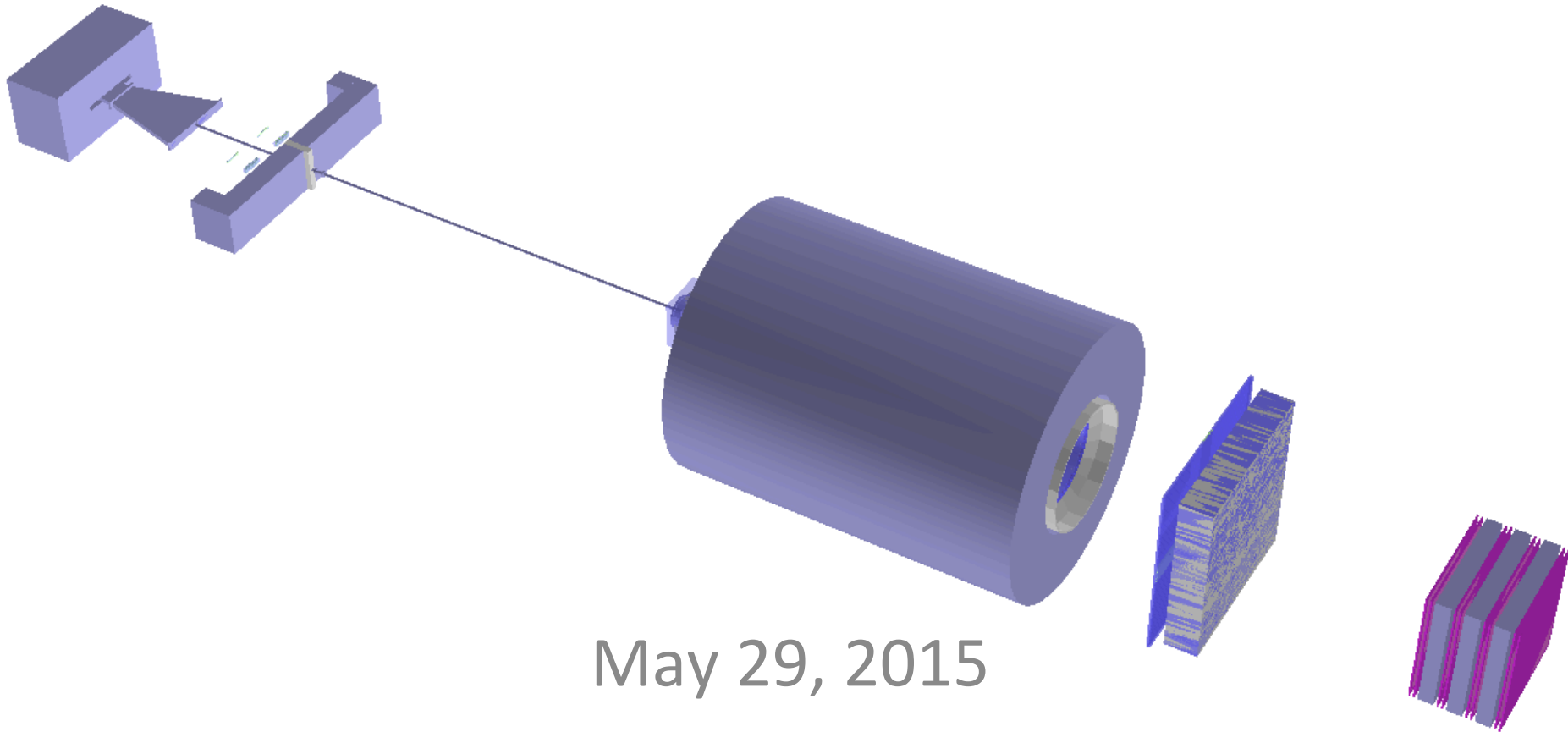
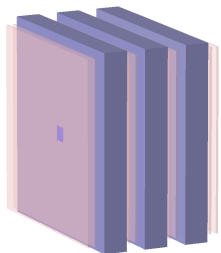


