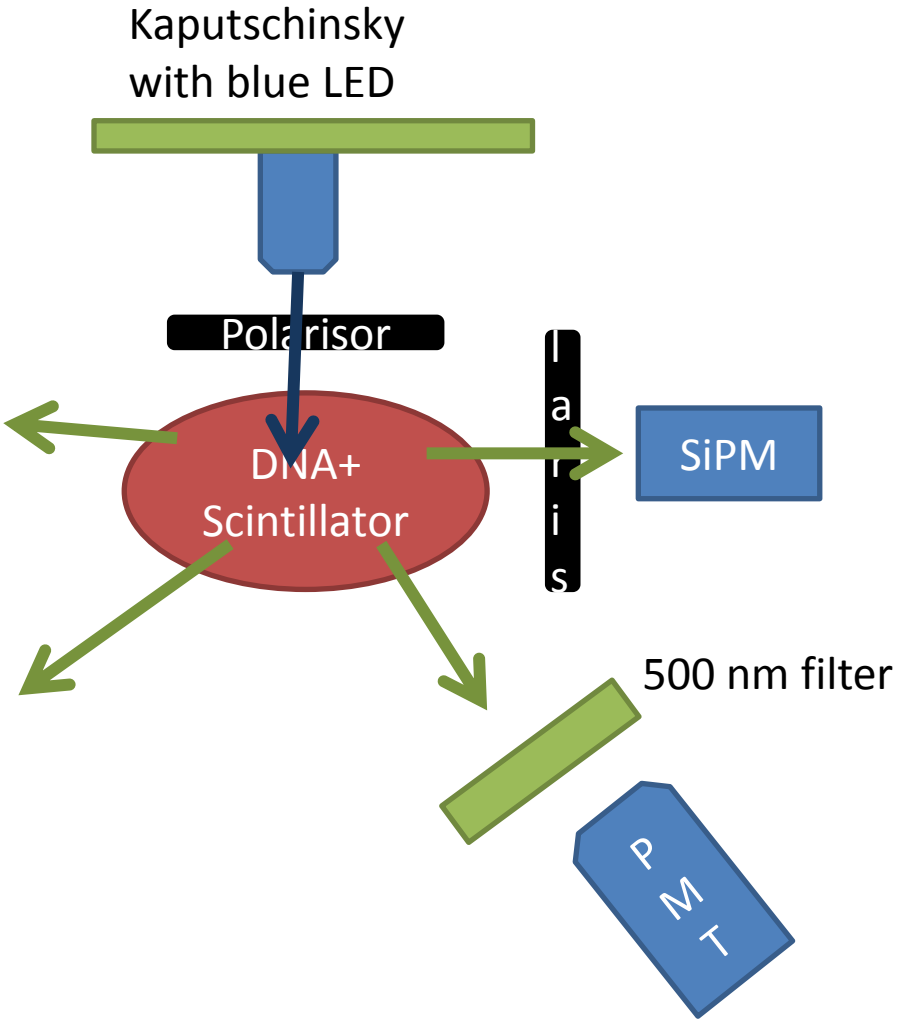
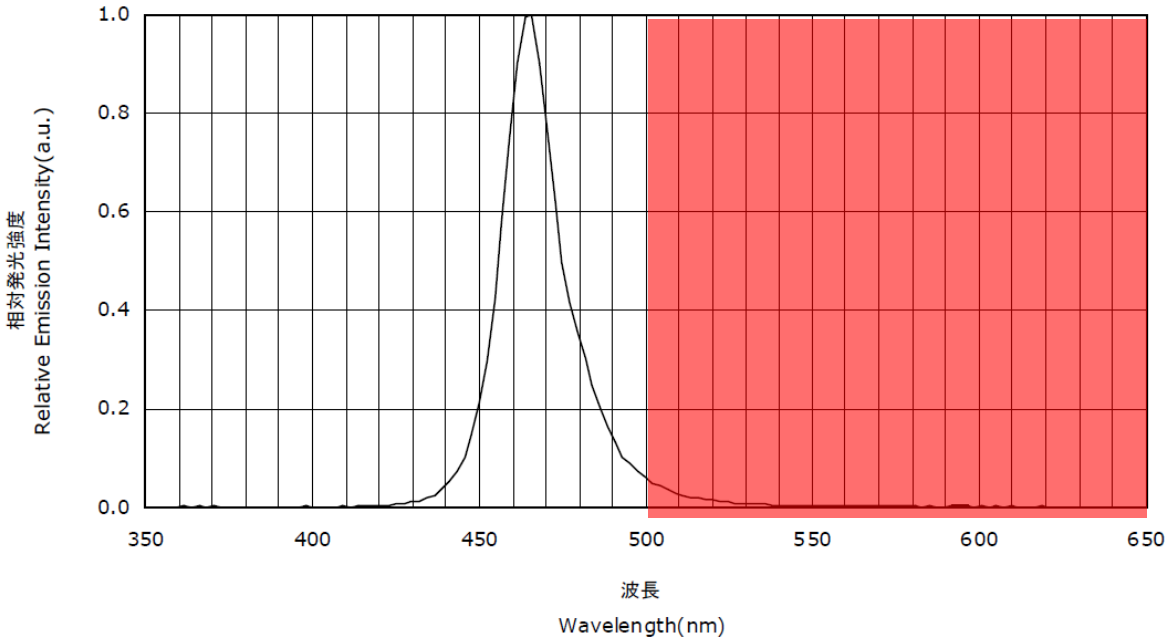
Situation after last DNA tests



