

Evaluation of the magnetic field map in view of the fall run

Fall run planning meeting
22/08/2019

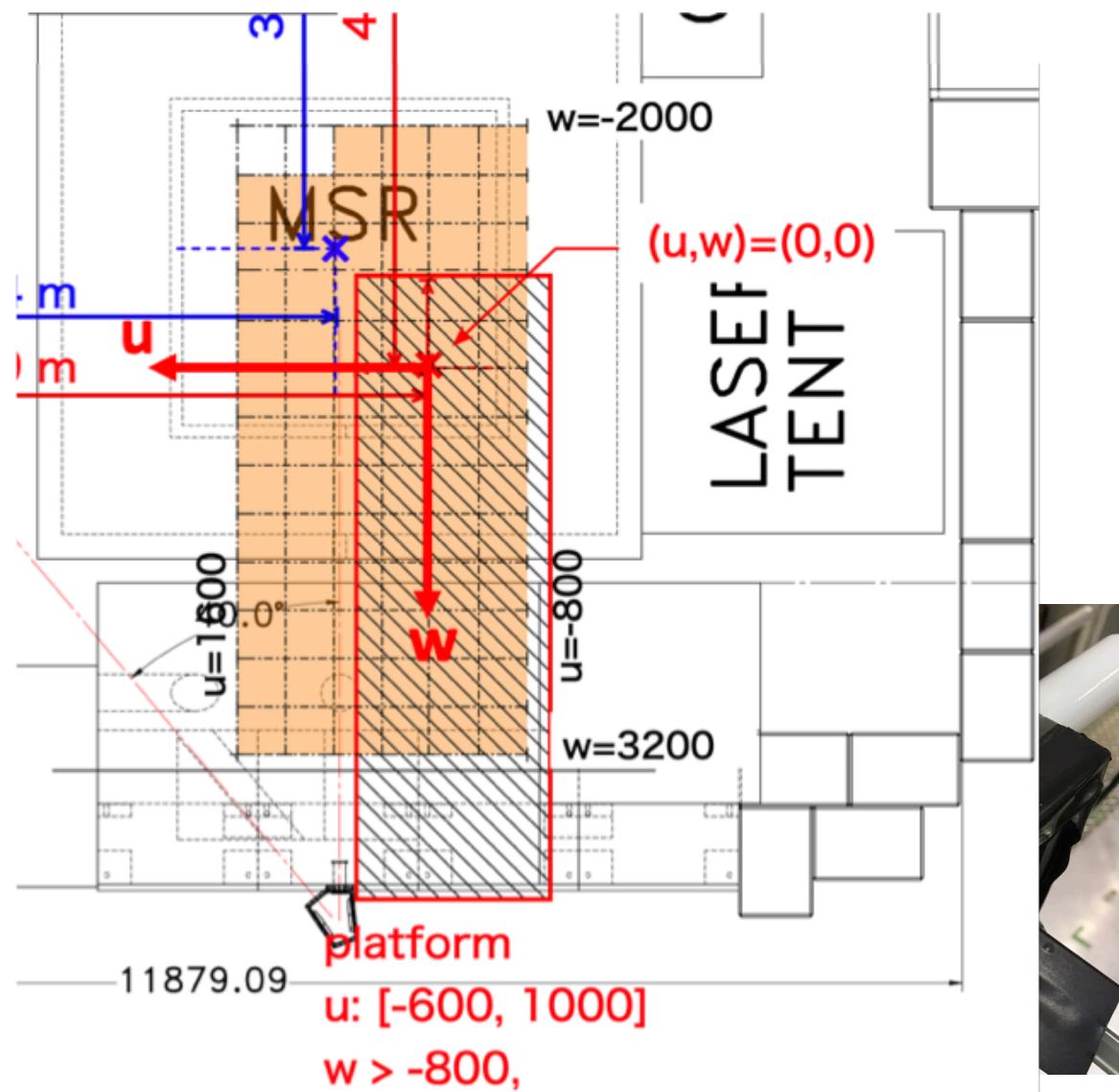
Takashi Higuchi
Xander Naumenko

Re-definition of the coordinate system

$$\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} -u + 10.25 \text{ cm} \\ -w \\ v - 1.25 \text{ cm} \end{pmatrix}$$

$$\begin{pmatrix} B_x \\ B_y \\ B_z \end{pmatrix} = \begin{pmatrix} -B_u \\ -B_w \\ B_v \end{pmatrix}$$

- Changed to right-handed coordinate system
 @Russ & Maedeh : might invert coordinate in the model
 - Center of the SCM: $x=0$
 - Floor level: $v=-1.881$ m
 - $y=0$ ($w=0$) same position
 - Height difference between the marker on the probe and the center of the sensor
 - Fall run: UCN travel along $x=0$, $y: -450$ cm → 0

