Field Mapping: Magnetic axis of FC2, SSU & SSD

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Video Conference

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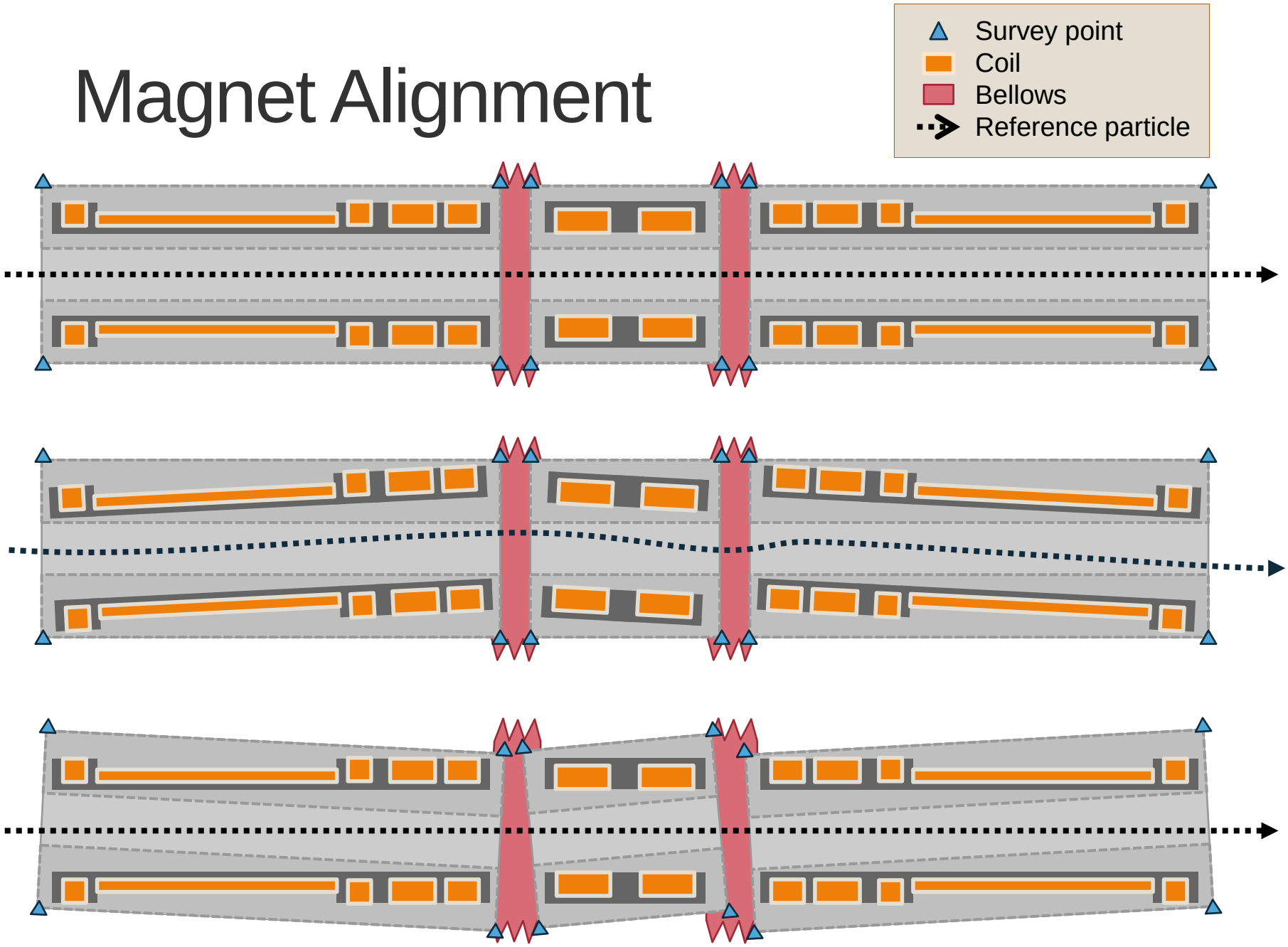
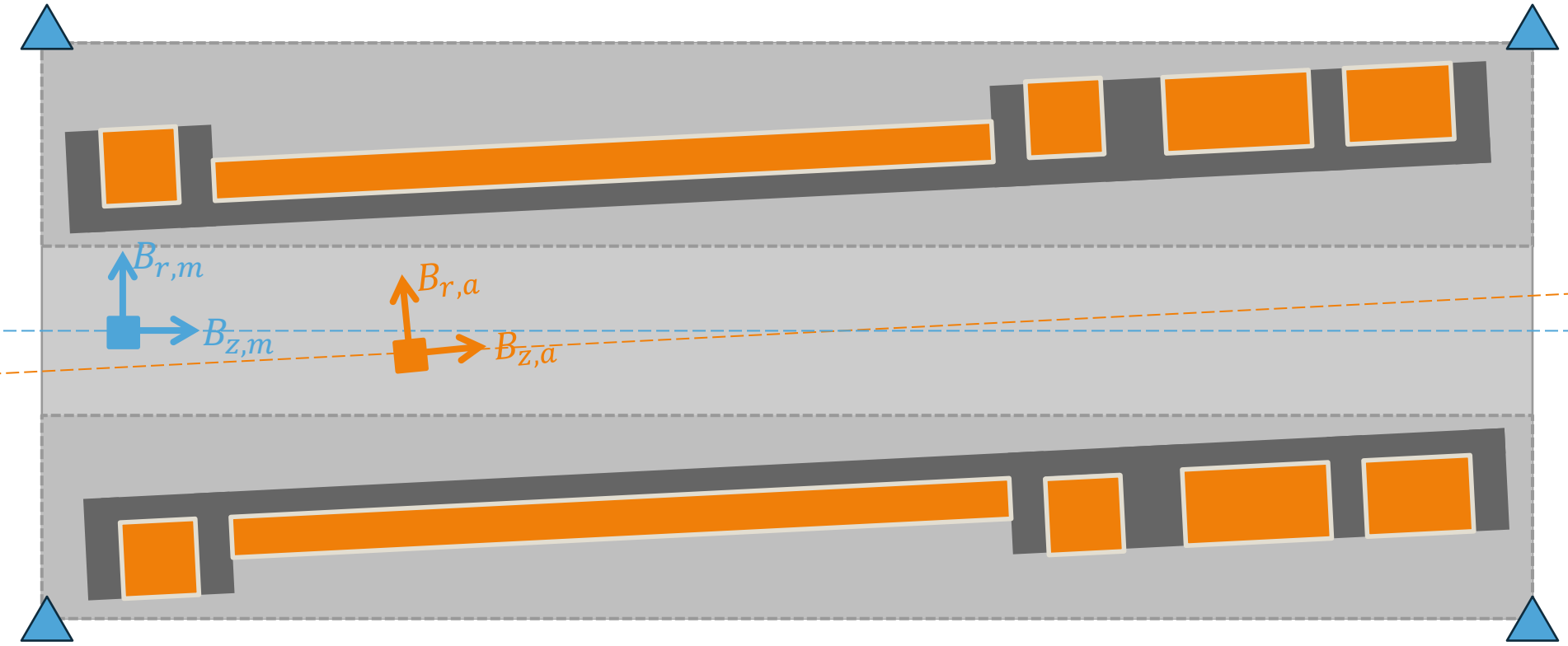
Magnet Alignment