1. Saw direct light with PMT which should not be the case since we used blue (465 nm) LED
2. No clear signal neither with SiPM nor with PMT

Some Possible Problems Identified

- LED peaks at 465 nm but has long tails to shorter and longer wavelength
- Small fraction even above 500 nm => not filtered by longpass filter
- Solution: acquired short pass filters which let pass light below 475 and 500 nm pass



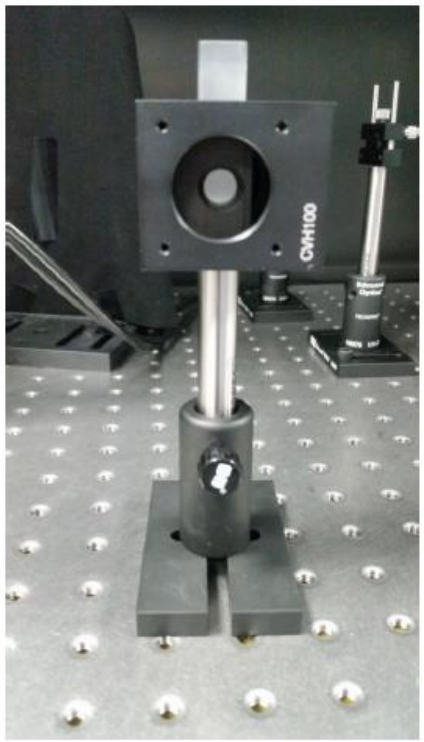
Some Possible Problems Identified

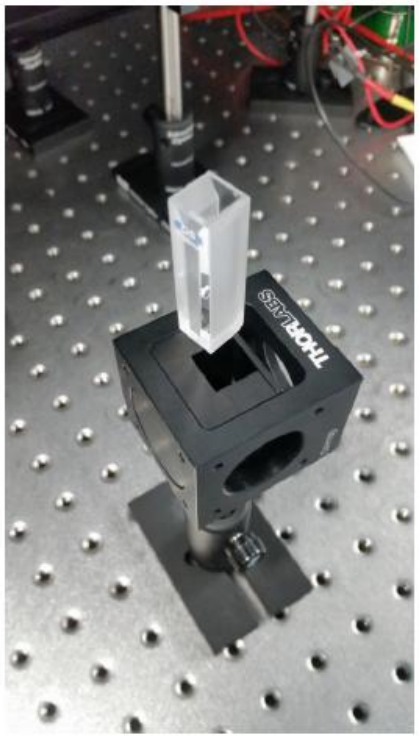
- Light sensors, especially SiPM, only covers tiny solid angle => very few photons might only reach SiPM
- Decay time of scintillator might be long (micro- to miliseconds) compared to chosen time window on oscilloscope (about 80 ns) => very few photons from scintillator might be within time window

