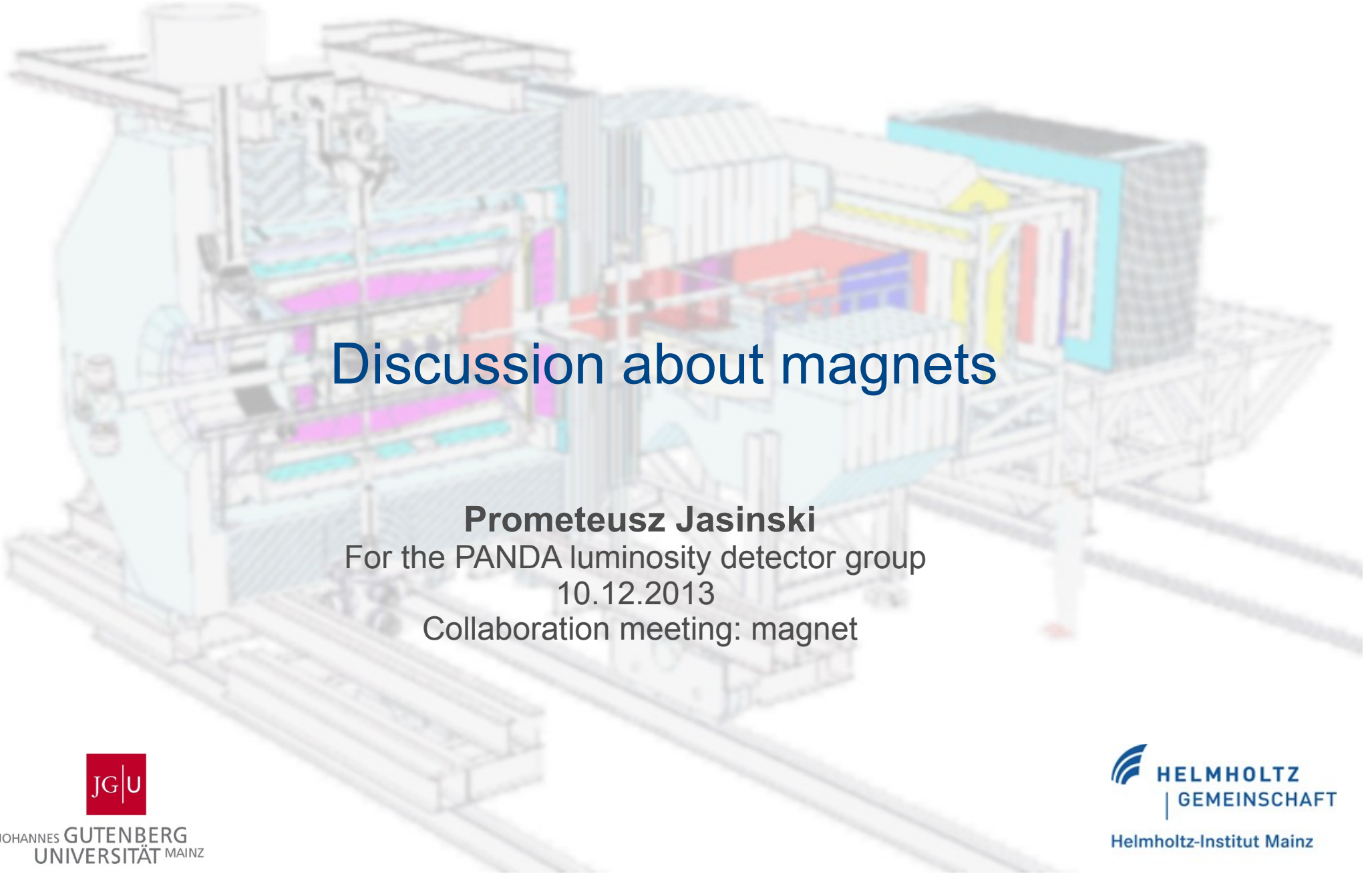


Discussion about magnets

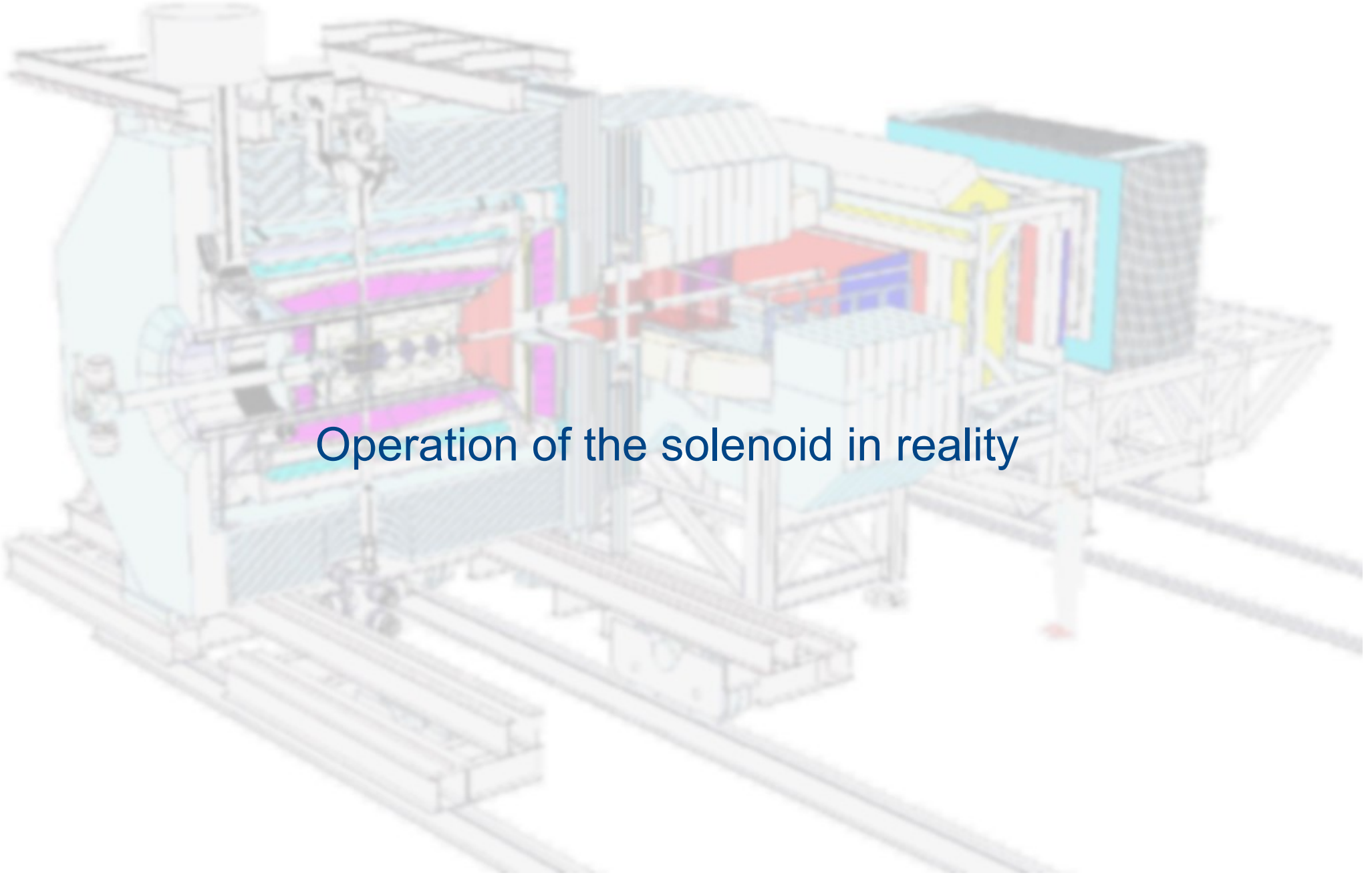
Prometeusz Jasinski
For the PANDA luminosity detector group
10.12.2013
Collaboration meeting: magnet

JOHANNES GUTENBERG UNIVERSITÄT MAINZ

HELMHOLTZ GEMEINSCHAFT
Helmholtz-Institut Mainz

topics

1. Operation of the solenoid in reality
2. Issues when including 1T fieldmaps into pandaroot
3. Observations when working with fieldmaps within pandaroot



Operation of the solenoid in reality

Beam parameters at injection

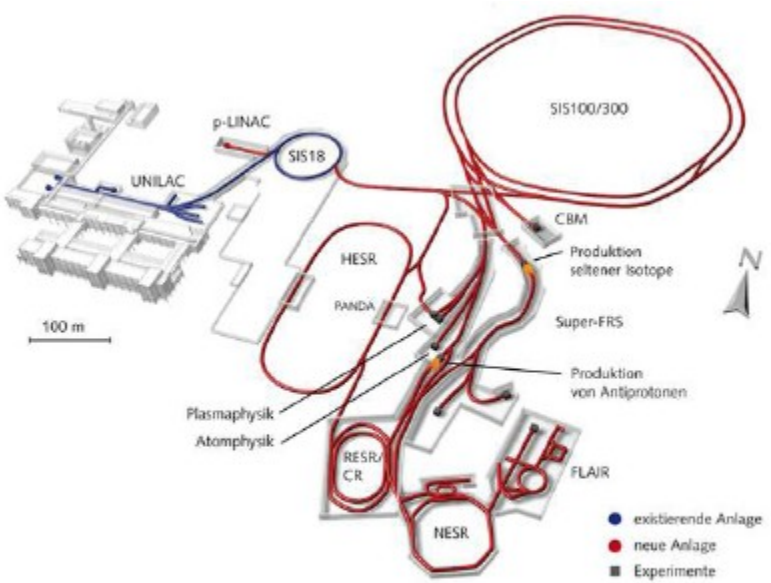


Figure 2.1: The FAIR complex

values	at injection	at extraction
p [GeV/c]	3.8	3.8
$\Delta p/p$ (2σ)	$\pm$ 3 %	$\pm$ 0.1 %
$\epsilon_{x,y}$ [mm mrad] (4σ?)	240	5

Table 2.1: Antiproton beam parameters for the CR before and after debunching and cooling within a 10 s cycle. [5]

