Effects of Undulator Field Errors on Beam Trajectory

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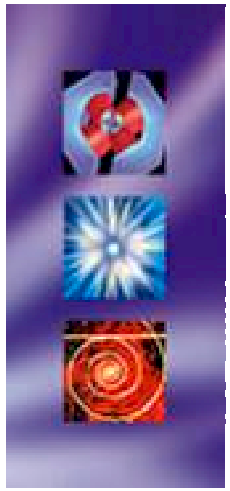
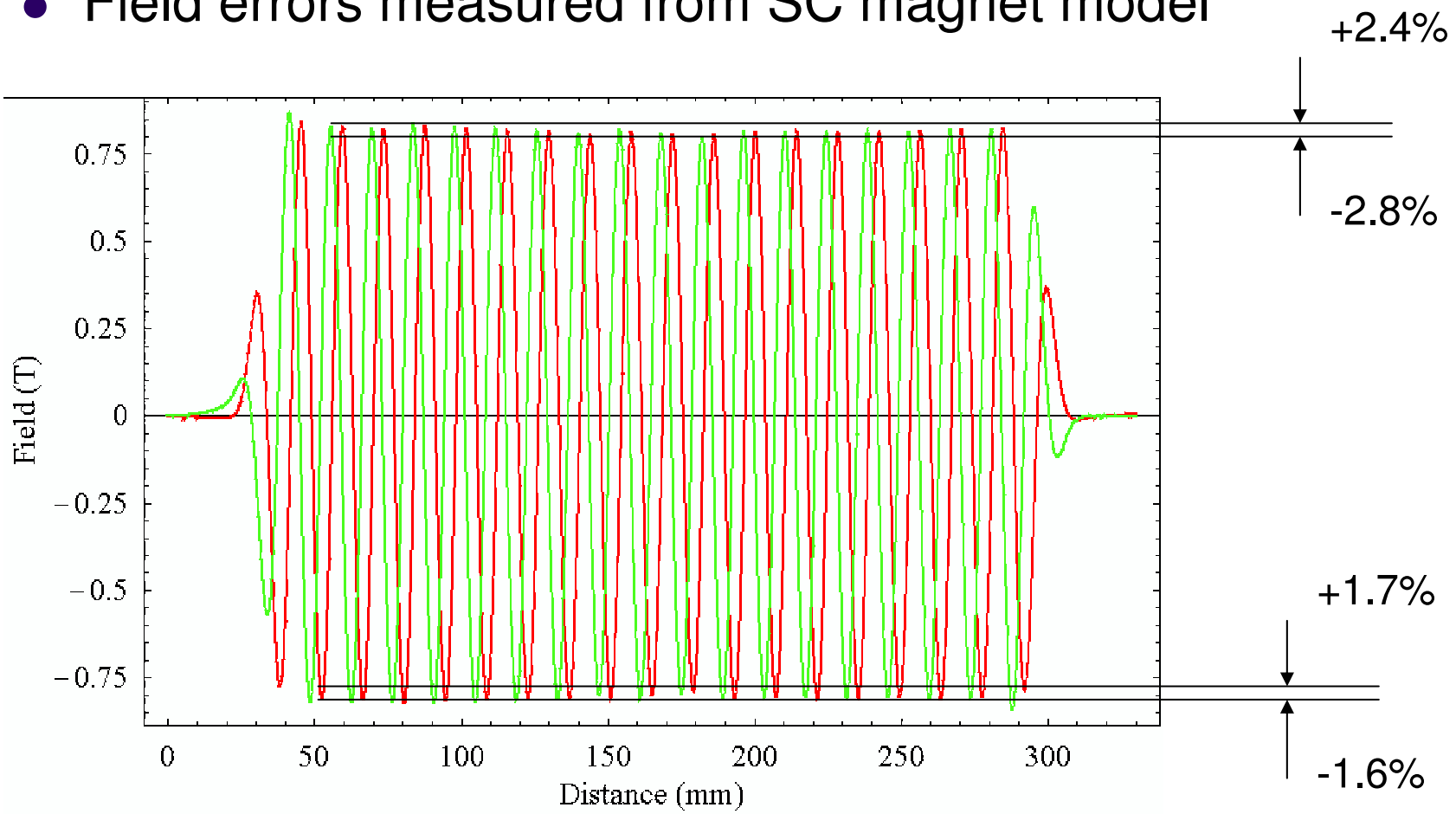


