Subject: GLAD magnetic field
Posted by C. A. Douma on Mon, 08 Feb 2016 14:44:47 GMT

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I am doing an R3B simulation with the following components:

STaRTrack, DCH, mTOF, MFI, PSP, TOF, VACVESSEL and CALIFA.

Without the GLAD geometry in the simulation, the magnetic field looks
fine. But when I add the GLAD geometry to the simulation (even when it is
somewhere at the boundary of the world volume), the magnetic field
suddenly looks completely wrong (see attached screenshots).

Can anyone help me with this?

Christiaan Douma.

PS: the other screenshot is in a separate message

File Attachments
1) with GLAD.png, downloaded 678 times

Browser Eve
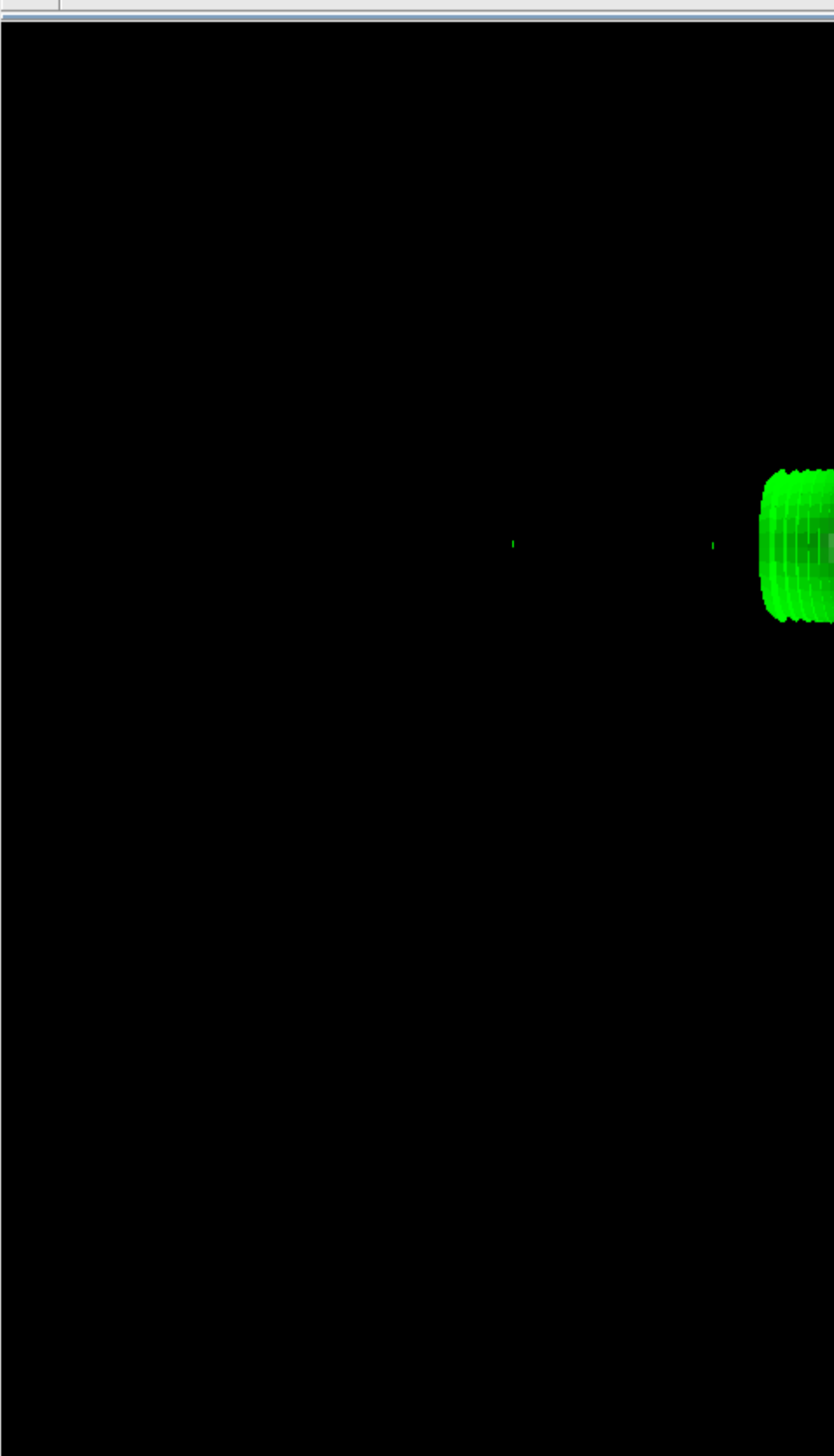
Eve | Files

- 📁 ☑ Window Manager
- 📁 ☑ Viewers
- 📁 ☑ Scenes
- 📁 ☑ FairEventManager
  - ⊞ 📁 ☑ proton ◻
  - ⊞ 📁 ☑ gamma ◻
  - ⊞ 📁 ☑ neutron ◻
  - ☑ STaRTraPoint ◼
  - ☑ CaloCrystalHitSim ◼
  - ☑ DCHPoint ◼
  - ☑ TOFPoint ◻
  - ☑ mTOFPoint ◻
  - ☑ MFIPoint ◻
  - ☑ PSPPoint ◻

Style | Info

FairEventManager [FairEventManager]

Input file : ../../Data/MonteCarlo/Double_rur
Run Id : 1454941447
No of events : 1
No. of Nodes : 6839
Current Event: 0
Event Time: 0.00 ns
☐ Primary Only
Select PDG : 0
Min Energy: 0.00
Max Energy: 10.00

Update

Viewer 1
Hide

Command
Command (local):

Subject: Re: GLAD magnetic field
Posted by C. A. Douma on Mon, 08 Feb 2016 14:45:51 GMT
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File Attachments
1) without GLAD.png, downloaded 498 times

Browser Eve

Eve | Files

- ☑ Window Manager
- ☑ Viewers
- ☑ Scenes
- ☑ FairEventManager
  - ☑ proton ■
  - ☑ STaRTraPoint ■
  - ☑ CaloCrystalHitSim ■
  - ☑ DCHPoint ■
  - ☑ TOFPoint ■
  - ☑ mTOFPoint ■
  - ☑ MFIPoint ■
  - ☑ PSPPoint ■

Style | Info

FairEventManager [FairEventManager]

Input file : ../../Data/MonteCarlo/Double_rur
Run Id : 1454941534
No of events : 1
No. of Nodes : 6831
Current Event: 0
Event Time: 0.00 ns
☐ Primary Only
Select PDG : 0
Min Energy: 0.00
Max Energy: 10.00

Update

Viewer 1

Hide

Command

Command (local):

Subject: Re: GLAD magnetic field
Posted by Ralf Plag on Wed, 10 Feb 2016 10:20:46 GMT
