

Dear all,

please update to v5.38.2. In the previous version, the Krivoruchenko model was not enabled by using the following command:

```
makeDistributionManager()->Exec("dalitz_mod: krivoruchenko");
```

It is very important to check the output of the reaction, it should print:

```
[D+_krivoruchenko] dgdm from Krivoruchenko {/}
```

some more word to the calculation of branching ratios. By default, Pluto does not calculate the branching ratio, but takes as a weight $1/N_{\text{ev}} * \text{BR}$, where BR is the static branching ratio. This leads of course to incorrect results at the pole, if the branching ratio shows a large mass-dependency.

The only way to let Pluto calculate the branching ratio, is the "Monte-Carlo-Integration method". In this case one has to use a flat dilepton mass generator:

```
makeDistributionManager()->Exec("dalitz_mod: static_br_thresh=0.100 ; flat_generator");
```

By using this, the another model is added:

```
[D+_generator_p_dilepton] Dilepton generator {/generator}
```

I attached below a macro which uses this method.

Toggle Spoiler

```
makeDistributionManager()->Exec("elementary");
makeDistributionManager()->Exec("dalitz_mod: krivoruchenko");
makeDistributionManager()->Exec("dalitz_mod: static_br_thresh=0.100 ; flat_generator");

PReaction *my_reaction =
new PReaction("3.5","p","p","p D+",NULL,1,0,0,0);

TH1F * pp_sum =
new TH1F ("pp_sum","pp DiLepton mass (coherent sum)",100,0.,0.6);
pp_sum->Sumw2();
TH1F * delta =
new TH1F ("delta","D mass ",100,0.9,1.6);
delta->Sumw2();

my_reaction->Do(pp_sum,"_x=[dilepton]->M()");
my_reaction->Do(delta,"_x=[D+]->M()");
my_reaction->Print();
```

```

my_reaction->Preheating(100);
my_reaction->Loop(100000);

PReaction *my_reaction2 =
new PReaction("3.5","p","p","p D+ [dilepton p]",NULL,1,0,0,0);

TH1F * pp_sum2 =
new TH1F ("pp_sum2","pp DiLepton mass (coherent sum)",100,0.,0.6);
pp_sum2->Sumw2();
TH1F * delta2 =
new TH1F ("delta2","D mass ",100,0.9,1.6);
delta2->Sumw2();

my_reaction2->Do(pp_sum2,"_x=[dilepton]->M()");
my_reaction2->Do(delta2,"_x=[D+]->M()");
my_reaction2->Print();

my_reaction2->Preheating(100);
my_reaction2->Loop(100000);

// delta2->Divide(delta);
delta->Draw("");
delta2->Draw("same");[/QUOTE]

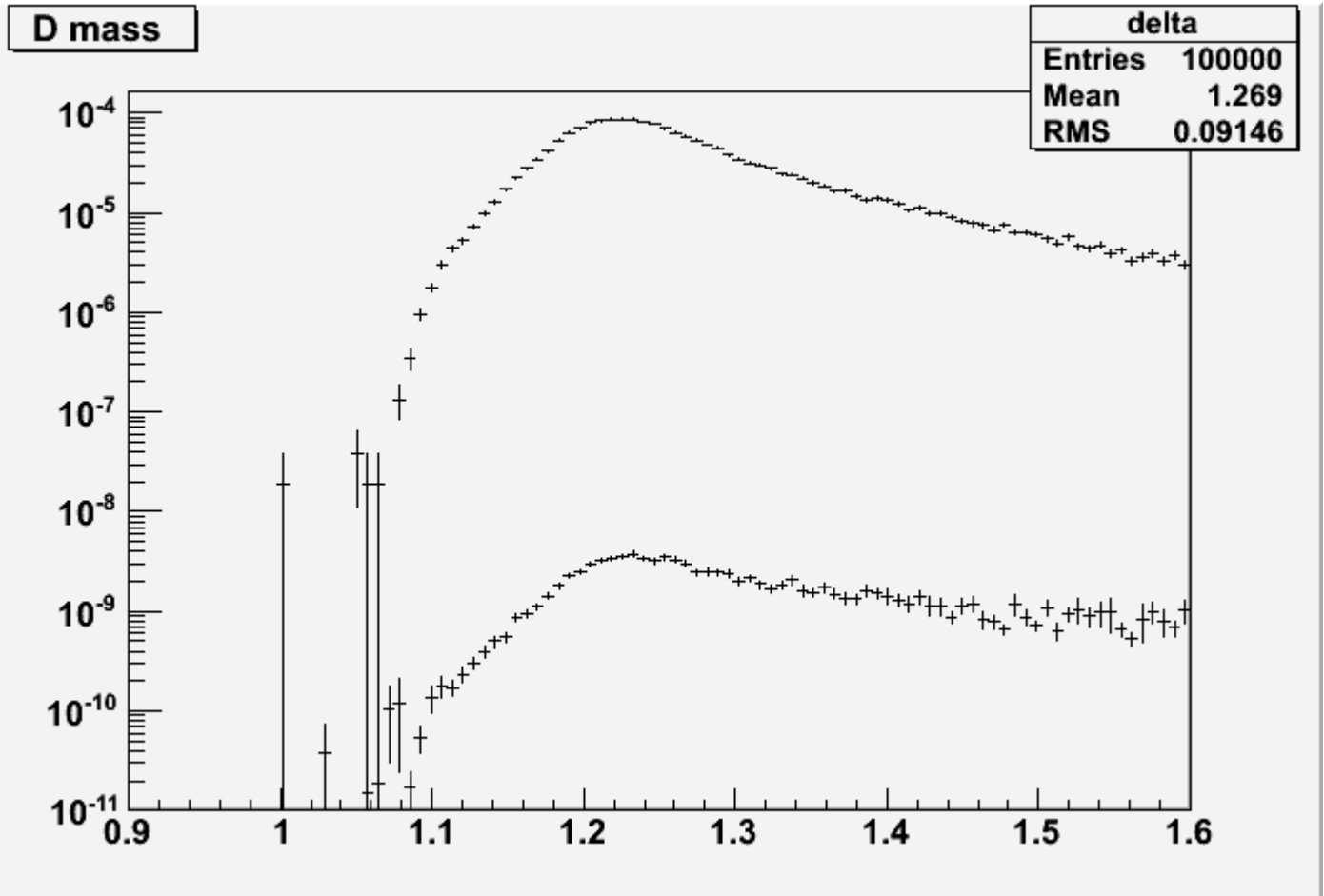
```

The result is shown below:

