HFOFO PROJECT UPDATES

Week of July 28 - August 1, 2025

https://github.com/criggall/muon-cooling/tree/main

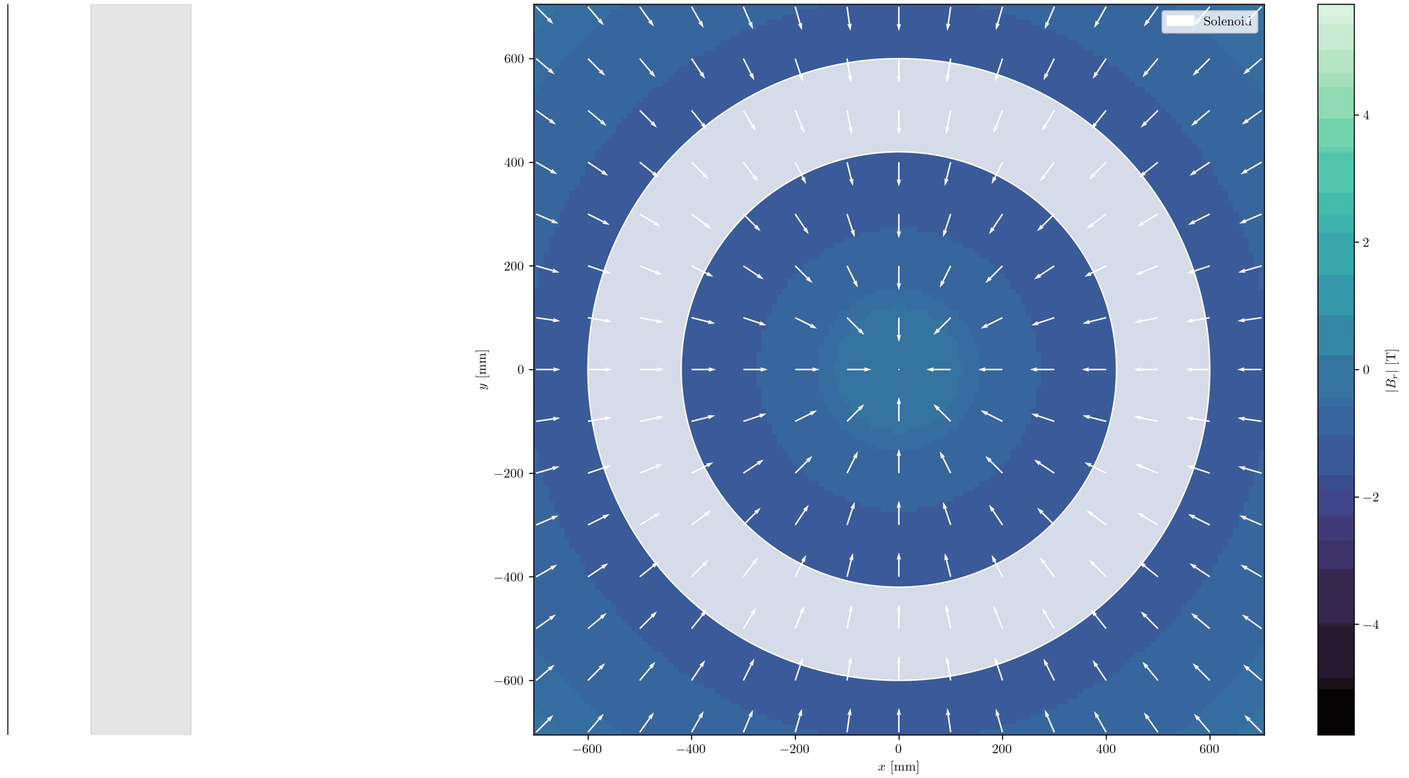
MAPPING THE MAGNETIC FIELD WITH G4BEAMLINE

For a single solenoid with HFOFO coil geometry

WITH NO ROTATIONS

FIELD MAP FROM G4BL - NO ROTATION

Animation of transverse field along z:

