Subject: B field scaling for PANDA
Posted by Aleksandra Wronska on Thu, 29 Jan 2009 08:48:55 GMT
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Dear all,

I am now trying to set up simulations for tracking TDR and have my first problems with it. It concerns scaling of the B-field.

The current default for PANDA FS is the so-called chicane option, which requires that B-field of the dipole scales with the beam momentum, reaching its max. value of 1 T at pbeam=15 GeV/c.
For realistic simulations, I load three field maps:

1) SolenoidMap - for which scaling factor should be always 1, because this field does not affect beam direction

2) DipoleMap - which should scale with pbeam to keep the beam on the same position

3) TransMap - with which I have actually a problem, because this is a summed up fringe field of the dipole (which scales) and the solenoid (which is constant). Thus, the best solution that I see here is to have several maps for this region generated for different beam momenta (i.e. different dipole fields) such, that one can make reasonable interpolation between them to the simulated beam momentum.

Another issue is who and where should take care of that scaling stuff in the simulation macro. As I see it, the user should define one parameter of CbmRun, namely beam momentum, and the rest could be done for him/her in the CbmRun->SetField() function or a similar place. It should be possible everywhere in the code (also in the detector- and tracking-specific tasks) to ask the current run what its beam momentum is.

Write me (a.s.a.p. because of TDR time pressure) what you (in particular Mohammad) think about it. Perhaps some of the features are already there, just that I have not found them.

Thanks in advance,
ola

Subject: Re: B field scaling for PANDA
Posted by Mohammad Al-Turany on Thu, 29 Jan 2009 15:45:57 GMT
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Hallo Ola,

At the moment, each field map has a scale factor which can be set in the ASCII file, and I will provide a set method or additional parameter in the ctor to scale the existing map by a factor, So this is not a problem!

Quote:3) TransMap - with which I have actually a problem, because this is a summed up fringe field of the dipole (which scales) and the solenoid (which is constant). Thus, the best solution that I see here is to have several maps for this region generated for different beam momenta

(i.e. different dipole fields) such, that one can make reasonable interpolation between them to the simulated beam momentum.

As far as I know this can only be done on TOSCA level, the maps that I get where generated with both Solenoid and Dipole together, and then exported as single files, So here we should contact Lars and Jost if this is possible within few days from now!

about the beam momenta, does it have any other use here except the correlation with the scale of the map? and what about having this as a run parameter? I am planning to add a RunInfo class which should hold all run parameters (cuts, processes, event generators and so on!)
do you think it will be enough to have it there?

regards

Mohammad

Subject: Re: B field scaling for PANDA
Posted by Bertram Kopf on Thu, 29 Jan 2009 17:14:18 GMT
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Hi Ola, hi Mohammad,

Quote:
about the beam momenta, does it have any other use here except the correlation with the scale of the map? and what about having this as a run parameter? I am planning to add a RunInfo class which should hold all run parameters (cuts, processes, event generators and so on!)
do you think it will be enough to have it there?

to have easy and global access to the beam momentum infos is of course very helpful. Another important example is the kinematic fitter (4C fit). Here the complete 4vector of the pbar p or pbar A system, the beam spread (error matix) and the beam spot (+ spatial resolution) are the input parameters for the 4C fit. I would prefere to call the class EventInfo since the parameters can be changed within one run. What do you think?

Cheers,
Bertram.

Subject: Re: B field scaling for PANDA
Posted by Jost Lühning on Fri, 30 Jan 2009 15:52:44 GMT
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Dear all,

