

# ProtoDUNE Photon Detection Update

## January, 2019

Chris Macias

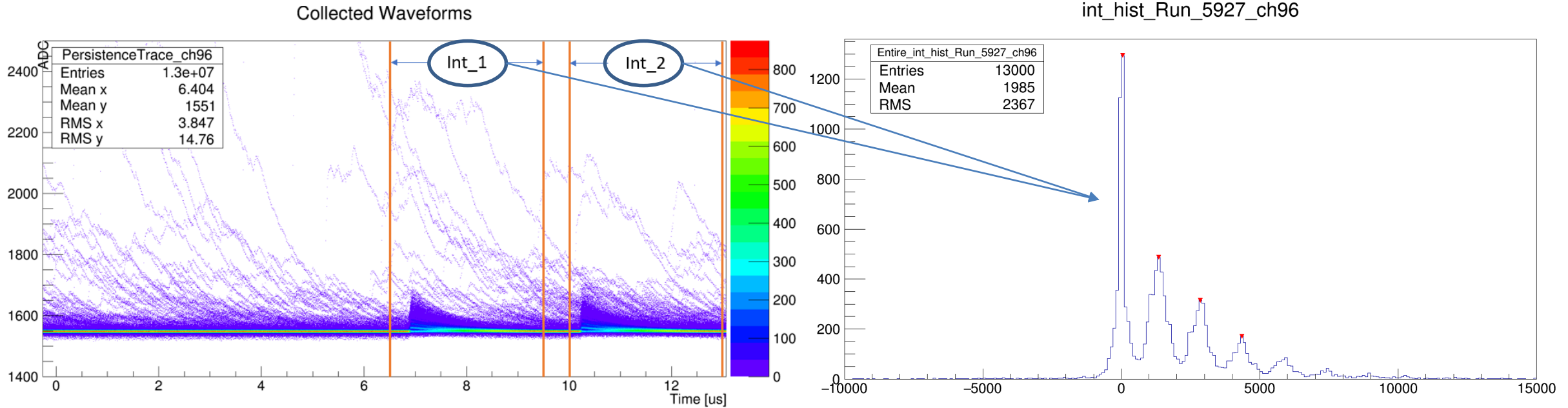
Indiana University, Caltech, FNAL

ProtoDUNE PD Update, January, 2019

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# SensL Calibrations for APAs 1-3

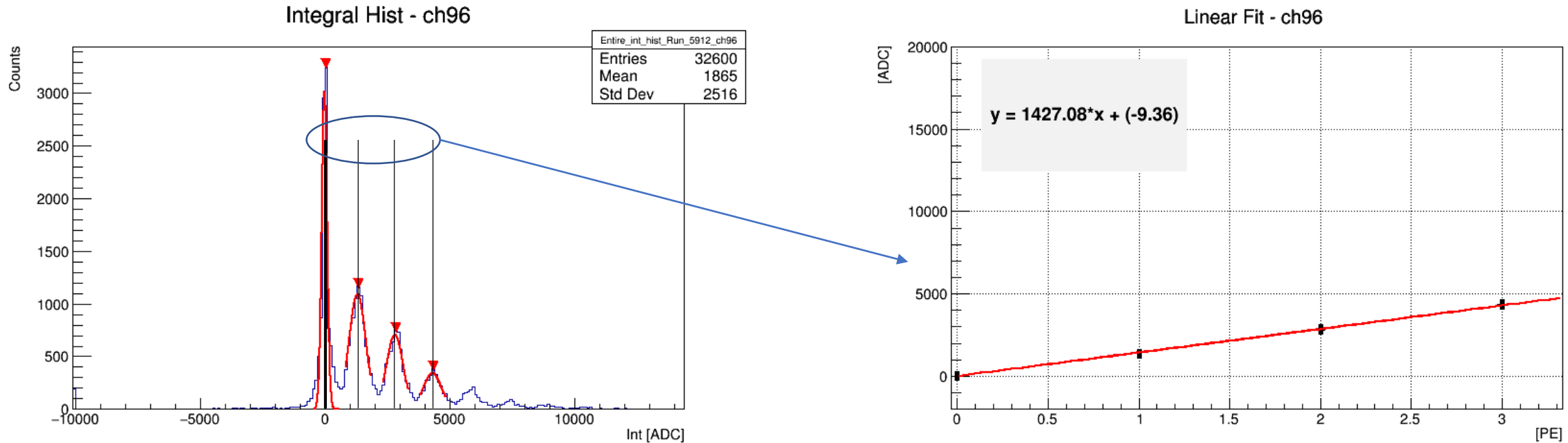
Run 5912 & 5927



- Pedestal calculated -> mean ([10,40] samples)
- Fixed integration interval -> [6.5,9.5] & [10.0,13.0]  $\mu\text{s}$  ([975,1425] & [1500,1950] samples)
- Bin integration values, Int\_1 & Int\_2, per 2000 sample event.

# SensL Calibrations for APAs 1-3

Run 5912 & 5927



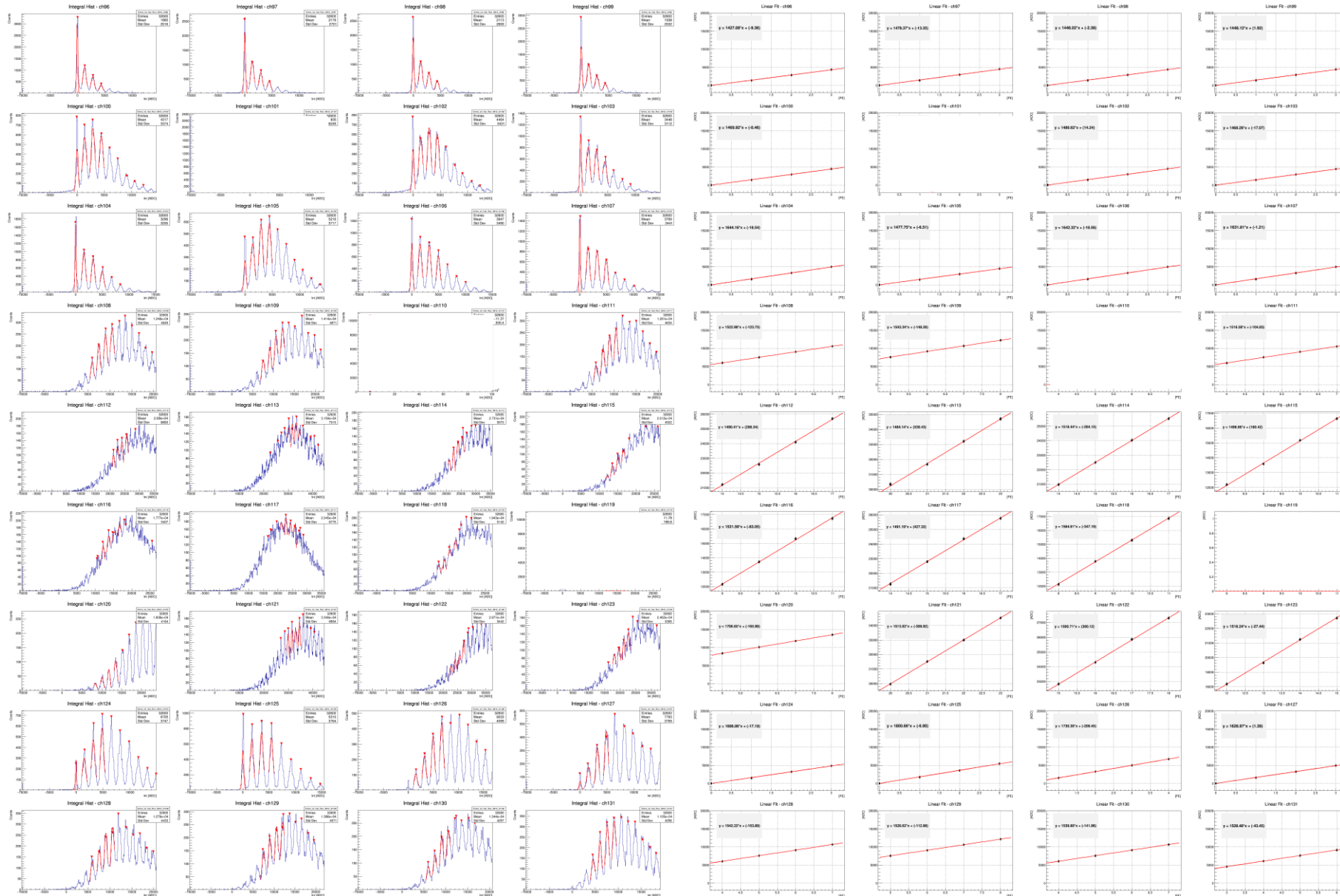
- Fit the lowest 4 consecutive PE peaks with a gaussian, using TF1 fit.
- Linear Fit, using
  - mean of each peak
  - sigma as error

# SensL Calibrations for APA 3

APA3-module	ch_x	ch_x+1	ch_x+2	ch_x+3
1	1427.08	1478.37	1448.02	1448.12
2	1469.92	-	1480.62	1468.28
3	1644.16	1477.75	1642.32	1631.81
5	1522.98	1543.34	-	1516.58
6	1490.41	1484.14	1518.44	1496.66
7	1531.59	1491.19	1564.61	-
8	1706.65	1513.92	1500.71	1516.24
9	1606.06	1800.66	1730.3	1626.97
10	1542.22	1528.62	1539.8	1528.48

# APA 3 SensL Fits

Run 5912 & 5927

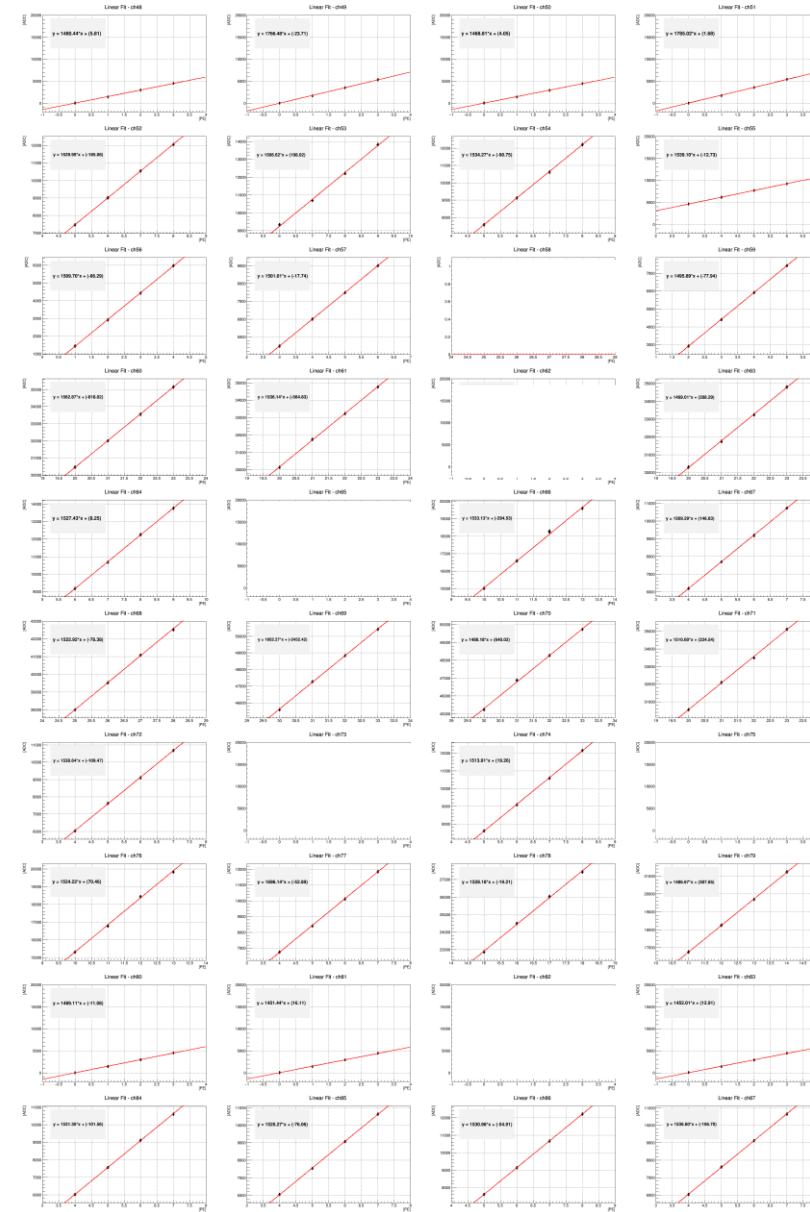
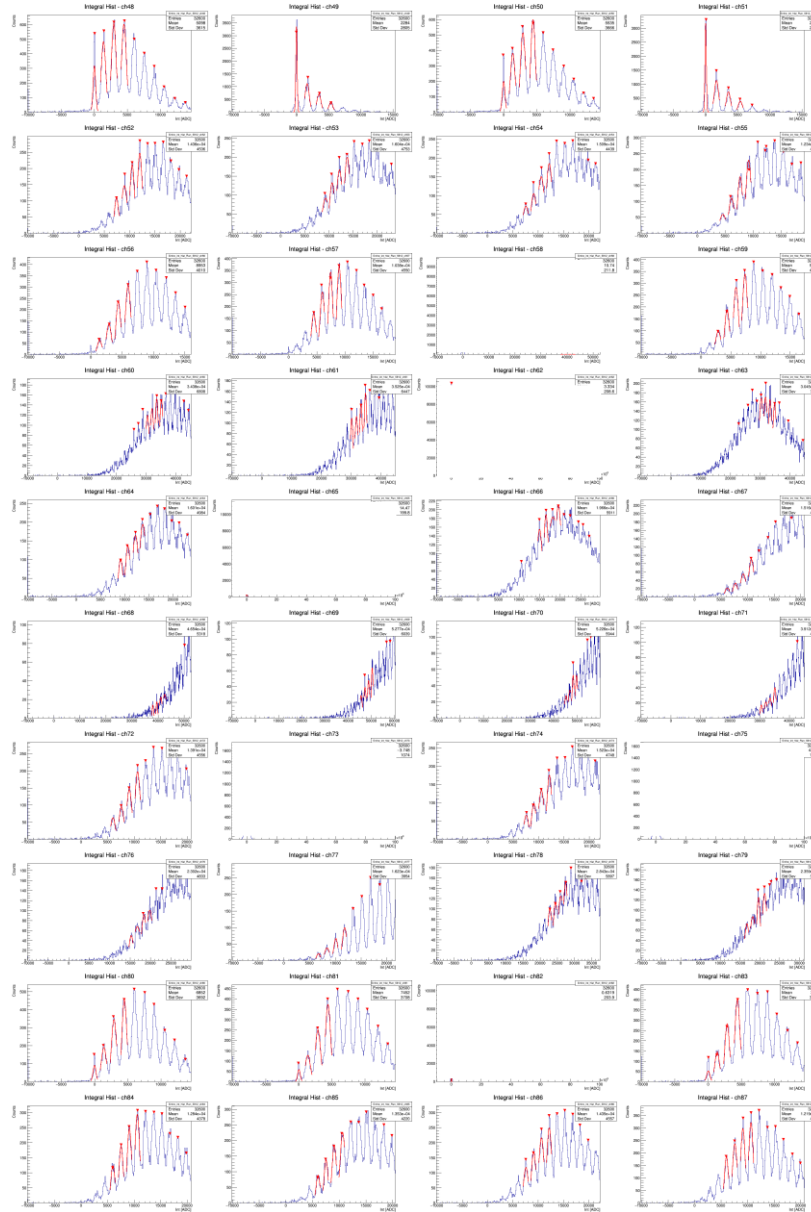


