ATF2 IPBPM meeting

jitRun33 resolution study

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Outline

Analysing with the different calibration constants and the same sample ranges and triggers for consistency check with Siwon's reported results.

Jitter run: jitRun33_0dB_0.95_ipbpm_160316 (triggers 1:200)

Calibrations:
IPAyCal1_0dB_0.95_ipbpm_160315
IPByCal1_0dB_0.95_ipbpm_160315
IPCyCal1_0dB_0.95_ipbpm_160315
IPAxCal1_20dB_1_ipbpm_160315
IPBxCal1_20dB_1_ipbpm_160315
IPCxCal1_20dB_1_ipbpm_160315

Sample numbers: 53:63 (integration)
Reference sample: 50

Resolution using IPA

Analysis results with geometric and multi-parameter fits. Coefficients for all parameters.

Fitting:

A: YI and constant
B: YI, YQ and constant
C: YI, YQ, Ref Y and constant
D: YI, YQ, XI, XQ and constant
E: YI, YQ, XI, XQ, Ref Y, Ref X and constant
F: YI, YQ, XI, XQ, Ref Y, Ref X, self XI, XQ and constant

Siwon's measured resolution with 13 parameter fit = 11.2634 nm

Parameter	Geometric	A	B	C	D	E	F
No. param	2	3	5	6	9	11	13
Y1I	1.464	1.068	1.225	3.395	1.386	3.431	3.393
Y2I	-0.464	-0.700	-0.359	0.372	-0.566	0.306	0.390
Const		3.422	-3.002	-60.093	-3.480	-59.830	-60.009
Y1Q			0.015	1.761	0.101	1.767	1.723
Y2Q			-0.741	-0.836	-0.659	-0.823	-0.896
YREF				-0.004		-0.077	0.299
X1I					-0.139	-0.048	-0.080
X2I					-0.054	0.328	0.411
X1Q					1.239	0.241	0.254
X2Q					0.016	-0.004	-0.004
XREF						0.000	0.000
X3I							-0.273
X3Q							0.338
Resolution (nm)	89.3	49.2	32.3	13.9	30.3	13.1	12.6
Res_s (nm)	2.5	2.7	1.8	0.8	1.7	0.7	0.7

Resolution using IPB

Analysis results with geometric and multi-parameter fits. Coefficients for all parameters.

Fitting:

A: YI and constant
B: YI, YQ and constant
C: YI, YQ, Ref Y and constant
D: YI, YQ, XI, XQ and constant
E: YI, YQ, XI, XQ, Ref Y, Ref X and constant
F: YI, YQ, XI, XQ, Ref Y, Ref X, self XI, XQ and constant

Siwon's measured resolution with 13 parameter fit = 11.6025 nm

Parameter	Geometric	A	B	C	D	E	F
No. param	2	3	5	6	9	11	13
Y1I	0.683	0.643	0.661	0.655	0.652	0.648	0.647
Y2I	0.317	0.633	0.156	0.082	0.162	0.087	0.105
Const		-0.973	0.455	2.307	0.440	2.279	1.821
Y1Q			-0.651	-0.621	-0.646	-0.616	-0.617
Y2Q			0.291	0.344	0.280	0.341	0.328
YREF				0.000		-0.021	0.039
X1I					-0.033	0.022	0.026
X2I					0.019	-0.004	-0.002
X1Q					0.159	-0.163	-0.140
X2Q					-0.147	0.000	0.000
XREF						0.000	0.000
X3I							-0.090
X3Q							-0.130
Resolution (nm)	89.3	80.6	11.6	10.6	10.6	10.1	10.0
Res_s (nm)	3.6	4.3	0.6	0.6	0.6	0.5	0.5

Resolution using IPC

Analysis results with geometric and multi-parameter fits. Coefficients for all parameters.

Fitting:

A: YI and constant
B: YI, YQ and constant
C: YI, YQ, Ref Y and constant
D: YI, YQ, XI, XQ and constant
E: YI, YQ, XI, XQ, Ref Y, Ref X and constant
F: YI, YQ, XI, XQ, Ref Y, Ref X, self XI, XQ and constant

Siwon's measured resolution with 13 parameter fit = 12.6368 nm

Parameter	Geometric	A	B	C	D	E	F
No. param	2	3	5	6	9	11	13
Y1I	-2.156	-0.529	-0.913	-0.848	-1.092	-0.976	-0.975
Y2I	3.156	0.795	2.030	-0.856	2.321	0.217	0.216
Const		3.597	-1.918	65.660	-3.413	44.097	44.089
Y1Q			0.769	1.719	0.929	1.511	1.511
Y2Q			0.596	-1.959	0.582	-1.162	-1.163
YREF				0.005		0.105	0.113
X1I					0.087	-0.032	-0.050
X2I					-0.130	-0.711	-0.711
X1Q					-1.028	0.956	0.949
X2Q					2.346	0.004	0.004
XREF						-0.001	-0.001
X3I							-0.006
X3Q							0.058
Resolution (nm)	89.3	40.5	26.5	15.2	15.8	11.5	11.5
Res_s (nm)	1.1	2.2	1.4	0.8	0.9	0.6	0.6

Conclusions

- Resolution results for IPA, IPB and IPC using a 13-parameter fit are close to Siwon's results. Differences are likely due to different fitting methods in determining calibration constants, and/or different flyer data cuts.