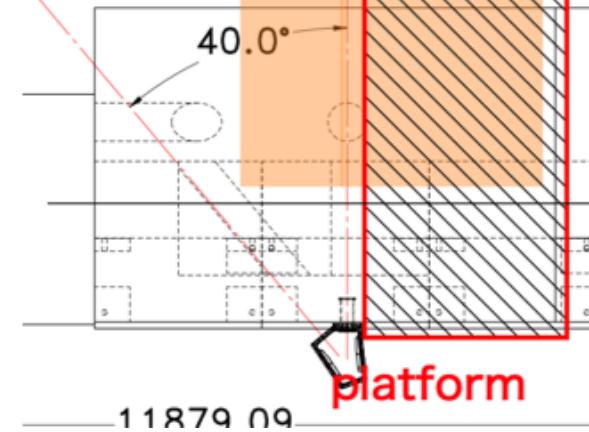
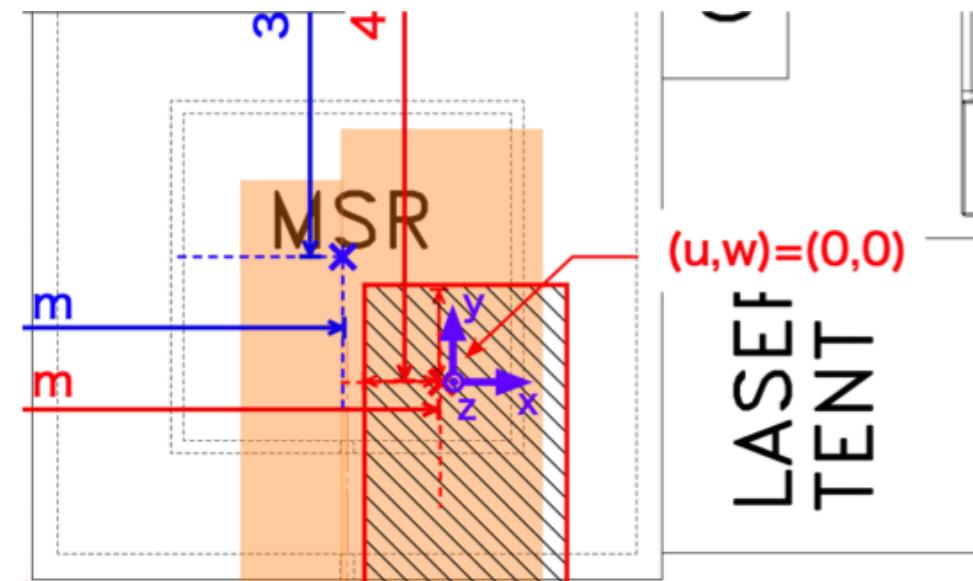


