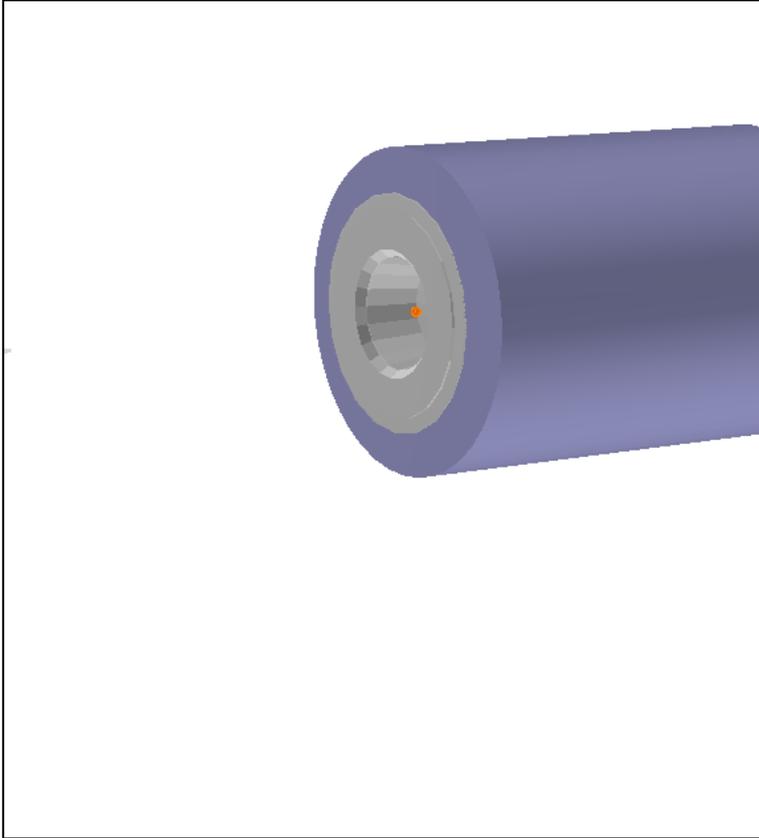


# Pion Polarizability MC Studies

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Apr. 26, 2012

# Geometries



Two geometries used for the current study:

1.) Nominal GlueX geometry with 30cm LH2 target replaced with 5% rad. len. Pb target.

2.) Same as 1.) but with Pb target moved 1m upstream and start counter removed.

For both geometries, the XML was updated and the material map for the target region was regenerated

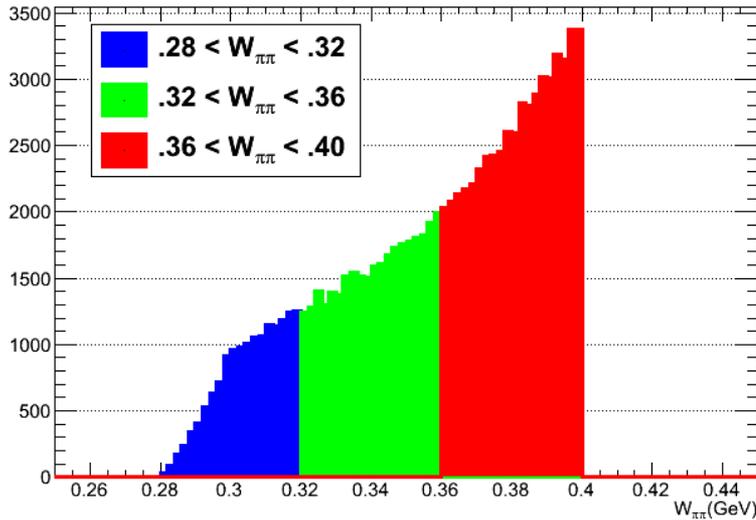
[https://halldweb1.jlab.org/wiki/images/9/97/20120426\\_Upstream\\_target.qif](https://halldweb1.jlab.org/wiki/images/9/97/20120426_Upstream_target.qif)

*Upstream target geometry where target was placed 1m upstream from nominal GlueX target position. Orange marker indicates location of target.*