New Setups

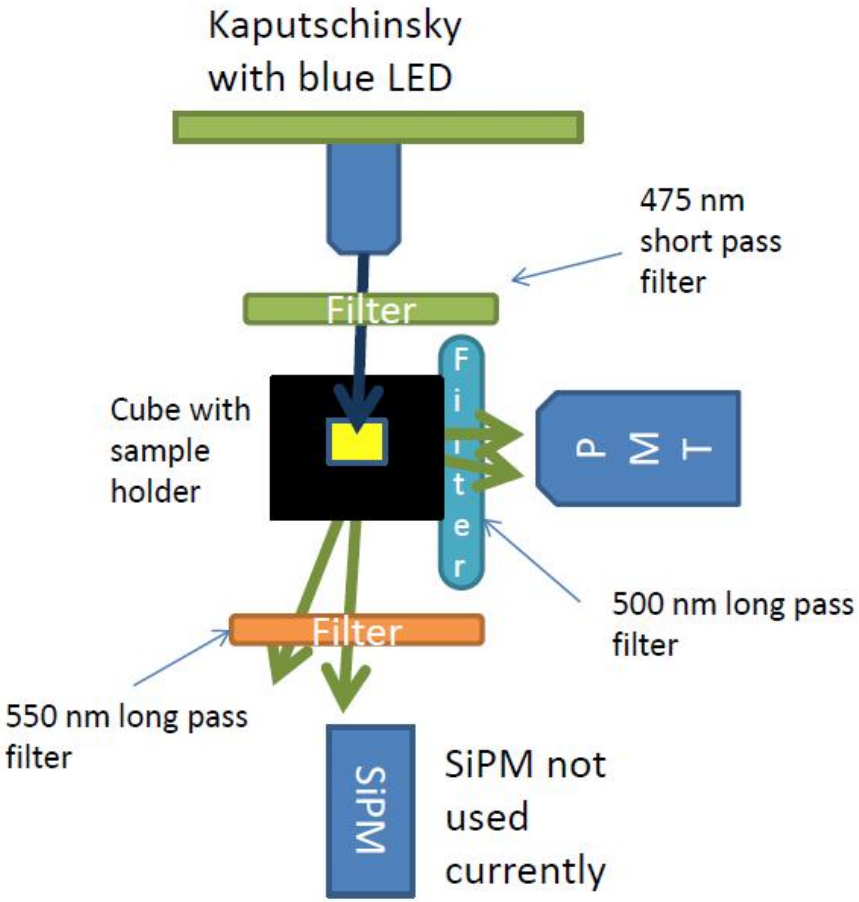
2 new possible setups:

- Cubic sample holder borrowed from Ruta
- Used in first tests



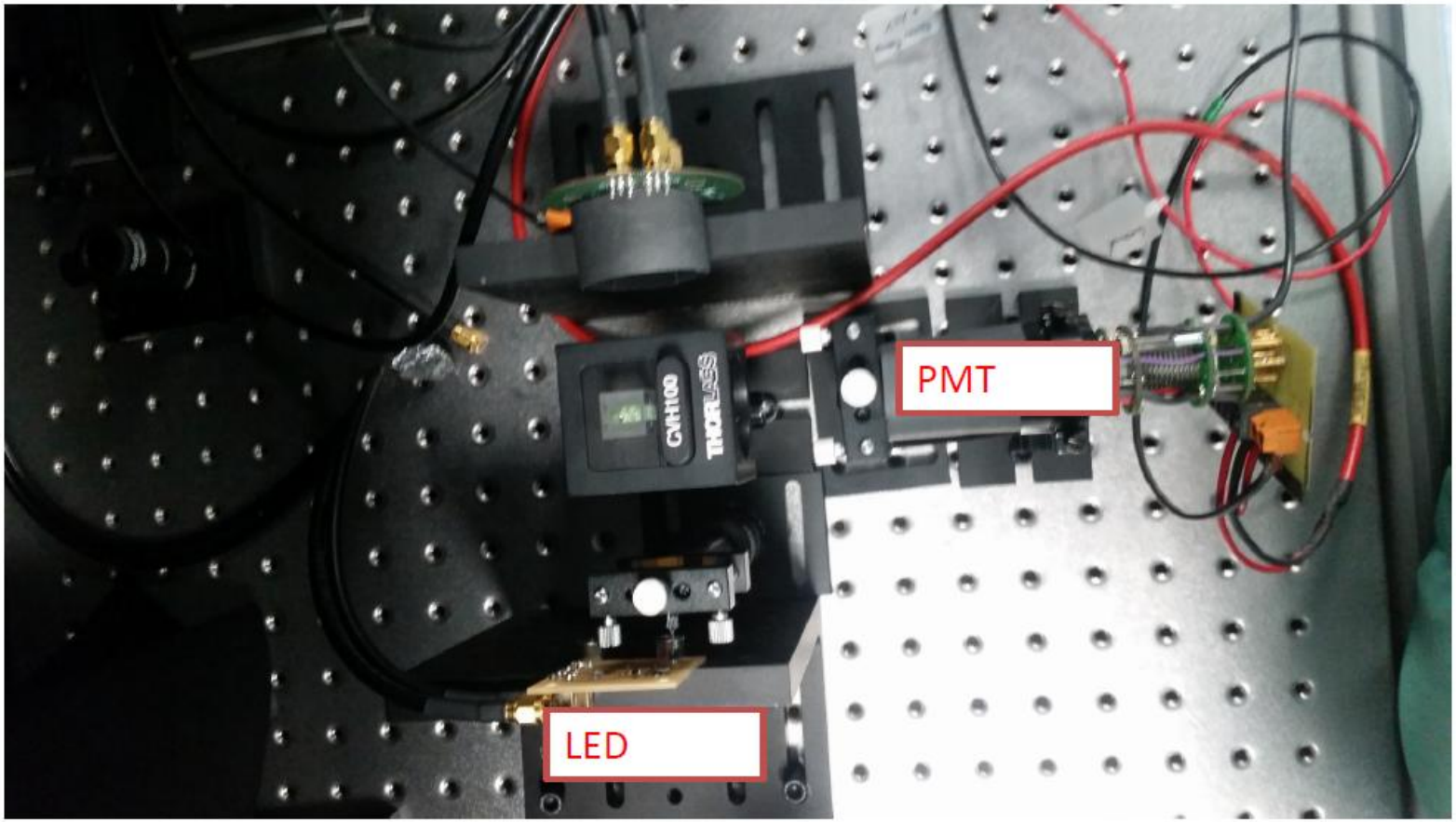


Current Setup



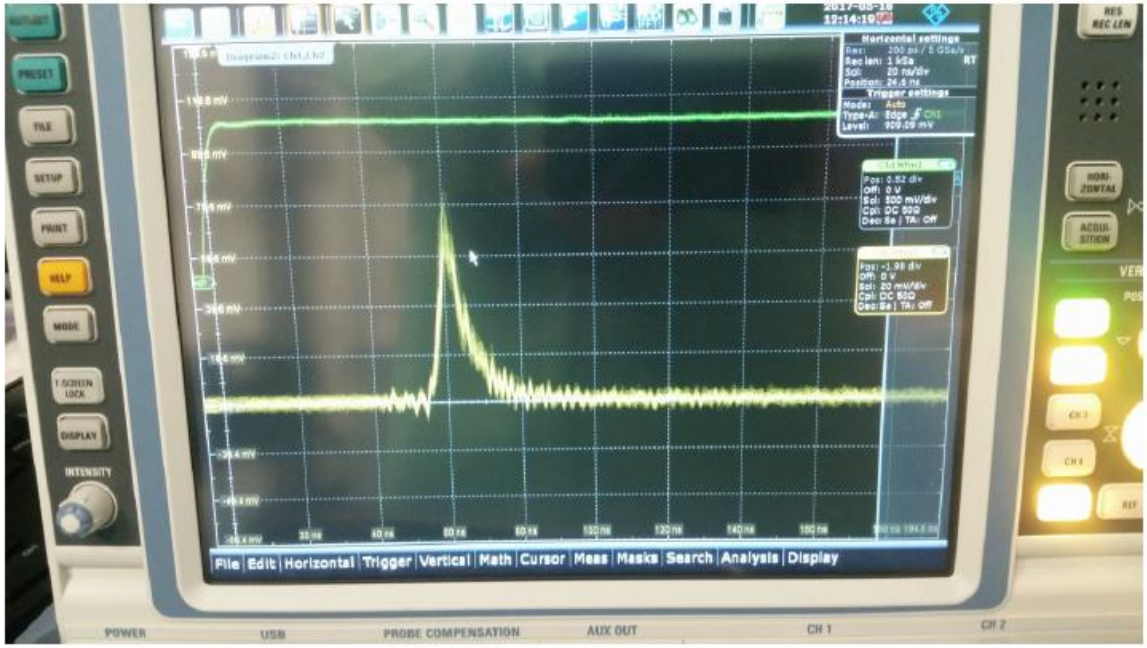
1. Only PMT used for 1st tests
2. Everything closer together
3. Instead of DNA scintillator used WaveLength Shifter (WLS) fiber cut in small pieces => fast scintillator (10 ns), emits in green

