

2023-Test beam data analysis updates

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Configurations

configuration	runs	gas	angle	momentum	events	MB
1	tbdata_1,_2,_3 run1,2	90/10	3°	10	18800 6987	460,4 3382
2	tbdata_4 run4	90/10	45°	10	4800 2585	119,3 1240
3	tbdata_10 run10	90/10	5°	8	4709 3413	118,2 ?
4	tbdata_5,_6,_7,_8,_9 run5,7,8	90/10	45°	8	8100 + 4548 +	67,1 + 2190 +
5	tbdata_11 run11	90/10	0°	6	4618 4973	115,3 2390
6	tbdata_12 run12	90/10	45°	6	3041 ?	83,9 ?
7	tbdata_14 run14	90/10	0°	4	1001 4365	25,2 ?
8	tbdata_13 run13	90/10	45°	4	1700 5355	42,7 ?
9	tbdata_15 run15	90/10	0°	2	6947 3516	184,6 ?
10	tbdata_16 run16	90/10	45°	2	? 4023	43,9 ?
11	tbdata_17 run17	85/15	0°	10	10400 4000	268,4 ?
12	tbdata_18 run18	85/15	45°	10	2000 2500	117 ?
13	tbdata_26 run26	85/15	0°	8	19814 5039	
14	tbdata_25 run25	85/15	45°	8	10000 ?	
15	tbdata_20 run20	85/15	0°	6	9800 5019	247,5 ?
16	tbdata_19 run19	85/15	45°	6	4112 3767	104 ?
17	tbdata_21 run21	85/15	0°	4	2827 3760	70,3 ?
18	tbdata_24 run24	85/15	45°	4	2900 4215	104,9 ?
19	tbdata_22 run22	85/15	0°	2	923 2691	23,2 ?
20	tbdata_23 run23	85/15	45°	2	2000 4000	83,9 ?

The set up

DRS16 channels	HV channels	Tubes
0	0	1.0cm-20 μ m
1	1	1.0cm-20 μ m
2	2	1.0cm-20 μ m
3	3	1.0cm-20 μ m
4	4	1.0cm-20 μ m
5	5	1.0cm-20 μ m
6	12	1.5cm-20 μ m
7	13	1.5cm-20 μ m
8	14	1.5cm-20 μ m
9	15	<u>1.5cm-20μm</u>
10	-	-
11	-	-
12	-	-
13	-	-
14	-	Sipm Scintillator upstream
15	-	Sipm Scintillator downstream

Oscilloscope	HV channels	Tubes
1	16	1.5cm-20 μ m
2	17	1.5cm-20 μ m
3	18	1.5cm-20 μ m
4	19	1.5cm-20 μ m
5	8	1.0cm-20 μ m
6	6	1.0cm-20 μ m
7	9	1.0cm-20 μ m
8	10	1.0cm-20 μ m

The peak finding formula:

```
if (amplitude[ip]>(float)(N_1*rms) && (amplitude[ip] - (float) (amplitude[ip-1]+amplitude[ip+1])/2 > (float) N_2*rms) && ((abs(fderiv[ip])< (float) (2.0 * N_3 * sigd1)) ||  
    (fderiv[ip-1] > (float) N_3 * sigd1 || fderiv[ip+1] < (float) (-1.0 *(float) N_3 * sigd1))) && sderiv[ip] < (float)( -1.0 * N_4 * sigd2 )
```

The set of cuts applied:

[sampling rate]	[Bsl]	[cut on amplitude]	[1st der.]	[2nd der.]	[Bsln time]	[n bins]	[clusterization]
1.0	4	1	0.5	0.05	25.0	1024	0.25
	N1	N2	N3	N4			

Example: Run4

collected by DRS16

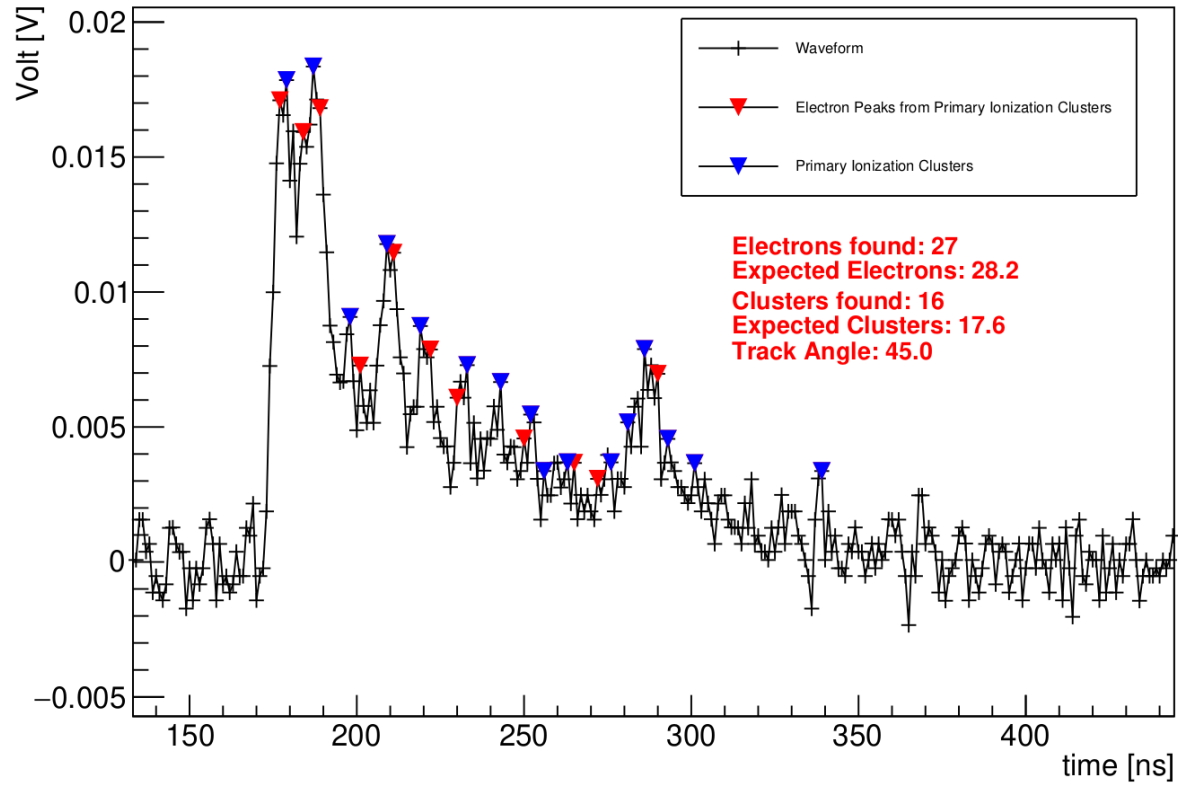
Configuration:

(Gas mix. 90/10, angle 45, momentum 10 GeV)

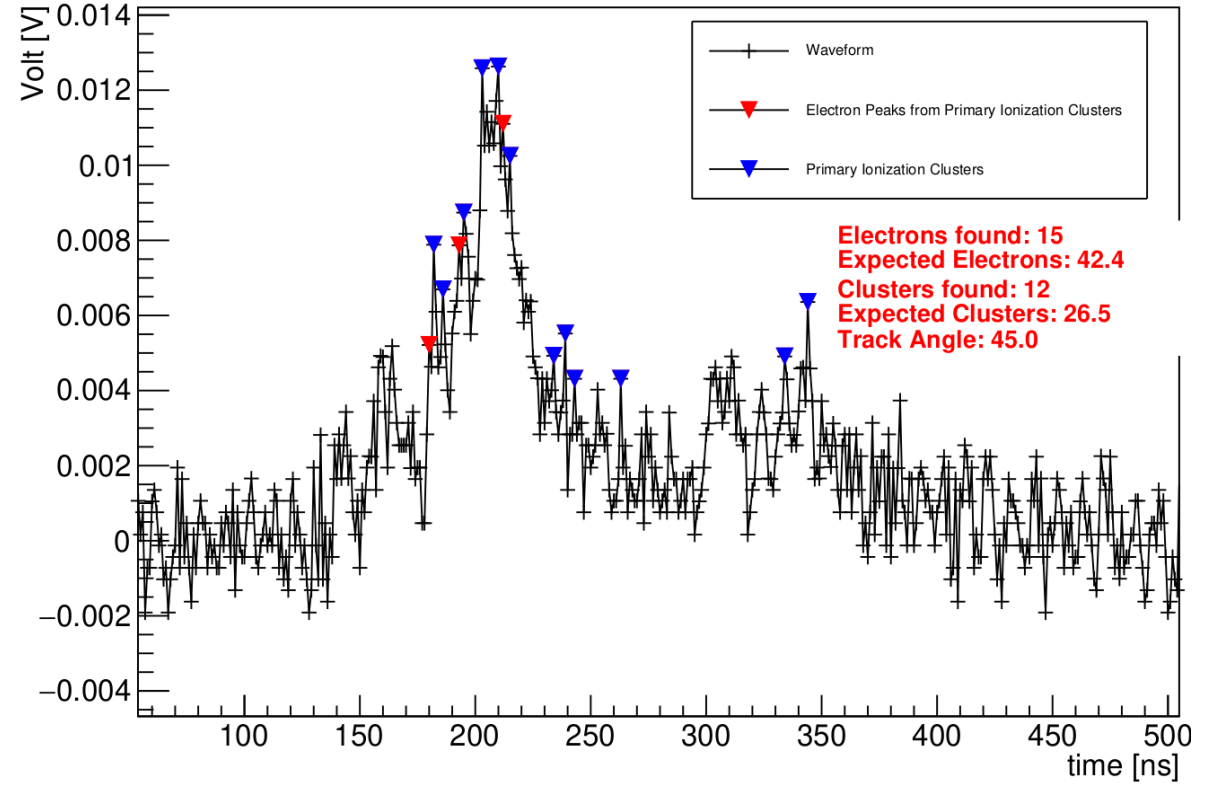
no. of events: 4830

Wave forms

Waveform signal Ch5 - Event 20 - Sense Wire Diameter 20 μm - Cell Size 1.0 cm - Track Angle 45.0 - run_4 - 1.0 GSa/s - 90/10 1 - 85/15 0

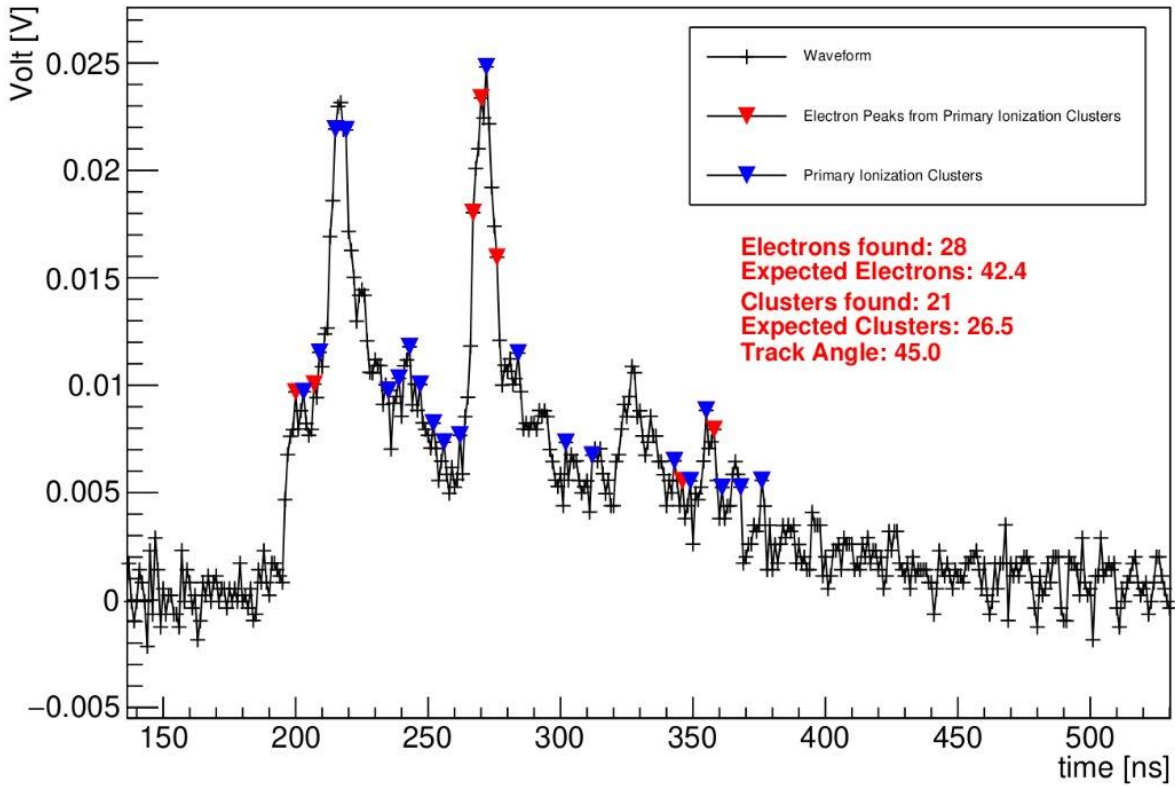


Waveform signal Ch9 - Event 0 - Sense Wire Diameter 20 μm - Cell Size 1.5 cm - Track Angle 45.0 - run_4 - 1.0 GSa/s - 90/10 1 - 85/15 0

