Tracker Commissioning and Data Analysis

To Understand

Pedestals

Gain

Stability

- electronics configuration
- Temperature drift
- Power stability

Trigger settings

Calibration

- channels
- Bias
- Cassettes/AFE boards
- Oxfords
- hall probes

Noise

- light leaks
- temperature drift (cryos)
- Bias
- cross talk (breakdown)
- electronics drift (hall temperature)
- fibre to fibre crosstalk

Dead Quiet and hot channels (where dead includes continually over hot channels)

- electronics noise
- manufacturers defects
- (any noise items from above)
- broken contacts

Readout windows (Timing)

- ISIS RF changes
- DAQ changes
- Detector locations
- Cabling changes
- Trigger changes
- Electronics drift

Mapping (waveguides int and ext)

- fibres within plane
- planes
- planes in stations
- station
- station to tracker
- internal waverguides
- external waveguides
- LEDs
- Hall probes

Data Readout Rate

- DAQ
- Timing
- Beam settings

- Target (depth, delay
- reconstruction.

MC
- Per channel noise study
- smearing

Alignment
- rotation, pitch, yaw, offset
- plane to plane
- station to stations
- tracker to tracker
- tracker to detectors
- tracker axis
- tracker to bore
- ~tracker wrt to fiducials
- tracker wrt field
- tracker wrt beam
- CMM - Validate with Data

Efficiency
- VLPC
- Readout window timing
- scint fibre
- waveguide
- reconstruction (digits, spacepoints, clusters, pattern rec (field on/field off) kalman tracks(field on/field off), digits/clusters, doublet/singlet clusters, clusters/spacepoints, spacepoints/pat rec, patrec/Kalman, patrec/momentum)

Reconstruction readiness
- 1pe peak check compare calib data and recon.
- efficiencies (plane, station, Tracker)
- systematics (we have 1mm 1 mrad allowed by analysis group)
- resolution (station, station to station, tracker to tracker, pz, emmittance)
- field dependance, (end coil 1 8A gives 1% change EC2 16% gives 1% change Mnote 474)
- momentum dependance
- decay (not sensitive)
- scattering
- knock on electrons (muons can kick electrons out of planes and onto next)
- P values (goodness of fit)
- multiple tracks per trigger
- Tests
- alignment dependencies
- dead channels

Field uniformity
- Field on in 1 field off in other tracker
- alignment
- Field axis (7273: Half field run....)

- Magnitude
- stability (PS variation in Amps)
- deviation from average (max and mean, rms)
- sensitivity to field magnitude

Low field effects.
- Effect on reconstruction
- Timing Calibration Trip Ts? - 8 weeks (increased cross talk)
  - 2 weeks to calibrating
  - discriminator works with expansive control changes ~ 1 month

Matter effects
- He to air in tracker volumes
- Monitor helium levels
- scattering energy loss (stations)

Documentation
- Tracker DAQ
- Tracker Calibration
- SW
- Analysis

Data Quality
- Analysable Tracker Yes/No
- Internal for us Quality structure – Add this in DIC not step IV but perhaps create a spreadsheet of all Tracker analysable runs and have a comment box next to the run number with comments from analysers
- (Scope (event by event etc))

Things to use For Solutions

DAQ
- Data integrity error checking
- triggers/spill
- pedestals/signal

Calibration
- Bias (VLPC)
- ADC (gain and pedestals)

Internal LEDs
Trigger
gain
npe
Digits
Clusters
Spacepoints
Straight PR tracks
Helical PR tracks
Straight Kalman tracks
Helical Kalman tracks
Thermometers on boards
thermometers hall probes
Hall probe field measurements

Helium level monitors (tracker volume)
Other detectors
Kuno Conjecture