# Generated distributions

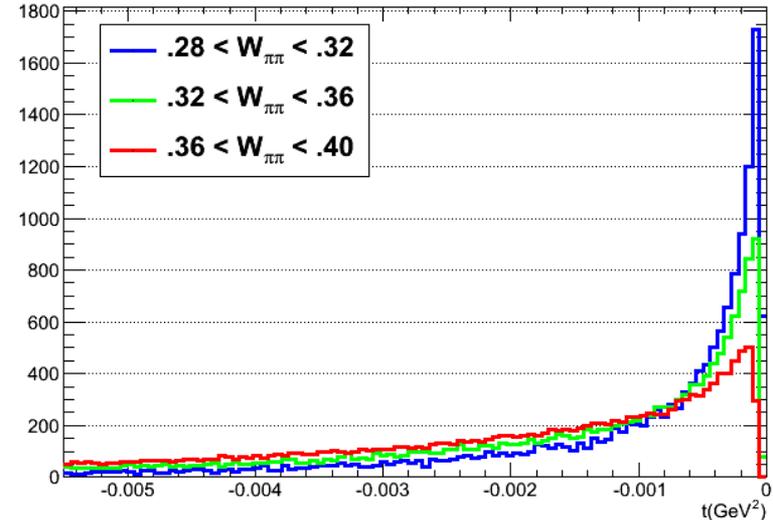
$\pi^+\pi^-$  invariant mass

April 25, 2012 DL  
svn revision 9024  
Generated values

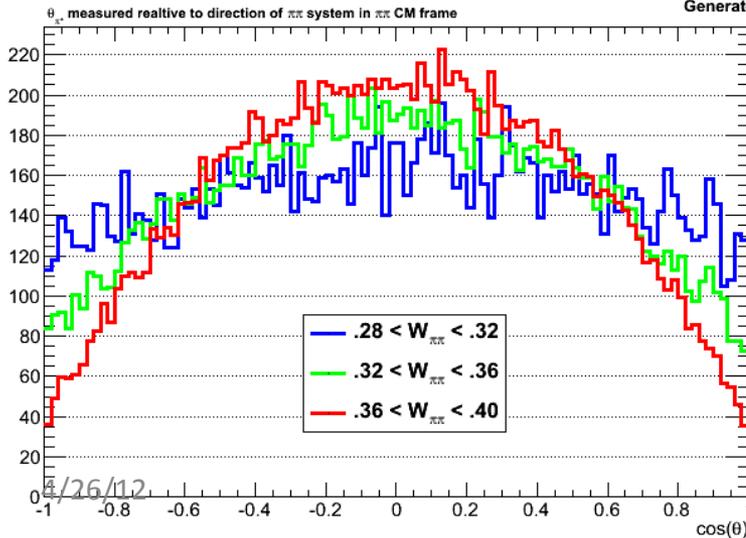


momentum transfer  $t$

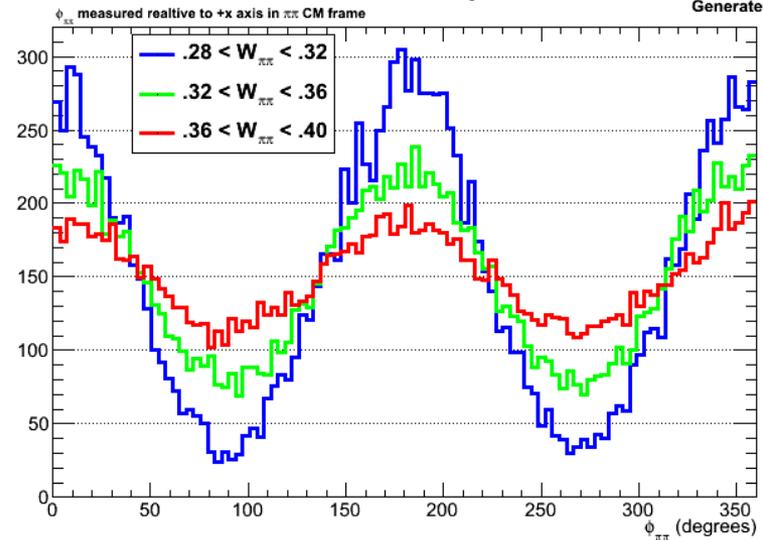
April 25, 2012 DL  
svn revision 9024  
Generated values



Cosine of  $\pi^+$  in  $\pi\pi$  CM frame relative to direction of  $\pi\pi$  system April 25, 2012 DL  
svn revision 9024  
Generated values

