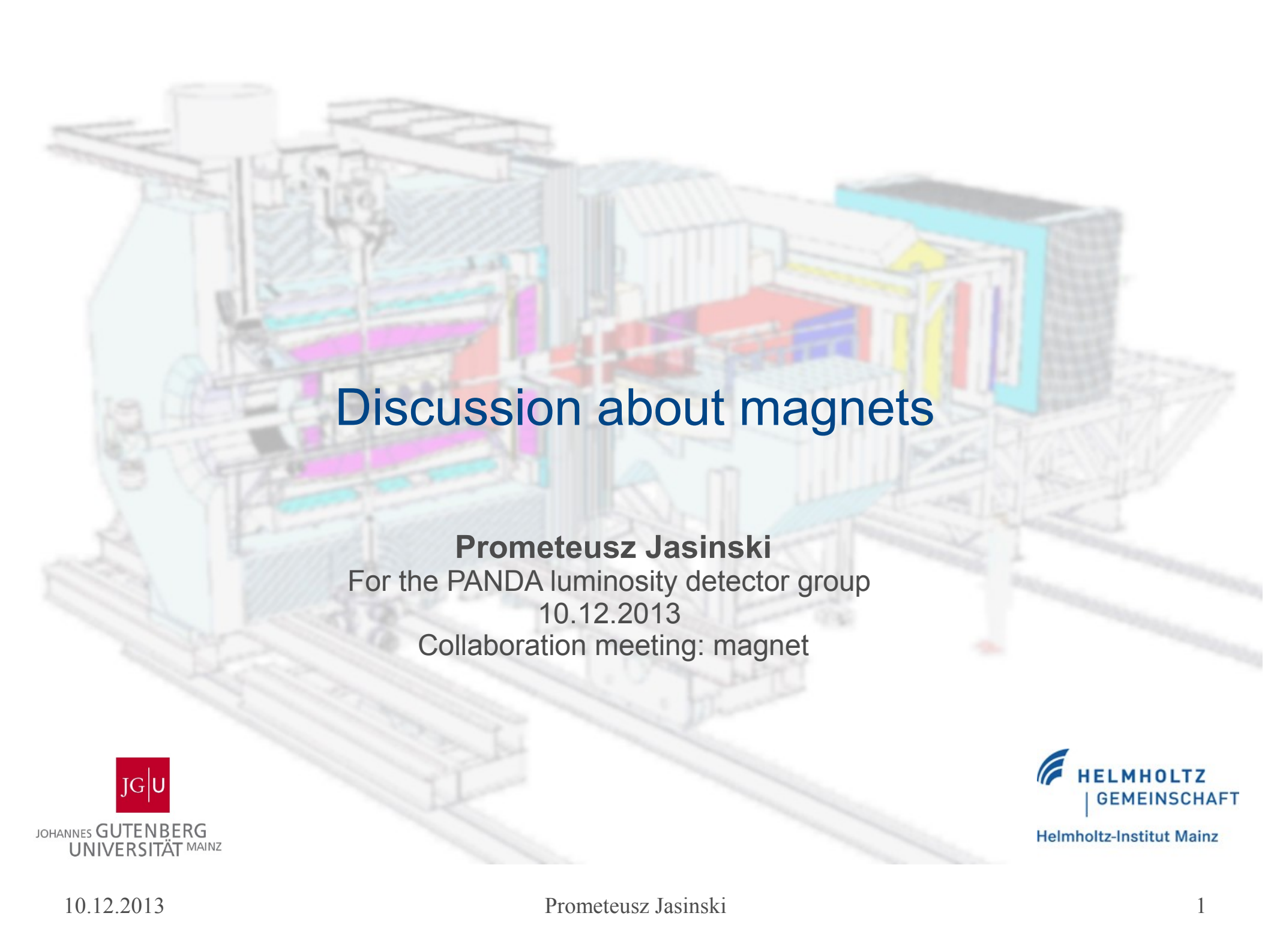


A detailed 3D cutaway diagram of a particle detector magnet assembly, likely for the PANDA experiment. The diagram shows various internal components, including a central beam pipe, surrounding magnetic coils, and structural supports. Different parts are color-coded: blue for the main structure, red for internal components, yellow for a central section, and green for a large outer coil. The assembly is mounted on a base with support legs.

Discussion about magnets

Prometeusz Jasinski

For the PANDA luminosity detector group

10.12.2013

Collaboration meeting: magnet



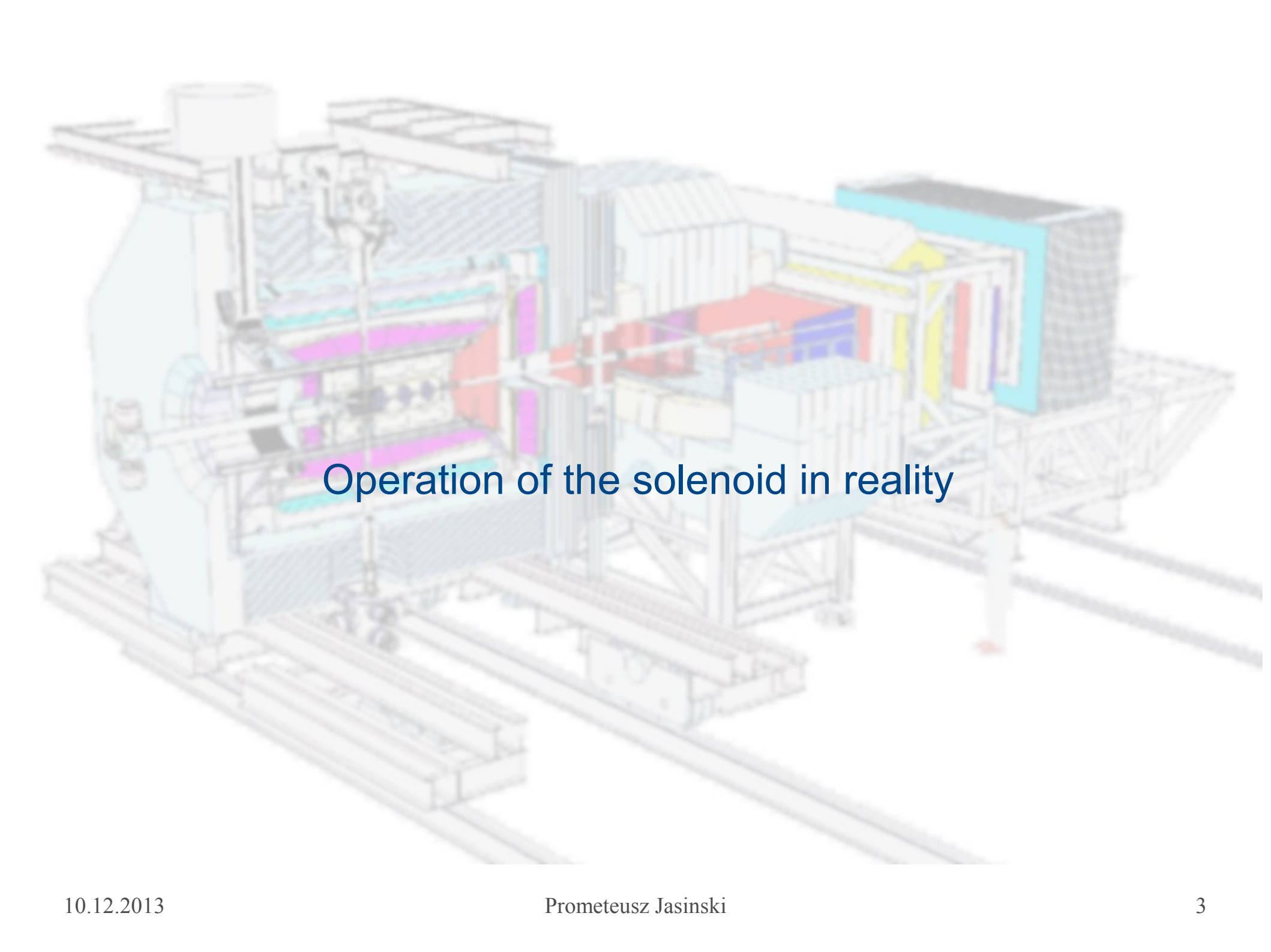
JOHANNES GUTENBERG
UNIVERSITÄT MAINZ



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

A detailed 3D cutaway diagram of a complex industrial machine, likely a particle accelerator component. The diagram shows a central cylindrical structure with various internal components, including a large blue cylindrical section on the left, a central red and yellow section, and a large blue rectangular section on the right. The entire assembly is supported by a complex metal frame and is mounted on a set of tracks. The text "Operation of the solenoid in reality" is overlaid in the center of the image.