HESR

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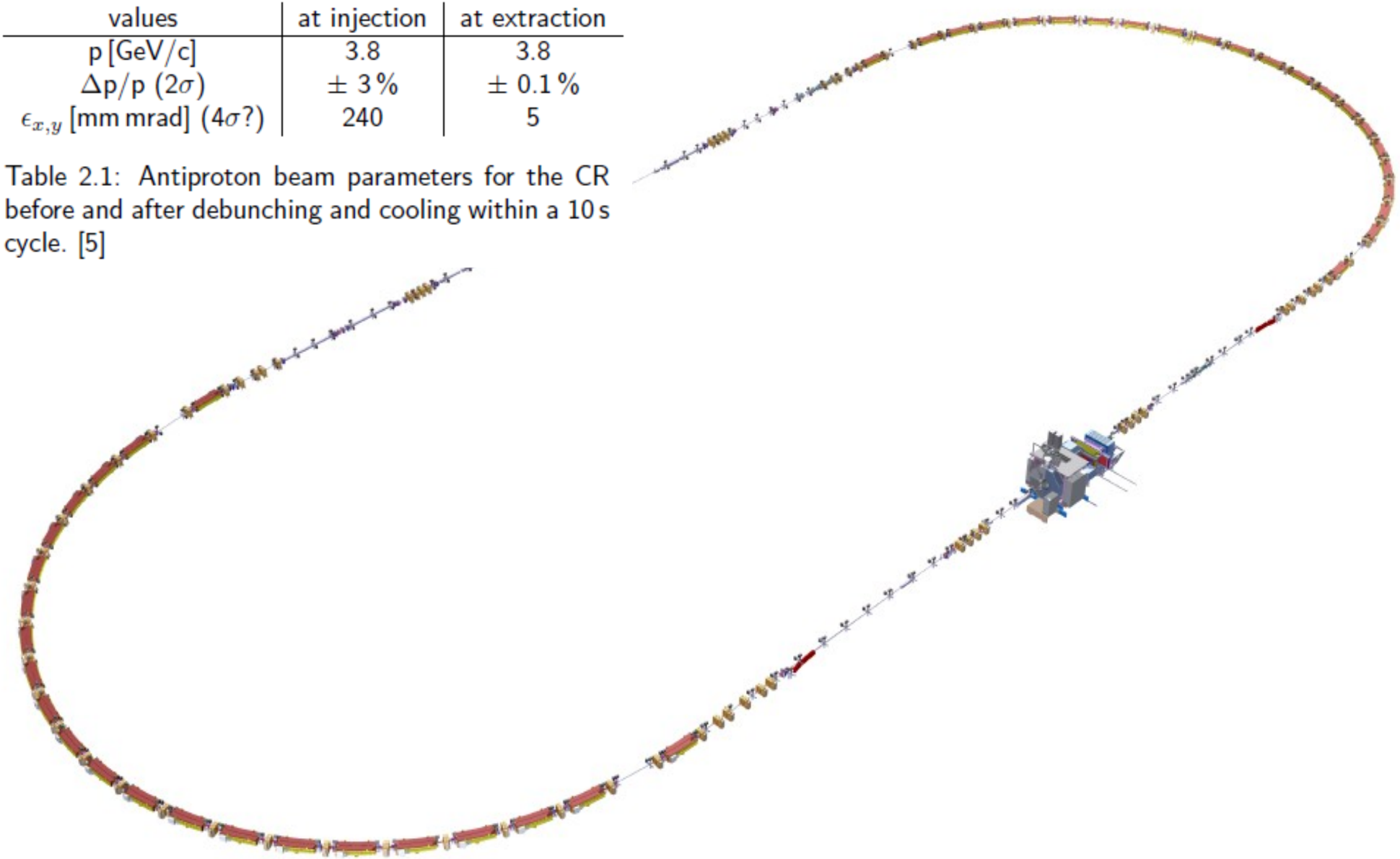
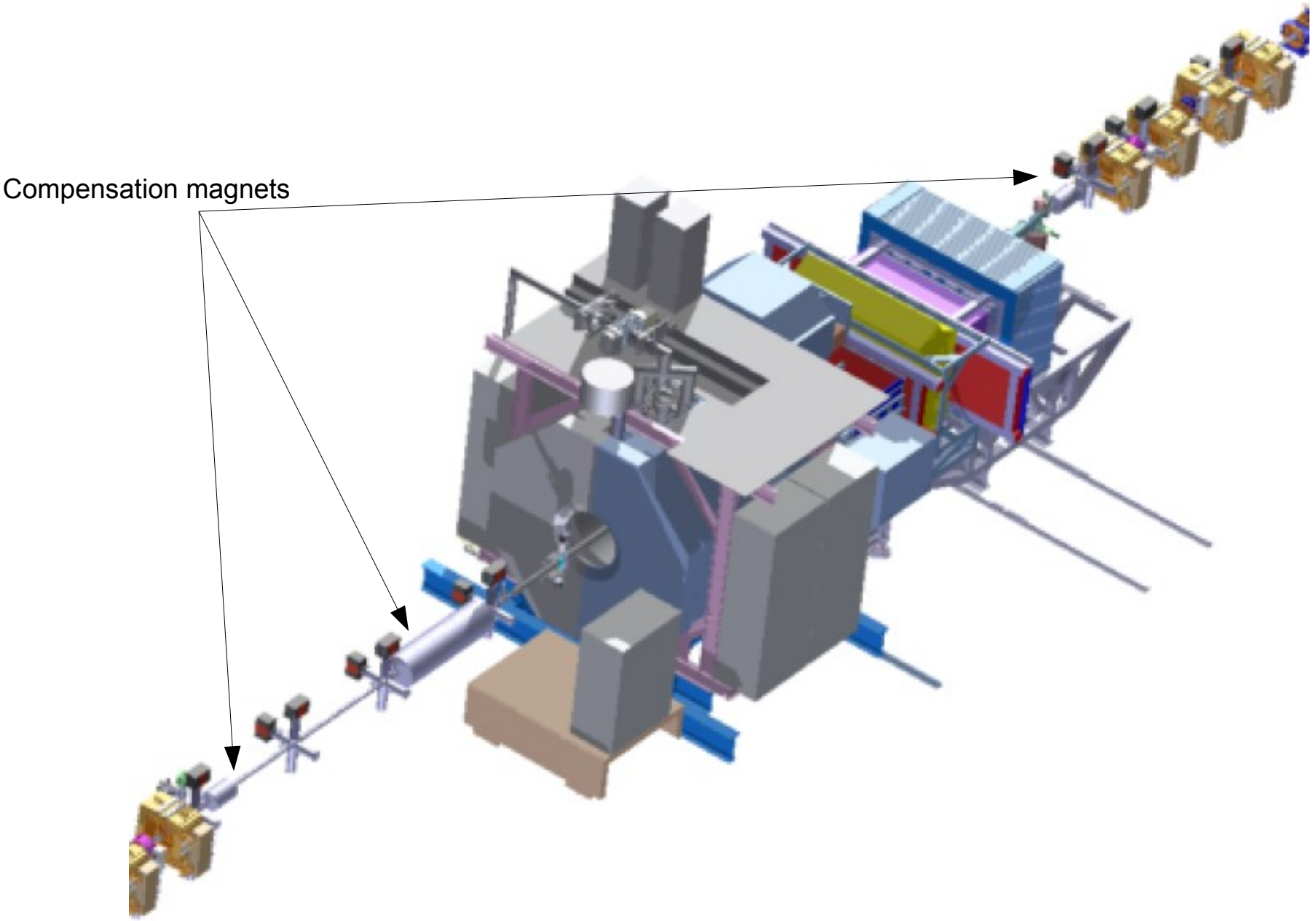