Magnet Alignment



$B_{r,m} \neq B_{r,a}$

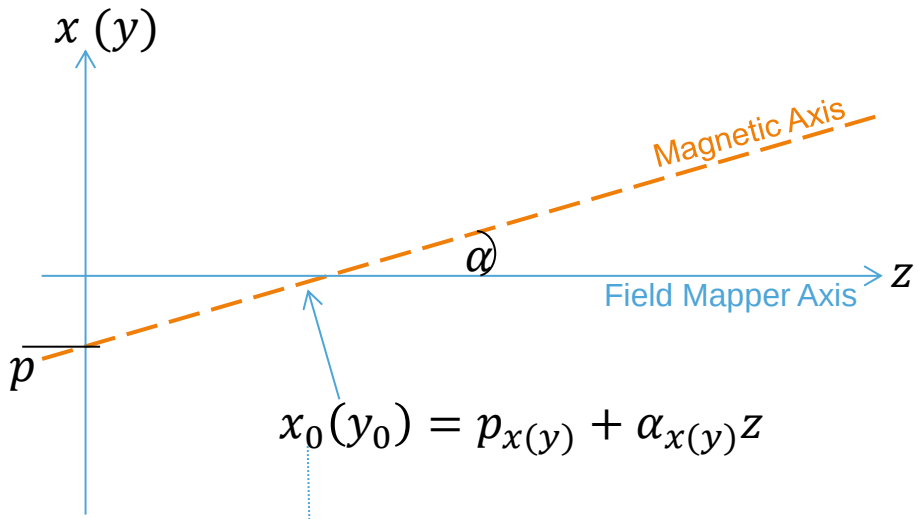
$B_{z,m} \neq B_{z,a}$

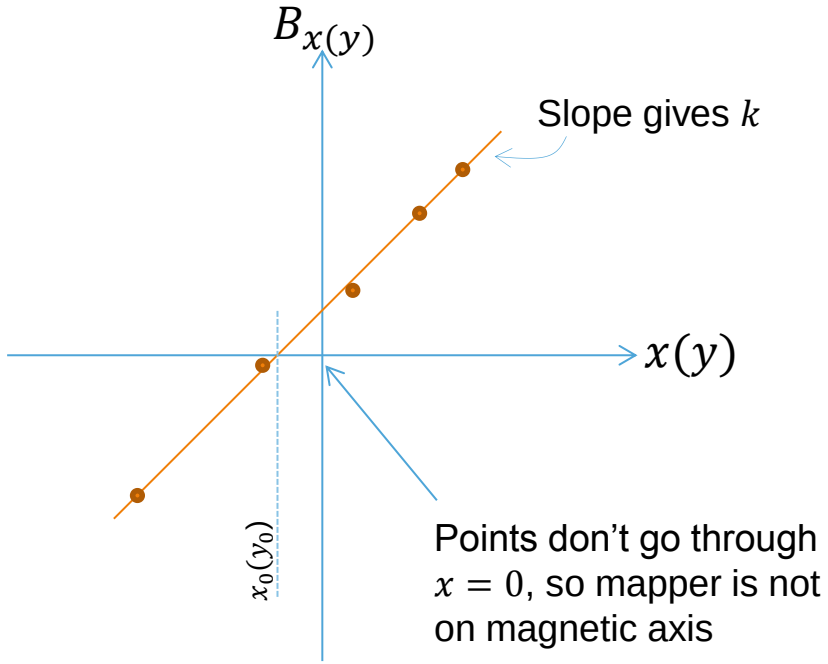
$B_{r,m}$ and $B_{z,m}$ are measured by the field mapper

$B_{r,a}$ and $B_{z,a}$ are the true axial values

→ Find the angle and offset between these values

Method #1



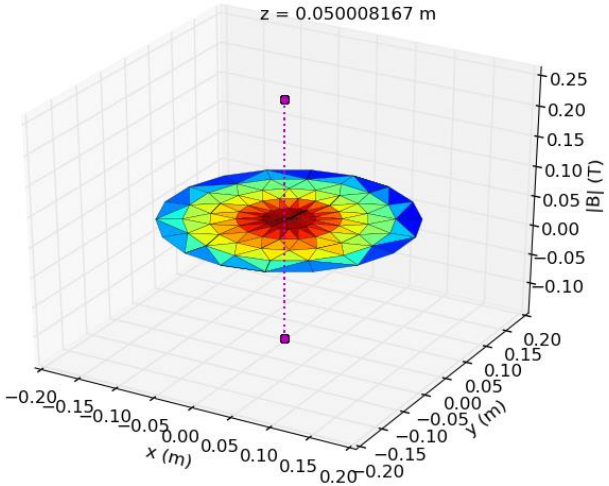


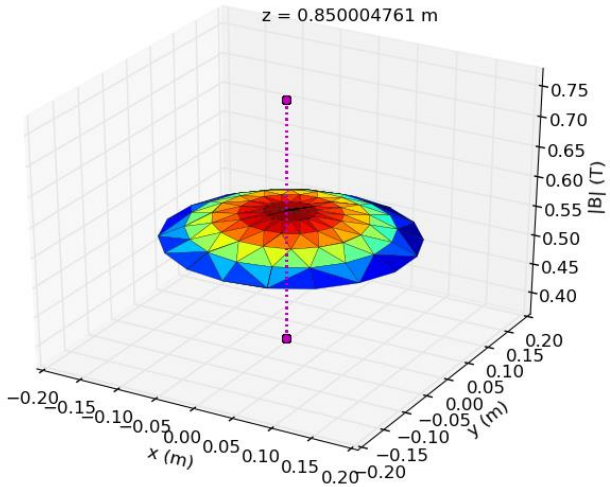
- Magnetic axis is tilted w.r.t. Hall probes/mapper
- Measure field in mapper system
- At each z, look at (x, B_x) and (y, B_y)

