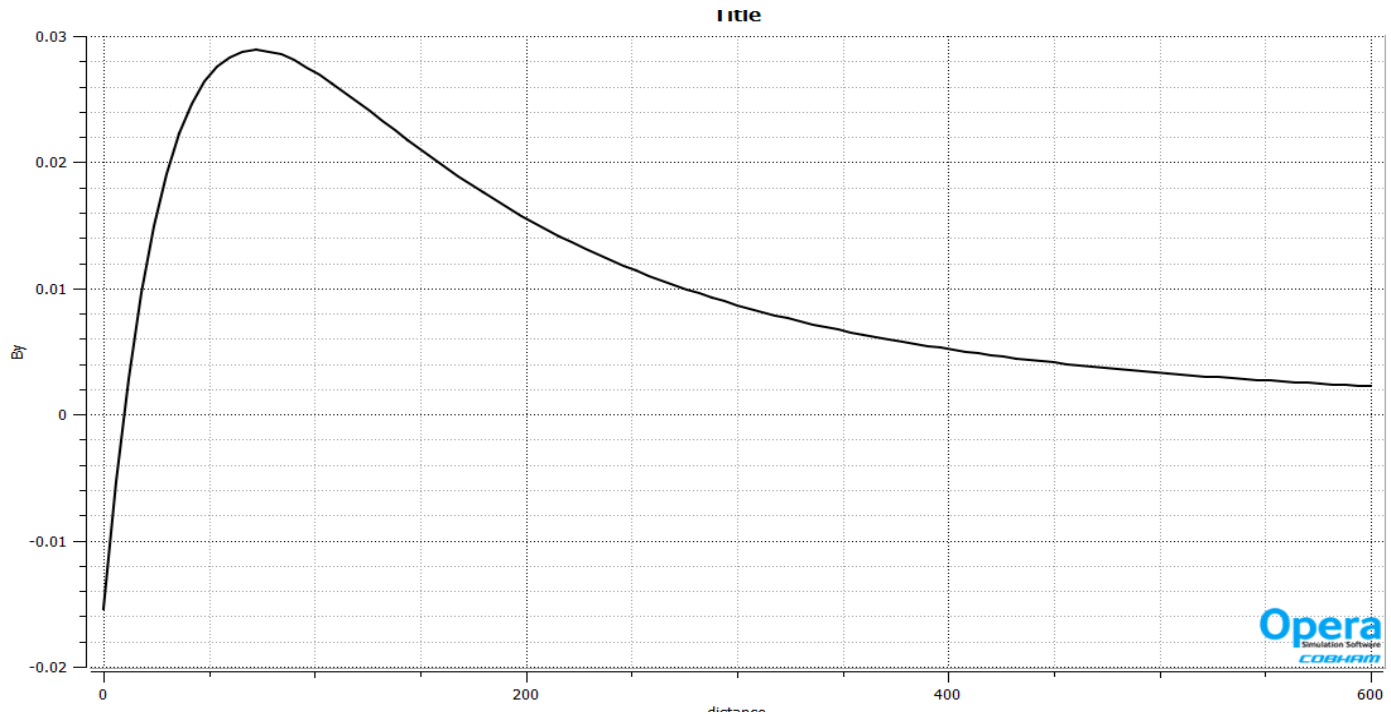




# **Injection of the e-beam around the LHC beam: issues and possible solutions**

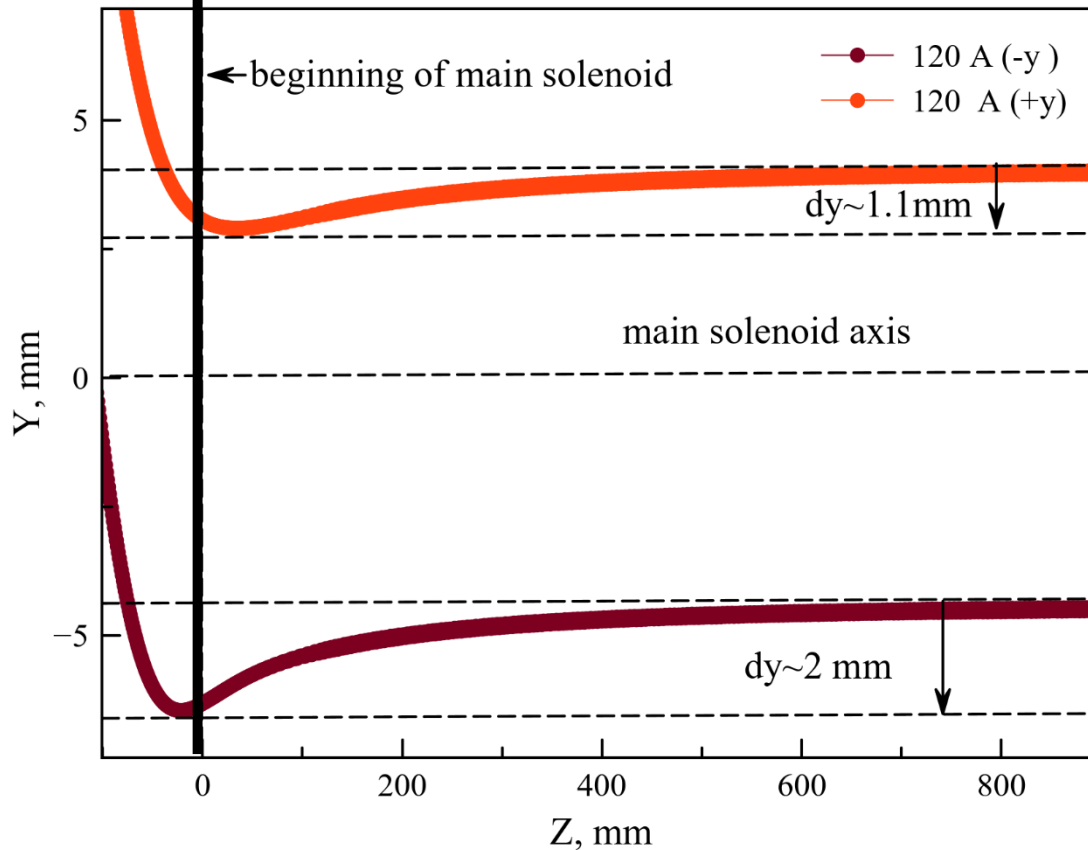
Vadim Pavliuchenko  
Danila Nikiforov

# INTRODUCTION



Maximum  $B_y$  field amplitude  $\sim 300$  Gs  $\rightarrow$  beam deflection in the entrance and exit of main solenoid  $\sim 1.5$  mm

# Trajectories of the beam center of mass



*Behavior of E beam centroids in the entrance of the main solenoid for different currents in the gun corrector*



