TPC noise plots from run 10895

DUNE 35t coordination

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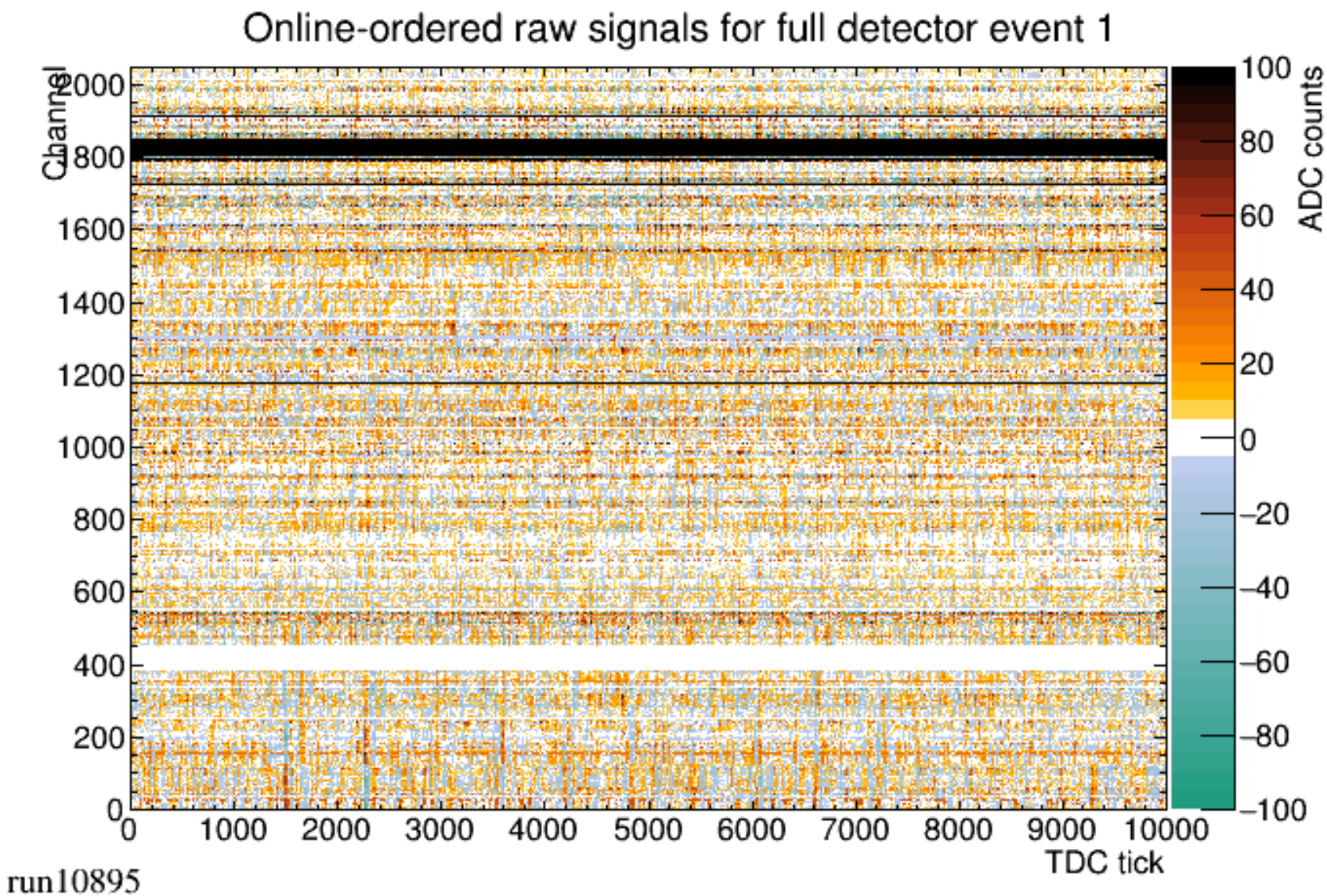
Introduction

I have started looking at data from 35 ton prototype

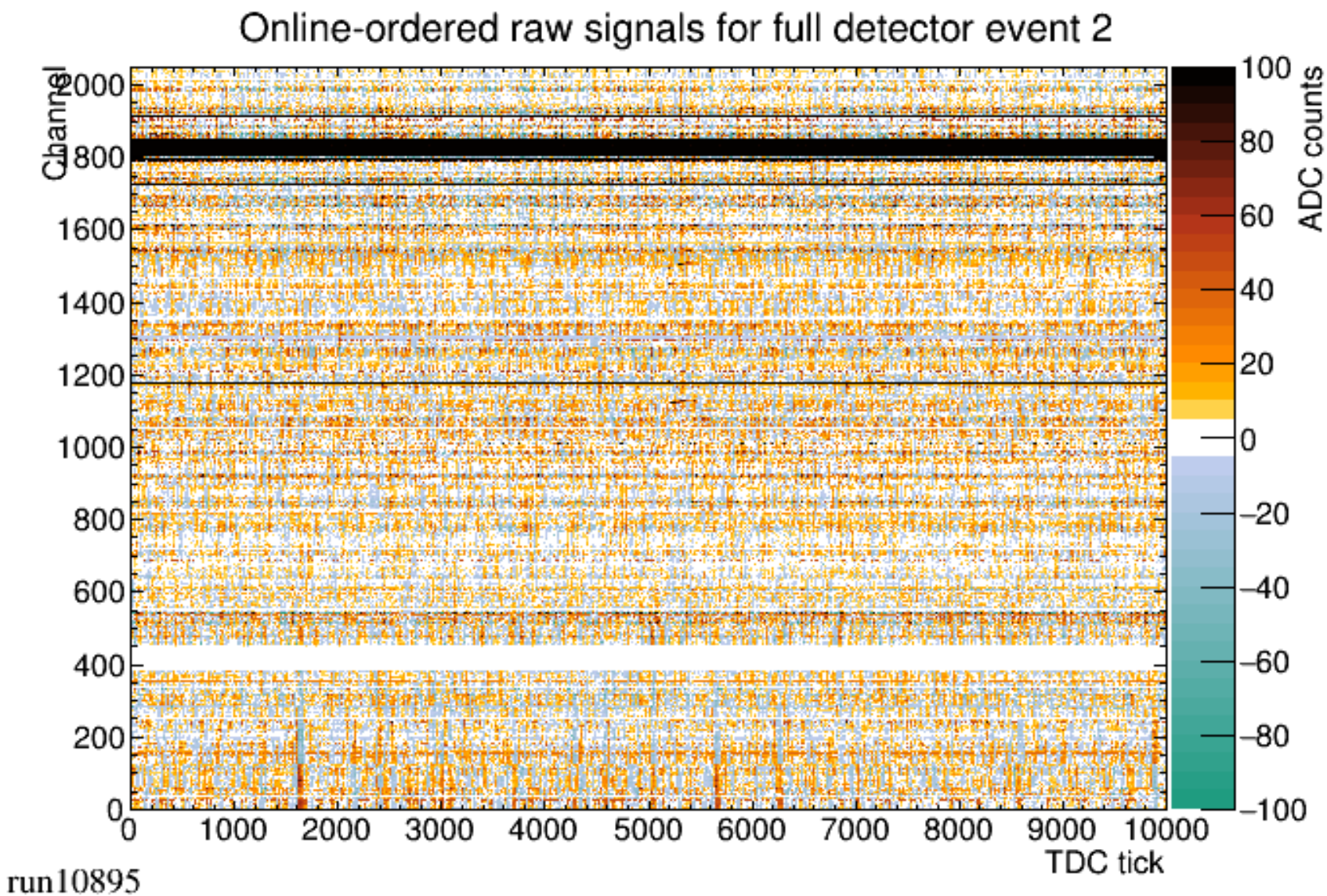
- Today plots from run 10895
  - One of the first runs after cooldown
  - LAr is dirty and so we so not expect many tracks
  - First event purported to show track circulated in mailing lists
    - I don't see it but might be looking at wrong event
- Event IDs are ambiguous
  - I (and all others?) use EventSplitter to read data
  - It is configured to select events based on trigger
  - Event numbering is based on this selection
  - I take events passing any trigger (I think)
- I make plots using dune_extensions
  - https://github.com/dladams/dune_extensions
  - Plot pedestal-subtracted raw data channel vs. tick
    - These plots use online channel numbering to show coherence
    - Plots of full detector for many events
    - And zooming on RCE and tick region for event 5

Full detector plots

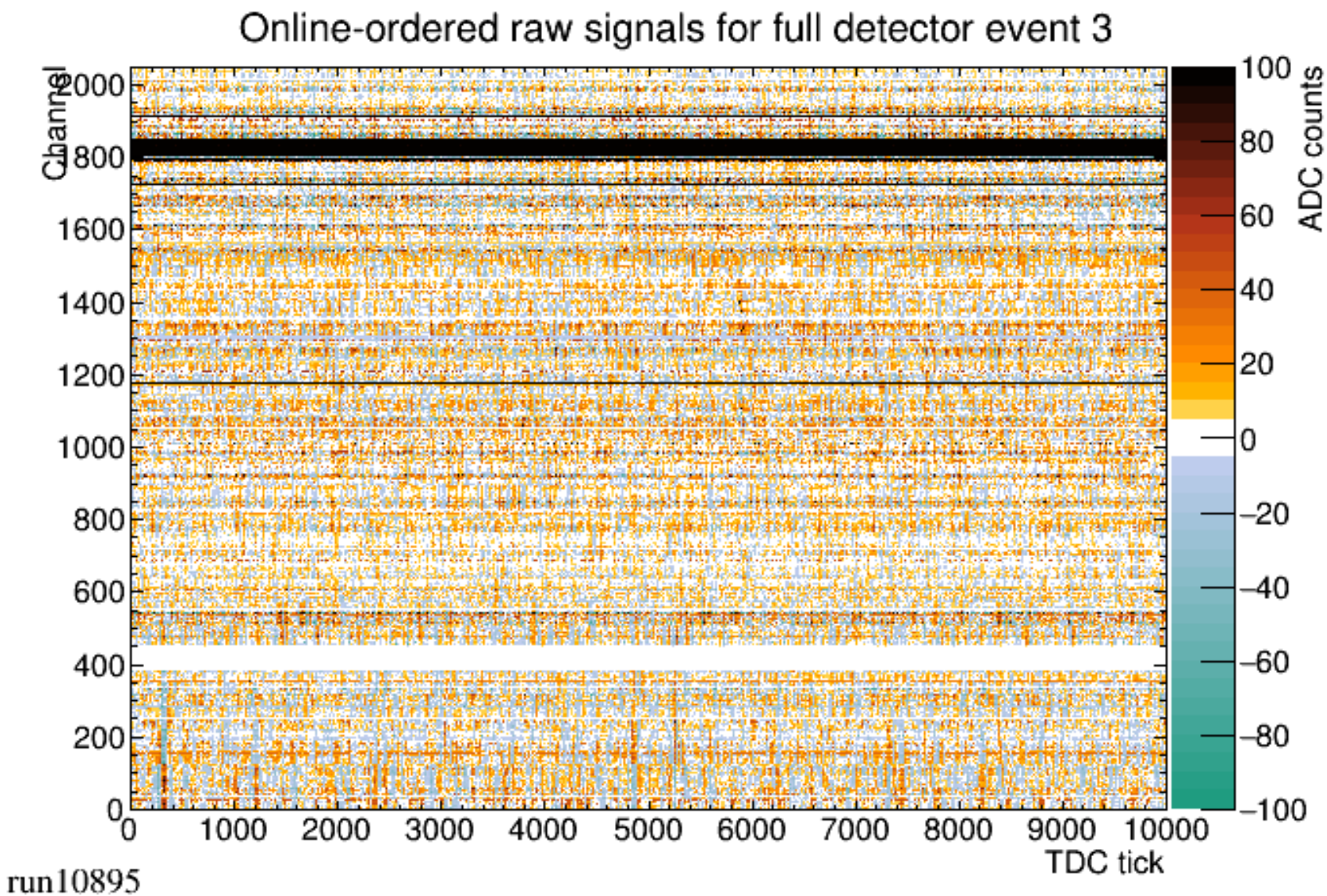
Event 1


Online-ordered raw signals for full detector event 1
Channel
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
TDC tick
100
80
60
40
20
0
−20
−40
−60
−80
−100
ADC counts
run10895

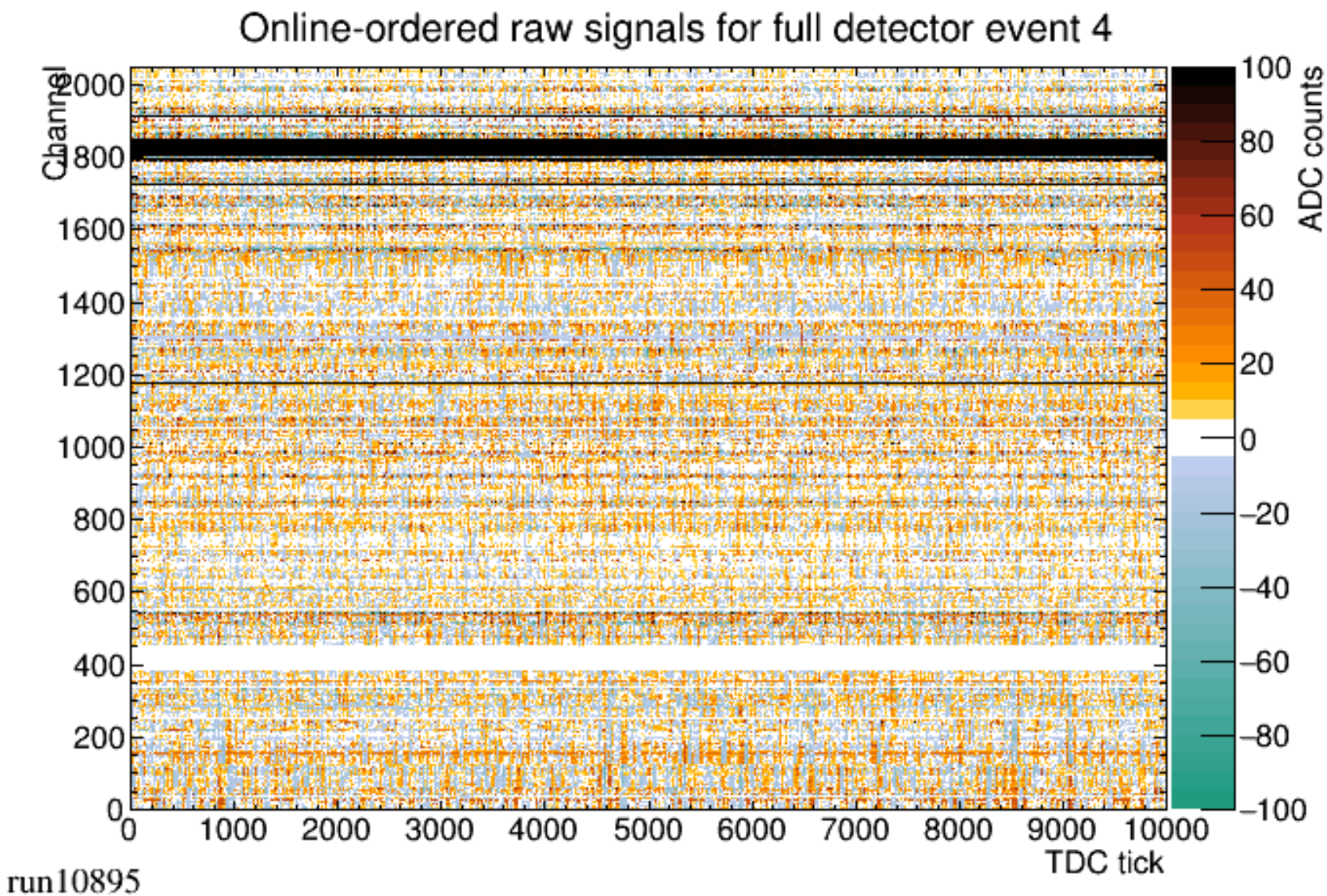
Event 2


Online-ordered raw signals for full detector event 2
Channel
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
TDC tick
100
80
60
40
20
0
−20
−40
−60
−80
−100
ADC counts
run10895

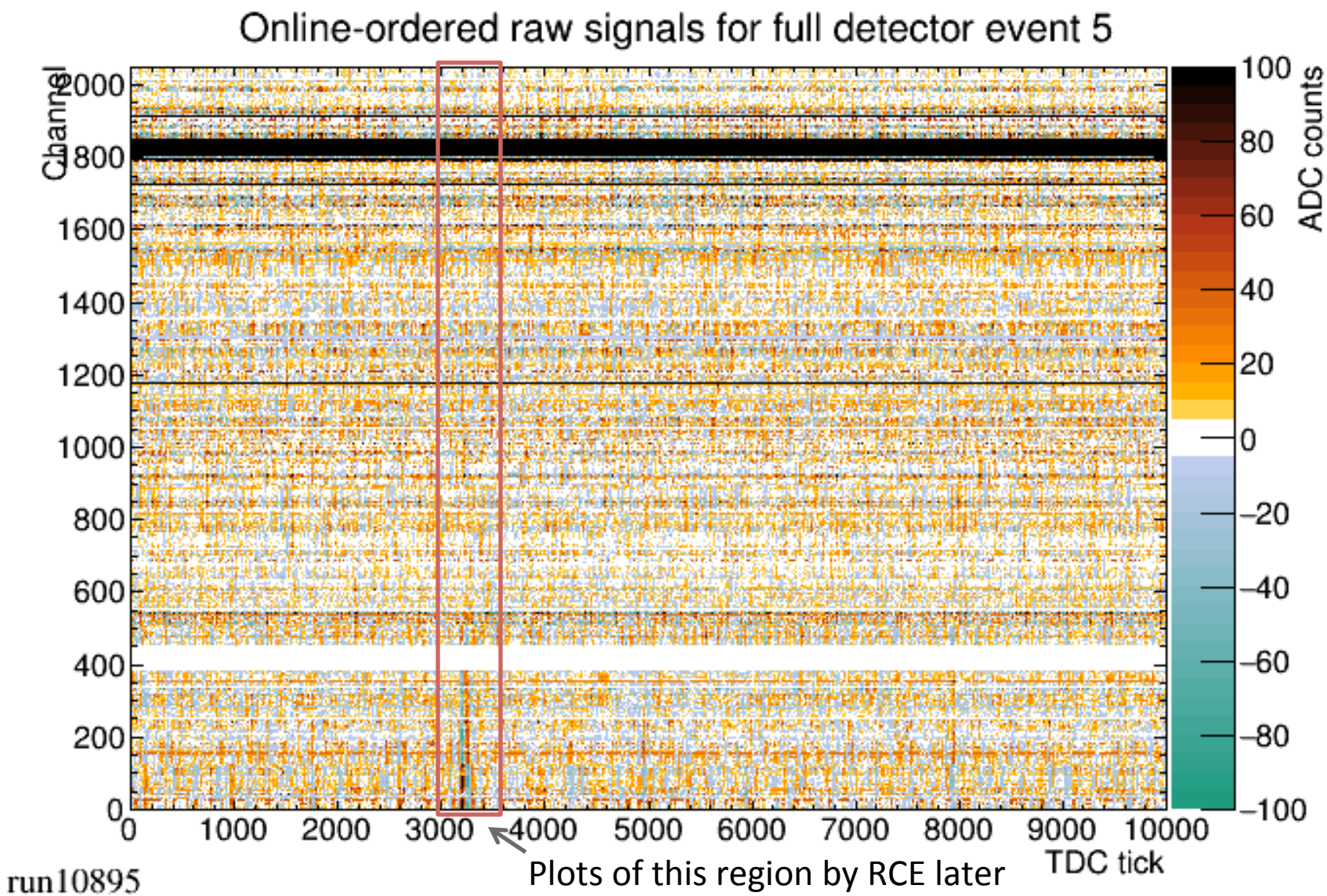
Event 3


Online-ordered raw signals for full detector event 3
Channel
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
TDC tick
100
80
60
40
20
0
−20
−40
−60
−80
−100
ADC counts
run10895