Current Setup



First Results

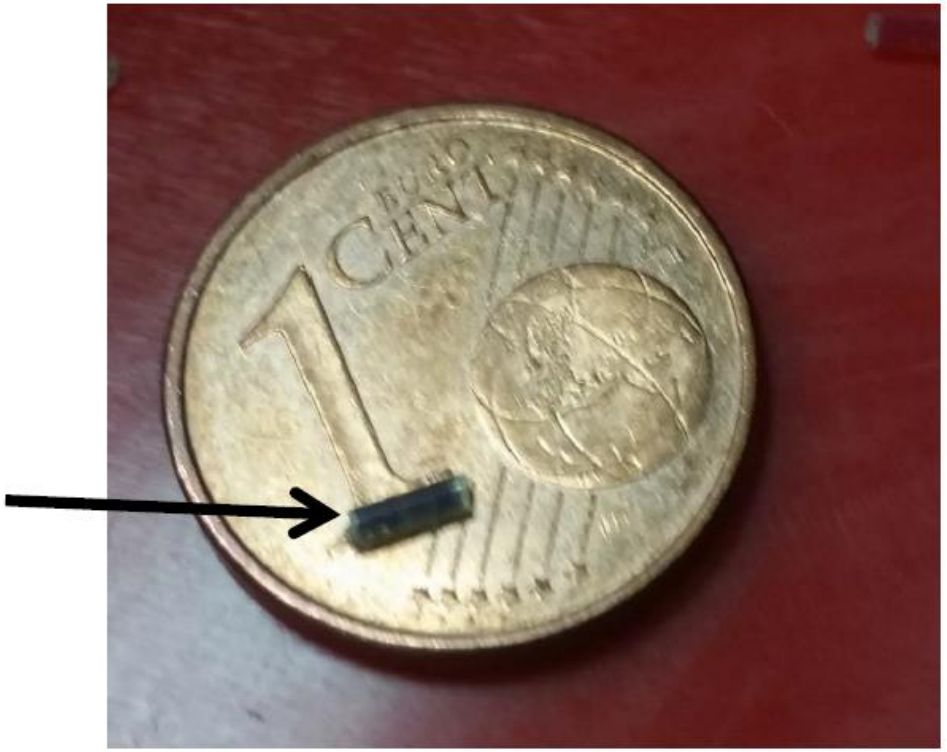
- the sample holder was supposed to be empty (it was not as you will see on the next slide)
- PMT signal starts around 55 ns (x axis), peaks at around 62 ns and then has a tail to about 80 ns
- PMT signal amplitude around 80 mV