Operation of the solenoid in reality

Beam parameters at injection

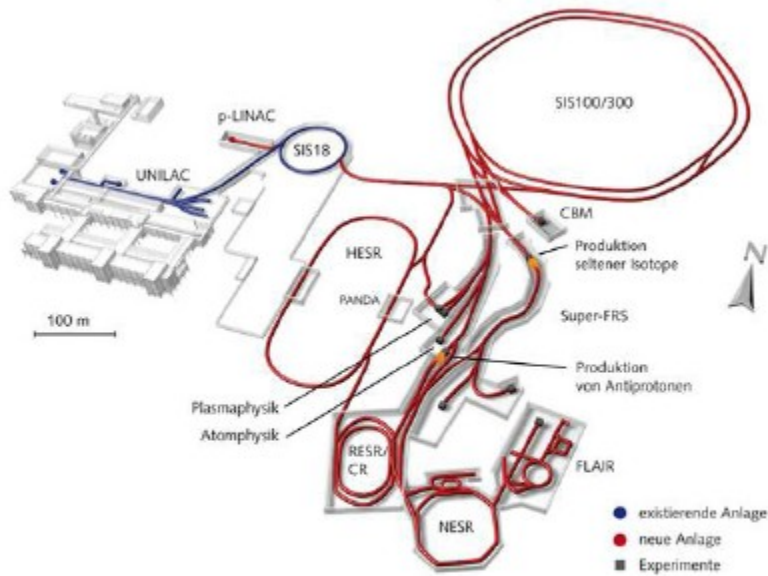


Figure 2.1: The FAIR complex

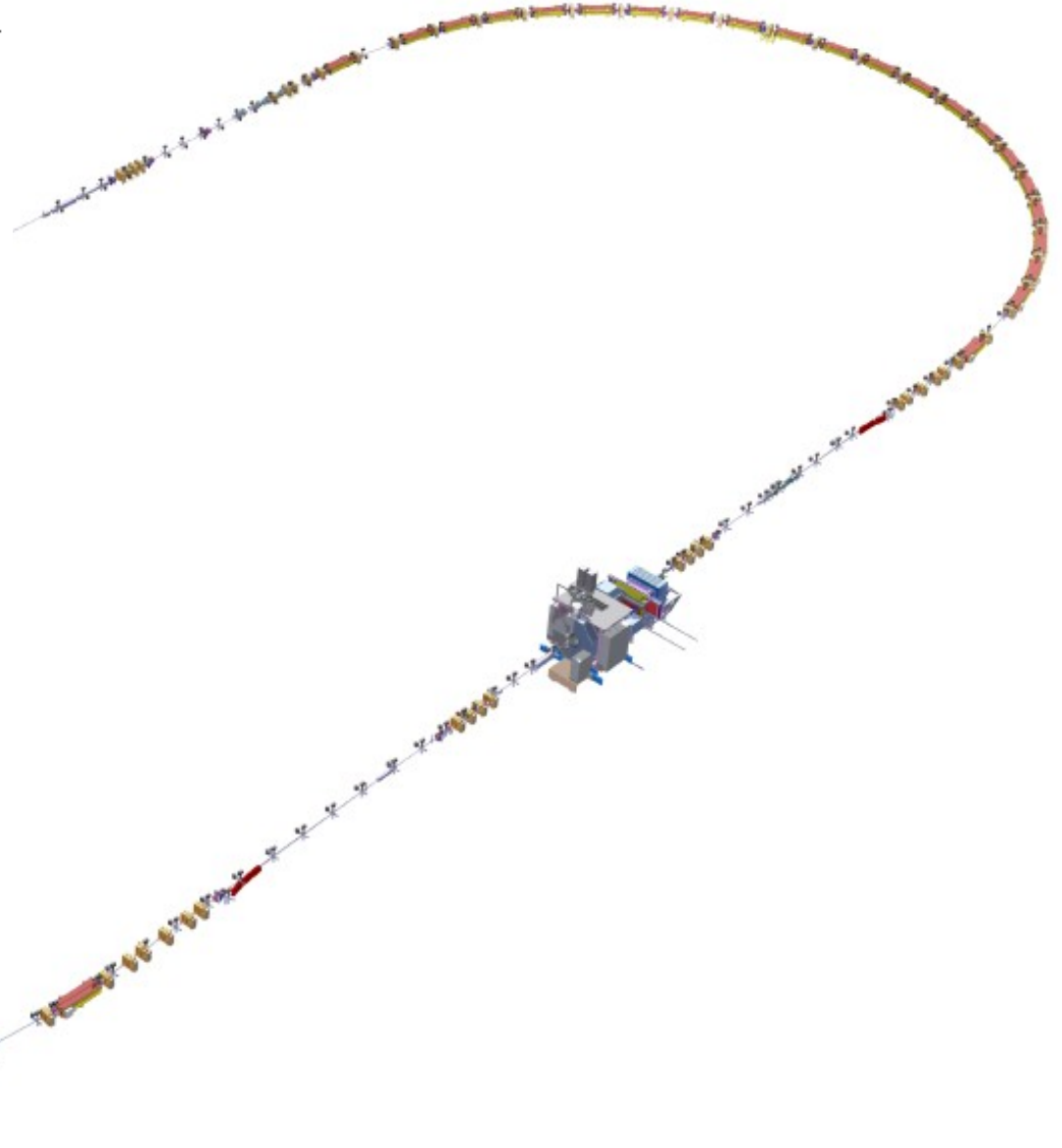
values	at injection	at extraction
p [GeV/c]	3.8	3.8
$\Delta p/p$ (2σ)	$\pm 3 \%$	$\pm 0.1 \%$
$\epsilon_{x,y}$ [mm mrad] (4σ ?)	240	5

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

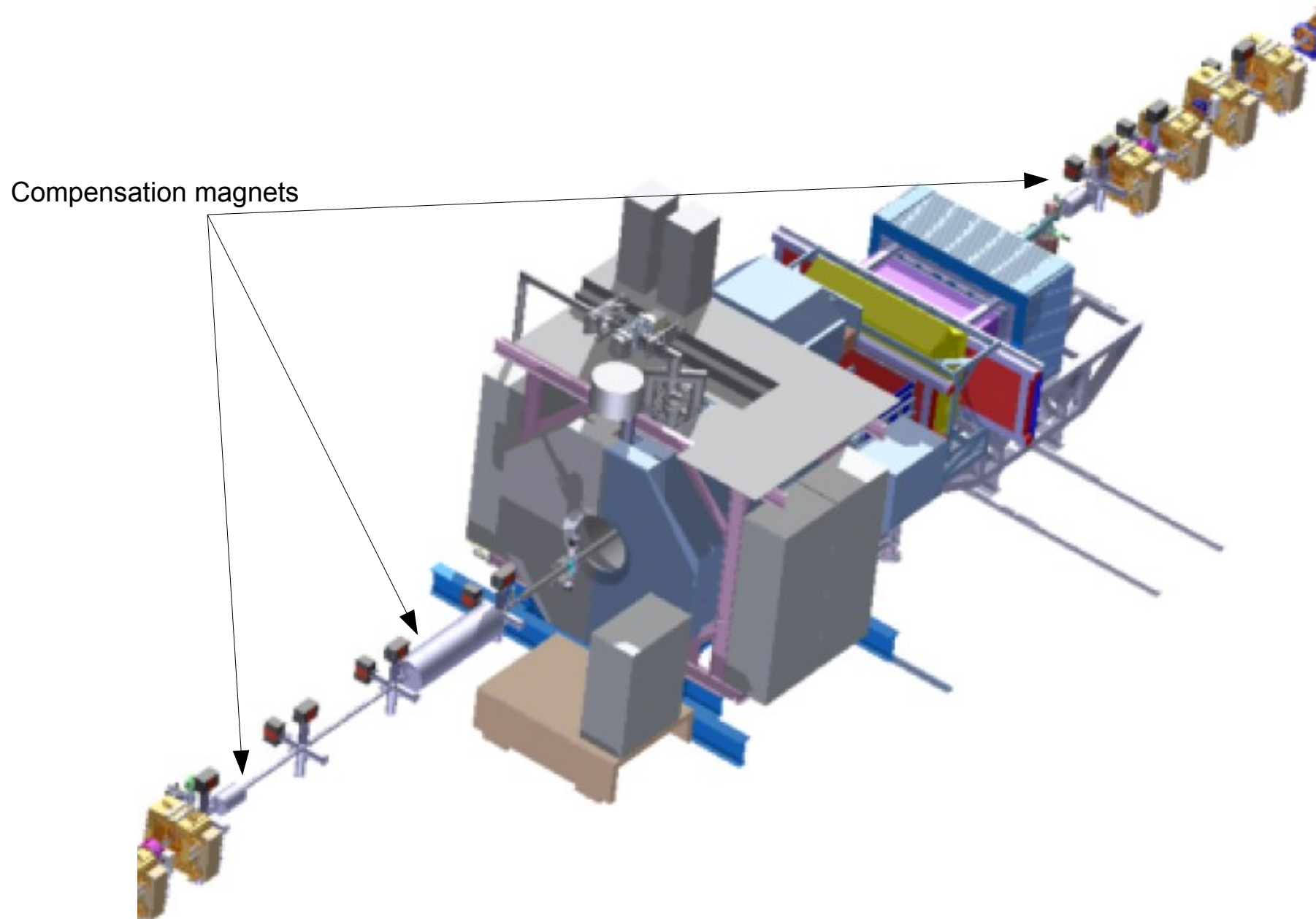
HESR

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]



