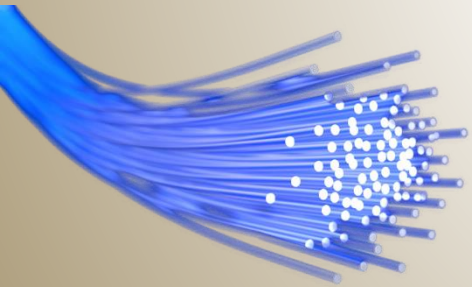
ProtoDUNE-DP (6x6x6 m^3) Light Calibration Control and DAQ

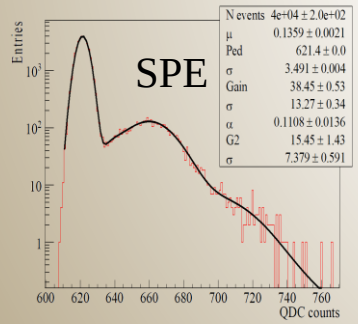
J. Boix, T. Lux (IFAE)
D. Belver, C. Cuesta, A. Gallego. S. Jiménez, A. Verdugo (Ciemat)
August 30th, 2018

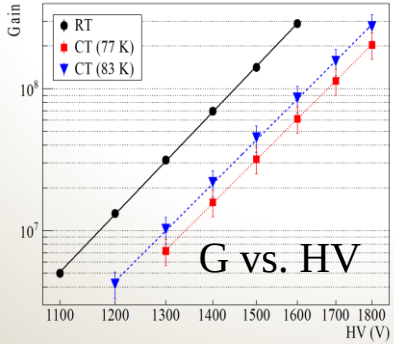


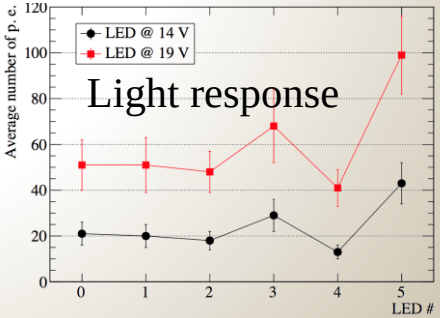
Calibration Measurements

Measurement	Periodicity	# Events/PMT	Size*	Time
Gain stability	Daily	20000	**10 MB**	~5 min
G vs HV	Weekly	20000 * 8 PMT HV	**80 MB**	~1 hour
Light response	Weekly	20000 * 3 LED HV	**30 MB**	~15 min

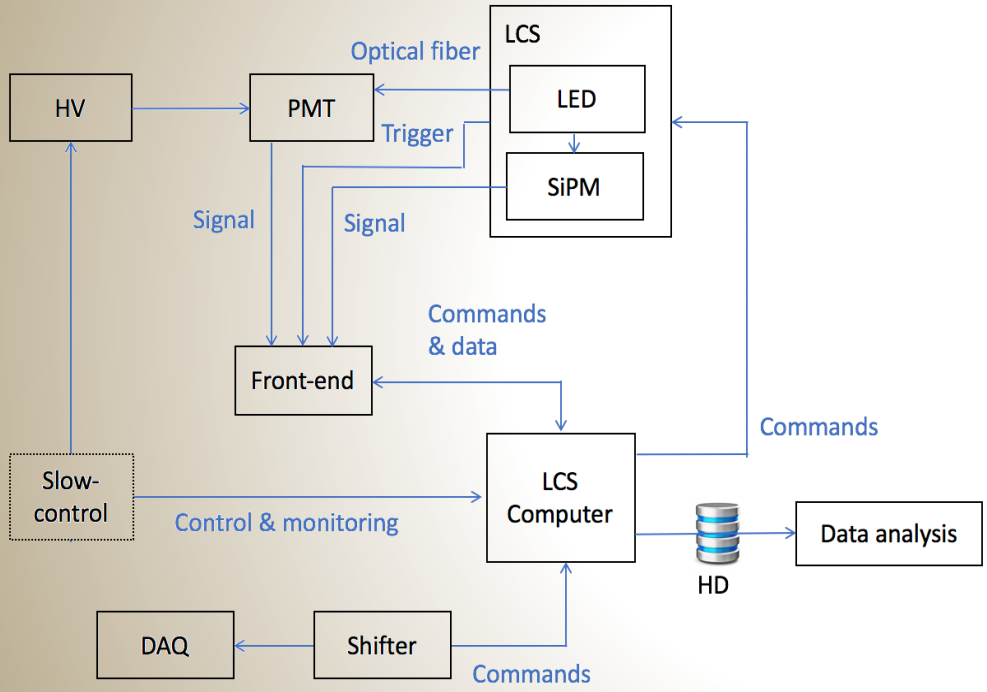
All measurements are taken with one LED providing light pulses to 6 PMTs simultaneously at a time.