# RHIC experience

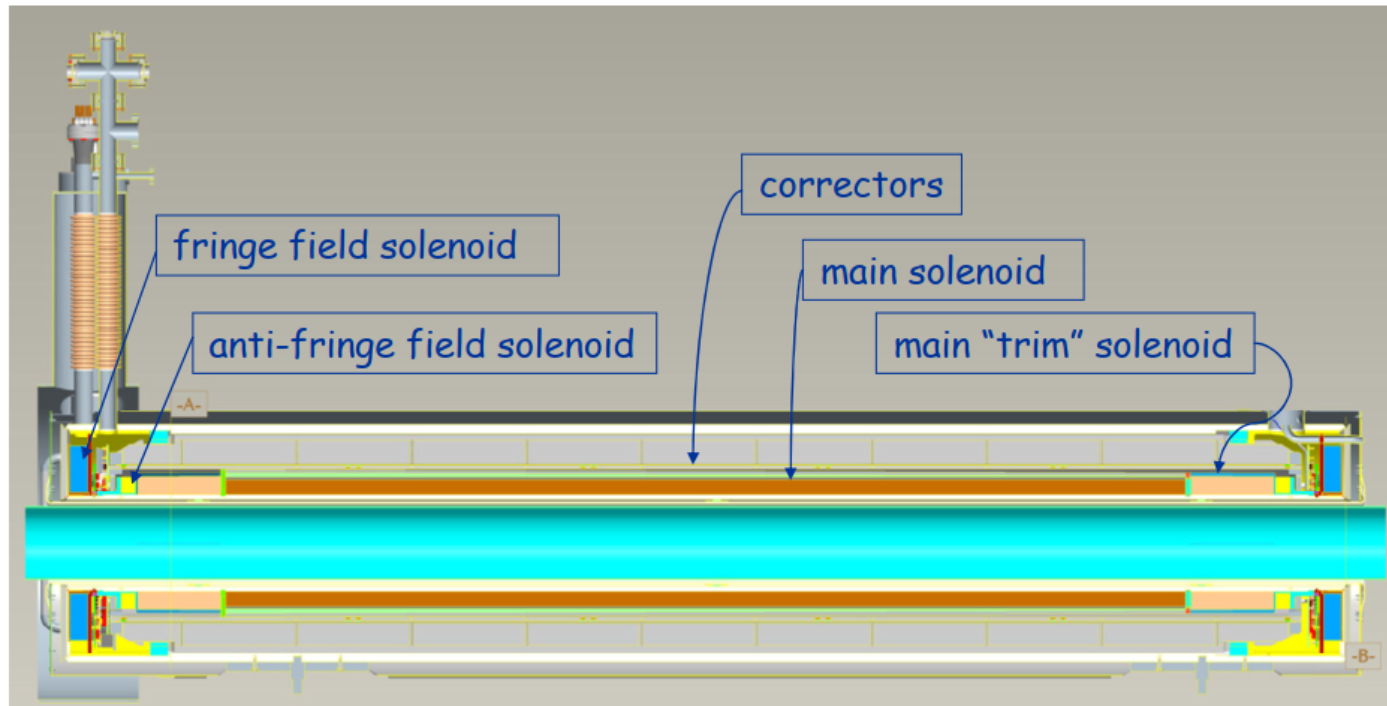
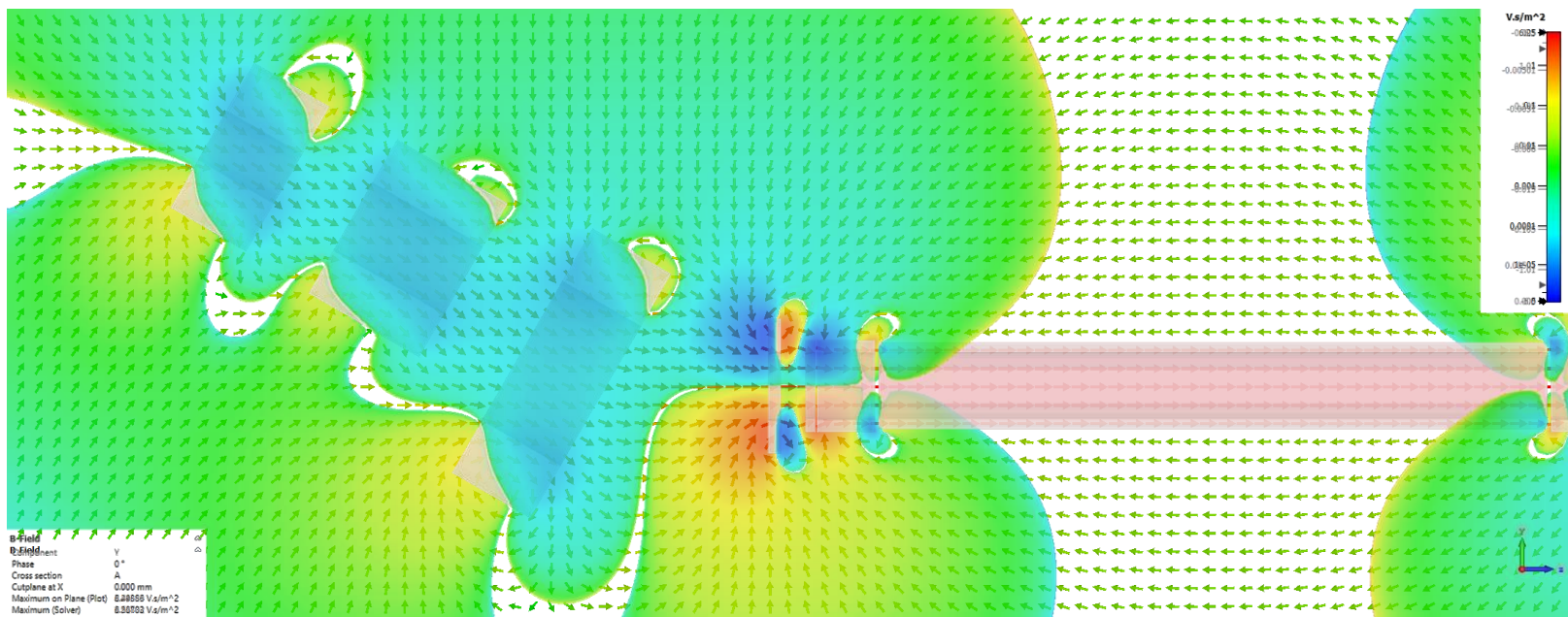


Figure 8: Schematic of the superconducting e-lens magnet system consisting of five superconducting solenoid coils and twelve superconducting dipole corrector coils.

<https://accelconf.web.cern.ch/PAC2011/papers/tup164.pdf>

# RHIC experience

$$|B_Y| > 0.005T$$

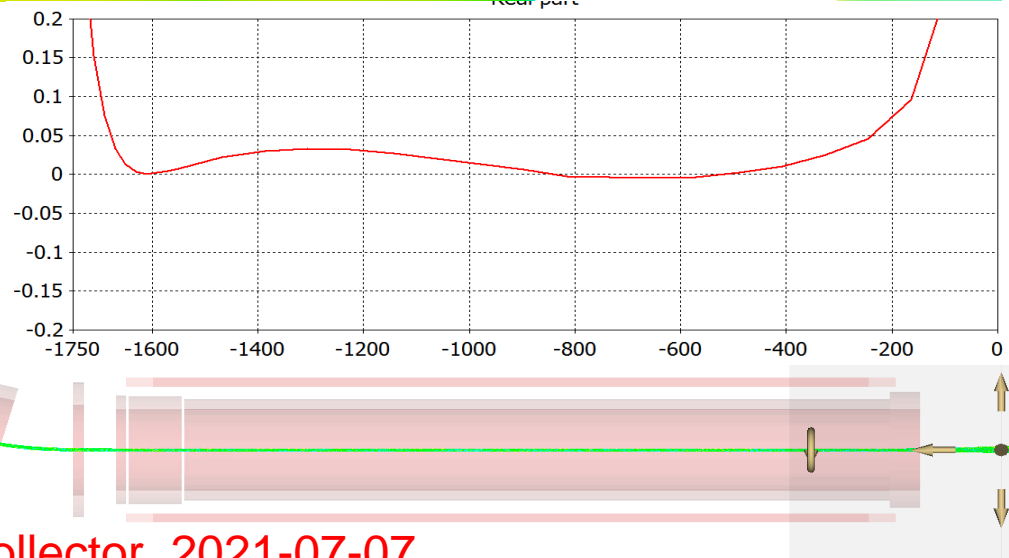
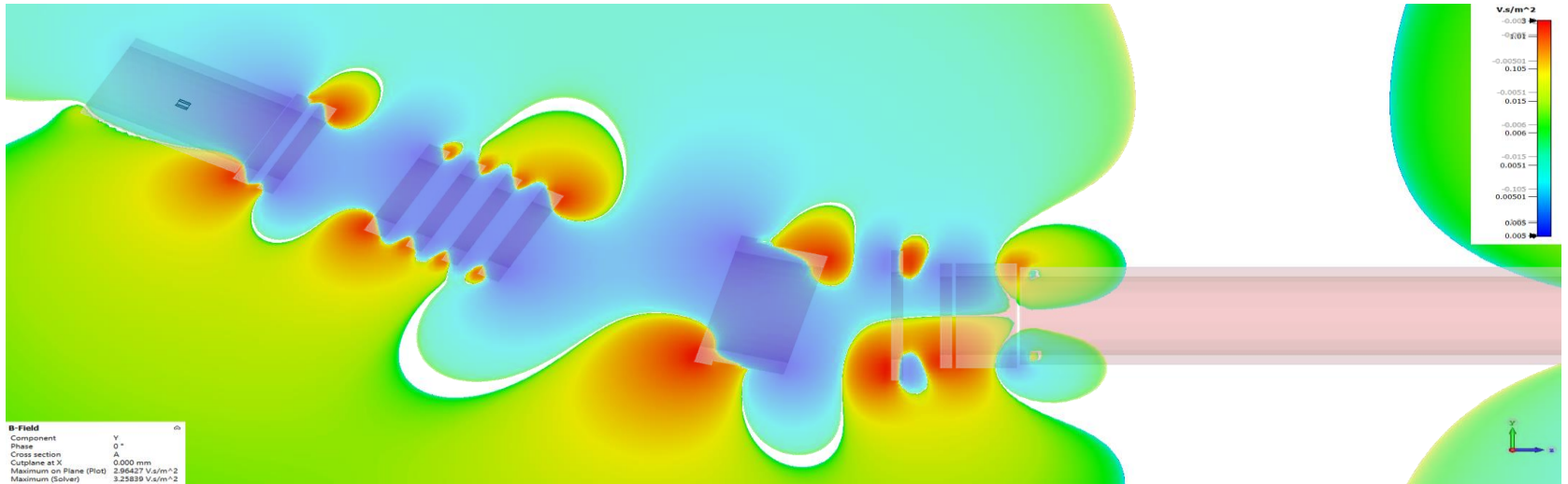


