

# Film digitization

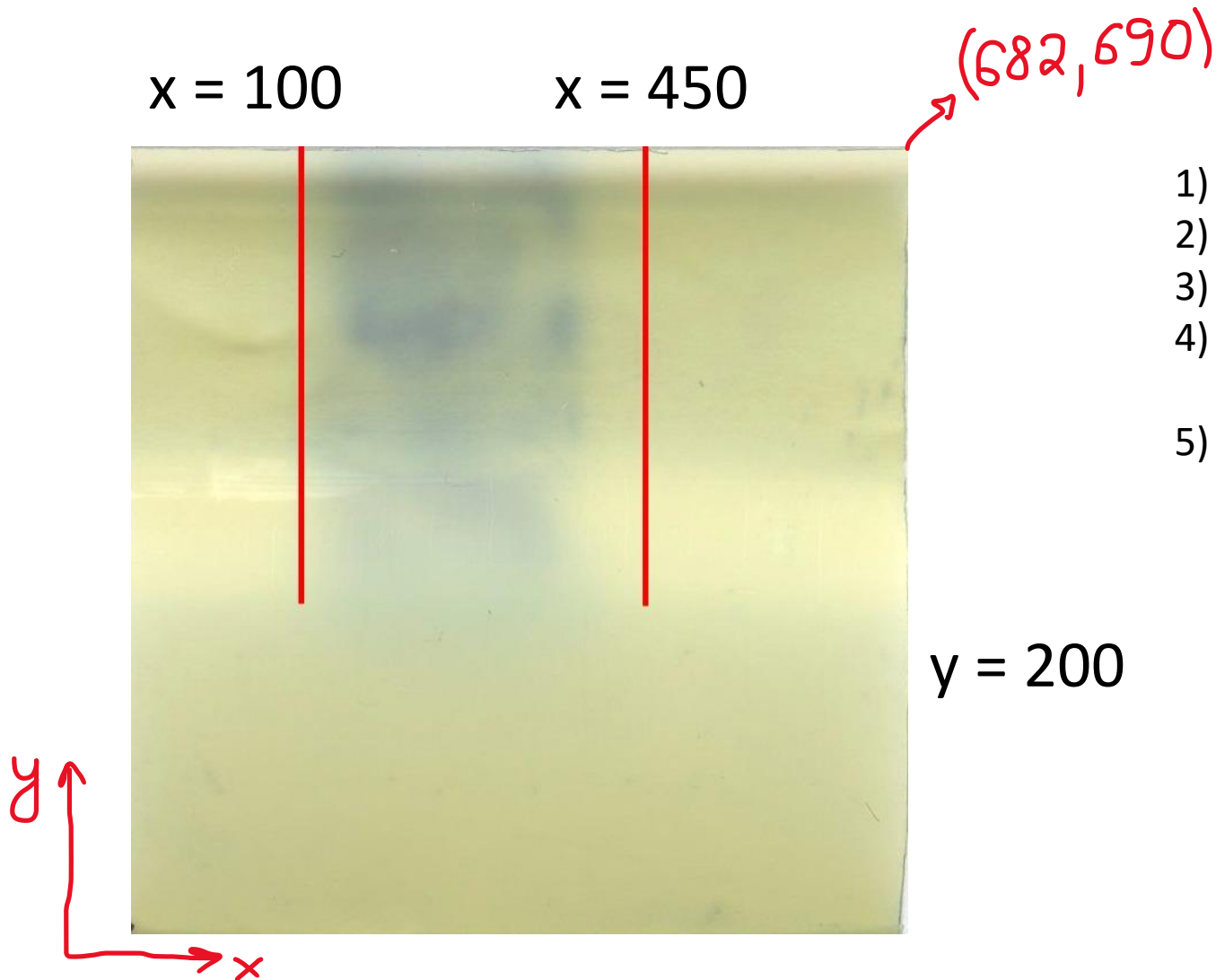
## Background removal algorithm

Tulgaa Turtuvshin

ATLAS-JINR FCalPulse project meeting

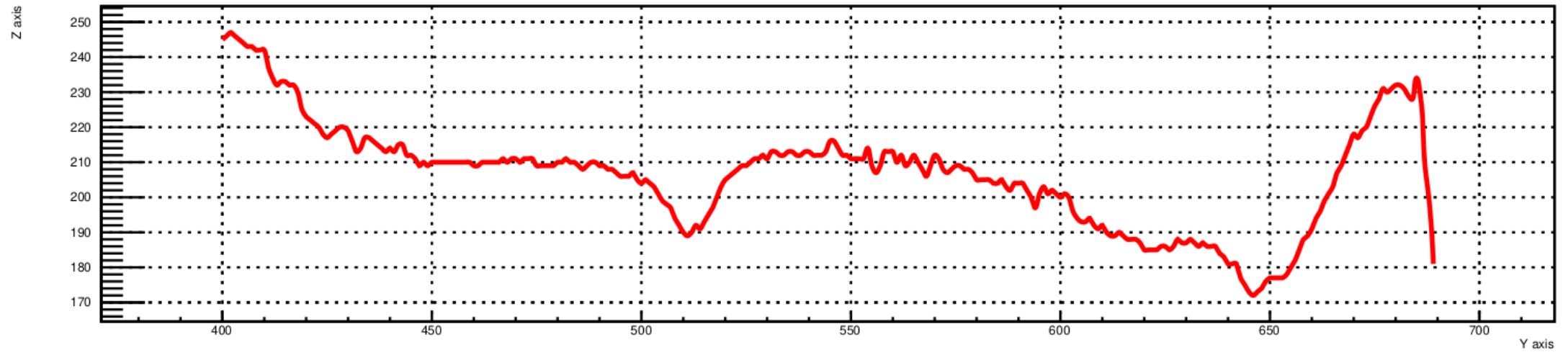
23 September 2022

# Idea of Background removal algorithm

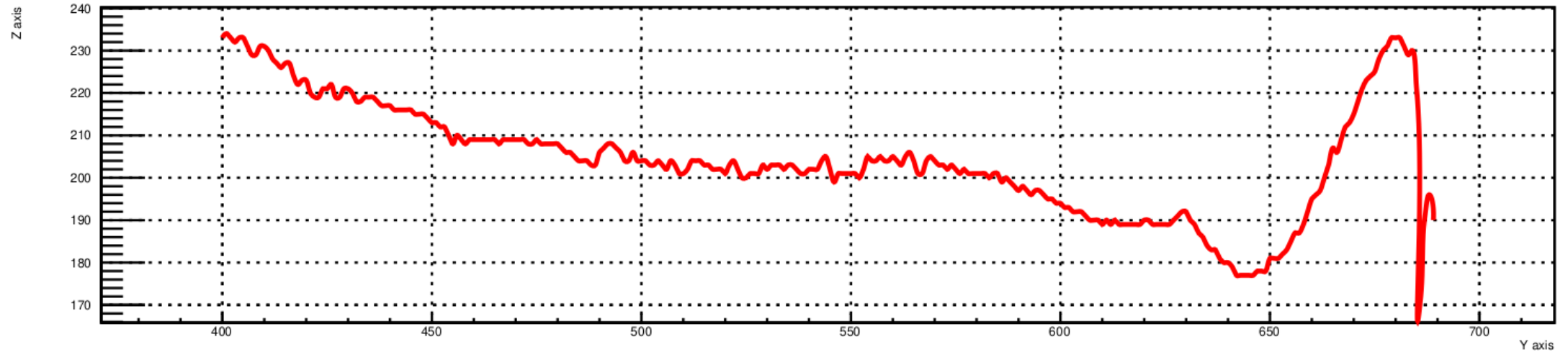


- 1) Draw 2 lines outside of the exposure area
- 2) Define RGB color codes on red lines.
- 3) Remove area between the lines.
- 4) Connect dots between the lines and fill the area to define background
- 5) Subtract background values from original image

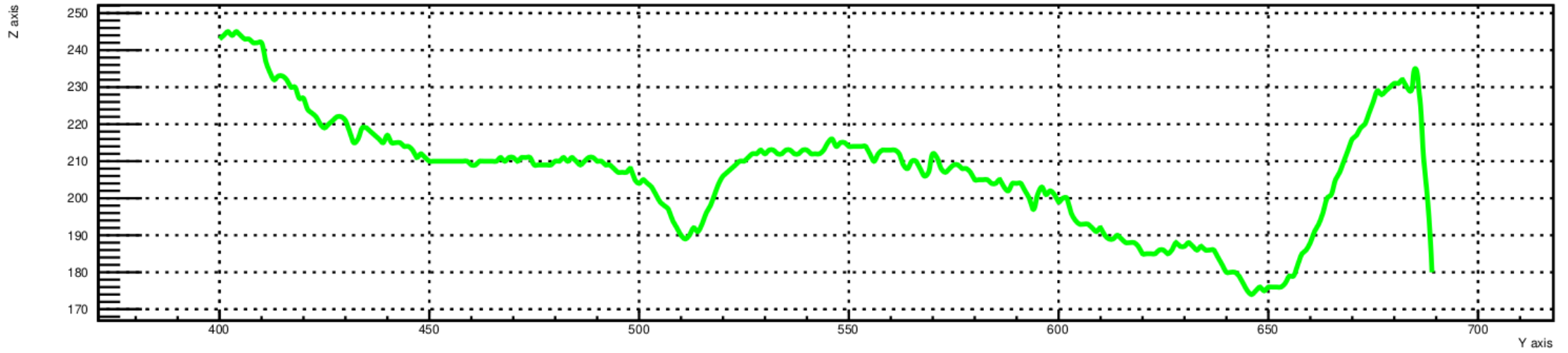
30s (x = 100)



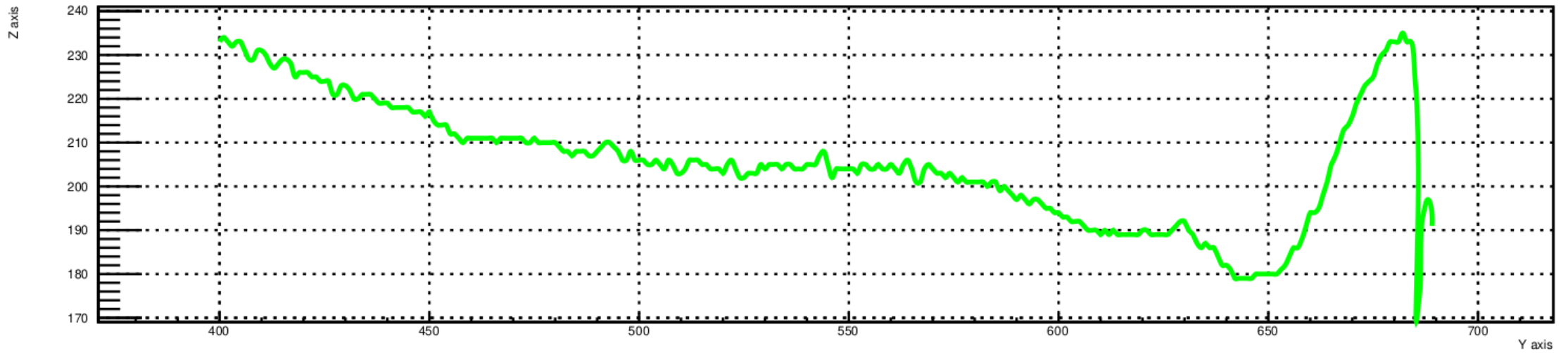
30s (x = 450)



