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Subject: Pion off Nuclei [quasi-free]

Posted by [Ingo Froehlich](#) on Mon, 16 Apr 2012 14:39:53 GMT

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Just a macro which adds the quasi-free ( $\pi^- + p$ ) reaction to Pluto:

```
{

//Add our quasi-free composite:
makeStaticData()->AddParticle(14009, "pi- + p",0.938272+0.139570);
//Creates just a symbolic link:
makeStaticData()->AddAlias("pi- + p","pi-+p");

//Executes the fermi plugin which adds also nuclei:
makeDistributionManager()->Exec("nucleus_fermi");

//Add a new composite particle (target_id*1000 * beam_id)
//N.B. that "nucleus_fermi" has already added the 12C (with id=614)
makeStaticData()->AddParticle(614009,"pi- + 12C",11.174862+0.139570);
//Creates again a symbolic link:
makeStaticData()->AddAlias("pi- + 12C","pi-+12C");

//adds a decay by using the "pi- + 12C" particle as created above:
makeStaticData()->AddDecay(-1, "pi- + 12C -> (pi- + p) + 11B (quasi-free)","pi- + 12C","pi- +
p,11B", 1.0);

//This is the fermi model (contributed by M. Dieterle and L. Witthauer, Basel):
PFermiMomentumGA * pmodel = new PFermiMomentumGA("pi-p_in_12C@pi- +
12C_to_pi- + p_11B", "Quasi-free particle production <nucleus_fermi>",-1);
pmodel->Add("q,parent");
pmodel->Add("pi-,grandparent,beam");
pmodel->Add("12C,grandparent,target");
pmodel->Add("11B,daughter,spectator");
pmodel->Add("q,daughter,composite");
pmodel->Add("p,granddaughter,participant");
pmodel->Add("pi-,granddaughter,p2");
makeDistributionManager()->Add(pmodel);

//This is our reaction, in this case just a quasi-free elastic reaction:
PReaction *Reac = new PReaction ("_P1=3.5","pi-","12C","(pi- p) pi- p (11B)","filename");

TH2F * histo2 = new TH2F ("histo2","Rap. vs. Pt",50,-1.5,3.5, 50,0,1.5);
Reac->Do(histo2,"foreach(pi-); _x = [pi-]->Rapidity(); _y=[pi-]->Pt(); ");

Reac->Print();
Reac->loop(1000); // Number of events

histo2->Draw("colz");

}
```

The nucleus\_fermi plugin supports already gamma and proton beams - I think in the future I

will add the pion beam as well, but at the moment the macro above should do the job (it needs some adaptations of course to other cases like  $\pi^+ + n$ )

For completeness, this is the result:

## File Attachments

1) [cl.png](#), downloaded 499 times

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Subject: Re: Pion off Nuclei [quasi-free]

Posted by [Johannes Siebenson](#) on Tue, 17 Apr 2012 07:26:35 GMT

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Hello Ingo,

do I need latest PLUTO version for that macro? I tried to run it with v5.34 but it does not do its job. There is a message:

Warning in <PNucleusFermiPlugin::Exec>: Syntax error:

Info in <PStaticData::AddDecay>: (ALLOCATION) Decay index 614009:  $\pi^- + 12C \rightarrow (\pi^- + p) + 11B$  (quasi-free)

and in the end there comes a message:

PReaction: calculating widths in PData...

PReaction: insufficient energy

100% done in 0.009896 sec

Thanks a lot in advance

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Subject: Re: Pion off Nuclei [quasi-free]

Posted by [Ingo Froehlich](#) on Tue, 17 Apr 2012 07:55:40 GMT

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It's better to use the latest stable version. 5.34 is quite old

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Subject: Re: Pion off Nuclei [quasi-free]

Posted by [Johannes Siebenson](#) on Tue, 17 Apr 2012 12:09:04 GMT

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Hello,

ok with Pluto v5.40 it seems to work. But now I tried to include production of Lambda and K0S and somehow this does not work. I probably do something wrong. Could you tell me what?

