Status Update

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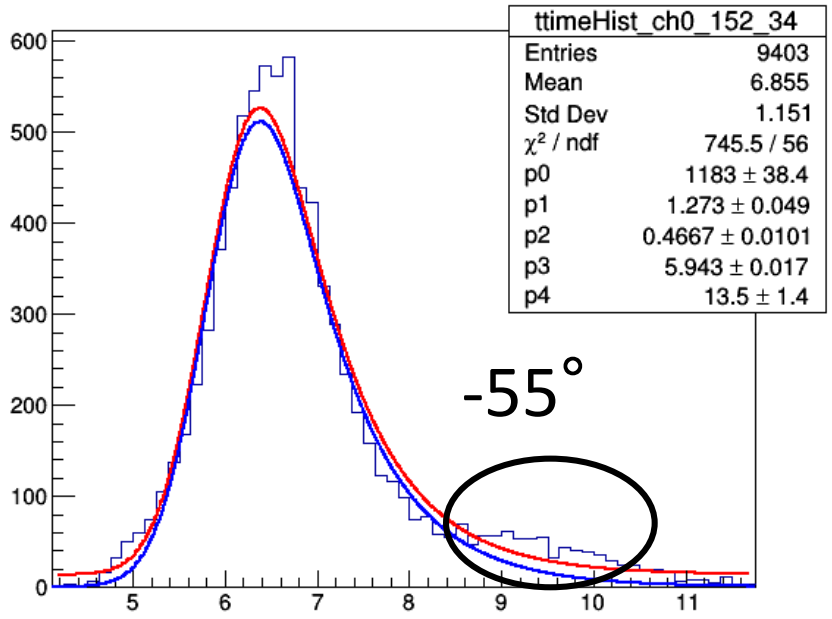
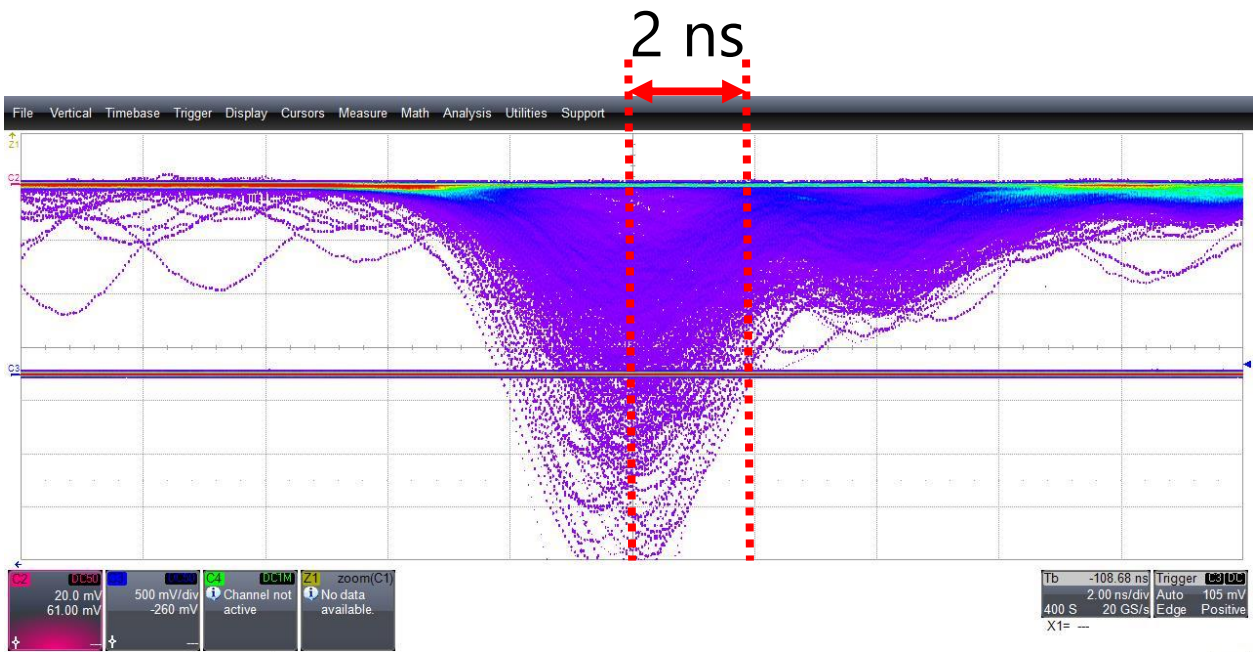
Delayed signal

- There are some delayed signals in the time histogram at large angles.
- I'm trying to find out how the delayed signals occur.
  - ➢First, I tried to check the waveform with the oscilloscope.
  - ➢Second, I moved the laser in x-direction and tried to see where the cause of reflection is.

