Subject: Solenoid field effect on the particle track theta!
Posted by Huagen Xu on Mon, 17 Aug 2009 12:09:02 GMT
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Dear solenoid field experts,

Here I'd like to escalate a problem which I came across during the simulation for luminosity monitor detector. The problem is the solenoid field would bend the particles emitting from IP toward beam axis, for the worst case, the particle track theta would be shifted about 0.5mrad@1.5GeV/c for antiproton. Attached is the MC points plot on the 4 luminosity sensors viewed on xy plane with field and with no field. This effect absolutely would impact the theta resolution which was determined by the luminosity monitor detector.
Is this effect is normal or abnormal for solenoid field?

Best Regards!
Huagen Xu
IKP, Juelich

File Attachments
1) Field effect.pdf, downloaded 364 times

Subject: Re: Solenoid field effect on the particle track theta!
Posted by Jost Lühning on Mon, 17 Aug 2009 15:57:41 GMT
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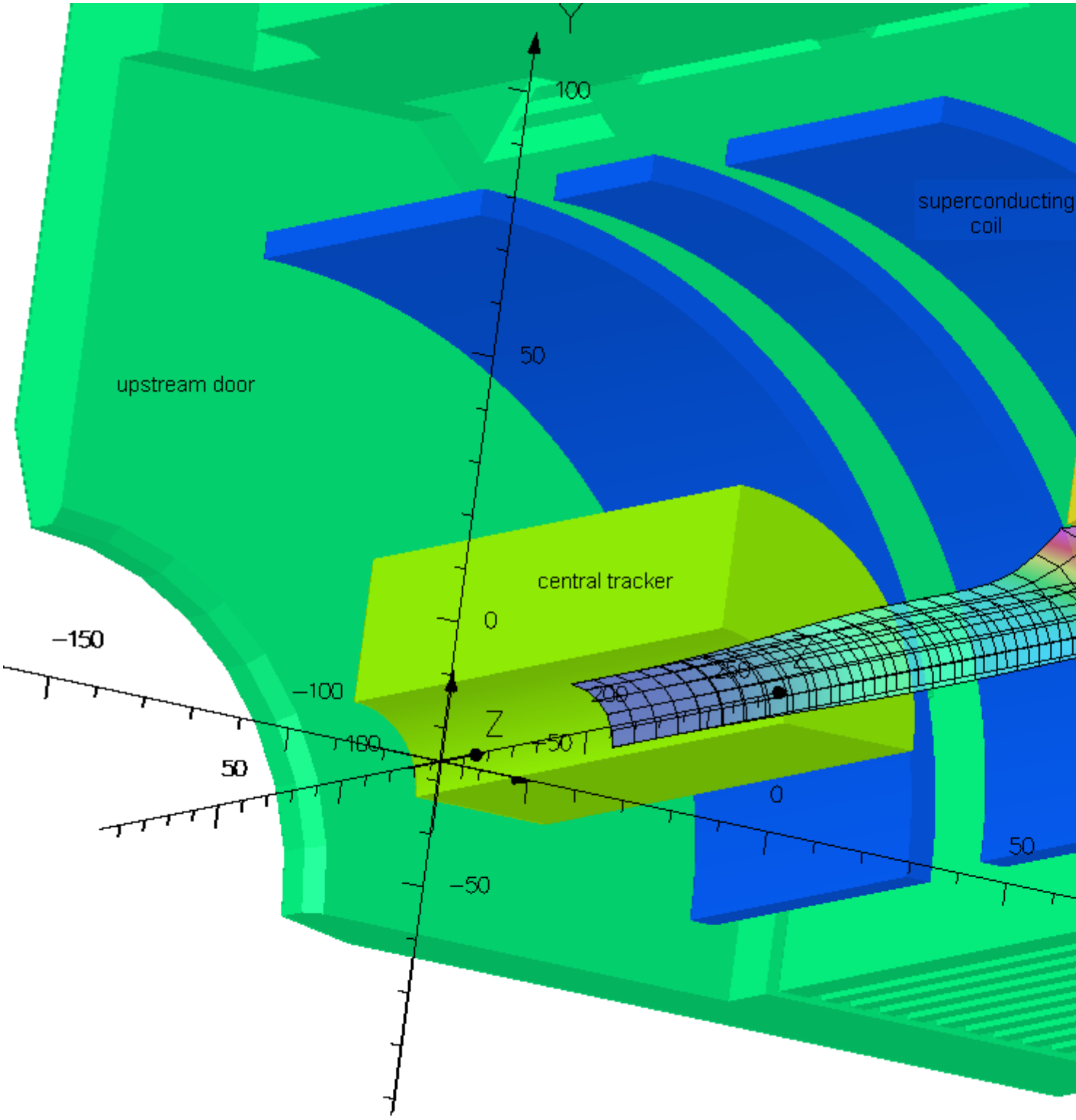
Dear Huagen Xu,

the distortion of the circle is due to the rectangular shape of the aperture which we need in the downstream door of the solenoid. In the aperture the field component in y-direction is much bigger than in x-direction (see attachment).

Best regards,
Jost Luehning

File Attachments
1) RadialFieldApertureDS.png, downloaded 547 times



Radial field on the surface of a cylinder with a radius of 10 cm.
Maximum field towards the top edge of the aperture of the downstream door (red/pi

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Subject: Re: Solenoid field effect on the particle track theta!
Posted by Inti Lehmann on Tue, 18 Aug 2009 13:59:26 GMT
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Hi Huagen and Jost,

That effect seems a stronger effect to me that I would have naively expected from the slight asymmetry of the door iron. In particular as we are talking about the field only 1.5cm off the beam axis, right?

Another thing which strikes me odd is that the deviation in theta seems more (at least double) than the rotation in phi. It also seems to bend the tracks to lower theta only. (It is difficult to read from the plots, but I would take ~5.5 without field, and 0.5-1deg less with field, right?) I'm not sure, if I am just confused, but wouldn't that mean, we had to have a circular field component larger than the radial one? Maybe I'm just lost....

Could you check what happens to protons? Will this be opposite and equal?

As I understand you only switch the solenoid on and off. What happens if you add a dipole field? Ideally the whole thing should just be shifted, but...

Cheers,
Inti

Subject: Re: Solenoid field effect on the particle track theta!
Posted by Jost Lühning on Thu, 20 Aug 2009 07:57:21 GMT
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Hi,

there are 2 files attached showing tracks in the x-y-plane at z=900cm (there is the end of my FEM-model).
In the second file we can see a symmetry for protons and antiprotons (as expected, so the model should be okay in this regard).

Jost

File Attachments
1) Tracks1.pdf, downloaded 409 times
2) Tracks2.pdf, downloaded 382 times