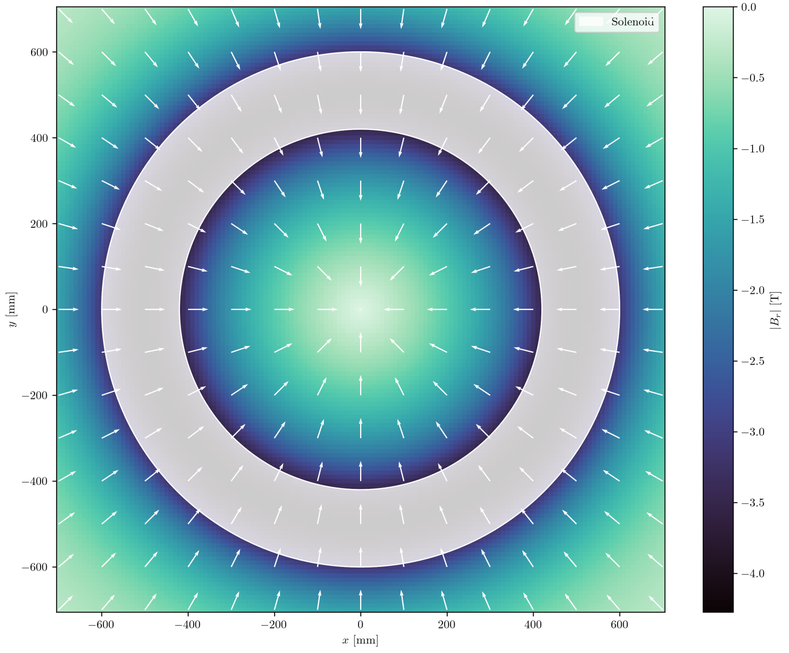


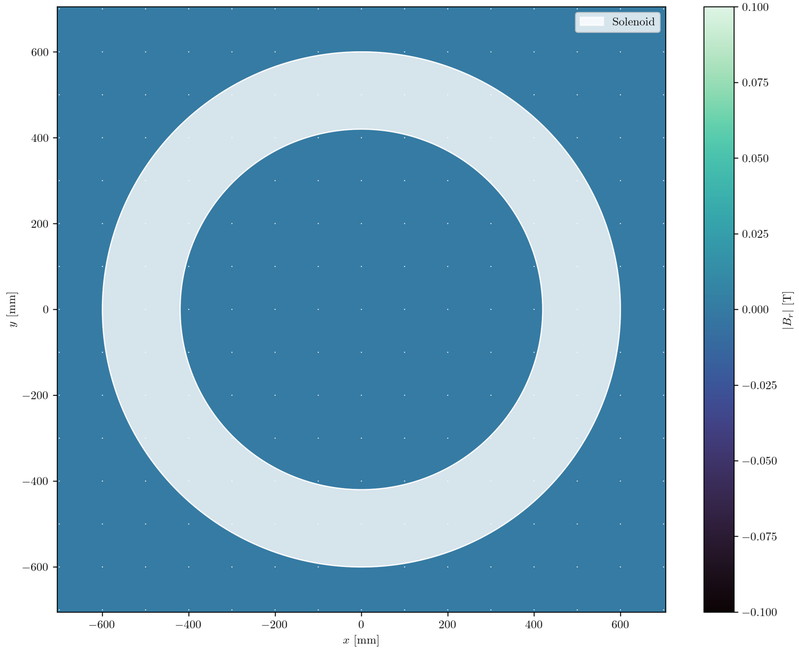
* Note again that neither visualizations of the solenoid account for the tilt

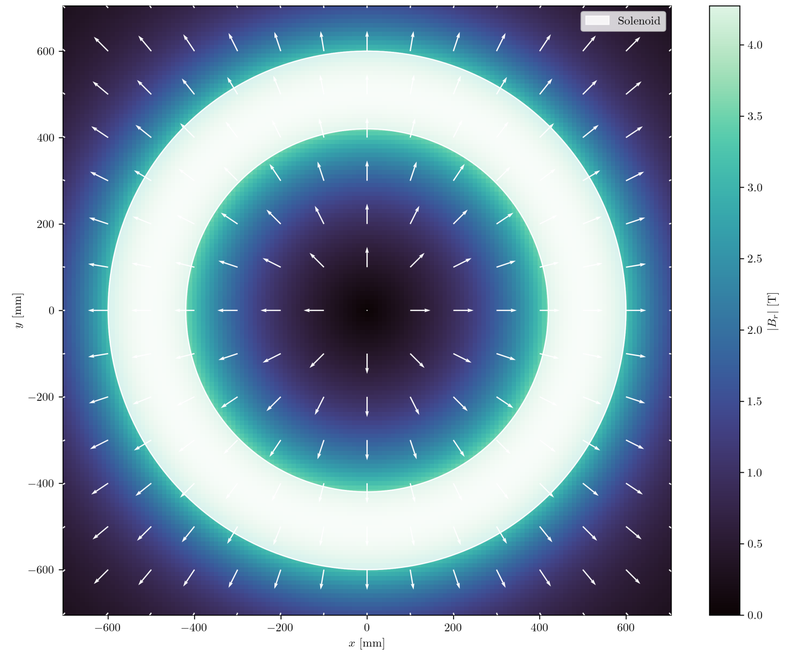
$z = -200$

$z = 0$

$z = 200$


Solenoid
600
400
200
0
−200
−400
−600
y [mm]
−600
−400
−200
0
200
400
600
x [mm]
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
$|B_\perp|$ [T]