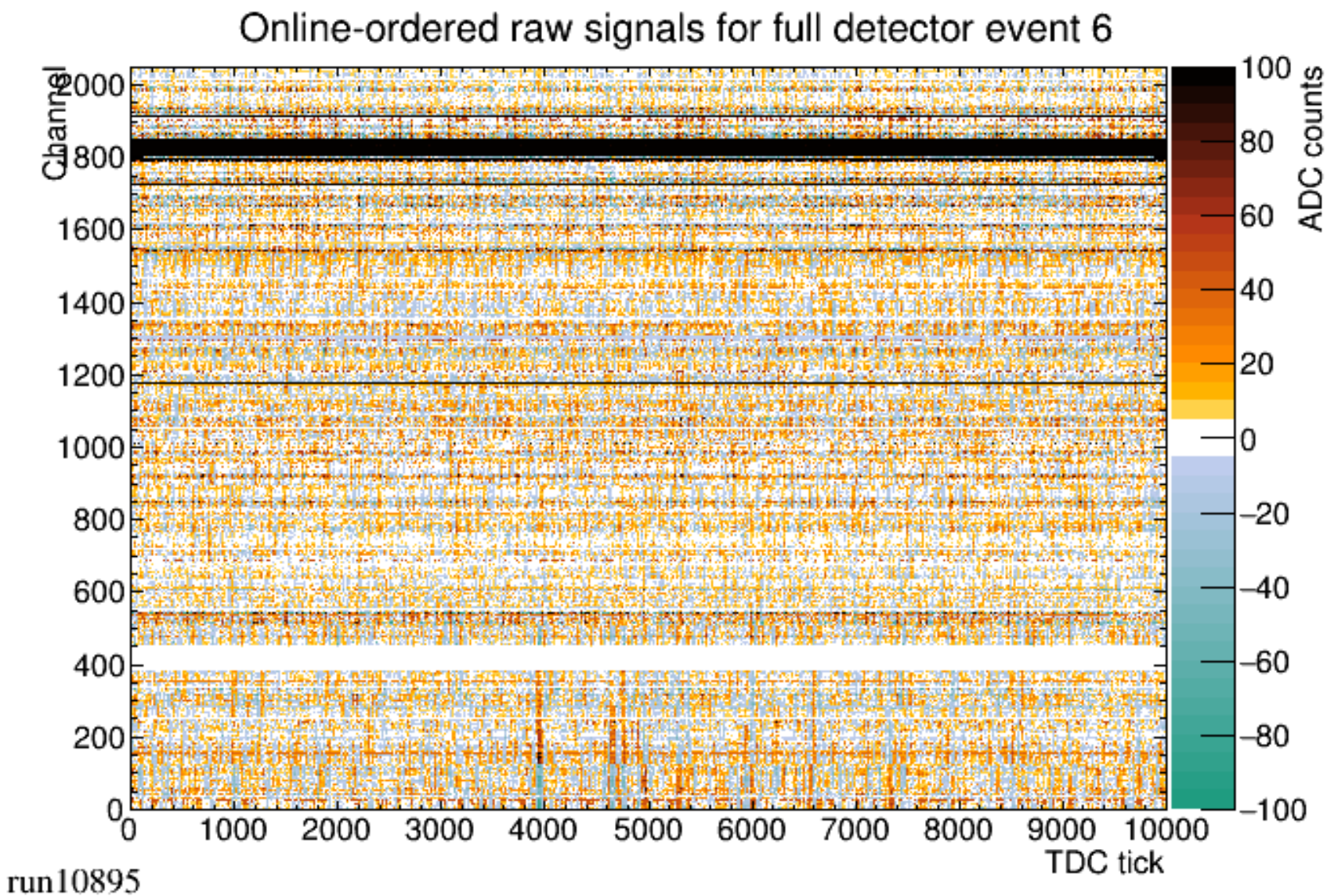
Event 4


Online-ordered raw signals for full detector event 4
Channel
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
TDC tick
100
80
60
40
20
0
−20
−40
−60
−80
−100
ADC counts
run10895

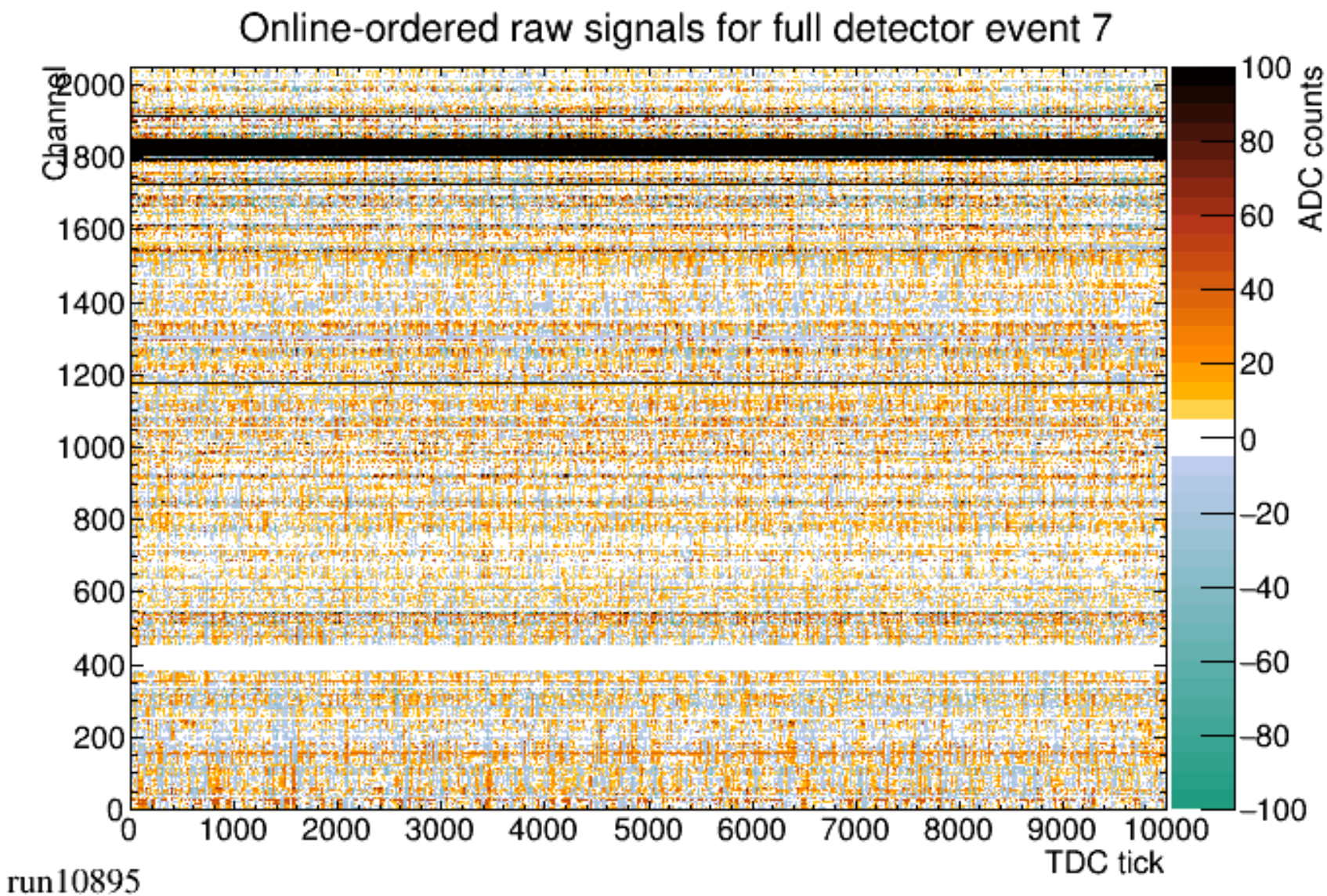
Event 5


Online-ordered raw signals for full detector event 5
Channel
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
TDC tick
100
80
60
40
20
0
−20
−40
−60
−80
−100
ADC counts
run10895
Plots of this region by RCE later

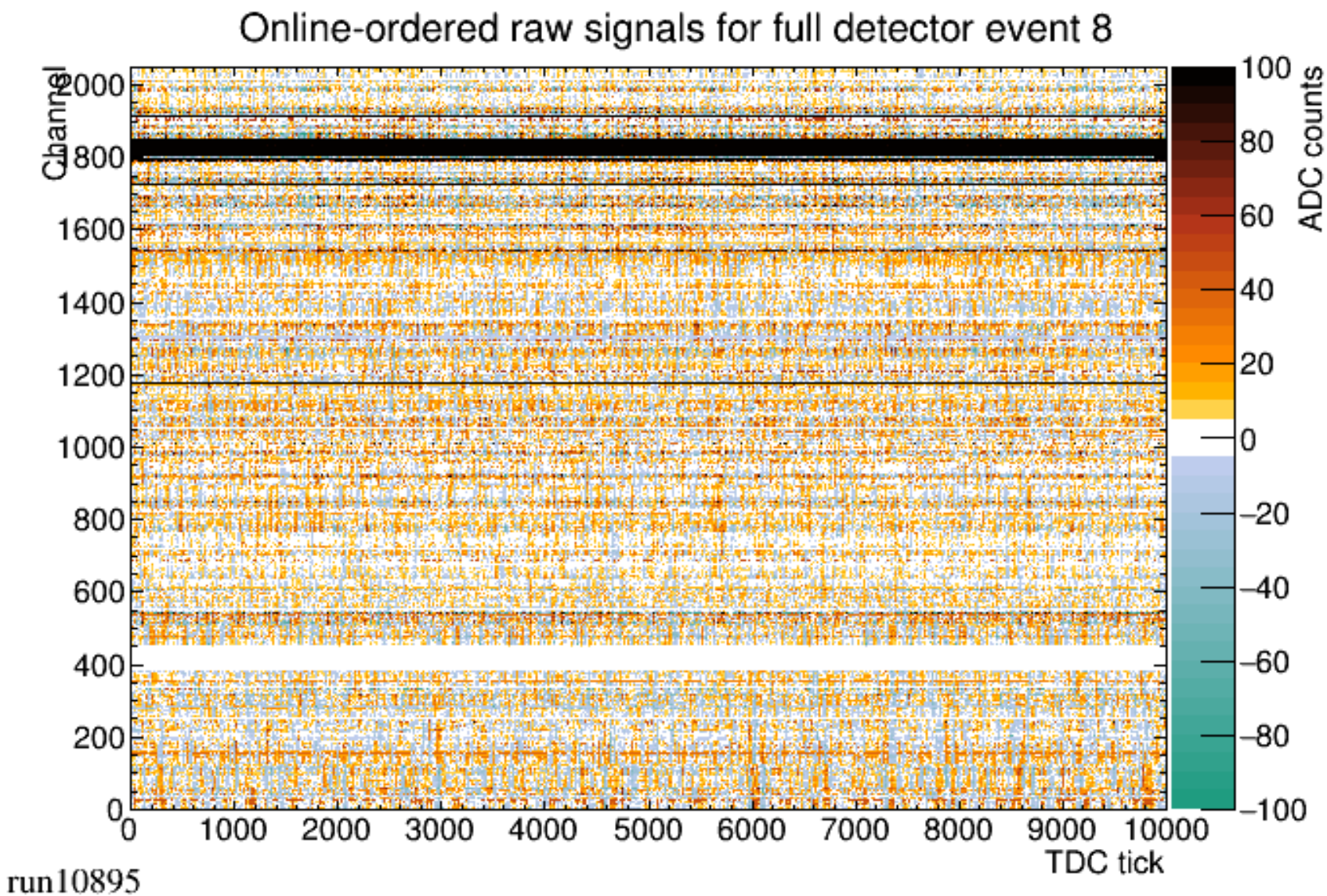
Event 6


Online-ordered raw signals for full detector event 6
Channel
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
TDC tick
100
80
60
40
20
0
−20
−40
−60
−80
−100
ADC counts
run10895

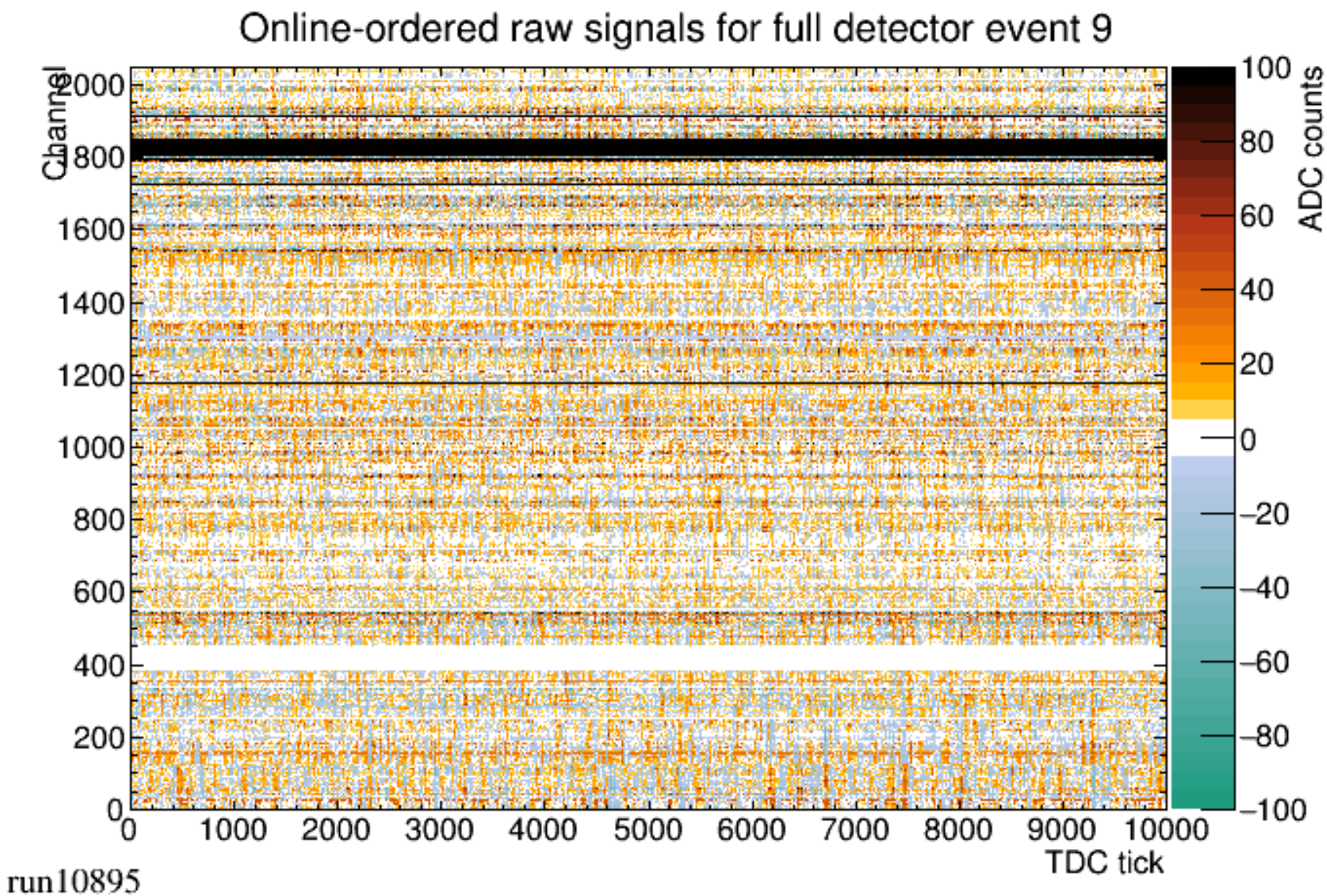
Event 7


Online-ordered raw signals for full detector event 7
Channel
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
TDC tick
100
80
60
40
20
0
−20
−40
−60
−80
−100
ADC counts
run10895

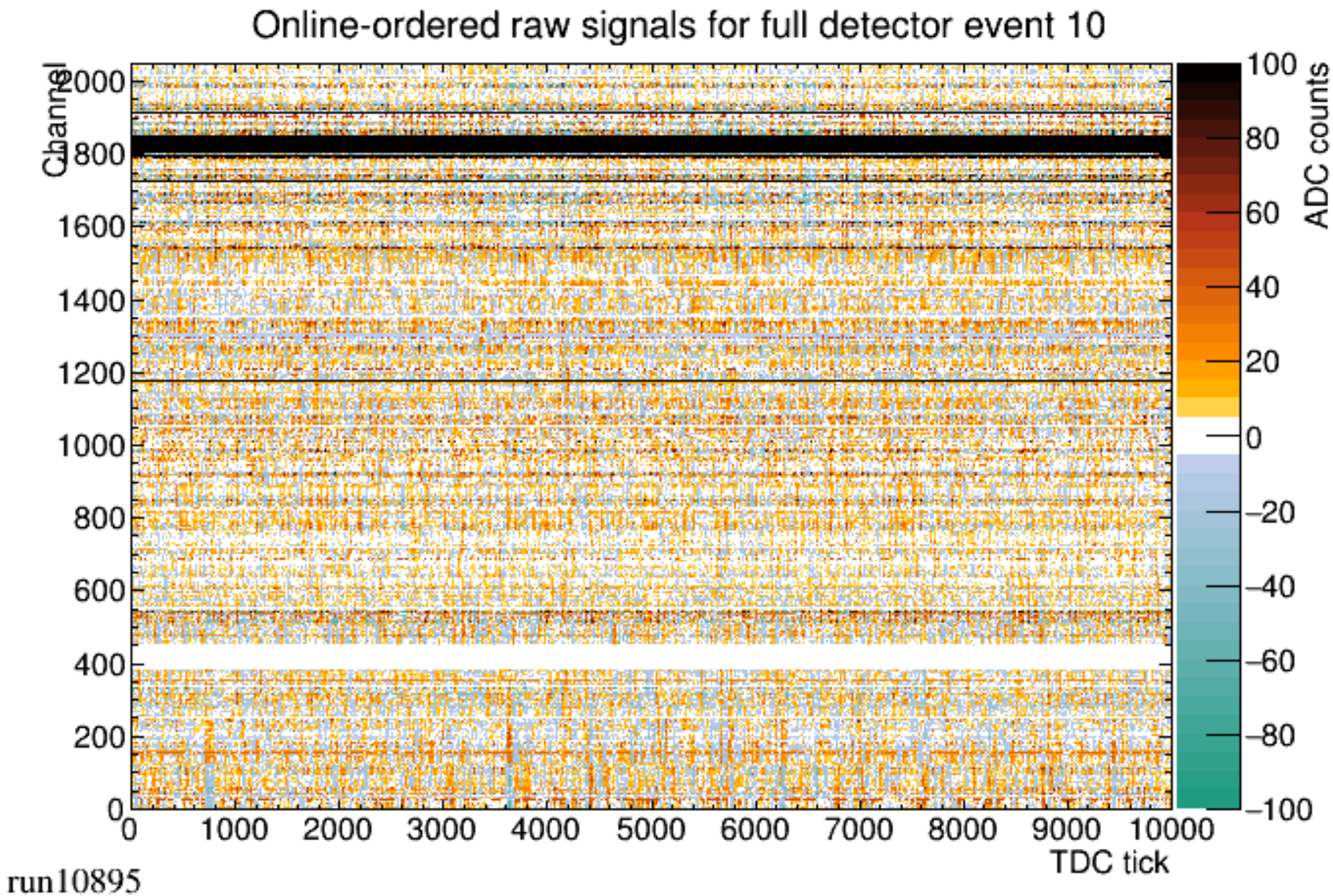
Event 8


Online-ordered raw signals for full detector event 8
Channel
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
TDC tick
100
80
60
40
20
0
−20
−40
−60
−80
−100
ADC counts
run10895