The PANDA section

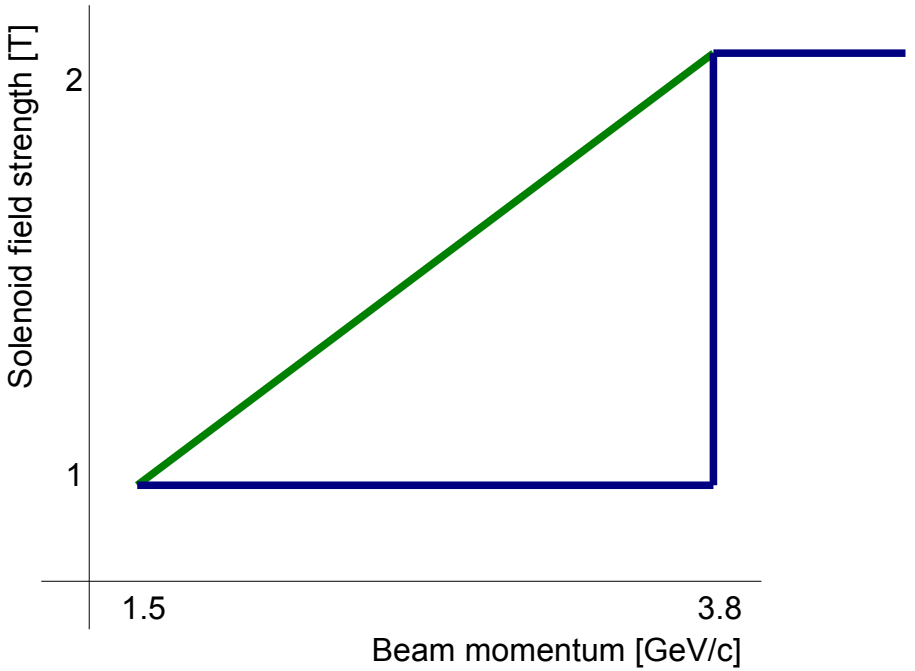


Questions to the operation of the solenoid

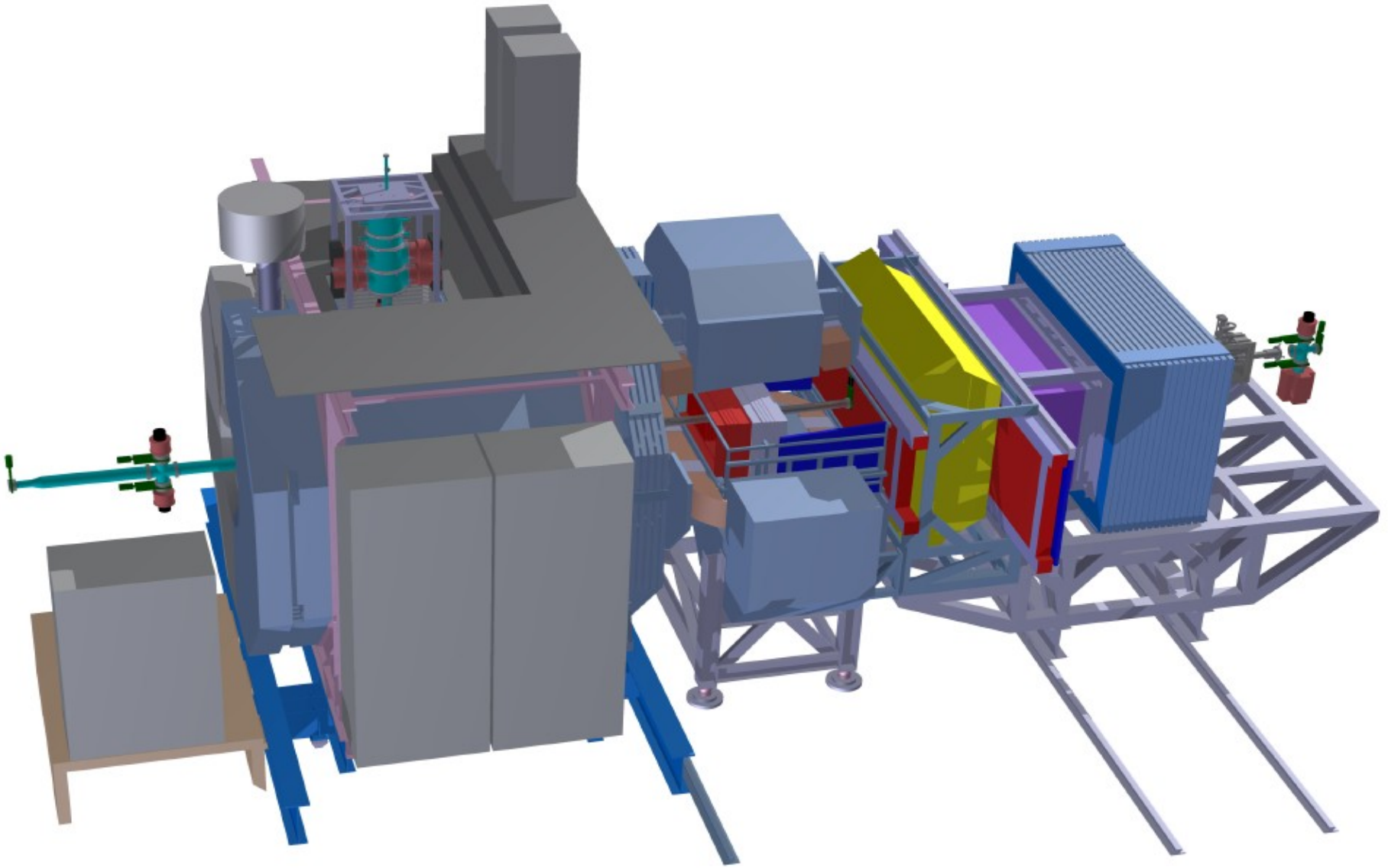
Below 3.8 GeV/c Solenoid field must be reduced down to 1T for 1.5 GeV/c, but how?

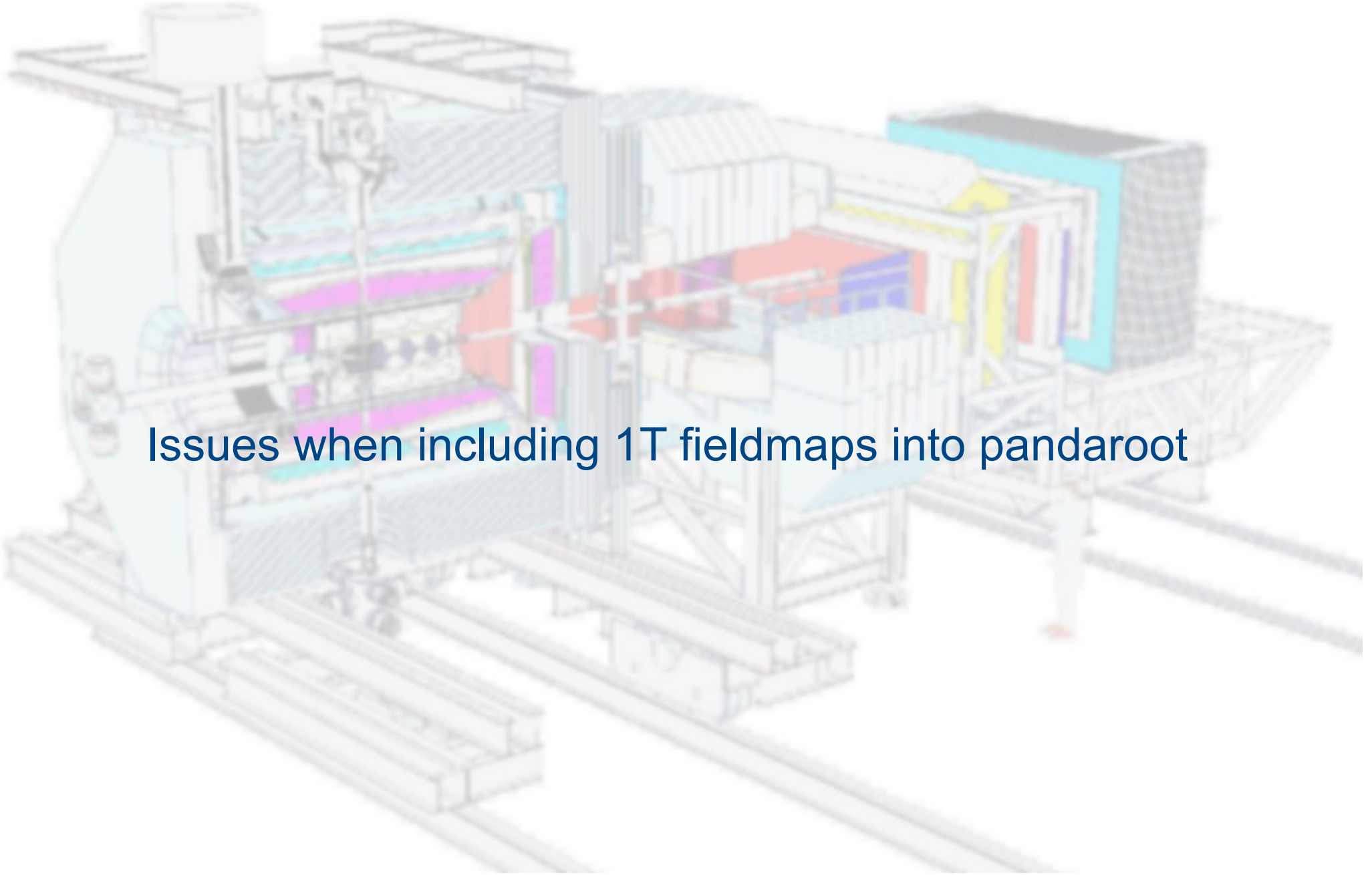
Linear decrease -> what about ramping speed and synchronization with correction solenoid?
How many fieldmaps do we need?

Step from 2T to 1T -> Detector performances? Who might complain?



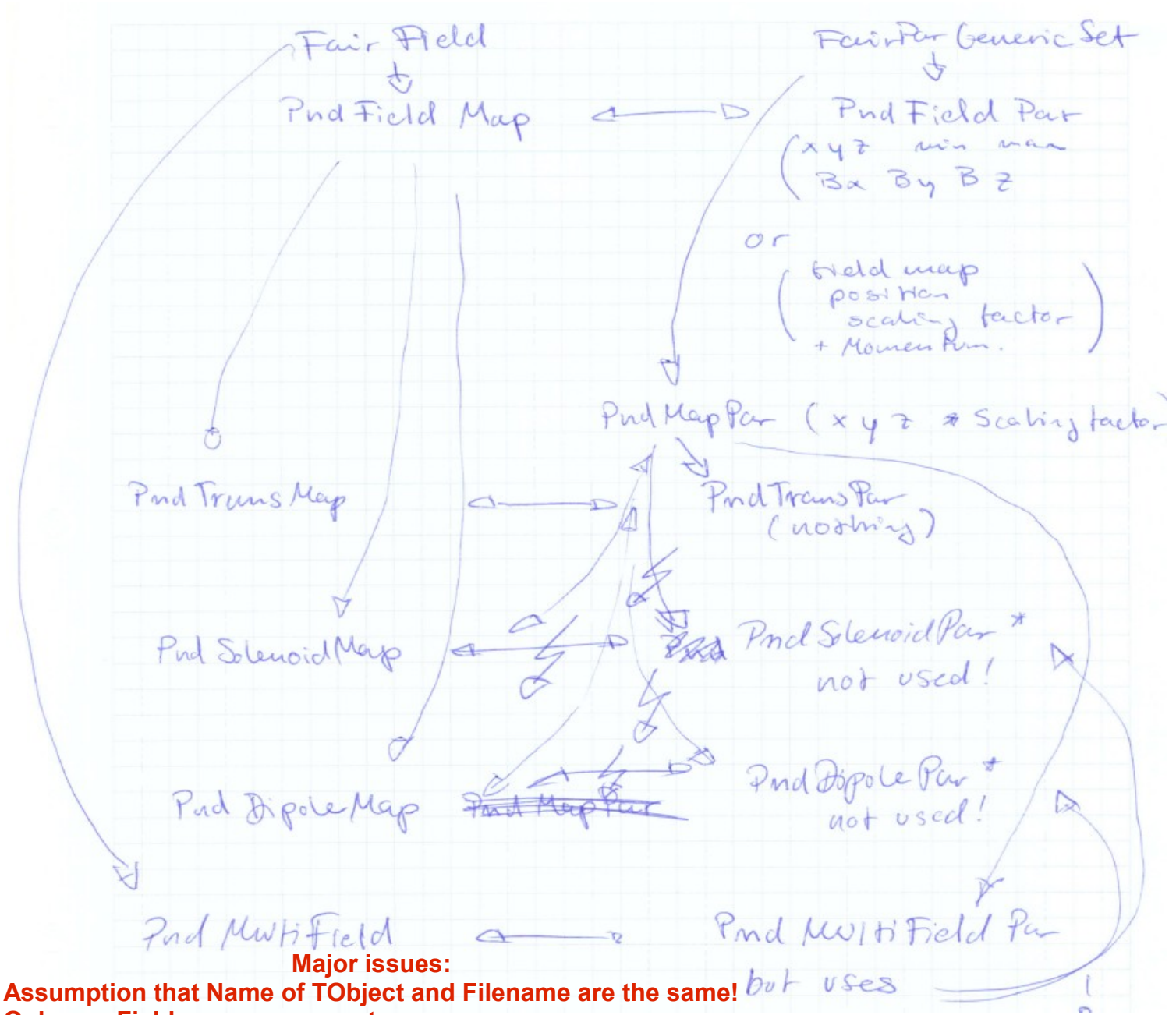
Just an illustration for possible discussions





