Improvements on test bench for large PMTs

M. Bohacova, G.L. Chiarello, J.P. Gongora, M. Havelka, M. Majerle, G. Marsella, J. Stastny, P. Tobiska, G. Tripodo

Università degli studi di Palermo
giovanni.tripodo@unipa.it

Outline

- Current L-PMT tests;
- SDECO Test bench in Malargue;
- ESS test system on Prague;
- New PMT test bench;
- Status of the test system;
- Conclusions and outlook;

Test on L-PMTs

- Why? To check the specifications of new PMTs or after reparation;
- Which specifications? See Barnhill et al.,2008 (Table below);
- Which tests? See Barnhill et al.,2008
  - SPE spectrum;
  - Gain vs Voltage;
  - Dark pulse rate;
  - Non-linearity;
  - Afterpulse;
  - ~~Dynode to Anode Ratio;~~
  - ~~Excess noise factor;~~

Test	Specification
SPE Peak to Valley	>1.2
Gain versus Voltage	10^6 gain with V$<$ 2000 Volts
Dark Pulse Rate	$<$ 10 kHz at 1/4 pe threshold
Non-linearity	$<$ 6% below 50 mA peak current
Dynode to Anode Ratio	between 25 and 40
Afterpulse Ratio	$<$ 5%

Current Test Bench for PMTs in Malargue

- Actually, the old system based on CAMAC is still working.
- 12 PMTs under test + 4 for check;
- The current system based on CAMAC is providing the integrated charge;

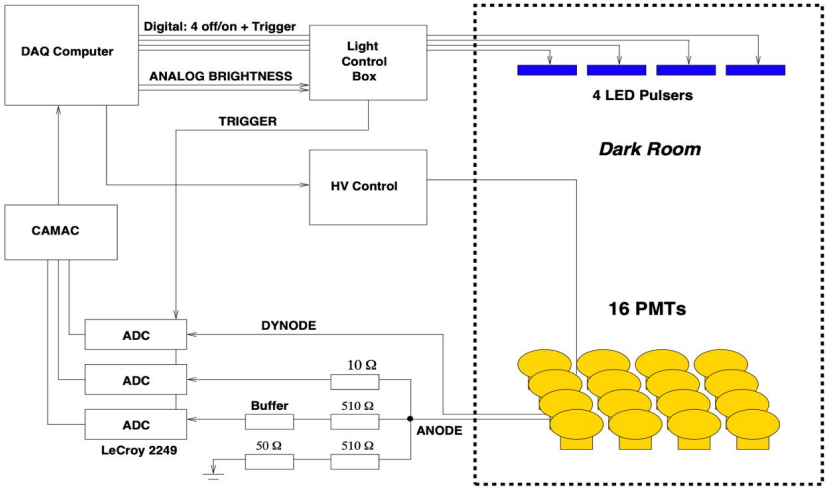


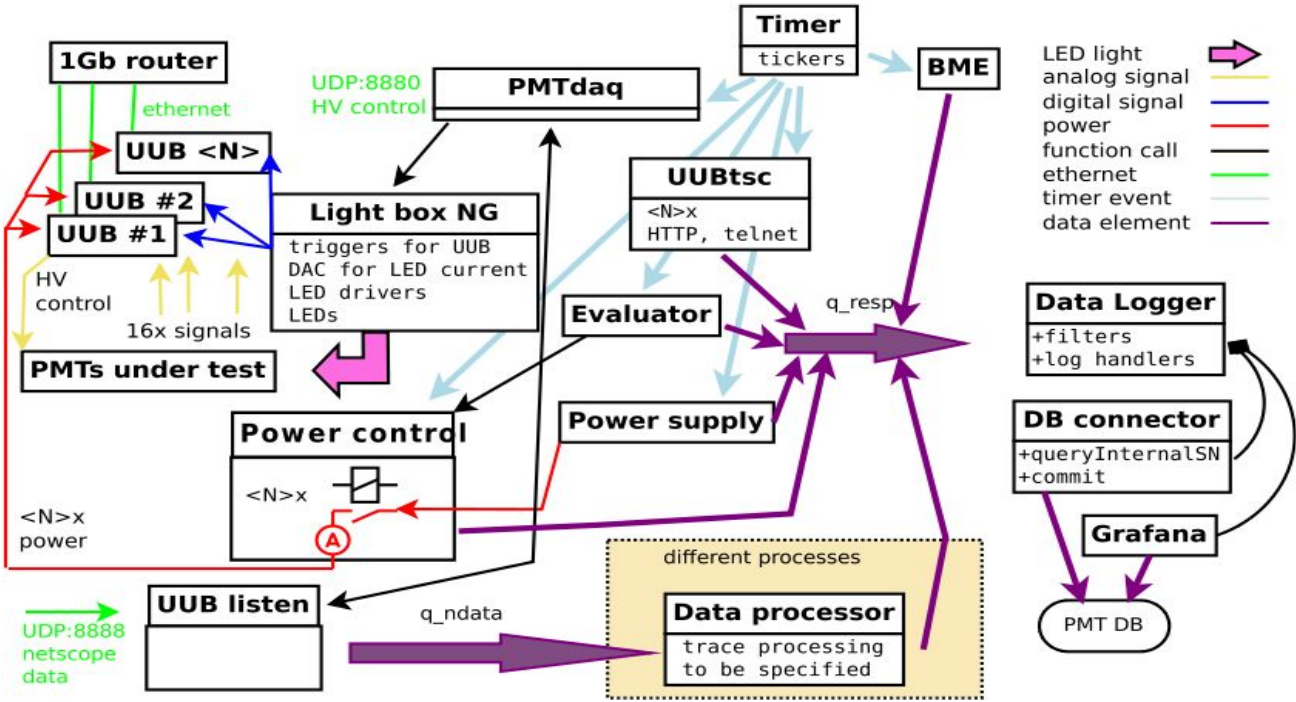
Fig. 1. Layout of the PMT data acquisition system.

