
Subject: PndMicroWriter and pi0 reconstruction efficiency
Posted by [Bertram Kopf](#) on Mon, 02 Feb 2009 16:02:33 GMT
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Dear EMC and analysis experts,

as far as I can see in the code, the "PndMicroWriter" is responsible for the conversion of the reco objects to the TCandidate objects. The EmcCluster list is used here for the creation of the neutral candidates.

I simulated 1000 single pi0 events (momentum: 5 GeV/c) and analysed these events with rho. Here is the result for the invariant gamma gamma mass:

http://www.ep1.rub.de/~bertram/inv_gg_cluster.pdf

By using to the bump list as input in the "PndMicroWriter" I get the following result which looks definitely better:

http://www.ep1.rub.de/~bertram/inv_gg_bump.pdf

Therefore my questions:

1. Is the gamma gamma analysis for the Physics Book based on rho tools and on the standard "PndMicroWriter". If so than one can explain the efficiency drop for high pbar momenta since the cluster reconstruction and "not the bump splitting" has been used.
2. I don't see the place (neither in the reconstruction nor in the analysis part) where the gamma threshold of normally 10MeV or 20MeV has been applied. Did I overlook it somewhere?
3. In "PndMicroWriter" the EMC energy correction has been applied by using just a factor of 1.035. The cluster / bump object contains the method "GetEnergyCorrected()". Why is this method not used for the energy correction?
4. The objects "PndEmcRecoHit" are finally created in the standard emc reconstruction. Therefore I assume that this list should be the input for the rho analysis? Is this now a dummy which will be used in the future?

Best regards,
Bertram.

Subject: Re: PndMicroWriter and pi0 reconstruction efficiency
Posted by [Stefano Spataro](#) on Mon, 02 Feb 2009 18:22:06 GMT
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Hi,
some of the answers you ask:

Bertram Kopf wrote on Mon, 02 February 2009 17:02

1. Is the gamma gamma analysis for the Physics Book based on rho tools and on the standard "PndMicroWriter". If so than one can explain the efficiency drop for high pbar momenta since

the cluster reconstruction and "not the bump splitting" has been used.

No, it does not. The direct EmcBump object is used (or at least, this is what I know, I don't think the analysis was moved to the TCandidate).

Quote:

2. I don't see the place (neither in the reconstruction nor in the analysis part) where the gamma threshold of normally 10MeV or 20MeV has been applied. Did I overlook it somewhere?

Try to look at the parameter directory, in particular macro/params/emc.par (or all.par). In the container [PndEmcRecoPar] you can see that the energy cuts to build a cluster are set to 3 MeV (the units are GeV):

```
EnergyThresholdBarrel:d 3.0e-3  
EnergyThresholdFWD:d 3.0e-3  
EnergyThresholdBWD:d 3.0e-3  
EnergyThresholdShashlyk:d 8.0e-3
```

(8 MeV for the Shashlyk). This is a conservative threshold, at the moment the user should tune the energy cut for his analysis. For my old h_c plots I have always used 30 MeV, I think for gamma gamma analysis there are no cuts, simply the bumps with the highest energies are taken into account (but I have no deep insight on that analysis).

Quote:3. In "PndMicroWriter" the EMC energy correction has been applied by using just a factor of 1.035. The cluster / bump object contains the method "GetEnergyCorrected()". Why is this method not used for the energy correction?

The PndMicroWriter was written before the energy correction by Dima, so it has the old 1.035 factor for the barrel part. I suppose Klaus should implement the new change inside the MicroWriter.

Quote:

4. The objects "PndEmcRecoHit" are finally created in the standard emc reconstruction. Therefore I assume that this list should be the input for the rho analysis? Is this now a dummy which will be used in the future?

The EmcRecoHit was an object requested long time ago by the genfit developers, for Kalman filter. After some time we have decided to not use the emc points for the kalman tracking, because of the reduced resolution with respect to tracking detectors and because new points make the analysis slower. So at the moment it is a dummy object which is not used at all. Maybe we should remove its task from the standard full_emc.C macro, in order to not introduce further misunderstanding.

At the moment, in the "lhetrack mode", the rho package (with MicroWriter) loops over LhePidTrack, which has the correlation to the EmcCluster of emc barrel (no endcaps), and takes the emc energy from that TCA. LheTrack at the moment does not use Bumps, because when I have written the code the bump code was not tested and those numbers had to be fixed. If we think that the bumps are now stable, I could easily modify the code and take the

info directly from the EmcBump.

I remember klaus has developed some other tools for neutral candidates, but I have no insight on his code, one should ask him directly.

I hope I have clarified some doubts.

Subject: Re: PndMicroWriter and pi0 reconstruction efficiency

Posted by [Bertram Kopf](#) on Mon, 02 Feb 2009 20:37:43 GMT

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Hi Stefano,

thank you very much for the prompt answer.

Quote:

Try to look at the parameter directory, in particular macro/params/emc.par (or all.par). In the container [PndEmcRecoPar] you can see that the energy cuts to build a cluster are set to 3 MeV (the units are GeV):

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(8 MeV for the Shashlyk). This is a conservative threshold, at the moment the user should tune the energy cut for his analysis. For my old h_c plots I have always used 30 MeV, I think for gamma gamma analysis there are no cuts, simply the bumps with the highest energies are taken into account (but I have no deep insight on that analysis).