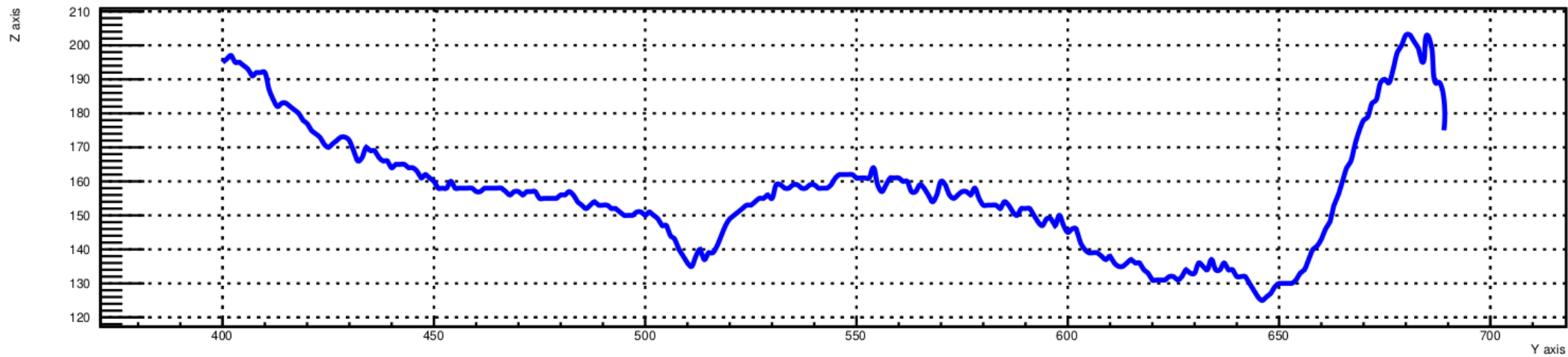
30s (x = 100)



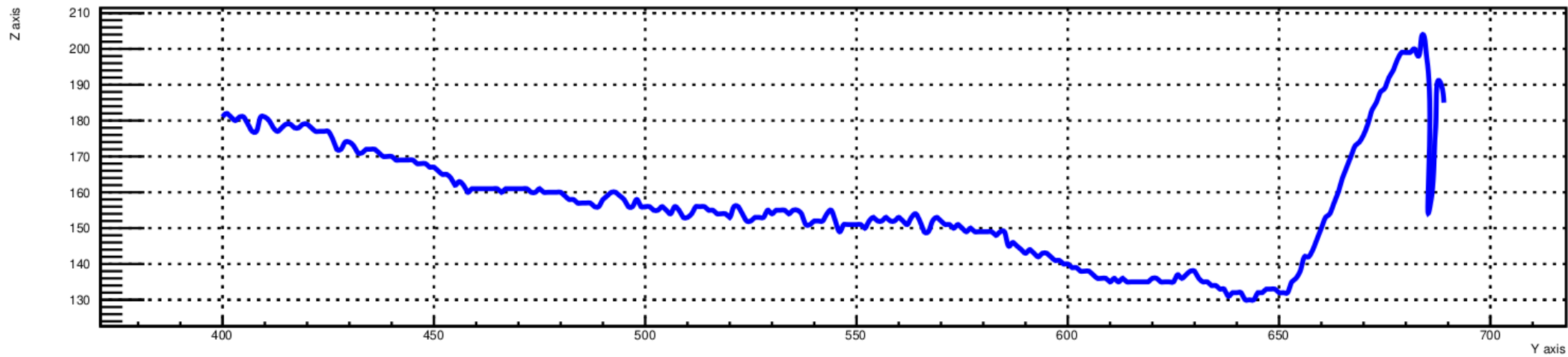
30s (x = 450)



30s (x = 100)

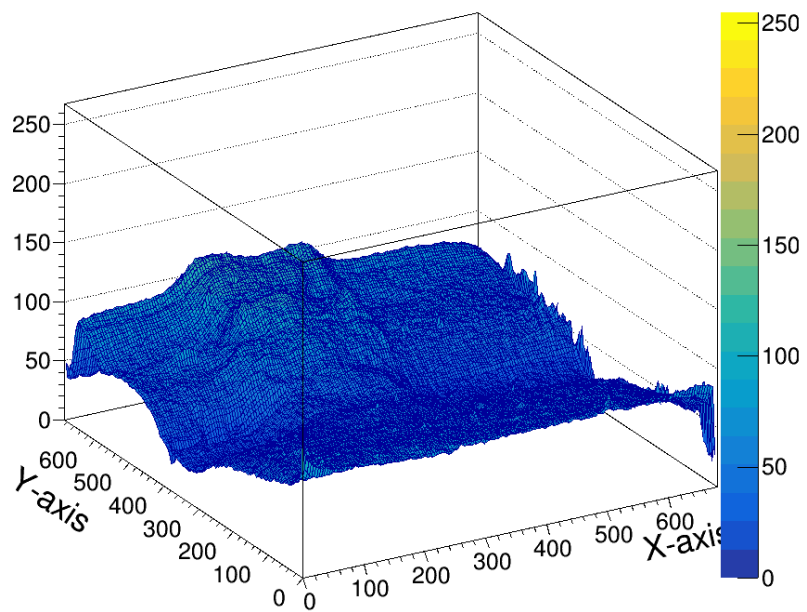


30s (x = 450)

