FCC-ee compensation solenoid

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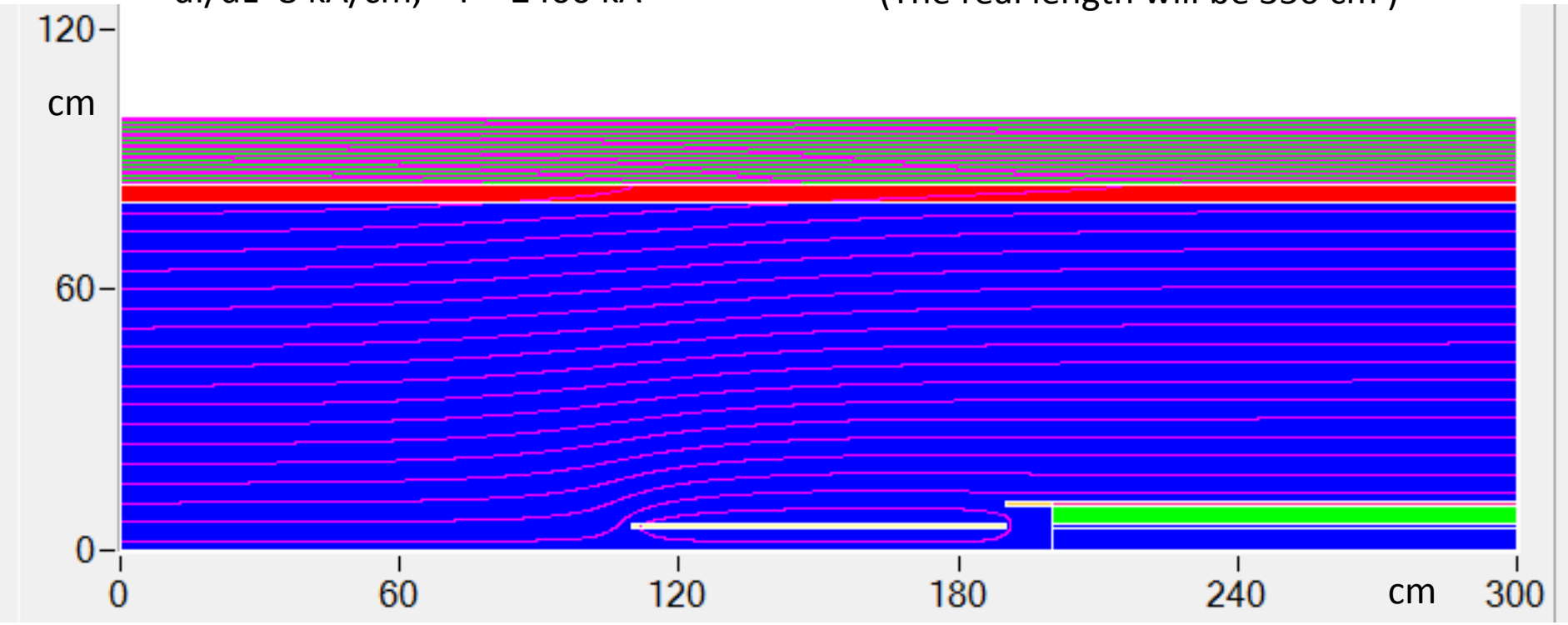
Comp. solenoid between IP and Q0