These are the typical single crystal thresholds. 3 MeV is roughly 3 sigma above the PWO crystal noise. I asked about the cluster or photon reconstruction threshold instead which is - as I already mentioned - usually 10-20 MeV for PWO. It is very important to apply this threshold cut in the gamma gamma analysis to get realistic results. In particular events with low energetic gammas originated from the pi0 decay are one of the major background source.

Quote:

The EmcRecoHit was an object requested long time ago by the genfit developers, for Kalman filter. After some time we have decided to not use the emc points for the kalman tracking, because of the reduced resolution with respect to tracking detectors and because new points make the analysis slower. So at the moment it is a dummy object which is not used at all. Maybe we should remove its task from the standard full_emc.C macro, in order to not introduce further misunderstanding.

After the bump splitting procedure the emc track matching should follow in the reco sequence. The bumps / cluster are then associated either with charged or with neutral particles. Then the energy and spartial correction should follow because the correction is strongly correlated to the

assumed particle type. Therefore I would prefore to introduce objects like EmcChargedCand and EmcNeutralCand which then should be interfaced to the analysis part.

Ciao,
Bertram.

Subject: Re: PndMicroWriter and pi0 reconstruction efficiency
Posted by [Stefano Spataro](#) on Tue, 03 Feb 2009 18:59:02 GMT
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Bertram Kopf wrote on Mon, 02 February 2009 21:37
After the bump splitting procedure the emc track matching should follow in the reco sequence. The bumps / cluster are then associated either with charged or with neutral particles. Then the energy and spartial correction should follow because the correction is strongly correlated to the assumed particle type. Therefore I would prefore to introduce objects like EmcChargedCand and EmcNeutralCand which then should be interfaced to the analysis part.

This part is done inside the PndMicroWriter, which fills PndChargedCandidates and PndNeutralCandidates TCA (TCandidate). The correlation depends on the tracking, then on the input that the user set to the MicroWriter. Inside the MicroWriter the code separates emc bumps/cluster correlated to tracks to the uncorrelated.

I think the structure of the code is present, of course the algorithms require an improvement and were never tested for large amount of data.

Subject: Re: PndMicroWriter and pi0 reconstruction efficiency
Posted by [Bertram Kopf](#) on Tue, 03 Feb 2009 20:00:19 GMT
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Hi Stefano,

Stefano Spataro wrote on Tue, 03 February 2009 19:59
Bertram Kopf wrote on Mon, 02 February 2009 21:37
After the bump splitting procedure the emc track matching should follow in the reco sequence. The bumps / cluster are then associated either with charged or with neutral particles. Then the energy and spartial correction should follow because the correction is strongly correlated to the assumed particle type. Therefore I would prefore to introduce objects like EmcChargedCand and EmcNeutralCand which then should be interfaced to the analysis part.

This part is done inside the PndMicroWriter, which fills PndChargedCandidates and PndNeutralCandidates TCA (TCandidate). The correlation depends on the tracking, then on the input that the user set to the MicroWriter. Inside the MicroWriter the code separates emc bumps/cluster correlated to tracks to the uncorrelated.

I think the structure of the code is present, of course the algorithms require an improvement

and were never tested for large amount of data.

Sorry. But the PndMicroWriter is only responsible for the conversion of the reco to the rho objects. The PndMicroWriter has definitely nothing to do with the reconstruction. The association between the cluster and charged tracks, the particle dependent energy and spatial correction and also the PID (together with the cluster track association) are parts of the reconstruction. Am I wrong?

Cheers,
Bertram.

Subject: Re: PndMicroWriter and pi0 reconstruction efficiency
Posted by [Stefano Spataro](#) on Tue, 03 Feb 2009 20:09:32 GMT
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Yes,
these are done inside lhetrack for the barrel tracking and are part of the reconstruction, but the MicroWriter is filling the neutral and charged candidates.
I mean, the reconstruction provides EmcBumps/Cluster and track correlated to emc, and then MicroWriter separate the two different candidates creating the two TClonesArray.

Subject: Re: PndMicroWriter and pi0 reconstruction efficiency
Posted by [Bertram Kopf](#) on Wed, 04 Feb 2009 12:56:15 GMT
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Hi Stefano,

Stefano Spataro wrote on Tue, 03 February 2009 21:09
these are done inside lhetrack for the barrel tracking and are part of the reconstruction, but the MicroWriter is filling the neutral and charged candidates.
I mean, the reconstruction provides EmcBumps/Cluster and track correlated to emc, and then MicroWriter separate the two different candidates creating the two TClonesArray.

I think that this is not the right way to realize the emc track matching, pid, etc. It is not a good idea to include this stuff only for specific track representations and for specific detector parts (e.g. barrel tracking (!)).
The reco has to provide a track list with "abstract" track objects and based on this one should do the emc track matching. This makes sure that "all" track objects (independent on how and where they have been produced) can be treated in the same way, also w/o changing any code.

And I think that it would be the best solution to have a emc track matching inside the emc reco sequence because the particle typ dependant energy and position correction of the cluster should follow afterwards.

Cheers,
Bertram.