# SensL Calibrations for APAs 2

APA2-module	ch_x	ch_x+1	ch_x+2	ch_x+3
1	1480.44	1766.48	1468.81	1785.02
2	1529.99	1506.62	1534.27	1539.1
3	1509.7	1501.01	-	1495.89
4	1562.87	1536.14	-	1499.01
5	1527.43	-	1533.13	1509.29
6	1522.92	1602.27	1488.18	1510.6
7	1538.64	-	1513.91	-
8	1524.22	1696.14	1528.18	1486.67
9	1489.11	1451.44	-	1452.01
10	1531.3	1525.27	1530.96	1536.6

# APA 2 SensL Fits

Run 5912 & 5927



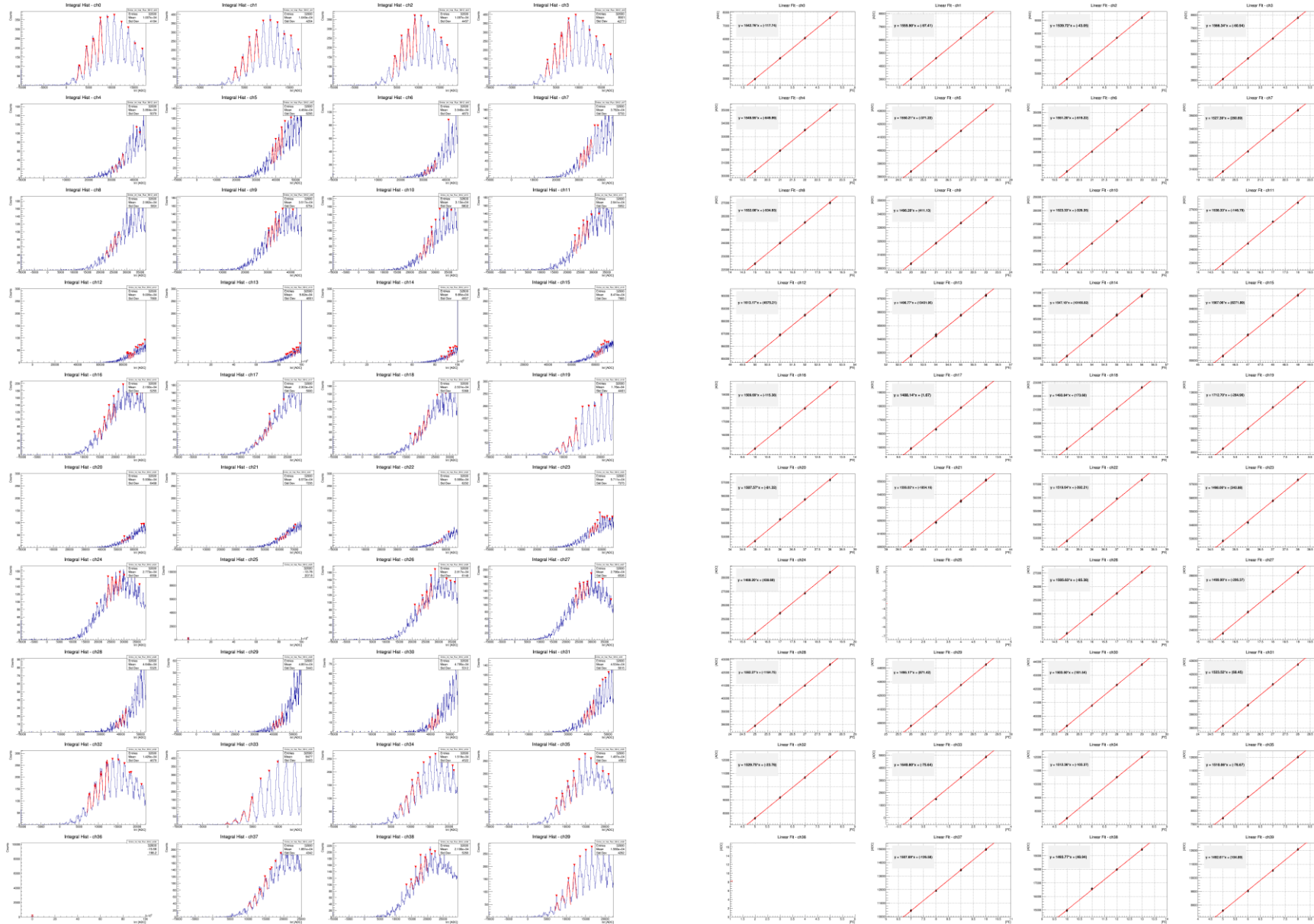
# SensL Calibrations for APAs 1

APA1-module	ch_x	ch_x+1	ch_x+2	ch_x+3
1	1,542.76	1,555.90	1,539.72	1,566.34
2	1,549.95	1,550.21	1,551.20	1,527.39
3	1,532.08	1,496.28	1,523.33	1,538.33
4	1,613.17	1,496.77	1,547.18	1,567.06
5	1,509.69	1,488.14	1,493.84	1,712.70
6	1,507.57	1,556.02	1,519.64	1,498.00
7	1,469.20	-	1,505.63	1,499.90
8	1,562.27	1,495.17	1,503.50	1,523.52
9	1,529.75	1,640.80	1,512.36	1,510.06
10	-	1,507.69	1,493.77	1,492.61