Issues when including 1T fieldmaps into pandaroot

The class structure

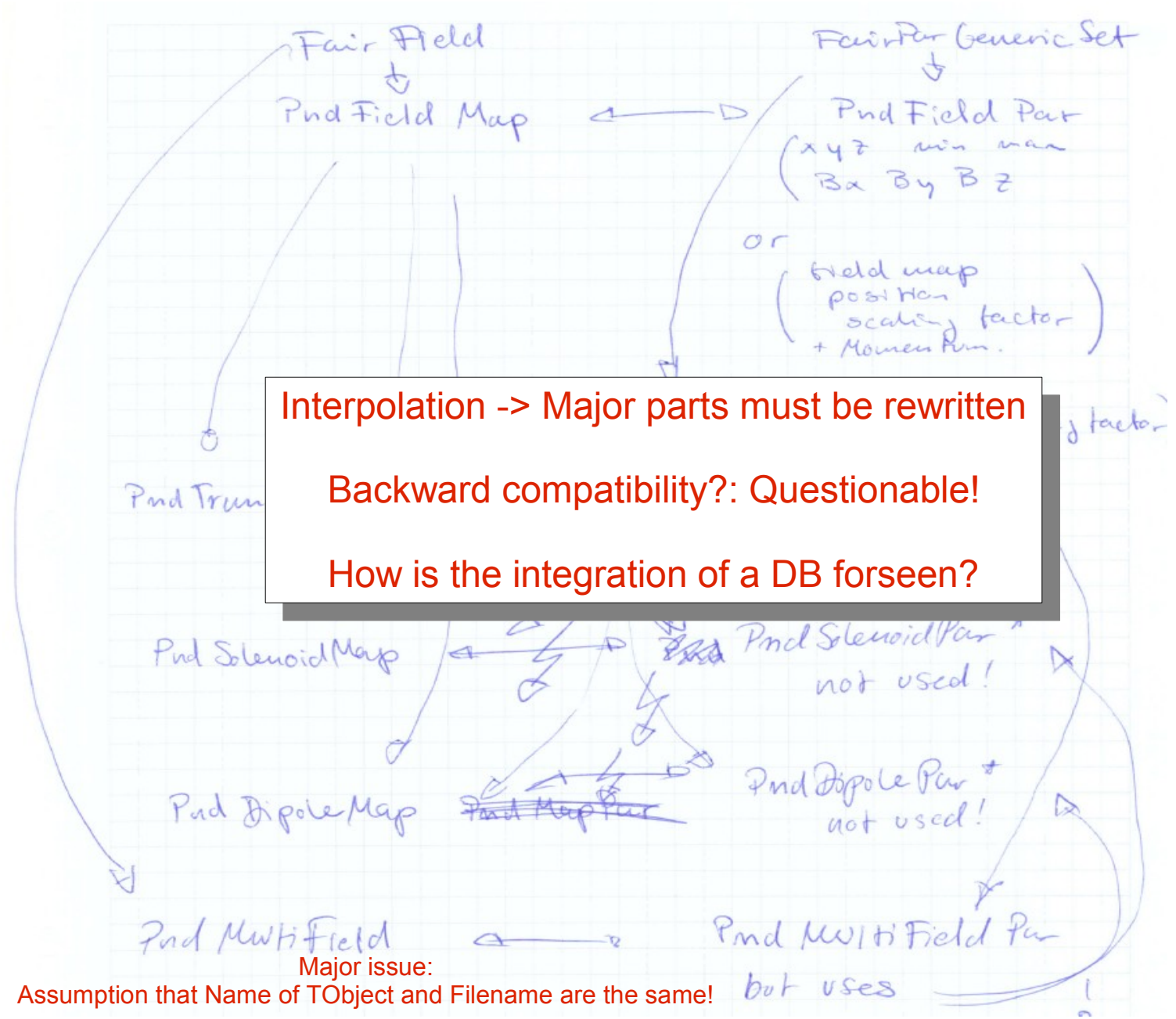


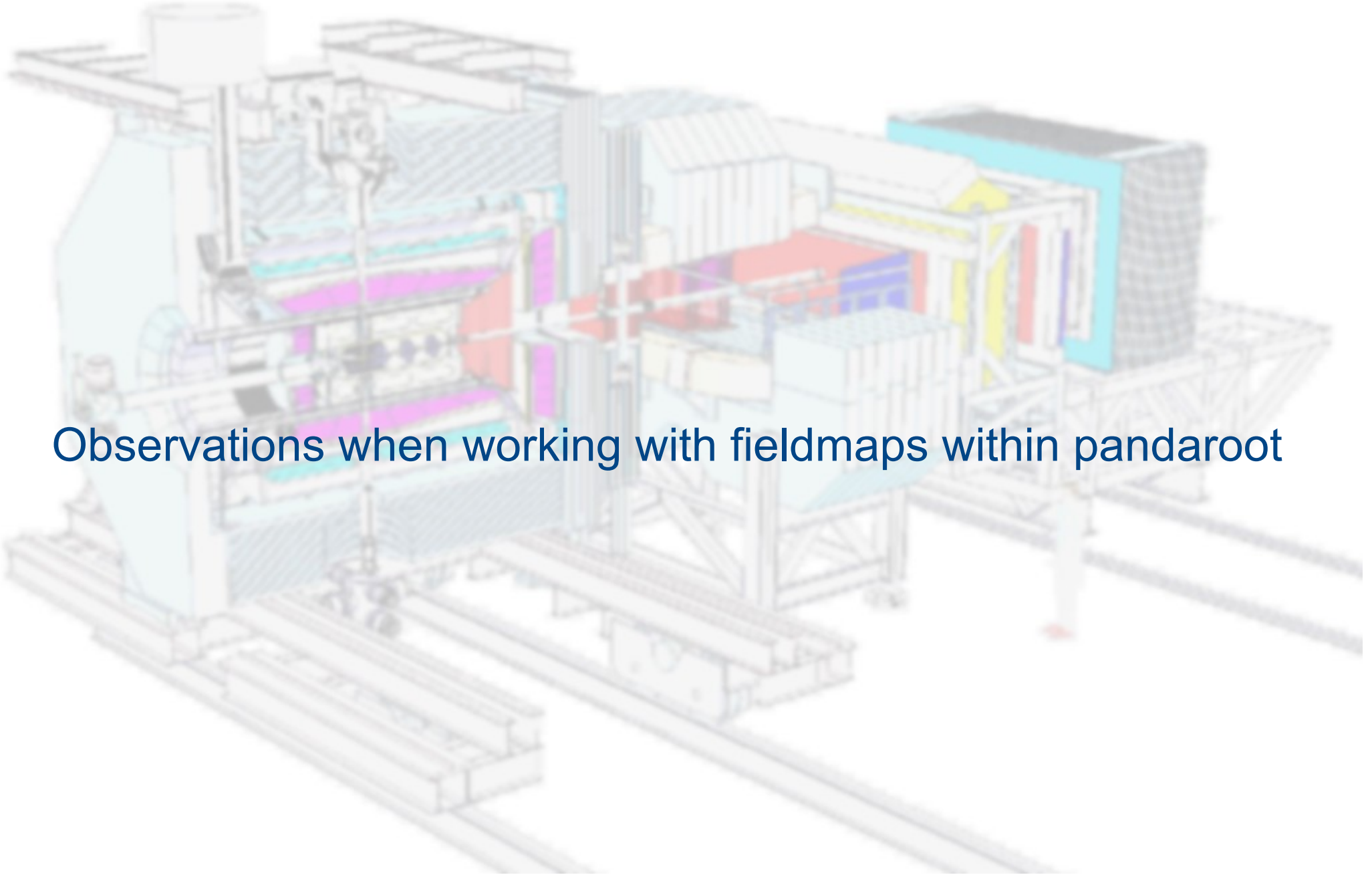
Major issues:

Assumption that Name of TObject and Filename are the same!

Only one Fieldmap per parameter.

