

Construction and testing of an RPC in Puebla

RPC 2018 - THE XIV WORKSHOP ON RESISTIVE PLATE CHAMBERS
AND RELATED DETECTORS

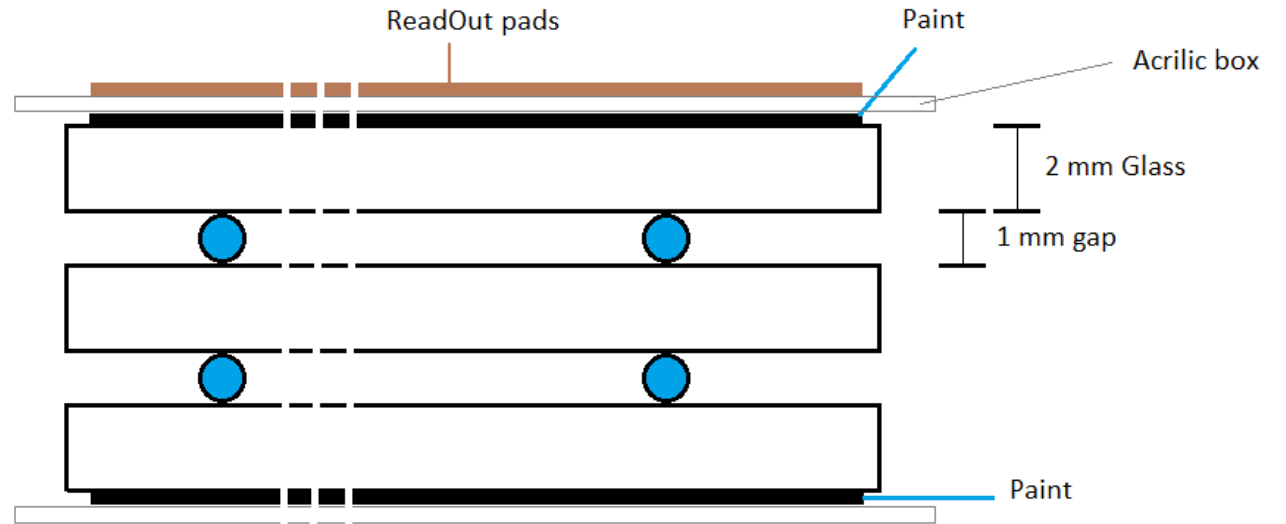
Guillermo Tejeda Muñoz

FCFM-BUAP

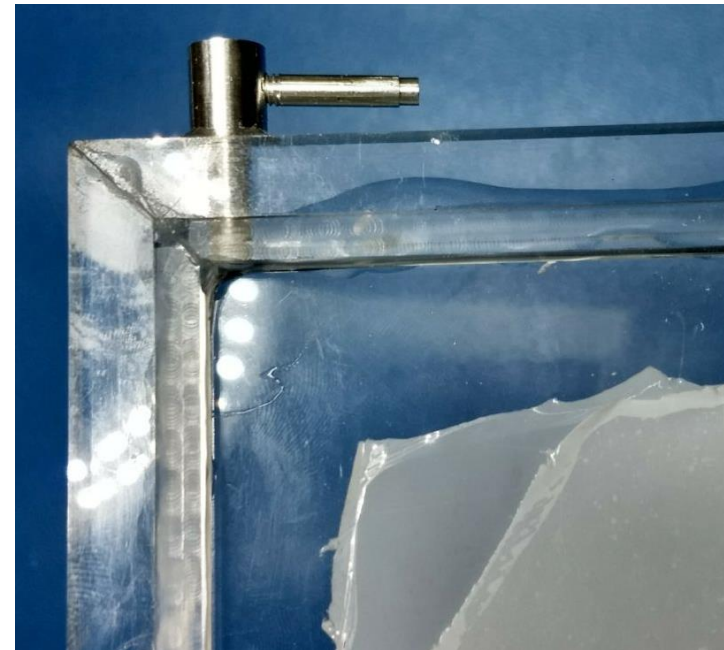
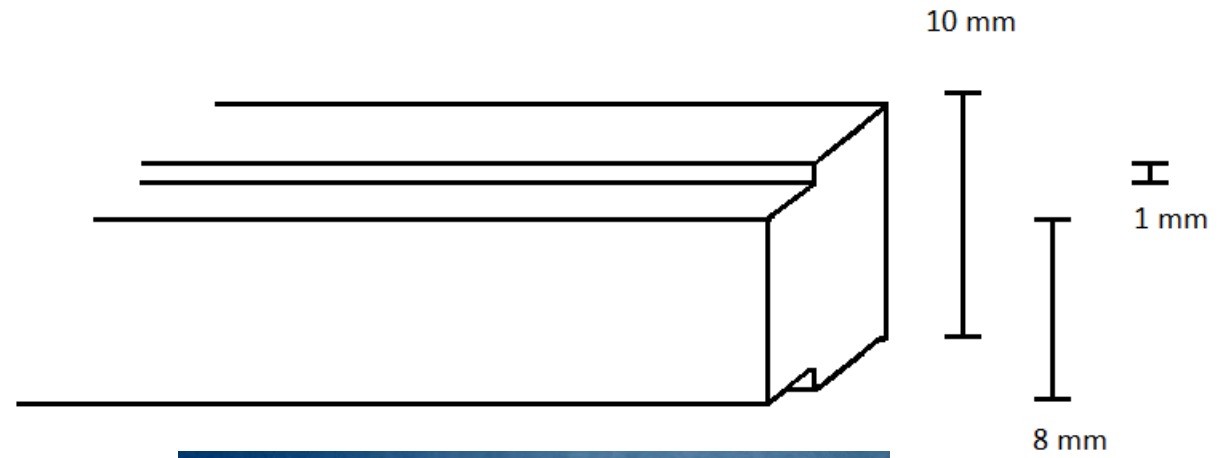
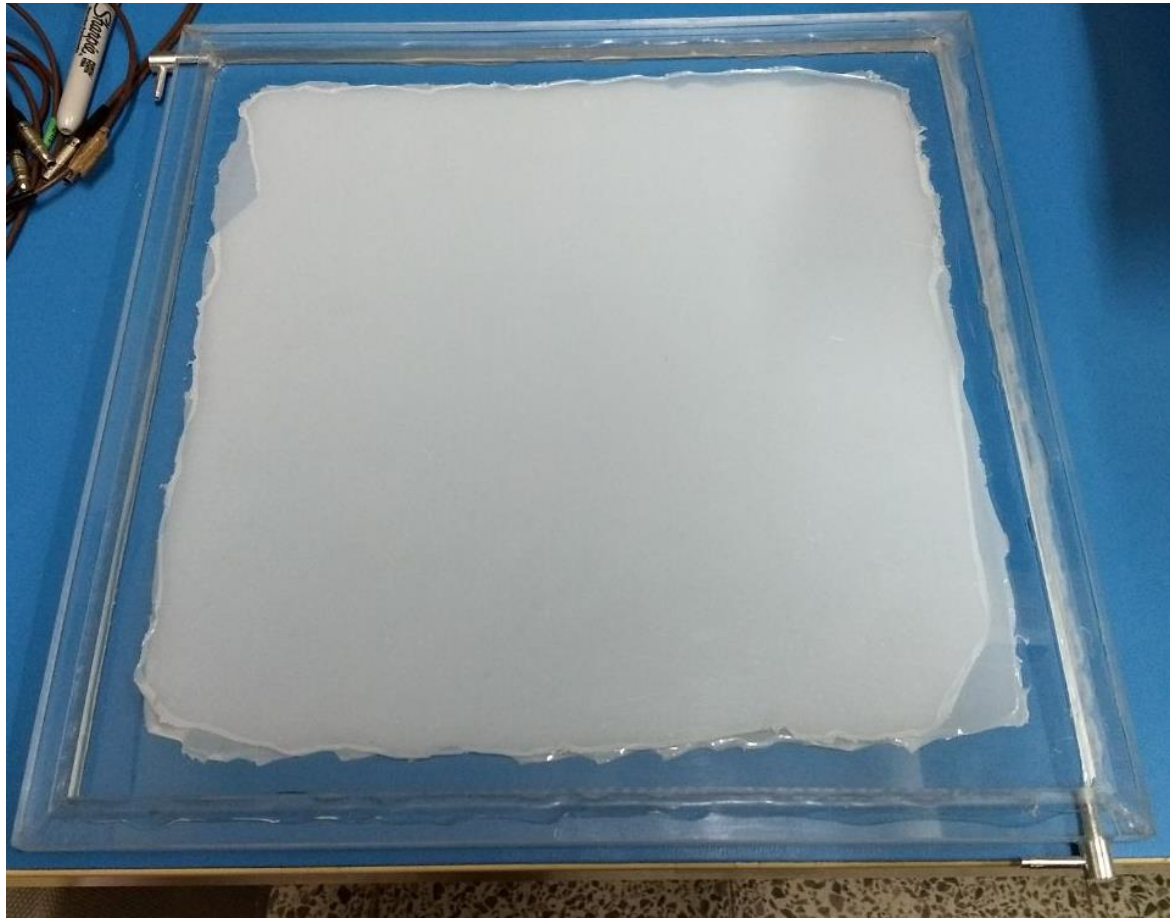
February 2018, Puerto Vallarta, México.