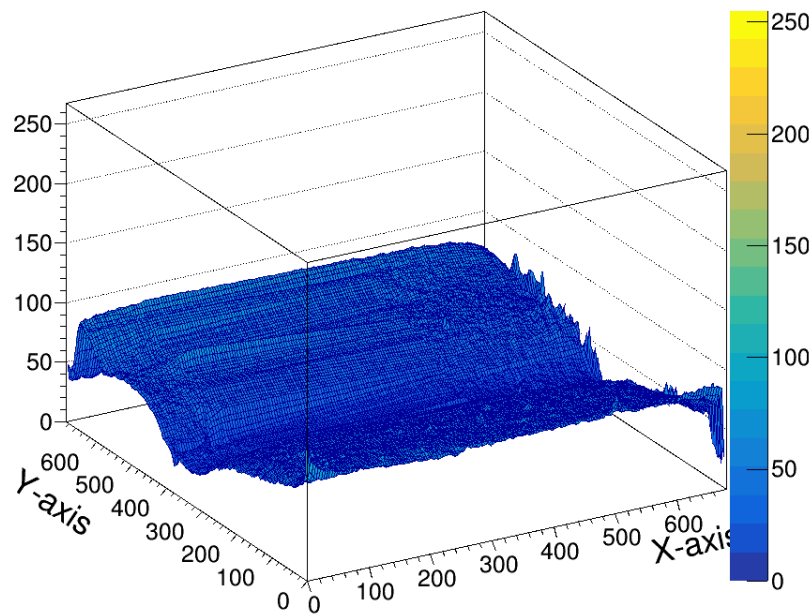


# 30 sec

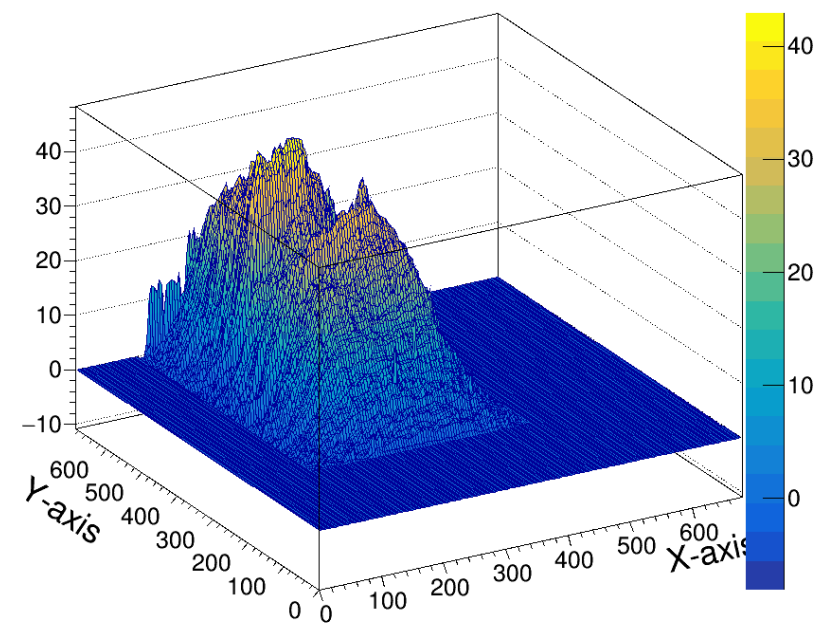
Original



Background

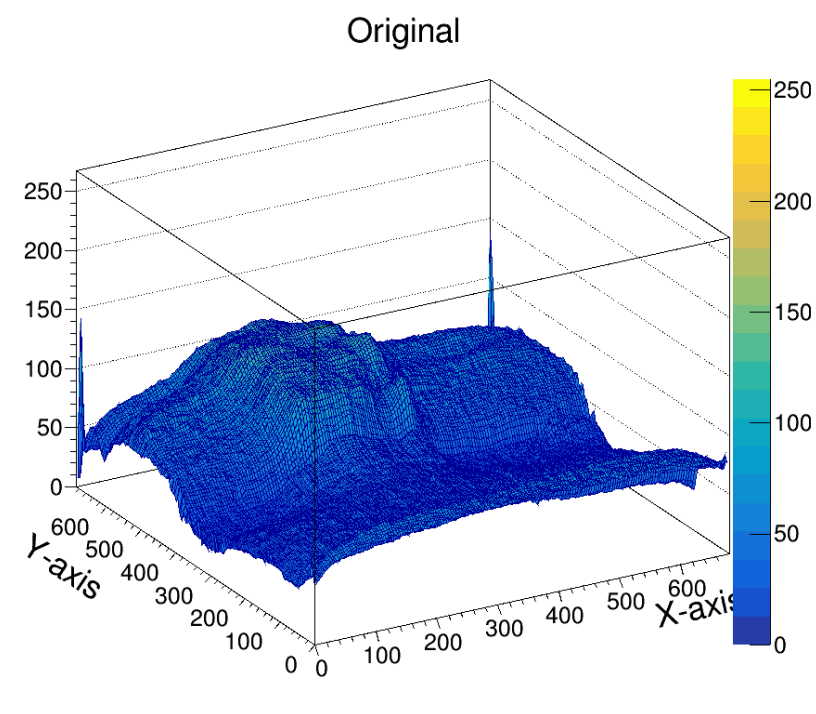


Signal

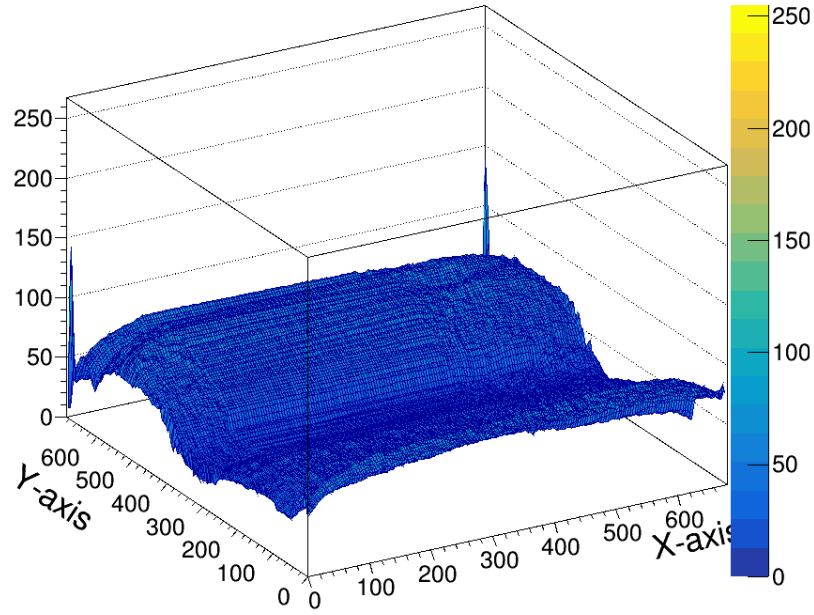


# 45 sec

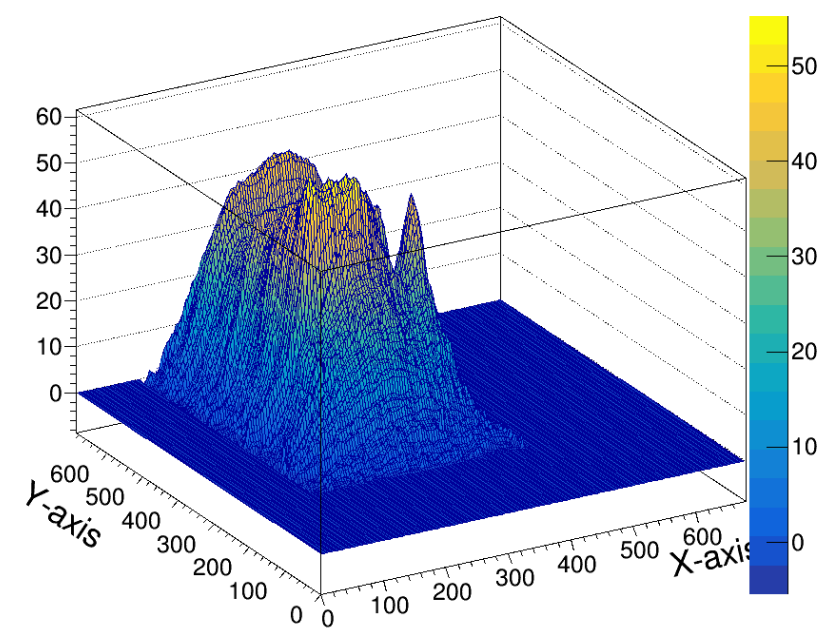
Original



Background

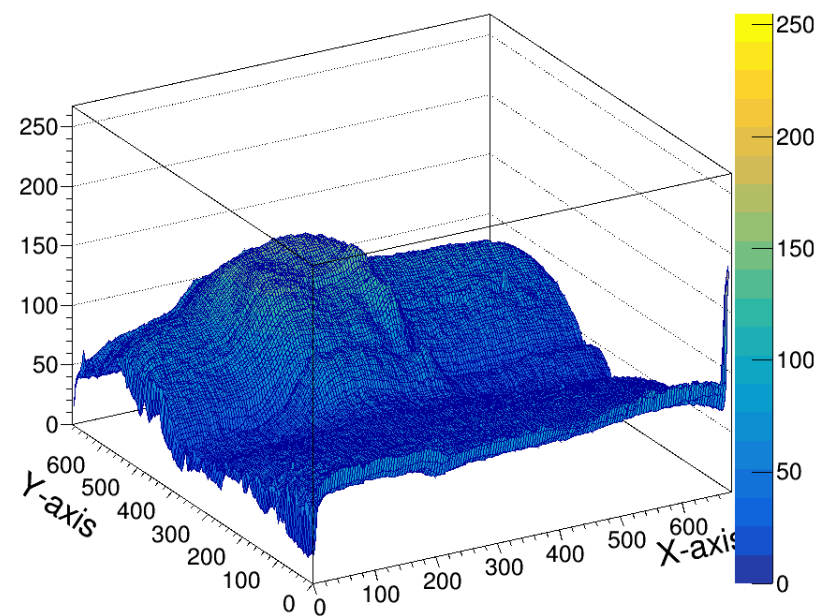


Signal

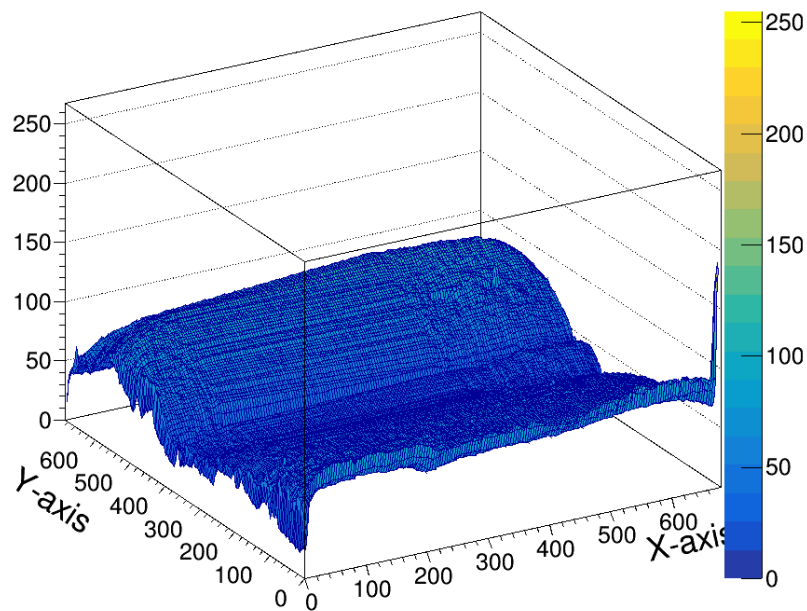


# 1 min

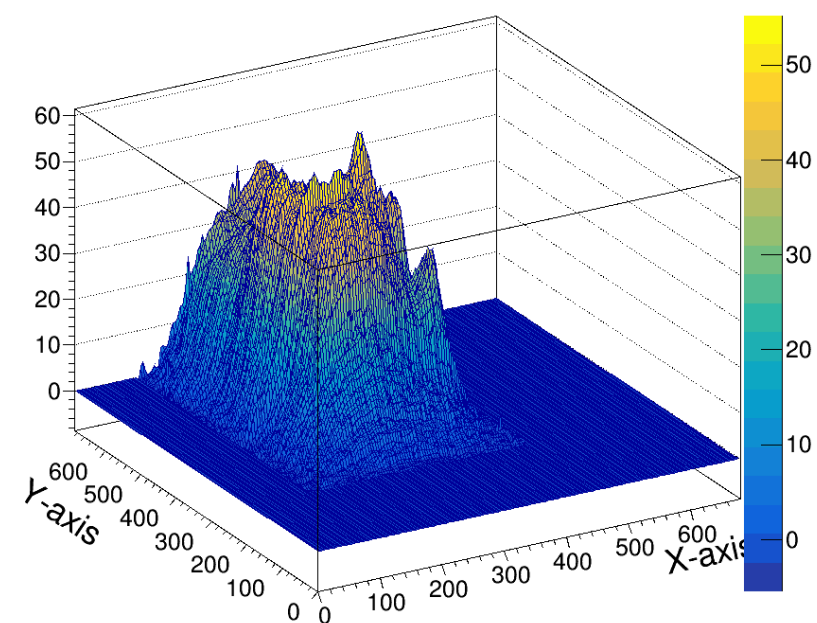
Original



Background



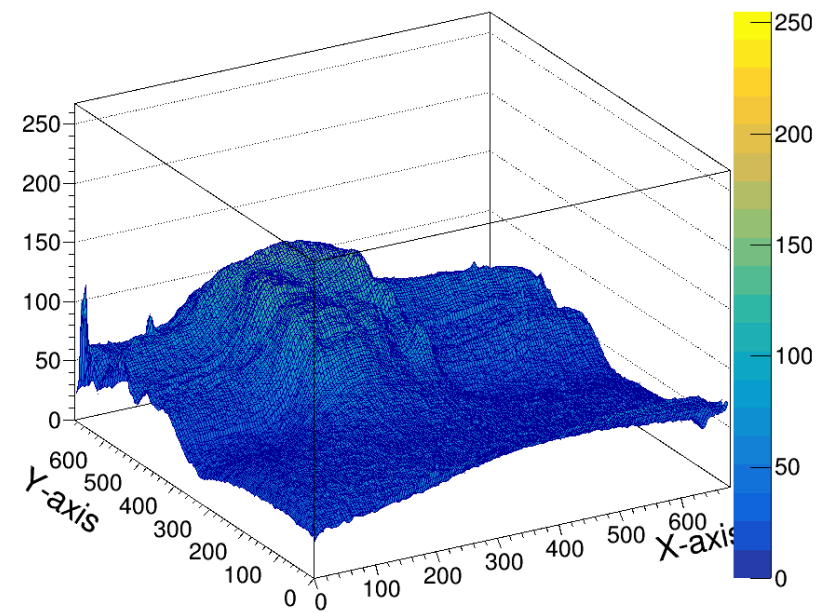
Signal



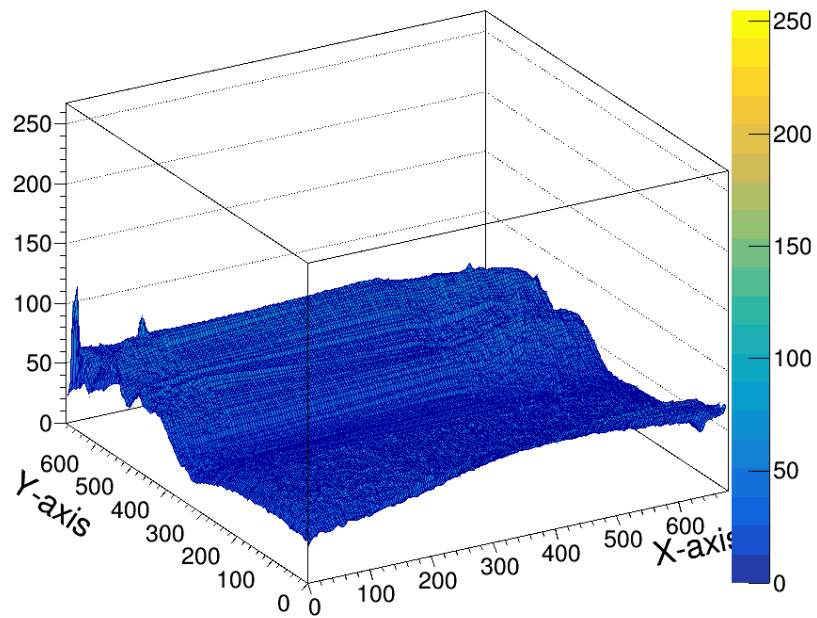


# 1 min 10 sec

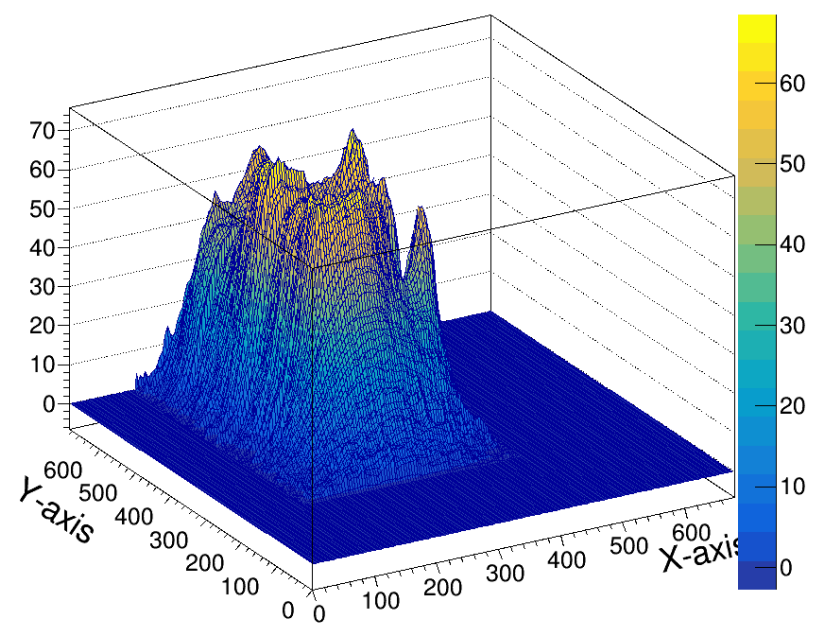
Original



Background

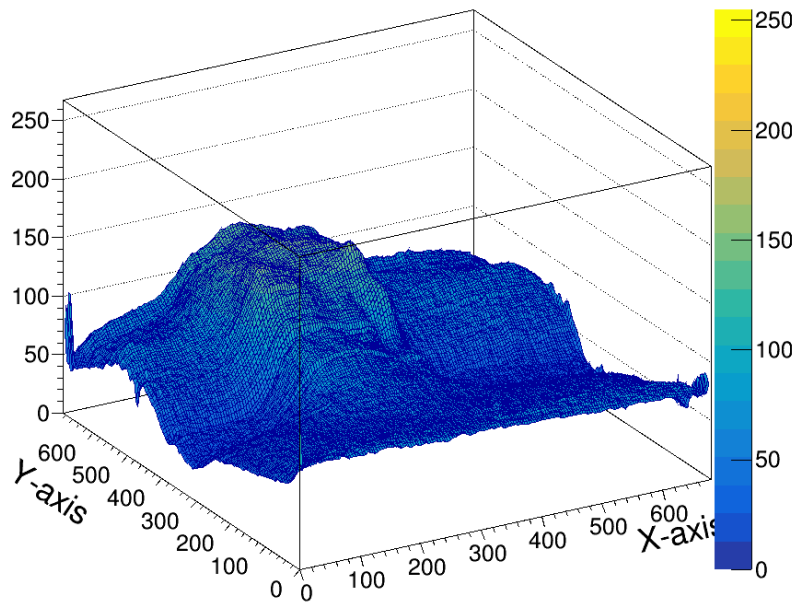


Signal

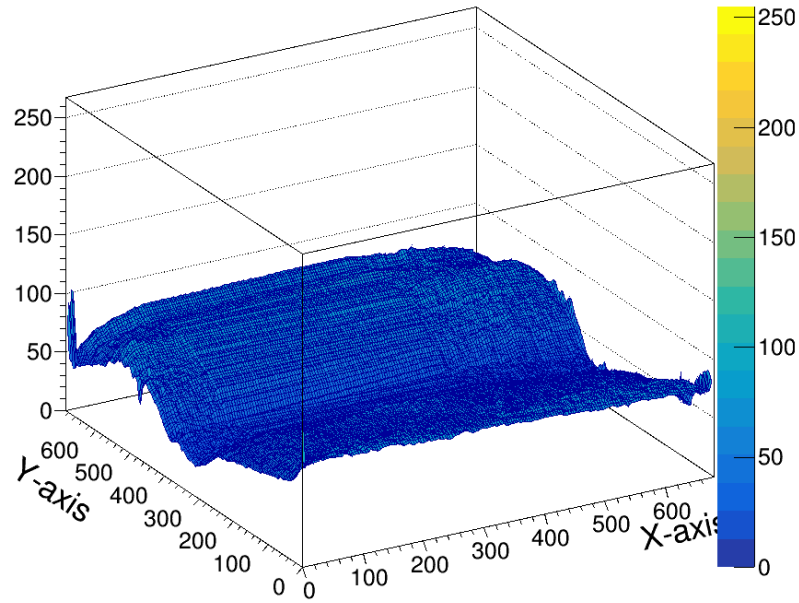


# 1 min 30 sec

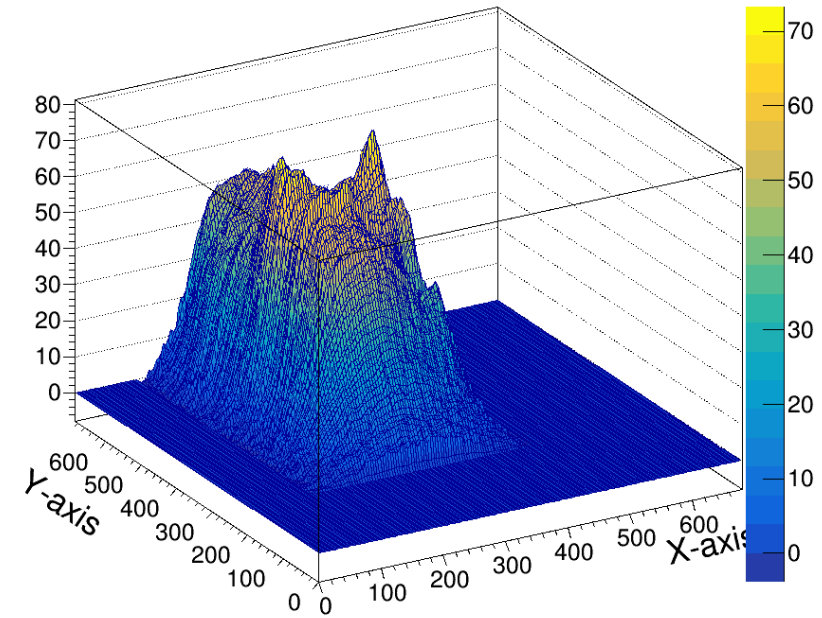
Original



Background



Signal



# Number of points with negative values (all area)

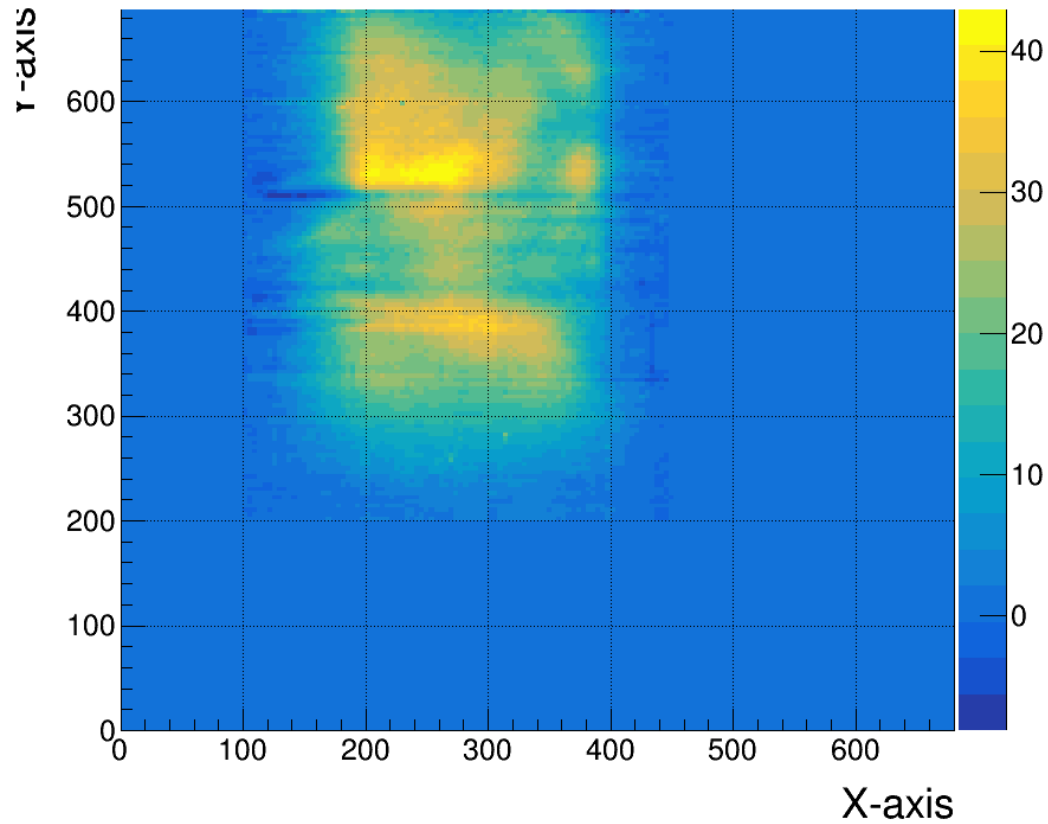
	30 sec			45 sec			1 min			1 min 10 sec			1 min 30 sec		