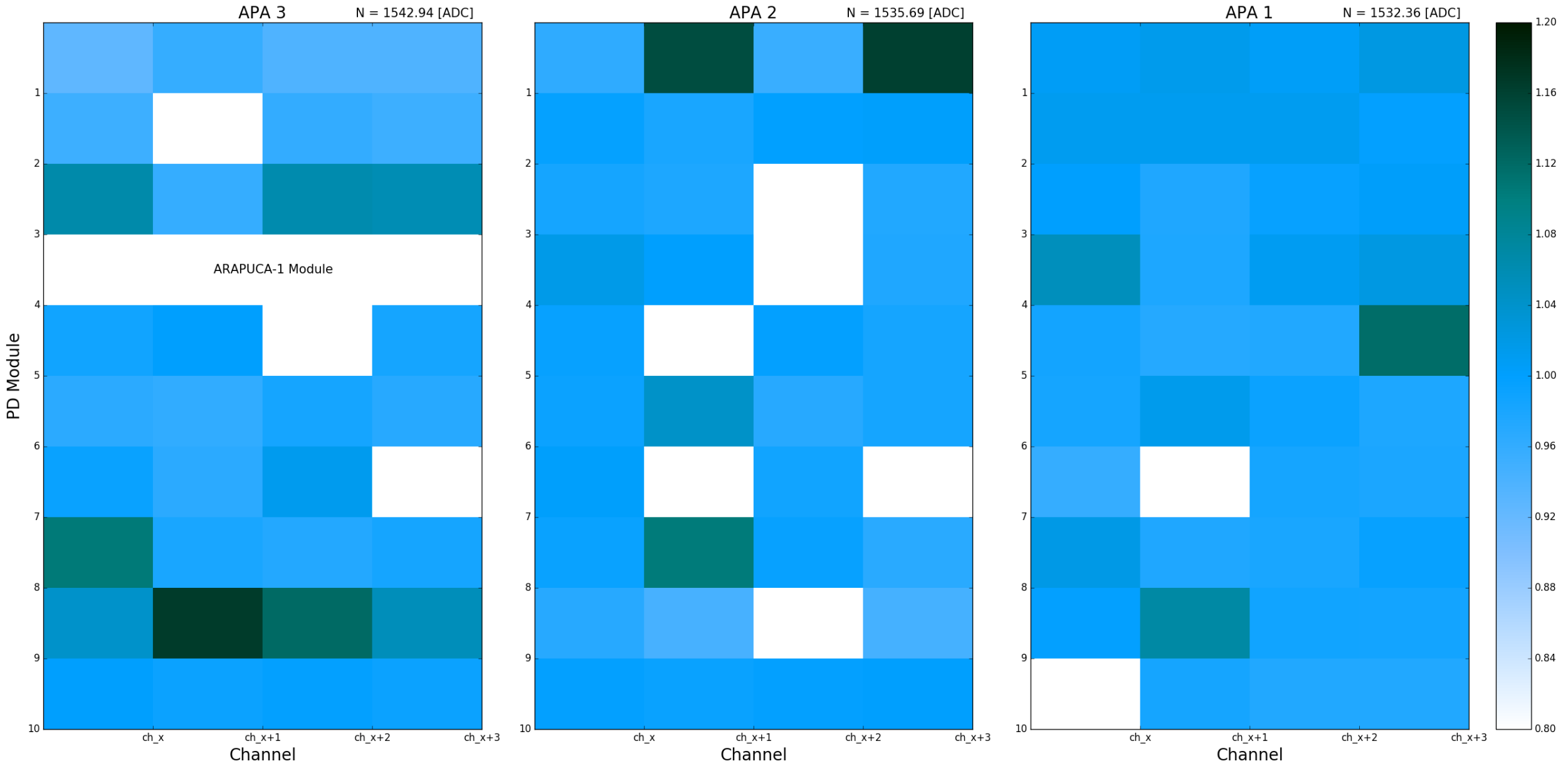
# APA 1 SensL Fits

Run 5912 & 5927




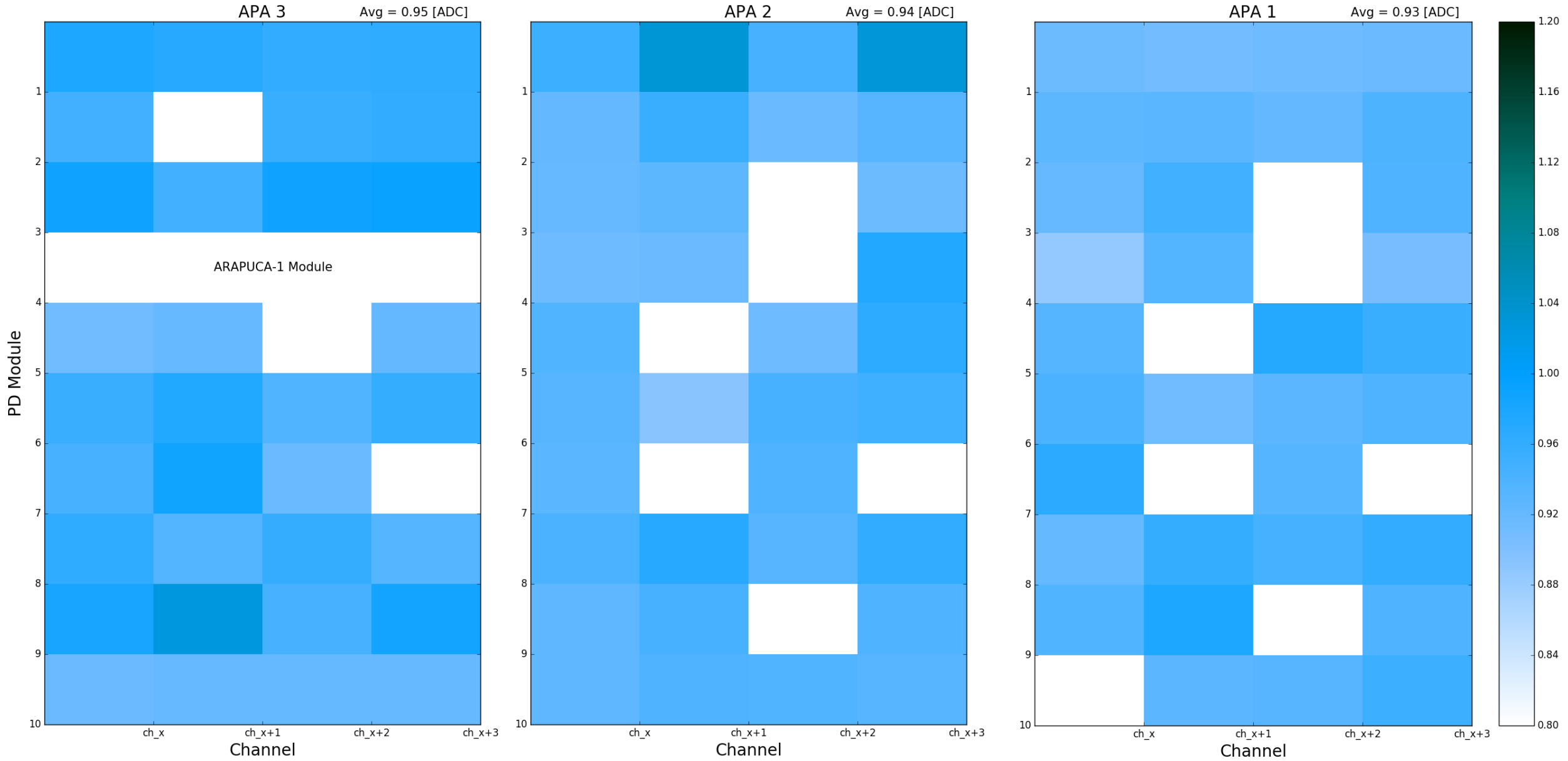
# Calibrations Normalized per APA

 = Ignored



# Calibrations Comparison- Ratio(Bryan/Chris)


 = Ignored

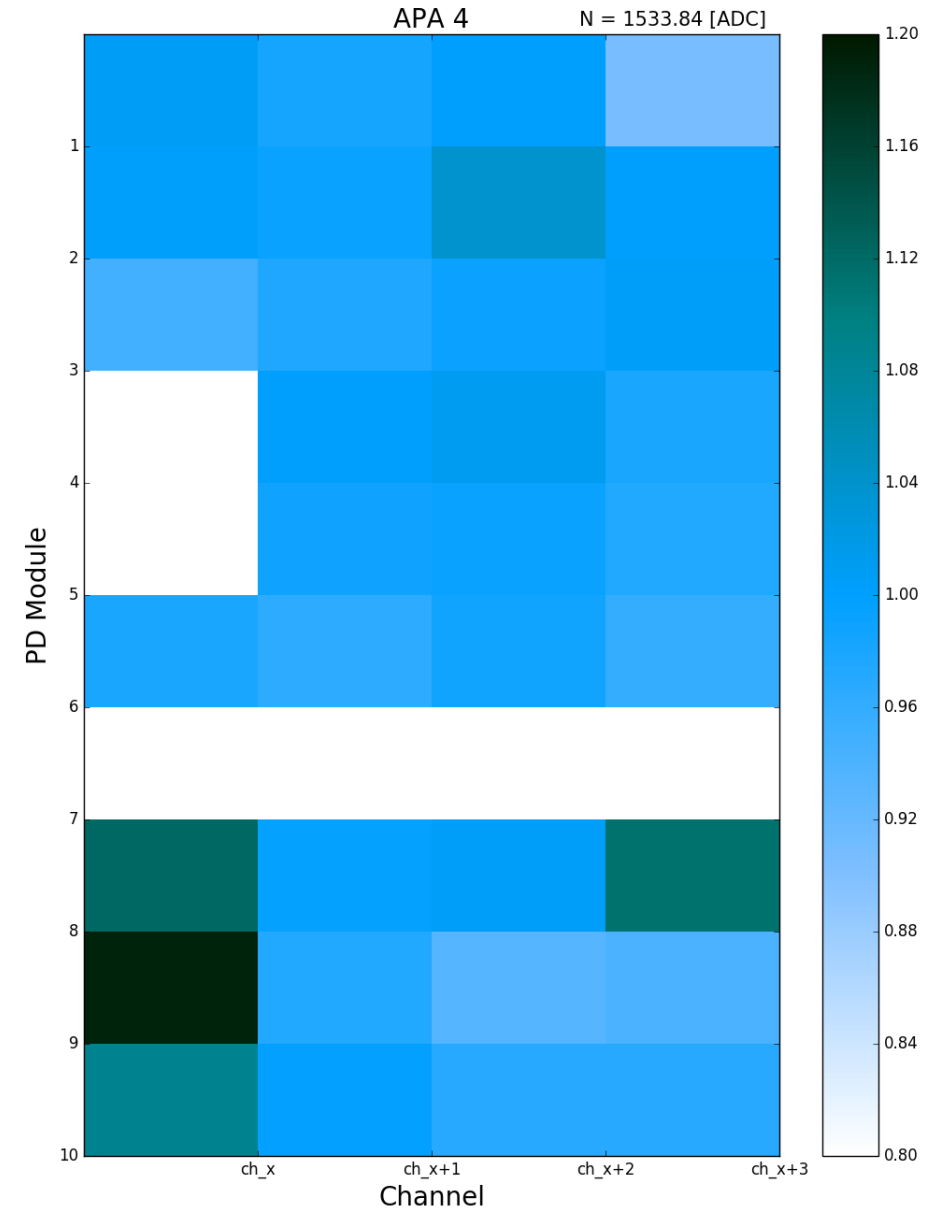


# SensL Calibrations for APAs 4


APA4-module	ch_x	ch_x+1	ch_x+2	ch_x+3
1	1,543.84	1,508.74	1,534.73	1,390.98
2	1,538.71	1,522.98	1,593.67	1,534.92
3	1,453.77	1,497.04	1,521.88	1,542.46
4	-	1,535.89	1,548.94	1,504.07
5	-	1,515.09	1,522.87	1,495.61
6	1,505.26	1,480.15	1,514.65	1,469.44
7	-	-	-	-
8	1,721.96	1,528.42	1,541.77	1,708.53
9	1,825.60	1,493.35	1,432.71	1,445.11
10	1,669.90	1,530.77	1,488.17	1,488.49