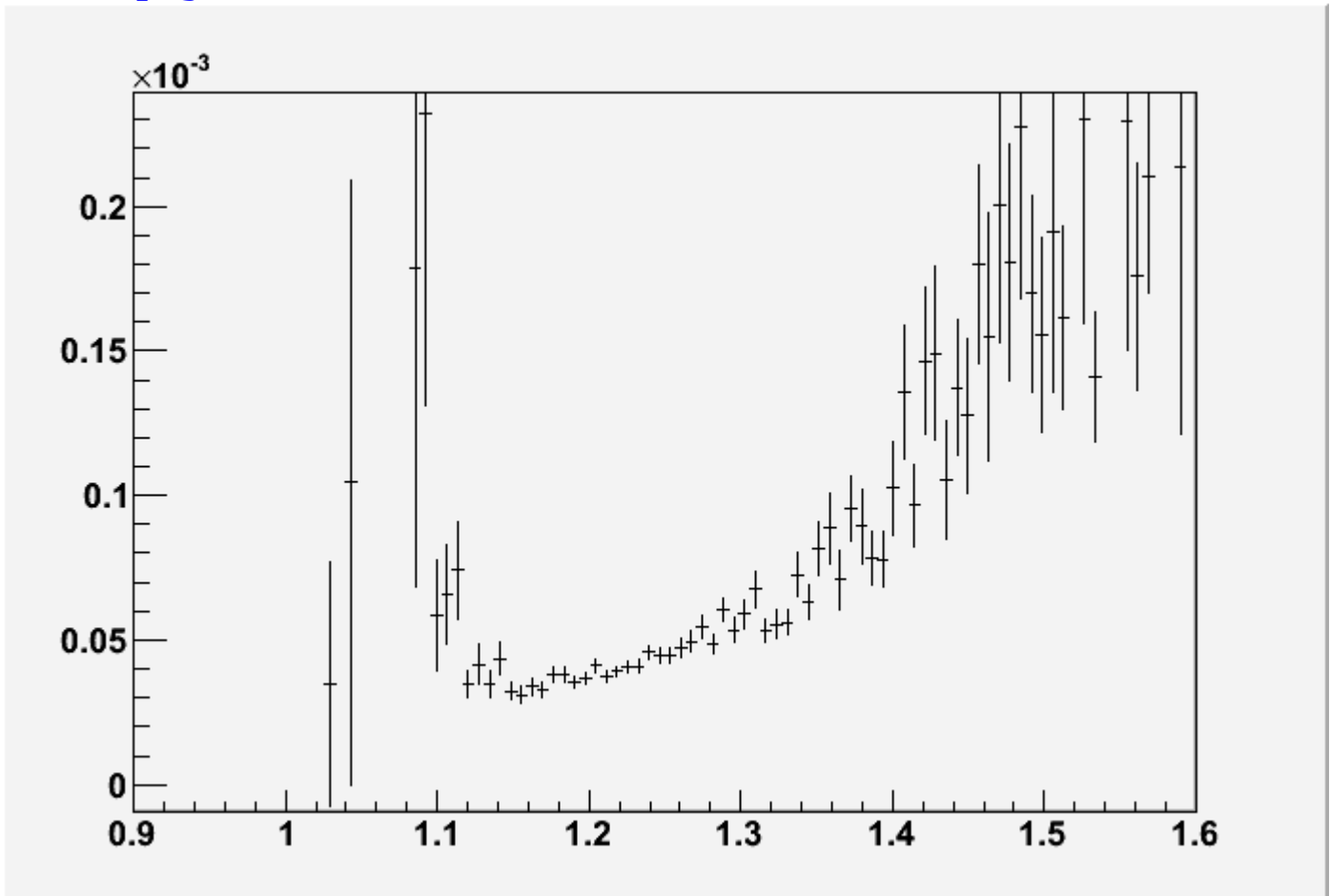
and this is the branching ratio which I obtain:

File Attachments

1) [kriv.png](#), downloaded 1487 times



2) [c1.png](#), downloaded 1538 times



Subject: Re: Delta from Krivoruchenko
Posted by [Adrian Dybczak](#) on Tue, 11 Oct 2011 11:51:52 GMT
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As we can see BR ratio in the pole is OK.
Also $d\Gamma/dM$ is working fine.

I put distributions of Delta mass drawn for 1 mln generated events directly from this macro (not in Log Scale).

This looks nice.

But for mas of (proton $e^+ e^-$) one can see

Question is: How large should be statistic to get smooth shape of Delta tail? Because 1 mln is not enough as we can see.

By the way i thought that main goal to use flat gen was to make tail smoother. Do we have reversed result?

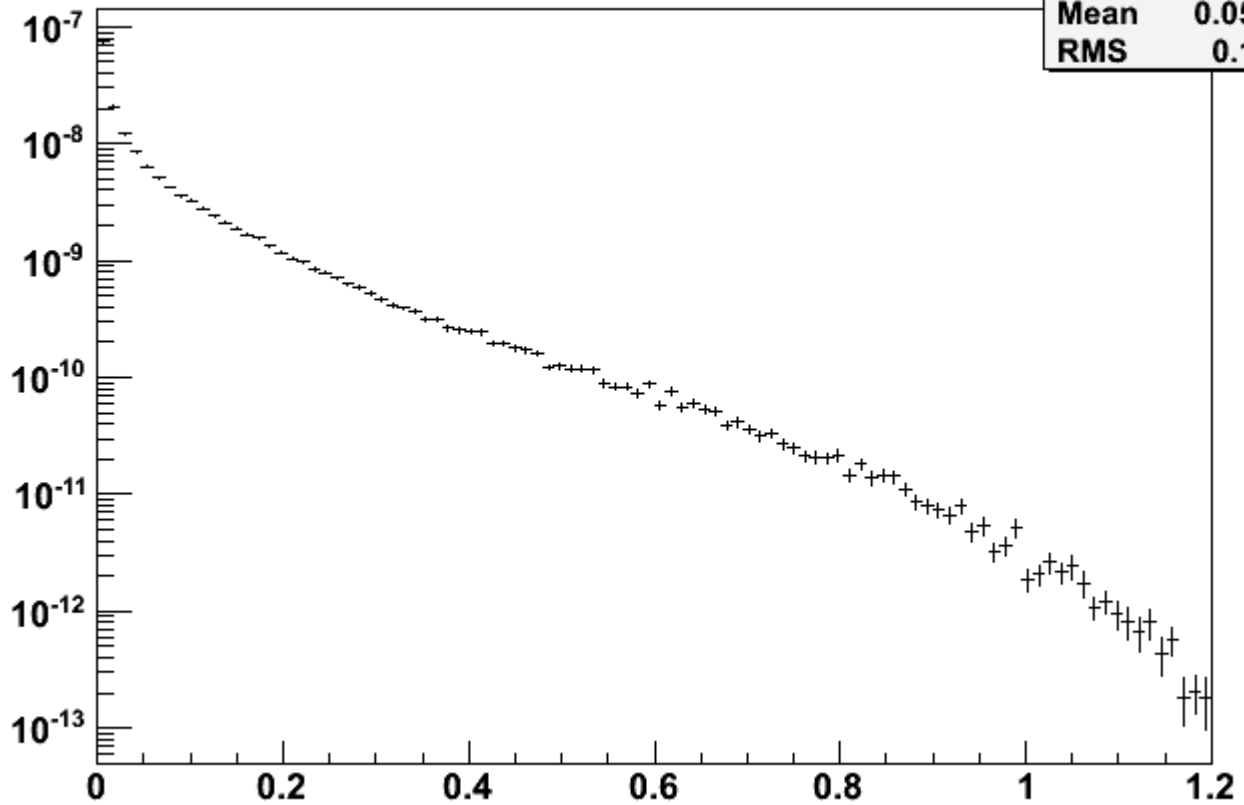
e^+e^- invariant mass looks quite smoothly.

File Attachments

1) [EpEm_mass.png](#), downloaded 1122 times

m_inv {sim_genweight}

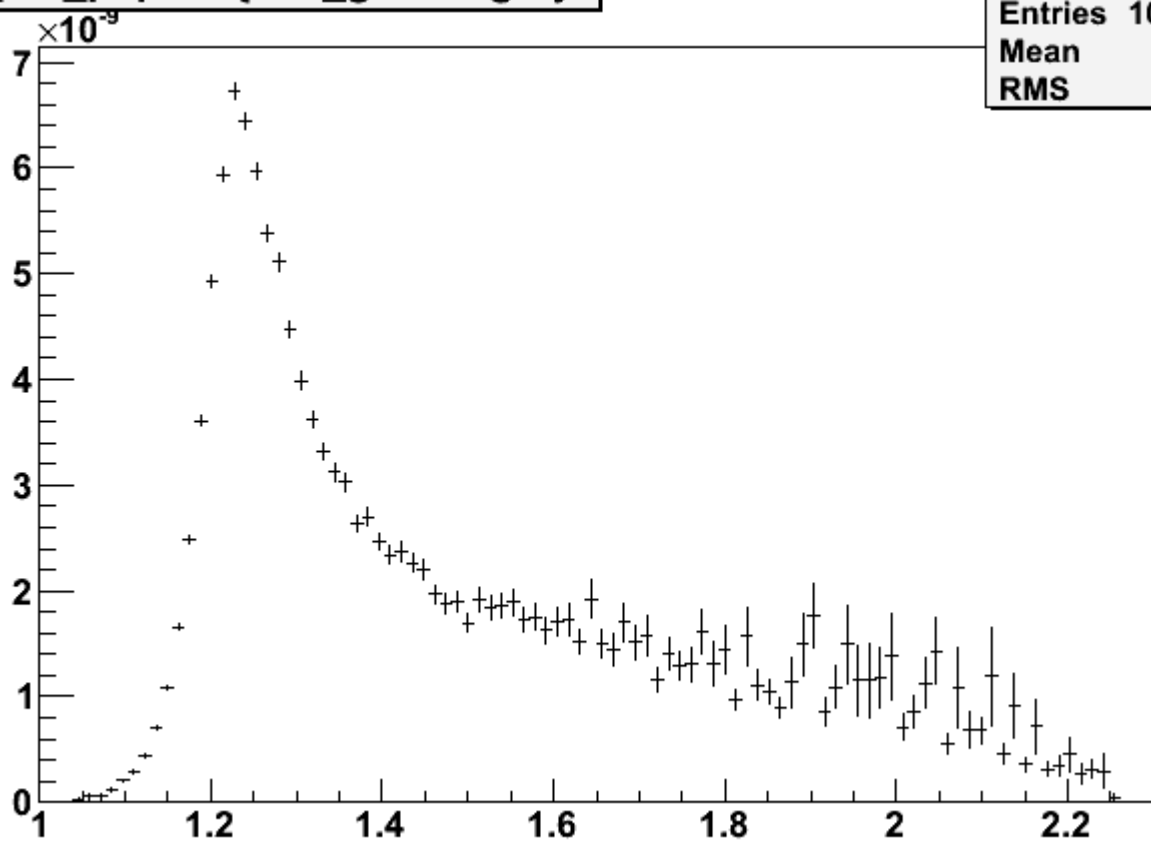
ll	
Entries	1000000
Mean	0.05742
RMS	0.1003



