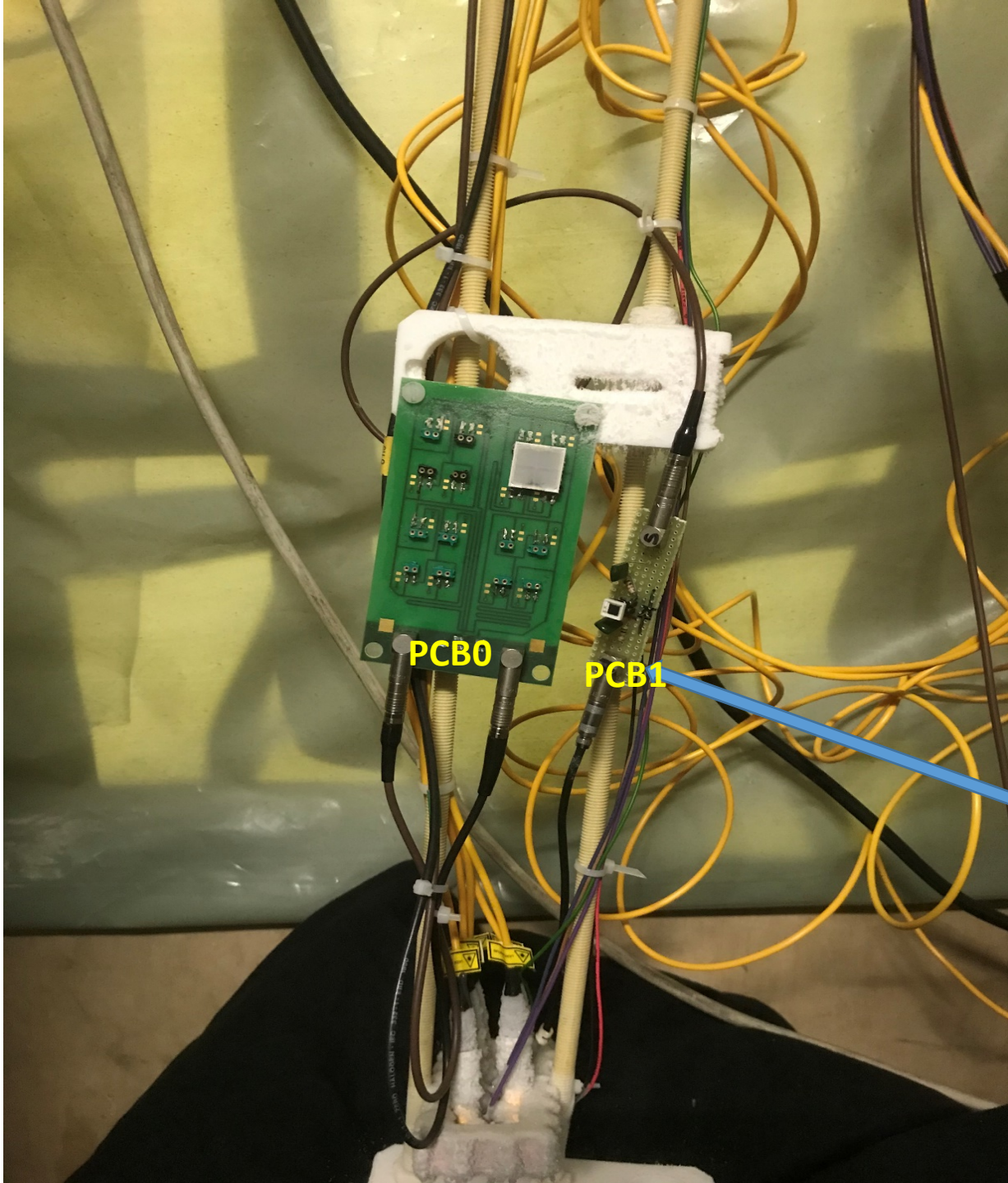


Testing Fermilab PoF system in LAr V (Nov 23-24,2020)