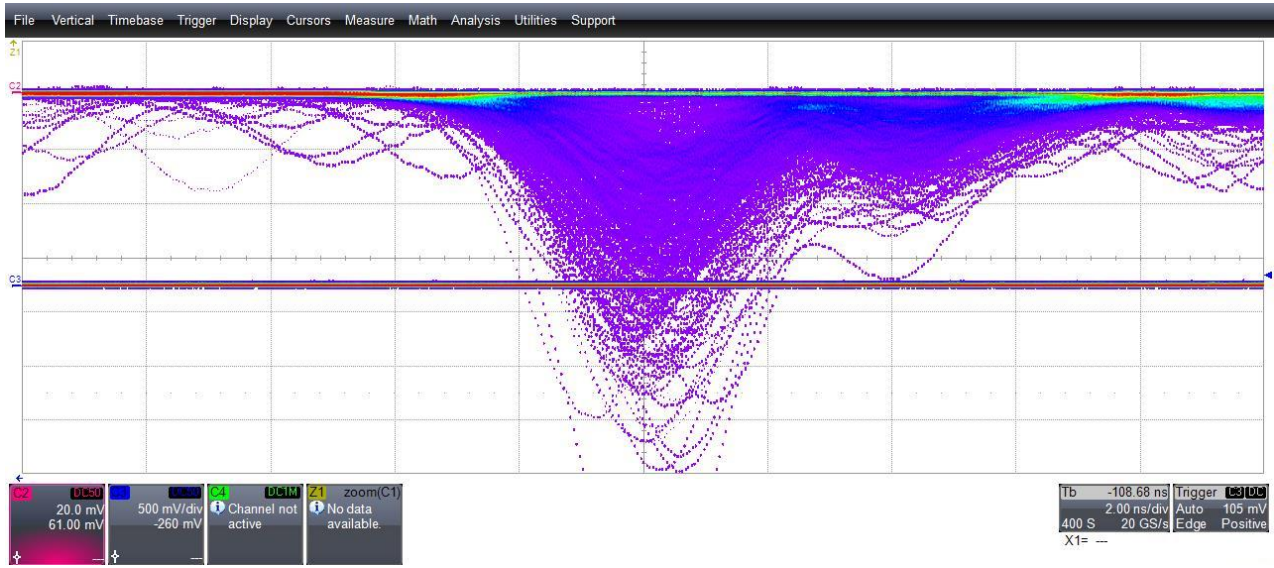


Waveforms

@55 degrees
Persistence time 20 s
2.00 ns/div.



Before rotation



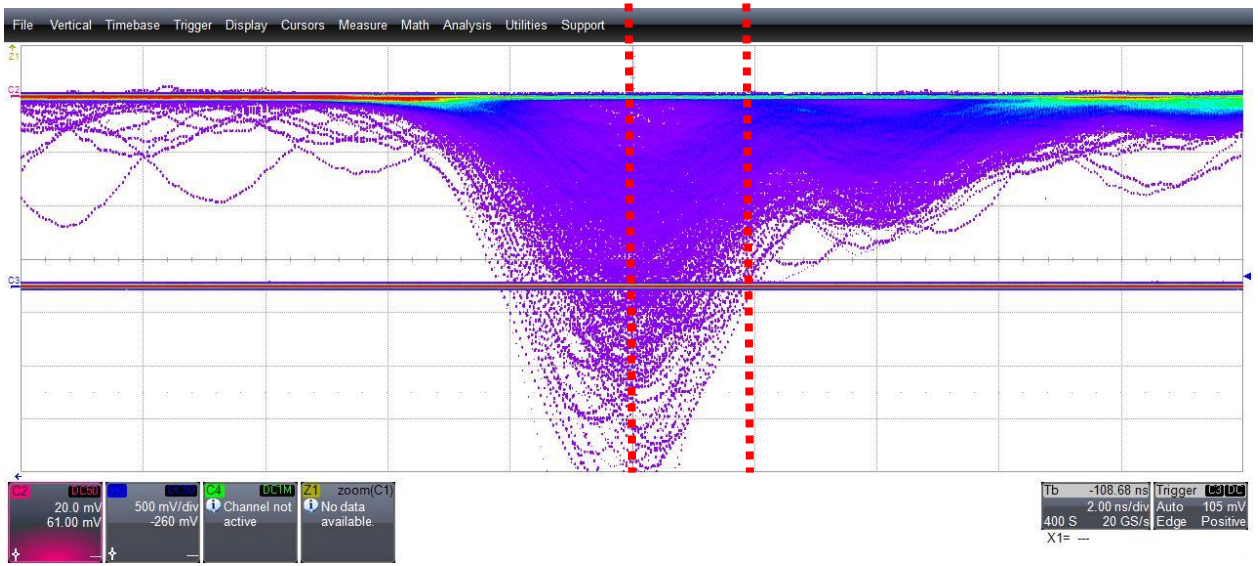
After rotation

The 2 waveforms look very similar.
The delayed signals are too small that they are buried in the after pulses?