Event 9

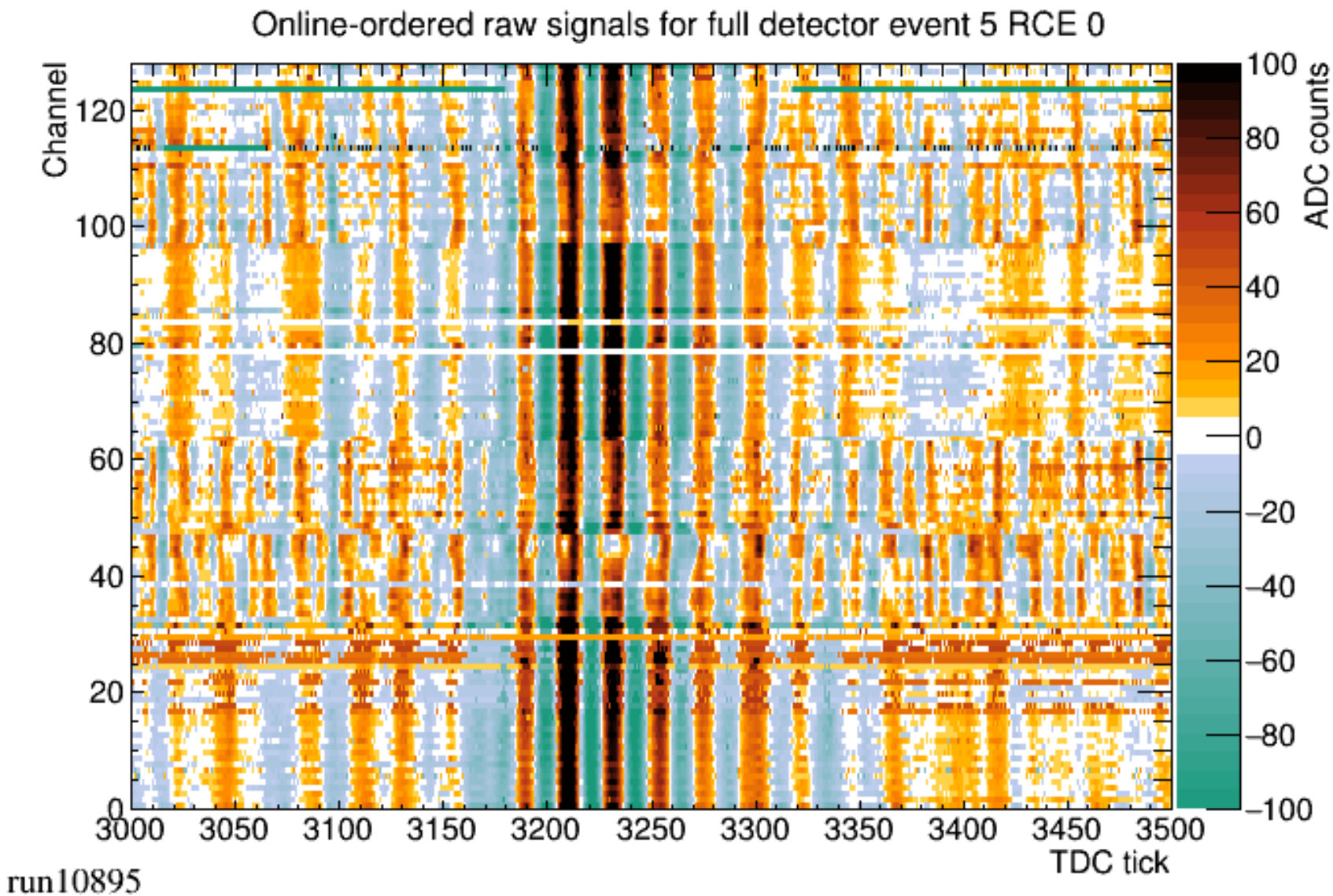

Online-ordered raw signals for full detector event 9
Channel
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
TDC tick
100
80
60
40
20
0
−20
−40
−60
−80
−100
ADC counts
run10895

Event 10

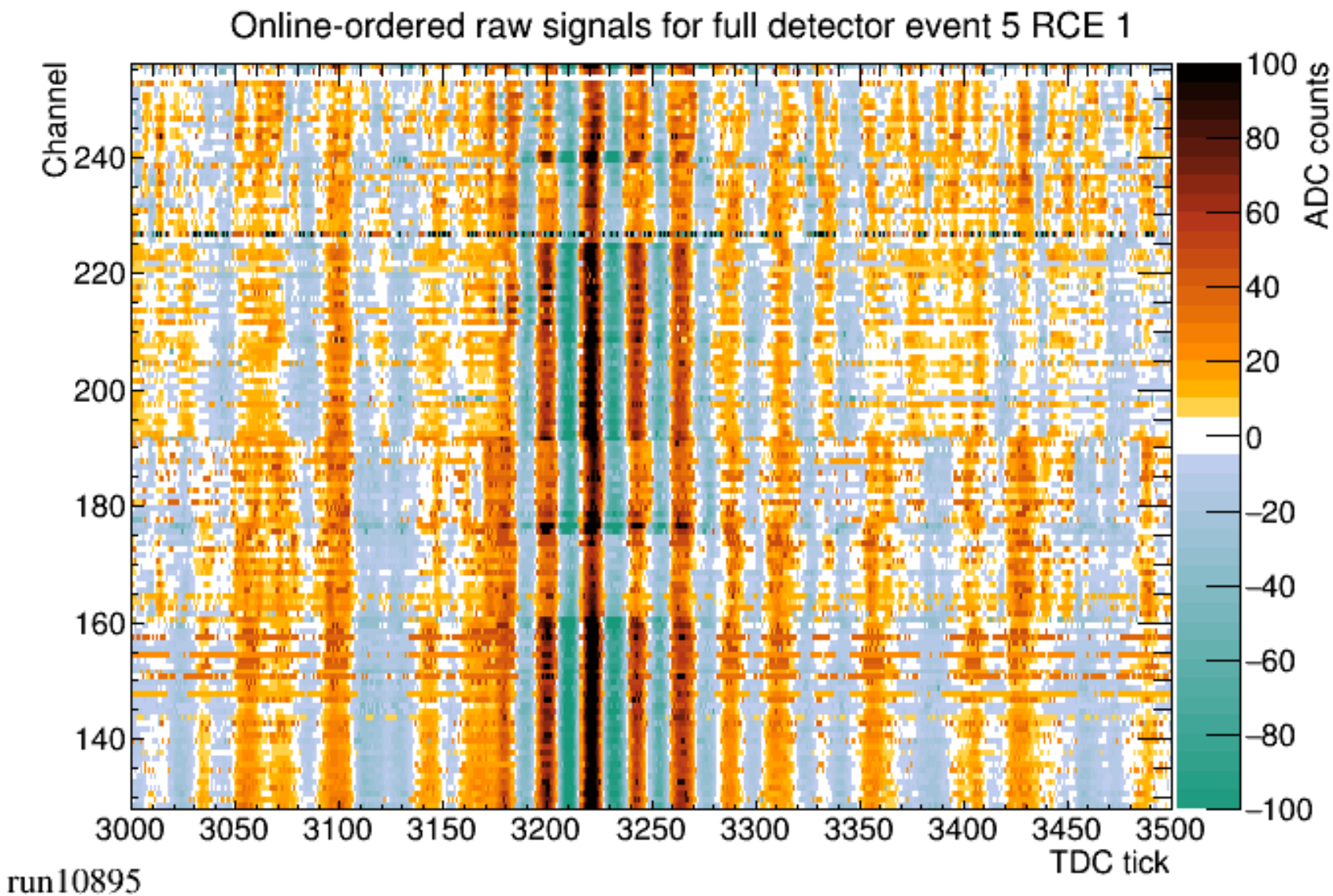

Online-ordered raw signals for full detector event 10
Channel
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
TDC tick
100
80
60
40
20
0
−20
−40
−60
−80
−100
ADC counts
run10895

Tick-zoomed RCE plots

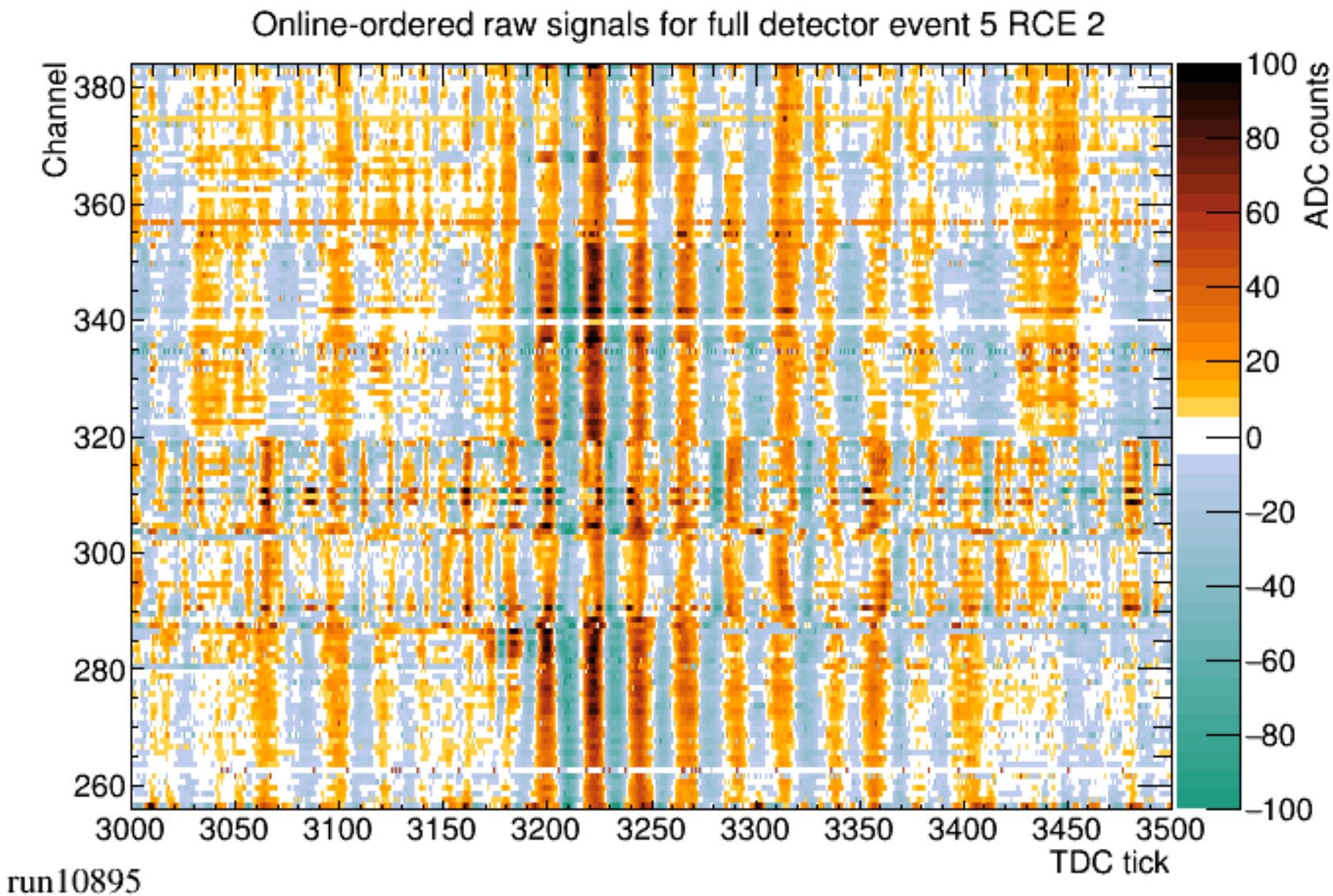
RCE 0


Online-ordered raw signals for full detector event 5 RCE 0
Channel
0
20
40
60
80
100
120
3000
3050
3100
3150
3200
3250
3300
3350
3400
3450
3500
TDC tick
ADC counts
100
80
60
40
20
0
−20
−40
−60
−80
−100
run10895

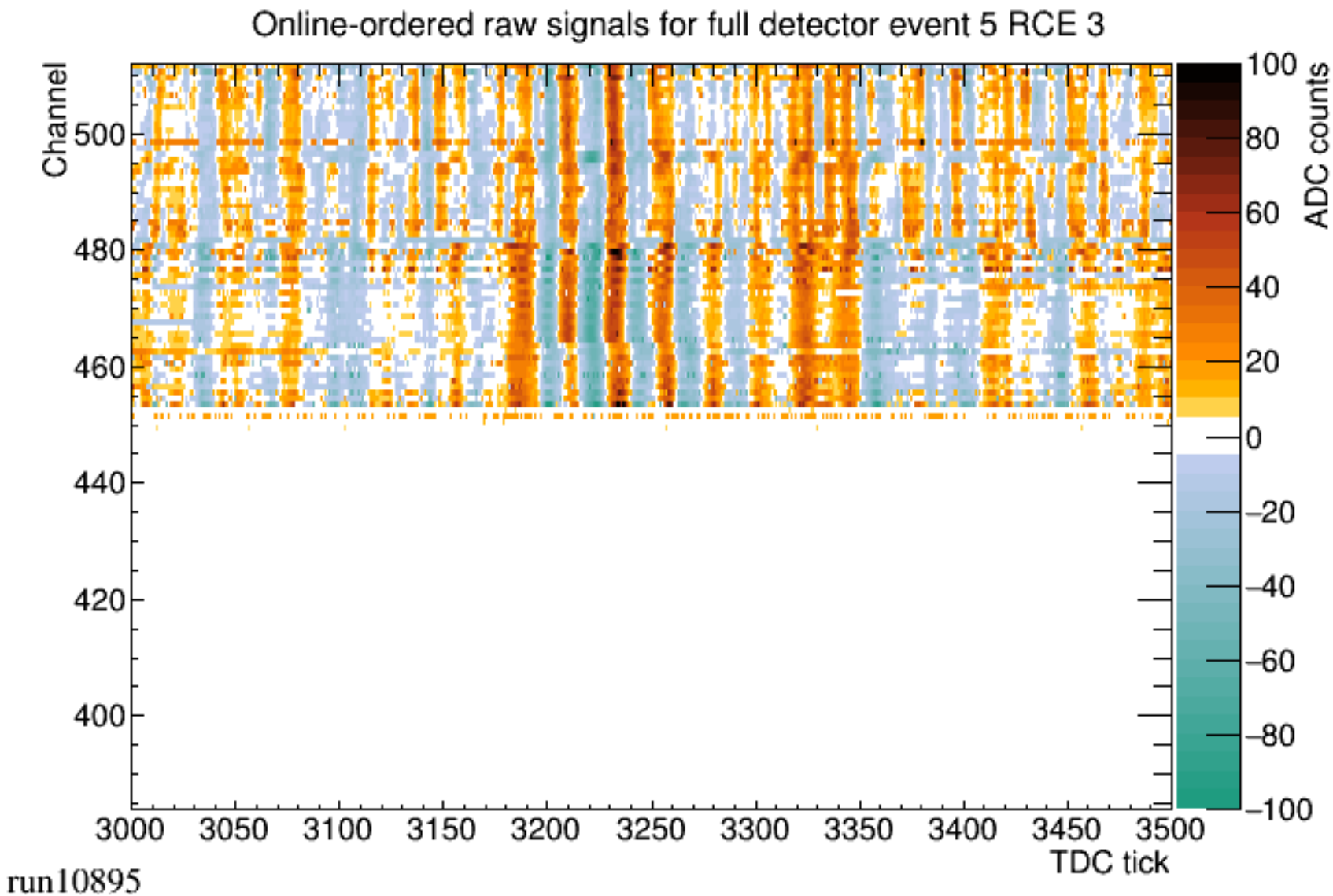
RCE 1


Online-ordered raw signals for full detector event 5 RCE 1
Channel
240
220
200
180
160
140
3000
3050
3100
3150
3200
3250
3300
3350
3400
3450
3500
TDC tick
100
80
60
40
20
0
−20
−40
−60
−80
−100
ADC counts
run10895

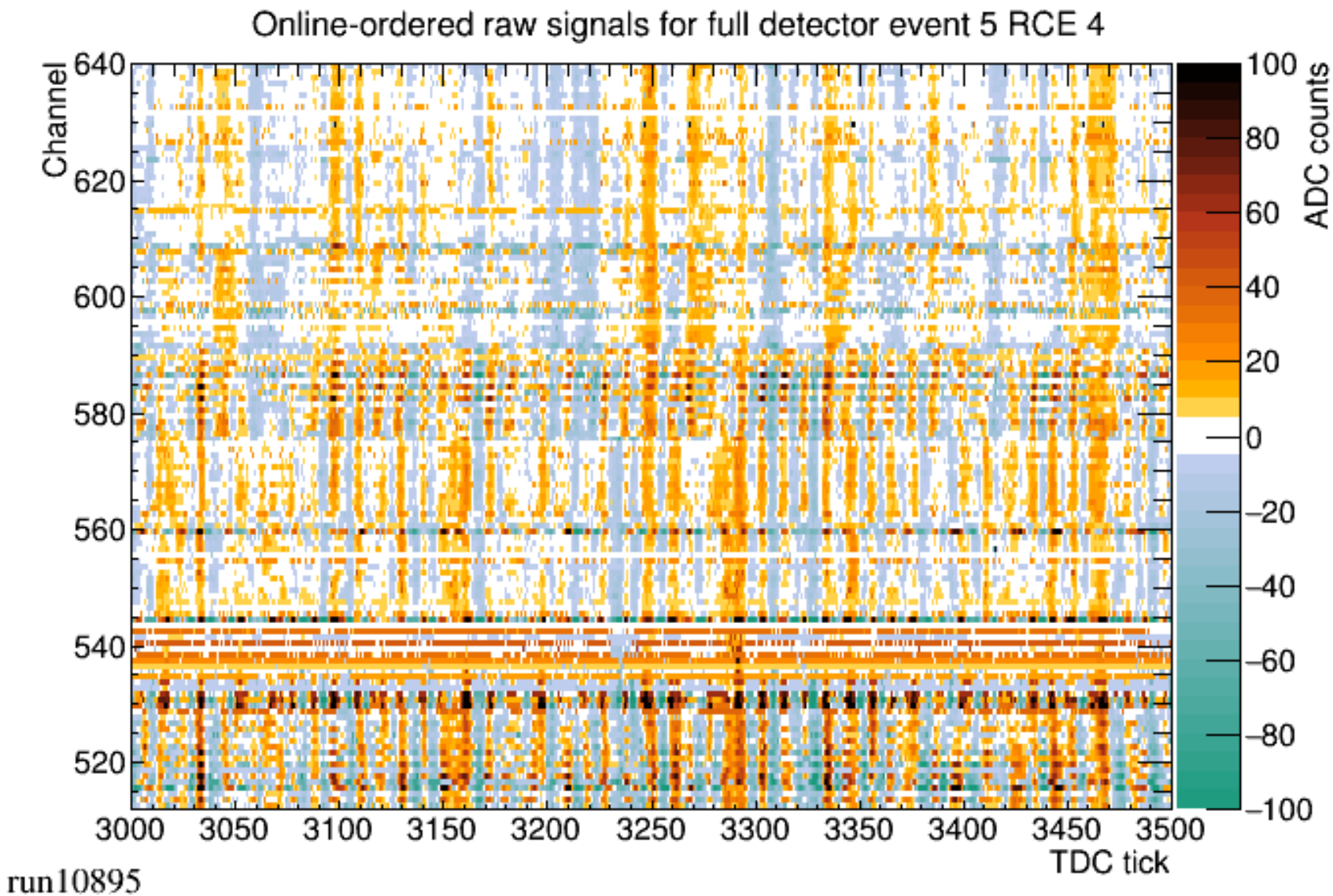
RCE 2


Online-ordered raw signals for full detector event 5 RCE 2
Channel
380
360
340
320
300
280
260
3000
3050
3100
3150
3200
3250
3300
3350
3400
3450
3500
TDC tick
100
80
60
40
20
0
−20
−40
−60
−80
−100
ADC counts
run10895