The PANDA section

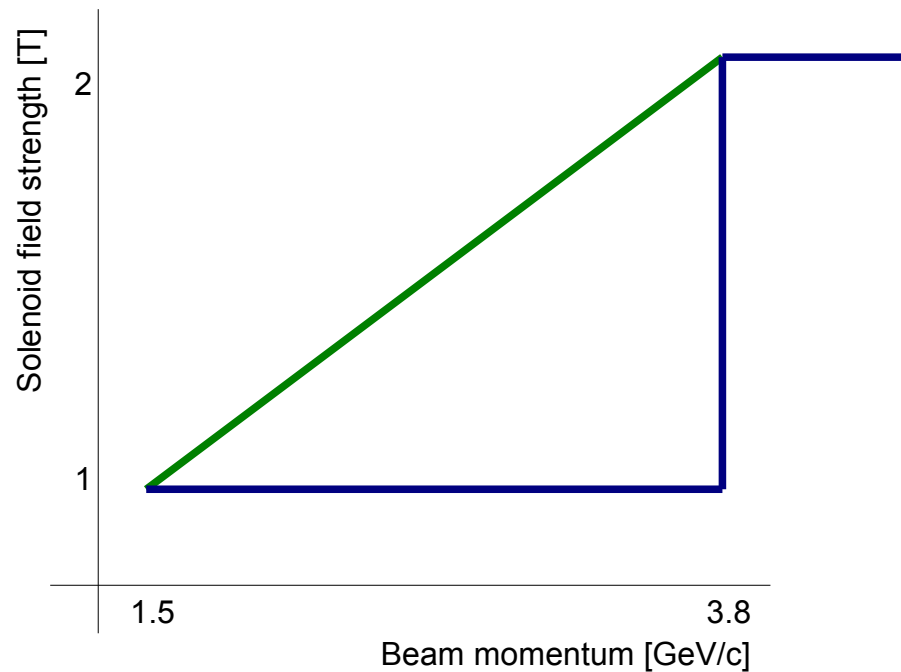


Questions to the operation of the solenoid

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

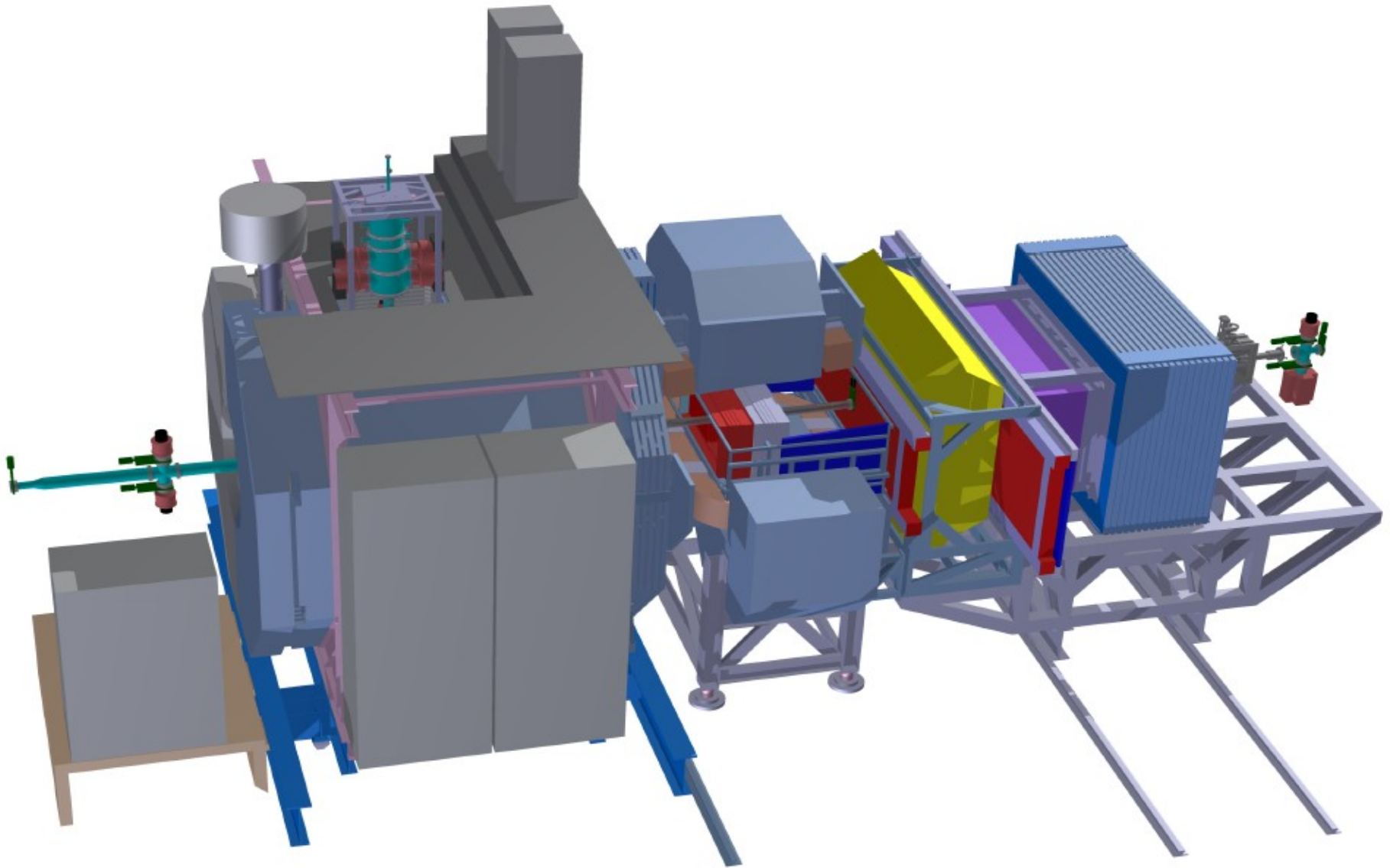




Diagram illustrating the mapping of various field types to their corresponding parameter sets:

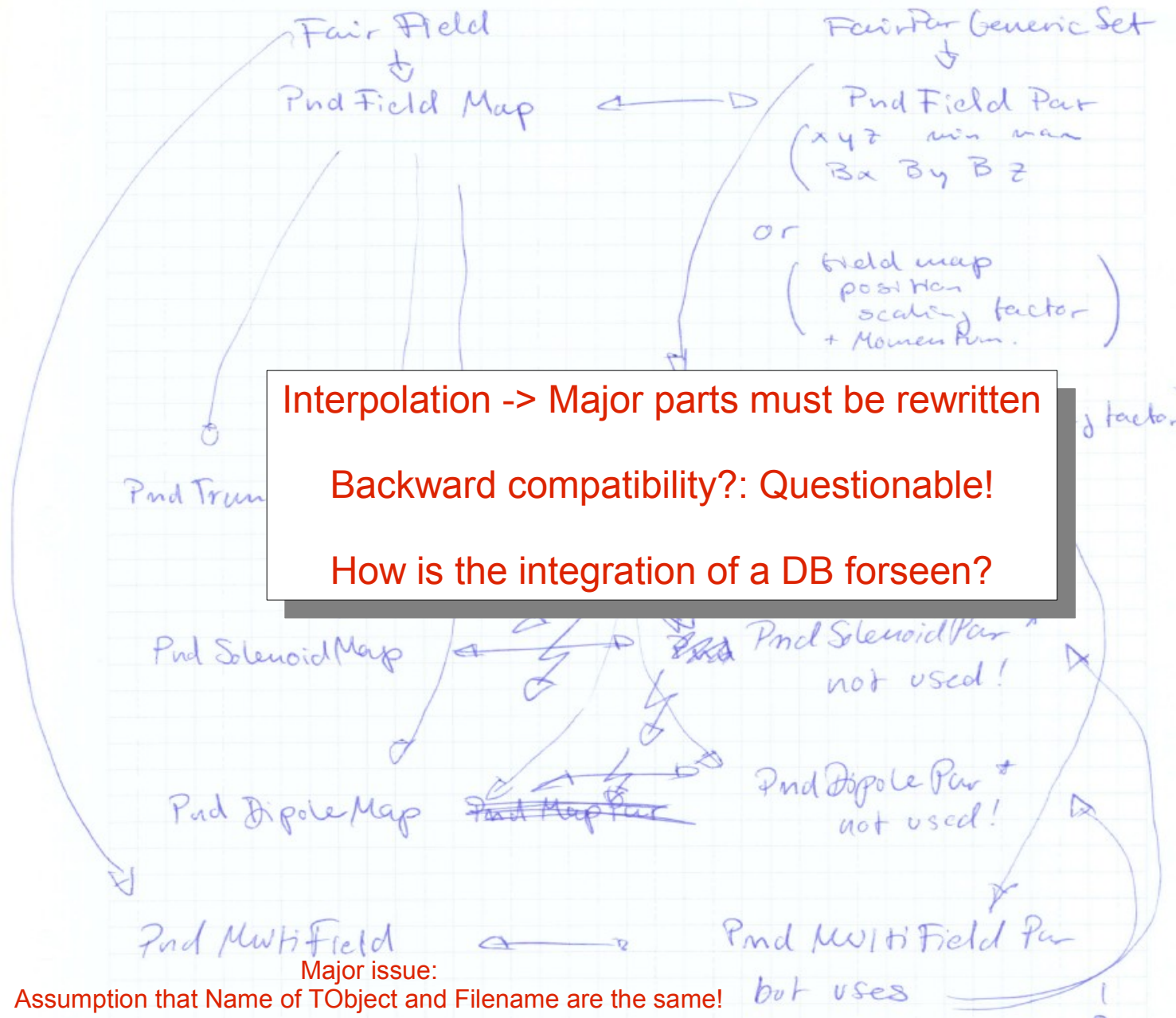
- Fair Field** maps to **Pnd Field Map**.
- FairPar Generic Set** maps to **Pnd Field Par** (x y z min max Bx By Bz).
- Pnd Field Par** (or field map position scaling factor + Momentum) maps to **Pnd Map Par** (x y z * Scaling factor).
- Pnd Map Par** maps to **Pnd Trans Map**, **Pnd Solenoid Map**, **Pnd Dipole Map**, and **Pnd MultiField**.
- Pnd Trans Par** (nothing) maps to **Pnd Trans Map**.
- Pnd Solenoid Par** (* not used!) maps to **Pnd Solenoid Map**.
- Pnd Dipole Par** (* not used!) maps to **Pnd Dipole Map**.
- Pnd MultiField Par** (but uses) maps to **Pnd MultiField**.