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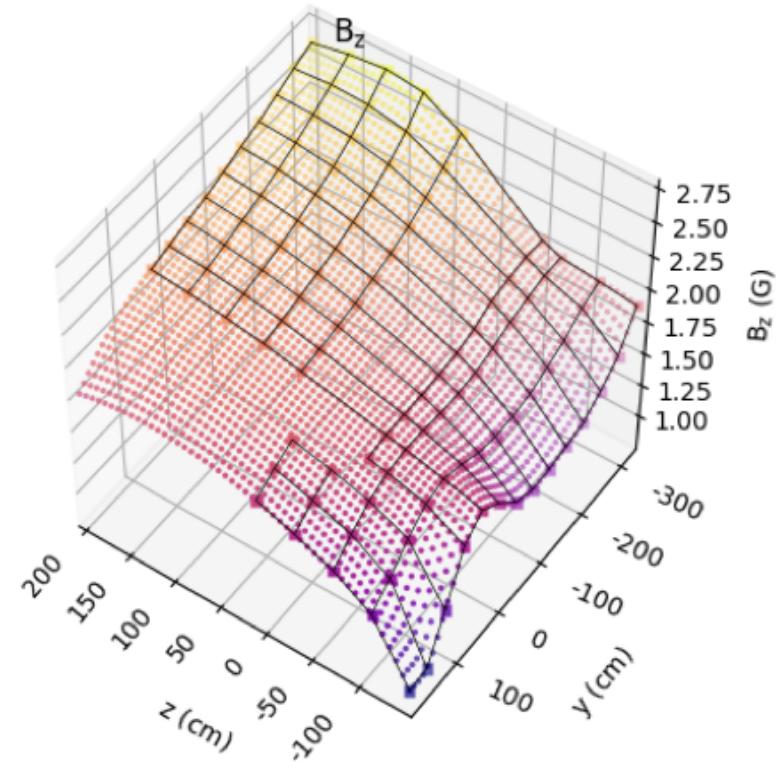
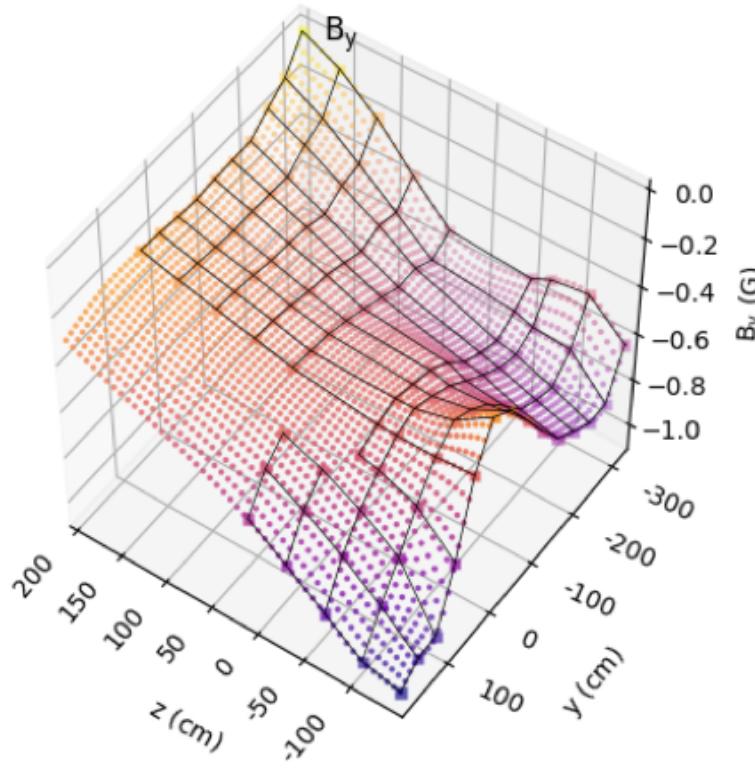
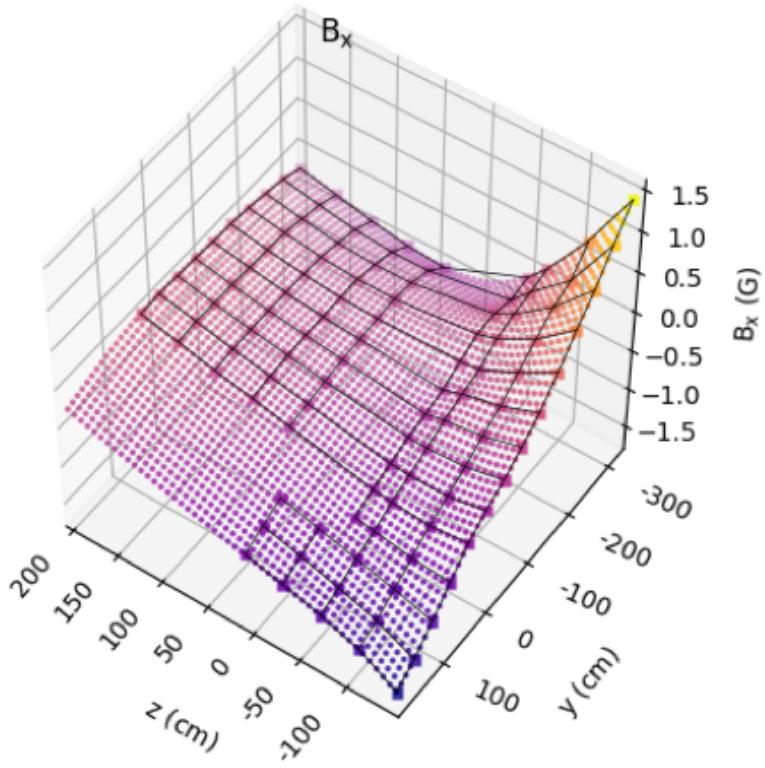
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Example (cut at $x=\text{const.}$)