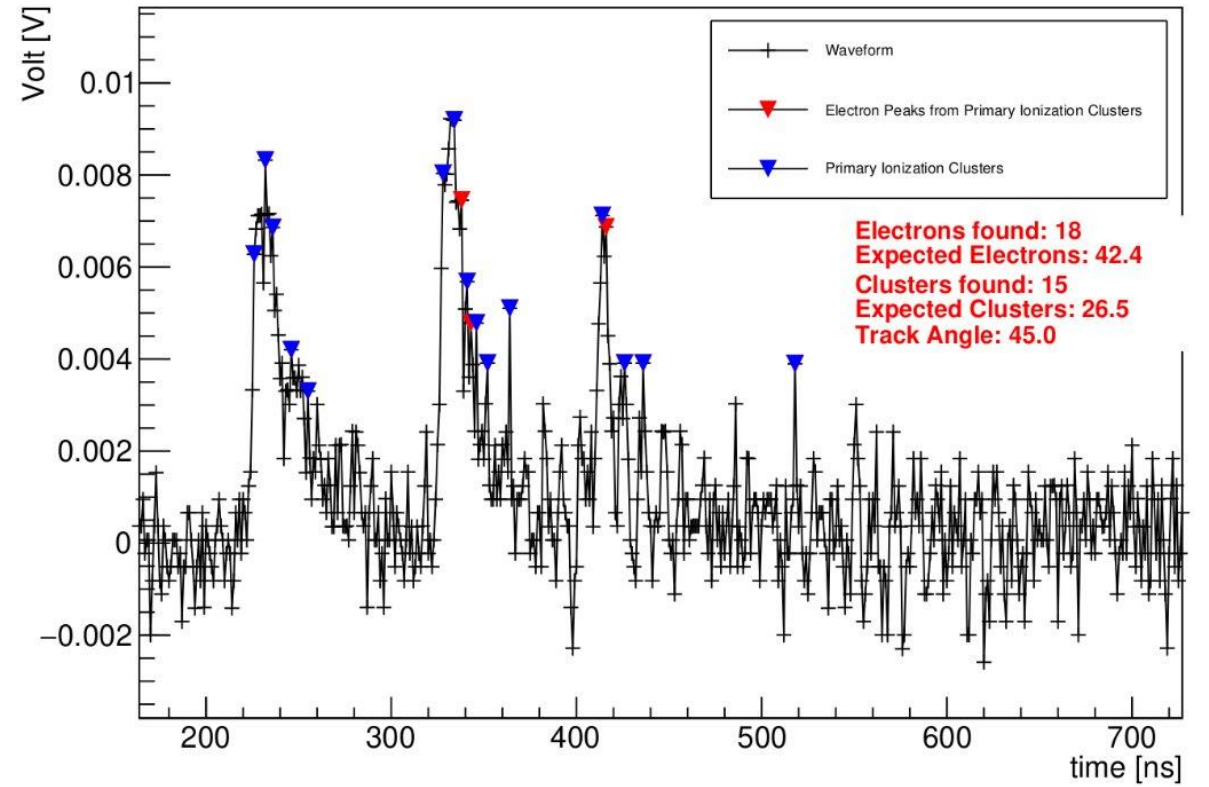


Wave forms

Waveform signal Ch9 - Event 45 - Sense Wire Diameter 20 μm - Cell Size 1.5 cm - Track Angle 45.0 - run_4 - 1.0 GSa/s - 90/10 1 - 85/15 0

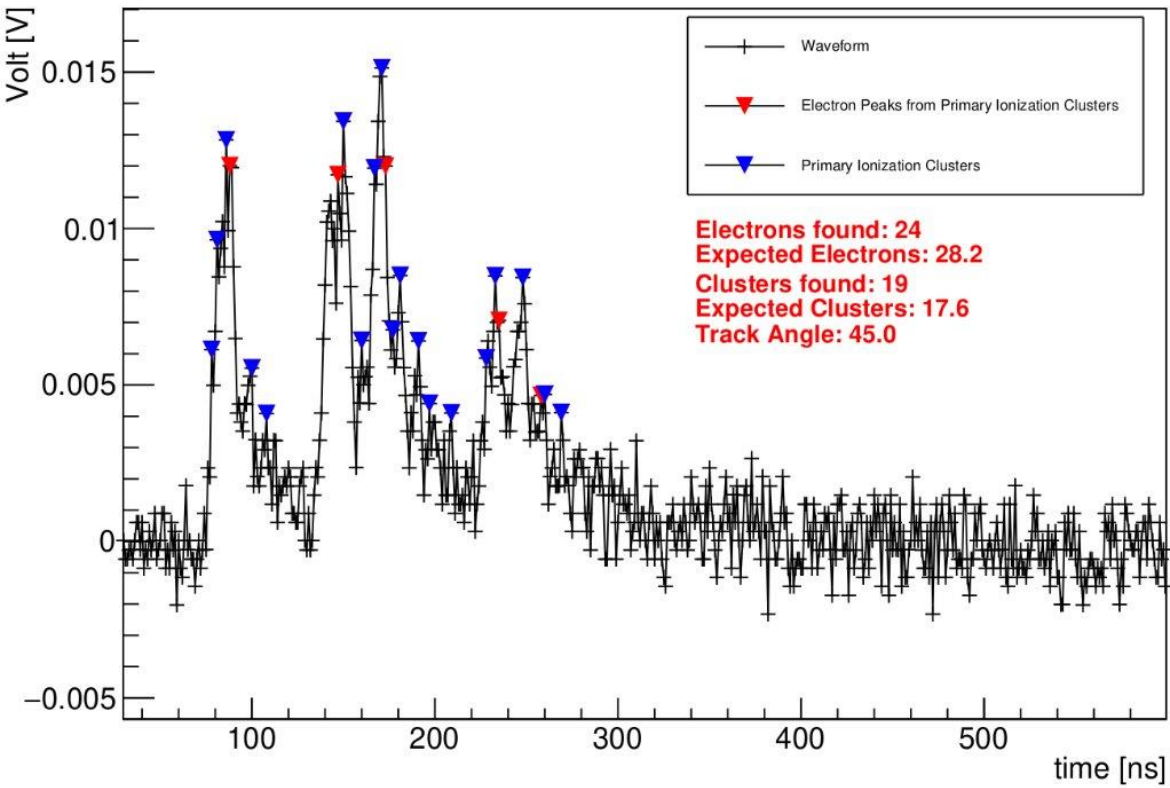


Waveform signal Ch6 - Event 15 - Sense Wire Diameter 20 μm - Cell Size 1.5 cm - Track Angle 45.0 - run_4 - 1.0 GSa/s - 90/10 1 - 85/15 0

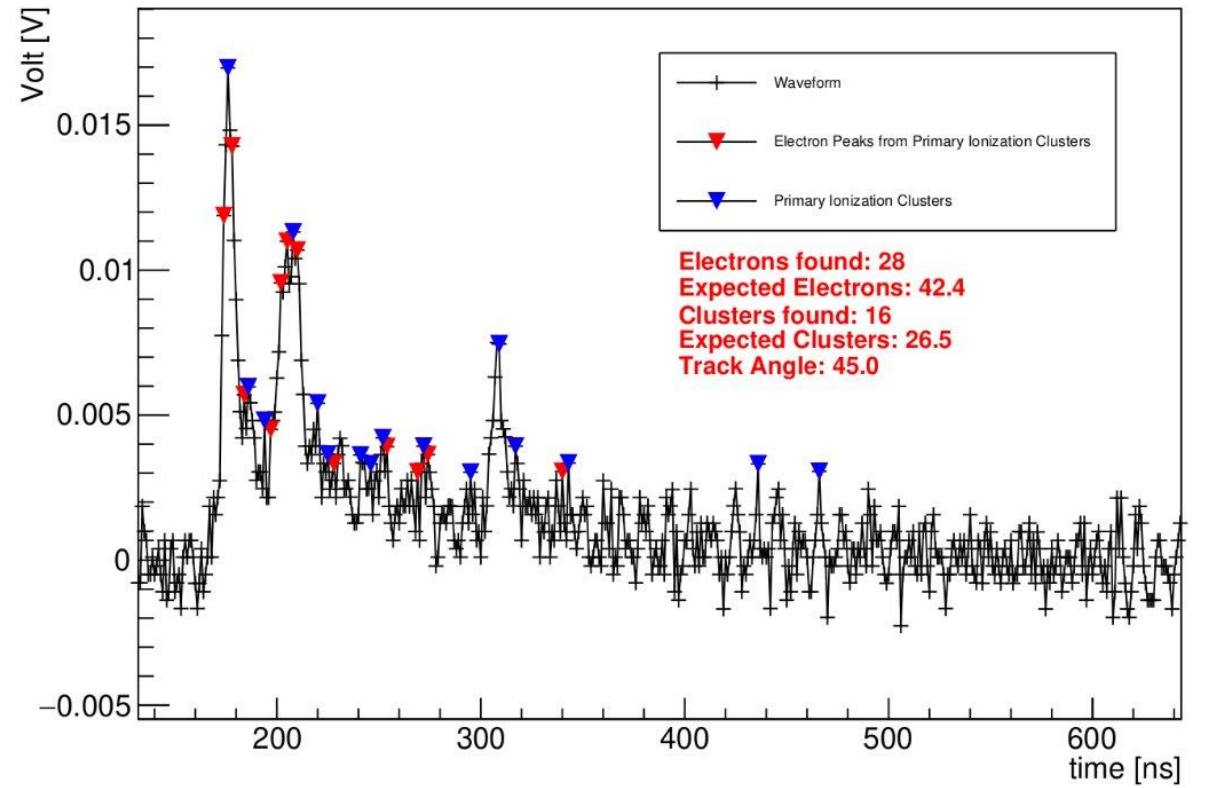


Wave forms

Waveform signal Ch2 - Event 76 - Sense Wire Diameter 20 μm - Cell Size 1.0 cm - Track Angle 45.0 - run_4 - 1.0 GSa/s - 90/10 1 - 85/15 0

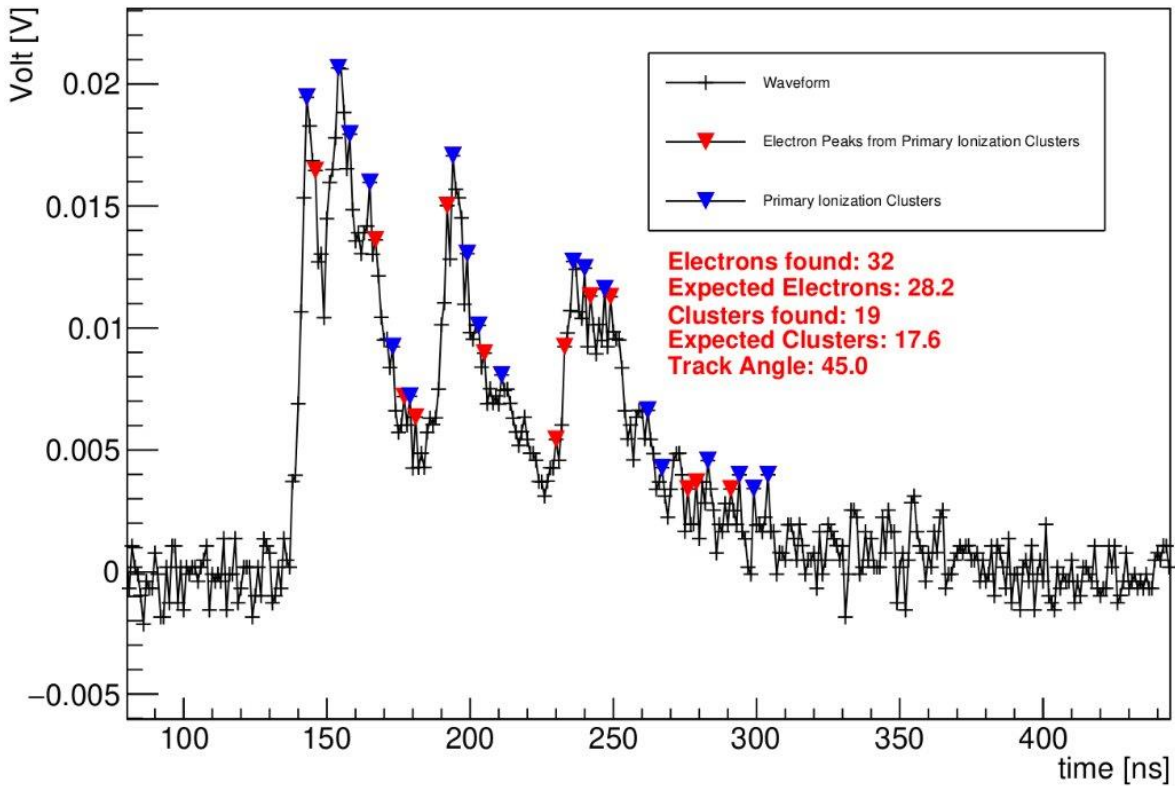


Waveform signal Ch6 - Event 17 - Sense Wire Diameter 20 μm - Cell Size 1.5 cm - Track Angle 45.0 - run_4 - 1.0 GSa/s - 90/10 1 - 85/15 0

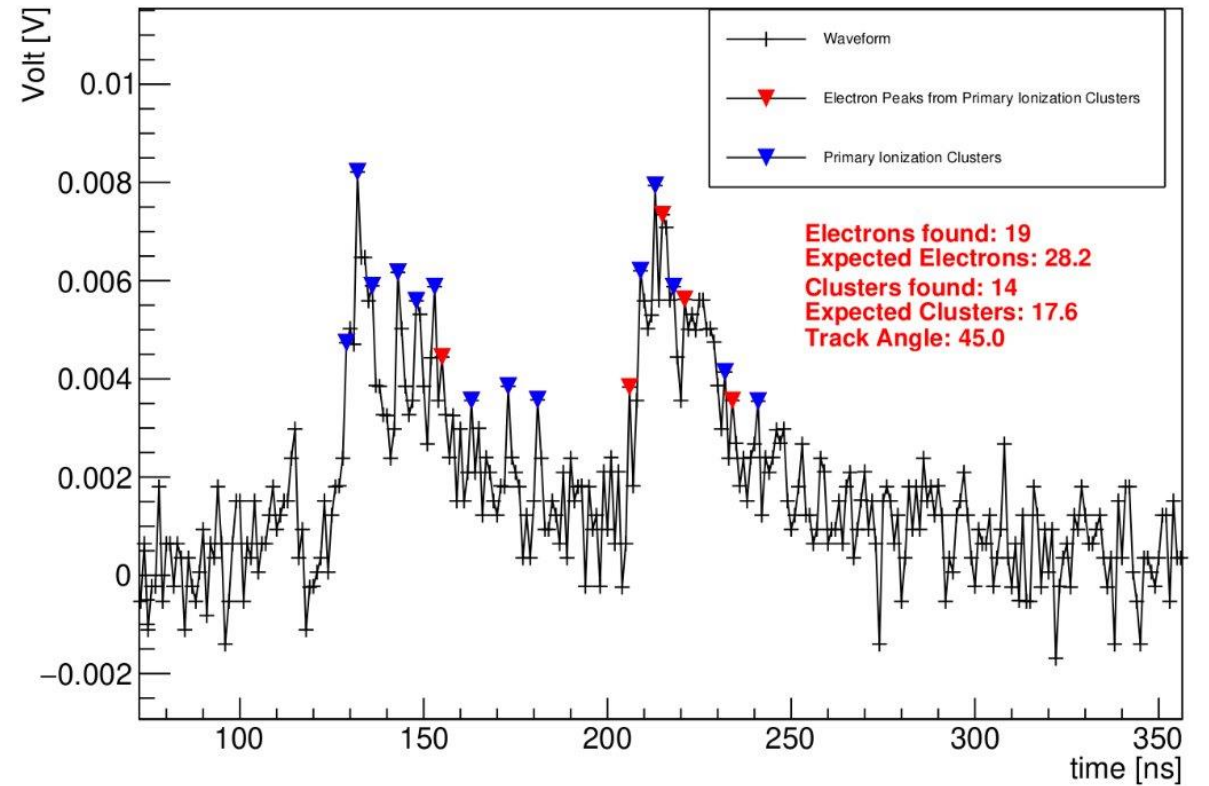


Wave forms

Waveform signal Ch2 - Event 109 - Sense Wire Diameter 20 μm - Cell Size 1.0 cm - Track Angle 45.0 - run_4 - 1.0 GSa/s - 90/10 1 - 85/15 0

