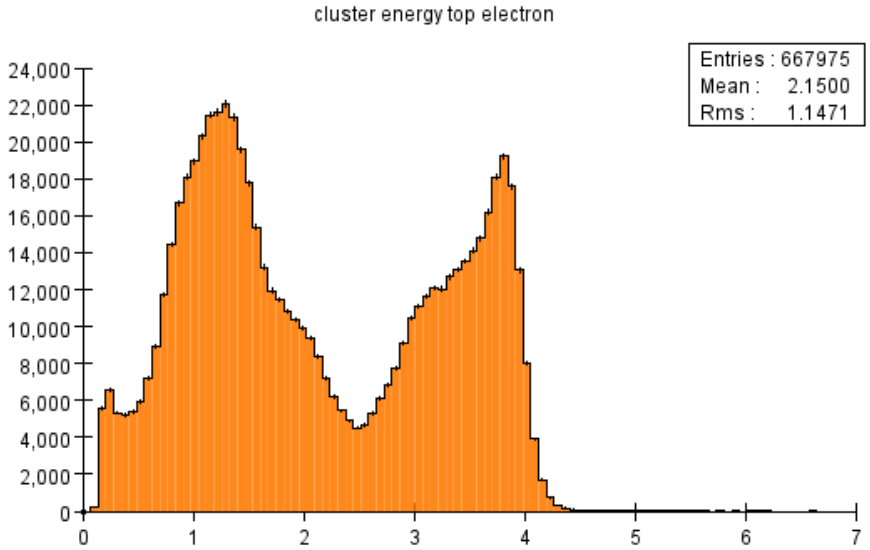


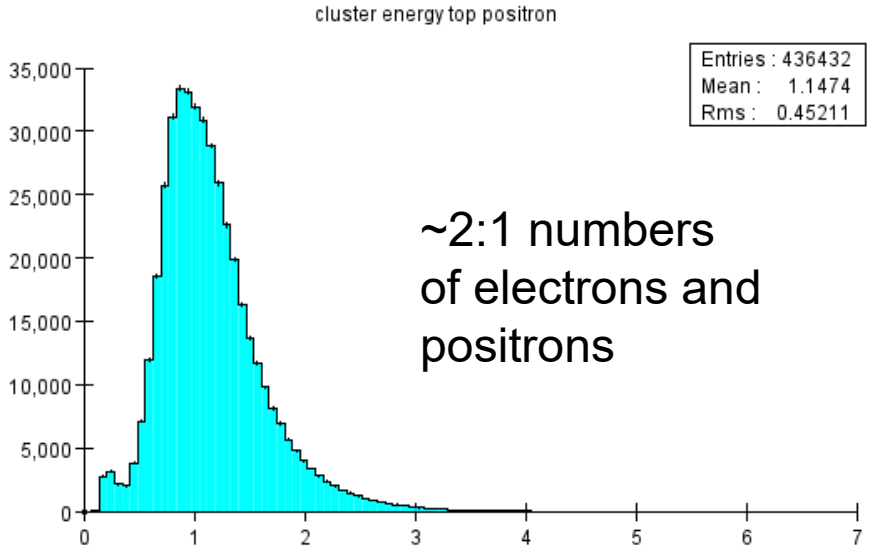
~2:1 numbers of electrons and positrons



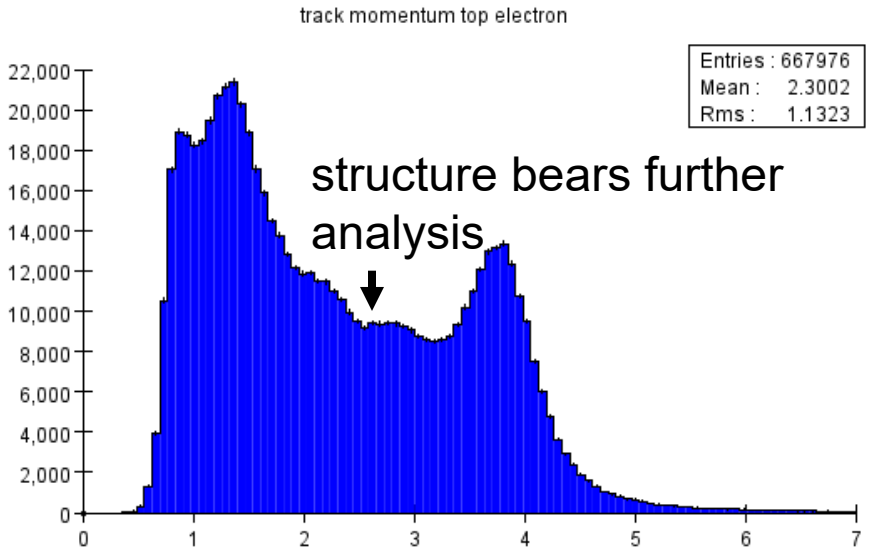


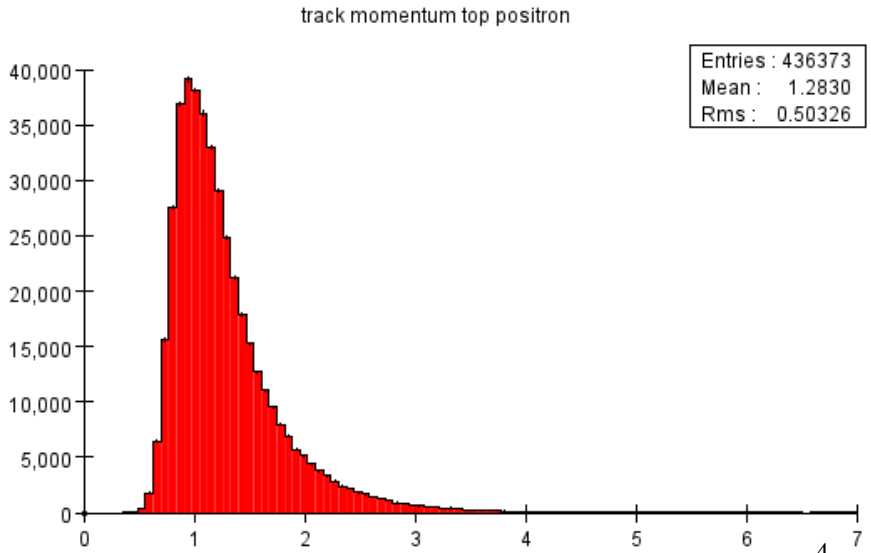
Bottom wire E & p (new)



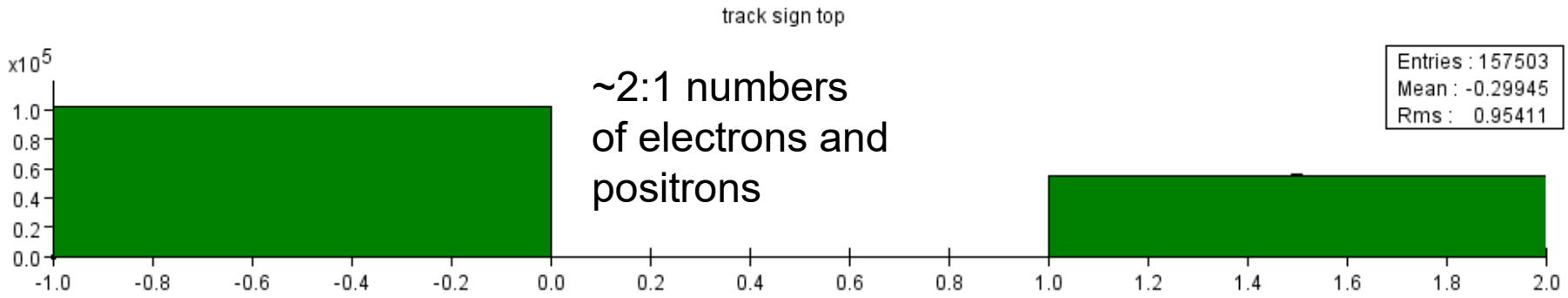


~2:1 numbers of electrons and positrons

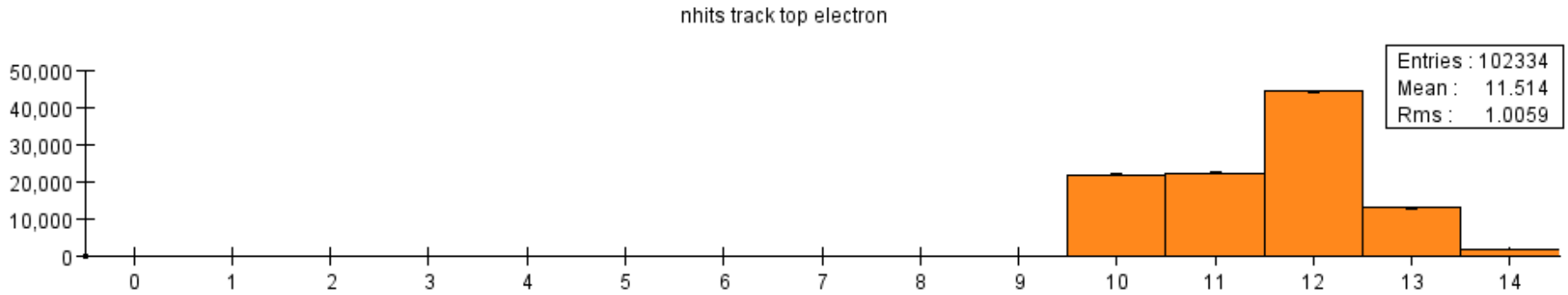


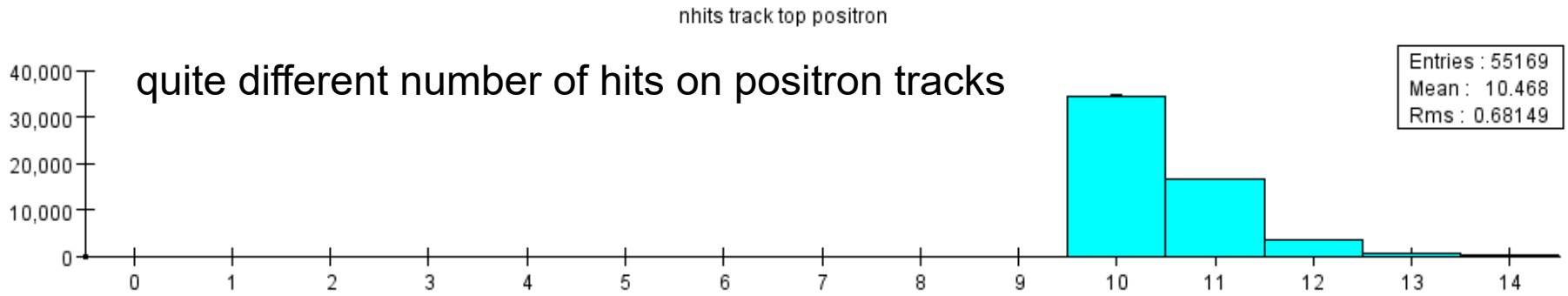


Bottom wire Nhits (old)