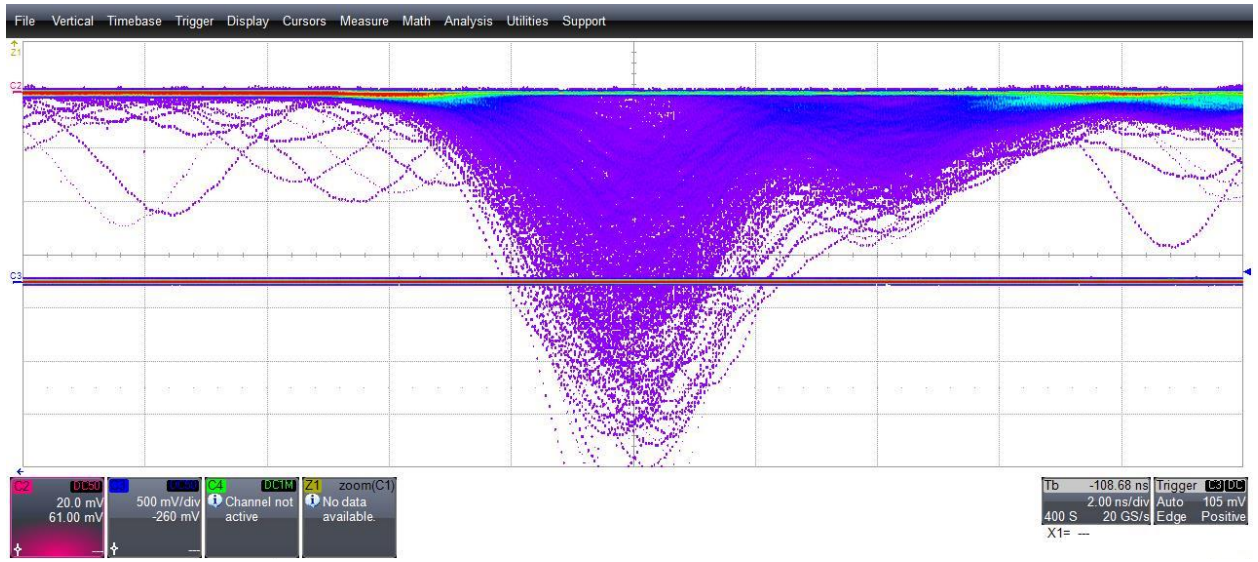
Waveforms

Before rotation
Persistence time 20 s
2.00 ns/div.

2 ns



55 degrees



30 degrees

There should be delayed signals at 55 degrees and should NOT be at 30 degrees, but I couldn't find any difference.