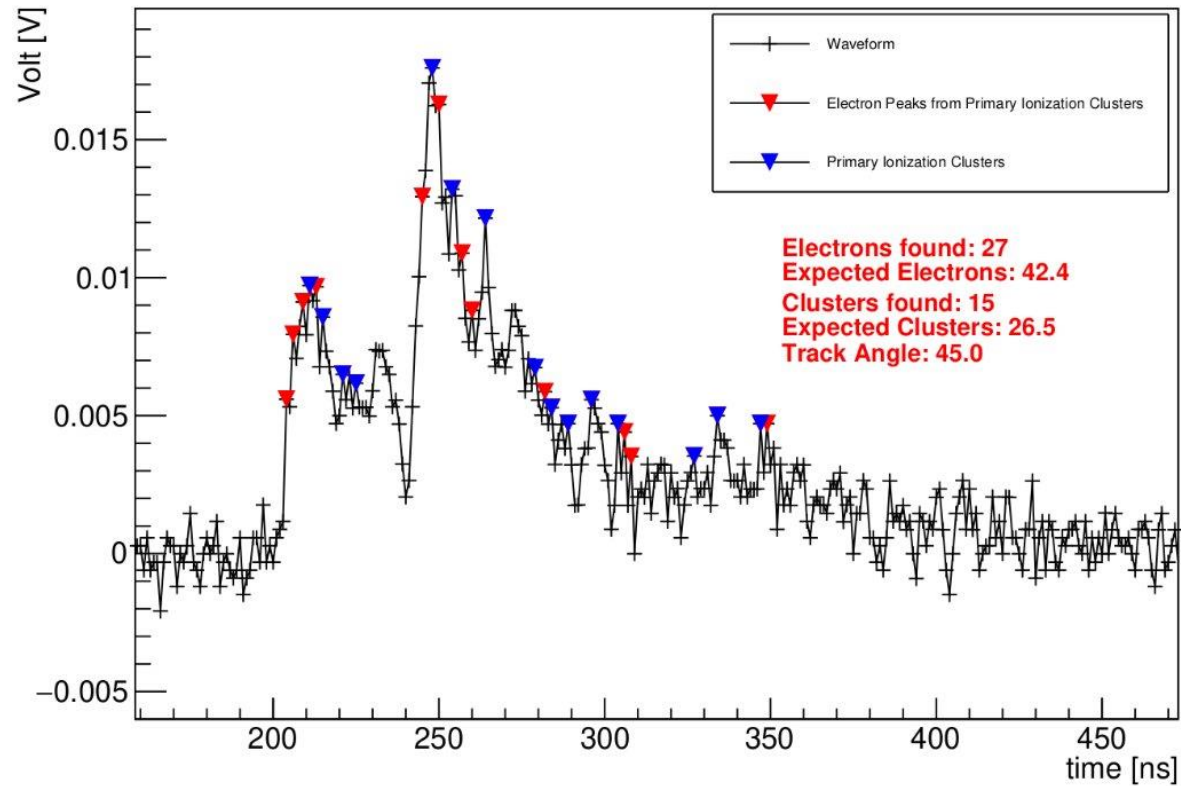


Waveform signal Ch2 - Event 70 - Sense Wire Diameter 20 μm - Cell Size 1.0 cm - Track Angle 45.0 - run_4 - 1.0 GSa/s - 90/10 1 - 85/15 0

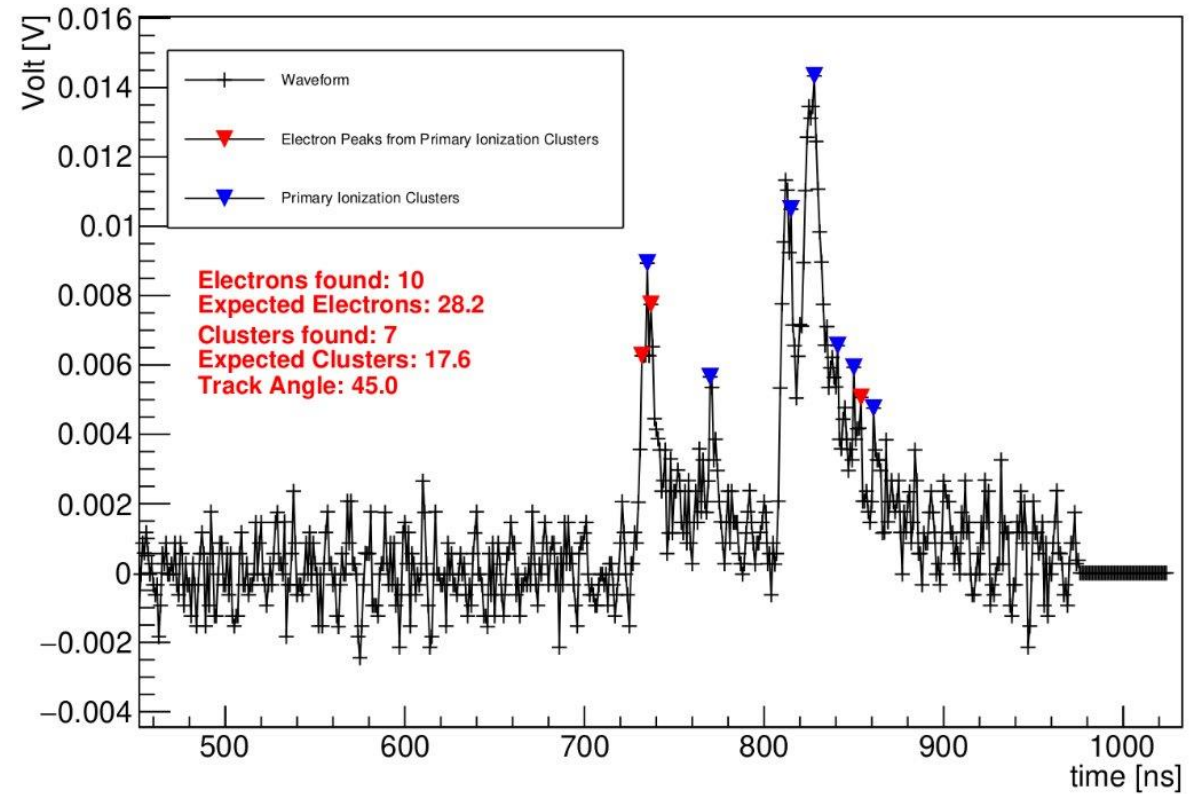


Wave forms

Waveform signal Ch6 - Event 0 - Sense Wire Diameter 20 μm - Cell Size 1.5 cm - Track Angle 45.0 - run_4 - 1.0 GSa/s - 90/10 1 - 85/15 0



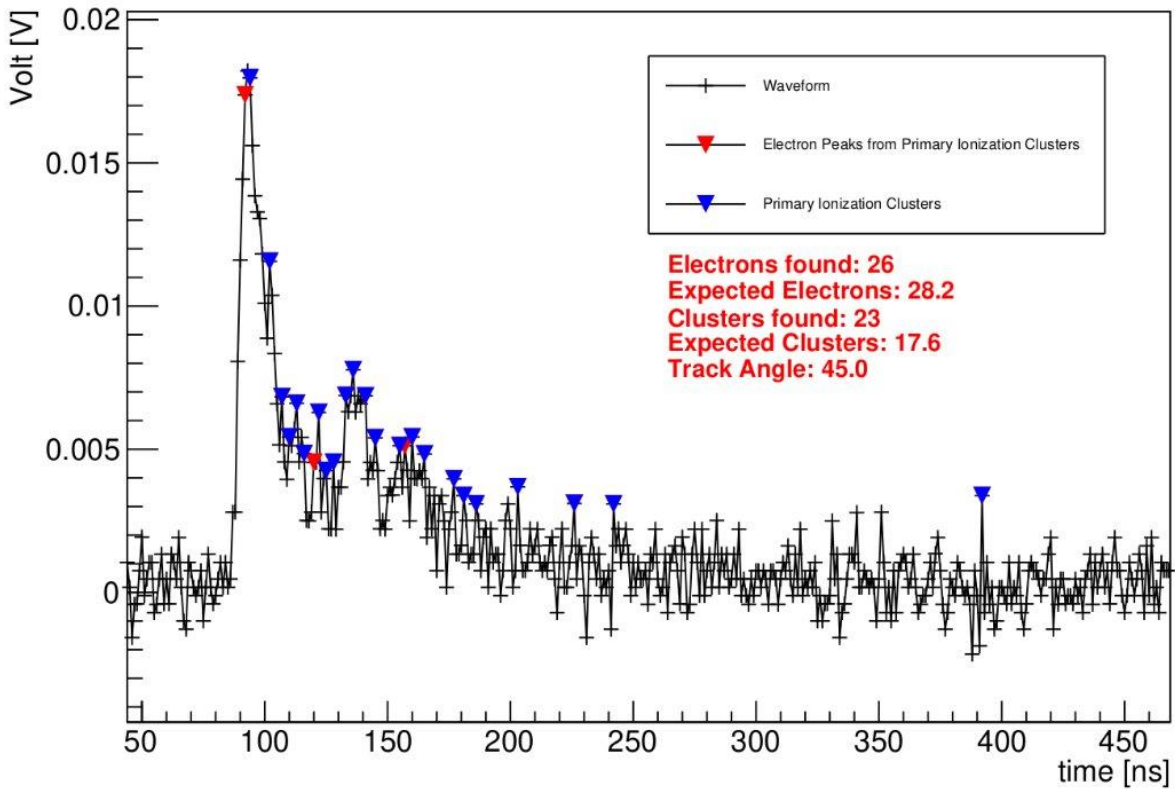
Waveform signal Ch5 - Event 60 - Sense Wire Diameter 20 μm - Cell Size 1.0 cm - Track Angle 45.0 - run_4 - 1.0 GSa/s - 90/10 1 - 85/15 0



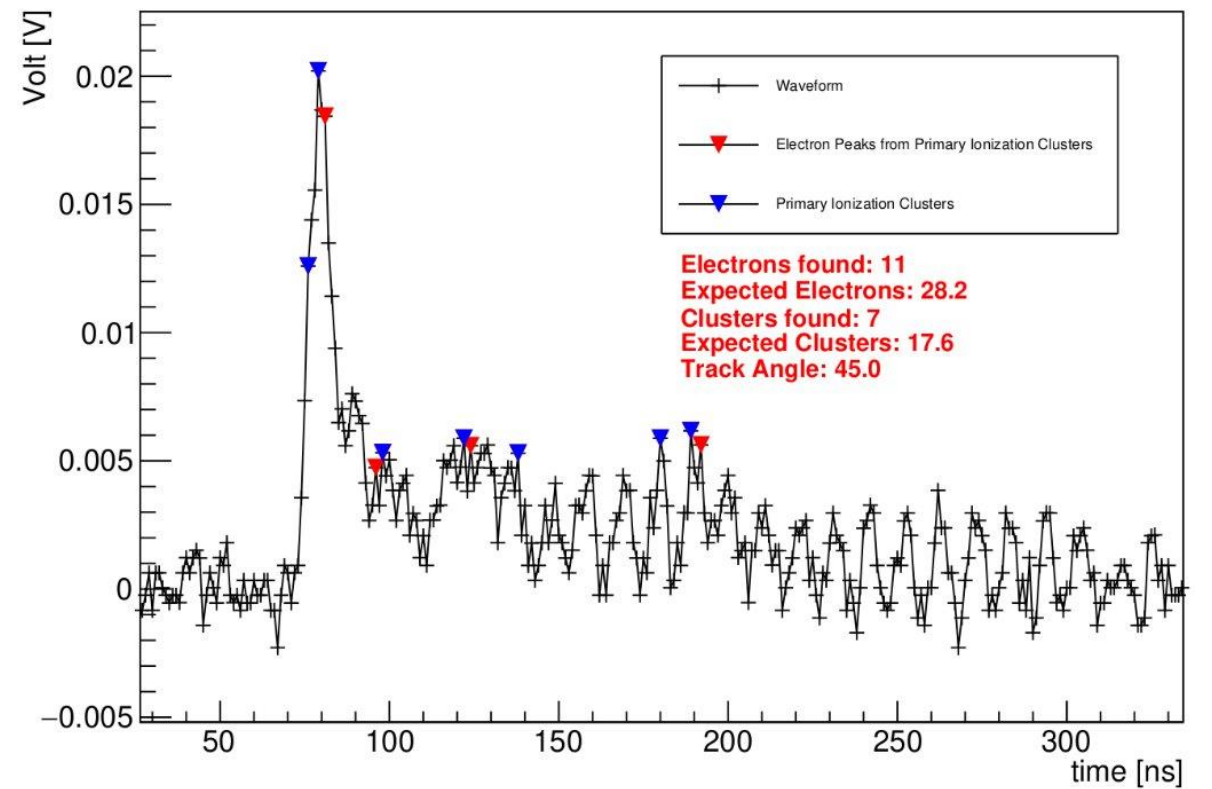
Wave forms

ns/new_folder/run4

Waveform signal Ch2 - Event 59 - Sense Wire Diameter 20 μm - Cell Size 1.0 cm - Track Angle 45.0 - run_4 - 1.0 GSa/s - 90/10 1 - 85/15 0

