Magnetic field calculation for Panda dipole magnet

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- 2. Dipole dynamic properties.
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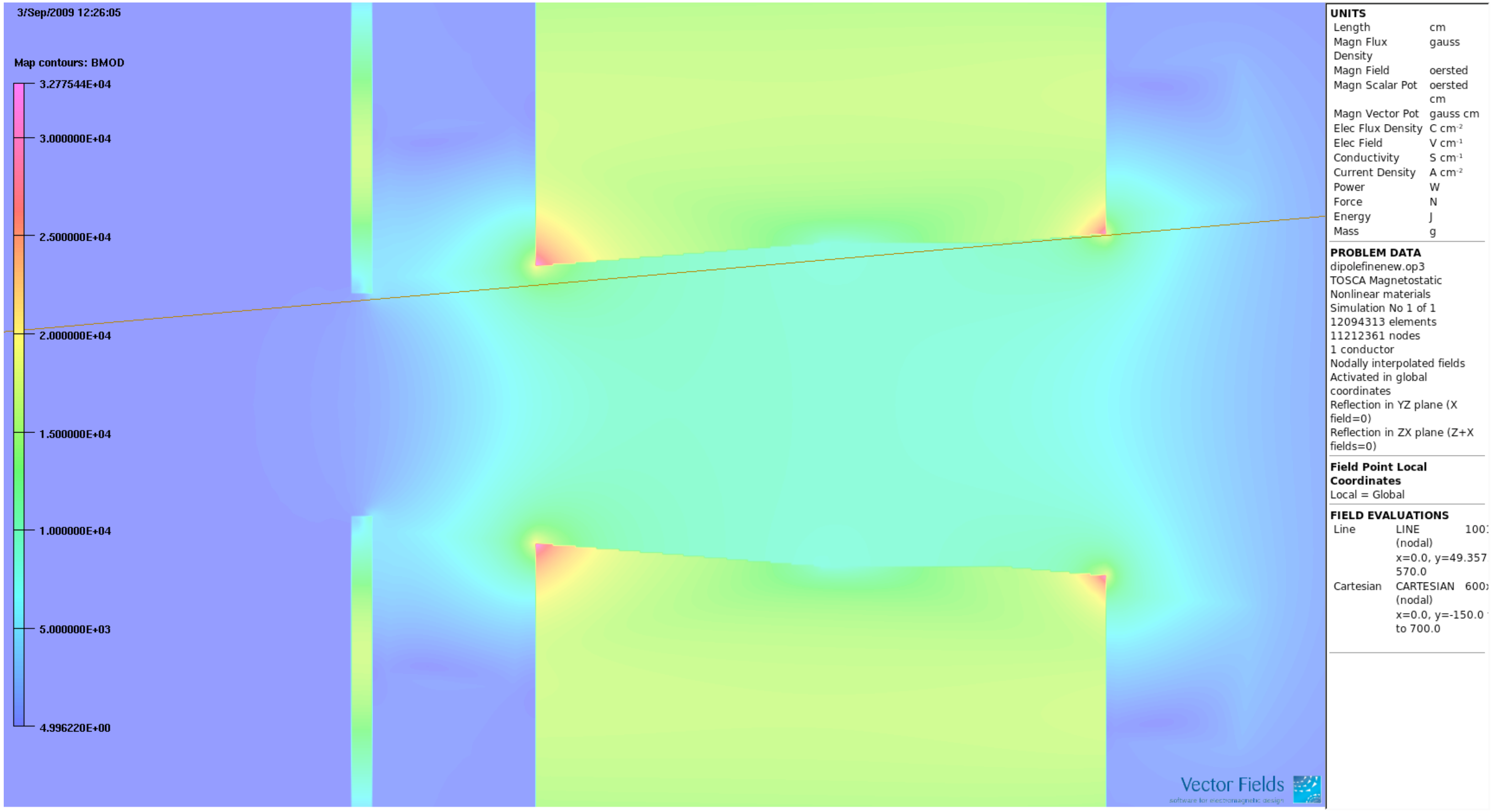
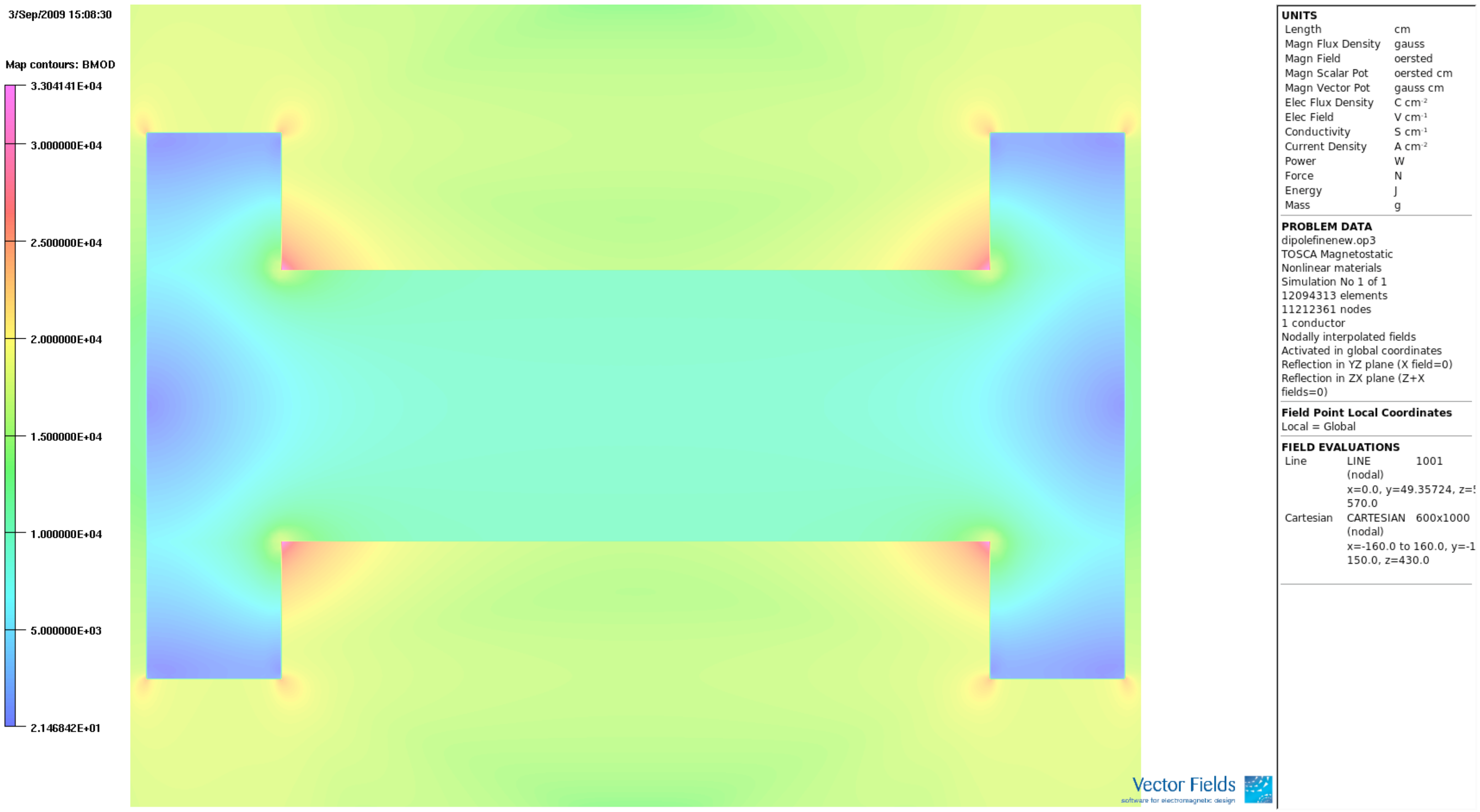
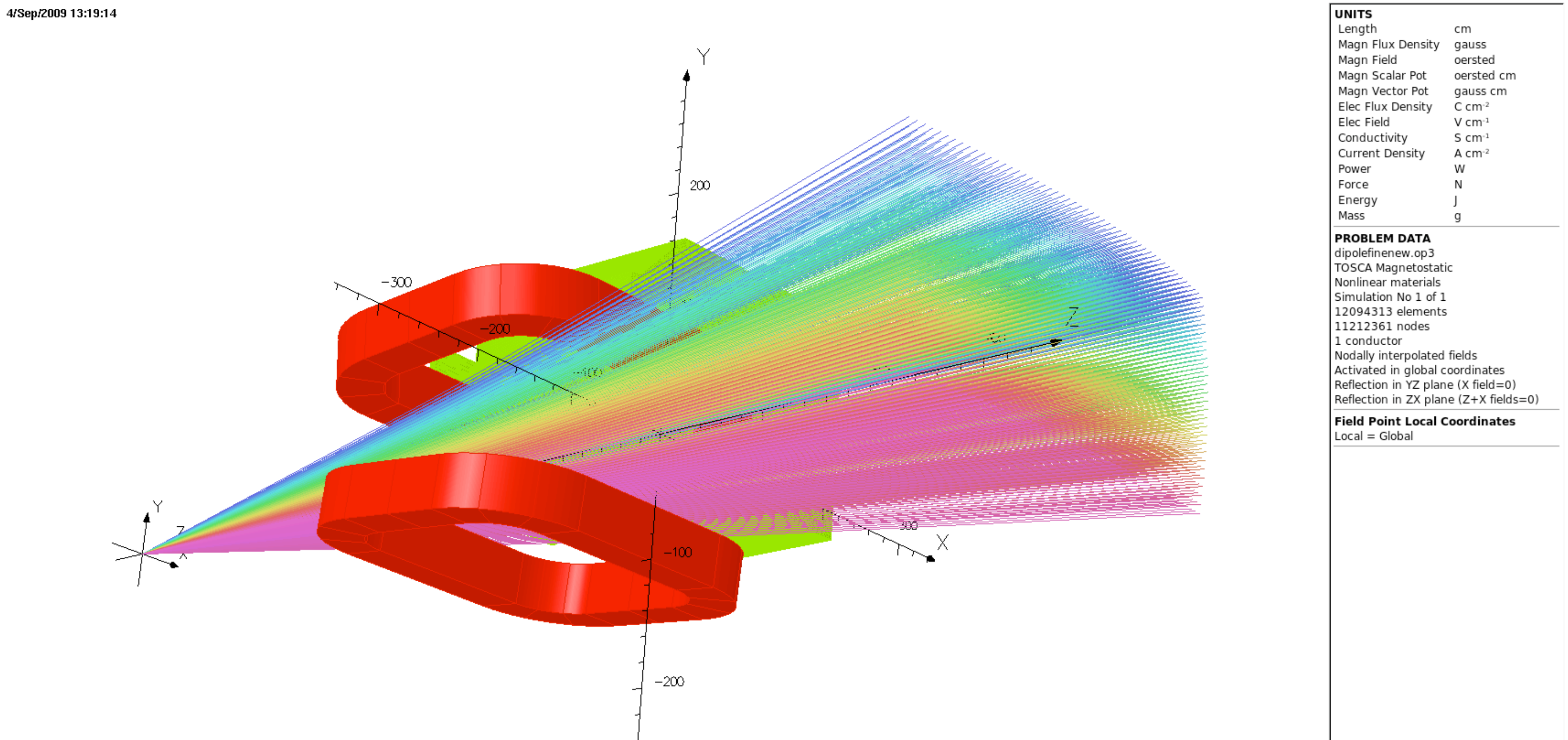
1. Dipole magnet field distribution in the yz plane (x=0)



