Subject: DPM theta cut off Posted by donghee on Mon, 27 Aug 2012 14:49:11 GMT View Forum Message <> Reply to Message

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 to 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.Nakmura 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 View Forum Message <> Reply to Message

## 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

I'm considering now a simple approach to introduce cut off parmater theta according 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 View Forum Message <> Reply to Message

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  $1e-2 \text{ GeV}^2$  (~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, lineair 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 View Forum Message <> Reply to Message

Dear all,

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

The value of -t=1e-2 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-nulear intersaction in his study, and found reasonably well described ratio.

That mean, that he used -t equal to 1e-3 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 View Forum Message <> Reply to Message

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 View Forum Message <> Reply to Message

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