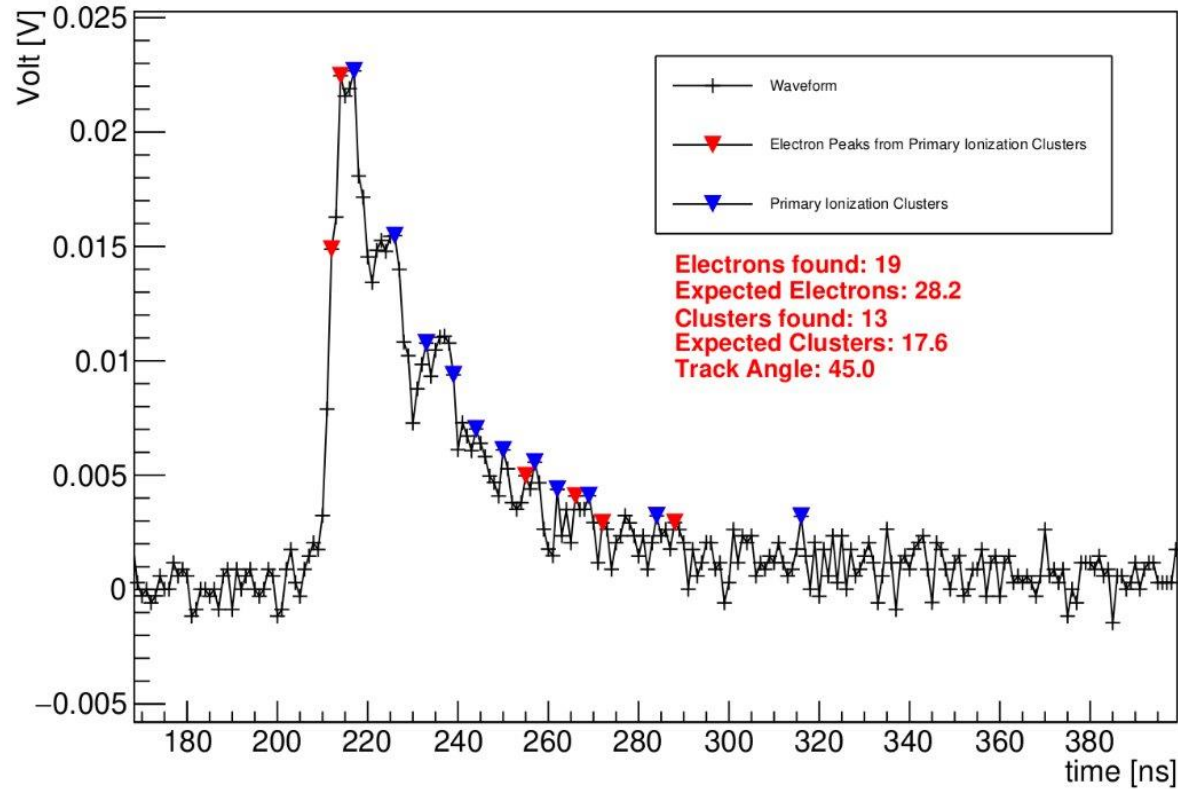


Waveform signal Ch3 - Event 32 - Sense Wire Diameter 20 μm - Cell Size 1.0 cm - Track Angle 45.0 - run_4 - 1.0 GSa/s - 90/10 1 - 85/15 0

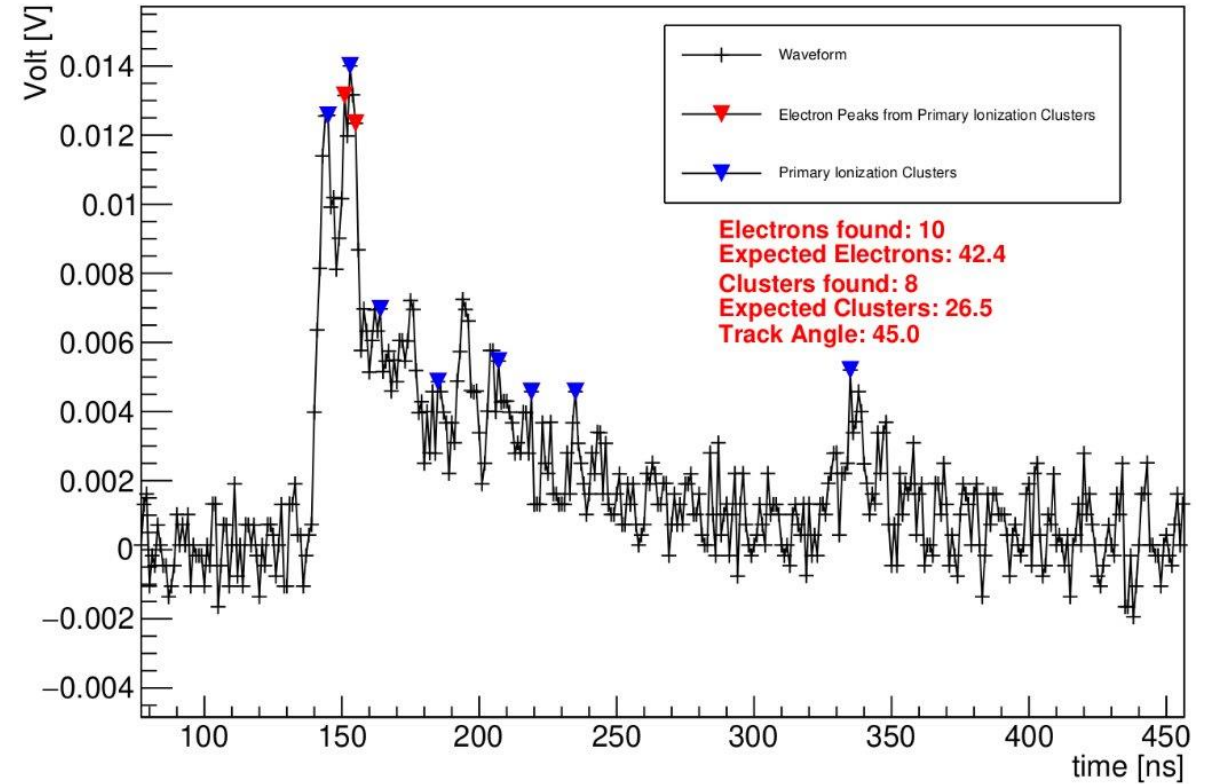


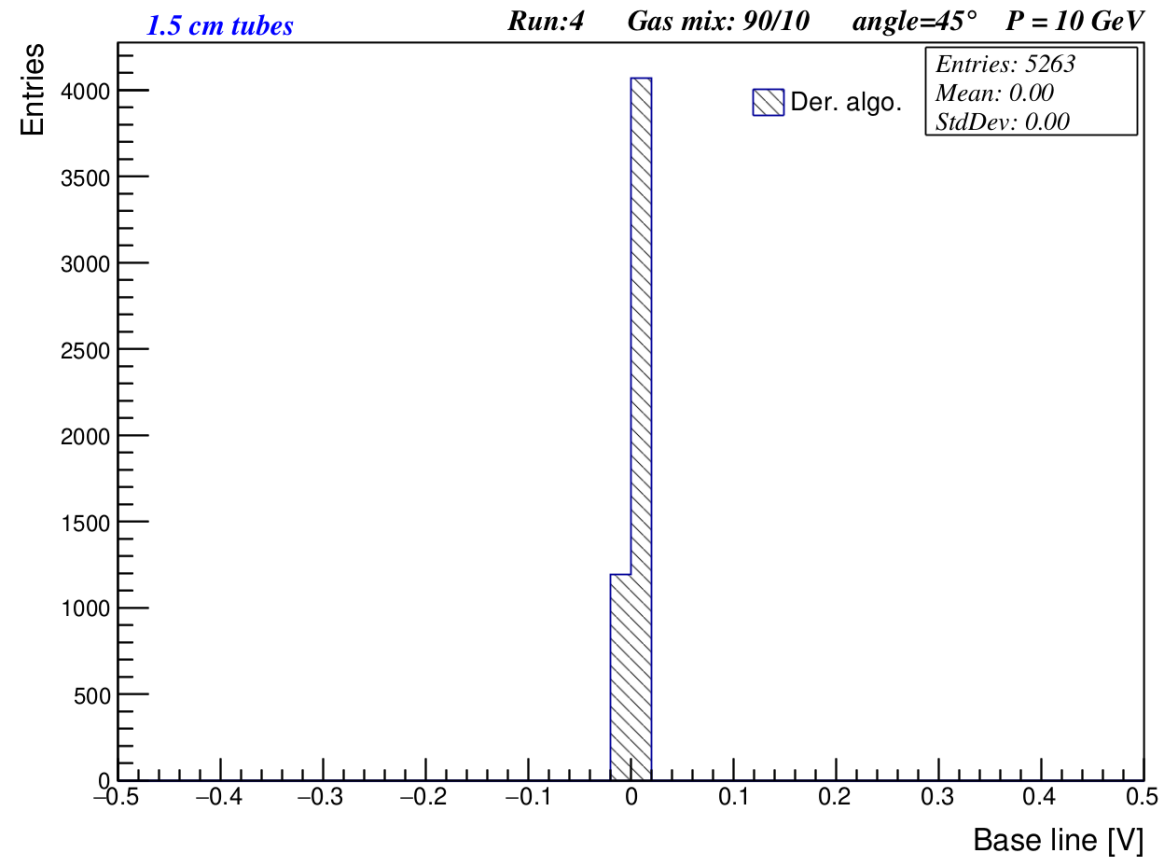
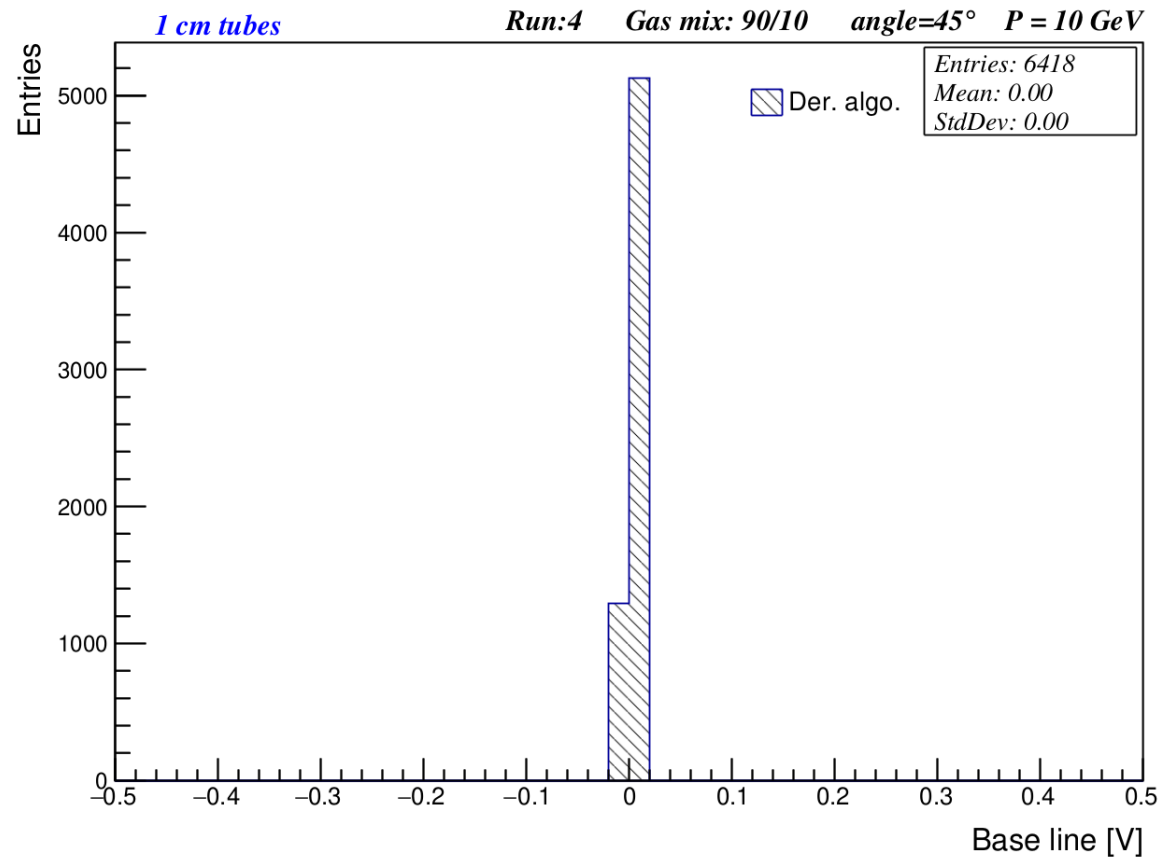
Wave forms

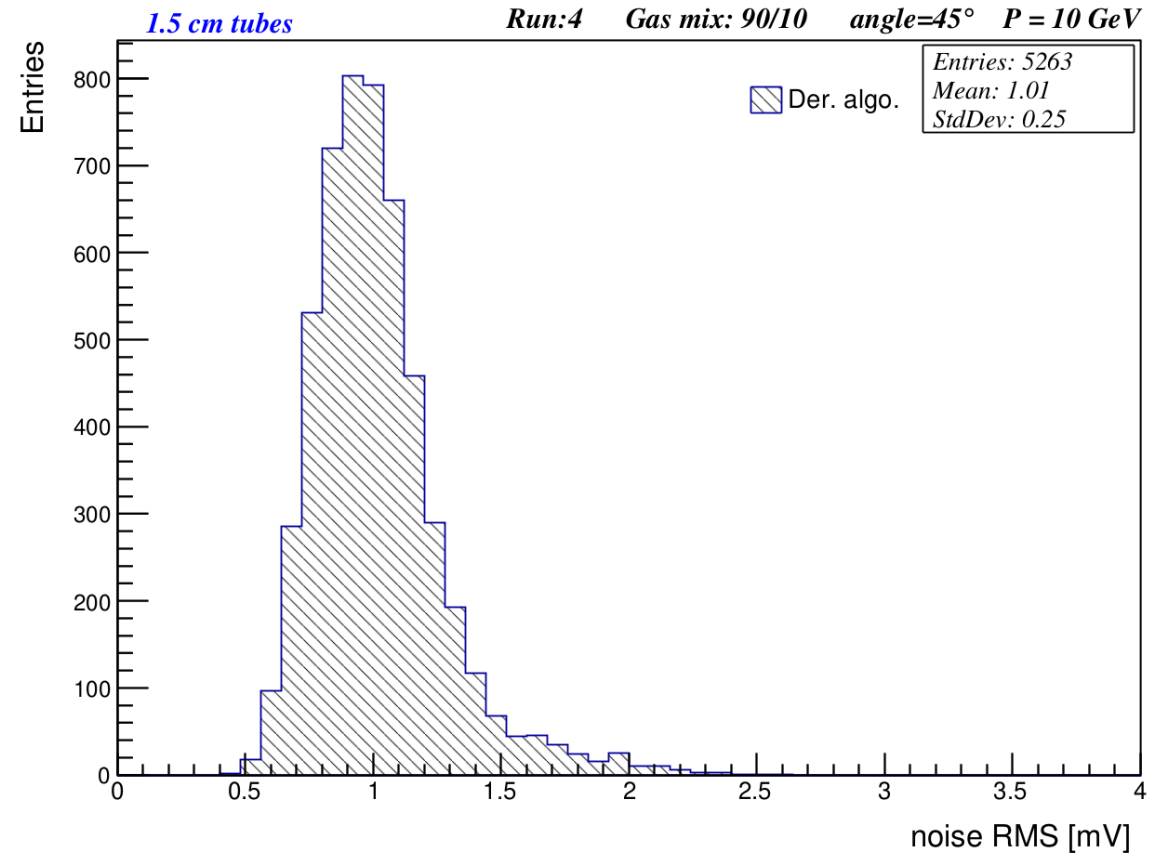
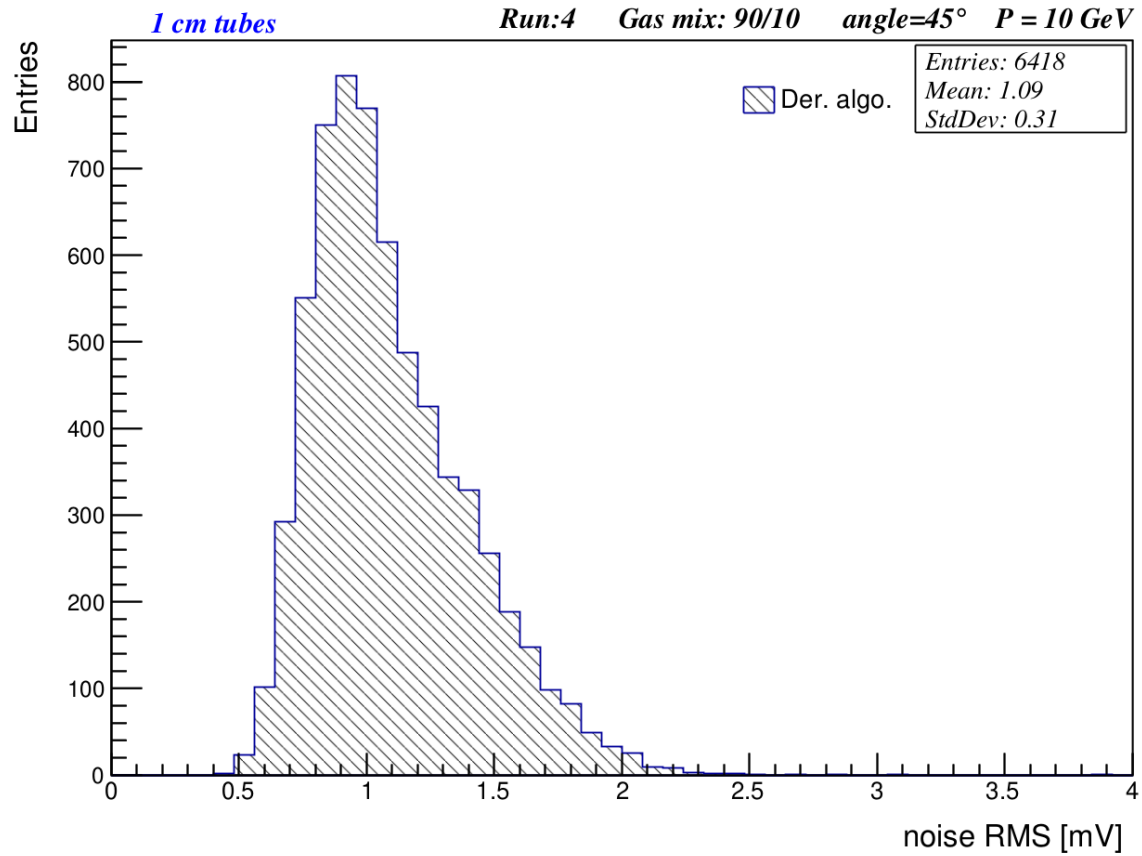
Waveform signal Ch2 - Event 100 - Sense Wire Diameter 20 μm - Cell Size 1.0 cm - Track Angle 45.0 - run_4 - 1.0 GSa/s - 90/10 1 - 85/15 0