Main solenoid parameters:
R=80 cm, L=300 cm
dI/dL=8 kA/cm, I= -2400 kA

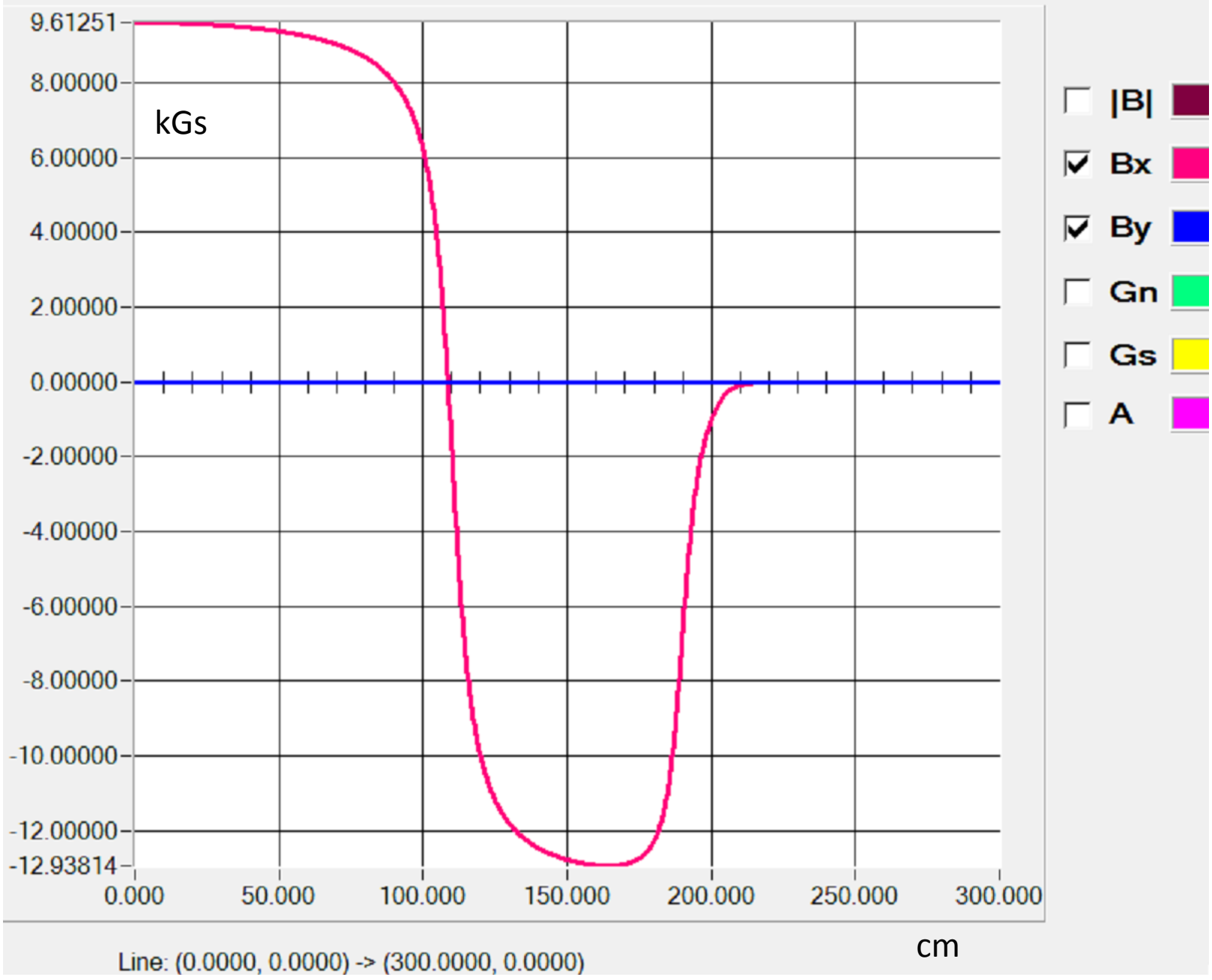
Q0-model iron yoke size:
R1=6 cm, R2=10 cm, L=100 cm
(The real length will be 350 cm)