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Hi Christiaan,

I have no idea how and why the Glad volumes affect the field. But maybe the field with Glad is not completely weird but only mirrored. Your particle gets first deflected into the opposite direction and then looks like it enters the coils where the field first reaches its maximum and then swaps the sign.

Cheers,
Ralf

Subject: Re: GLAD magnetic field
Posted by Dmytro Kresan on Thu, 11 Feb 2016 08:04:54 GMT
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Hi Christiaan,

If you run the simulation without ALADIN or GLAD volumes, due to "feature" of r3ball.C, ALADIN field map will be selected, so to say by default. And it works fine.

In case you add GLAD volume - then you run with GLAD field map, which indeed has a problem. We are working on the solution and will let you know as soon as it is done.

Best regards,
Dima

Subject: Re: GLAD magnetic field
Posted by Ralf Plag on Thu, 11 Feb 2016 09:52:57 GMT
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How do you actual set the field value?

When I successfully ran Glad, I used a negative field value. In the root macro, I had something like:

    Float_t fieldScale = -0.68; // 15O +1p @ 1GeV
    [...]
    R3BGladFieldMap* magField = new R3BGladFieldMap("R3BGladMap");
    magField->SetScale(fieldScale);

Cheers,
Ralf

Subject: Re: GLAD magnetic field
Posted by C. A. Douma on Thu, 11 Feb 2016 12:27:41 GMT
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Dear Dima and Ralf,

Thank you for your suggestions. I create The GLAD field with:
Int_t fieldScale = 1;
magField = new R3BGladFieldMap("R3BGladMap");
((R3BGladFieldMap*)magField)->SetPosition(0., 0., +350-119.94);
((R3BGladFieldMap*)magField)->SetScale(fieldScale);

I will try to run with the GLAD geometry and the ALADIN field map
and see how that goes. When the problem with the GLAD field is
solved, I can then switch back to the GLAD field.

Christiaan.

Subject: Re: GLAD magnetic field
Posted by Dmytro Kresan on Thu, 11 Feb 2016 12:33:09 GMT
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No, do not run the simulation with ALADIN geometry and GLAD magnetic field.