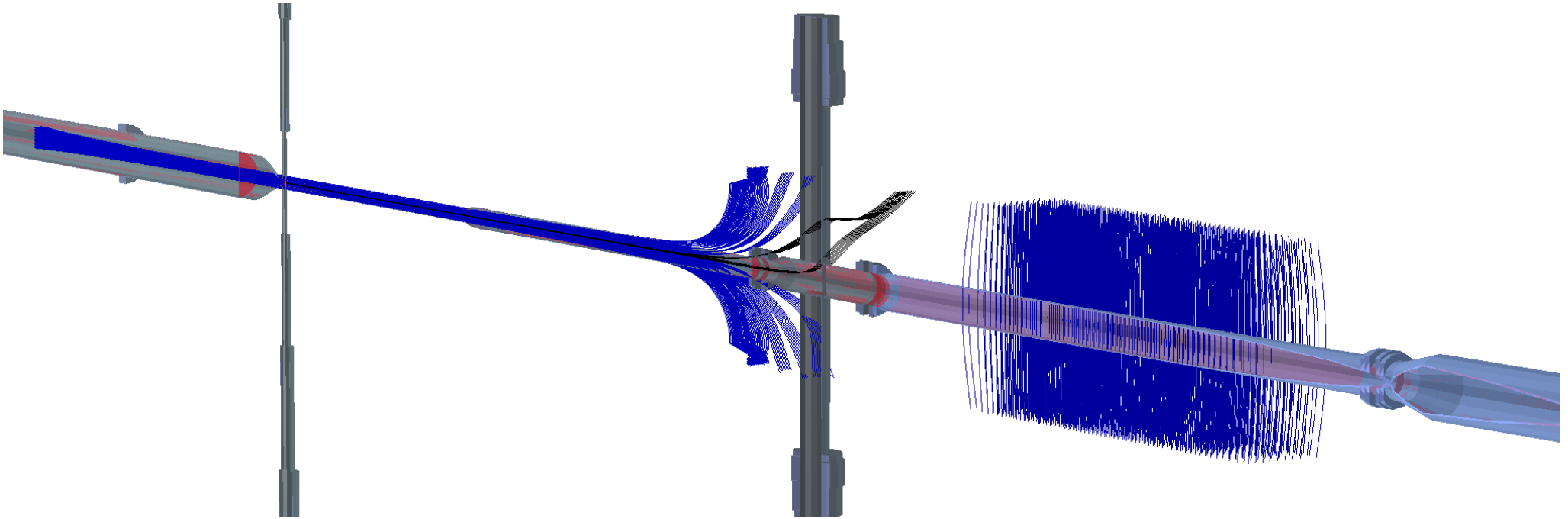
The class structure





Observations when working with fieldmaps within pandaroot

Illustration of field maps



1.5 GeV/c fieldmaps

Illustration of field maps

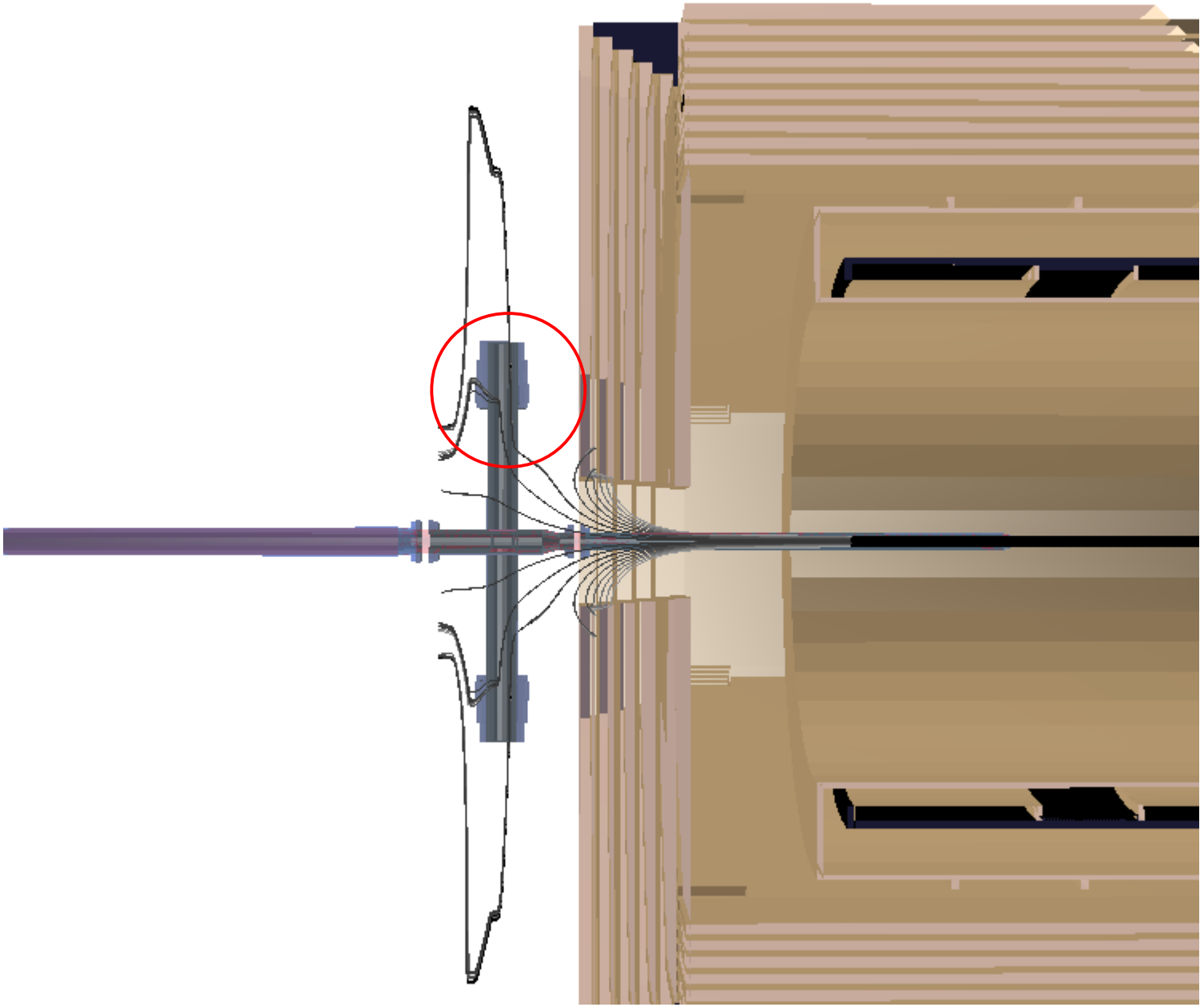
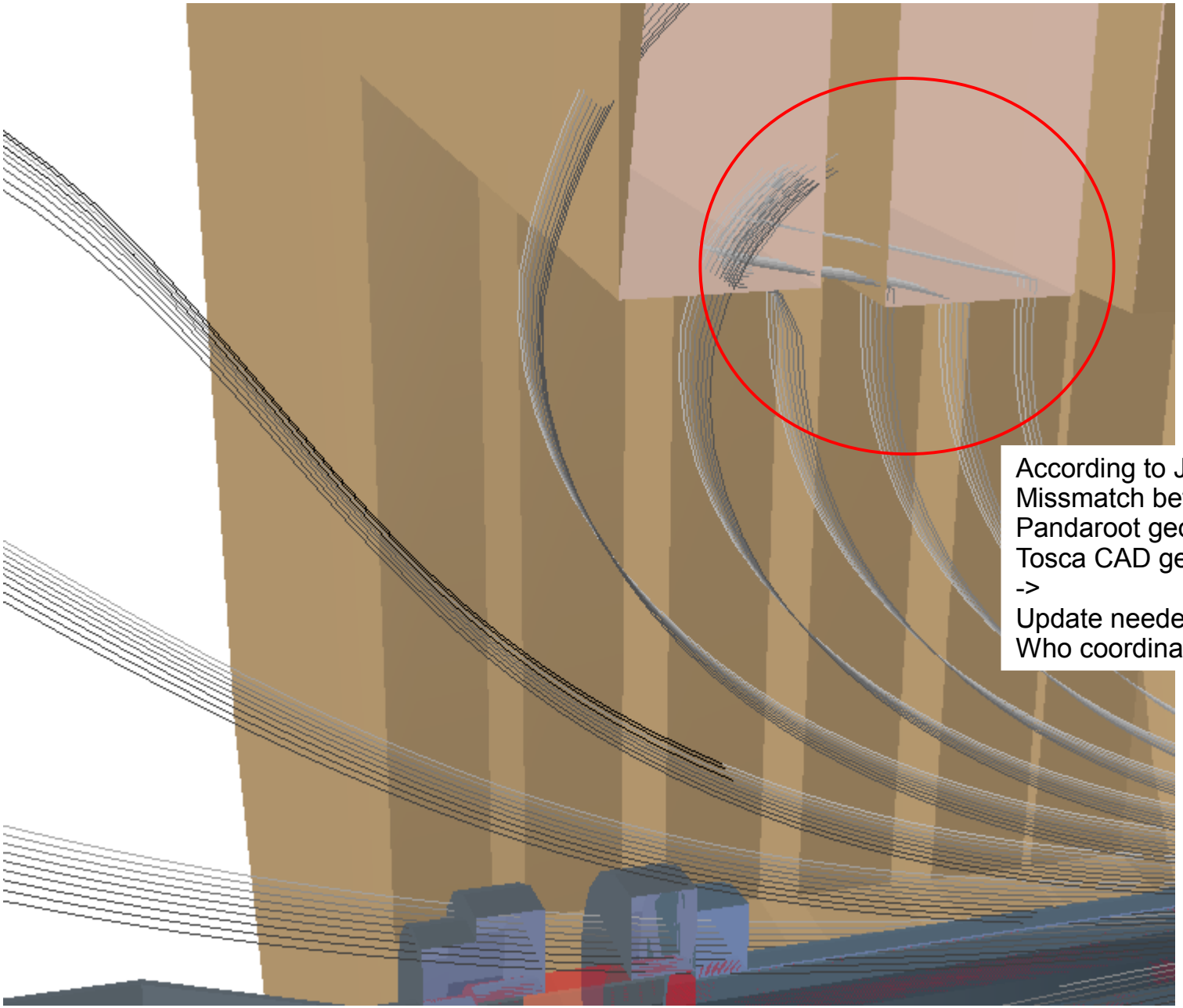
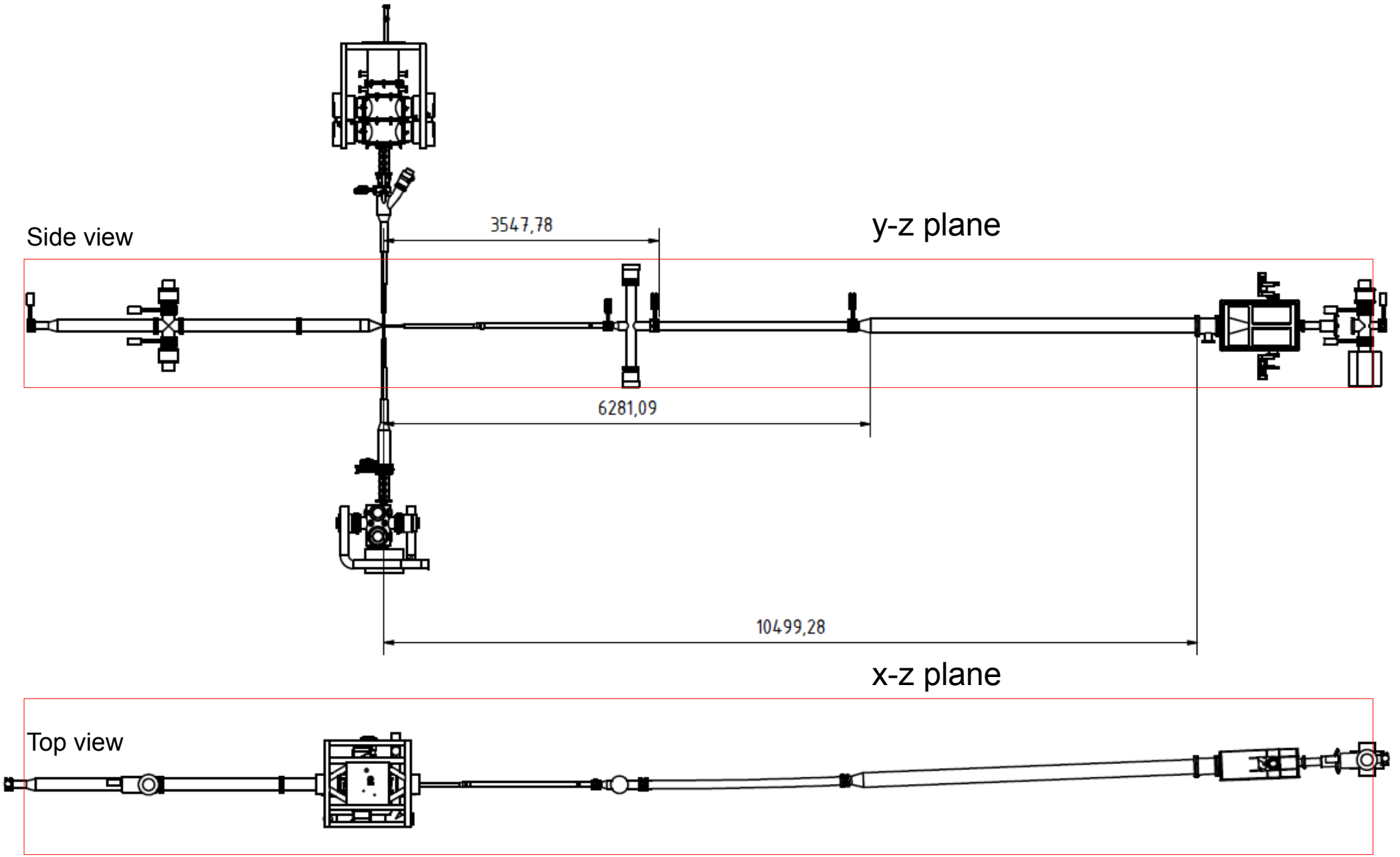