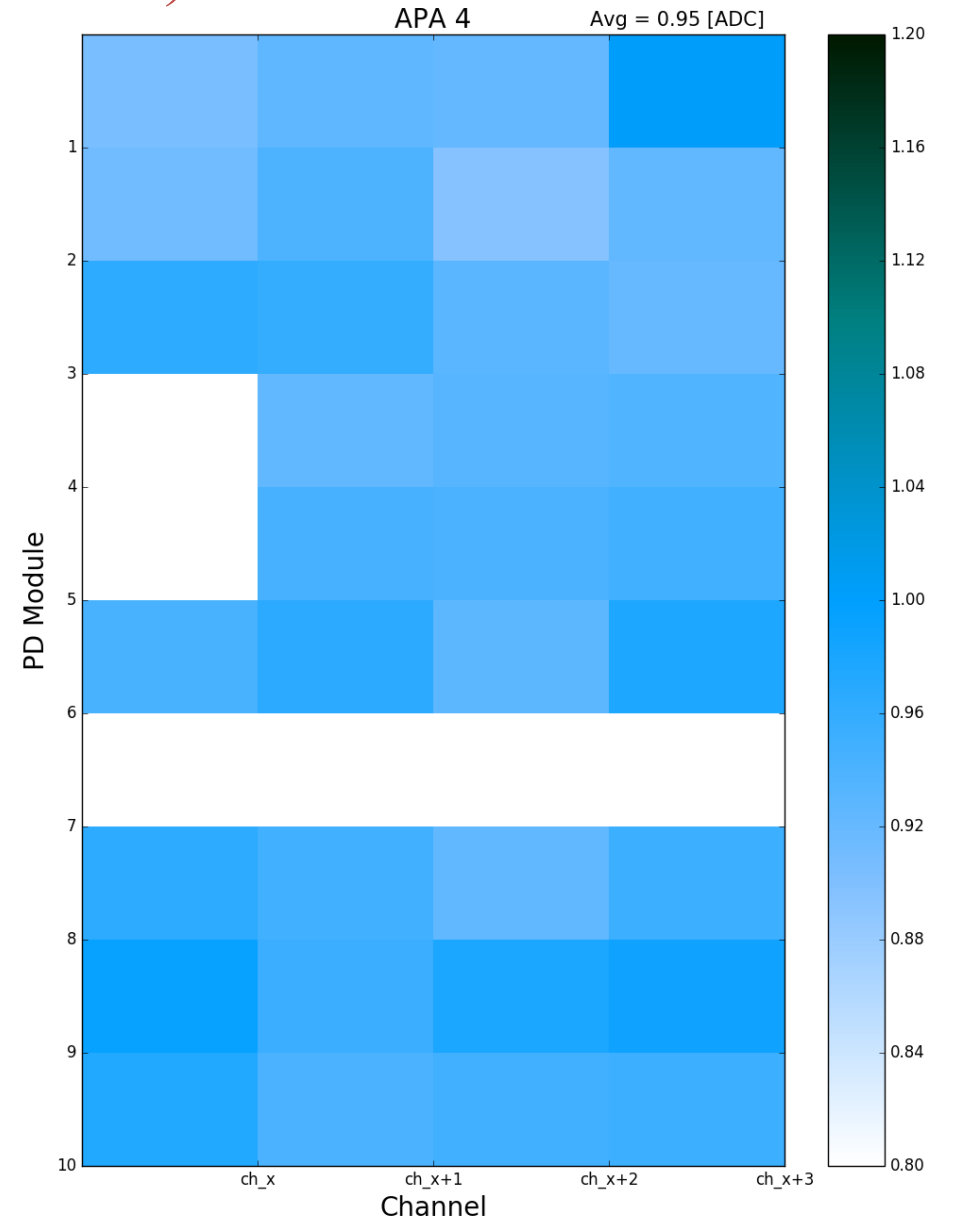
# Calibrations Normalized per APA

 = Will get back to at a later time

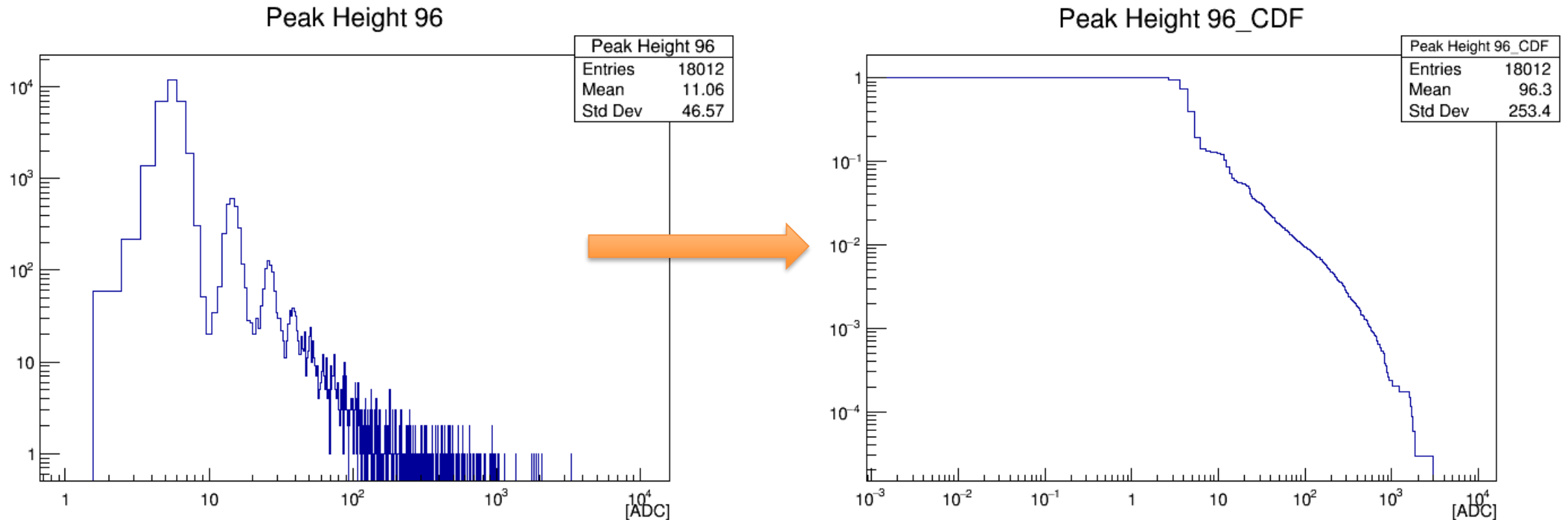


# Calibrations Comparison- Ratio(Bryan/Chris)

 = Will get back to at a later time

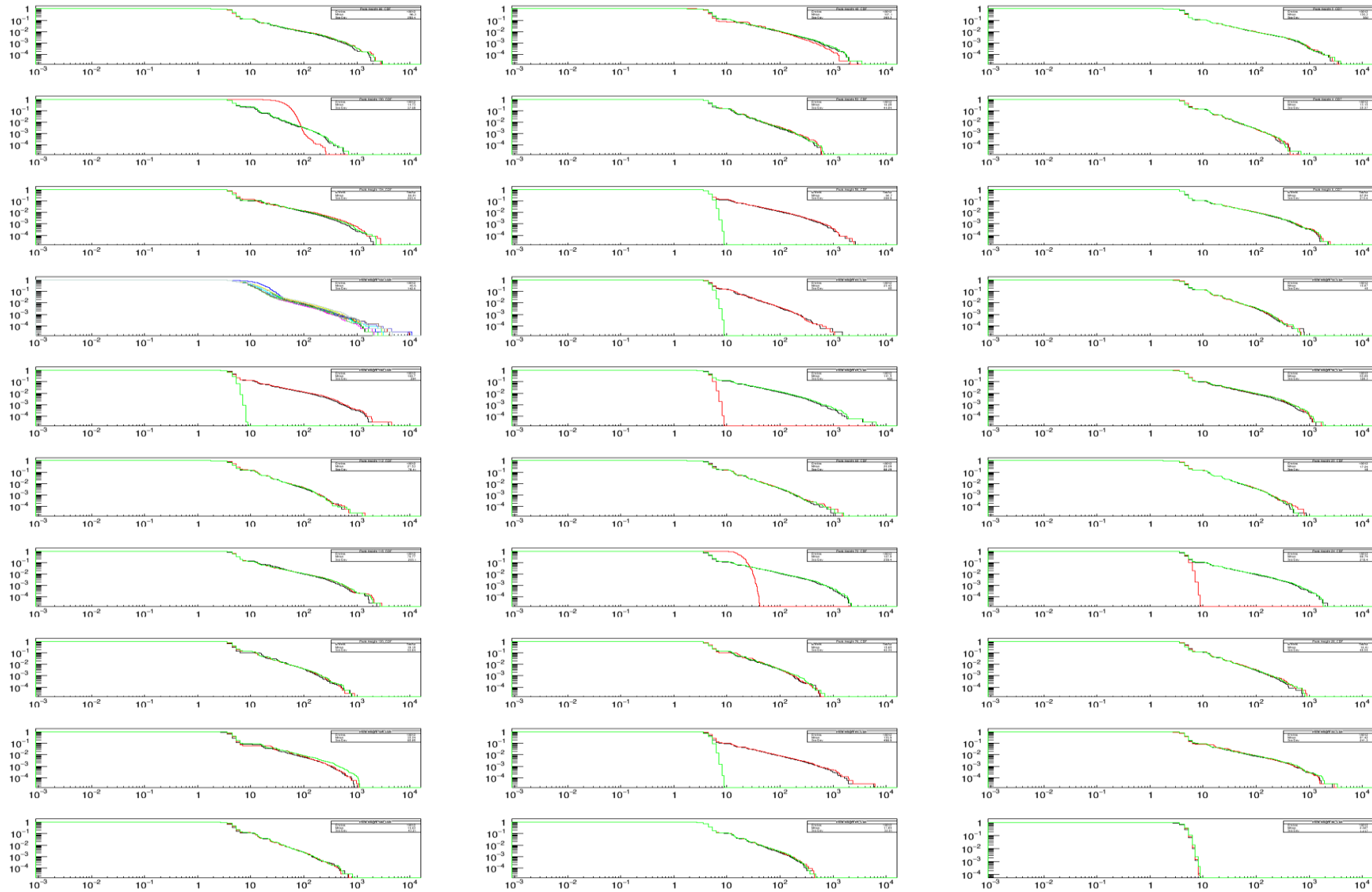


# Converted Leon's Peak Hist -> (1-CDF) Hist



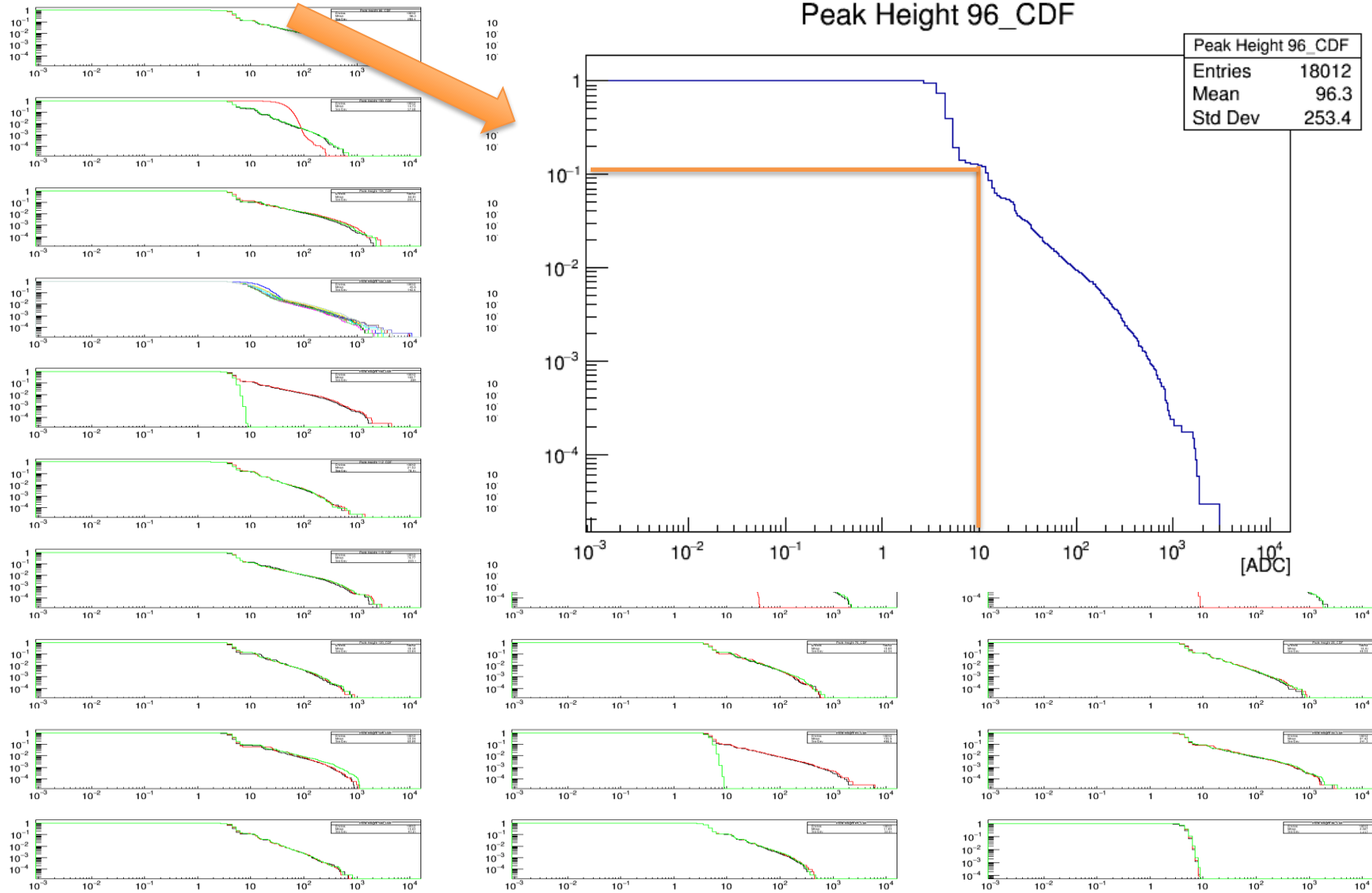
- Using Leon's processed data
  - Peak Histograms
- Modified Leon's macro (which allows you to easily access/plot his processed data)
  - Calculated the cumulative distribution function (CDF) for ALL channels

