TTF Superconducting Quadrupole Doublet

Simulation with MAFIA to compare with Measurements

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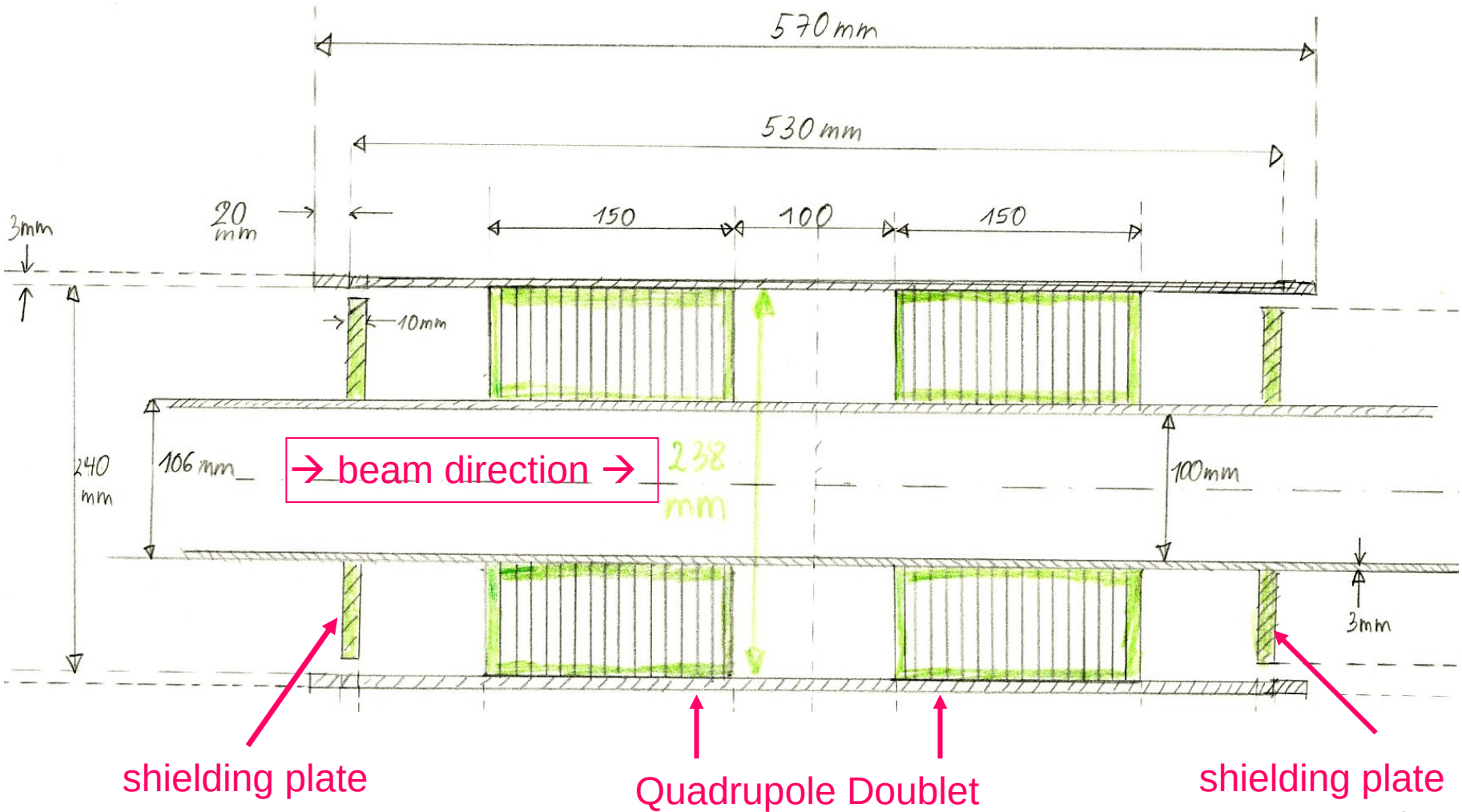
27 March 2006