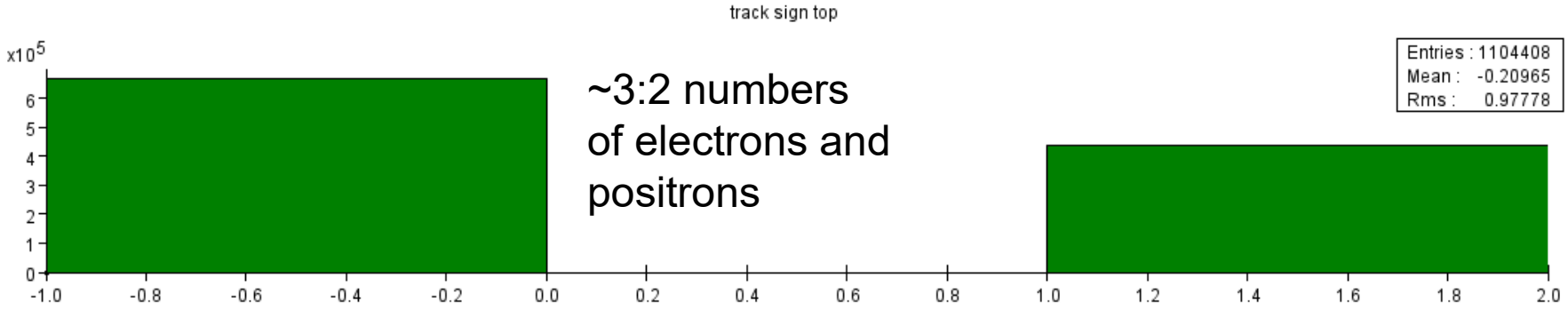
~2:1 numbers of electrons and positrons

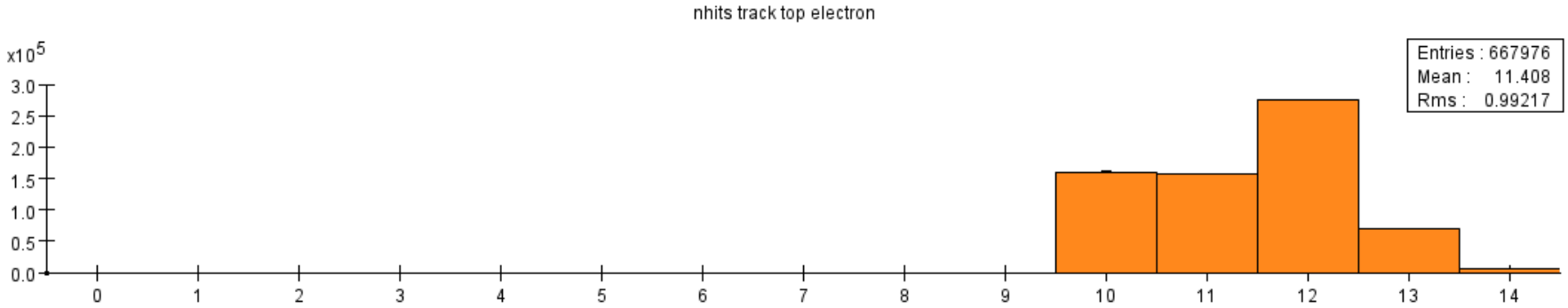


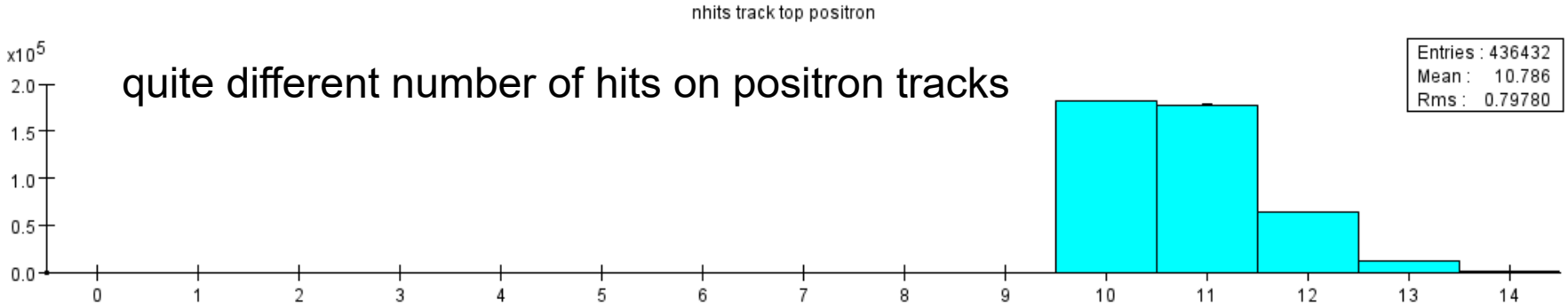


quite different number of hits on positron tracks

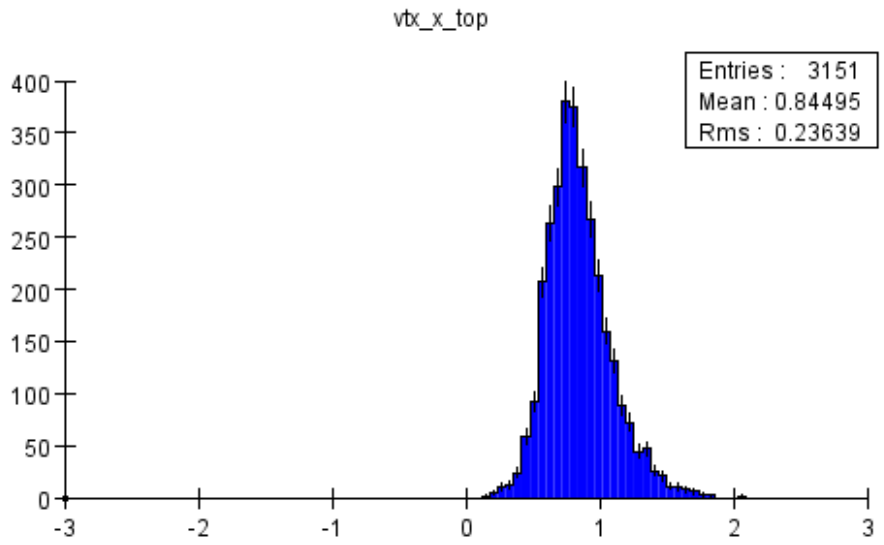
Bottom wire Nhits (new)

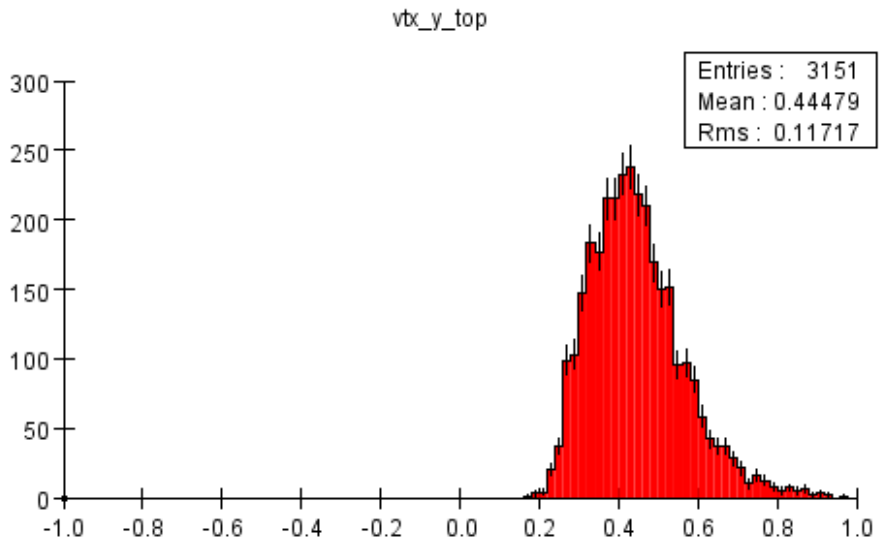


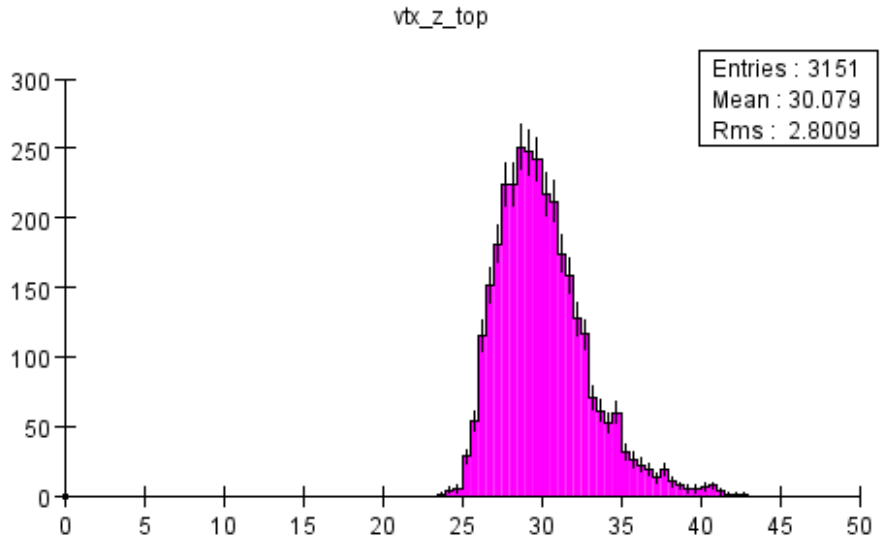


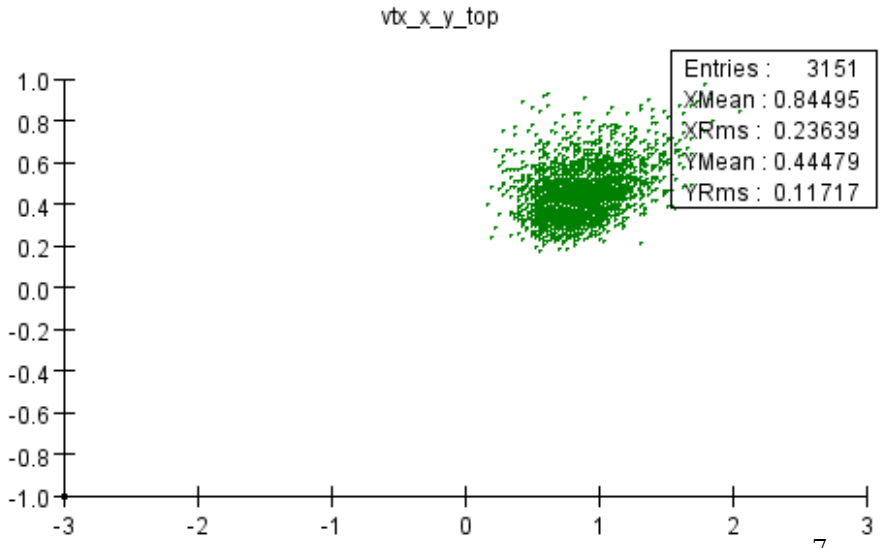


Bottom wire Vertex position (old)