# (1-CDF) for ALL Channels- Run 4600




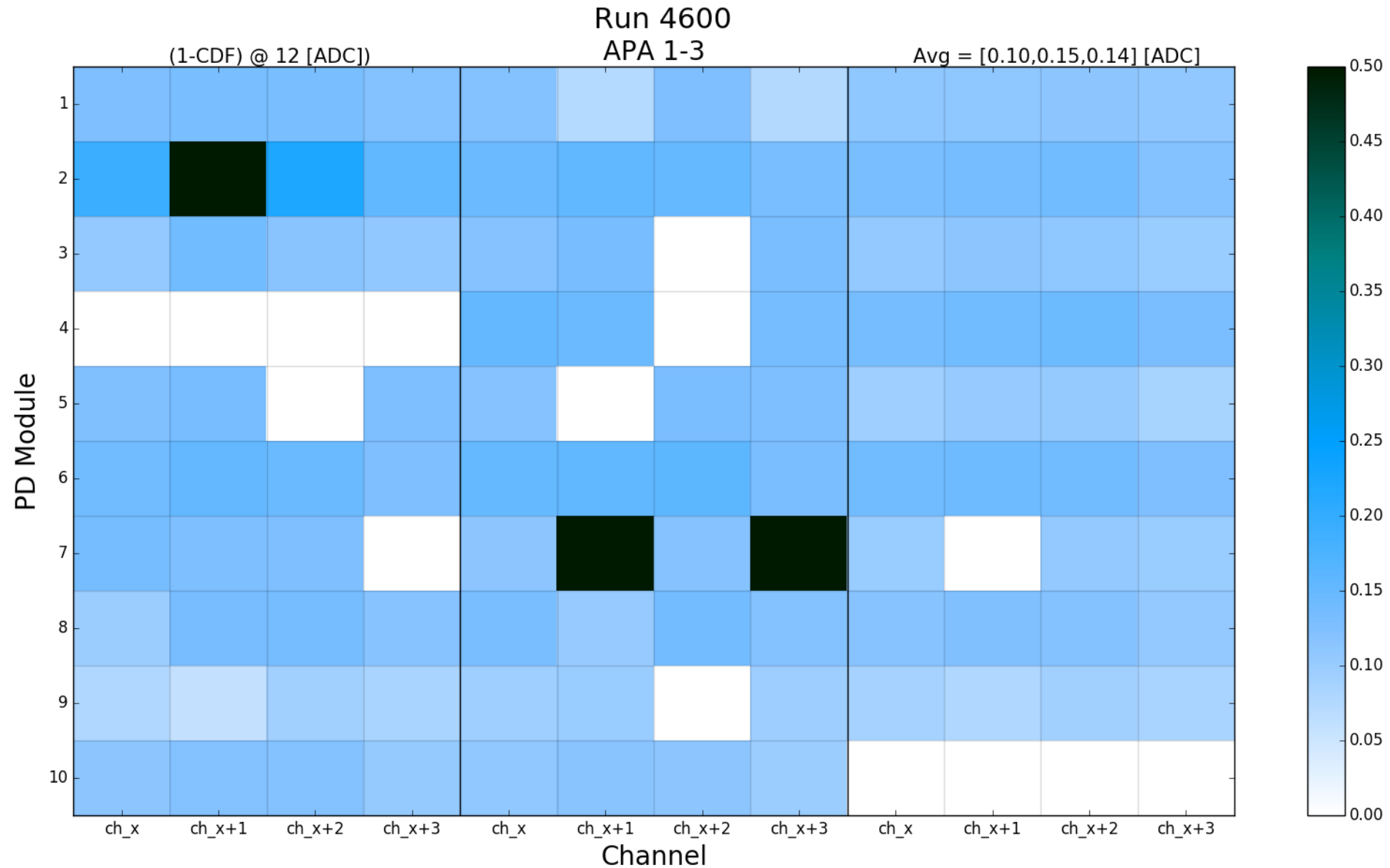


# (1-CDF) for ALL Channels- Run 4600

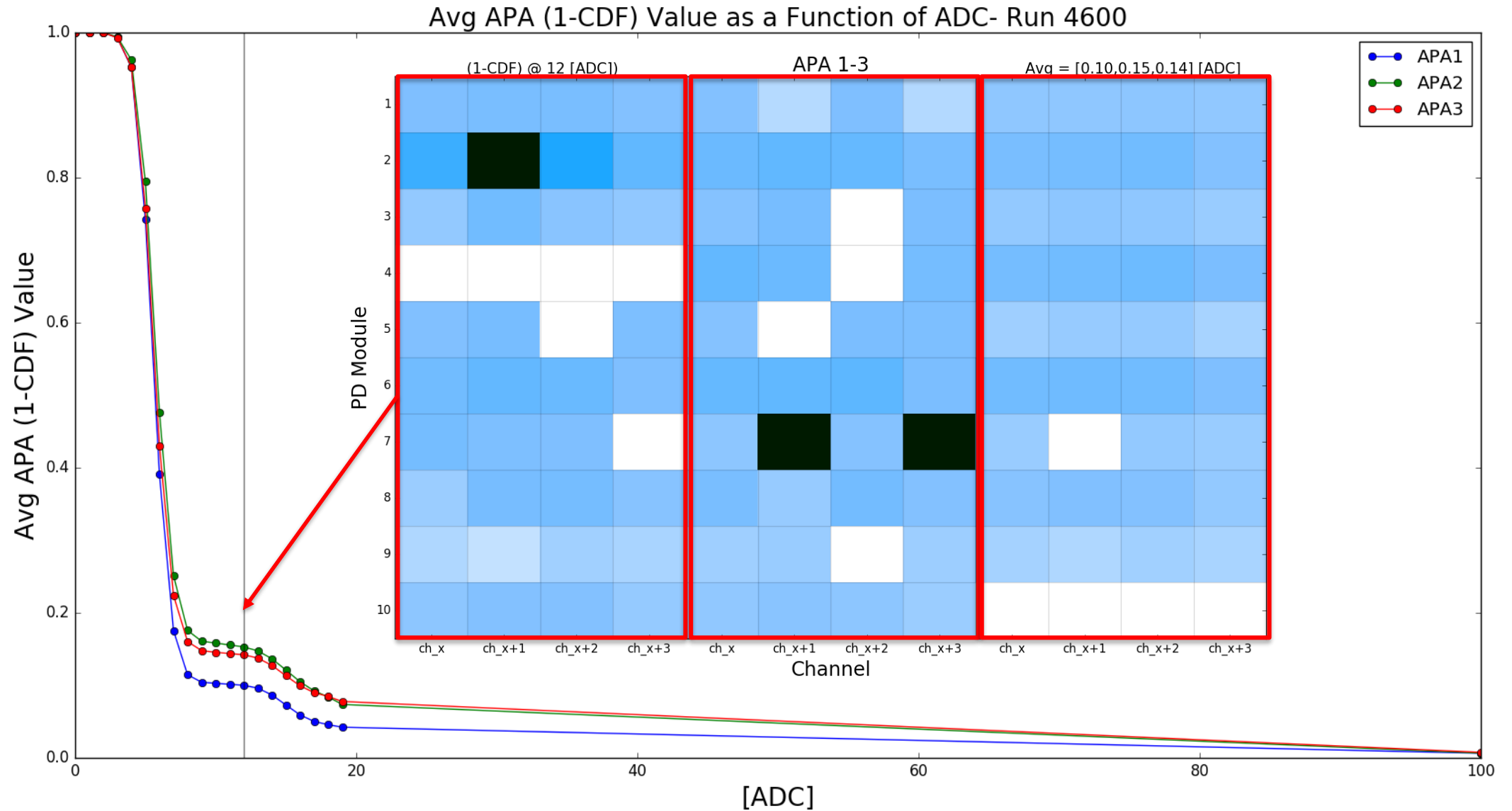


# (1-CDF) @ 12 Peak ADC (~1PE)

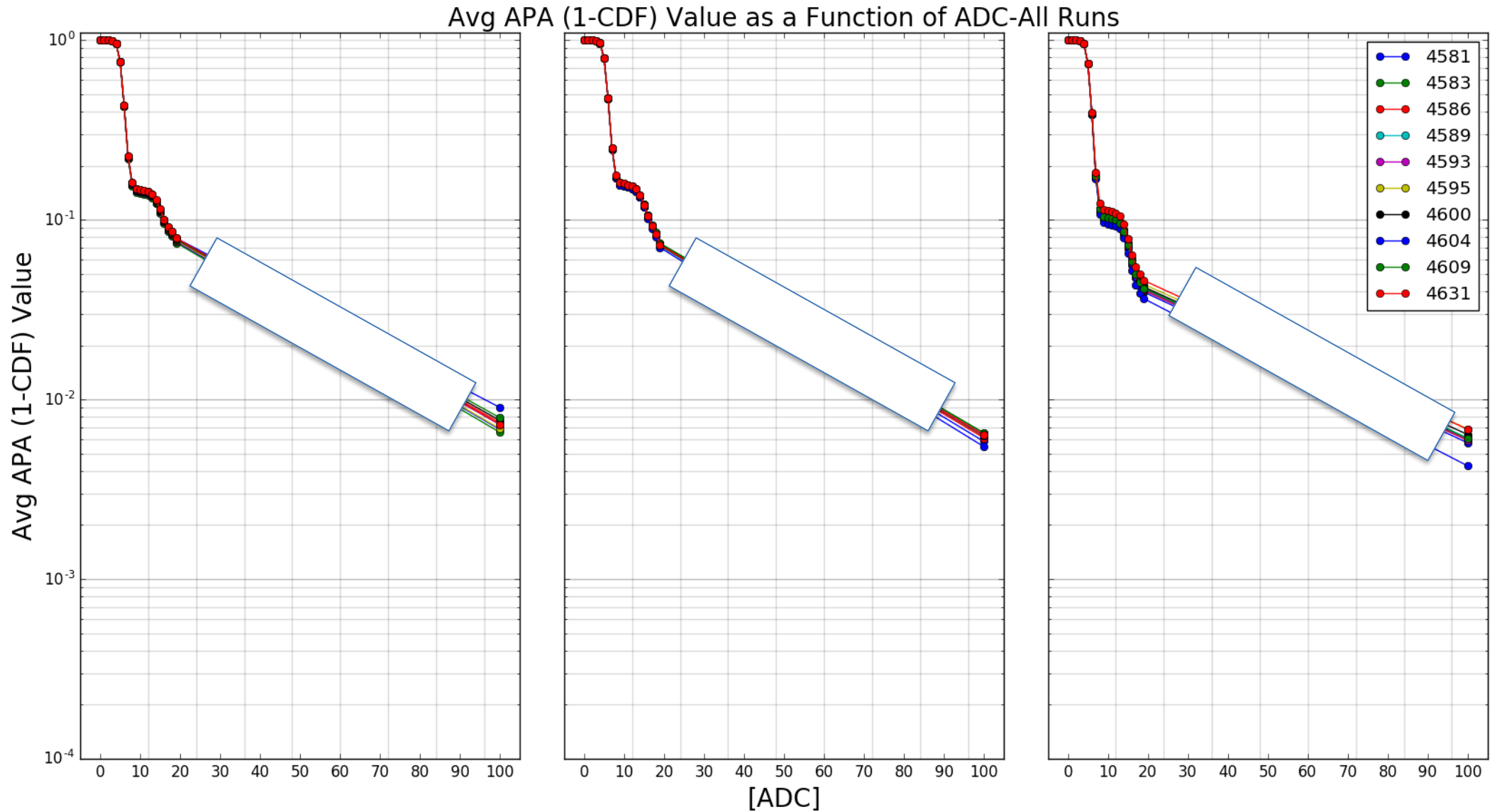
 = Ignored



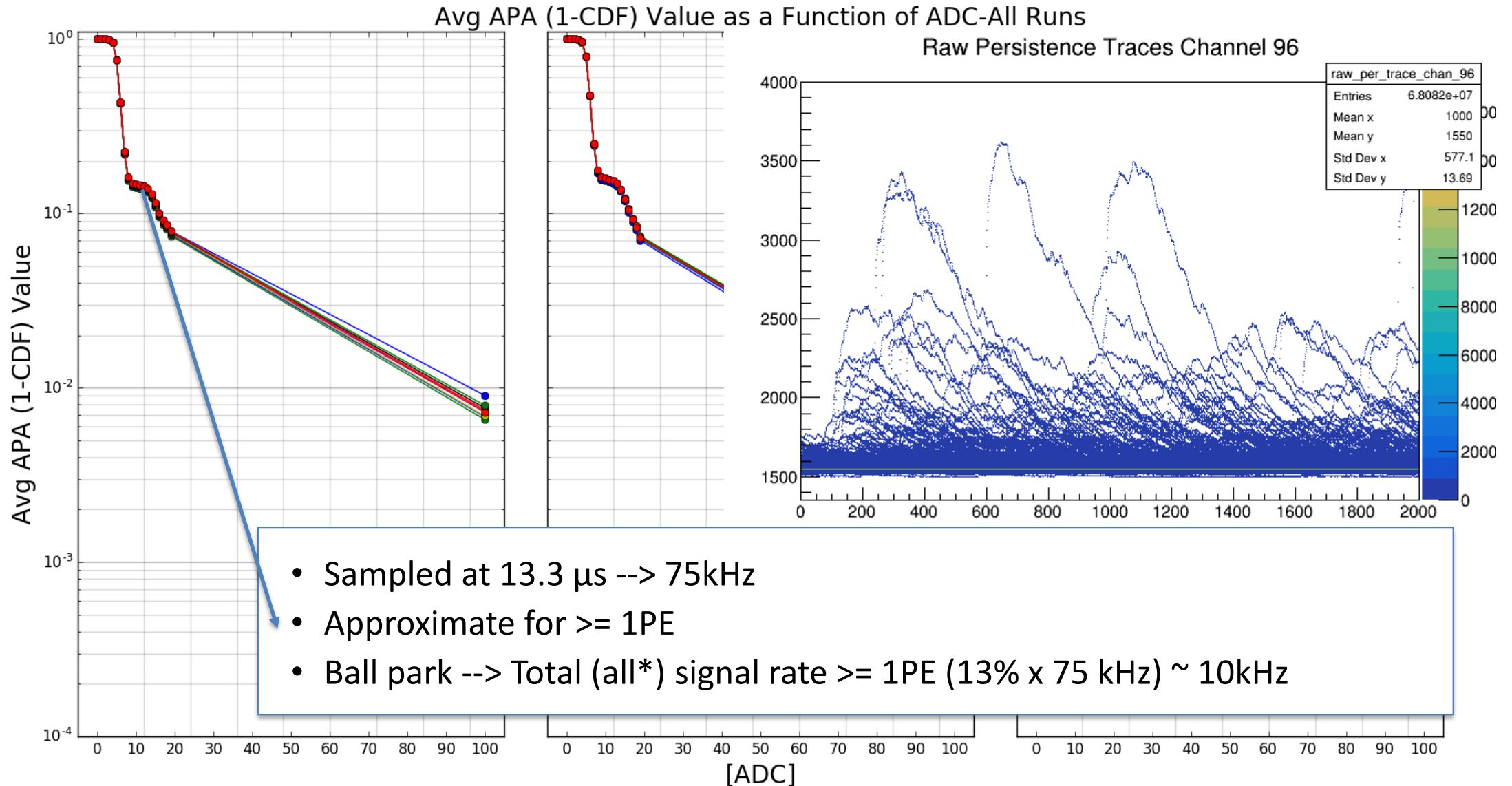
# Avg (1-CDF) Value per APA- Run 4600



# Avg (1-CDF) Value per APA- Multiple Runs



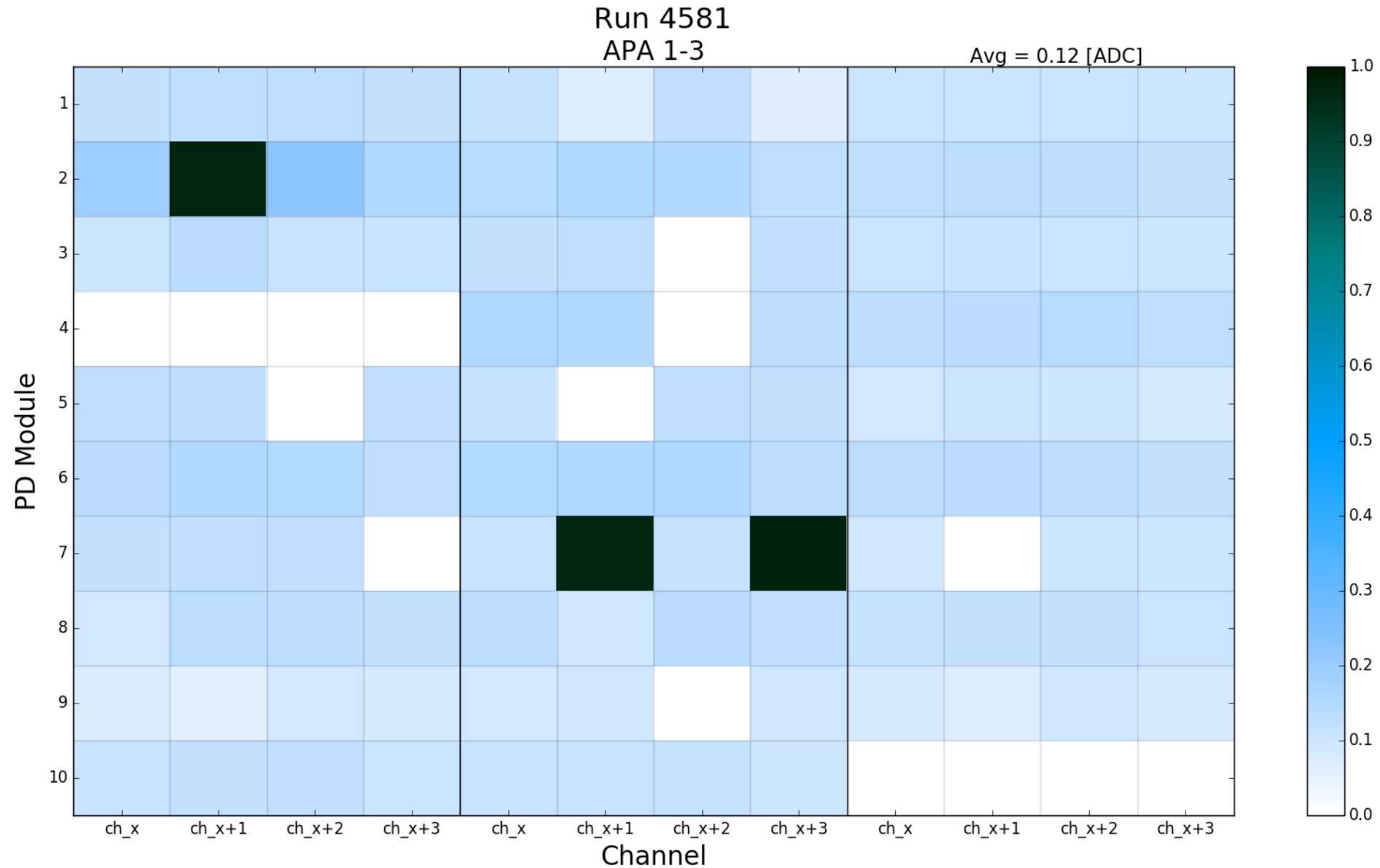
# Avg (1-CDF) Value per APA- Multiple Runs



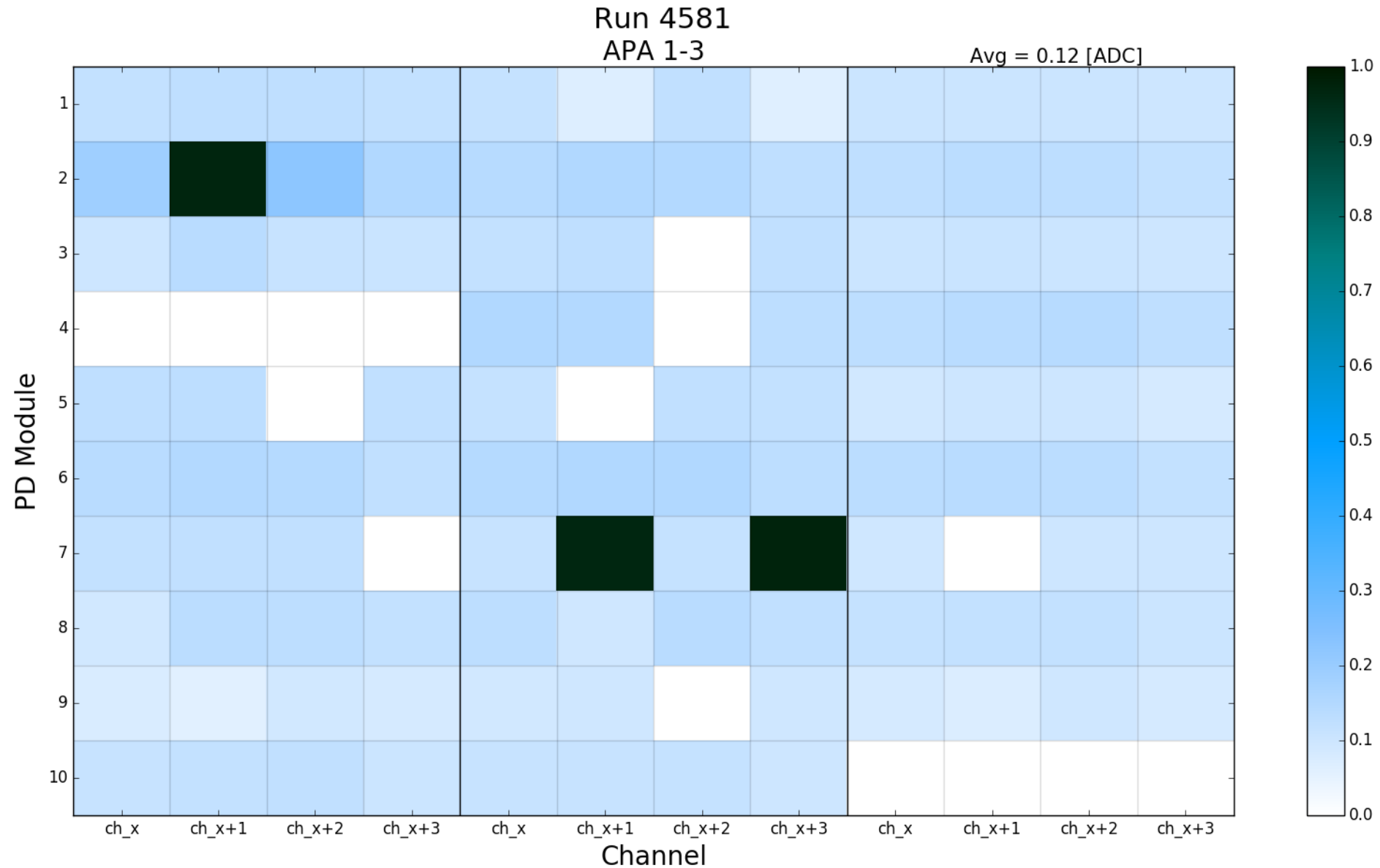
## Moving Forward- Short term

- Will redo slides 15 -20 over with Integration Histograms
  - Thanks for making them, Leon!
- Apply SensL Calibrations
- Look more into Rates
- Reliability tests
- Produce a PyROOT macro, similar to Leon's