The latest post from Ralf about "Float_t fieldScale = -0.68" is the solution for GLAD field map
you need.

Cheers,
Dima

Subject: Re: GLAD magnetic field
Posted by C. A. Douma on Thu, 11 Feb 2016 15:02:07 GMT
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I plan to do the other way around: ALADIN field and GLAD geometry.

But I will also try "Float_t fieldScale = -0.68"

Christiaan.

Subject: Re: GLAD magnetic field
Posted by C. A. Douma on Wed, 17 Feb 2016 09:35:48 GMT
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"Float_t fieldScale = -0.68" gives a good GLAD magnetic field.
However, the GLAD field does not depend on the fMeasCurrent.

Instead, the field becomes stronger/weaker when I adjust
the fieldScale. If I double the fieldScale, does that mean
the same as doubling the current through the magnet?

Christiaan.

Subject: Re: GLAD magnetic field
Posted by Dmytro Kresan on Fri, 19 Feb 2016 10:55:24 GMT
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Hi Christiaan,

fMeasCurrent is meant for ALADIN only. Field maps are measured with current 500, 1100,
1300, --, 2500 A. Depending on the fMeasCurrent you set in the macro the resulting field value
will be interpolated.

For GLAD we have currently only fScale, which controls the magnitude of field.

Whether dependence between current and field is linear - this I can not answer.

Best regards,
Dima

Subject: Re: GLAD magnetic field
Posted by Anna Corsi on Mon, 12 Sep 2016 22:27:30 GMT
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Hello,

I have a further question related to this topic. In the field map I got with R3BRoot code, the field
goes up to ~2T (in y). I saw in some plans that the field can reach up to 2.5-3 tesla in the
central region of GLAD. I we apply the 0.68 factor, the field value will be much below this
value. Is my understanding correct? Will it be possible to operate GLAD at higher B, in physics
experiment?

A further question is about the field map coordinates. A translation gTrans   = new
TVector3(0.0, 0.0, -113.4) is applied in R3BGladFieldMap.cxx. Does it mean that the map is
shifted by 113.4 cm? With respect to what?

Thanks in advance.
Best regards,
Anna

Subject: Re: GLAD magnetic field
Posted by Ralf Plag on Wed, 14 Sep 2016 09:24:49 GMT
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Hi Anna,

I suppose that values from 0 .. 1 are valid for the field factor.

For the translation:
The coordinates of the field map are relative to a point which is not precisely specified, but is located somewhere behind the entrance flange inside glad. (I know that sucks...)
World coordinates in R3BRoot are normally given with respect to the target. Hence, this translation of 113cm is needed to convert world coordinates into Glad field map coordinates. The value 113 is however only a preliminary guess.

Cheers,
Ralf

Subject: Re: GLAD magnetic field
Posted by C. A. Douma on Wed, 14 Sep 2016 10:08:44 GMT
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Dear Ralf,

I also noticed this problem when running simulations with the GLAD vacuum chamber. Since the field is not completely aligned,
I was unable to send ions through the center of the pipe (they can fly through without hitting the wall, but their path cannot be completely aligned with the pipe).
My guess would be that the center point of the field should be the intersection of the pipe axis with the z-axis.
However, it is not clear to me where the pipe axis should be. The macro I included will produce the correct orientation of
the chamber, but not necessarily the right global position. This is because the global position depends on the position of GLAD. But
the position and orientation of GLAD as it is today overlaps with CALIFA and will not connect to the chamber properly...
So may I suggest to solve orientation & position of the GLAD geometry should first? Then the chamber can interfaced with it, giving
us the right location of the pipe axis and hence the right centerpoint of the field.

Christiaan.

File Attachments
1) Chamber_Dummy_Geometry.cpp, downloaded 1063 times

Subject: Re: GLAD magnetic field
Posted by Dmytro Kresan on Wed, 14 Sep 2016 13:01:21 GMT
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Dear Christiaan,

there was mismatch in rotation between field map and GLAD geometry. Fix is on GitHub.

Update your R3BRoot and try again.

According to what I see in our Issue Tracker, Lorenzo Zanetti is taking care about vacuum chamber for tracking detectors, let us wait for him to finish.

Concerning the overlap between CALIFA and GLAD, please contact Hector.