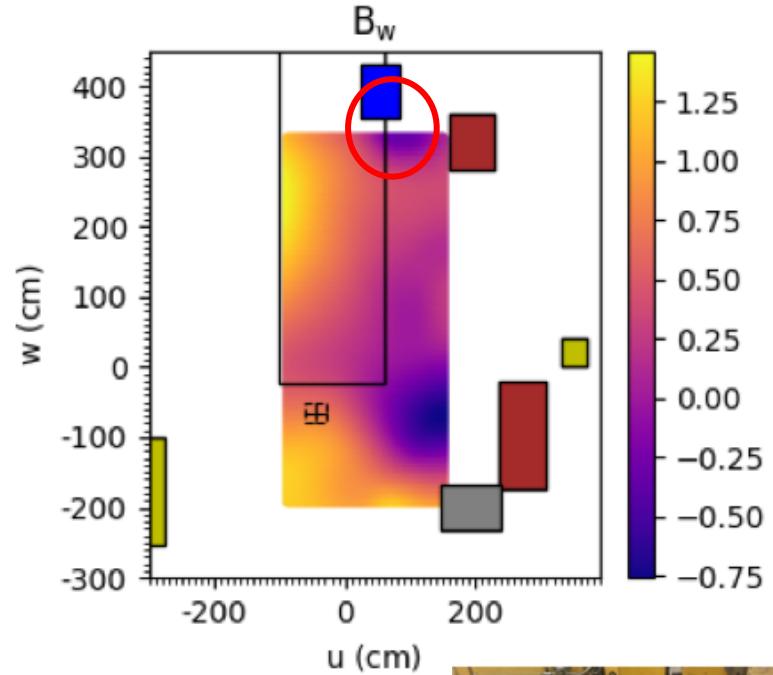
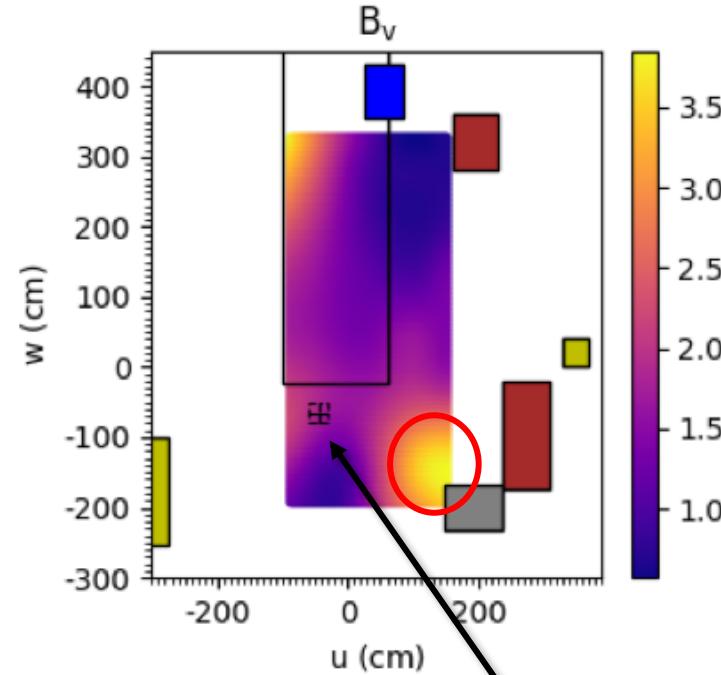
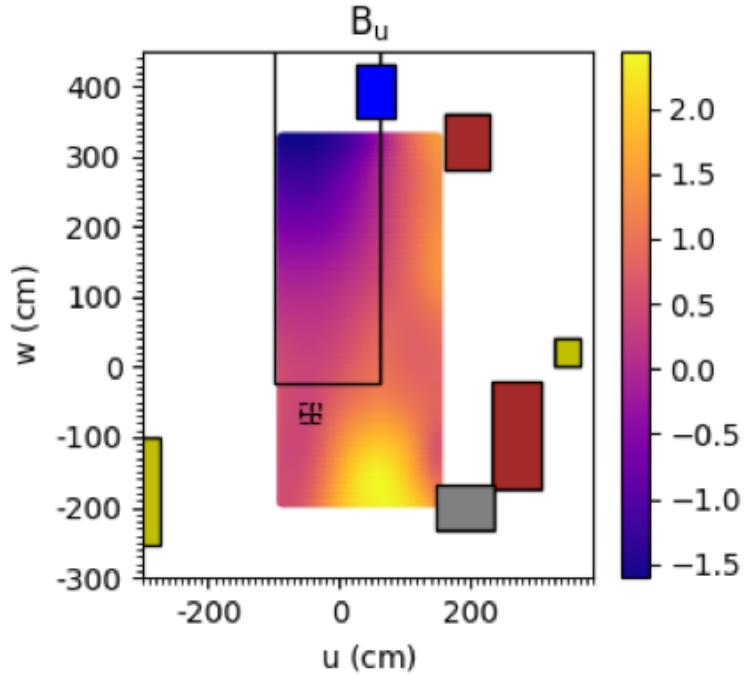
$x = 18.20 \text{ cm}$