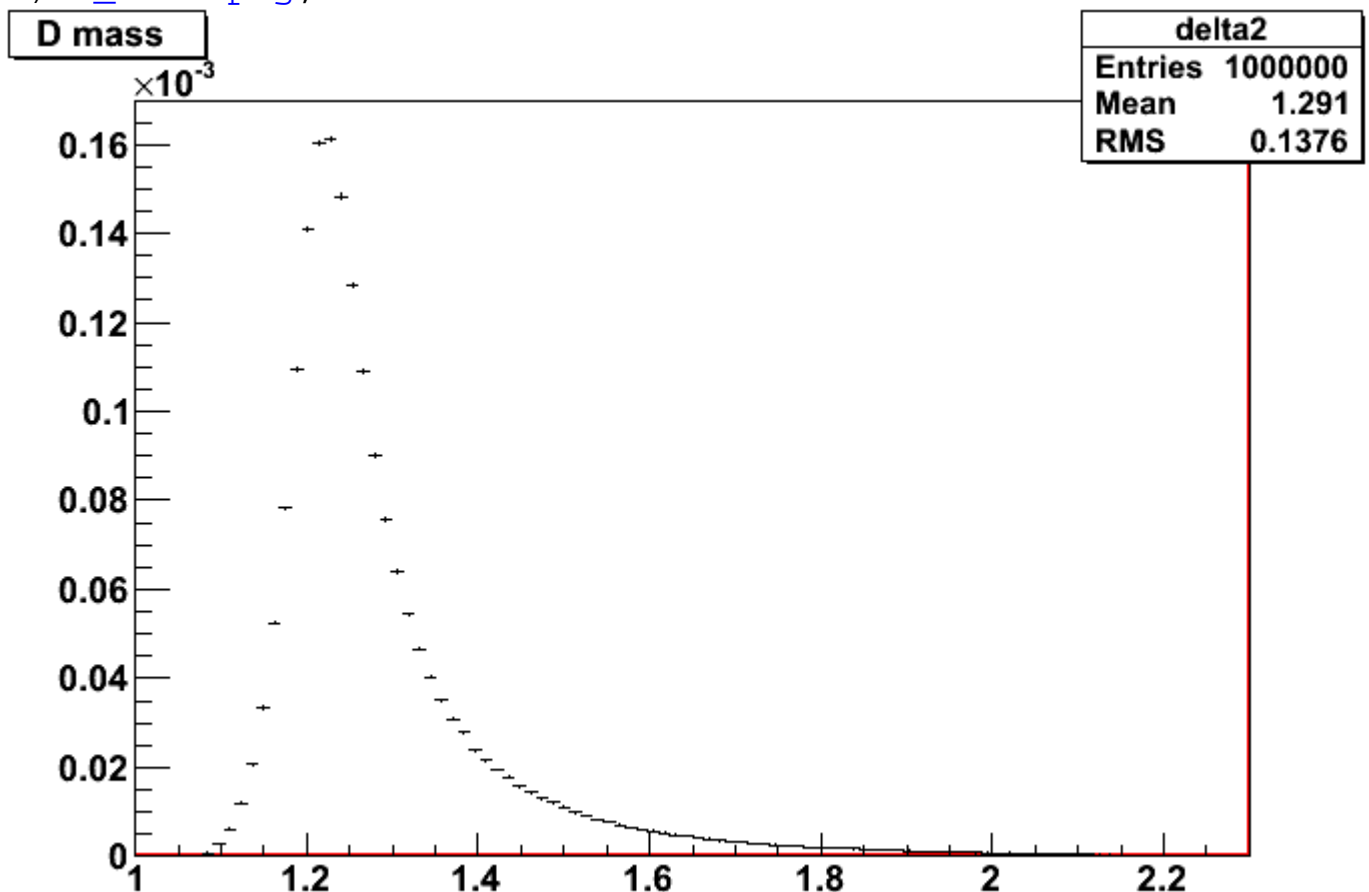
2) [PEpEm_mass.png](#), downloaded 1089 times

m_inv_pepem {sim_genweight}

ll	
Entries	1000000
Mean	1.505
RMS	0.2872



3) [D_mass.png](#), downloaded 1057 times



Subject: Re: Delta from Krivoruchenko

Posted by [Ingo Fröhlich](#) on Tue, 11 Oct 2011 16:28:42 GMT

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Dear Adrian,

thank you for this observation. I understand now much clearer what you mean when talking about fluctuations.

I think the source of the fluctuation is as follows: the pure Delta does not have the large tails. When you use the intrinsic calculation of the branching ratio (this is what we do when you want to have the correct b.r. at pole), I have to disable the explicit mass-dependent partial decay width, i.e. the tail at large masses is also disabled.

This means we strongly enhance the remaining tails. You can see this also in my plot, where I have plotted the mass-dependent branching ratio. So it is not a matter of statistics.

The only way to avoid this is to go back to the "classical" method (no flat di-electron generator). But in this case, as you know, the weight is fixed to $1/N_{\text{ev}} \cdot \text{"static branching ratio"}$. This means you have to correct the old histogram such that it overlays with the new one, then you have a correction factor.

If I think more about it, there could be one solution, this is a "box-like" Delta generator together with the weight of the shape. But I never tested this and it is one additional source of complication.

Subject: Re: Delta from Krivoruchenko
Posted by [Adrian Dybczak](#) on Wed, 12 Oct 2011 16:46:37 GMT
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Hi Ingo

I have discussed with Piotr and conclusion is that fluctuations are acceptable if correction of this means lot of work. One can plot M_{inv_pepem} with smaller number of bins. This is not problem.

Subject: Re: Delta from Krivoruchenko
Posted by [Piotr Salabura](#) on Wed, 19 Oct 2011 08:54:27 GMT
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Here I post document written by Beatrice which summarize differences in descriptions of Delta Dalitz decays by various models which exist on the market. In `_Pluto` we use Krivoruchenko/Martemayenov which is eq. to Zetenyi/Wolf (if use constant form-factors)

Piotr

File Attachments

1) [remarks_Delta.pdf](#), downloaded 591 times

Subject: Re: Delta from Krivoruchenko
Posted by [Malgorzata Gumberidze](#) on Thu, 20 Oct 2011 07:17:40 GMT
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I have made similar studies for the $pp@2.2$.

For the pluto cocktail which is included into the draft of the publication we were using pluto version v5.36 and PDecayManager. In the plot below you can see mass dependent branching ratio for the Delta+ in channel $pp \rightarrow pD^+$.

the color meaning is following:

Pluto v5_36 with DecayManager, not working Krivoruchenko, no flat generator

PLEASE notice that there is mistake in the label in plot, it is v5.36 and not v5.26

Pluto v5_38.2 with PReaction and all flags switch on:

```
makeDistributionManager()->Exec("elementary");  
makeDistributionManager()->Exec("dalitz_mod: krivoruchenko");  
makeDistributionManager()->Exec("dalitz_mod:static_br_thresh=0.100 ; flat_generator");
```

In case of the BLACK normalization comes for free using weights. RED curve is normalize in a way that at pole this ration is $4.15e-5$.

mass dependance of the BR in both calculations are very similar.