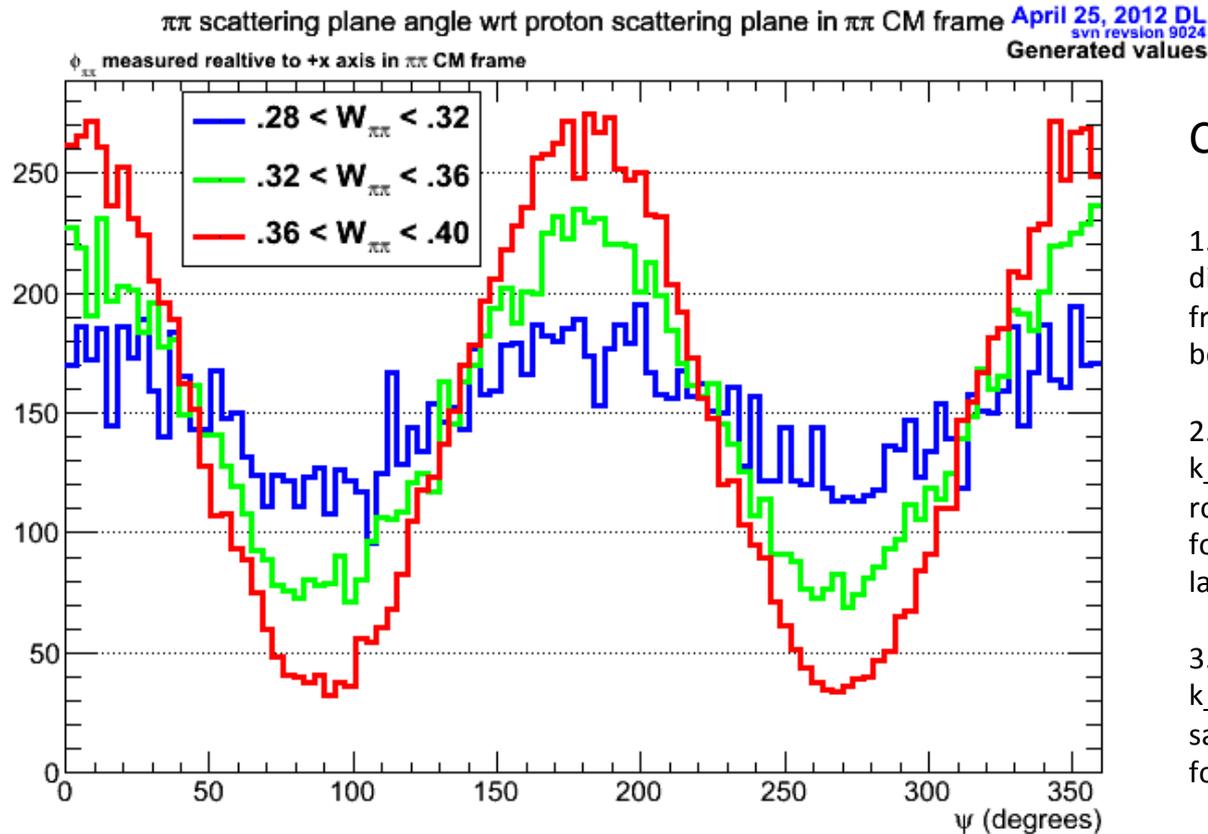


Azimuthal distribution of  $\pi^+\pi^-$  system in Lab frame April 26, 2012 DL  
svn revision 9024  
Generated values



4/26/12

# $\psi$ From generated events



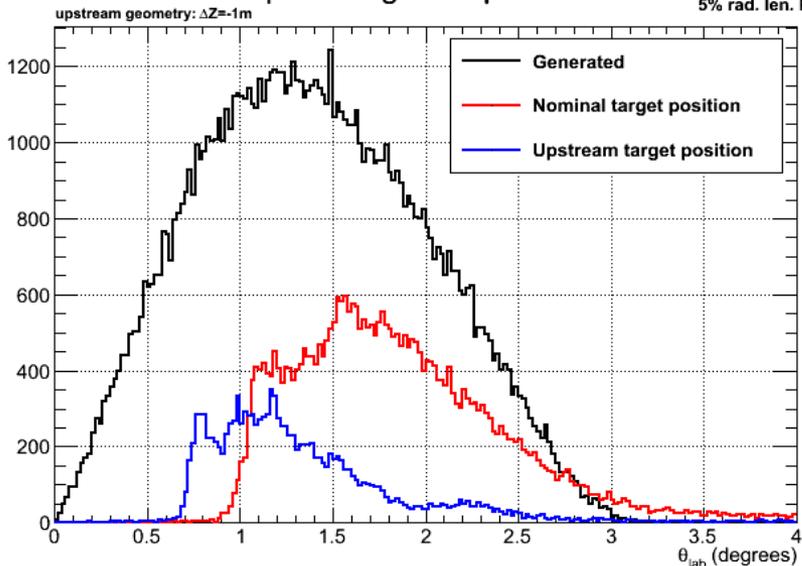
Calculated using Rory's recipe:

1. Find the unit vector  $k_{\text{hat}}$  that points in the direction of the  $\pi\pi$  cm system in the lab frame, where the beam axis is in the  $z$  direction.
2. Do a rotation around the  $y$  axis, so that  $k_{\text{hat}}$  is now in the  $y$ - $z$  plane. Do the same rotation for the  $k_{+ \text{hat}}$ , the unit vector pointing in the lab direction of the  $\pi^+$ .
3. Do a rotation around the  $x$  axis, so that  $k_{\text{hat}}$  now points in the  $z$  direction. Do the same rotation for  $k_{+ \text{hat}}$ .
4. The angle  $\psi$  is given by  $\cos(\psi) = k_{+x} / \sqrt{k_{+x}^2 + k_{+y}^2}$

# Fully reconstructed $\theta_{\text{lab}}$

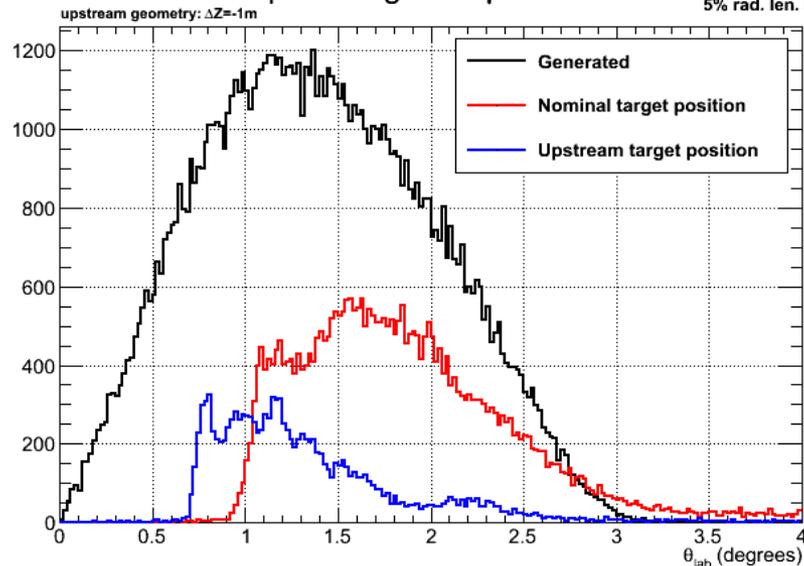
$\pi^+$  polar angle for  $\gamma X \rightarrow X \pi^+ \pi^-$

April 26, 2012 DL  
svn revision 9061  
5% rad. len. Pb target



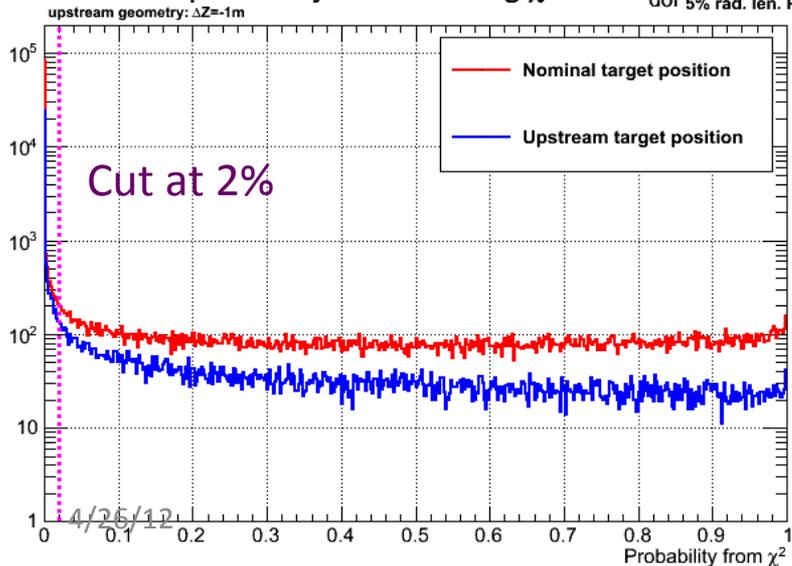
$\pi^-$  polar angle for  $\gamma X \rightarrow X \pi^+ \pi^-$