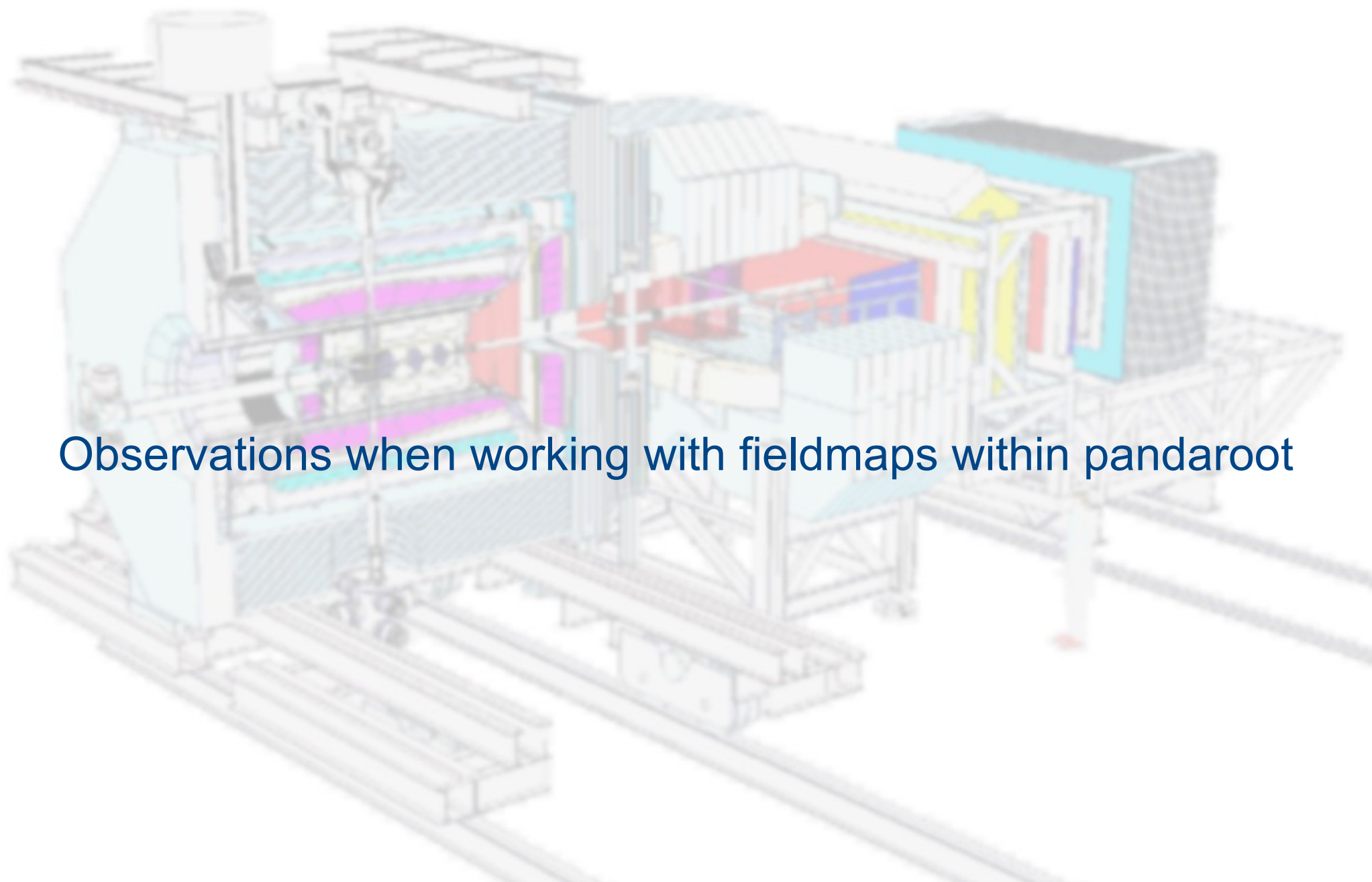
Major issues:
Assumption that Name of TObject and Filename are the same!

Assumption that Name of TObject and Filename are the same!
Only one Fieldmap per parameter.

