B-Field Maps and Bdot Measurements

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MINOS Collaboration Meeting at Ely

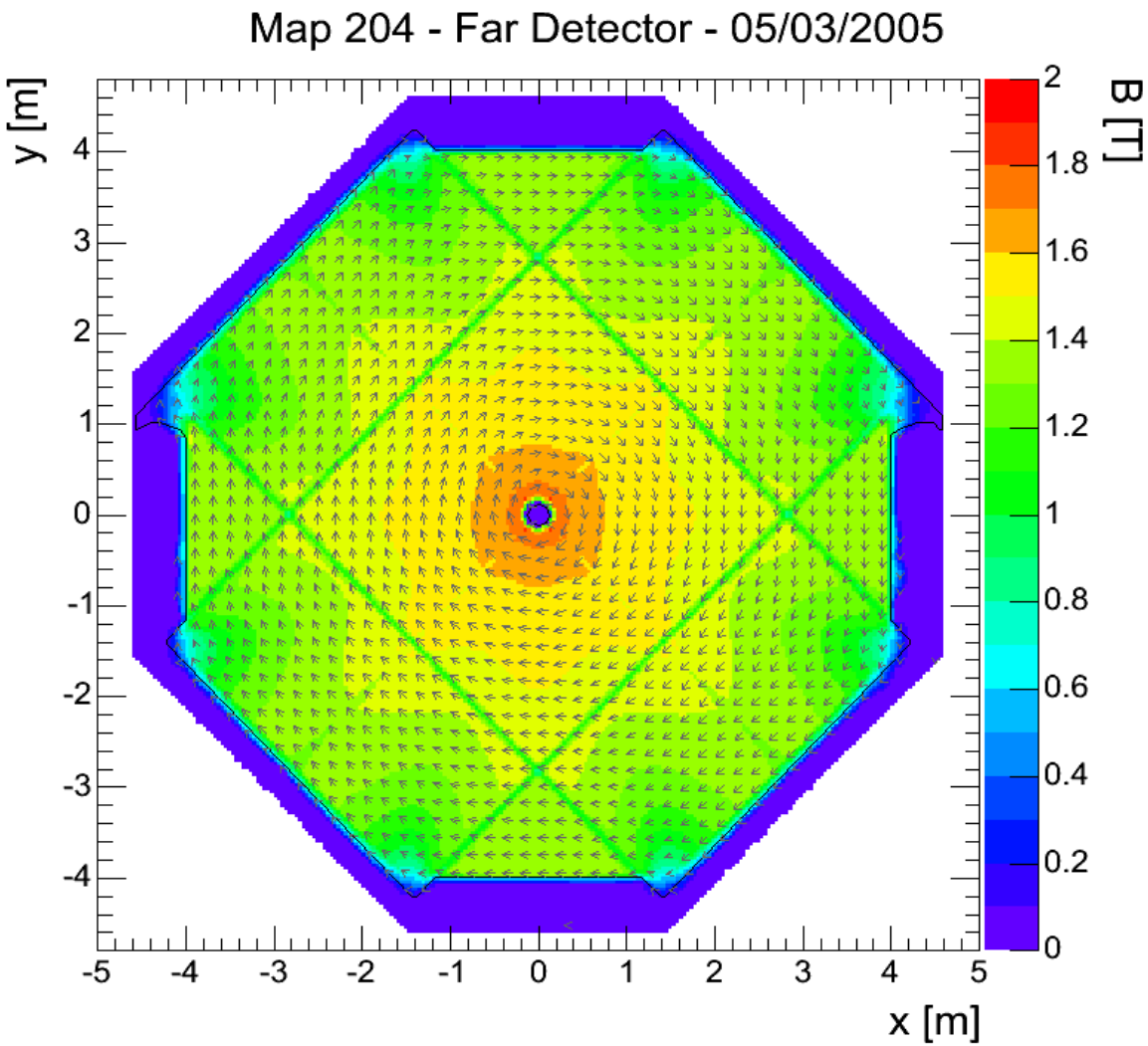
June 15, 2005

Talk Outline

- Bfield Maps
  - Recap from last meeting.
  - FD maps: end-effect and supermodule gap models.
  - ND maps.
- Bdot measurements
  - FD Bdot
  - ND Bdot
  - Toroids

