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Subject: New DPMgen results disagree with earlier simulations

Posted by [Felix Boehmer](#) on Tue, 02 Feb 2010 16:55:21 GMT

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Dear colleagues,

I just tried to re-do some results from last year for the TPC space charge simulations. I need simulations for panda background, including elastic and inelastic processes. On first glance I noticed that the new simulation results look very different to what I obtained last summer.

Attached you can find 2 plots of the MCTrack phase space of 50.000 events as given by the DPM generator. Both have been simulated with elastic and inelastic scattering turned on in the DPM settings (option "1") and with a very recent checkout of the pandaroot framework (svn rev. 7557). The "old" results correspond to rev. 4226 of the DPM folder (with everything else unchanged), that is a version before the changes in September '09.

As you can see, the very prominent band of elastic scattering almost disappeared. The spectrum seems no longer to be dominated by elastic processes. Can somebody from the DPM experts please comment on this?

Kind Regards,

Felix

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Subject: Re: New DPMgen results disagree with earlier simulations

Posted by [Ralf Kliemt](#) on Wed, 03 Feb 2010 15:14:27 GMT

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Hello Felix,

As far as I know we have the option to choose what DPM should include.

```
"pandaroot/pgenerators/PndDpmDirect.h"/** Standard constructor
```

```
* @param Mom in GeV/C
```

```
* @param Mode = 0. - No elastic scattering, only inelastic
```

```
* @param Mode = 1. - Elastic and inelastic interactions
```

```
* @param Mode = 2. - Only elastic scattering, no inelastic one
```

```
**/
```

```
  PndDpmDirect(Double_t Mom, Int_t Mode);
```

Does that help?

Greetings to Munich, Ralf

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Subject: Re: New DPMgen results disagree with earlier simulations

Posted by [Felix Boehmer](#) on Wed, 03 Feb 2010 15:38:34 GMT

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Hello Ralf,

as I wrote, both runs have been simulated with OPTION 1 (elastic and inelastic).

Cheers

Felix

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Subject: Re: New DPMgen results disagree with earlier simulations

Posted by [Tobias Stockmanns](#) on Wed, 03 Feb 2010 15:48:02 GMT

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Dear Felix,

in the old DPM generator the elastic option only included the simulation of the hadronic part of the elastic scattering. I know that Aida has extended the generator to include Coulomb and interference term. Maybe this is the reason for the different results.

Cheers,

Tobias

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Subject: Re: New DPMgen results disagree with earlier simulations

Posted by [Felix Boehmer](#) on Wed, 03 Feb 2010 15:53:36 GMT

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Hi Tobias,

this would make sense if the elastic part would have increased, but it is significantly lower now. Apparently something substantial has changed? Can they interfere somehow? \*scratching my head\*

Kind Regards

Felix

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Subject: Re: New DPMgen results disagree with earlier simulations

Posted by [Felix Boehmer](#) on Fri, 05 Feb 2010 09:33:36 GMT

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On second thought the effect could be explained if the relative size of the hadronic and

Coulombic cross sections fits accordingly...

The effect, however, is drastic: deposited energy in the TPC is reduced by a factor of 20!  
I NEED confirmation from a DPMGen expert.

Regards

Felix

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Subject: Re: New DPMgen results disagree with earlier simulations

Posted by [Stefano Spataro](#) on Fri, 05 Feb 2010 10:07:10 GMT

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Whe don't you check an older version of dpm package, when you have done your first test, and check if it is a problem coming from the generator or from the remaining code? I think this test could be helpful.

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Subject: Re: New DPMgen results disagree with earlier simulations

Posted by [Sebastian Neubert](#) on Fri, 05 Feb 2010 11:01:13 GMT

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Hi Stefano!

As Felix has written in his previous message, that was one of the first checks he did.

Cheers! Sebastian.

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Subject: Re: New DPMgen results disagree with earlier simulations

Posted by [Stefano Spataro](#) on Fri, 05 Feb 2010 11:02:50 GMT

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If you write the svn release you are using, one can see which are the changes in the code.

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Subject: Re: New DPMgen results disagree with earlier simulations

Posted by [Felix Boehmer](#) on Fri, 05 Feb 2010 11:08:08 GMT

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This I have also written in the very first message.