# (1-CDF) @ 10ADC

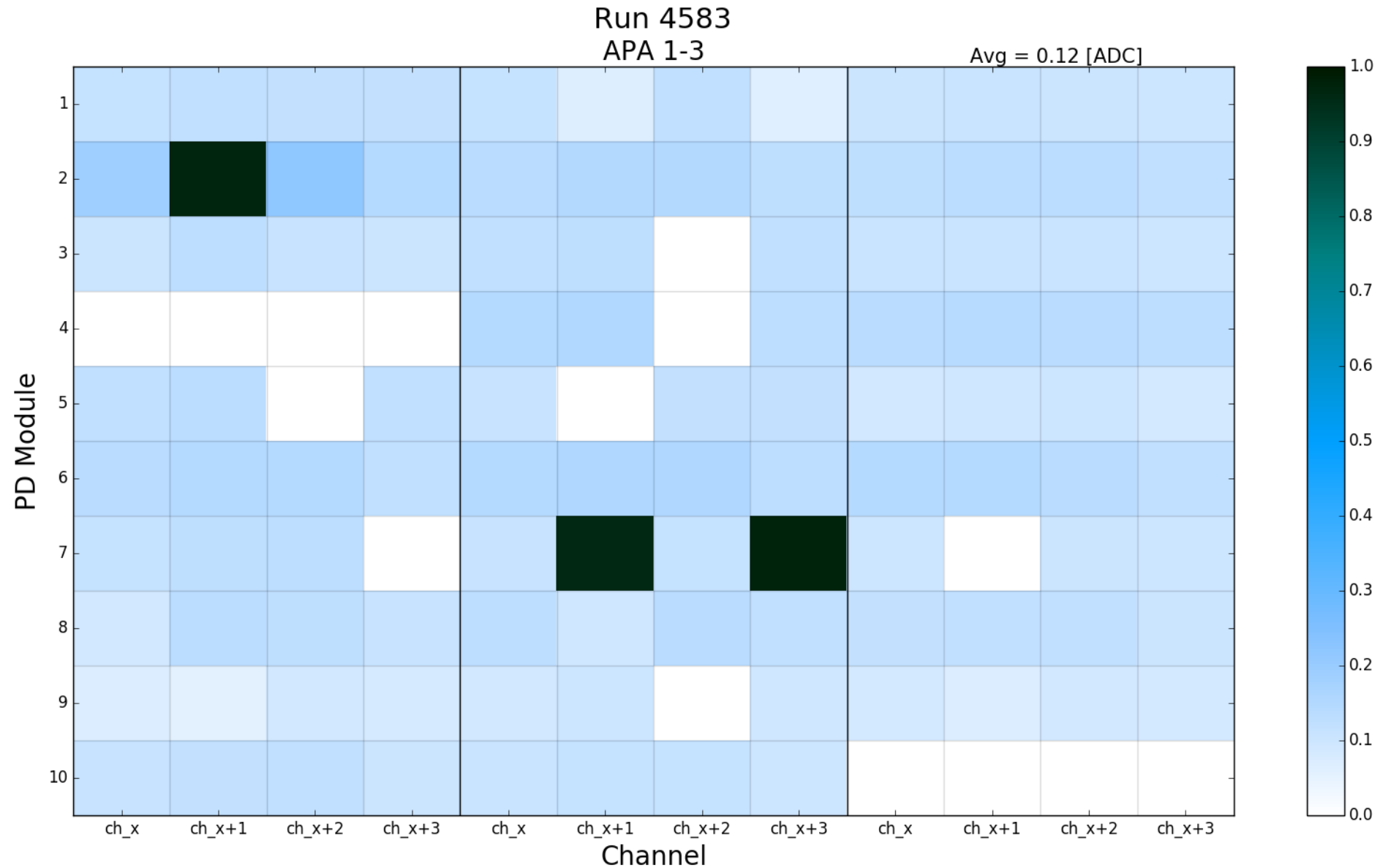


# (1-CDF) @ 10ADC

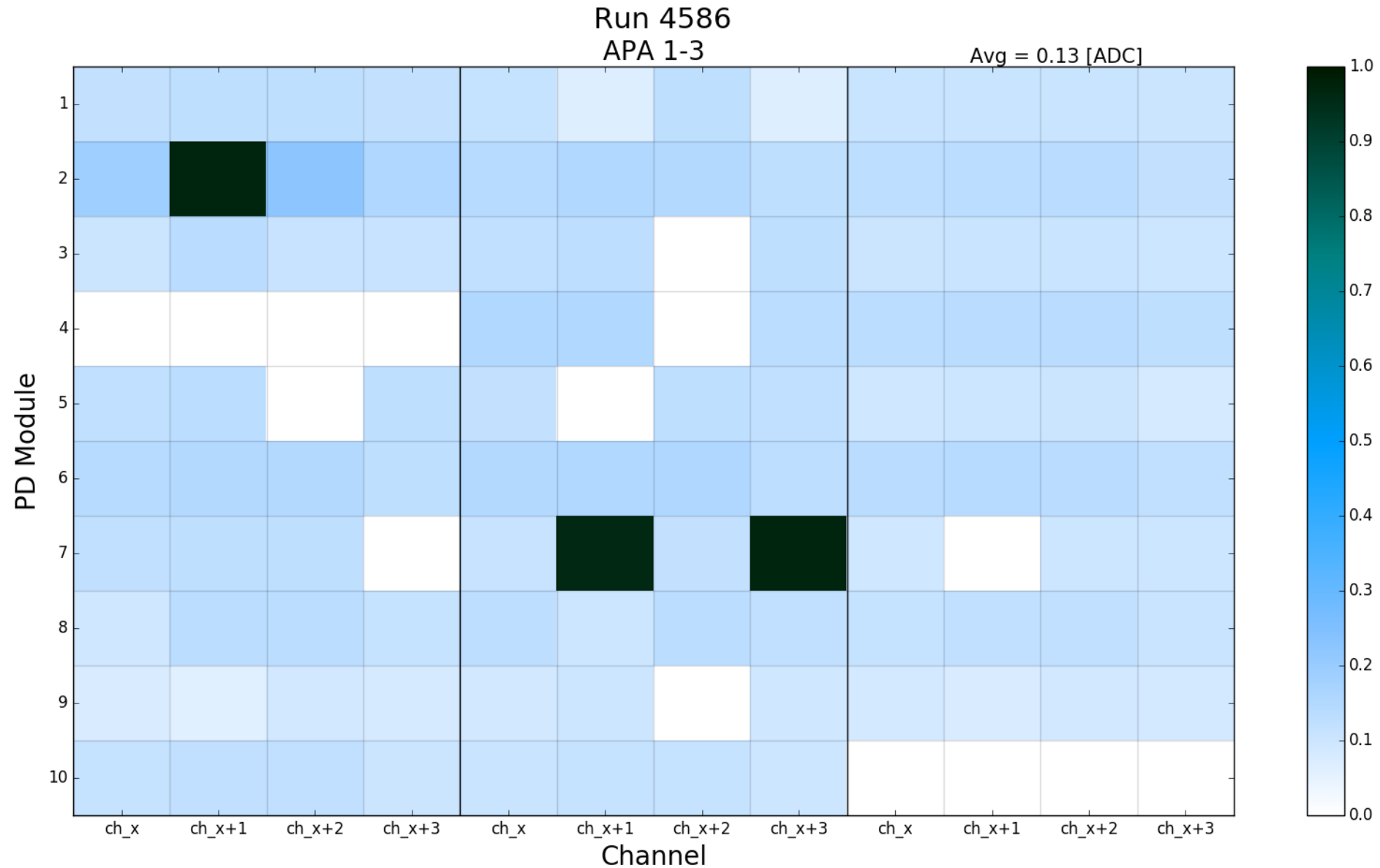




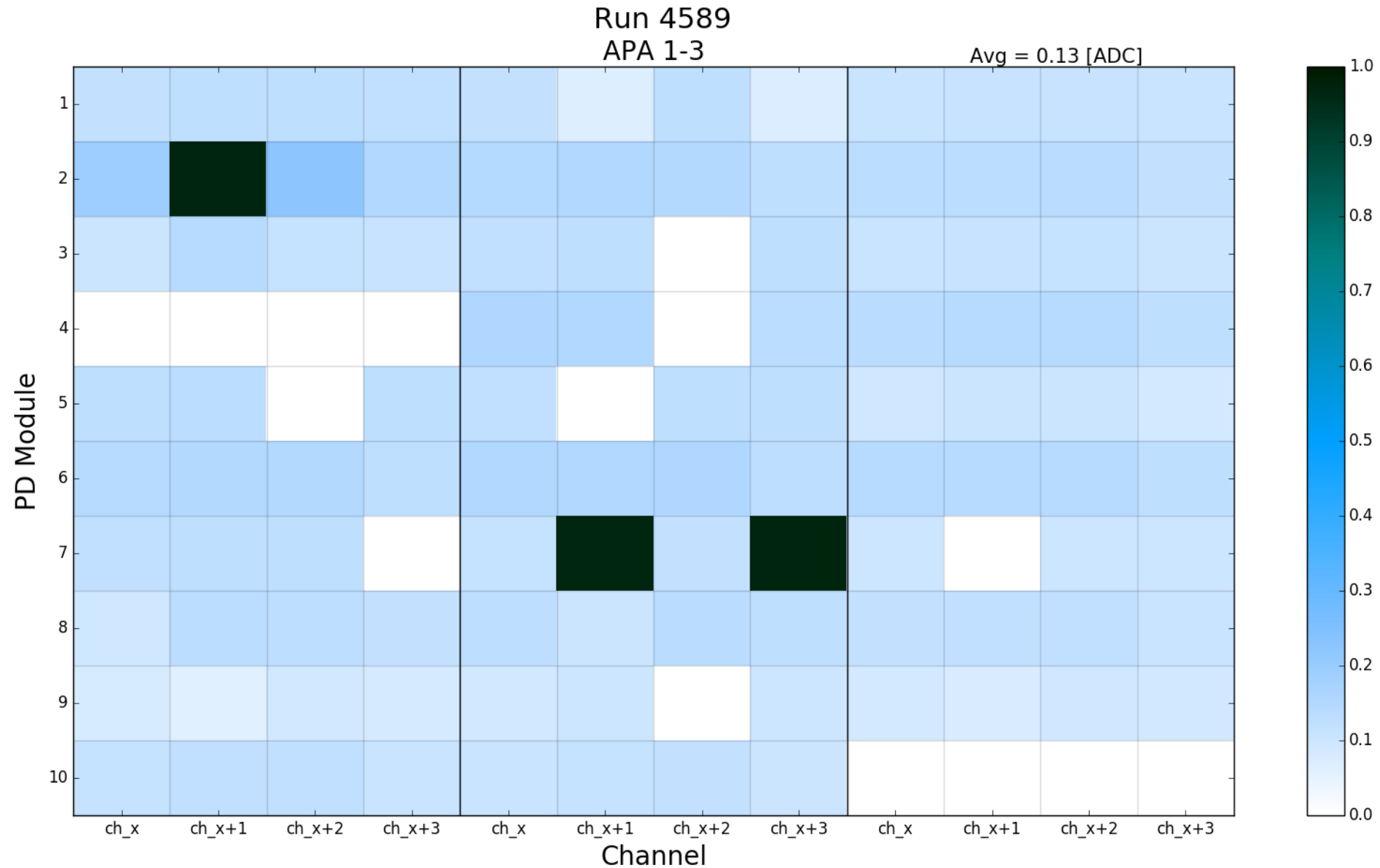
# (1-CDF) @ 10ADC



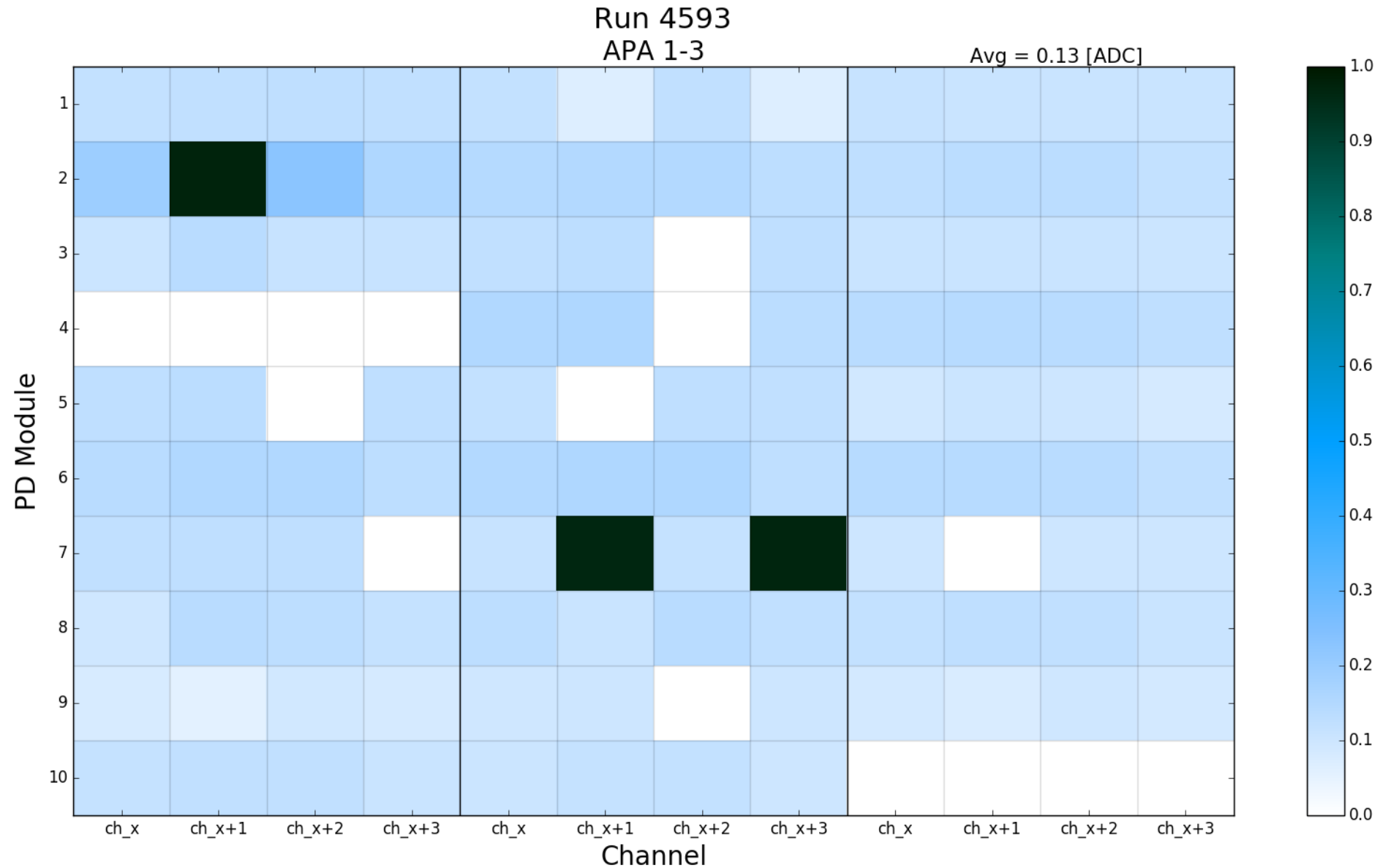
# (1-CDF) @ 10ADC



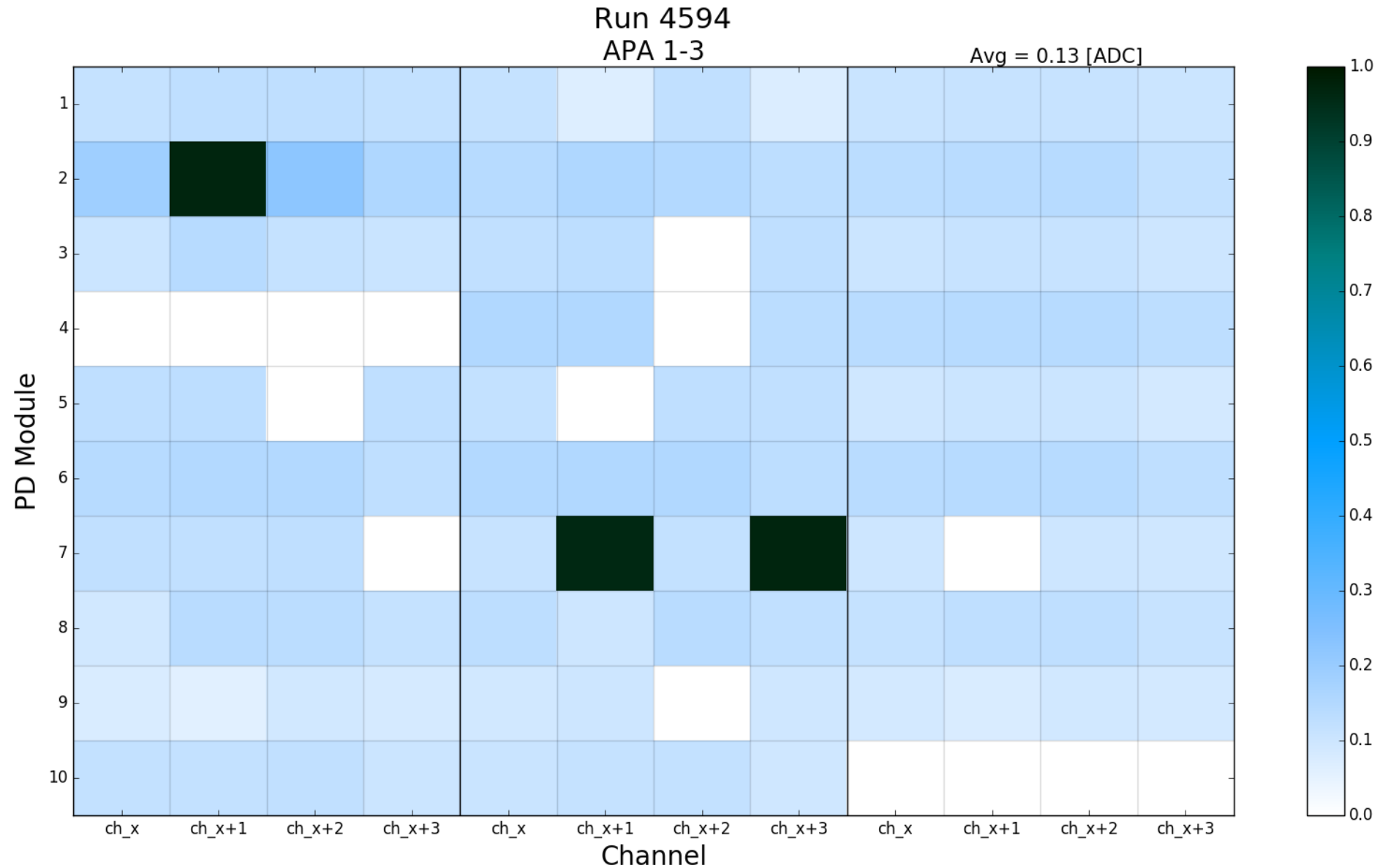
