Nov 19, 2019

Probe calibration:

- What procedure was followed to measure and correct for probe offsets?
  - Does the offset change/drift over time?
  - Does the offset change/drift between power cycles?
  - Was the probe placed in the zero-field box, calibrated, and then placed into the measurement jig with no other changes to the measurement device? (That is, no power cycling, no plugging/unplugging of the probe, etc?)
  - Where was the probe 'zero' physically measured?
    - On the target platform near the magnets, yoke steel, etc?
    - Were any of the magnets on at the time?

For each (Bx, By, Bz) vs. (x, y, z) data point:

- How long did it take for each field measurement point to settle?
  - I gather the raw data were noisy, so the system took data for a while and then the (Bx, By, Bz) values were extracted from the central value of a resulting Gaussian spread?
  - What is the width (std. deviation) of the Gaussian?

What is the error on the (x,y,z) data points vs. the Hall coordinate system?

- If you are measuring in a local coordinate system, how did you locate that coordinate system in the Hall?

Each raw dataset taken should be clearly annotated with the following:

- Date and time (start : finish)
- SHMS angle and HB setting
- HMS angle and Q1 setting
- Target coil settings
- Whether the data were taken before or after the target was repositioned by the Survey and Alignment group.

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My understanding is that the bulk of the main field data were taken before the target was repositioned by the Survey and Alignment group. The statement from Chris Curtis to me was that it was roughly a 3 mrad pitch adjustment that raised the upstream part of the main coils roughly 3 mm.

*** That is not 'official' though -- it is just a rough estimate ***

*** Confirmation must come from directly from the Survey Group ***

Jixie spent an evening after the above target shift and re-measured a limited set of data as a cross check.

- A description/summary of what was done here would be useful.
- An earlier presentation indicated the presence of a large steel level near the probe location.
  - It was not clear if that iron mass was still present during some of the field measurements?
  - Clarification would be good.

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Clearly summarize the analysis approach:

- What was done to convert each measured data point to a final data value?
  - Note corrections/calibrations applied to both the field components and position.
  - Clearly indicate units and what coordinate system is in use.
  - Clearly indicate if a different process was followed for a different dataset.

Representative error estimates:

- What are estimated uncertainties on the measured field values and position values? (Along with data or discussion that supports the estimates.)
- Pick a few points and propagate the errors through your calculations.
  - How do they impact the final field gradient? Particularly as expressed by
    - By component, and
    - in-plane (Bx, Bz) field angles?

Cross checks:

- Were there any repeated measurements taken?
  - ie. Same spectrometer configuration (angle, magnet settings + same target field settings)?
  - How do they compare?

- How many measurements of the probe baseline were measured?
  - How do they compare?

- Plot the difference between the measured data (after corrections) and the TOSCA model for a particular configuration.

- For each setting that overlaps Murchhana's measurements
  - Compute the angle between the (Bx, Bz) vector vs the beam axis.
  - Plot:
    - [(angle between that vector) - (angle Murchhana measured)] vs z

Next steps:

- Assuming the above data are sound and make sense, then we need a way to model/interpolate between the data taken to find settings for all of our productions kinematic conditions.
  - How will this be done?
  - What is the model used for the parametrization?
  - It is only multi-dimensional linear interpolation, or is that just a first step?

- Whatever the model (interpolation/fit/whatever), it can be readily tested/ verified by picking pseudo-data points from the TOSCA models using identical granularity to the real measurements, and seeing how well the interpolated values match the 'real' TOSCA values.

- Demonstrate how the data-driven model differs from the TOSCA simulations.