Spectrometer Field Mapping –Thoughts

Discussed at Analysis meeting 22nd Jan

But no software or spectrometer person present

Nothing new since then except (possibly) a volunteer

Some requirements:

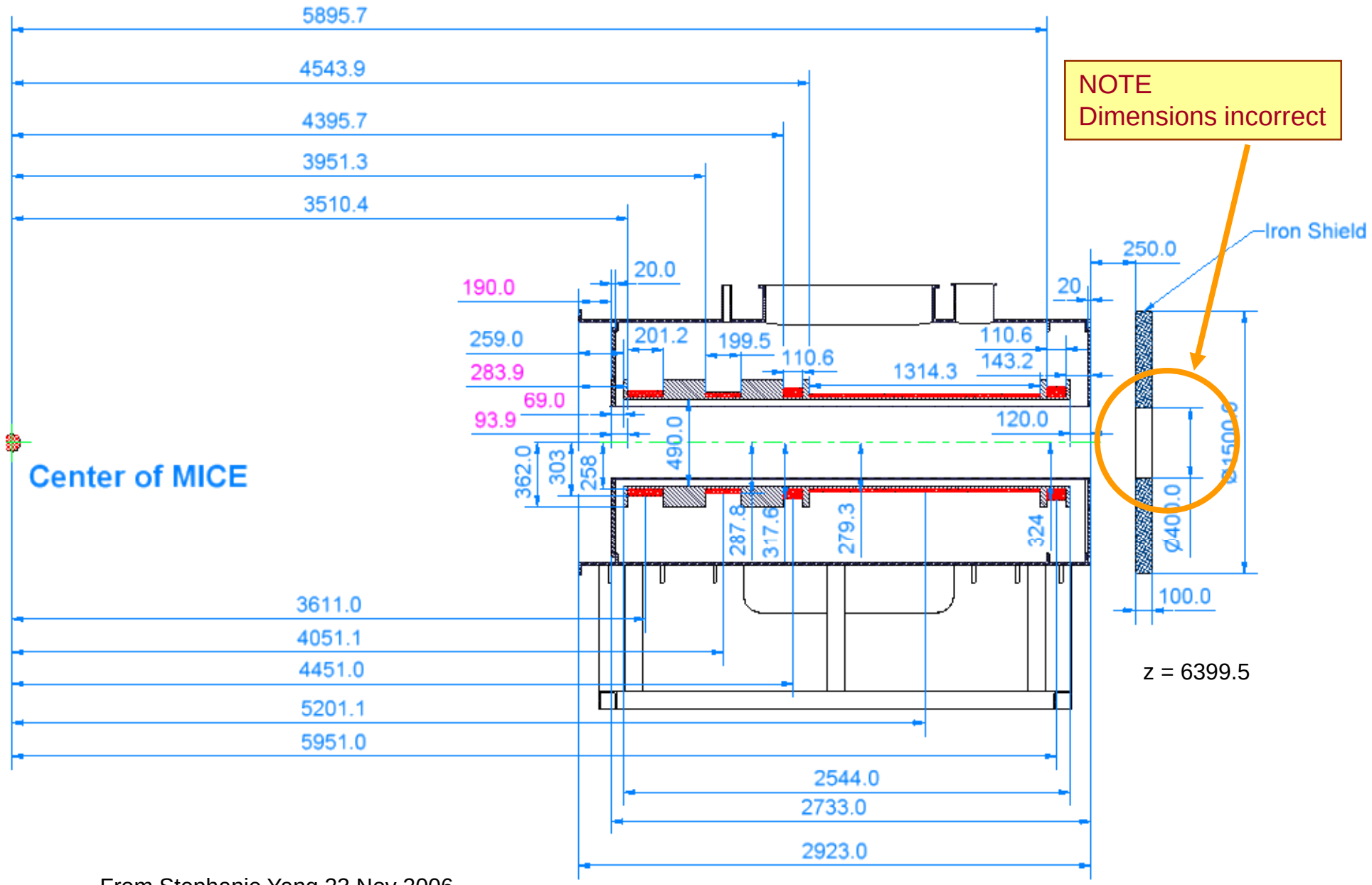
1. 'Good' field region flat to 1% over > 1m

   To prevent multiple solutions to track fits (M.E.)

2. $\sigma(B) / B_{max} < 1 / 10^3$

   General MICE criterion

To be discussed & formalised



From Stephanie Yang 23 Nov 2006

Tracker solenoid mapping – some considerations

- ***Many*** configurations of currents in the 5 coils of each solenoid
  - Momentum ***x*** beta function ***x*** flip/non-flip at least
    - can think of others
  - Maybe also different 'good' fields:
    - scaled as B = 4T ***x*** *p*/200 or 4T for all *p* – *tbd*
  - Most (not all) configurations require changes to match coils only
    - Some small influence on 'good' field region – *tbd*
- ***Cannot possibly to map all these cases***
  - ***in any case we don't yet know what we want***
  - e.g. FC's & CC's will undoubtedly be somewhat different from spec.
  - Different match coil currents

- **Maxwell's Eqn's** apply; everything linear
  - *Except* for the iron shield(s)
    - (hard to compute even if linear)
  - Effect of shields does not propagate far into solenoid
  - Adjustment of ***J*** in end-coil #1 sufficient to 'flatten' B_{good}

- Differences real ➔➔ computed fields due to exact details of windings (+alignment)

- ➔ ***Mapping = Calibration of some (FE?) software to compute fields***

- ➔ ***Software (G4Mice etc.) uses computed fields***

Possible Mapping / Calibration Procedure

1. **Measure** real solenoid (+ 1 shield plate)
   - Resolution – *tbd*
2. **Compute** field map using best knowledge of true dimensions of coils
3. **Confront** [1] & [2]
   1. Make global **Quality Factor**, (e.g. chi^2) – *tbd*
   2. Adjust alignment for best ***QF***
      - small translations & rotations
   3. Is ***QF*** good enough? – *tbd*
      - NO ➔ back to [2] & figure out why; improve software
      - YES ➔ [4]
4. **Repeat** from (1) with different currents to look for non-linearities
   - Worth checking at this point with different software?
5. **Package** software for G4MICE *et al.*

- *Significant amount of work for dedicated person (or people)*
  - *Volunteer?*