Construction

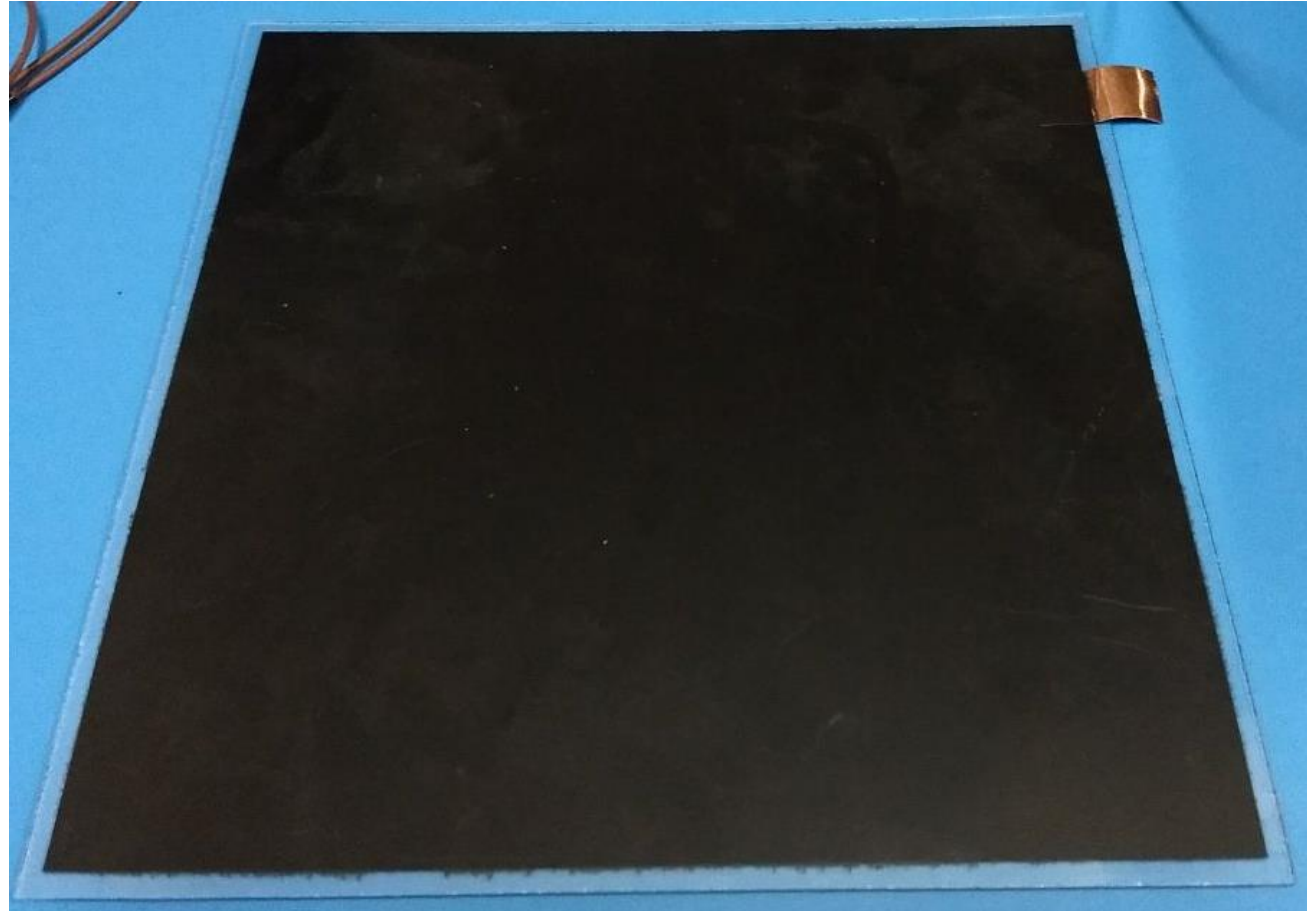
- RPC size -> 30 x 30 cm
- Glass -> 2 mm (Saint-Gobain)
- Gas Gap -> 2 x 1mm
- Acrylic gas box -> 35 x 35 cm
- ReadOut Pads -> 4 and 9
- Grafitte and acrylic paint for electrodes
- Paint resistivity -> $\sim 5\text{M}\Omega/\square$
- Gas -> Argon, Freon



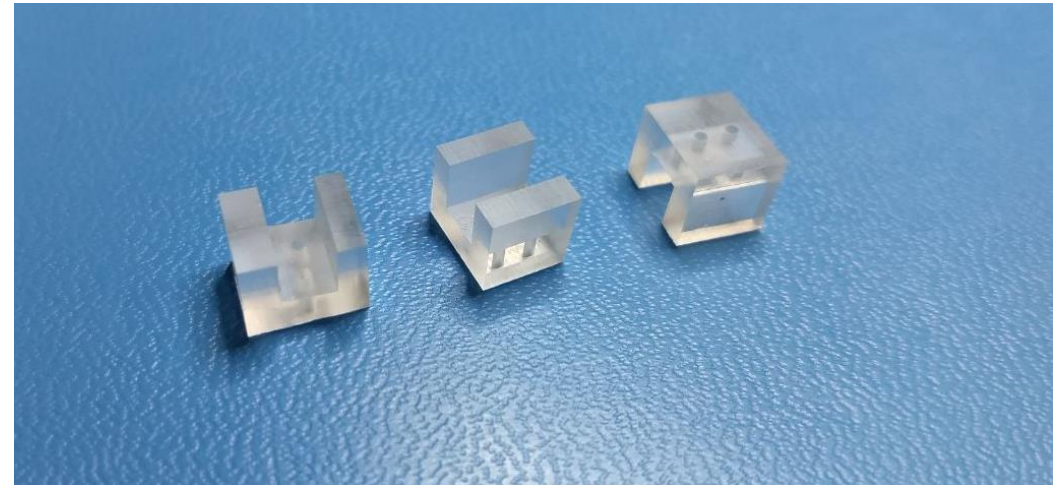
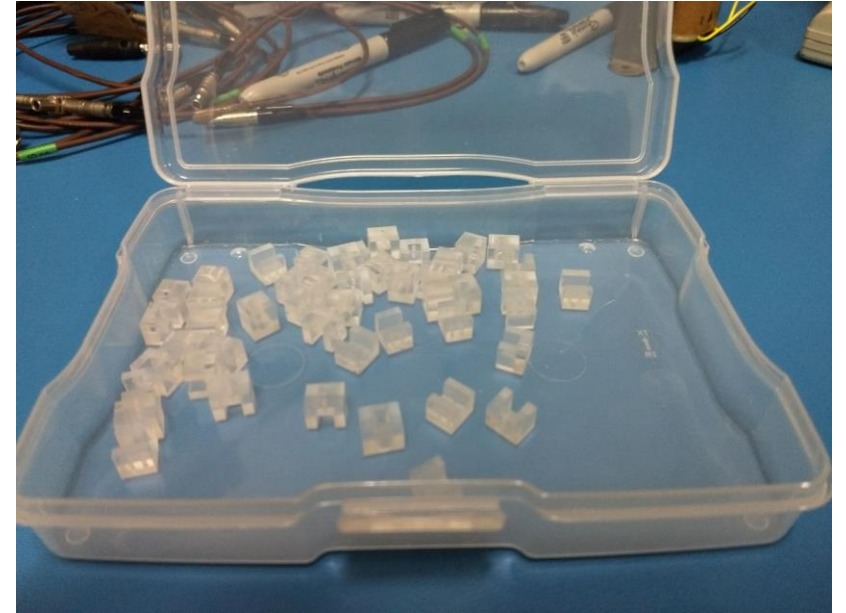
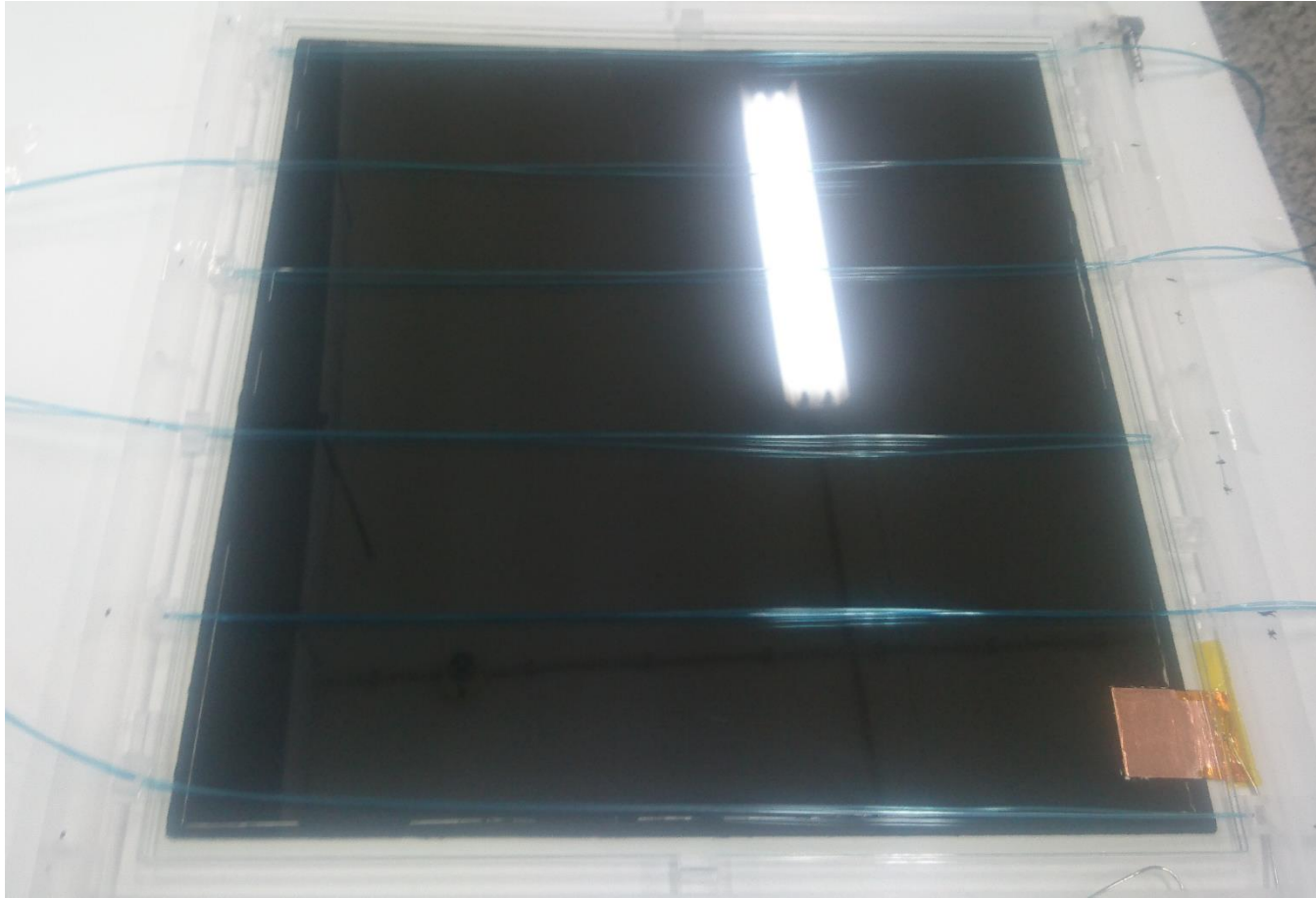
RPC box