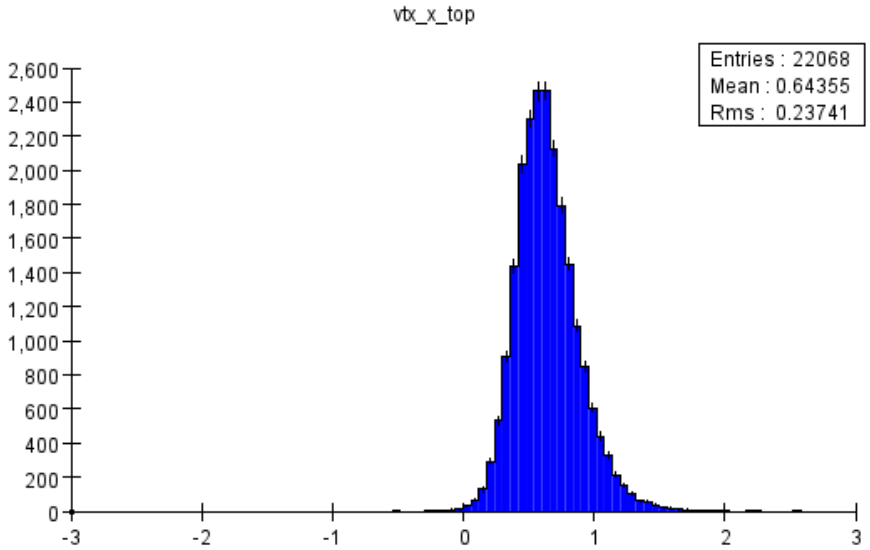


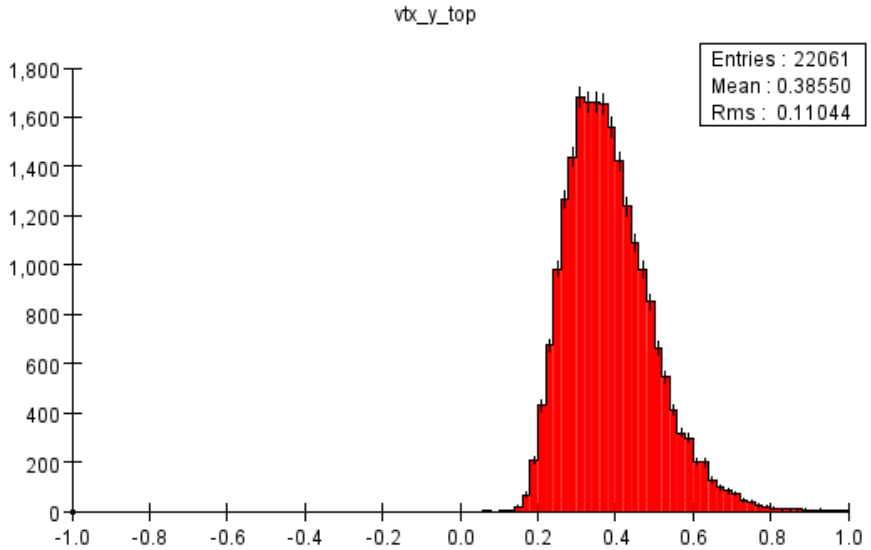


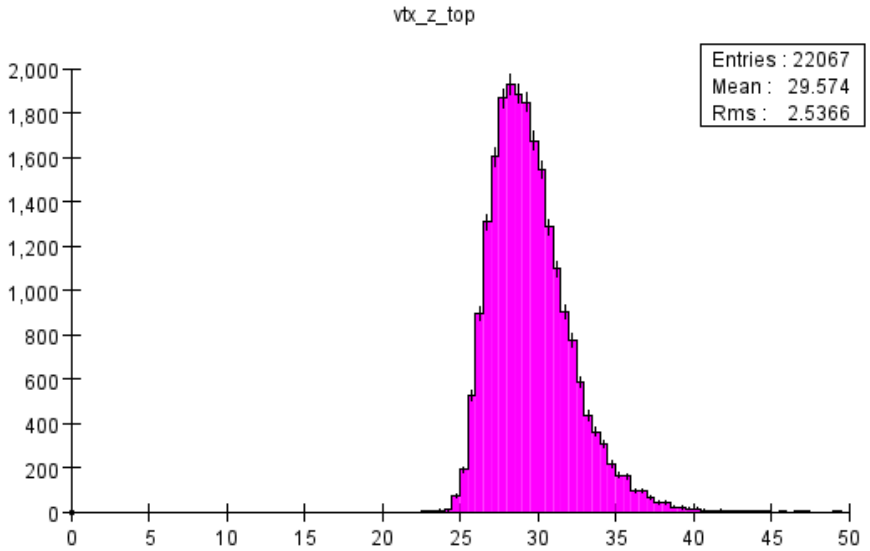


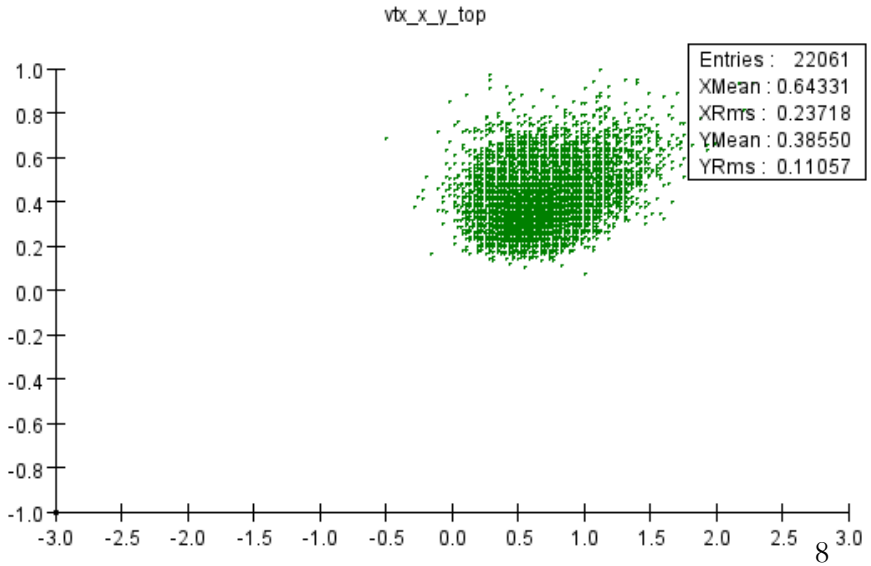


Bottom wire Vertex position (new)