Dipole magnet field distribution in the xy plane (z=430 cm)

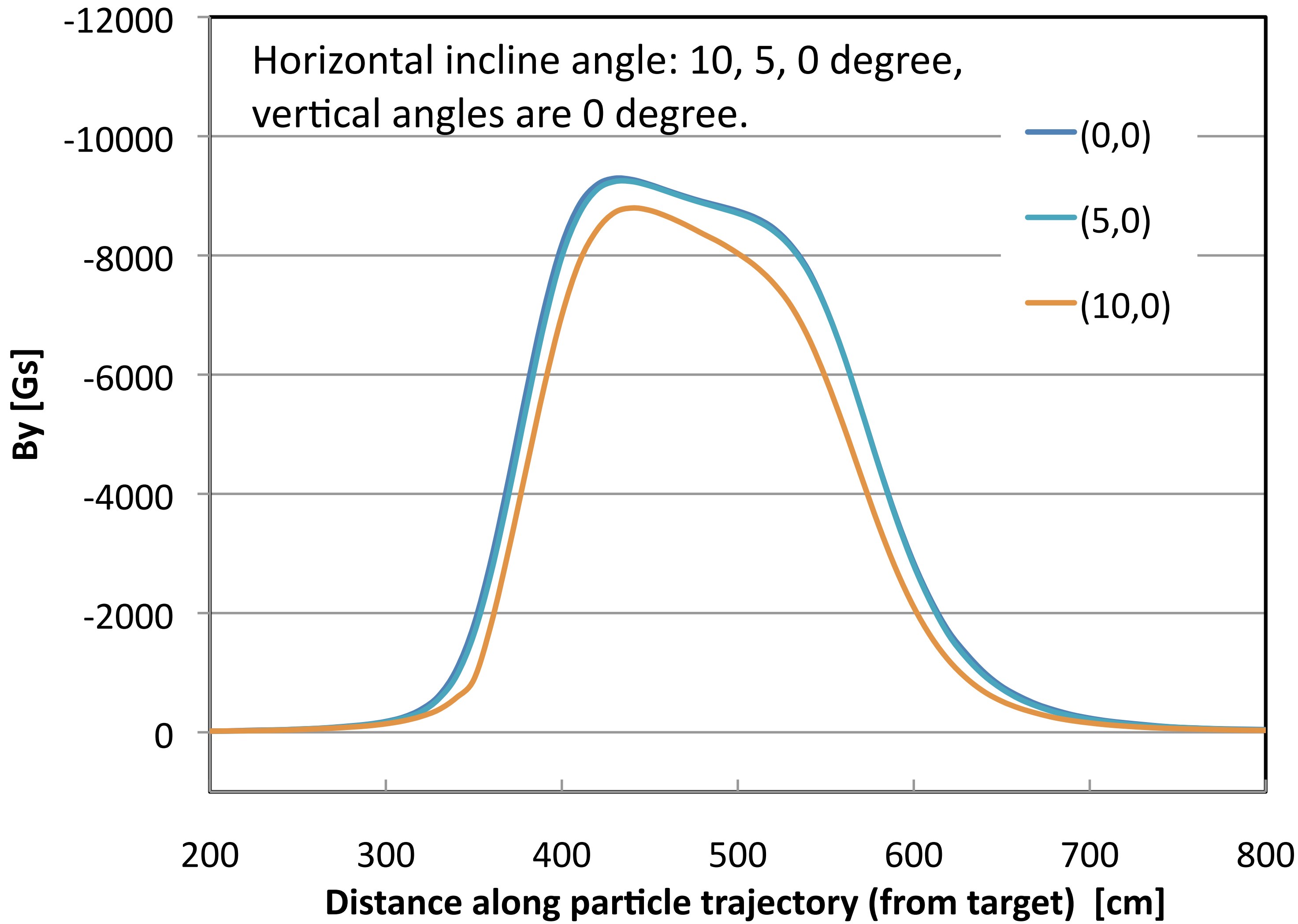


Antiproton trajectories

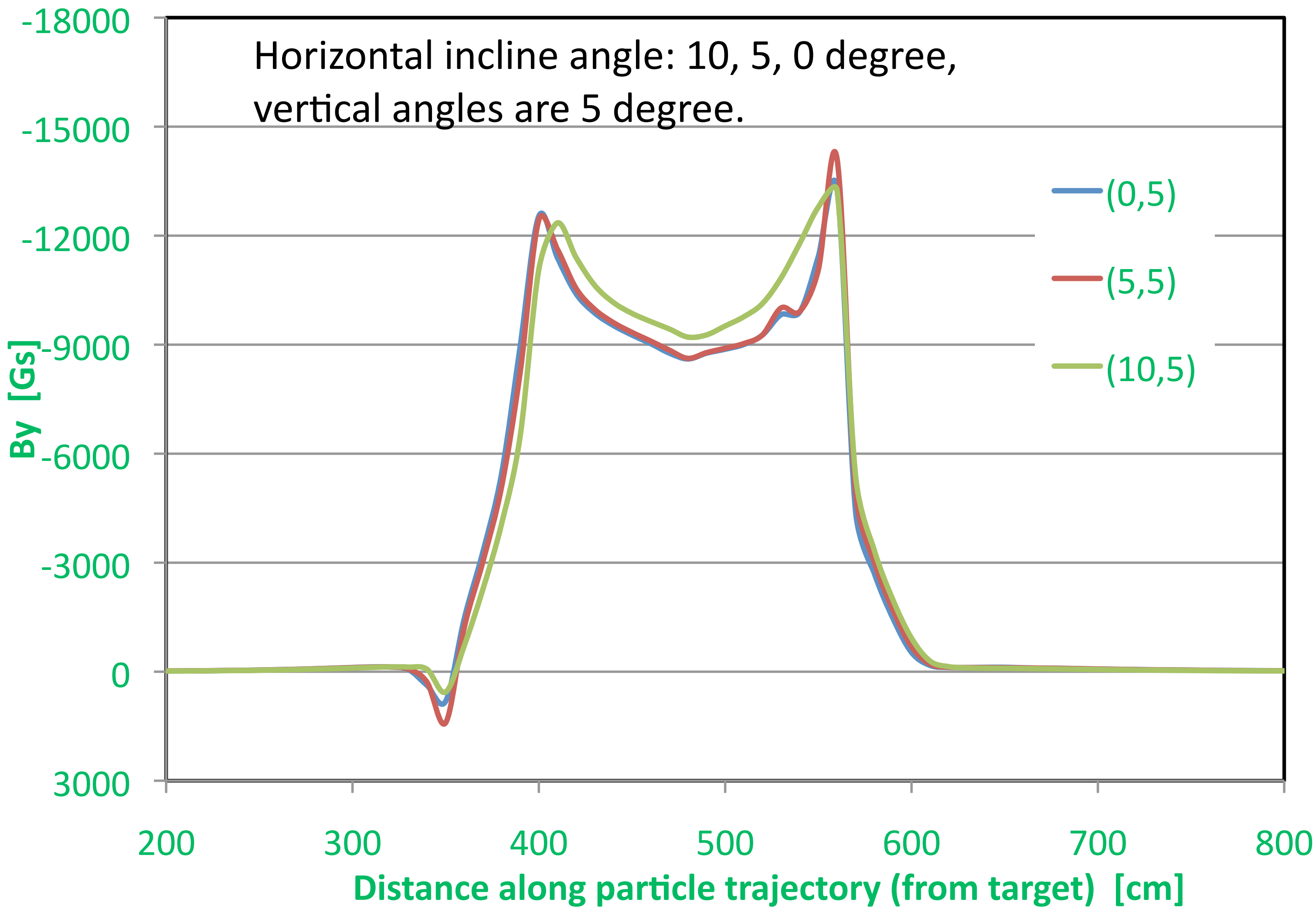


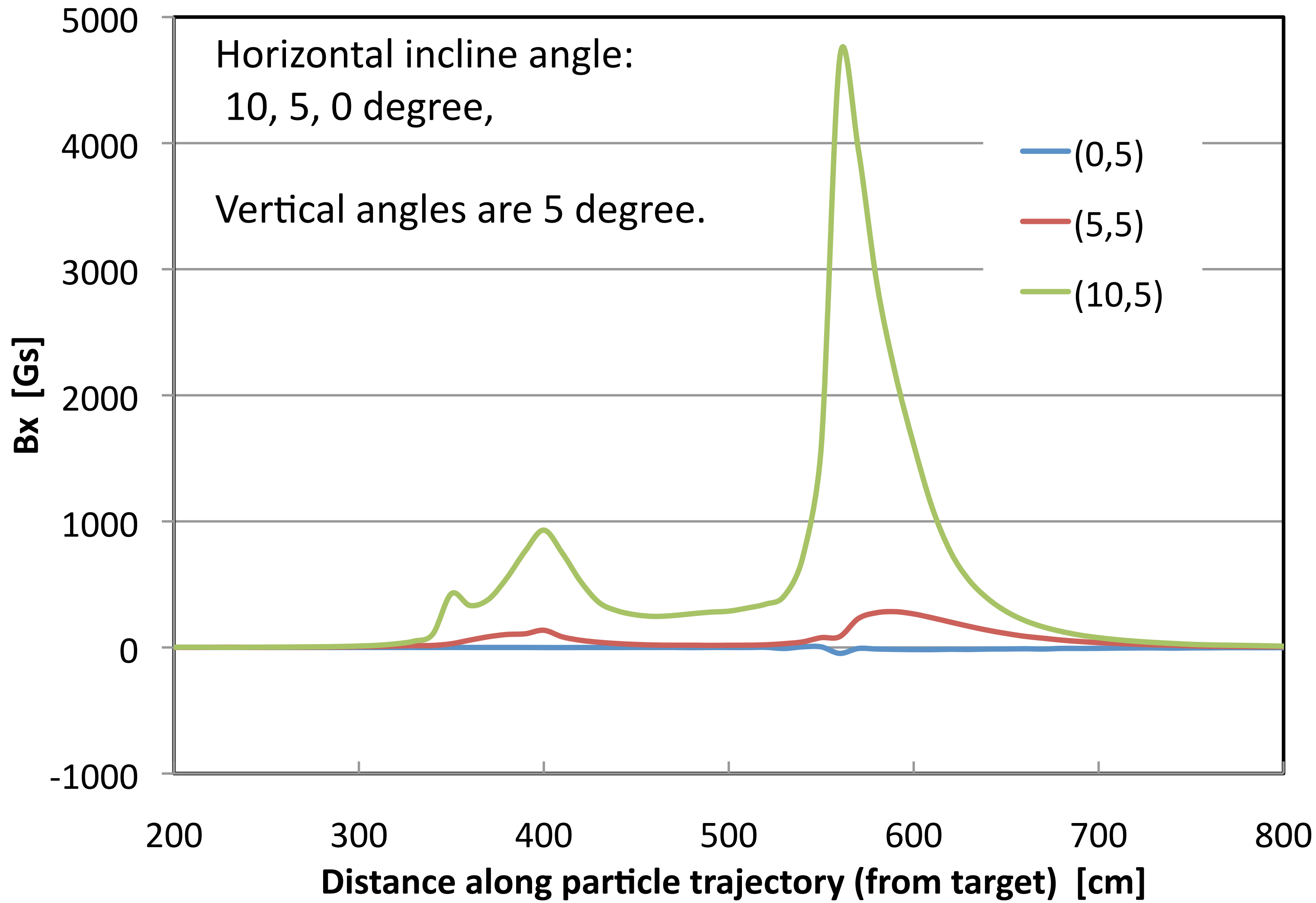
15 GeV /c anti proton beam.
Starting from target position (0,0,0),
Horizontal angle: 10 to -10 degree,
Vertical angle: 5 to -5 degree,
Angle Steps: 0.4 degree.