- Fit parameters seem very different from Siwon's fit parameters. Need to look at this in more detail to understand why.

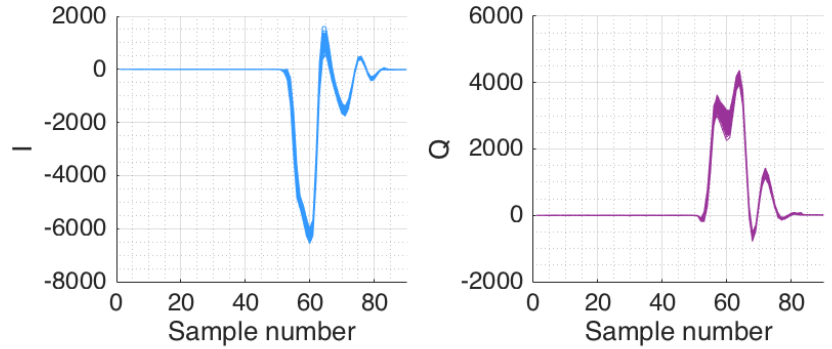
- Also need to look at stability of parameter coefficients across different jitter runs.

Appendix

- I and Q waveforms for IPA, IPB and IPC from jitRun33

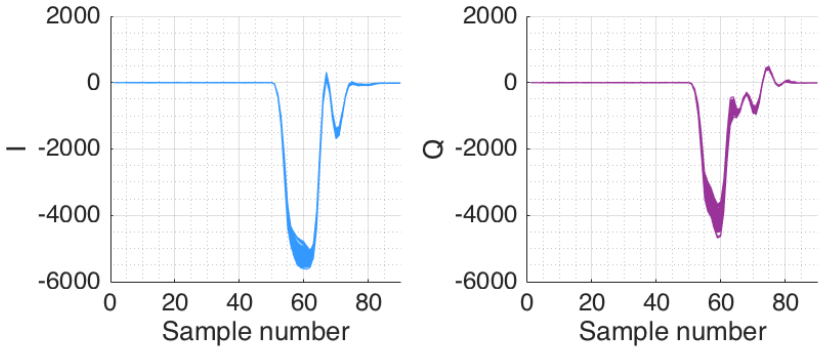
On the following slides:

- Calibration runs and fit plots for the calibration constants



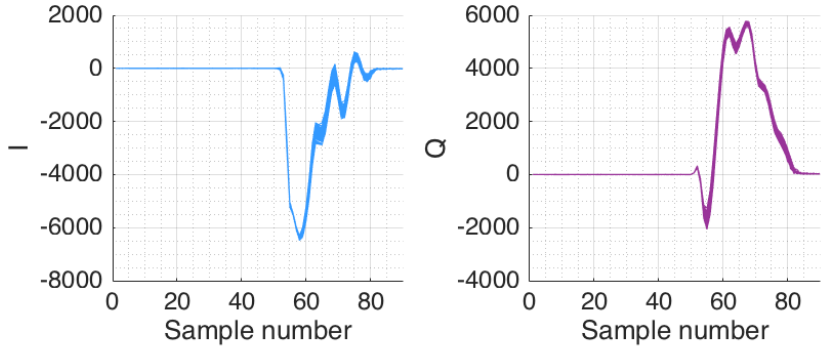
jitRun33_0dB_0.95_ipbpm_160316

Number of triggers: 200
Number of samples: 190
IPBPM analysed: AY
Waveform starts at sample: 54
Reference maximum at sample: 50
IQ maximum at sample: 60