HEL\_MagneticField\_Collector\_2021-07-07

Sergey Sadovich

07/07/2021

# RHIC like solution by S. Sadovich

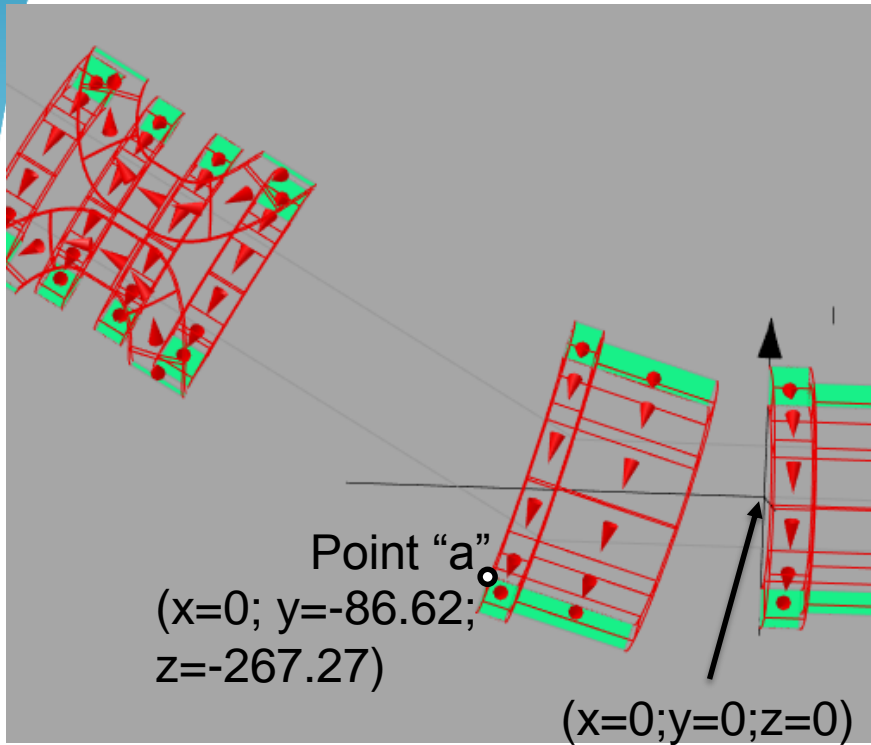


HEL\_MagneticField\_Collector\_2021-07-07

Sergey Sadovich

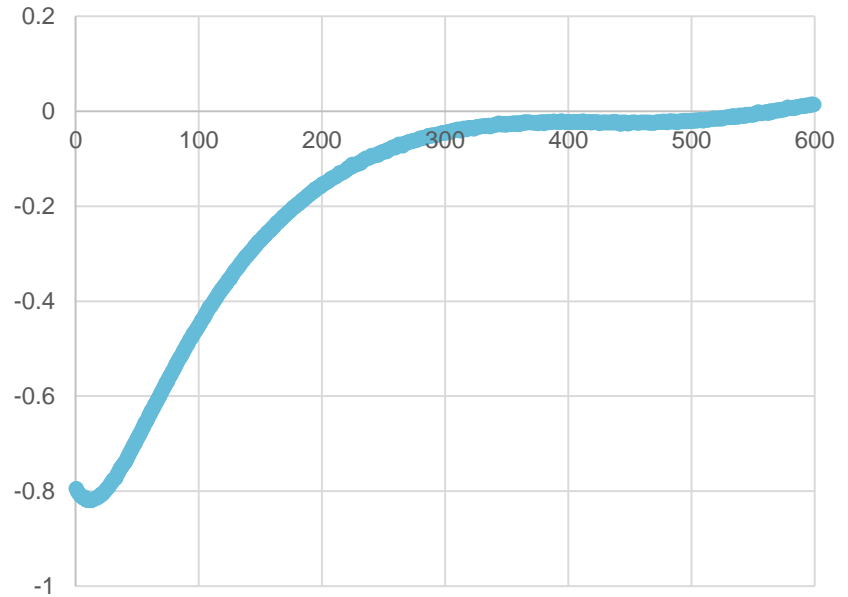
07/07/2021

# Initial position and angle of bending coil (Baseline)



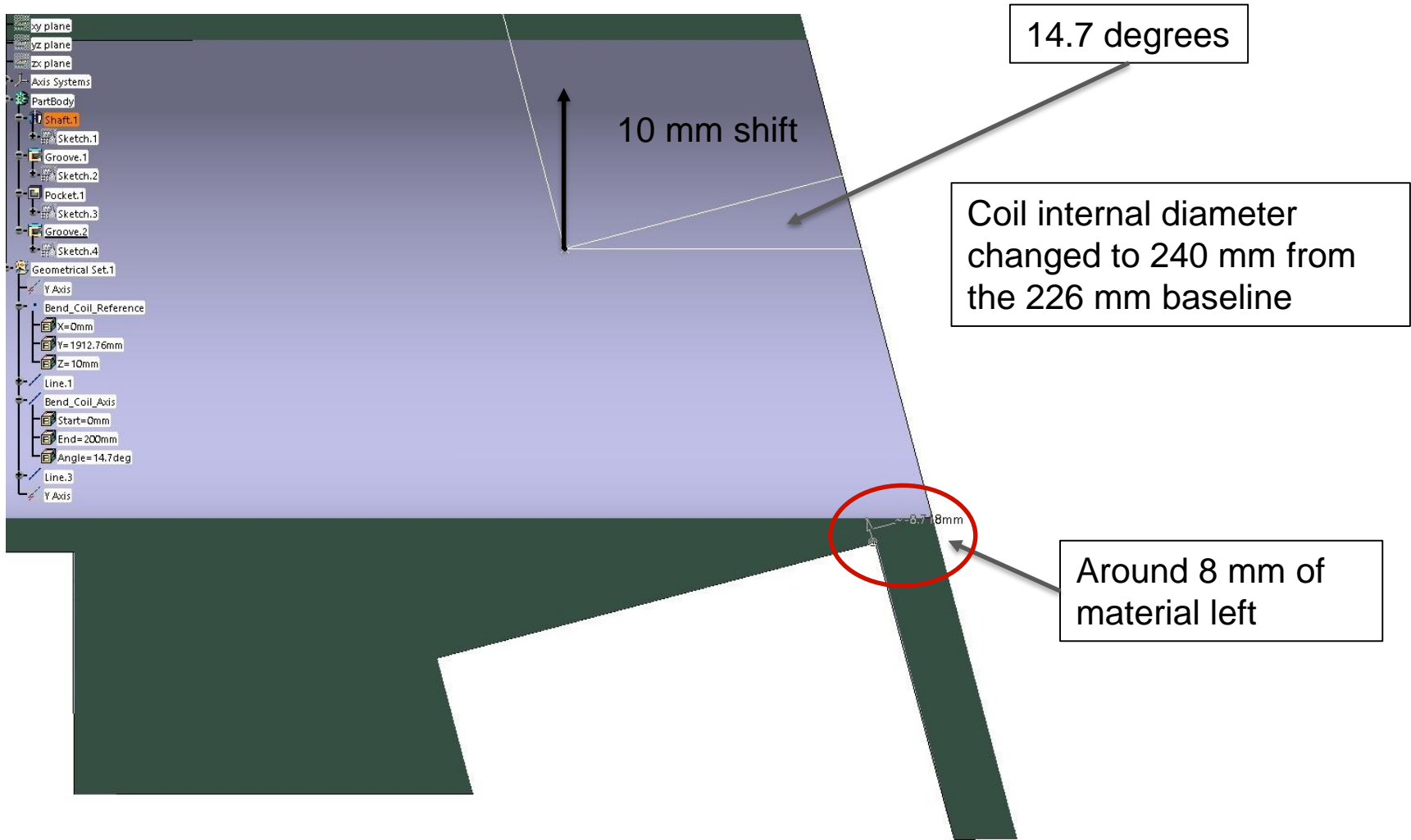
Centre of bending coil is  $x=0$ ;  $y=0.03$ ;  $z=-162.86$   
Angle is 16.7 degrees  
Inner diameter is 226 mm

tracks: "the best for curent configuration  
initial position" Y [mm]



**Beam shift more 0.8mm!**

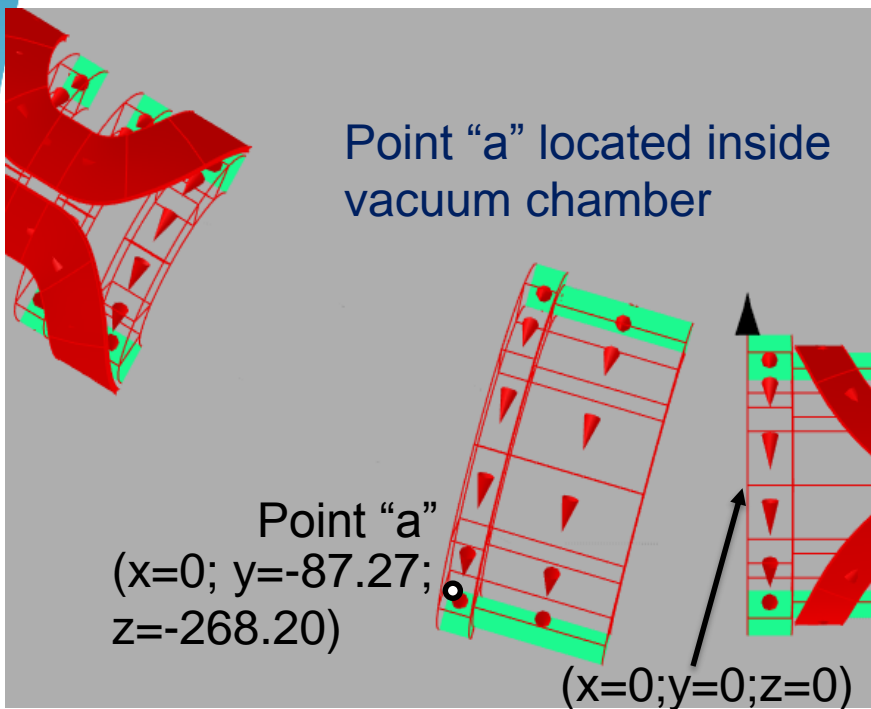
# 14.7 degrees + 10 mm shift



Hollow Electron Lens - injection side bending coil position  
Antti Kolehmainen  
26/4/2021