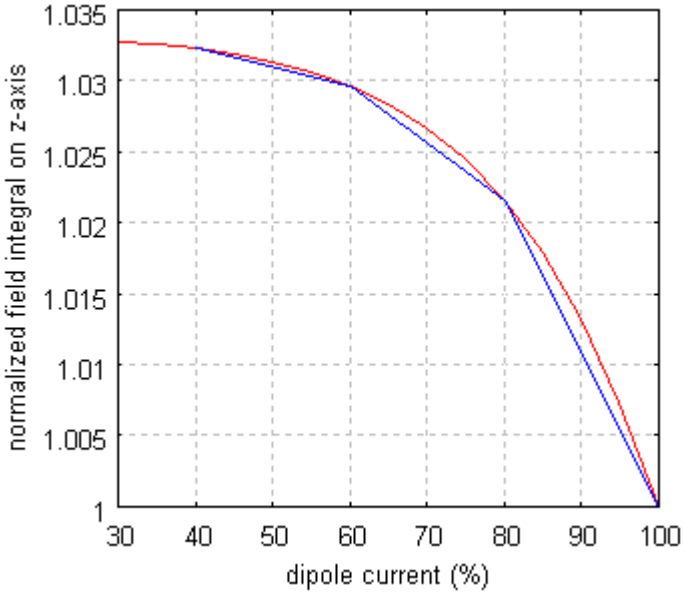
next week I could produce new field maps for the dipole and for the area between dipole and solenoid. The question is: At which dipole currents?
There is a saturation in the dipole which can be seen in this plot:

It shows the normalised field integral of the dipole on the z-axis. The red line is calculated for steps of 5% dipole current, the blue line indicates steps of 20% .
Would 5 field maps (in steps of 20%) be sufficient for the dipole?

Ciao,
Jost

File Attachments

1) Norm_Field_Dip.png, downloaded 1530 times



Subject: Re: B field scaling for PANDA
Posted by Mohammad Al-Turany on Sun, 01 Feb 2009 16:47:55 GMT
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Hallo Bertam,

I prefer to have at least three classes, RunInfo, MCEventInfo and EventInfo. because it make no sense to save for example Geant cuts for each MC event!

cheers, Mohammad

Subject: Re: B field scaling for PANDA
Posted by Lars Schmitt on Mon, 02 Feb 2009 10:20:04 GMT

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Hello,

I would propose to use some physics related beam momentum settings.

How about 1.5, 8.9, 15 GeV/c? These are values related to the accelerator.
Then in between one could choose 3.6 GeV/c (for J/psi) and maybe some
other value between 8.9 and 15 GeV/c.

Has anyone else an opinion?

Cheers,

Lars

Subject: Re: B field scaling for PANDA
Posted by Aleksandra Wronska on Mon, 02 Feb 2009 13:40:42 GMT
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Dear all,

I think Lars's proposal is reasonable. Thus, whatever dipole currents they correspond to, we would like to have Dipole and Trans maps for the beam momenta listed by Lars.

Concerning the representation of the beam momentum and B field in our data I see the following aspects:

1) most likely, in real experiment we will run with the fixed beam momentum and fixed beam quality (spreads in p and x,y). Beam momentum is directly related to the dipole B-field, which we should probably set once for the whole simulation, i.e. load the field maps once. Thus I think those numbers, along with the target mass, belong to the RunInfo.

2) on the other hand in every event we can have some spatial offsets (measured in the experiment on the pellet basis or set in the simulations). Those offsets clearly belong to the EventInfo.

3)-MINOR I can also imagine that at some point PANDA will start measurments "on ramping", with changing beam momentum and dipole field. The question is, however, if we want to prepare PandaRoot to simulate such runs or we think about it when there is a need for that

cheers,
ola

Subject: Re: B field scaling for PANDA
Posted by StefanoSpataro on Mon, 02 Feb 2009 14:48:03 GMT
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Maybe one could try to fit the distributions at different beam momenta, so that, when the user set the value of "p", the system itself is able to recalculate the correct field value at that value. In this case one does not need to store or load many maps.
But I have no idea if this was can be followed, or if maybe requires too much cpu time, or whatever.

Subject: Re: B field scaling for PANDA
Posted by Lars Schmitt on Tue, 03 Feb 2009 10:01:25 GMT
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Dear Stefano,

If you look at Jost's plot in his message it is clear that we need something like 5 field calculations and then can make a linear interpolation in between momenta for which the field was calculated.