Illustration of field maps



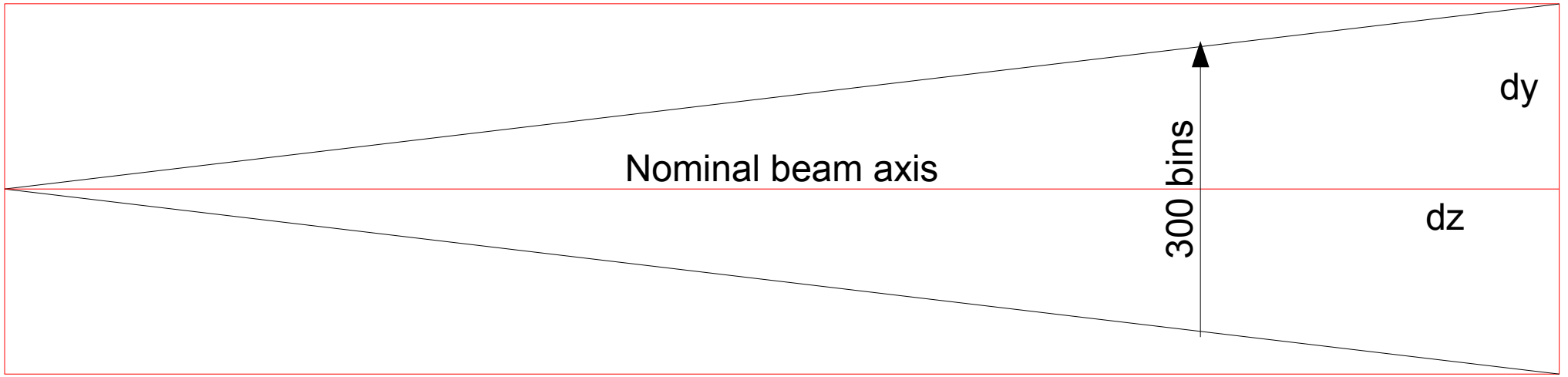
According to Jost:
Missmatch between
Pandaroot geometry and
Tosca CAD geometry
->
Update needed?
Who coordinates sim<>reality ?