Best regards,
Dima

Subject: Re: GLAD magnetic field
Posted by Anna Corsi on Wed, 14 Sep 2016 20:34:38 GMT
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Dear Ralf and all,

Thanks for the reply. Still I have some issue with GLAD field map. I attach two plot obtained shooting 1.5 GeV protons along the beam axis, with fieldScale=1 and -0.68. Only the second one looks reasonable, in agreement with what is said in post #19024, but I don't know how to interpret this: is it a problem of the field map, the simulation (when the particle enters or approaches GLAD), or for some experimental condition the GLAD should be operated with reduced B field (and inverted in sign)?
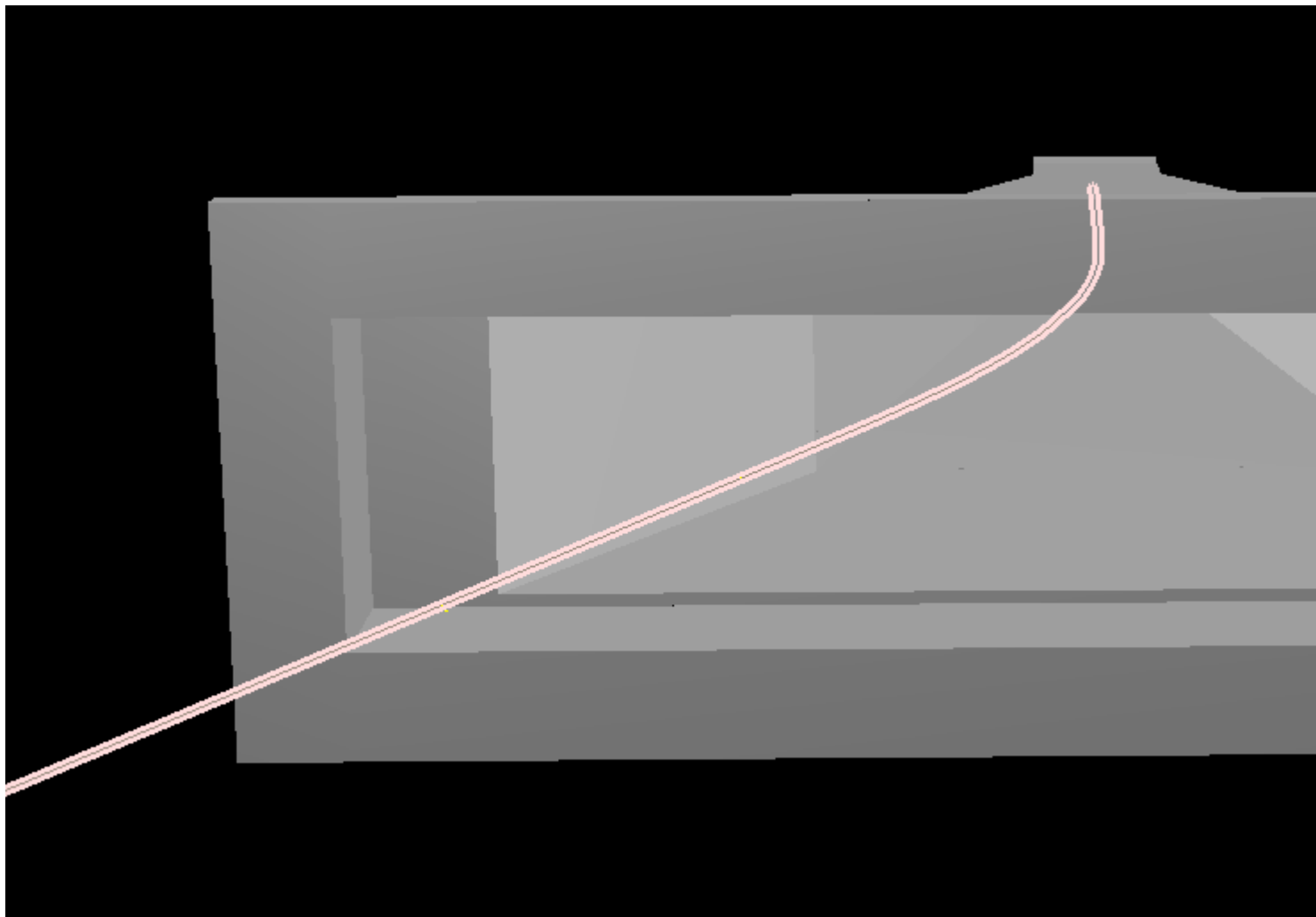
Cheers,
Anna

```
File Attachments
1) fieldscaleminus0.68.png, downloaded 493 times
```
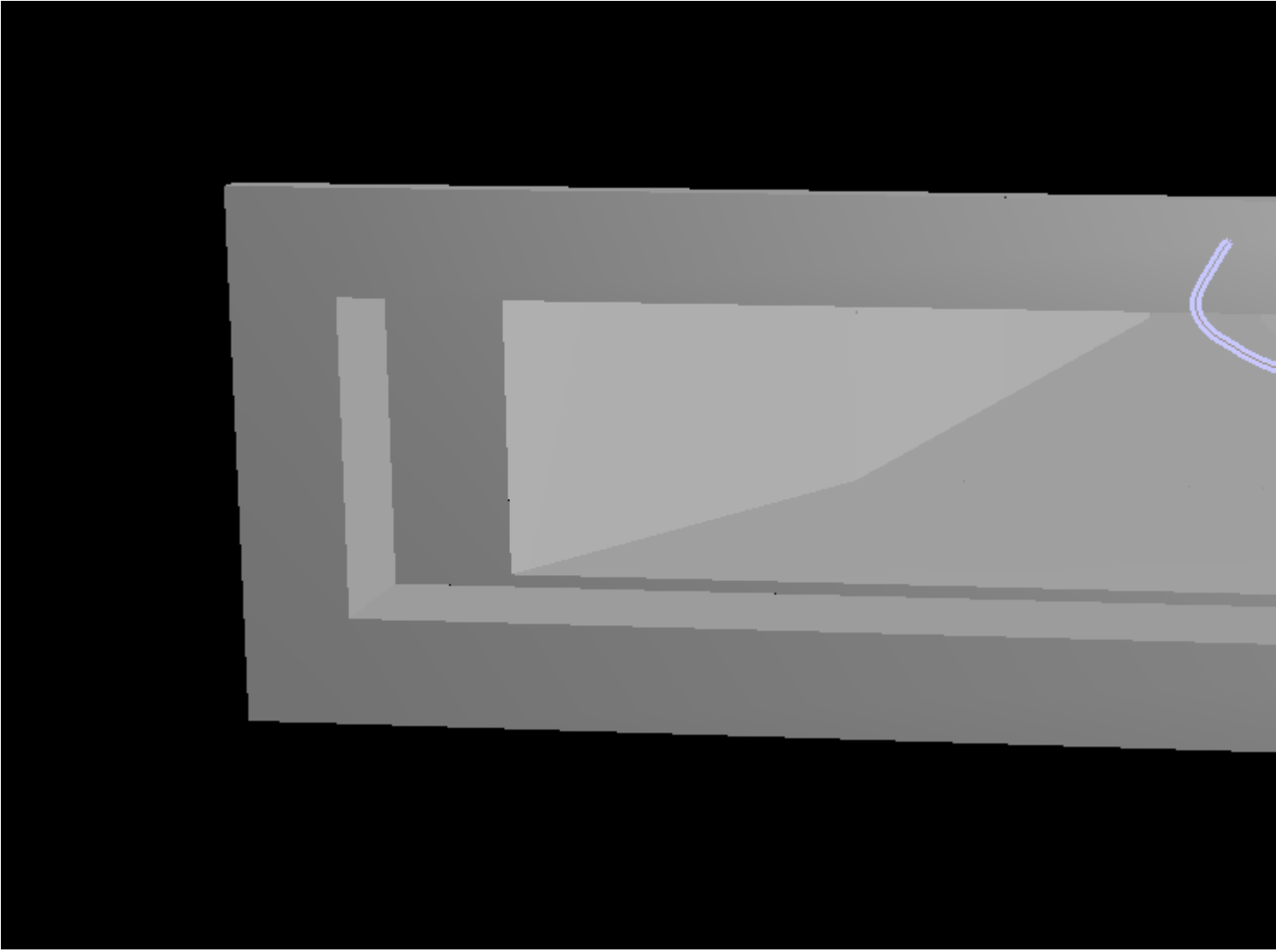
2) fieldscale1.png, downloaded 496 times