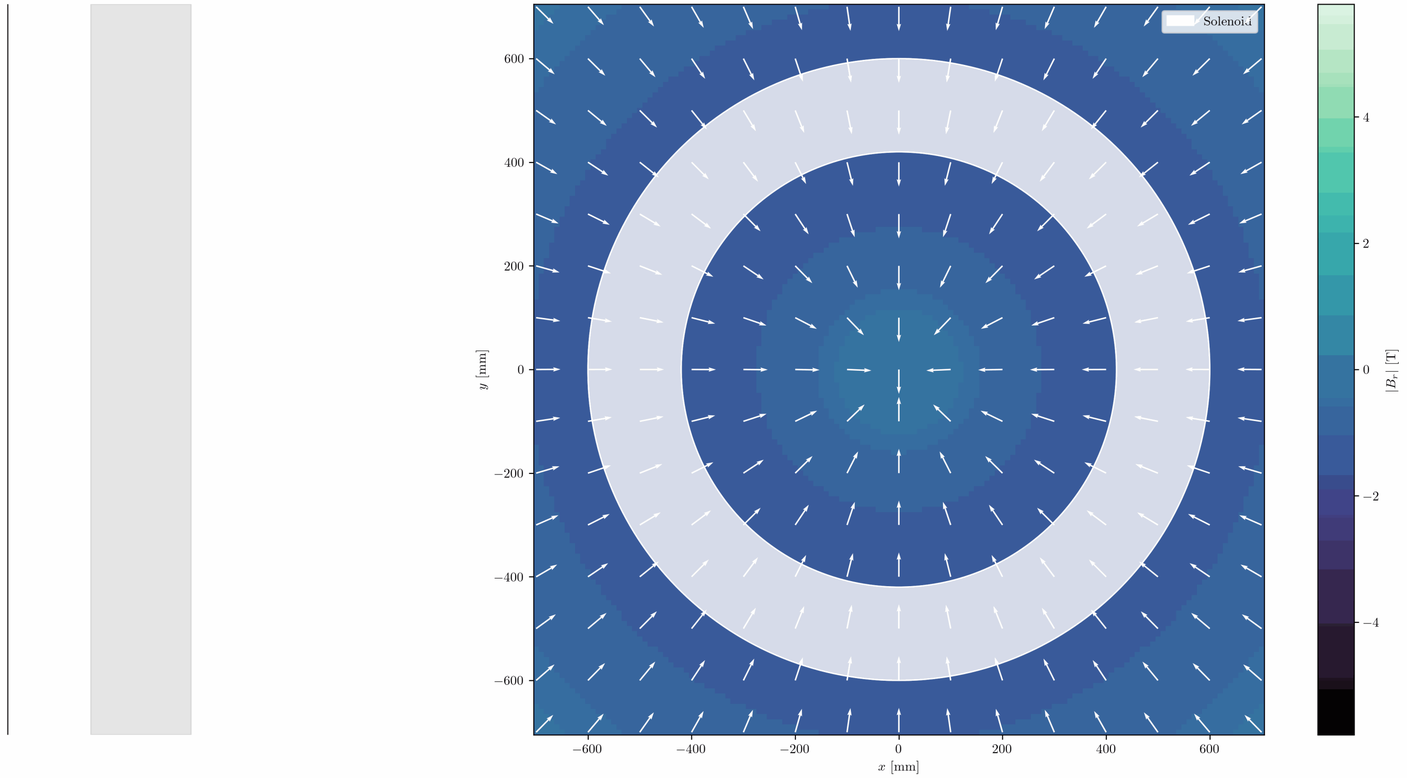

Solenoid
600
400
200
0
−200
−400
−600
y [mm]
−600
−400
−200
0
200
400
600
x [mm]
0.100
0.075
0.050
0.025
0.000
−0.025
−0.050
−0.075
−0.100
$|B_\perp|$ [T]


Solenoid
600
400
200
0
−200
−400
−600
y [mm]
−600
−400
−200
0
200
400
600
x [mm]
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
$|B_\perp|$ [T]

WITH ROTATION ABOUT X-AXIS

FIELD MAP FROM G4BL - WITH X ROTATION

Animation of transverse field along z:

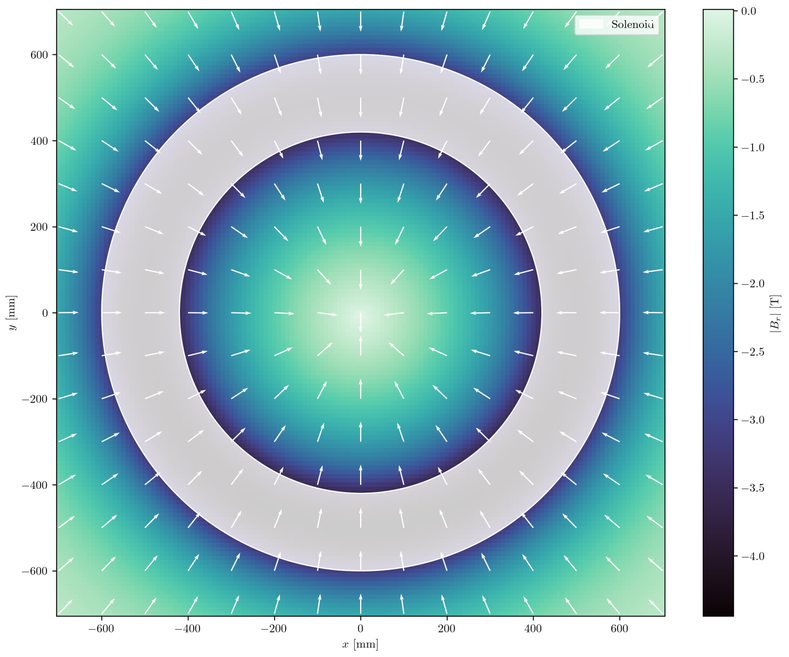


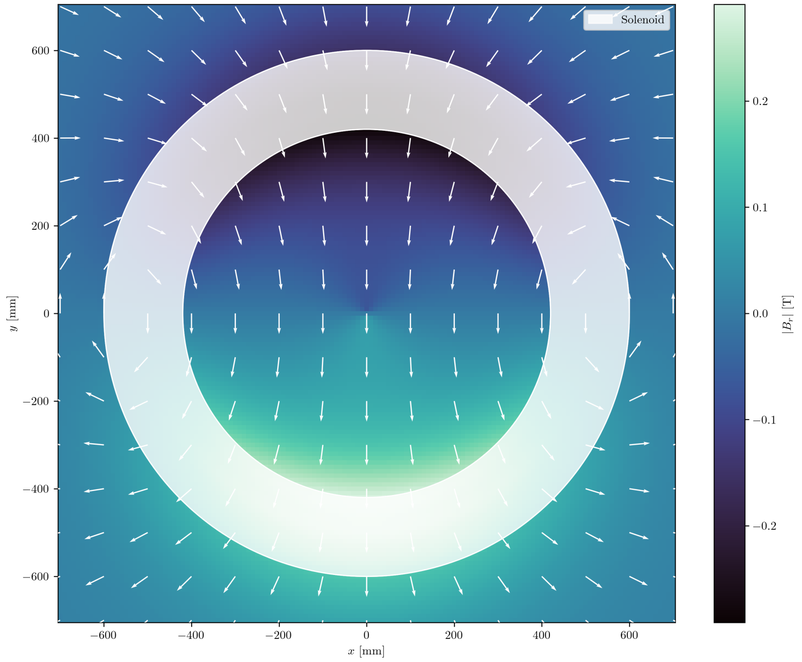
* Note again that neither visualizations of the solenoid account for the tilt

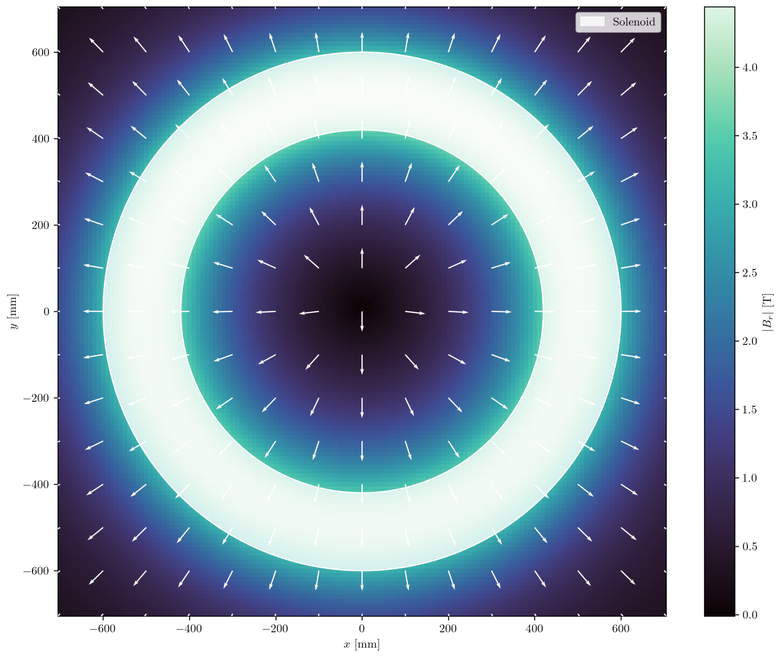
$z = -200$

$z = 0$

$z = 200$


Solenoid
600
400
200
0
−200
−400
−600
y [mm]
−600
−400
−200
0
200
400
600
x [mm]
0.0
−0.5
−1.0
−1.5
−2.0
−2.5
−3.0
−3.5
−4.0
$|B_T|$ [T]

