Subject: TPC digitization blocks everything for too many cluster events
Posted by StefanoSpataro on Thu, 03 Jun 2010 20:04:36 GMT
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Dear all,
I have noticed, producing many events with different momentum values, that sometimes the digi macro persists on some well defined events even for tenth of minutes!
In particular, the detector which is "blocking" the digitization is the TPC.

This is a sample of "blocking" event, produced when I was trying to simulate one single pion events from 0.5 to 4 GeV/c:

PndTpcClusterizer:: 20278 clusters created
41409 electrons arriving at readout
Aggregating drifted electrons into avalanches finished.
41409 Avalanches created
0 aggregations done.
77354 Signals created
PndTpcElectronicsTask::Exec
Building up padmap ...finished. 317 pads hit
.....

After 20 minutes it is still blocked at the same event. This happens also many times... in this particular case 20278 clusters created, 41409 avalanches.

I copy a "normal" TPC event:

PndTpcClusterizer:: 674 clusters created
1214 electrons arriving at readout
Aggregating drifted electrons into avalanches finished.
1214 Avalanches created
0 aggregations done.
2260 Signals created
PndTpcElectronicsTask::Exec
Building up padmap ...finished. 287 pads hit
.....
166 Digis created

In this case "only" 674 clusters. Digitization time... less than 1 second.

I can understand that for large events the required digitization time is high, but 20 minutes are really too much, I think. I am not sure if, at the end, we will be able to analyse them or they will be simply too much noisy. In the latter case, maybe a rejection of events with a too high number of clusters/avalanche in tpc could help making the digitization a bit faster, without losing too much signal. Or maybe sometimes the code enters inside a too alrge loop that could be optimized, I don't now.

I would call for comments from the TPC experts.

Subject: Re: TPC digitization blocks everything for too many cluster events

Posted by StefanoSpataro on Sun, 06 Jun 2010 18:21:31 GMT
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Hello,
this weekend I have run many events, and the problem appeared in a ... strong way!

At the event 5533:

PndTpcClusterizer:: 30582 clusters created
65536 electrons arriving at readout
Aggregating drifted electrons into avalanches finished.
65536 Avalanches created
0 aggregations done.
126730 Signals created
PndTpcElectronicsTask::Exec
Building up padmap ...finished. 232 pads hit
.....
1575 Digis created

It took 24 hours, from saturday 20:04 to sunday 20:13 to digitize one single event.

I think, as soon as possible this should be fixed, if not it results hard to simulate "many" events. I have digged a bit in the code, and if I have understood well PndTpcElectronicTask should be the guilty guy. But I have not understood how.

Subject: Re: TPC digitization blocks everything for too many cluster events
Posted by Felix Boehmer on Sun, 06 Jun 2010 22:02:20 GMT
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Dear Stefano,

as I told you, I am unfortunately unable to investigate this in detail right now, since I have limited internet access in my hotel.

Can you give me any more information on the type of event? I would guess some low momentum decay product is spiraling in the chamber, producing tons of digits.

Please supply me with more information. Until then I suggest you introduce a cutoff on the avalanches.

Cheers

Felix

Subject: Re: TPC digitization blocks everything for too many cluster events
Posted by Malgorzata Gumberidze on Mon, 07 Jun 2010 14:05:45 GMT
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I have the same problem as Stefano.

I'm using pandaroot revision 8473 for my simulation.
What i do is to simulate with pgun electrons with the
momenta 0-5GeV/c. I'm running 10k events. Simulations get block
at the event 1201, and it take a lot of time, till it pass
problematic event. I'm already waiting 20 minutes.

this is a last print out which i get:

********** PndEmcMakeBump, event: 1201 **********
 Digi at (66, 68) was a local max. Energy = 1.46065
EMC header: fired crystals= 26, digi= 15, Total energy= 1.66663 [GeV],
Reconstructed clusters= 3, Total energy in clusters= 1.65603 [GeV]
-I- PndTofHitProducerIdeal: 2 TofPoints, 2 Hits created.
-I- PndTofHitProducerIdeal: 0 SciFTofPoints, 0 sciF Hits created.
PndTpcClusterizer:: 26737 clusters created
51323 electrons arriving at readout
Aggregating drifted electrons into avalanches finished.
51323 Avalanches created
0 aggregations done.
103810 Signals created
PndTpcElectronicsTask::Exec
Building up padmap ...finished. 397 pads hit

Few months ago i was doing the same kind of simulations with the older version of the revision, and i didn't have this kind of problem.