Subject: Re: GLAD magnetic field
Posted by PaulinaM on Fri, 17 Mar 2017 14:07:03 GMT
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Hello everyone,

I wanted to ask a few things on GLAD field. Is this fieldScale thing still on, or is it possible to select now values from 0 to 1? Does '1' than mean maximum field? Is it now possible to run without Gladgeometry but with Gladfield?

In my simulations, it looks like the angle of entrance is problematic, everything hits the wall of

accordingly?

Thank you.
Best regards,
Paulina

Subject: Re: GLAD magnetic field
Posted by Dmytro Kresan on Mon, 20 Mar 2017 08:46:23 GMT

Hello Paulina,

Currently, the field scale for the GLAD map has to be negative. "-1" stands for the maximum field value.

Running a simulation with the field but without geometry is kind of unusual application case, and we will not make this option available as standard. You will need to hack the r3ball.C in your working version.

Concerning the last point, please post here a picture illustrating the tracks hitting the GLAD volume, also with information on particles and energy. Note that the scale has to be adjusted to beam energy - field map region starts upstream the geometry.

Best regards,
Dima

Subject: Re: GLAD magnetic field
Posted by PaulinaM on Mon, 20 Mar 2017 10:46:51 GMT

Hi Dima,

thank you very much for your reply. Adjusting the fieldscale worked well for charged particles. However, primary neutrons very often interact with the Glad wall, which is problematic for my task. I attach a picture of an event with one alpha (red) and two neutrons (blue). Only primaries are displayed, the neutron hitting the wall produces a mess, naturally. What can be/has to be done in order to get the majority of the neutrons further away from the Glad wall?
Also the trajectory of the alpha often just ends somewhere in the magnet, without hitting or producing anything (as in the picture, there were no secondary trajectories at that endpoint) is this related to some cut off that can be adjusted?
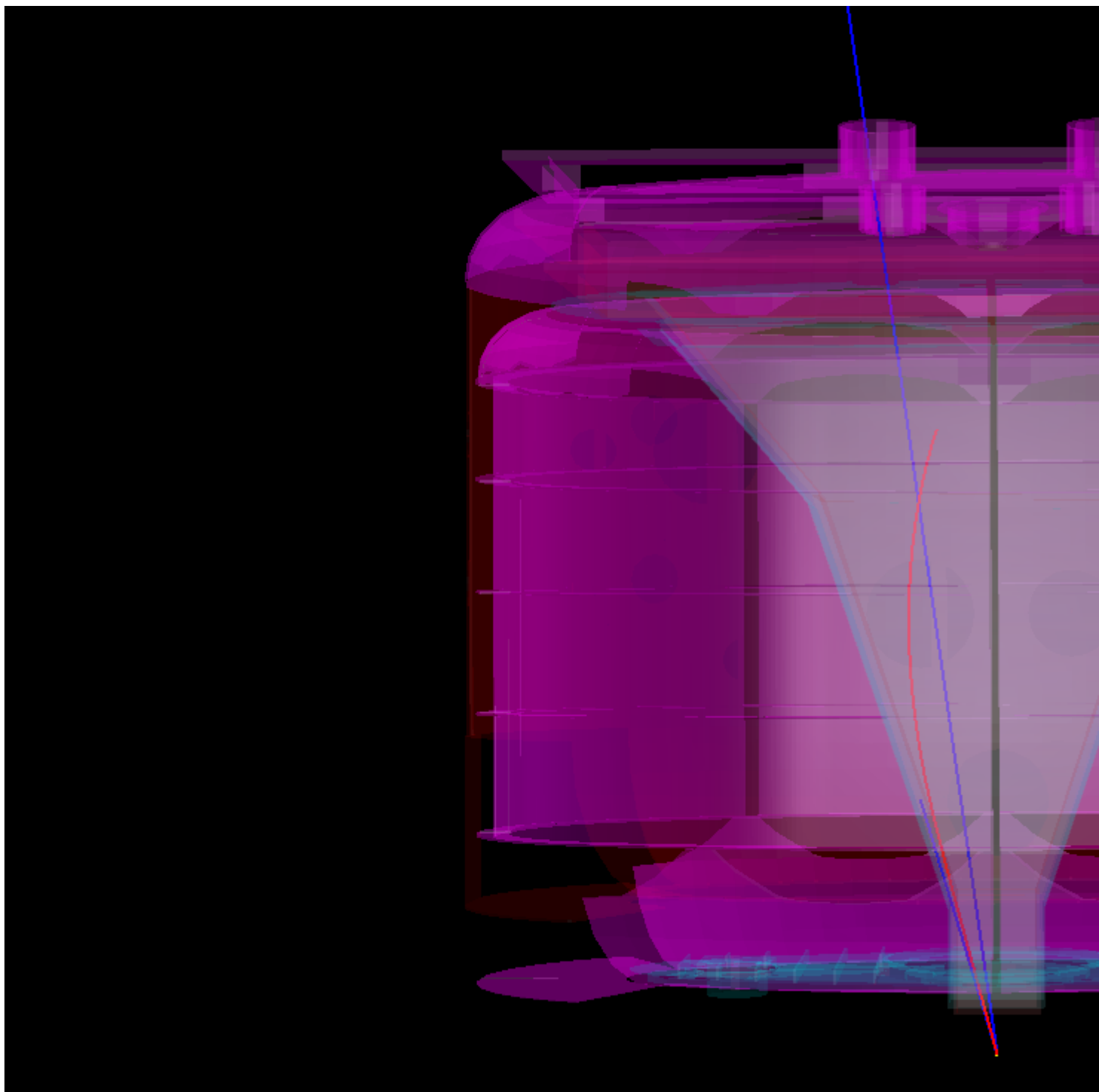
Thanks a again and best regards,
Paulina

```
File Attachments
1) Glad_alpha-2n.png, downloaded 459 times
```