ESS system in Prague

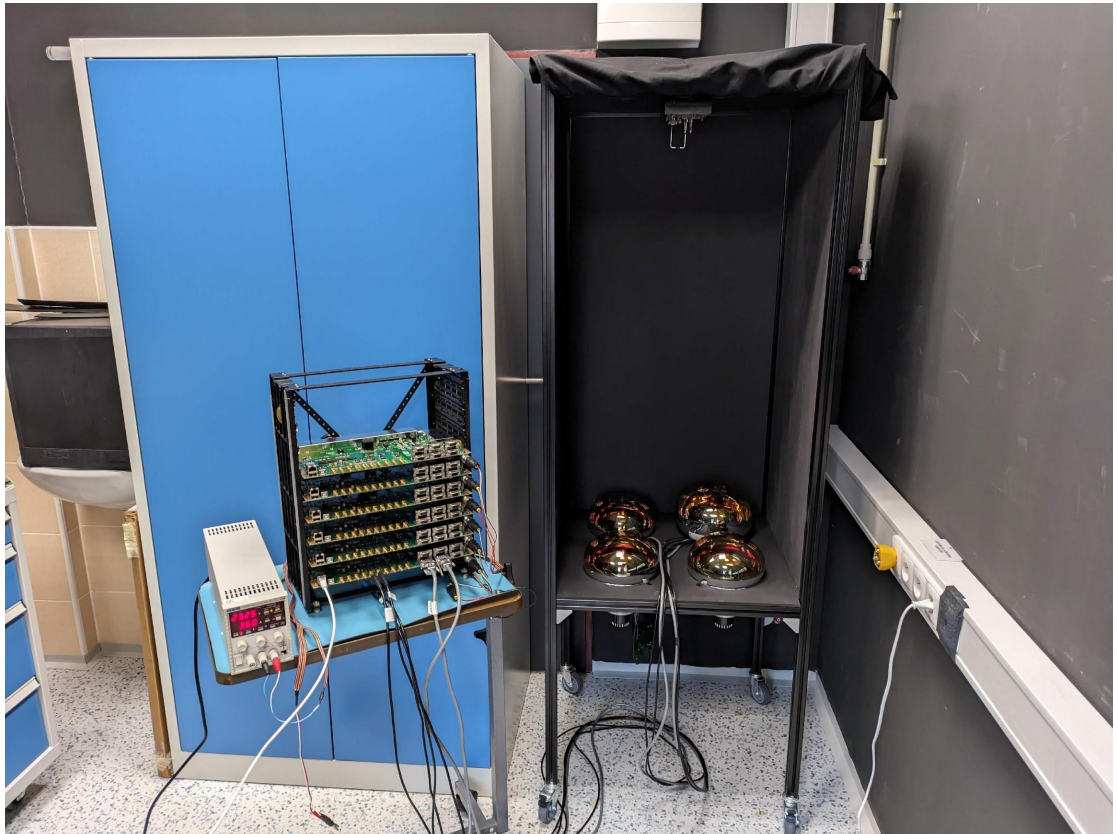
Python Class to manage the acquisition:

- HV;
- LED Pulser (new light box);
- Storage of Waveforms;