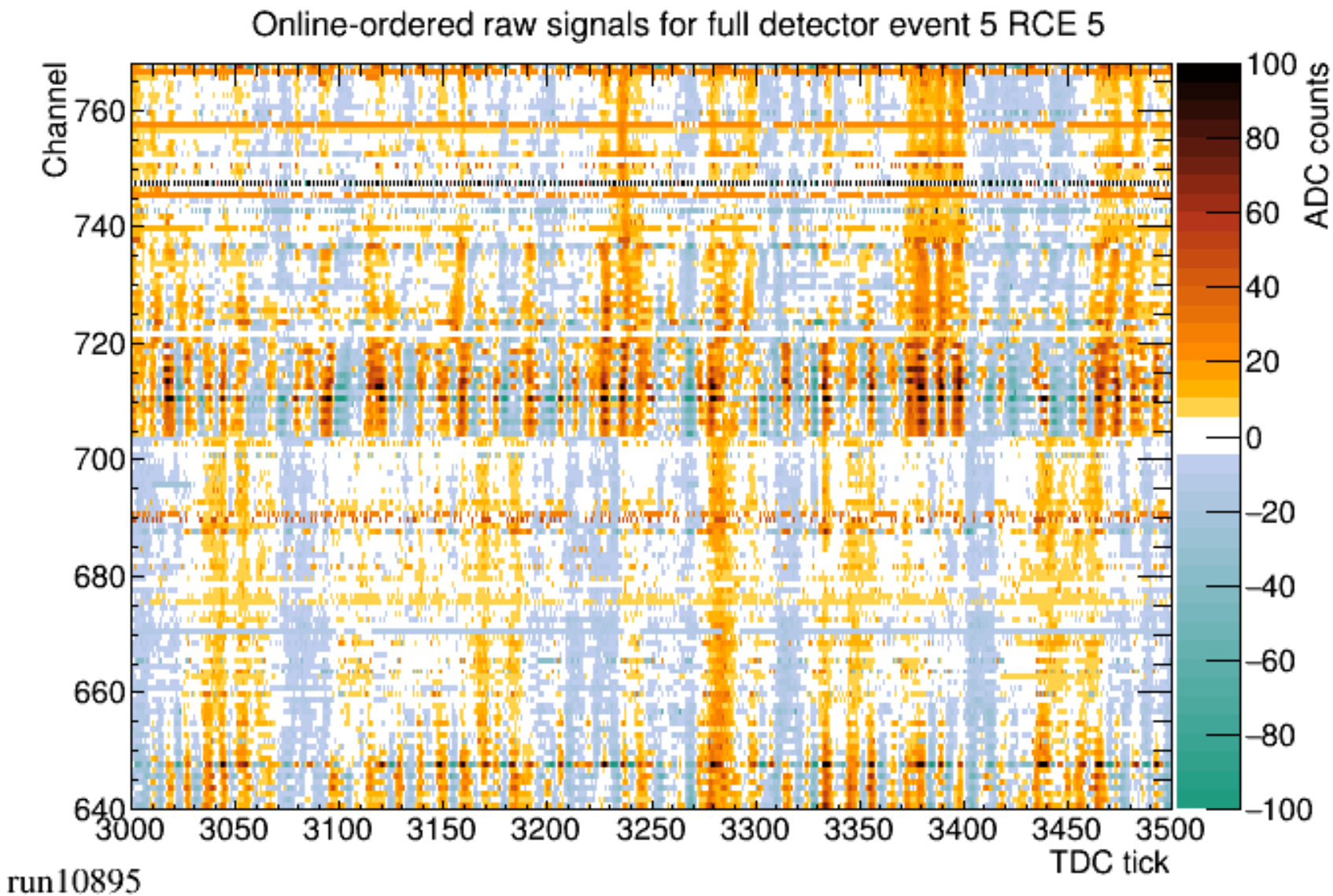
RCE 3


Online-ordered raw signals for full detector event 5 RCE 3
Channel
500
480
460
440
420
400
3000
3050
3100
3150
3200
3250
3300
3350
3400
3450
3500
TDC tick
100
80
60
40
20
0
−20
−40
−60
−80
−100
ADC counts
run10895

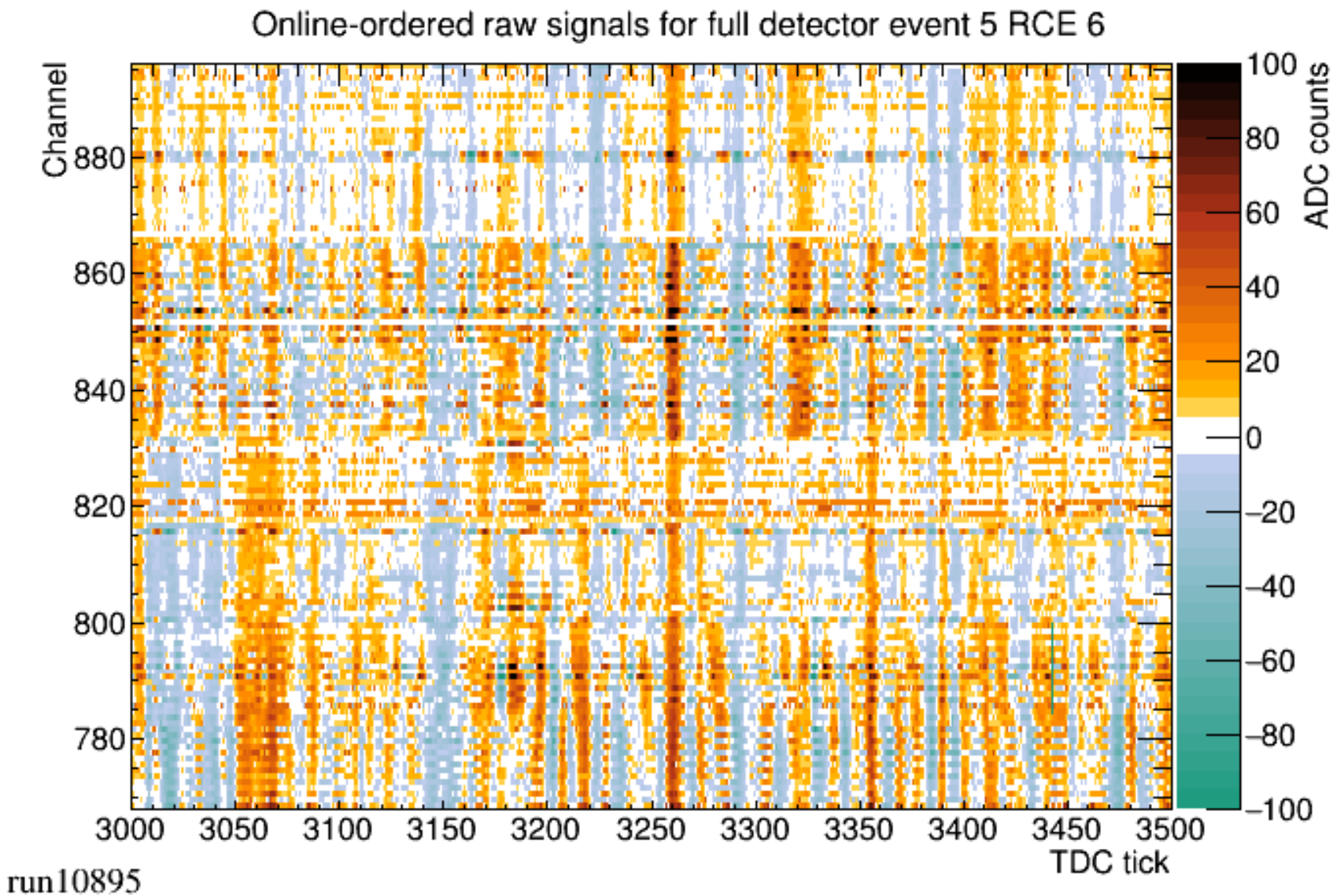
RCE 4


Online-ordered raw signals for full detector event 5 RCE 4
Channel
640
620
600
580
560
540
520
3000
3050
3100
3150
3200
3250
3300
3350
3400
3450
3500
TDC tick
100
80
60
40
20
0
−20
−40
−60
−80
−100
ADC counts
run10895

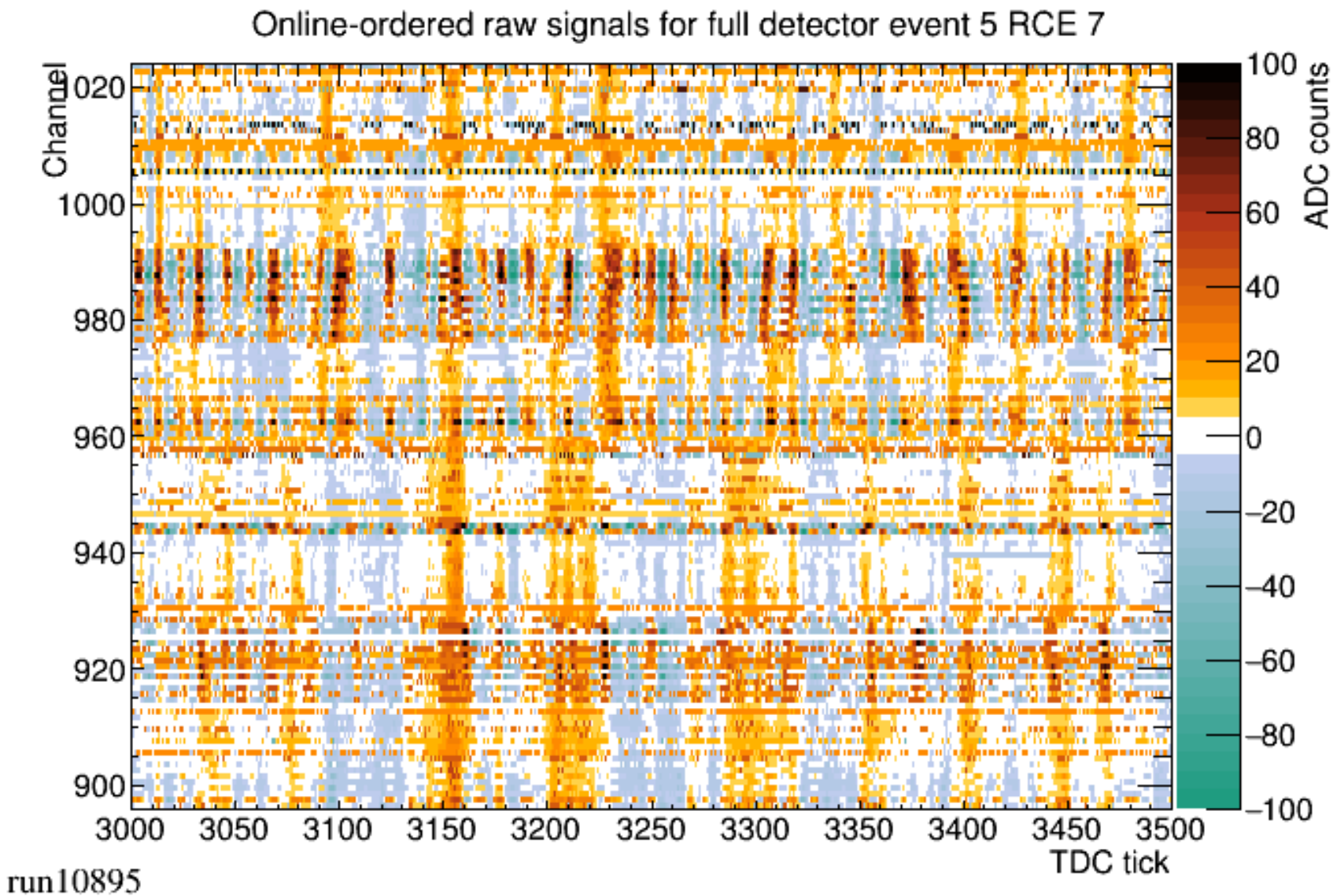
RCE 5


Online-ordered raw signals for full detector event 5 RCE 5
Channel
760
740
720
700
680
660
640
3000
3050
3100
3150
3200
3250
3300
3350
3400
3450
3500
TDC tick
100
80
60
40
20
0
−20
−40
−60
−80
−100
ADC counts
run10895

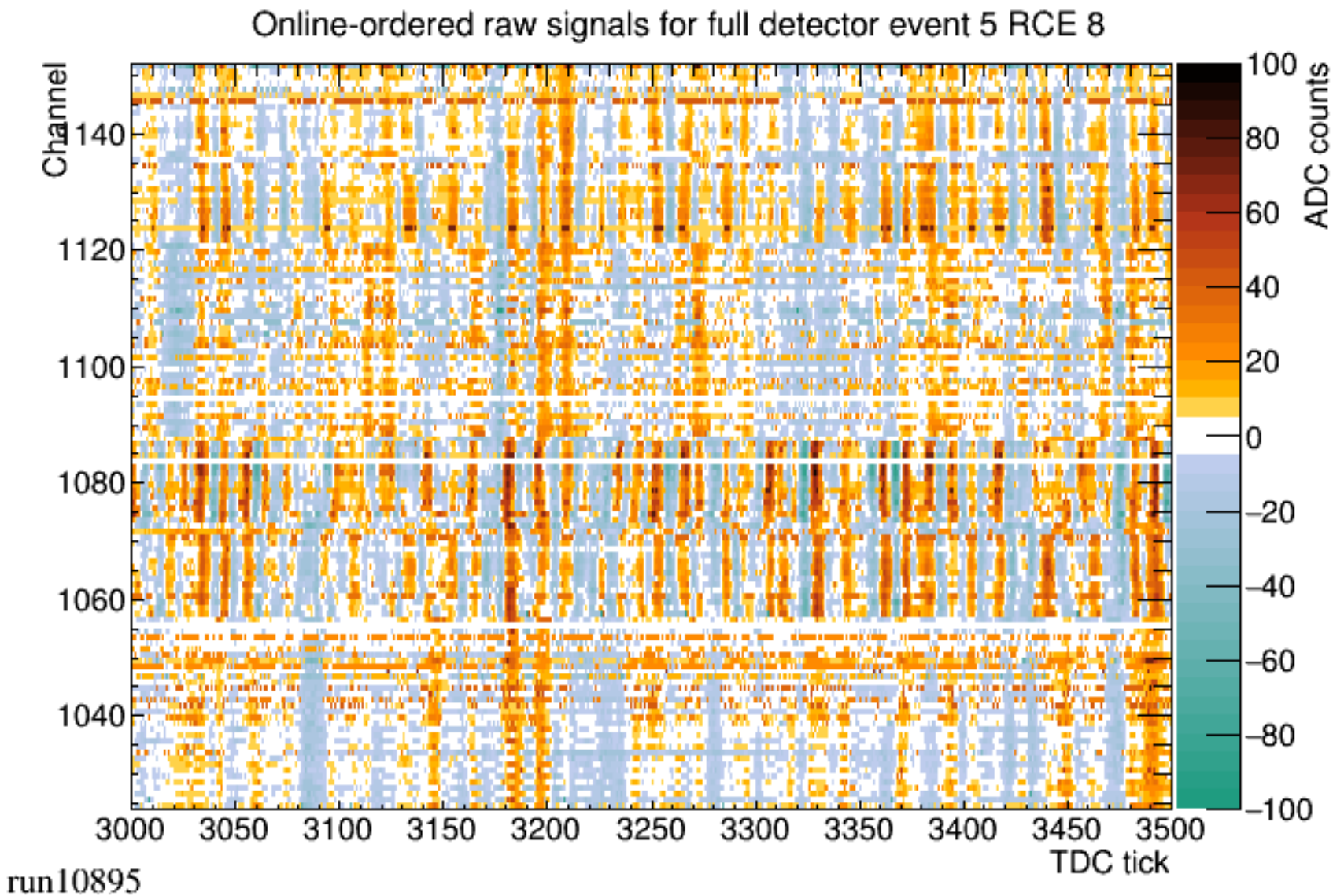
RCE 6


Online-ordered raw signals for full detector event 5 RCE 6
Channel
880
860
840
820
800
780
3000
3050
3100
3150
3200
3250
3300
3350
3400
3450
3500
TDC tick
100
80
60
40
20
0
−20
−40
−60
−80
−100
ADC counts
run10895

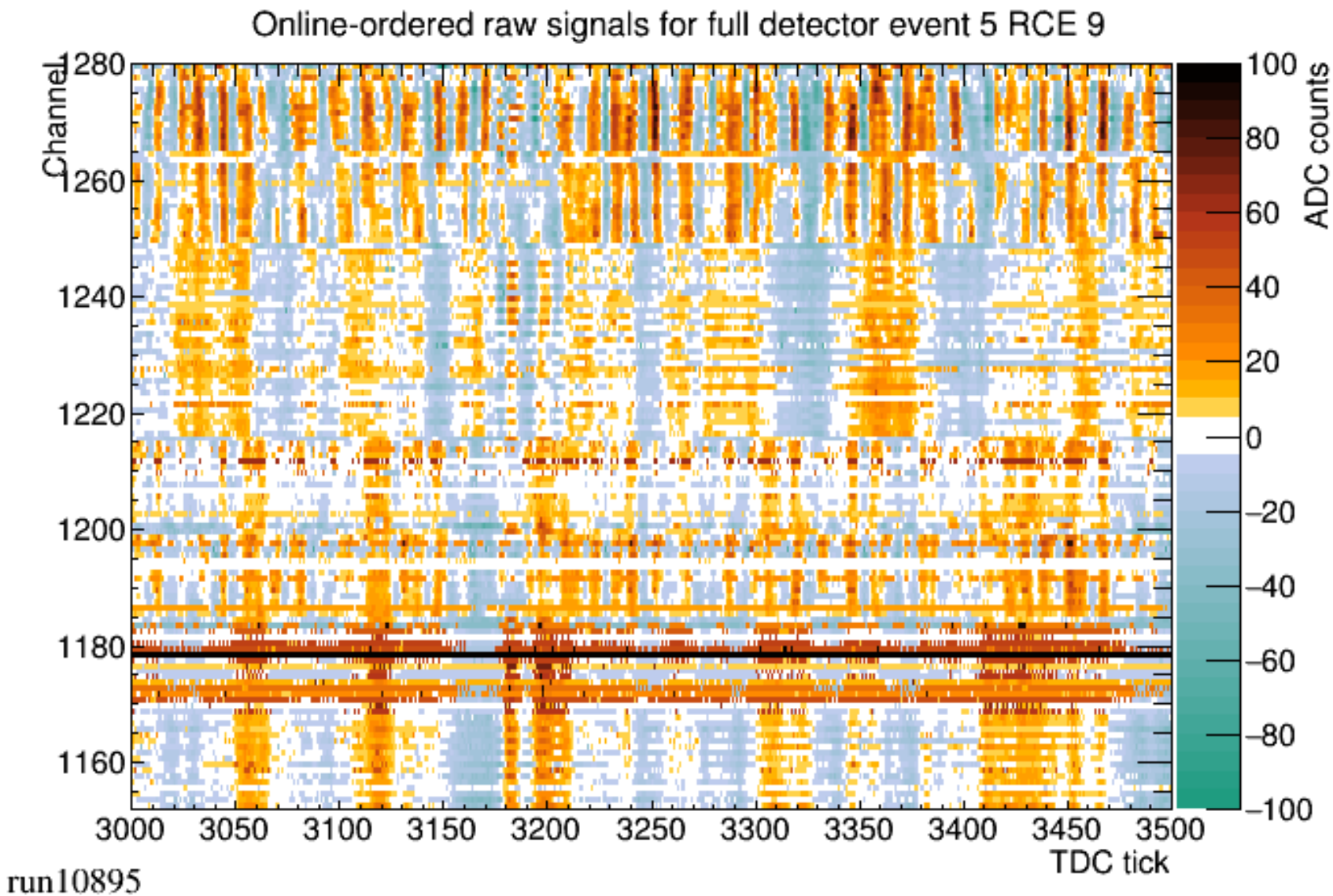
RCE 7


Online-ordered raw signals for full detector event 5 RCE 7
Channel
1020
1000
980
960
940
920
900
3000
3050
3100
3150
3200
3250
3300
3350
3400
3450
3500
TDC tick
100
80
60
40
20
0
−20
−40
−60
−80
−100
ADC counts
run10895