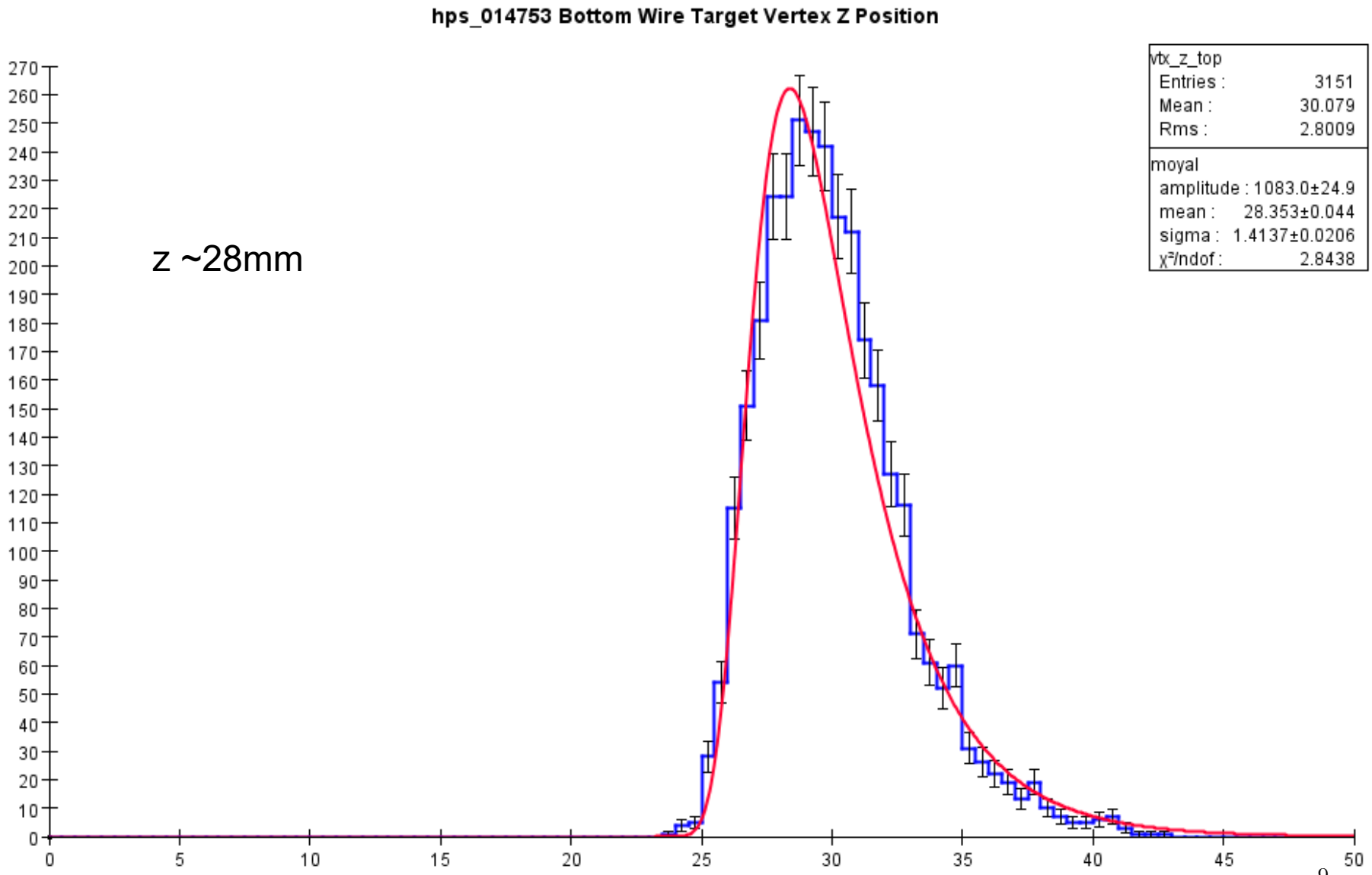






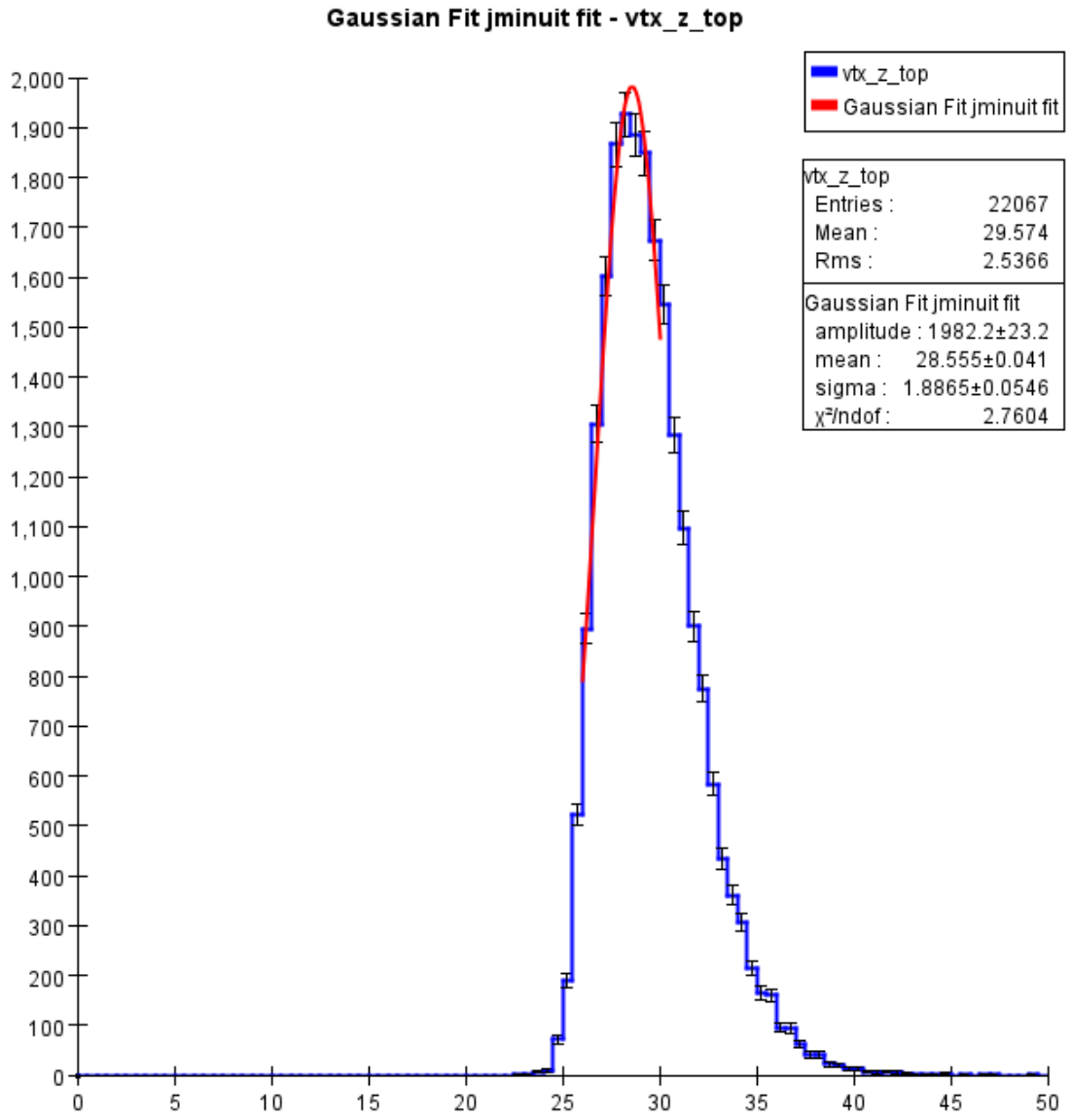


Bottom wire Vertex z (old)

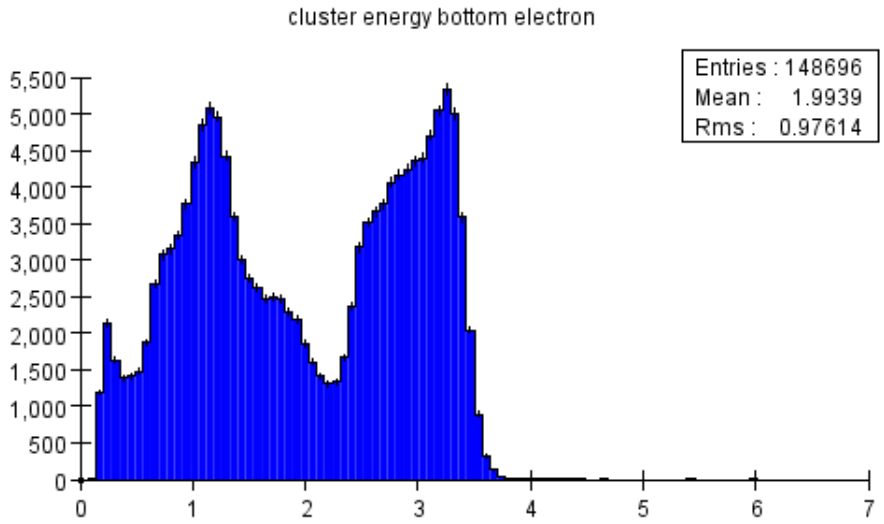


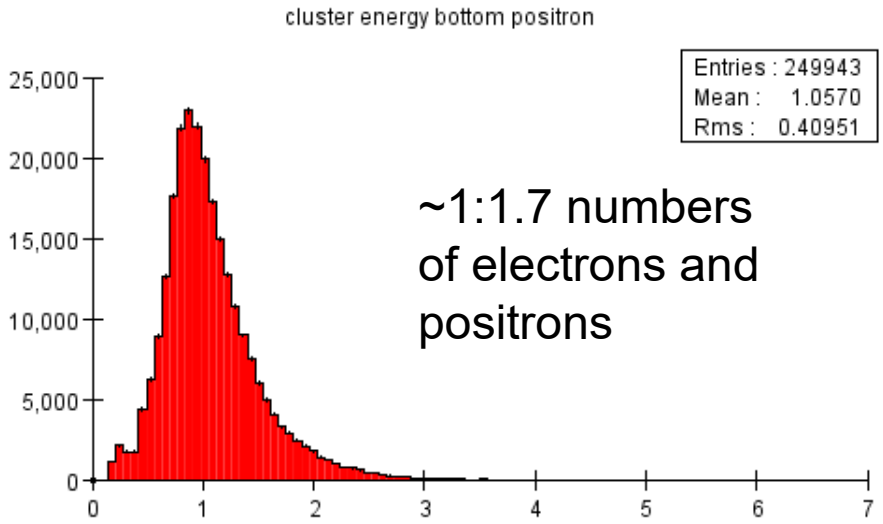
Bottom wire Vertex z (new)

z ~28mm

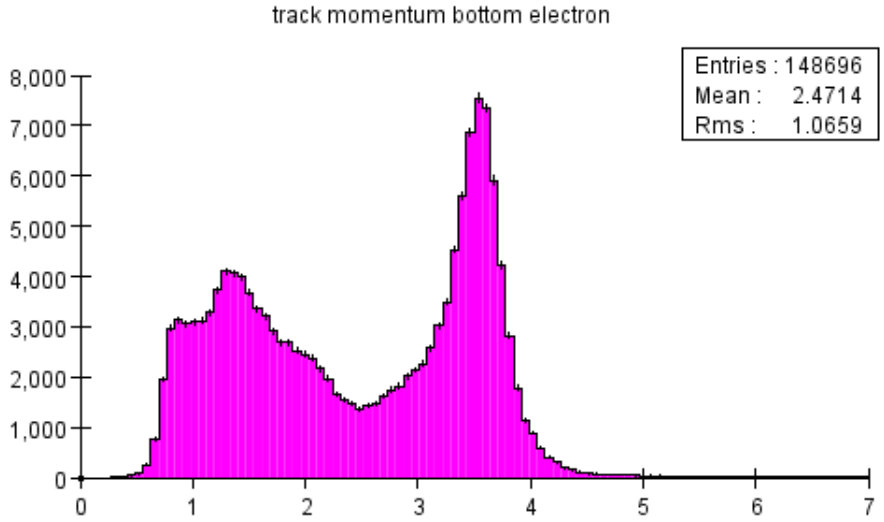


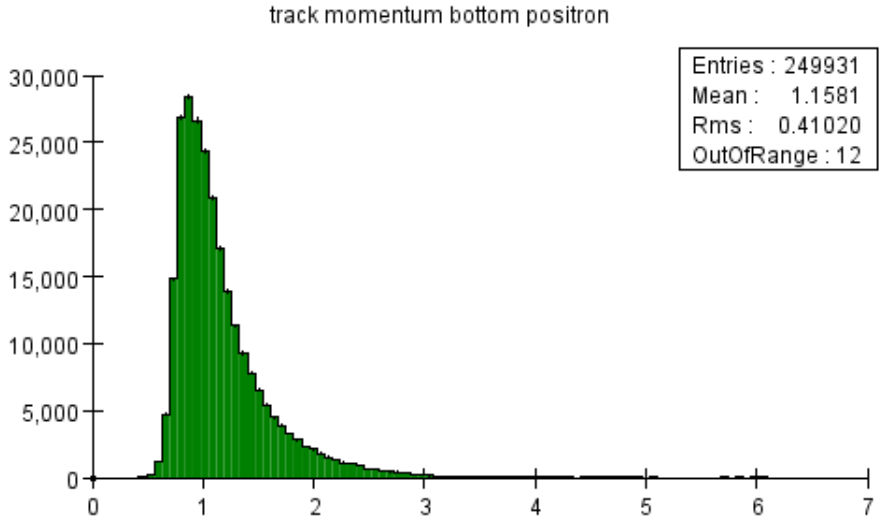
Top wire E & p (old)



