PID activities in Bari

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Outlook

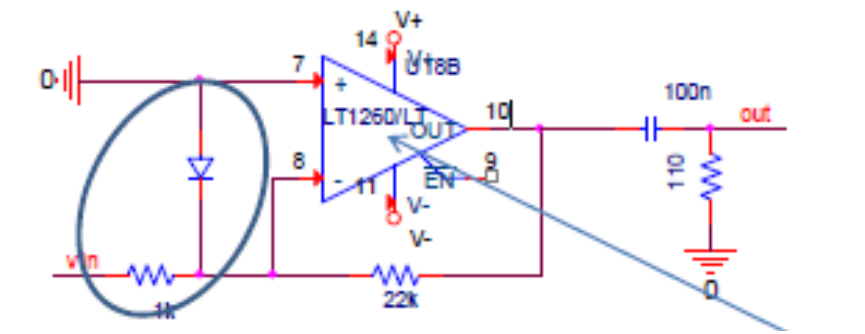
- Mechanical activities(Nicola M., Vincenzo V., Maurizio M.)
- Electronics development (Francesco)
- MaPMT test (Fabio)
- Simulation and data analysis (ALL)

Electronics for MaPMTs Lab Test

- Requirements:
  - Coupling with the MaPMT (H8500)
  - Fast (for timing studies)
  - Good gain (to «clearly see» the single p.e)
  - Low power consumption
  - Reasonable time for prototype realization and testing
  - Design based on commercial electronics components

SIMULATION: ORCAD-CADENCE 16.3

- Source:
  - Voltage step differentiated over 1pF capacitor



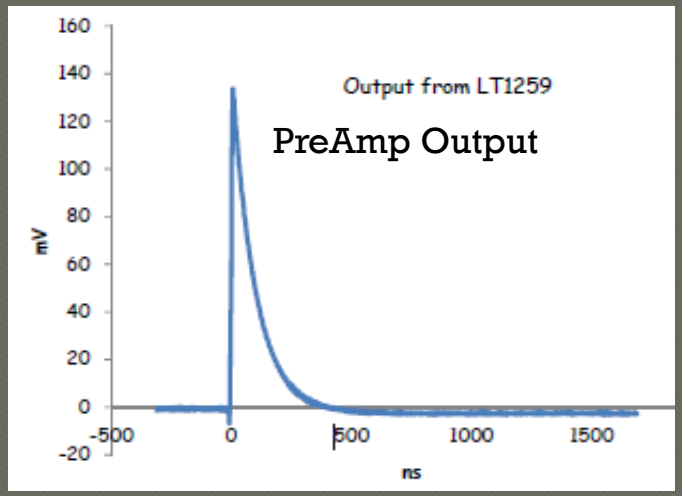
Protection network suggested by HAMAMATSU

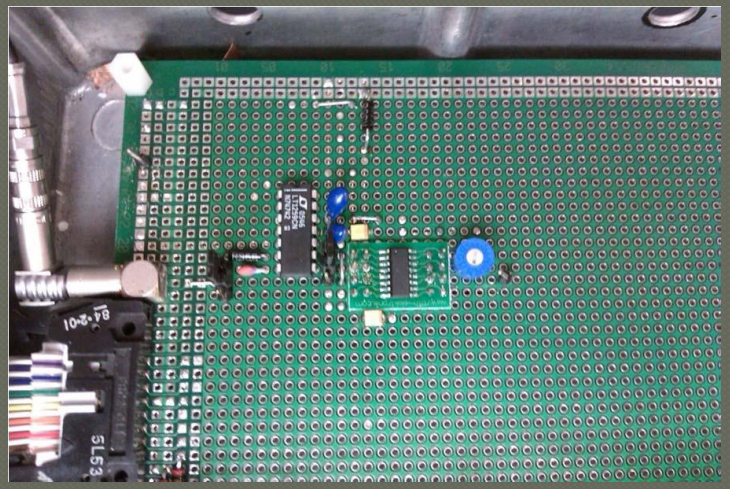
Operational amplifier LT1259
Good compromise between speed and power