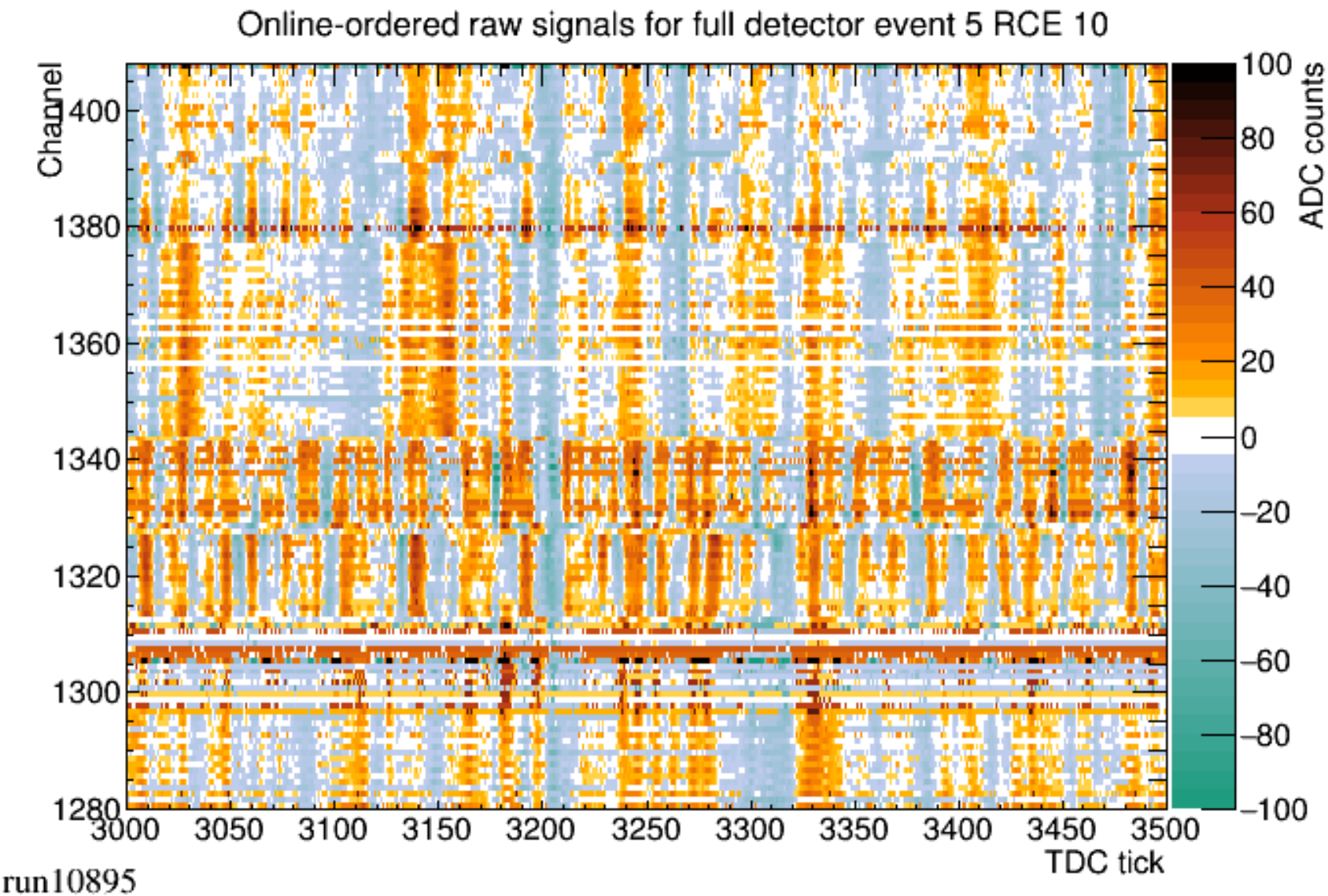
RCE 8


Online-ordered raw signals for full detector event 5 RCE 8
Channel
1140
1120
1100
1080
1060
1040
3000
3050
3100
3150
3200
3250
3300
3350
3400
3450
3500
TDC tick
100
80
60
40
20
0
−20
−40
−60
−80
−100
ADC counts
run10895

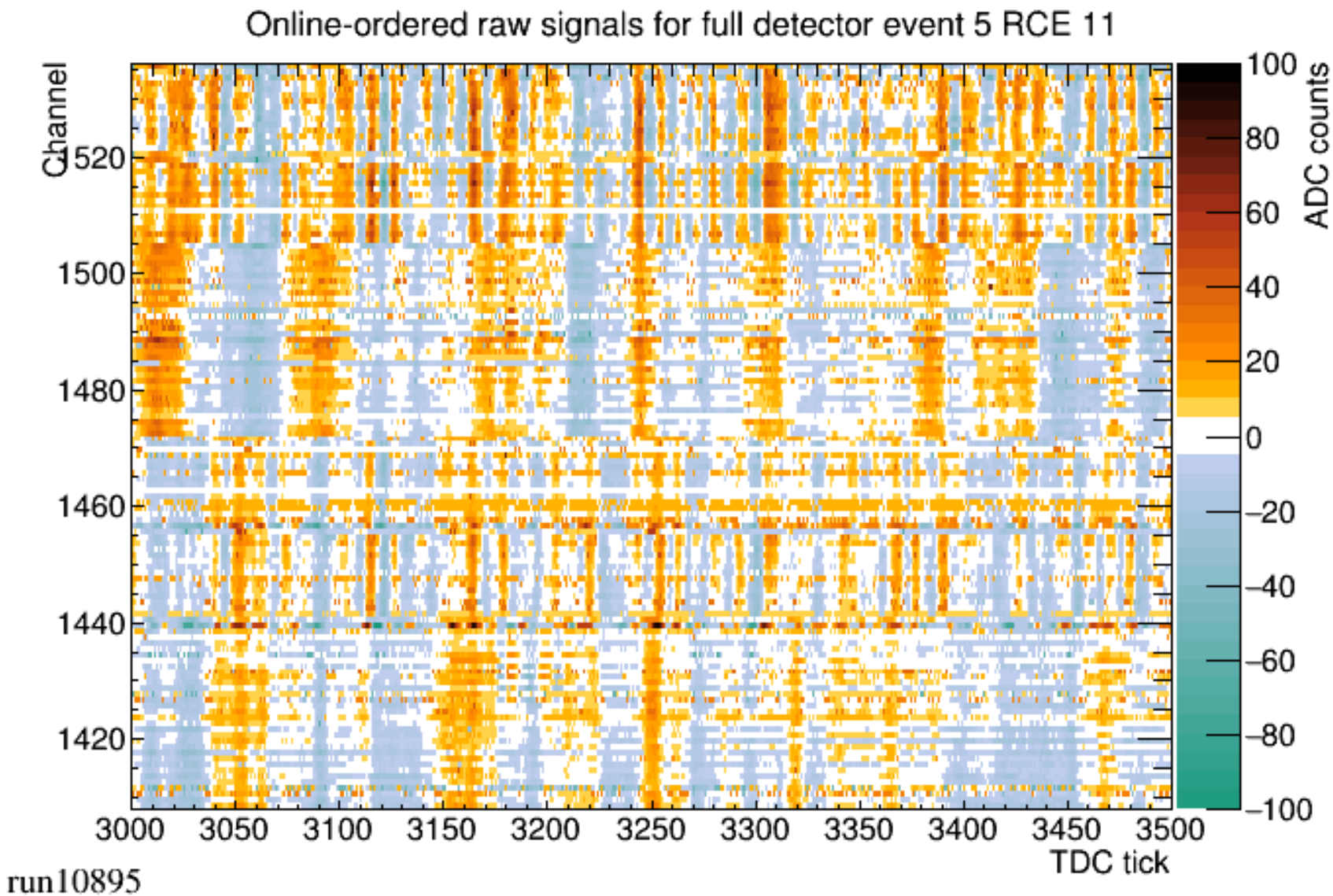
RCE 9


Online-ordered raw signals for full detector event 5 RCE 9
Channel
1280
1260
1240
1220
1200
1180
1160
3000
3050
3100
3150
3200
3250
3300
3350
3400
3450
3500
TDC tick
100
80
60
40
20
0
−20
−40
−60
−80
−100
ADC counts
run10895

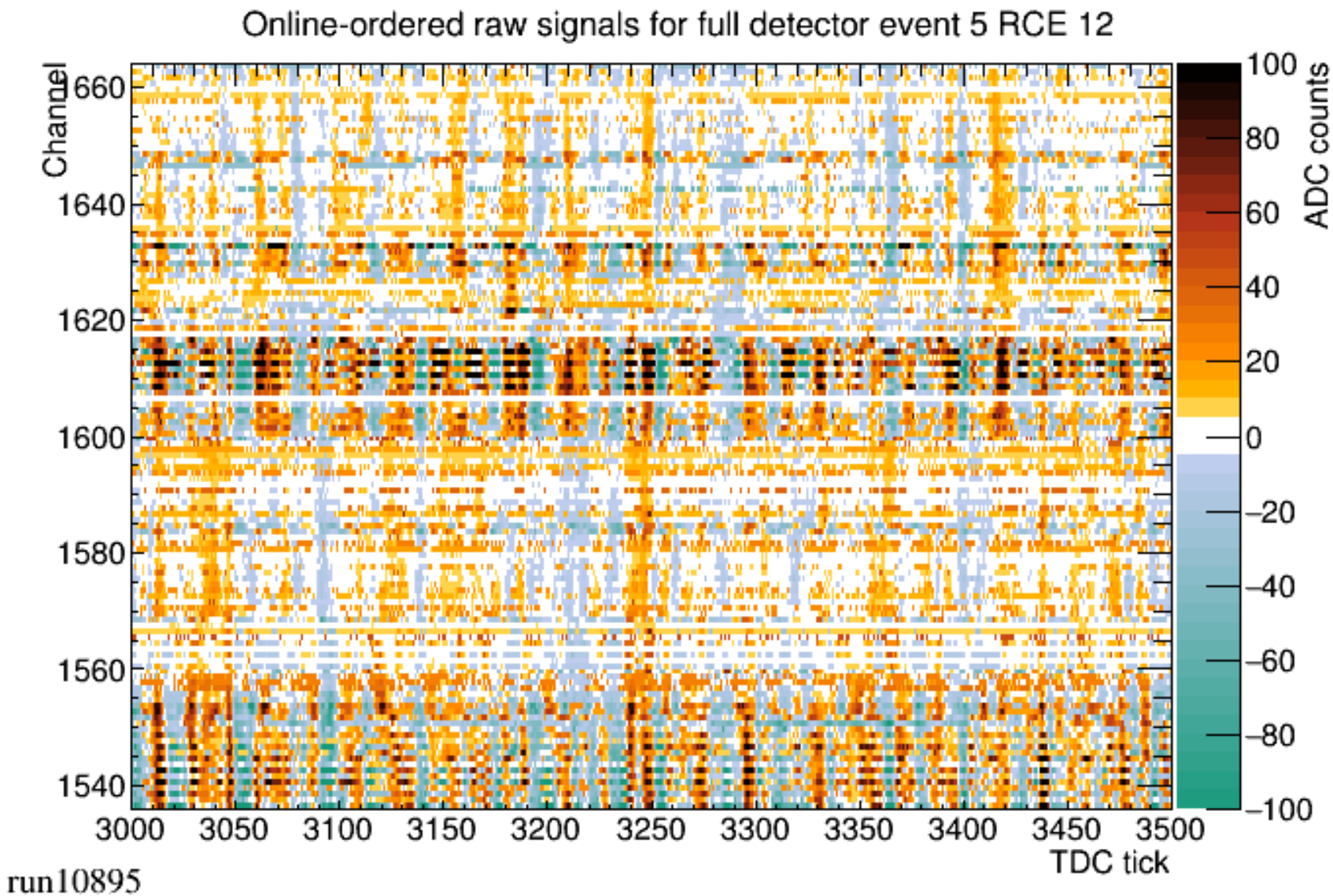
RCE 10


Online-ordered raw signals for full detector event 5 RCE 10
Channel
1400
1380
1360
1340
1320
1300
1280
3000
3050
3100
3150
3200
3250
3300
3350
3400
3450
3500
TDC tick
100
80
60
40
20
0
−20
−40
−60
−80
−100
ADC counts
run10895

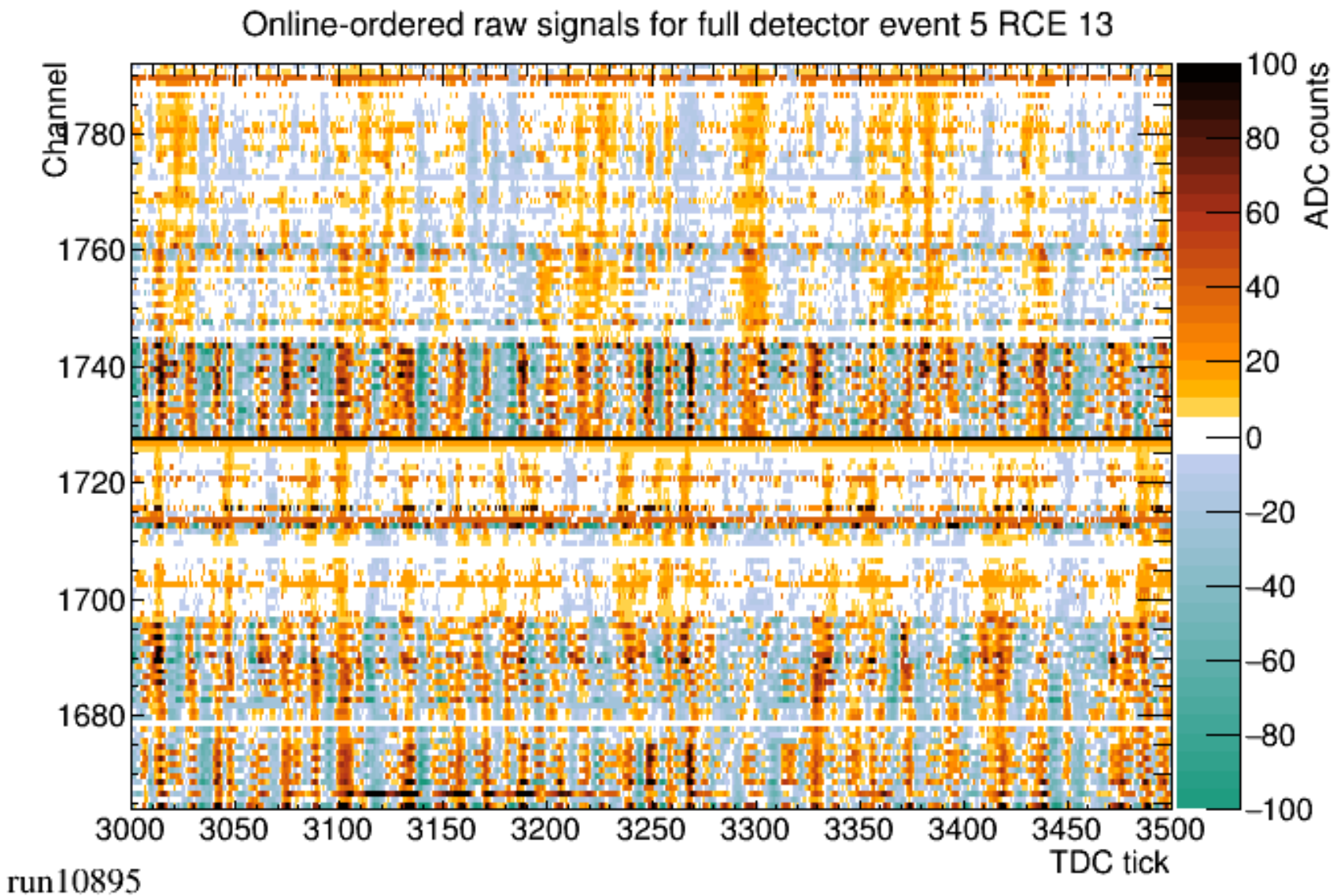
RCE 11


Online-ordered raw signals for full detector event 5 RCE 11
Channel
1520
1500
1480
1460
1440
1420
3000
3050
3100
3150
3200
3250
3300
3350
3400
3450
3500
TDC tick
100
80
60
40
20
0
−20
−40
−60
−80
−100
ADC counts
run10895