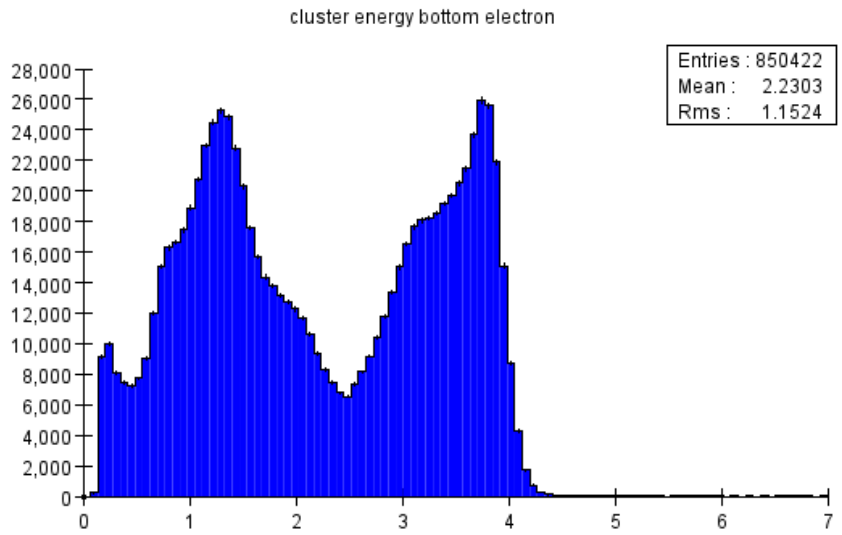


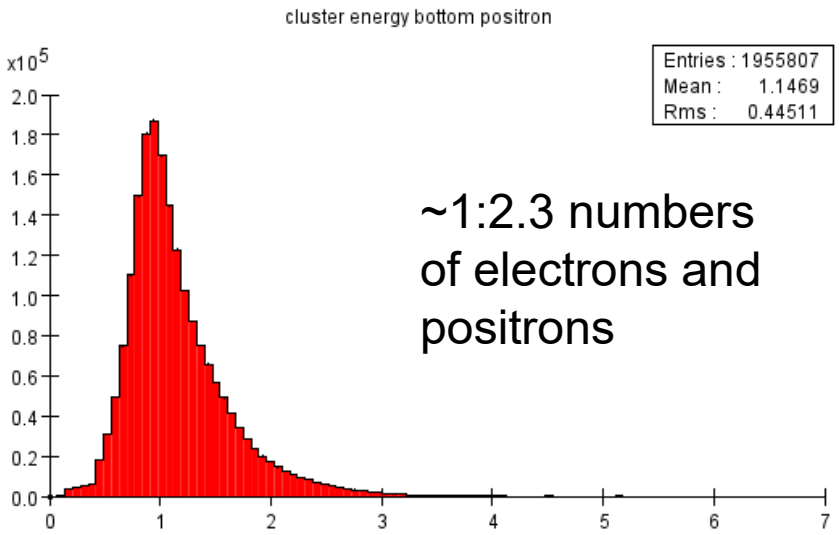
~1:1.7 numbers of electrons and positrons



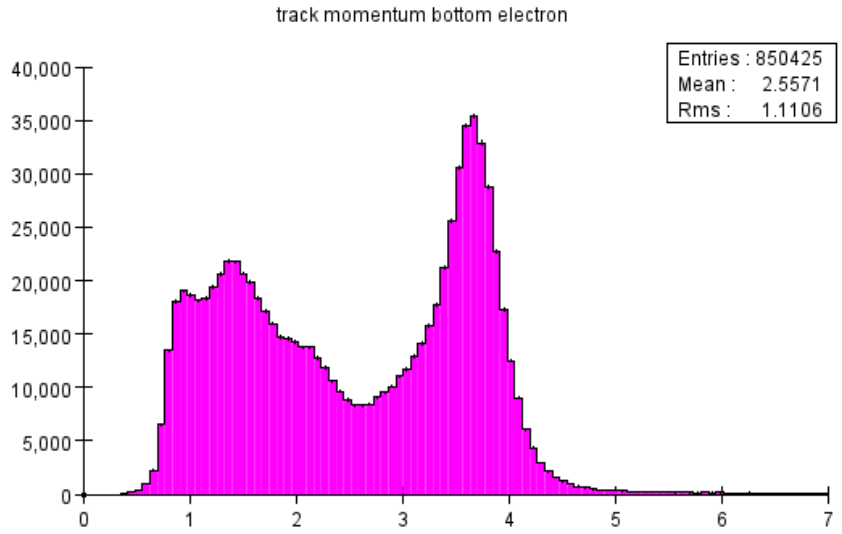


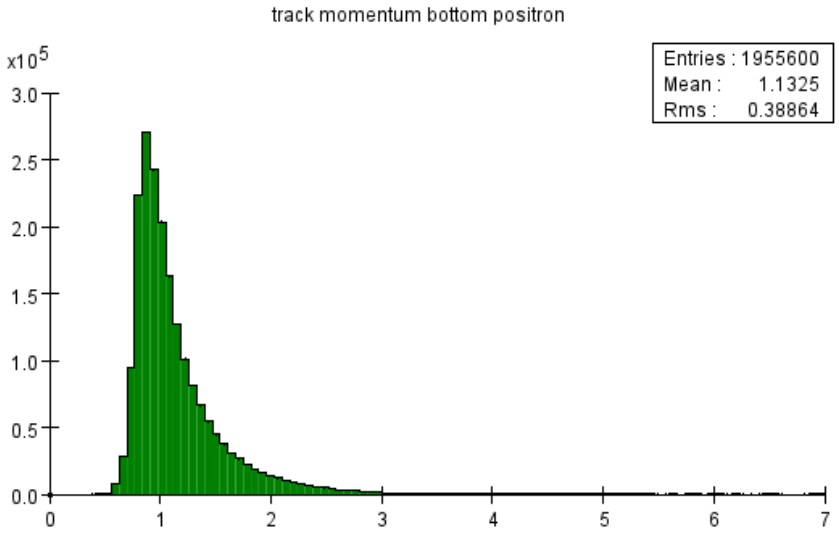
Top wire E & p (new)



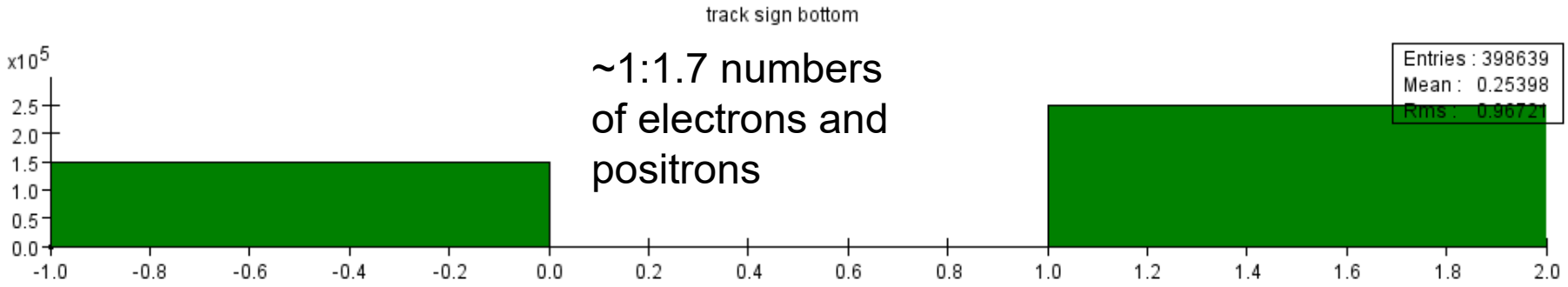


~1:2.3 numbers of electrons and positrons

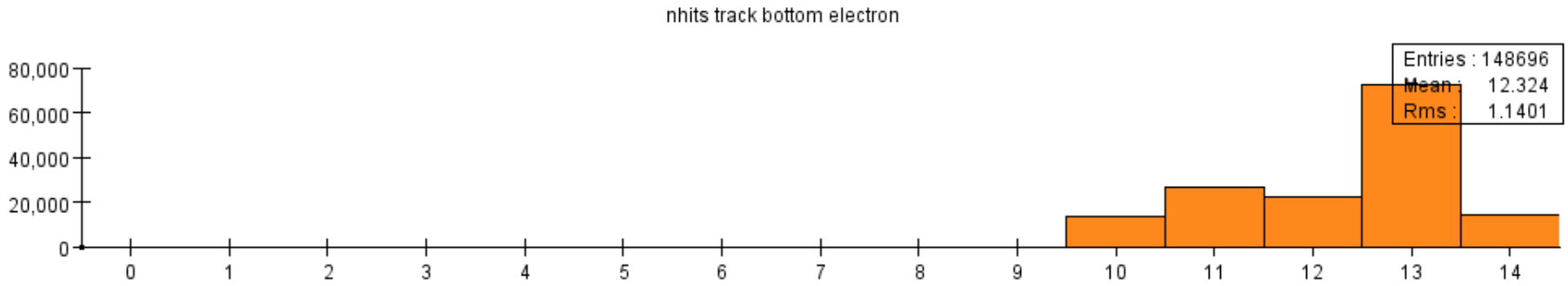


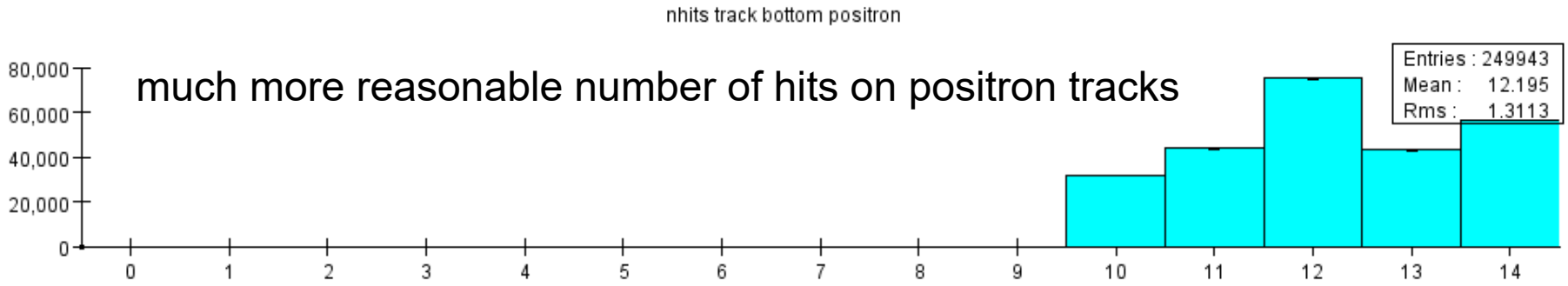


Top wire Nhits (old)