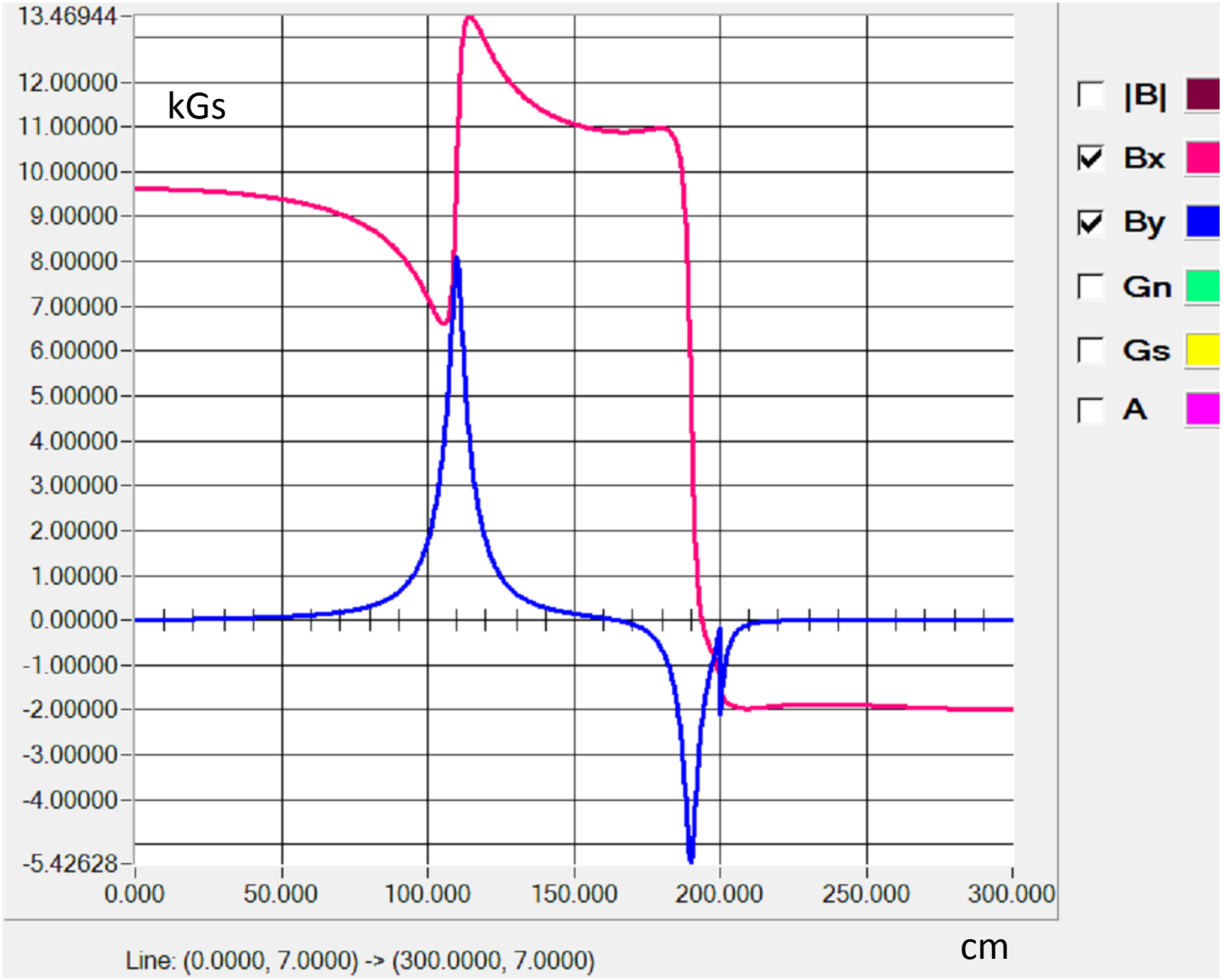
Compensation solenoid parameters:
R1=5 cm, R2=6 cm, L=80 cm
dI/dL=19 kA/cm
I=1520 kA

Screening solenoid parameters:
R1=10 cm, R2=11 cm, L=110 cm
dI/dL=8 kA/cm, I=880 kA

Field on the axis, (MERMAID data)