jitRun33_0dB_0.95_ipbpm_160316

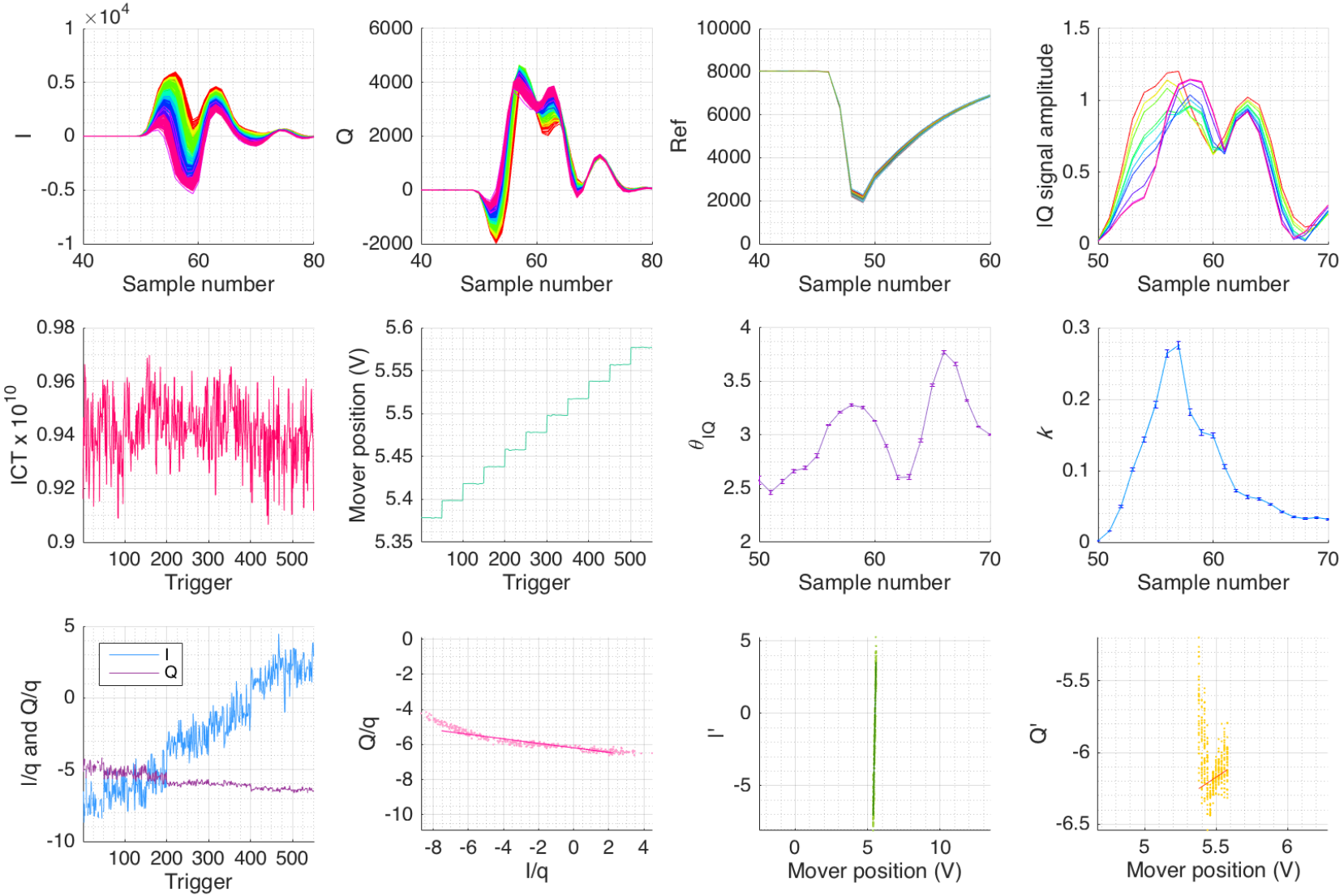
Number of triggers: 200
Number of samples: 190
IPBPM analysed: BY
Waveform starts at sample: 52
Reference maximum at sample: 50
IQ maximum at sample: 59



jitRun33_0dB_0.95_ipbpm_160316

Number of triggers: 200
Number of samples: 190
IPBPM analysed: CY
Waveform starts at sample: 53
Reference maximum at sample: 50
IQ maximum at sample: 60

IPBPM Calibration



IPAyCal1_0dB_0.95_ipbpm_160315

Number of triggers: 551
Number of samples: 190
IPBPM analysed: AY
Waveform starts at sample: 50
Reference maximum at sample: 49
IQ maximum at sample: 58