First Results

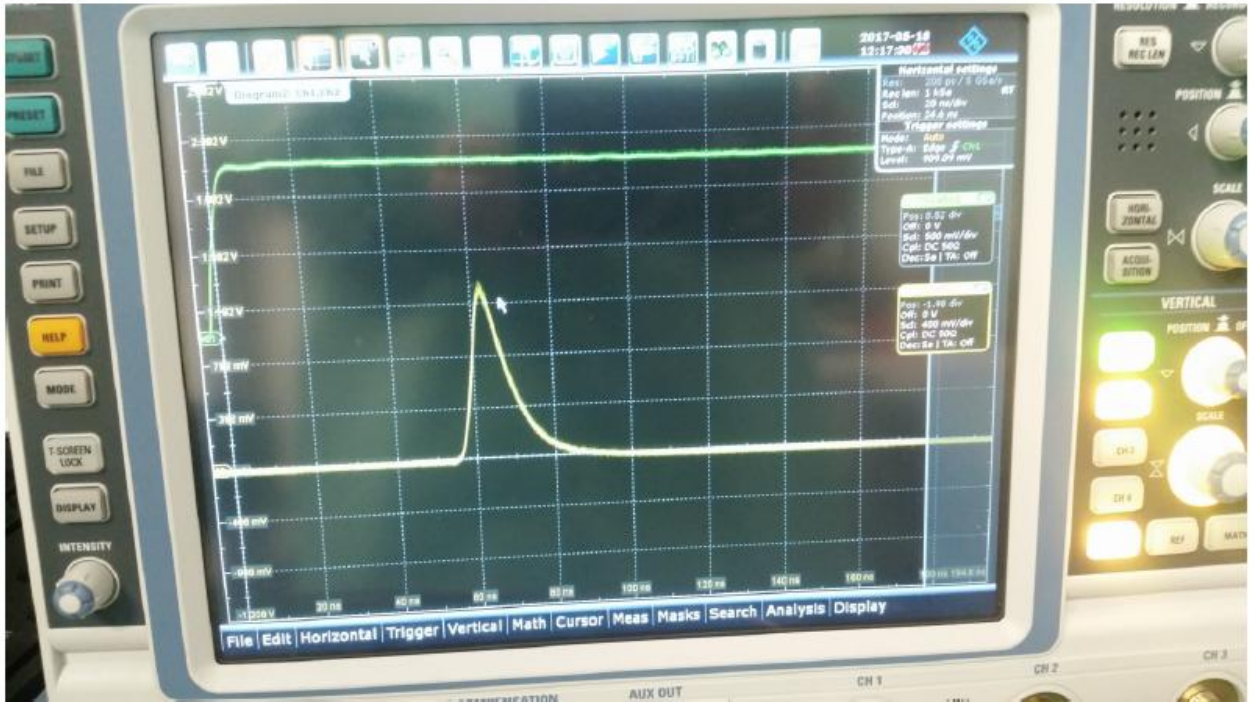
- next test was with holder filled with WLS fibers
- before filling discovered that 1 small fiber piece had been forgotten in sample holder from previous test

