Subject: Possible improvement to dE statistics in DSSSDs?
Posted by LScruton on Tue, 30 Sep 2014 13:03:57 GMT
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Hi,

I was having a look at the statistics of the LYCCA wall DSSSDs at various points through the code from raw to fully calibrated and noticed that there was quite a drop in stats caused by the following if statement in DSSSD.cpp:

```
if( n_clusters_p != 1 || n_clusters_n != 1)
  return;
```

where n_clusters_p and n_clusters_n are the number of "groups of hits" in an event... i.e, if p-side strip 5,6 and 7 were hit in an event, the cluster multiplicity would be 1, whereas if p-side strips 5,6,7 and 12 were hit in an event, the cluster multiplicity would be 2.
I guess this is there so that only events with one group of neighbouring hits are allowed to continue in the analysis to make the sub-pixel algorithm easier to calculate, which makes sense. However, this also means that events where there is one low-energy spurious hit found away from a group of real hits of neighbouring strips
are ignored.

Is there any other reason why this if statement was included other than making the sub-pixel algorithm easier?

I tried getting rid of this if statement and including a bit more code that limited the sub-pixel algorithm to only those strips around the strip with the maximum energy. Comparing the two methods, I found an increase of ~8% in stats for the wall DSSSD and ~60% increase in target DSSSD stats when plotting the x-y maps. There is also around 7-8% increase in statistics in the Coulex isotope in the LYCCA dE-E plot.

I've attached the DSSSD.cpp file with the changes mentioned... I hope this turns out to be useful, although I wanted to double check that this doesn't introduce any issues with the rest of the code!

What do people think?

File Attachments
1) DSSSD.cpp, downloaded 606 times
2) DSSSD.hpp, downloaded 619 times

Subject: Re: Possible improvement to dE statistics in DSSSDs?
Posted by miree on Thu, 02 Oct 2014 09:09:16 GMT
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Hi,

Thanks for pointing this out! You are right, the current algorithm decreases efficiency at that point.
The reason why to stop the processing is the following:

In all the analysis as it is now (and also in previous analysis codes), we make the assumption, that only one particle was present in the entire event. Having more than 2 groups in the DSSSD detector is an indication of having more than 1 particle, which is considered to be a "bad event", and the analysis doesn't need to proceed.

Your idea to take only one of the two hits (the one with highest energy) can be better. But it might also contribute to the backgound in the final gamma spectrum if the "correct" particle was the one with lower energy in the DSSSD. In any case it would be good to have both options available and being able to switch between them with a parameter. That would make it very easy to compare the final efficiency and also peak/BG ratio of both options.

Thanks a lot for looking into theses things!!

Subject: Re: Possible improvement to dE statistics in DSSSDs?
Posted by LScruton on Thu, 02 Oct 2014 09:45:18 GMT
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Hi,

Using a parameter to switch between the options would be a good idea as I see your point about the possible background increase in the gamma spectra. I just thought I should put it forward as a possible suggestion.

Thanks,

Lianne

Subject: Re: Possible improvement to dE statistics in DSSSDs?
Posted by miree on Thu, 02 Oct 2014 11:21:25 GMT
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I think it is a very good suggestion !

I will include it soon.

Or, if you prefer, you can also push your changes to the repository. Just make sure that the parameter's default value results in the previous behavior. If you have more ideas, it might be a good way to add a second DSSSD processor. That avoids any unintended change of existing analysis configurations.

Ideally, we might end up with a library different processors of the same detector that are optimized for different kind of experiments (high/low rate, light/heavy mass, ...)