gosia

Subject: Re: TPC digitization blocks everything for too many cluster events
Posted by Jens Sören Lange on Tue, 08 Jun 2010 06:49:30 GMT
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Hi all,
yes, the same happens not only for pgun, but sometimes for EvtGen generated events, which are "normal" input events (i.e. there is a priori no low momentum particle in the generated event). It means: if these are spiraling tacks, they must originate from Geant.
However, it is not blocked. It is true that it takes a lot of time, but it continues. I had events which needed ~2 hours (same as Gosia, ~30000 clusters or more), but they are always finished. One can also see in the CPU comsumption ("top") that it continues to run.
cheers, Soeren

Subject: Re: TPC digitization blocks everything for too many cluster events
Posted by StefanoSpataro on Tue, 08 Jun 2010 07:10:28 GMT
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I agree, it is not blocked.

In my case, the guilty event needed 24 hours, but after the digitization continued. The only problem consists in how many "guilty" events are inside one sim file.

Subject: Re: TPC digitization blocks everything for too many cluster events
Posted by Sebastian Neubert on Wed, 09 Jun 2010 06:03:11 GMT
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Dear colleagues,

there have been a few modifications in the ElectronicsTask (or more correctly in the components it uses) that have been introduced while we were studying the real data from our test-chamber. If the problem has appeared after these modifications then one should look into the PulseShapeAnalysis or the ClusterFinder.

Obviously there are several options to circumvent the problem but I would strongly suggest to cut out "bad" events (with a lot of primary clusters from a spiraling particle) since in fact they will be reconstructable most of the time. So this is only an option if you need a fast simulation and do not plan to study any efficiencies!

I will look into the digitization if I find a bug there but it might take some time. In the meantime it would be helpful if you could turn on all digitization output for the tpc (SetPersistence for all tasks, plus SetSamplePersistence for the ElectronicsTask) and plot the Signal amplitudes, Sample amplitudes and Digi amplitudes (A few events are enough) Maybe we can tune some cuts there.

Cheers! Sebastian.

Subject: Re: TPC digitization blocks everything for too many cluster events
Posted by Sebastian Neubert on Wed, 09 Jun 2010 08:05:38 GMT
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Hi!

I spotted a mistake in my recent post - what I meant was: "I would strongly suggest NOT to cut out "bad" events..."

Sebastian.

Subject: Re: TPC digitization blocks everything for too many cluster events
Posted by Jens Sören Lange on Wed, 09 Jun 2010 08:29:19 GMT
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Hi Sebastian, yes, I was just about writing the same!!
I completely agree that it is important to keep these events in.
This is real background which will occur in data taking as well.
I actually think this might Bremsstrahlung in the detector material, beampipe or TPC gas (by Geant) with gamma->e+e- and then curling e+/-.

I suspect so because it seems to occur more often in J/Psi->e+e- (about 1/1000 events) than in J/Psi->mu+mu-
(rough estimate is ~1/10000 events or even less).
cheers, Soeren

Subject: Re: TPC digitization blocks everything for too many cluster events
Posted by Malgorzata Gumberidze on Wed, 16 Jun 2010 16:29:00 GMT
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Hi,

So what i have done is to run simulation (pgun) for positrons with the momentum
range 0.15- 5 GeV/c . For one of the event, e.g. 246, simulations takes 6 minutes.
This is not the worst case of event. Here is printout which i'm getting on the scream.
in addition i'm attaching plot which is showing amplitude of the sample: PndTpcSample.famp()

```
-------------------------------------------
-----  PndTpcDigiPar  -----
--  Context/Purpose:  PndTpcDefaultContext
-------------------------------------------
PndTpcGasFile: Int_t   0
EField: Double_t   400
AttachFlag: Int_t   0
LogitudinaldiffusionFlag: Int_t   1
TransversediffusionFlag: Int_t   1
DriftDistortionFlag: Int_t   0
zGem: Double_t   -40
zMax: Double_t   110
Gain: Double_t   4000
Supression: Double_t   0.001
Spread: Double_t   0.02
MinSignalAmp: Double_t   10
rMin: Double_t   15.5
rMax: Double_t   41.5
PadPlaneFile: Int_t   24
PadShapeFile: Int_t   14
PadShapeRange: Double_t   0.5
PadShapeStep: Double_t   0.02
PadShapeIntStep: Double_t   0.01
ADCThreshold: Int_t   10
ADCMax: Int_t   100000
ADCBits: Int_t   12
SamplingFreq: Double_t   40
T0_wallclock: Double_t   -60000
TimeBits: Int_t   28
PSAThreshold: Int_t   100
Shaper_tDiff: Double_t   50
Shaper_tInt: Double_t   50
Shaper_tSig: Double_t   2
```