Intervals	R	G	B	R	G	B	R	G	B	R	G	B	R	G	B
[-5,-1]	8617	9868	36184	6412	7184	35590	6419	9652	40134	4311	5151	26750	3320	3968	24105
[-6,-10]	351	435	2064	100	127	1824	106	139	724	11	7	659	34	54	609
[-11,-20]	176	194	598	4	4	58	26	30	123	0	0	47	2	2	81
[-21,-30]	41	57	89	0	0	0	4	6	24	0	0	1	0	0	2
[-31,-40]	6	7	16	0	0	0	5	5	6	0	0	0	0	0	0
[-41,-50]	2	2	4	0	0	0	0	0	1	0	0	0	0	0	0

# Number of points with negative values (selected area)

	30 sec			45 sec			1 min			1 min 10 sec			1 min 30 sec		
Intervals	R	G	B	R	G	B	R	G	B	R	G	B	R	G	B
[-5,-1]	97	105	10028	0	2	8992	4	12	2960	0	0	2588	0	0	1378
[-6,-10]	88	104	714	0	0	1395	3	2	73	0	0	130	0	0	22
[-11,-20]	96	109	283	0	0	33	1	2	32	0	0	43	0	0	0
[-21,-30]	16	28	62	0	0	0	1	2	8	0	0	1	0	0	0
[-31,-40]	0	0	7	0	0	0	0	0	1	0	0	0	0	0	0
[-41,-50]	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0

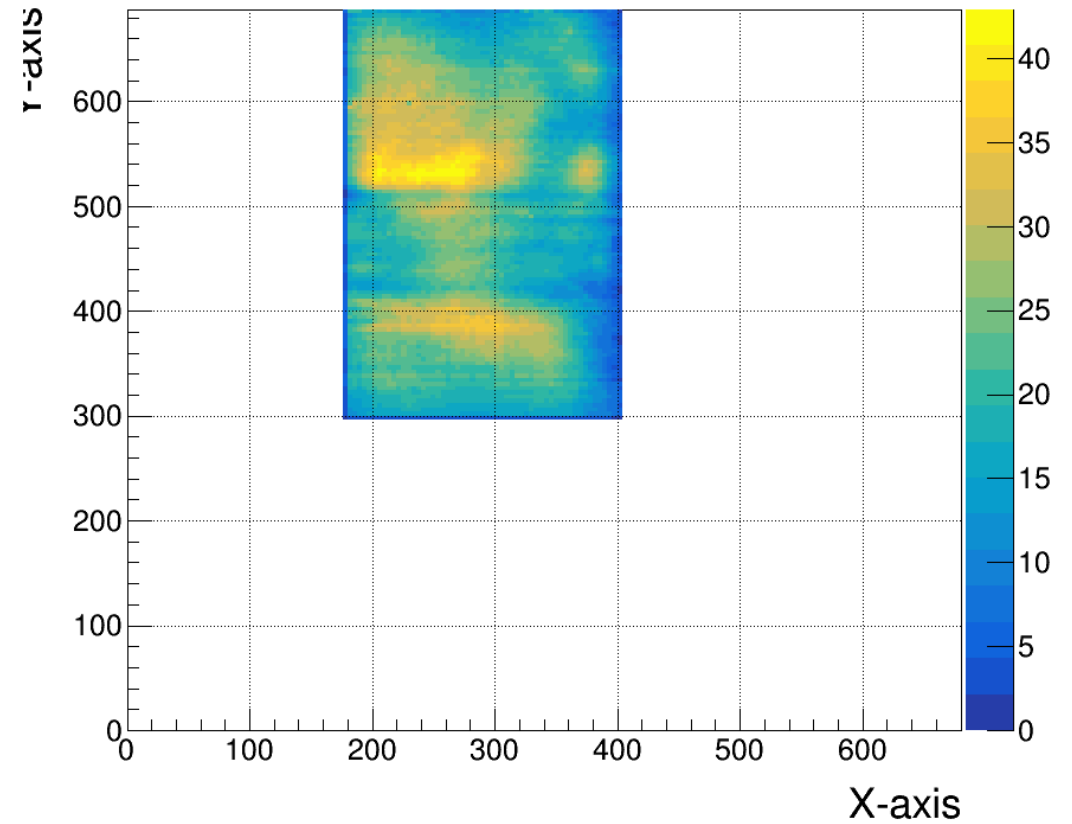
# 30 sec

Signal



Points with negative values: **8.8%** (41585/470580)

