Subject: Loss of efficiency for electrons at theta~22^deg, due to association failure in EMC Posted by Ermias on Fri. 20 Feb 2015 16:10:26 GMT

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Dear all,

While doing simulations on electrons, I noticed a localized efficiency loss for electrons at around theta~22^deg. After

digging around a bit, I was able to pinpoint that it was due to electrons in this location not being associated to *any* cluster,

even though there is a valid reconstructed cluster sitting near the electron's projection. I first started to notice this problem

in oct.14 release. Even though the efficiency drop with oct.14 was localized in a relatively smaller zone (~1degree window),

the effect on the signal I was simulating was significant (~10%) because the electrons for this signal peak around 20^{deg} in theta.

However with the current development version (26841) the loss in efficiency is striking (see attached figure,

left panel, count of all electrons vs electrons with eid vs. theta). The efficiency loss is there for positrons too.

I looked at the change in the EMC association code and the only significant change that happened between apr.13 release

and current trunk is the addition of the following conditions before starting the cluster association:

if ((emcModule<3) && (helix->GetZ()>150.)) continue; // not consider tracks after emc barrel for BARREL

if ((emcModule==3) && (helix->GetZ()<165.)) continue; // consider tracks only from last gem plane for FWD

if ((emcModule==4) && (helix->GetZ()>-30.)) continue; // consider tracks only ending at the back of STT for BKW

at L47 of PndPidEmcInfo.cxx. I assume these lines are there for a reason (would appreciate to hear from

EMC experts why...), but I was able to recover most of the loss in efficiency by commenting them out (right panel).

Could it be that the actual cut values are not correctly set?

What fix do EMC experts suggest? Maybe its a known issue and people are working on it, but for "mass" simulation,

would it be advisable to just go back and patch oct.14 version? or wait until a new release that includes fixes? What

would be the approximate time scale for the next release, if it is okay to ask?

Thanks in advance!

Ermias.



Subject: Re: Loss of efficiency for electrons at theta~22^deg, due to association failure in EMC Posted by StefanoSpataro on Fri, 20 Feb 2015 20:58:20 GMT View Forum Message <> Reply to Message

Nobody of EMC has ever worked on the track-EMC correlation, you are asking to the wrong

guys.

if ((emcModule<3) && (helix->GetZ()>150.)) continue; // not consider tracks after emc barrel for BARREL

if ((emcModule==3) && (helix->GetZ()<165.)) continue; // consider tracks only from last gem plane for FWD

if ((emcModule==4) && (helix->GetZ()>-30.)) continue; // consider tracks only ending at the back of STT for BKW

The lines are well commented, and they explain why they were put there. helix is the track parameters at the last point of the track. Since these are geometrical selections, in theory they should work. Which is the EMC module which is suffering from that drop? A check with MC id could help (but you need to use recent trunk since in oct14 the MC for EMC was bugged).

Subject: Re: Loss of efficiency for electrons at theta~22^deg, due to association failure in EMC Posted by Ermias on Fri, 20 Feb 2015 23:04:30 GMT View Forum Message <> Reply to Message

Hi Stefano,

Sorry, I made the wrong assumption about who's working on that part of the code. I didn't mean to offend anyone and I should have known better to check...

For tracks that fail to get associated (emcIndex<0 after the loop over emcHits), I printed out the track MC index, its energy calculated from tracking using pion hypothesis together with the module number and energy of the emcHit with the closest energy to the track.

I only printed out a few hundred events, but It seems like module 3 is contributing to all of the unintended misses in the events I checked. Please let me know if I can provide any other useful feedback...

ps: Do you advise against using oct.14 for any simulation that uses the EMC?

Cheers,

Ermias.

pidCandMcIndex= 0	:	trackEnergy= 0.849534	Module= 3	emcHitEnergy= 0.740053
pidCandMcIndex= 0	:	trackEnergy= 4.03095	Module= 3	emcHitEnergy= 3.51169
pidCandMcIndex= 0	:	trackEnergy= 4.97663	Module= 3	emcHitEnergy= 4.8357
pidCandMcIndex= 0	:	trackEnergy= 3.74218	Module= 3	emcHitEnergy= 3.74057
pidCandMcIndex= 0	:	trackEnergy= 2.5047	Module= 3	emcHitEnergy= 2.40757
pidCandMcIndex= 0	:	trackEnergy= 0.405984	Module= 3	emcHitEnergy= 0.347898
pidCandMcIndex= 0	:	trackEnergy= 1.16359	Module= 3	emcHitEnergy= 1.08486
pidCandMcIndex= 0	:	trackEnergy= 2.81498	Module= 3	emcHitEnergy= 2.69472
pidCandMcIndex= 10	84	: trackEnergy= 0.22849	Module= 3	emcHitEnergy= 0.36478
pidCandMcIndex= 10	83	: trackEnergy= 0.42876	64 Module= 3	emcHitEnergy= 0.36478
pidCandMcIndex= 0	:	trackEnergy= 2.87692	Module= 3	emcHitEnergy= 2.68255