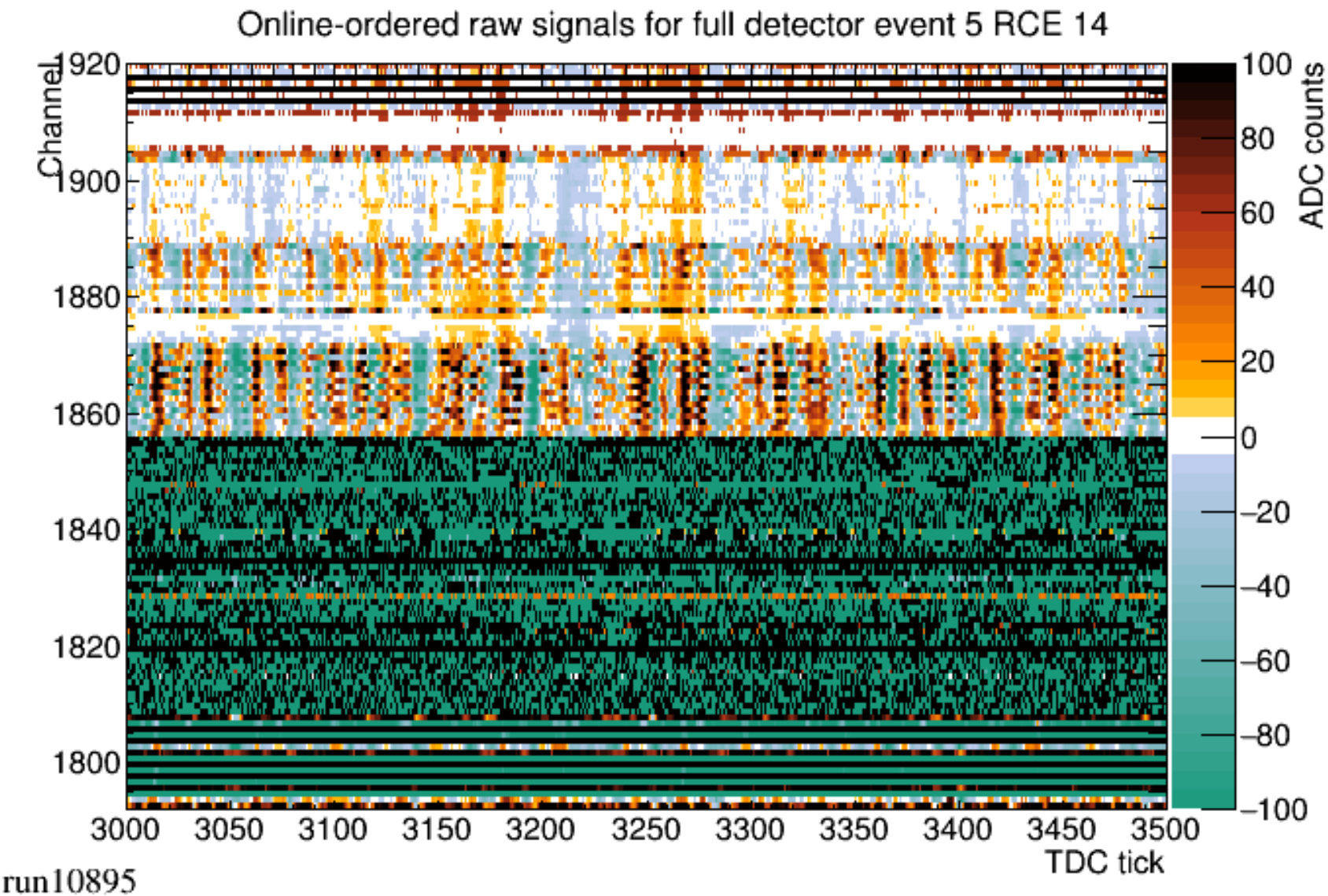
RCE 12


Online-ordered raw signals for full detector event 5 RCE 12
Channel
1660
1640
1620
1600
1580
1560
1540
3000
3050
3100
3150
3200
3250
3300
3350
3400
3450
3500
TDC tick
100
80
60
40
20
0
−20
−40
−60
−80
−100
ADC counts
run10895

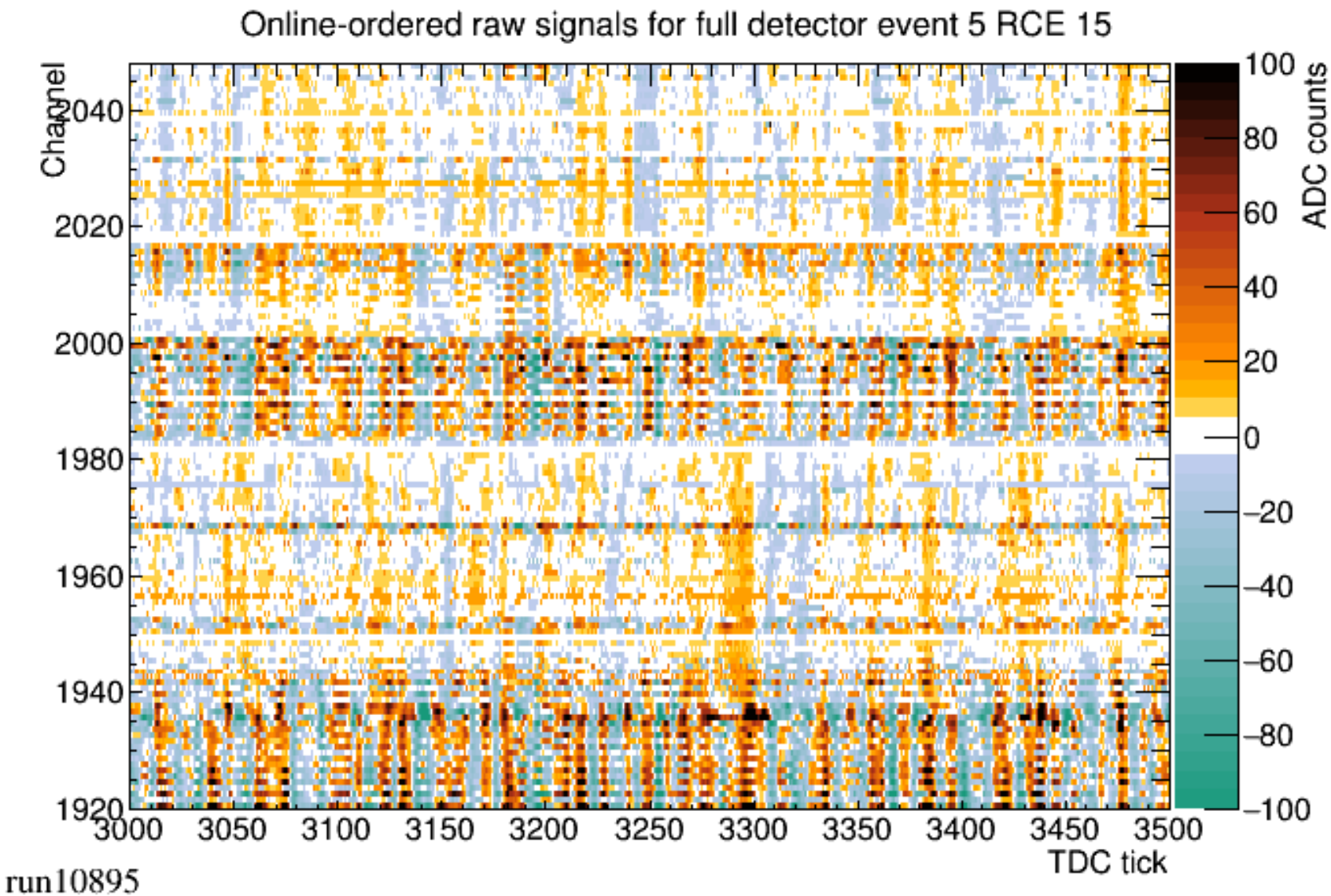
RCE 13


Online-ordered raw signals for full detector event 5 RCE 13
Channel
1780
1760
1740
1720
1700
1680
3000
3050
3100
3150
3200
3250
3300
3350
3400
3450
3500
TDC tick
100
80
60
40
20
0
−20
−40
−60
−80
−100
ADC counts
run10895

RCE 14


Online-ordered raw signals for full detector event 5 RCE 14
Channel
1920
1900
1880
1860
1840
1820
1800
3000
3050
3100
3150
3200
3250
3300
3350
3400
3450
3500
TDC tick
100
80
60
40
20
0
−20
−40
−60
−80
−100
ADC counts
run10895

RCE 15


Online-ordered raw signals for full detector event 5 RCE 15
Channel
2040
2020
2000
1980
1960
1940
1920
3000
3050
3100
3150
3200
3250
3300
3350
3400
3450
3500
TDC tick
100
80
60
40
20
0
−20
−40
−60
−80
−100
ADC counts
run10895

Comments

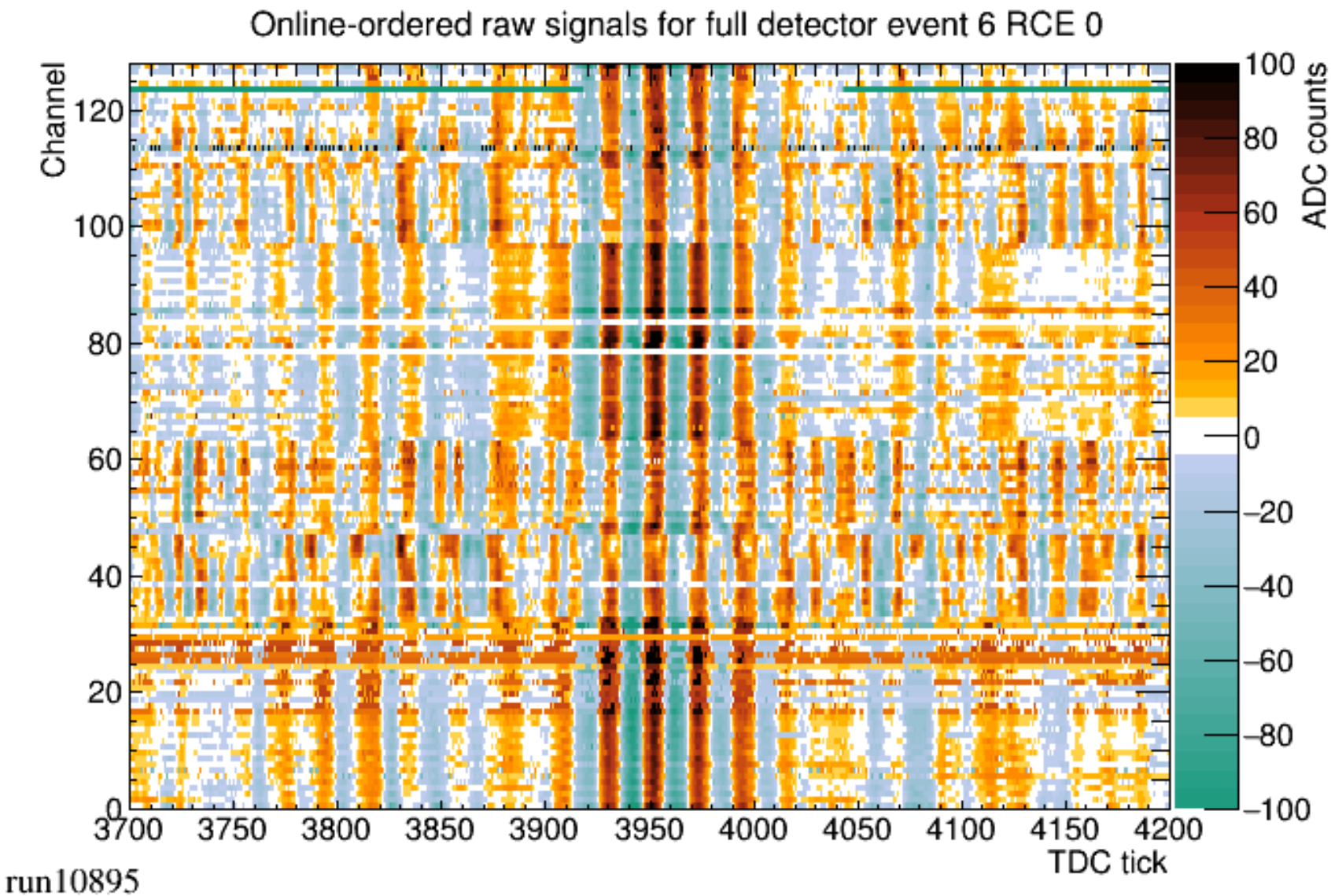
Plots show noise for run 10895

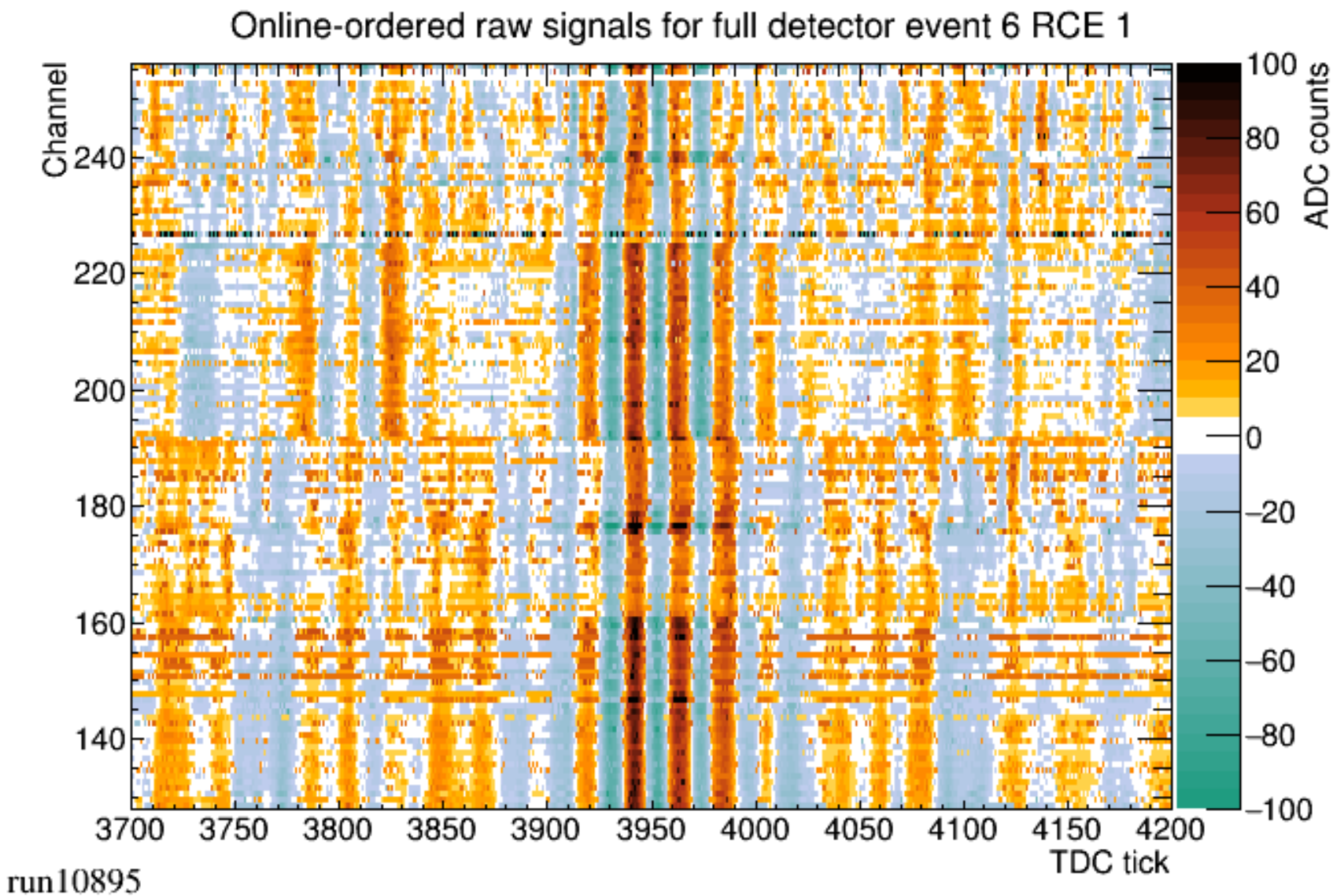
- LAr is dirty but cold
- Noise level is high: 10-20 ADC counts in the best regions
- My understanding is that we don't expect the noise to get better
  - Have to warm up to access electronics

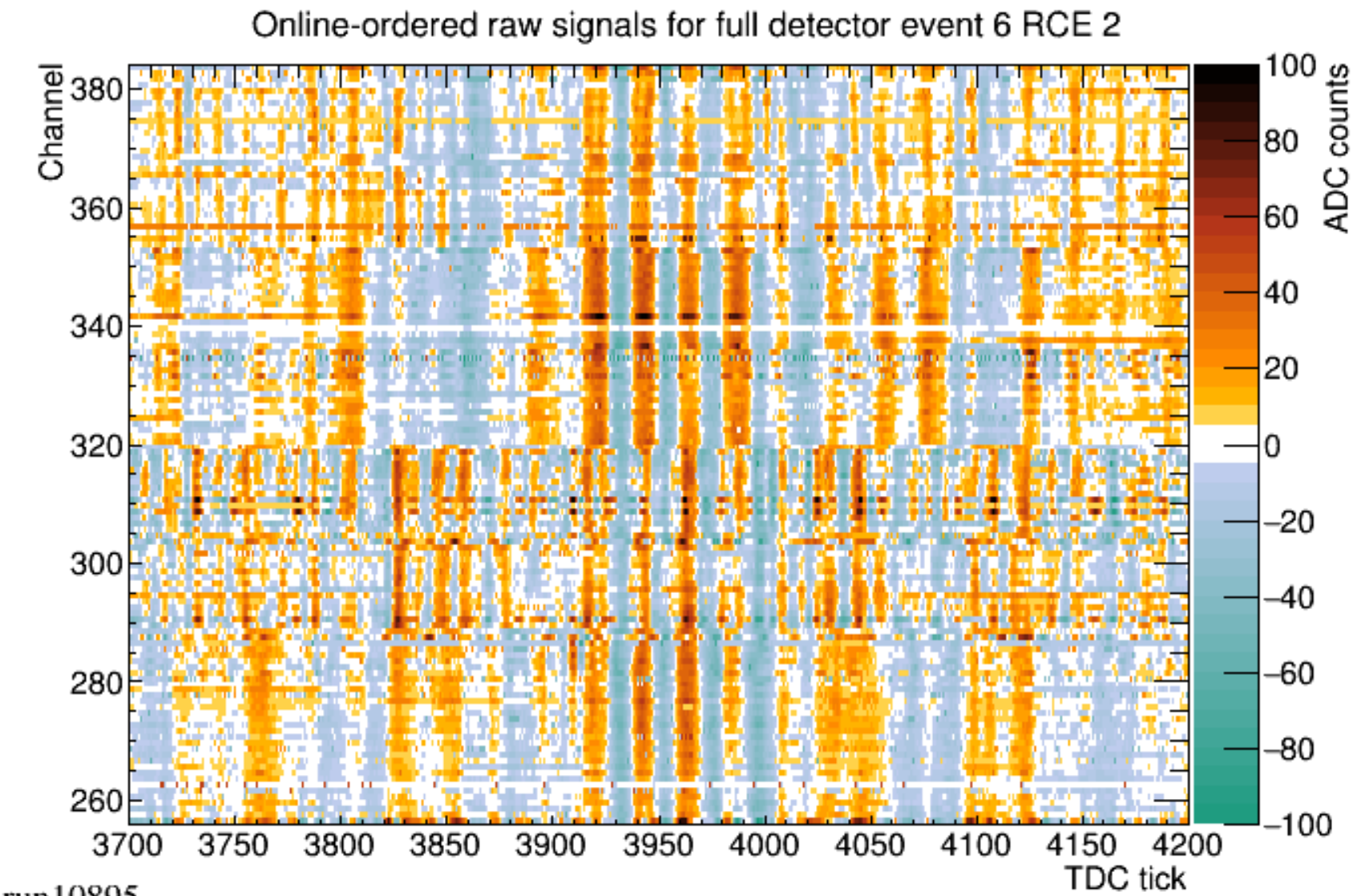
Hope to use coherent noise subtraction to clean things up

- But not so easy
- Little coherence across the full detector
  - Some coherence across 128-channel RCEs
  - But much of the noise is only coherent across 16-channel ¼-RCEs
  - And some cases only across eight channels
- And event when coherent, the amplitude varies by channel