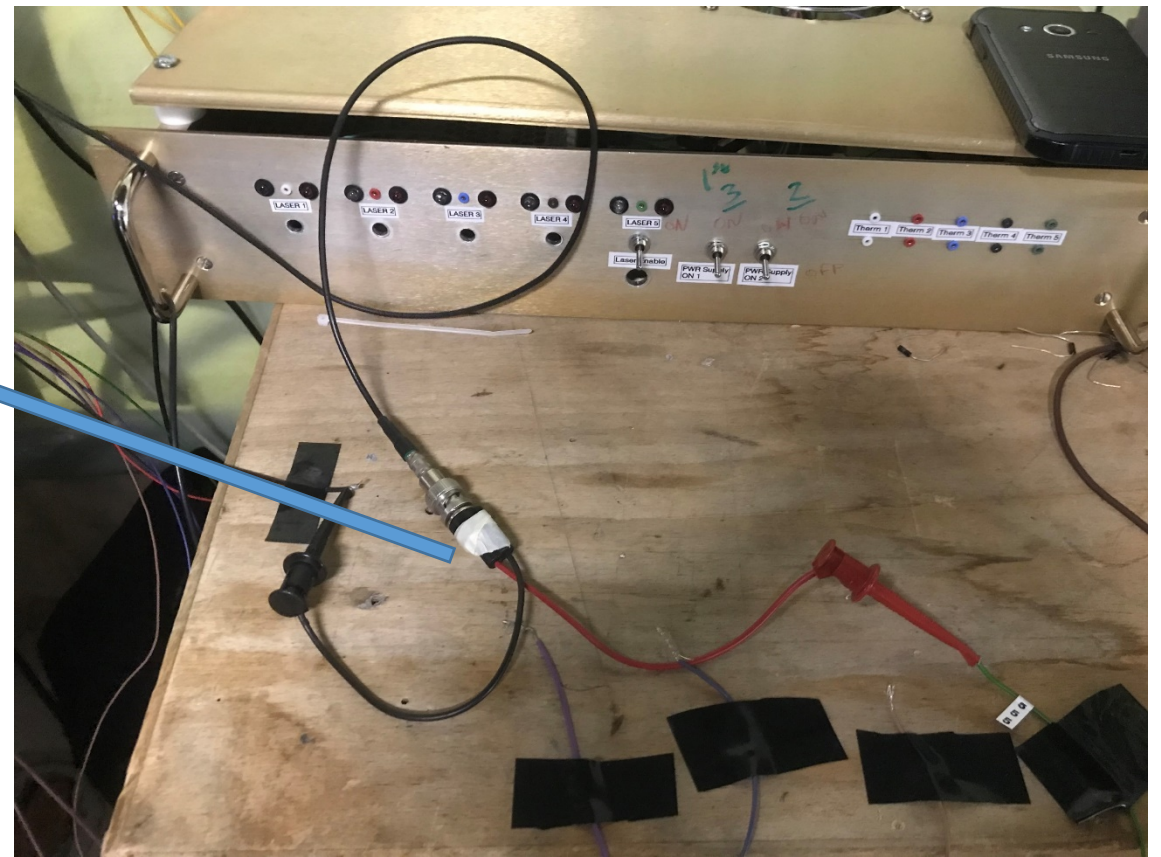
Dante TOTANI

Umut KOSE



What is the source of the noise?

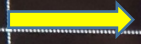
In order to understand whether the noise is coming from the board itself or from somewhere else we have placed additional readout circuit (PCB1) with 3x3 mm³ SiPM biased with Power over Fiber system (signal readout with 10nF capacitor)



File Vertical Timebase Trigger Display Cursors Measure Math Analysis Utilities Help