# CPPsim (Geant4 + GlueX)

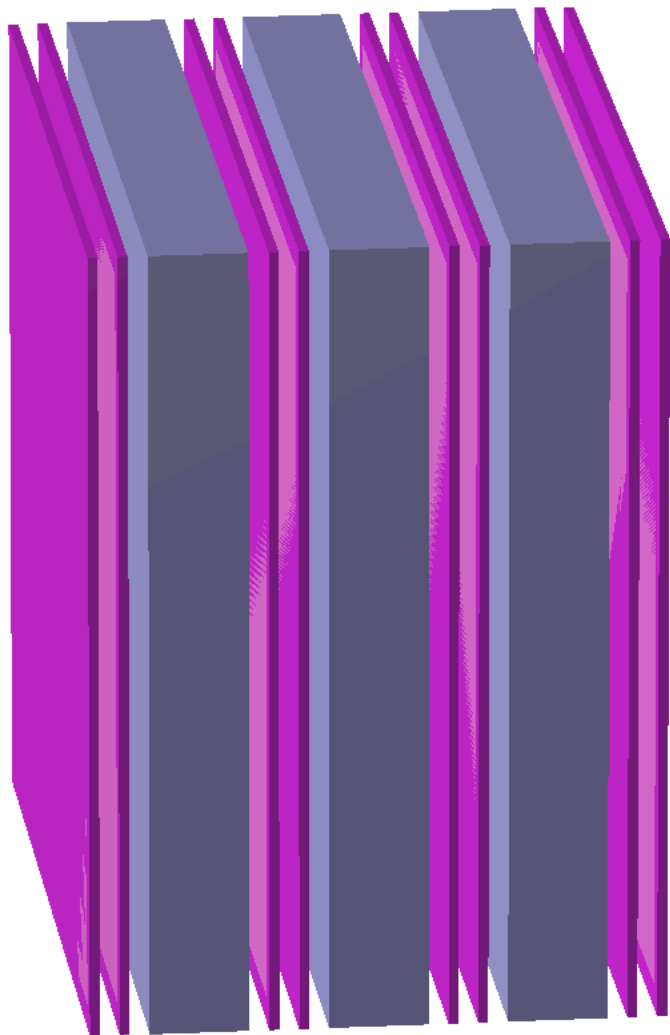


May 29, 2015

David Lawrence JLab



# MWPC definition

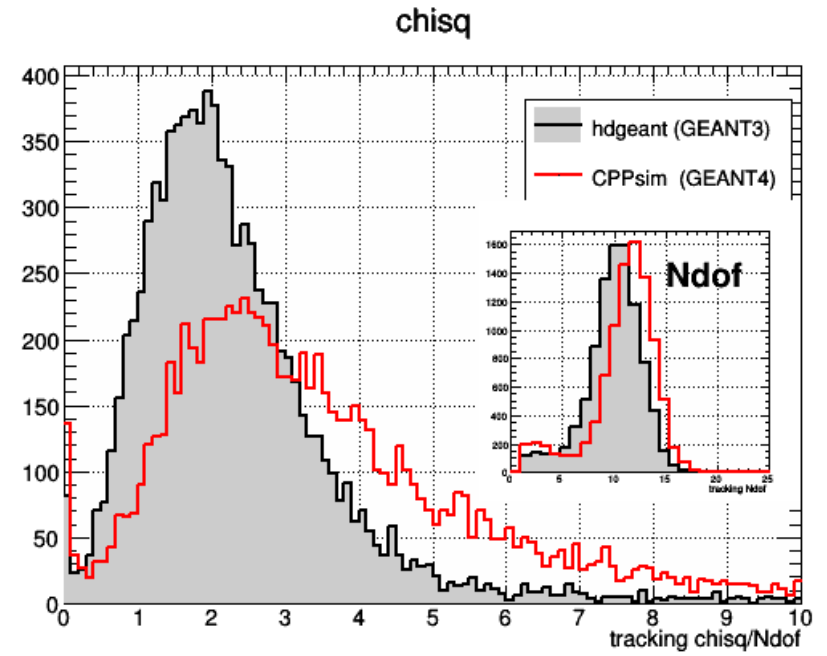
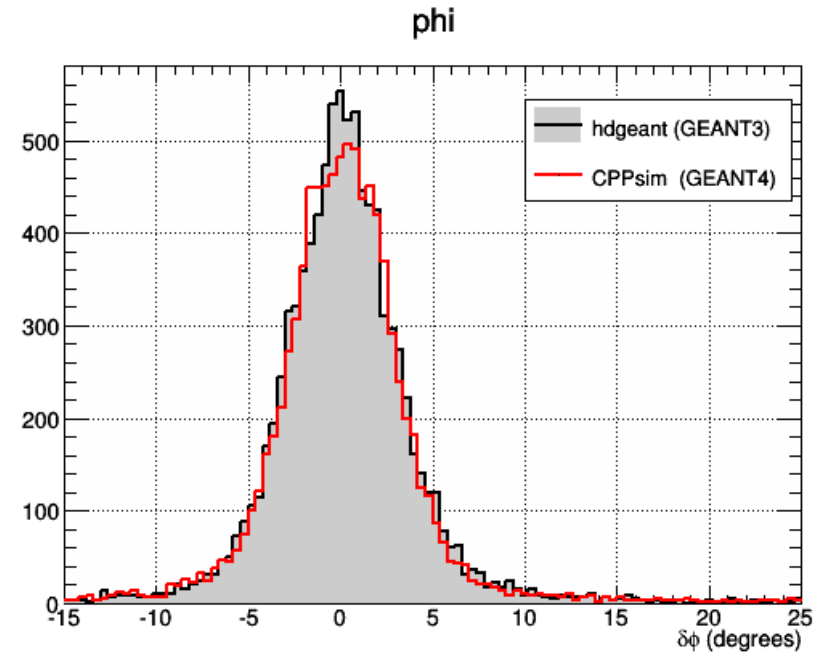
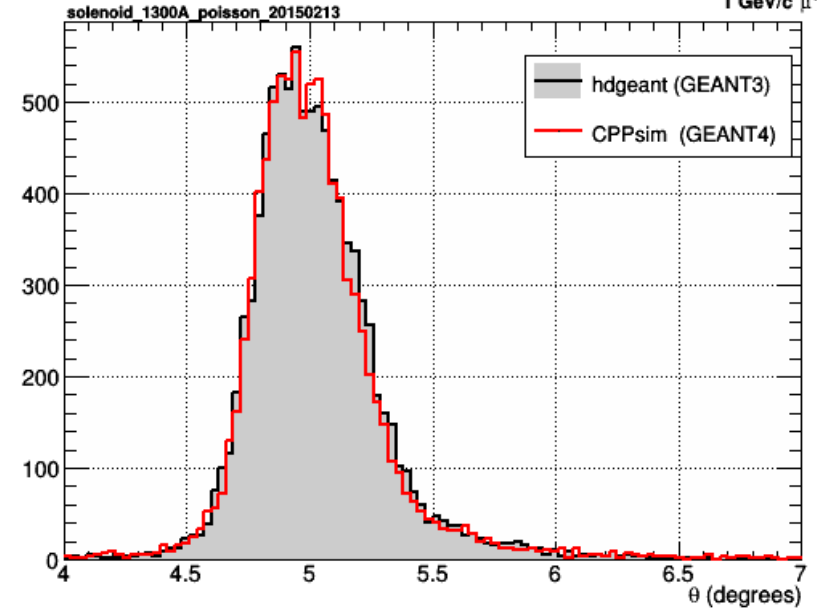
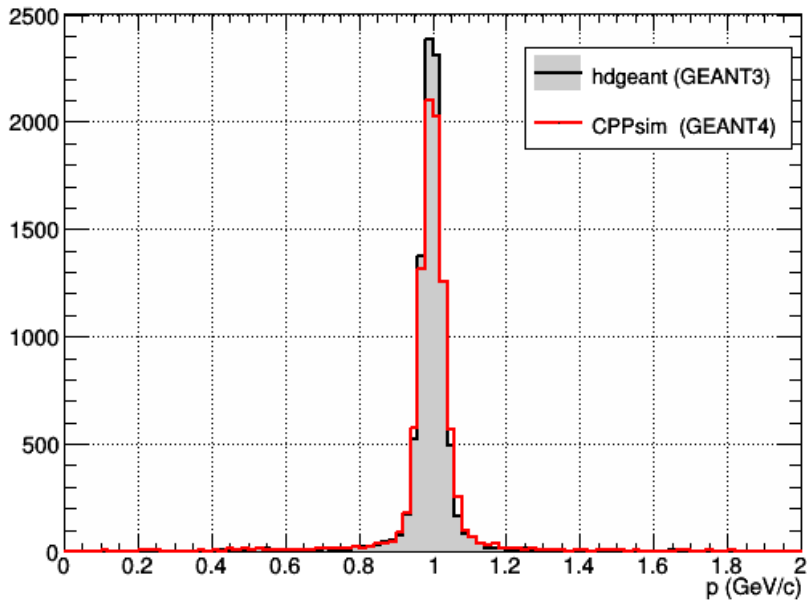