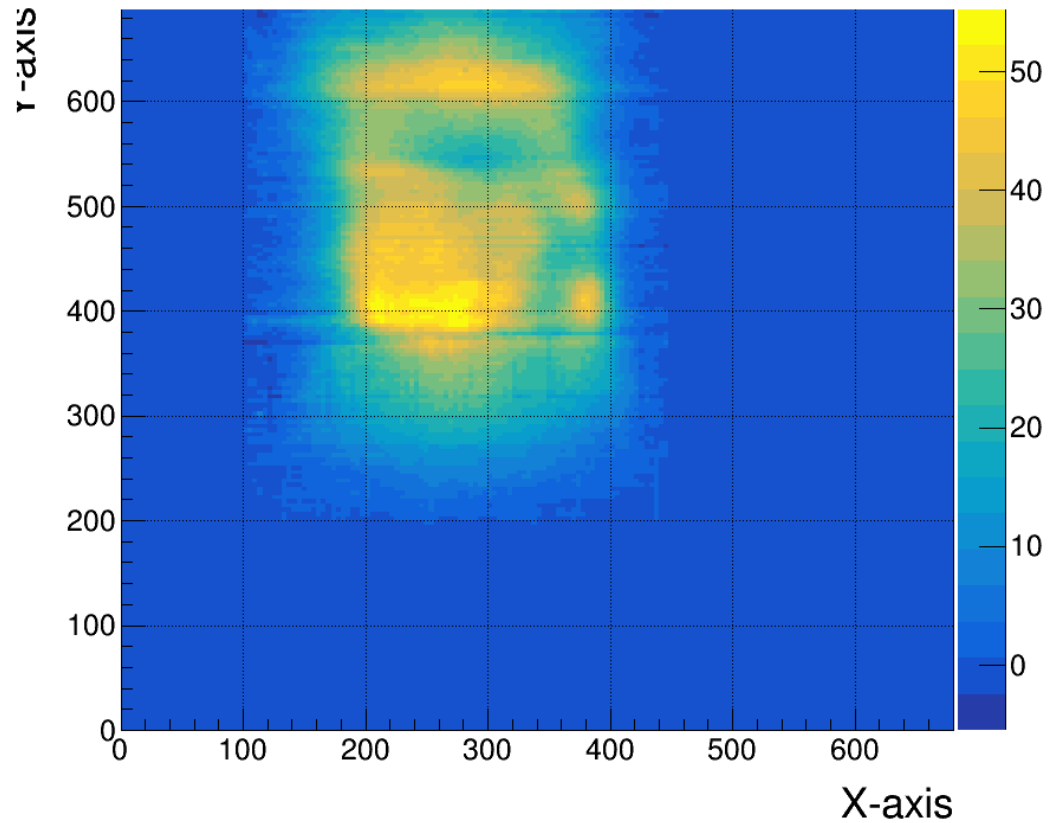
Signal (improved)



Points with negative values: **11.5%** (10030/87360)  
**Negative values changed to 0.**

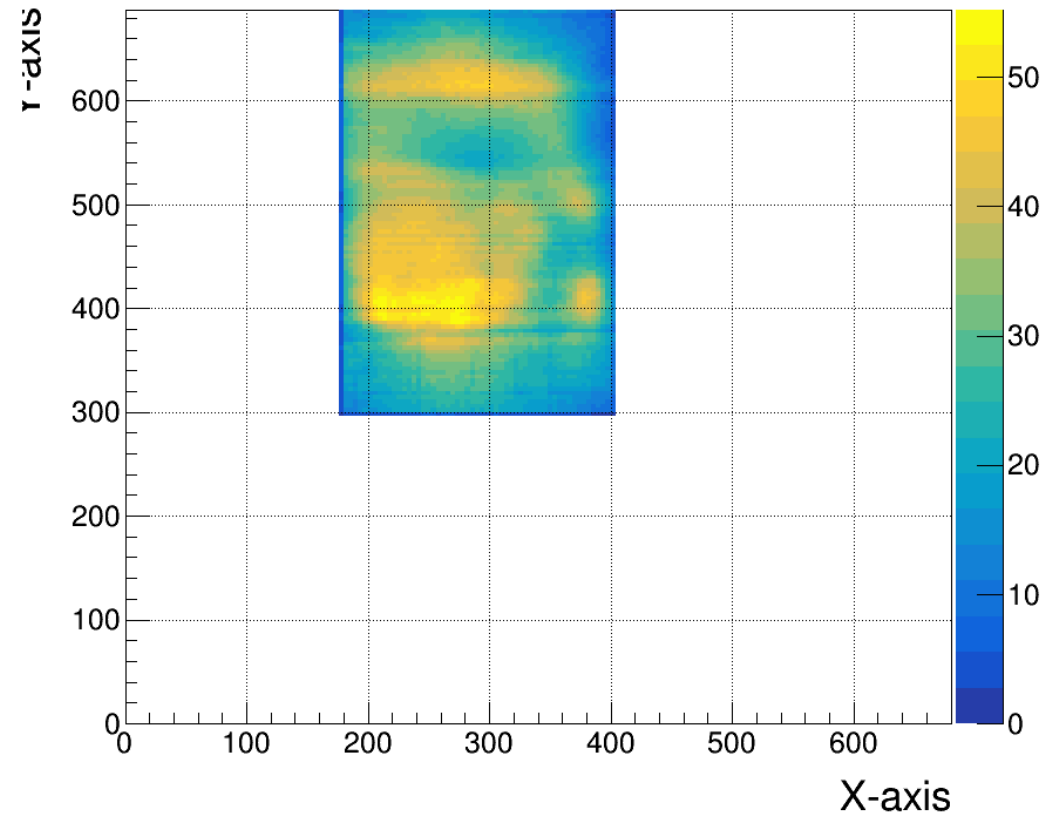
# 45 sec

Signal



Points with negative values: **8.4%** (39690/470580)

Signal (improved)

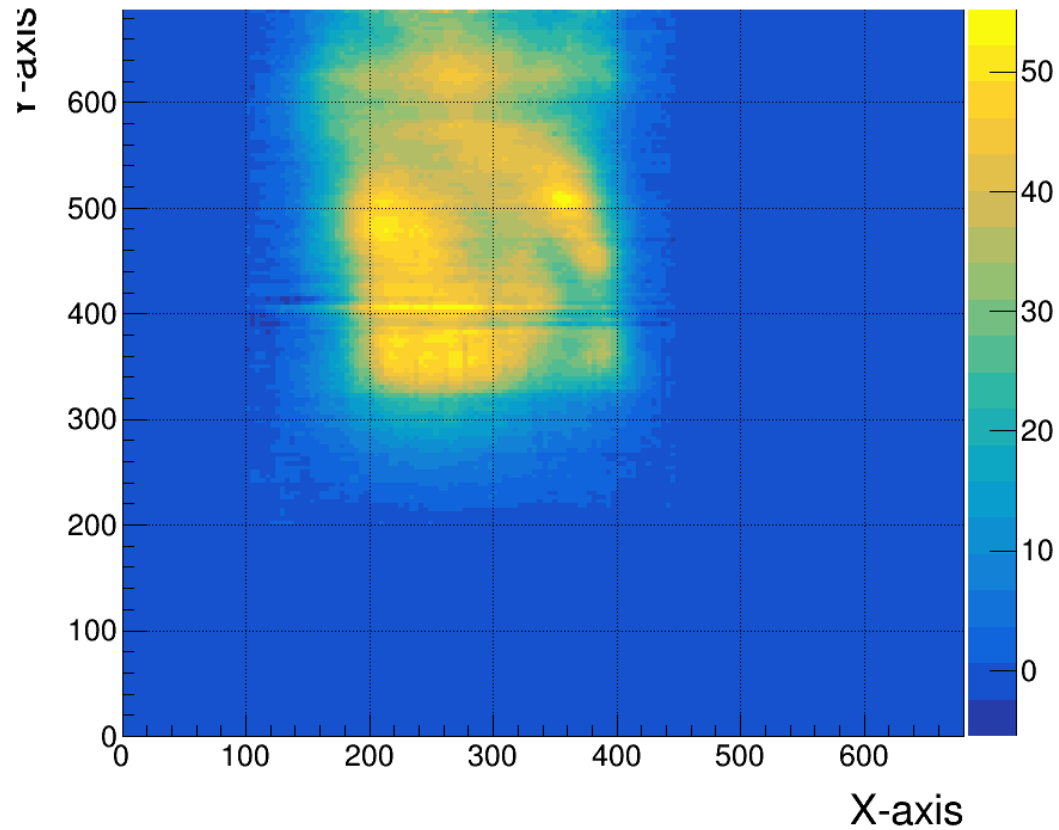


Points with negative values: **10.3%** (8994/87360)

**Negative values changed to 0.**

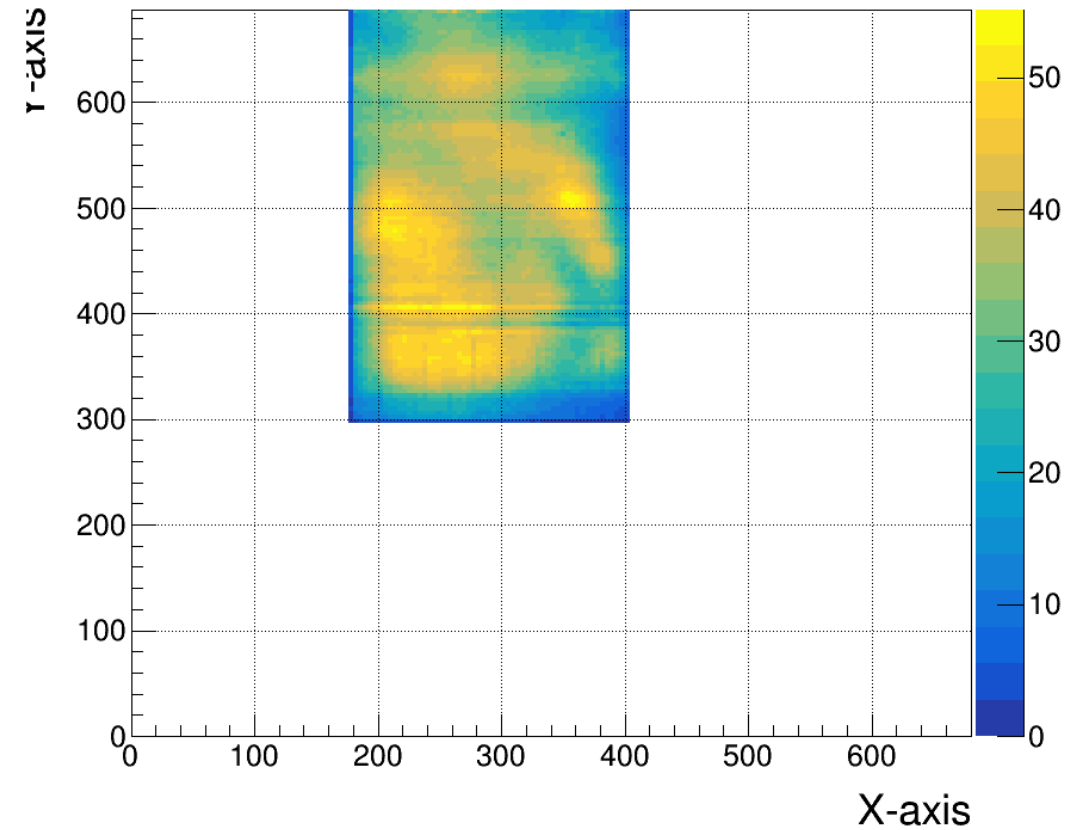
# 1 min

Signal



Points with negative values: **9.1%** (42888/470580)

Signal (improved)

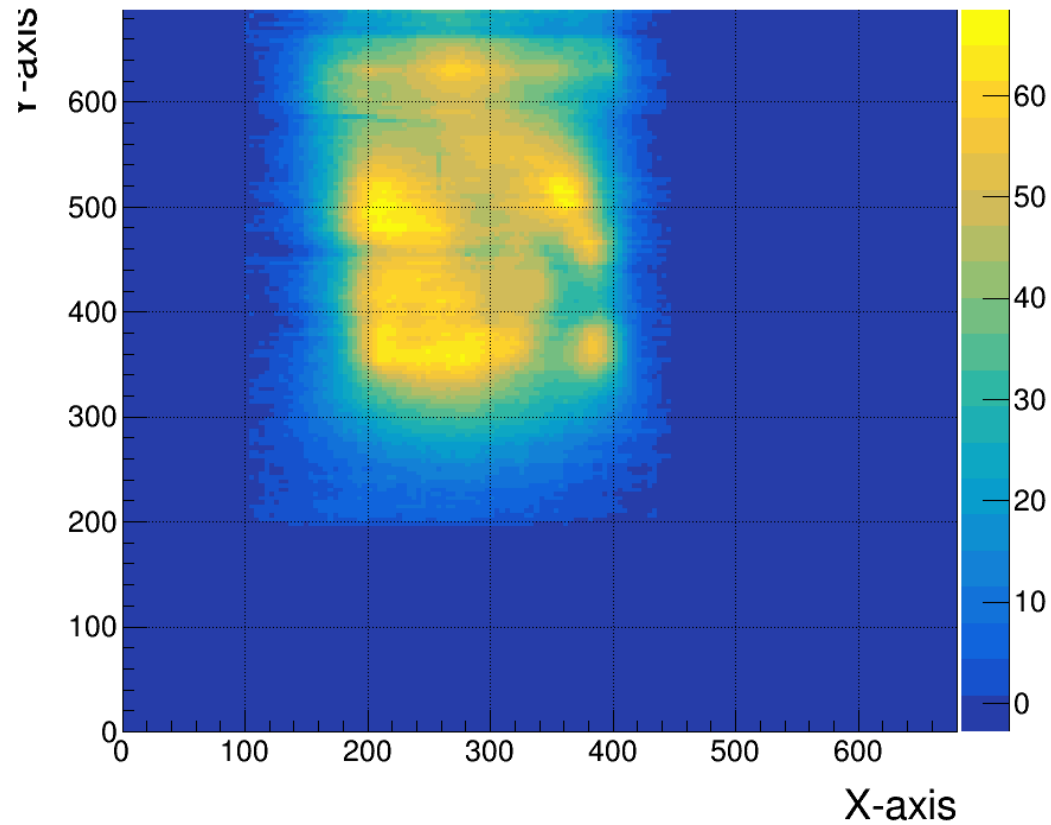


Points with negative values: **3.5%** (3075/87360)