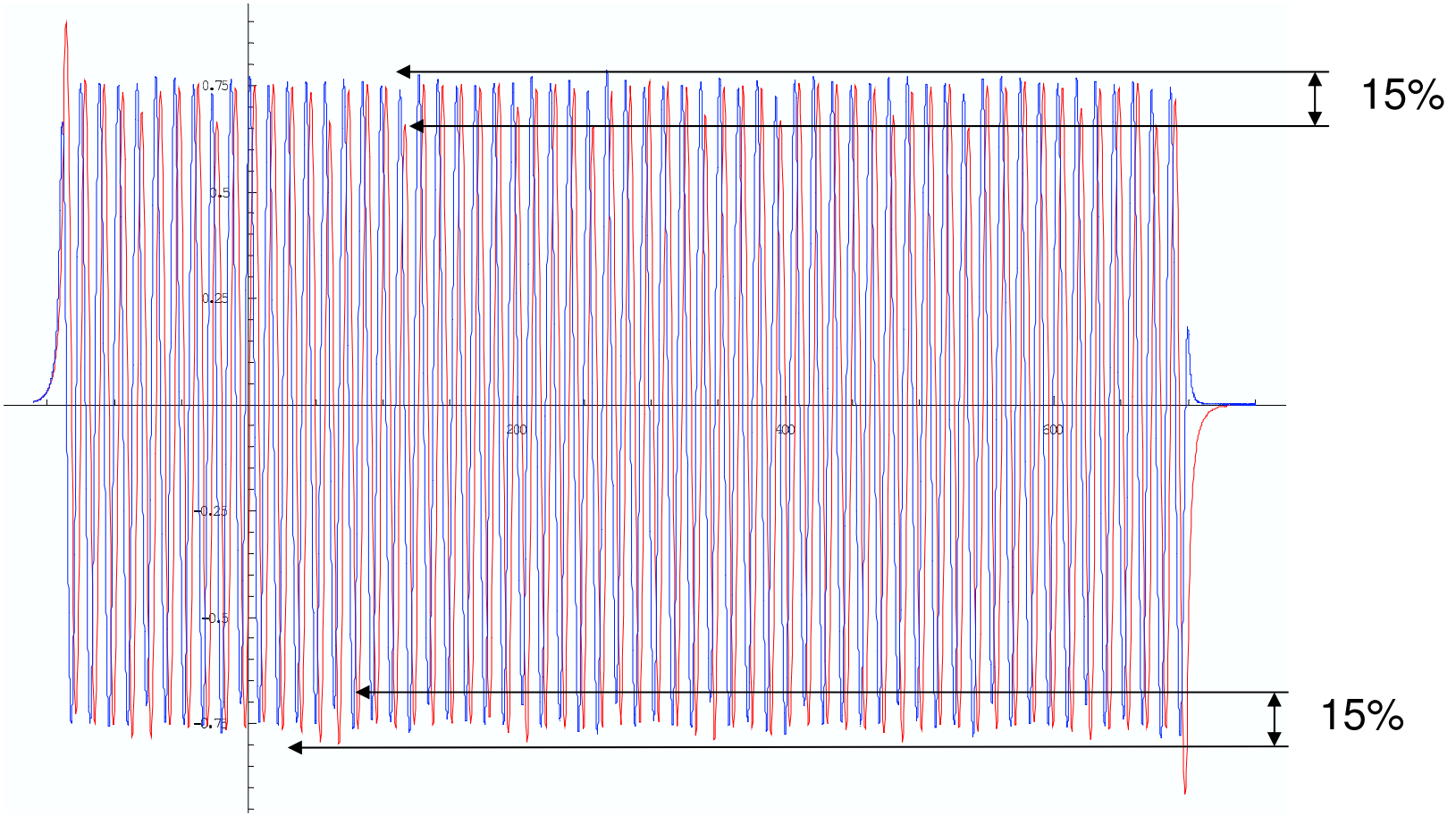
Range of Measured Peak Fields

- Field errors measured from SC magnet model