Light Calibration Control and DAQ



LCS independent from DAQ as discussed in previous meetings.

LCS Computer will communicate with the rest of the modules involved, the adjustments they need to perform to execute the different calibration runs.

Interactions with these systems have been previously defined and are explained with more detail in the LCS Specifications and Requirements document.

In this talk we will describe the LCS Computer operations and then focus on the topics to be defined and work to be done with the rest of the systems to achieve this tasks.

LCS Computer (CIEMAT, IFAE)

Interactions:

- **HV/Slow-control:** send commands to the HV to program the voltage and monitor the values of the setting.
- **LCS:** send commands with the settings (SiPM voltage, LED voltage and pulse frequency) and receive SiPM monitoring values from the LCS internal ADC if the option to receive them is selected.
- **Front-end:** the front-end receives an LCS command from the shift control with the contents to acquire and receives digitized PMT signals.
- **Shifter:** gives the command that calibration can start and receives the calibration completion message.

A visualization tool able to show on-line the SPE spectrum of the PMTs and the reference sensor will help to quickly identify failures of the PMTs, LEDs, and/or reference sensor. At least, a counter showing the acquired events is required to know that the system is working.

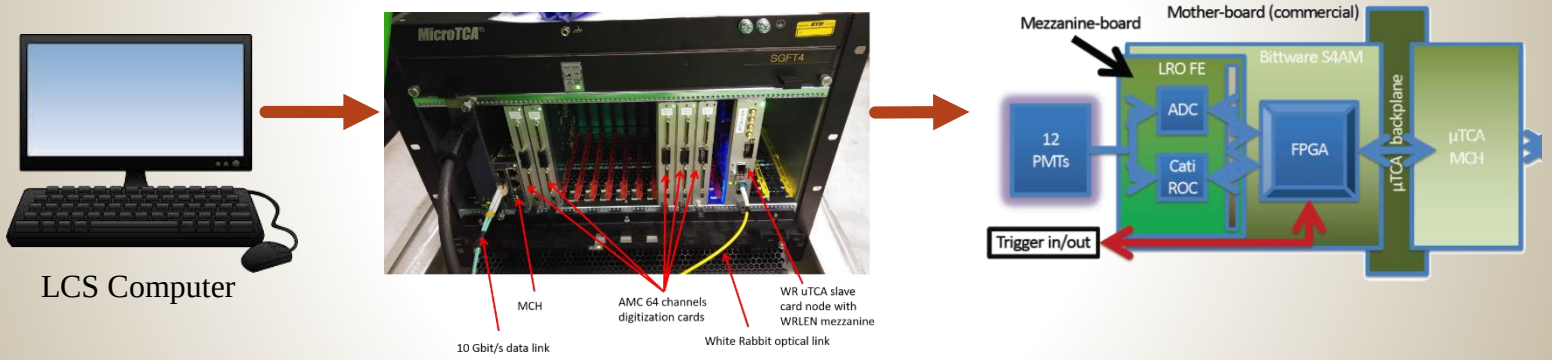
We would like to adapt the one available for the charge for PMT charge signals.

LCS Computer and FRONT-END Communication

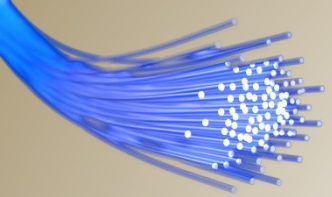
The LCS computer will send to the front-end the commands to start the acquisition in LCS mode. The front-end will send the LCS data with a special header to be identified.

To Be defined:

- Physical interface with the uTCA.



- Communications protocol: LCS Computer ➔MCH and MCH ➔ Front End. Computer software needed
- Commands & Data to be sent: Operation mode, number of events , channels to be acquired, sampling rate, acquisition window, start/stop



LCS Computer and PMT HV System
Communication

The HV system needs to be connected to the LCS computer (directly or through the slow-control) to control and monitor the status of the different HV channels.

To Be defined:

- Physical interface with the HV Boards or Slow Control.
- Communication Protocol to be used
- Communication commands for biasing individually or a group of PMTs and voltage level monitoring.

Summary

- The LCS Computer will communicate with all the systems involved and display the performance of an ongoing run. (Front End, High Voltage, Light Calibration System and Shifter)

- Interactions of the LCS computer with other systems need to be developed to perform the calibration runs:

  - **HV – Slow control:** Commands to change and monitor the PMTs Voltage.

  - **Front-end:** Commands to configure the Calibration Mode adapted to PMTs timing and dynamic range signals during the tests. LCS Running Software to communicate with uTCA