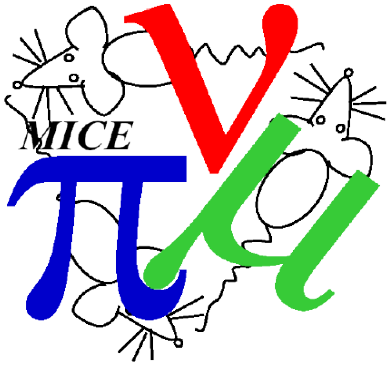
MICE Surveys



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Overview

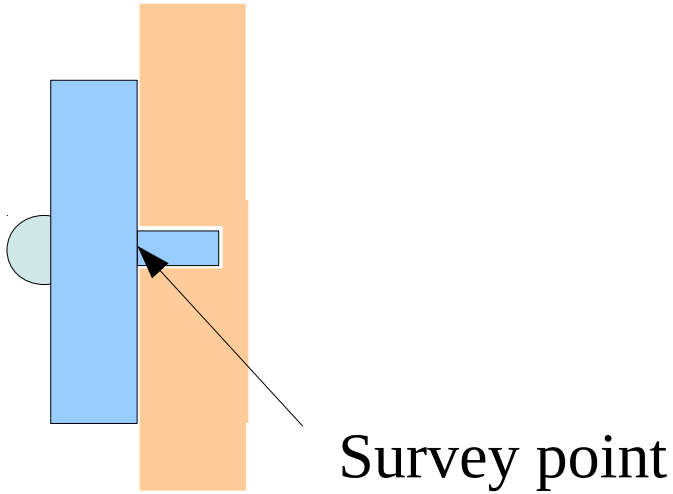
- Mis-processing of configuration data poses significant risk to MICE computing effort
  - Mis-processing of survey data can lead to misalignment of equipment in software
  - This is very difficult to resolve in analysis
  - E.g. mis-placement of TOF is virtually impossible to unravel
- We need a robust process in place to
  - Guarantee that we know the position of objects correctly
  - Enable experts to go back to raw survey data and cross-check if there is a problem

Context

- All survey raw data prior to 2012 is now lost
  - Left with a series of MICE notes that may or may not make sense
  - Unable to reconcile emittance analysis paper with Monte Carlo
  - For beamline this is uncomfortable
  - For cooling channel this would be a disaster
- New survey data post-2012 uses
  - Different surveyor
  - Different coordinate system
- Physics should be the problem, not bureaucracy
  - Incorrect bureaucracy gets in the way of physics

Technical Specification (1)

- Survey is performed using Absolute Distance Measurement
  - Use speed of light in air to infer distance
- Survey is to centre back point of survey nest
  - e.g. centre of front face of the hole
  - If the survey nest is glued, survey will be to the front face of the glue



Technical Specification (2)

- Equipment owners are responsible for
  - Installing survey nests
    - Must be labelled
  - Survey nest identifier should be of form
    - <Equipment name>A
    - <Equipment name>B
    - Etc
    - e.g. TOF1A, TOF1B, etc
  - Understanding relationship of survey nest to the physical equipment position
- This includes equipment currently installed in hall
  - E.g. beamline magnets

Coordinate System

- X is along beamline with beam travelling in positive direction
- Y is across beamline; positive points south (towards MLCR)
- Z is vertical with up in positive direction
- X axis is defined by taking least squares fit to quadrupole mirror plate apertures for Q4-9
  - Defines D2-MICE-beamline
- Define a line-on-floor approximately parallel to x-axis by looking at floor markings
  - Brass plate under D2
  - Sticker on floor in front of Q4
  - Sticker on floor in front of Ckovs
- Z-axis is defined by
  - fitting a plane to line-on-floor and D2-MICE-beamline
  - Taking perpendicular to x-axis in that plane
- Y-axis is defined by perpendicular to x-z
  - Right handed coordinate system (as in e.g. Geant4)

Survey process (1)

- Survey process
  - Surveyor places laser on a firm surface
  - Surveyor ties laser in to as many fixed points as are visible
    - Enter by hand unique ID of fixed points
  - Surveyor checks that fixed points tie in correctly
    - No outliers
  - Surveyor proceeds to add any survey targets to the survey geometry
    - Either as fixed targets
    - Or as moving targets e.g. tracing outline of a physical object, tracking a moving object during physical alignment
- Survey produces raw data in xit format
  - Requires proprietary Spatial Analyzer tool to extract
  - DL have a licence

Survey process (2)

- Survey raw data should be emailed to MOM and stored on MOM laptop
  - This is backed up
  - We may need a better storage for this sort of data
    - CASTOR eventually, but may be heavy handed for initially few kb of data
    - Would be nice to have remotely accessible data store
- Survey should be written up as a MICE note detailing
  - Unique ID of survey probe
  - x, y, z position of survey probe
- TBD: survey is integrated with software by geometry group

Conclusions

- Survey data has been lost
- Inconclusive surveys make life difficult
  - Sometimes impossible
- “Precision experiment” means doing this properly