
Subject: DPM theta cut off

Posted by [donghee](#) on Mon, 27 Aug 2012 14:49:11 GMT

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Hello DPM expert,

I have couple of questions for DPM generator.

Now I'm trying to evaluate contributions of inelastic and elastic part from DPM generator with a particular beam momentum.

I used theta_min 0.01 degree for inelastic plus elastic mode during the DPM generation. When I try to calculate the ratio of cross-section between total and elastic in DPM. I have too high elastic contribution due to small theta cut off. (I'm now understanding theta_min in DPM direct represents theta cut off.) Which kind of theta cut off value do I have to introduce to get correct ratio, which is pronounced in many reference, for instance, beam momentum 15GeV/c case the elastic cross section must be 10mb.

I'm also wondering wheather the elastic cross section of 10 mb has been taken into account the coulomb contribution in the reference?[K.Nakamura et al. (PDG), J.Phys.G 37, 075021 (2010)]

I assume that coulomb and interference part of elastic process are used in the DPM model. In order to make correct ratio between elastic and inelastic part, I have to apply correct theta cut off value during the generation in my understanding.

Thank you for your teaching in advance.

Donghee

Subject: Re: DPM theta cut off

Posted by [Simone Bianco](#) on Mon, 27 Aug 2012 15:37:25 GMT

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Dear Donghee,

Thomas performed a detailed analysis of the effect of the theta_min cut-off. In his thesis (that you can download here <http://hss.ulb.uni-bonn.de/2011/2623/2623.pdf>) you can find his parametrization in order to select the correct cut-off as a function of the beam momentum (see section 6.1). The DPM code might have changed a bit in the meanwhile, but I think this could be useful for you anyway.

Regards,

Simone

Subject: Re: DPM theta cut off
Posted by [donghee](#) on Wed, 29 Aug 2012 09:09:56 GMT
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I'm considering now a simple approach to introduce cut off parameter theta according to Thomas work.

I found cut off values for certain beam momentum from the equation, which is suggested in his Thesis.

Quote:

```
double mom = 15; //beam momentum
double cut = 0.0777-0.976*TMath::Log10(mom);
double cutoff=TMath::Power(10, cut);
```

Quote:

```
mom = 1.43170 ; cms = 2.23 ; cut off theta =0.842536
mom = 15.000   ; cms = 5.474 ; cut off theta =0.085079
```

Then I put this value into the theta minimum in the control option for PndDpmDirect.

Could someone confirm about the value and this approach?

Best wishes,
Donghee

Subject: Re: DPM theta cut off
Posted by [Simone Bianco](#) on Wed, 29 Aug 2012 09:28:31 GMT
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Dear Donghee,

the work of Thomas and the results of some discussions of one year ago about the theta_min parameter were included in the PndDpmDirect class.

Johan introduced the parametrization of theta_min in the implementation of the ctor PndDpmDirect::PndDpmDirect(Double_t Mom, Int_t Mode, Long_t Seed):

```
PndDpmDirect::PndDpmDirect(Double_t Mom, Int_t Mode, Long_t Seed) {

//
// Calculate ThtMin first. For this we make a cut-off on the value of -t of 1e-2 GeV^2 (~100
// MeV/c momentum)
// This estimated from a parametrization found in thesis of Thomas Wuerschig (figure 6.4, page
// 121):
// Roughly: 0.4 deg at 15 GeV/c and 4 deg at 1.5 GeV/c, linear interpolation in double
// log-scale.
//
```

```

Double_t logangle =
TMath::Log(0.4)+(TMath::Log(15.)-TMath::Log(Mom))*(TMath::Log(4)-TMath::Log(0.4))/(TMath
::Log(15)-TMath::Log(1.5));
Double_t ThtMin = TMath::Exp(logangle);

PndDpmDirect(Mom, Mode, Seed, ThtMin) ;
}

```

so if you use this ctor you don't need to calculate by hands a value for theta_min, since this is automatically obtained as a function of the beam momentum.

I hope this helps.

Cheers,

Simone

Subject: Re: DPM theta cut off
 Posted by [donghee](#) on Wed, 29 Aug 2012 10:26:22 GMT
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Dear all,

So, I am now more clear than before for this approach.

The value of $-t=1e-2 \text{ GeV}^2$ is chosen to get standard cut-off value.
 Then I'm wondering the ratio between total cross-section and elastic one for this cut-off value.
 Is it still comparable with experimental data?
 Thomas used the cut-off value at the coulomb-nuclear interaction in his study, and found reasonably well described ratio.

That mean, that he used $-t$ equal to $1e-3 \text{ GeV}^2$ and cut-off theta is deduced 4 times smaller than introduced value in PndDpmDirect.
 It was about 0.1 degree at 15GeV/c.

Does anyone make some test for that?
 or motivated just MVD detector point of view, which have sufficient energy to go through the MVD layers.
 I think that cut off 4 degree at 1.5 GeV might be too large to study lumi detector, for example.
 Because Lumi can cover 3-8 degree.

Thank you for your teaching.
 Best regards,
 Donghee

Subject: Re: DPM theta cut off
Posted by [Mathias Michel](#) on Wed, 29 Aug 2012 11:25:05 GMT
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Donghee Kang wrote on Wed, 29 August 2012 12:26
I think that cut off 4 degree at 1.5 GeV might be too large to study lumi detector, for example.
Because Lumi can cover 3-8 degree.

Just to prevent misunderstandings let me correct a small typo:
The Lumi covers about 3-8 mrad = 0.17-0.46 degree.
To study effects of the magnetic fields and stuff we even have to simulate lower than 3 mrad,
but i guess we are a special case

Cheers,
Mathias

Subject: Re: DPM theta cut off
Posted by [donghee](#) on Wed, 29 Aug 2012 12:51:54 GMT
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Thanks Mathia for your kind correction.

Anyhow, the case of studying the range of 0.17-0.46 degree with DPM, one has to care this
fact, when the efficiencies or some normalization of event rates are calculated.

Best wishes,
Donghee