Dipole fields in the horizontal plane along 15GeV/c antiproton trajectories (from target)

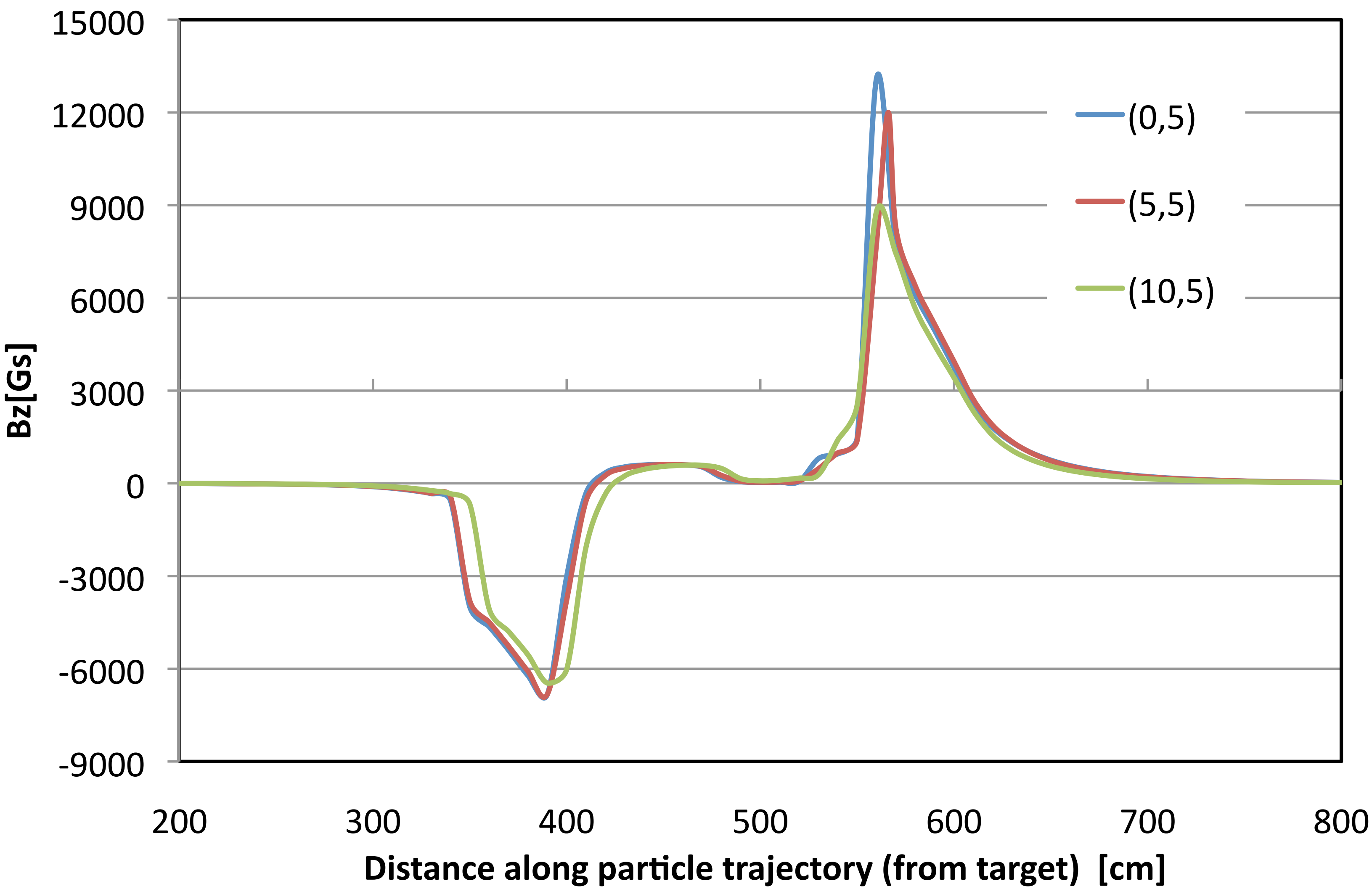


Dipole fields along 15GeV/c antiproton trajectories





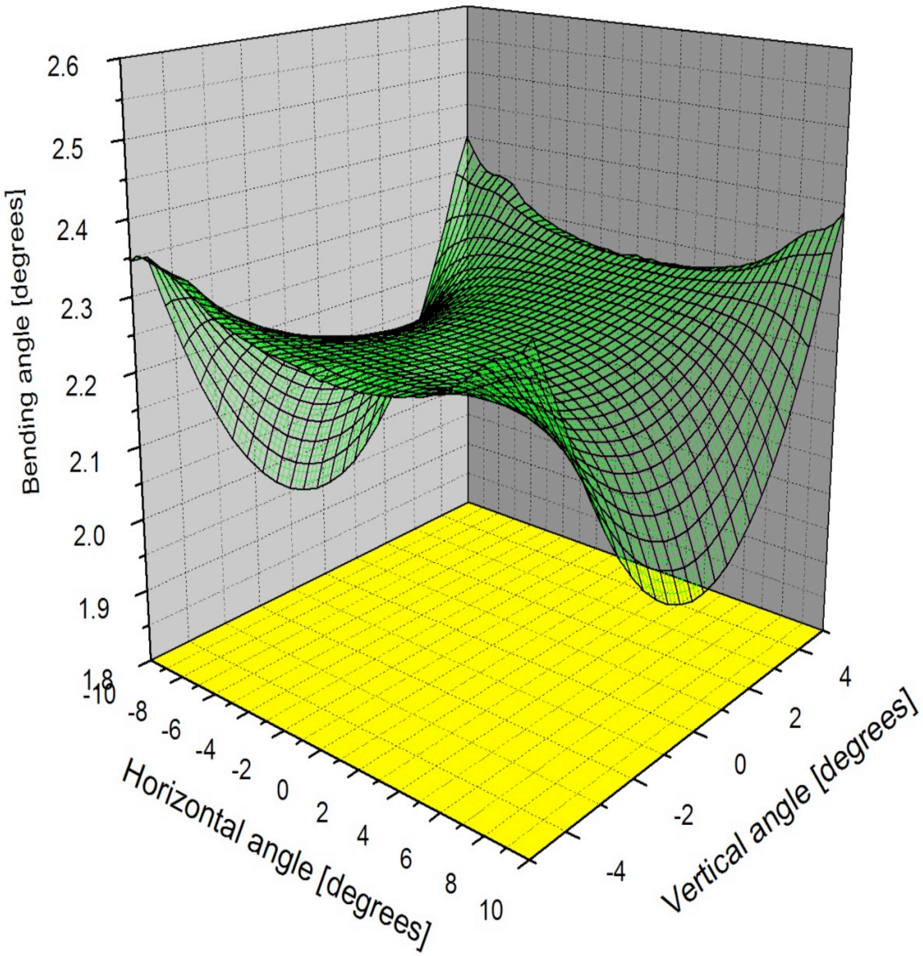
Very strong Bx, leading to vertical bending.

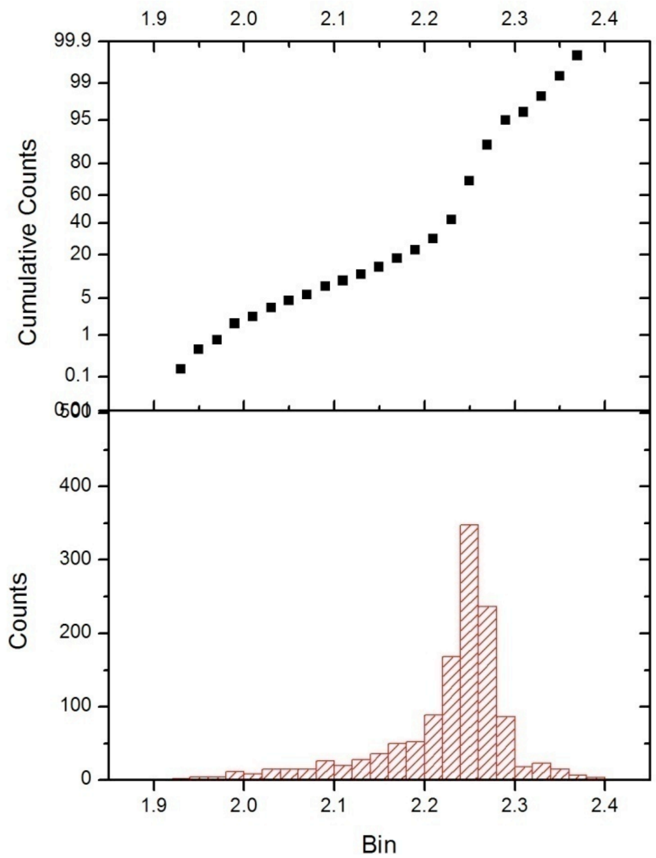


Very strong Bz component, but the integration is very small.

