TT telescope data checking

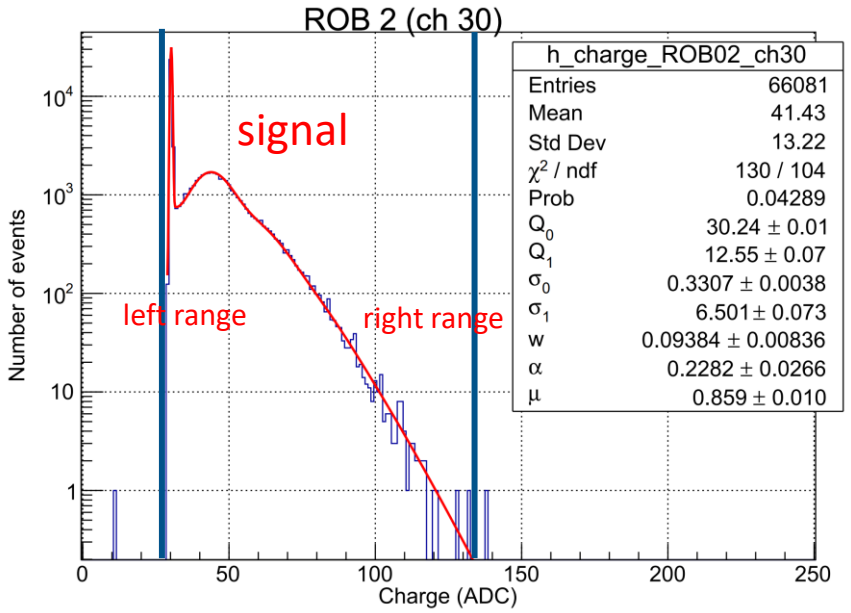
Motivation

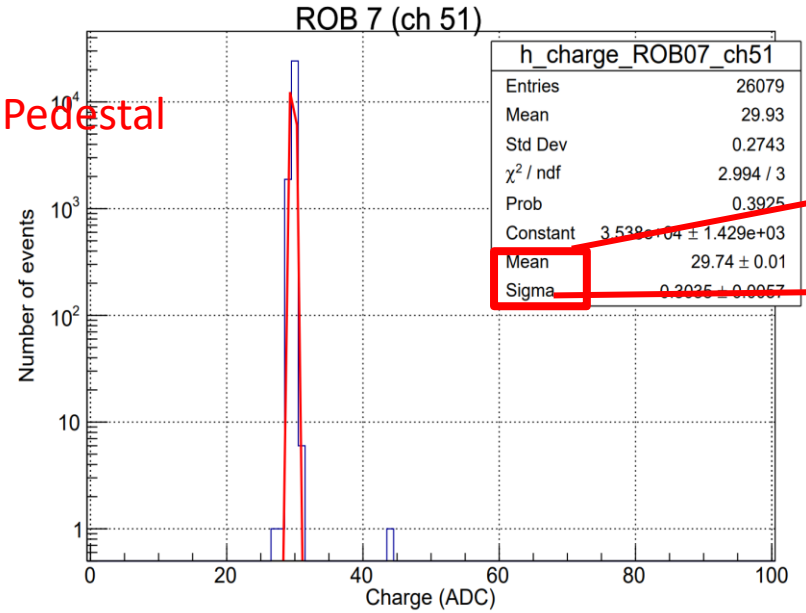
- ❖Check the pre-amp factor.
- ❖Develop an automatic calibration algorithm program for future installation.

Data:

- ped_cCB-19_2023-11-10_10:49.data.bz2
- led_cCB-1_2023-11-10_10:50.data.bz2

Fit process





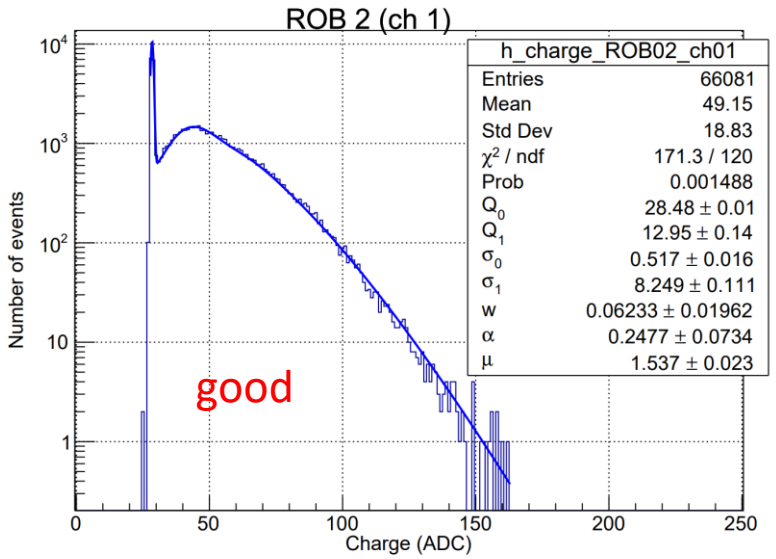
❖ Initial fitted parameters:
- N_0 : fixed by events number
- Q_0 : pedestal fit [mean value]
- Q_1 : 12
- σ_0 : pedestal fit [sigma value]
- σ_1 : 10
- w : 0.1
- α : 0.2
- μ : 1.0

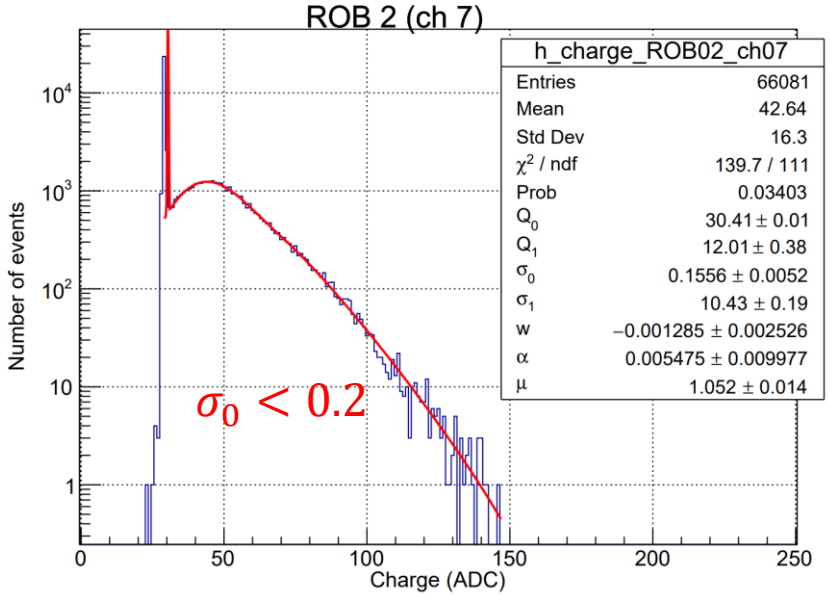
❖ Pedestal fitted by gauss function, signal fitted by Bellamy function