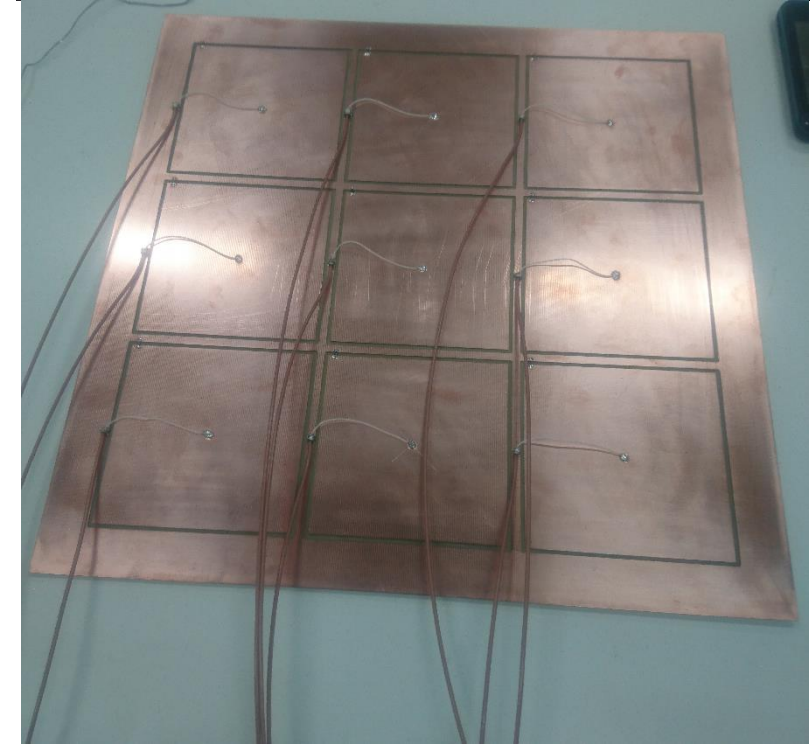
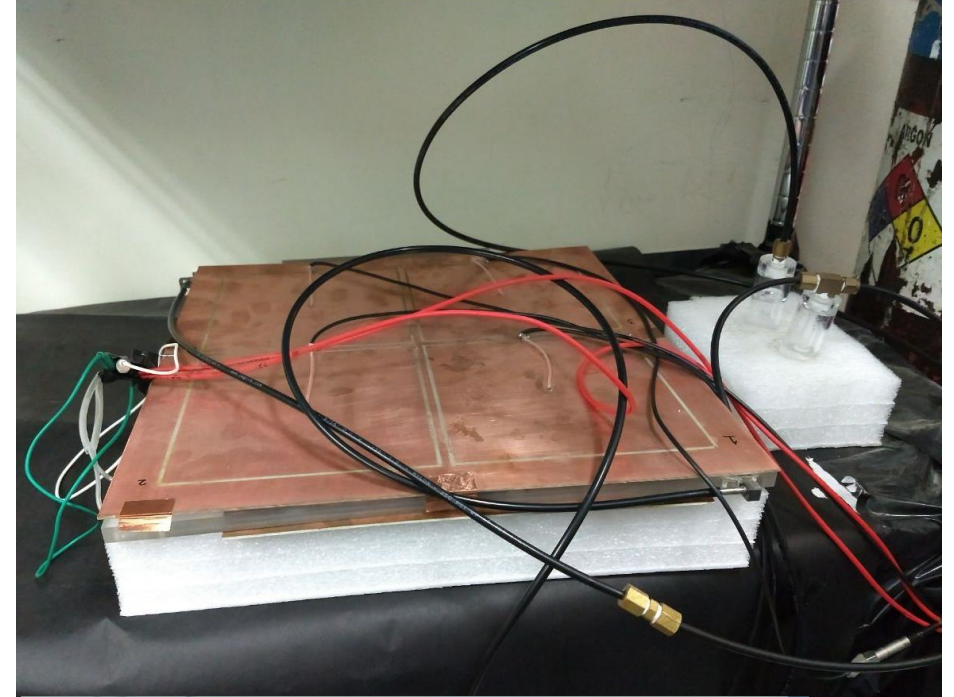
Paint



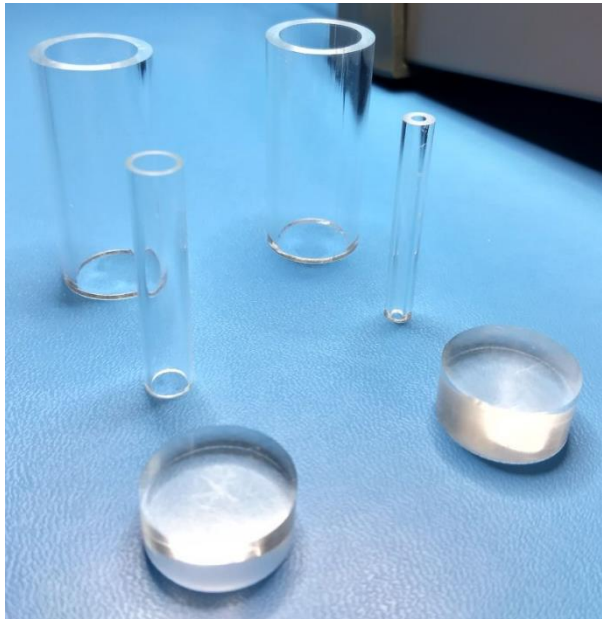
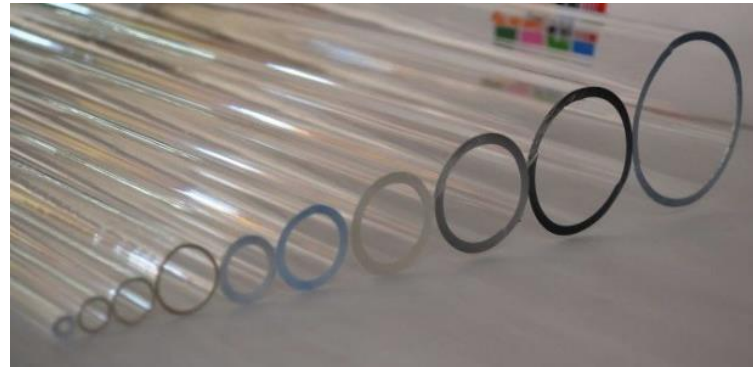
Assembling