From the picture: the opening angle of the stopped neutron is as large as the angle of the magnet - maybe it does help when one moves the origin (target) closer to the magnet. Which kind of event generator are you using?

What is the energy of this alpha, approximately? One can try to put vacuum in the cave and see whether this stopping disappears.

Best regards,
Dima

Subject: Re: GLAD magnetic field
Posted by C. A. Douma on Mon, 20 Mar 2017 14:24:29 GMT
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You can also add the scattering chamber to the simulation.
The included file contains not only the chamber geometry itself,
but also a vacuum content that fits inside GLAD.

It might also help to prevent air scattering of the neutron
inside GLAD.

Yours Sincerely,
Christiaan Douma.

```
File Attachments
1) Chamber_Dummy_Geometry.cpp, downloaded 347 times
```

Subject: Re: GLAD magnetic field
Posted by PaulinaM on Mon, 20 Mar 2017 15:12:29 GMT
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Thanks Christiaan and Dima.

The alpha particle had about 1GeV per nucleon kinetic energy. The fieldscale was set to -0.85.
I used the ascii generator with a file produced by Dominic Rossi.

So, I want to try your suggestions, but I fear I need a few further hints

Can I add a translation in the create_target_geo.C macro to move the target closer to the magnet? But then the origin would not match the target position any further? How can I change the origin?

I didn't know the scattering chamber. Is this the DCH in the r3bsim macro? I could'nt find anything named scattering chamber.