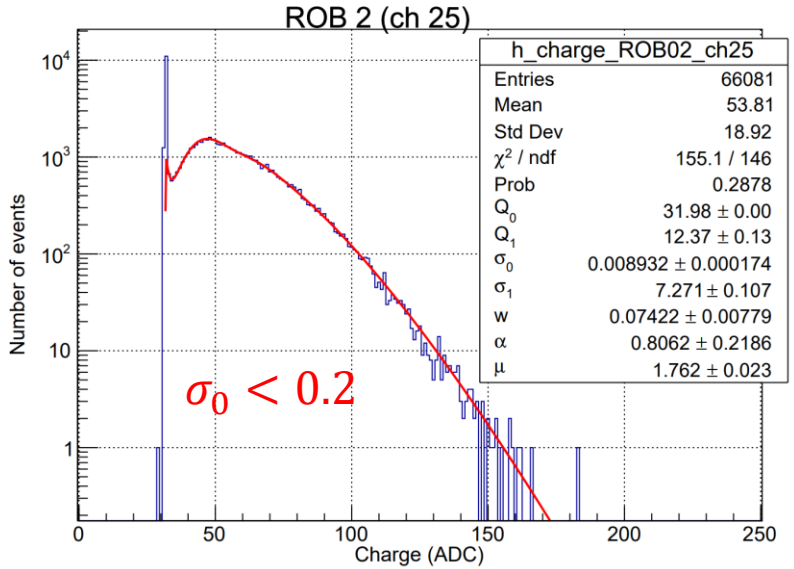
❖ Fit result is sensitive to the fit range!!!!
- left range: mean – 3 × σ_0
- right range: max charge value

❖ Likelihood (red line) and least squares (blue line):
- select minimum of χ^2/NDF as final fit result.
- $\chi^2/NDF < 3$