Horizontal bending angles

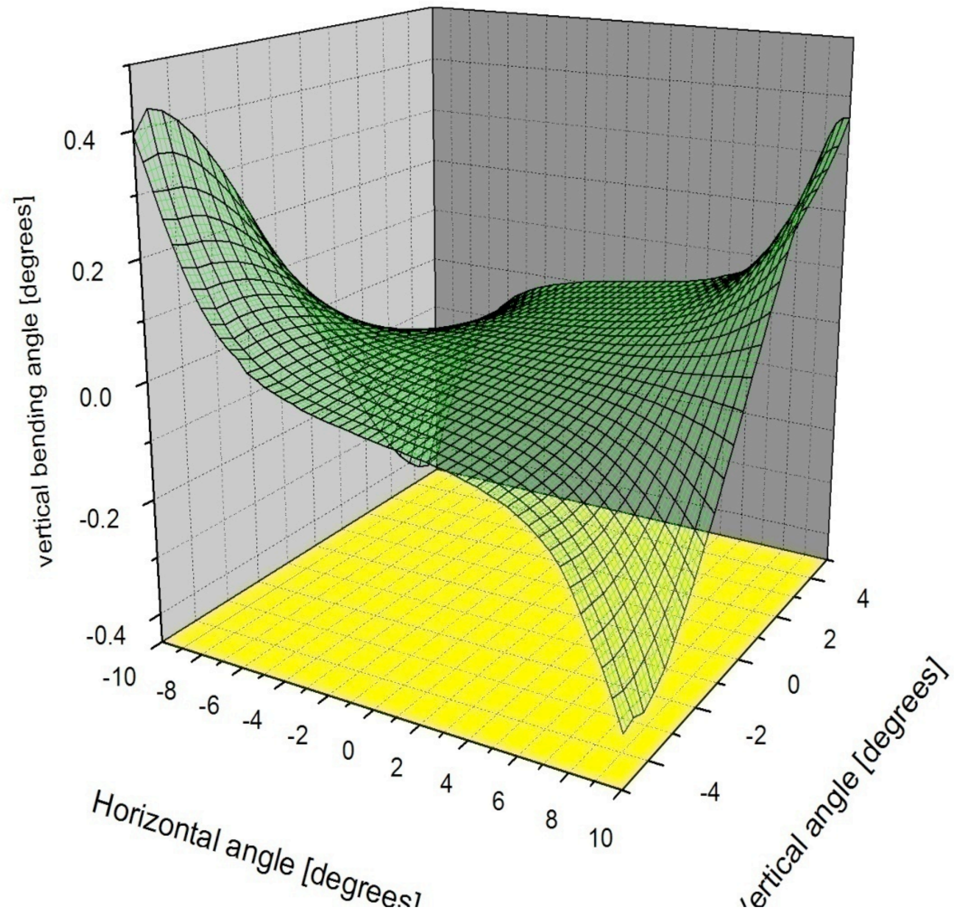
(Calculated from the antiproton trajectories)

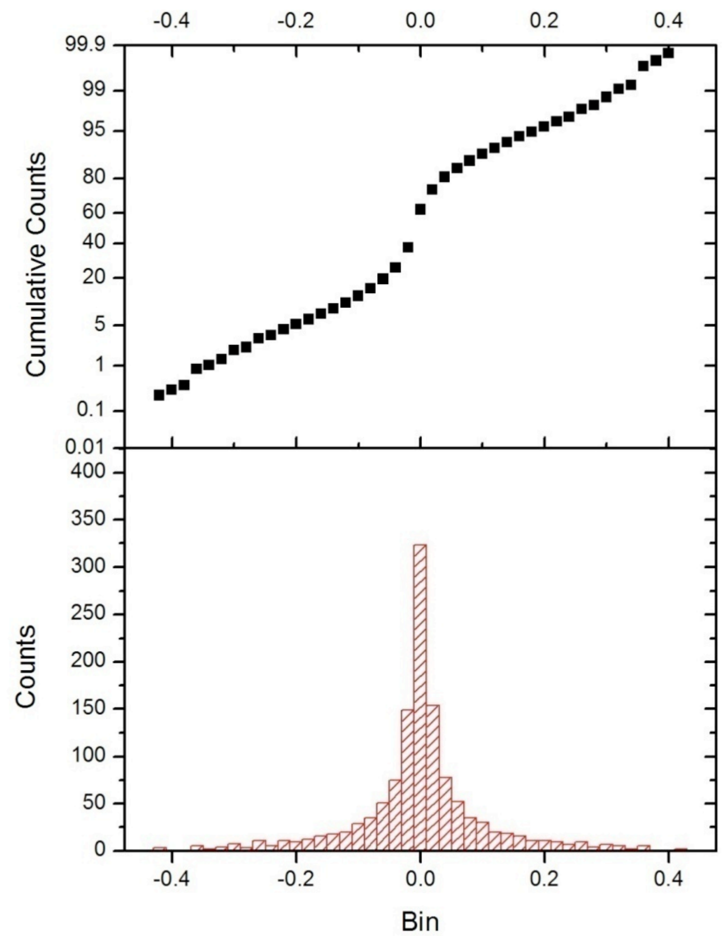


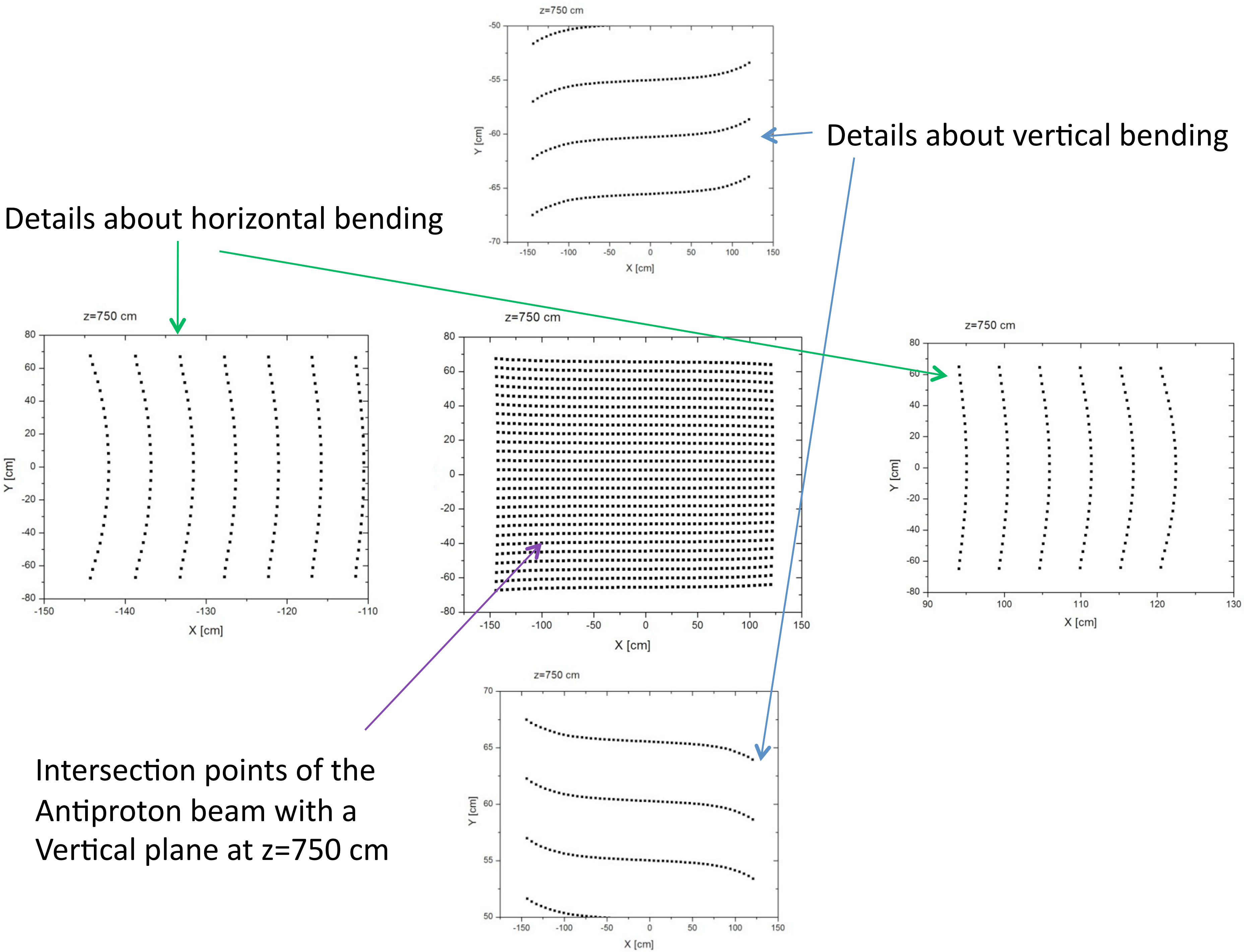


Vertical bending angles

(Calculated from the antiproton trajectories)