//Add our quasi-free composite:

```
makeStaticData()->AddParticle(14009, "pi-p",0.938272+0.139570);
```

```

//Creates just a symbolic link:
makeStaticData()->AddAlias("pi- + p","pi-+p");

//Add our quasi-free composite:
makeStaticData()->AddParticle(18016, "Lambda + K0S",1.115683+0.497672);
//Creates just a symbolic link:
makeStaticData()->AddAlias("Lambda + K0S","Lambda+K0S");

//Executes the fermi plugin which adds also nuclei:
makeDistributionManager()->Exec("nucleus_fermi");

//Add a new composite particle (target_id*1000 * beam_id)
//N.B. that "nucleus_fermi" has already added the 12C (with id=614)
makeStaticData()->AddParticle(614009,"pi- + 12C",11.174862+0.139570);
//Creates again a symbolic link:
makeStaticData()->AddAlias("pi- + 12C","pi-+12C");

//adds a decay by using the "pi- + 12C" particle as created above:
makeStaticData()->AddDecay(-1, "pi- + 12C -> (K0S + Lambda) + 11B (quasi-free)","pi- +
12C","Lambda + K0S,11B", 1.0 );

//This is the fermi model (contributed by M. Dieterle and L. Witthauer, Basel):
PFermiMomentumGA * pmodel = new PFermiMomentumGA("pi-p_in_12C@pi- +
12C_to_Lambda + K0S_11B", "Quasi-free particle production <nucleus_fermi>",-1);
pmodel->Add("q,parent");
pmodel->Add("pi-,grandparent,beam");
pmodel->Add("12C,grandparent,target");
pmodel->Add("11B,daughter,spectator");
pmodel->Add("q,daughter,composite");
pmodel->Add("Lambda,granddaughter,participant");
pmodel->Add("K0S,granddaughter,p2");
makeDistributionManager()->Add(pmodel);

//This is our reaction, in this case just a quasi-free elastic reaction:
PReaction *Reac = new PReaction ("_P1=3.6","pi-","12C","(pi- p) Lambda K0S
(11B)","filename");

//TH2F * histo2 = new TH2F ("histo2","Rap. vs. Pt",50,-1.5,3.5, 50,0,1.5);
//Reac->Do(histo2,"foreach(pi-); _x = [pi-]->Rapidity(); _y=[pi-]->Pt(); ");

Reac->Print();
Reac->loop(1000); // Number of events

//histo2->Draw("colz");

```

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Subject: Re: Pion off Nuclei [quasi-free]  
Posted by [Ingo Froehlich](#) on Tue, 17 Apr 2012 13:25:44 GMT

The composites must stay "pi- + 12C" and "pi- + p", this is your envelope and quasi-free reaction (in fact you try now a K0S beam...)

```
makeStaticData()->AddDecay(-1, "pi- + 12C -> (pi- + p) + 11B (quasi-free)", "pi- + 12C", "pi- + p, 11B", 1.0);
```

This line has a "pi- + 12C" composite as an input, and a 11B fragment and the "pi- + p" quasi-free reaction particle as daughters.

Consequence: everything in the original macro above the PReaction declaration must be unchanged (but only if you don't want to use pi+ + n, e.g.)

(Edit) This is the chain:

#### Reaction of 5 Particles interacting via 2 Channels

##### Reaction Particles:

0. quasi-particle (pi- beam and 12C target)
1. pi- + p
2. 11B
3. K0S
4. Lambda

##### Reaction Channels:

1. pi- + 12C -> (pi- + p) + 11B (quasi-free)  
Interaction model(s):  
[pi-p\_in\_12C] Quasi-free particle production <nucleus\_fermi> {/}
2. pi- + p --> K0S + Lambda  
Interaction model(s):  
[pi- + p\_fix\_K0S\_Lambda] 2-body fixed mass, partial width {/}  
[pi- + p\_genbod\_K0S\_Lambda] Pluto build-in genbod {/genbod}

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Subject: Re: Pion off Nuclei [quasi-free]

Posted by [Johannes Siebenson](#) on Tue, 17 Apr 2012 15:06:01 GMT

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Now it works. Thanks a lot

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