ROB2 Check



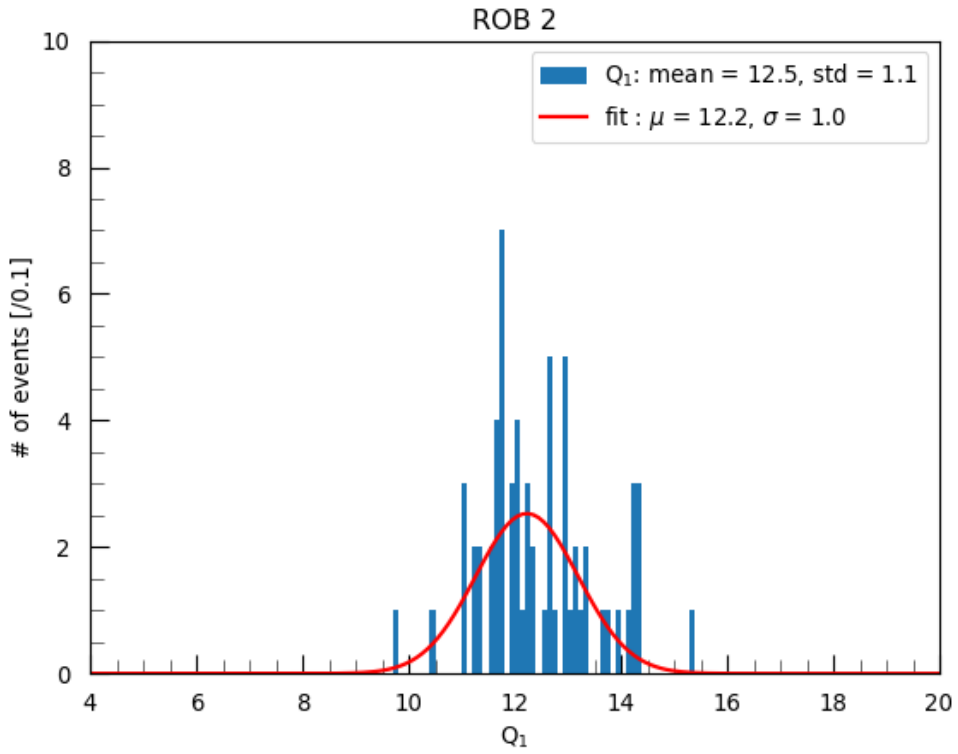


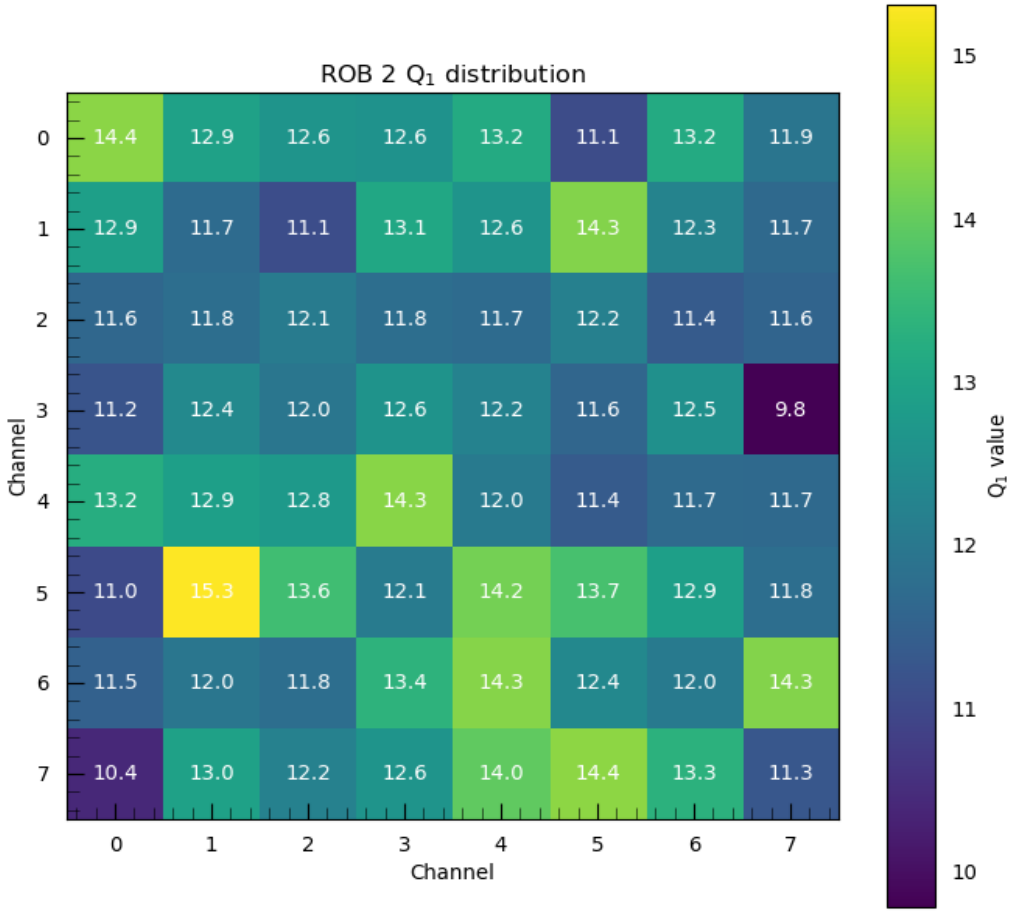


- All channel of ROB 2: $\frac{\chi^2}{NDF} < 3$
- Fit result of pedestal is not good if $\sigma_0 < 0.2$
  - hist->Setparalimit()
  - Calculated $\frac{\chi^2}{NDF}$, separately

=> Luckily, we have the pedestal data, poor pedestal fitting will be ignored if only meet the requirement.

ROB2 Check


ROB 2
Q_1: mean = 12.5, std = 1.1
fit : μ = 12.2, σ = 1.0
# of events [/0.1]
Q_1


ROB 2 Q_1 distribution
Channel
Channel
Q_1 value
14.4 12.9 12.6 12.6 13.2 11.1 13.2 11.9
12.9 11.7 11.1 13.1 12.6 14.3 12.3 11.7
11.6 11.8 12.1 11.8 11.7 12.2 11.4 11.6
11.2 12.4 12.0 12.6 12.2 11.6 12.5 9.8
13.2 12.9 12.8 14.3 12.0 11.4 11.7 11.7
11.0 15.3 13.6 12.1 14.2 13.7 12.9 11.8
11.5 12.0 11.8 13.4 14.3 12.4 12.0 14.3
10.4 13.0 12.2 12.6 14.0 14.4 13.3 11.3

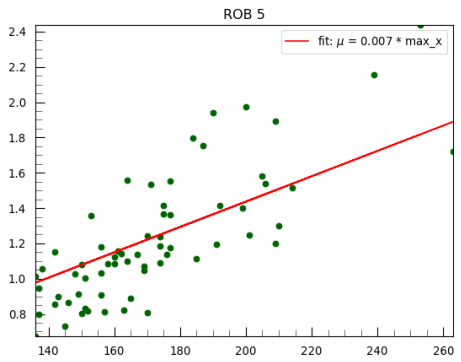
All ROBs results

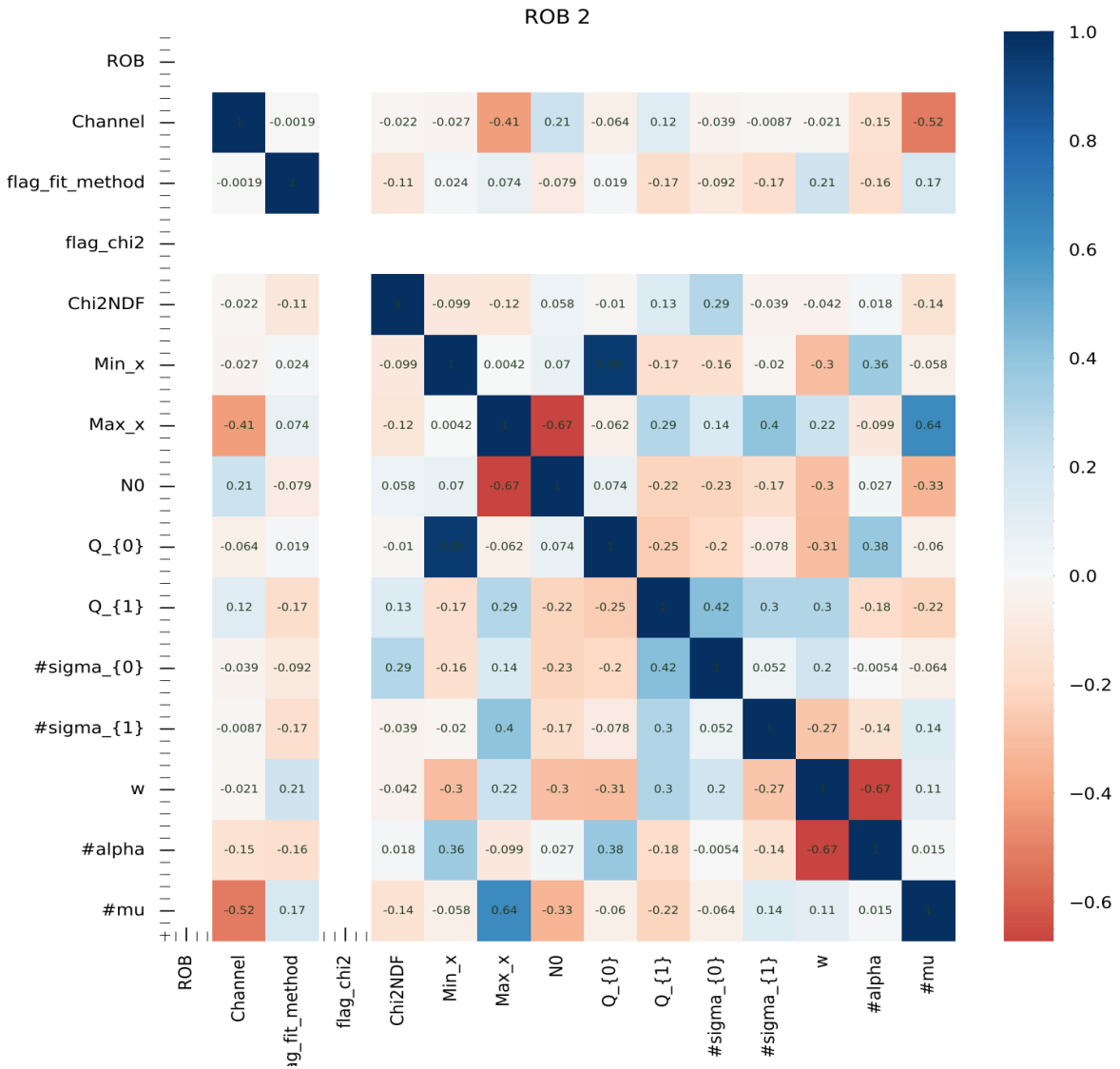
ROB	Channel numbers ($\frac{\chi^2}{NDF} > 3$)
0	1
1	3
2	0
3	8
4	12
5	8
6	2
7	17