10

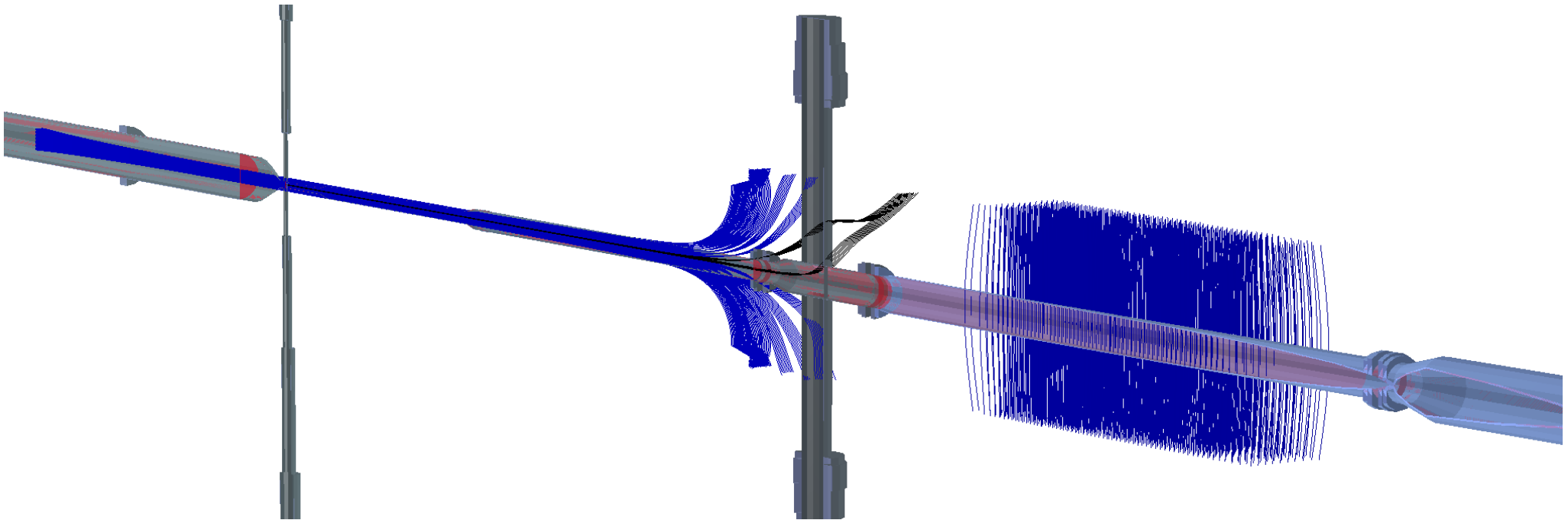
The class structure





Observations when working with fieldmaps within pandaroot

Illustration of field maps



1.5 GeV/c fieldmaps

Illustration of field maps

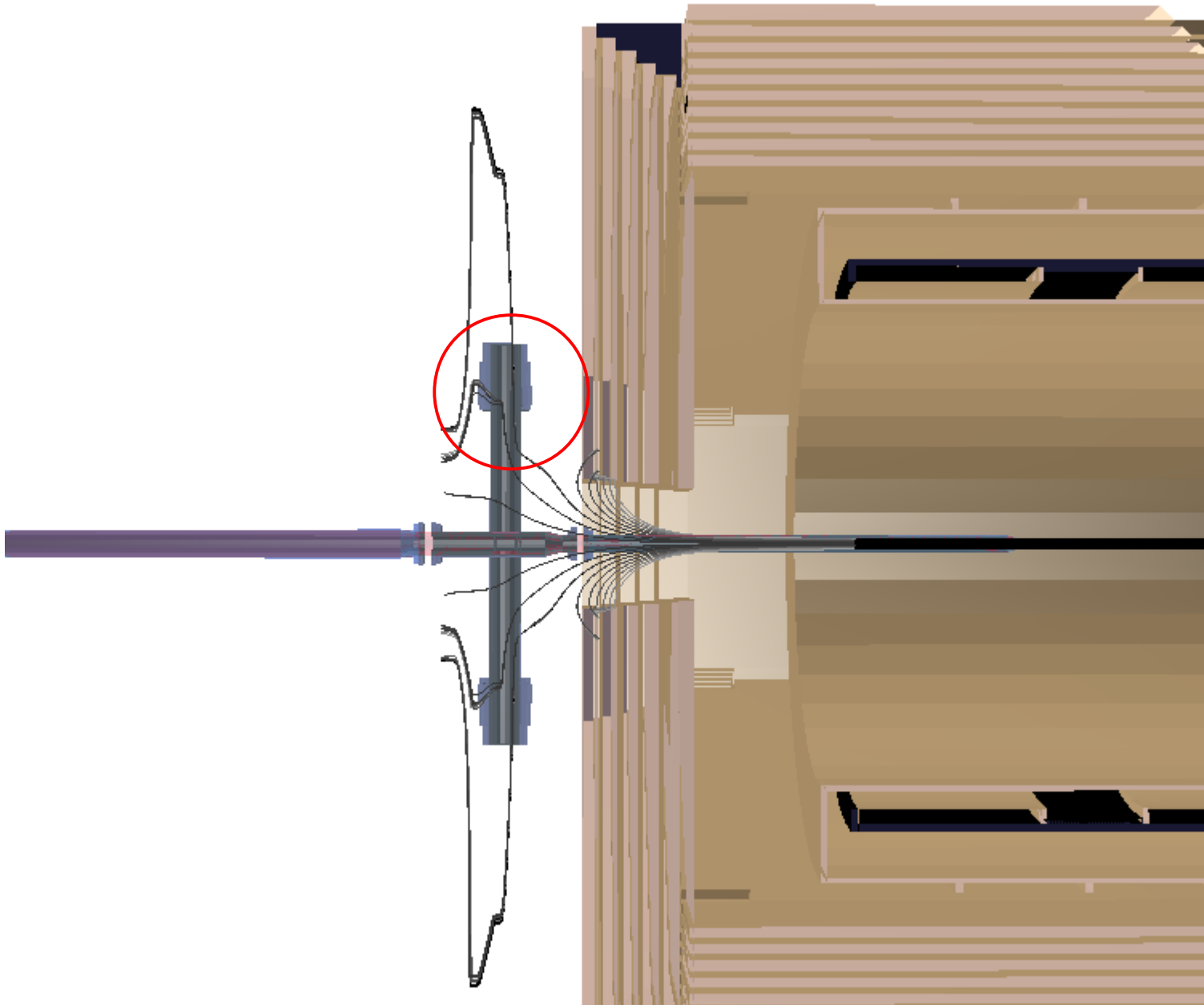
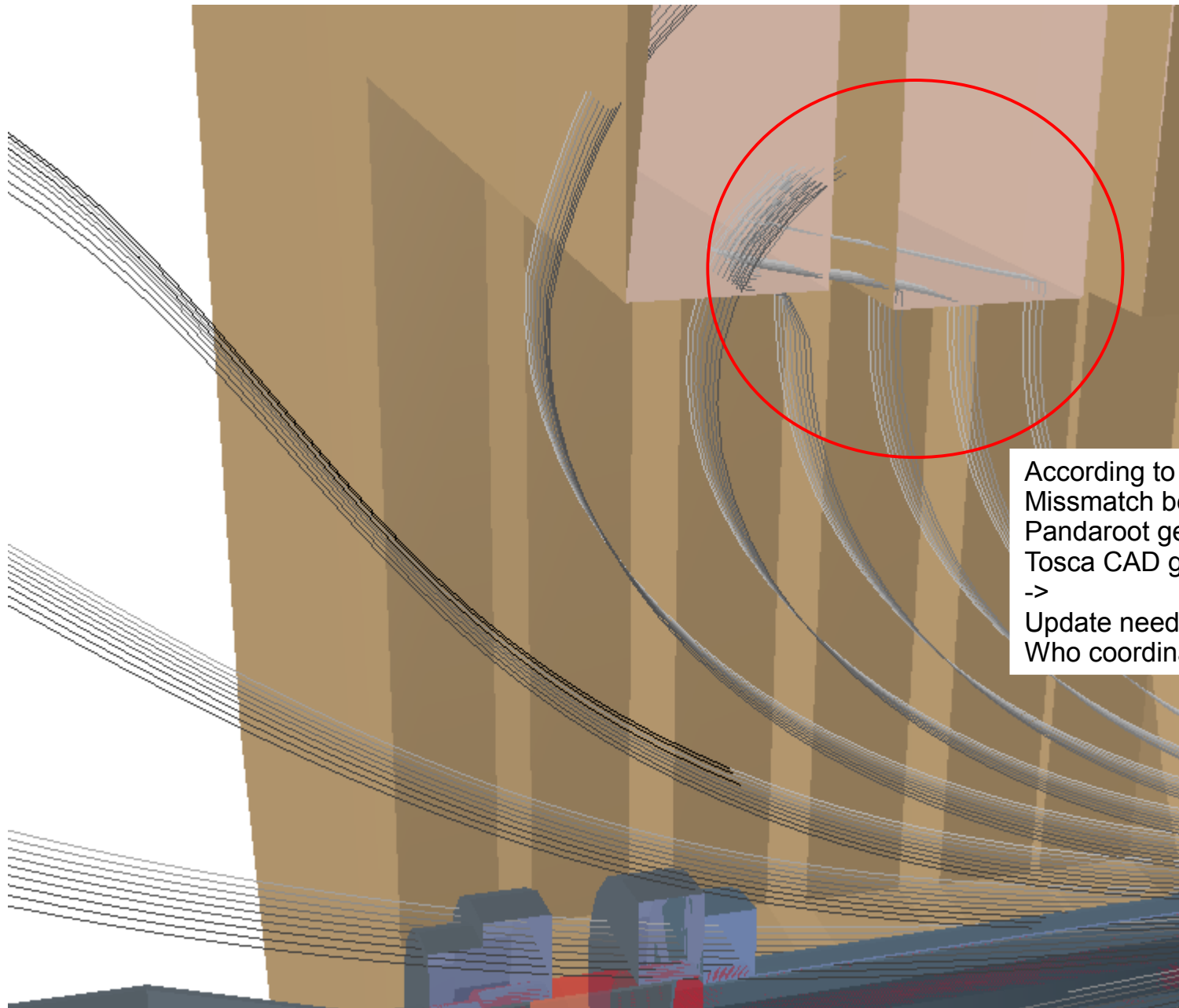
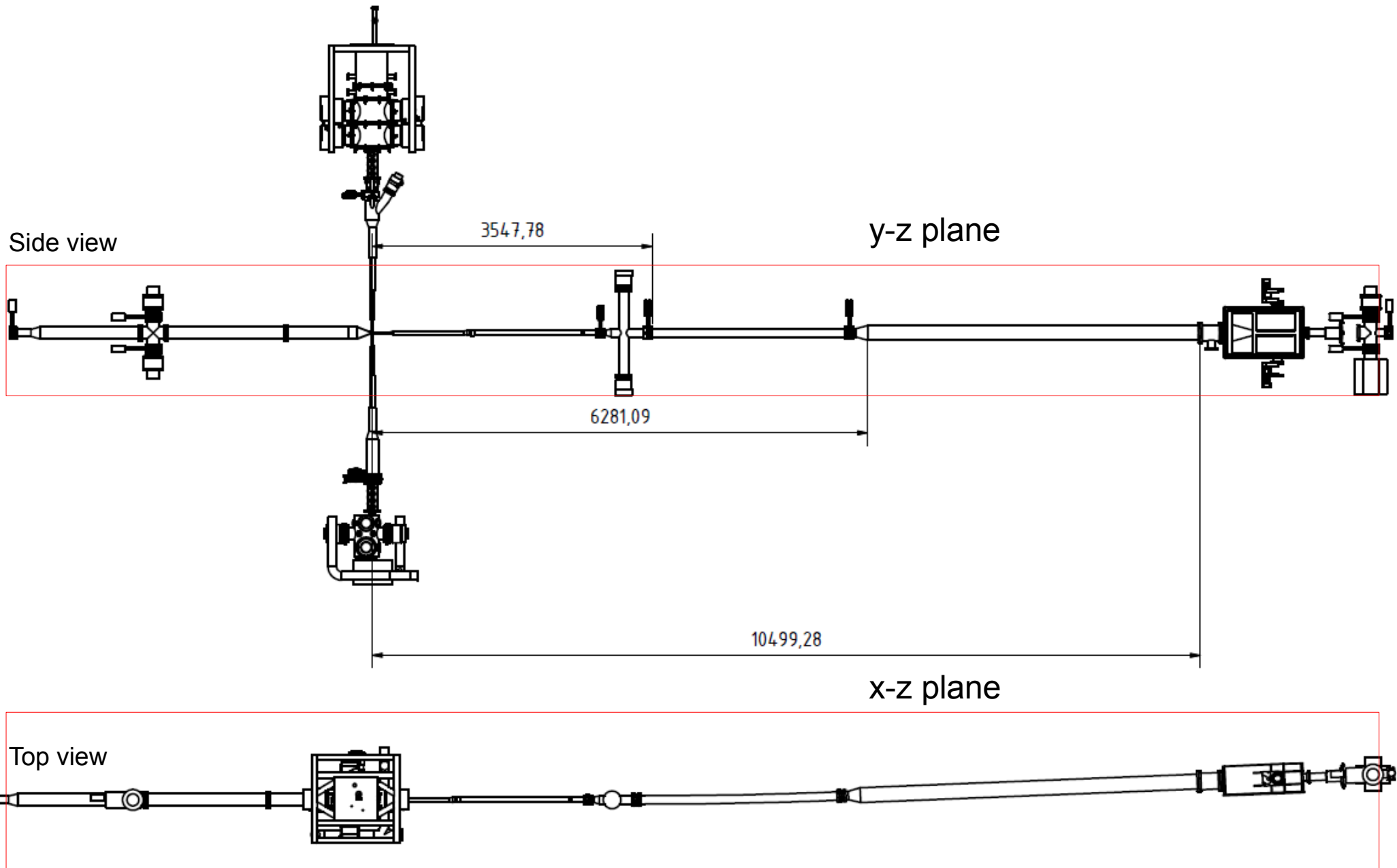