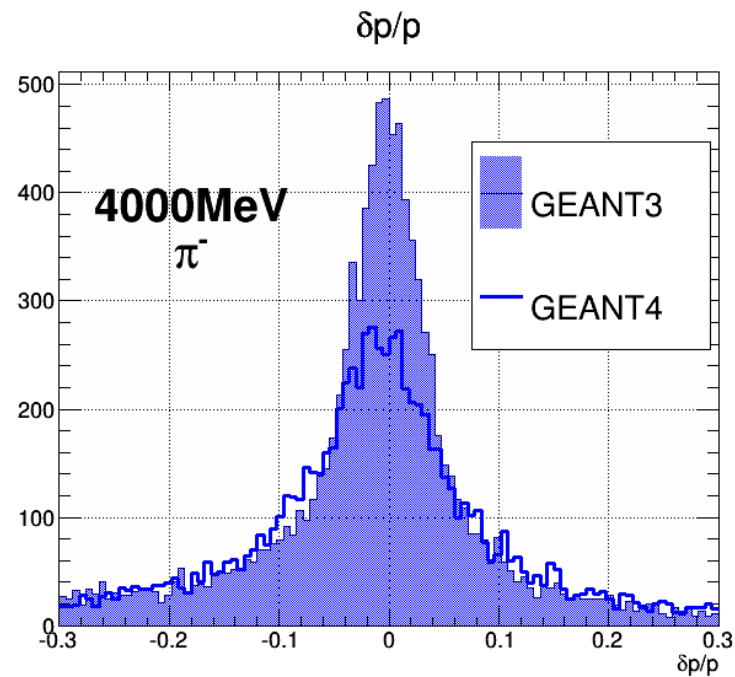
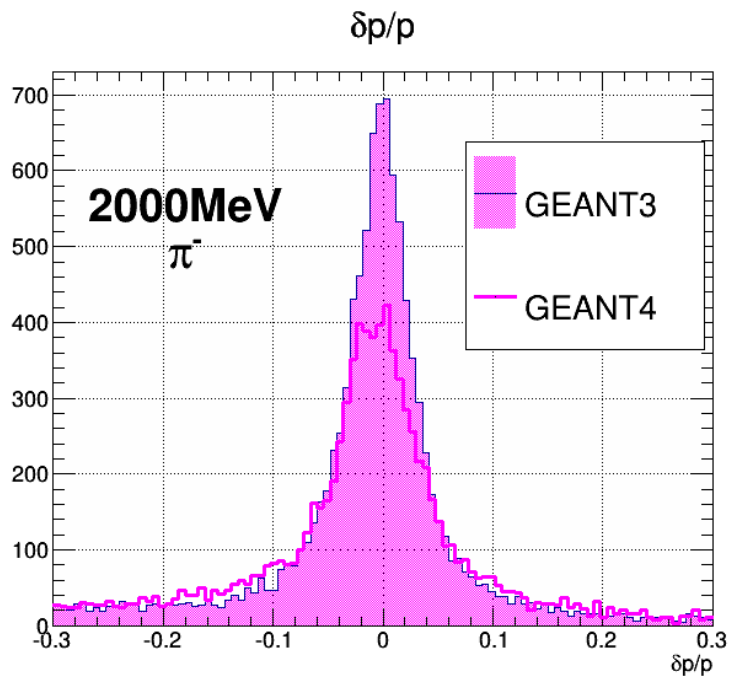
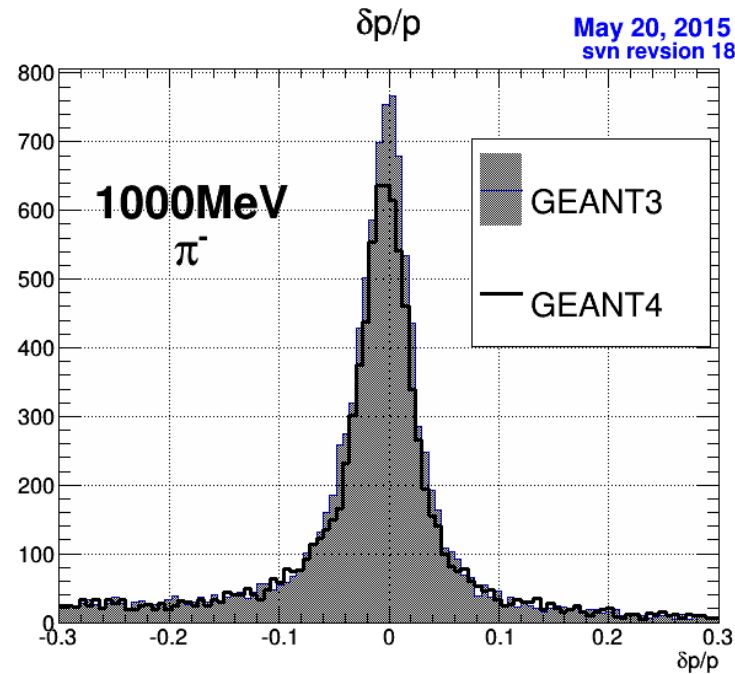
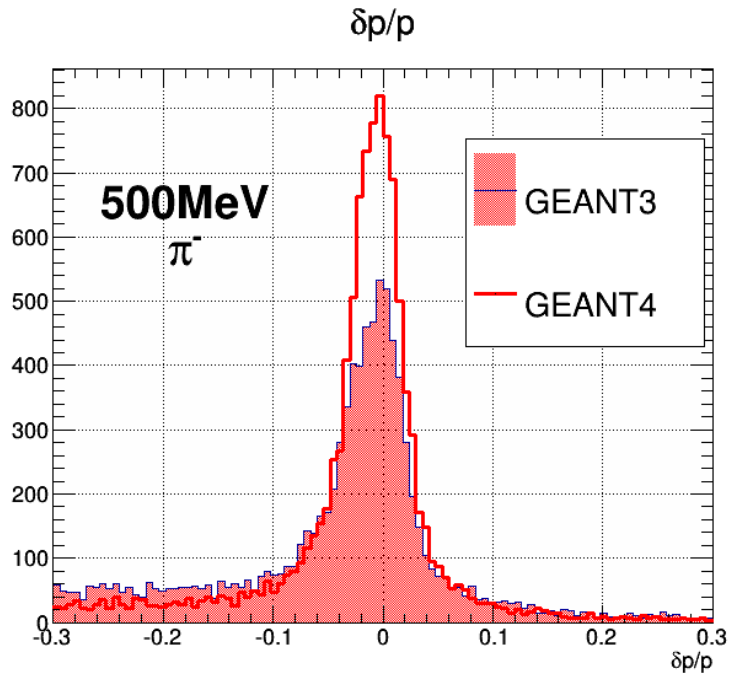
- 8 chambers
  - 2cm Ar/CO<sub>2</sub> (38%/62%)
  - *64" x 64"*
  - Frames are *2"* wide FR-4 (*needs to be fixed!*)
  - Wires not in geometry but hits calculated assuming 1cm spacing with upstream chamber of each pair having wires oriented vertically and downstream chamber horizontally
  - *144 wires per plane*
  - *No cut on dead region near beamline*
- Absorbers
  - 20cm Iron
  - *64" x 64"*
  - 12cm x 12cm beam hole