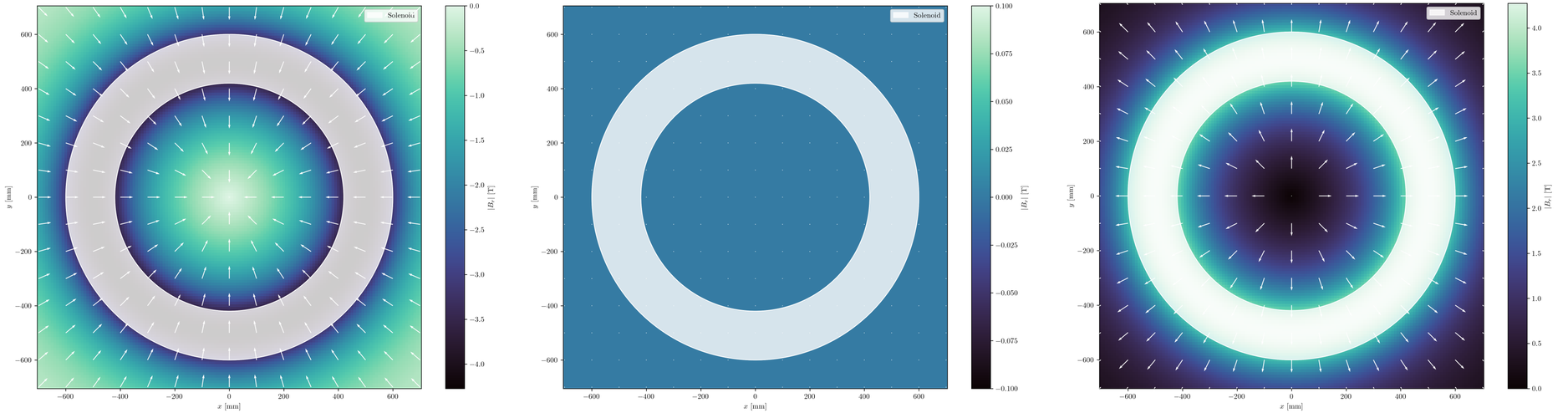

Solenoid
600
400
200
0
−200
−400
−600
y [mm]
−600
−400
−200
0
200
400
600
x [mm]
0.2
0.1
0.0
−0.1
−0.2
$|B_T|$ [T]


Solenoid
600
400
200
0
−200
−400
−600
y [mm]
−600
−400
−200
0
200
400
600
x [mm]
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
$|B_T|$ [T]