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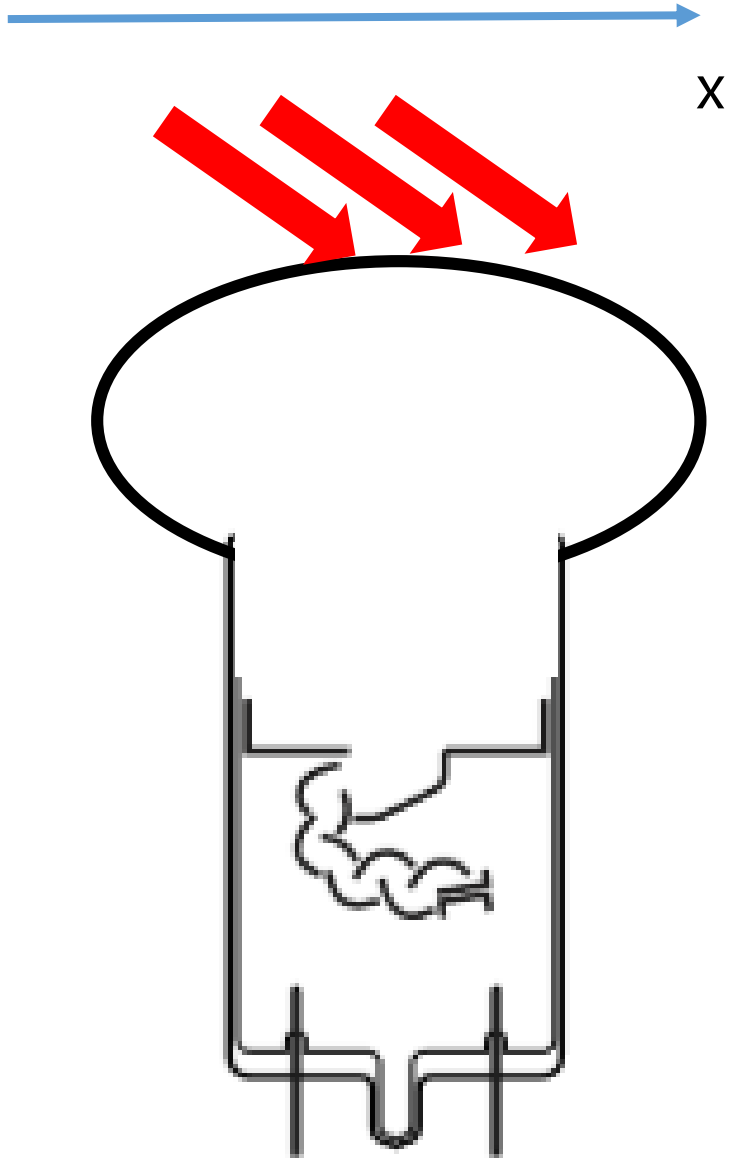
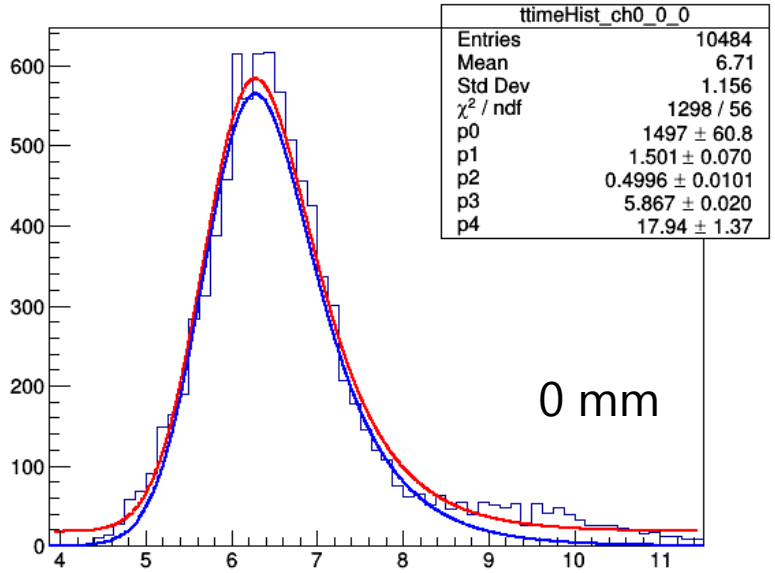
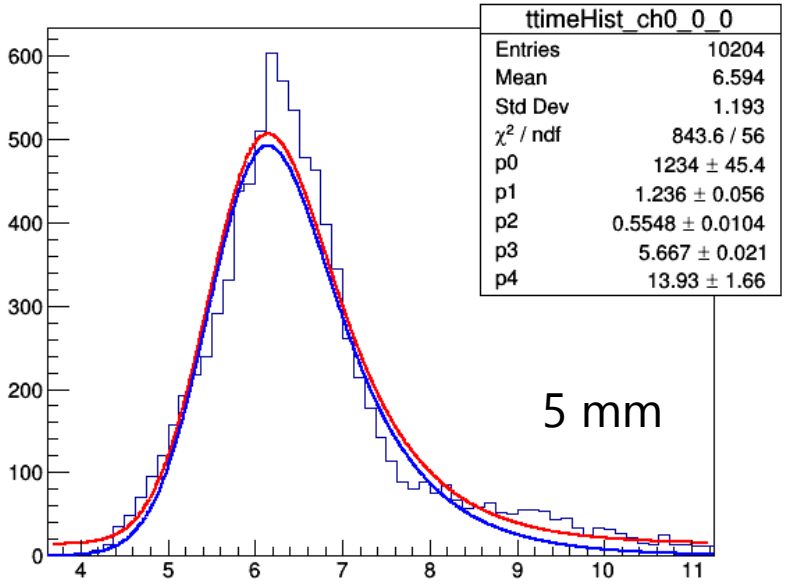
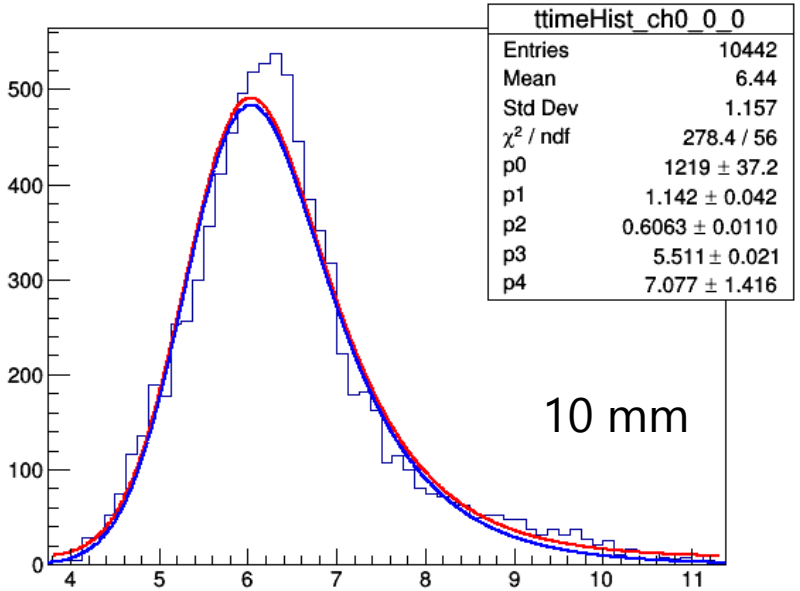
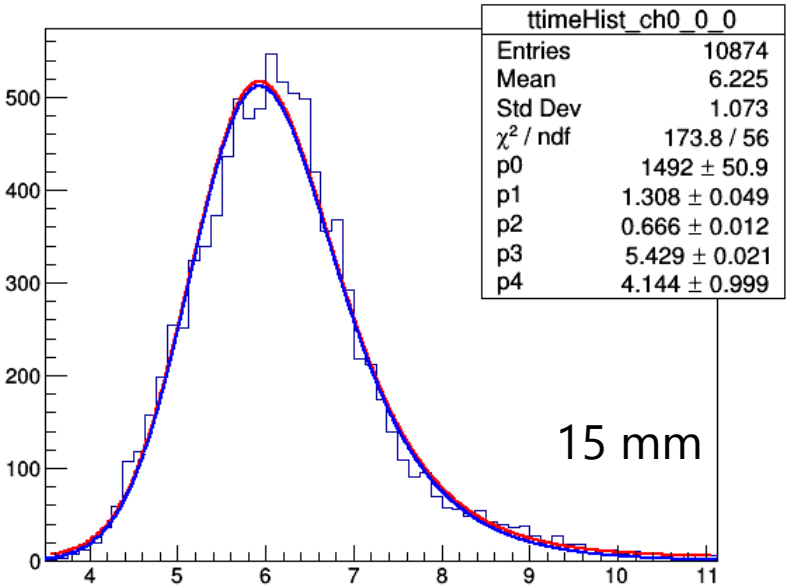
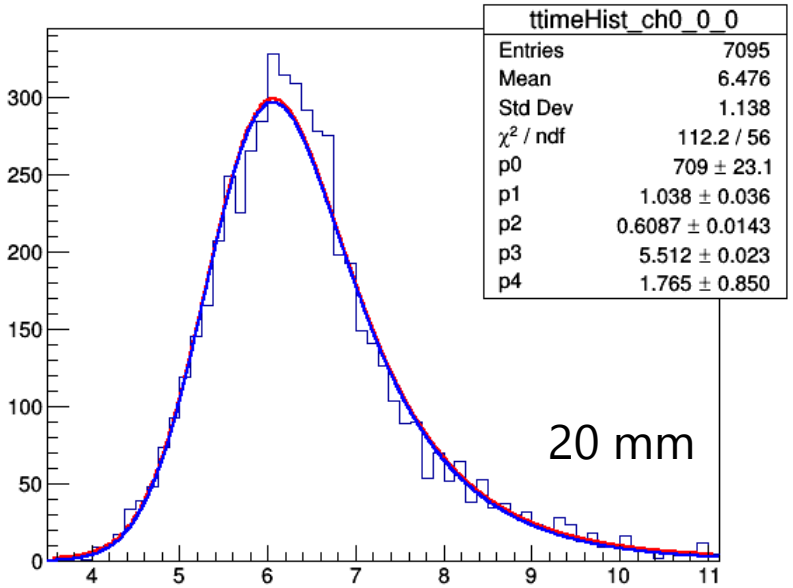