Illustration of field maps



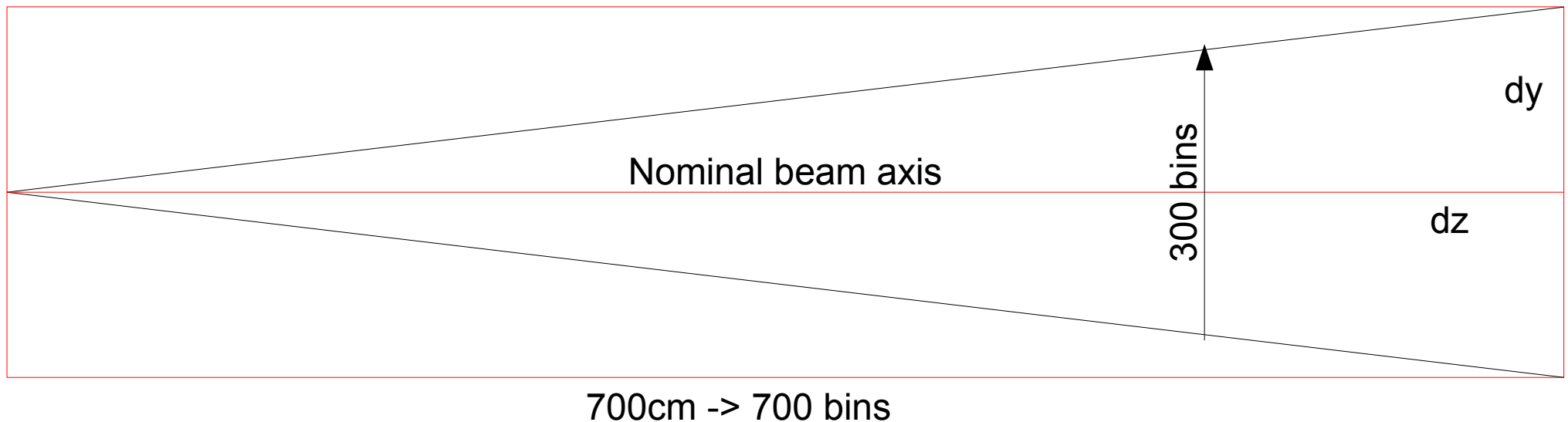
According to Jost:
Mismatch between
Pandaroot geometry and
Tosca CAD geometry
->
Update needed?
Who coordinates sim<>reality ?