*red = updated since last meeting*

# Charged muons in FDC

May 6, 2015 DL  
syn revision 18238  
1 GeV/c  $\mu^+$   $\theta=5^\circ$



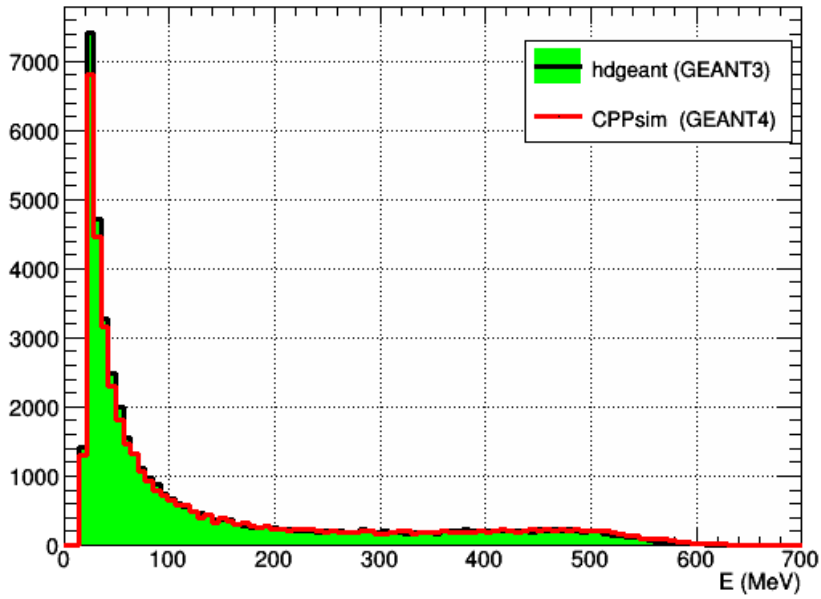




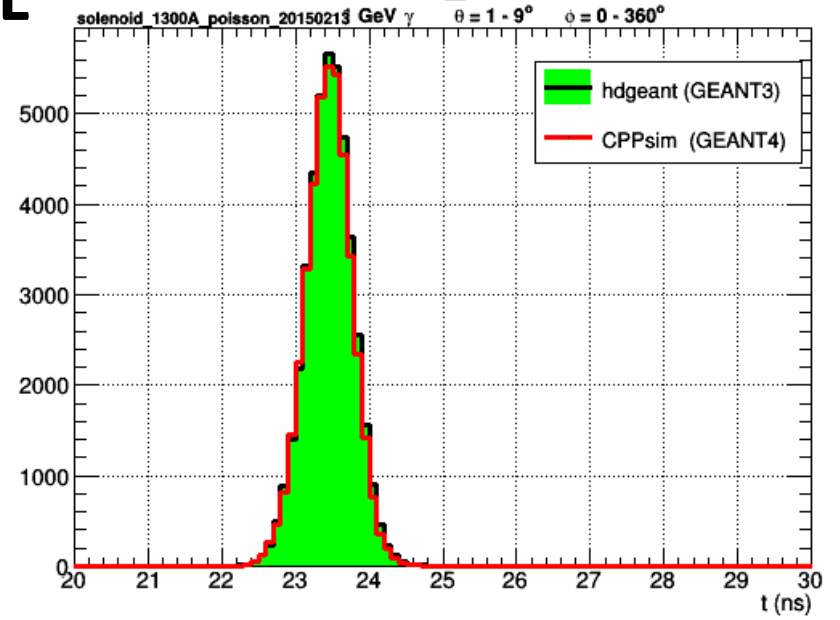


# FCAL

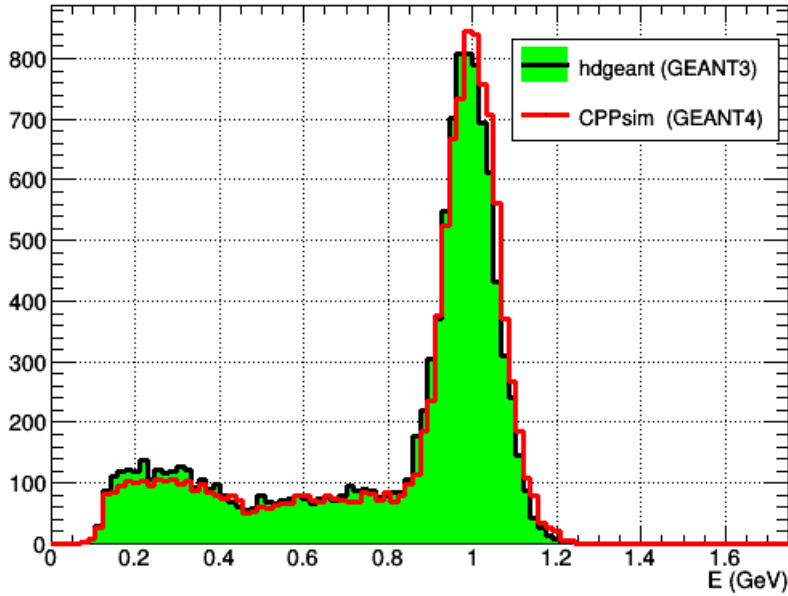
### hitE



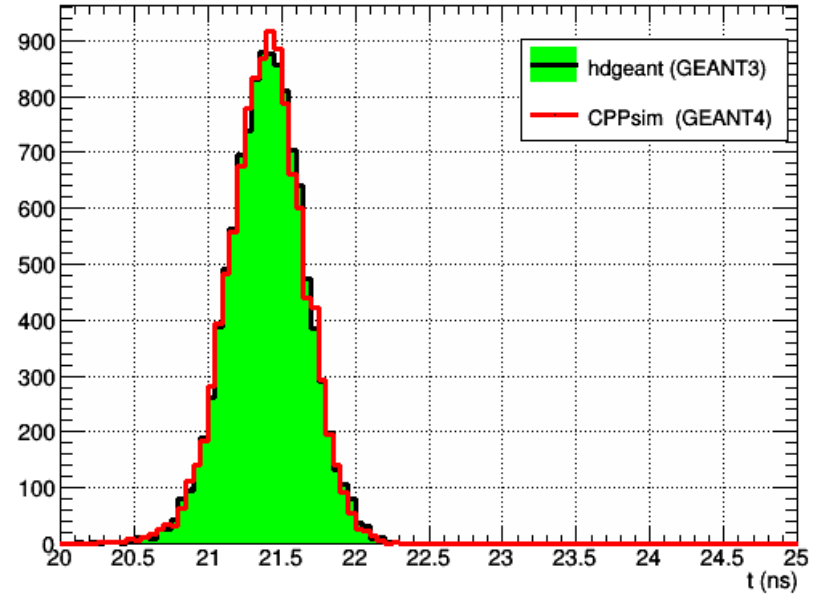
### hit\_t



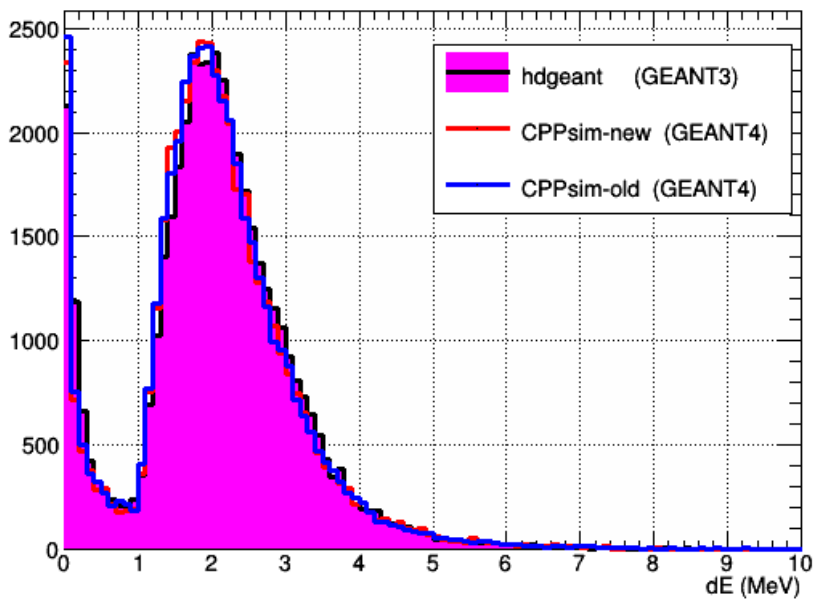
### showerE



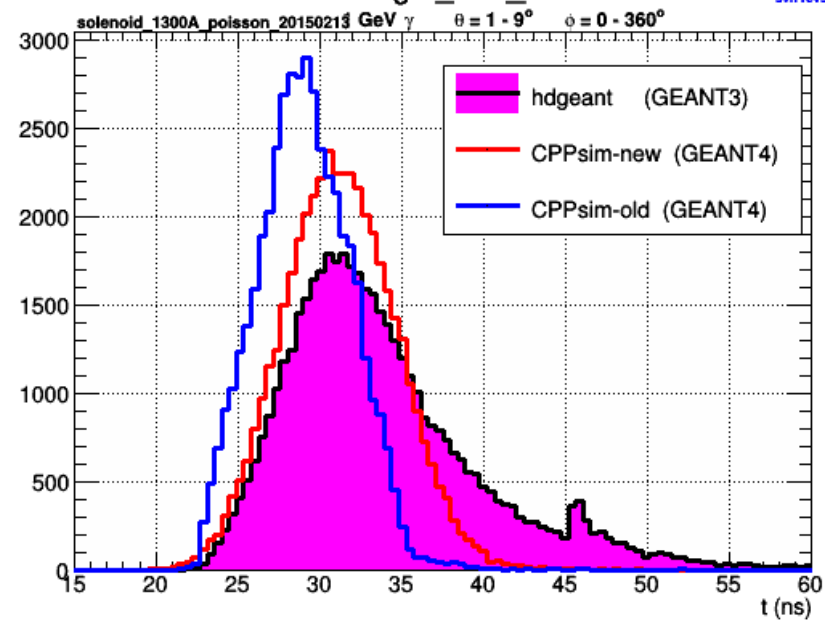