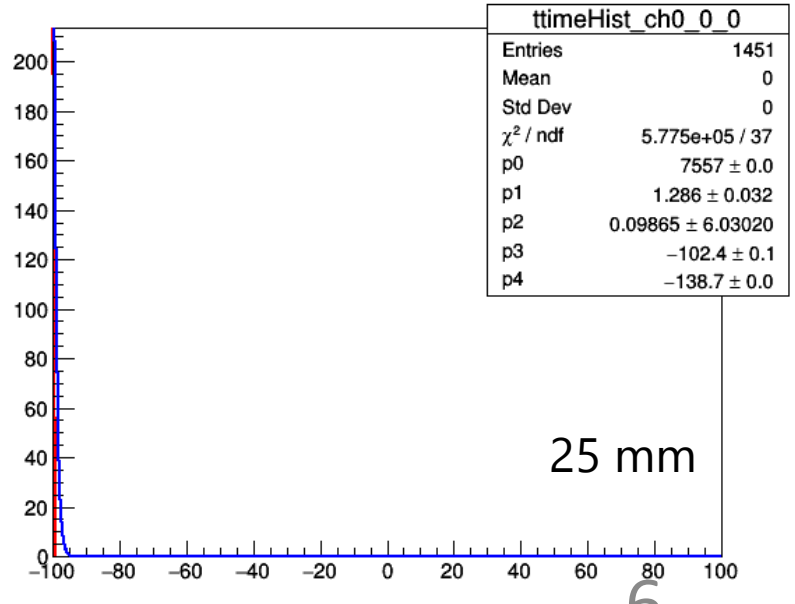

ttimeHist_ch0_0_0
Entries 10484
Mean 6.71
Std Dev 1.156
χ² / ndf 1298 / 56
p0 1497 ± 60.8
p1 1.501 ± 0.070
p2 0.4996 ± 0.0101
p3 5.867 ± 0.020
p4 17.94 ± 1.37
0 mm