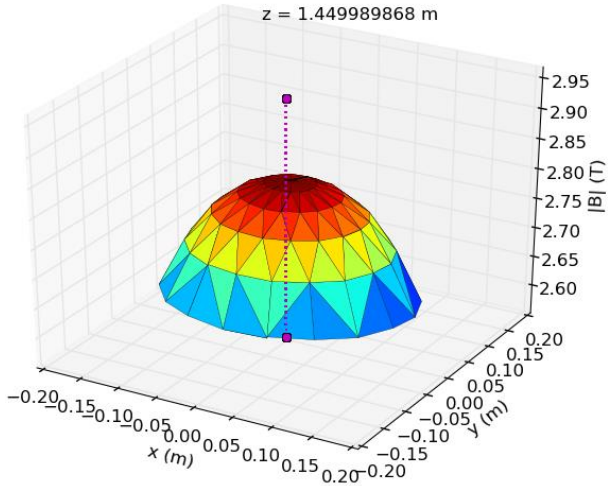
- In x, mapper measures $B_x = k(z)(x - x_0) + \alpha B_z$ (and similar for y)
- Find k at each z, then find best p, α across all measurements.
- p, α define the magnetic axis

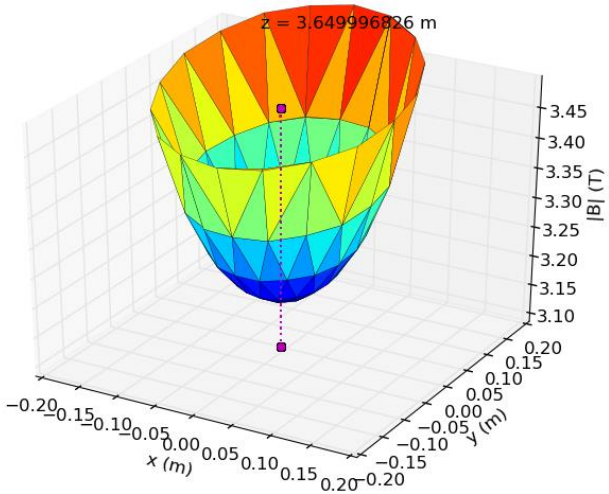
Method #2

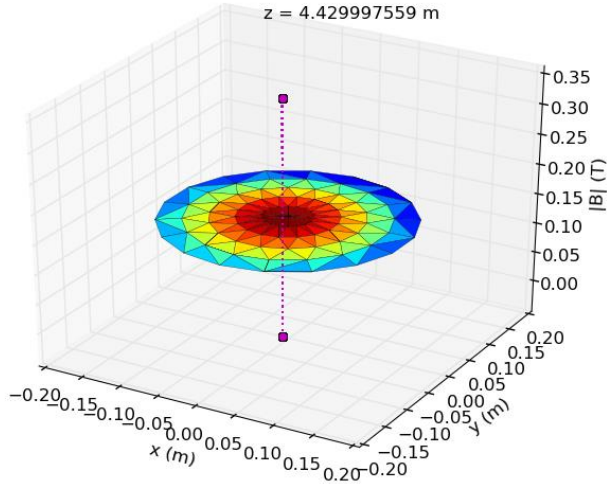
- Look at $|B|$ at each z.
- Max/Min at axis
- “Bowl” is shallow
  - Difficult to fit given probe radii on mapper







