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Subject: entries at unphysical mass after vertex fit  
Posted by [Albrecht Gillitzer](#) on Thu, 04 Dec 2014 09:17:53 GMT  
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Hi all,

When comparing the Lambda mass spectrum evaluated before and after the vertex fit using PndKinVtxFitter, one can see that the fwhm of the Lambda mass distribution improves by the vertex fit but in contrast larger tails in the mass distribution are created. On the low mass side the tails extend far into the unphysical region at masses below the sum mass of the daughter particles  $M_{\text{sum}} = m_{\pi} + m_p$ .

The attached plot has been generated from 10000 events 4 GeV/c pbar p --> Xi-bar+ Xi- (PHSP) --> Lambda-bar pi+ Lambda pi- --> pbar pi+ pi+ p pi- pi- with the oct14 release. Upper row: Lambda mass before vertex fit / Lower row: after vertex fit // Left: lin y axis / Right: log y axis.

The corresponding plot for Lambda-bar shows the same feature. Simulation and analysis of the same reaction with the scrut14 release also shows the same feature.

My interpretation: Can it be that in the vertex fit the 3-momenta of the daughter particles are modified according to the modified track parameters as a result of the fit, but their energies are left unchanged? As a consequence the energy momentum relation would be destroyed and particles no longer would have the correct mass value.

Albrecht

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### File Attachments

1) [LambdaMass\\_4p.pdf](#), downloaded 384 times

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Subject: Re: entries at unphysical mass after vertex fit  
Posted by [Ralf Kliemt](#) on Thu, 04 Dec 2014 10:49:43 GMT  
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Hallo Albrecht,

Firstly I suggest you do a crosscheck with the other vertex fitter PndVtxPRG. From my understanding there you don't alter the momentum magnitude and energy of the daughter particles.

Secondly, you may want to study the fit quality (chisquare) for the unphysical candidates.

Kind regards.  
Ralf

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Subject: Re: entries at unphysical mass after vertex fit  
Posted by [Ralf Kliemt](#) on Thu, 04 Dec 2014 10:59:03 GMT  
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Hi again,

Please plot the masses of the daughters (pions/protons) before and after the fit. Those should be exact needles.

Cheers

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Subject: Re: entries at unphysical mass after vertex fit  
Posted by [Jennifer Pütz](#) on Mon, 17 Aug 2015 13:16:16 GMT  
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Hi everyone,

I found the same problem as Albrecht. I plotted the difference of the masses of the daughters before and after the fit and saw that they are not exact needles. So I had a closer look into the PndKinVtxFitter and found that the four-momentum of the daughters after the vertex fit is set to  $(p_{\text{vtx}}, E_{\text{vtx}})$ .  $p_{\text{vtx}}$  and  $E_{\text{vtx}}$  are the 3-momentum-vector and the energy of the daughter particle coming out of the vertex fit.

But  $E_{\text{vtx}}$  is not taking the mass hypothesis of the daughter particle into account. So I replaced  $E_{\text{vtx}}$  with  $\sqrt{p_{\text{vtx}}^2 + m^2}$ . (This was already implemented in the code but commented out.)

After doing that, the unphysical masses for Lambda0 have disappeared and the mass differences show now exact needles (see attached files).

Best,

Jenny

### File Attachments

- 1) [Lambda0Mass\\_vtxfit\\_uncorrected.pdf](#), downloaded 476 times
  - 2) [Lambda0Mass\\_vtxfit\\_daughters\\_uncorrected.pdf](#), downloaded 380 times
  - 3) [Lambda0Mass\\_vtxfit\\_corrected.pdf](#), downloaded 389 times
  - 4) [Lambda0Mass\\_vtxfit\\_daughters\\_corrected.pdf](#), downloaded 357 times
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