# (1-CDF) @ 10ADC



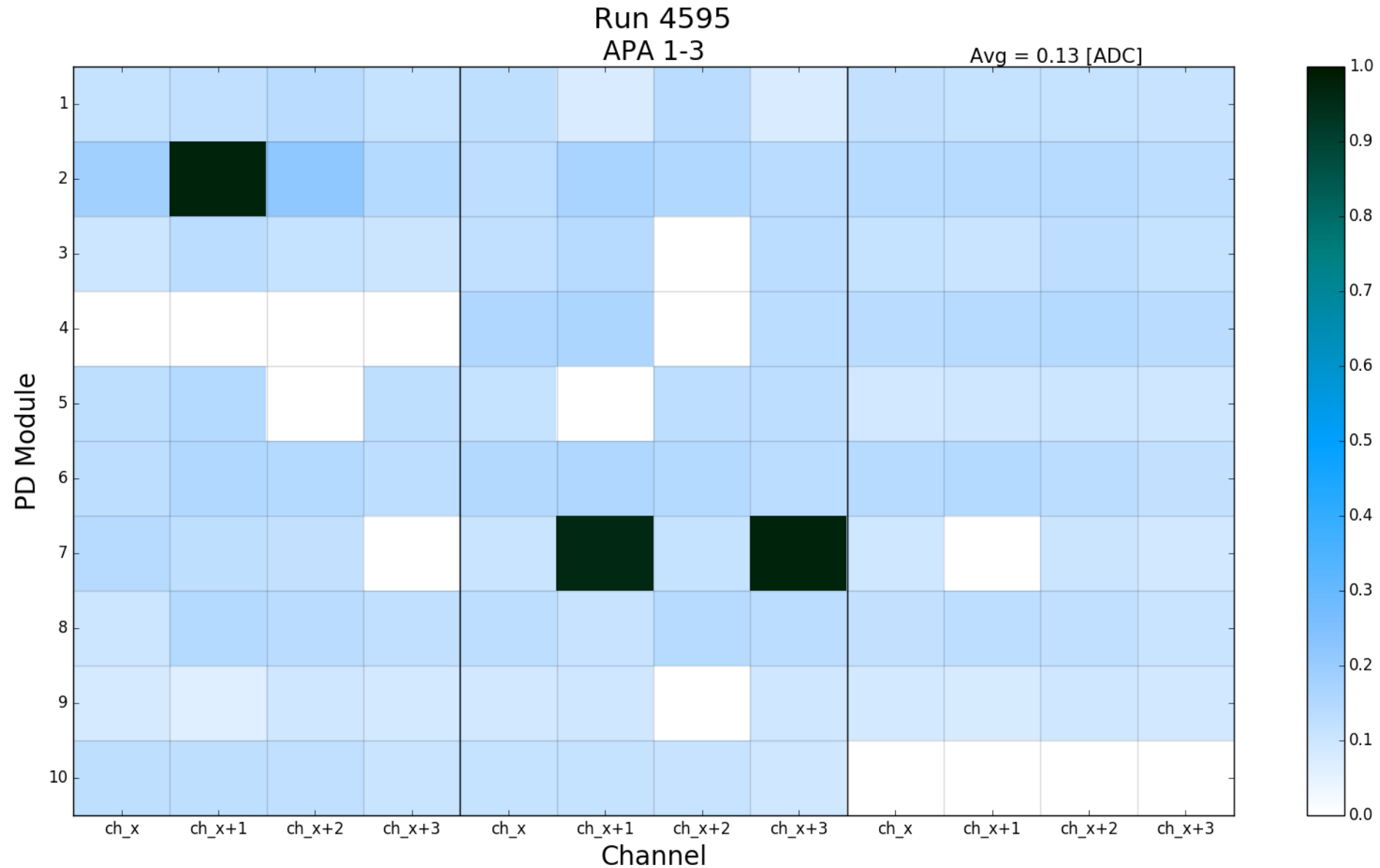
# (1-CDF) @ 10ADC



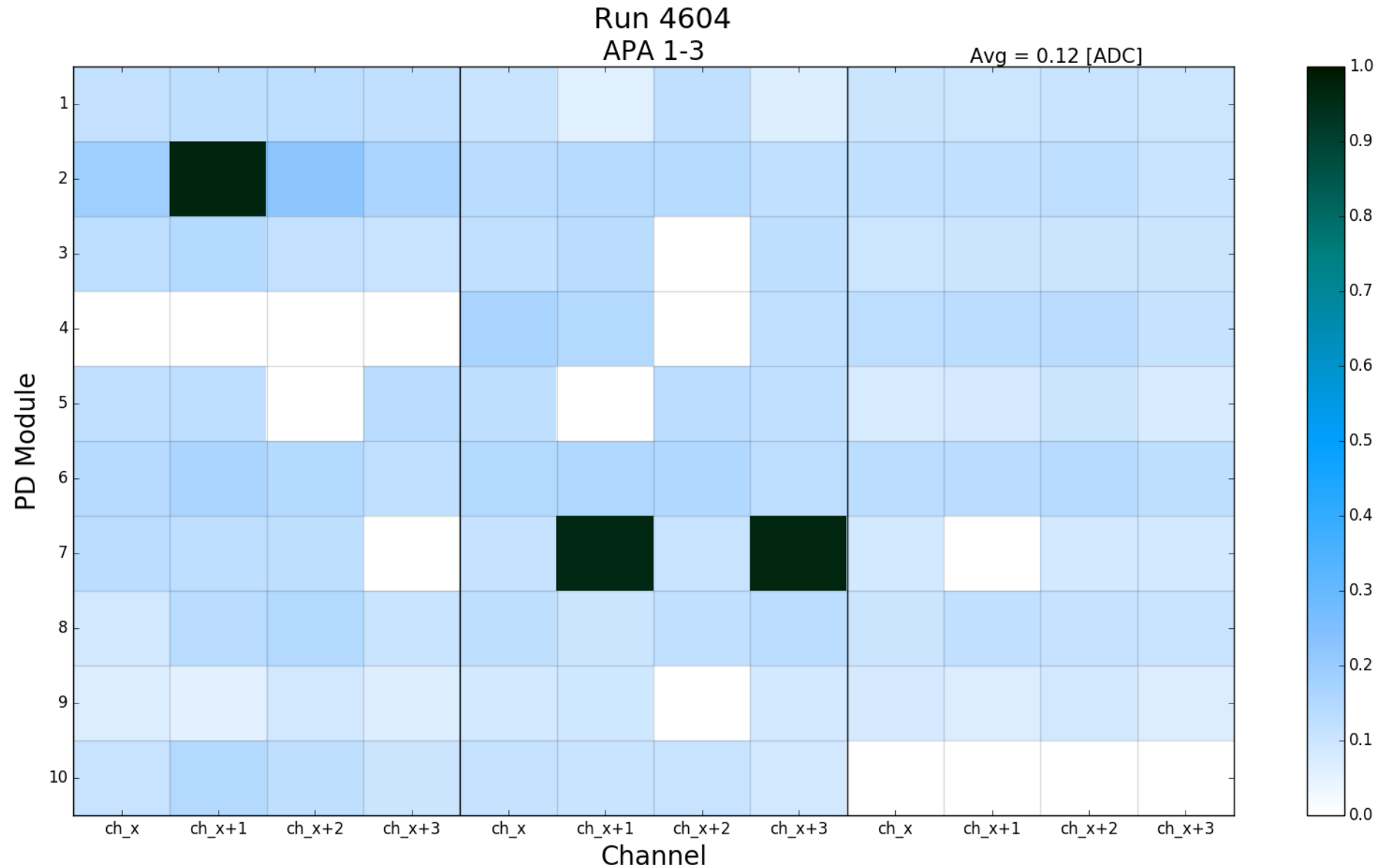
# (1-CDF) @ 10ADC



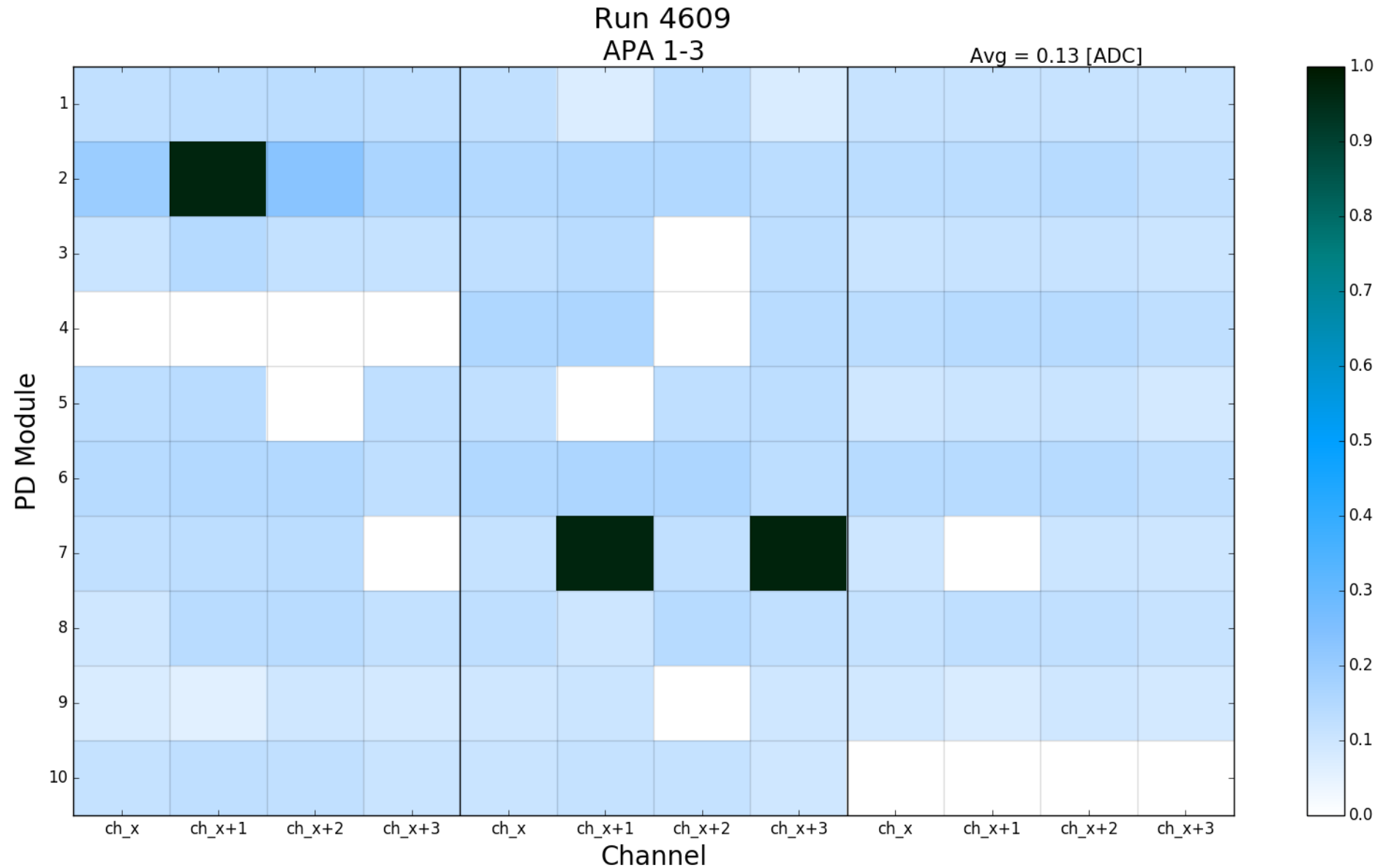
# (1-CDF) @ 10ADC



# (1-CDF) @ 10ADC

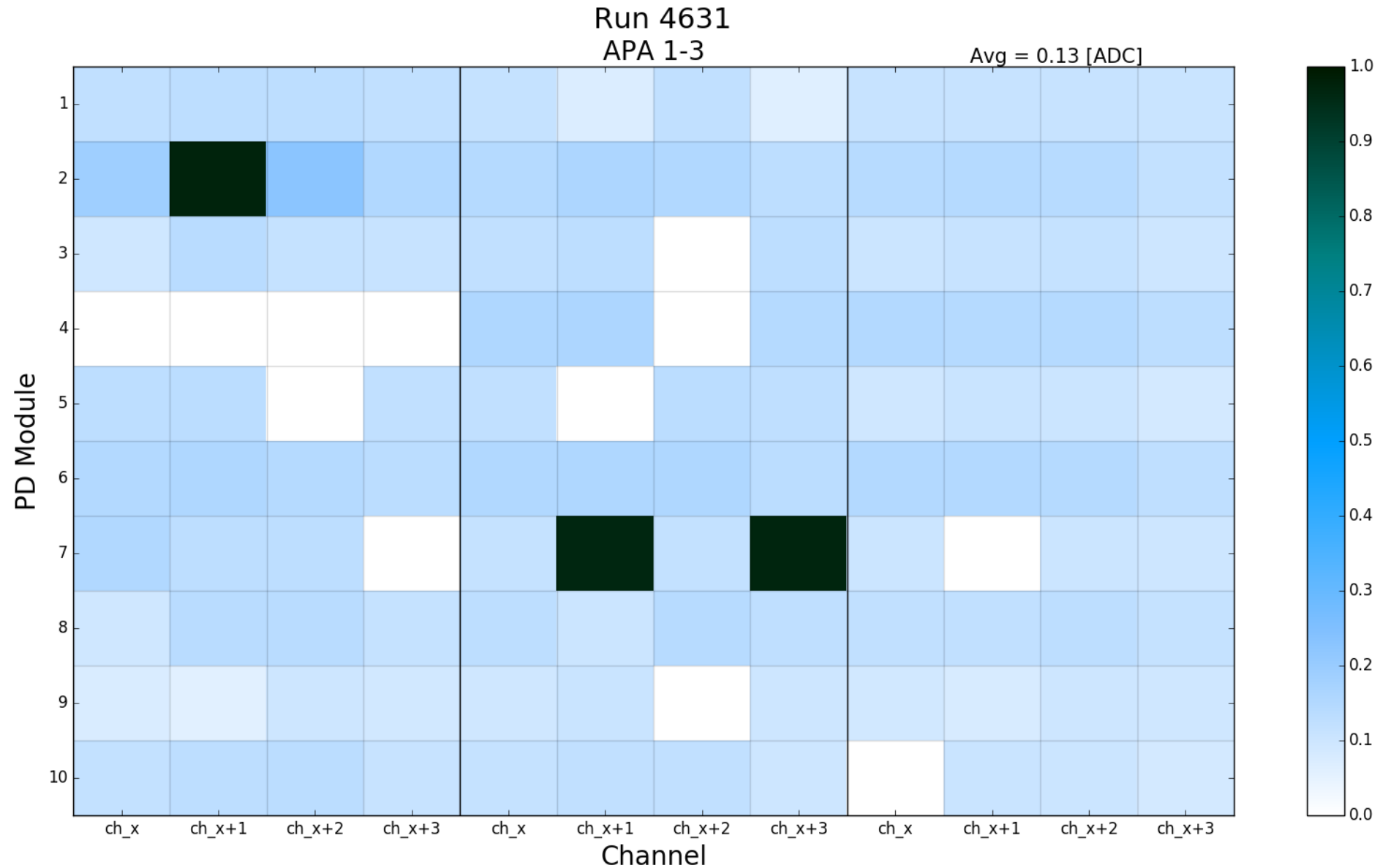


