Test Beam Task List - ECAL

- Aim:
  - Identify all tasks essential for run and analysis of beam data
  - Ensure (at least) 1 person commits to produce results in each area
  - Very variable size of tasks – easier for more people to contribute
- List made from discussions in the UK, so only included UK names
  - We know their short term interests
  - Did not know everyone else's
- There is a sigfnificant amount of code already existing (Calice-SW; Goetz G.; George M.), and people are needed to use this to carry out the studies
- List of tasks and names will be updated with feedback / volunteers
- Summarise list, then discussion

Analysis – data/model comparisons

1. Energy resolution vs. energy, angle - YM/NKW + MR +
   Need containment/complete detector

2. Position resolution vs. energy, angle - AM/PD/HY + GM + MR +
   Individual hit resolution in each layer

3. Angular resolution vs. energy, angle - AM/PD/HY + NKW/YM + MR +

4. Comparision and tuning of simulation to data - CTA + DRW + MR +

5. Comparision of calibrations in cosmics vs. real data – MR +

6. Efficiency, dead space between pads and wafers - GM + MR +
   Individual sensor response, modelling geometric inefficiency

Electronics/DAQ understanding

Using LCIO or (very fast turnaround before conversion) the binary files

1. Coherent noise – CTA + GG
   Study sources of noise, why they vary between configurations, how to minimise using VFE timing sequence.

2. Crosstalk – CTA + BB
   In VFE calibrations runs, pulse one channel, look at others. Will same cross-talk be present in beam data?

3. Shaping times – CTA +
   Measure for each preamplifier using VFE calibration runs and cosmics (or beam) HOLD scans. Determine channel-by-channel correction to gain as necessary

4. HOLD timing setting – CTA + DB
   Determines HOLD delay to run system, urgent – current cosmic run may not have optimal setting!

Reconstruction

1. Tracker calibration – MFG, EG, MGroll. (MFG to travel to DESY for this)
   Survey/alignment of drift chambers vs. stage; map material upstream of ECAL; track fitting; V_{drift} (+stability); efficiency with modified gas %
2. Pedestals vs. time, noise vs. time – CTA +
   Determination of stability
3. Pedestals vs. temperature, noise vs. temperature – CTA +
   Stability with ambient conditions, ∴ precision to monitor temperature in run
4. Cosmics / data compatibility – GM +
   Compare gain calibration in 2005 cosmics with new data, understand changes
5. VFE calibration – GM +
   Compare with gain calibrations determined from cosmics and/or beam data.
   If useful/compatible → "Run Planning, 2"
6. Electron beam calibration - NKW/YM +
   Select subset of reconstructed electron events to extract cleaner MIP peak?
   If works → "Run Planning, 3"
7. Production data reconstruction – GM +
   Systematic production of LCIO data with reconstructed objects using best mappings, conditions, …. Make available to collaboration

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Run planning

1. Optimisation of missing slab positions – DRW + AM/PD/HY
   Study placement of inactive slabs if too few for 30 layers x 6 wafers

2. Need for electronics calibration; how often? - CTA + RP
   Determine frequency required based on stability study

3. Need for electron beam calibration - YM/NKW +
   If "Reconstruction 6" possible, define data (spatial distribution into ECAL, no. good events/beam position, .:. time required).

Run monitoring

1. Immediate online monitoring – PD +
   Timescale ~ few s: simple, always available, predefined histos, real time.
2. Semi-online bin file monitoring – GM +
   Timescale ~ few – 30 mins.: operate on binary files from DAQ, present histograms (see talk), event display. Includes diagnostic test programs which can be modified/run on shift for individual channel study. Can output converted LCIO.
3. (Near-offline) (a) LCIO conversion (could simply use output of 2, above)
   (b) LCIO monitoring – GG + RP
   Timescale ~ 1 day: offline job which can include any contributed Marlin processor, but does not need dCache. Needs appropriate mapping file .:. delays if configuration changes. PC, LCIO installation for this provided by HCAL group? Read whatever LCIO files are available on 3TB NFS disk
4. Book keeping during shifts - ? EG→ SK
   Electronic logbook (must be available off-site), tabular run summary. Expect common logbook with HCAL. Temperature also to record. Profit from GANMVL/EUDET effort c/o Sven K.
5. Recording test beam conditions - ? EG→ SK
   Beam parameters should be available electronically and put into conditions data, via slow Controls. Ask SK to liase with CERN.
6. Recording physical configuration - ? EG→ SK
   Survey drift chambers/scintillators/detectors on stage, + many photos of experimental area
   CERN Survey Group should be aware of CALICE requirements before installation.

Simulation

1. Digitisation of tracking hits – FS ☺
   Drift chambers hits for all individual energy deposits, need to remove low energy simulated hits. Find appropriate level. Store as tracker hits
2. Truth particle information – FS ☺
   Positions (and p) at tracking chambers and also immediately in front of ECAL front face should be stored
3. Digitisation of ECAL - CTA, AM +
   Add noise (channel-by-channel), threshold, time-dependence due to preamp shaper, crosstalk, coherent noise. Implement as a Marlin processor, build on existing work.
4. Production MC simulation – FS, DB
   Mokka production of standard MC samples, 100k events each angle/energy/stage position and detector configuration. Initially use programme of measurements to be made with beam. Make LCIO available to collaboration.
5. Production MC reconstruction - MFG/FS + DB
   Reconstruction, including any default digitisation. Make LCIO files with reconstructed objects available to collaboration.
6. Simulation of Cerenkov chambers – ??
   These will form part of the beamline instrumentation at CERN, need to be included in Mokka

Discussion

- Over to Goetz/Erika/…
- Additional items for list?
- Overlap with HCAL
- Names