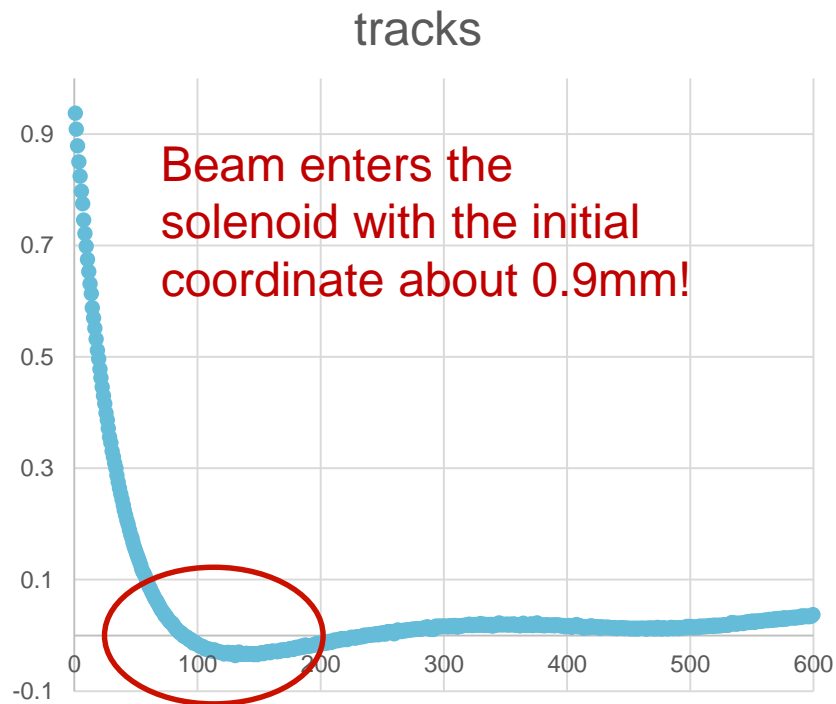


# Shift and rotate of bending solenoid and increase its radius (“Base”)

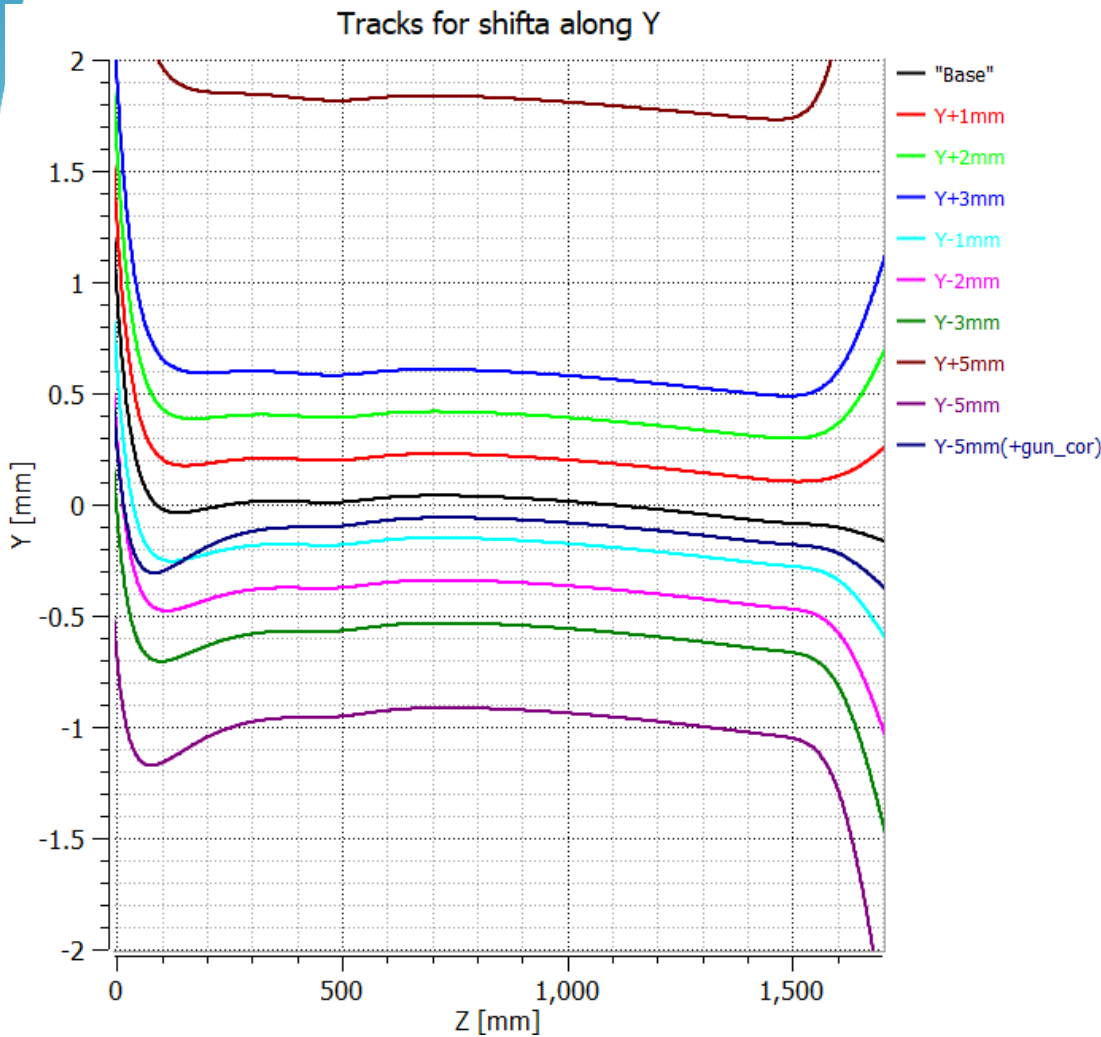


Centre of bending coil is  $x=0$ ;  $y=12.75$ ;  $z=-162.07$   
Angle is 15.7 degrees  
New inner diameter is 250 mm

But for this case gun corrector have current =  $15060 \text{ A} \cdot \text{turn} = 84 \text{ A}$  for power supply

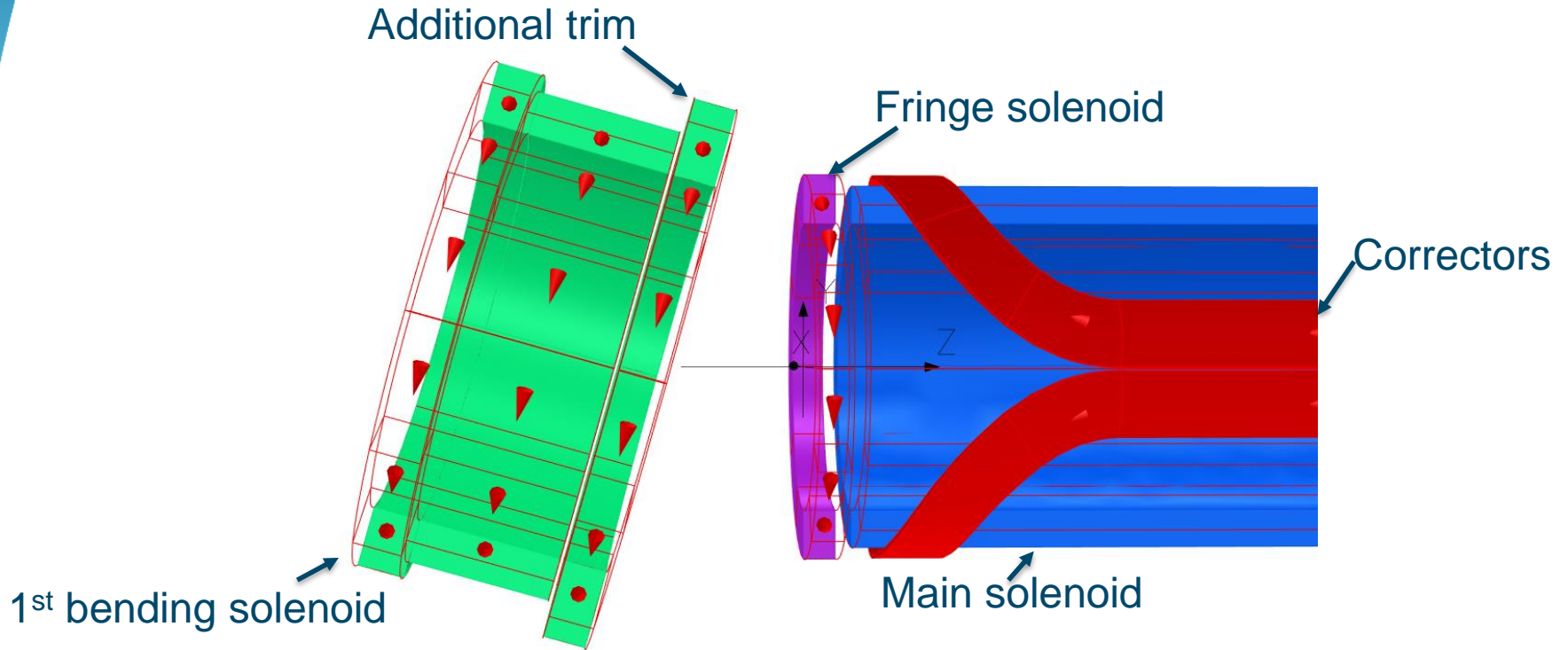


# Deviations of the exhibition along the Y-axis

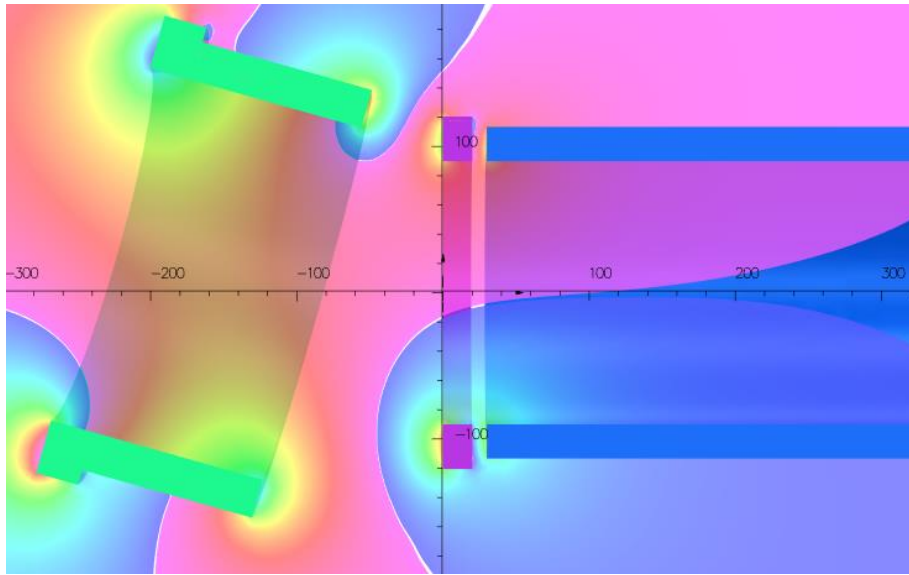


Shift	Bump [mm]
"Base"	0.078
Y+1mm	0.054
Y+2mm	0.032
Y+3mm	0.026
Y-1mm	0.085
Y-2mm	0.138
Y-3mm	0.172
Y+5mm	0.023
Y-5mm	0.261
Y-5mm(+Gun_cor)	0.249