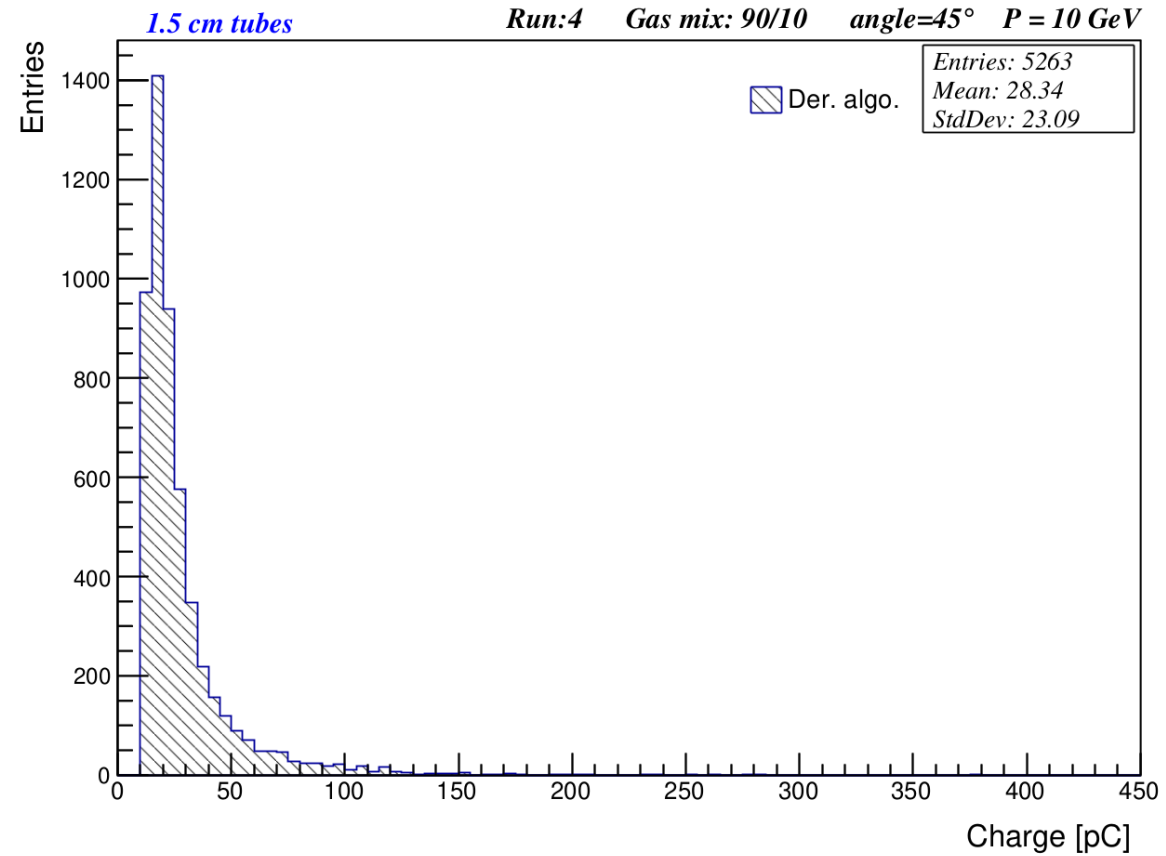
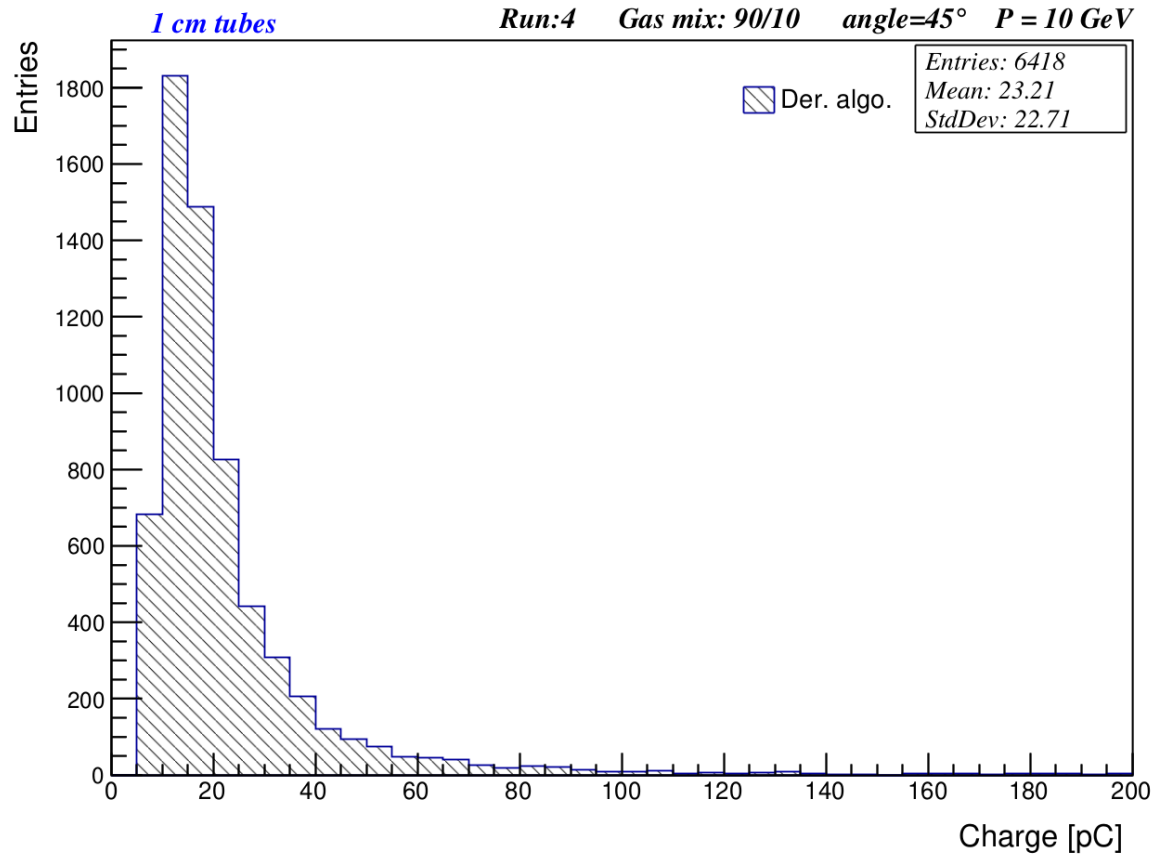


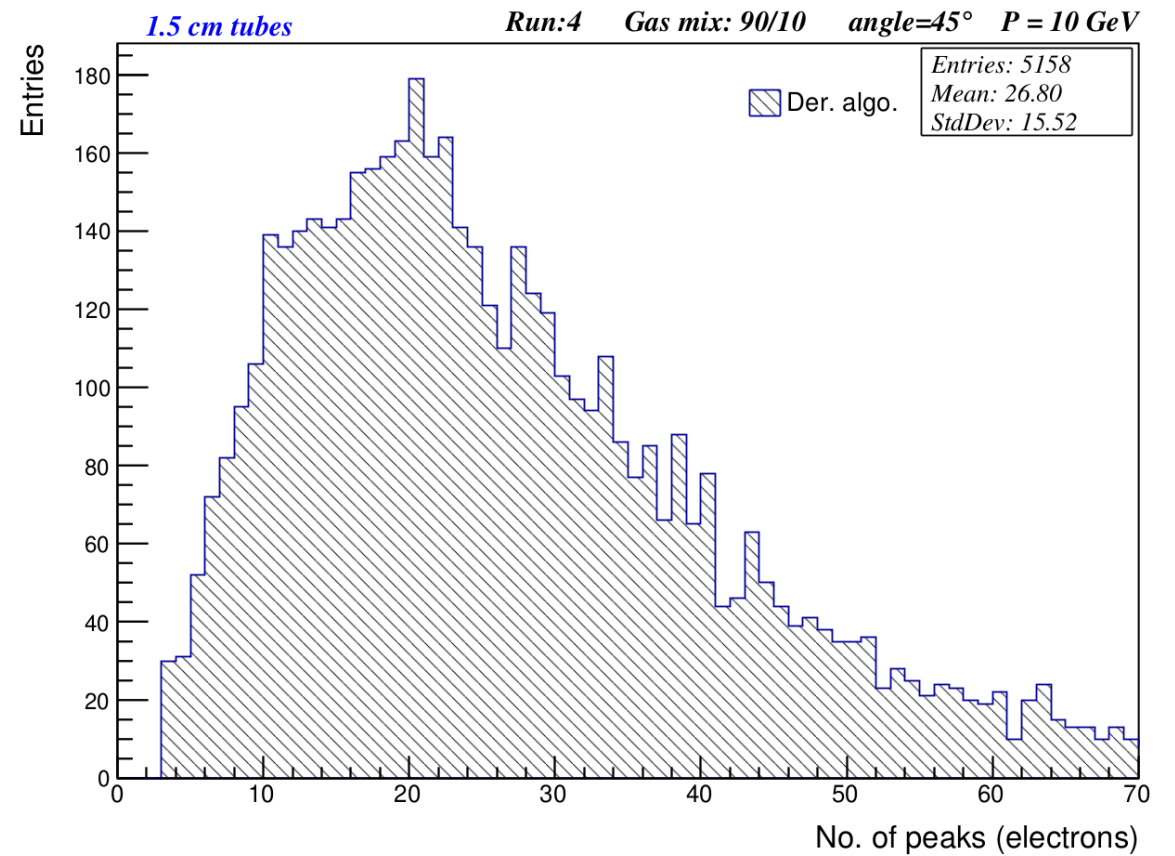
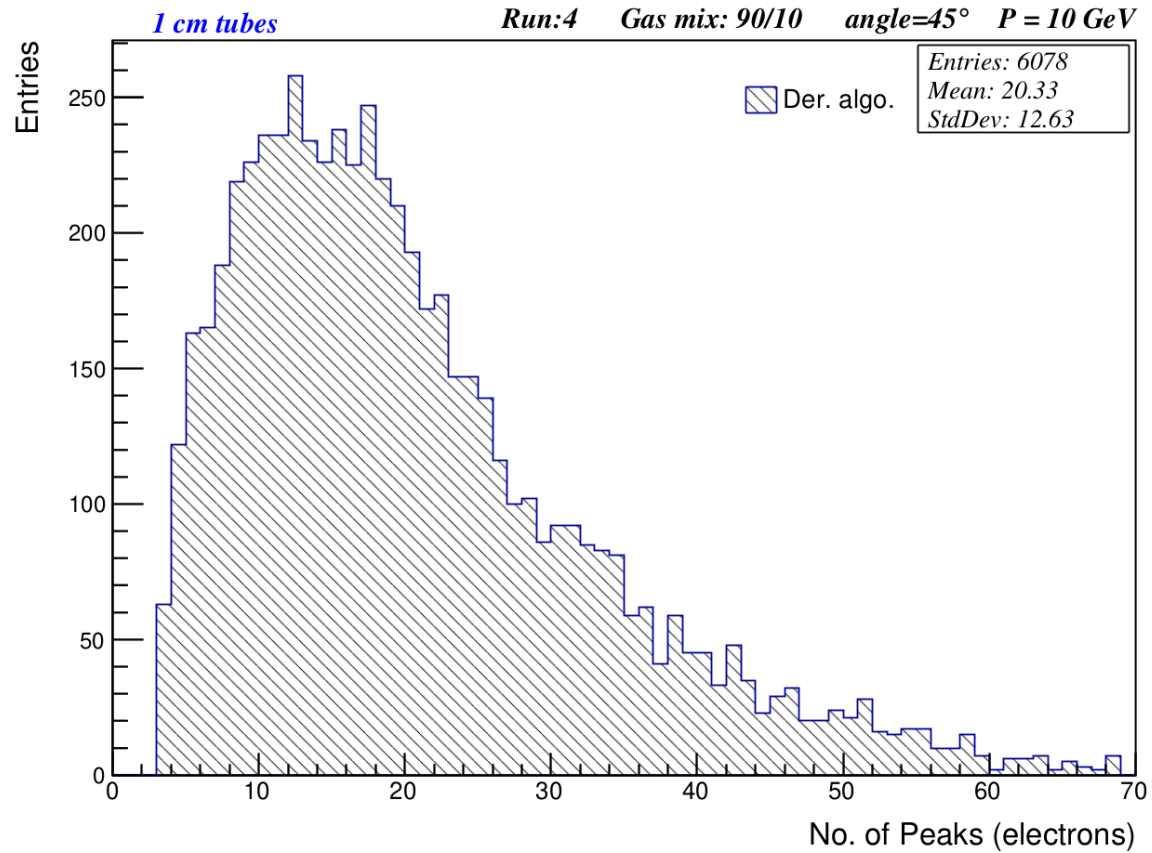
Waveform signal Ch9 - Event 62 - Sense Wire Diameter 20 μm - Cell Size 1.5 cm - Track Angle 45.0 - run_4 - 1.0 GSa/s - 90/10 1 - 85/15 0