WLS fiber piece which was in holder during "empty" test



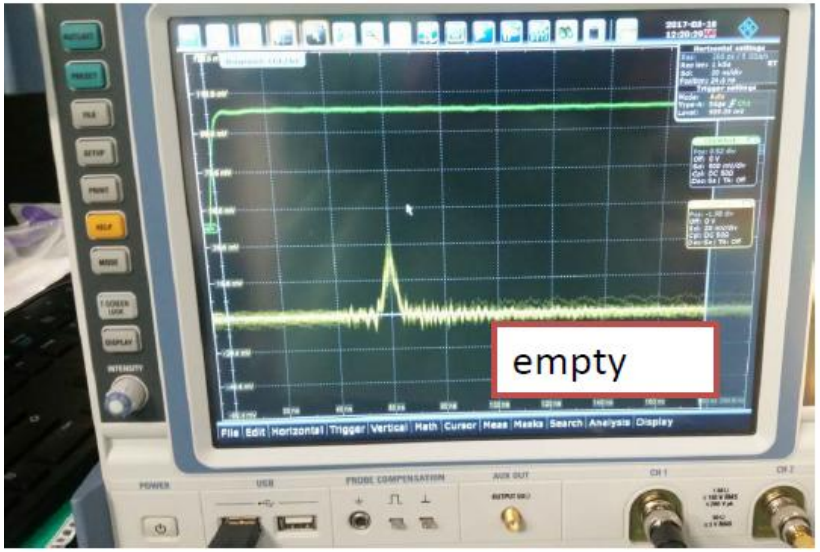
First Results

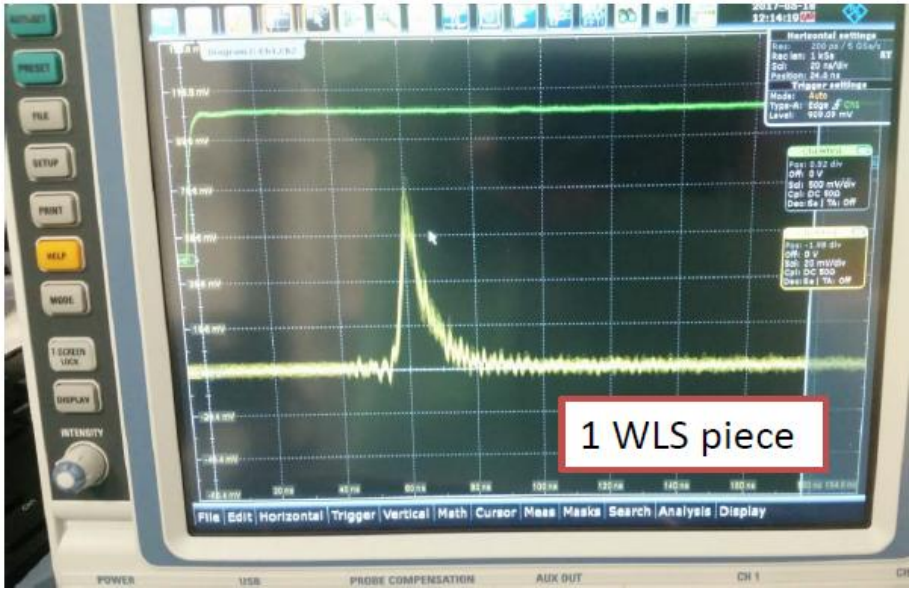
- filled holder with WLS fiber as shown on slide 6
- PMT signal huge
- Signal starts at about 55 ns, peaks around 62 ns and has a tail to 80+ ns
- signal amplitude above 1 V



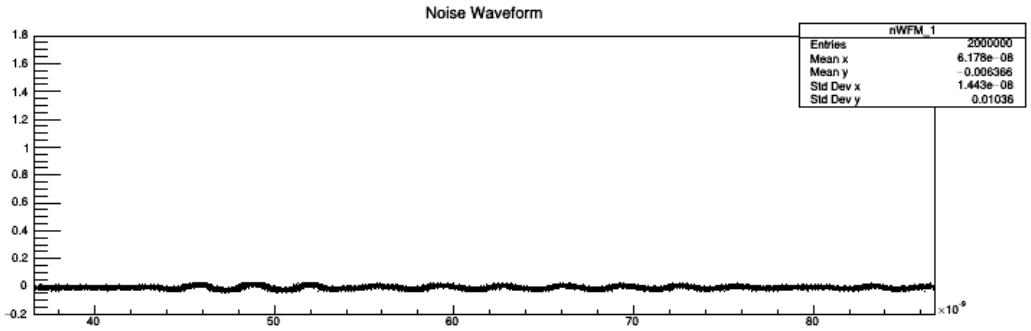
First Results

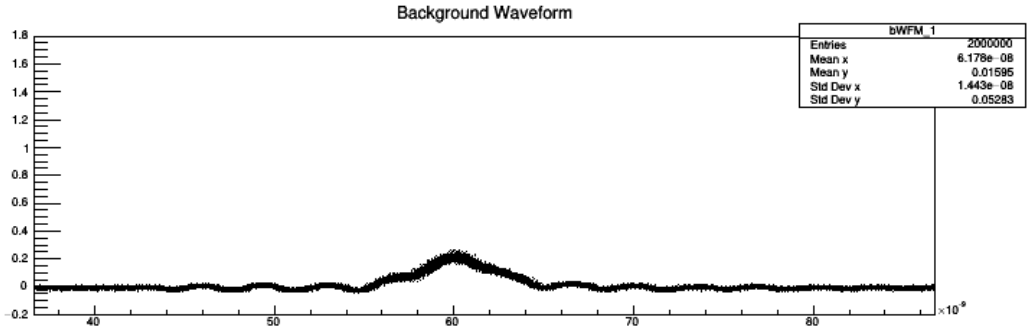
- afterwards repeated empty test ensuring that no piece of WLS was forgotten in holder
- PMT signal much smaller and symmetric
- signal starts at 55 ns, peaks at 60 ns, ends at 65 ns
- signal amplitude about 40 mV
- clear difference in shape and amplitude between “1 WLS piece” and “empty”