CHARGE AND TIME

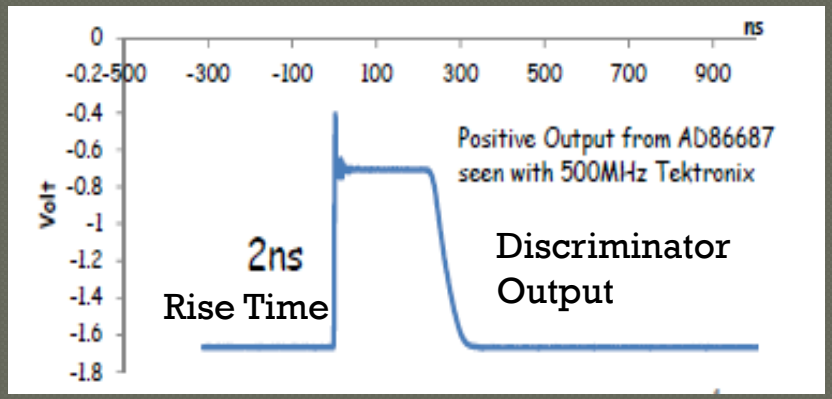
- The goal is to have the electronics compatible with different DAQ systems
- At the moment it is tailored to work with CAEN VME modules
  - Differential Output for Charge measurements with a 64ch ADC
  - Differential ECL Output for timing measurements with a 64ch TDC)
- It can be easily modified to match other request