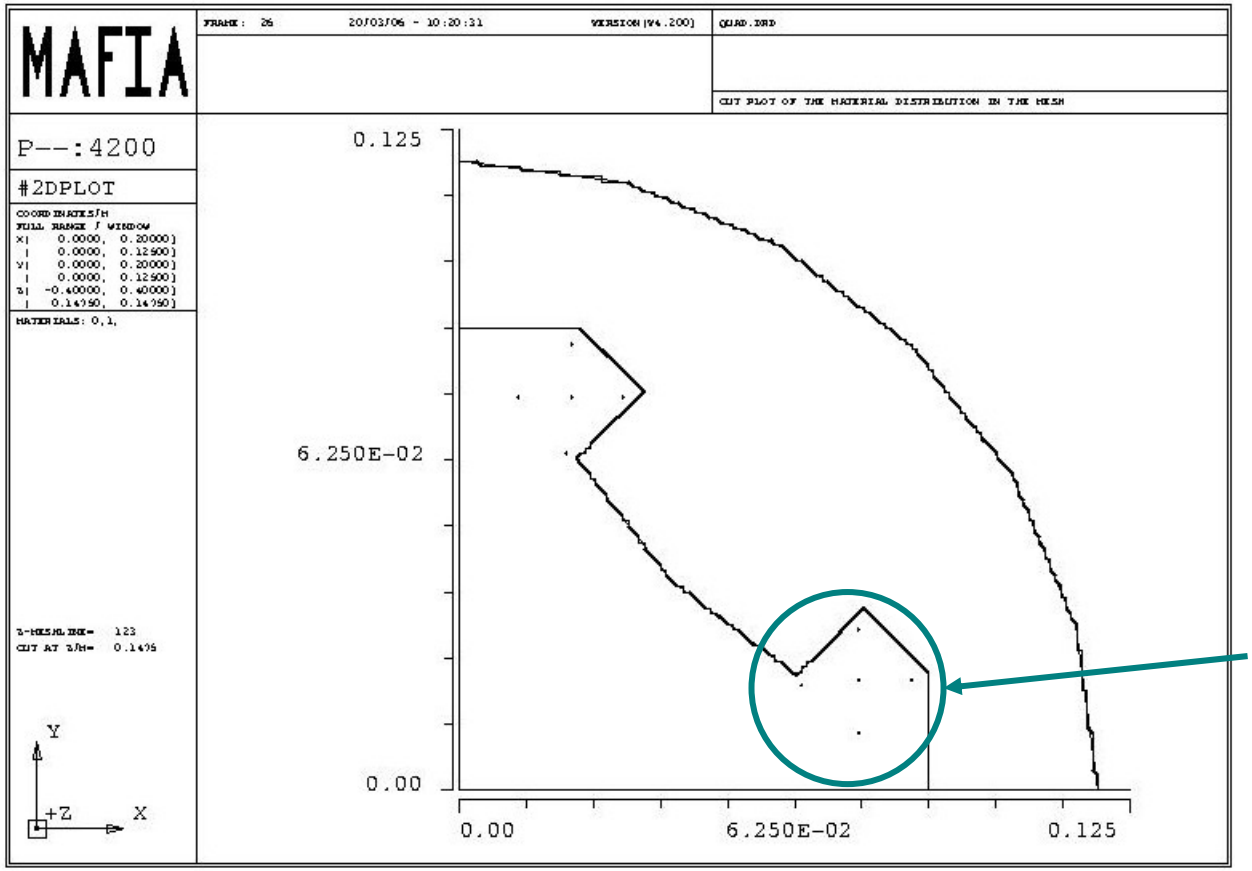
Sketch from technical drawing



TTF Quadupole: General Information

- iron quality: HERA Iron
- laminated plates, 5 mm thickness
- aperture radius = 56 mm
- length: 150 mm
- distance between 2 Quads in doublet: 100 mm
- maximum current: 60 A