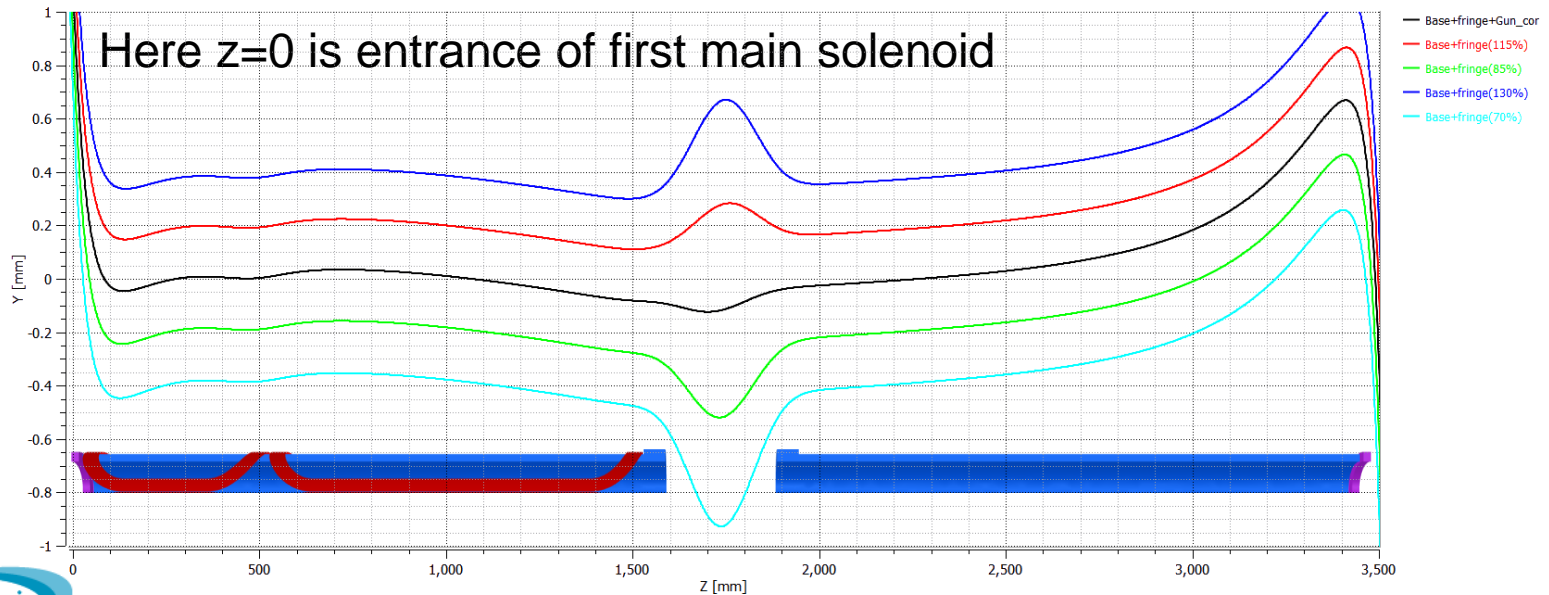
# Separate additional trim and fringe



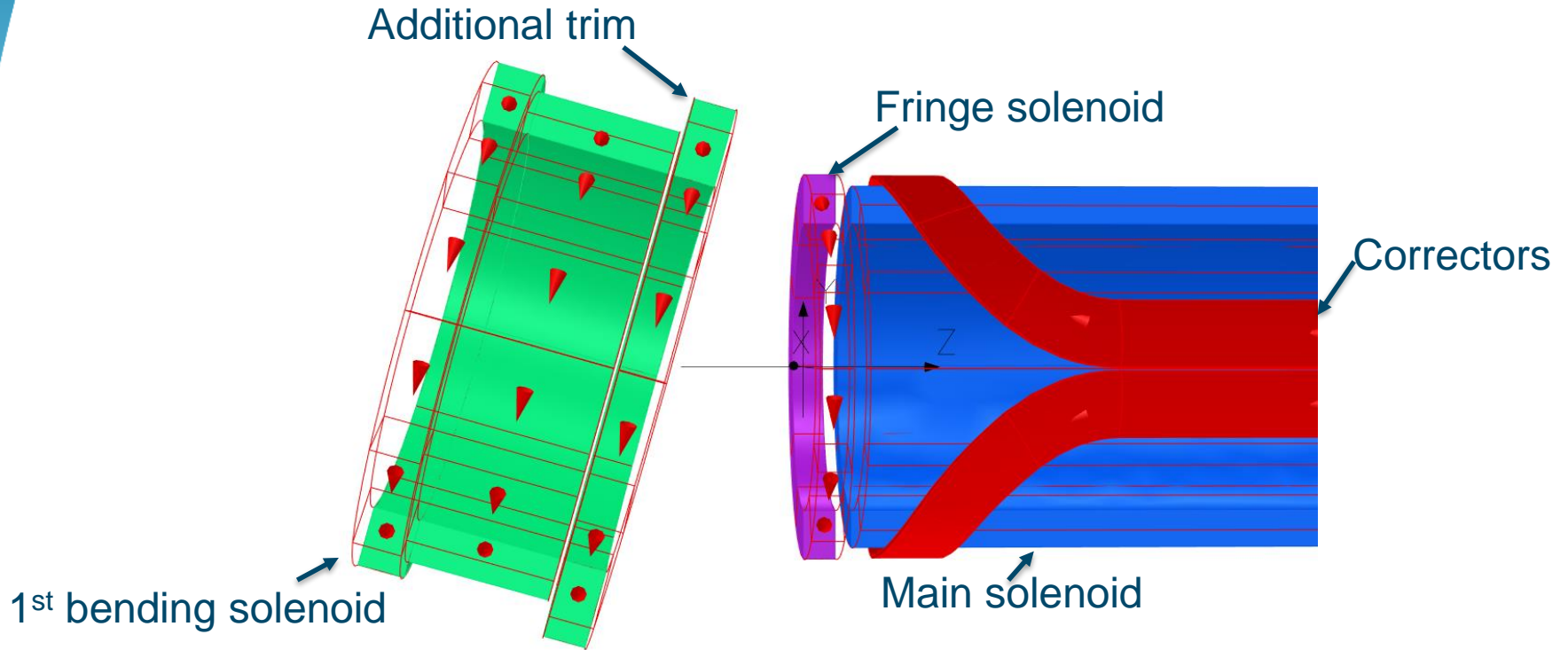
# Model with fringe solenoid



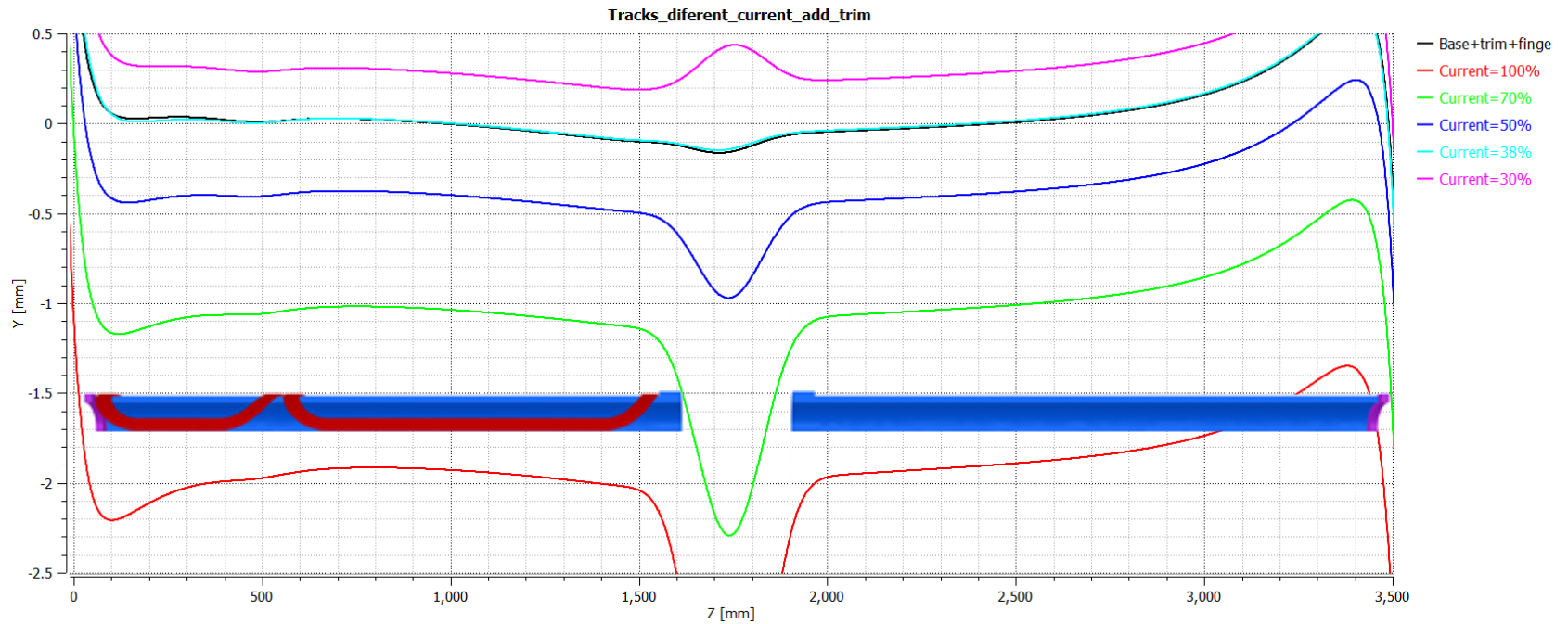
Tracks



# Separate additional trim

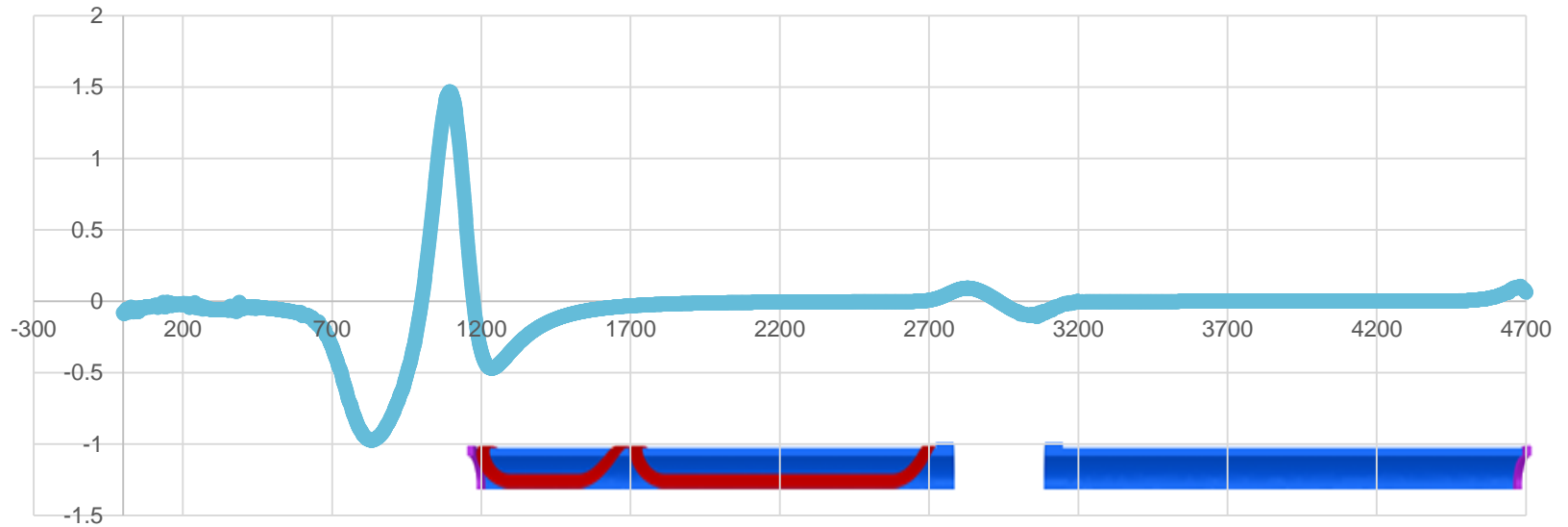