TOTPSA: Int_t 1
GAUSSIANNOISE: Int_t 0
GAUSSIANNOISEAMP: Int_t 0
Rate: Double_t 0.02

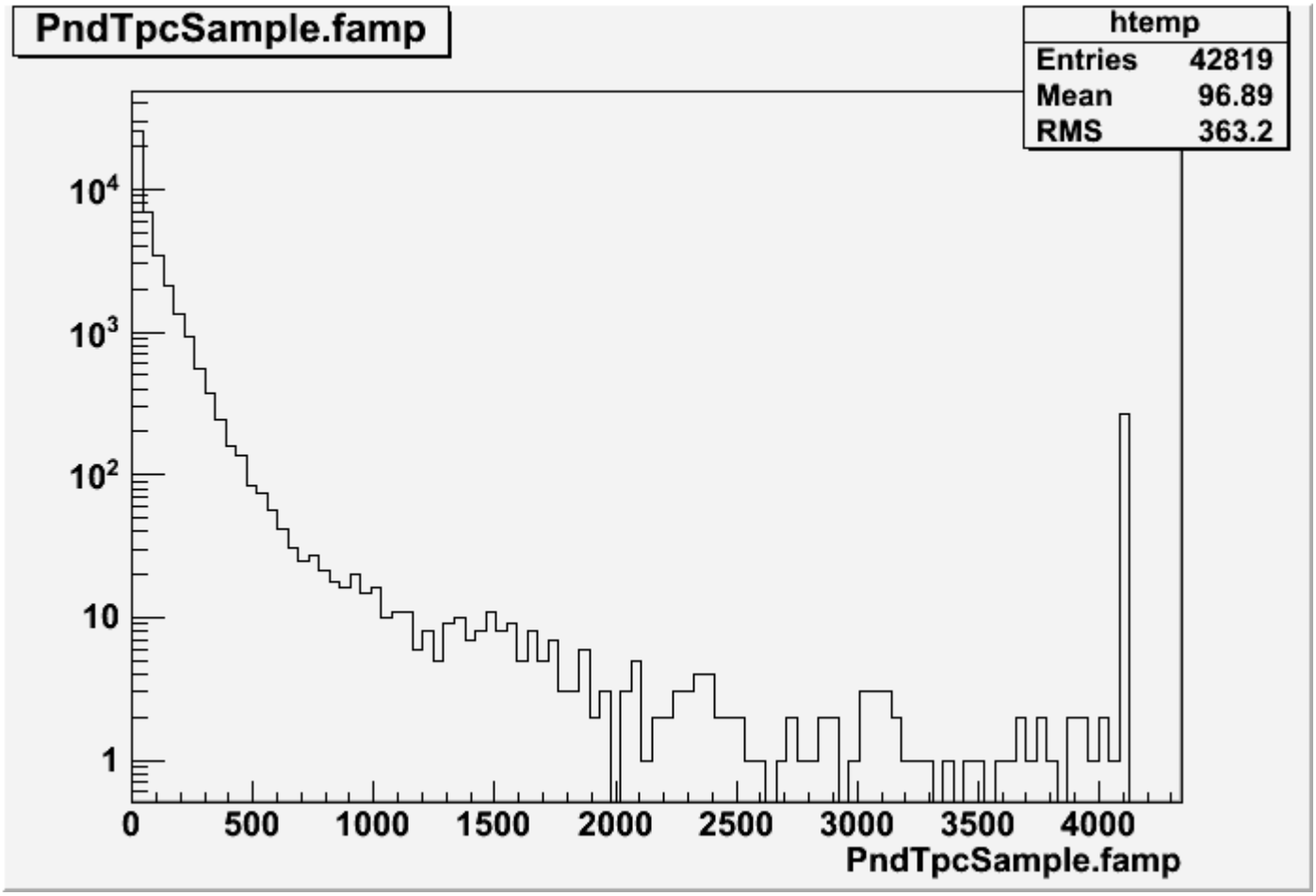
PndTpcClusterizer:: 18573 clusters created
39515 electrons arriving at readout
Aggregating drifted electrons into avalanches finished.
39515 Avalanches created
0 aggregations done.
73880 Signals created
PndTpcElectronicsTask::Exec
Building up padmap ...finished. 1094 pads hit
.....
1497 Digis created
PndTpcClusterFinderTask::Exec
387 cluster created containing 1497 digis from 1497
Hit array contains 3 hits
PndEmcMakeCluster, event: 1