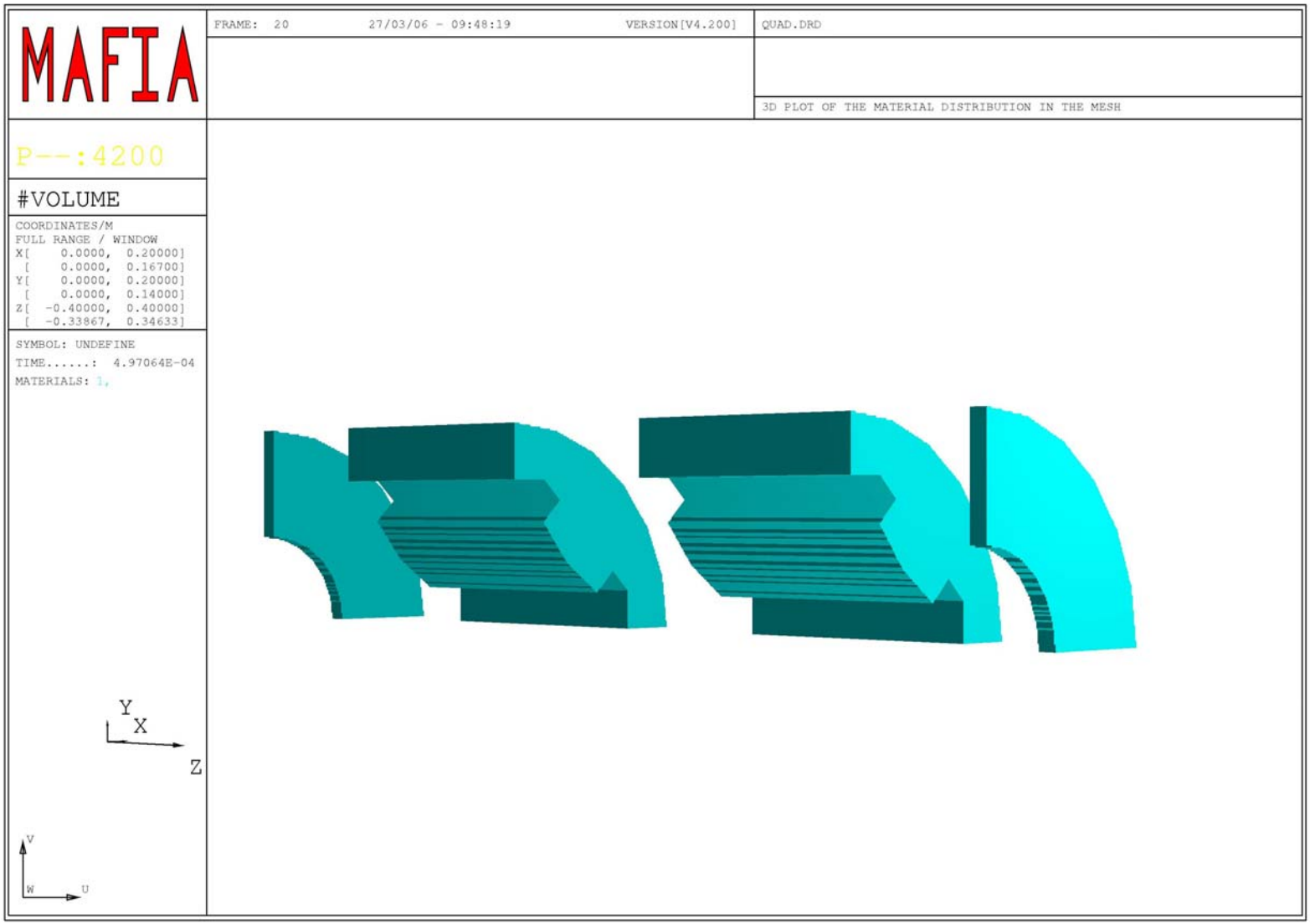
The MAFIA Model: 2d view



One quarter of the quadrupole has been discretized on a rectangular grid,
(grid distance = 1 mm).

Coil is simulated by 5 filaments.