Looking only on 2 coplanar planes



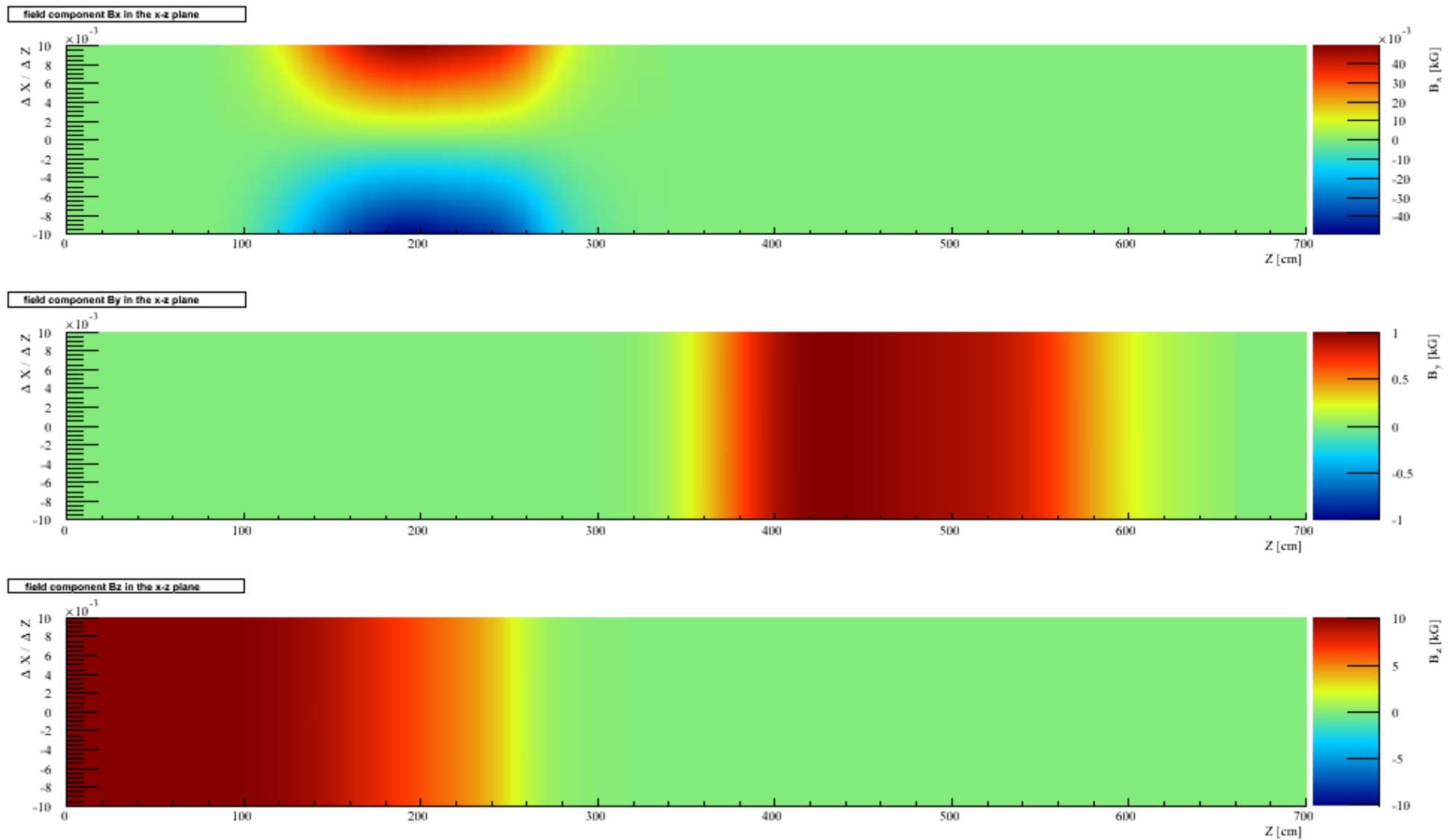
Definition of coordinates

y-z plane

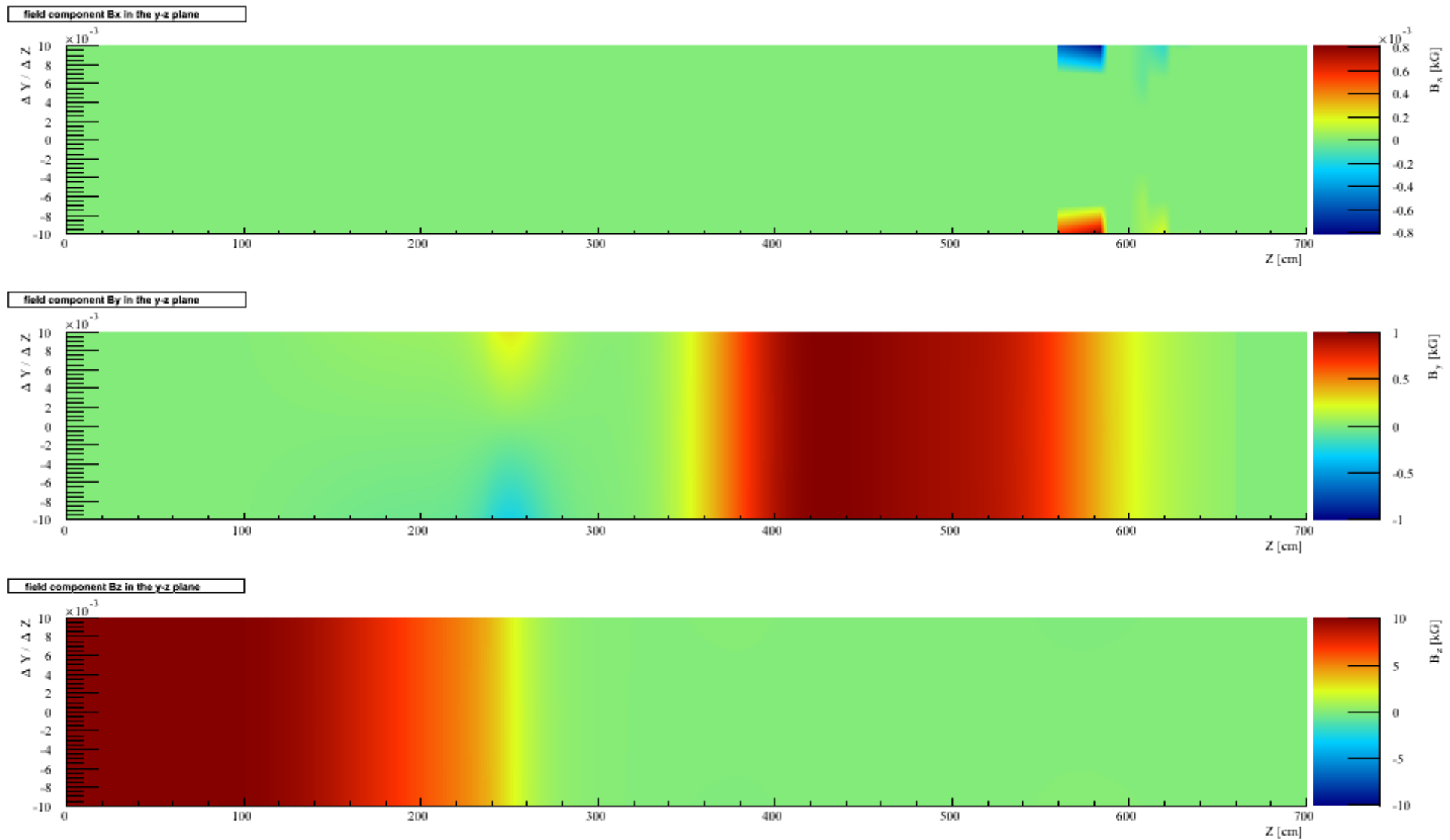


-10 mrad < dy/dz < 10 mrad in 300 bins
Origin is on the nominal beam axis, specially important for
Curved axis in the x-z plane