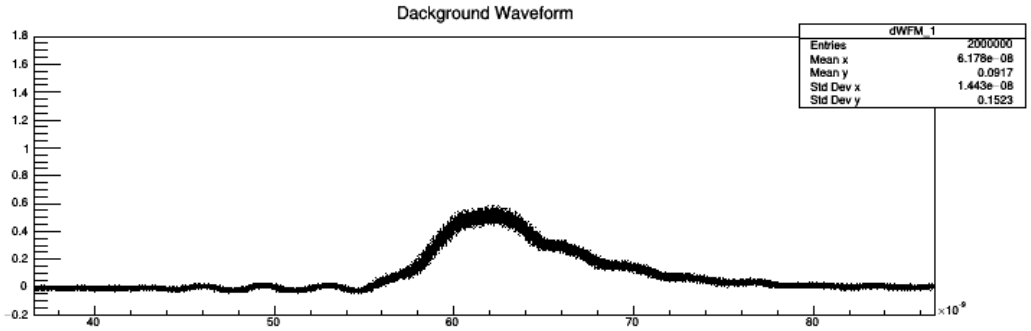




Prelimary Analysis

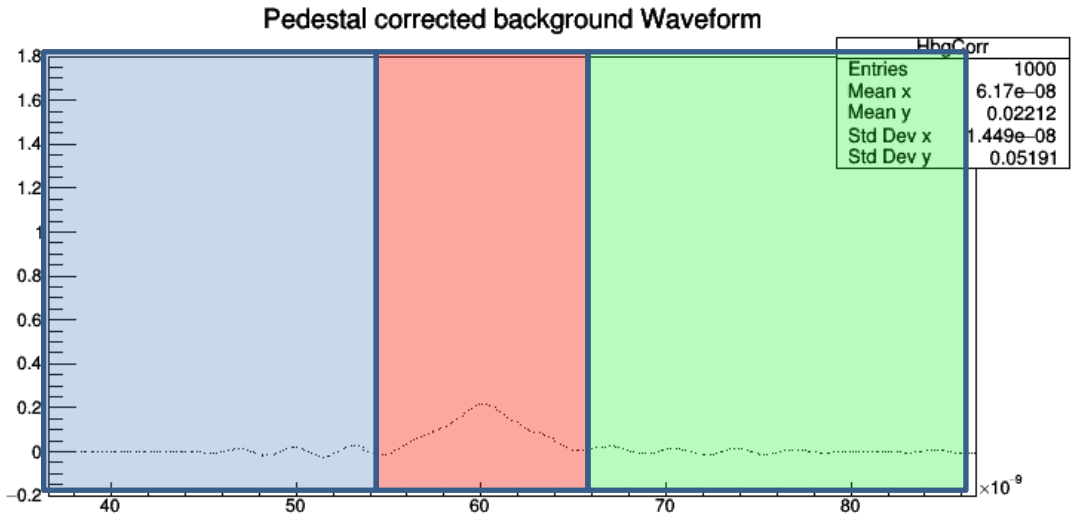


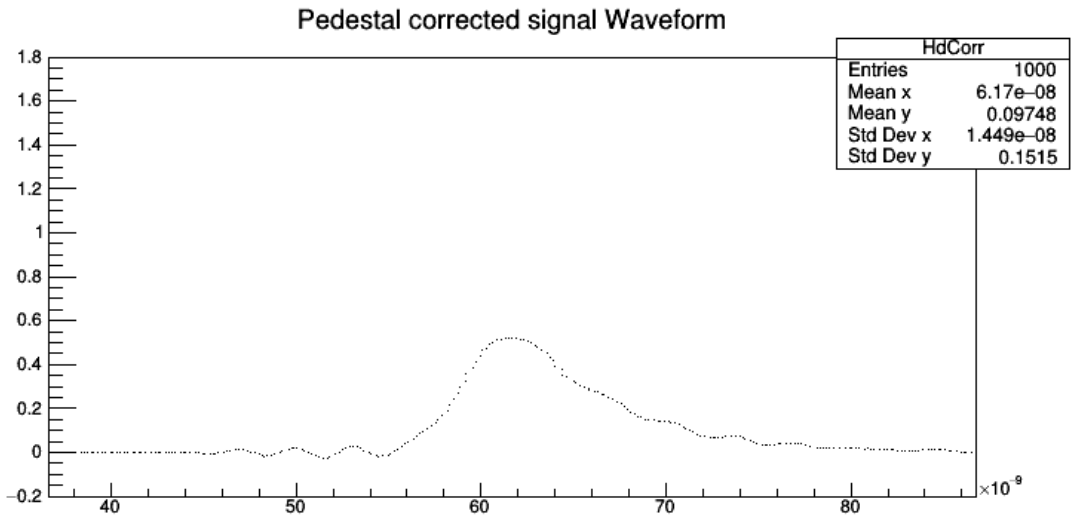




- 2000 events without light, with light but no scintillator and with scintillator
- ripple from ground when Kaputschinsky is switched on
- small signal without scintillator in the range of 45 to 65 ns and symmetric
- large signal with scintillator, asymmetric between 55 and 80 ns
- plots show overlay of the 2000 events

Prelimary Analysis





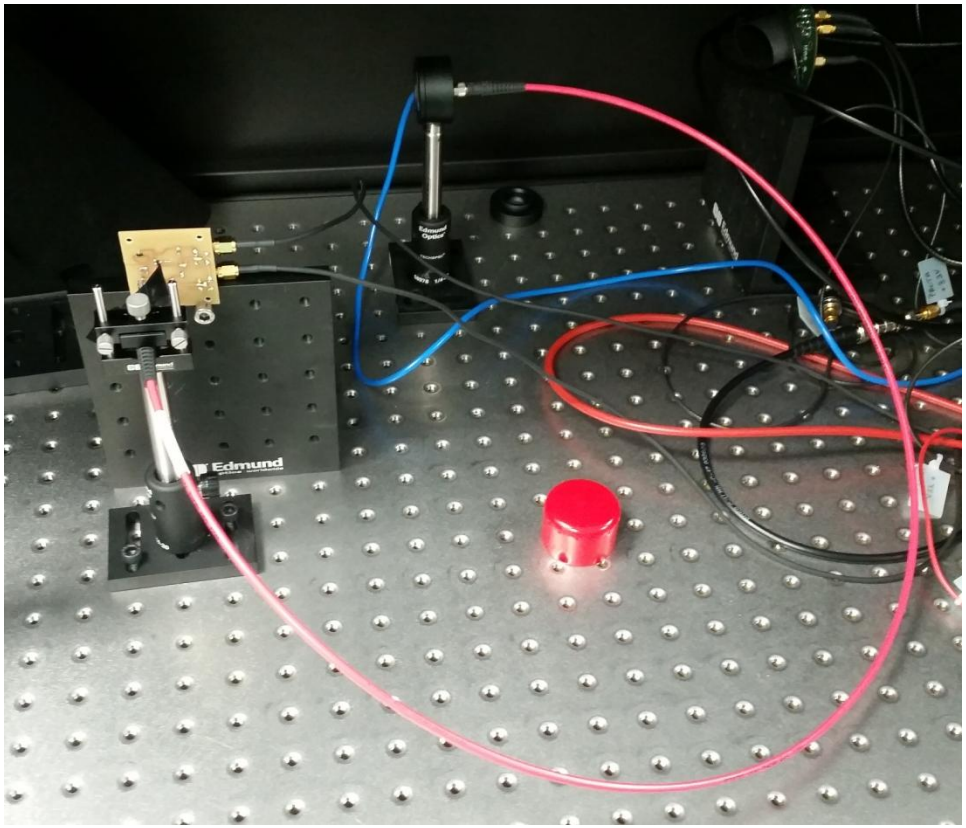
- tried to substract noise ripple from background and signal but time structure had changed
- plots show mean values of each X bin for background and signal
- Ratio of integrals calculated for each region:
  - no difference in 1st region
  - factor 3 in 2nd
  - factor 43 in 3rd
- high concentration of scintillator
- What is the minimum concentration?
- Improved analysis to calculate probability that distributions are identical?

Next Steps

- Current samples does not work anymore (perhaps freezing same is not the right thing)
- Will have to ask for new samples but first:
  - Improve noise ripple to be able to detect single photons
  - Work on improved analysis
- Will now first give feedback to other people involved

WA105 Task

- More tests about light calibration system necessary
- Testing of additional LEDs (preferred wavelength 430 nm)
- Also test of reference sensor necessary
- Talk to be given on Monday



Plans for next week

- Priority tests for light calibration system
- Work on PMT noise (for light calibration and DNA tests)
- Clarify a few things:
  - Stay at CIEMAT? When? How long?
    - Contribution to PMT characterization
    - Learning assmbling and disassembling of PMT support (Silvestro)
    - Ion Transmission measurement
  - Status IFAE contribution to T2K ND upgrade?
    - Electronics
    - Mechanics
  - What is needed for Ignite project from Joan?