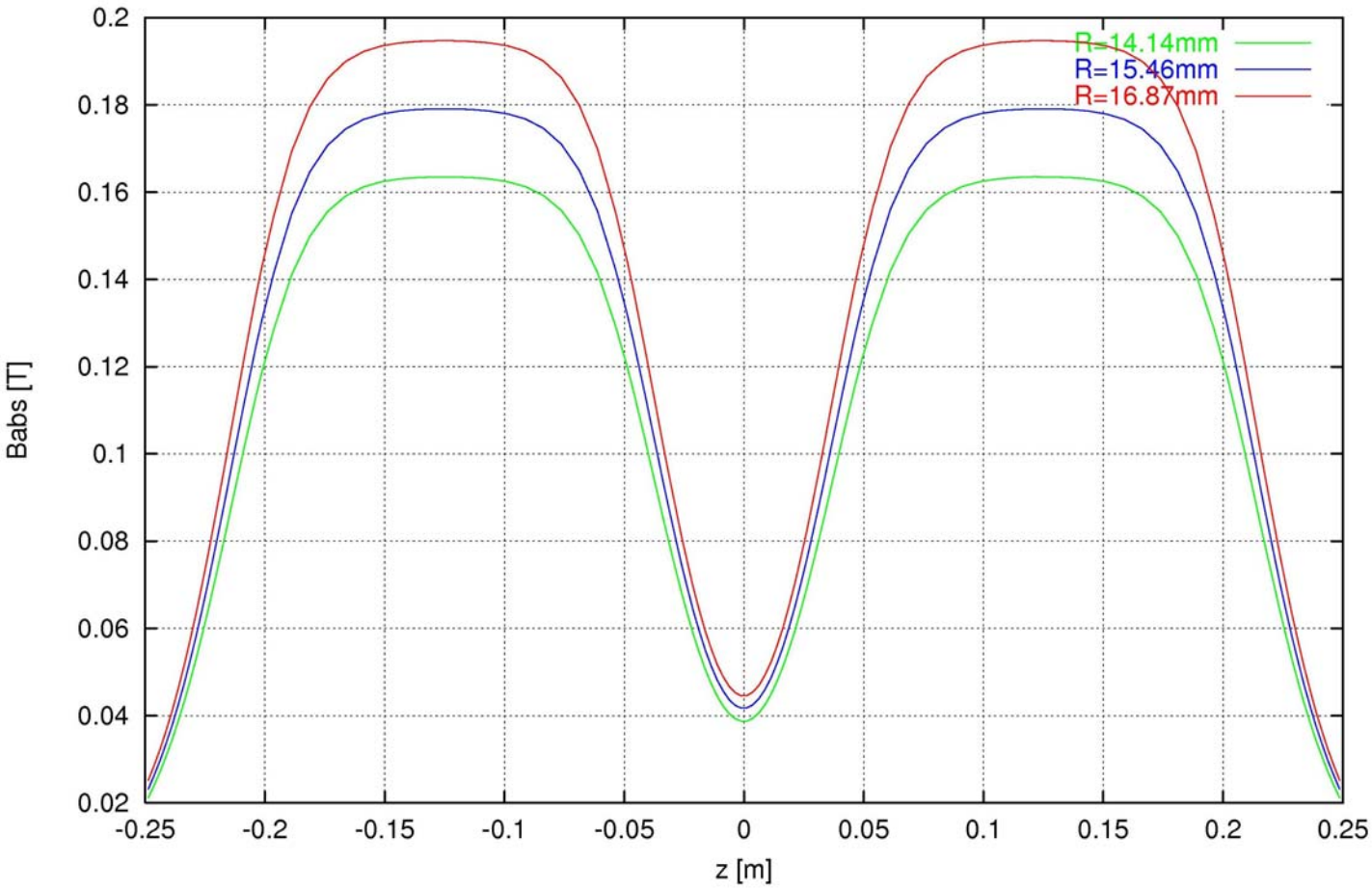
The MAFIA Model: 3D view



MAFIA: Calculation Results

Field B_{abs} plotted in beam direction at different radial positions near pole tip,