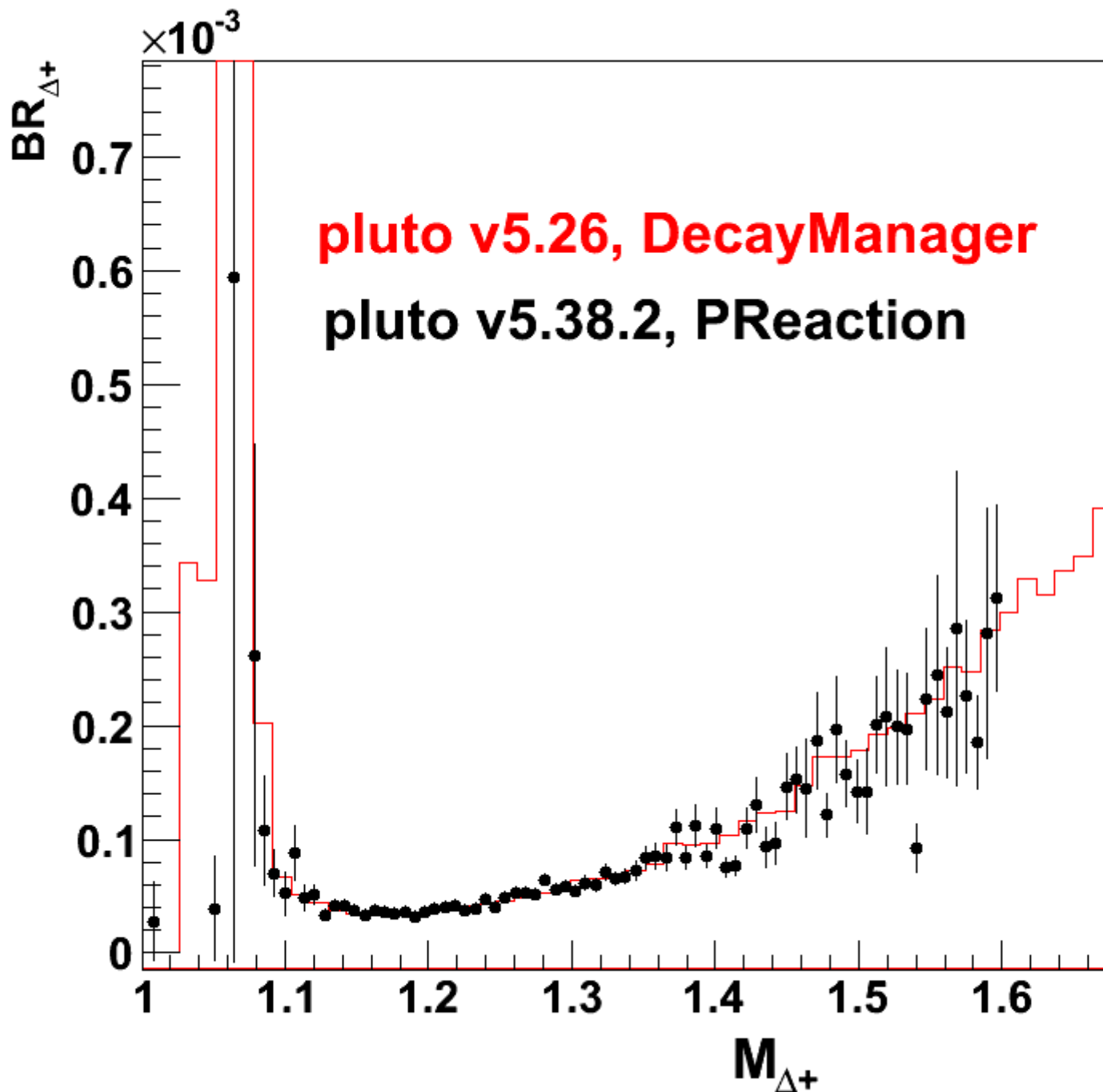
That means if the DecayManager spectra are scaled such that average BR is $5.9e-5$ (as obtain with the recommnded procedure from the Forum) then the resulting Delta contribution to the dilepton mass spectrum should be fine.

same investigation for the rho0 will follow

gosia

File Attachments

1) [BD_massDp_old_newPluto.gif](#), downloaded 1035 times



Subject: rho BR

Posted by [Malgorzata Gumberidze](#) on Thu, 20 Oct 2011 08:27:49 GMT

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Please find here now plot which is showing mass dependent BR for the rho0.

In similar way as before:

For the pluto cocktail which is included into the draft of the publication we were using pluto version v5.37 and PDecayManager. This version is different then for Delta but it is due to some futures in case of rho0 which were in previous version, and were not correct.

In the plot below you can see mass dependent branching ratio for the Delta+ in channel $pp \rightarrow p\rho^0$.

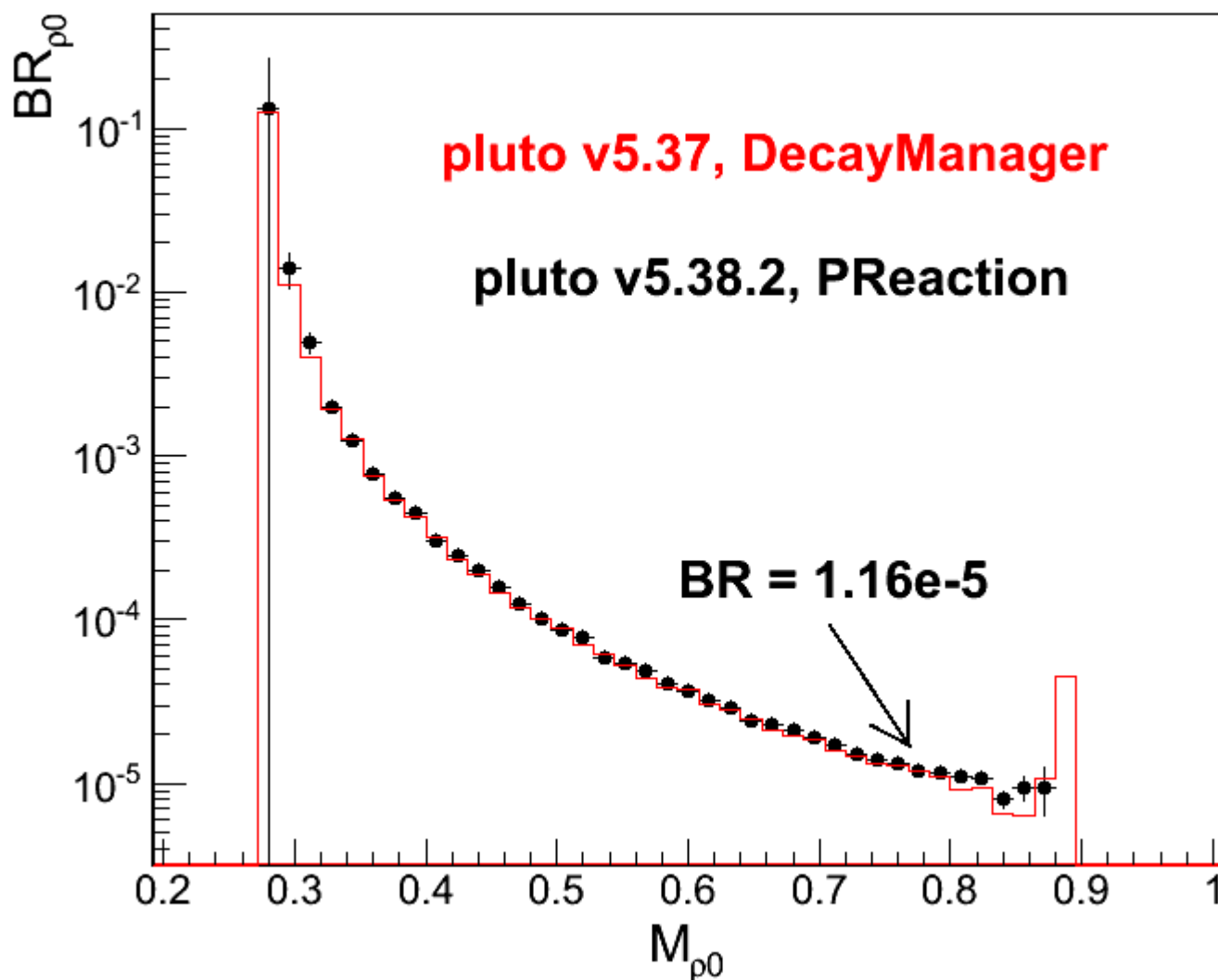
In case of the BLACK normalization comes for free using weights. RED curve is normalize in a way that at pole BR is the same like for BLACK one.