**Negative values changed to 0.**

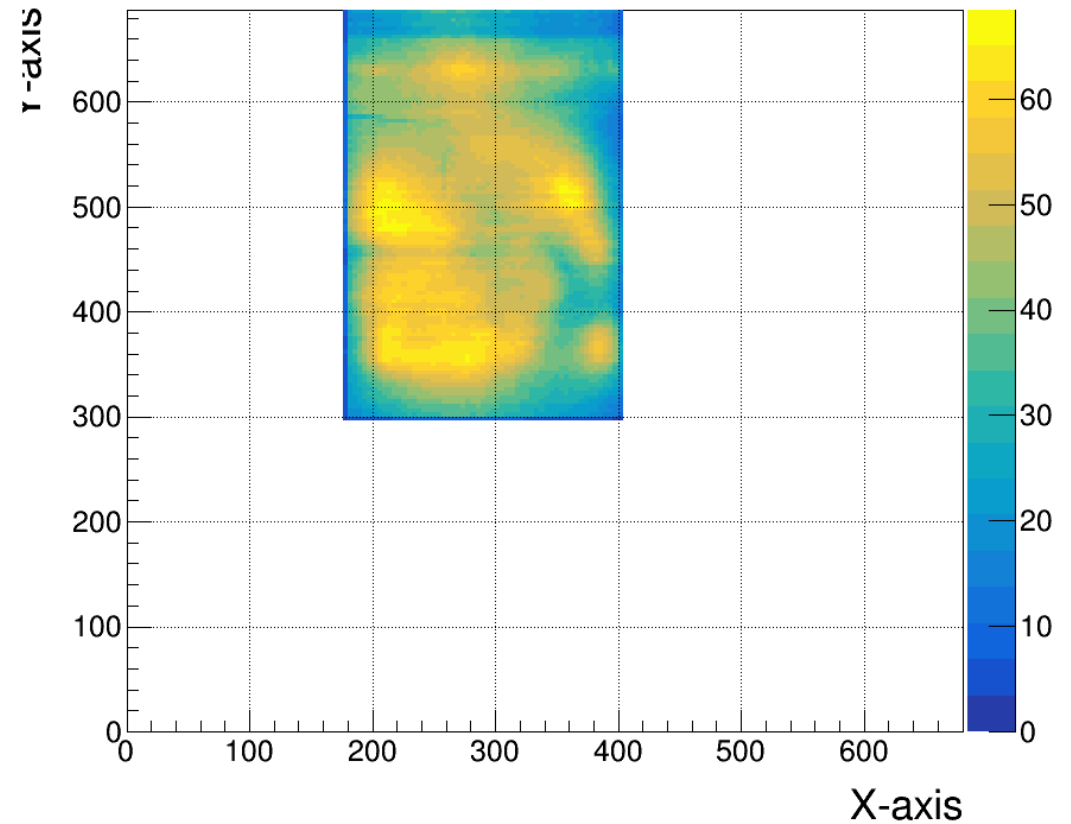
# 1 min 10 sec

Signal



Points with negative values: **6.1%** (28919/470580)

Signal (improved)



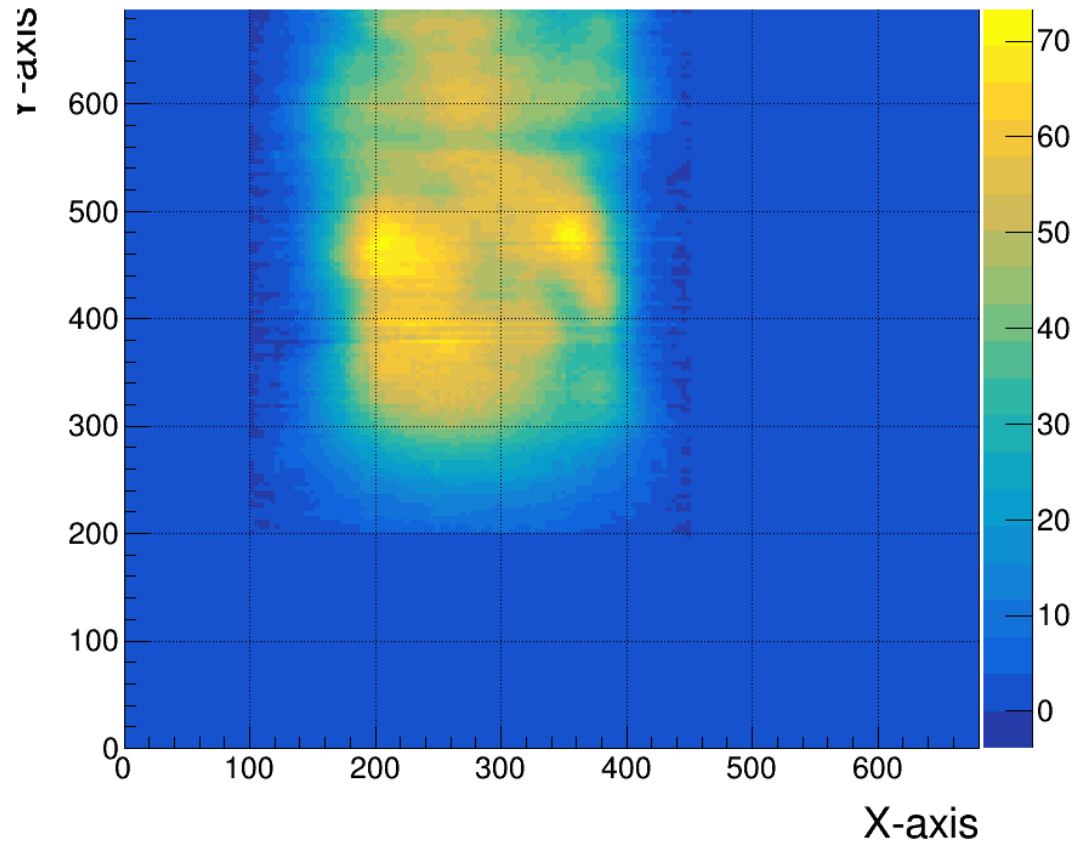
Points with negative values: **3.2%** (2762/87360)

**Negative values changed to 0.**



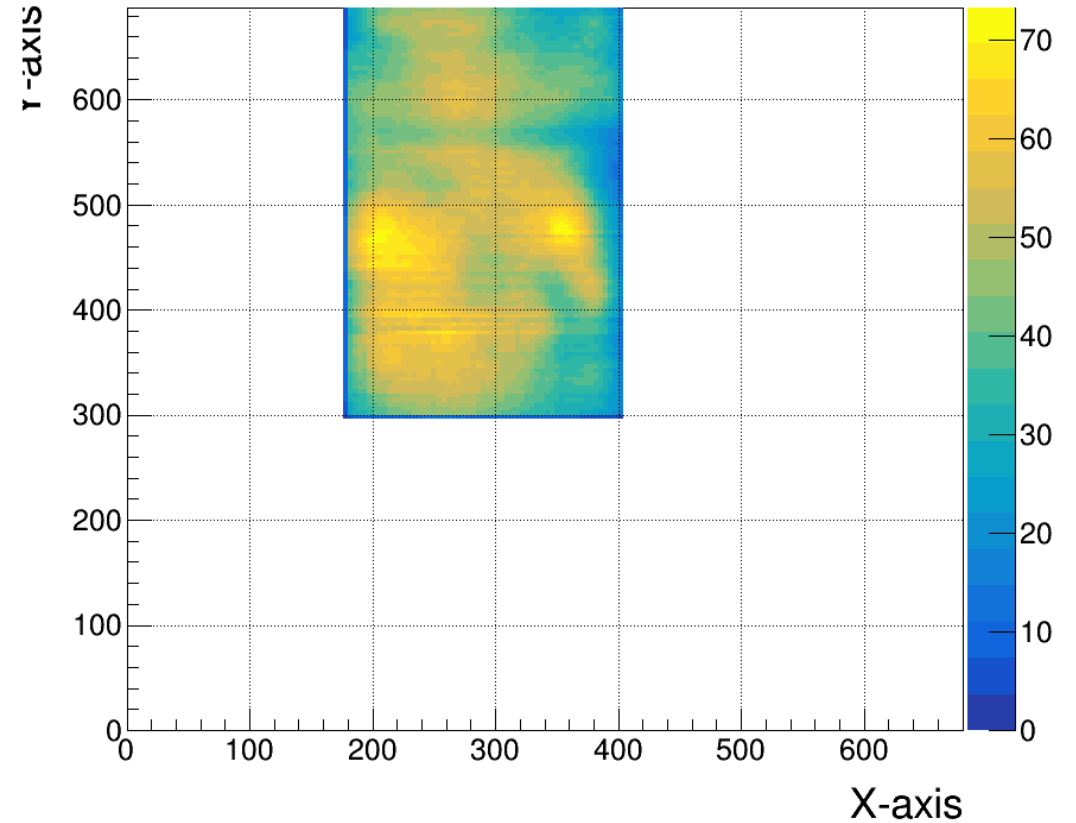
# 1 min 30 sec

Signal



Points with negative values: **5.5%** (25832/470580)

Signal (improved)

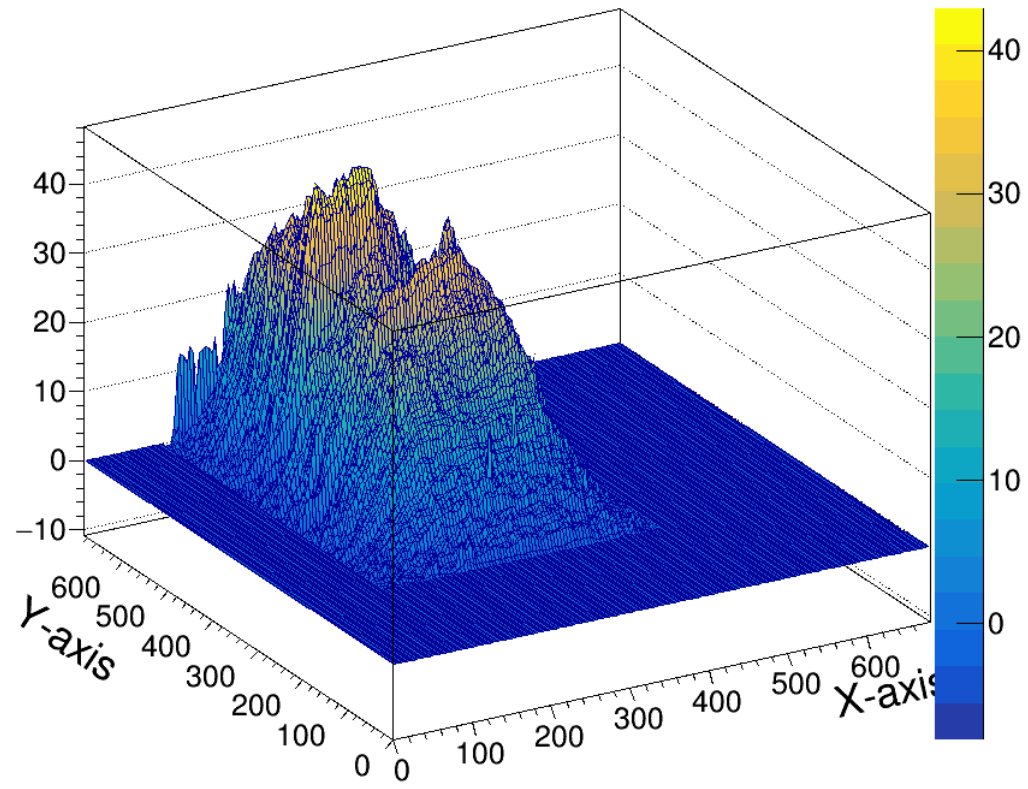


Points with negative values: **1.6%** (1400/87360)