Reason 1 :Inappropriate mu value

$\mu = k * max\_x$

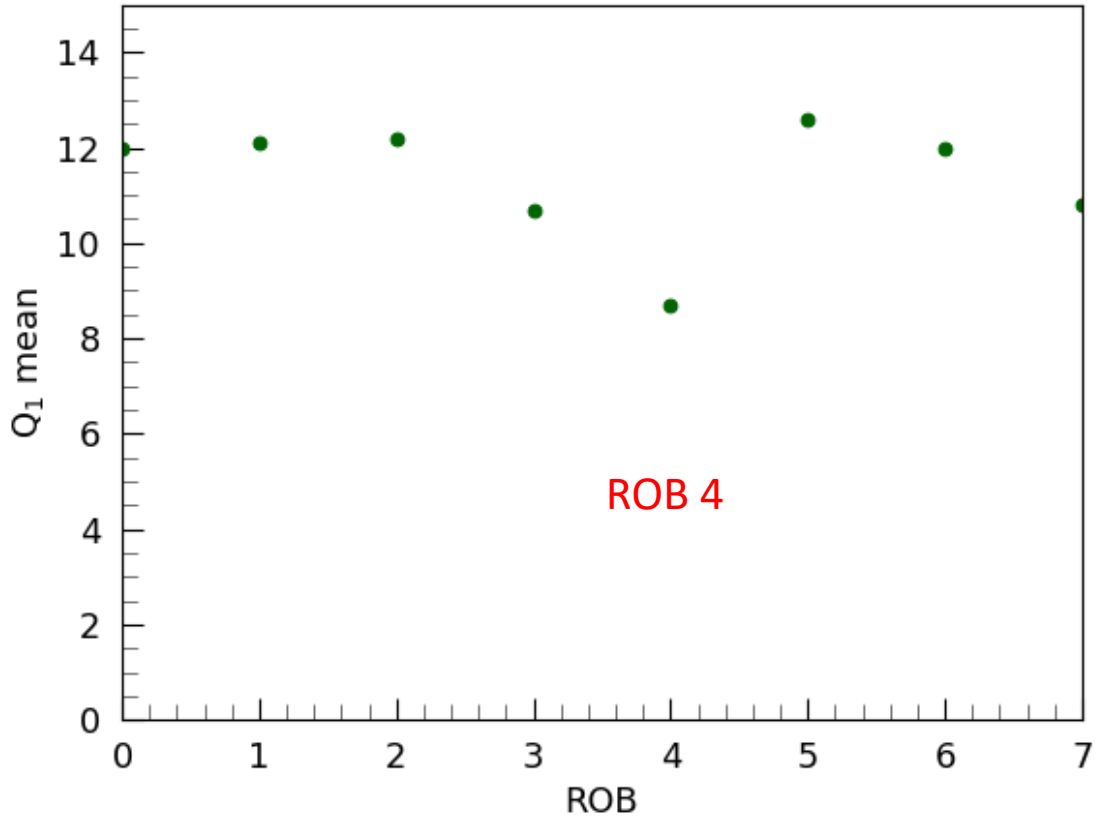
K: mean from ROB 0,1,2,6





All ROBs results

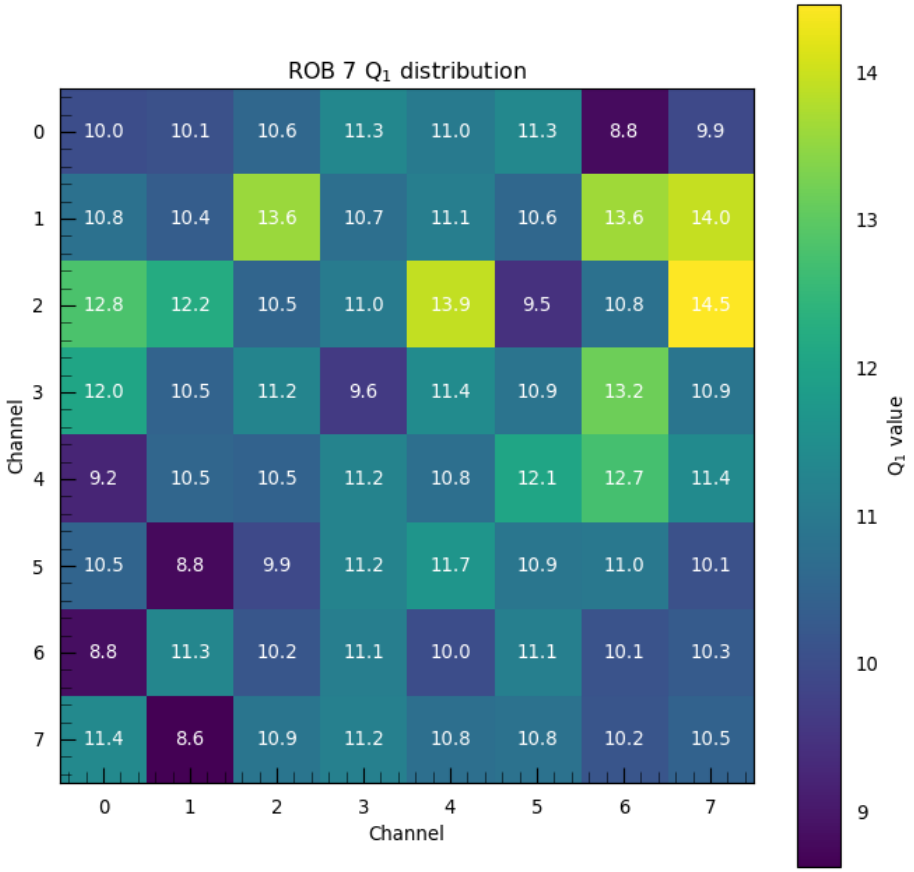
ROB	Channel numbers ($\frac{\chi^2}{NDF} > 3$)
0	0
1	1
2	0
3	2
4	2
5	1
6	2
7	2