Final assembling for test

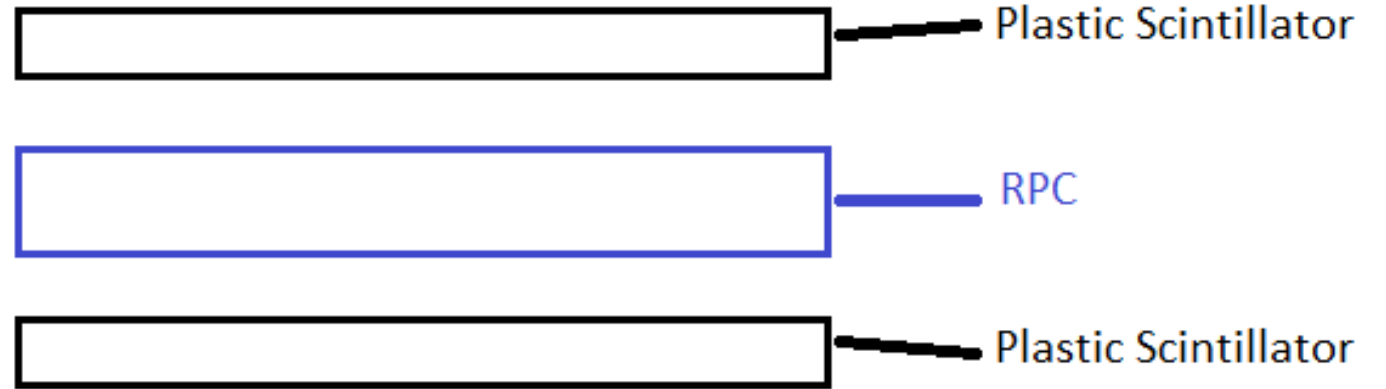


Gas

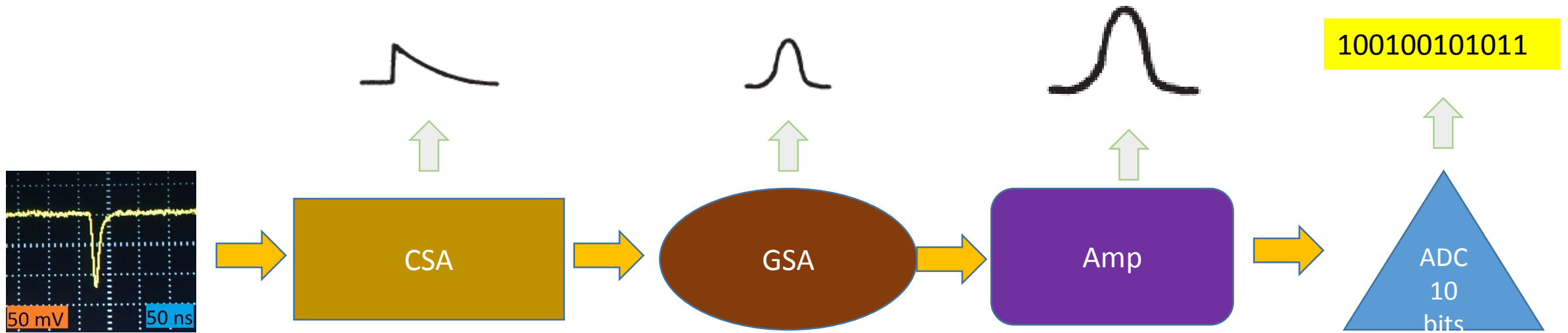


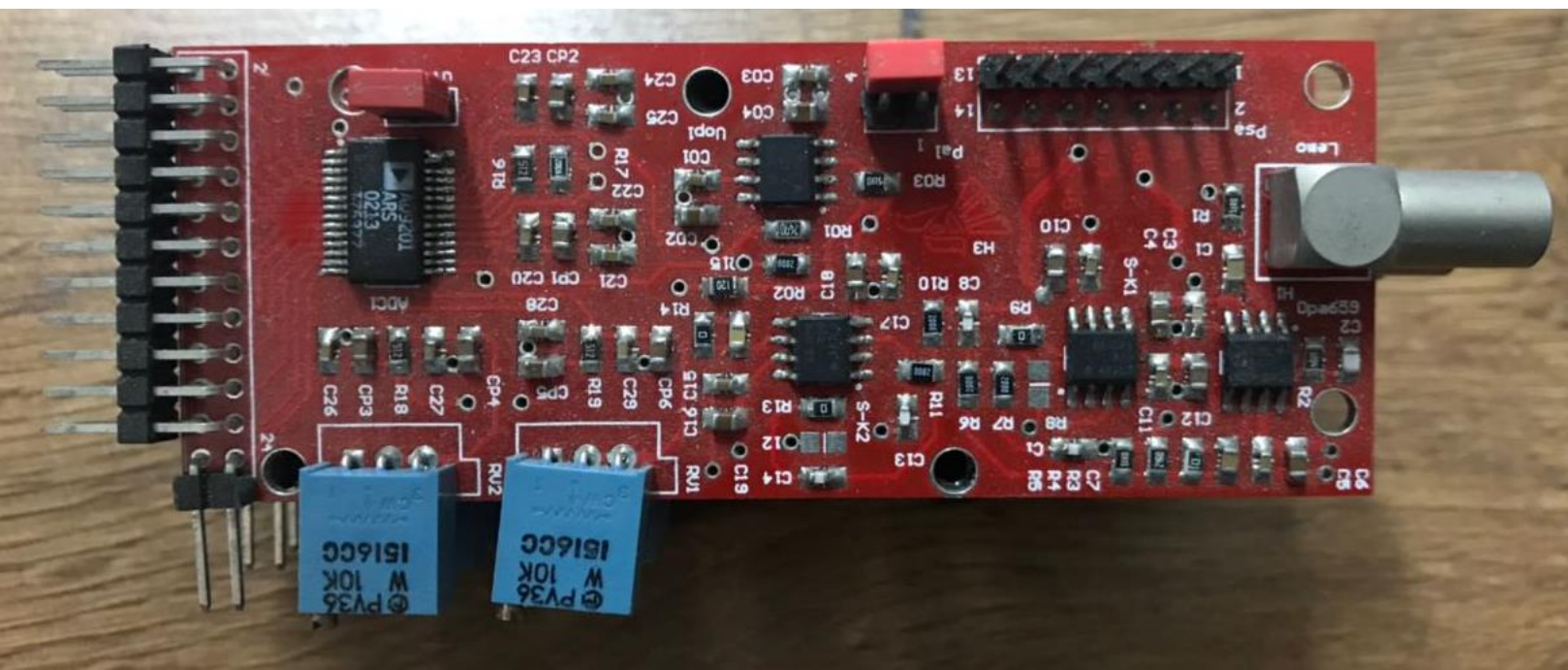
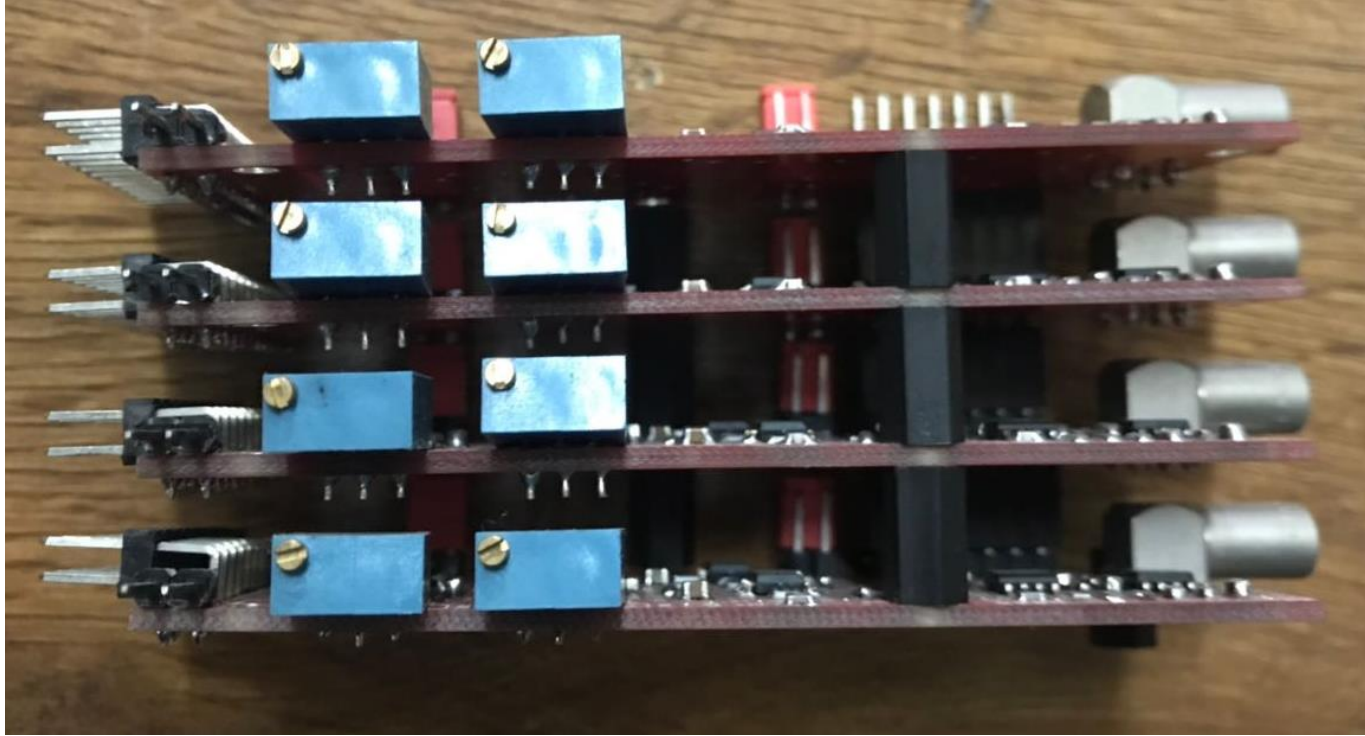
HV

