Subject: Cut in energy for EMC hit and digi
Posted by StefanoSpataro on Wed, 17 Dec 2014 20:55:43 GMT
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Dear EMC experts,
I noticed running the standard simulation macros the following message coming from the Emc Hit producer:

-I- PndEmcHitProducer INITIALIZATION **********
-I- PndEmcHitProducer: Using nonuniform lightoutput HitProducer has EnergyHitThreshold of 0.000001 GeV and Use_nonuniformity 1
-I- PndEmcHitProducer: Intialization successful

Indeed checking the emc params:

[PndEmcDigiPar]
EnergyHitThreshold:Double_t 0.000001

The energy threshold for each EMC hit is 1 KeV... Is it maybe a too small cut? I mean, I suppose the minimum energy for emc is at the level of MeV and not KeV.
Indeed later in the param file:

EnergyDigiThreshold:Double_t 2.0e-3

Then the minimum energy is 2 MeV. This low cut for energy in the hit could have effects on the data size (but I did not try to raise the cut and see the effect). Were there maybe particular reasons to use such low cut?

Speaking about minimum digi energy, I read also in the digi params :

Incoherent_elec_noise_width_GeV_APD:Double_t 1.5e-3 ### optimized based on the results of proto60 experiment
Incoherent_elec_noise_width_GeV_VPT:Double_t 1.5e-3

If the sigma of the elec noise is 1.5MeV, I would say that a reasonable energy cut could be 3 sigma -> 4.5 MeV and not 3 MeV, maybe with 3 sigma the cut is too close to the electronic noise... but I am not expert of emc electronics, these are just thought which came into my mind.

Subject: Re: Cut in energy for EMC hit and digi
Posted by Dima Melnychuk on Thu, 18 Dec 2014 10:06:30 GMT
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Hi Stefano,
I suppose that EnergyHitThreshold could be safely changed to the same value as EnergyDigiThreshold and indeed it can reduce data size but probably not so much.

The reason for two separate cuts is historical.
Initially where only PndEmcHitProducer was implemented the EnergyHitThreshold cut played

the role of the threshold set for EMC electronics. But later when digitization classes were implemented this electronic threshold was moved to digi classes but separate parameter was introduced EnergyDigiThreshold.

So the low value of EnergyHitThreshold is effectively 0 and from PndEmcHit you can study the distribution of energy deposited in crystals even for low energy close or below the threshold and changing one parameter EnergyDigiThreshold you can see how energy resolution is affected by this threshold.
And the role of EnergyHitThreshold could be only the data size reduction. And if you want to reduce the data size by default you can increase it as high as EnergyDigiThreshold.

Concerning the value of the threshold it should be indeed at the level of 3 sigma of electronics noise for the whole calorimeter, which will give 1 per 1000 EmcDigi from electronics noise. But so far with prototype measurements where the number of crystals is lower the threshold was not set at 3 sigma level but was optimized by hand and digitization parameters in simulation are based more or less on prototype measurements. So I would leave in simulation it as it is now and at the end it will be modified according to values used in real Panda experiment.

Dima

Subject: Re: Cut in energy for EMC hit and digi
Posted by StefanoSpataro on Thu, 18 Dec 2014 11:02:31 GMT
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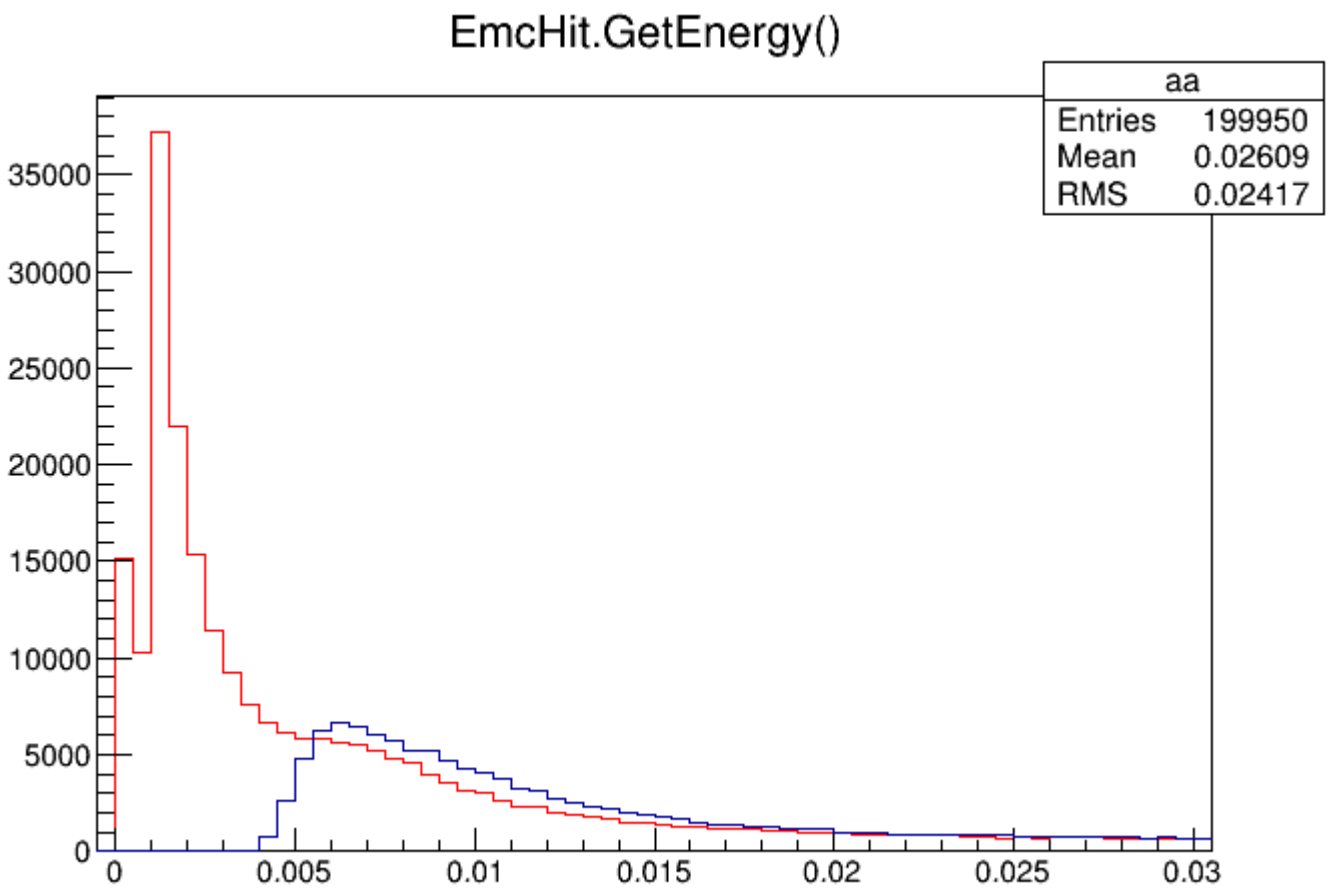
I plotted together the hit energy (red) and the digi energy (in blue) in 10k events of psi(3686)->j/psipi+pi-:

and now hit vs digi:

Most probably a cut of 2 MeV could be enough to remove a lot of noise. What do you think?

File Attachments

1) emc_hitdigi_ene.gif, downloaded 1123 times



2) emc_hitdigi_2D.gif, downloaded 1086 times