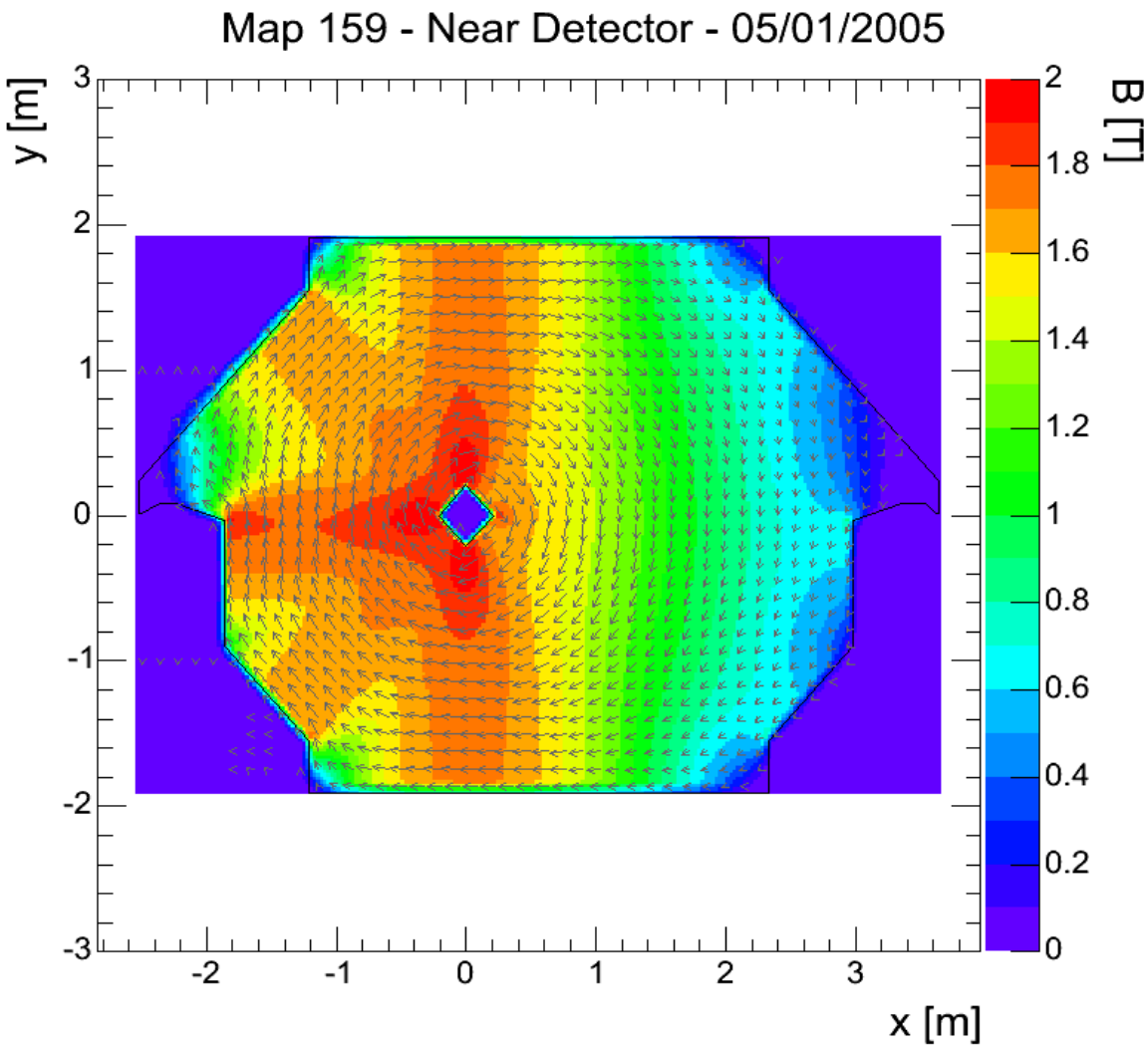
Bfield Maps Recap

- **Latest Map for FD is 204**
  - Reduced data in the air field.
  - Map cover all the steel.
  - Formatted map in MINOS xyz coordinate system.
  - Current is set to 15.2 kAmps-turns (190 turns x 80 Amps).
  - Variable slot model.
  - Mid-module model with ~300k elements.