# Separate additional trim

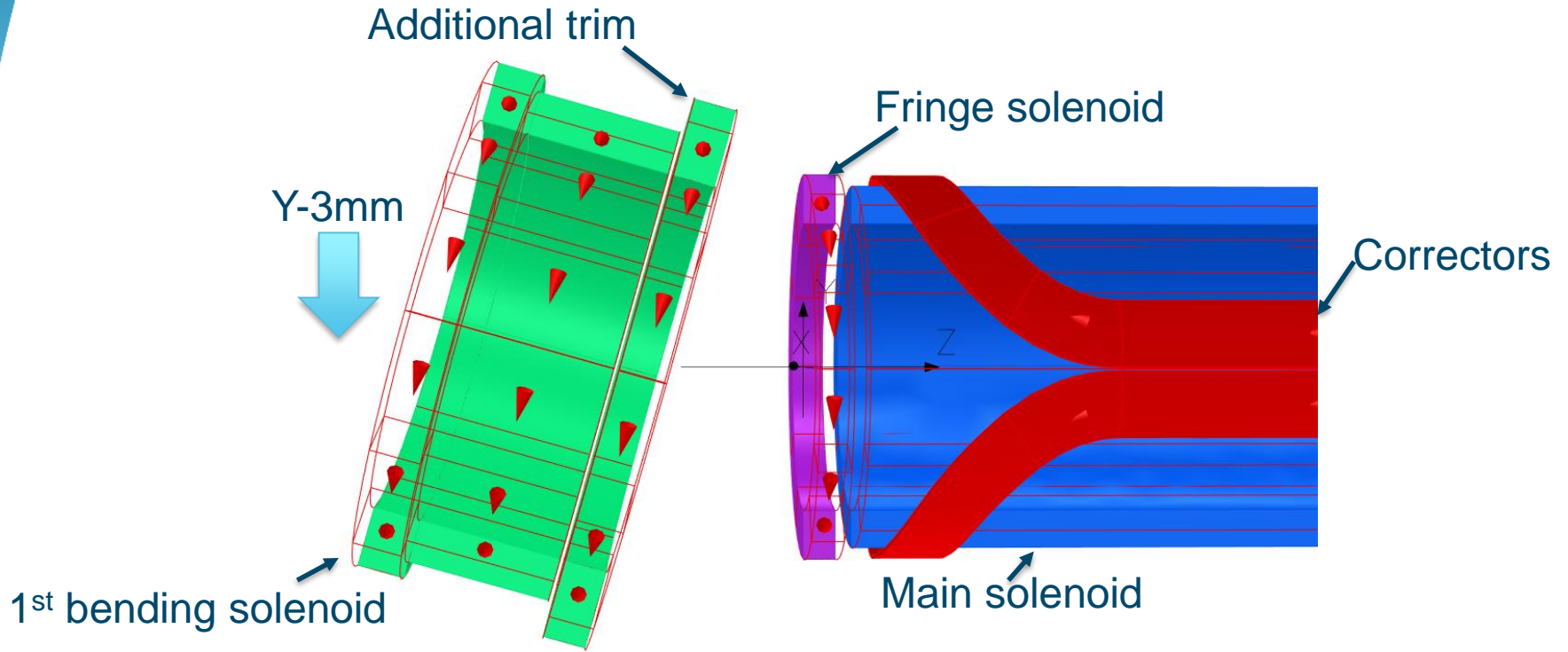


# Separate additional trim

$\Delta B[\%]$  (38 % in current)

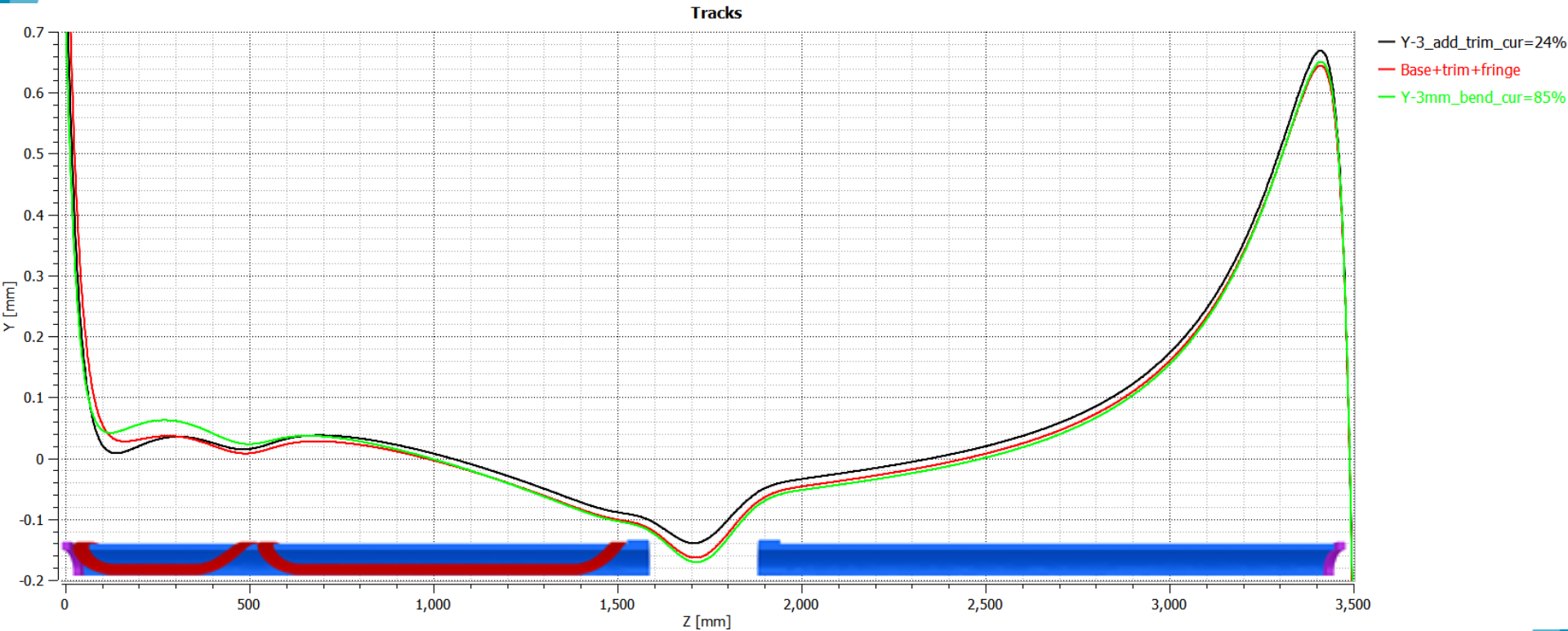


# Separate additional trim





# Separate additional trim influence with 3 mm shifting of bend solenoid



Bump value (without trim)