Thank you again,
Cheers,
Paulina

Subject: Re: GLAD magnetic field
Posted by C. A. Douma on Mon, 20 Mar 2017 15:17:39 GMT
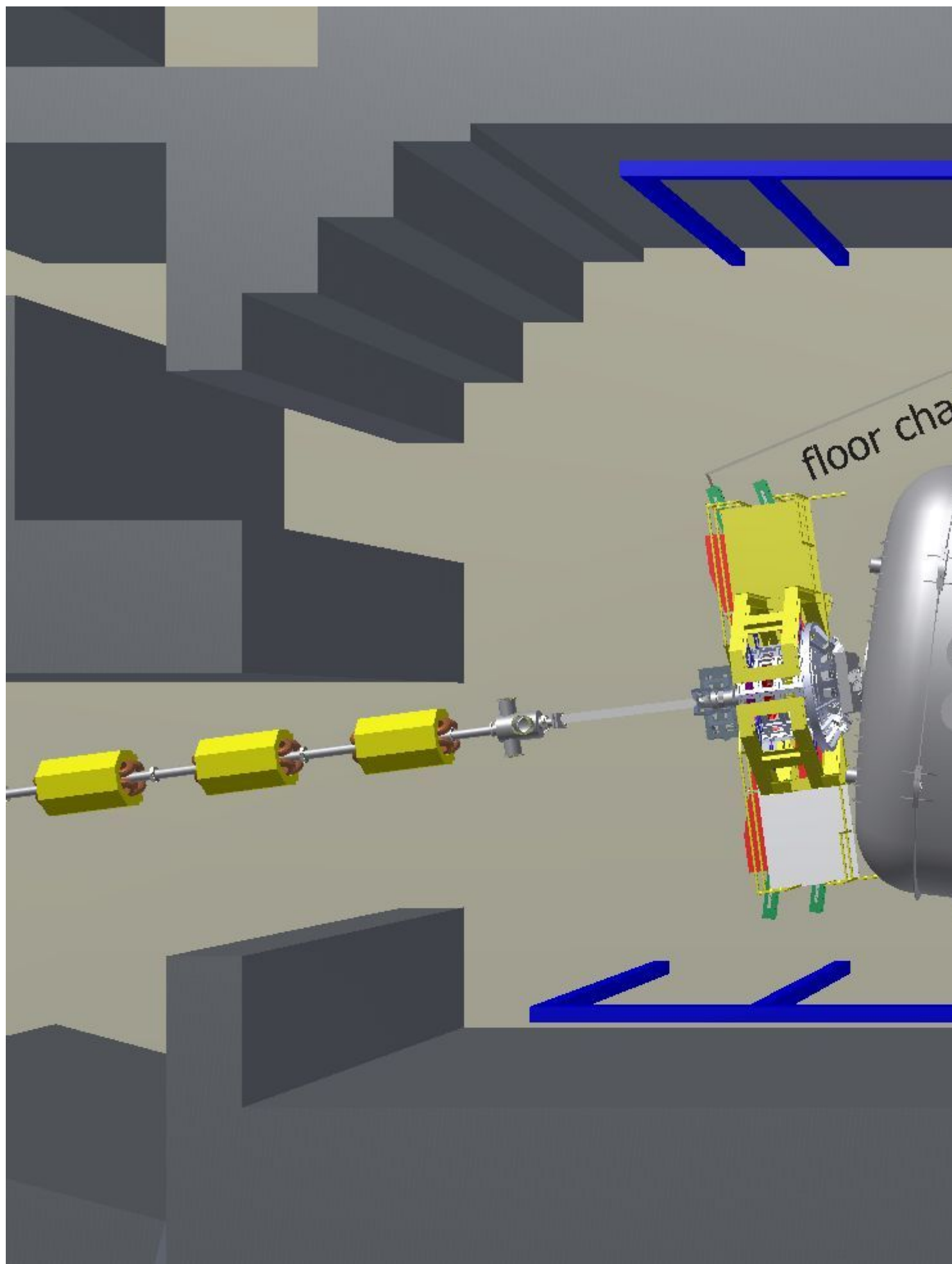View Forum Message <> Reply to Message

The scattering chamber is the large chamber behind GLAD (see picture).
As far as I know there is no official geometry available in R3BRoot yet
for this chamber. That is why I send you my simplified geometry.
You do need to rotate GLAD to 14 degrees to properly interface it with the
chamber (might already be the case, check your R3BRoot version).
You will also need to adapt some global positions for this.
This is important because otherwise the vacuum content for GLAD and GLAD itself
will not properly fit and you get overlaps.

Christiaan.

File Attachments
1) CAVE_C_PHASE_0(1).jpg, downloaded 658 times

floor cha

Subject: Re: GLAD magnetic field
Posted by Dmytro Kresan on Tue, 21 Mar 2017 08:25:01 GMT
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Hi Paulina,

For the first step, it will be enough to shift the origin of tracks. Please post here the lines from your ASCII input file defining an event (one line for the header and a line for each primary particle), and I will point out the place where the vertex is defined.

Best regards,
Dima

Subject: Re: GLAD magnetic field
Posted by PaulinaM on Tue, 21 Mar 2017 08:32:50 GMT
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Hi Dima,

an event looks like this:

```
1 3 0.  0.
 -1  2  4 -0.0926227  -0.0615376  7.19282  0.  0.  0.  3.7284
  1  0  2112 -0.085658  0.0103547  1.44778  0.  0.  0.  0.939565
  1  0  2112 0.178281  0.0511829  1.69912  0.  0.  0.  0.939565
```

Thank you very much,
Cheers,
Paulina

Subject: Re: GLAD magnetic field
Posted by Dmytro Kresan on Tue, 21 Mar 2017 10:26:54 GMT
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Hi Paulina,

The position of GLAD in the cave volume in the current version of R3BRoot has to be cross-checked. I will create an issue on that and report back here later.

For the moment you can skip the magnet geometry. For that comment out the line "detGeo.Add(new TObjString("GLAD"), ..." in your r3bsim.C, and change the following line in r3ball.C to have the proper field map. Line no. 89 has to be:

Int_t fFieldMap = 1;

Best regards,
Dima

Subject: Re: GLAD magnetic field
Posted by PaulinaM on Tue, 21 Mar 2017 10:32:25 GMT
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Ok, thanks