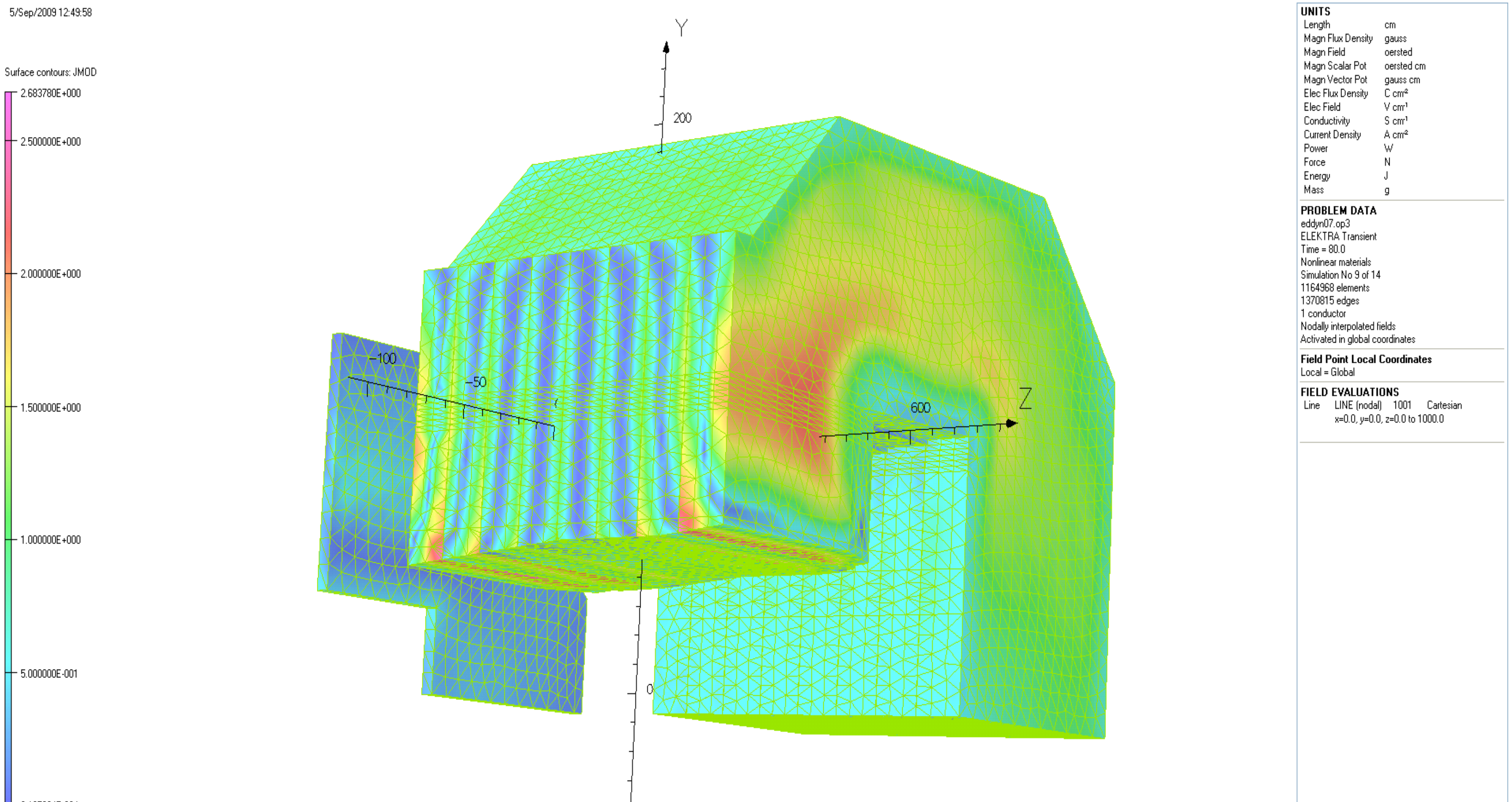






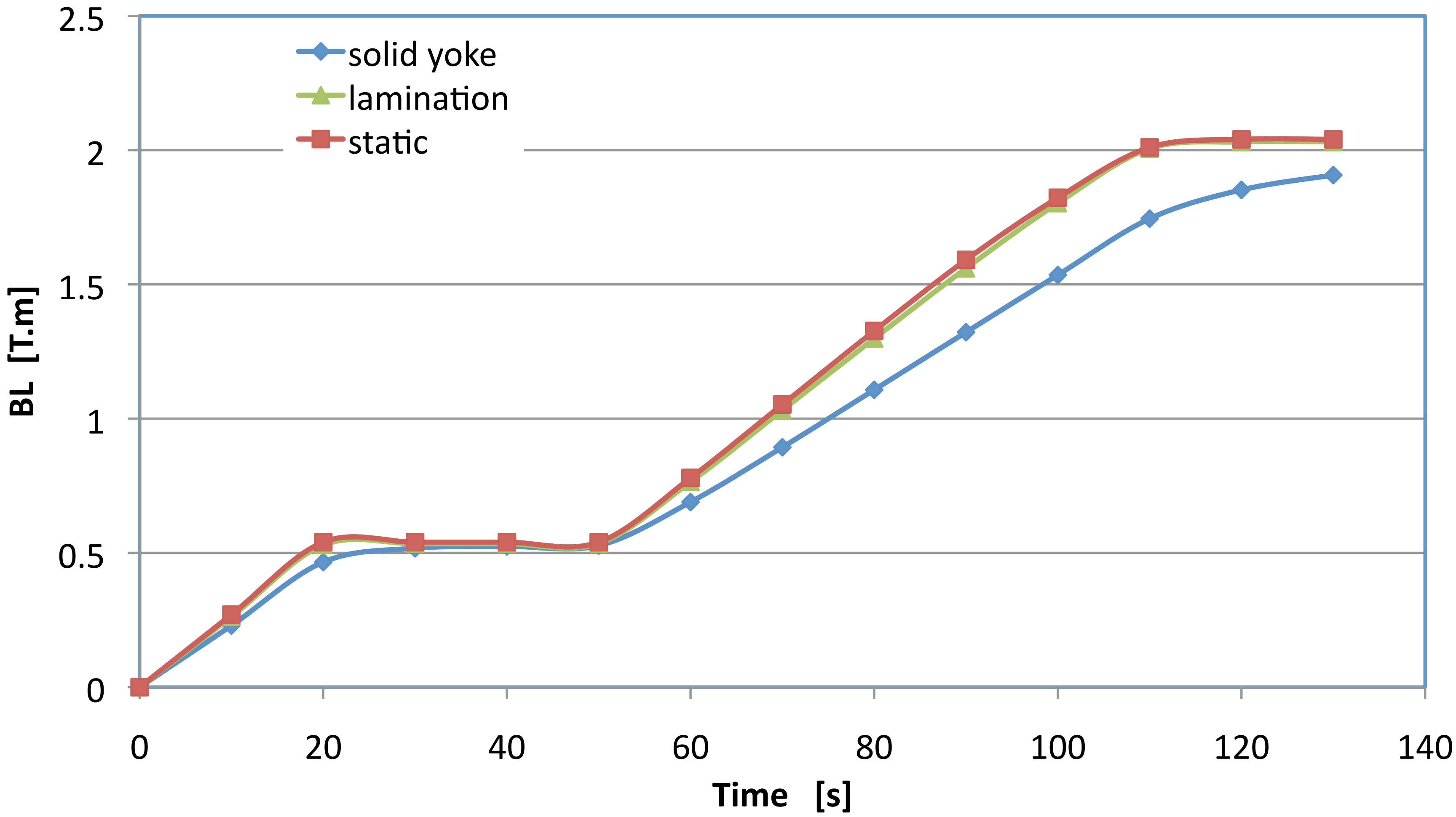
Details about vertical bending
Details about horizontal bending
Intersection points of the Antiproton beam with a Vertical plane at z=750 cm
z=750 cm
X [cm]
Y [cm]