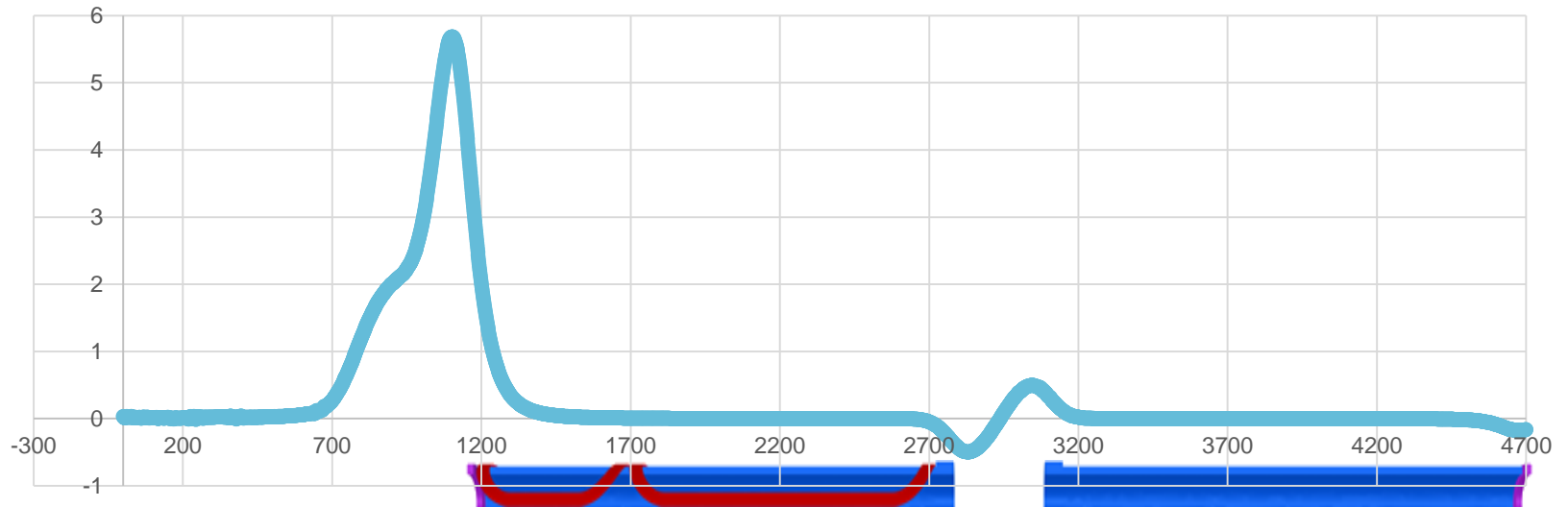
0.172 mm

Bump value (trim)