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Subject: Re: New DPMgen results disagree with earlier simulations

Posted by [Stefano Spataro](#) on Fri, 05 Feb 2010 13:36:17 GMT

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Just to understand,  
what have you used exactly? I have tried DPMGen right now and I got a nice elastic peak.

Have you tried PndDpmDirect or the original Dpm? And using which params?

I have tried with the following params:

seed: 1234  
p: 15  
mode: 1  
thetamin: 0.1

I think the problem could stay if you have set thetamin=0 -> divergence of the coulomb part.  
Which theta min have you used now? Before the coulomb implementation this param was not set before, and I have seen this is not propagated into PndDpmDirect.

Could you please try my settings and let me know?

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**Subject: Re: New DPMgen results disagree with earlier simulations**  
Posted by [Felix Boehmer](#) on Fri, 05 Feb 2010 14:43:45 GMT

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Hey Stefano,

you are right! I use the "classic" DPMGen and naively set ThetaMin to zero! I re-tried with your setting of 0.1 and now I have the elastic peak back in principle.

Now I am curious: How was this implemented before? I will have to understand this better to "tune" the Theta parameter...

Many thanks for now!!

Cheers,

Felix

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**Subject: Re: New DPMgen results disagree with earlier simulations**  
Posted by [Tobias Stockmanns](#) on Fri, 05 Feb 2010 14:58:47 GMT

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Just in short, why this was introduced:

The cross section for elastic scattering diverges for low scattering angles. Therefore you need to have a cut-off parameter (theta) to define down to which angles you want to simulate it.

The new version of DPM was introduced because there was no EM elastic scattering in the old version but this is needed for the luminosity monitor which relies on this effect to calculate the luminosity.

I hope this helps a bit.

Cheers,

Tobias

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Subject: Re: New DPMgen results disagree with earlier simulations  
Posted by [Felix Boehmer](#) on Fri, 05 Feb 2010 15:09:56 GMT

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Hi Tobias,

just so there is no misunderstanding: there was NO elastic EM scattering before, not even some simplified implementation?

Is there some documentation on the DPMGen that I can read?

Cheers

Felix

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Subject: Re: New DPMgen results disagree with earlier simulations  
Posted by [Stefano Spataro](#) on Fri, 05 Feb 2010 16:07:36 GMT

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However,

PndDpmDirect does not propagate anymore this number, which is not so nice and must be fixed.

I am wondering which could be a good value for thetamin, and how much this can change the final results for elastic coulomb, to use it as default value instead of zero.

Do you have some idea on what could be used as default parameter?

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Subject: Re: New DPMgen results disagree with earlier simulations  
Posted by [Aida Galoyan](#) on Fri, 05 Feb 2010 17:37:21 GMT

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Hi all,

When I installed version of DPM with Coulomb, I wrote  
(message# 9312 in General)

>>>>

I have committed new version of DPM generator.

Full elastic scattering, Coulomb, interference, hadronic parts are included in the new DPM.

You need to put the minimal angle of scattering `"tetmin"(>0)` at DPM running, if you give value of parameter

`"Elastic" = 1` (Inelastic with Elastic scatterings)

or `= 2` (only Elastic scatterings).

The implementation of full elastic scattering in DPM is

important for Luminosity monitoring and, may be, for estimation of radiation doses in MVD.

>>>>

How I remember, Mohammad also wrote for new `PndDpmDirect`,

if you choose `Elastic = 1` or `=2`, you need to put `tetmin > 0`.

The calculations at `Elastic 1` or `2` (with Elastic scattering) at `tetmin = 0` are wrong, because Coulomb scattering go to infinity at `tetmin=0`.

If you want to choose `tetmin` for your detector (TPC) make some calculations with simulation of only elastic scattering

(`Elastic =2`) with various values of `tetmin`. There will be a lot of recoil protons from Coulomb scattering (at small `tetmin`), but most of them will have low energies and, I think, they will be absorbed by beam pipe or MVD. Only protons at large `tetmin` will fall in your Detector, because they can penetrate beam pipe and MVD.

`Tetmin` determines relation between elastic and inelastic events. At increasing `tetmin`, the Coulomb part of elastic scattering decreases sharply, and number of inelastic events increases.

Best regards,

Aida