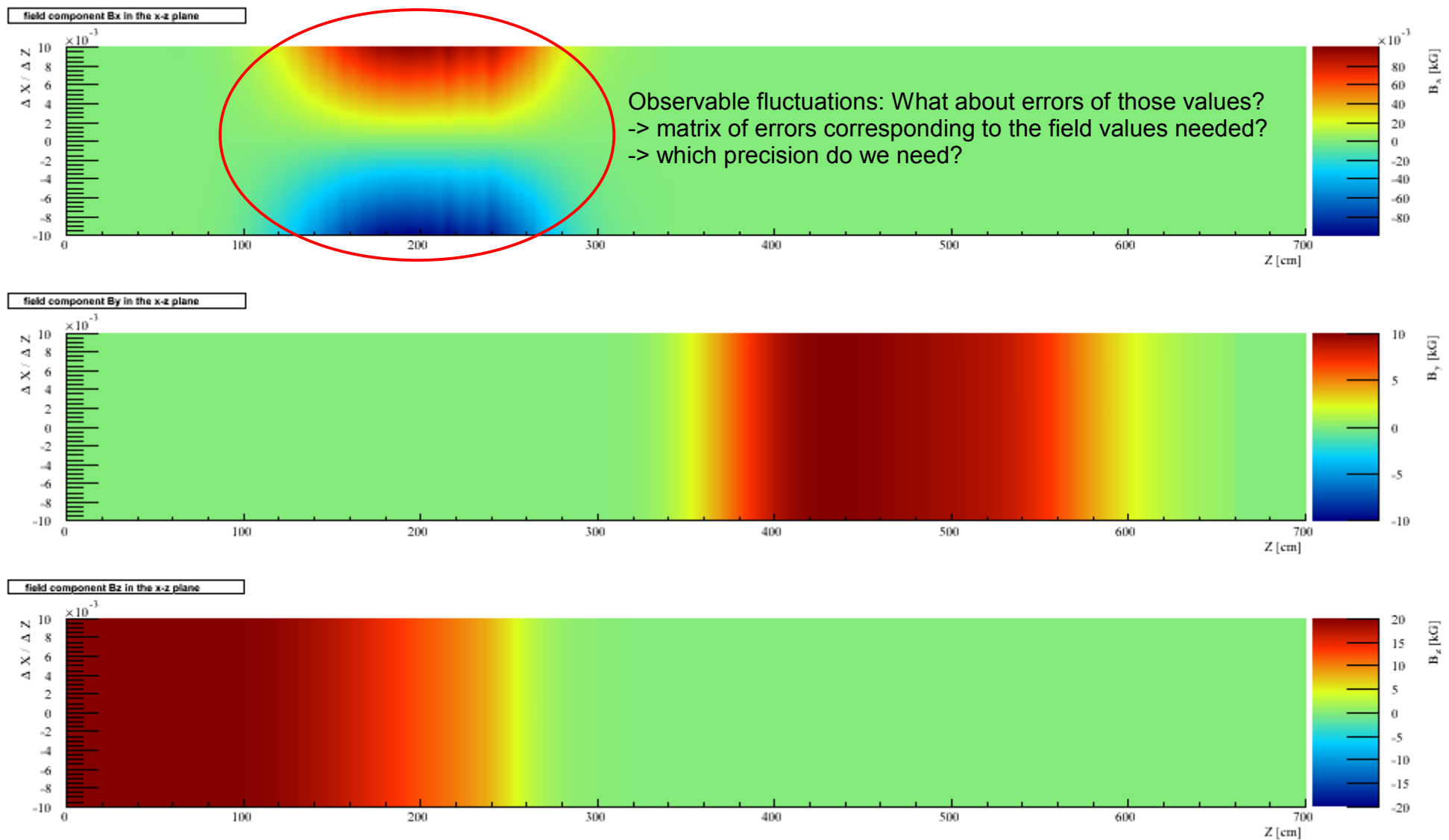
Field values for 1.5 GeV/c



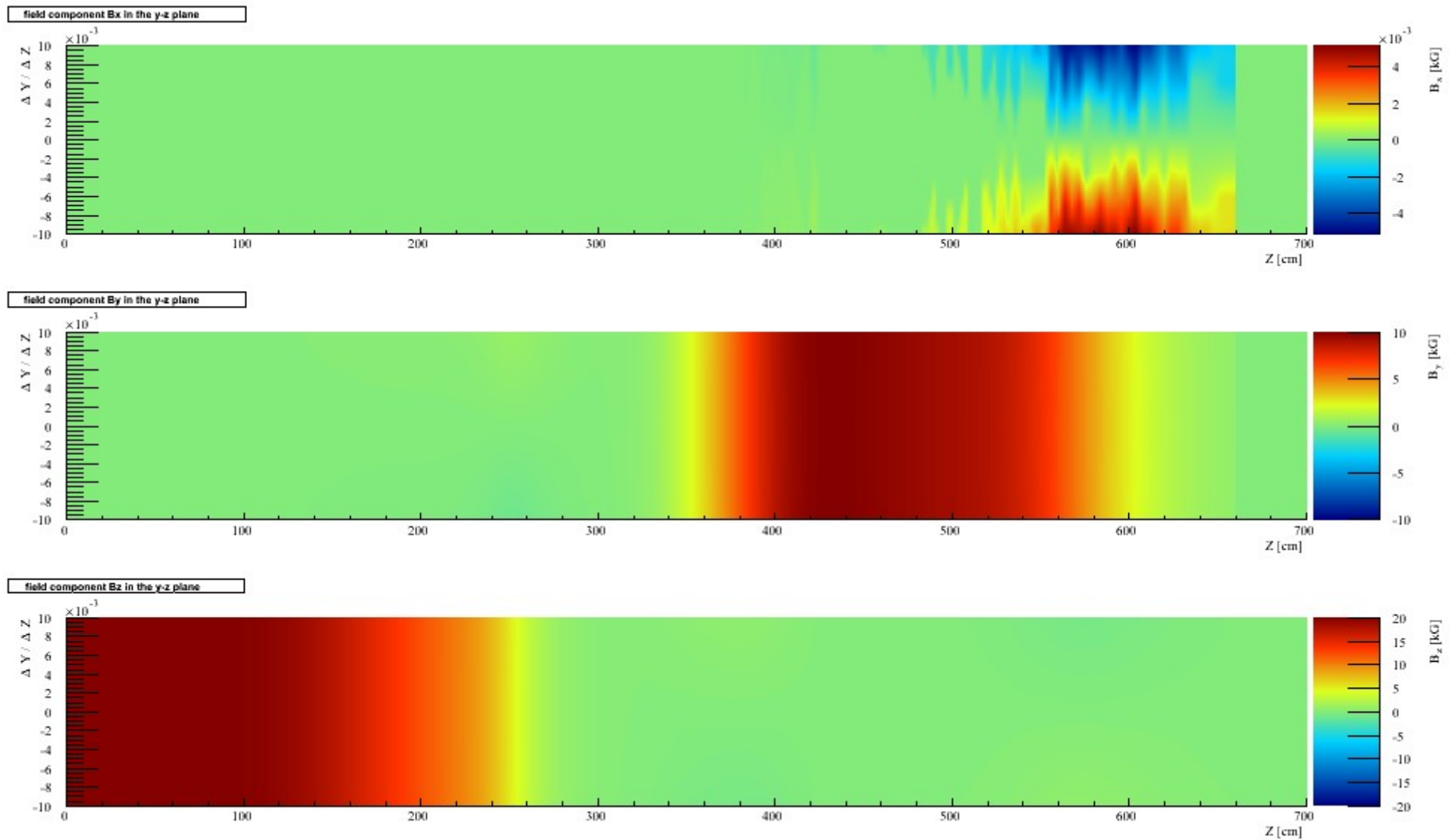
Field values for 1.5 GeV/c



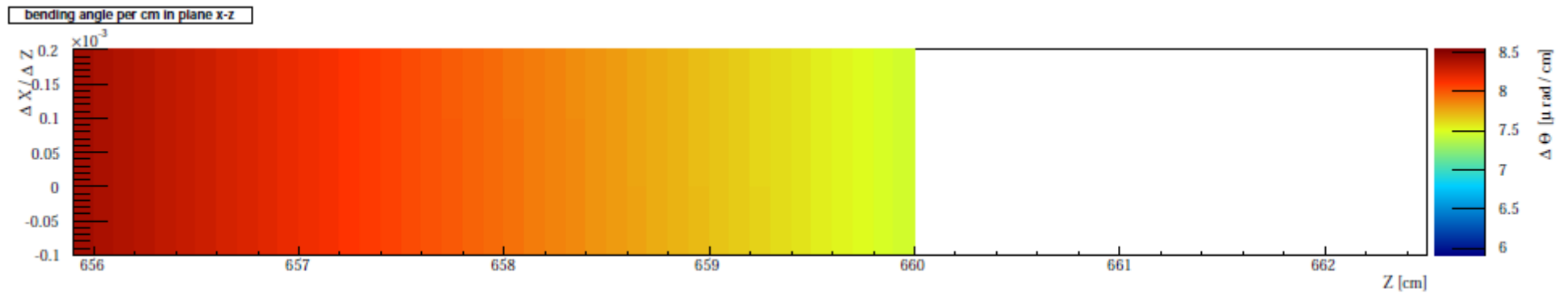
Field values for 15 GeV/c



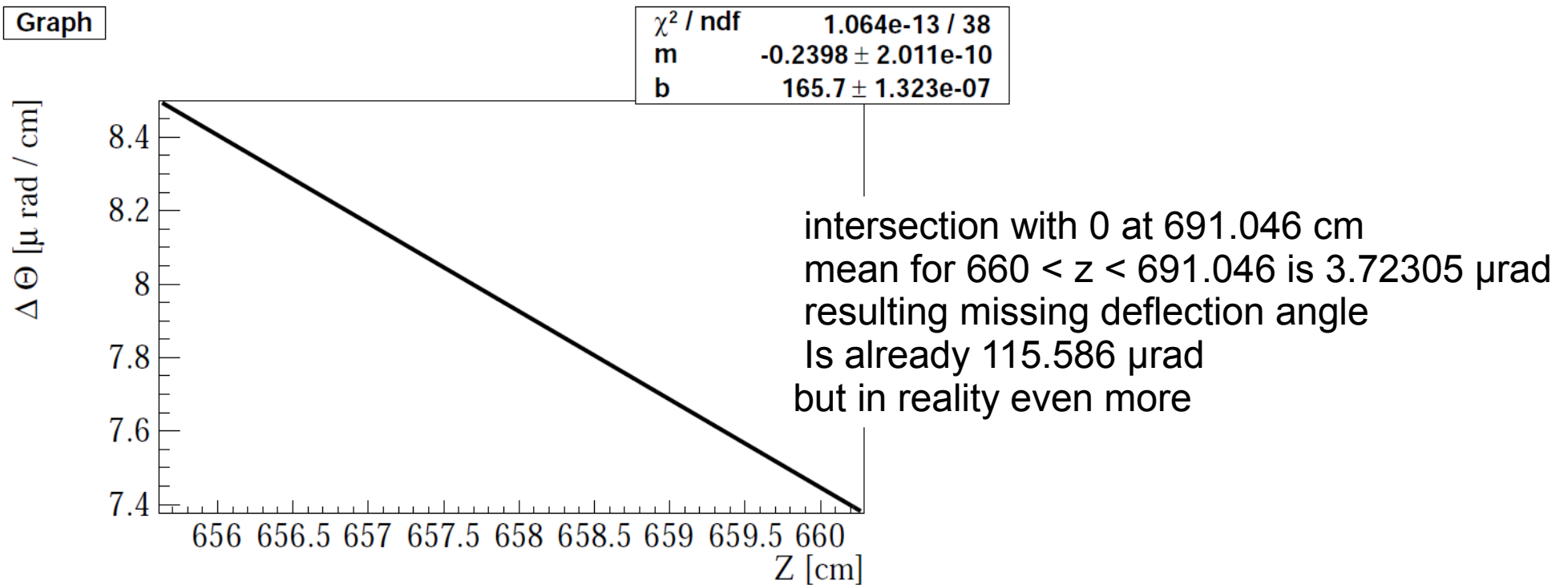
Field values for 15 GeV/c



The fringe field cutoff



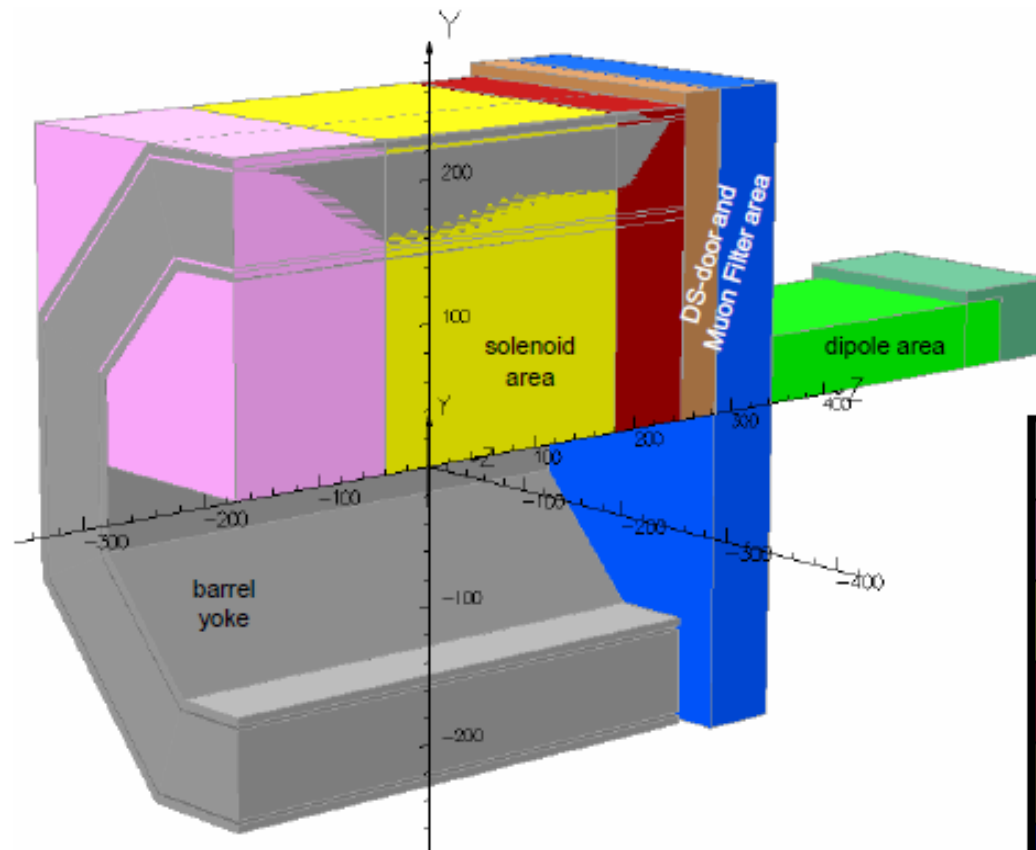
Graph



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?