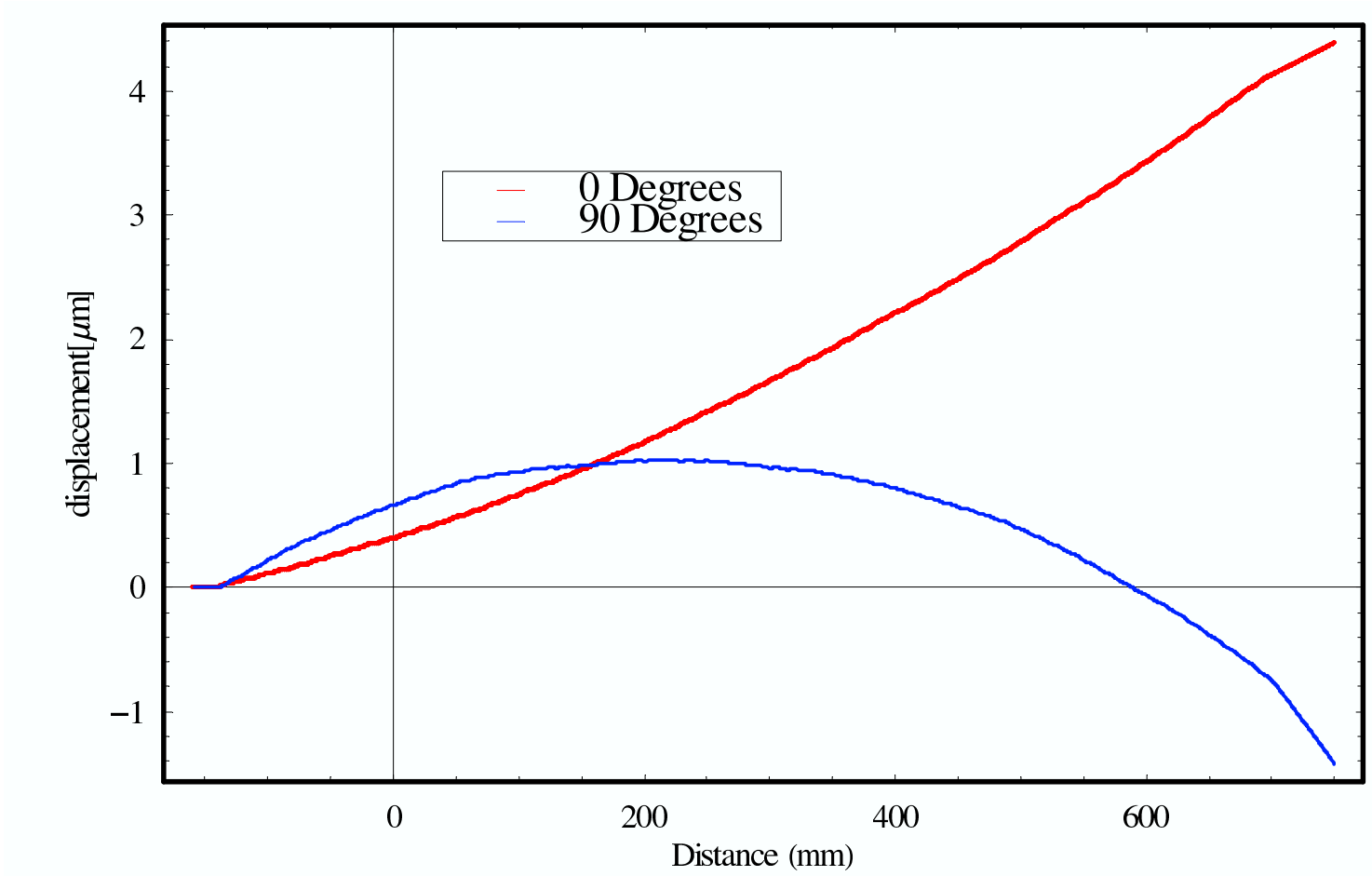
Created full magnet models with errors (PPM Design)