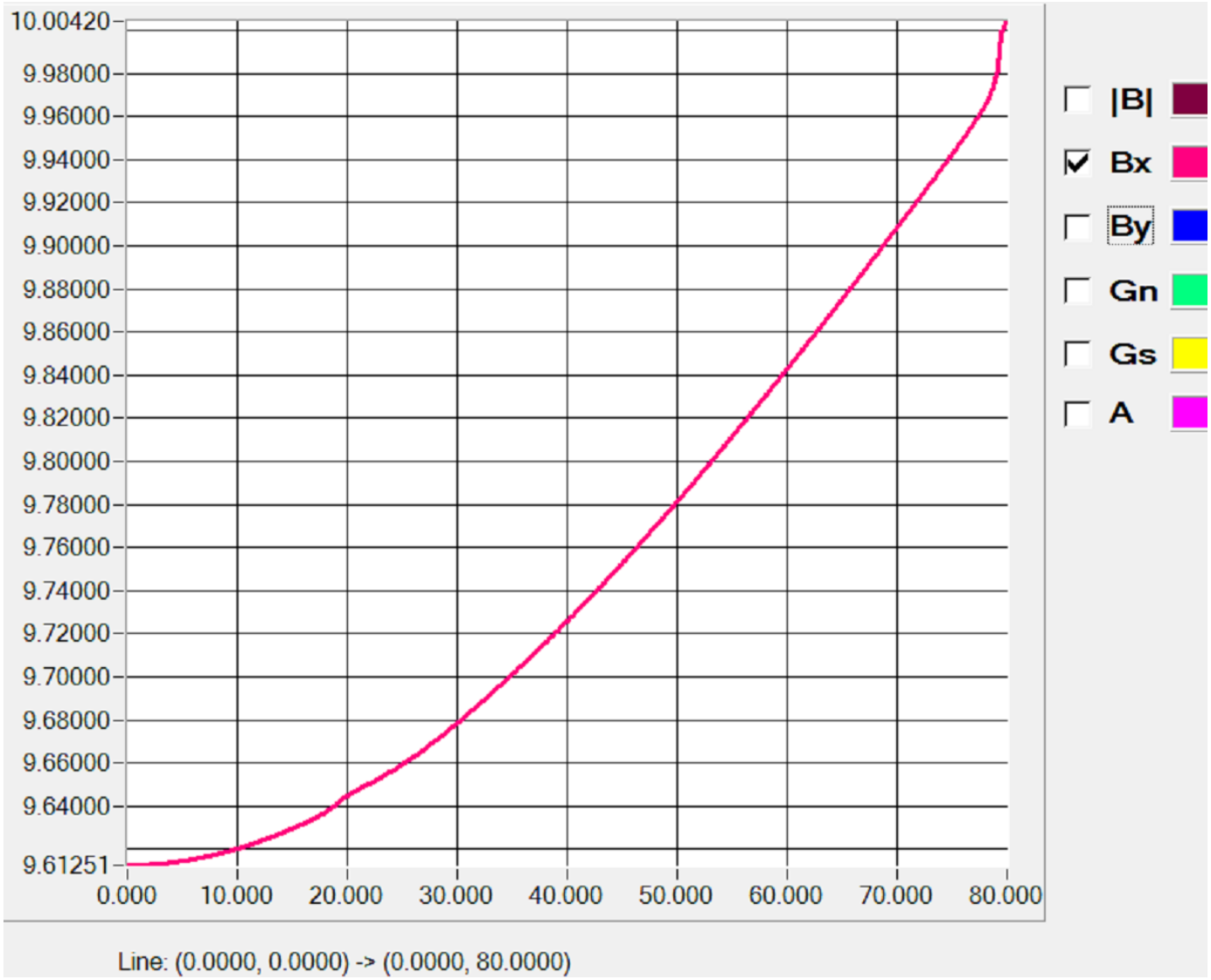


Field along the line y=7 cm



In the Q0 iron-yoke B=-2 kGs

Field along the line x=0

