

# Test beam proposal

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LHCb calorimeter upgrade meeting

# Introduction

Beam from the SPS should be available for LHCb during the period November 12nd to November 21st.

The person responsible for the organisation of the test beams for LHCb is Heinrich Schindler.

The agenda is not full in November :

- Contacts taken with Heinrich
- Positive answer

We need to study

- What we would get from such a test beam ? Will we learn something ?
- Is it feasible ?
  - ▶ Are the present prototypes good enough (analog, digital) for such a test ?
  - ▶ Do we have the manpower ? Can we be ready on time ?

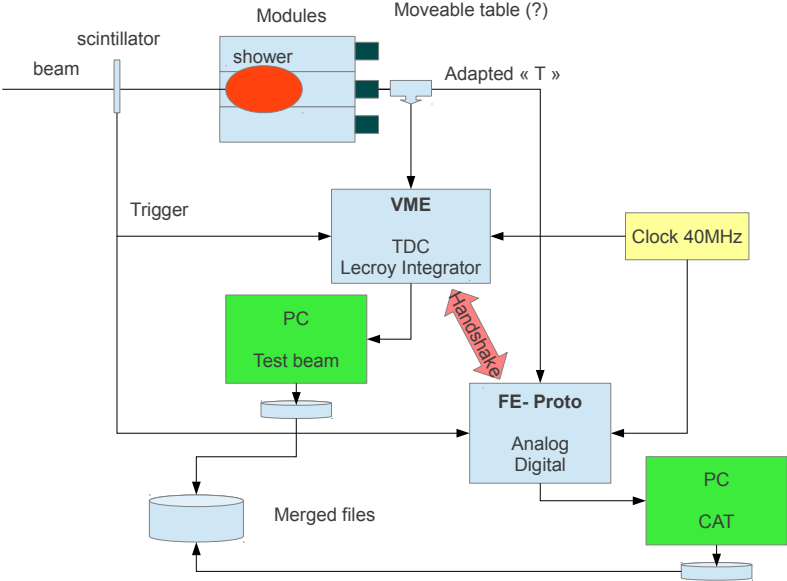
# Test beam conditions (I)

- The proposal here copies roughly what was done for the present calorimeter electronics.
- Benefit from the SPS beam, with particles beam ranging from a few tens of GeV to 150GeV.
- Test beam area provides :
  - ▶ 40MHz clock, trigger signal (from a scintillator on the beam line)
  - ▶ Several (9 ?) outer modules of the calorimeter
- Propose to have two parallel acquisitions :
  - ▶ VME crate : present acquisition system for module calibration (Yuri)
    - ★ Lecroy long time range integrator for energy measurement
    - ★ TDC in order to measure the particle time arrival wrt clock front (1ns resolution)
    - ★ Store on disc : Energy measured and TDC value for each event.
  - ▶ Front-end prototype
    - ★ Energy measurement with our prototypes (ASIC, discrete part ?, digital)
    - ★ Store the energy on disc for each event

## Test beam conditions (II)

- The 2 acquisitions must be synchronized (same events)
  - ▶ Need to think carefully about the handshake
  - ▶ Some digital firmware to develop
  - ▶ Both files produced can be merged into a single file
- Handshake could be made from a coincidence between FE-proto/Lecroy electronics enables and the test beam trigger
- Do we have such an enable on the Lecroy electronics ? Could make it (firmware) on the digital proto.
- Need to design an adapted "T" in order to propagate half the signal to each acquisition. Should probably adapt the gain of the PMT.
- How many channels could be connected at present on the FE-proto electronics ?

# First ideas on the acquisition



# What kind of measurements ?

- Study the shape of the plateau in realistic conditions
  - ▶ depending on the TDC value, the particles are "more or less" synchronous with the clock. By selecting particles with a defined TDC value, one selects a specific region of the plateau.
    - ★ This is useful for the ASIC
    - ★ and for the discrete solution. But, we have a clipping by default on the PMT base...
- Test linearity by requiring several particle energies and by comparing the two acquisitions.
- Measure crosstalk (shoot at the next module).
- Measure full chain noise.

# Conclusions

- Trigger a discussion on
  - ▶ Is it worth doing it ?
  - ▶ Is the prototype electronics status such that this is feasible and interesting ?
  - ▶ Is there any technical problem with this ?
  - ▶ Do we have the manpower ?
- If "yes", then, should get prepared rapidly
- There will be no test beam at CERN before 2015 earliest.
- Propose to test the acquisition system by the end of October/beginning of November at CERN
- Irradiated modules could be calibrated during the same period (Yuri)