Hope it will help you, i can also plot different distributions, but it would be nice
if you would be more exact what to plot.

best regards,
gosia

File Attachments

1) sample.gif, downloaded 1049 times



Subject: Re: TPC digitization blocks everything for too many cluster events
Posted by StefanoSpataro on Tue, 22 Jun 2010 17:08:08 GMT
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Dear all,
I think I have found the guilty guy. Which is not tpc digitization, not exactly.
Putting some thousands of cout in PndTpcElectronicTask::Exec, I have found that the code stucks at the following line:

dig->SetLinks(FairMultiLinkedData(kTpcSignal, sigIdMap[padIt->first]));

Now we have understood why the problem was not appearing before: becuase it is related to the new fairlink propagation! If I comment out this line, the code is slow for the "heavy" events, but it is processed in a "reasonable" amount if time...
I have taken my wonderful 5533 event, it took 24 hours with FairLink line, 1 minute without....

I suppose there is something bad in the linking procedure for tpc, for large events, maybe because the too many objects to handle.

Another slow line, but two orders of magnitude faster than the link line, is the following:

PndTpcDigitizationPolicy().Digitize(sv,&samplelist,ffrontend,fpulseshape);

The code is stucked there for the guilty event, but just for 10 seconds per iteration of the padmap. I am not sure if this is a "feature" or if this could be optimized somehow, I leave the word to digitization experts.

About the SetLinks, I would suggest for the moment to comment out the line, in order to make the digit faster. If somebody wants to check the guilty event, just send me a mail and I could give him the path at GSI where to get a root file with... many problems.
Regards

Subject: Re: TPC digitization blocks everything for too many cluster events
Posted by Felix Boehmer on Tue, 22 Jun 2010 18:14:38 GMT
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Dear Stefano,

many thanks for the effort you put into this! I didn't look into it yet, but I have to admit I also did not suspect the linking to be the culprit.
Are there any known performance issues with the FairLinks involving any other detectors?

Cheers

Felix

Subject: Re: TPC digitization blocks everything for too many cluster events
Posted by StefanoSpataro on Tue, 22 Jun 2010 18:26:38 GMT
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From what I have seen, all the "handbrakes" were at the tpc level... I should run many events to see if the same effect appears also with other detectors, tomorrow I will try the whole file w/o the SetLink line... and maybe I could tell you.

Subject: Re: TPC digitization blocks everything for too many cluster events
Posted by Jens Sören Lange on Tue, 22 Jun 2010 18:45:55 GMT
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that's great Stefano. thanks so much.

Subject: Re: TPC digitization blocks everything for too many cluster events
Posted by Malgorzata Gumberidze on Tue, 22 Jun 2010 20:44:49 GMT
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Hi Ste,

I have commented the same line in my code:

dig->SetLinks(FairMultiLinkedData(kTpcSignal, sigIdMap[padIt->first]));

and now event which before took several hours is fine,
it take maybe 30 seconds.

good job,
gosia

Subject: Re: TPC digitization blocks everything for too many cluster events
Posted by Bjoern Spruck on Thu, 24 Jun 2010 08:32:24 GMT
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Felix Boehmer wrote on Tue, 22 June 2010 20:14
Are there any known performance issues with the FairLinks involving any other detectors?

I would expect a similar behavior in Detectors where you have a lot of secondaries. This might be DIRC (with Cherenkov photons on) and EMC. For EMC some cleaning procedure is applied before the linking takes place.
I could comment out that cleaning and check what is happening then.

Bjoern

Subject: Re: TPC digitization blocks everything for too many cluster events
Posted by Tobias Stockmanns on Thu, 24 Jun 2010 11:06:26 GMT
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Dear colleagues,

I have studied the FairLink problem in more detail. The problem is the enormous amount of data created for the TPC. For one special event it has: 19281 PrimäriClusters, 42958 Drifted Electrons, 42958 Avalanches, 80300 Signals and 1,674,929 Digis.

All this objects have links to the previous one. I could speed up the linking by a factor of 2 by using std::set instead of std::vector. Nevertheless this one event takes 500 s on my PC. I think that for the TPC one should bypass the linking and only connect the TpcClusters with the MC points and only for dedicated studies one switches on linking.

Cheers,

Tobias