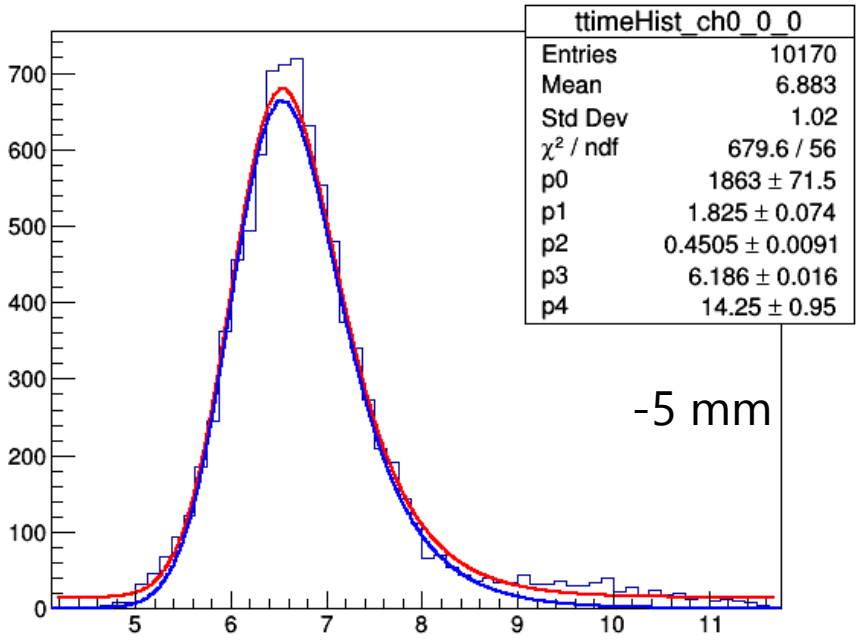

ttimeHist_ch0_0_0
Entries 10204
Mean 6.594
Std Dev 1.193
χ² / ndf 843.6 / 56
p0 1234 ± 45.4
p1 1.236 ± 0.056
p2 0.5548 ± 0.0104
p3 5.667 ± 0.021
p4 13.93 ± 1.66
5 mm

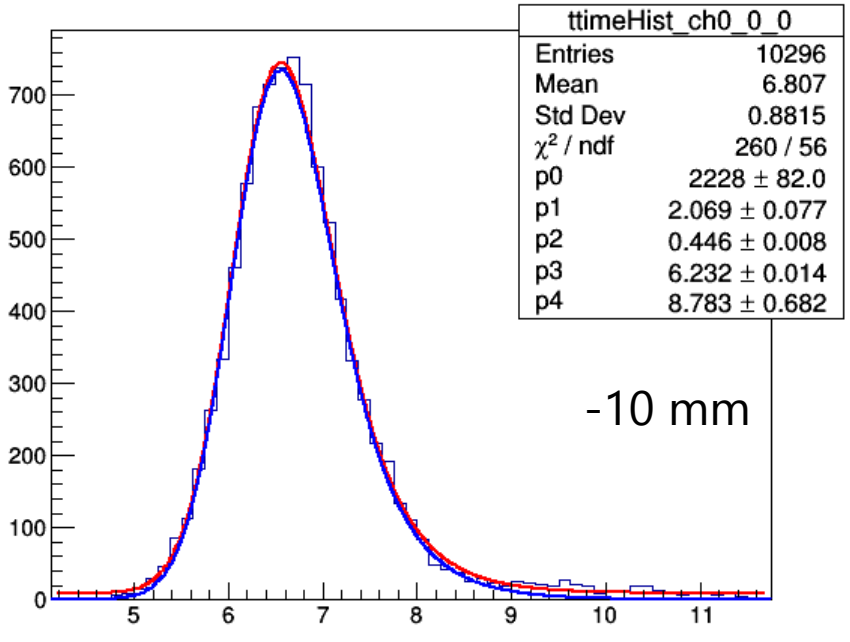

ttimeHist_ch0_0_0
Entries 10442
Mean 6.44
Std Dev 1.157
χ² / ndf 278.4 / 56
p0 1219 ± 37.2
p1 1.142 ± 0.042
p2 0.6063 ± 0.0110
p3 5.511 ± 0.021
p4 7.077 ± 1.416
10 mm

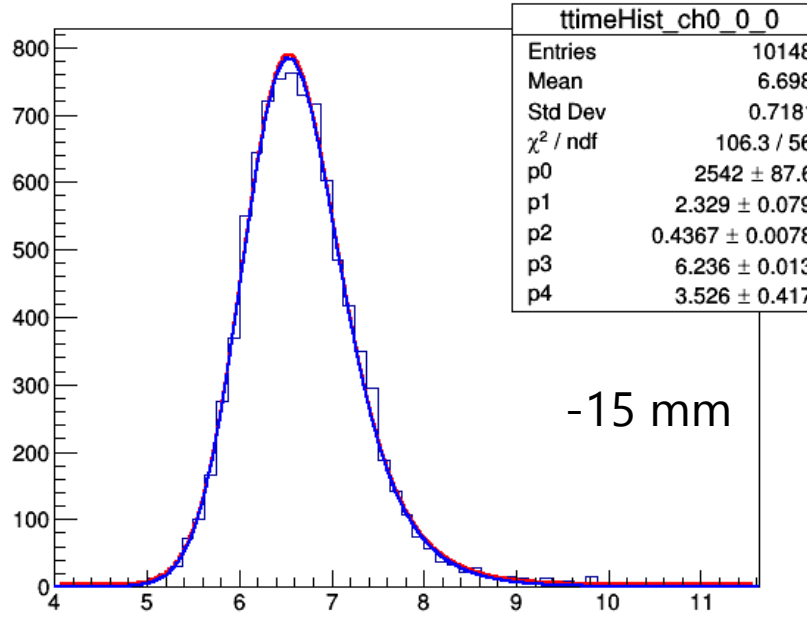

ttimeHist_ch0_0_0
Entries 10874
Mean 6.225
Std Dev 1.073
χ² / ndf 173.8 / 56
p0 1492 ± 50.9
p1 1.308 ± 0.049
p2 0.666 ± 0.012
p3 5.429 ± 0.021
p4 4.144 ± 0.999
15 mm