### shower\_t



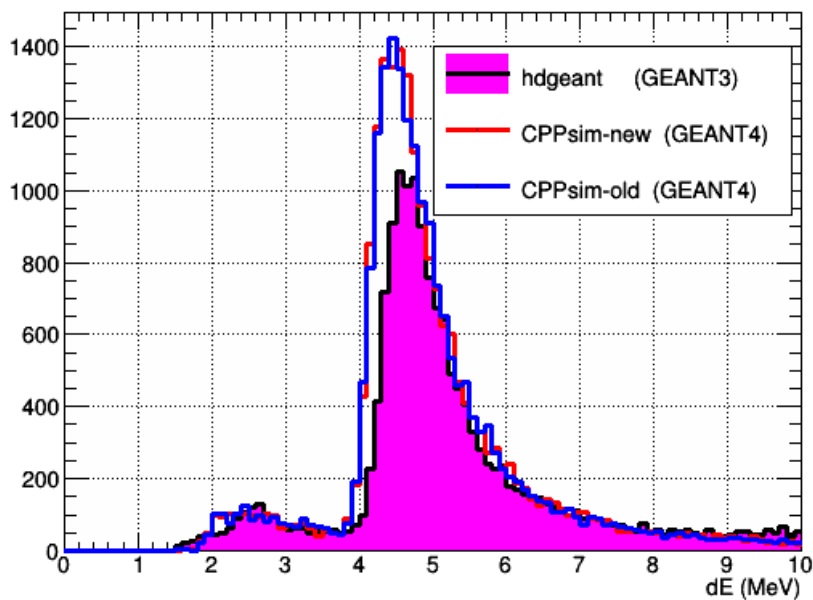
single\_end\_dE



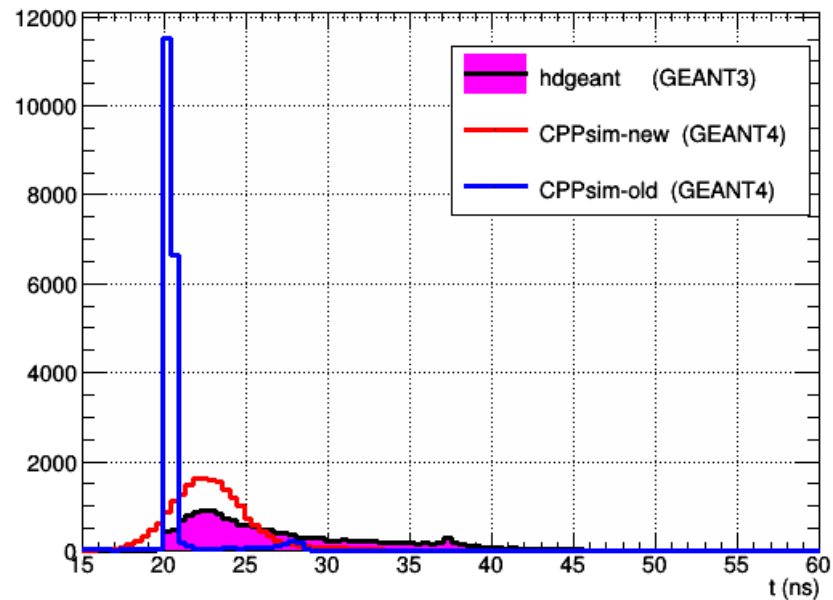
single\_end\_t



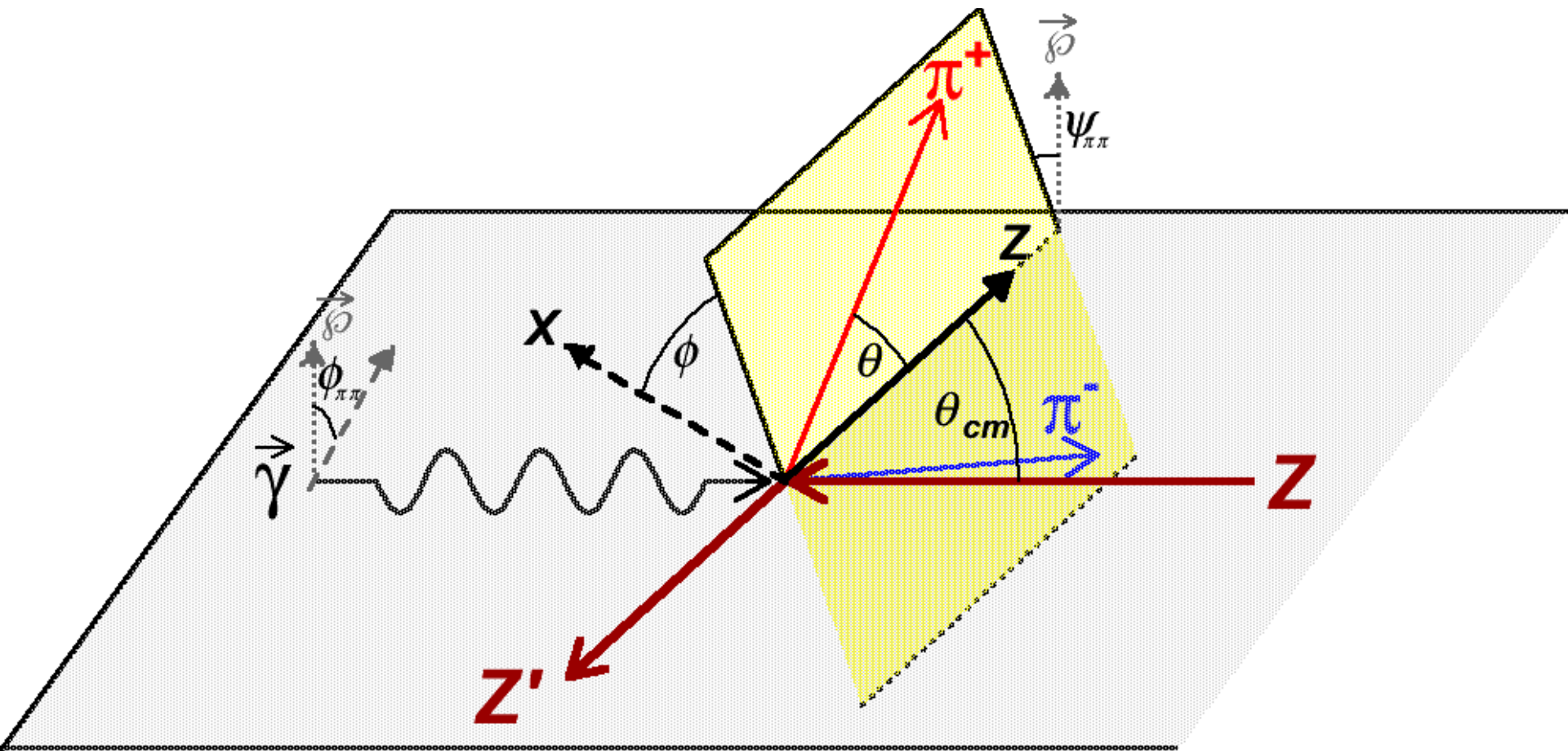
coincidence\_dE



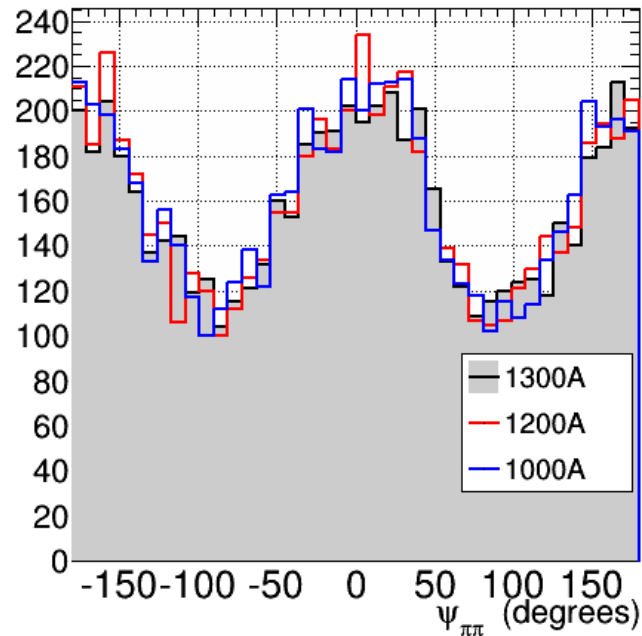
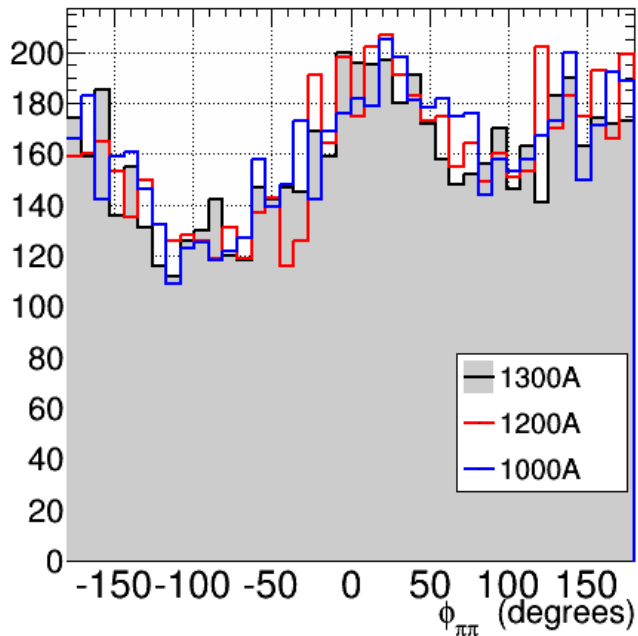
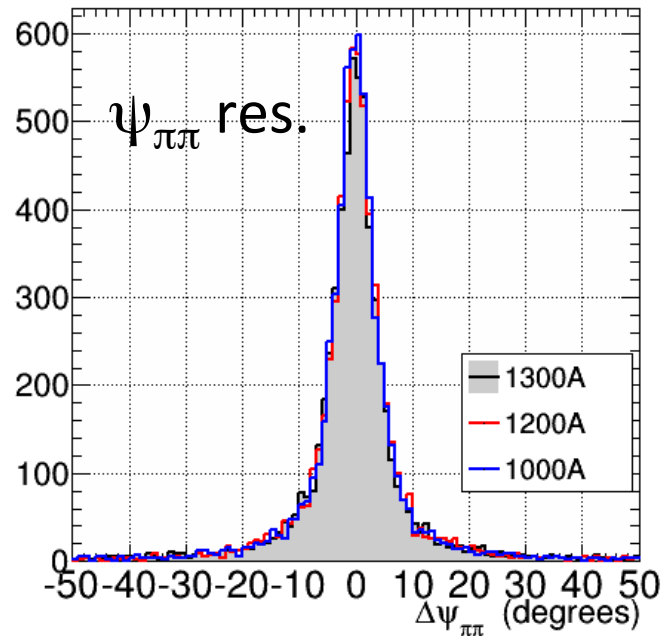
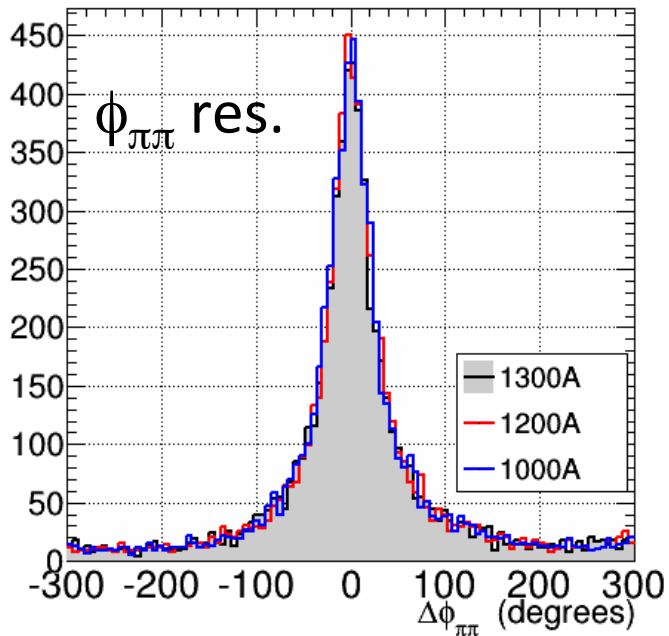
coincidence\_t







# First 10k events of pb\_pol70\_10days



# Summary

- Hits for FDC, TOF, FCAL, and MWPC implemented (*good agreement with hdgeant in many places*)
- Richard Jones at UConn working on more efficient geometry implementation
- Unable to successfully run multi-threaded at this point (new geometry may fix)
- Starting to look at effects of lower field
  - Need to model beam background to see how it affects  $\pi/\mu$  separation