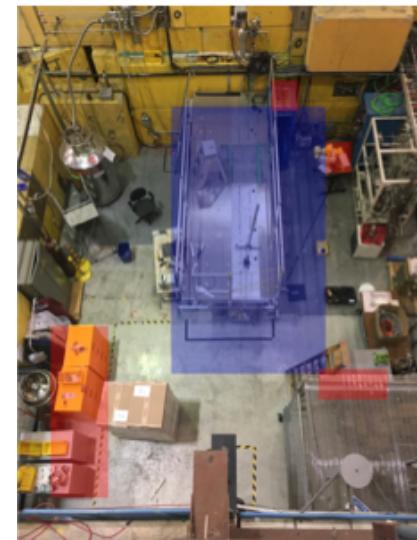
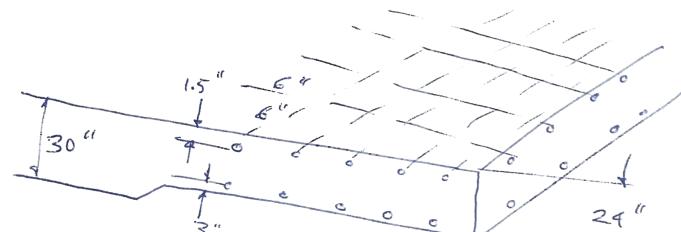
- The field can be understood as a superposition of
 - A cyclotron stray field (has gradients, smooth function of positions)
 - Fields from the floor (local inhomogeneity)
- Interpolation (scipy.interpolate.Rbf) performed in order to obtain enough data points for color plot
- This presentation: focus on the cyclotron field at the experiment's level

Fields near the floor (old coordinate, u, v, w)

$v = -146.13 \text{ cm}$ (41.99 cm from floor)

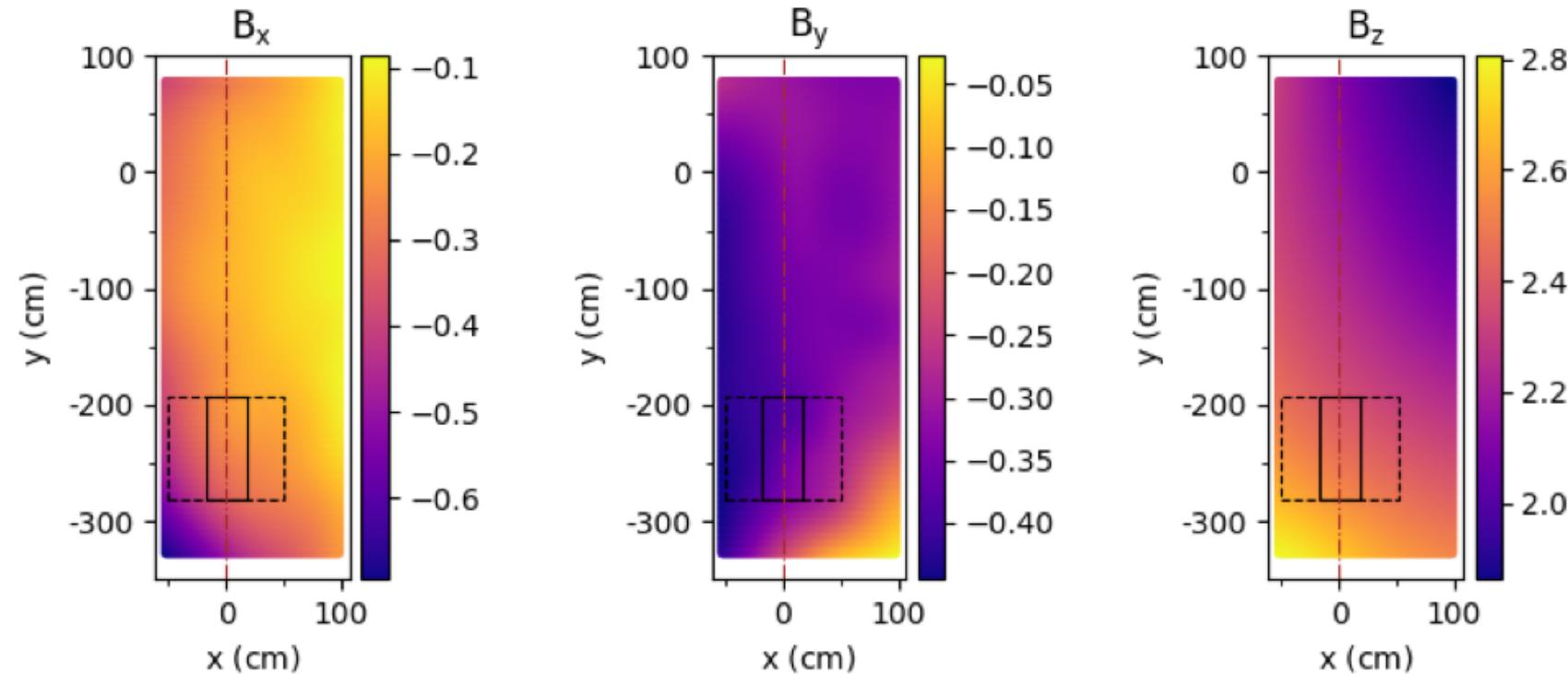


- The domains are not from the local magnetic components (at least not all of them, perhaps those circled are)
- The size of the domains are much larger than the grids (6 inches) of the steel rebars in the floor
- Would like to repeat after floor degaussing