Looking only on 2 coplanar planes



Definition of coordinates

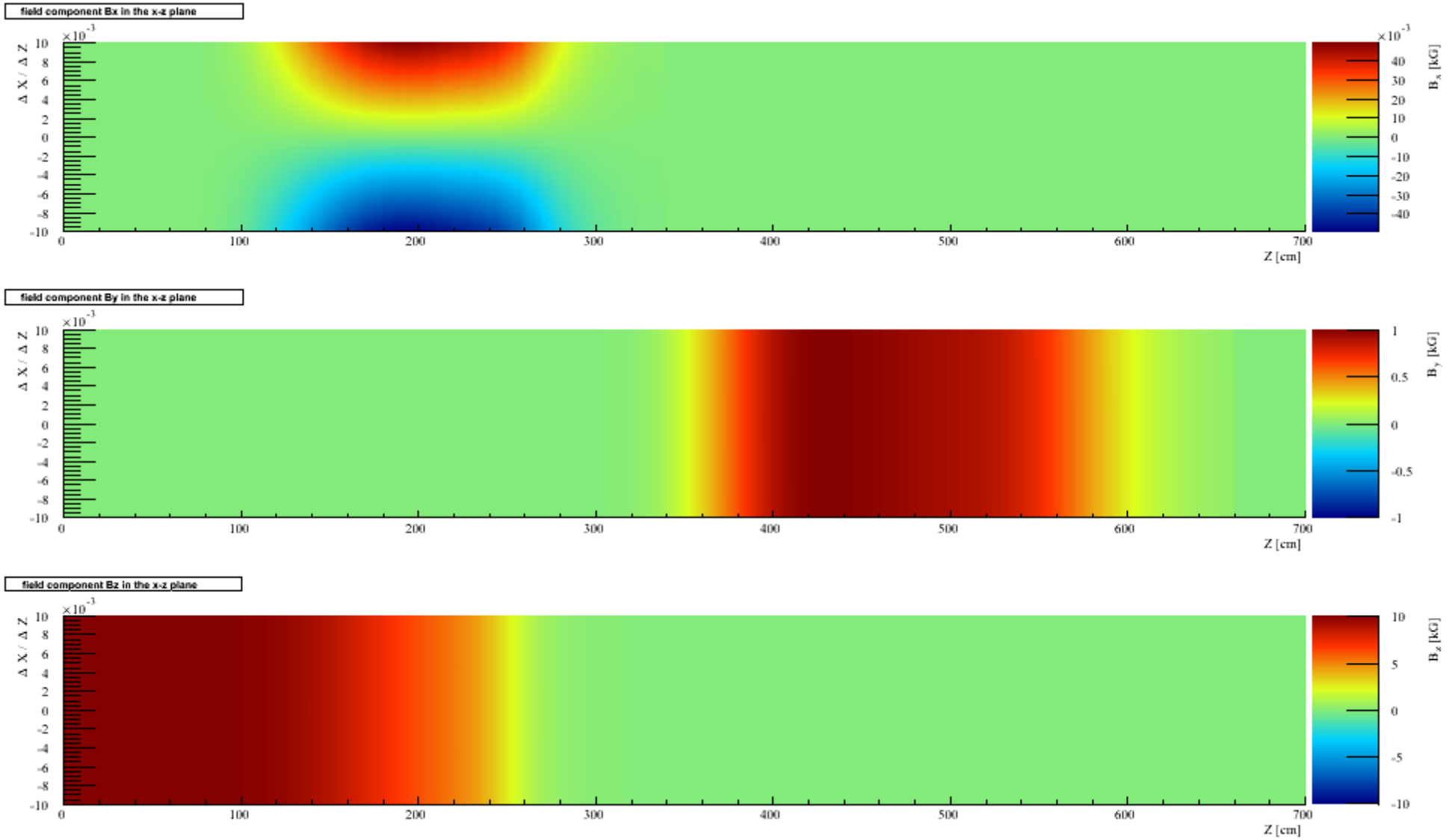
y-z plane



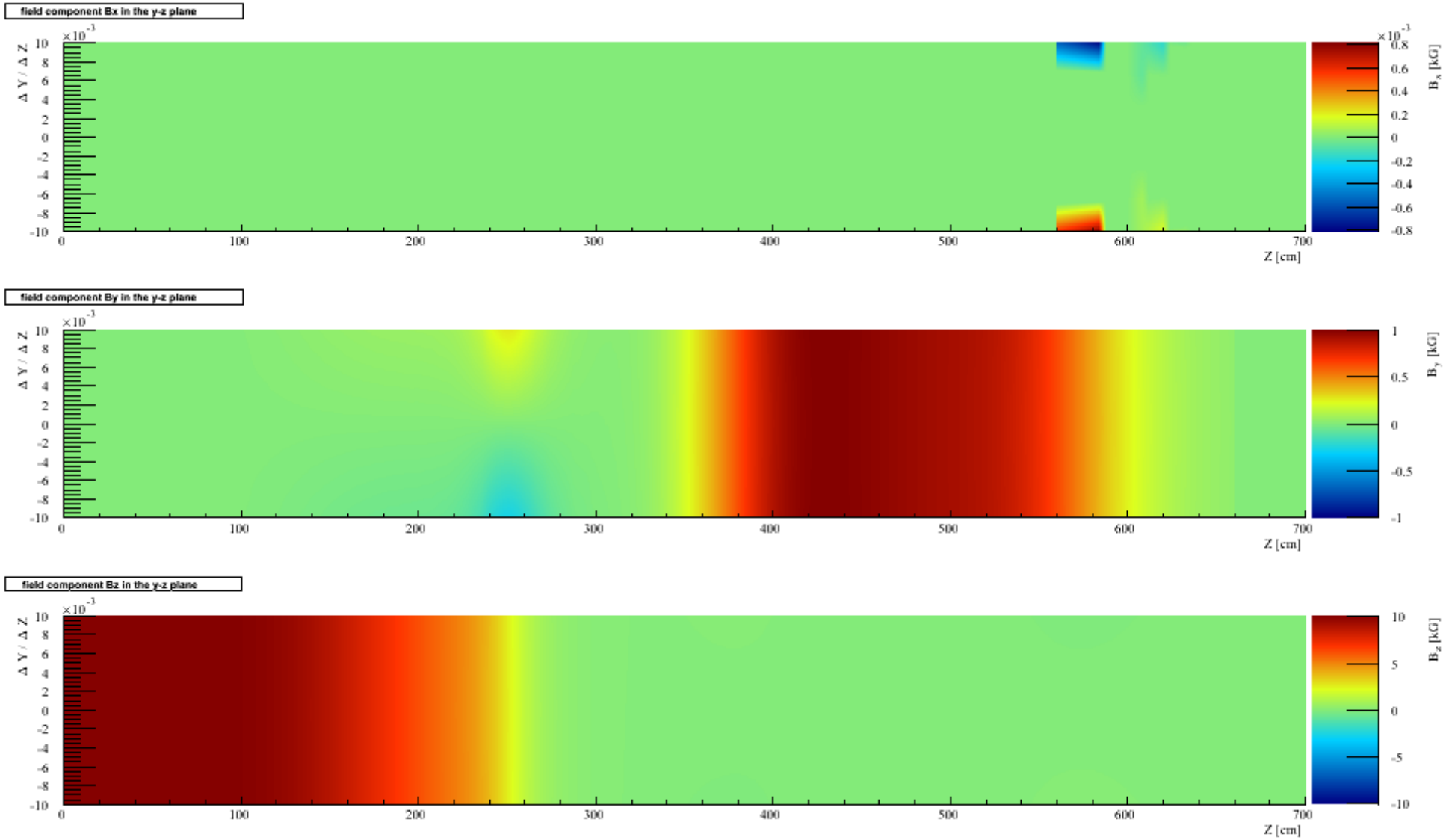
700cm -> 700 bins

-10 mrad < dy/dz < 10 mrad in 300 bins
Origin is on the nominal beam axis, specially important for
Curved axis in the x-z plane