Setup for efficiency

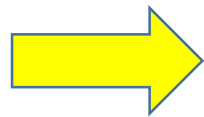


Electronics

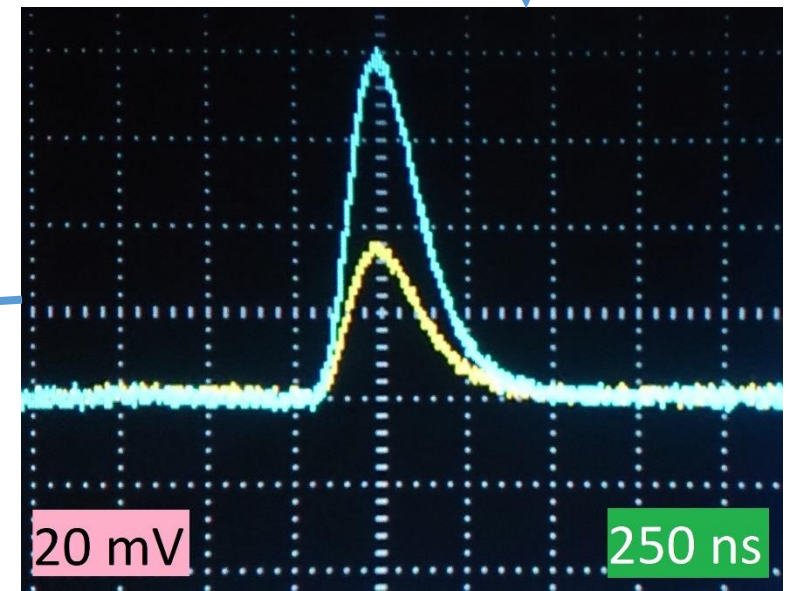
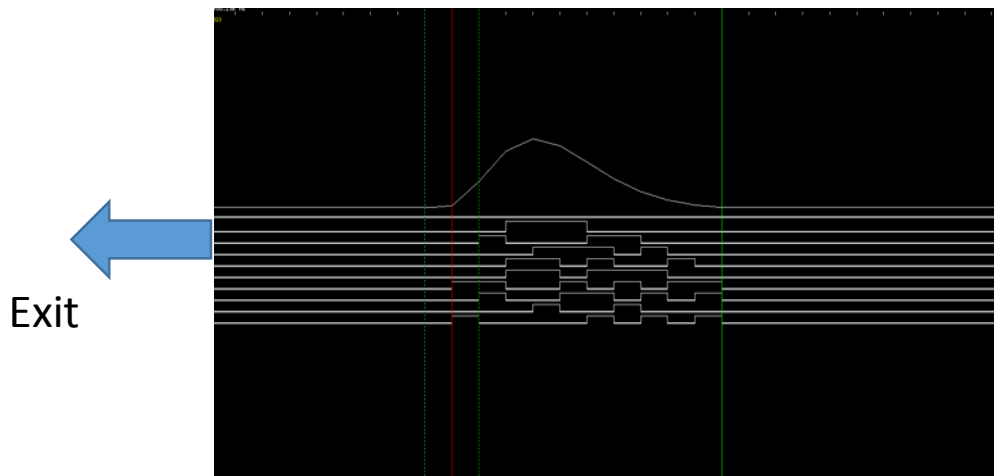
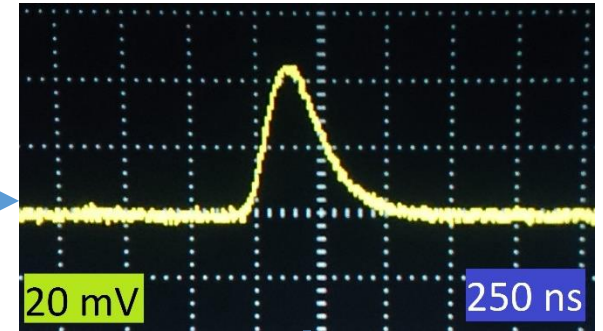
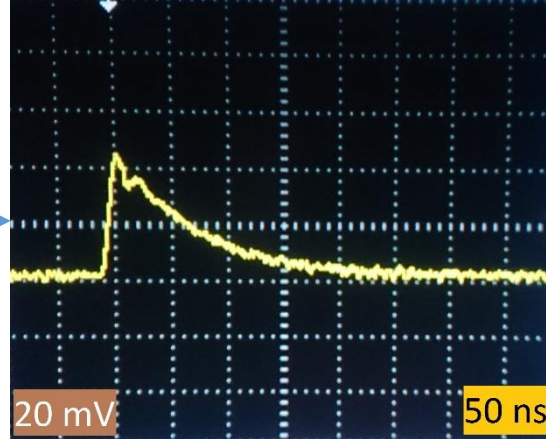
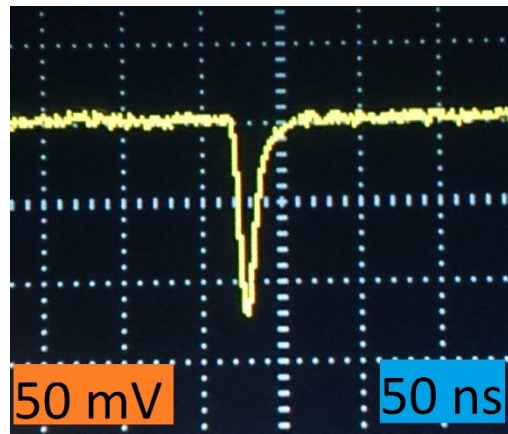




Response of the FEE



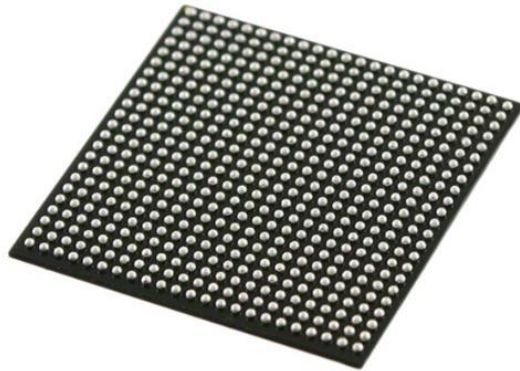
Input
Signal



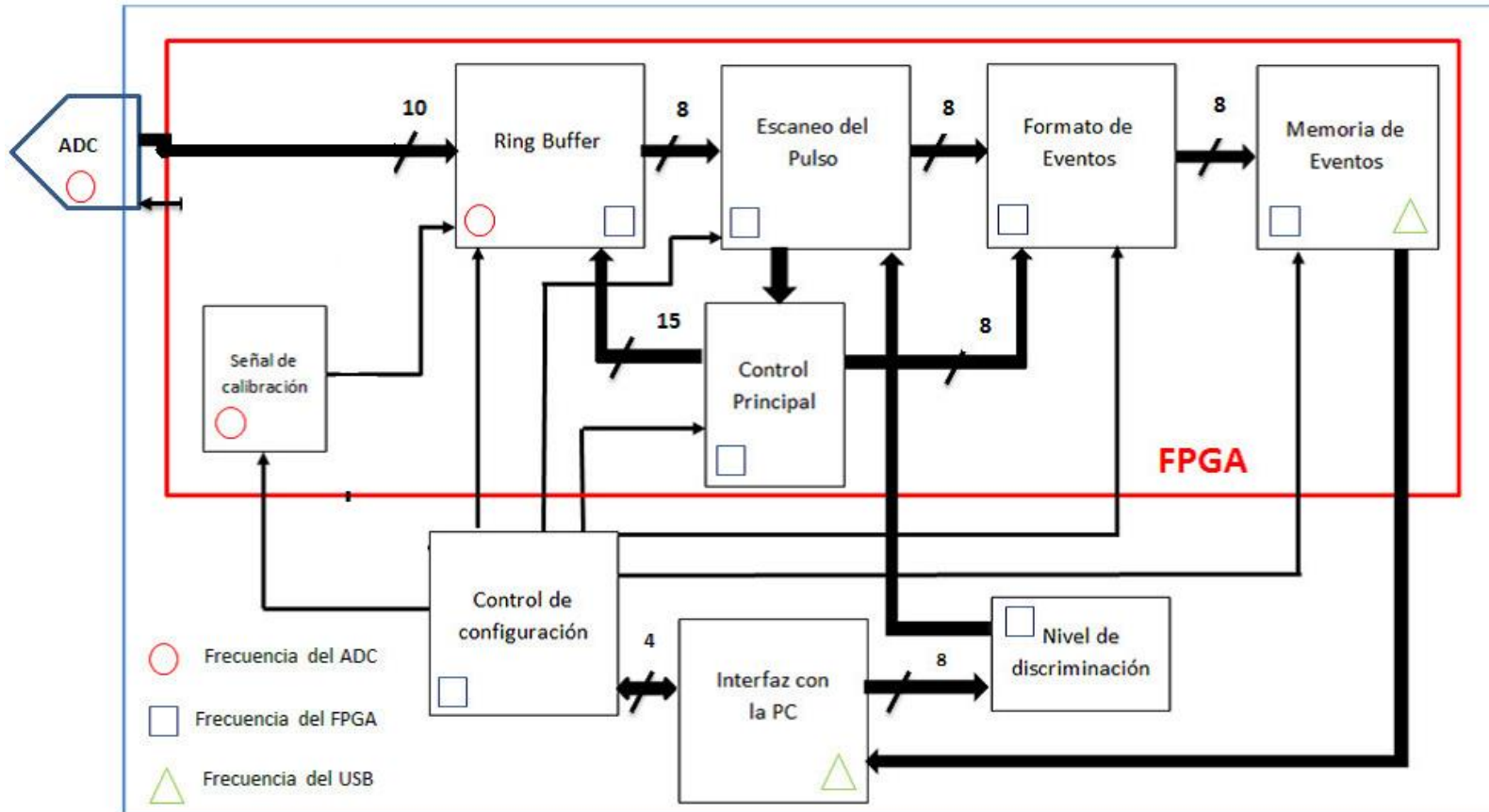
Data processing

- **FPGA**

- Cyclone 5, 5CEFA2F23C8N



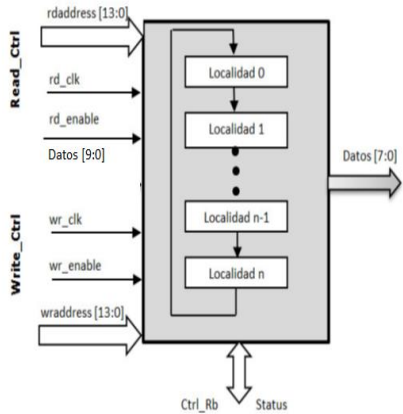
Data processing Diagram



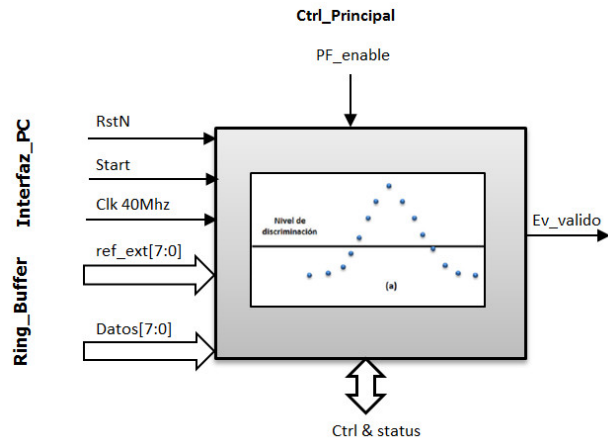
- Ring buffer
- Pulse finder
- Data Format.
- Event Memory
- Control
- Test Signal

Sistema de adquisición

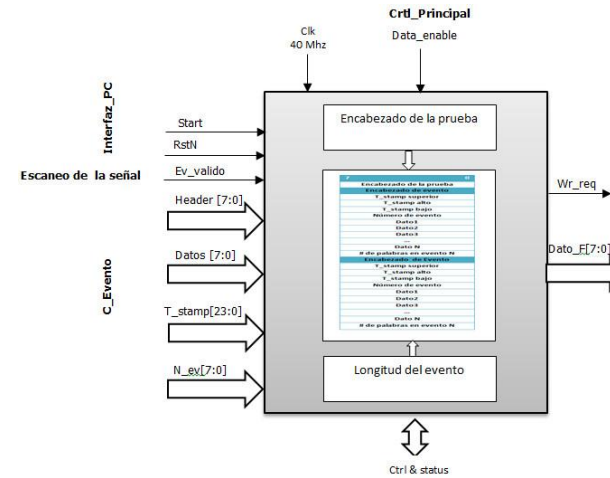
R.B. (DPM)