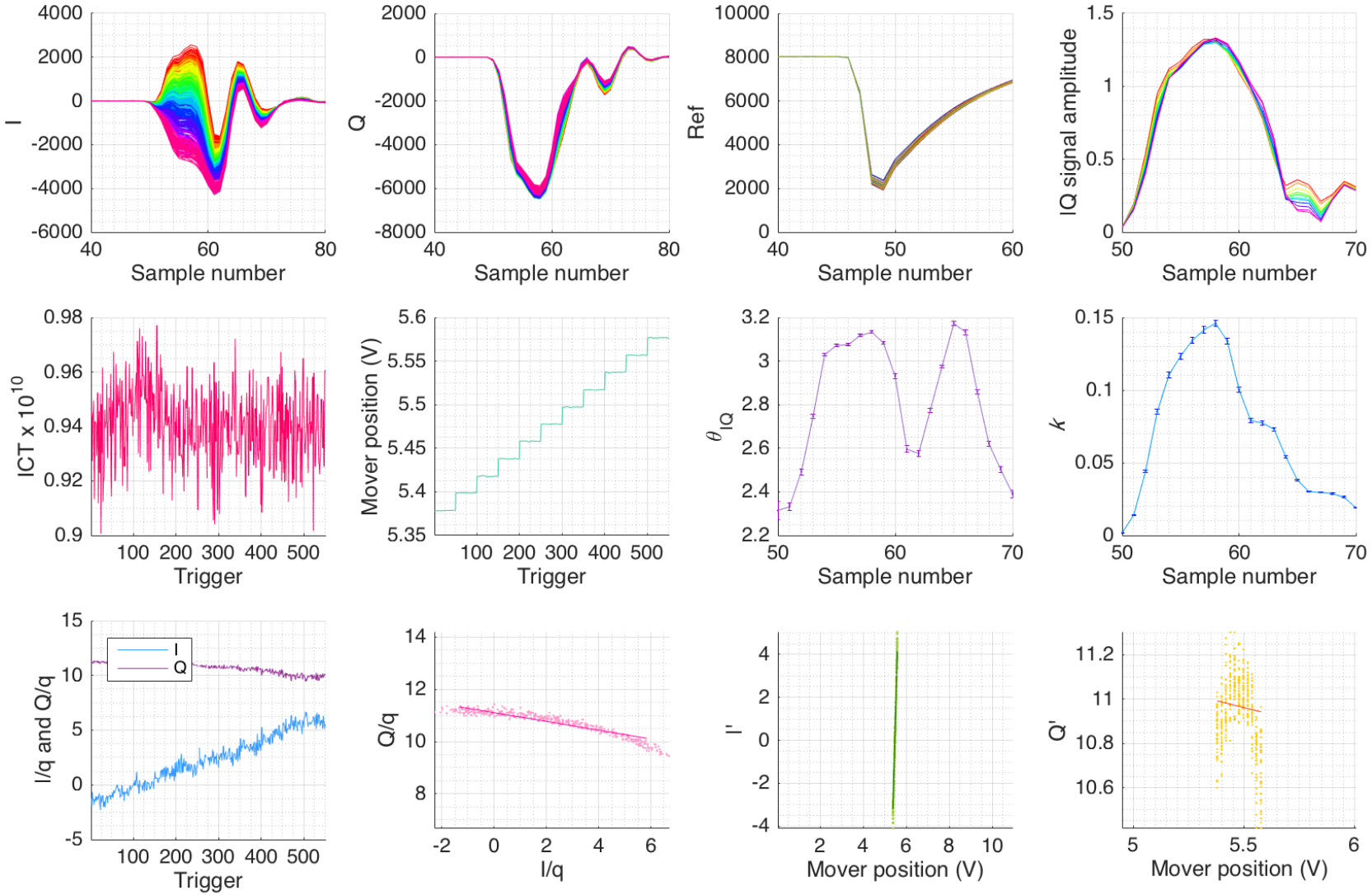
CHARGE
$0.9418 \pm 0.0005 \times 10^{10}$

MOVERS
Number of steps: 11
Triggers per step:
50 50 50 50 50 50 50 50 50 50 51
Steps used: 1: 11

CUTS
Saturated samples: 6
Reference threshold cuts: 0
3-sigma reference cuts: 2
3-sigma ICT cuts: 0
Total triggers cut: 11
1 6 7 10 22 23 34 40
40 47 537 538

CALIBRATION
Samples 53 to 63
Integration
Reference sample number: 50
IQ rotation angle θ: -0.128 $\pm$ 0.006
Scale factor k: 1.72 $\pm$ 0.03

IPBPM Calibration



IPByCal1_0dB_0.95_ipbpm_160315

Number of triggers: 551
Number of samples: 190
IPBPM analysed: BY
Waveform starts at sample: 50
Reference maximum at sample: 49
IQ maximum at sample: 58