First Bench test



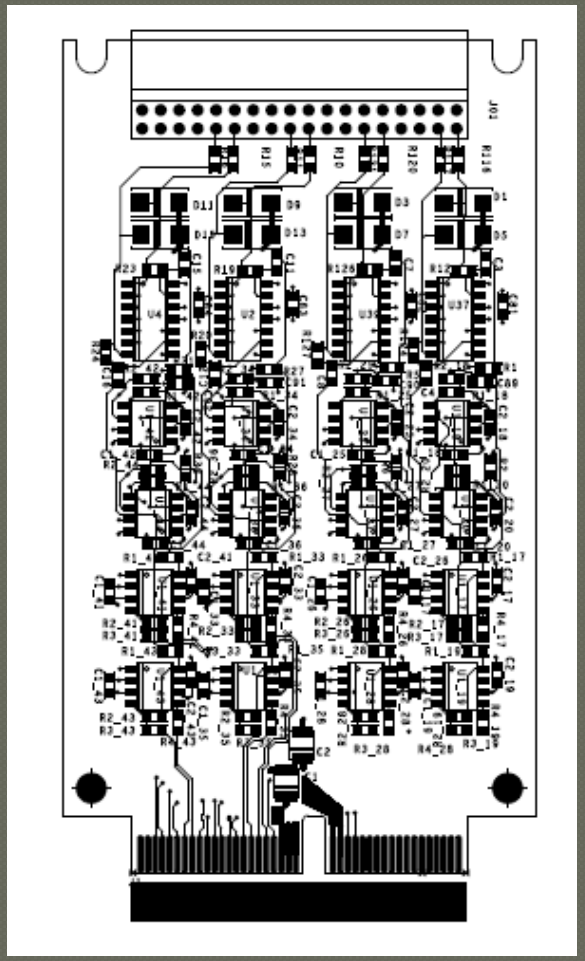


Bread Board prototype

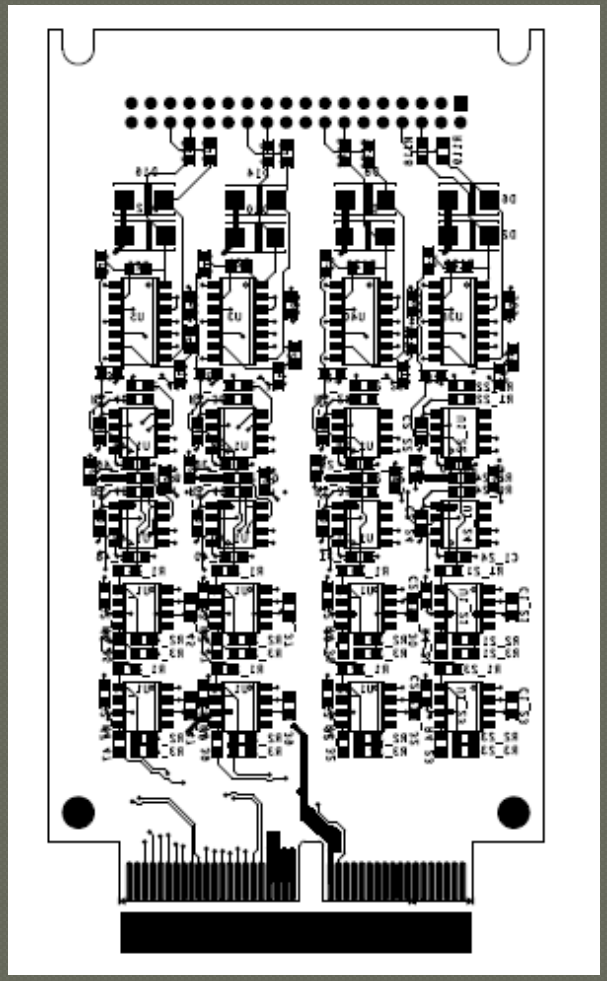


Power Consumption
(single channel)
20mA @ ±5V

Board Design



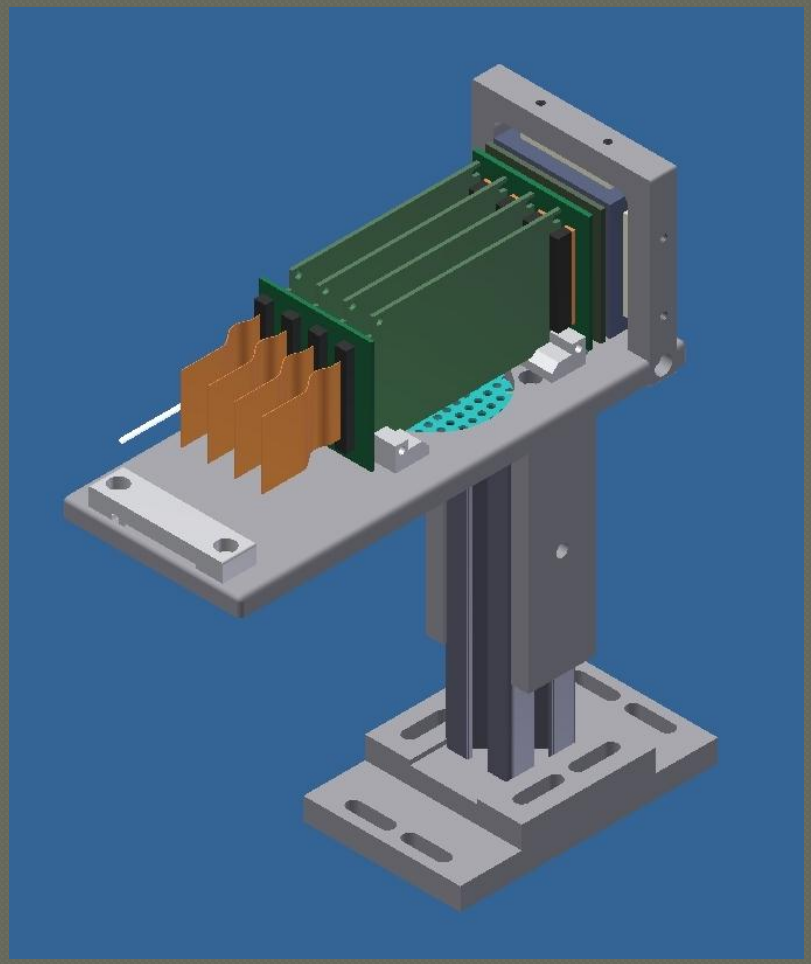
TOP

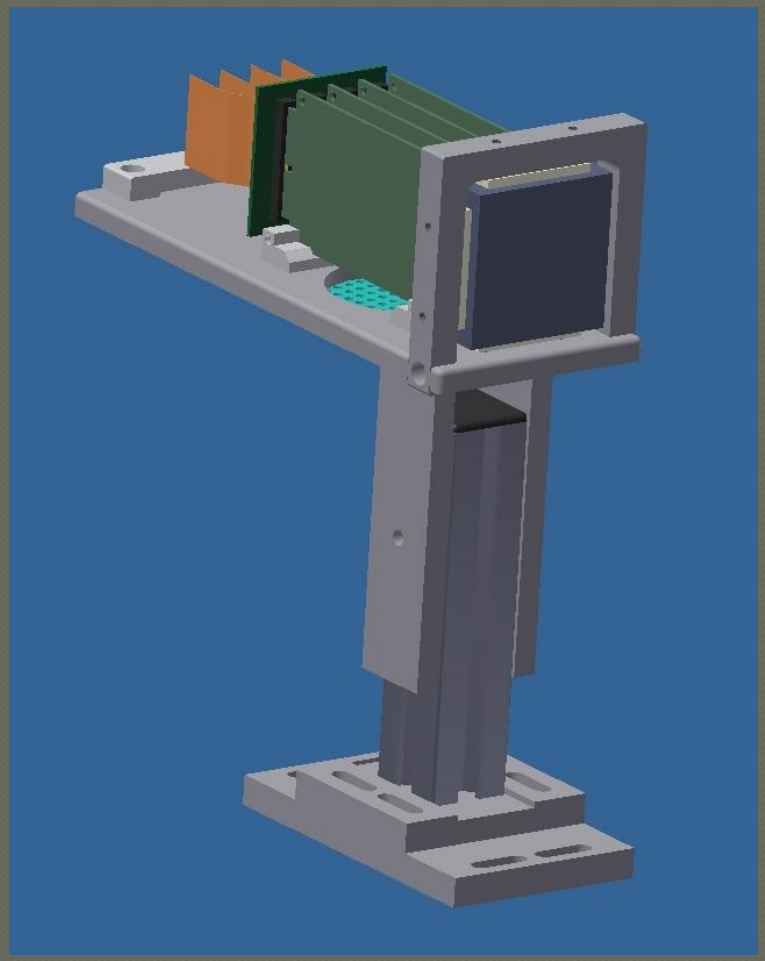


BOTTOM

- Each board has 16chs
- 4 boards are needed for a single MaPMT

Assembly sketch





On going

- First Interactions with Dominique and Christophe to improve the design.
- they would like to have LVDS instead ECL -> we just started to think about
- One of the main point they raised was the cross-talk: it has to be measured as we will have all in hand (see MaPMT test later)

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Main Goal

- To goal is to build a test facility to study the performance of MaPMTs and readout electronics.
- To do this we need:
  - A light source (pico-second laser)
  - A scanning stage
  - MaPMT + reference high gain standard PMT
  - Readout electronics + DAQ system
  - some of the equipments have been borrowed from our colleagues in Bari just to start the setup