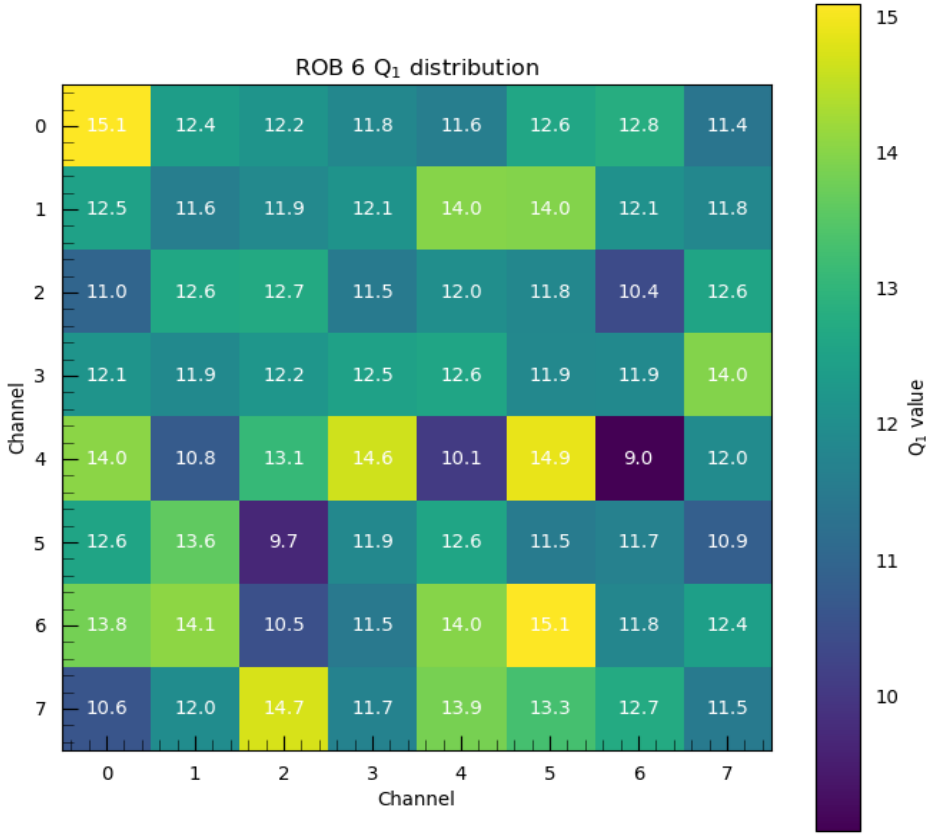


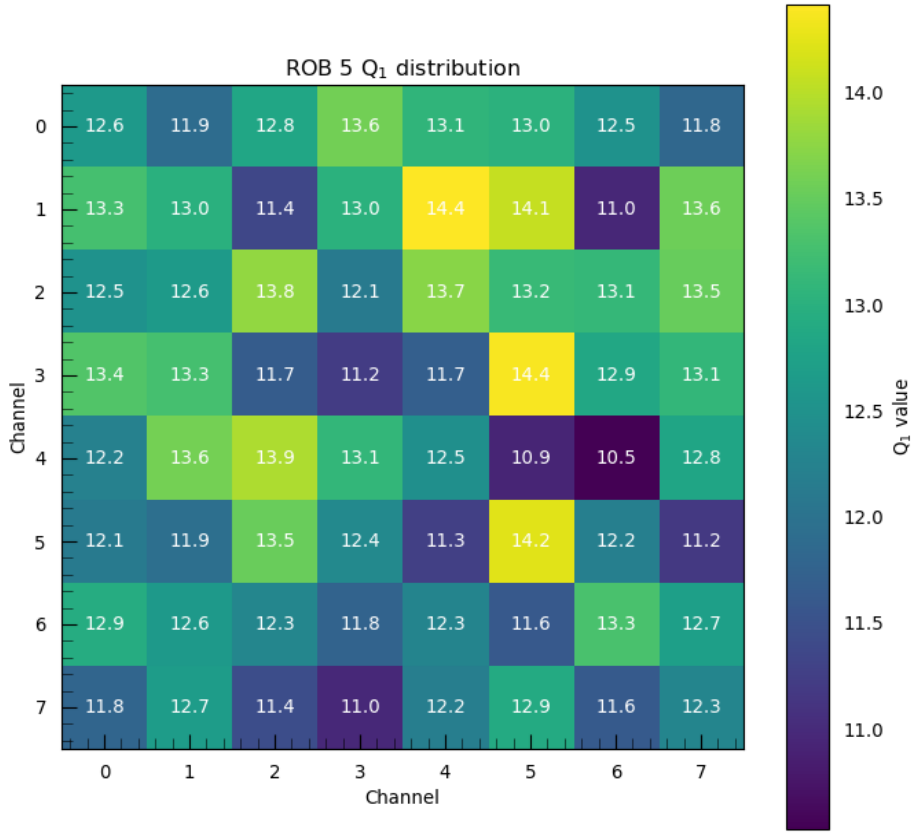
- Better result
  - Fit range and μ is important for fit result
  - Still problem channel need further check