ttimeHist_ch0_0_0
Entries 7095
Mean 6.476
Std Dev 1.138
χ² / ndf 112.2 / 56
p0 709 ± 23.1
p1 1.038 ± 0.036
p2 0.6087 ± 0.0143
p3 5.512 ± 0.023
p4 1.765 ± 0.850
20 mm


ttimeHist_ch0_0_0
Entries 1451
Mean 0
Std Dev 0
χ² / ndf 5.775e+05 / 37
p0 7557 ± 0.0
p1 1.286 ± 0.032
p2 0.09865 ± 6.03020
p3 −102.4 ± 0.1
p4 −138.7 ± 0.0
25 mm







Delayed signals could be observed when the laser is -10 mm to 20 mm from the center.
It can be guessed that the cause of the reflection is about 30 mm.

Cause of reflection

- These are the candidates for the cause of reflection which could be seen from the outside of the PMT.

First dynode side

Second dynode side

front

- The metal at the first dynode is parallel to the PMT's axis, so it shouldn't be the cause of reflection(?)

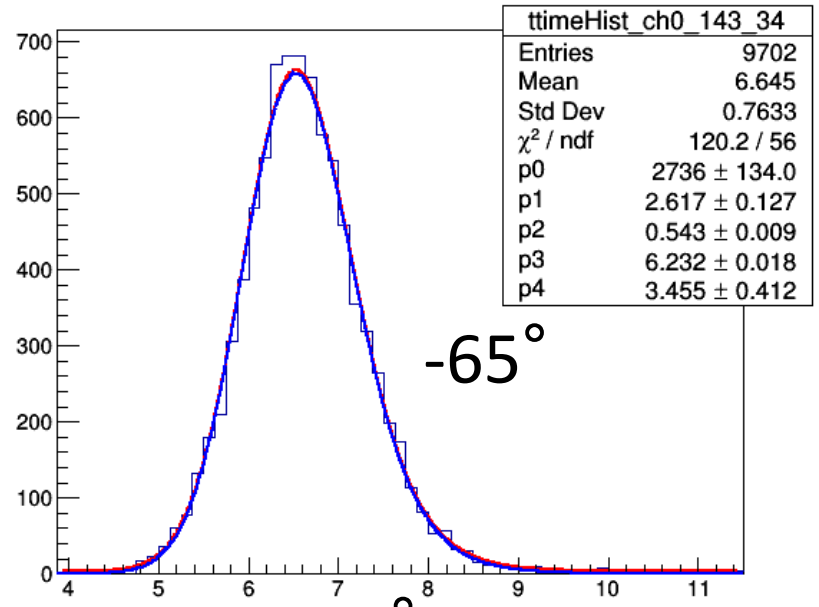
Future plan

- I will keep investigating the cause of reflection.

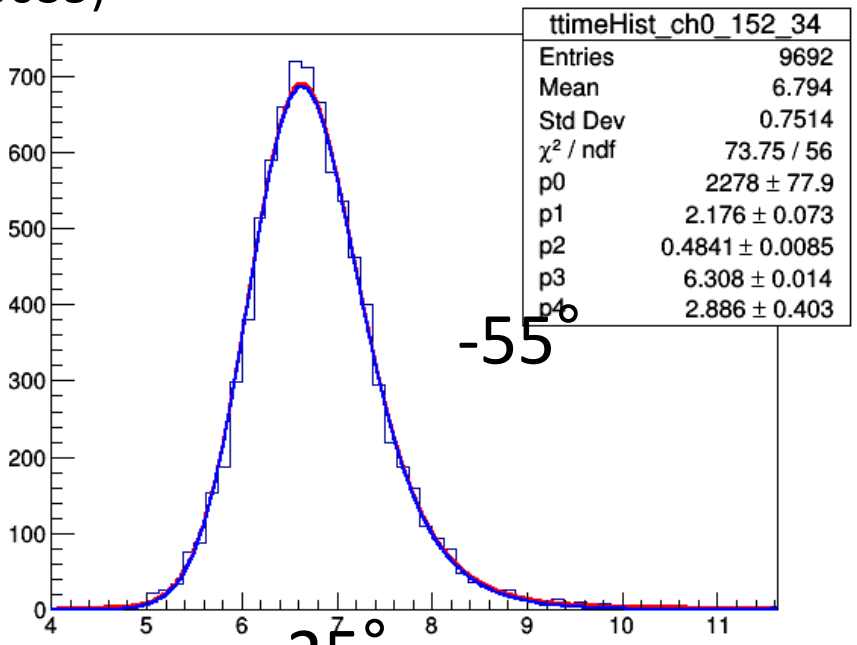
- I’m thinking of trying to move in y-axis too, but I doubt it will help a lot.
- If you have any idea, please let me know.