I = 30 A, both quadrupoles focus in the same plane



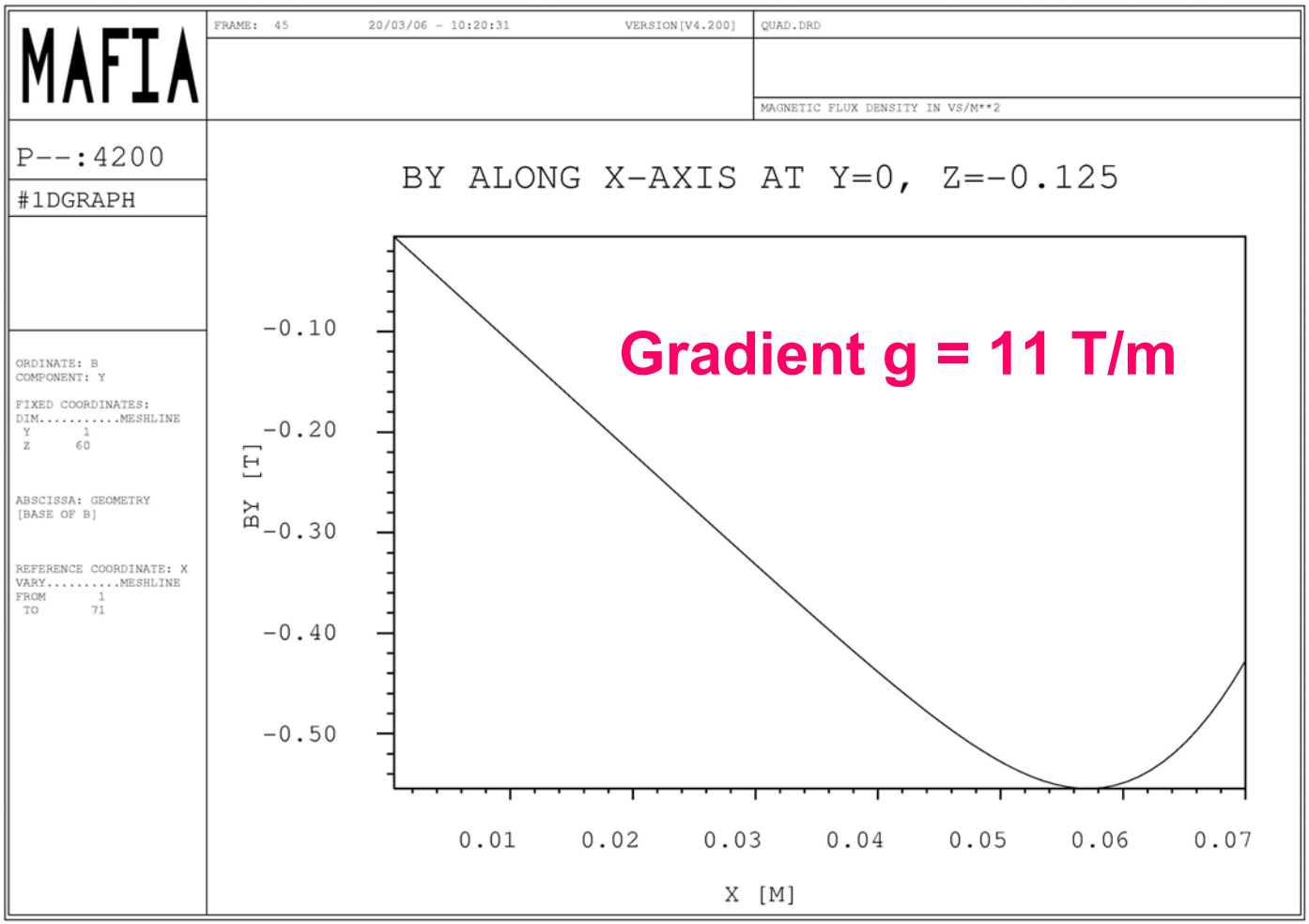
Bmax = 194.7 mT

Bmax = 179 mT

B_{max} = 163.5 mT

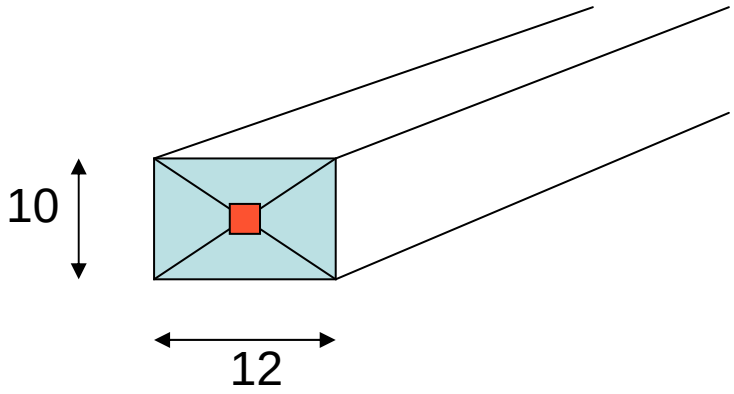
MAFIA: Calculation Results

TTF Quadrupole Doublet, I = 30 A

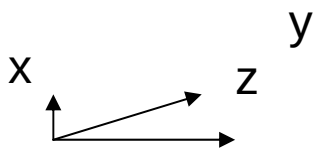


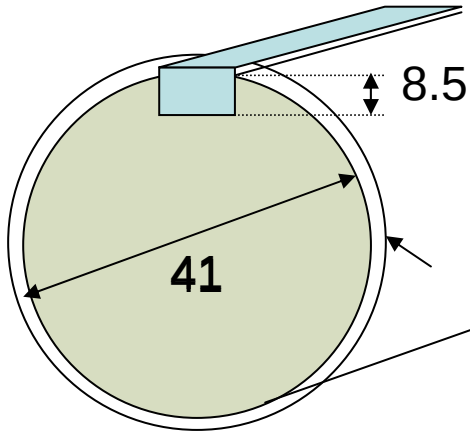
Measurement: Sketch of the testing probe

(Transparency from H. Brück)