- ΔB Peaks 15% - on axis 1m long



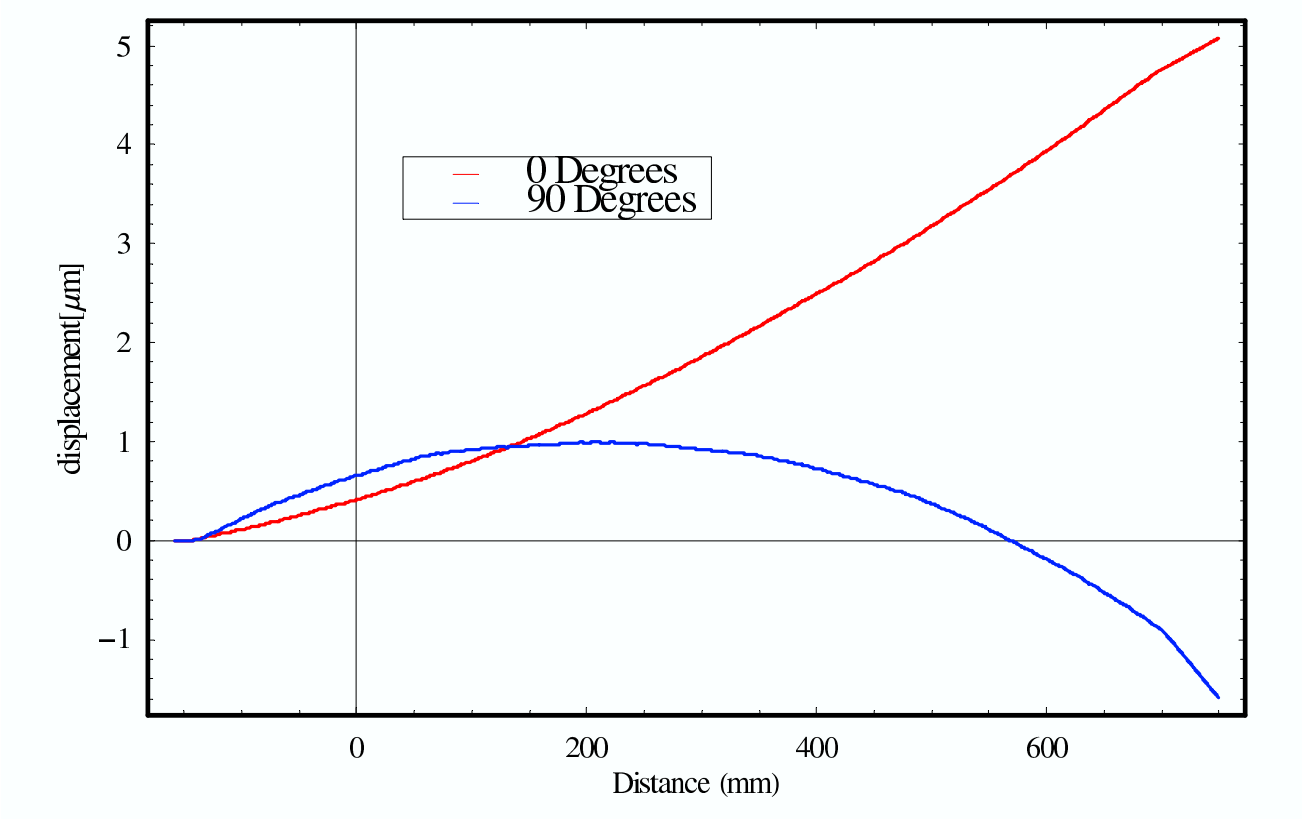
On-axis trajectory – 250GeV

- No correction, no “end field design”



Trajectory 0.5mm Off-Axis – 250GeV

- No correction, no “end field design”,
- very little difference
- Therefore correcting the on-axis trajectory should be ok