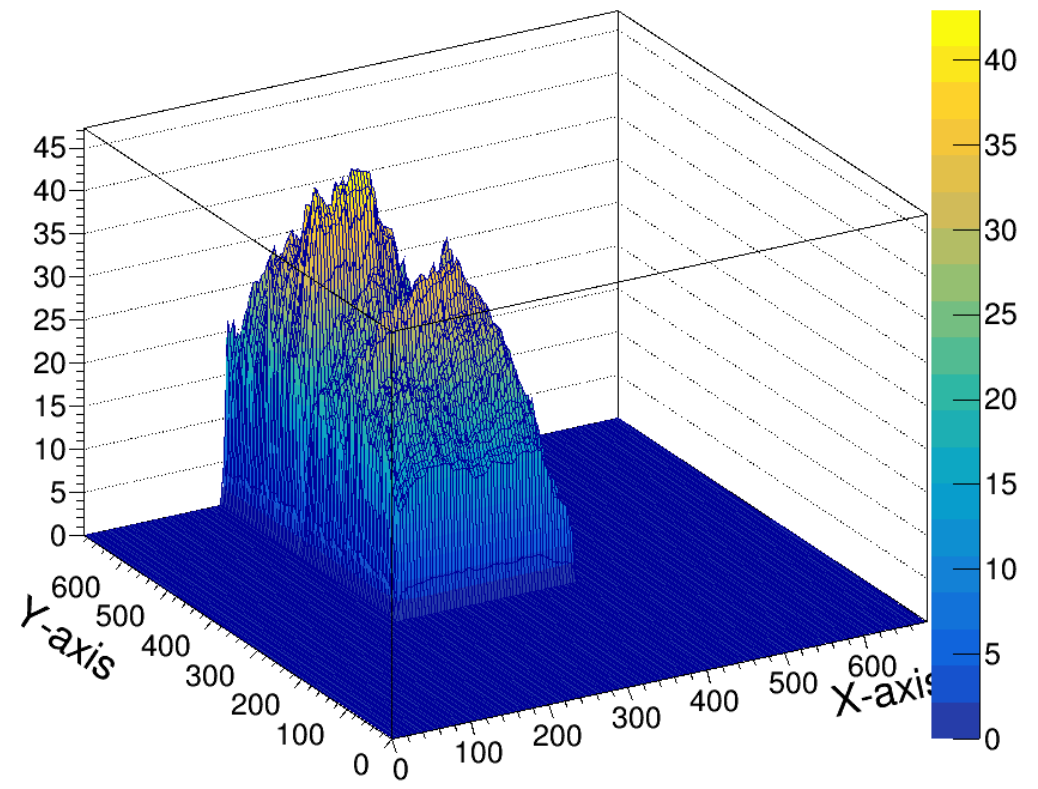
**Negative values changed to 0.**

# 30 sec

Signal

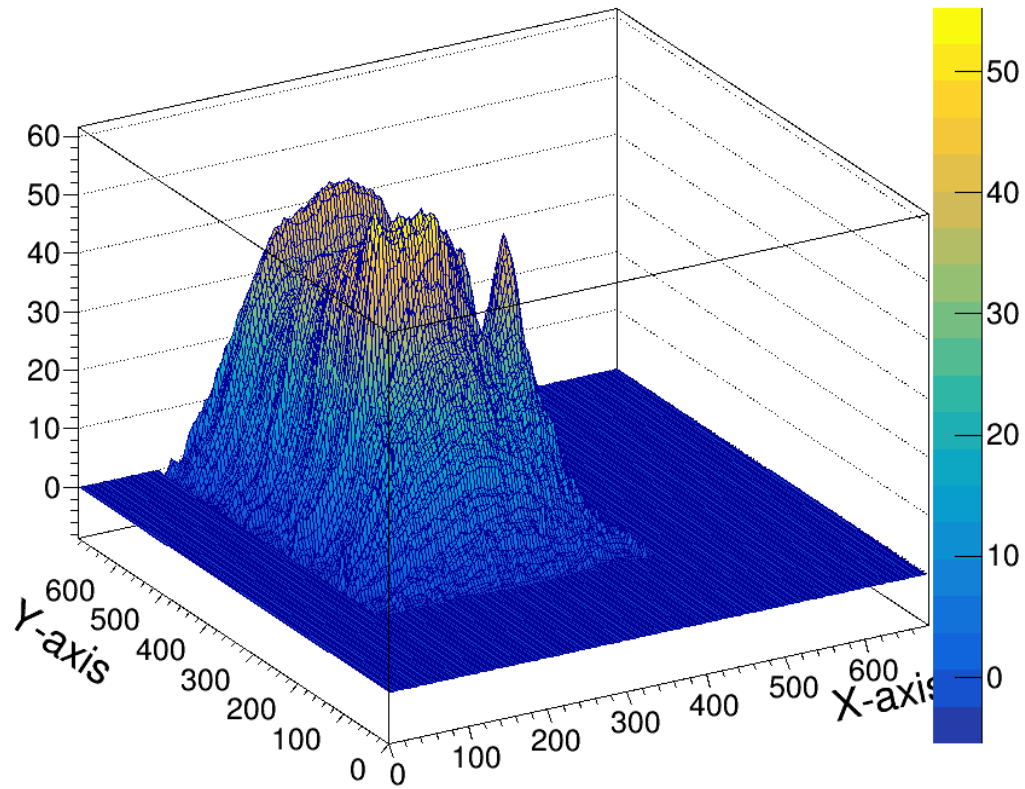


Signal (improved)

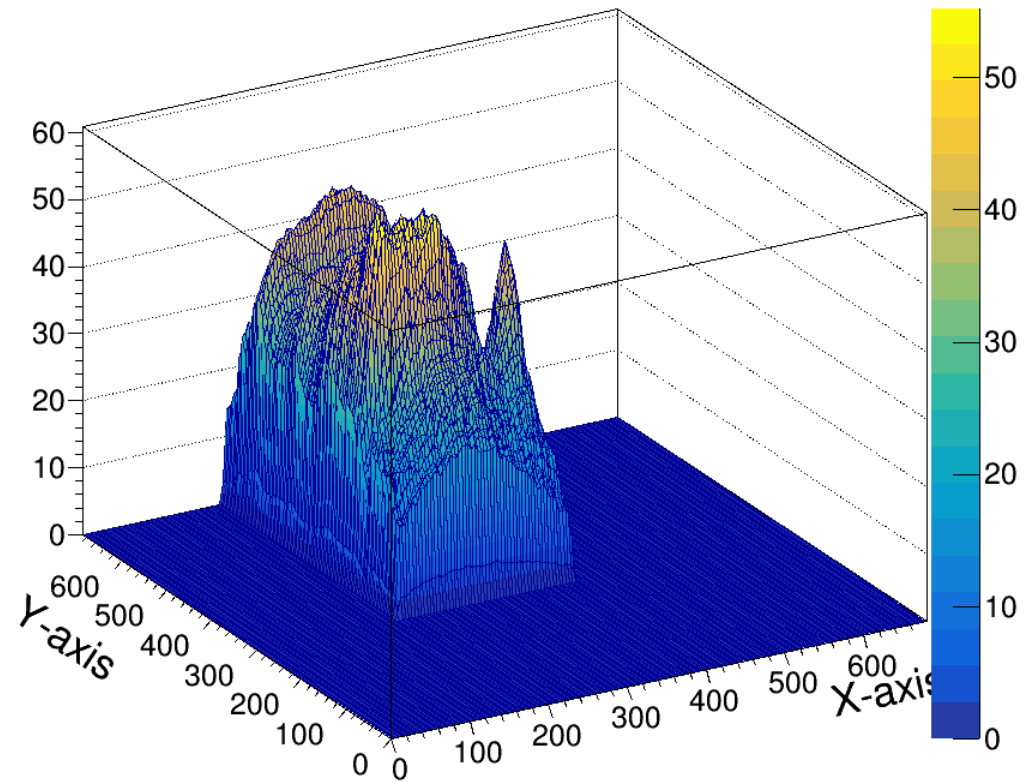


# 45 sec

Signal

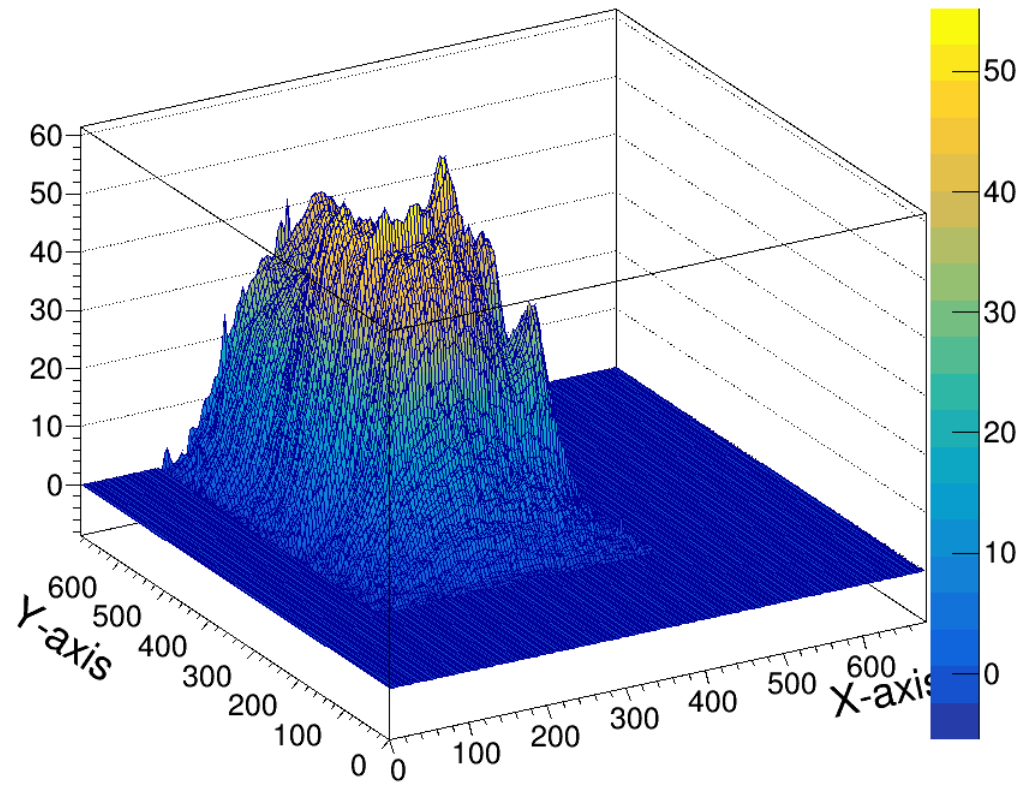


Signal (improved)