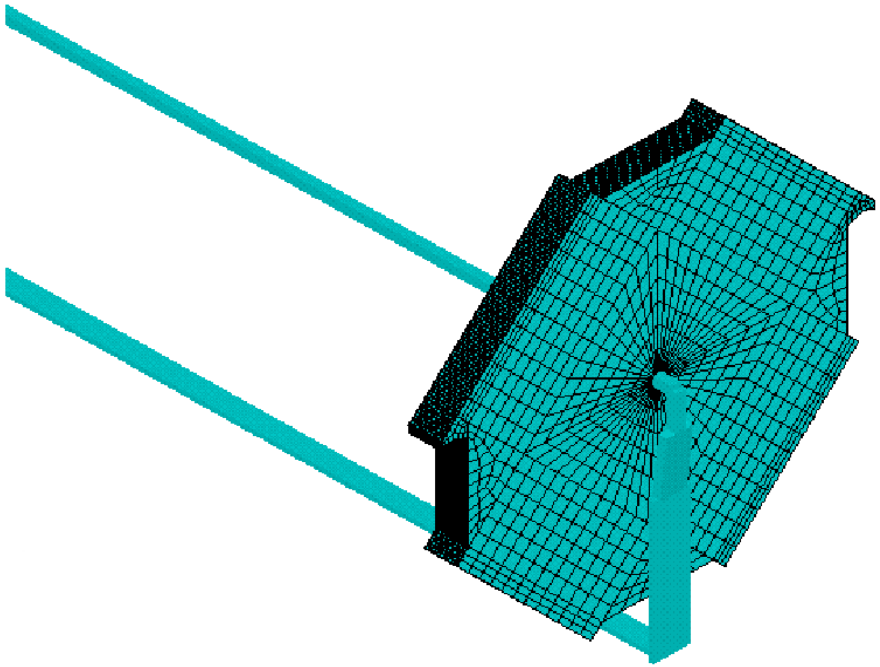
Bfield Maps Recap (II)

- **Latest Map for ND is 159**
  - Mid-module model.
  - 2D model.
  - B-H curve from MINOS steel.
  - Formatted map in MINOS xyz coordinate system.