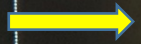
Zoom Undo

SiPM signal from PCB1



I2

SiPM signal from PCB0



C1

C1 DC50 C2 DC50

1.00 MHz 500 ns/div

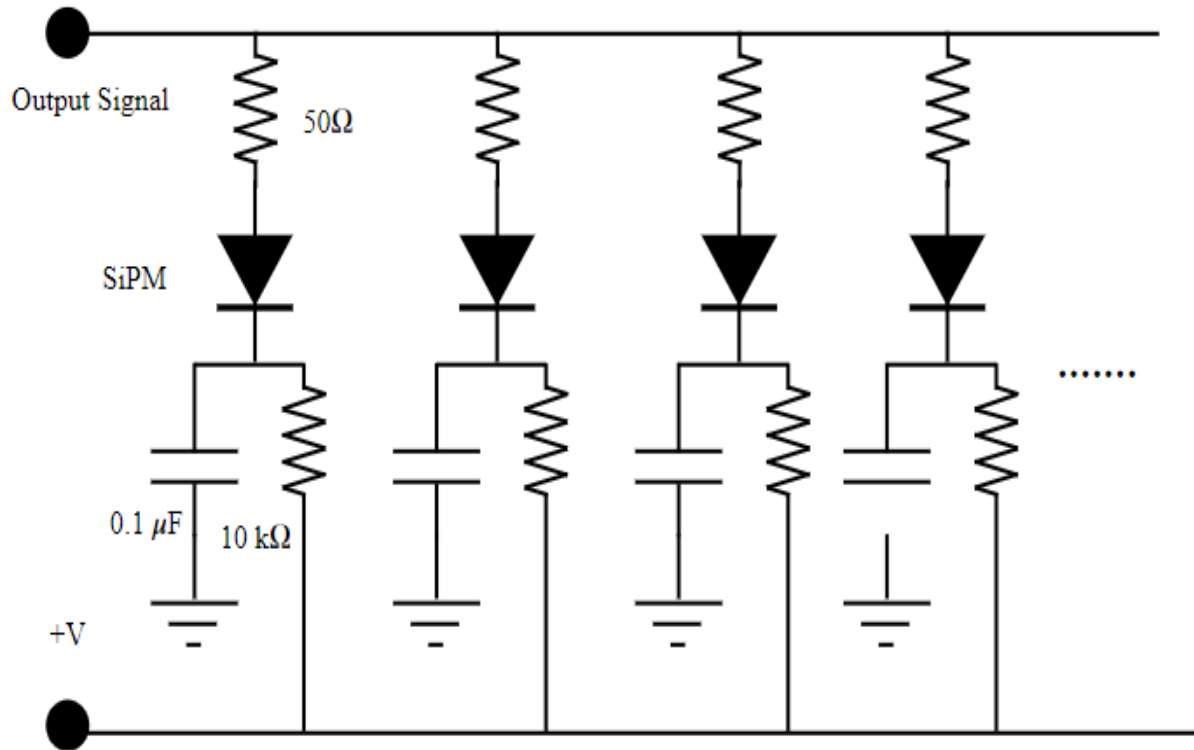
11/23/2020 12:40:32 PM

TELEDYNE LECROY

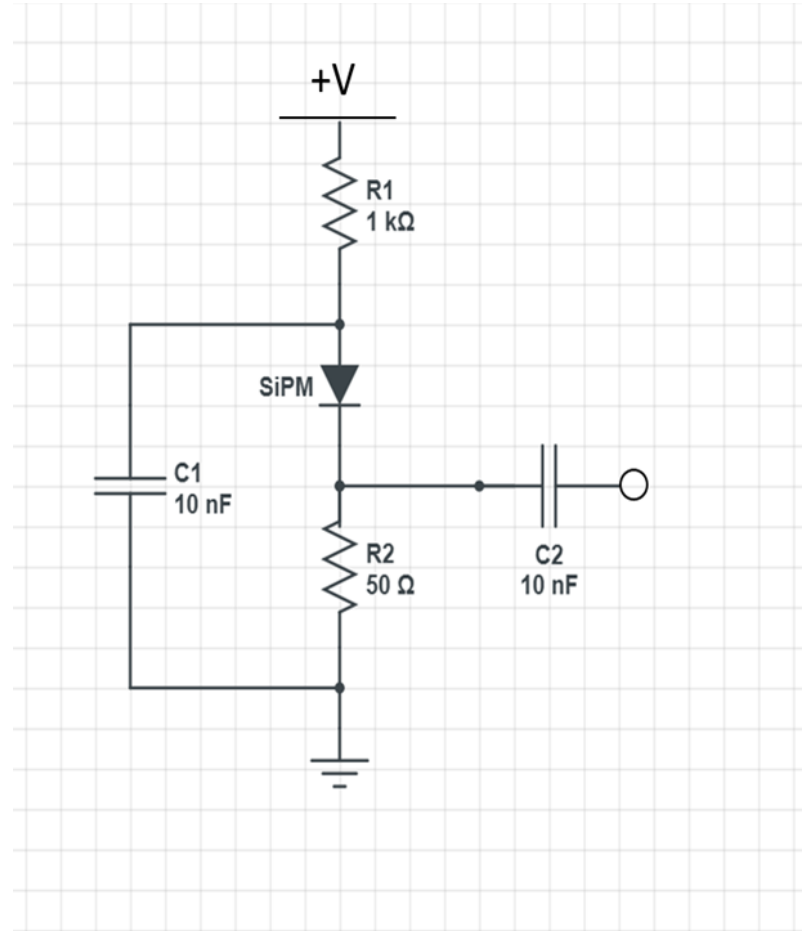
We do not see the noise seen in other SiPM board!