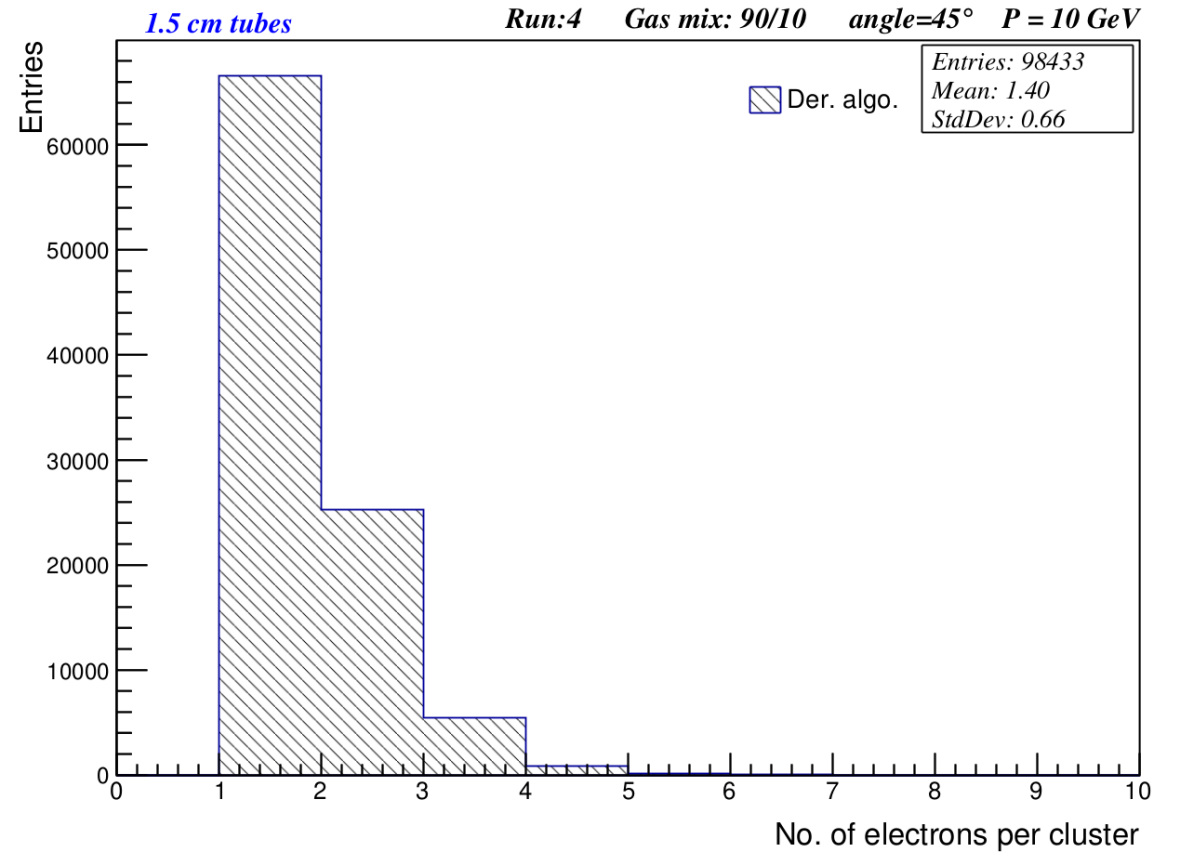
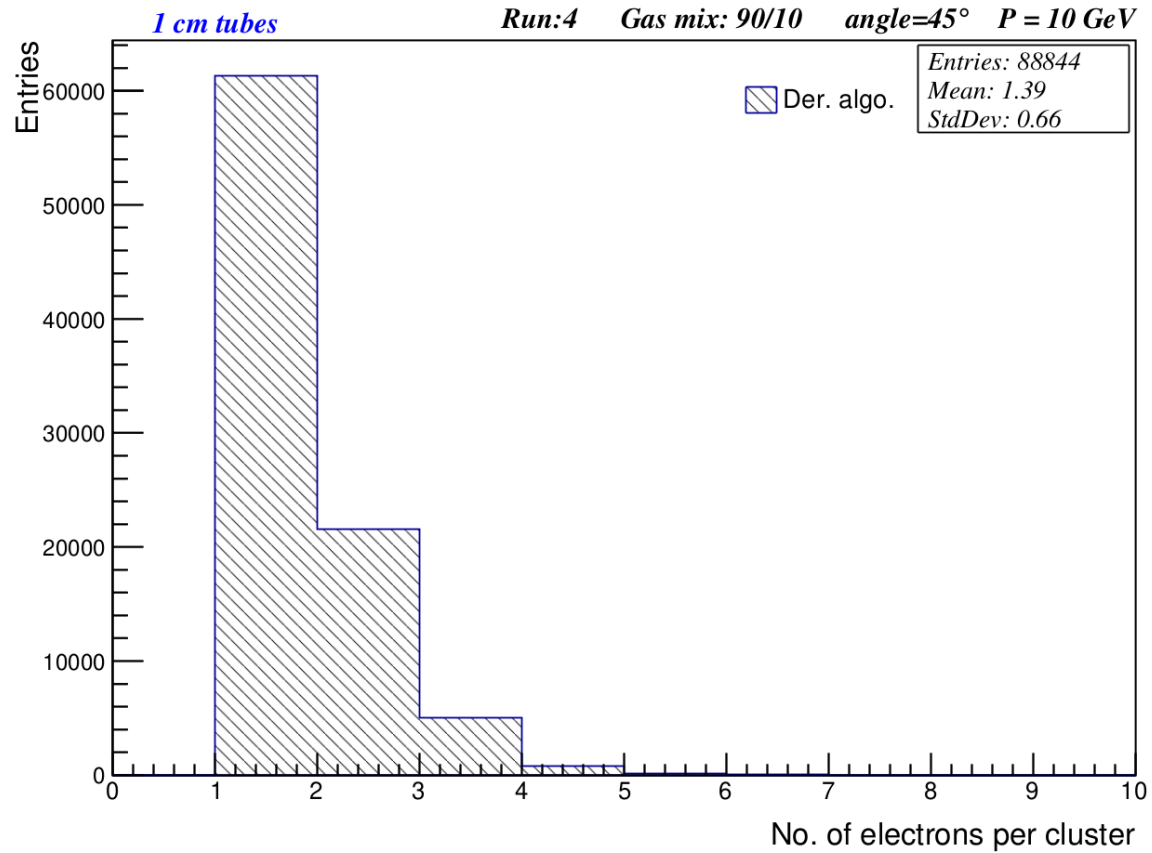


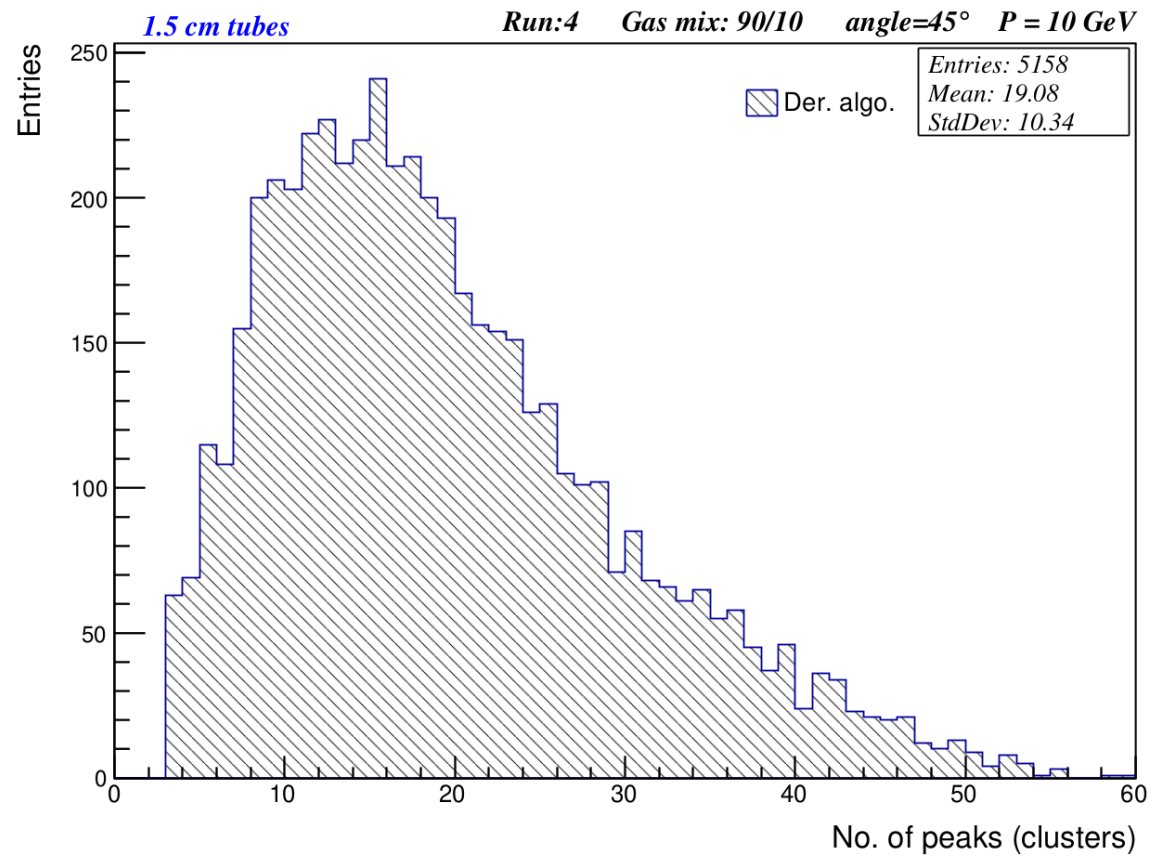
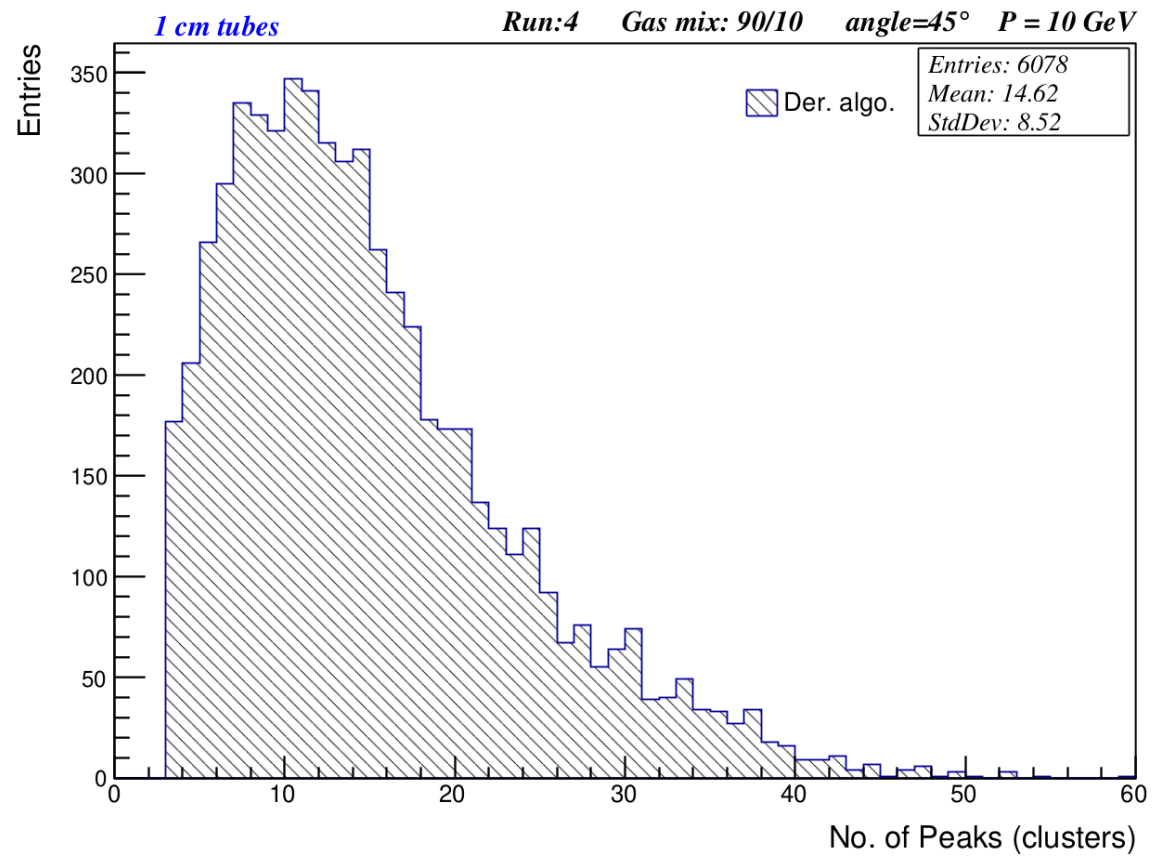