0.03 mm

# Separate additional trim

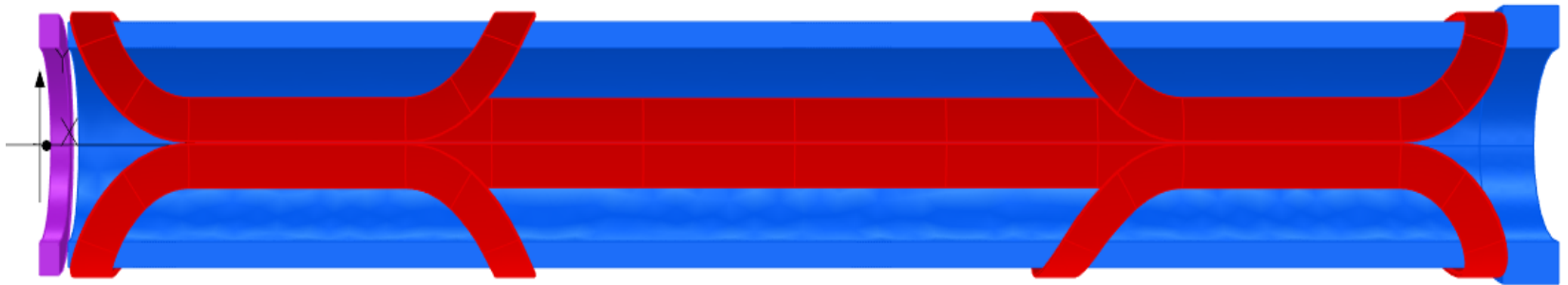
$\Delta B$ [%], 24 % in trim current



# New correctors

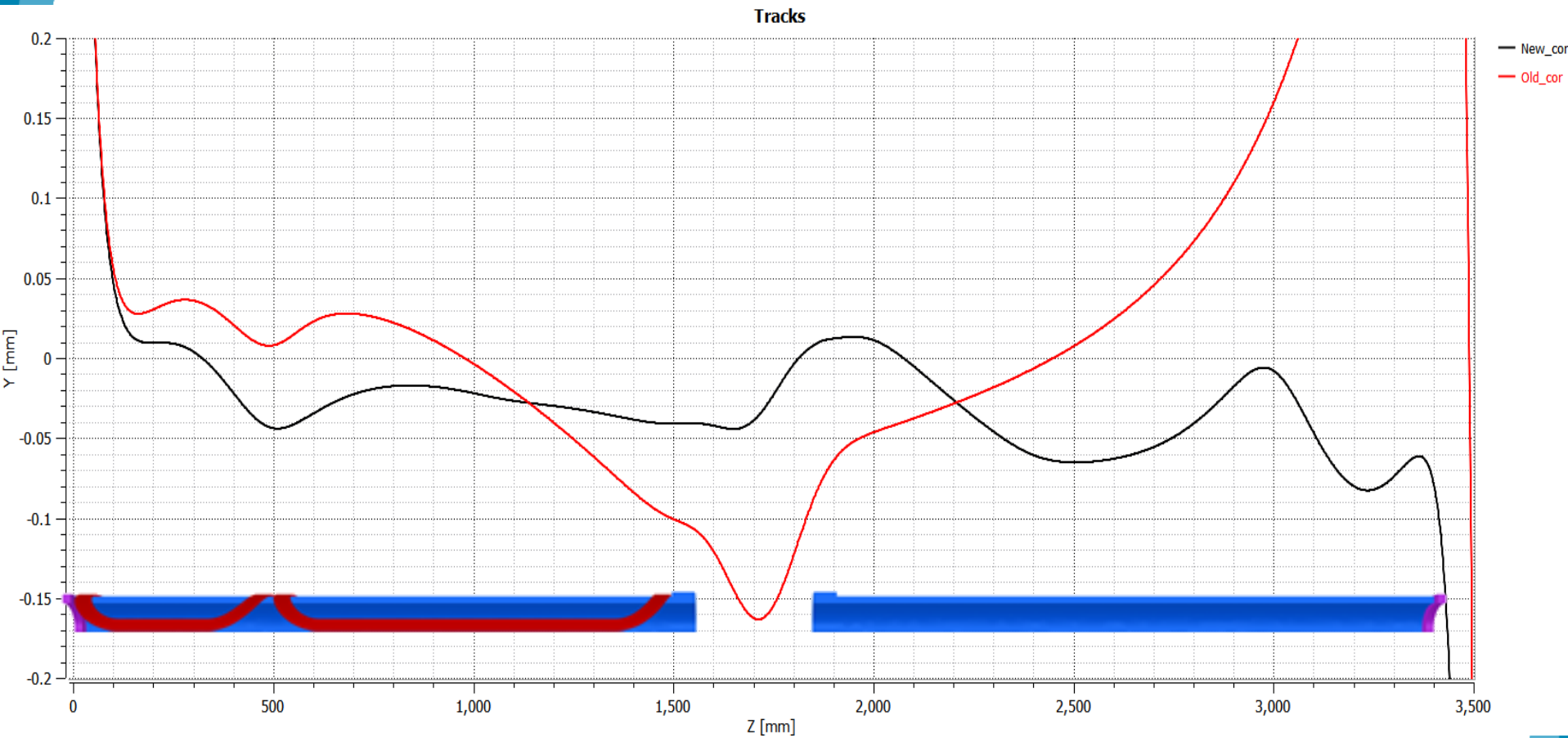


Old vertical correctors



New vertical correctors

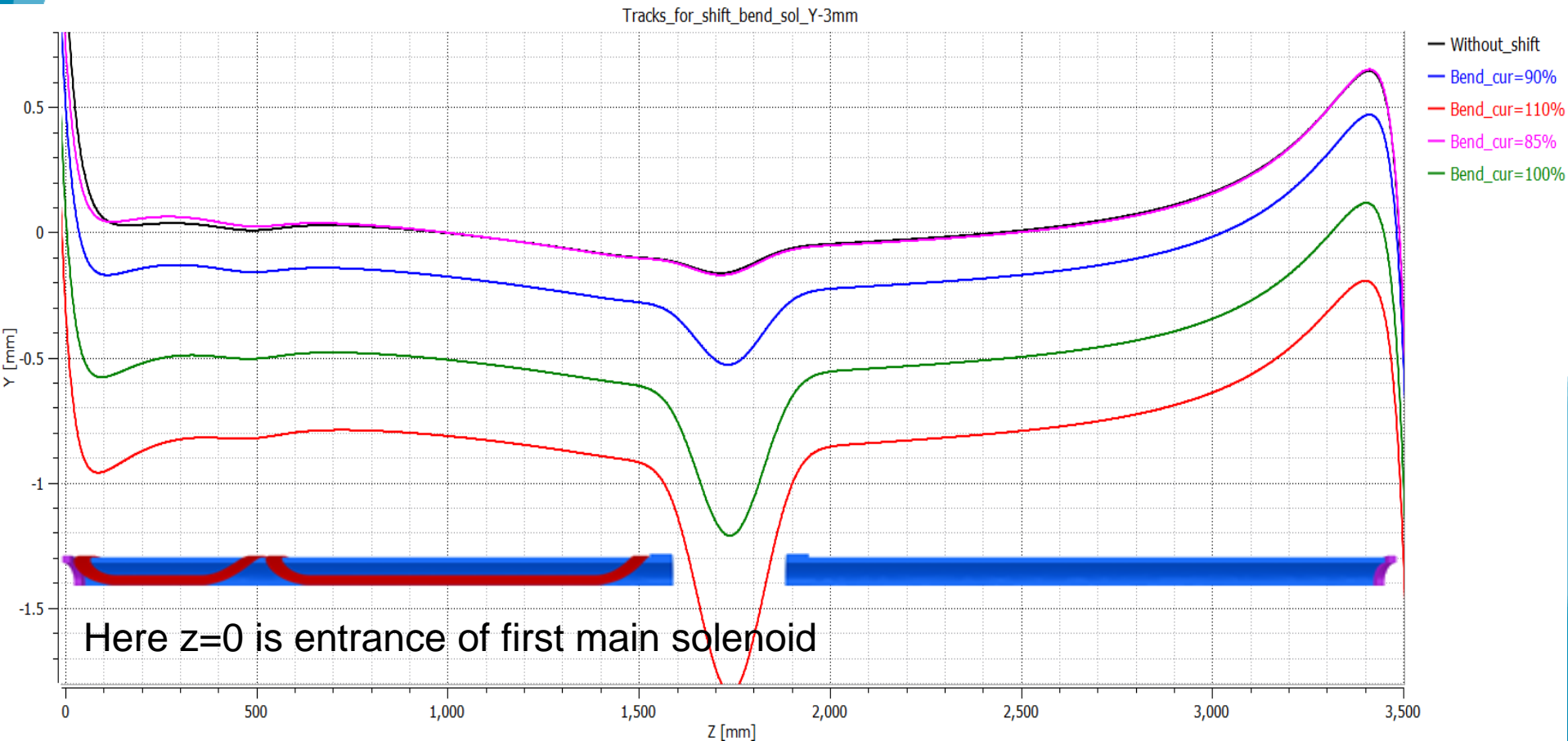
# New correctors





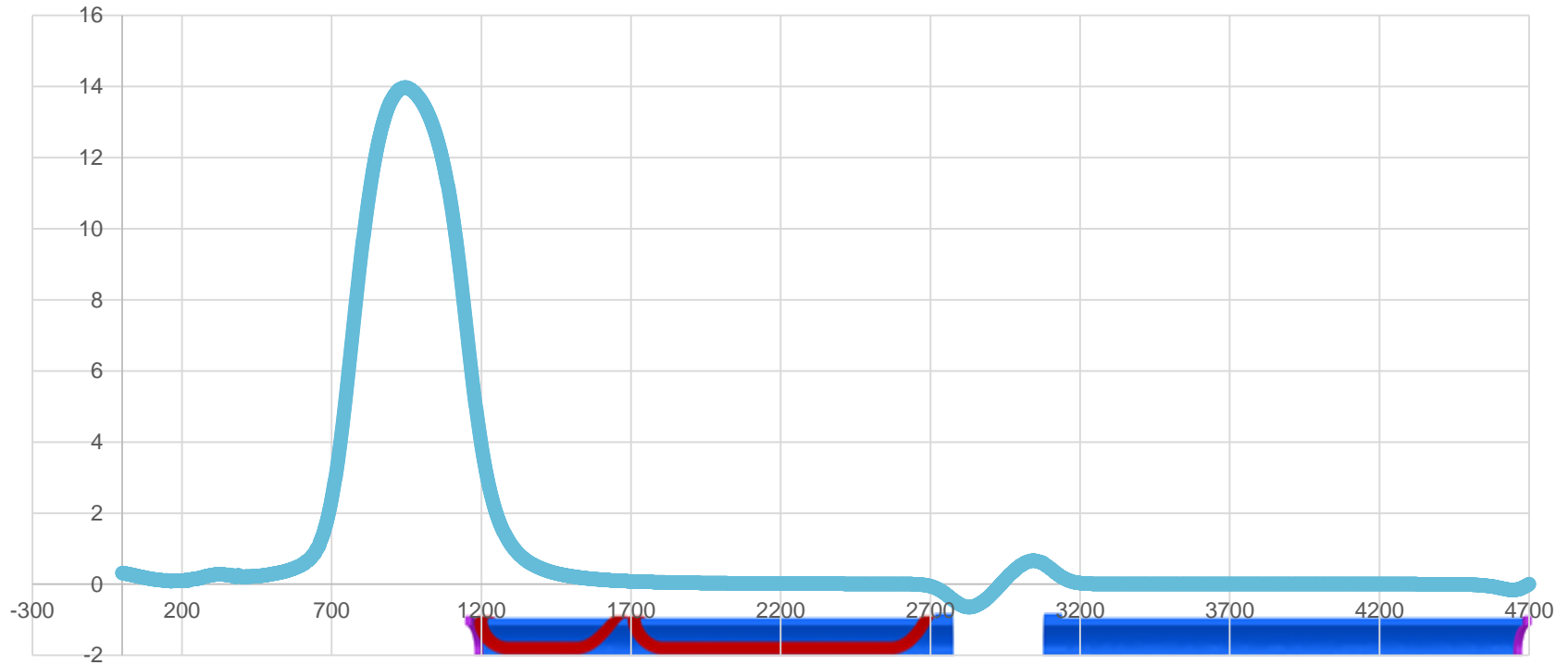
***Thank you for your attention  
Your questions please***

# Shift bend solenoid and change its current



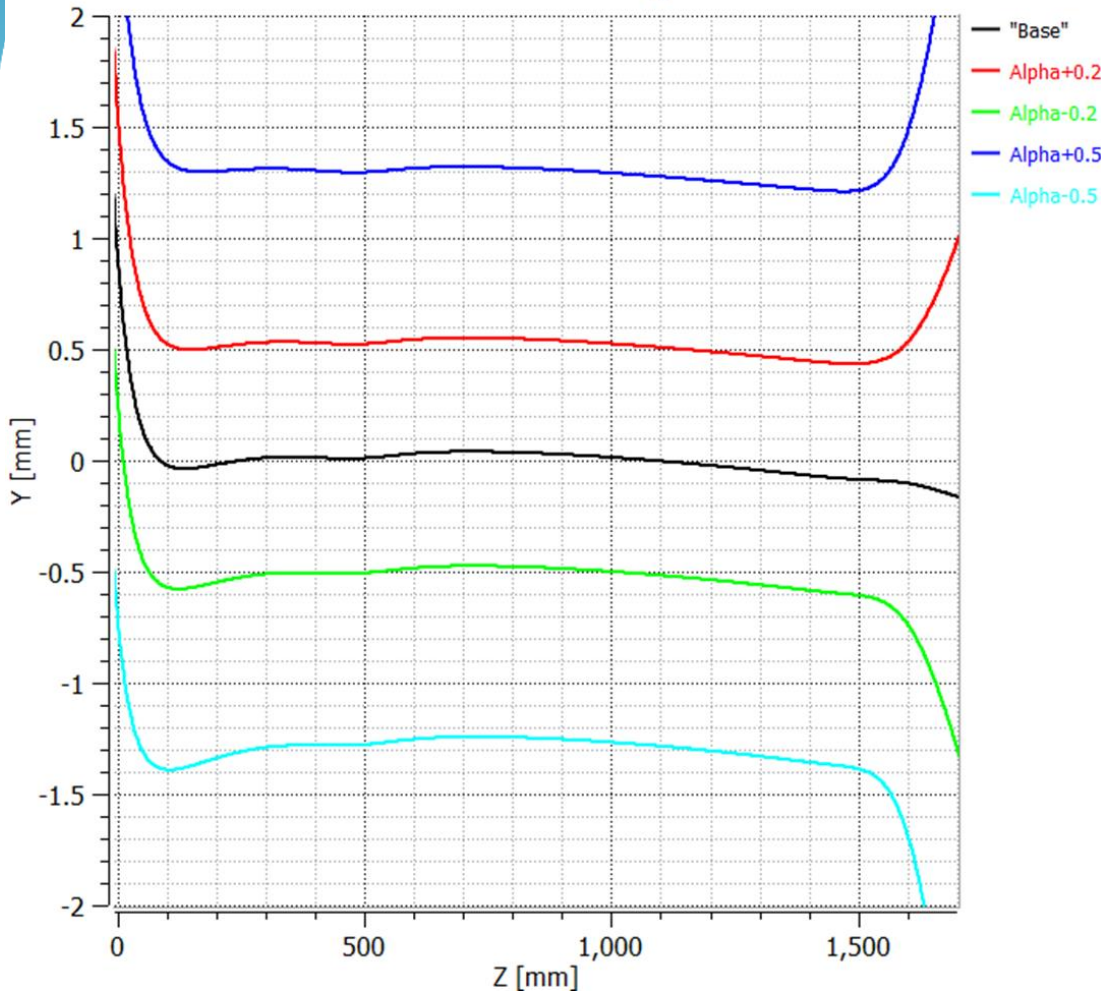
# Shift bend solenoid and change its current

$\Delta B$ [%]



# Deviations of the exhibition of angle

Tracks for shift of angle



Shift	Bump [mm]
"Base"	0.078
Alpha+0.2	0.035
Alpha-0.2	0.104
Alpha+0.5	0.026
Alpha-0.5	0.149