All Inputs 500 Ω 5V RMS 1MΩ > 250V PK

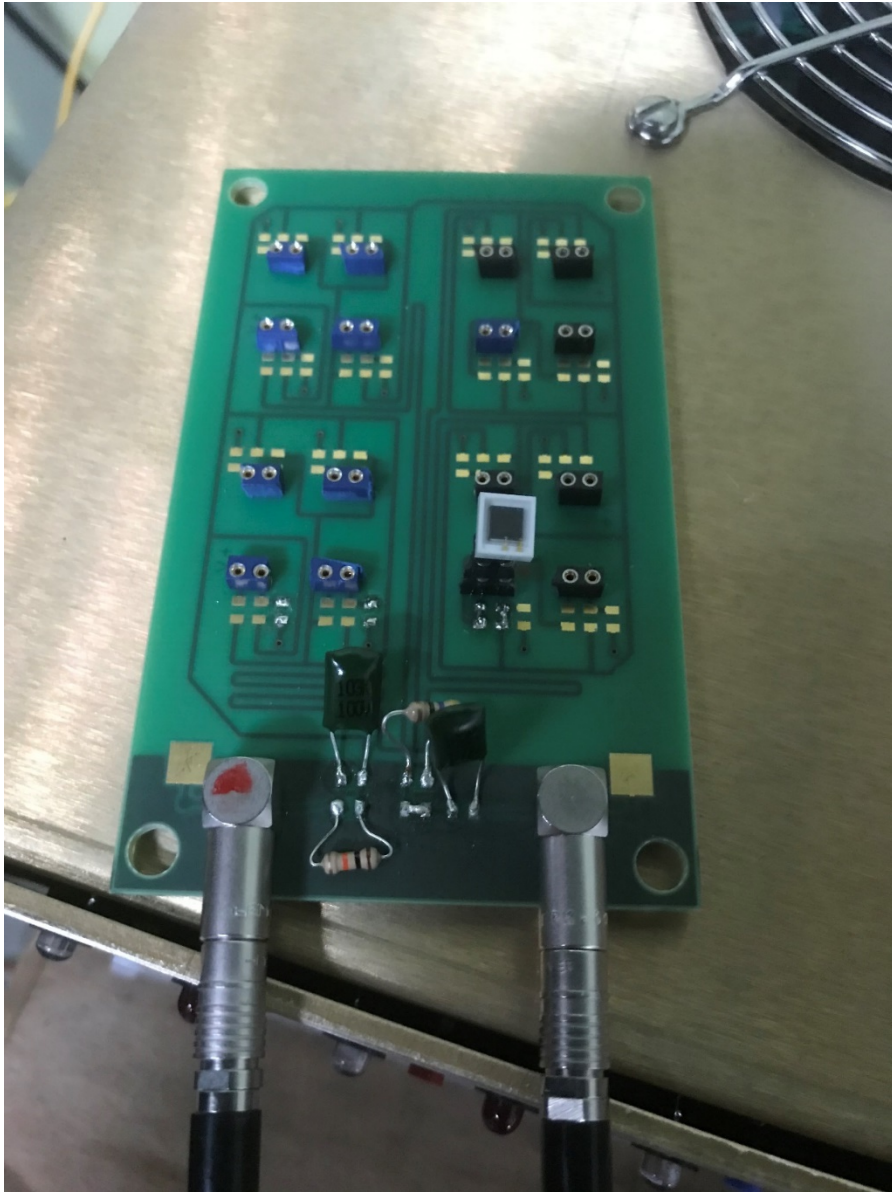
SiPM readout circuit (PCB0) designed for PoF test:



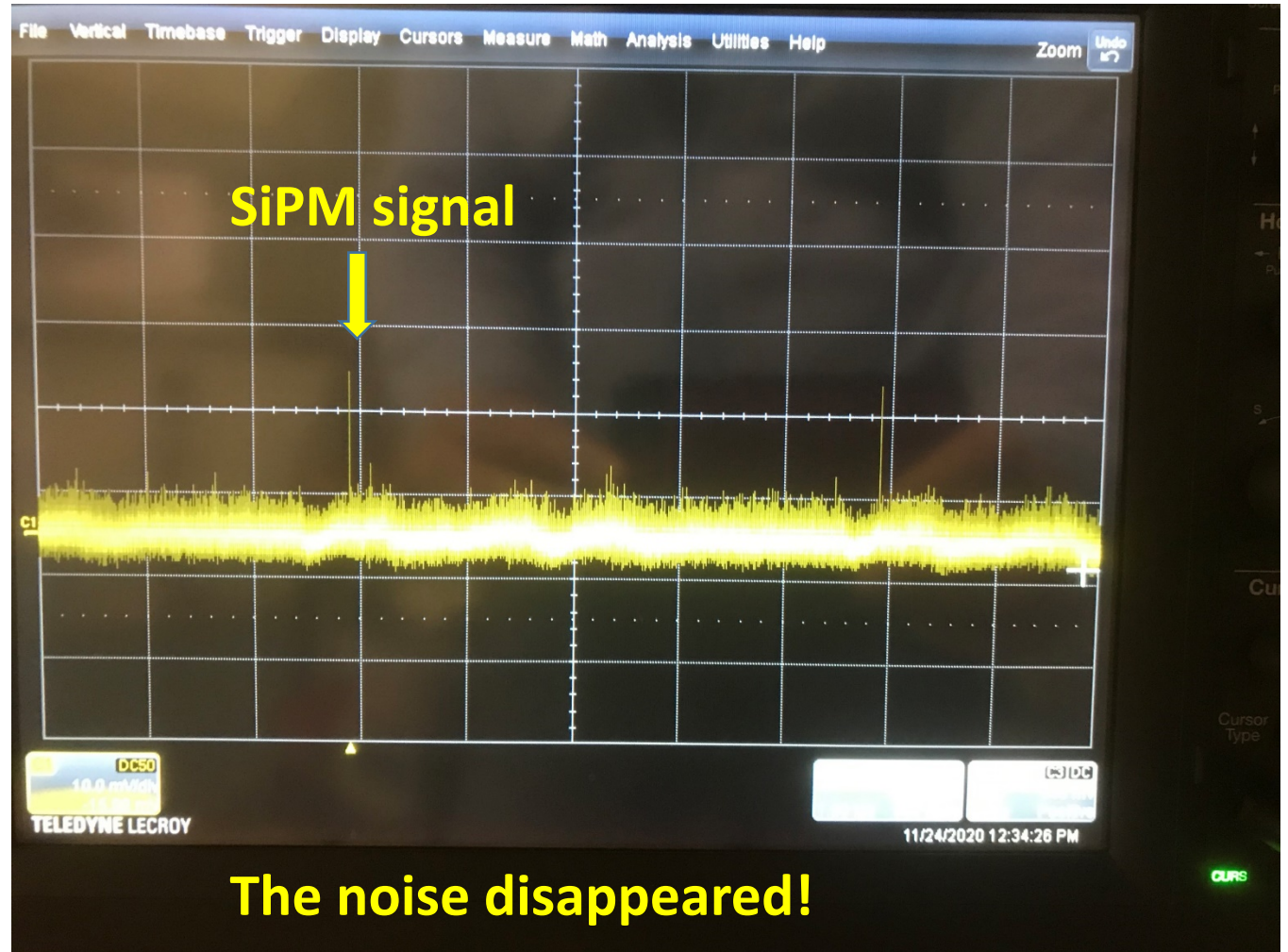
SiPM readout circuit (PCB1) to compare:



See the videos uploaded to CERN, taken during the test



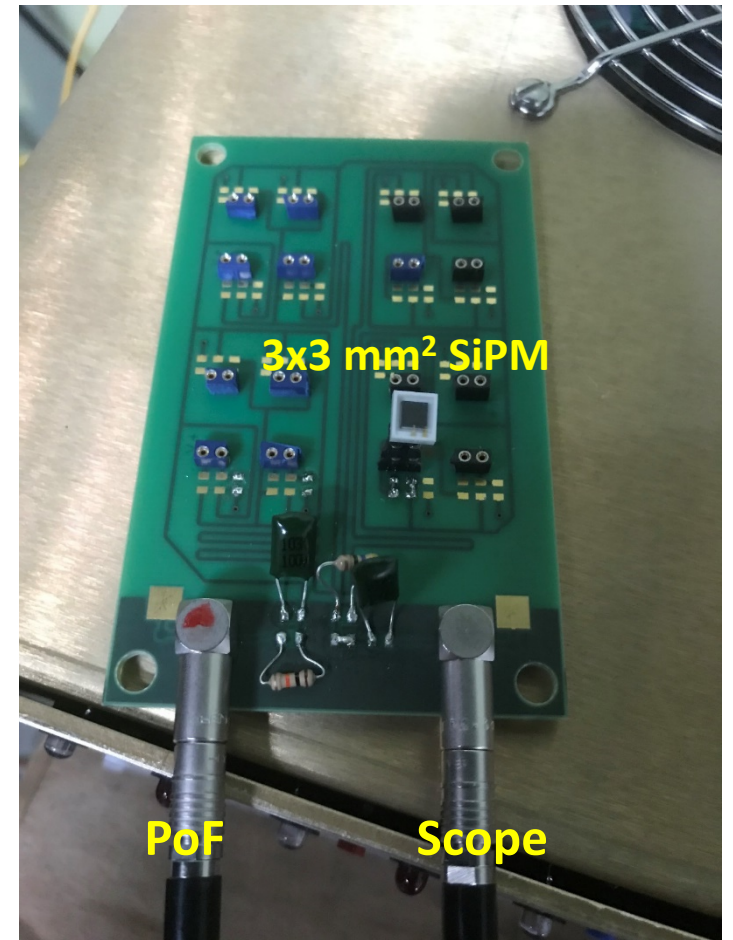
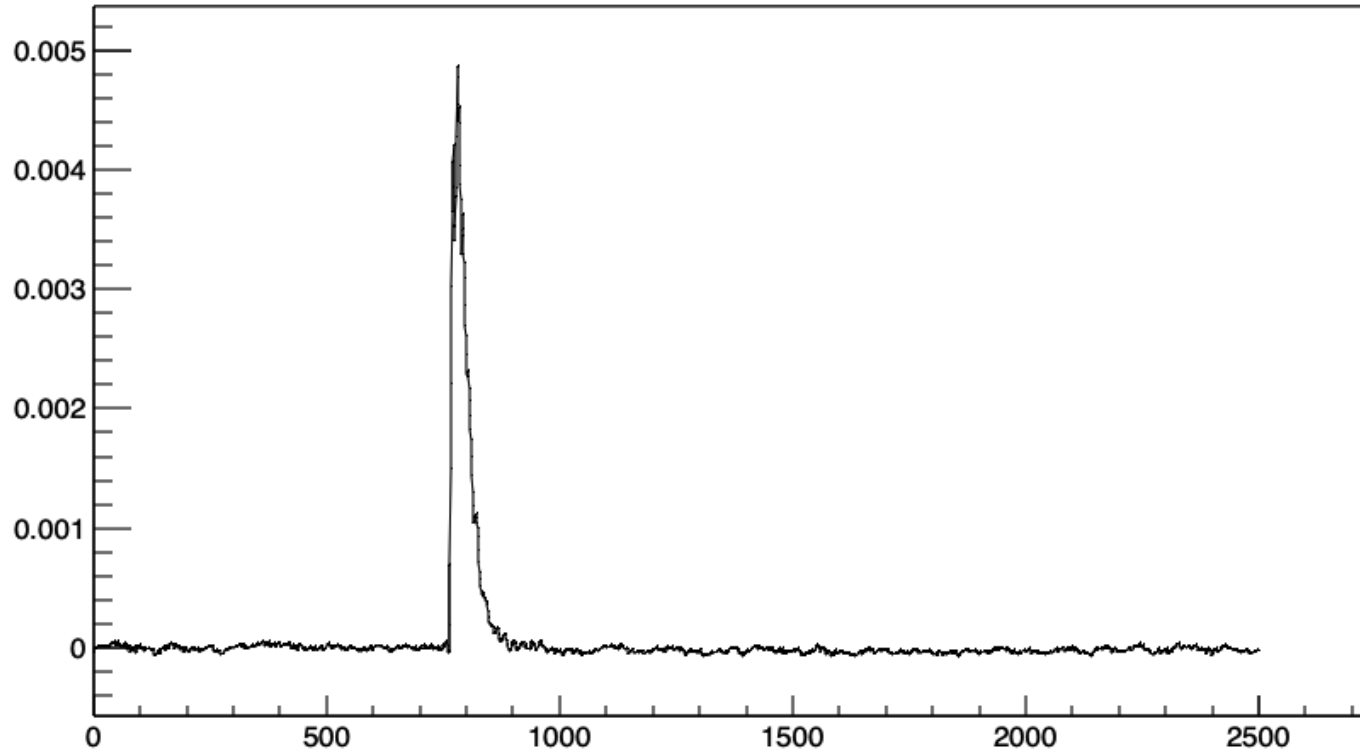
We prepare a new PCB same as PCB1 (reading out signal with a 10nF capacitor) to understand well whether the noise is related to PCB itself