I guess the most efficient way is to do the work in the initialization phase and create a new map in memory from the two neighboring maps calculated by Tosca. I don't believe (and Jost agrees) that one can just take the function and scale from 15 GeV/c with it to any value. The plot shown is just the field integral, but the actual field is different in any given point of the map and can have a slightly different behavior everywhere.

Coming back to the values: I made a mistake with J/psi. It should be 4.06 GeV/c. For the higher value I propose either 11.91 (Ds(2460)) or 12.01 (Xi_c) with a slight preference for 11.91.

The 8.9 GeV is the end of electron cooling and the 1.5 GeV/c and the 15 GeV/c are just the extremes we can have.

I would like to know Mohammad's opinion on this subject.

Cheers,

Lars

Subject: Re: B field scaling for PANDA
Posted by Mohammad Al-Turany on Tue, 03 Feb 2009 10:13:44 GMT
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Hallo Lars and all,

I already discussed with Jost about this, and the fact that the field in the region between dipole and solenoid cannot be calculated alone make it impossible to scale this map just by a factor. I agree on what you said about doing this in the initialization, in fact I do not see any other way to do this, one have simply to choose a TOSCA calculated map for a certain beam energy.

In fact, for each energy we need three maps, (i.g: Transient and the two dipole regions) Jost already told me that he will generate these maps (with different dipole current) and I will put them in the SVN end of this week (I hope!). Then we have to see how to correlate between the beam energy and the loaded maps but this is a detail!

regards,

Mohammad

Subject: Re: B field scaling for PANDA
Posted by Mohammad Al-Turany on Mon, 16 Feb 2009 13:05:29 GMT
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Hi,

It is now implemented and available in SVN, Jost has generated the maps for different beam energies, namely:

15.0 GeV/C
11.91 GeV/C
8.90 GeV/C
4.06 GeV/C
1.5 GeV/C

the corresponding maps are:

The dipole itself:
DipoleMap1.1500.root
DipoleMap1.1191.root
DipoleMap1.0890.root
DipoleMap1.0406.root
DipoleMap1.0150.root

in front of the dipole:
DipoleMap2.1500.root
DipoleMap2.1191.root
DipoleMap2.0890.root
DipoleMap2.0406.root
DipoleMap2.0150.root

and the region between dipole and Solenoid:

TransMap.1500.root
TransMap.1191.root
TransMap.0890.root
TransMap.0406.root
TransMap.0150.root

The beam energy can be set in sim macro with:

FairRunSim::SetBeamEnergy(Double_t Energy /** GeV/c */)

according to the energy the field is selected, for now the selection is as following:

```
BeamEnergy   < 2.0      Map   0150
BeamEnergy   < 5.0      Map  0406
BeamEnergy   < 10.0     Map  0890;
BeamEnergy   < 12.0    Map  1190
otherwise                  Map  1500;
```

An example for using this can be found in macro/run/run_sim.C and macro/emc/sim_emc.C

setting this in a simulation session, the RuntimDB will take care that the reconstruction get the proper fields!

regards

Mohammad

Subject: Re: B field scaling for PANDA
Posted by Aleksandra Wronska on Thu, 26 Feb 2009 10:13:12 GMT
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Hi Mohammad,

so now a pedestrian question:
how to get info about beam momentum set in the simulation run from one of my tasks within the analysis run?

cheers,
ola

Subject: Re: B field scaling for PANDA
Posted by Mohammad Al-Turany on Thu, 26 Feb 2009 12:26:00 GMT
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Hi,

Sorry I forget to add the beam momentum to the parameters! any way later it will go to the run info. For now I just add it to the FairBaseParSet. In an analysis or reconstruction run you can do:

```
FairRuntimeDb* rtdb = fRun->GetRuntimeDb();
FairBaseParSet* par=(FairBaseParSet*)
        (rtdb->findContainer("FairBaseParSet"));
Double_t BeamMom= par->GetBeamMom();
```

this will give you the momentum setted in the simulation run, these lines can be added to the task Init.

Mohammad