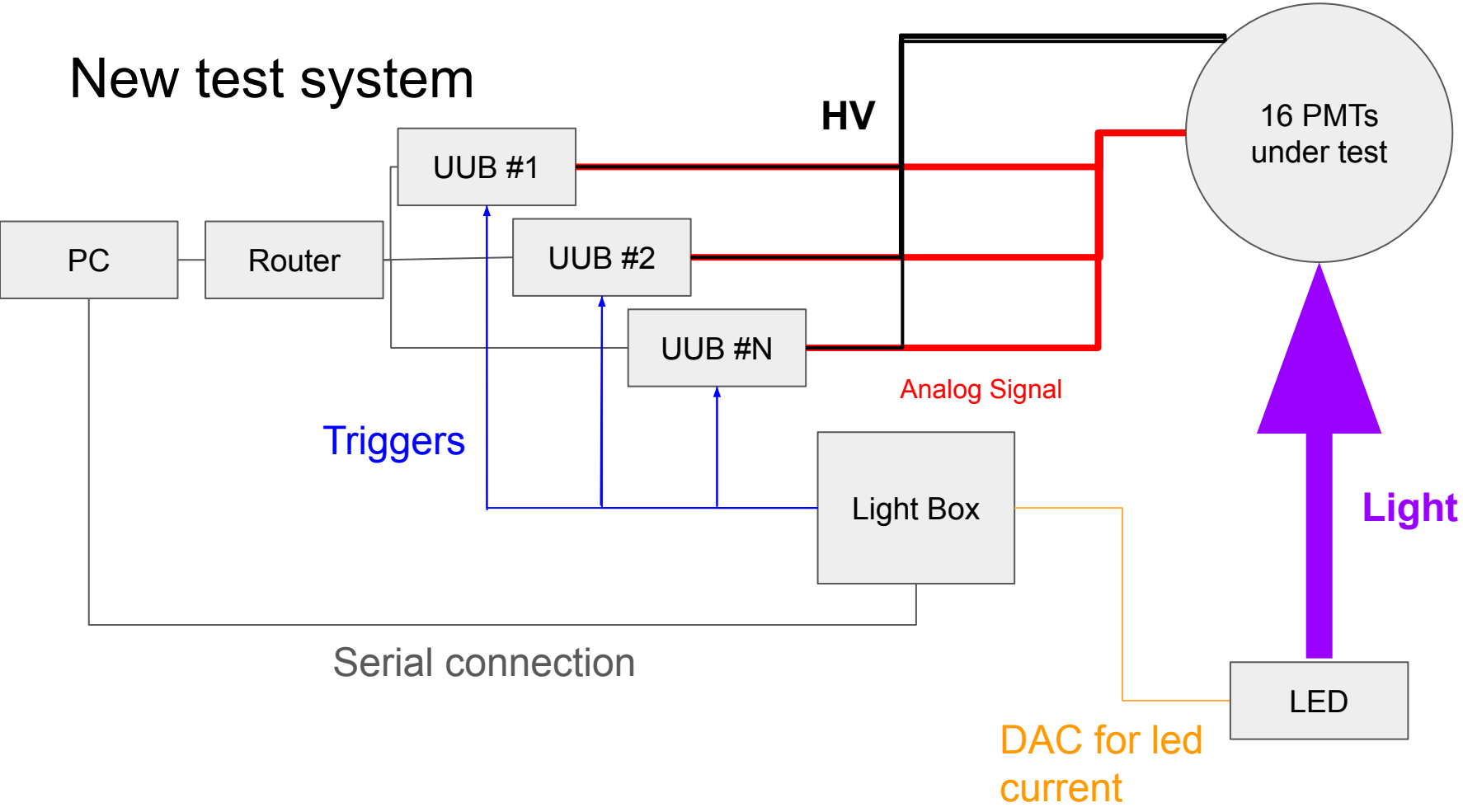
The system is able to manage multiple UUB!



Test bench in development in Prague



New test system



New test system features

- Use of 6 UUBs instead of CAMAC/VME or more (with Prague system);
- The system based on UUBs will provide traces instead of integrated charge;
- UUBs can directly manage PMT HV;
- Light Box based on raspberry pico: provides DAC for LED, Triggers for UUBs;
- Future test on S-PMTs and SSD-PMTs can be done with the same setup;
- Integrated analysis tools will reproduce the actual results.

Status of the test system

- @Prague:
  - Multiple UUBs management (based on ESS system);
  - New Light Box: ready to be installed;
- @Palermo:
  - Analysis of waveforms (online or offline);
  - SPE management;

Conclusions and outlooks

- Most of the code for the new test is available. It has been developed by Petr Tobiska adapting the ESS system;
- We are integrating Trace analysis to present the test results as already stored from the actual system;
- The new Light Box is developed in Prague;
- Some code must be developed in order to synchronize the operation. Improvement on the test and new function can be designed;
- We are planning multiple tests in Prague and Palermo before delivering the system to Malargue.