See the videos uploaded to CERN, taken during the test

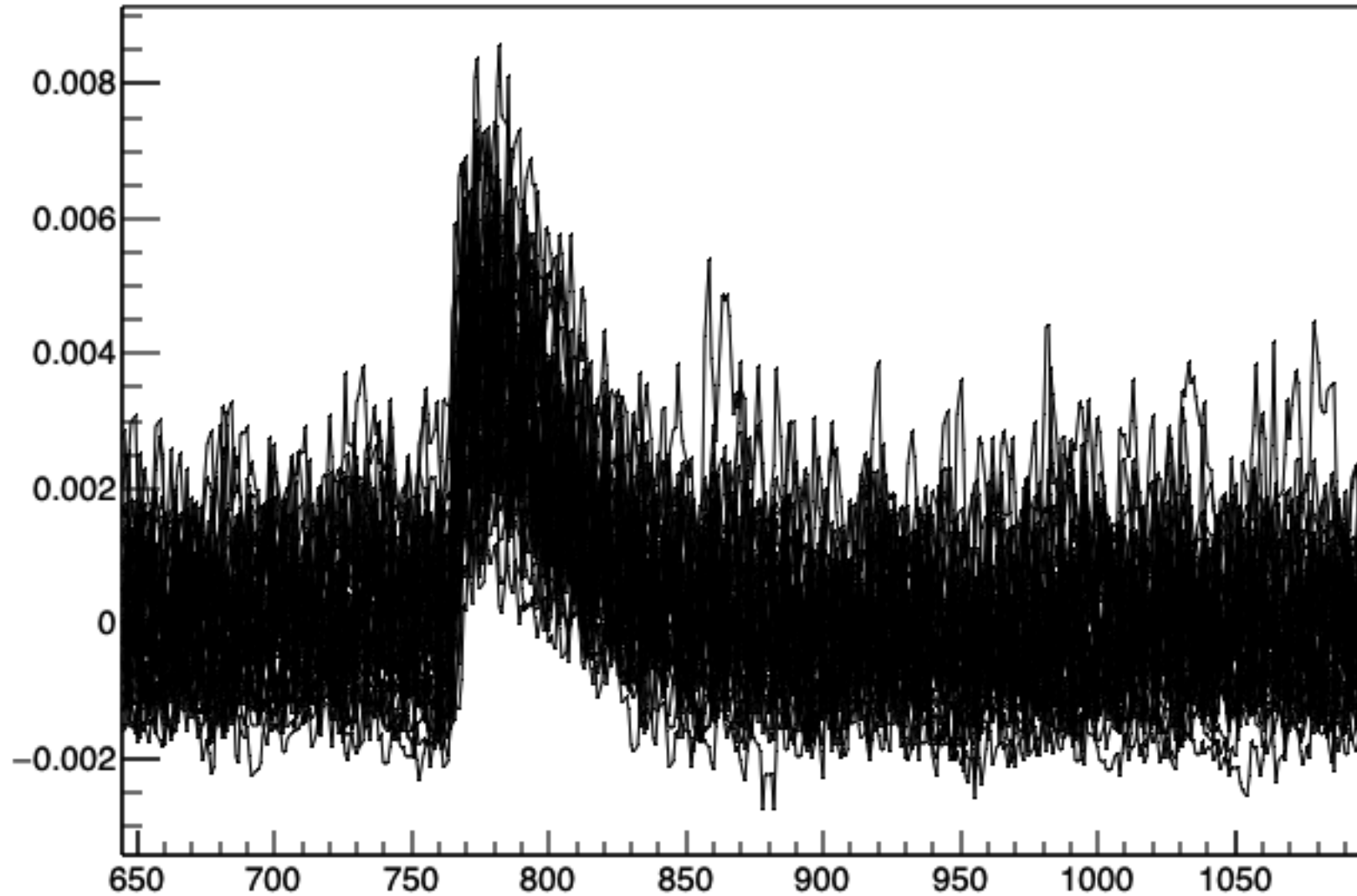
Waveforms analysis

Average waveform



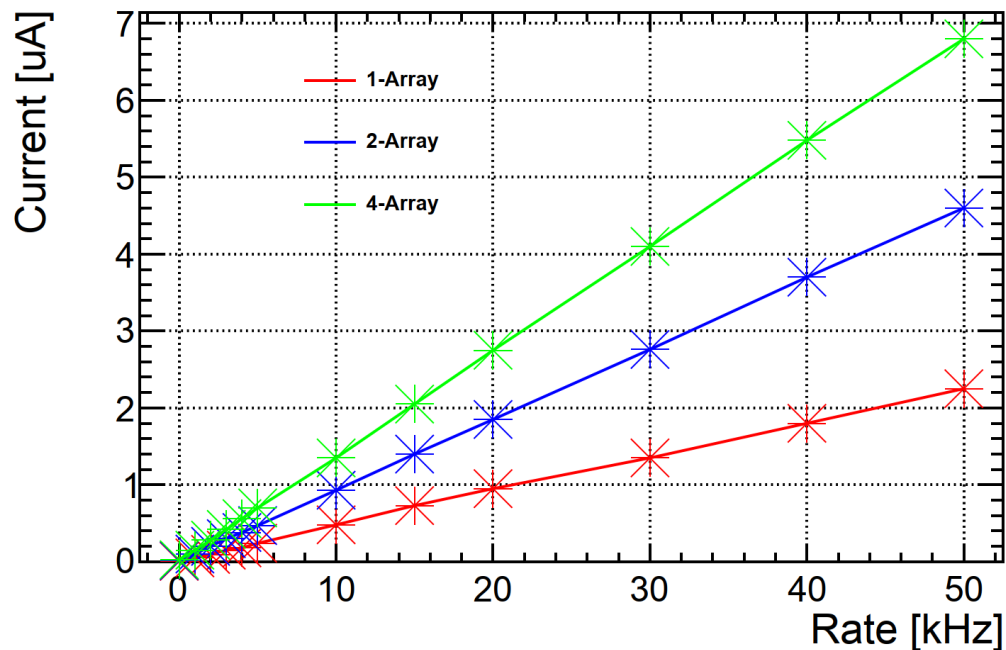
- Acquiring waveforms in LAr (pulsed LED)
- The MPPC output readout include a 50 Ohm resistor from Output to ground and a 10 nF capacitor from output to Scope input.