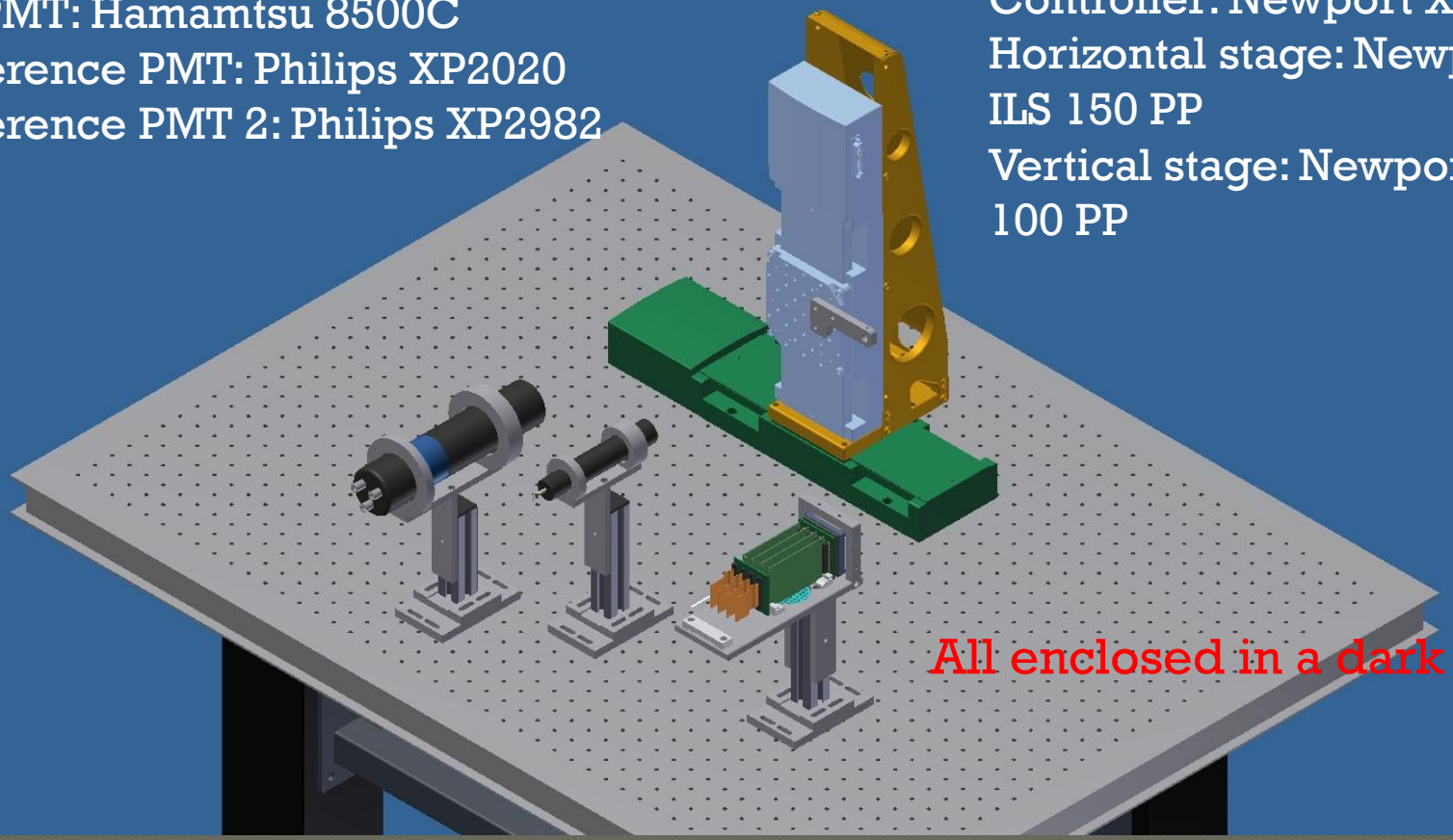
Light Source (borrowed)

- PILAS EIG1000D with PIL040SM
- λ = 410.1nm
- $\Delta\lambda$ = 2nm
- Beam Φ = 3mm
- Time Jitter = few ps
- Suitable for timing studies

Scanning Stage + MaPMT

MaPMT: Hamamtsu 8500C
Reference PMT: Philips XP2020
Reference PMT 2: Philips XP2982

Controller: Newport XPS 8C
Horizontal stage: Newport ILS 150 PP
Vertical stage: Newport ILS 100 PP



All enclosed in a dark box

DAQ system

- Written in LabView to easily control both the stages and the DAQ system
- CAEN VME TDC VN1488 (borrowed)
  - 64 input (Differential ECL)
  - Full scale (100ns – 1600ns)
  - Resolution (25ps-400ps)
- CEAN VME ADC VN1465 (borrowed)
  - 64 input
  - Full scale (200pC – 1600pC)
  - Resolution (50fC – 400fC)

To do list

- Build the dark box
- DAQ optimization
- Write analysis tools (ROOT/Python scripts)

- The test stand is designed:
  - To study the performances of the MaPMT (with the actual DAQ)
  - To perform some ancillary checks such us cable cross talk, light source calibration and so on
  - To study the performances of all the readout chain (Electronics + MaPMT) in the final configuration. In this case a new DAQ system will be developed to match the common accepted standard

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Just started

- We have just started to play with Jerry and Kurtis scripts to analyze CRT data
- We started contacting Doug to work on the simulations of the CRT, as first step, and the final PID design later on