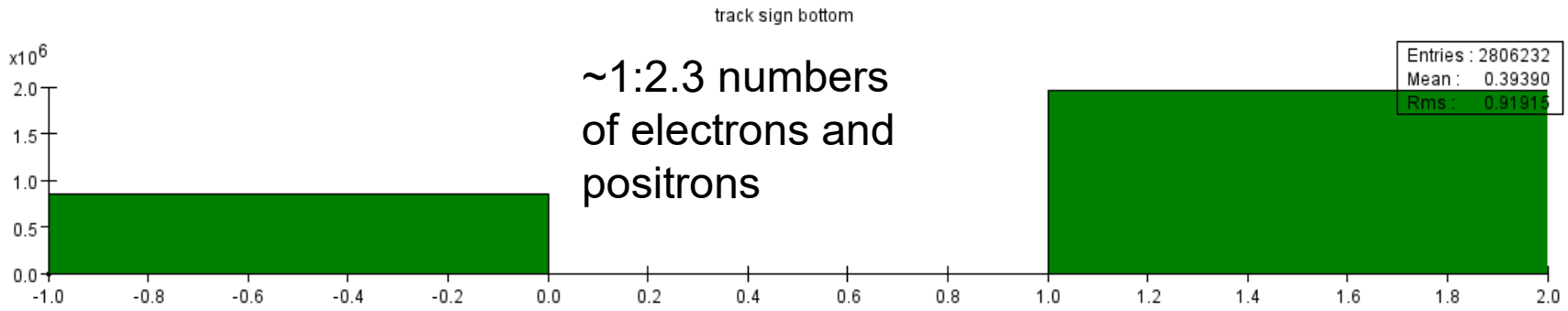
~1:1.7 numbers of electrons and positrons



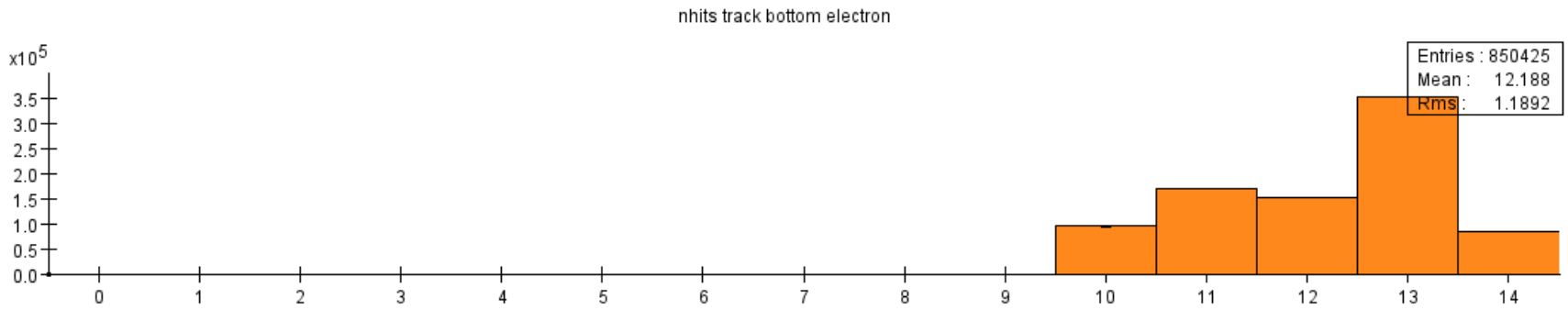


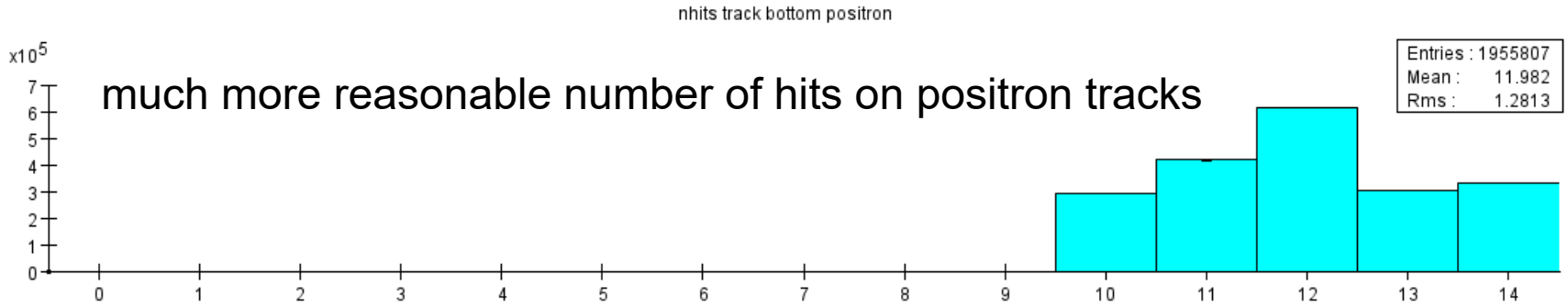
much more reasonable number of hits on positron tracks

Top wire Nhits (new)



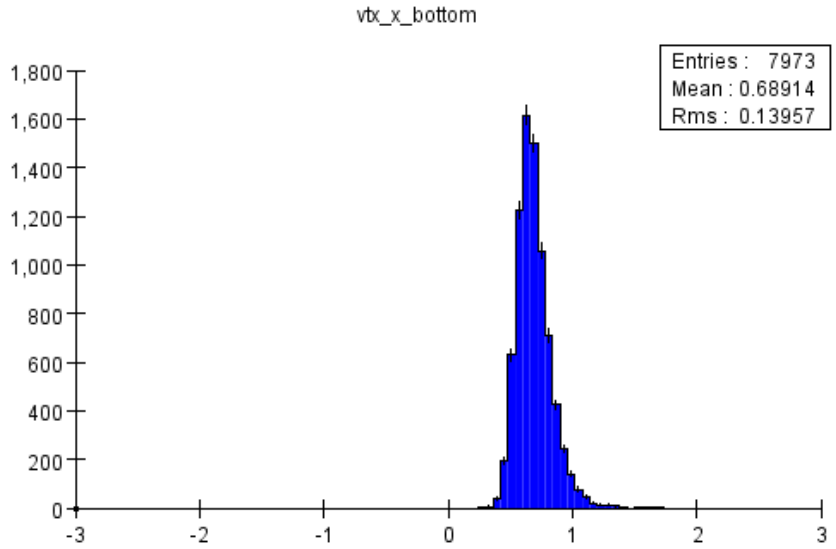
~1:2.3 numbers of electrons and positrons

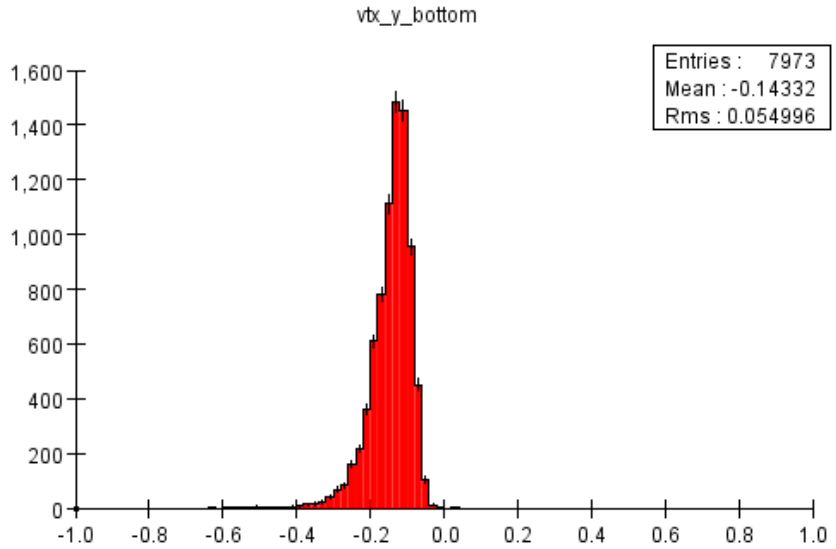


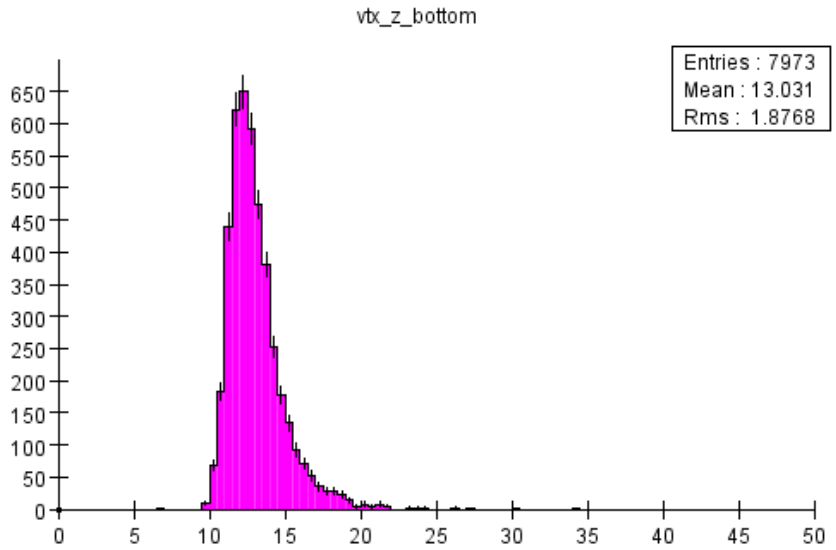


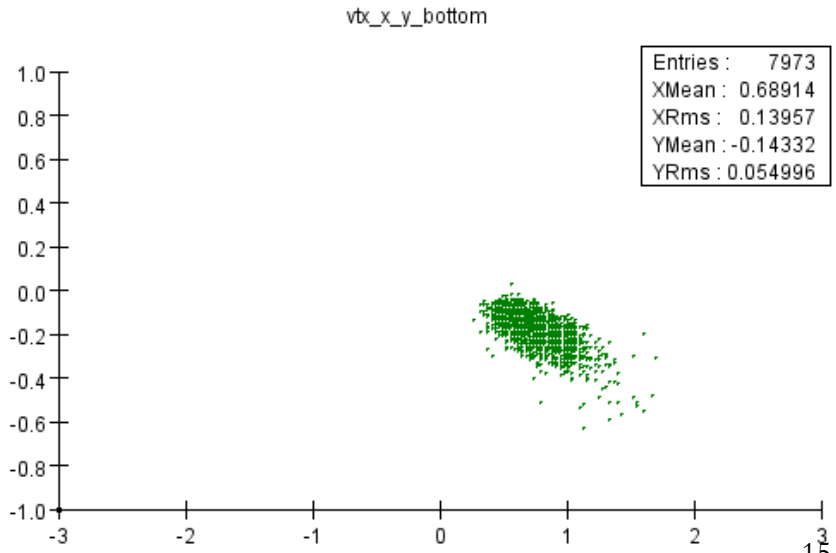
much more reasonable number of hits on positron tracks