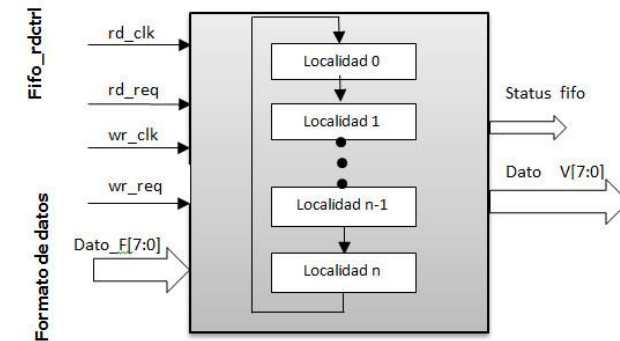
P.F.: Trigger



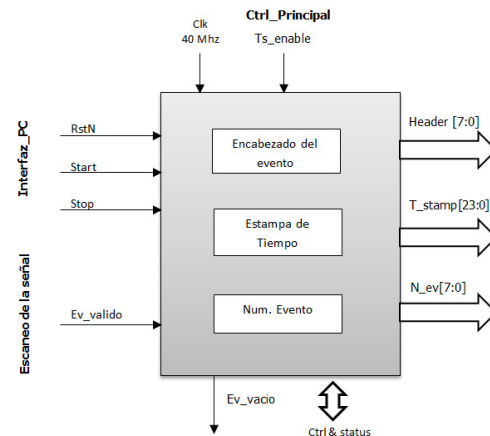
D. F



M.E.B (FIFO)



C.D: Clock Distribution



Data Format

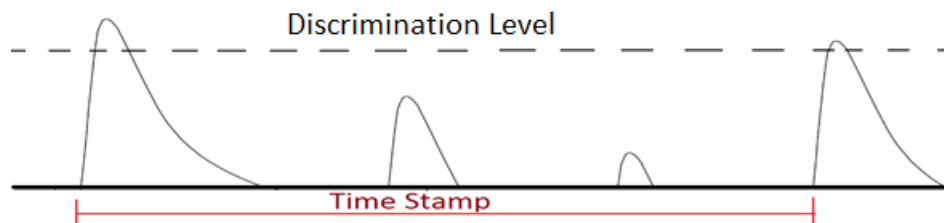
Valid Event

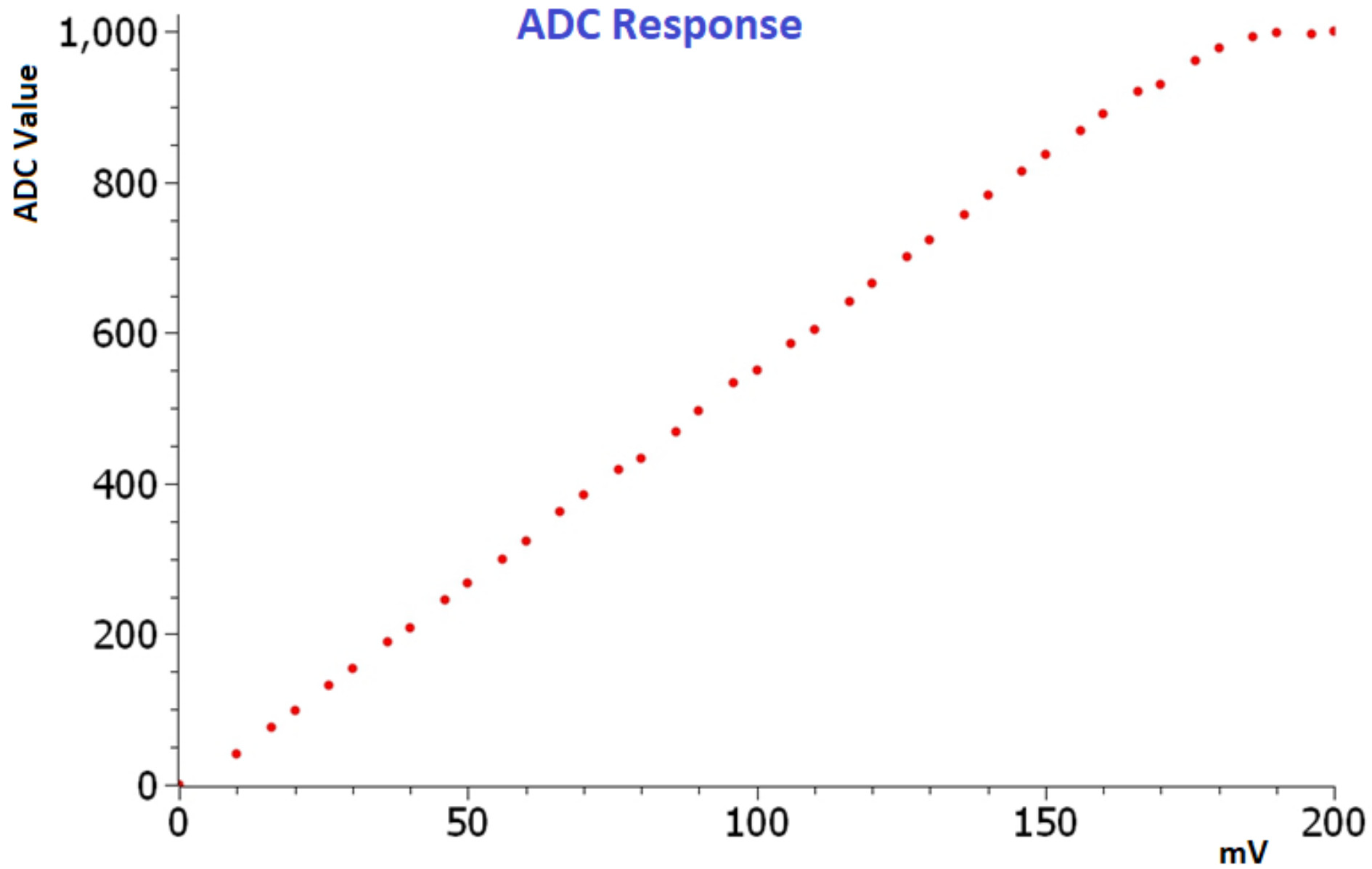
| | |
|---------------------------------|-----|
| Channel Address (101,111...) | DW1 |
| TSH (255) | DW2 |
| TSM (255) | DW3 |
| TSL (255) | DW4 |
| Event Number | DW5 |
| Event Data | DW6 |
| Number of data word (6) | DW7 |

Empty Event

| | |
|----------------------------------|-----|
| Channel Address (101, 111...) | DW1 |
| TSH (255) | DW2 |
| TSM (255) | DW3 |
| TSL (255) | DW4 |
| Event Number | DW5 |
| Number words (6) | DW6 |

- Channel Address (0x101, 0x111, 0x121...)
- Time Stamp
- Event Number
- Event Data
- Total Number of Words

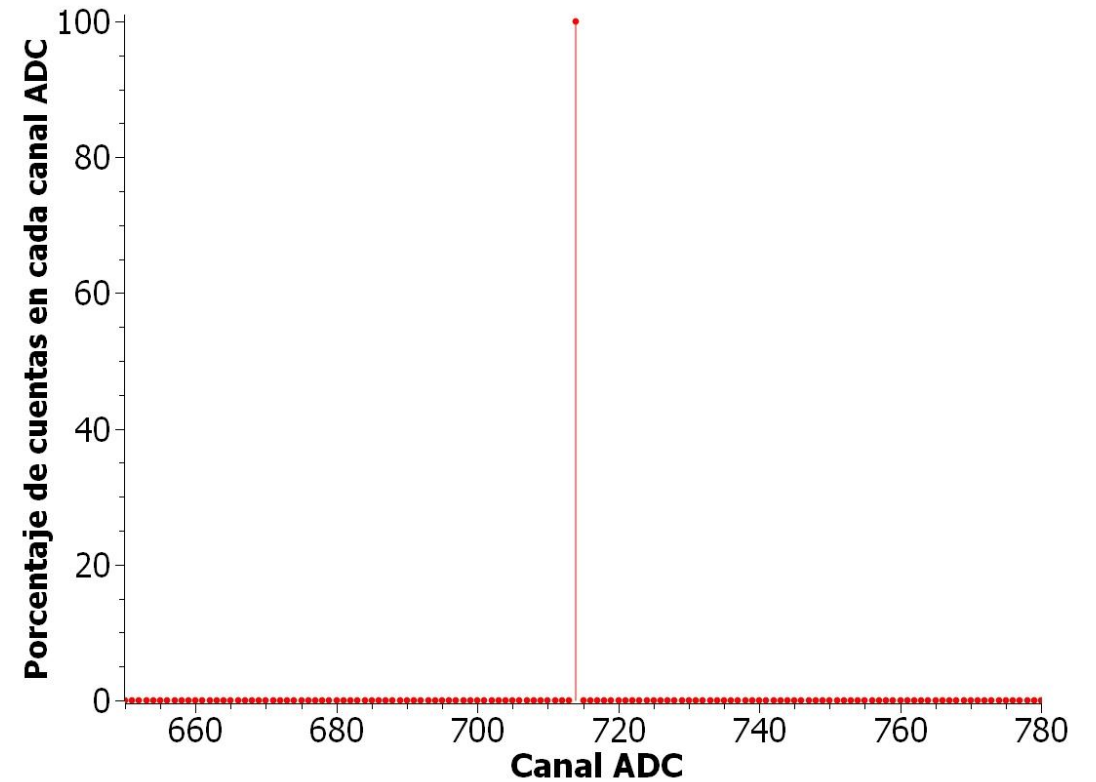




Auto-test Signal

Signal stored in the FPGA to verify the processing path.