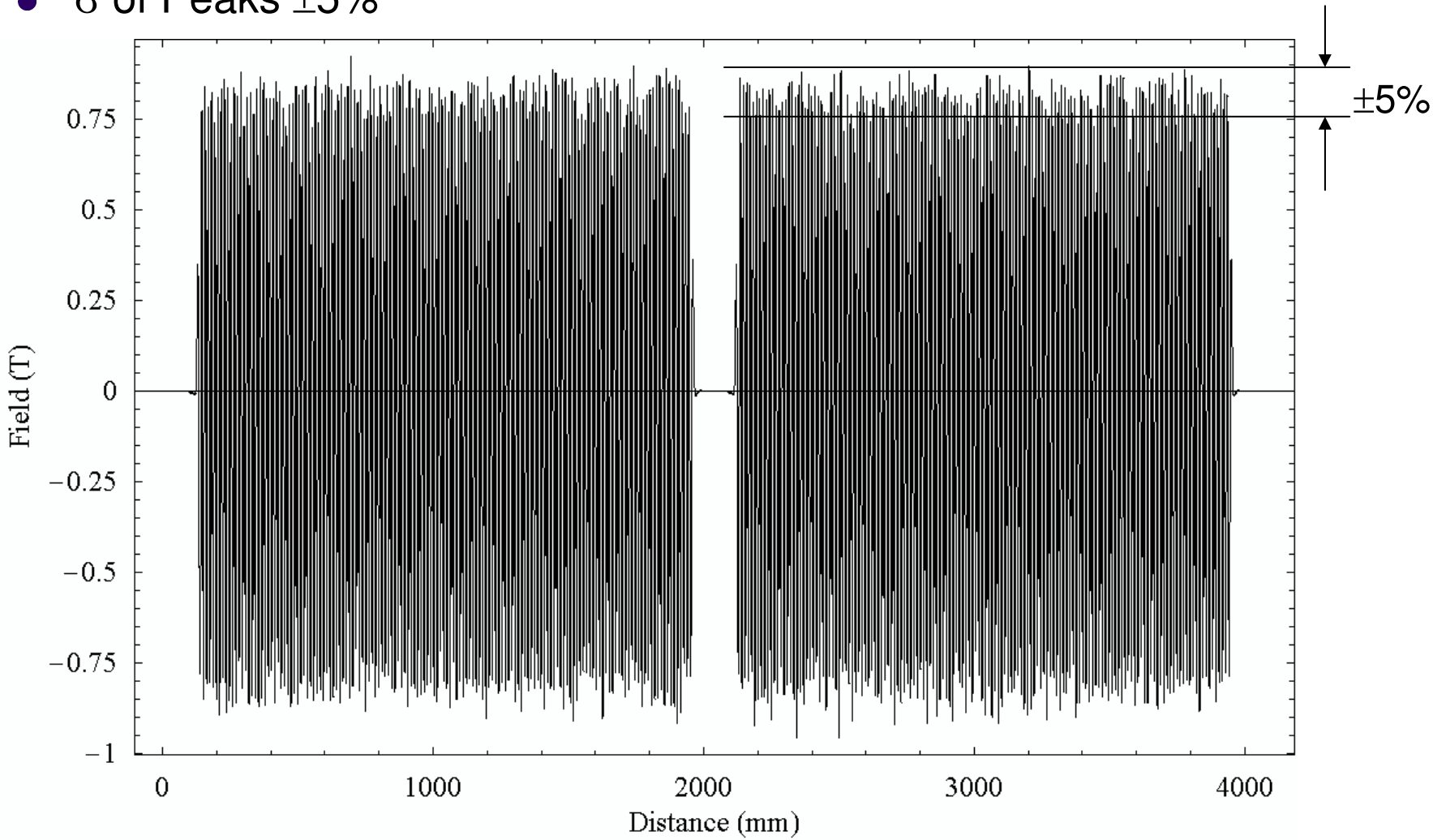


Full Length Undulator Modules

- Current design has 2x2m long undulators in a cryo-module
- Full magnetic modelling with many random seeds is *extremely* CPU intensive
- Based on 1m long undulator results we can create a random periodic undulator field and just look at “on-axis” field.