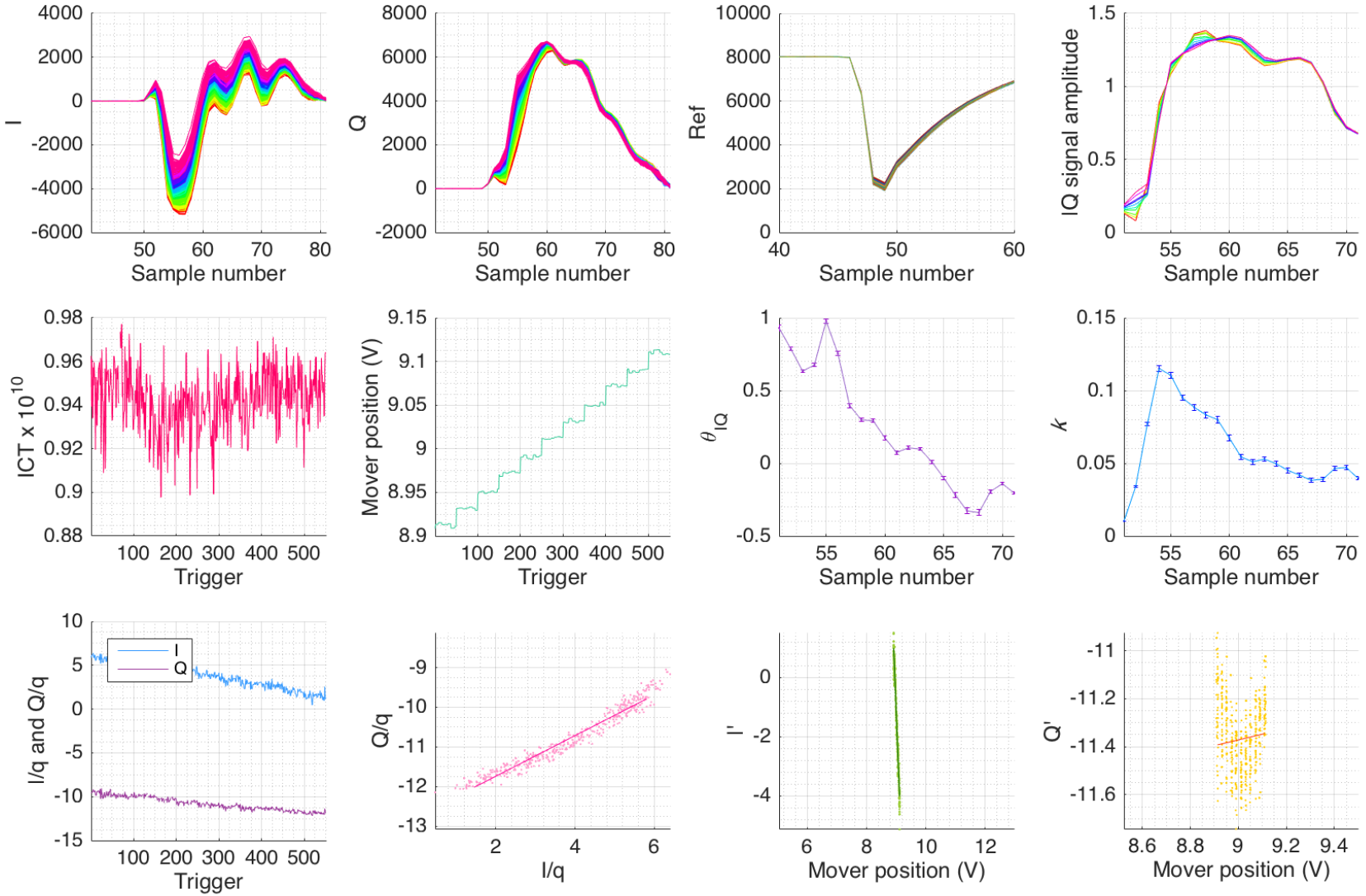
CHARGE
$0.941 \pm 0.0005 \times 10^{10}$

MOVERS
Number of steps: 11
Triggers per step:
50 50 50 50 50 50 50 50 50 50 51
Steps used: 1: 11

CUTS
Saturated samples: 6
Reference threshold cuts: 0
3-sigma reference cuts: 4
3-sigma ICT cuts: 1
Total triggers cut: 5
99 253 273 297 298

CALIBRATION
Samples 53 to 63
Integration
Reference sample number: 50
IQ rotation angle θ: -0.166 $\pm$ 0.006
Scale factor k: 1.19 $\pm$ 0.01

IPBPM Calibration



IPCyCal1_0dB_0.95_ipbpm_160315

Number of triggers: 551
Number of samples: 190
IPBPM analysed: CY
Waveform starts at sample: 51
Reference maximum at sample: 49
IQ maximum at sample: 59