Backup

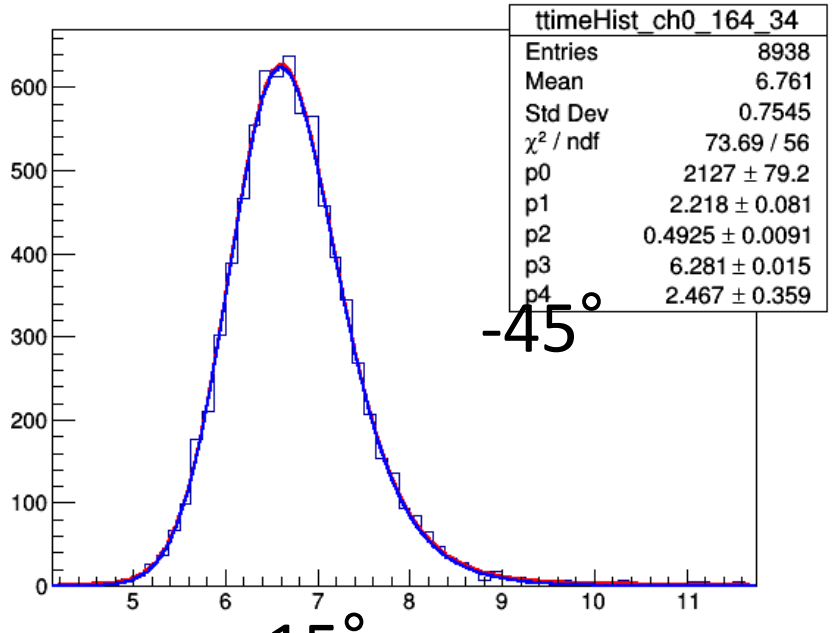
Small laser spot after rotation (BC0035)



-65°

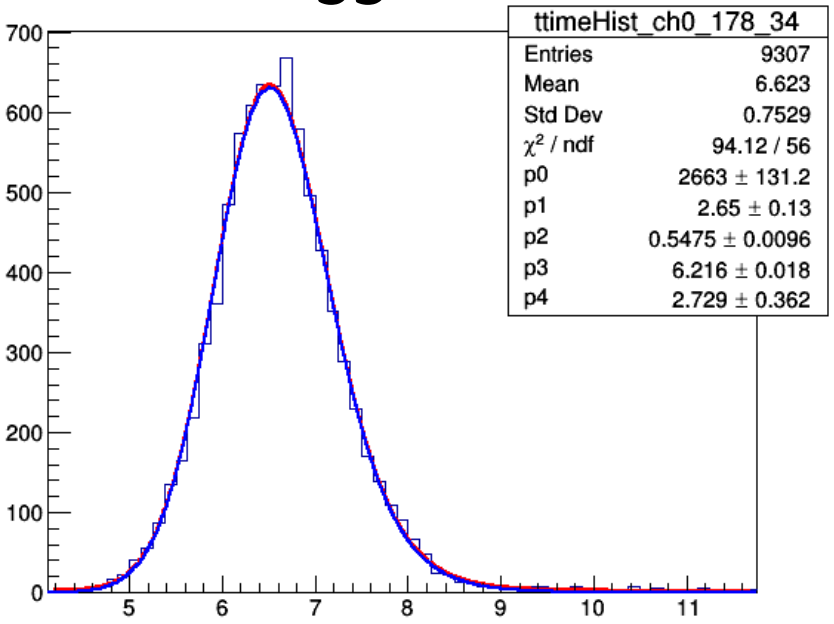


-55°

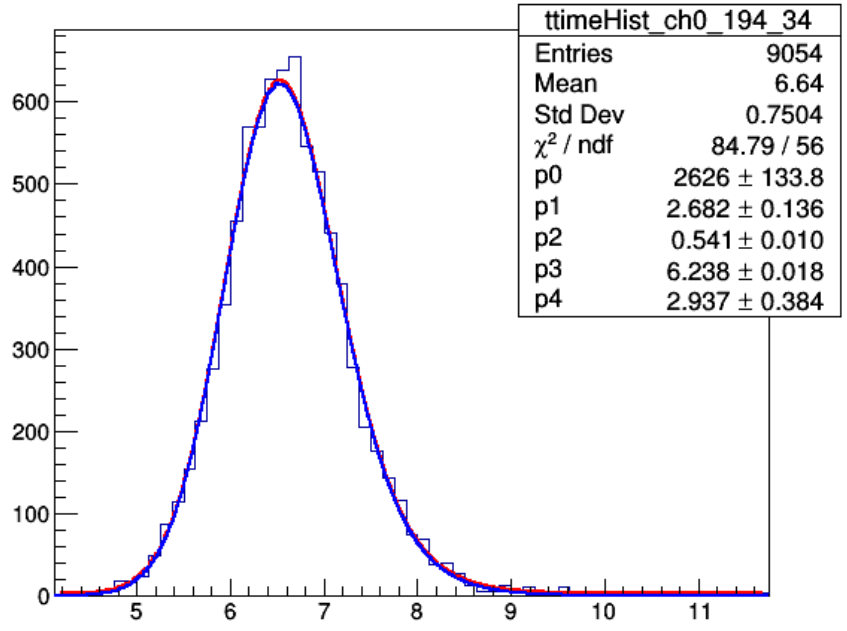


-45°

-35°



-25°



-15°