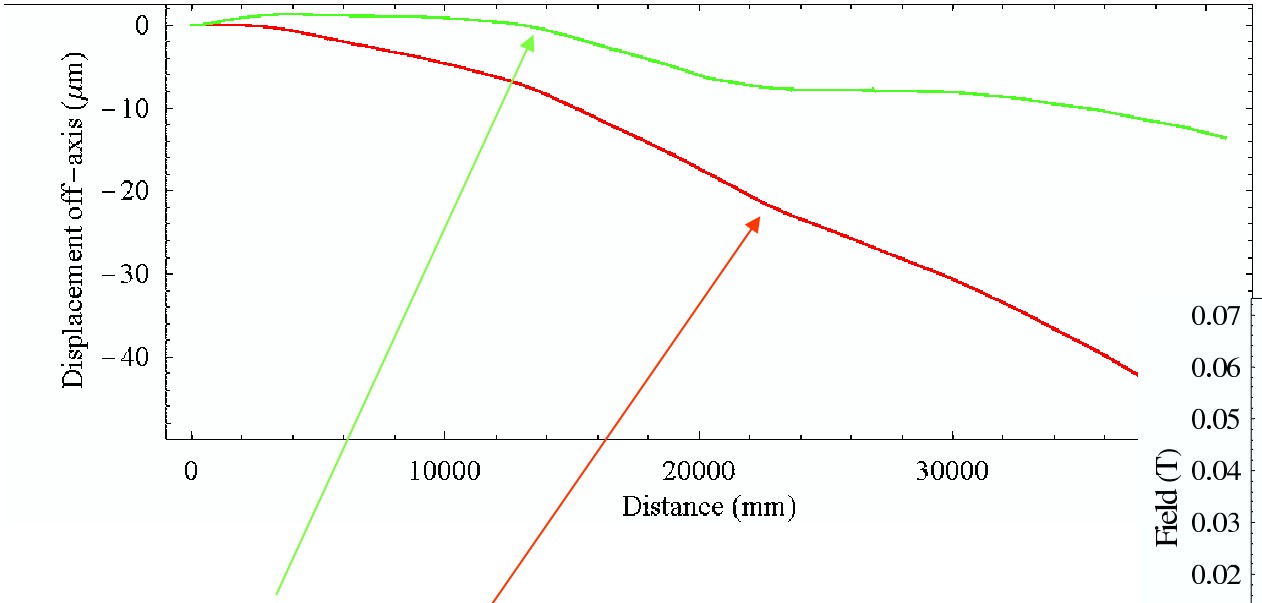
On-Axis field with Random Errors

- σ of Peaks ±5%

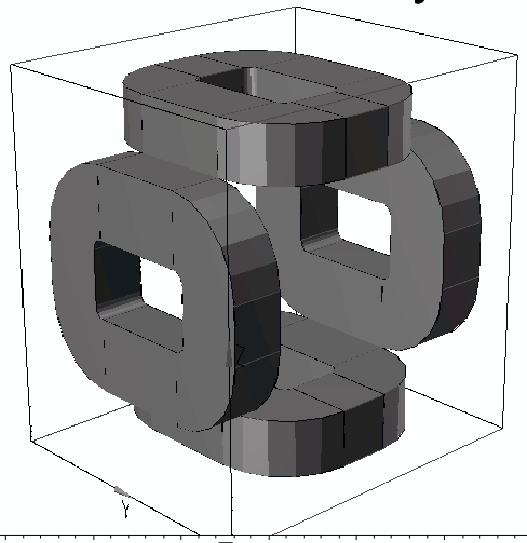


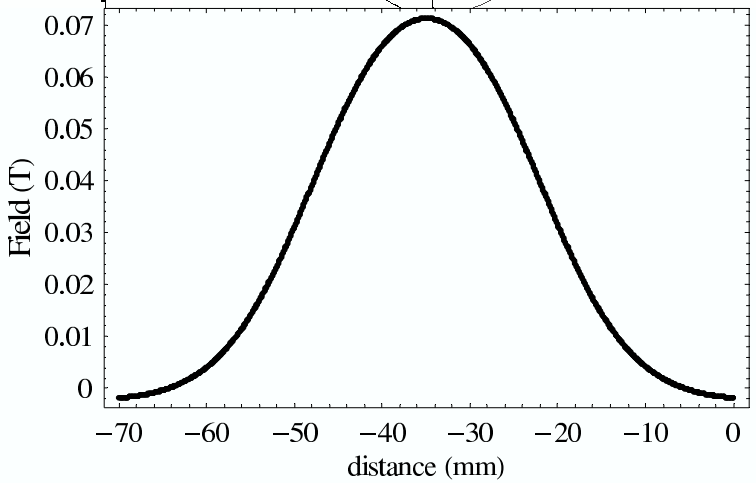
Corrector Magnets

- Small corrector Magnets were added at the start and middle of the cryo-module
- Field strength optimised to correct trajectory



