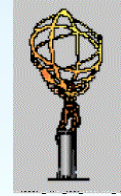15th May 2002
Calibration & Calo Discussions at CERN – May 2002

C .N .P .Gee

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Overview

- **Murrough, Norman, Thomas – Pre-arranged meetings during DIG phase-II training. About 1 hour each with**
  - Rupert Leitner, Bob Stannek (Tilecal)
  - Pascal Perrodo, Isobel Wingerter (LAr)
- **Aim – start discussions on the procedure for calibrating LVL1 with calorimeters**
  - i.e. how the existing tools will be used, controlled, synchronised between the calorimeters and ourselves.

Our Requirements on calorimeter systems
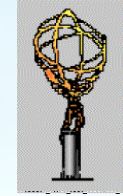
- **Granularity: We must be able to pulse each trigger tower separately**

- **Energy: We need pulses within our 0-255 GeV range and beyond.**

- **Timing: Calibration pulses must have the same shape as real particles.**

- **Synchronous: it is desirable to pulse different areas of the calorimeter simultaneously, e.g. to see signals summed across the barrel/endcap transition**

Tilecal – calibration tools
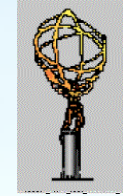
- **Mobile Caesium source:**
  - equalize the response of all cells by adjusting the PMT HV.

- **Laser system:**
  - tracks the response of the PMTs on any desired time scale.
  - The laser has a variable attenuation using a filter wheel.
  - PMT gain will be measured to a relative precision of 0.5% by measuring the laser light intensity pulse by pulse.
  - Maximum Rate 100 Hz

- **Charge injection.**
  - Typically 30-50.000 events in 120 secs. 250 1 GeV steps, maximum charge 800 pC corresponding 800 GeV

Tilecal –calibration procedures
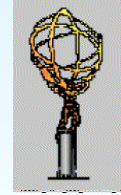
- **Up to now they have no detailed overall calibration procedure (how to use Central Trigger Processor, how to specify settings, sequence of steps, etc)**
- **They will probably do one dedicated calibration run per day during ATLAS operation.**
- **We can use the charge injection method to calibrate our system.**
  - dynamic range and number of steps are sufficient.
- **They are happy to seek a common solution (based around run control, etc) with us.**

Liquid Argon – calibration tools
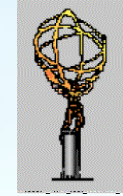
- **Precision charge injection system:**
  - Pulser rate : 10 kHz, 300k Triggers required (100 different amplitudes x 10 DAC settings x 5 delays x 20 patterns x 3 gains)

- **Calibration is controlled by a dedicated calibration board (7 sectors pulsed in parallel)**
  - A Local Trigger Processor (LTP) is used to generate the triggers.
  - Their RODs generate BUSY at the end of each burst of pulses. This is used to control the sequence of operations in the calibration run.

- **First studies with a TTC, Calibration board & ROC are underway.**

Liquid Argon – calibration procedures

- **The LAr calibrates in stand-alone mode (free from central DAQ).**
- **More work is required on both sides to establish a procedure for doing calibrations together with level 1.**
  - It seems hard to use their system without a hardware handshake;
  - It seems essential to control the timing using the CTP for a joint calibration run.

Next Steps
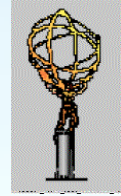
- **We agreed with both calorimeters to prepare a document to specify the calibration procedures.**
  - NG has made an outline & passed to Thomas to fill in.
  - Part of level-1 content copied from early ML calibration note
- **Contents:**
  - Brief overview of level-1, Tile & Lar systems
  - Statement of Level-1 requirements (justification)
  - Agreed procedures for running with Tilecal & LAr
    - *This is where we have to do the work.*
  - Anything else – e.g. outline of testing procedures, timescale,…
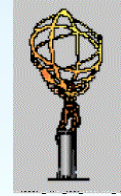- **First draft at Stockholm for everyone to comment on.**

Important aside
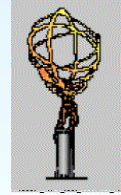
- **While talking to Beniamino & separately to Pascal, learnt of emerging plans for beam tests in 2004:**
  - LAr + Tile
  - Muons
  - DAQ
  - Trigger ??
- **Not yet discussed in TDSG (says F Wickens)**
- **Such a test cannot be later (no SPS in 2005).**
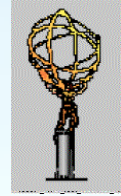- **…and probably cannot be earlier (TDAQ not ready).**

Level-1

- **What should we try to do in such a test:**
  - Run l1calo & l1muon together into CTP, measure latencies etc.
  - Confirm that detectors can read out correct data from L1As
  - Send RoIs through RoIB to level-2 and slice data to ROS
  - Manage thresholds via common trigger menu, runs from central run control, combined databases, etc…
  - Test calibration procedures with calorimeters, check results
  - Exercise timing-in procedure between Atlas subsystems
  - …etc, etc.
  - A Very Important set of tests. We should encourage this initiative.

End

The End