2. Dynamical properties.

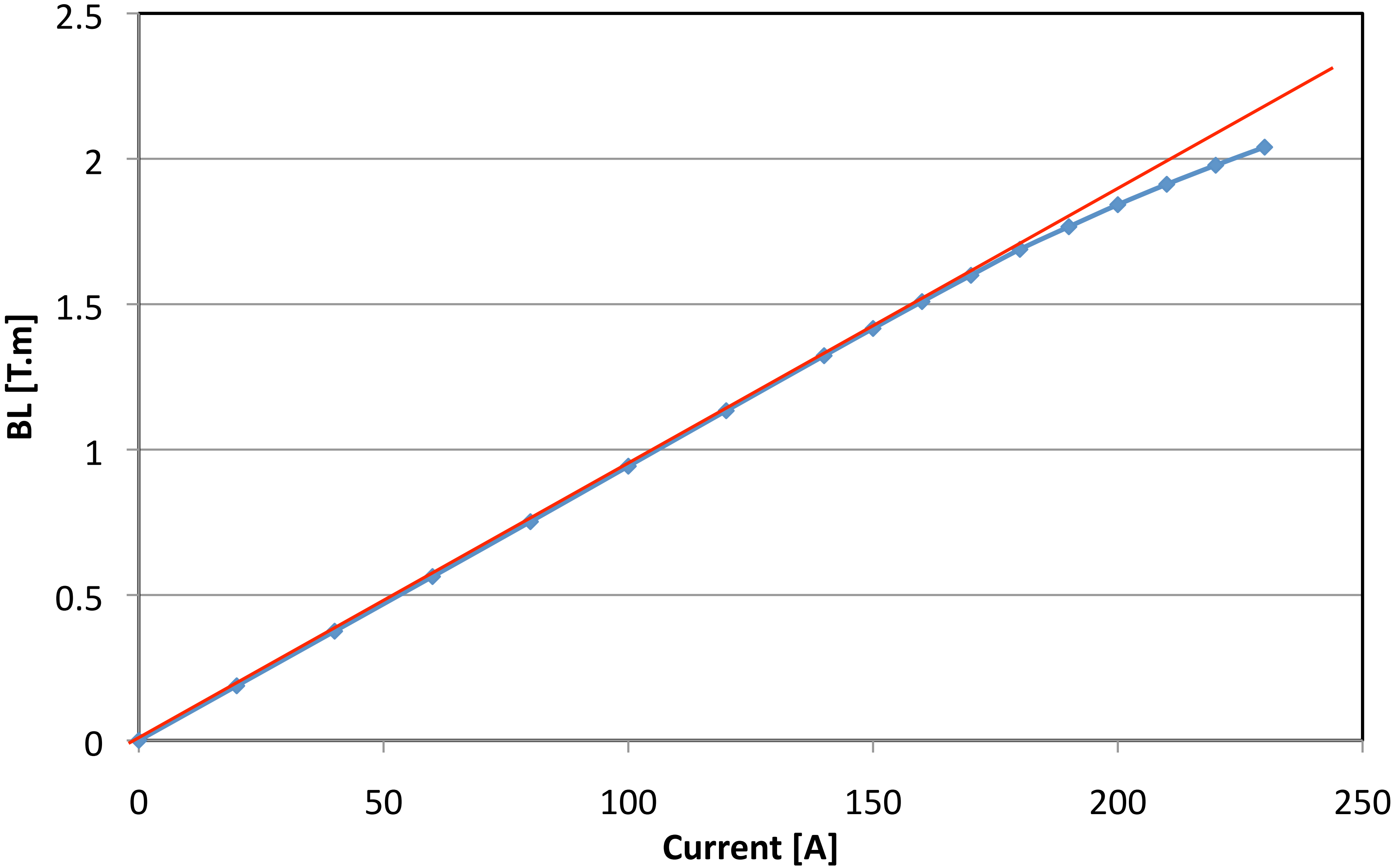


View of ¼ of the dipole magnet indicating the eddy current density 20 seconds after the start of ramp.