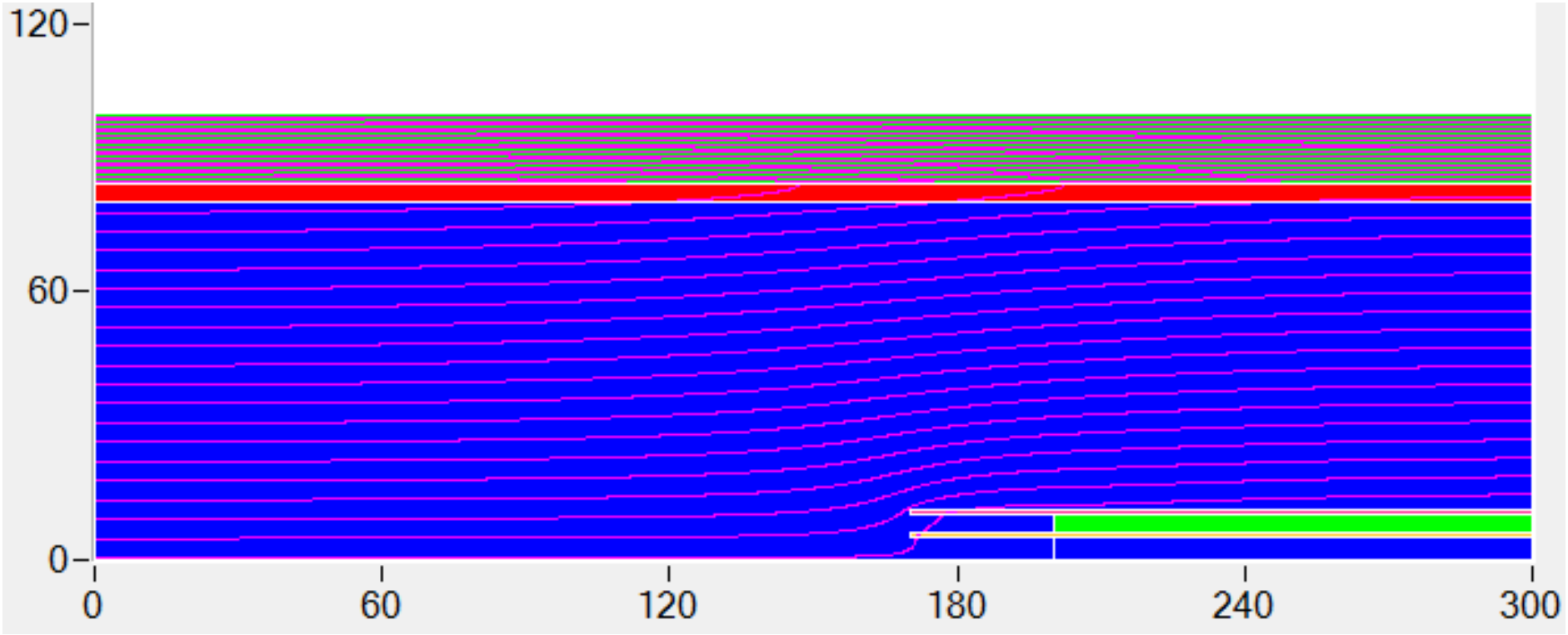


Playing with the main coil current density distribution, the detector field could be made more homogeneous!?