# (1-CDF) @ 10ADC

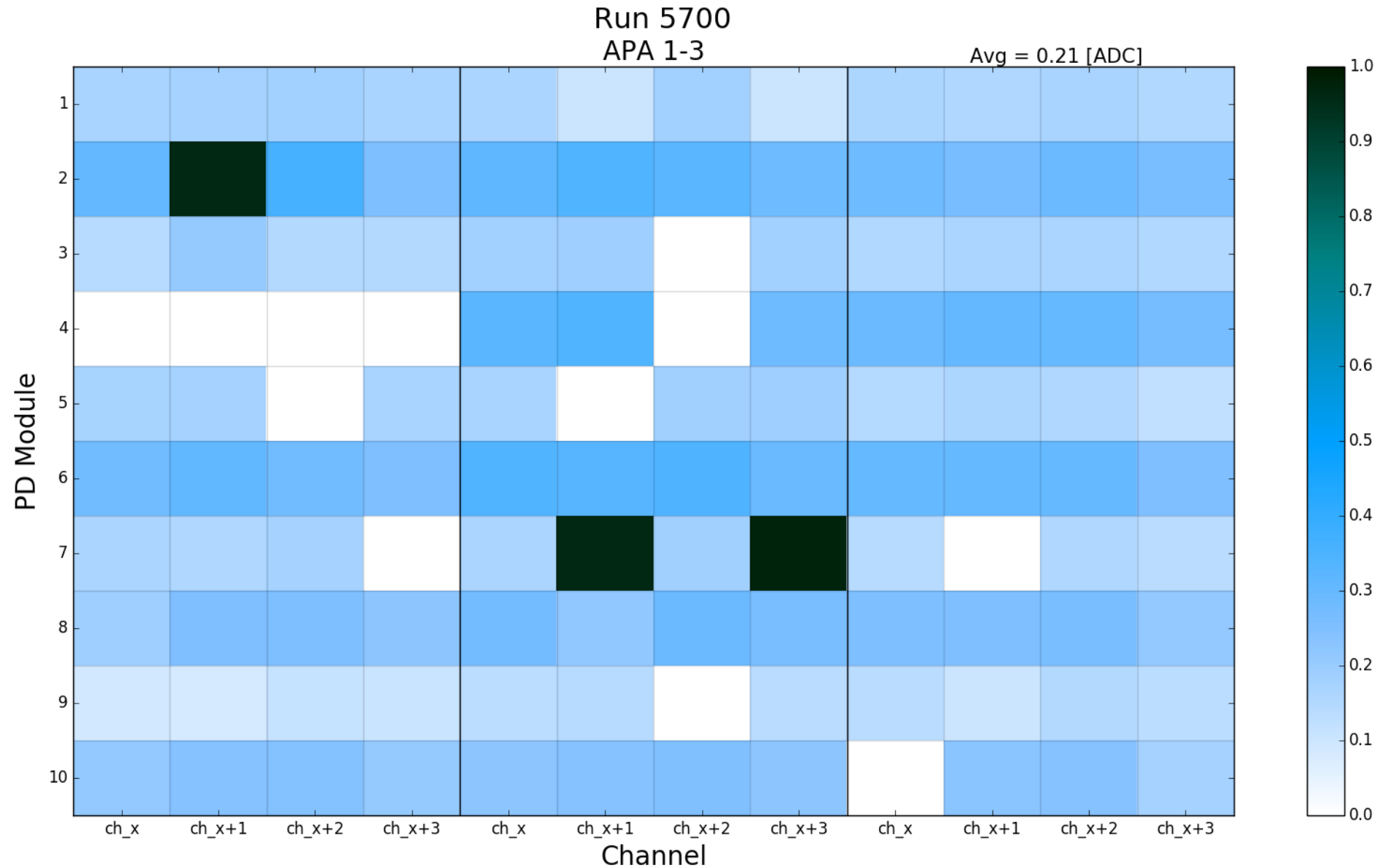




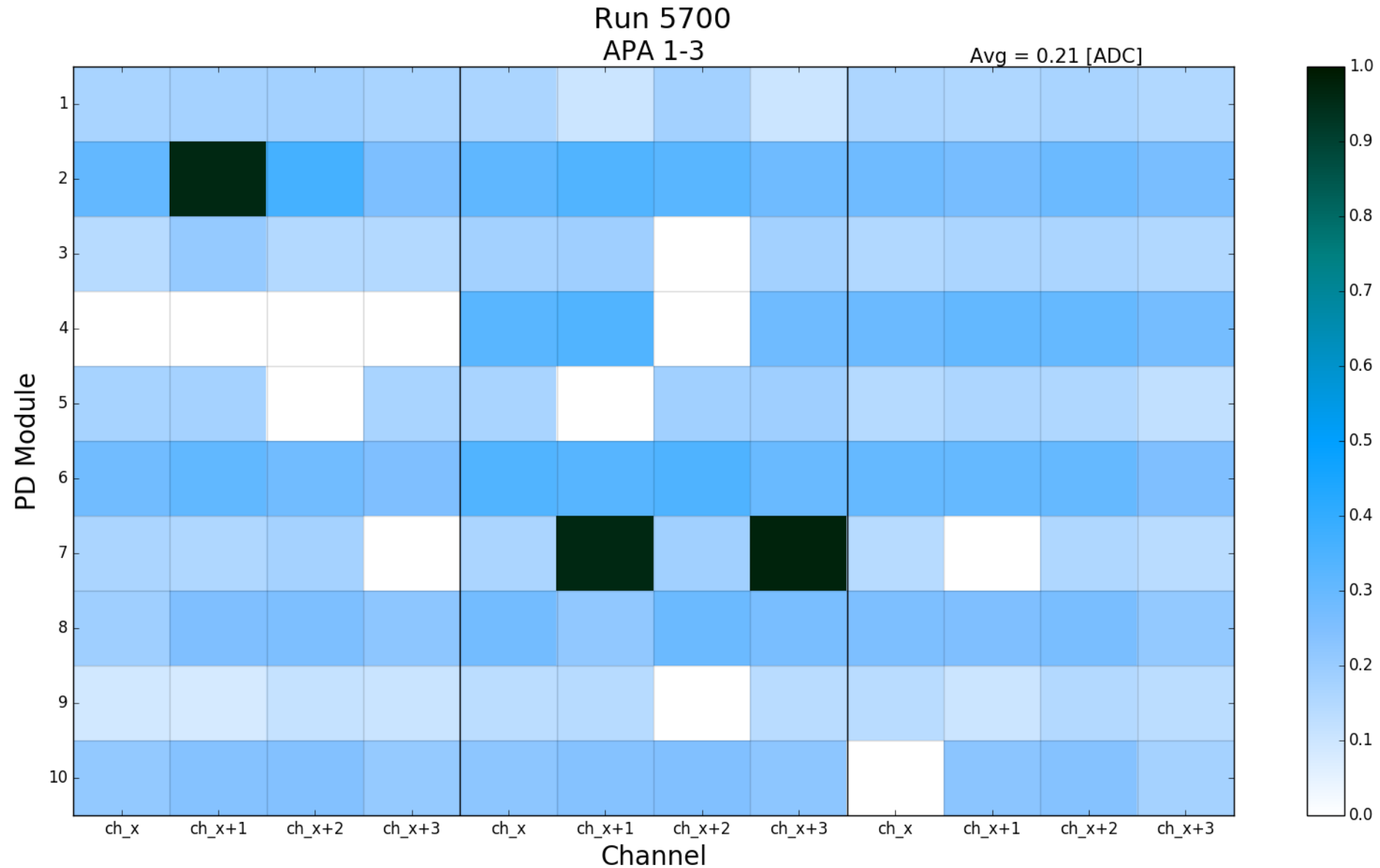
# (1-CDF) @ 10ADC



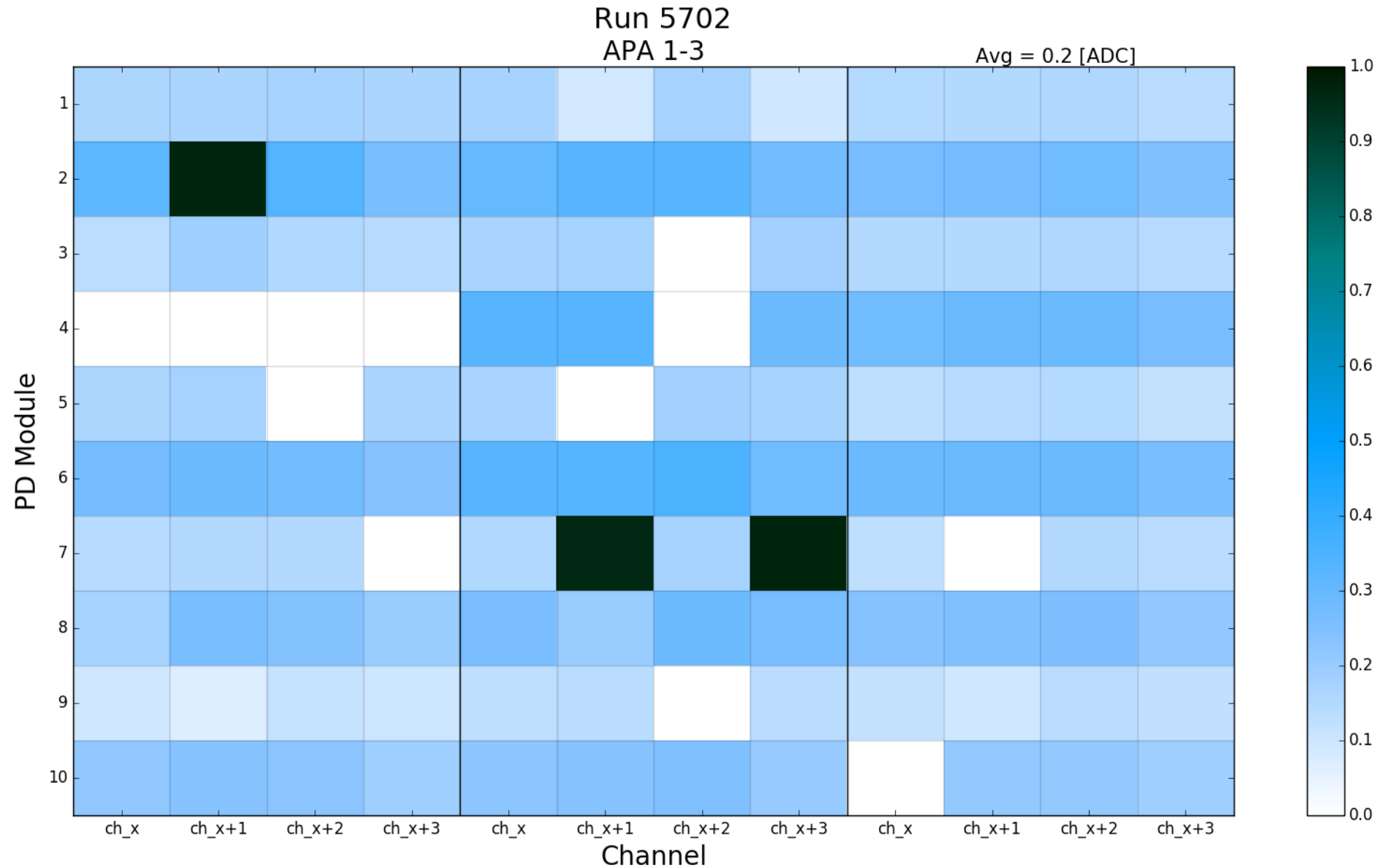
# (1-CDF) @ 10ADC



# (1-CDF) @ 10ADC



# (1-CDF) @ 10ADC



# CDF for Run 4600