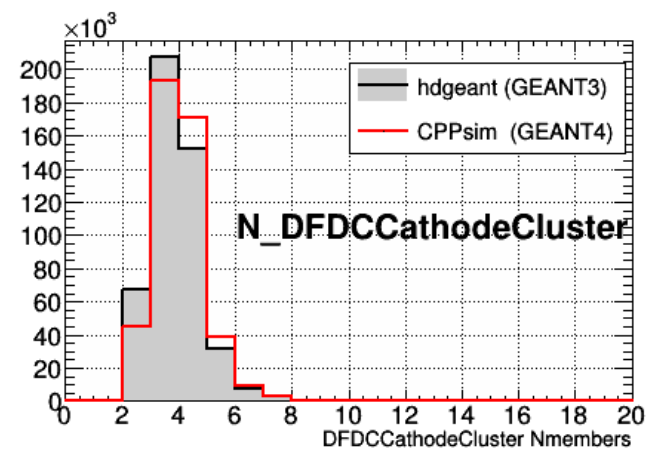
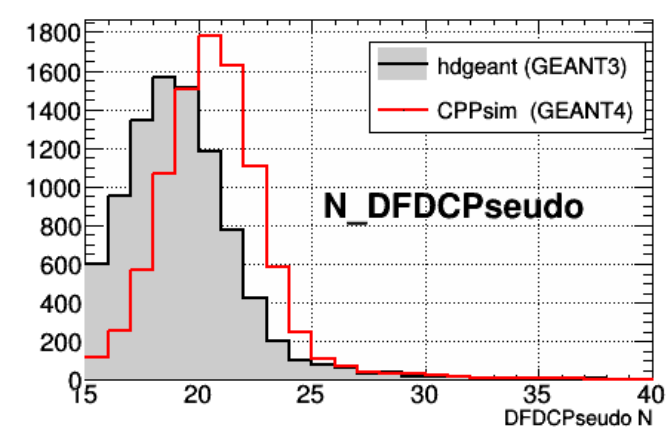
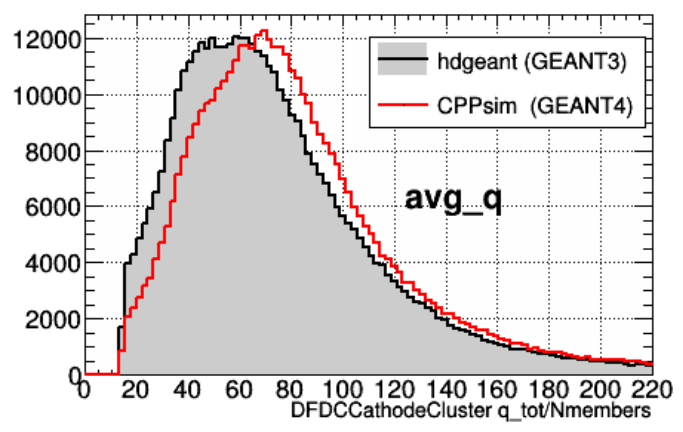
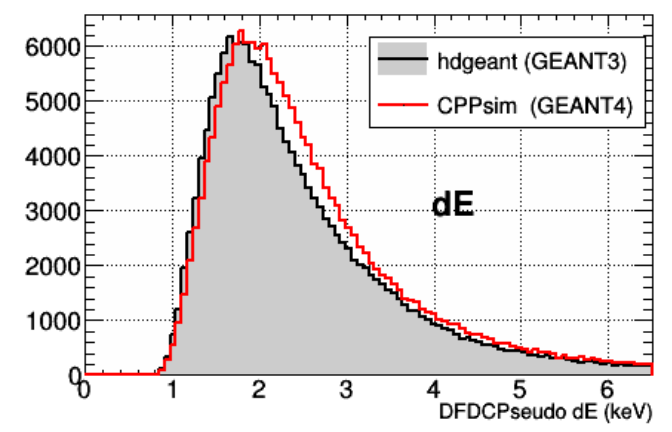
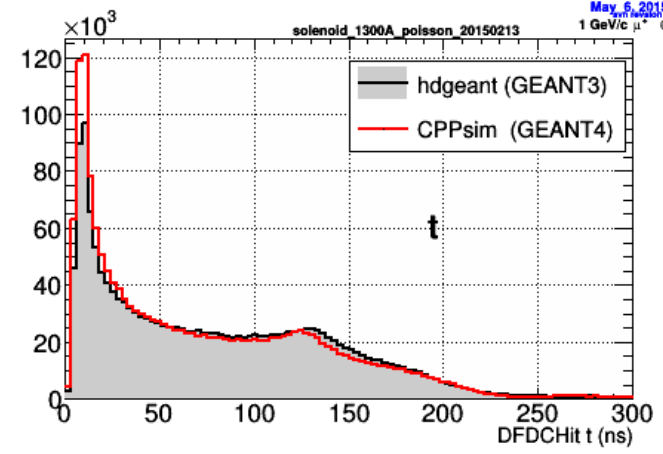
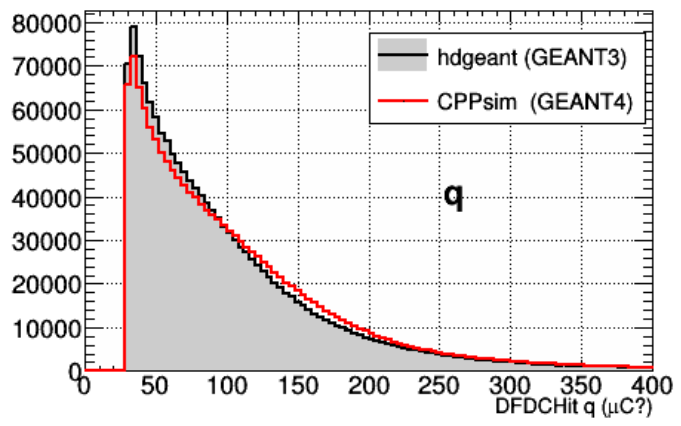
# Geometry Implementation

- Geometry implemented in standard GlueX HDDS, but with dedicated top-level XML file
  - main\_HDDS.xml -> cpp\_HDDS.xml
  - Removed:
    - Start counter
    - Target
    - ComptonEMcal
  - Added:
    - MWPC
    - (still need to add upstream nuclear target)
- Geometry converted to GDML automatically when building HDDS  
\*IF\* local ROOT was built with GDML support
- Anticipate GDML will be replaced in near future with alternative provided by Richard Jones

# Compatibility with *hdgeant*

- Reads same *control.in* (*not all flags honored*)
- Implements particle gun
- Reads same generated event format (HDDM)
- Writes same output format (HDDM)
  - TOF hits
  - FCAL hits
  - FDC hits
  - MWPC hits (*not implemented in hdgeant*)