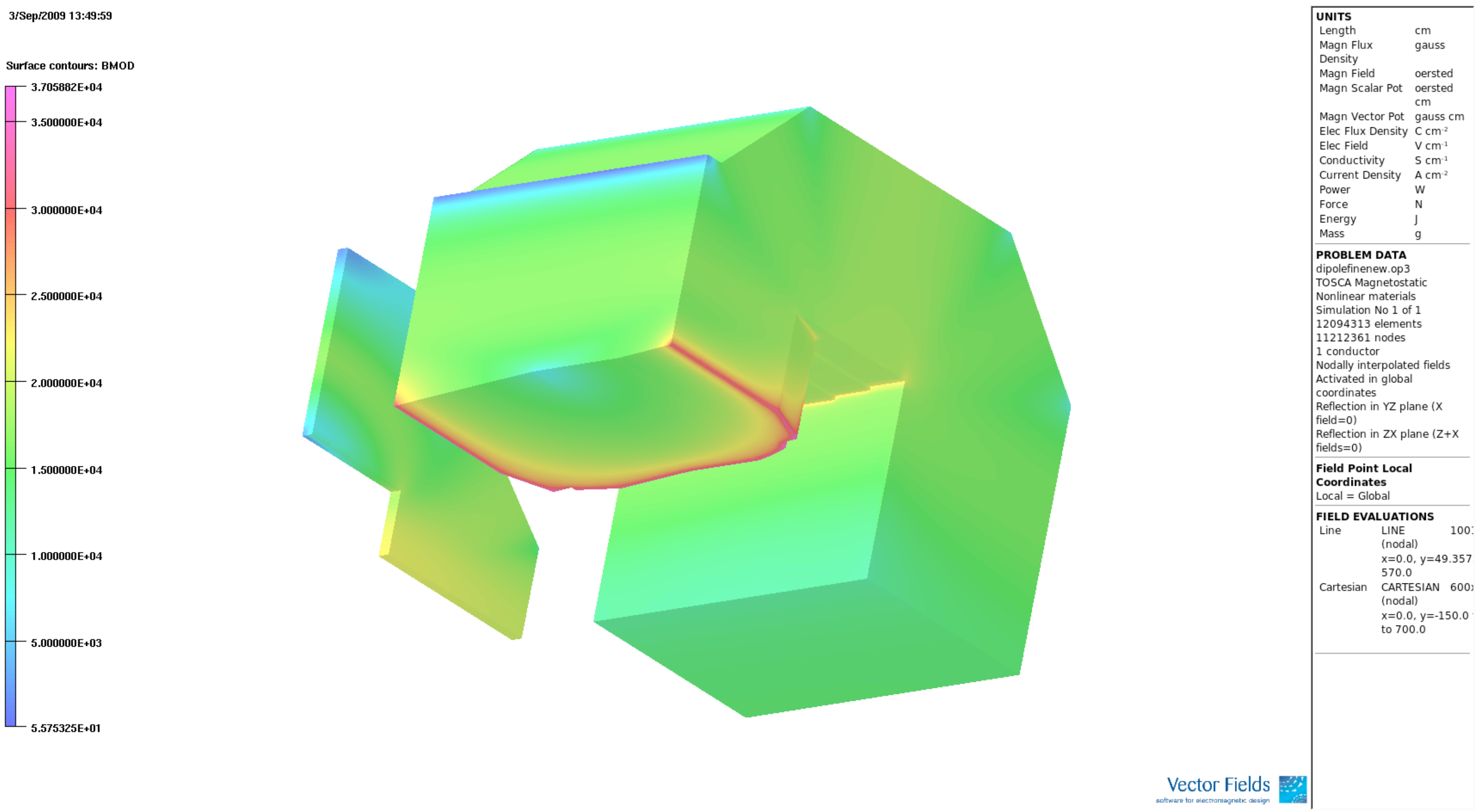
Bending power versus ramping time



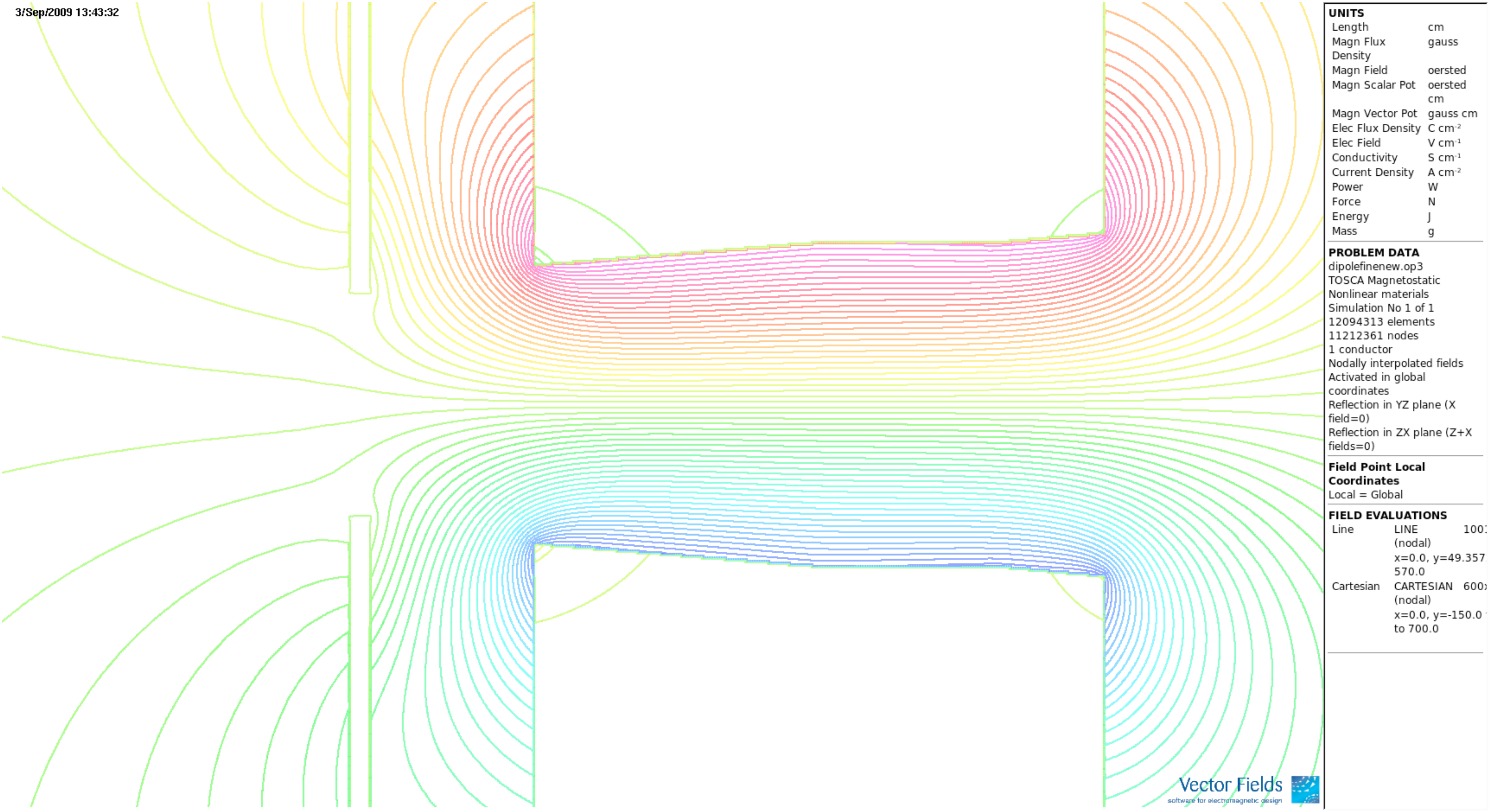
Dipole magnet transfer function



Magnetic flux density at surface of the dipole magnet model



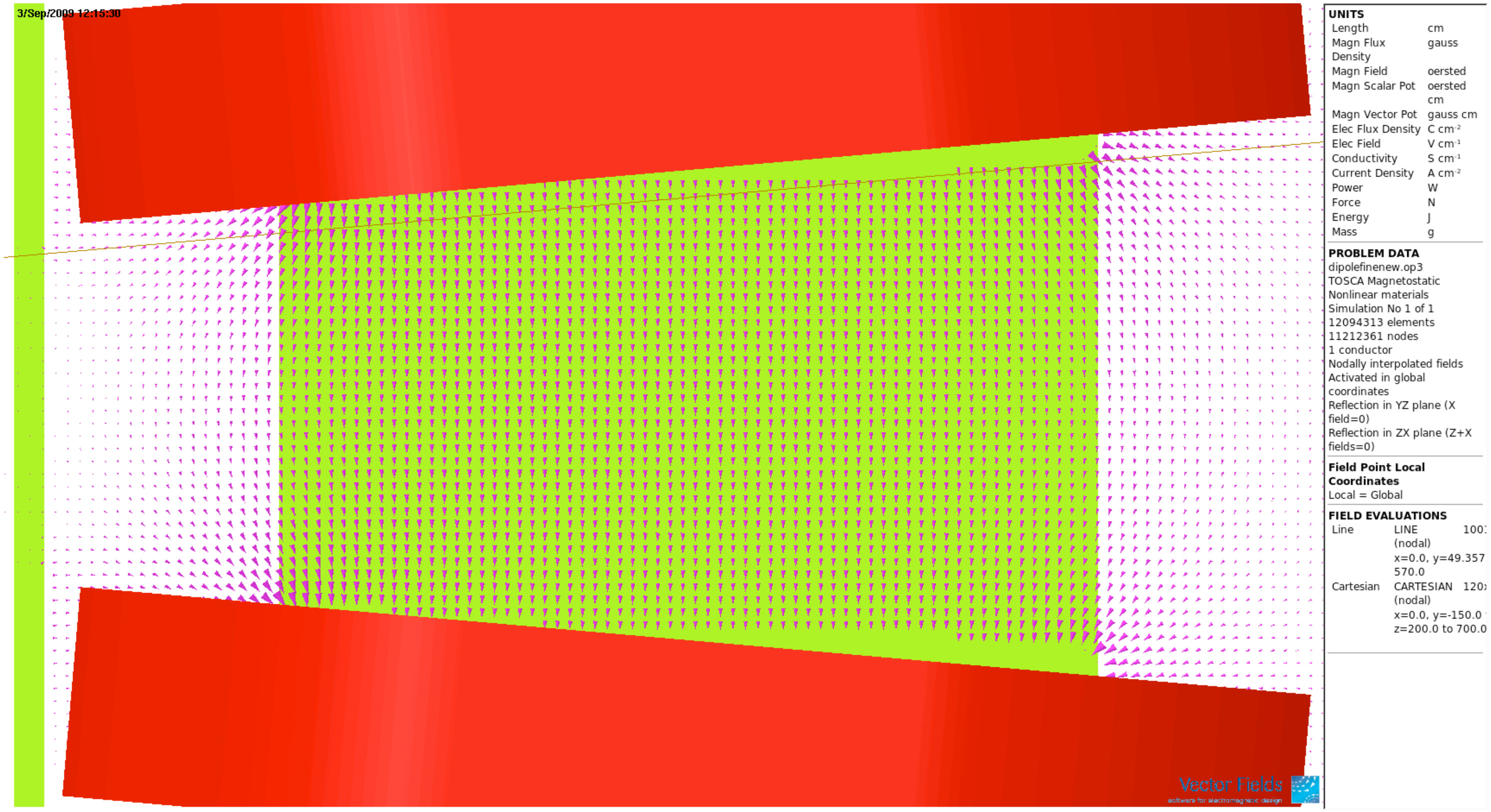
Magnetic scalar potential



Conclusions

- The dipole magnet fields uniformity was studied. Vertical bending was found.
- The dipole magnet must have laminated yoke, a 20 cm lamination will be good enough.
- The dipole pole shoes are heavily saturated at the edges. Future study is needed for their effects on field repeatability...

Backup slides



Dipole field map
(Hy)