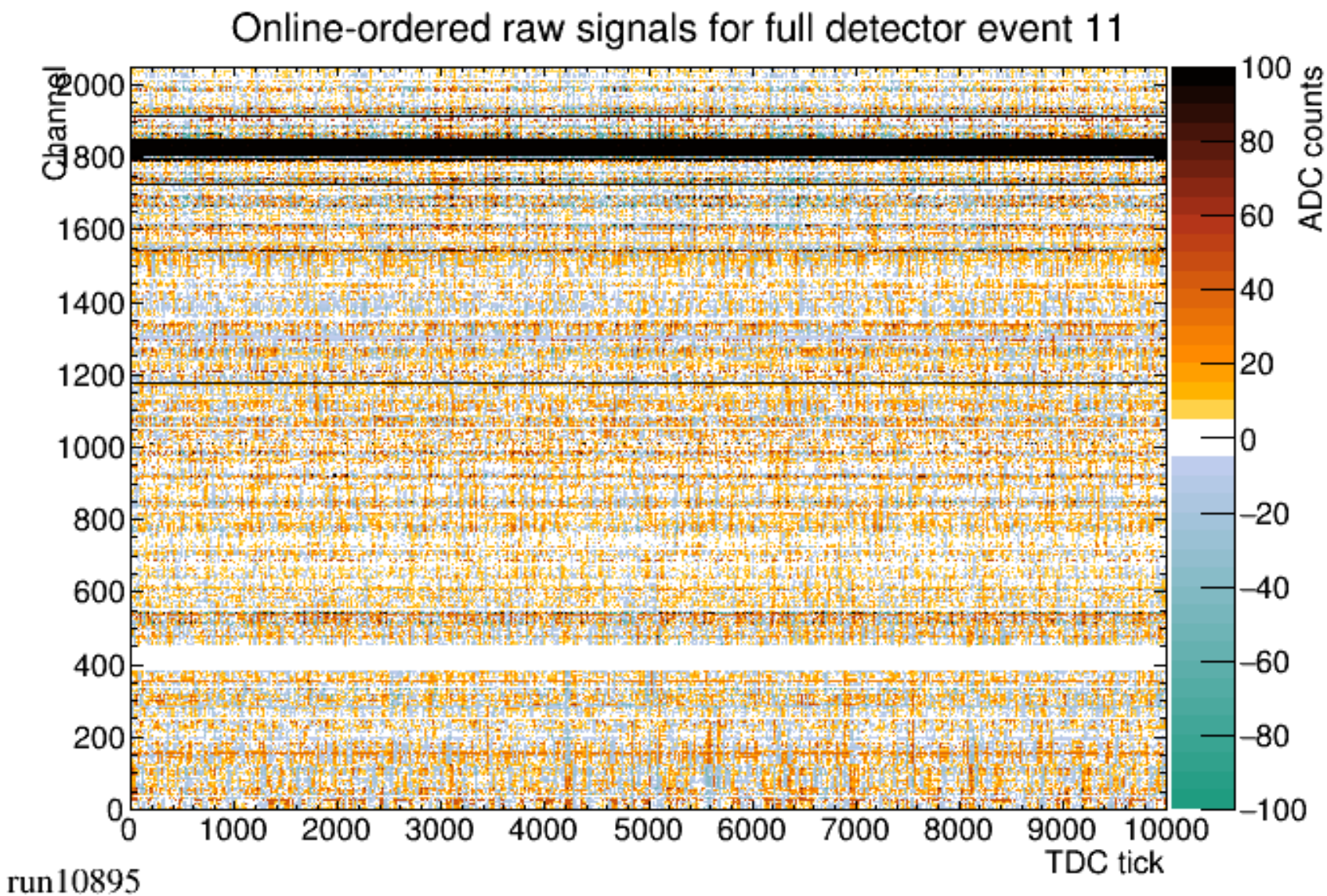
Extra plots

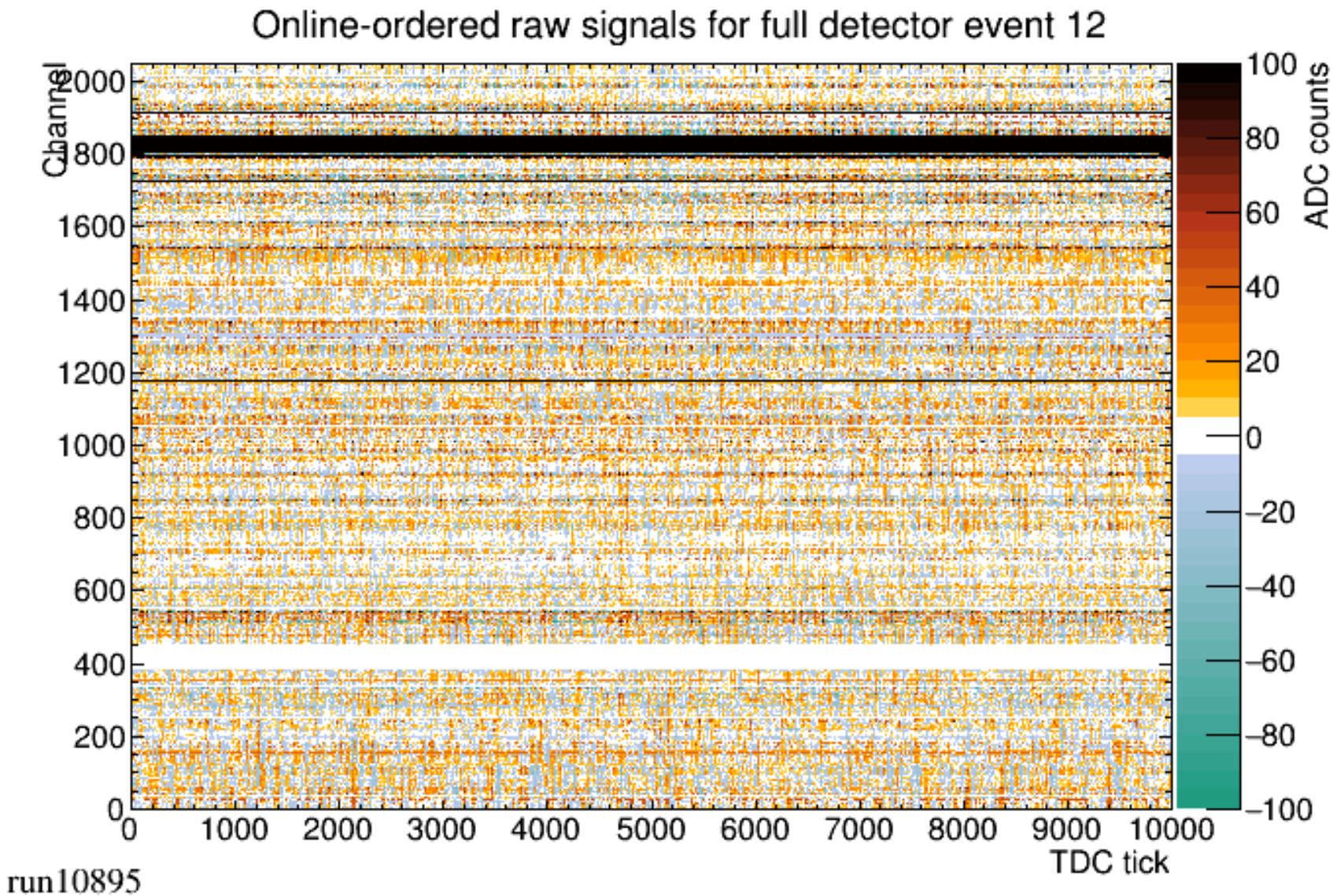

Online-ordered raw signals for full detector event 6 RCE 0
Channel
0
20
40
60
80
100
120
3700
3750
3800
3850
3900
3950
4000
4050
4100
4150
4200
TDC tick
ADC counts
100
80
60
40
20
0
−20
−40
−60
−80
−100
run10895

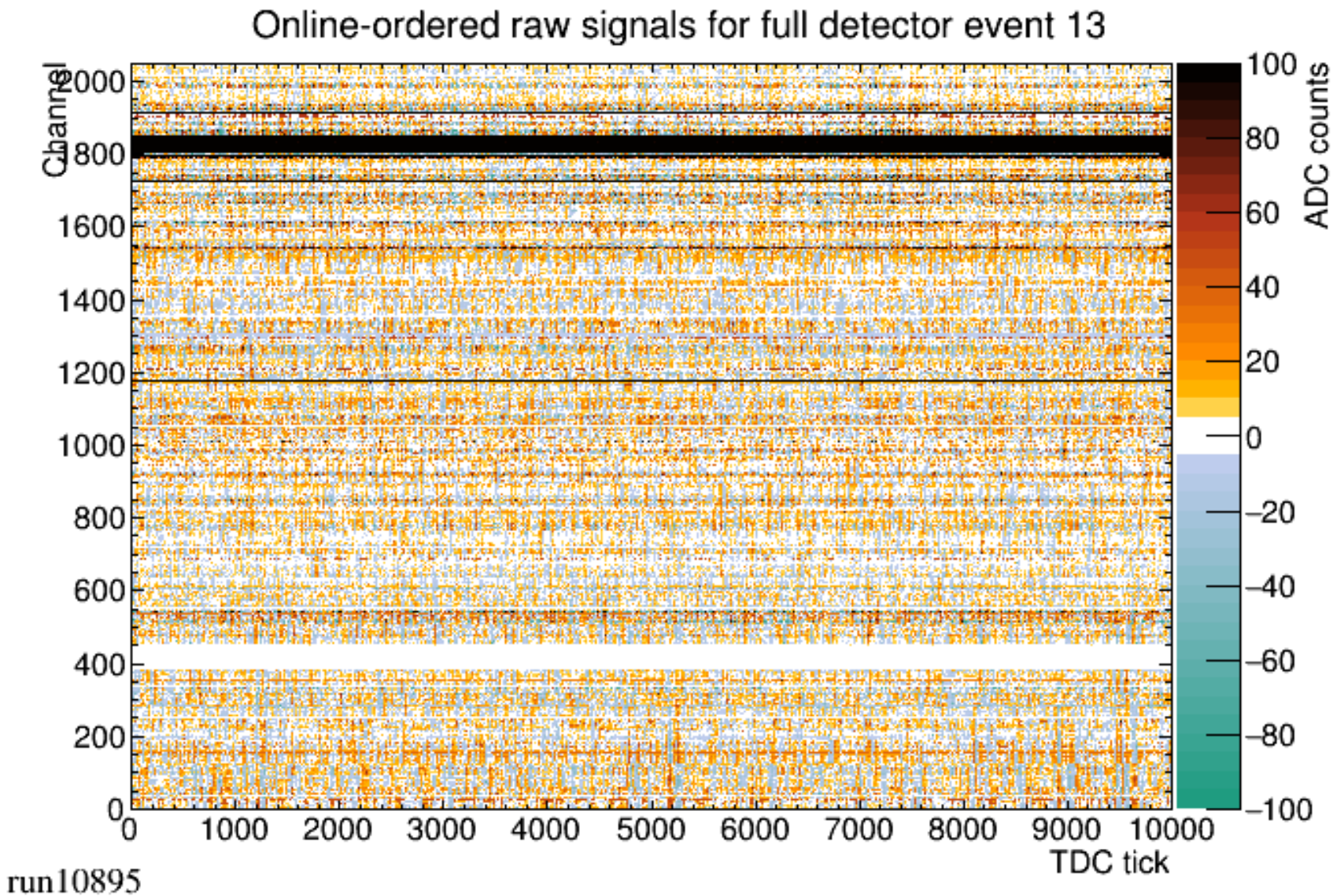

Online-ordered raw signals for full detector event 6 RCE 1
Channel
240
220
200
180
160
140
3700
3750
3800
3850
3900
3950
4000
4050
4100
4150
4200
TDC tick
100
80
60
40
20
0
−20
−40
−60
−80
−100
ADC counts
run10895

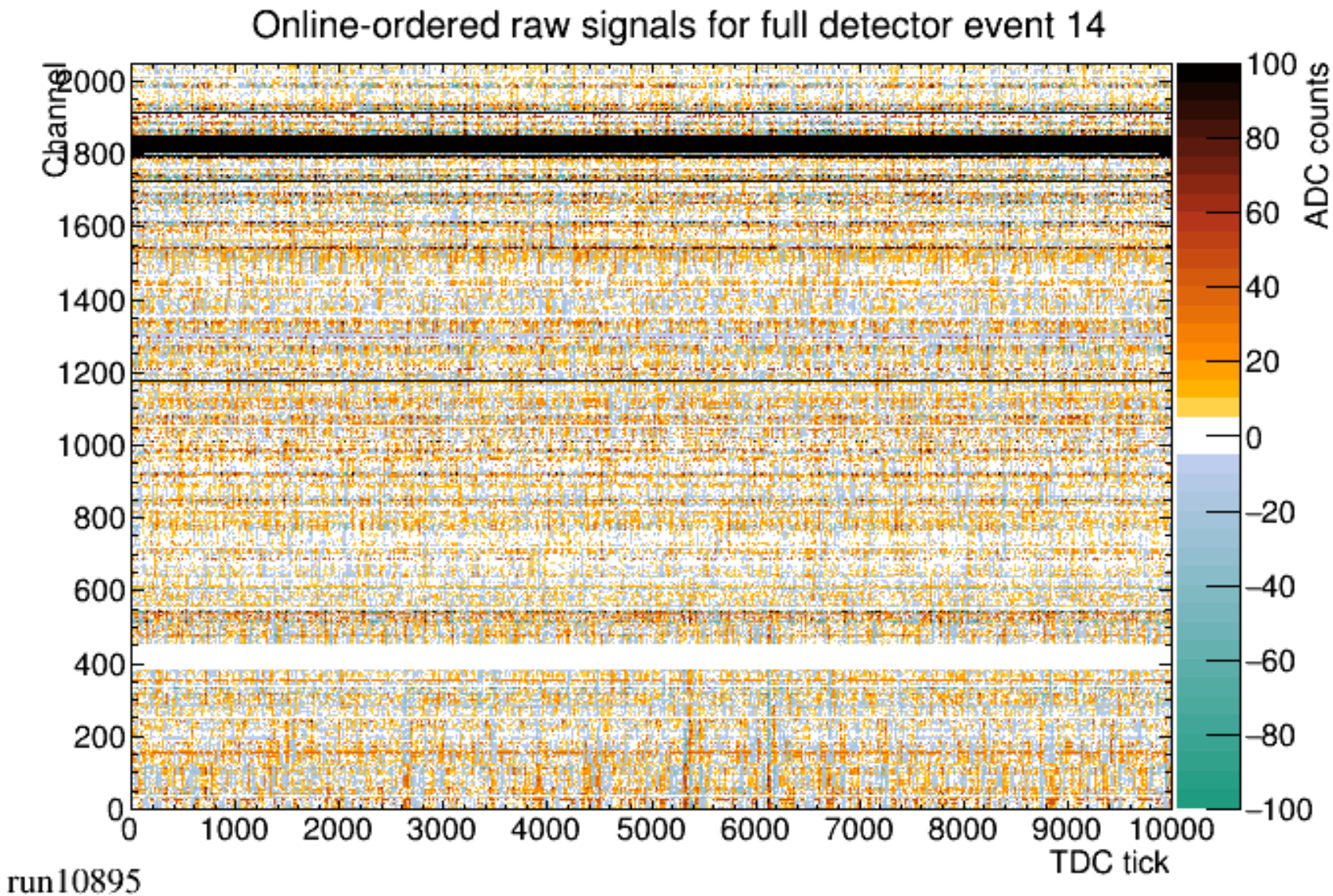

Online-ordered raw signals for full detector event 6 RCE 2
Channel
380
360
340
320
300
280
260
3700
3750
3800
3850
3900
3950
4000
4050
4100
4150
4200
TDC tick
100
80
60
40
20
0
−20
−40
−60
−80
−100
ADC counts