Field map on the platform (UCN port height z=136.5cm)

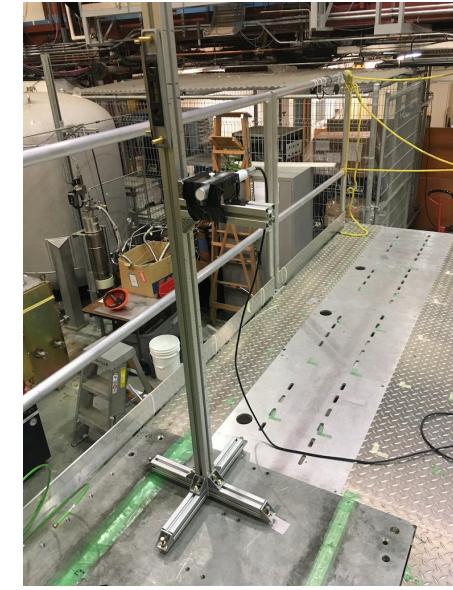
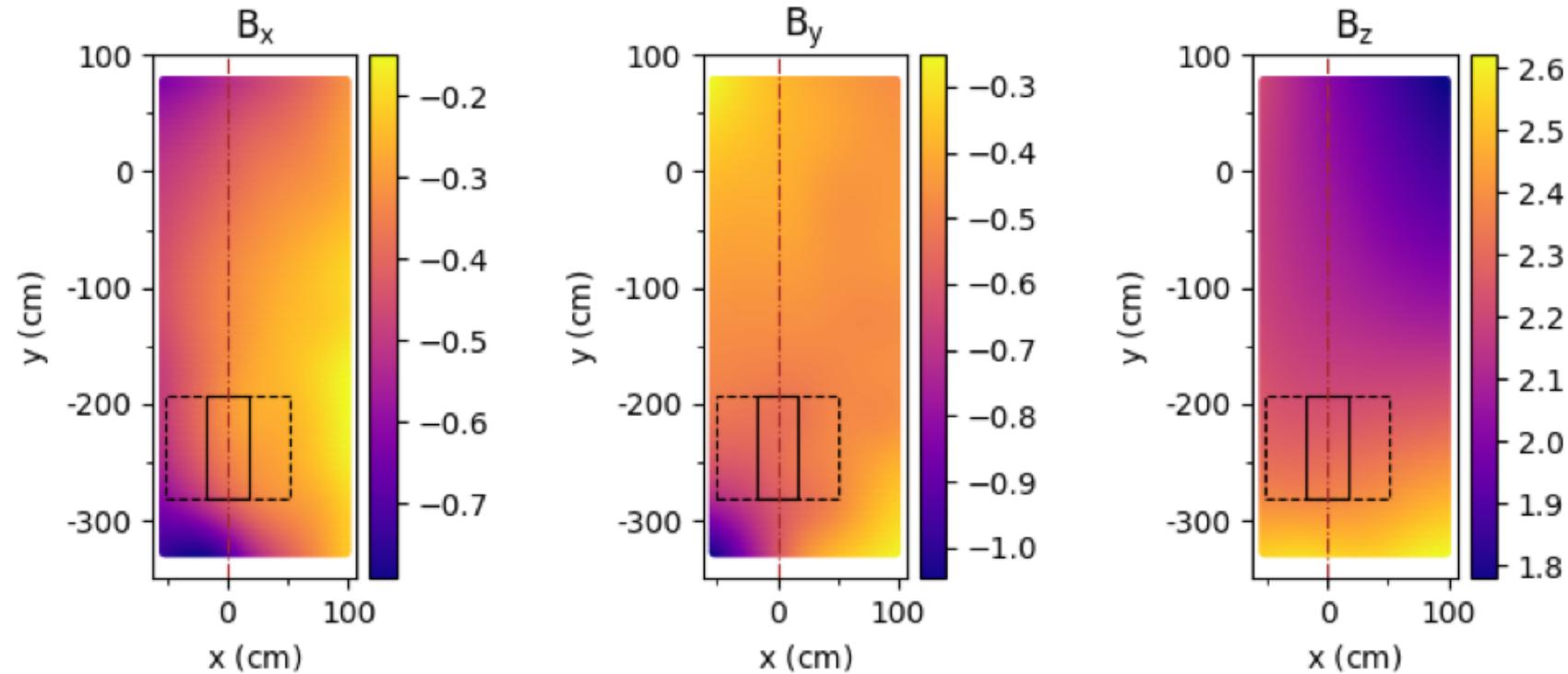
$z = 136.50 \text{ cm (UCN port level), } \bar{\mathbf{B}} = (-0.280, -0.369, 2.471)$