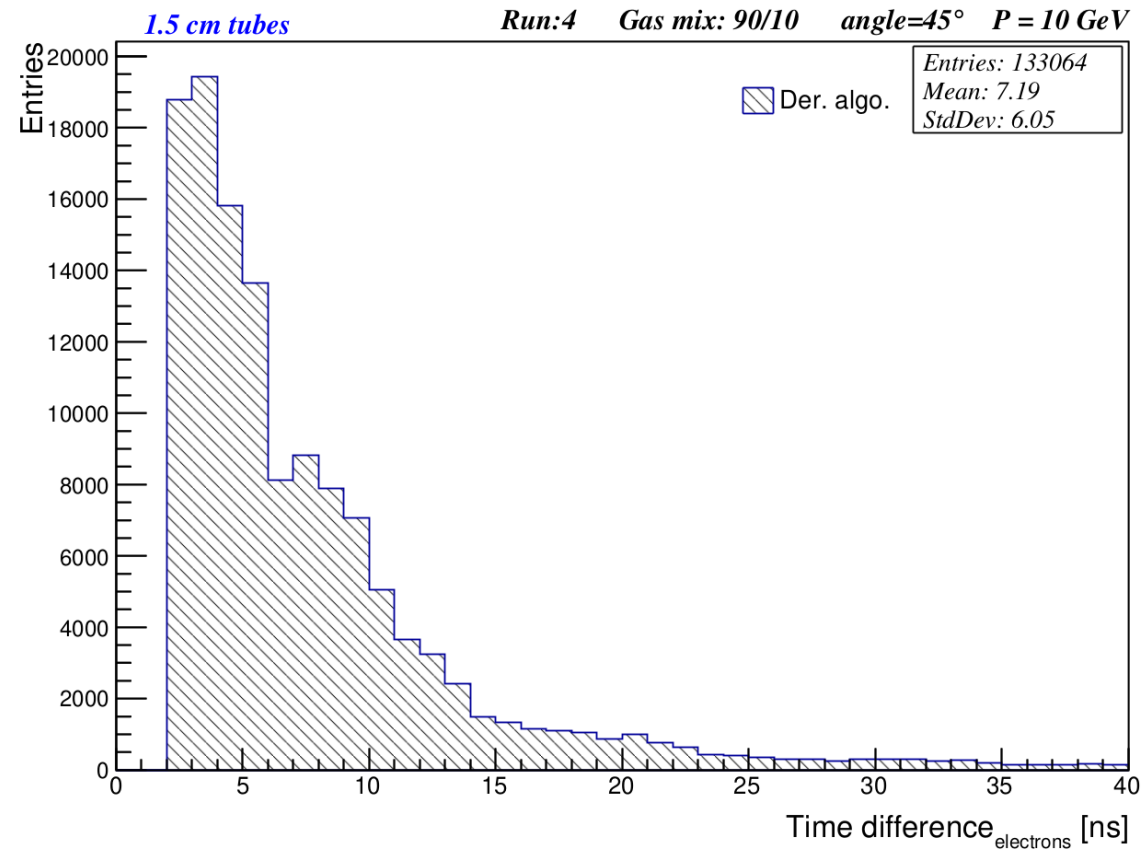
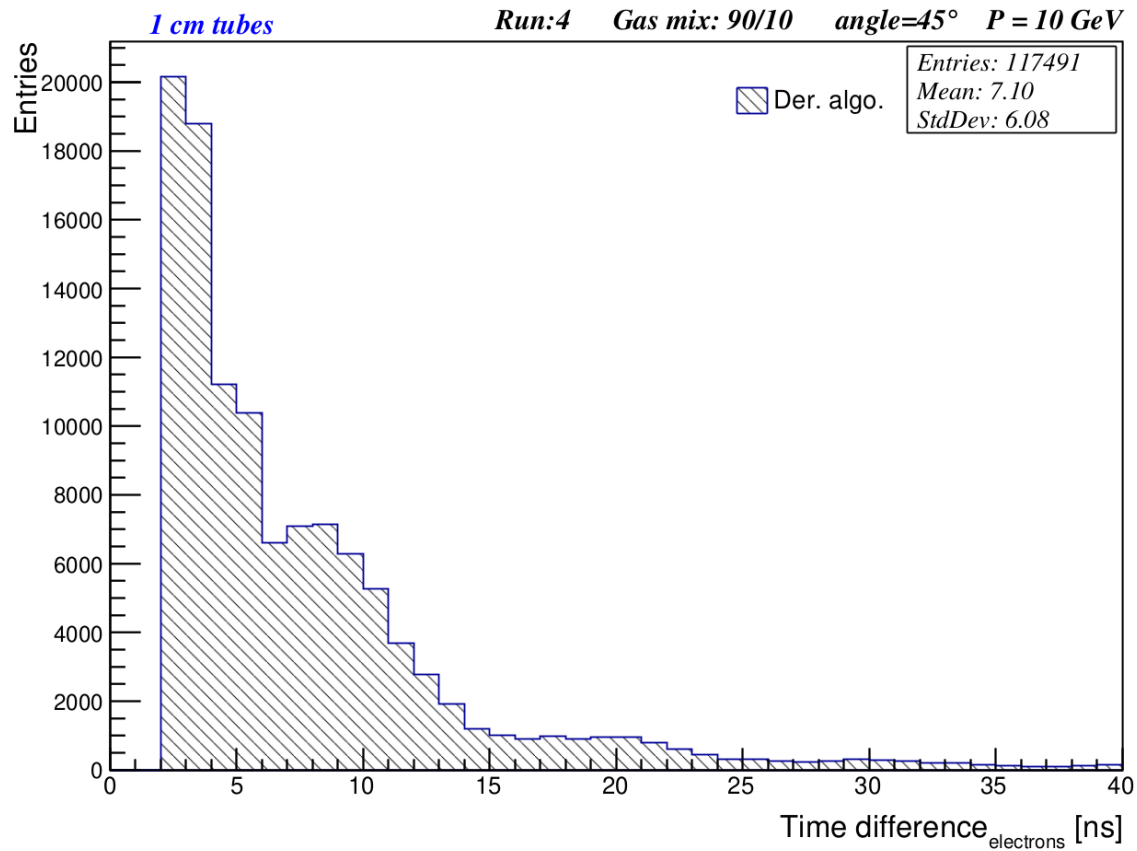


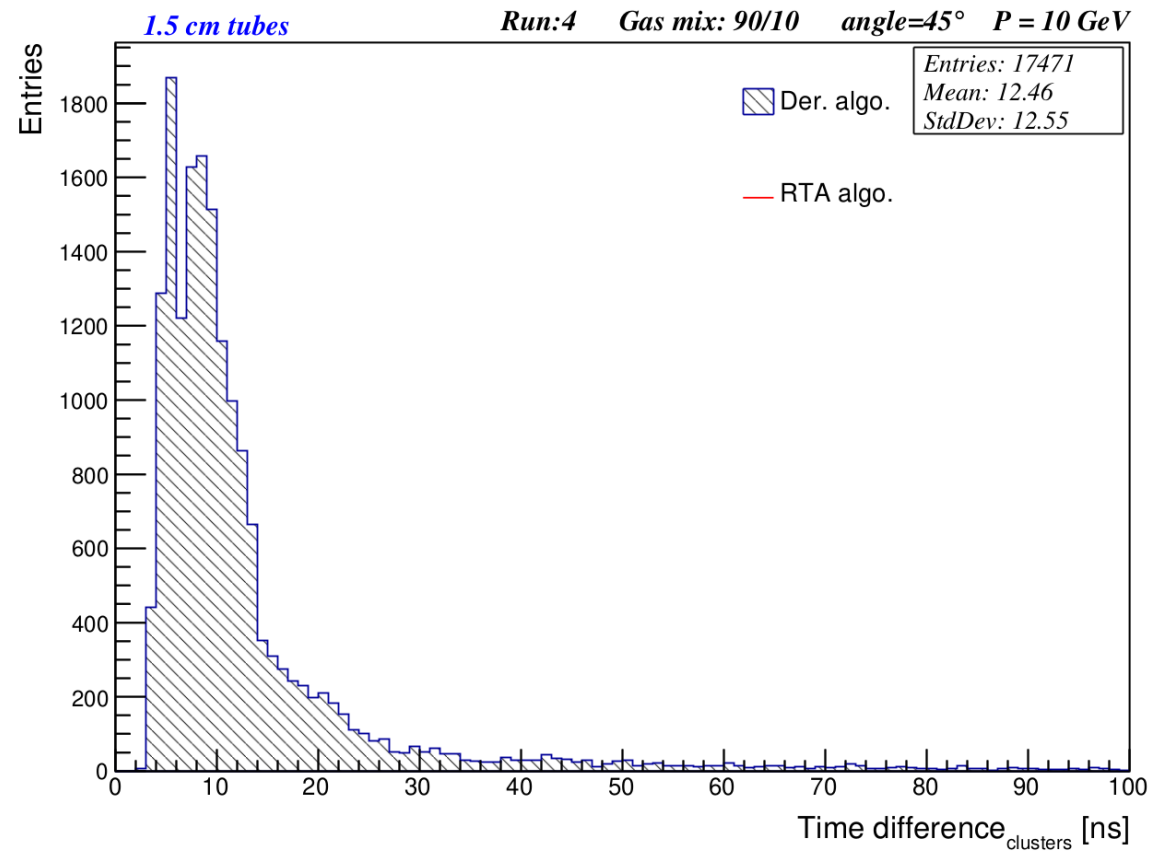
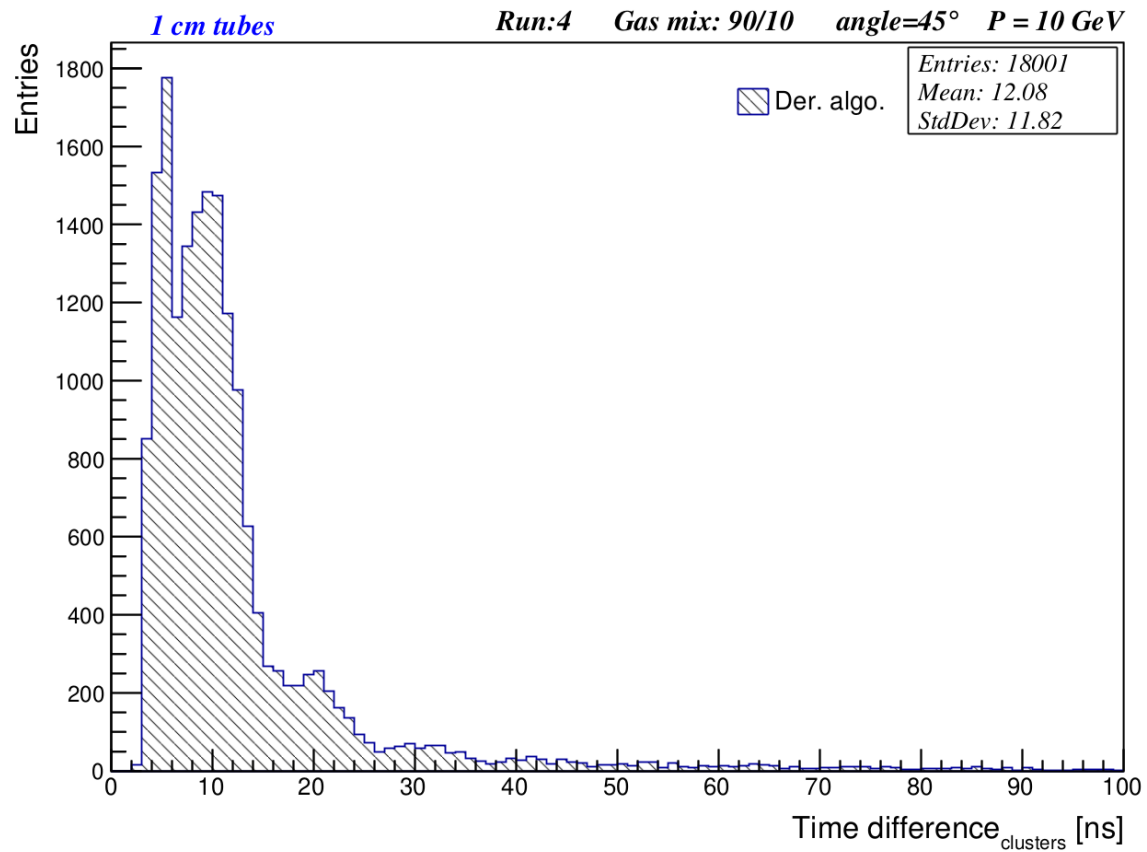