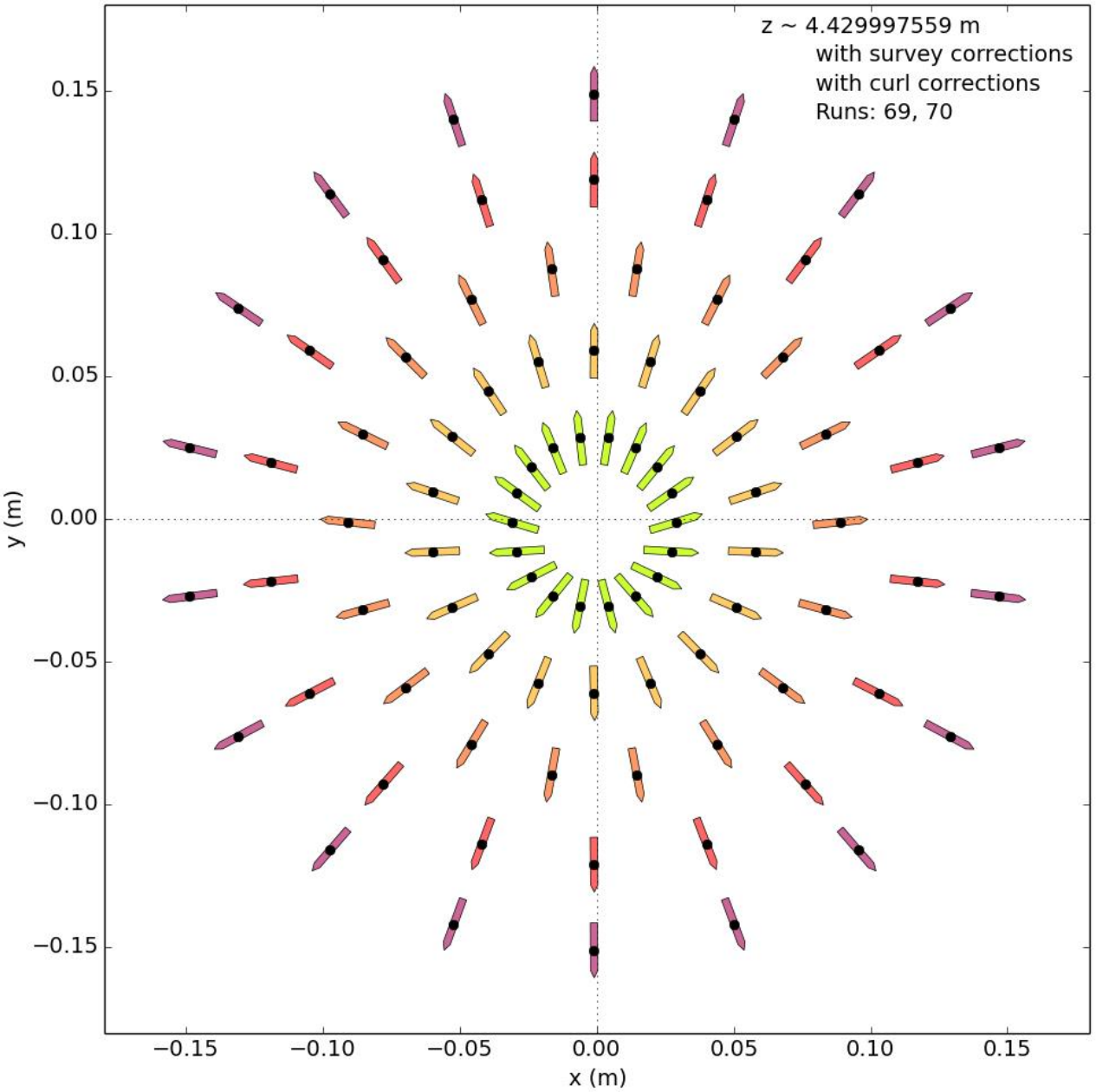




Plots are SSD data

Method #3

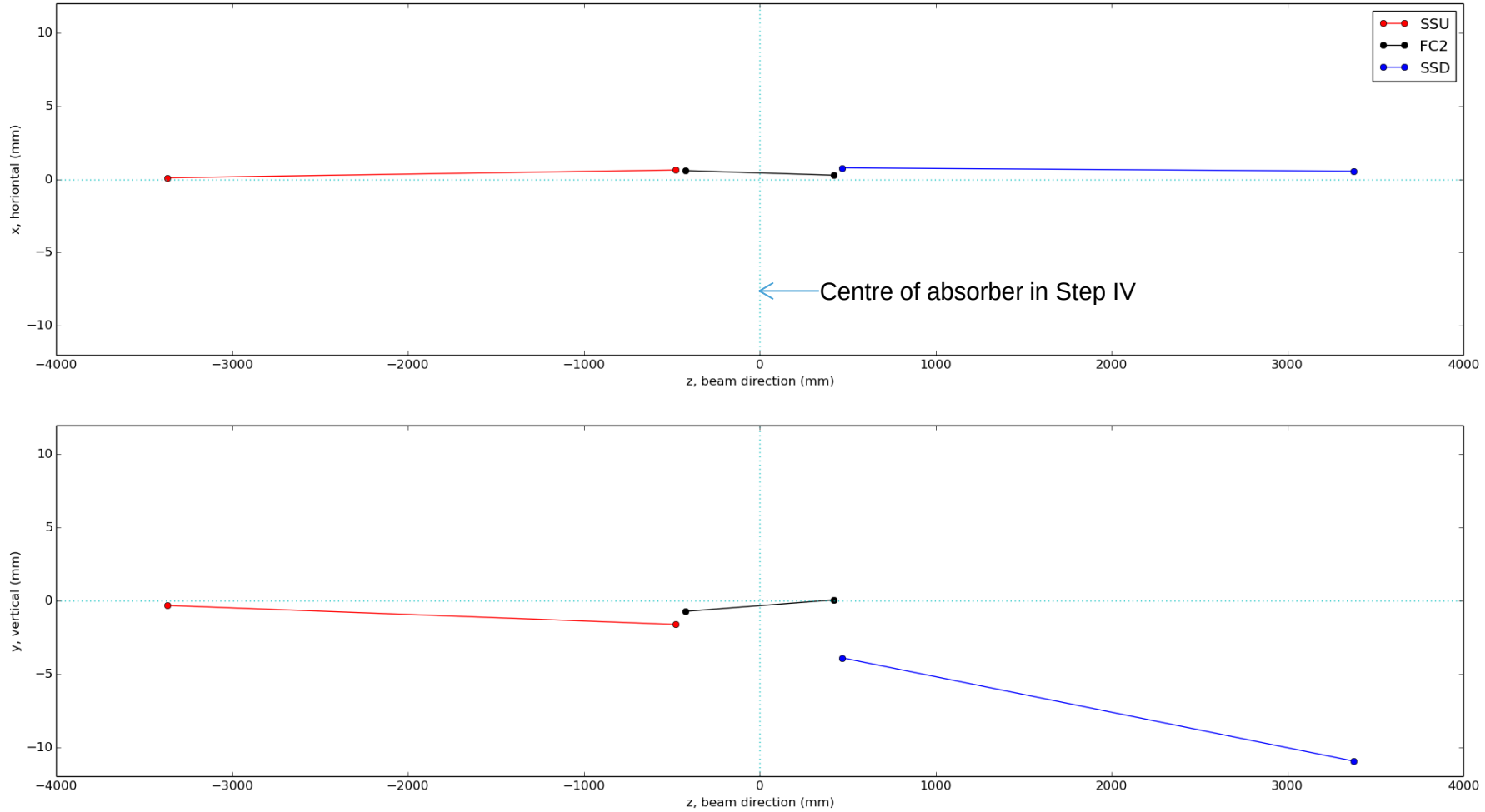
- Look at the transverse field vectors at each z.
- Vectors *should* all point to axis.



Plots are SSD data

(Preliminary) Results

Magnets aligned along mechanical axis. Lines show magnetic axis of SSU, FC2 and SSD.



NB: Error bars are on the order of 0.5 mm

Consequences of (Preliminary) Results

- C. Rogers carried out MC study using predicted misalignment.
  - Worried parties are encouraged to look at this
  - Beam will feel a kick → small increase in emittance seen in MC
  - Further study ongoing
- Have looked and looked ***and looked*** for errors in analysis, but everything (so far) appears sensible
- SSD has “worst” axis alignment, but can’t be ruled out given what’s known of its construction

- **The plan**:
  - Align magnets along their mechanical axis
  - Confirm magnetic axis with beam
  - Continue MC study
  - Improve field maps for MC study → proceed with coil dimension fits from magnetic measurements
  - Produce MICE note