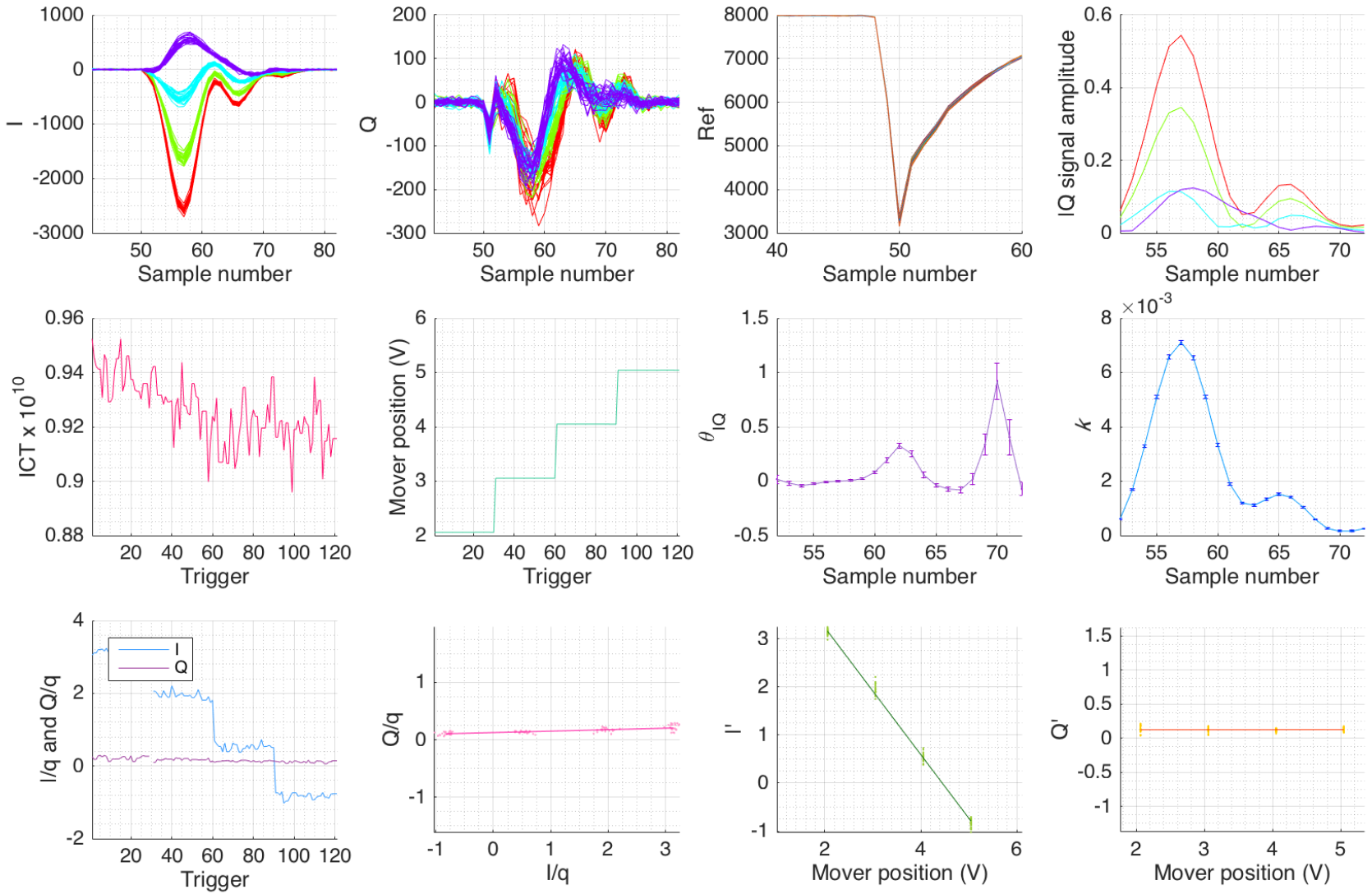
CHARGE
$0.9421 \pm 0.0005 \times 10^{10}$

MOVERS
Number of steps: 11
Triggers per step:
50 50 50 50 50 50 50 50 50 50 51
Steps used: 1: 11

CUTS
Saturated samples: 6
Reference threshold cuts: 0
3-sigma reference cuts: 5
3-sigma ICT cuts: 2
Total triggers cut: 7
66 133 163 173 188 189 231

CALIBRATION
Samples 53 to 63
Integration
Reference sample number: 50
IQ rotation angle θ: 0.47 ± 0.01
Scale factor k: 0.84 ± 0.01

IPBPM Calibration



IPAxCal1_20dB_1_ipbpm_160315

Number of triggers: 121
Number of samples: 190
IPBPM analysed: AX
Waveform starts at sample: 52
Reference maximum at sample: 50
IQ maximum at sample: 57