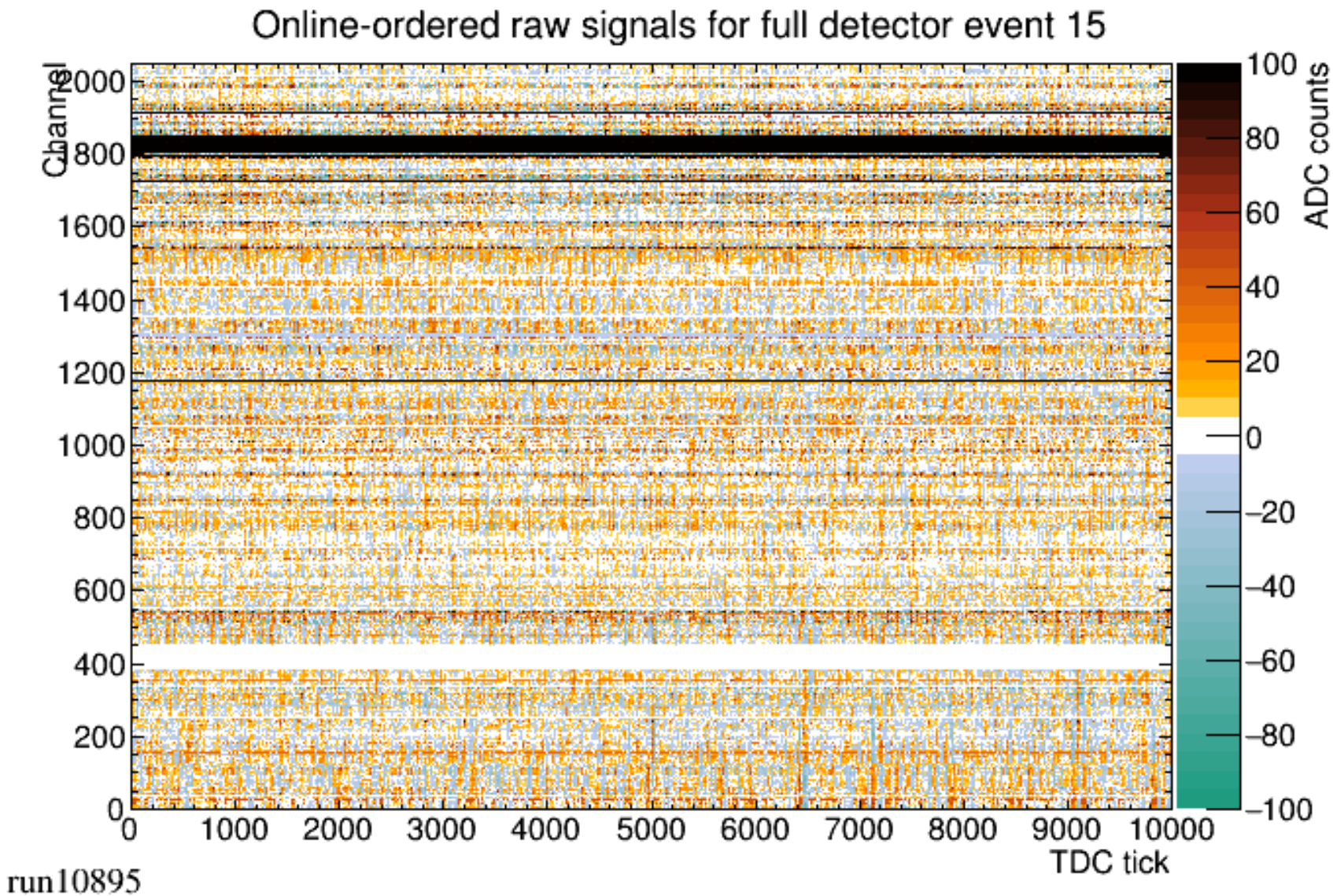
run10895

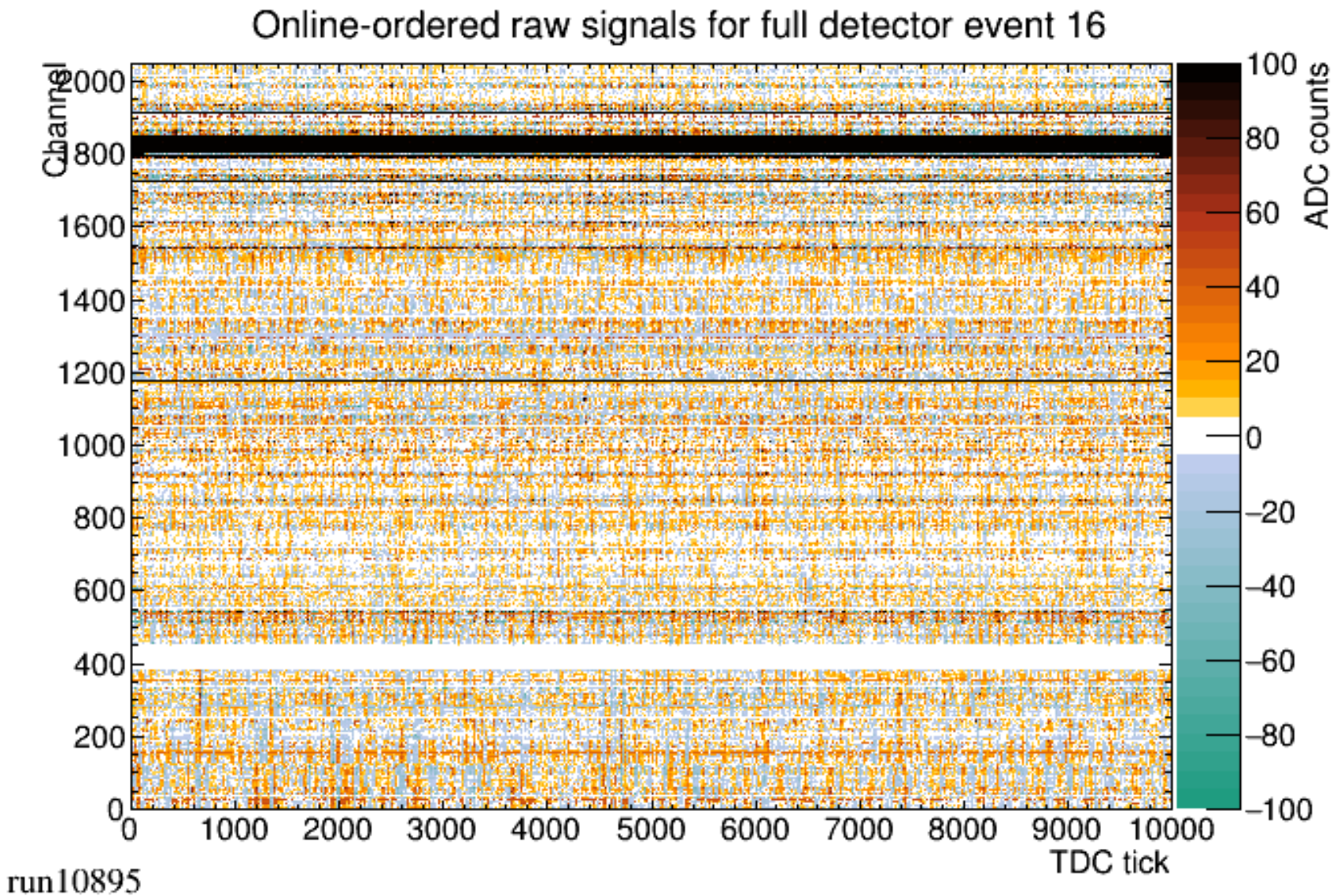

Online-ordered raw signals for full detector event 11
Channel
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
TDC tick
100
80
60
40
20
0
−20
−40
−60
−80
−100
ADC counts
run10895

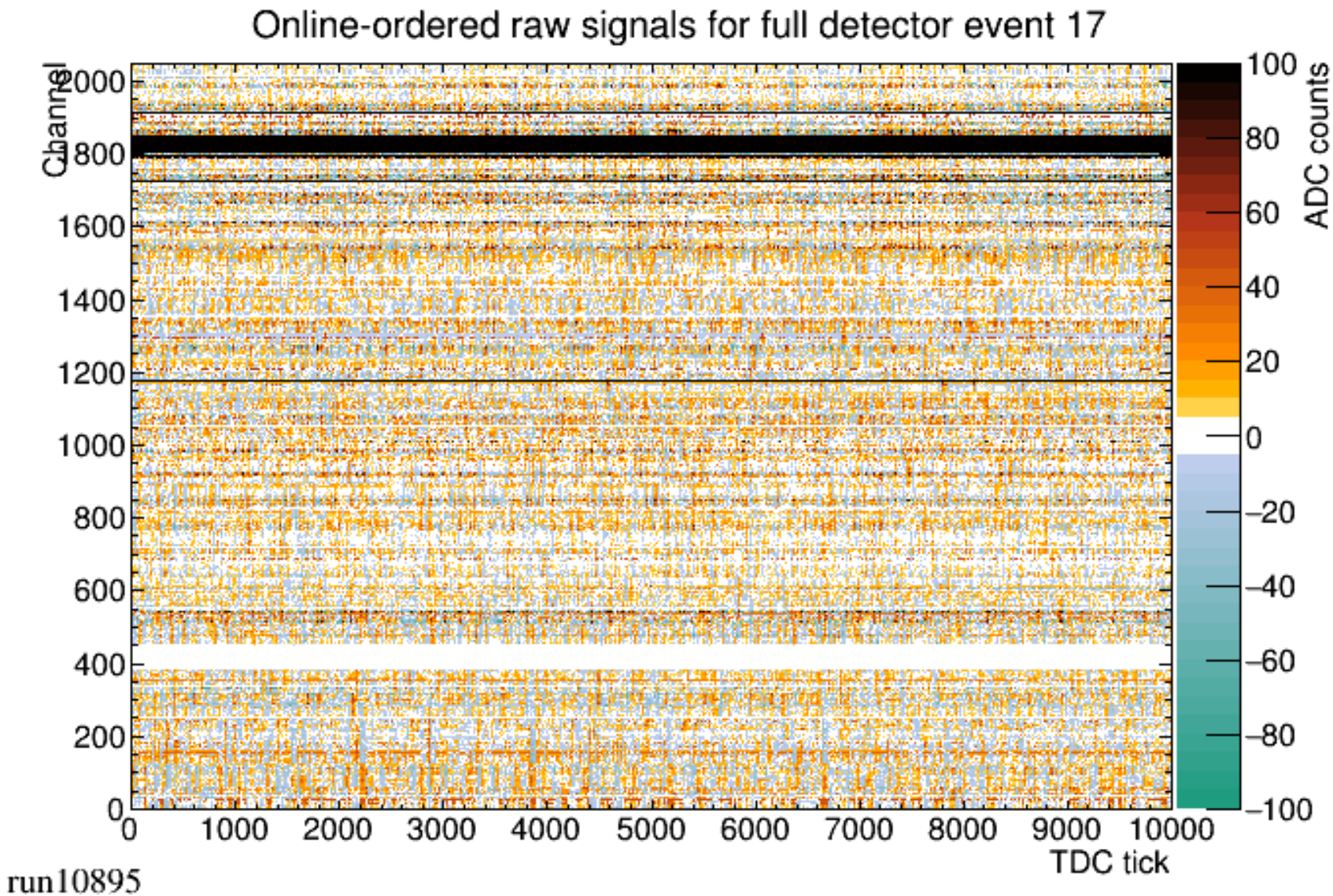

Online-ordered raw signals for full detector event 12
Channel
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
TDC tick
100
80
60
40
20
0
−20
−40
−60
−80
−100
ADC counts
run10895

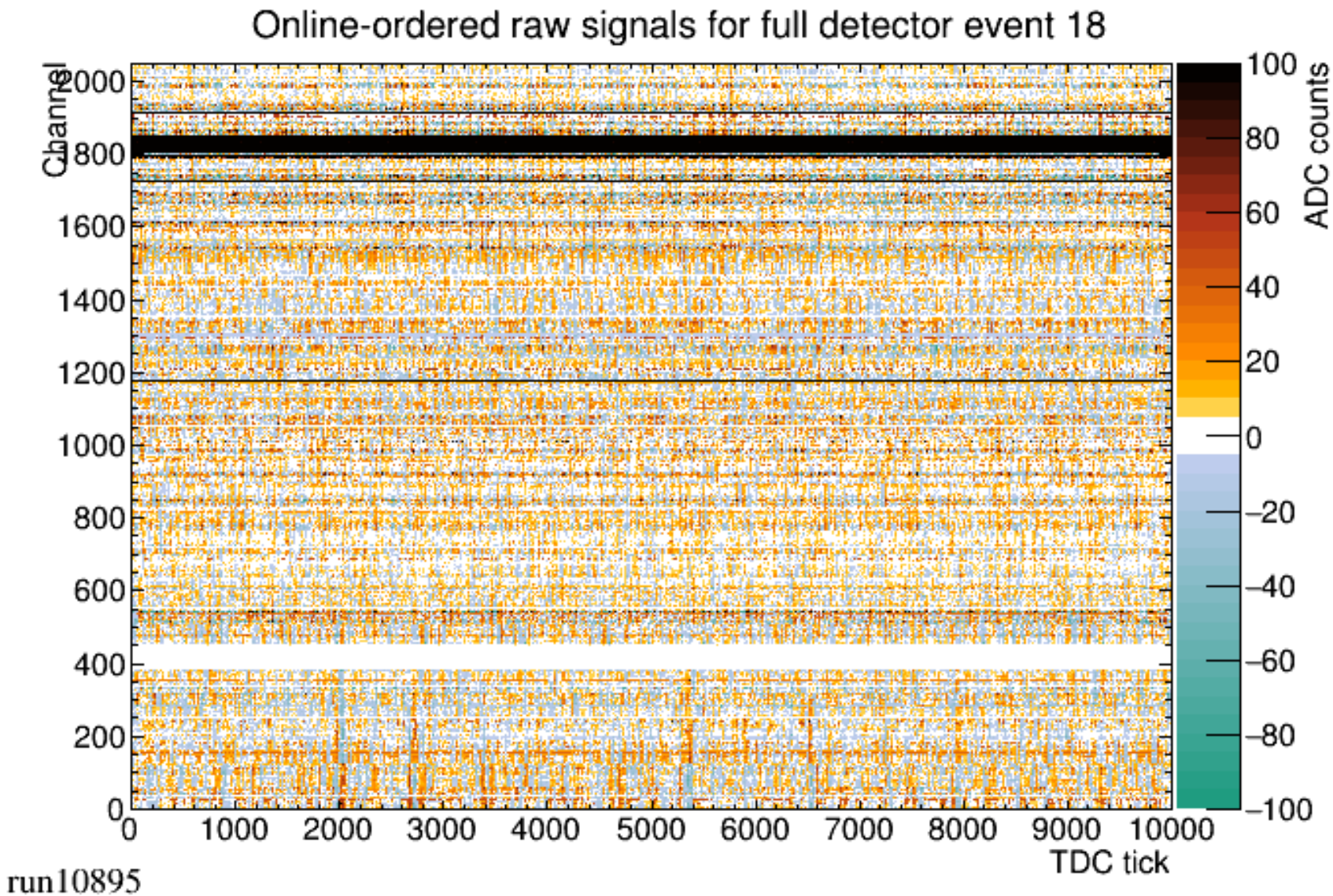

Online-ordered raw signals for full detector event 13
Channel
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
TDC tick
100
80
60
40
20
0
−20
−40
−60
−80
−100
ADC counts
run10895

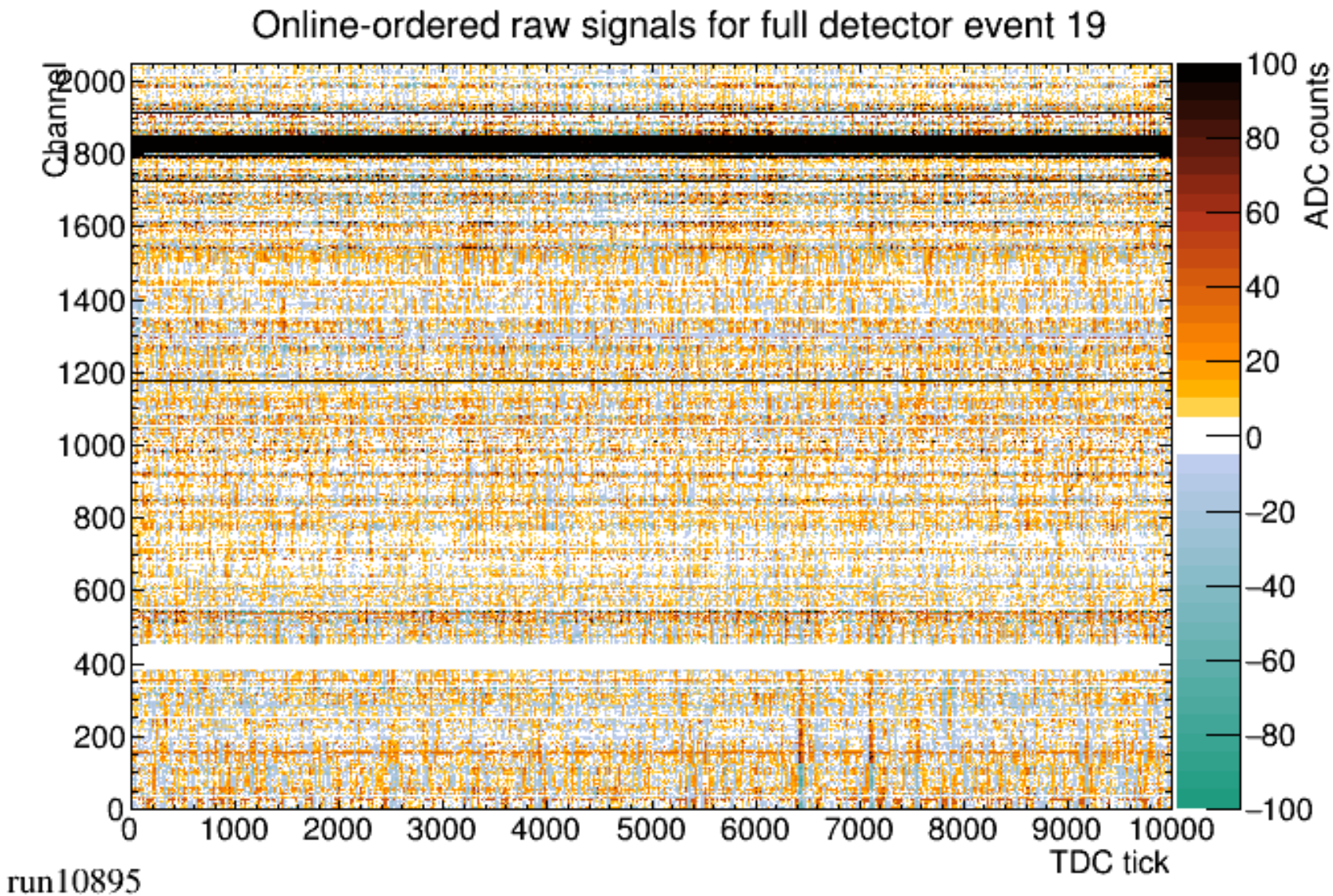

Online-ordered raw signals for full detector event 14
Channel
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
TDC tick
100
80
60
40
20
0
−20
−40
−60
−80
−100
ADC counts
run10895

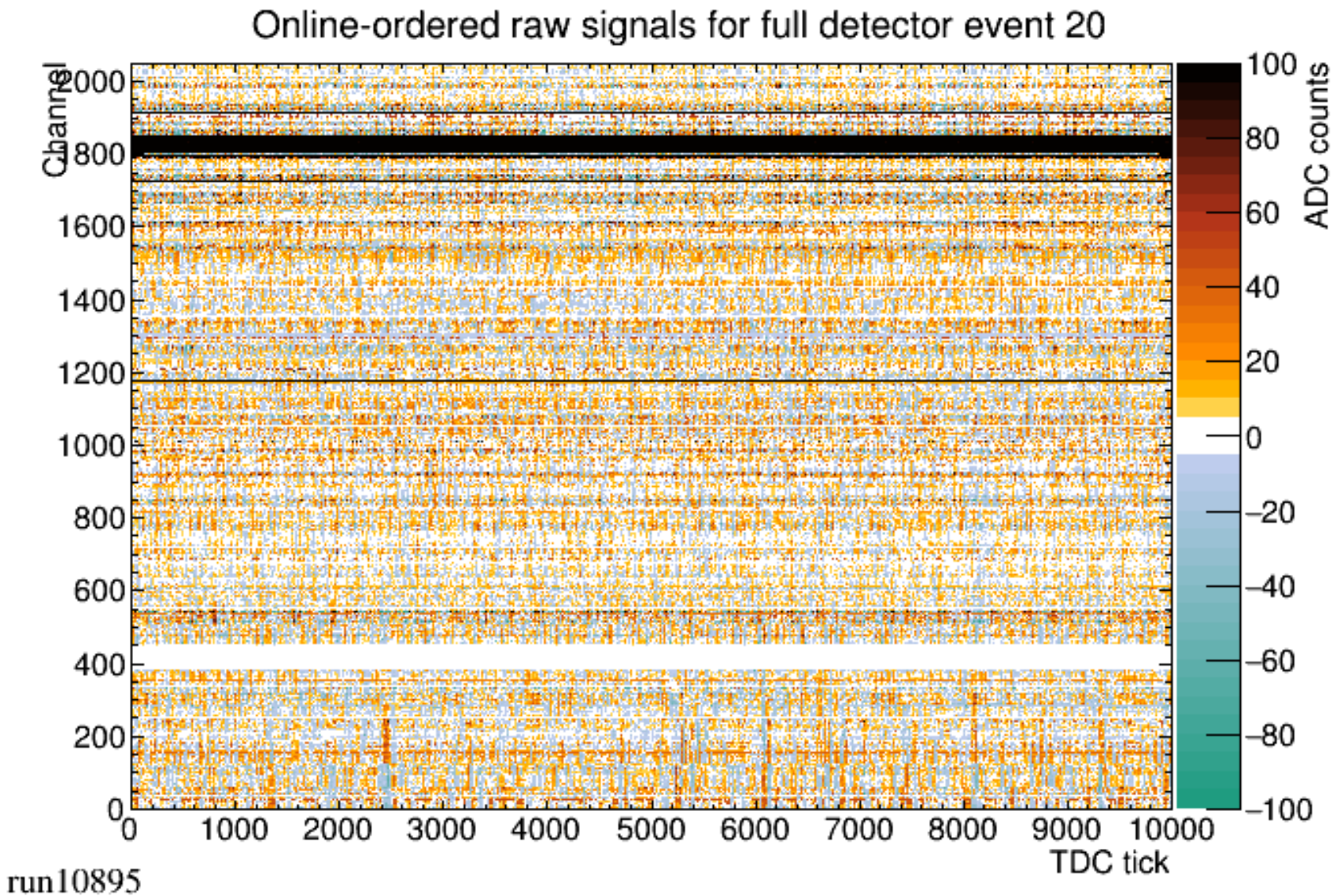

Online-ordered raw signals for full detector event 15
Channel
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
TDC tick
100
80
60
40
20
0
−20
−40
−60
−80
−100
ADC counts
run10895


Online-ordered raw signals for full detector event 16
Channel
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
TDC tick
100
80
60
40
20
0
−20
−40
−60
−80
−100
ADC counts
run10895


Online-ordered raw signals for full detector event 17
Channel
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
TDC tick
100
80
60
40
20
0
−20
−40
−60
−80
−100
ADC counts
run10895


Online-ordered raw signals for full detector event 18
Channel
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
TDC tick
100
80
60
40
20
0
−20
−40
−60
−80
−100
ADC counts
run10895


Online-ordered raw signals for full detector event 19
Channel
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
TDC tick
100
80
60
40
20
0
−20
−40
−60
−80
−100
ADC counts
run10895


Online-ordered raw signals for full detector event 20
Channel
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
10000
TDC tick
100
80
60
40
20
0
−20
−40
−60
−80
−100
ADC counts
run10895