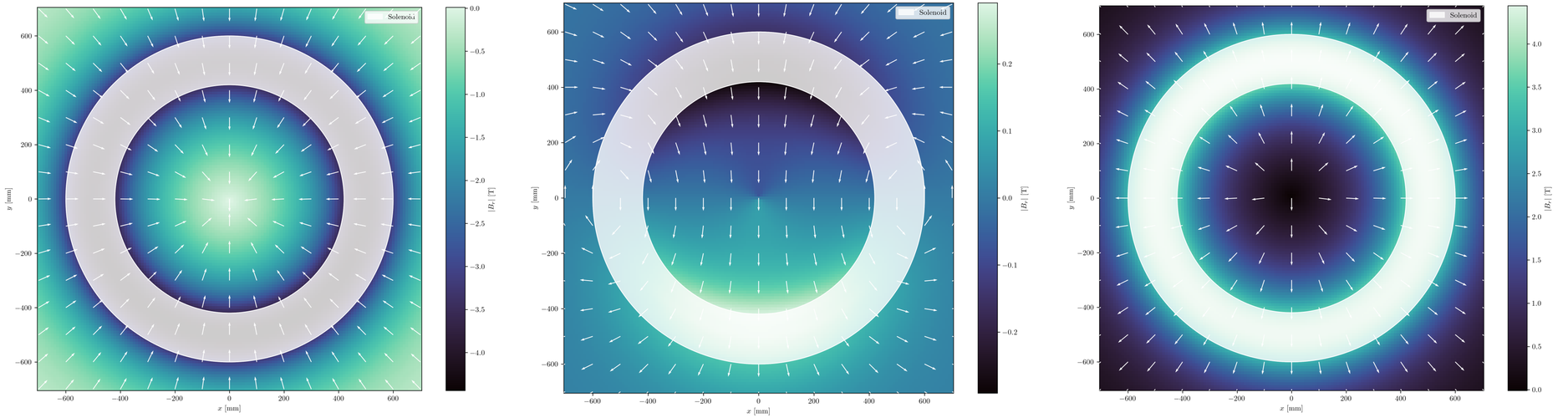
ROTATED VS. NOT-ROTATED

$z = -200$ $z = 0$ $z = 200$

No rotations



Rotations

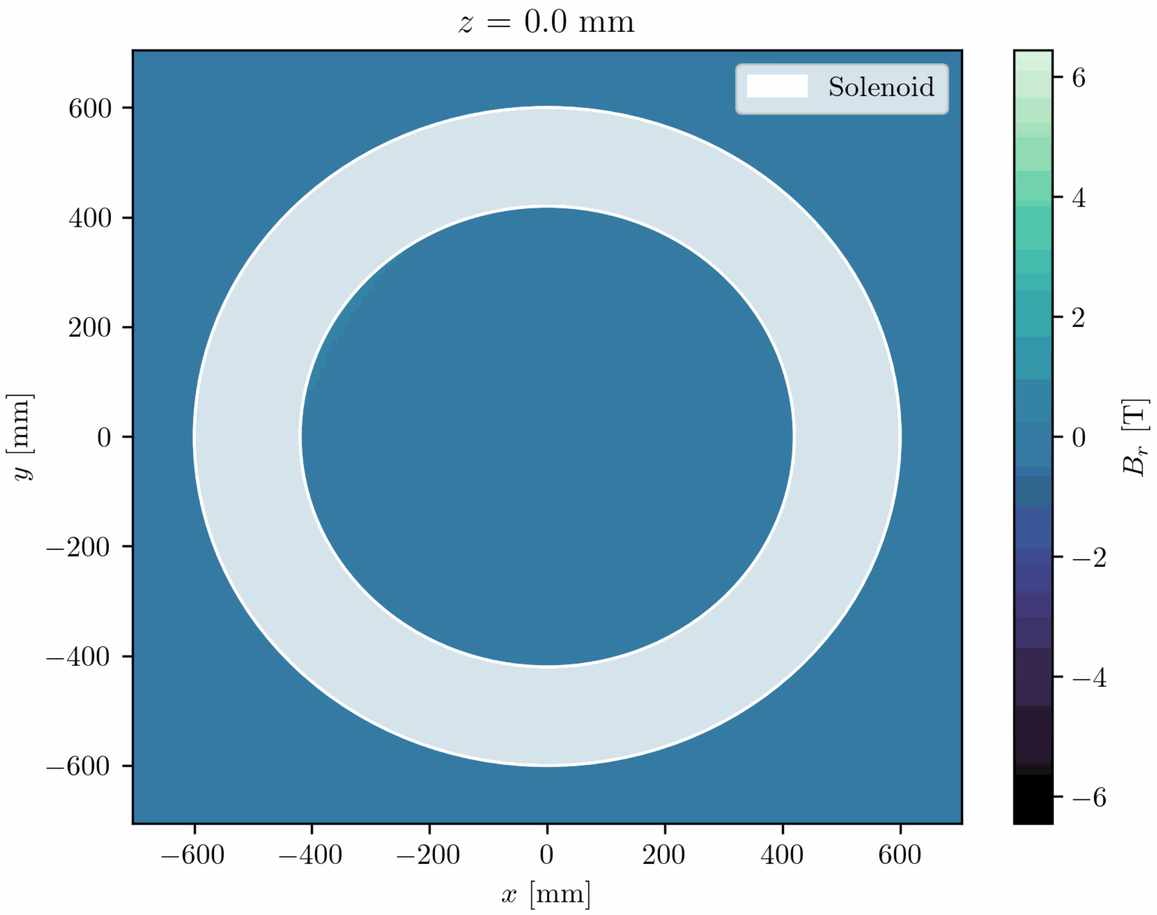


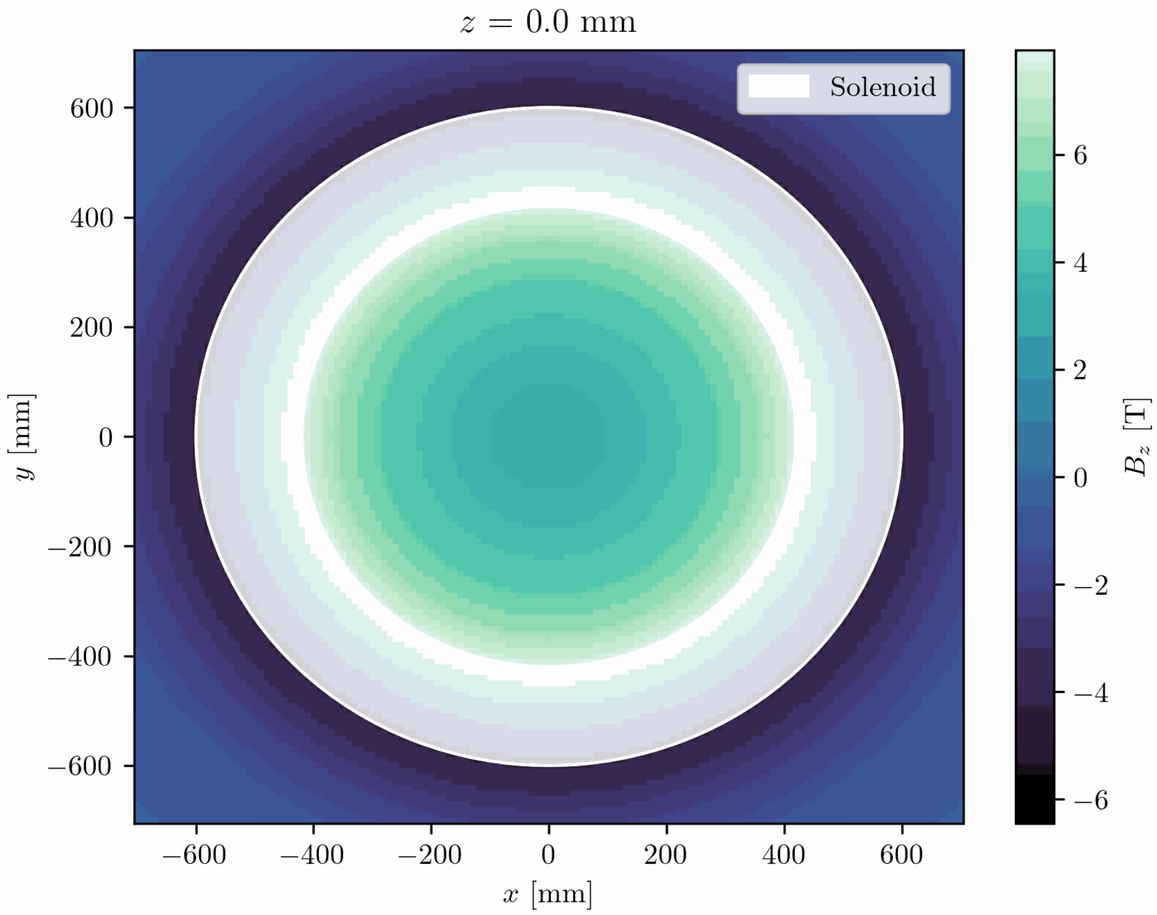
MAPPING THE MAGNETIC FIELD WITH G4BEAMLINE