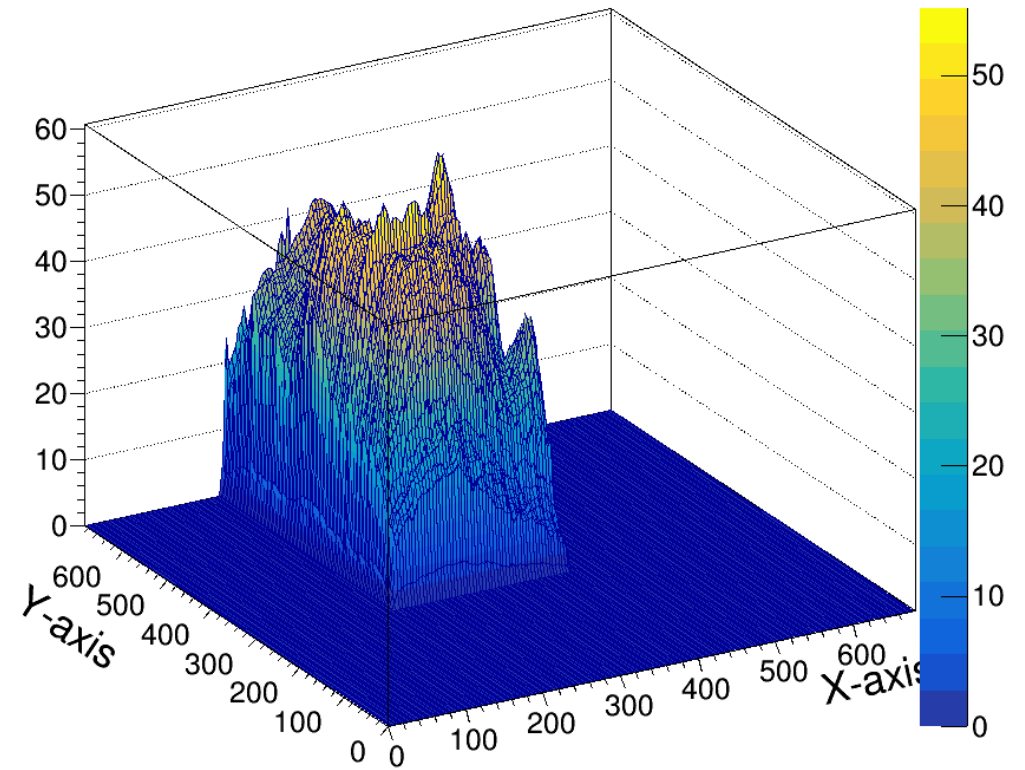


# 1 min

Signal

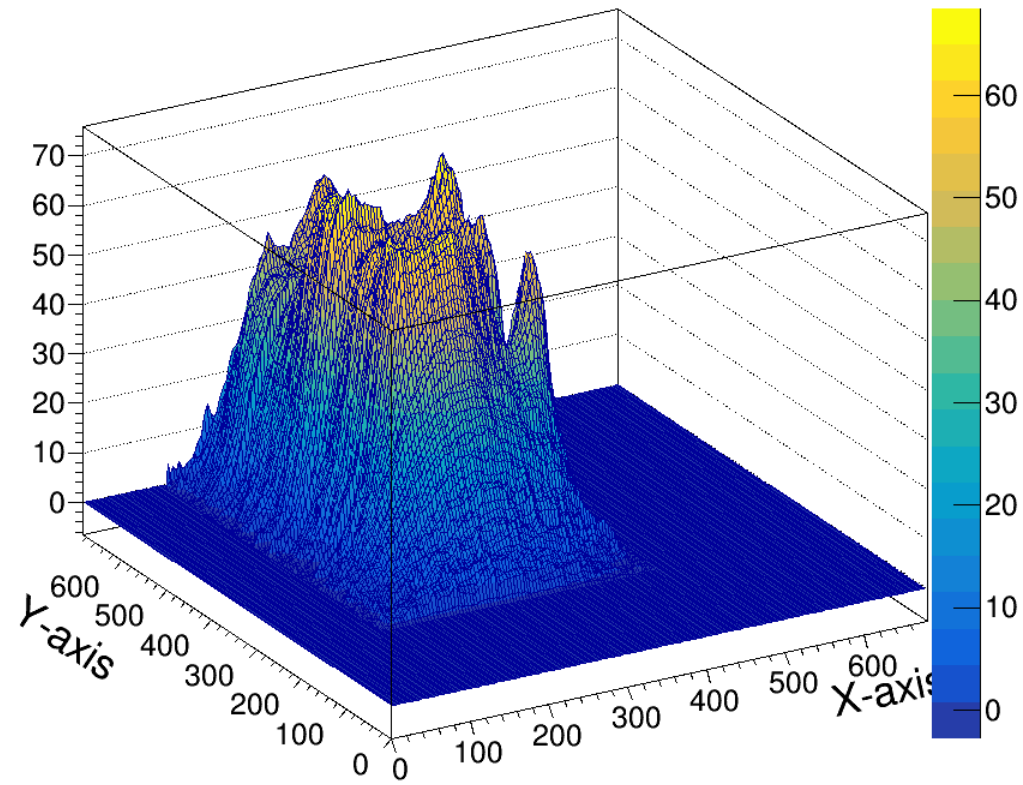


Signal (improved)

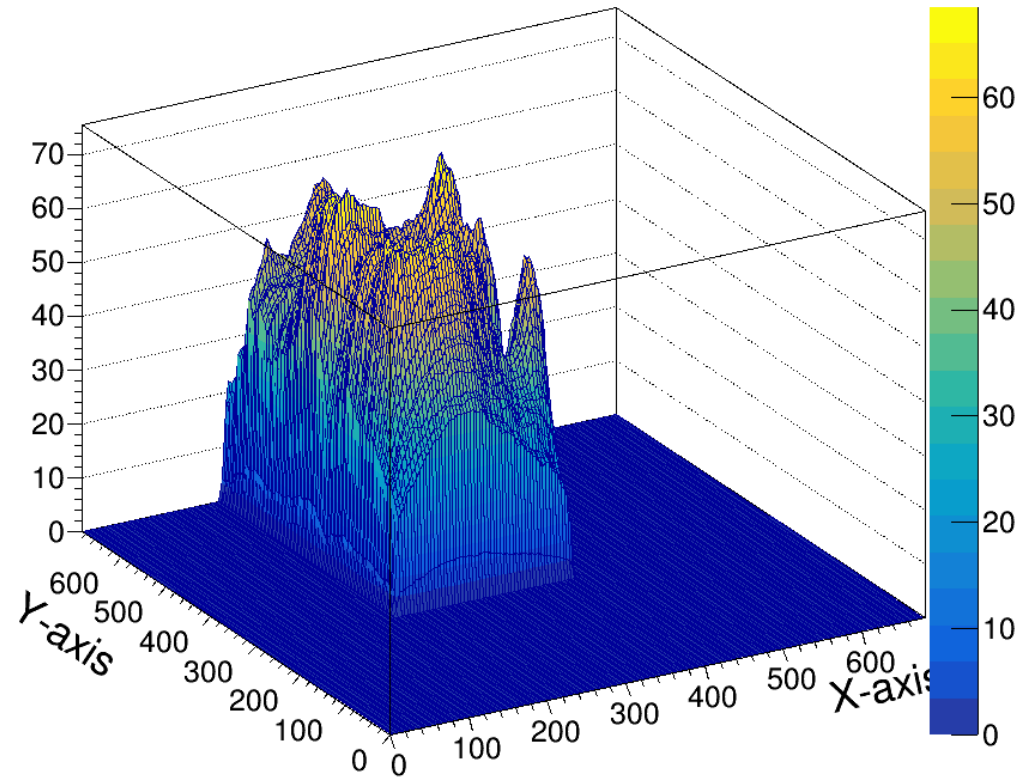


# 1 min 10 sec

Signal

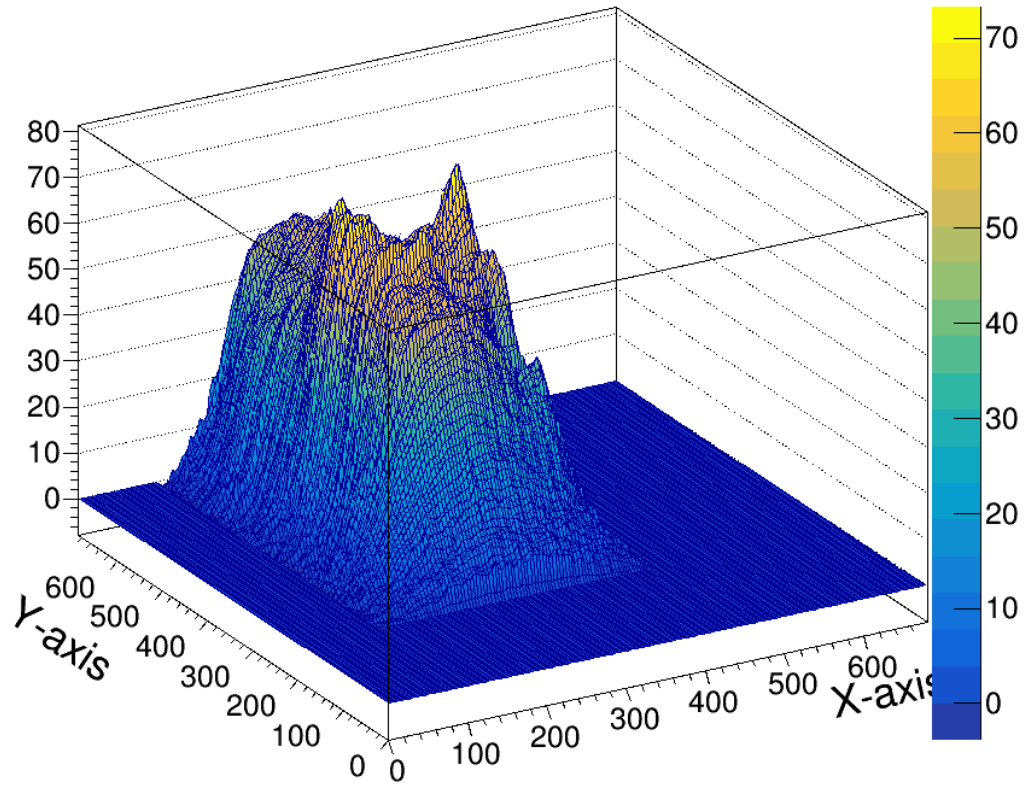


Signal (improved)

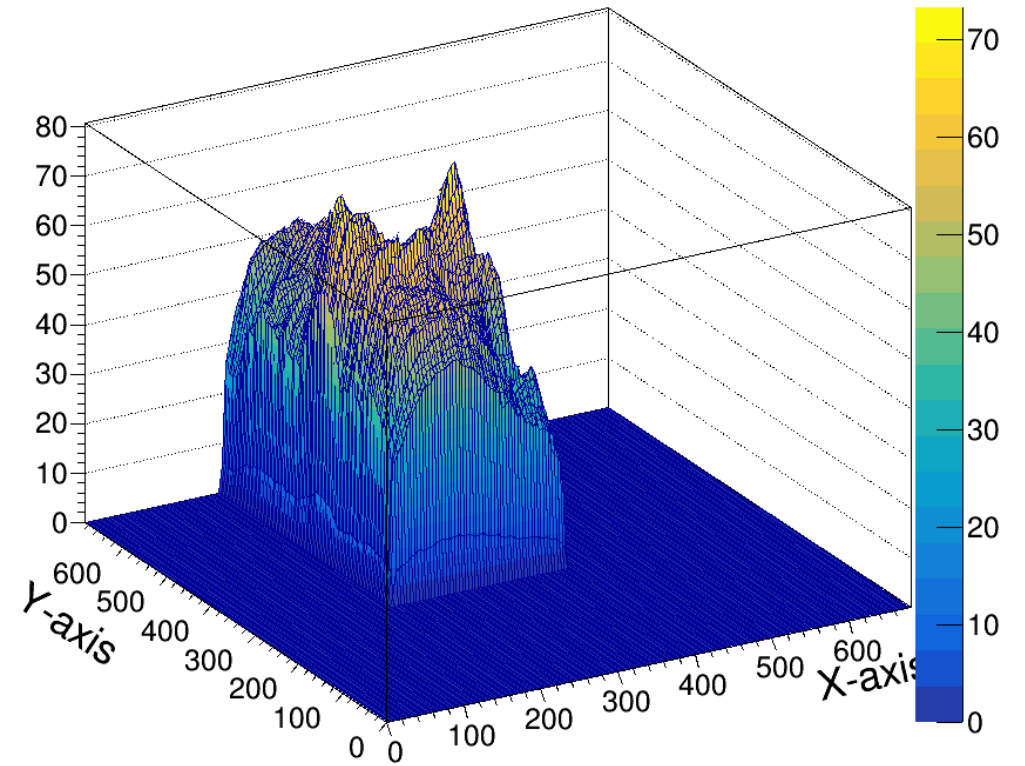


# 1 min 30 sec

Signal



Signal (improved)



# Summary

- Background removal algorithm gave us reasonable results.
- The most of negative values appeared in range of [-5,-1] and also in blue color range.

## Next step

- Calibration
- Create intensity plots

Thank you!