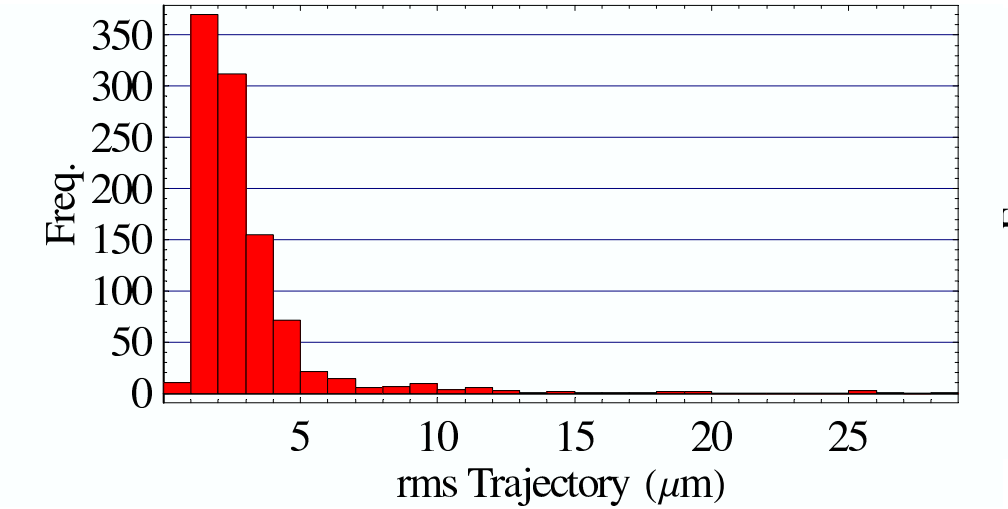
Good and Bad Trajectory (150GeV)

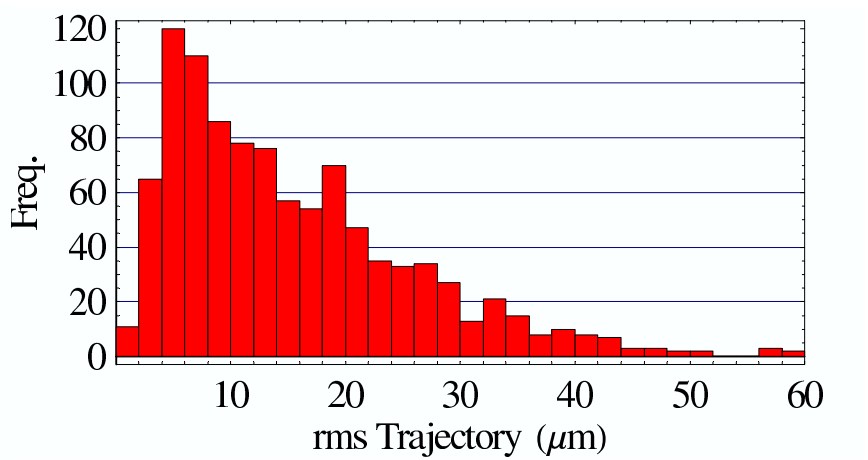




Results from 1000 random seeds

- The trajectory can be corrected to within a few microns over 4m
- (with no correction it's not too bad)





RMS trajectory of three modules

- No correction – 500 random seeds