Please notice also that in this case the BR at pole is not correct, but maybe i do something wrong, so please ingo have a look into my macro.

gosia

File Attachments

1) [plot_rho.gif](#), downloaded 1042 times



2) [macro_ingo_rho.C](#), downloaded 421 times

Subject: Re: Delta from Krivoruchenko

Posted by [Tetyana Galatyuk](#) on Mon, 24 Oct 2011 09:22:03 GMT

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Dear all,

to complete the story, I have prepared
few plots for p+p at $E_{\text{kin}}=1.25$ GeV.

Figure bellow shows the mass dependent
branching ratio of Delta estimated by dividing
 $pp \rightarrow p\Delta^{++} \rightarrow ppp\pi^0$ by $pp \rightarrow p\Delta^{++} \rightarrow ppe^+e^-$

The next point which was checked concerns the following issue:

Ingo wrote:

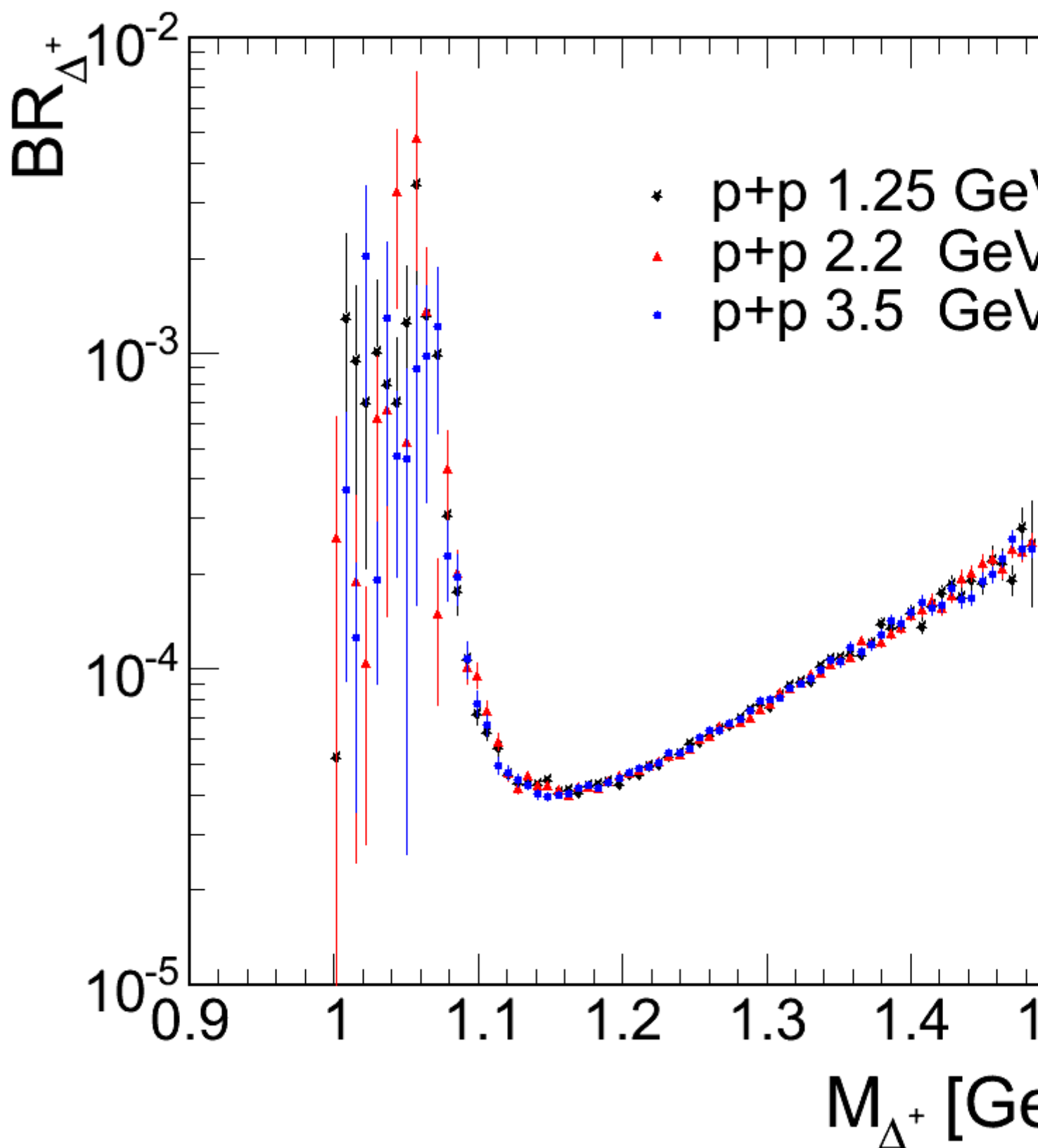
```
>please update to v5.38.2. In the previous version,  
>the Krivoruchenko model was not enabled by using  
>the following command:  
>makeDistributionManager()->Exec("dalitz_mod: krivoruchenko");
```

Bellow you can find a figure which shows the Delta+ mass distribution in channel $pp \rightarrow pD^+ \rightarrow ppe + e^-$ for two versions of Pluto. Indeed, the Krivoruchenko model was not enable in the Pluto versions $< v5.38.2$!

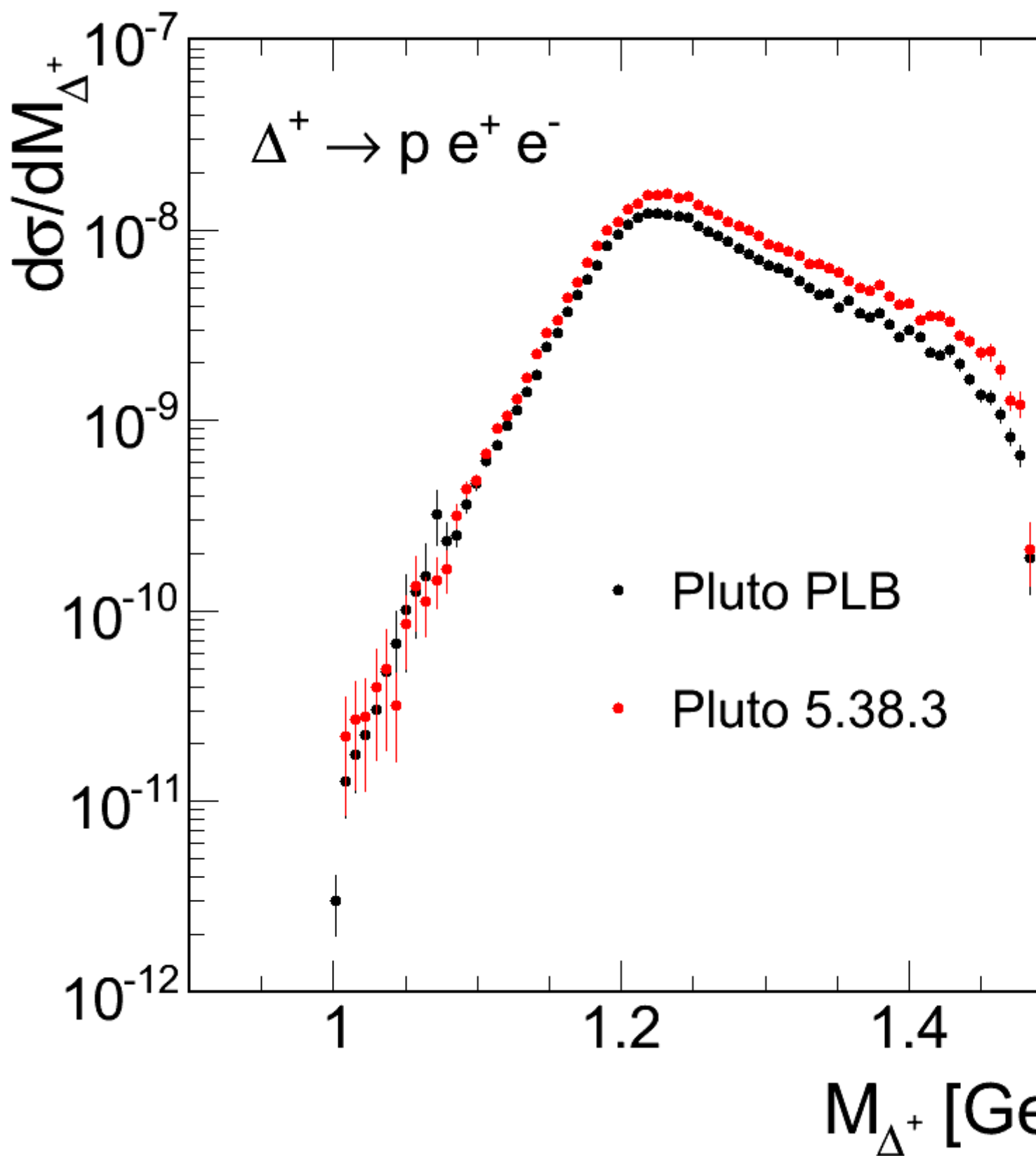
Finally, you can see the influence on invariant e^+e^- mass spectrum:

File Attachments

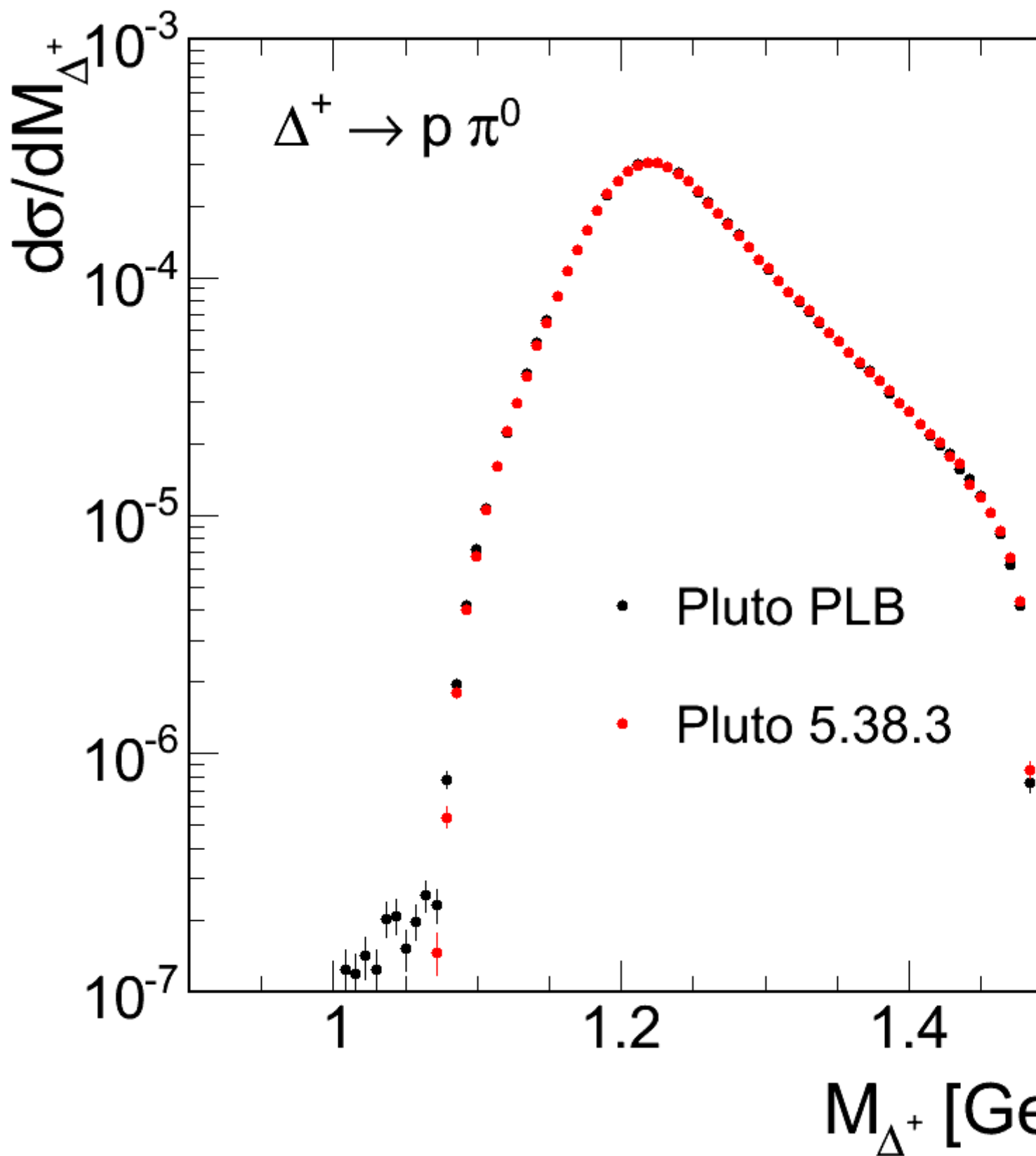
1) [BR_DeltaPlus_pp125_pp22_pp35.gif](#), downloaded 1055 times



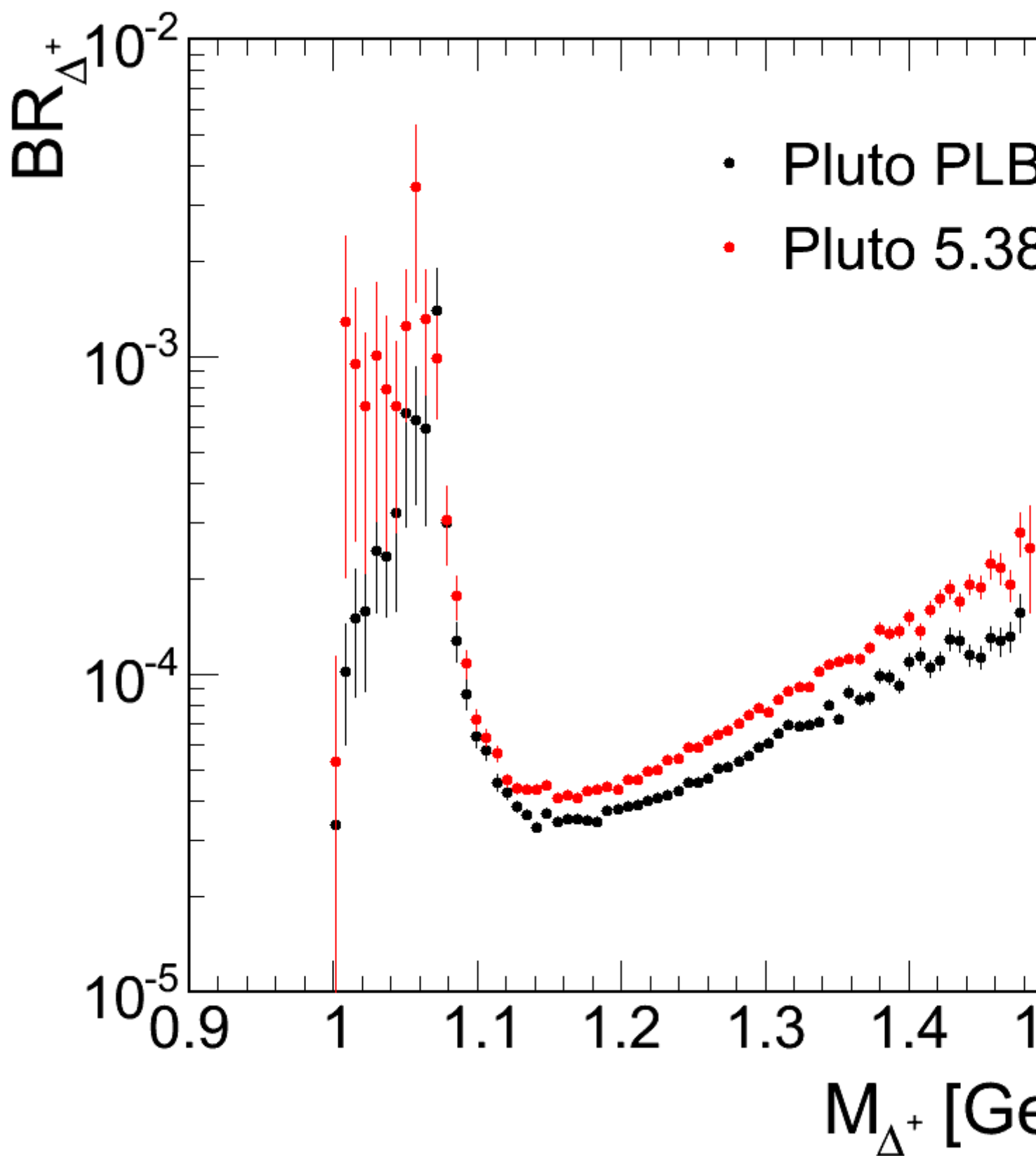
2) [Delta_ProtonEpEm_pp125.gif](#), downloaded 1027 times