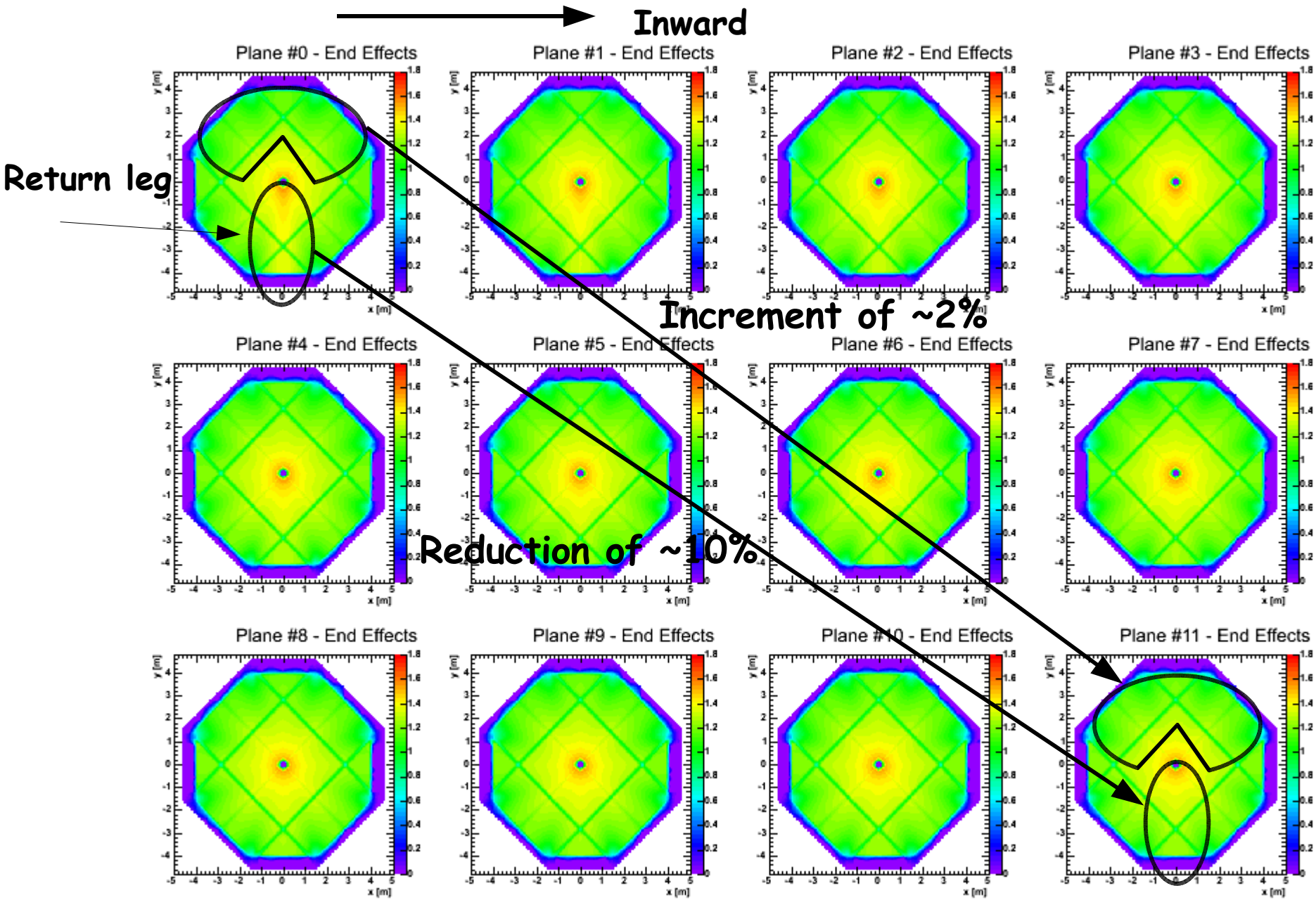
Coming new Bfield maps for FD

- **End-effect model**
  - Based in the latest mid-module model.
  - Twelve planes model.
  - 600k elements: takes 4 weeks to run and post-process.



Detector seem in the FEA

Coming new Bfield maps for FD – End-effect model



Differences between the end-effect and mid-module model

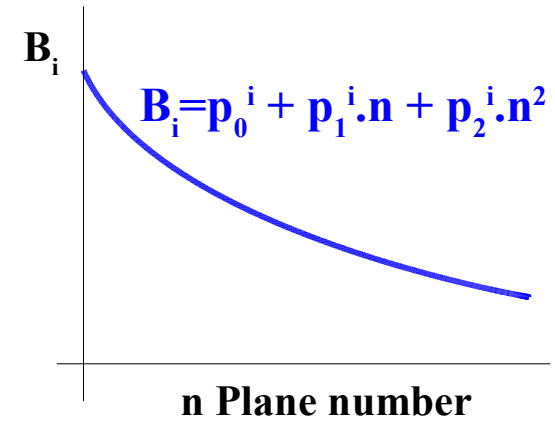
- 10% too low in field on average between the furthest in plane and the mid-module model.
- Currently, we are investigating the differences:
  - Mesh density.
  - Lower coil in mid-module model is square (0.2x0.2 m^2) and not rectangular (0.45x0.10 m^2) as in the end-effect model.
  - Adding more planes will not solve the problem.
  - Extract a typical plane from the end model, and give it the boundary conditions of the mid-module model and solve.

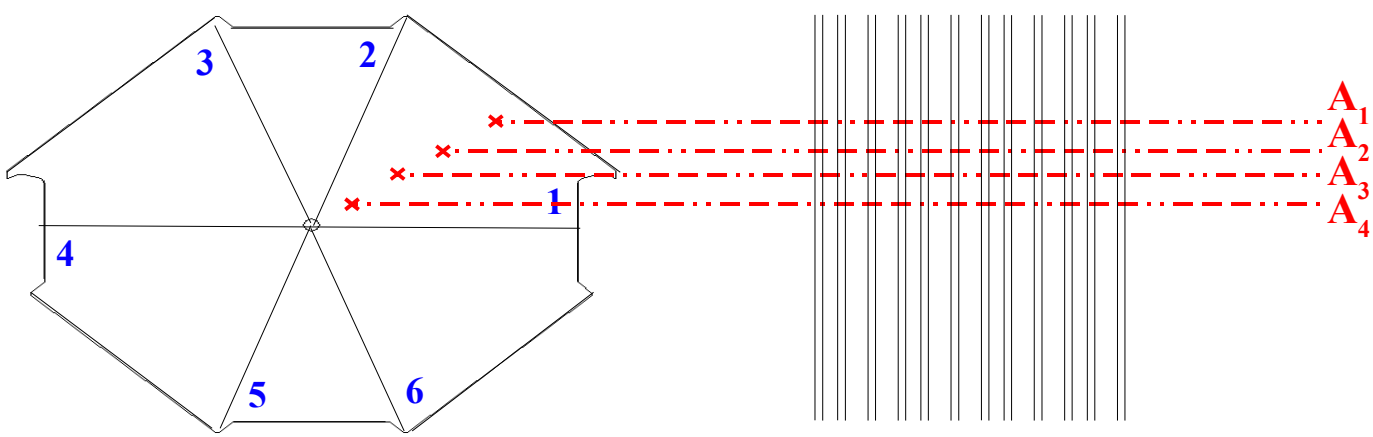
Implementation of the end-effect model in the code