Persistence and zoom on trigger point: the illumination is much higher than Single PE, probably we need an amplification to make a SPE resolution study

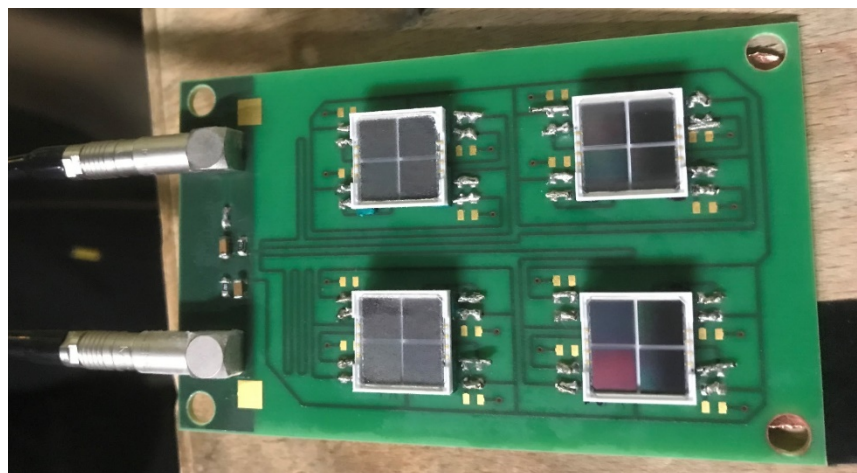
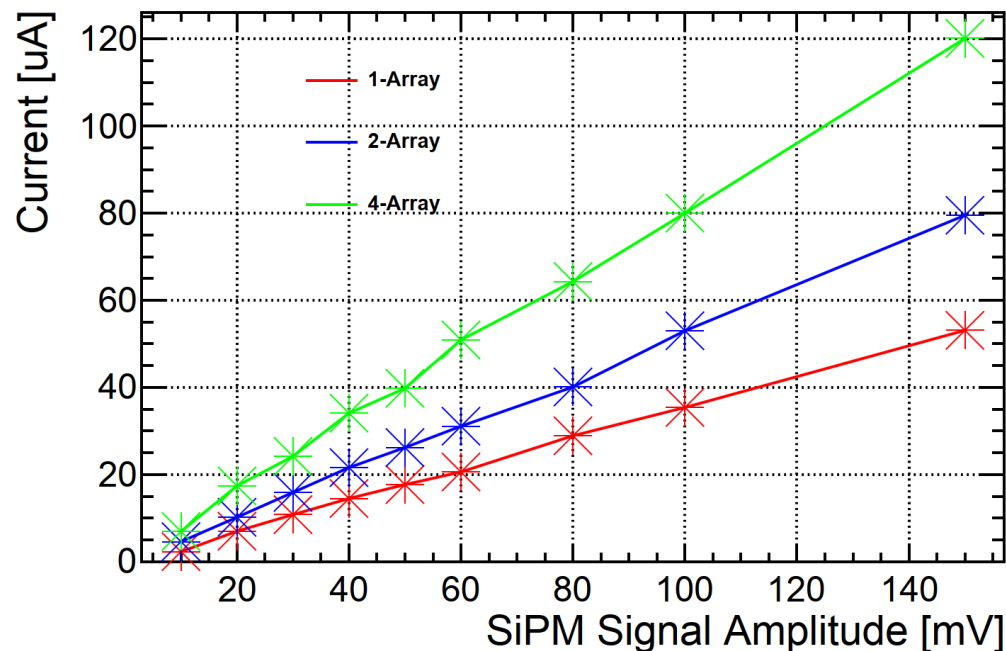


Checking current consumptions on SiPM arrays in LAr

LED pulse rate vs Current [$V_{op}@48V$]



SiPM Amplitude vs Current [$V_{op}@48V$, LED 50kHz]



- In this test SiPMs biased and current readout with Keithley 2410 Sourcemeters.
- 48 Volts set
- Dependence on LED pulse (8-10mV signal amplitude) rate of: 1, 2, 3, 4, 5, 10, 15, 20, 30, 40, 50 kHz
- Dependence on SiPM signal amplitude (we fixed a rate of 50kHz on LED pulser)

Checking whether we still have bubbles or not?



More epoxy added to prevent boiling the liquid.

It is hard to see from the photo, check the video in November24 folder at usual CERNBox link.

Summary:

We spent most of our time to understand the source of the noise seen on PCB0.

Reading SiPM signal with a capacitor get rid of the noise (almost). Some waveforms acquired with scope to study SPE resolutions.

Next step to modify the board and perform once more again the test with an array.

We have also studied current consumptions of SiPM in LAr.

Need to add more epoxy in order to avoid boiling the liquid.