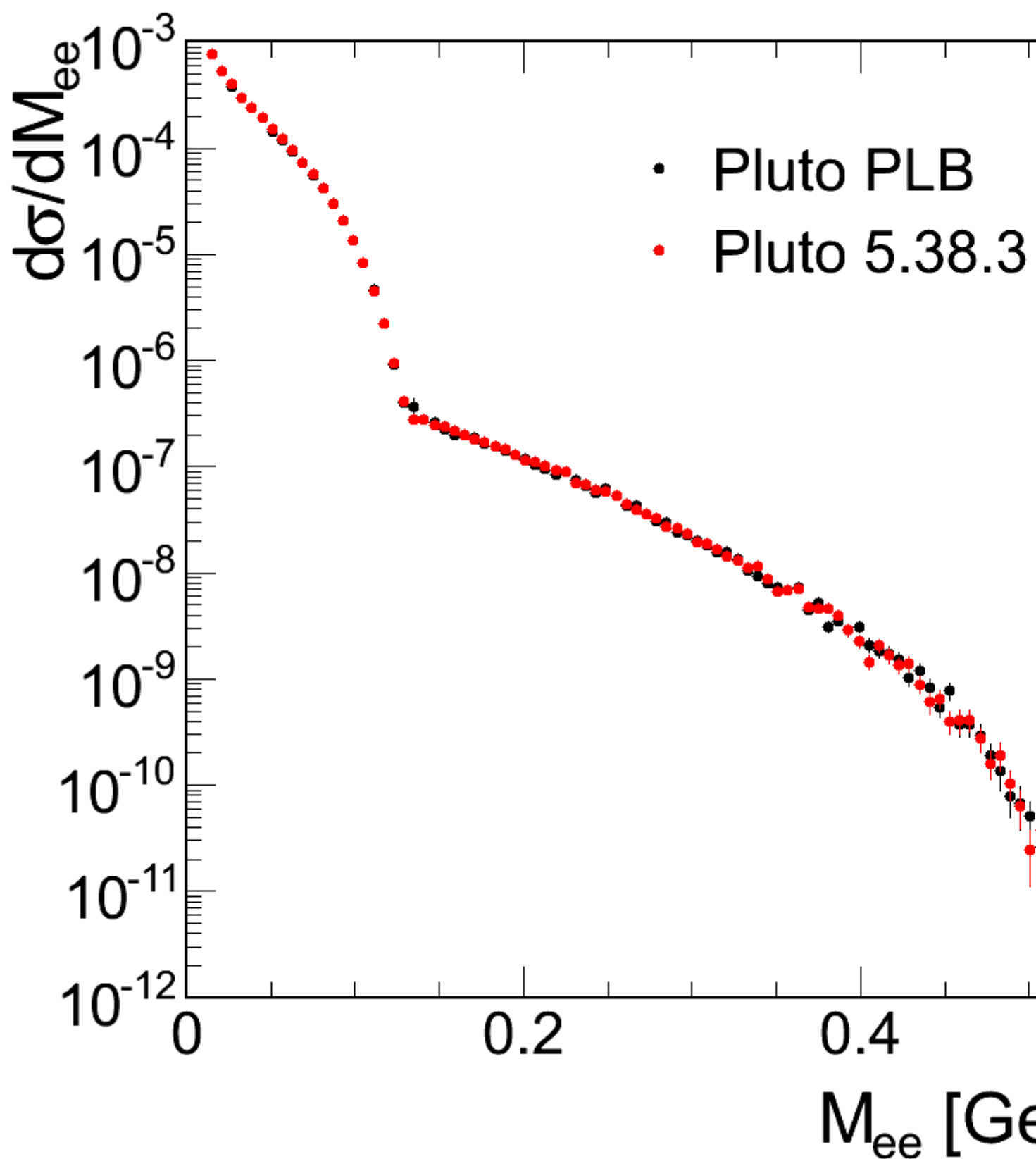
3) [Delta_ProtonPi_pp125.gif](#), downloaded 743 times



4) [BR_DeltaPlus_pp125_PlutoPLBvsPluto5382.gif](#), downloaded 795 times



5) [Minv_EpEm_pp125.gif](#), downloaded 1027 times



Subject: Re: Delta from Krivoruchenko

There is also Delta and Rho Branching ratios from my simulation.

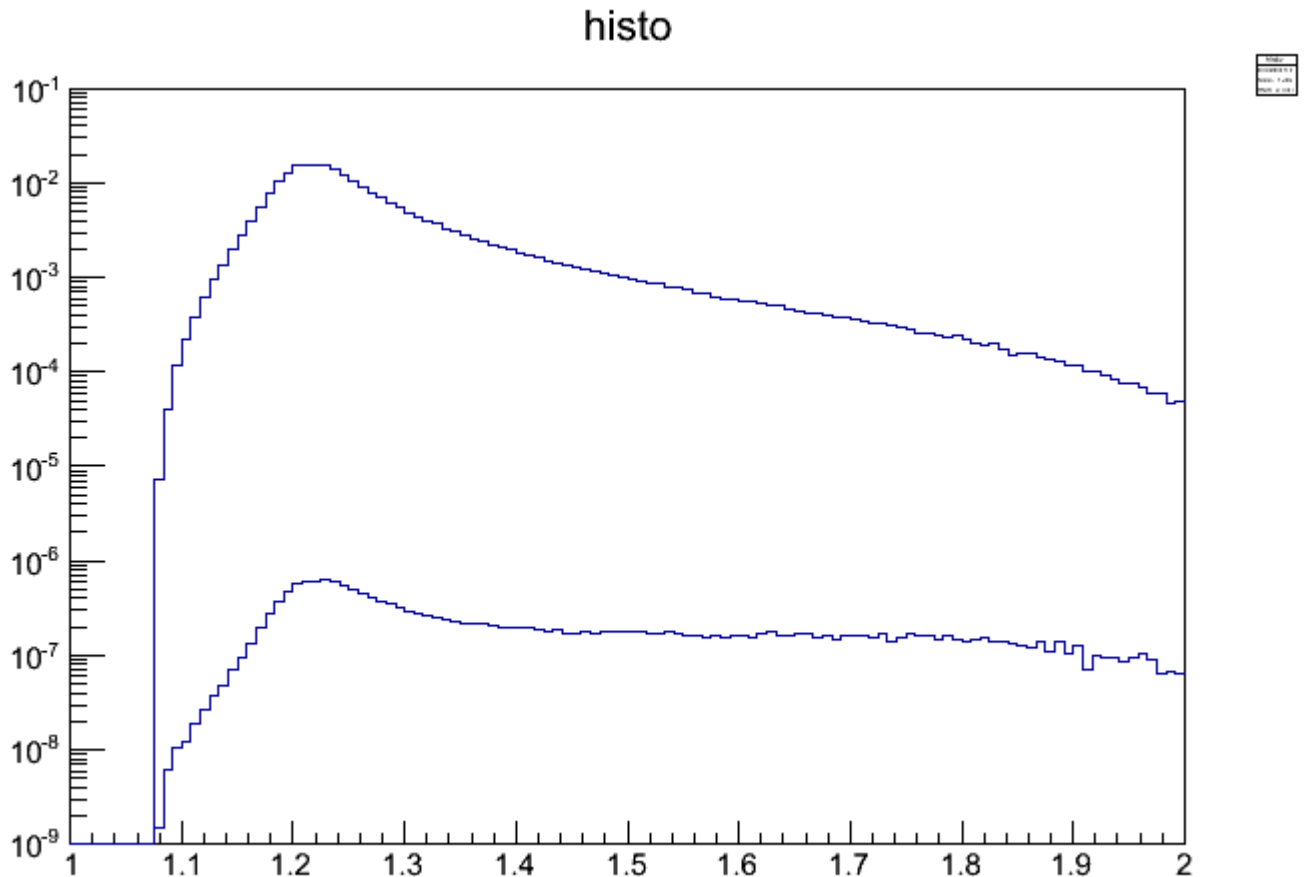
Note:

I use PYTHIA output both for the Delta and Rho.