pidCandMcIndex= 0 : trackEnergy= 1.2923 Module= 3 emcHitEnergy= 1.2199	
pidCandMcIndex= 0 : trackEnergy= 3.45425 Module= 3 emcHitEnergy= 3.62943	
pidCandMcIndex= 0 : trackEnergy= 4.53307 Module= 3 emcHitEnergy= 3.92069	
pidCandMcIndex= 0 : trackEnergy= 3.95271 Module= 3 emcHitEnergy= 3.83431	
pidCandMcIndex= 0 : trackEnergy= 2.07854 Module= 3 emcHitEnergy= 3.70188	
pidCandMcIndex= 0 : trackEnergy= 0.840579 Module= 3 emcHitEnergy= 0.816670	6
pidCandMcIndex= 0 : trackEnergy= 3.44526 Module= 3 emcHitEnergy= 3.43316	
pidCandMcIndex= 0 : trackEnergy= 4.48627 Module= 3 emcHitEnergy= 4.15238	
pidCandMcIndex= 0 : trackEnergy= 3.05255 Module= 3 emcHitEnergy= 3.01602	
pidCandMcIndex= 0 : trackEnergy= 1.46736 Module= 3 emcHitEnergy= 0.845704	ł
pidCandMcIndex= 0 : trackEnergy= 1.70518 Module= 3 emcHitEnergy= 1.62284	
pidCandMcIndex= 0 : trackEnergy= 1.37598 Module= 3 emcHitEnergy= 1.33291	
pidCandMcIndex= 0 : trackEnergy= 2.54198 Module= 3 emcHitEnergy= 3.89186	
pidCandMcIndex= 0 : trackEnergy= 4.27216 Module= 3 emcHitEnergy= 4.15942	
pidCandMcIndex= 0 : trackEnergy= 1.54658 Module= 3 emcHitEnergy= 1.48835	
pidCandMcIndex= 0 : trackEnergy= 3.80585 Module= 3 emcHitEnergy= 3.40713	
pidCandMcIndex= 0 : trackEnergy= 3.73259 Module= 3 emcHitEnergy= 3.56458	
pidCandMcIndex= 0 : trackEnergy= 0.898616 Module= 3 emcHitEnergy= 0.949504	4
pidCandMcIndex= 0 : trackEnergy= 1.25923 Module= 3 emcHitEnergy= 0.920801	
pidCandMcIndex= 0 : trackEnergy= 0.463938 Module= 3 emcHitEnergy= 0.095798	54
pidCandMcIndex= 0 : trackEnergy= 2.92428 Module= 3 emcHitEnergy= 3.71379	
pidCandMcIndex= 0 : trackEnergy= 0.611837 Module= 3 emcHitEnergy= 0.546310	6
pidCandMcIndex= 0 : trackEnergy= 4.05194 Module= 3 emcHitEnergy= 4.24035	
pidCandMcIndex= 0 : trackEnergy= 0.40836 Module= 3 emcHitEnergy= 0.320374	ł
pidCandMcIndex= 349 : trackEnergy= 0.262772 Module= 3 emcHitEnergy= 0.13042	23
pidCandMcIndex= 0 : trackEnergy= 4.78844 Module= 3 emcHitEnergy= 4.82905	
pidCandMcIndex= 0 : trackEnergy= 0.384974 Module= 3 emcHitEnergy= 0.215389	9
pidCandMcIndex= 0 : trackEnergy= 1.66274 Module= 3 emcHitEnergy= 1.65131	
pidCandMcIndex= 1 : trackEnergy= 0.212189 Module= 3 emcHitEnergy= 0.02141	77

Subject: Re: Loss of efficiency for electrons at theta~22^deg, due to association failure in EMC Posted by StefanoSpataro on Fri, 27 Feb 2015 11:04:55 GMT View Forum Message <> Reply to Message

Oct14 suffers for a problem of MC truth for the neutrals, but apart from this the release is fine. All the lines you write come from geometrical considerations:

if ((emcModule<3) && (helix->GetZ()>150.)) continue; // not consider tracks after emc barrel for BARREL

If the position of the last hit is in the GEMS then most probably the will not hit the barrel, then skip this correlation

if ((emcModule==3) && (helix->GetZ()<165.)) continue; // consider tracks only from last gem plane for FWD

Consider only the tracks with are using the last GEM plane for the propagation to the forward endcap.

if ((emcModule==4) && (helix->GetZ()>-30.)) continue; // consider tracks only ending at the back of STT for BKW

If the last hit is not in the negative Z then it will not go to the backward endcap.

In theory, all these conditions make sense. BUT, maybe, if you suffer from a lack of counts for module 3, the 2nd command is somehow wrong, maybe not all the tracks hit the last plane of the GEM (problems in tracking). It could make sense to check the geometry of not GEMs and EMC to see how far we are in this "edge" region of 22°.

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