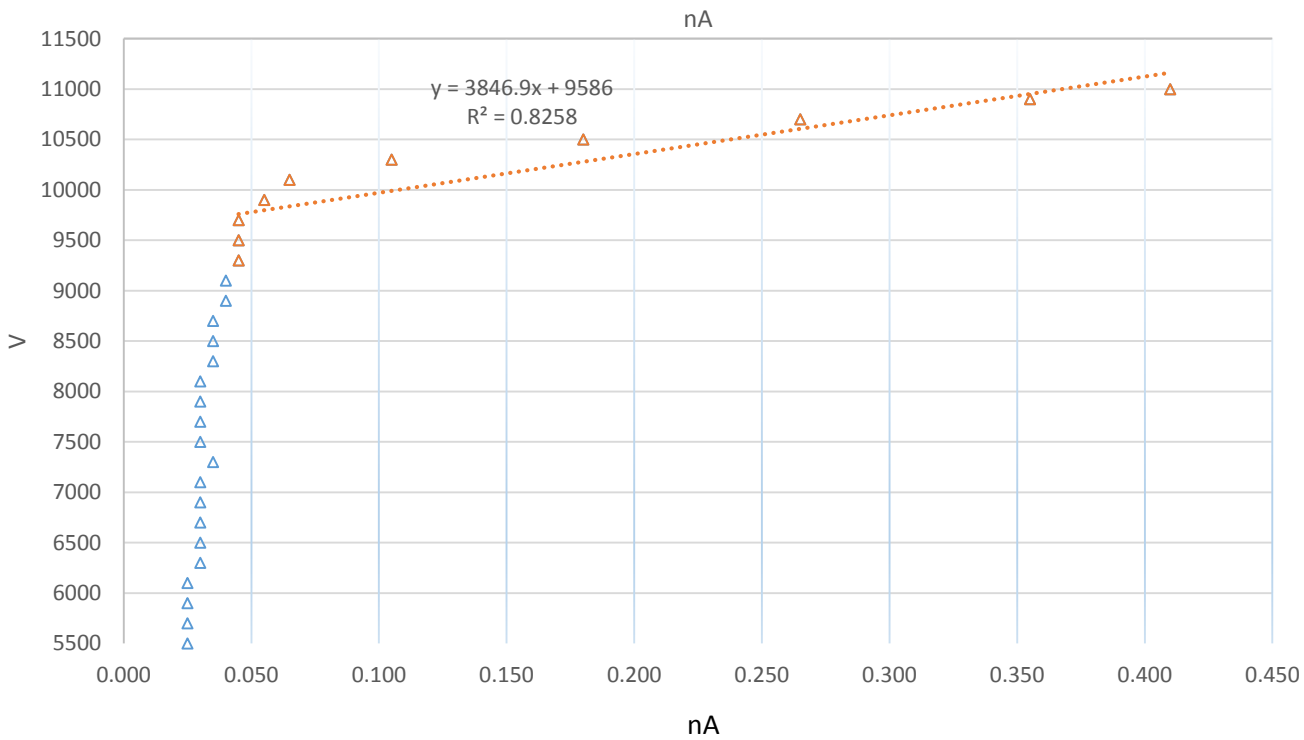
100000 Eventos



Results

ARGON

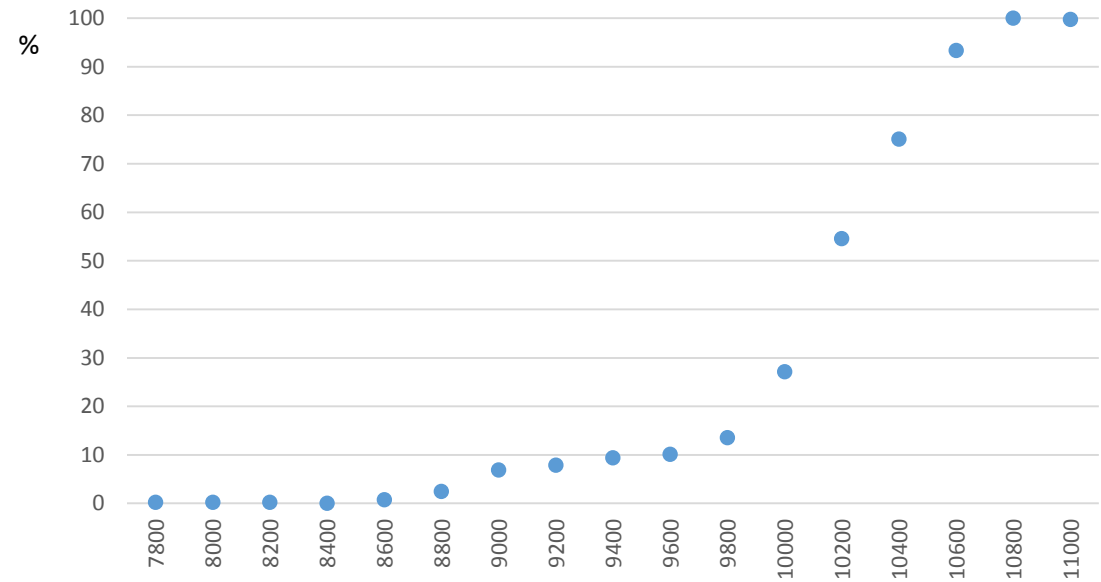
RPC 2 gaps Resistivity



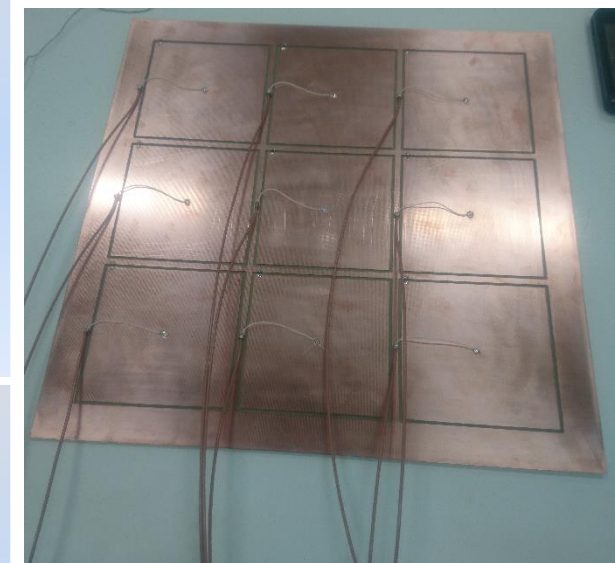
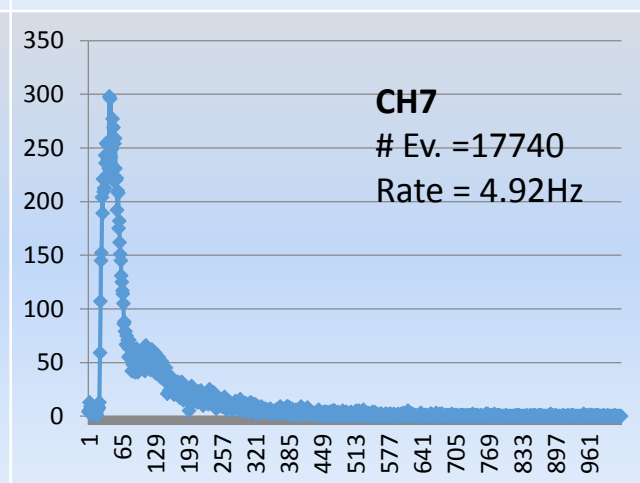
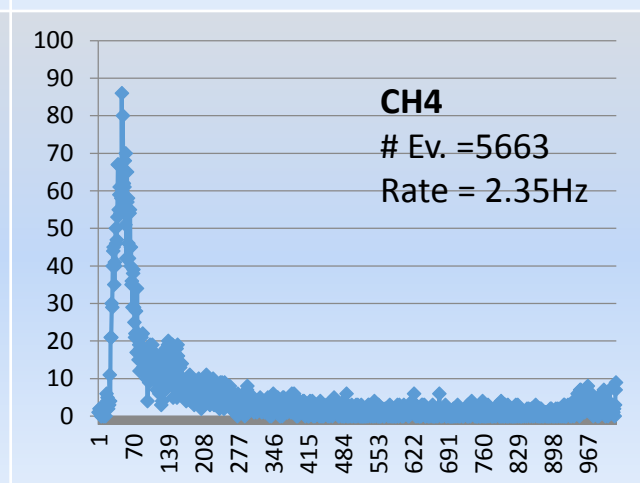
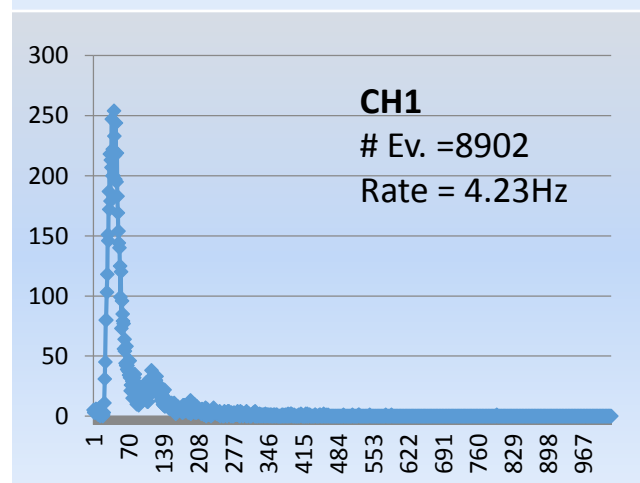
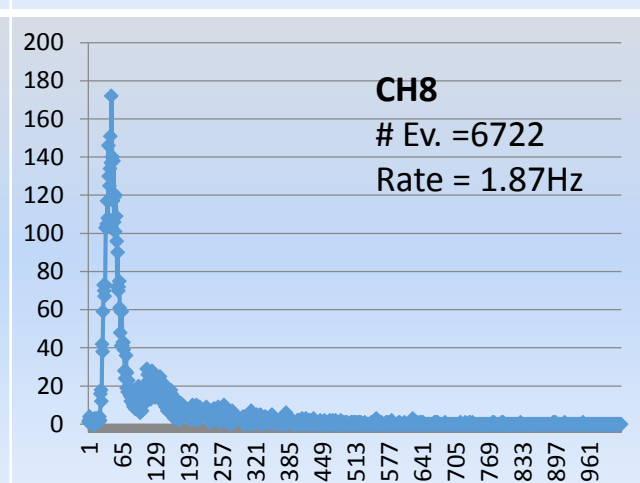
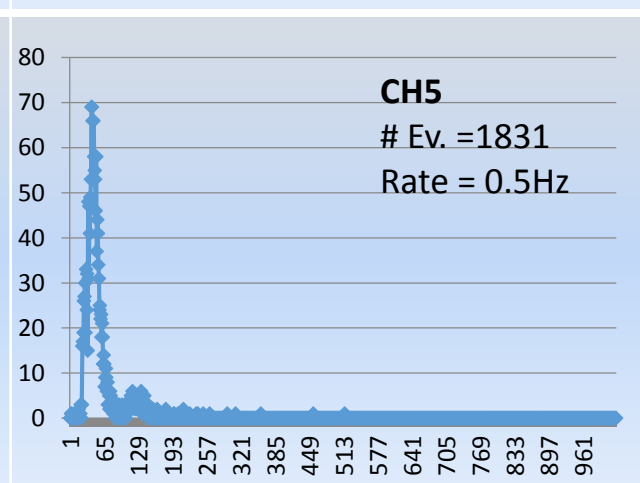
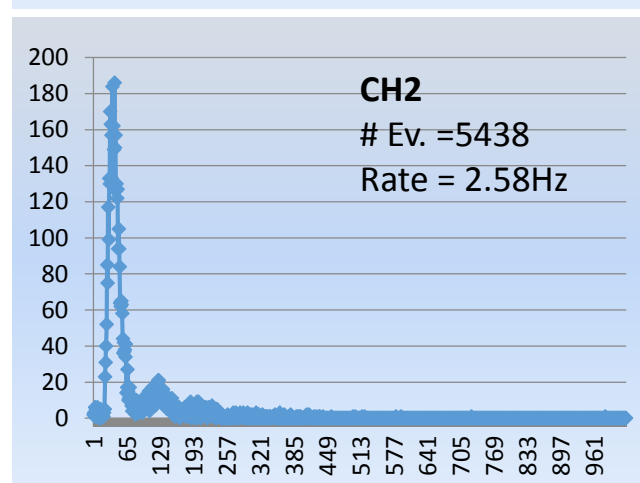
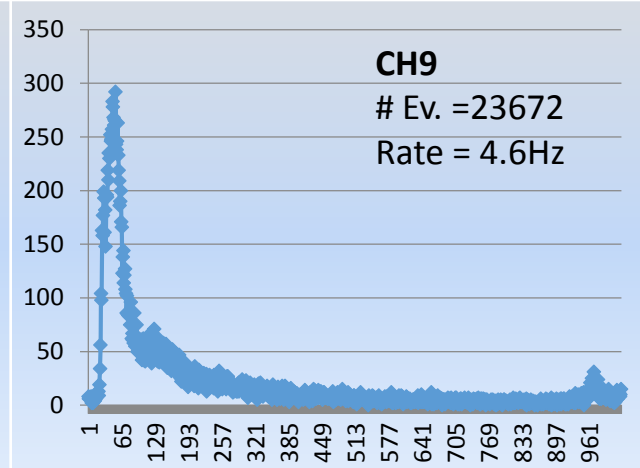