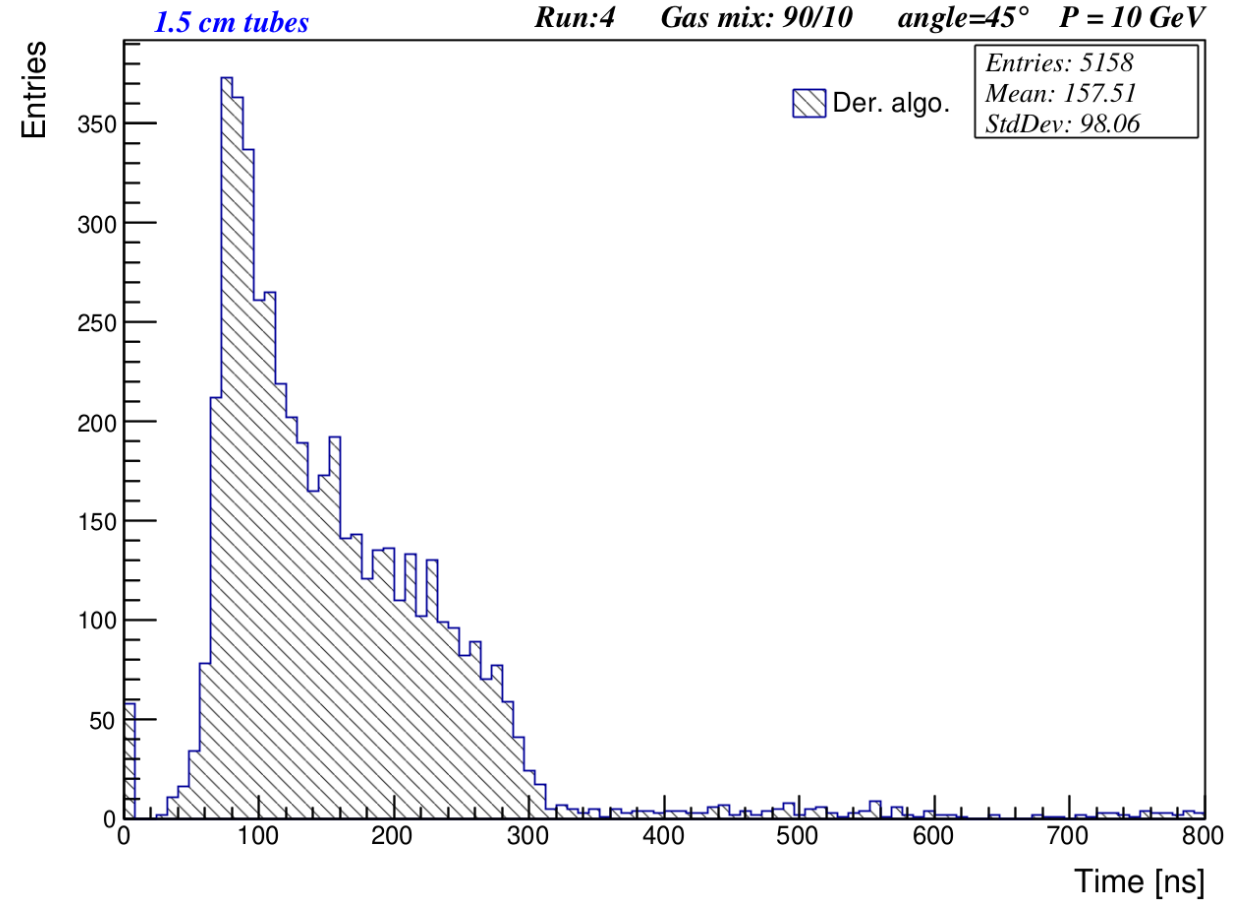
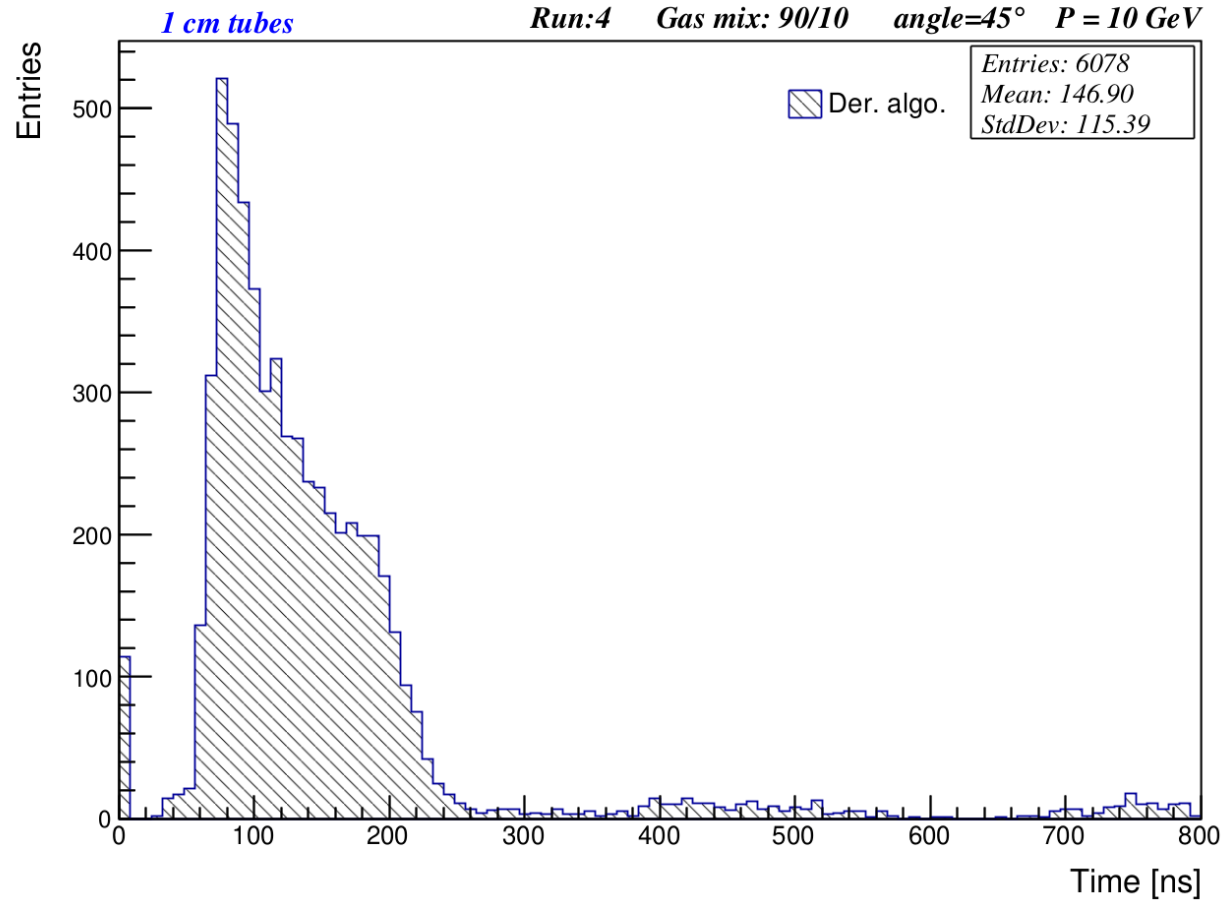


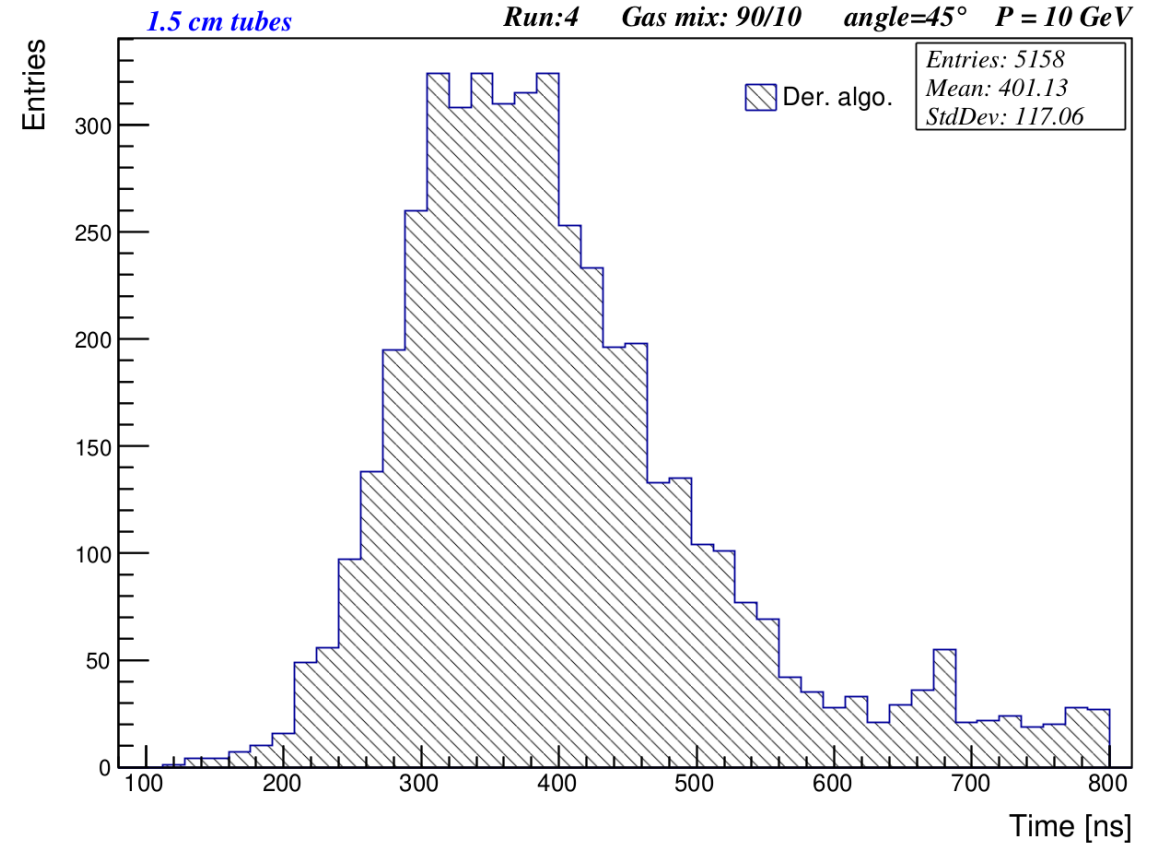
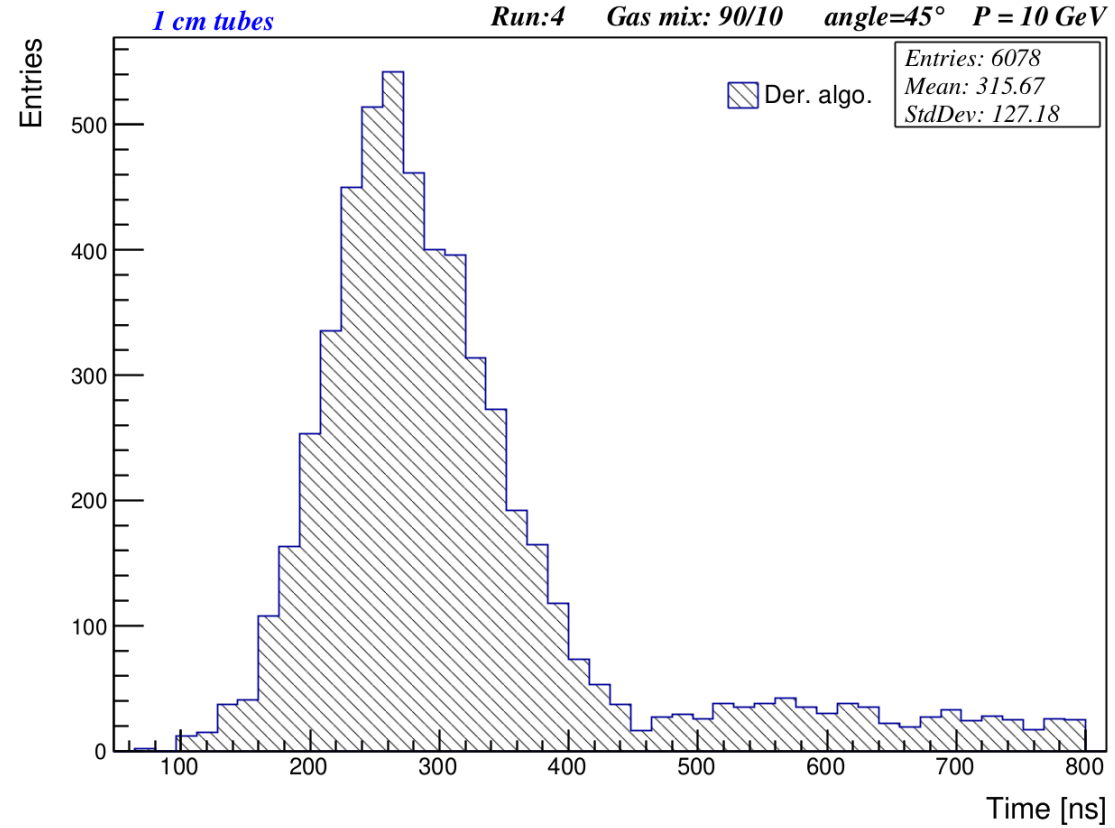










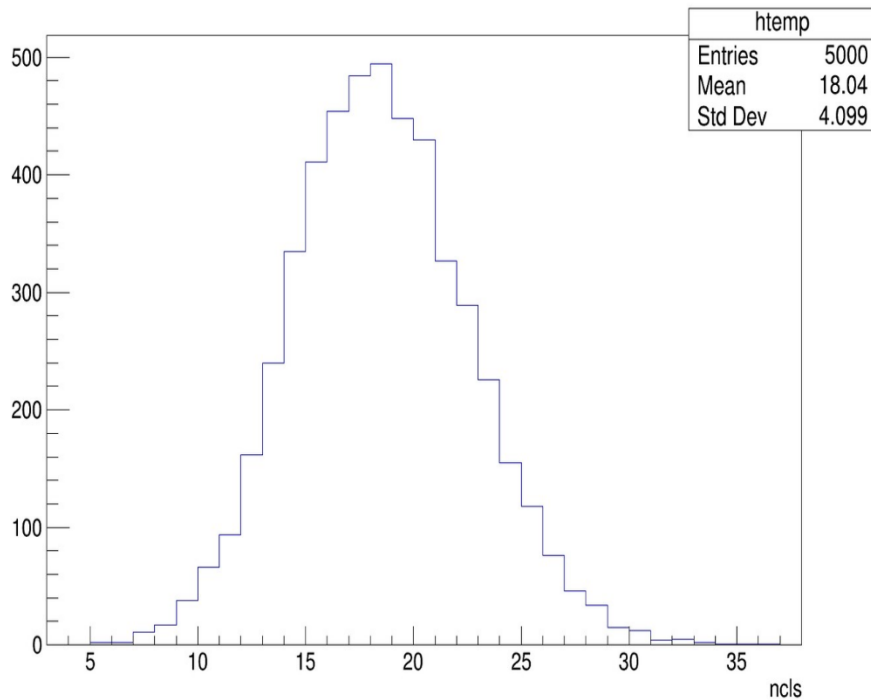


Simulation based on Garfield++

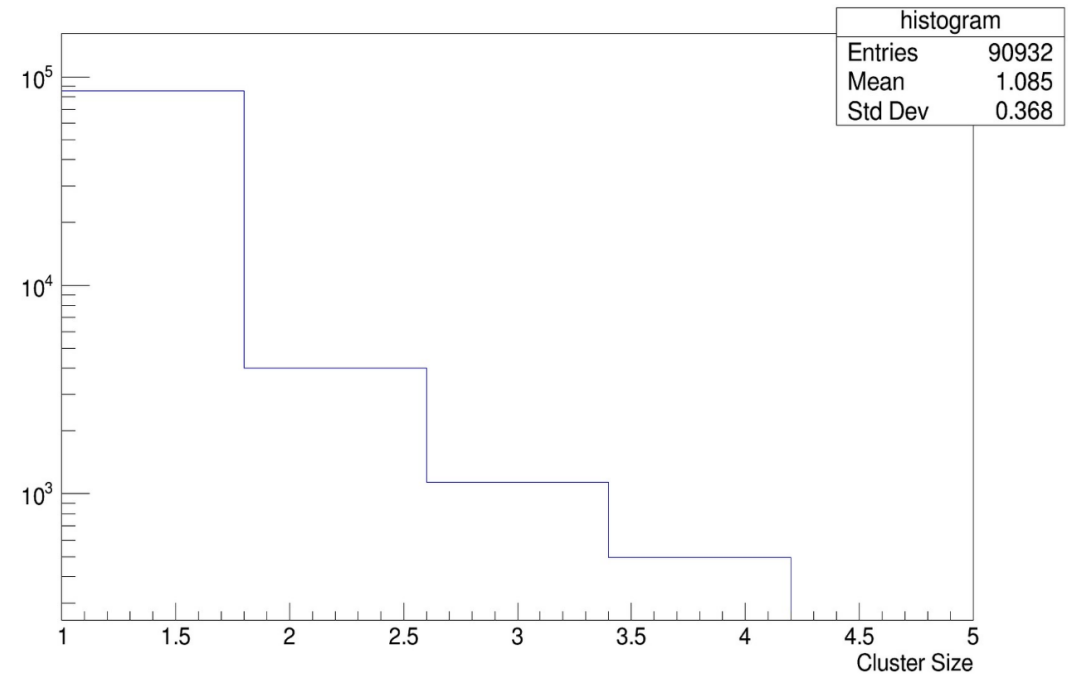
Taken from Muhammad Anwar's talk - 4 July 2024

- Muon particles is passed through mixture of gas having 90% He and 10% Isobutane C₄H₁₀ by using a geometry of drift tubes mimicking what was used for the beam test at CERN in 2023

- The simulation parameters included a cell size of 0.8 cm, a sampling rate of 1.0 GHz, a time window of 800 ns, 45 angle between the z axis of drift tube chamber and track of the muon particle, and momentum muon particles with momentum 10 GeV/c. The simulation was conducted using Garfield++



No. Of clusters



Clusters' size

Using CNN for clusterization

Taken from Muhammad Anwar's talk - 4 July 2024