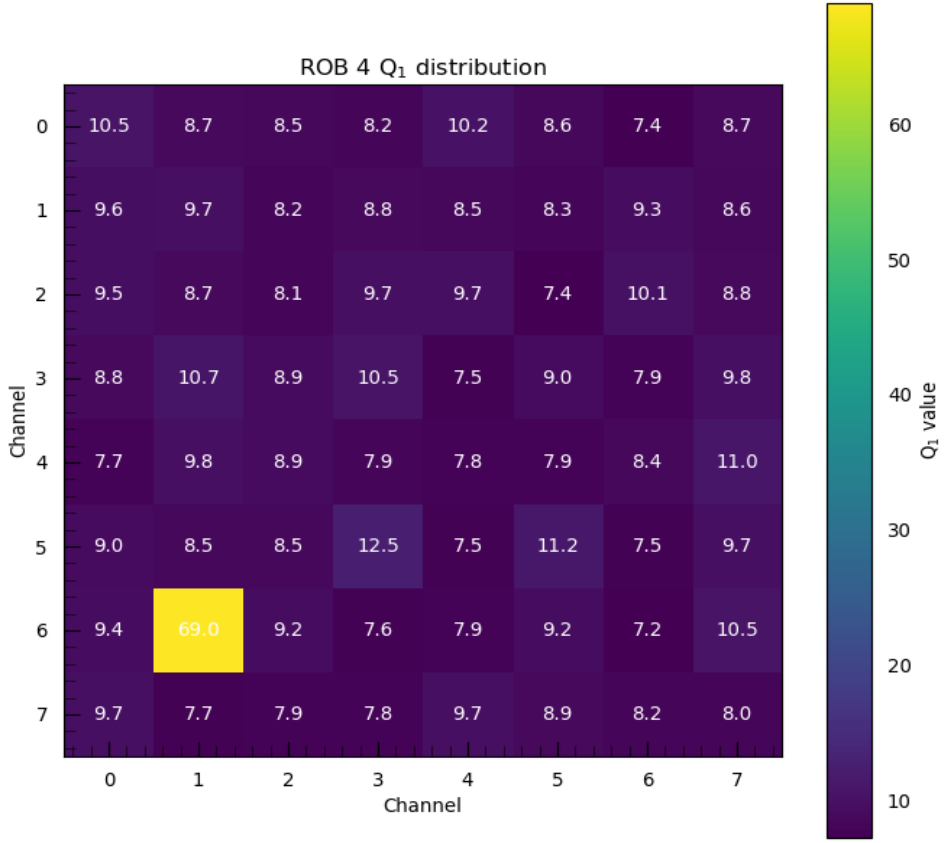
Next plan

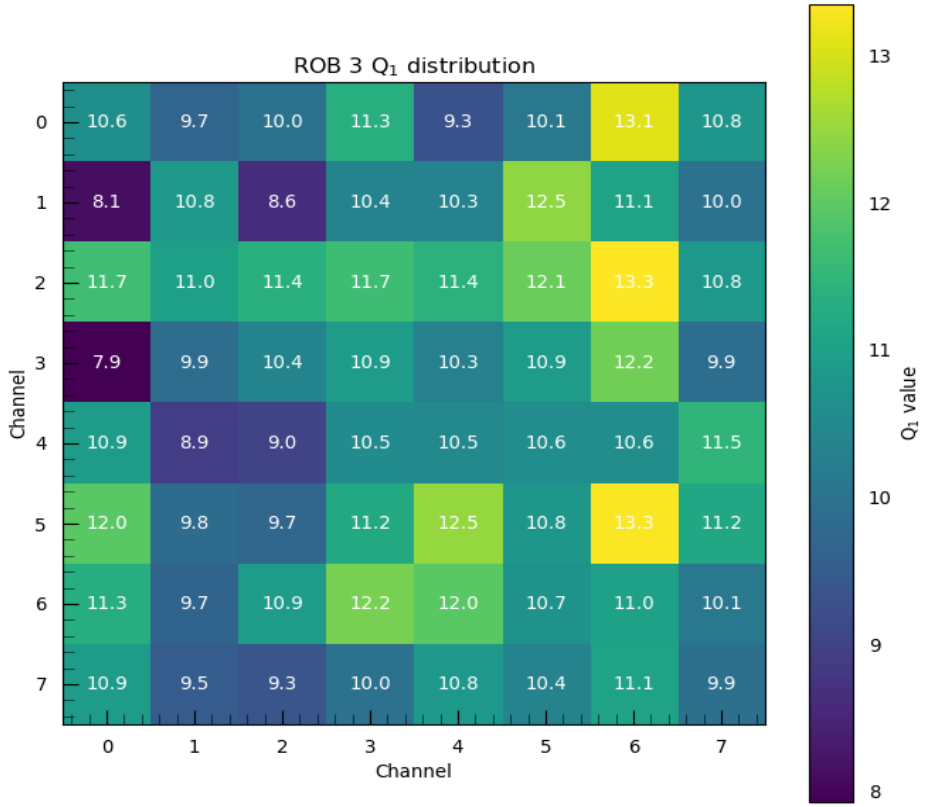
- Further check problem channel, find good way to solve them.
  - TMinuit method
- Put the left range into the for loop for best result.
  - $mean\ -3\times\sigma_0$ 0,1,2,3
- Data taking again, check again.