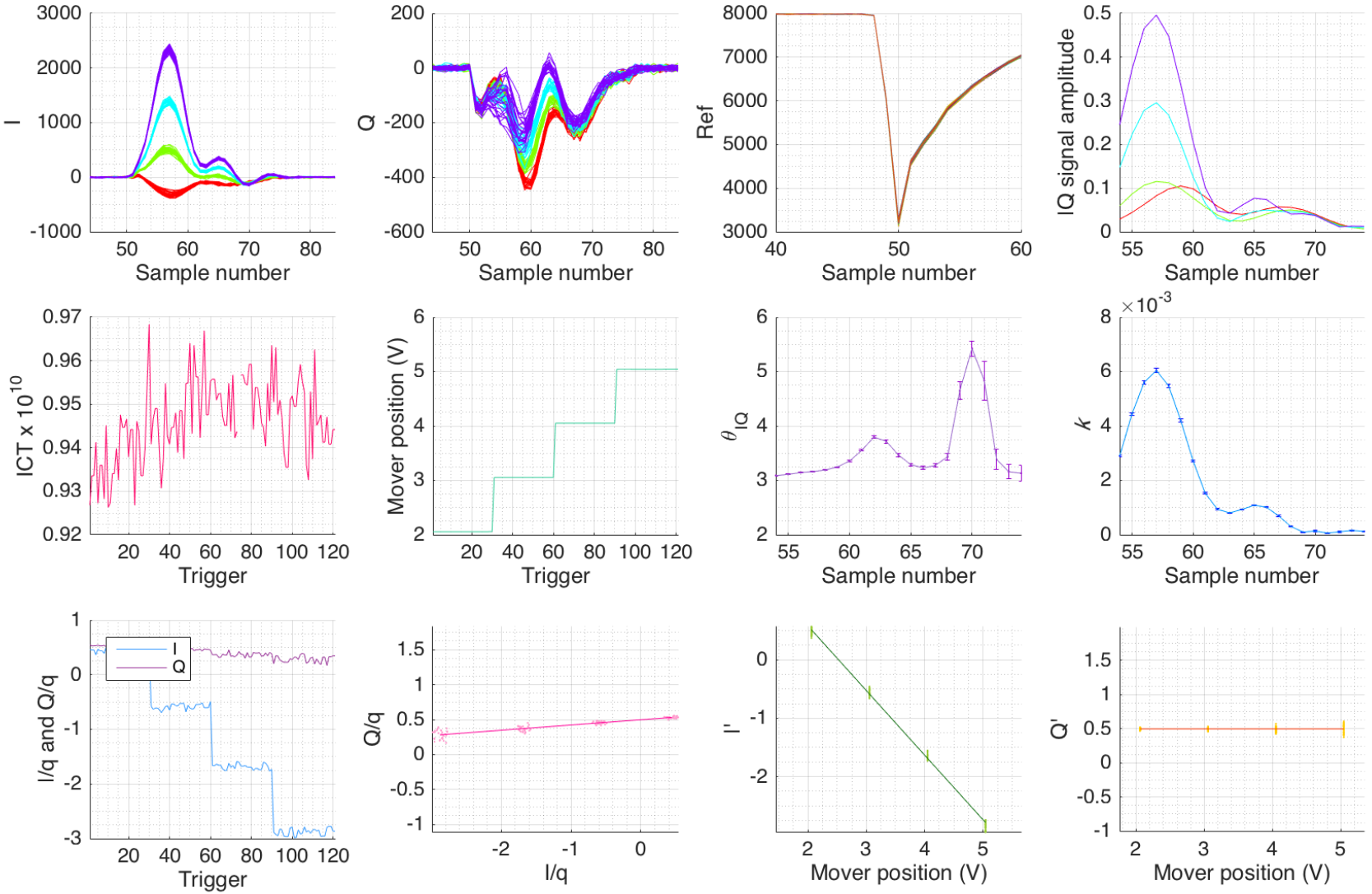
CHARGE
$0.926 \pm 0.001 \times 10^{10}$

MOVERS
Number of steps: 4
Triggers per step:
30 30 30 31
Steps used: 1: 4

CUTS
Saturated samples: 6
Reference threshold cuts: 0
3-sigma reference cuts: 1
3-sigma ICT cuts: 0
Total triggers cut: 1
30

CALIBRATION
Samples 53 to 63
Integration
Reference sample number: 50
IQ rotation angle θ: 0.025 ± 0.006
Scale factor k: -0.0427 ± 0.0004

IPBPM Calibration



IPBxCal1_20dB_1_ipbpm_160315

Number of triggers: 121
Number of samples: 190
IPBPM analysed: BX
Waveform starts at sample: 54
Reference maximum at sample: 50
IQ maximum at sample: 58