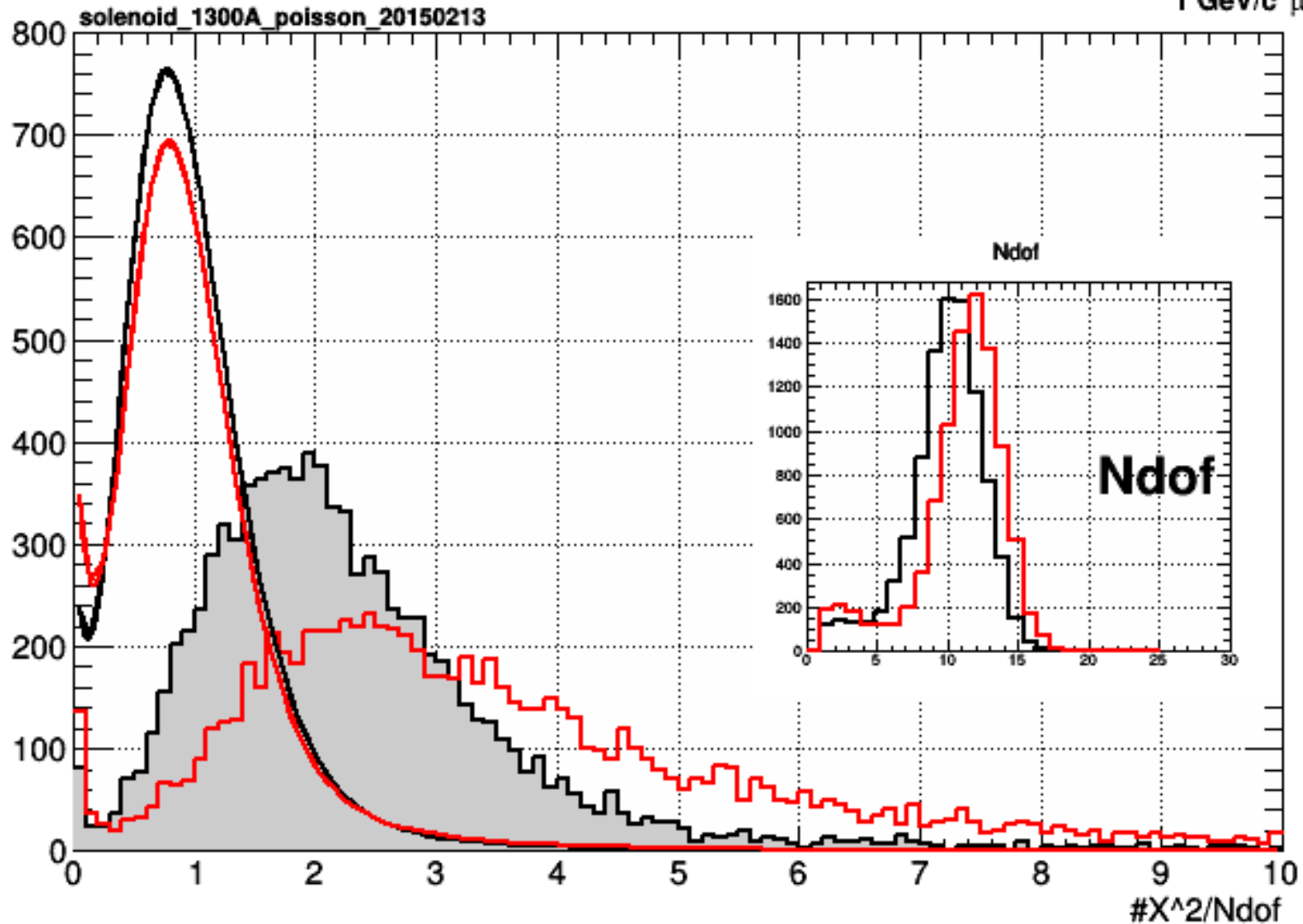
# Charged muons in FDC



# Comparing chi-sq to expected

$$\chi^2/N_{\text{dof}}$$

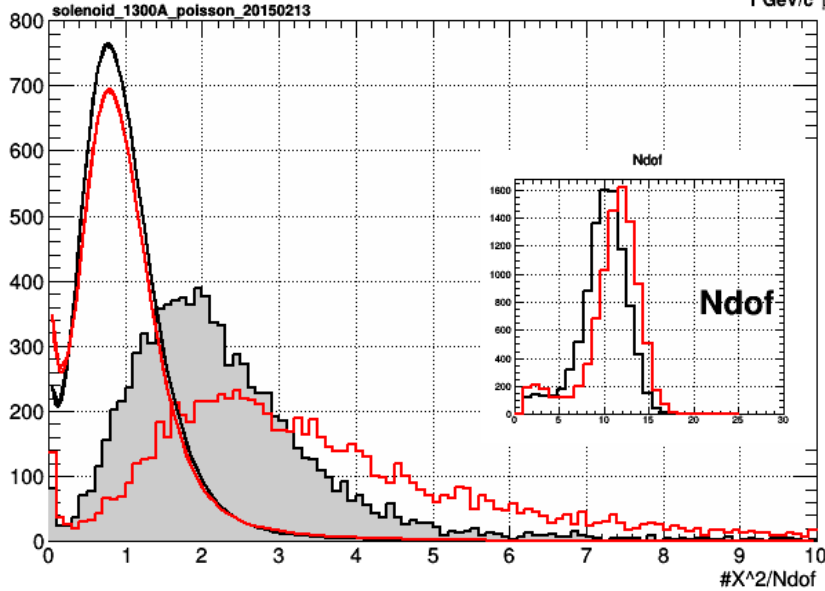
May 6, 2015 DL  
svn revision 18236  
1 GeV/c  $\mu^+$   $\theta=5^\circ$



# Comparing chi-sq to expected

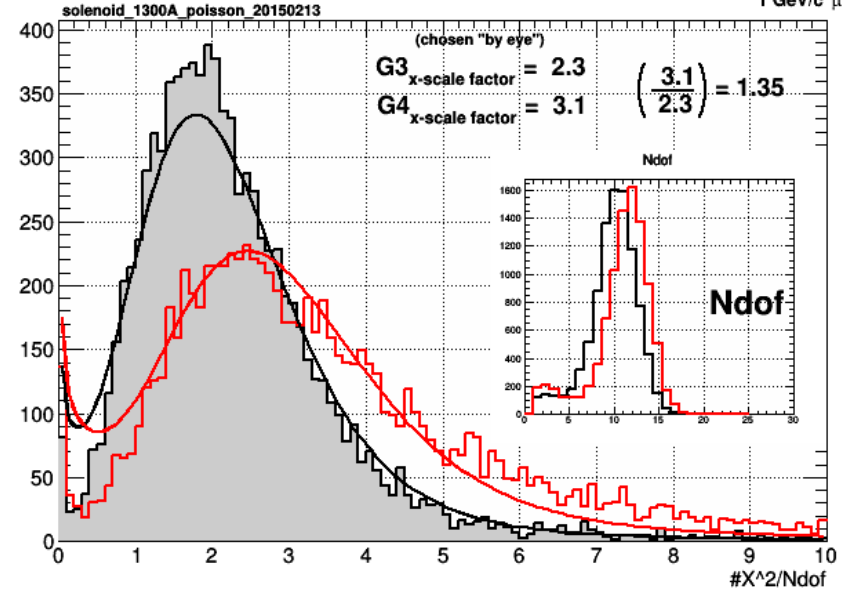
$\chi^2/N_{\text{dof}}$

May 6, 2015 DL  
svn revision 18236  
1 GeV/c  $\mu^+$   $\theta=5^\circ$



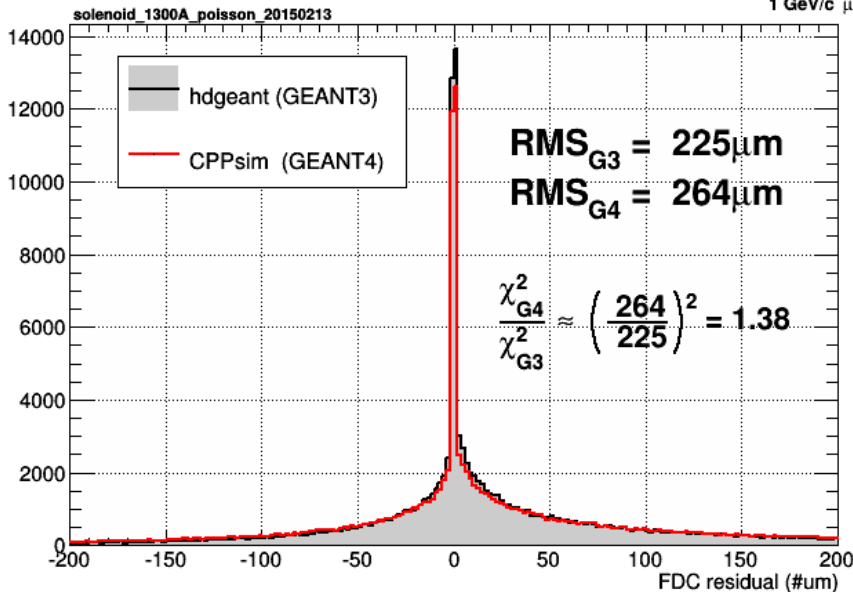
$\chi^2/N_{\text{dof}}$

May 6, 2015 DL  
svn revision 18236  
1 GeV/c  $\mu^+$   $\theta=5^\circ$



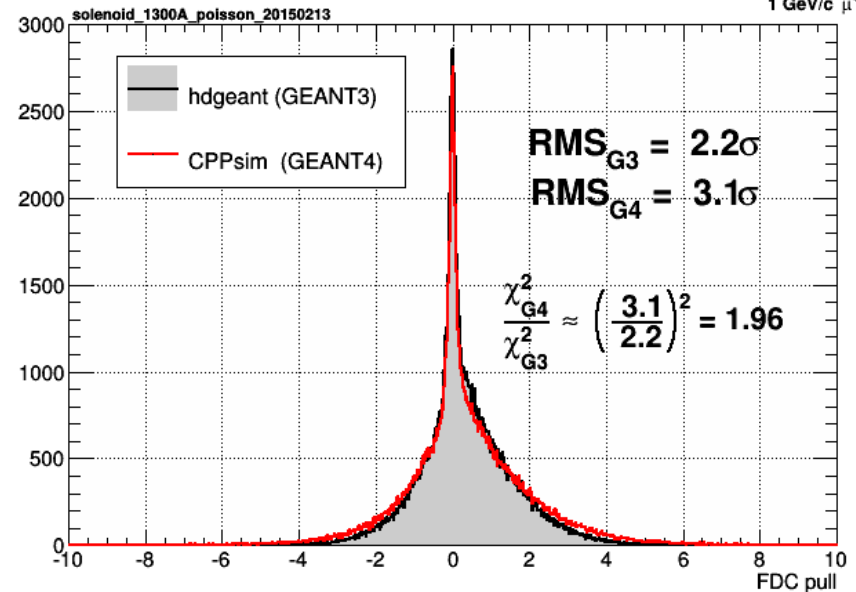
$\chi^2/N_{\text{dof}}$

May 6, 2015 DL  
svn revision 18236  
1 GeV/c  $\mu^+$   $\theta=5^\circ$



$\chi^2/N_{\text{dof}}$

May 6, 2015 DL  
svn revision 18236  
1 GeV/c  $\mu^+$   $\theta=5^\circ$





Tracking momentum resolution vs.  $\theta$