April 26, 2012 DL  
svn revision 9061  
5% rad. len. Pb target



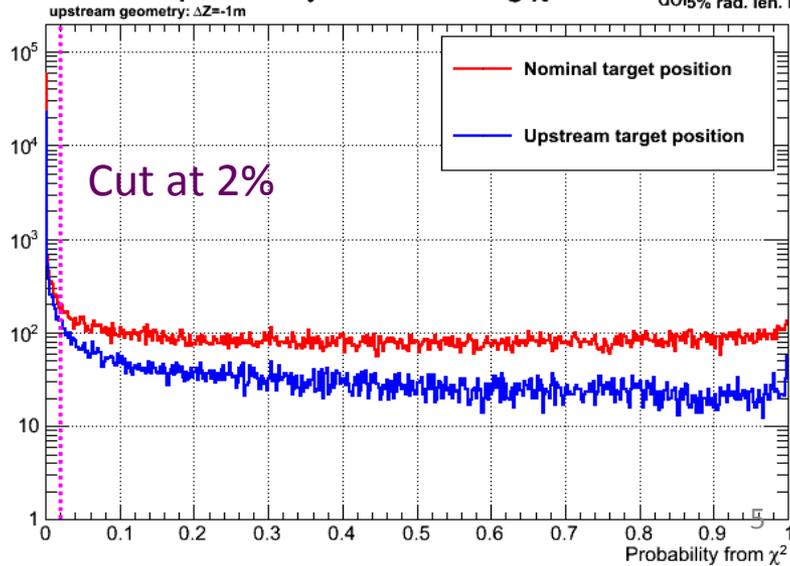
$\pi^+$  probability from tracking  $\chi^2$  and  $N_{\text{dof}}$

April 26, 2012 DL  
svn revision 9061  
5% rad. len. Pb target

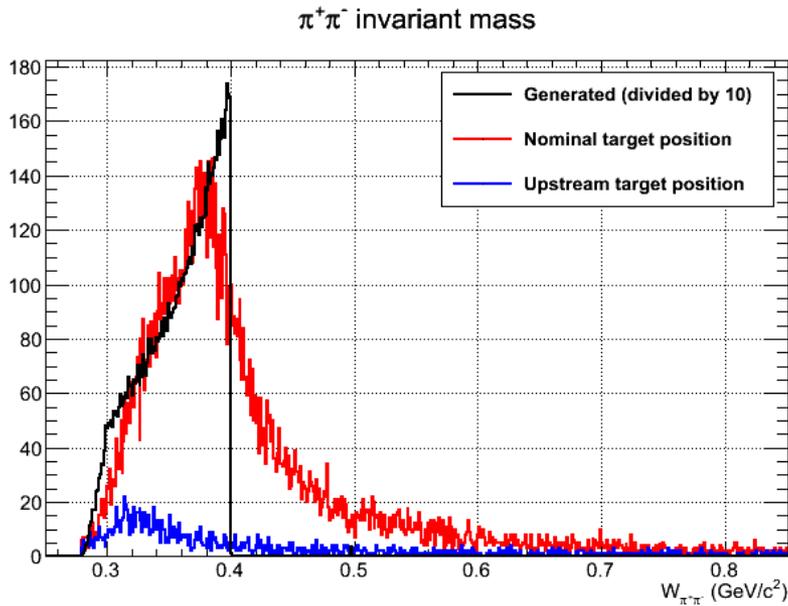


$\pi^-$  probability from tracking  $\chi^2$  and  $N_{\text{dof}}$

April 26, 2012 DL  
svn revision 9061  
5% rad. len. Pb target



# $\pi^+\pi^-$ invariant mass



Acceptance here is very low for the upstream target geometry.

Tuning the tracking code to this geometry should (hopefully) improve this significantly.