Top wire Vertex position (old)

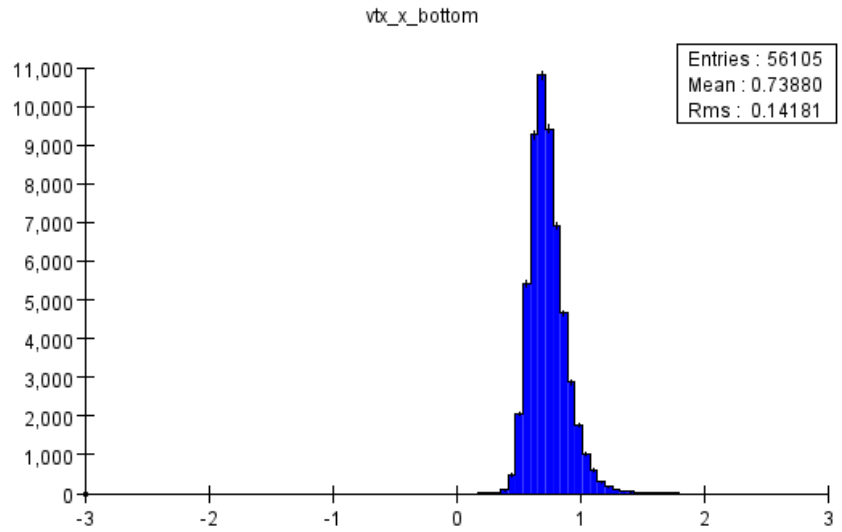


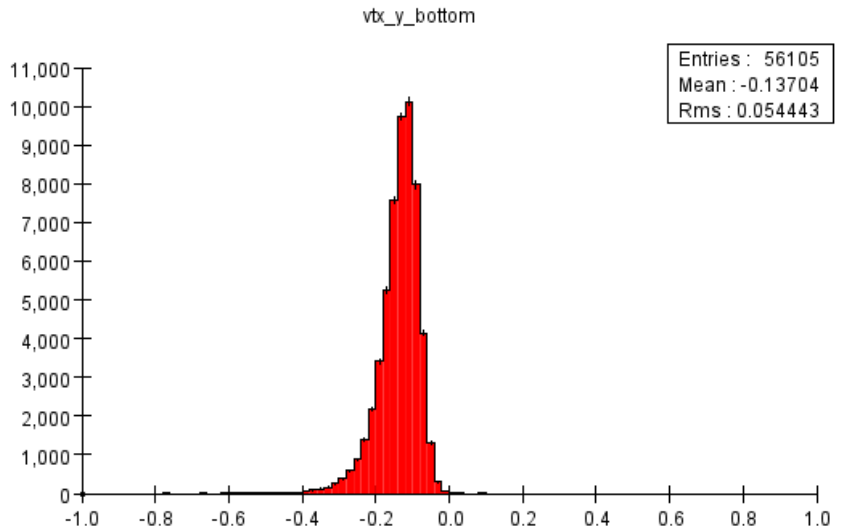


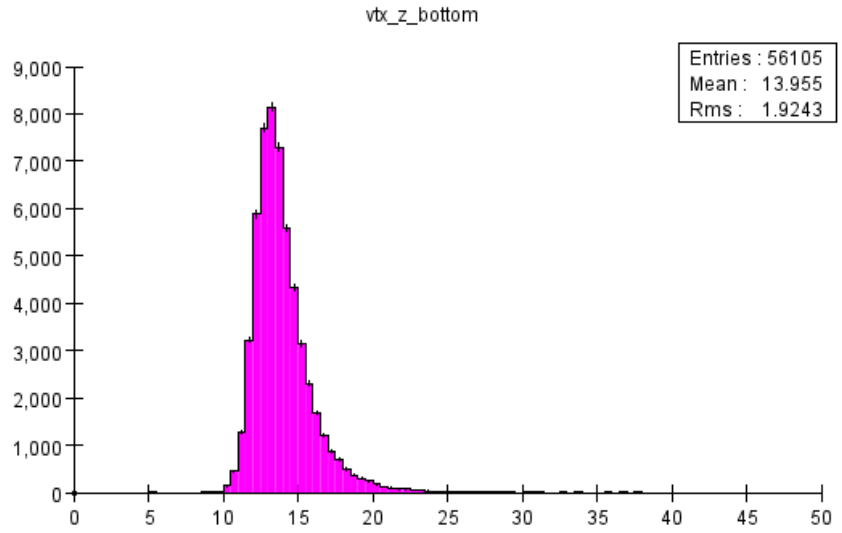


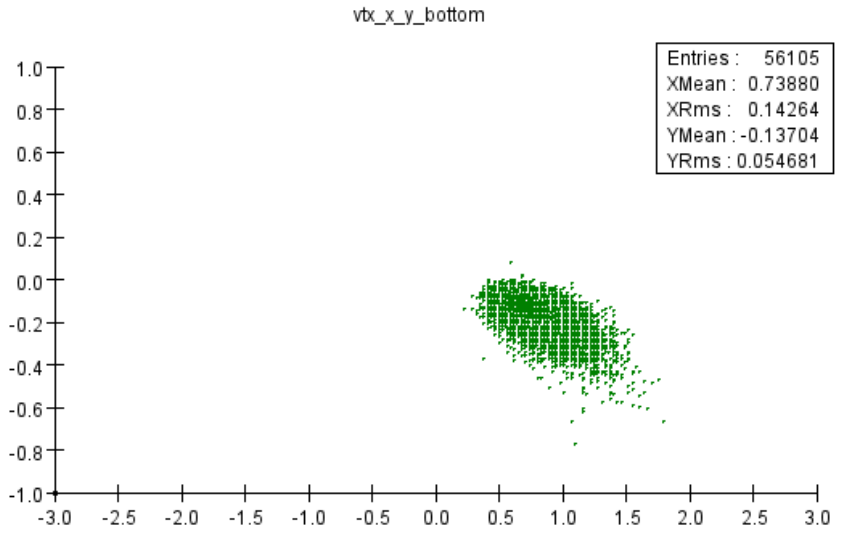


Top wire Vertex position (new)