Compensation solenoid inside Q0

Main solenoid parameters:
R=80 cm, L=300 cm
dI/dL=8 kA/cm, I= -2400 kA

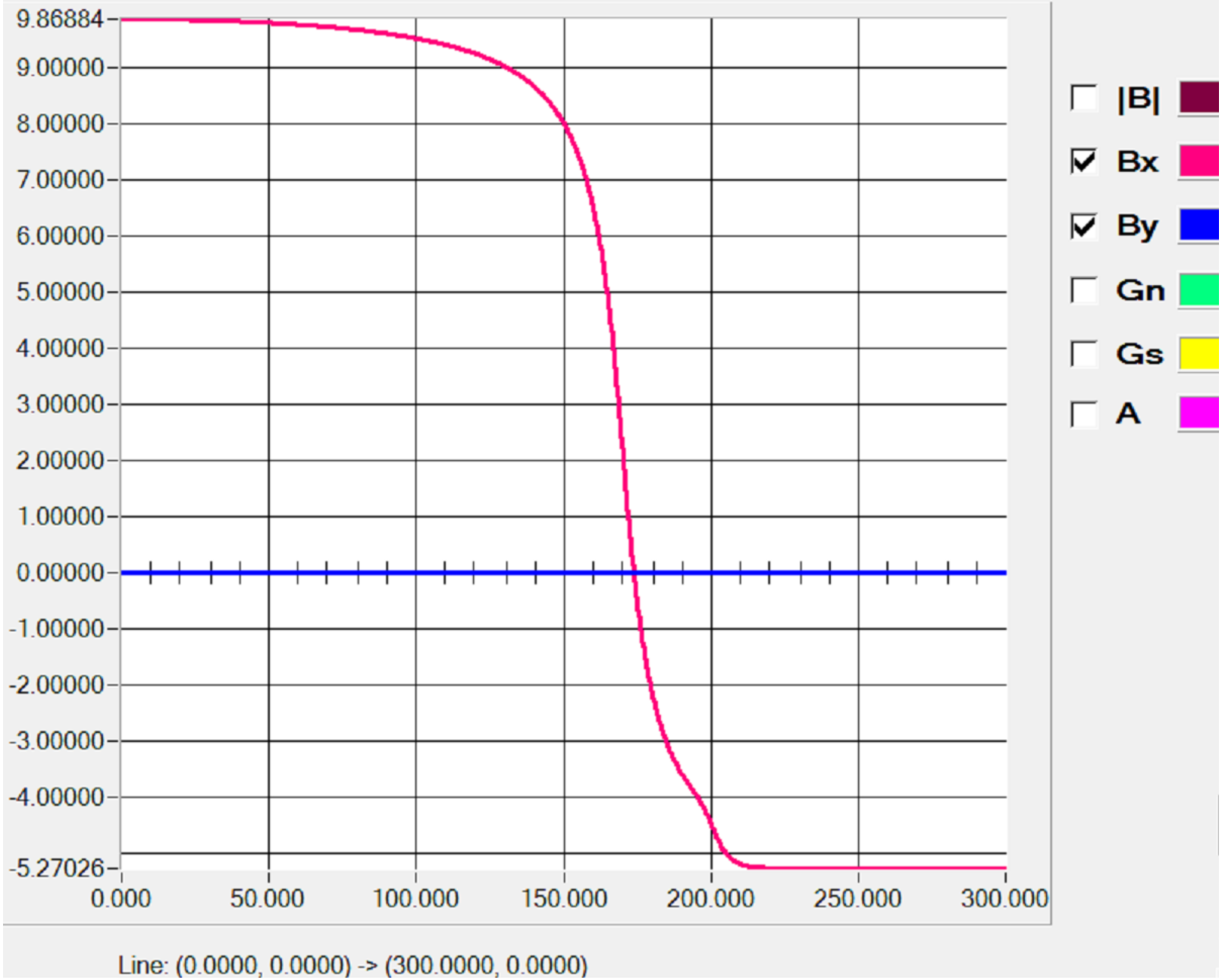
Q0-model iron yoke size:
R1=6 cm, R2=10 cm, L=100 cm
(The real length will be 350 cm)