- UCN port : $(0, -440.5\text{cm}, 136.5\text{cm})$
- Dashed box: plate of the SCM, solid box: bore diameter 35 cm
- Average magnetic field in the solid box: $(B_x, B_y, B_z) = (-0.28, -0.37, 2.47) \text{ G}$

Field map on the platform (SCM bore height z=52.8cm)

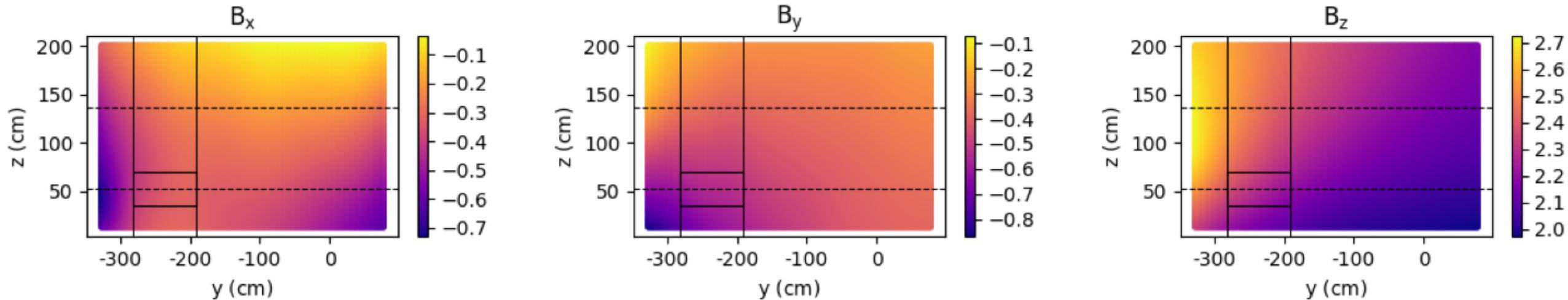
$z = 52.80 \text{ cm}$ (SCM bore level), $\bar{\mathbf{B}} = (-0.350, -0.550, 2.297)$



- UCN port : $(0, -440.5\text{cm}, 136.5\text{cm})$
- Dashed box: plate of the SCM, solid box: bore diameter 35 cm
- Average magnetic field in the solid box: $(B_x, B_y, B_z) = (-0.35, -0.55, 2.30)$ G