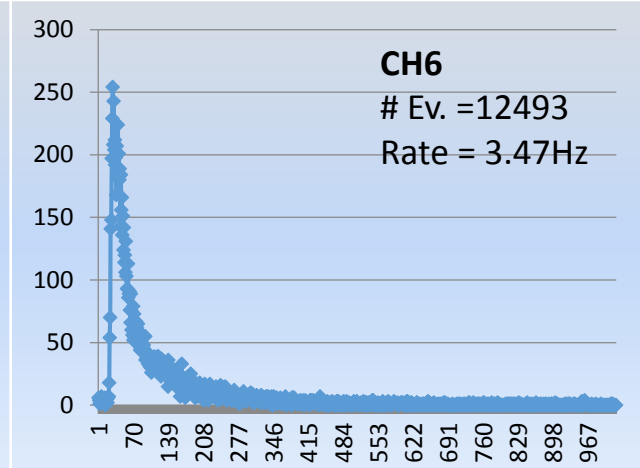
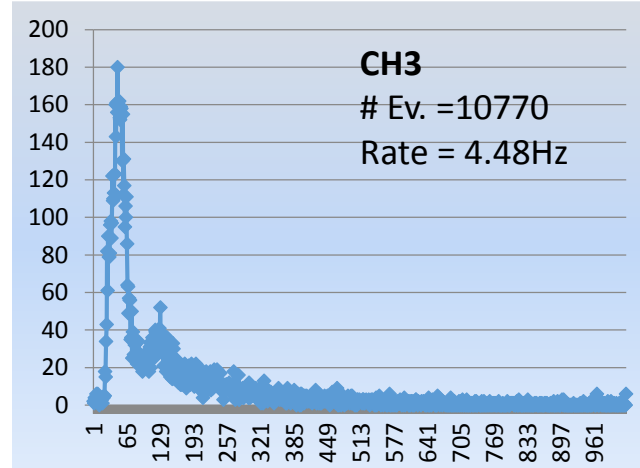
$5.6 \times 10^{12} \Omega/\text{cm}^2$

FREON

Efficiency



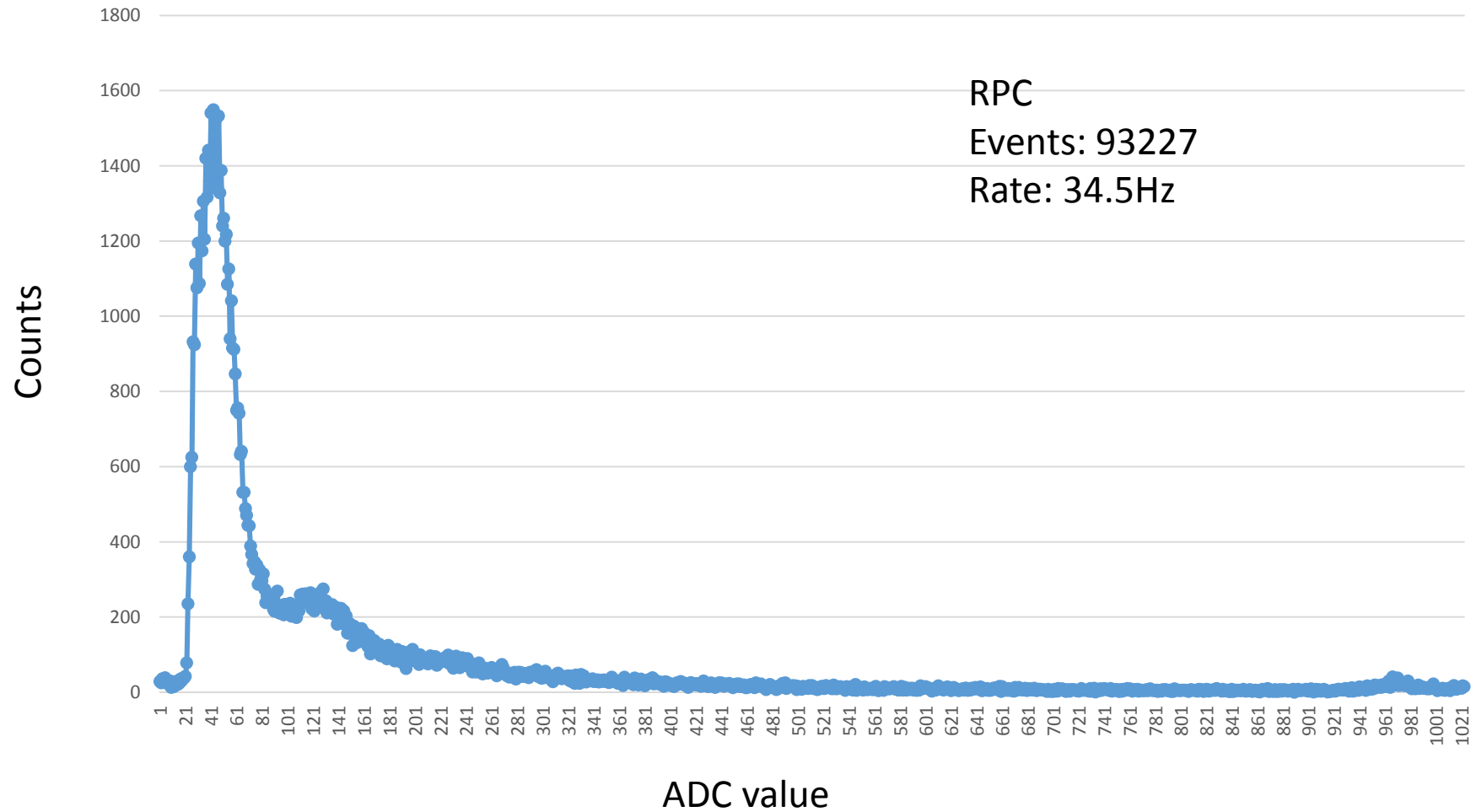
V



Counts

ADC Value

All RPC pads



Summary on RPC construction

- 30 x 30 cm RPC Fully constructed and under test with cosmics
- Electronics is working for 8 channels
- The quality of the materials are ok.
- New electronics using Kintex 7 Ultra scale
- HVPS is under development

Thank You