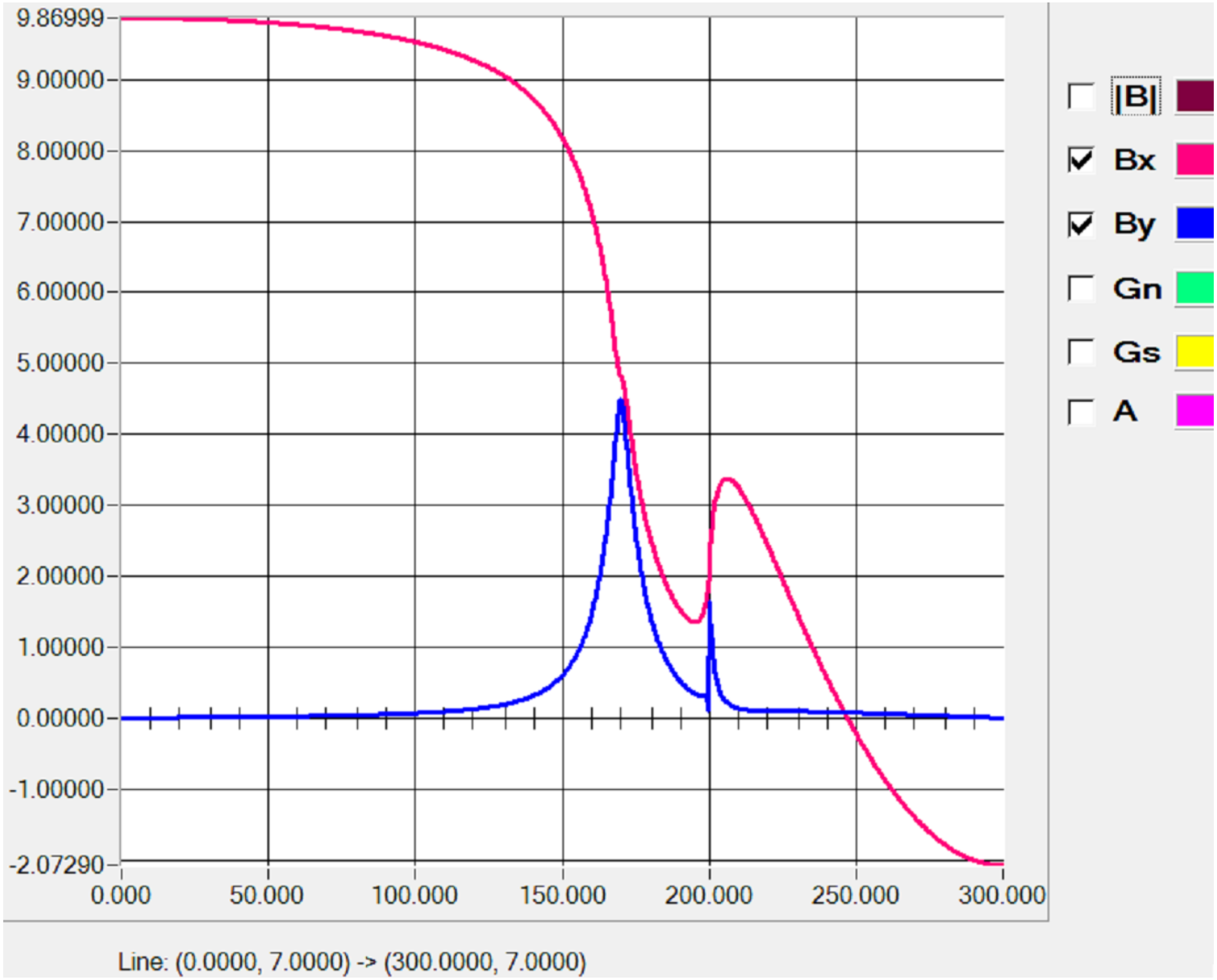
Compensation solenoid parameters:
R1=5 cm, R2=6 cm, L=130 cm
dI/dL=4.192 kA/cm
I=545 kA

Screening solenoid parameters:
R1=10 cm, R2=11 cm, L=130 cm
dI/dL=8.338 kA/cm
I=1084 kA