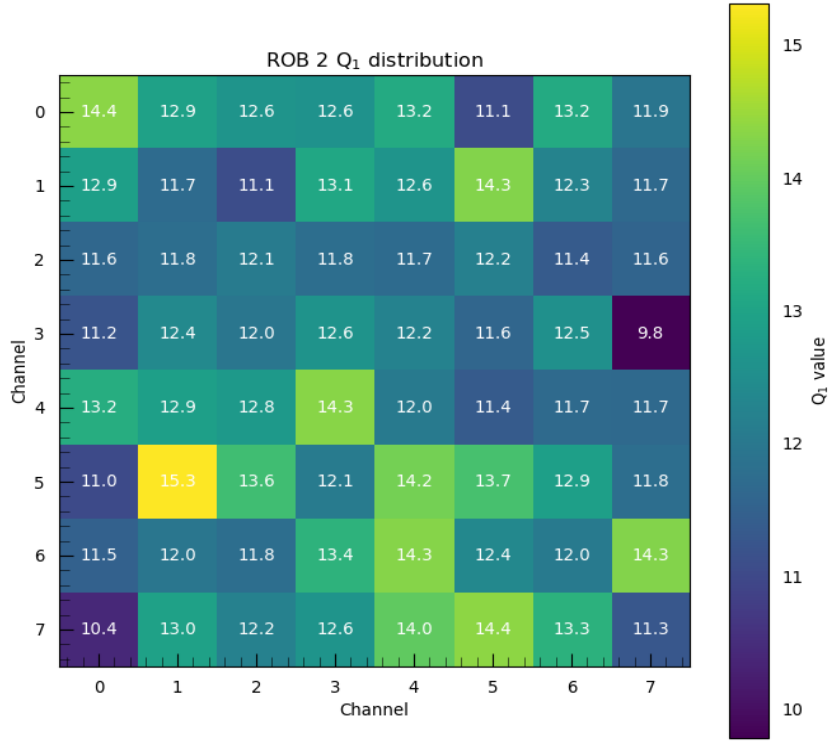

ROB 7 Q_1 distribution
Channel
Channel
Q_1 value
0 10.0 10.1 10.6 11.3 11.0 11.3 8.8 9.9
1 10.8 10.4 13.6 10.7 11.1 10.6 13.6 14.0
2 12.8 12.2 10.5 11.0 13.9 9.5 10.8 14.5
3 12.0 10.5 11.2 9.6 11.4 10.9 13.2 10.9
4 9.2 10.5 10.5 11.2 10.8 12.1 12.7 11.4
5 10.5 8.8 9.9 11.2 11.7 10.9 11.0 10.1
6 8.8 11.3 10.2 11.1 10.0 11.1 10.1 10.3
7 11.4 8.6 10.9 11.2 10.8 10.8 10.2 10.5
0 1 2 3 4 5 6 7
9 10 11 12 13 14

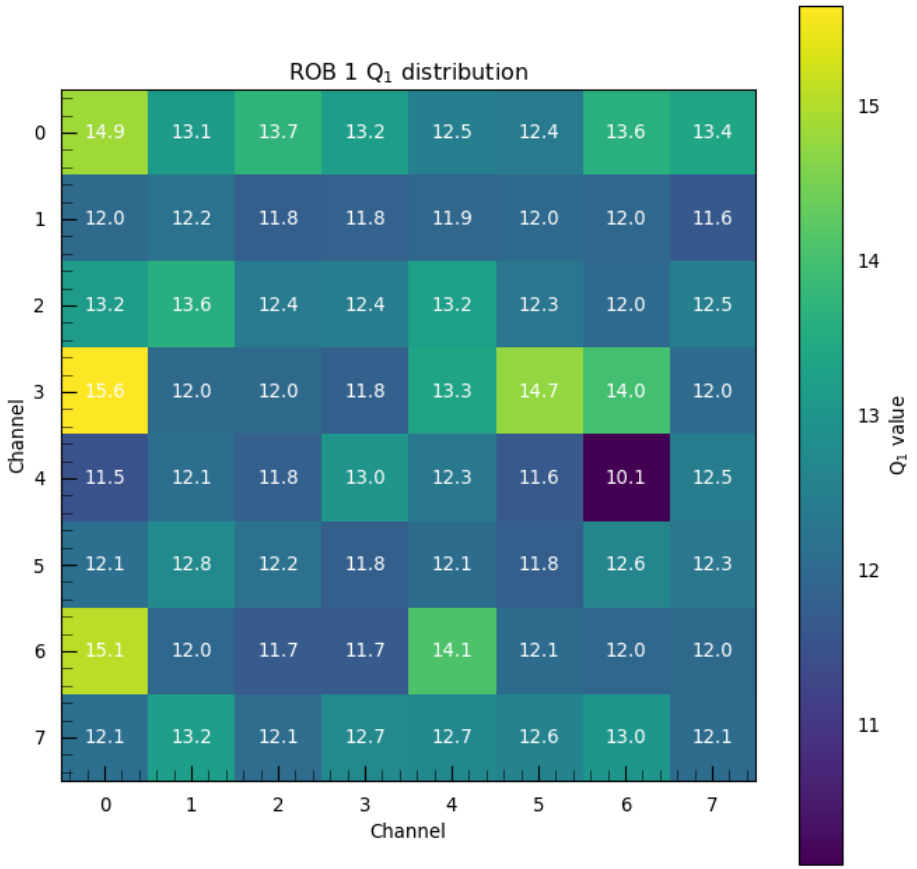

ROB 6 Q_1 distribution
Channel
Channel
Q_1 value
0 15.1 12.4 12.2 11.8 11.6 12.6 12.8 11.4
1 12.5 11.6 11.9 12.1 14.0 14.0 12.1 11.8
2 11.0 12.6 12.7 11.5 12.0 11.8 10.4 12.6
3 12.1 11.9 12.2 12.5 12.6 11.9 11.9 14.0
4 14.0 10.8 13.1 14.6 10.1 14.9 9.0 12.0
5 12.6 13.6 9.7 11.9 12.6 11.5 11.7 10.9
6 13.8 14.1 10.5 11.5 14.0 15.1 11.8 12.4
7 10.6 12.0 14.7 11.7 13.9 13.3 12.7 11.5
0 1 2 3 4 5 6 7
10 11 12 13 14 15