Probenvolumen (x y z): 0.2 x 1.5 x .5 mm^3

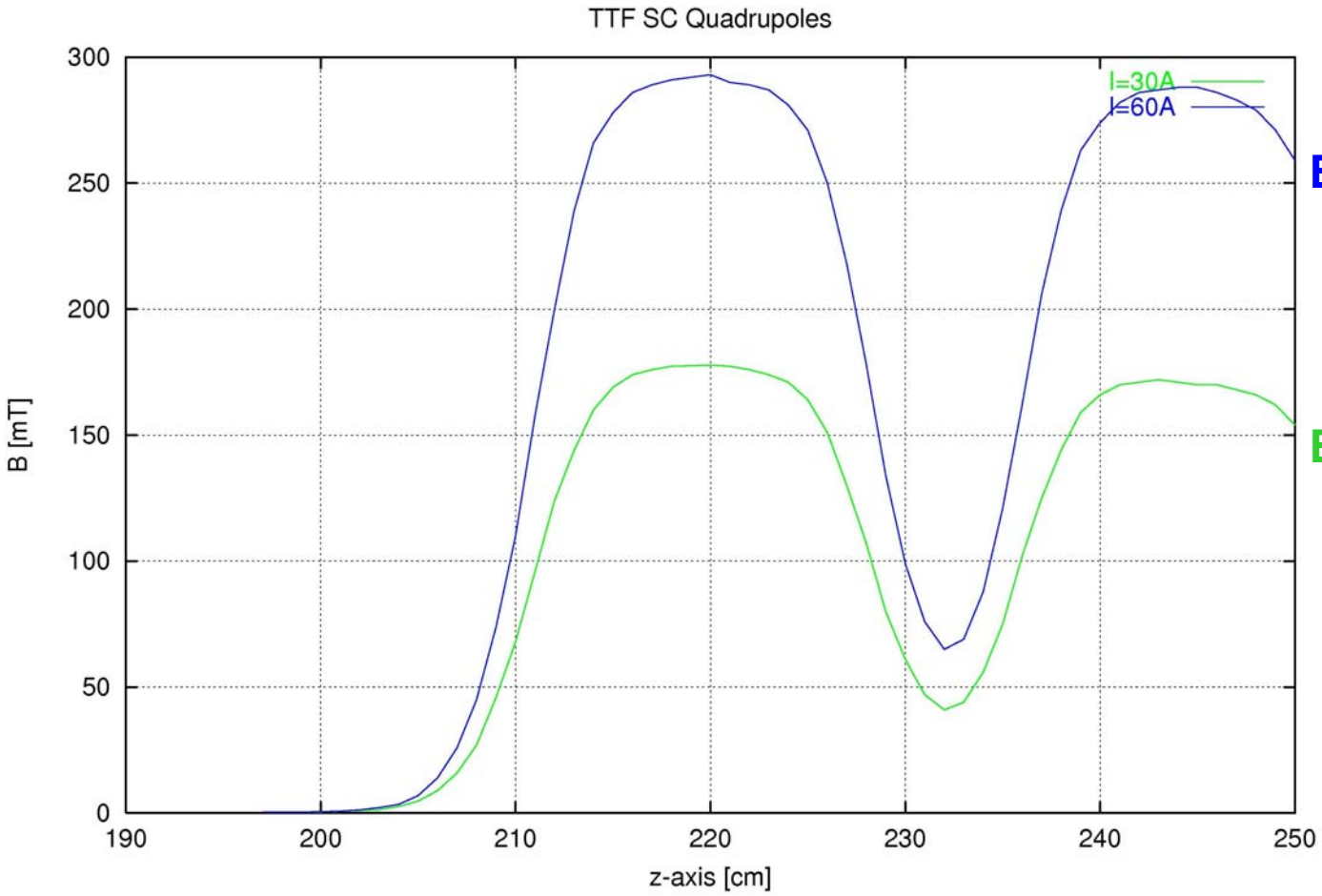




Probenhalter in Messrohr (~42.5),
Probe im Messrohr frei,
daher radiale Position nicht
genau bestimmt!!!

Measurements

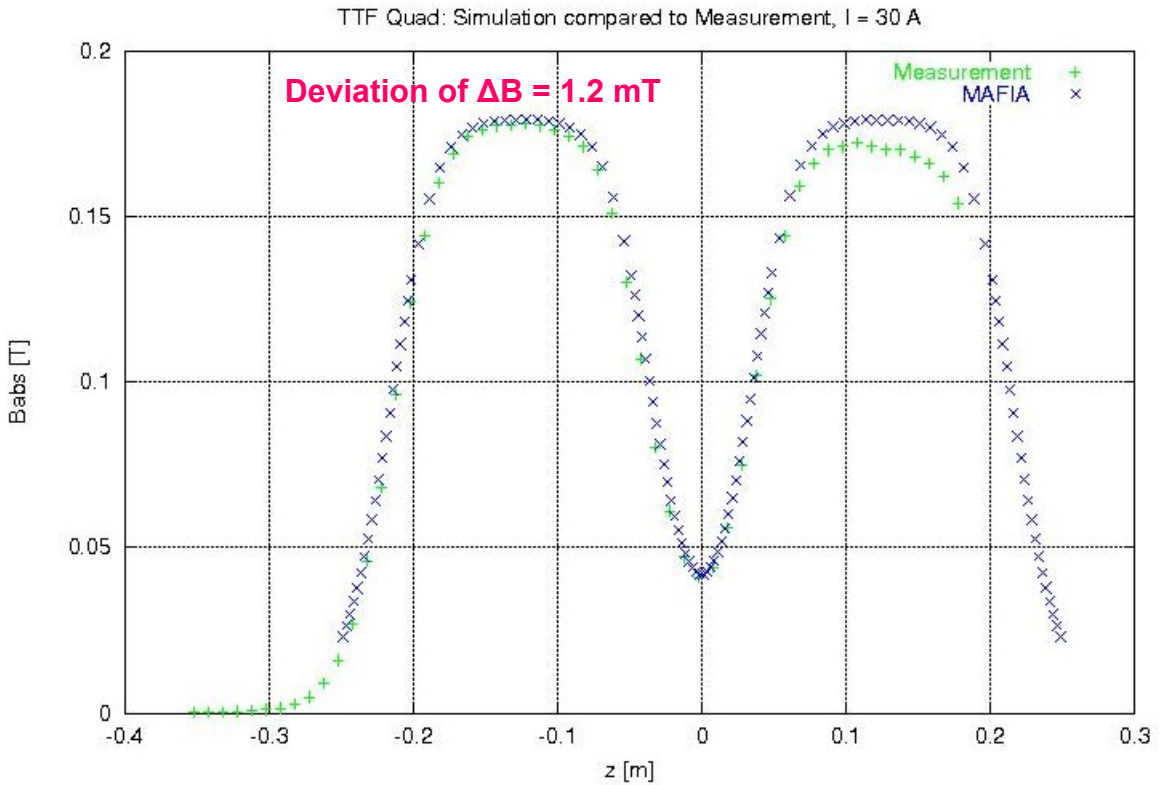
Measurements have been done for a quadrupole doublet with I=30 and I=60 A. Both quadrupoles focus in the same plane.



Bmax = 293 mT

Bmax = 177.8 mT

Results: Comparison of Measurement and MAFIA Simulation



Good agreement between simulation and measurement.

Exact position of measurement could not be determined and was estimated to compare with the simulation.

=➔ **More calculations will follow for lower currents and different current distributions to simulate a quadrupole doublet consisting of a horizontal and a vertical focussing quadrupole.**