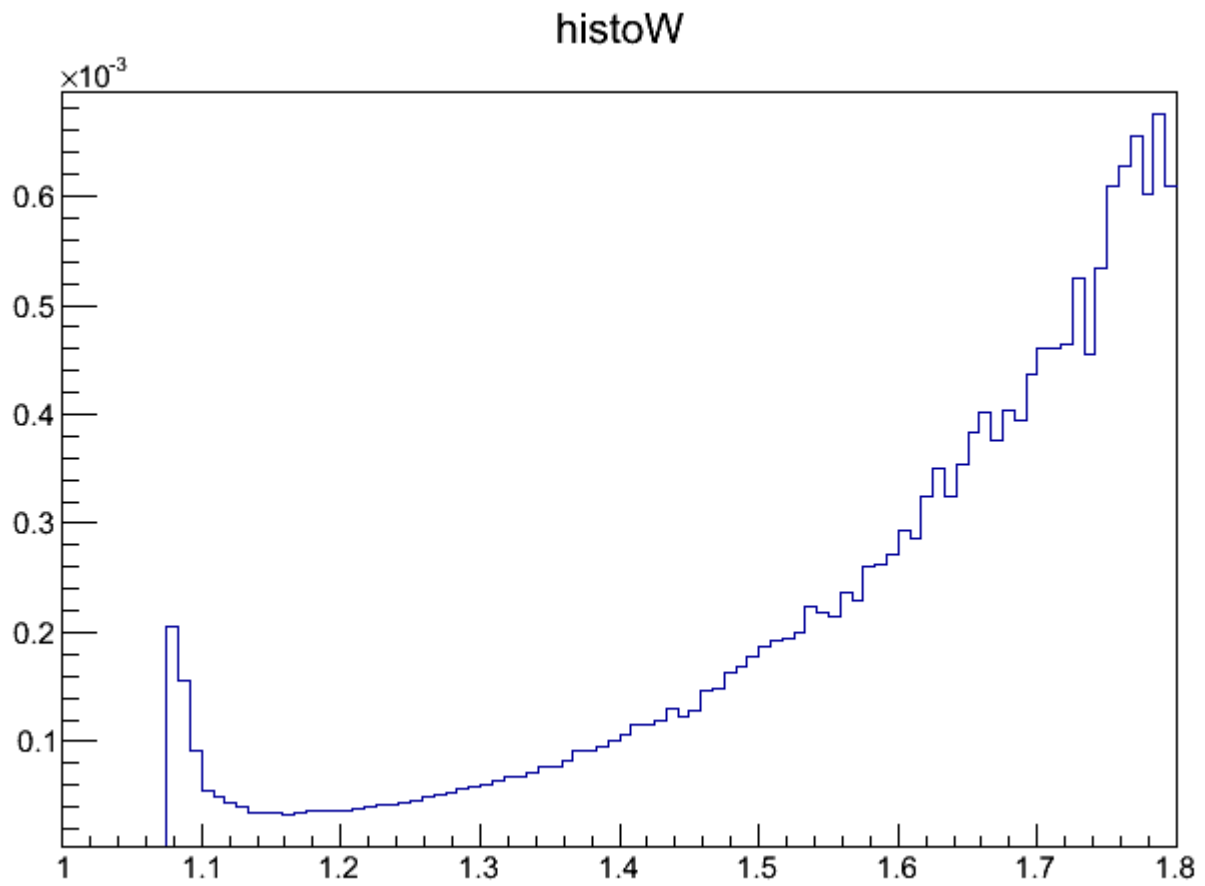
Then I decay Delta inside PLUTO, while Rho I decay myself within VMD;

File Attachments

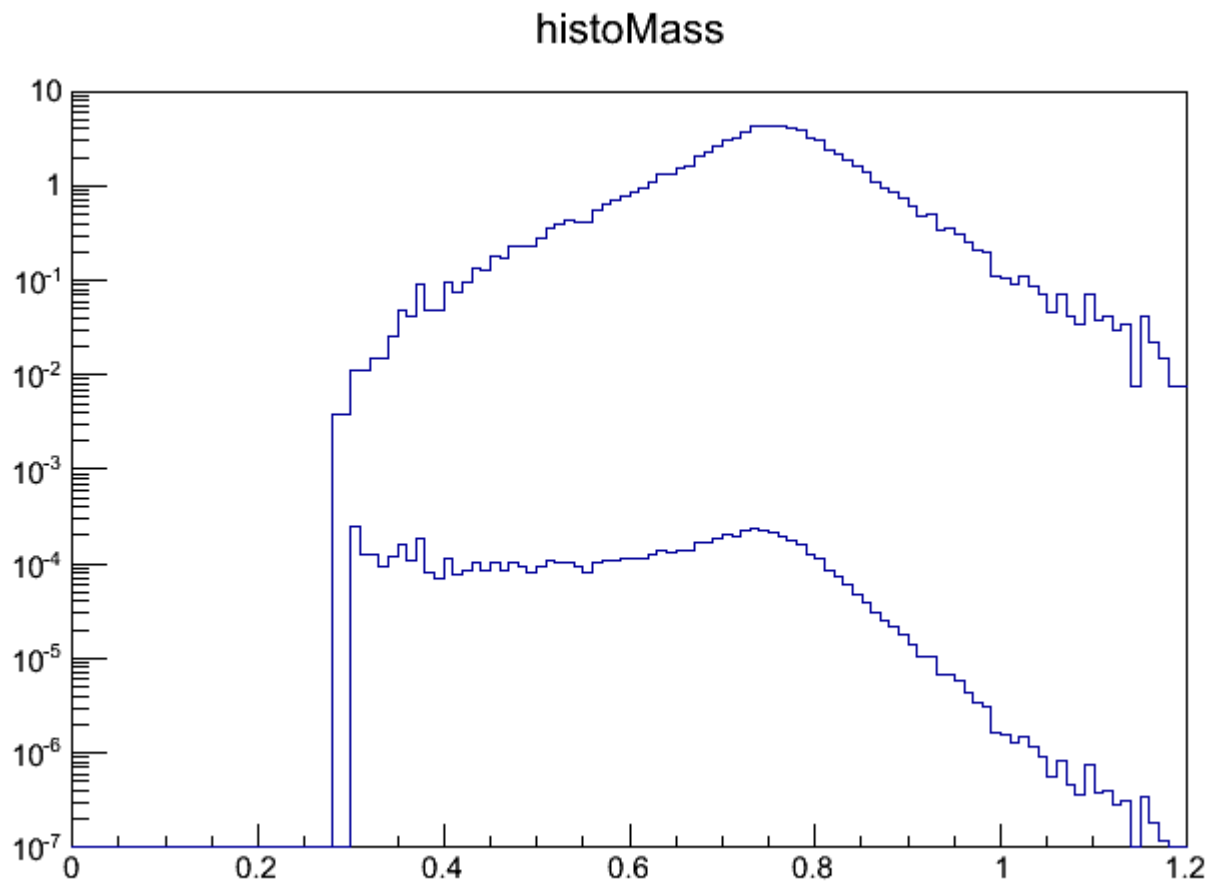
1) [deltaMass.png](#), downloaded 949 times



2) [deltaBr.png](#), downloaded 937 times



3) [rhoMass.png](#), downloaded 957 times



4) [RhoBr.png](#), downloaded 953 times

BrRho