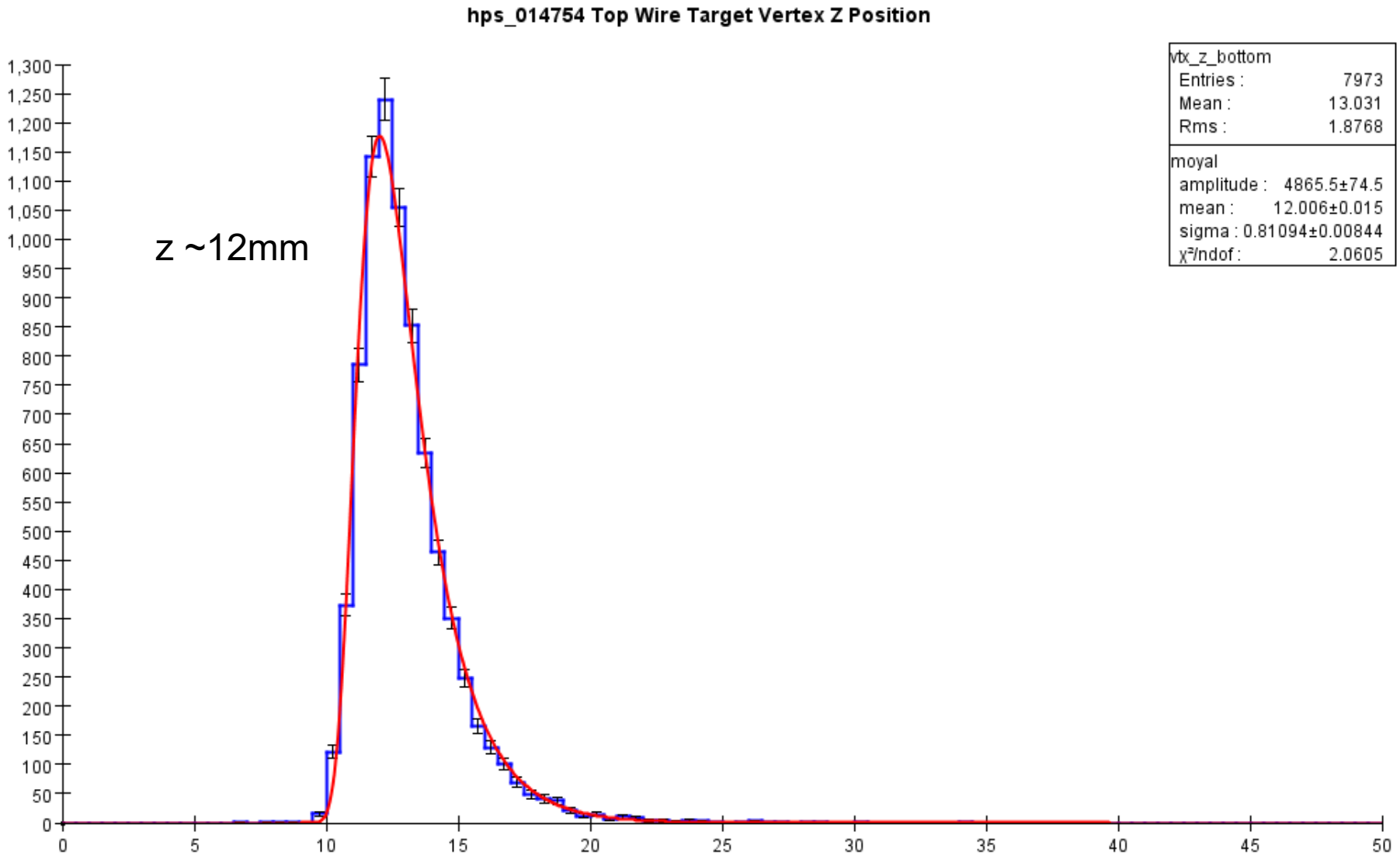






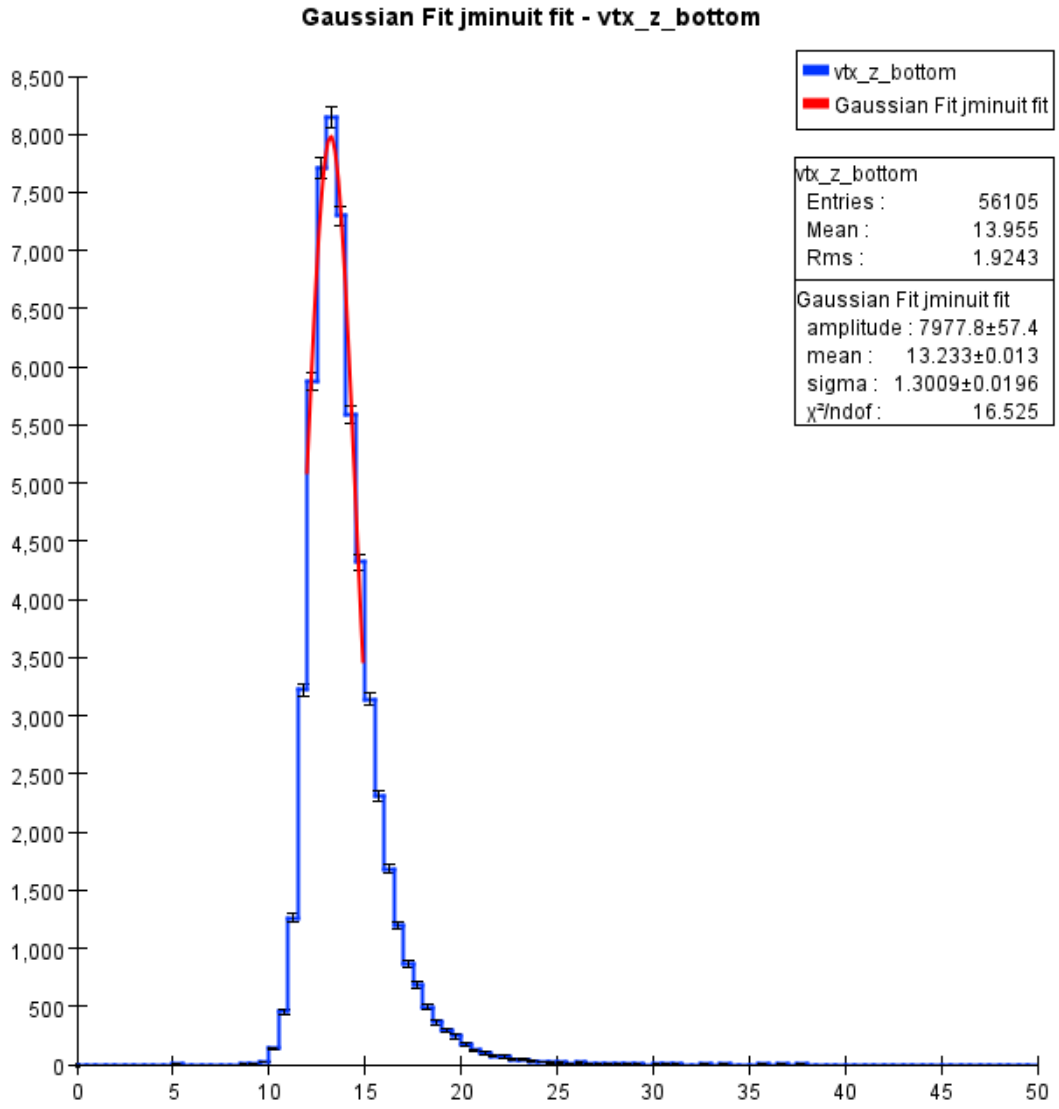


Top wire Vertex z (old)

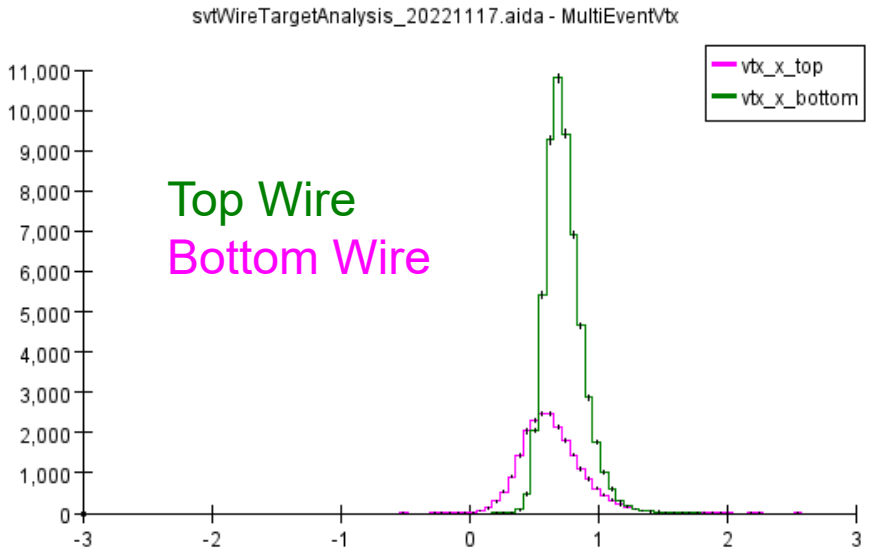


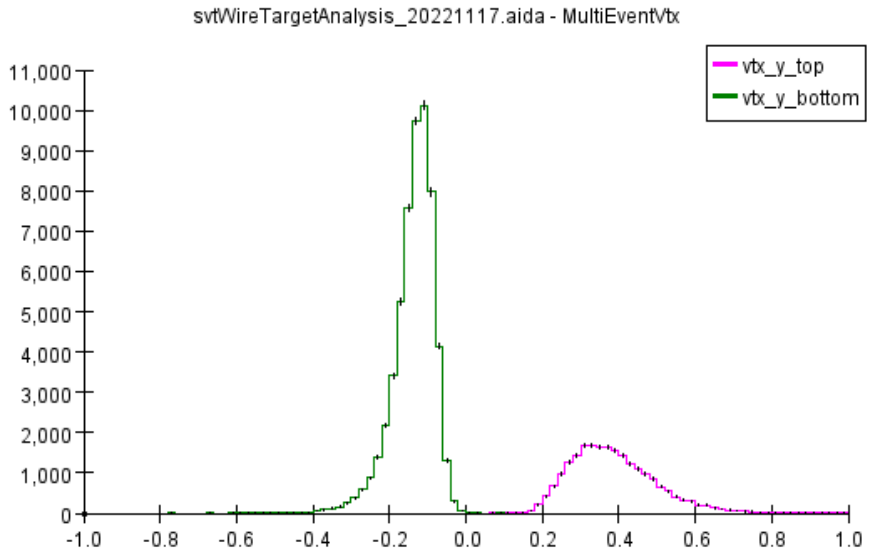
Top wire Vertex z (new)

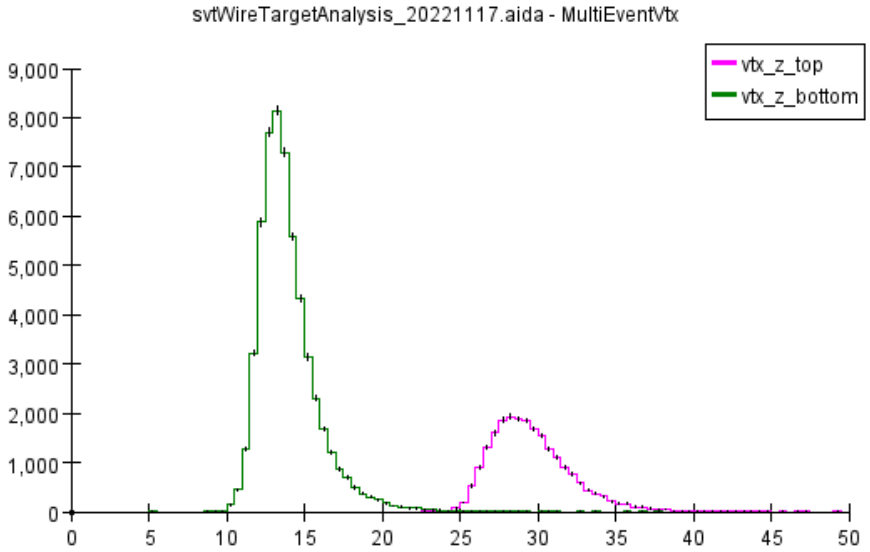
z ~13mm

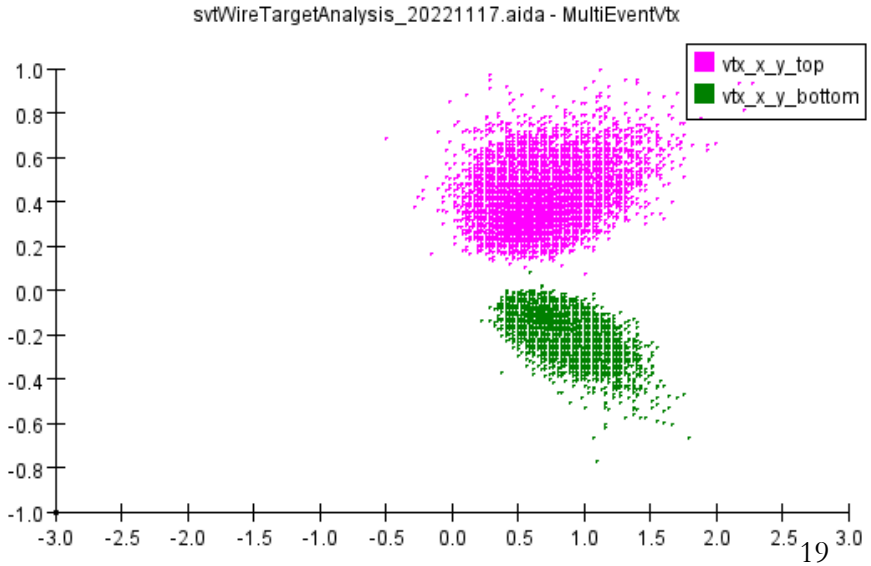


Latest SVT Wire Position Analysis









Vertex Position

- Using the top wire as a target, we vertex bottom tracks and find a z distribution peaked at ~13 mm to be compared with a measured position of 20.600 mm for the top wire
  - $\Delta z = 12 - 20.600 = -8.6$ mm (old)
  - $\Delta z = 13.233 - 20.600 = -7.367$mm (new)
- Using the bottom wire as a target, we vertex top tracks and find a z distribution peaked at ~28 mm to be compared with a measured position of 34.544 mm for the top wire
  - $\Delta z = 28 - 34.544 = - 6.5$ mm (old)
  - $\Delta z = 28.555 - 34.544 = -5.989$ (new)
- Are we really still off by almost a centimeter!?
- Check if we can at least measure the relative distance between the two wires

28.555 - 13.233 = 15.322 (measured)
compared to :
34.544 - 20.600 = 13.944 (predicted)
So, off by -1.378

Next Steps

- The data taken using the SVT positioning wires (runs 14753 and 14754) should be used when imposing a beamspot constraint
  - 01753 SVT beamspot at (0.0, 0.2, 34.544)
  - 01754 SVT beamspot at (0.0, 0.2, 20.600)
  - recall that beam was elevated ~200 μm to give us similar tracker acceptance in top and bottom