- To have twelve bfield maps stored are not an option.
- One map plus an extrapolation model map could work:
  - Map 204 + Fit parameters Map.
  - A quadratic polynomial approximates well to the variations between planes.
  - Divide the plane in 6 sections.
  - Fit the variations of B across the planes in 4 different points.
  - Fit parameter map could have the following notation:

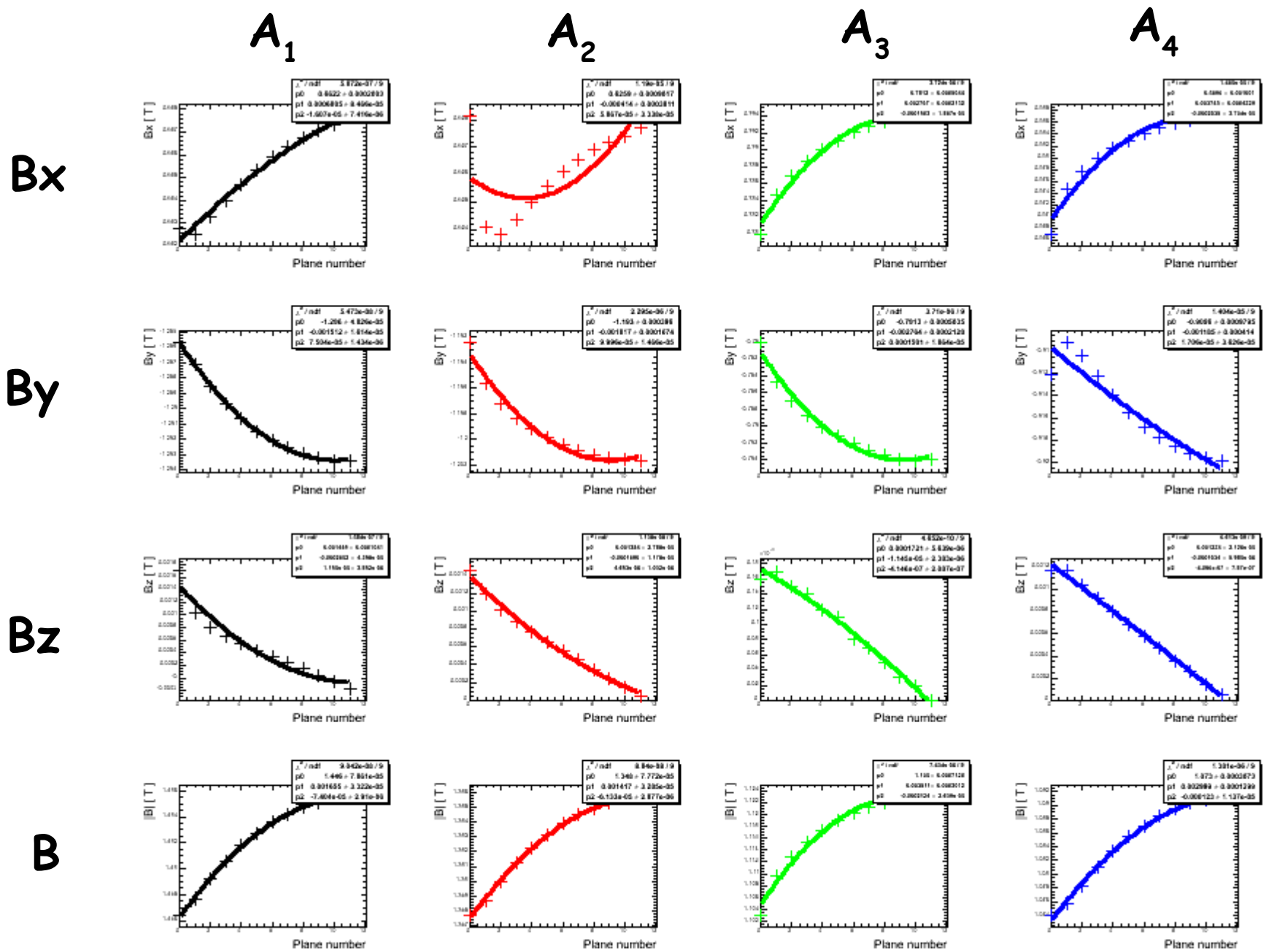
$$x \quad y \quad z \quad p_0^{Bx}\ p_1^{Bx}\ p_2^{Bx} \quad p_0^{By}\ p_1^{By}\ p_2^{By} \quad p_0^{Bz}\ p_1^{Bz}\ p_2^{Bz}$$