Field on the axis with solenoid inside Q0

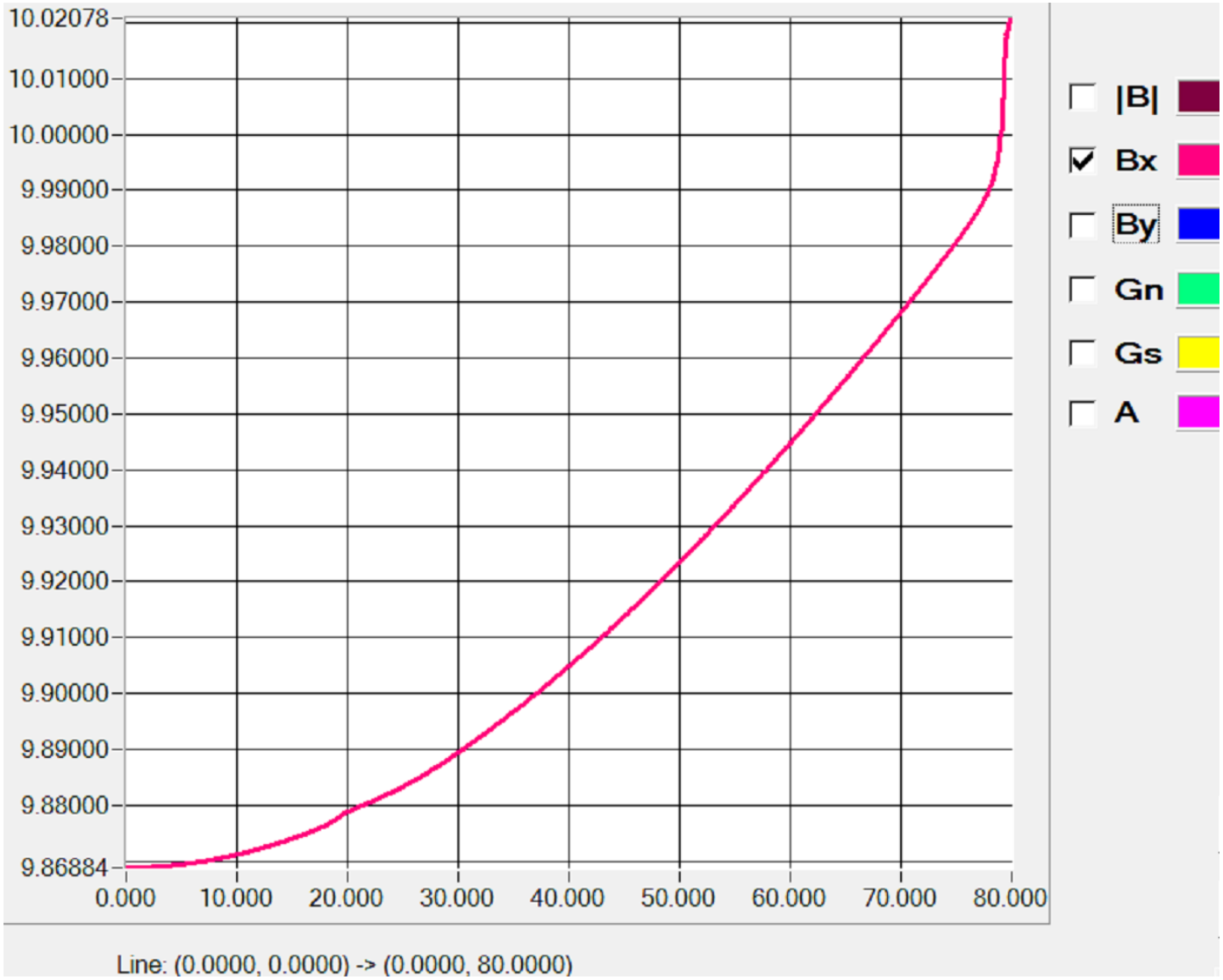


Field along the line y=7 cm, sol. inside Q0



In the Q0 iron-yoke B=+3 ,-2 kGs

Field along the line: x=0, sol. inside Q0



Playing with the main coil current density distribution, the detector field could be made more homogeneous!?

Conclusion

- The detector field integral could be compensated by the solenoid, placed in front of Q0 + solenoid wind above Q0's iron yoke . Then the longitudinal field inside Q0 becomes canceled.

- Less attractive from point of view of beam dynamics looks scheme with placing compensation solenoid inside Q0 aperture.
  Still, this version saves the space for the luminosity monitoring.