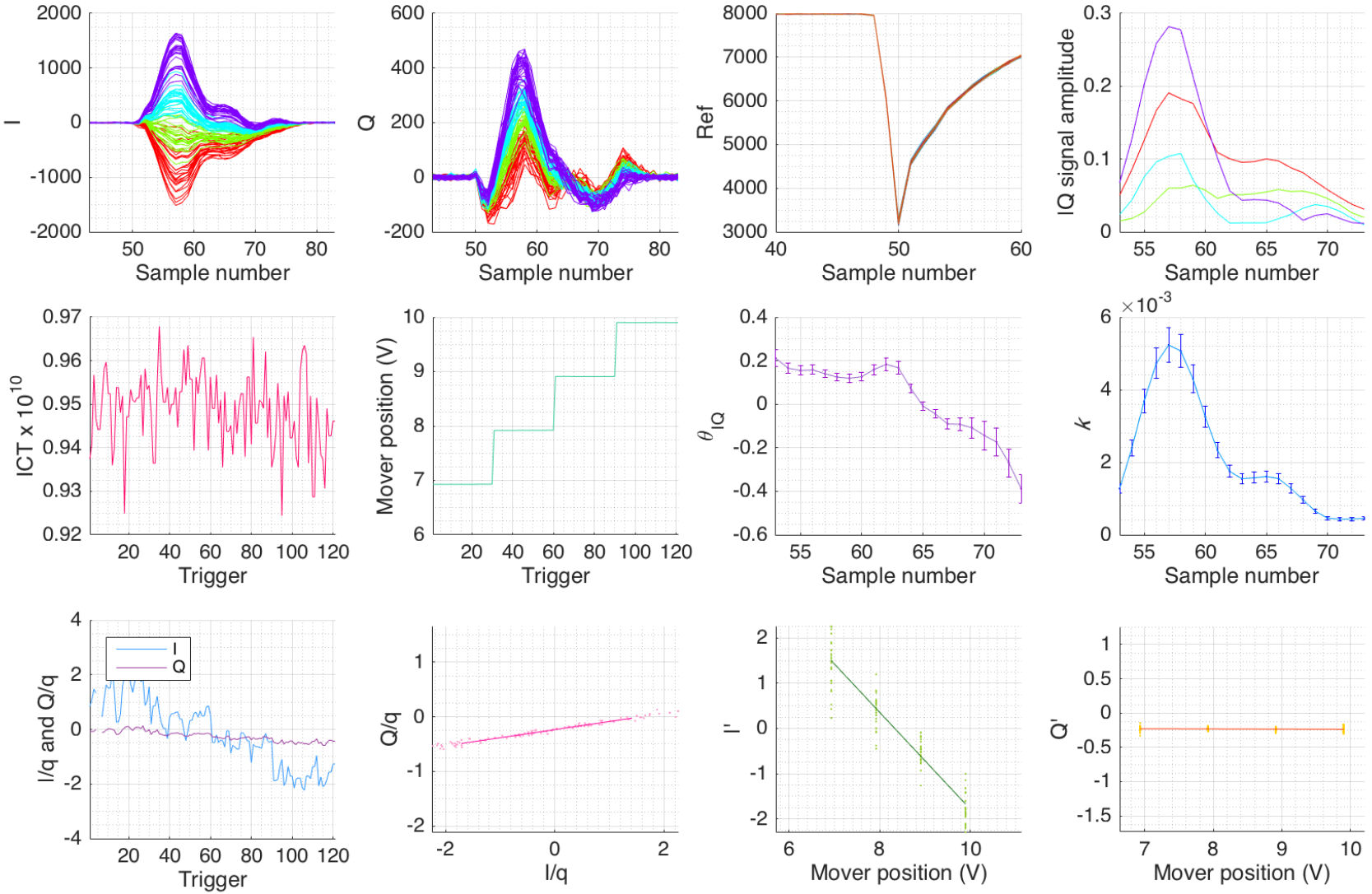
CHARGE
$0.9462 \pm 0.0008 \times 10^{10}$

MOVERS
Number of steps: 4
Triggers per step:
30 30 30 31
Steps used: 1: 4

CUTS
Saturated samples: 6
Reference threshold cuts: 0
3-sigma reference cuts: 0
3-sigma ICT cuts: 0
Total triggers cut: 0

CALIBRATION
Samples 53 to 63
Integration
Reference sample number: 50
IQ rotation angle θ: 0.075 ± 0.006
Scale factor k: -0.0357 ± 0.0004

IPBPM Calibration



IPCxCal1_20dB_1_ipbpm_160315

Number of triggers: 121
Number of samples: 190
IPBPM analysed: CX
Waveform starts at sample: 53
Reference maximum at sample: 50
IQ maximum at sample: 58

CHARGE
$0.9485 \pm 0.0007 \times 10^{10}$

MOVERS
Number of steps: 4
Triggers per step:
30 30 30 31
Steps used: 1: 4

CUTS
Saturated samples: 6
Reference threshold cuts: 0
3-sigma reference cuts: 2
3-sigma ICT cuts: 0
Total triggers cut: 2
5 6

CALIBRATION
Samples 53 to 63
Integration
Reference sample number: 50
IQ rotation angle θ: 0.15 ± 0.01
Scale factor k: -0.036 ± 0.003