where p_i is the parameter "*i*" for each B component.



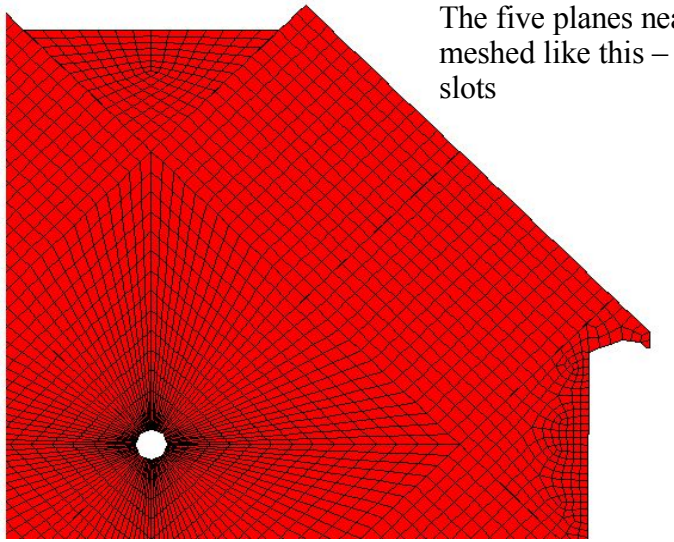


Coming new Bfield maps for FD – End-effect model

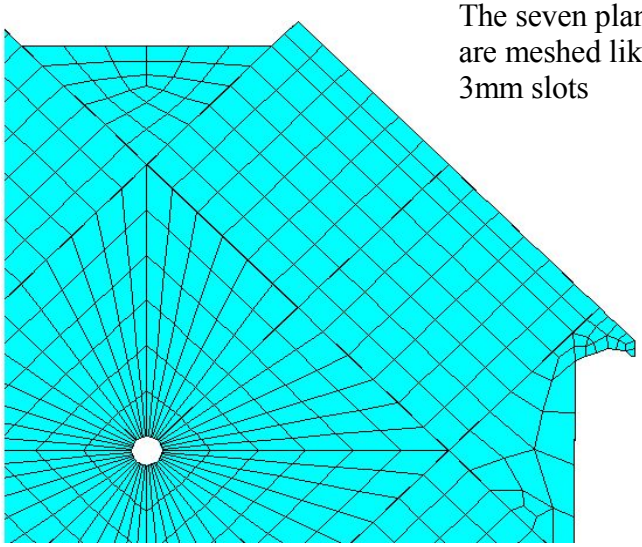


Coming new Bfield maps for FD – SM gap model

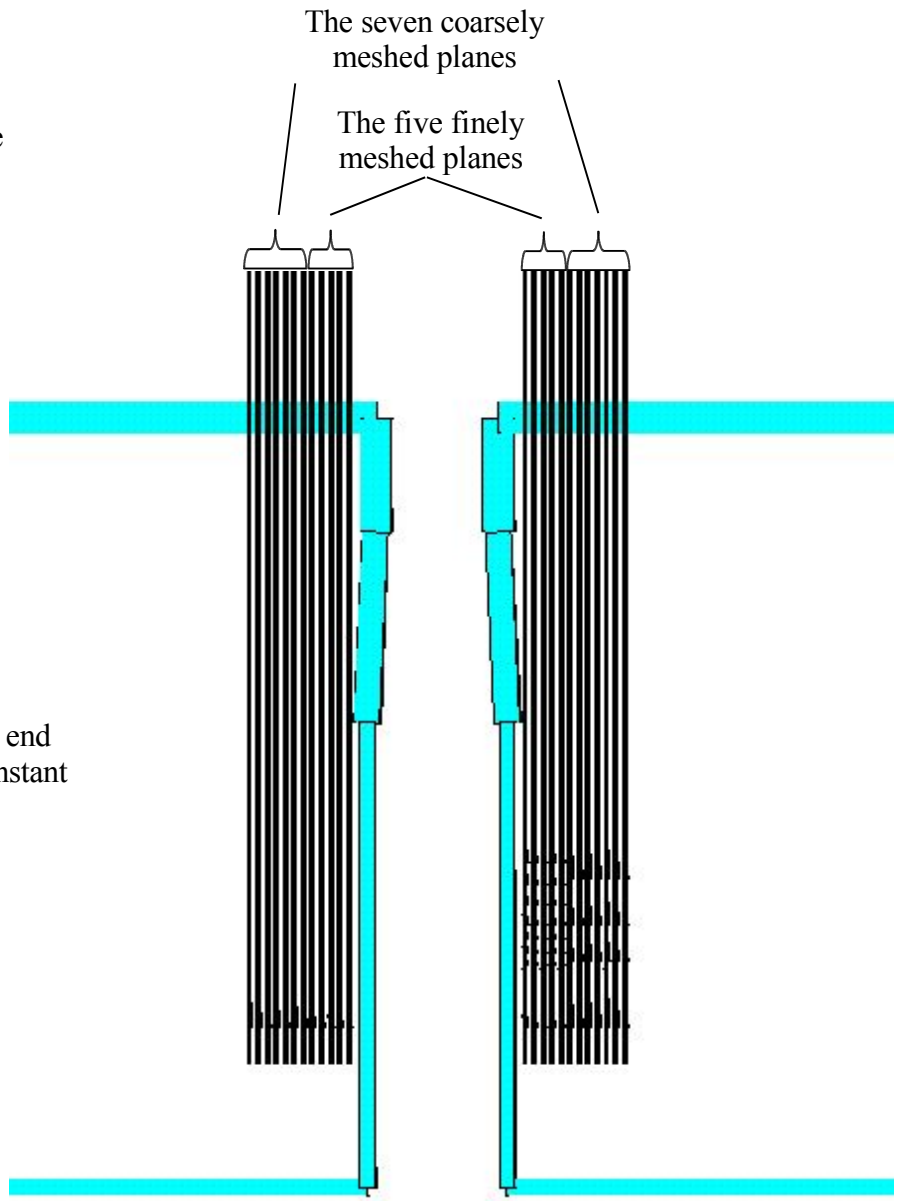
- Currently running (2 weeks), post-processing 2 more weeks.



The five planes nearest the end are meshed like this – gaps and variable slots



The seven planes furthest from the end are meshed like this – gaps and constant 3mm slots



BDOT System at the Far Detector

- Hardware and software running in both super modules.
- A complete raw data set taken only on SM2.
- Current offset of +/- 17Amps in SM1 power supply – bad relay in BDOT/DCS box. This will be fixed on fall.
- ADC calibration will be done on July. No interference with data taking.

BDOT System at the Near Detector

- Observed high frequency noises on the BDOT system from the magnet power supply. Large enough to cover BDOT signals.
- Tested several low-pass filters installed in a few BDOT boards.
- We found that a common mode filter makes possible to take BDOT measurements.
- We need to take ~300 BDOT boards off the detector. About 90% of them can be removed while the coil is running.
- The board will be retrofitted by undergraduates at W&M.
- Ground connections need to be terminated at the PC and BDOT boards then boards will be connected to the ribbon cables on the detector. 90% of this job can be done with the coil running.
- We would like to know if we have authorization to work on the boards so we can make plans with the students for a trip on July.
- Recently noticed that PS current was sometimes a bit low: W. Jaskierny adjusted the PS regulator. The water temperature may have gone up or the 480 VAC line voltage may have gone down requiring this adjustment.