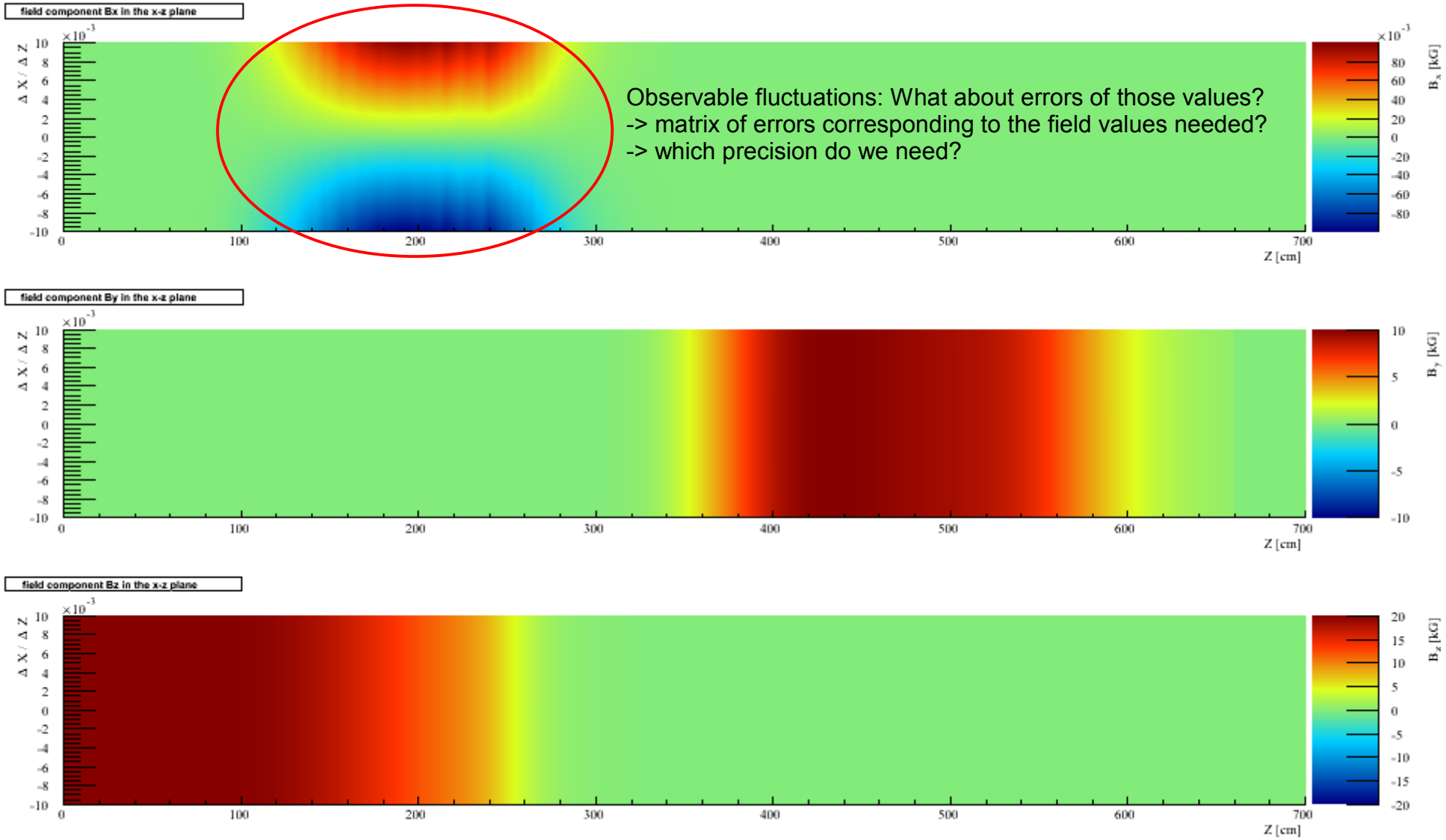
Field values for 1.5 GeV/c



Field values for 1.5 GeV/c

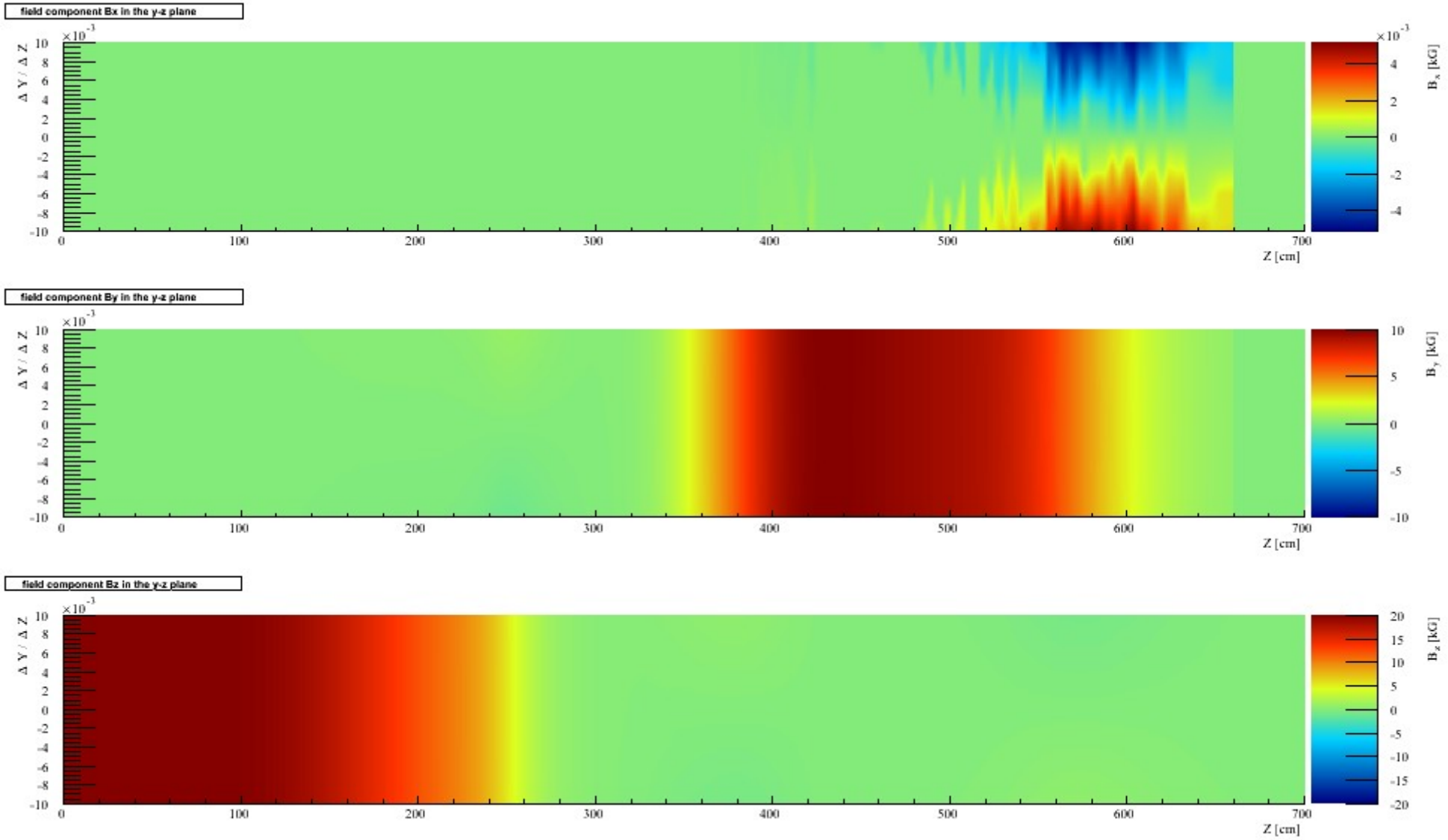


Field values for 15 GeV/c

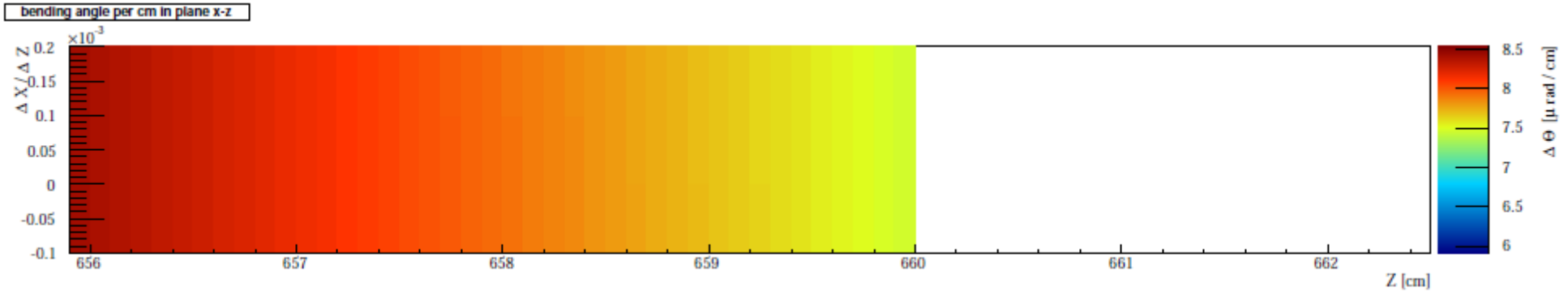


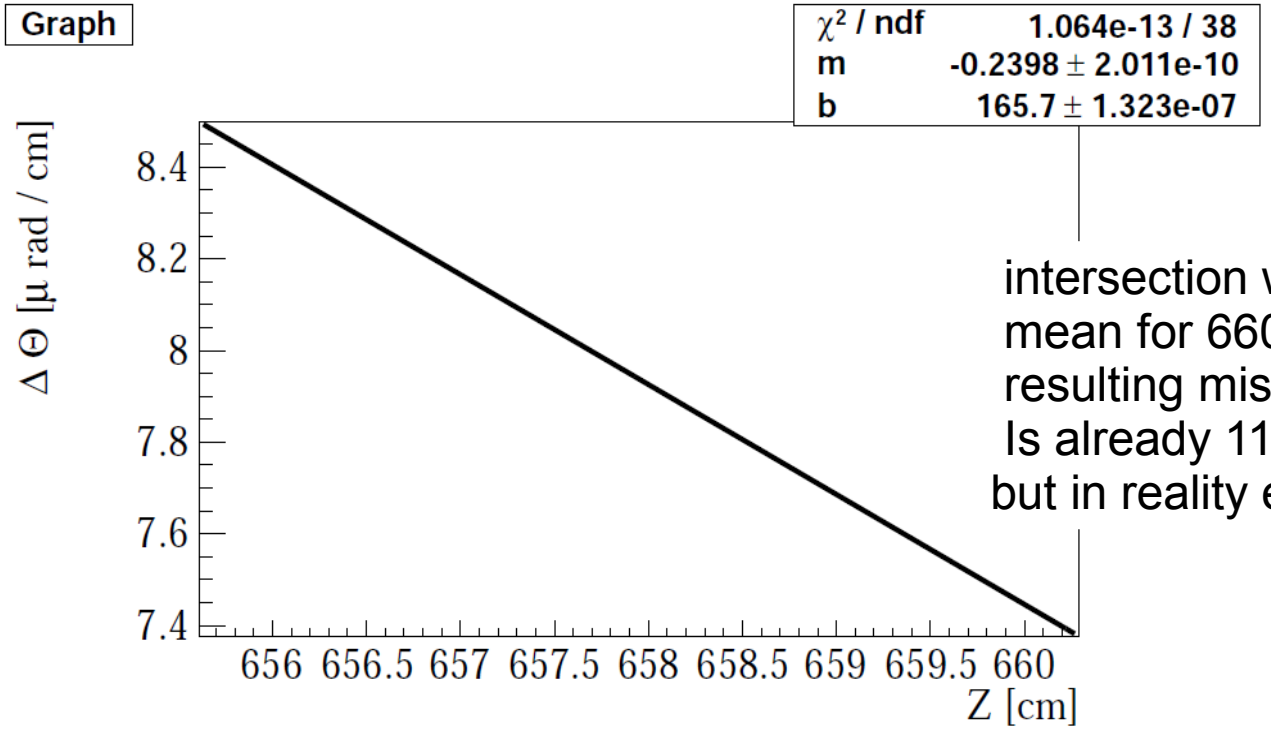
Observable fluctuations: What about errors of those values?
-> matrix of errors corresponding to the field values needed?
-> which precision do we need?

Field values for 15 GeV/c



The fringe field cutoff



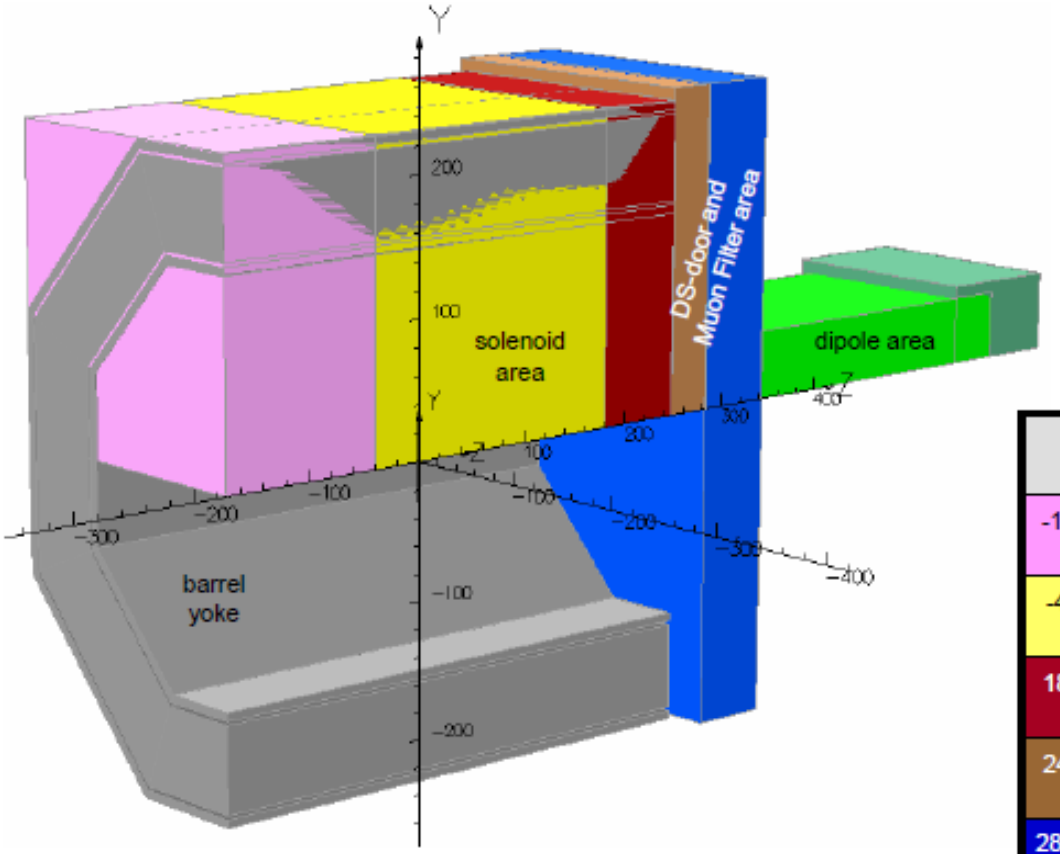


intersection with 0 at 691.046 cm
mean for 660 < z < 691.046 is 3.72305 μrad
resulting missing deflection angle
Is already 115.586 μrad
but in reality even more

Fieldmap ranges

PANDA Field Map Areas

Field maps are partly overlapping



Boundary conditions: symmetry about Z-Y plane, $B_x = 0$

X-Z plane: in solenoid area (up to z = 283 cm) $B_y = 0$

in dipole area (starting from z = 343 cm) $B_x = B_z = 0$

in between (blue area) no boundary condition

grid size

	dx / mm	dy / mm	dz / mm
-1720<z<-400, 0<x<2310, 0<y<2310	30	30	40
-400<z<1800, 0<x<2310, 0<y<2310	15	15	25
1800<z<2480, 0<x<2310, 0<y<2310	10	10	40
2477<z<2837, 0<x<2400, 0<y<2400	15	15	15
2830<z<3430, 0<x<2400, -2400<y<2400	40	20	15
3420<z<6020, 0<x<1580, 0<y<510	20	10	20
5600<z<6600, 0<x<1700, 0<y<600	50	20	40

More questions concerning pandaroot

- Which value is taken, when fieldmaps overlapp?

- Implementation of consistency checks?

- What if fieldmaps are NOT symetric?

- No interpolation between momenta forseen?

- How is the switch over to a DB intended to be done?

- Integration of measured field maps into simulated ones?