For a the full HFOFO lattice

FIELD MAP FROM G4BL - FULL LATTICE

Animation of transverse and longitudinal field along z:

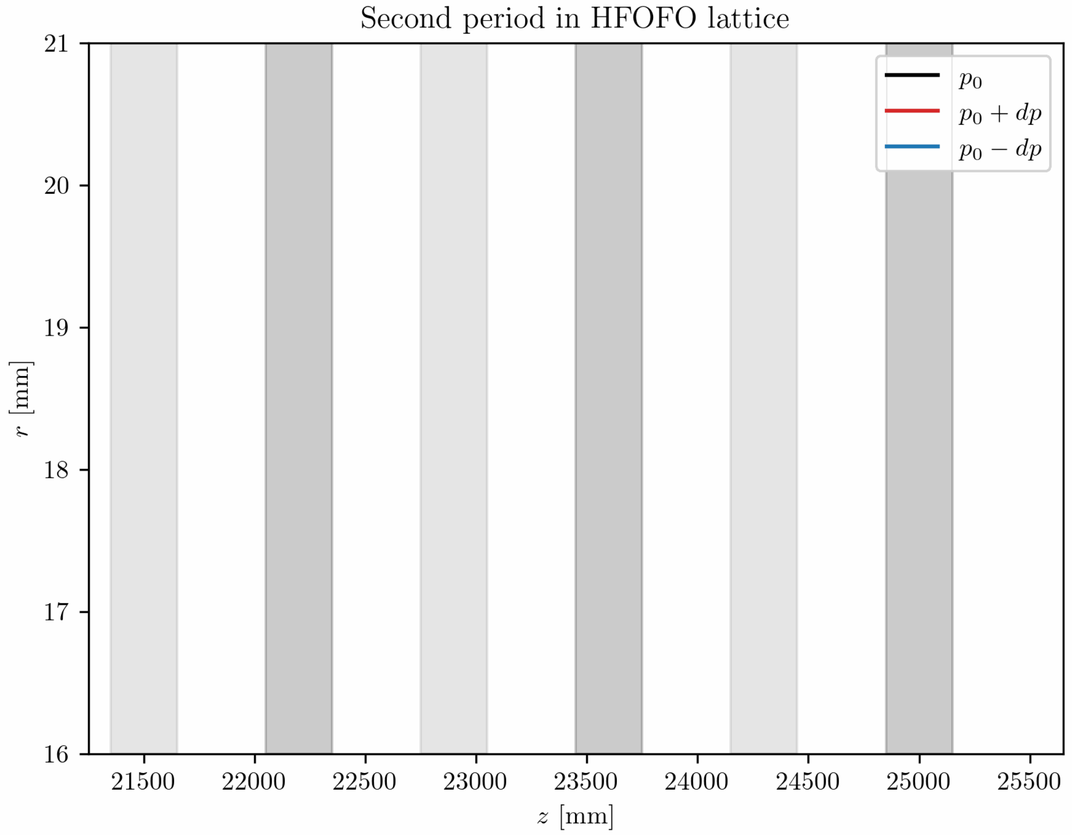


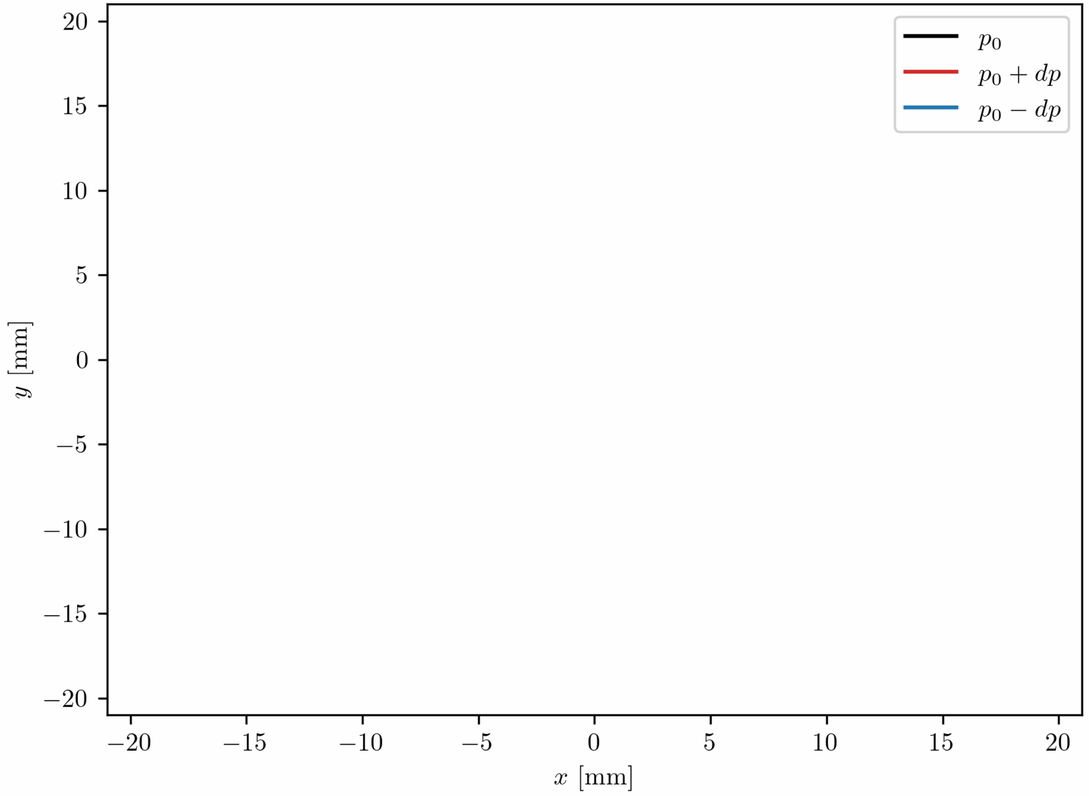


A SIDE QUEST

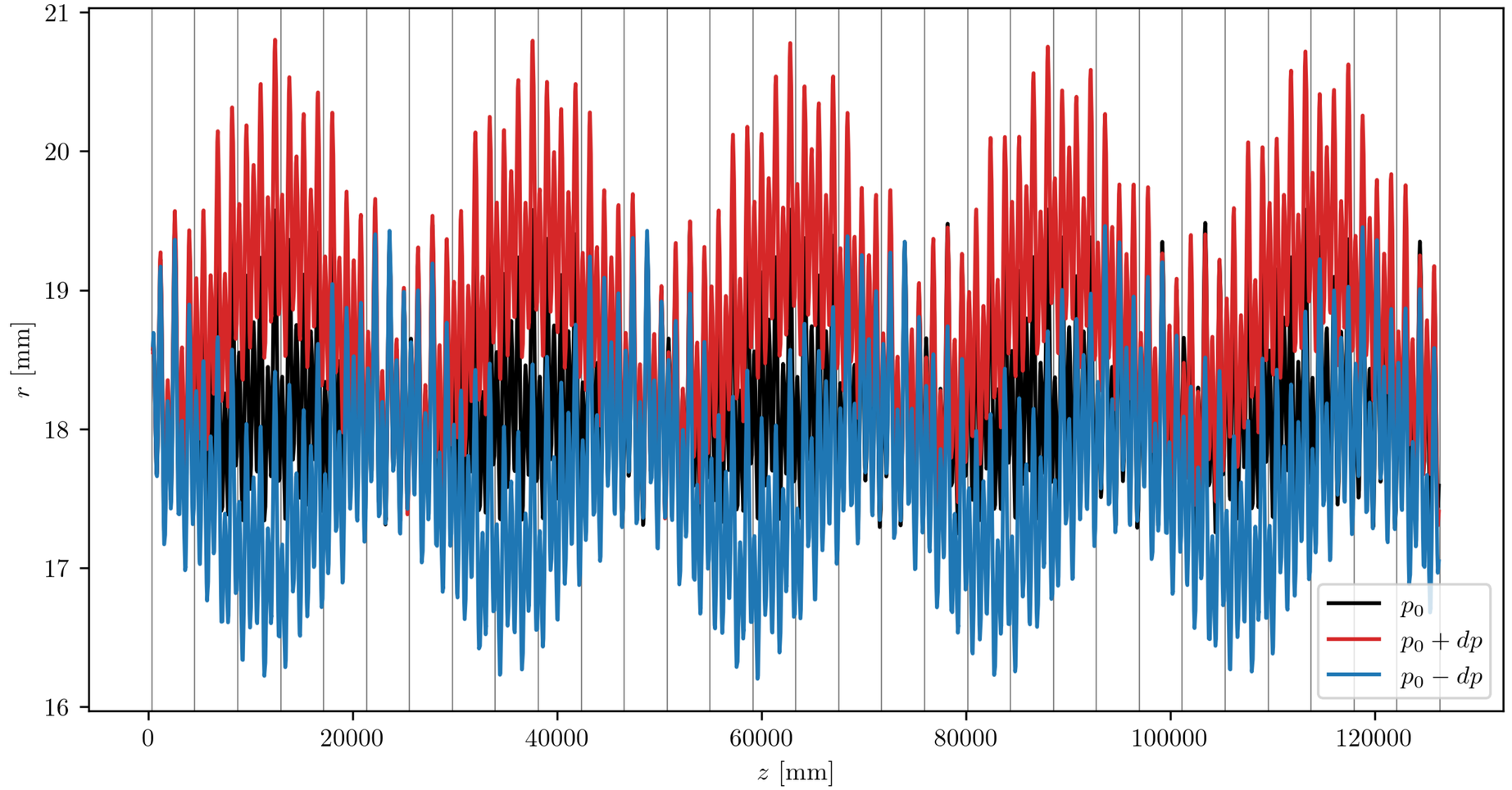
Thinking about particle behavior w.r.t. lattice elements

RADIAL POSITION WITH MOMENTUM OFFSET





RADIAL POSITION WITH MOMENTUM OFFSET



REFERENCE PARTICLE TRAJECTORY W.R.T. ABSORBERS

Observe μ^+ reference alternatingly passing and not passing through the absorbers

Need to study this in μ^- next!