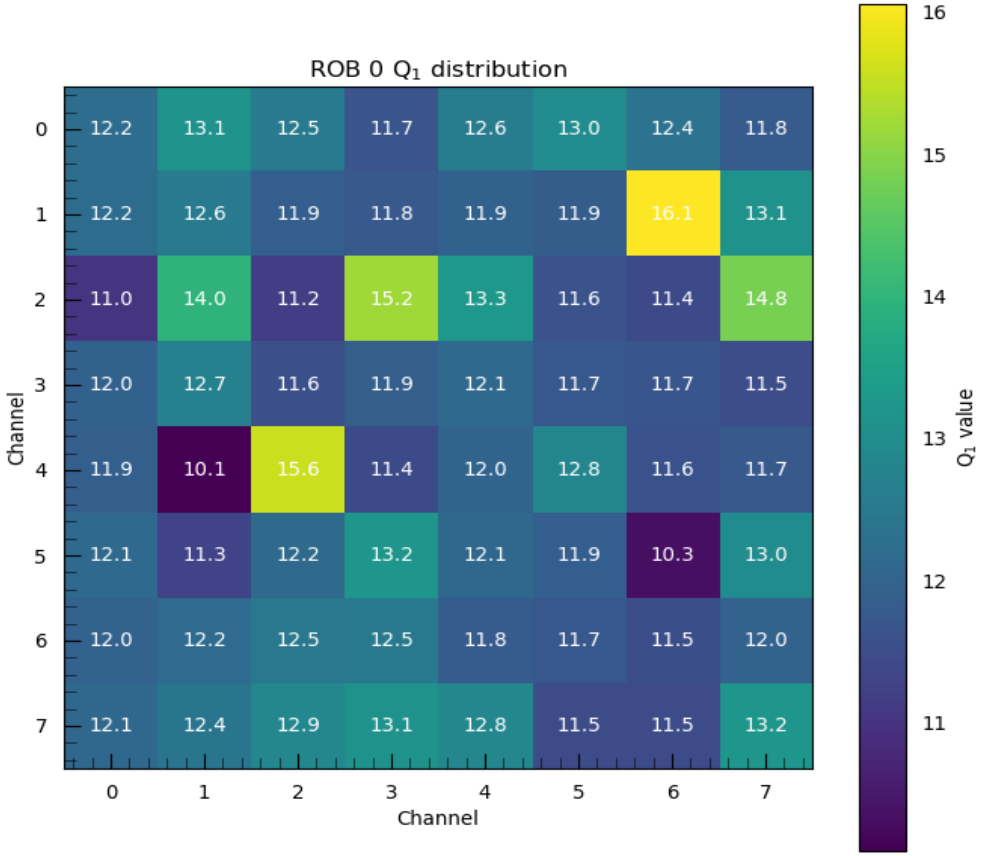

ROB 5 Q_1 distribution
Channel
Channel
Q_1 value
0 12.6 11.9 12.8 13.6 13.1 13.0 12.5 11.8
1 13.3 13.0 11.4 13.0 14.4 14.1 11.0 13.6
2 12.5 12.6 13.8 12.1 13.7 13.2 13.1 13.5
3 13.4 13.3 11.7 11.2 11.7 14.4 12.9 13.1
4 12.2 13.6 13.9 13.1 12.5 10.9 10.5 12.8
5 12.1 11.9 13.5 12.4 11.3 14.2 12.2 11.2
6 12.9 12.6 12.3 11.8 12.3 11.6 13.3 12.7
7 11.8 12.7 11.4 11.0 12.2 12.9 11.6 12.3
0 1 2 3 4 5 6 7
14.0 13.5 13.0 12.5 12.0 11.5 11.0


ROB 4 Q_1 distribution
Channel
Channel
Q_1 value
0 10.5 8.7 8.5 8.2 10.2 8.6 7.4 8.7
1 9.6 9.7 8.2 8.8 8.5 8.3 9.3 8.6
2 9.5 8.7 8.1 9.7 9.7 7.4 10.1 8.8
3 8.8 10.7 8.9 10.5 7.5 9.0 7.9 9.8
4 7.7 9.8 8.9 7.9 7.8 7.9 8.4 11.0
5 9.0 8.5 8.5 12.5 7.5 11.2 7.5 9.7
6 9.4 69.0 9.2 7.6 7.9 9.2 7.2 10.5
7 9.7 7.7 7.9 7.8 9.7 8.9 8.2 8.0
0 1 2 3 4 5 6 7
60 50 40 30 20 10


ROB 3 Q_1 distribution
Channel
0 10.6 9.7 10.0 11.3 9.3 10.1 13.1 10.8
1 8.1 10.8 8.6 10.4 10.3 12.5 11.1 10.0
2 11.7 11.0 11.4 11.7 11.4 12.1 13.3 10.8
3 7.9 9.9 10.4 10.9 10.3 10.9 12.2 9.9
4 10.9 8.9 9.0 10.5 10.5 10.6 10.6 11.5
5 12.0 9.8 9.7 11.2 12.5 10.8 13.3 11.2
6 11.3 9.7 10.9 12.2 12.0 10.7 11.0 10.1
7 10.9 9.5 9.3 10.0 10.8 10.4 11.1 9.9
0 1 2 3 4 5 6 7
Channel
Q_1 value
13
12
11
10
9
8


ROB 2 Q_1 distribution
Channel
0 14.4 12.9 12.6 12.6 13.2 11.1 13.2 11.9
1 12.9 11.7 11.1 13.1 12.6 14.3 12.3 11.7
2 11.6 11.8 12.1 11.8 11.7 12.2 11.4 11.6
3 11.2 12.4 12.0 12.6 12.2 11.6 12.5 9.8
4 13.2 12.9 12.8 14.3 12.0 11.4 11.7 11.7
5 11.0 15.3 13.6 12.1 14.2 13.7 12.9 11.8
6 11.5 12.0 11.8 13.4 14.3 12.4 12.0 14.3
7 10.4 13.0 12.2 12.6 14.0 14.4 13.3 11.3
0 1 2 3 4 5 6 7
Channel
Q_1 value
15
14
13
12
11
10


ROB 1 Q_1 distribution
Channel
0 14.9 13.1 13.7 13.2 12.5 12.4 13.6 13.4
1 12.0 12.2 11.8 11.8 11.9 12.0 12.0 11.6
2 13.2 13.6 12.4 12.4 13.2 12.3 12.0 12.5
3 15.6 12.0 12.0 11.8 13.3 14.7 14.0 12.0
4 11.5 12.1 11.8 13.0 12.3 11.6 10.1 12.5
5 12.1 12.8 12.2 11.8 12.1 11.8 12.6 12.3
6 15.1 12.0 11.7 11.7 14.1 12.1 12.0 12.0
7 12.1 13.2 12.1 12.7 12.7 12.6 13.0 12.1
0 1 2 3 4 5 6 7
Channel
15
14
13
12
11
Q_1 value


ROB 0 Q_1 distribution
Channel
0 12.2 13.1 12.5 11.7 12.6 13.0 12.4 11.8
1 12.2 12.6 11.9 11.8 11.9 11.9 16.1 13.1
2 11.0 14.0 11.2 15.2 13.3 11.6 11.4 14.8
3 12.0 12.7 11.6 11.9 12.1 11.7 11.7 11.5
4 11.9 10.1 15.6 11.4 12.0 12.8 11.6 11.7
5 12.1 11.3 12.2 13.2 12.1 11.9 10.3 13.0
6 12.0 12.2 12.5 12.5 11.8 11.7 11.5 12.0
7 12.1 12.4 12.9 13.1 12.8 11.5 11.5 13.2
0 1 2 3 4 5 6 7
Channel
16
15
14
13
12
11
Q_1 value