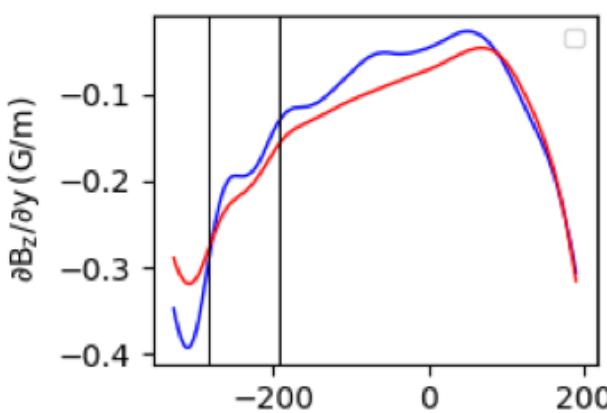
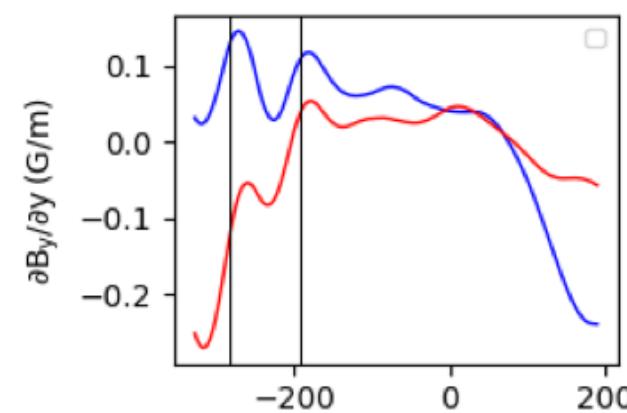
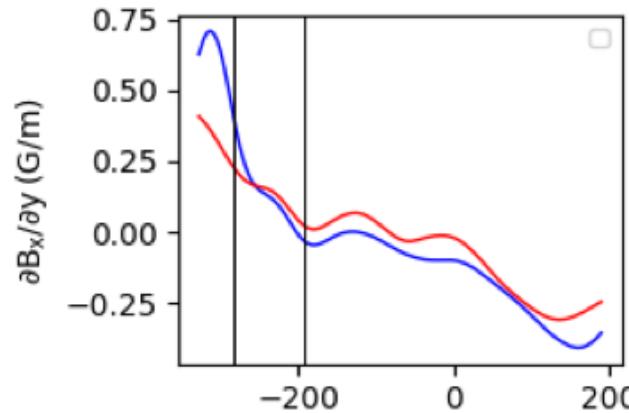
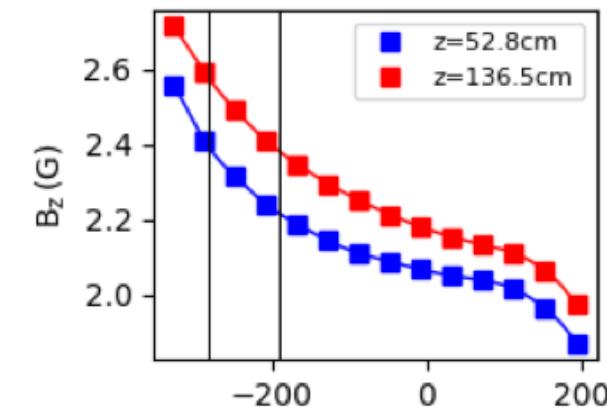
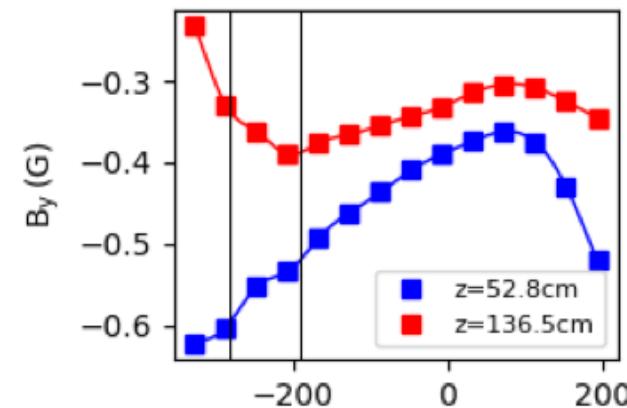
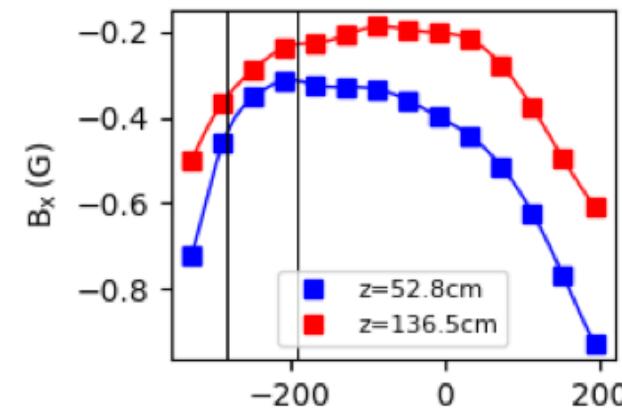
Field map on the platform ($x=0\text{cm}$)

$z = 52.80 \text{ cm}$ (SCM bore level), $\bar{\mathbf{B}} = (-0.348, -0.553, 2.294)$



- UCN port : $(0, -440.5\text{cm}, 136.5\text{cm})$
- Average magnetic field in the solid box: $(B_x, B_y, B_z) = (-0.35, -0.55, 2.30) \text{ G}$

Field map on the platform ($x=0\text{cm}$)



- Gradient up to 0.3 G/m ($30\text{ }\mu\text{T/m}$)

Comments/proposals

- General trend on the platform level is, the x-dependence is small while y- and z-dependencies are significant
- Is guiding field not necessary? Depends on the stray field of the SCM
- I propose to map the field with a realistic setup, closer date to the beamtime
 - The best is with the beamline magnets on and SCM on
 - Scan of the platform level takes 1-2h
 - Even after the run?
- Setup: TCN19-050 (Blair)
- The floor degaussing is on the list
 - Aiming early September, OK to keep current layout till then?
 - According to experiences of Thomas Planche, the stray field itself is too weak to magnetize the floor, so the degaussed condition should stay
 - If it is found to be effective, we should degauss all the relevant part of the floor
- Monitoring while moving the stuff is also on the list
- (Before leaving, I should make sure to transmit the information (e.g. where I put the SCM rails))

