# Resolution Study cont.

T. Bromwich

Outline

Look at different files from the May/June run and attempt to identify common conditions for achieving good resolution results.

- Study 1: Look at stray waveforms
        Check timing of data sets.
        Plot how position changes with time.
        Plot position residual changing with time.
        How theta changes with jitRuns.

- Study 2: Try removing outliers from Q/I plot.
        How theta changes within jitRuns + differences from calibration file.

Check stray waveforms

jitRun14(601:800) → 33nm
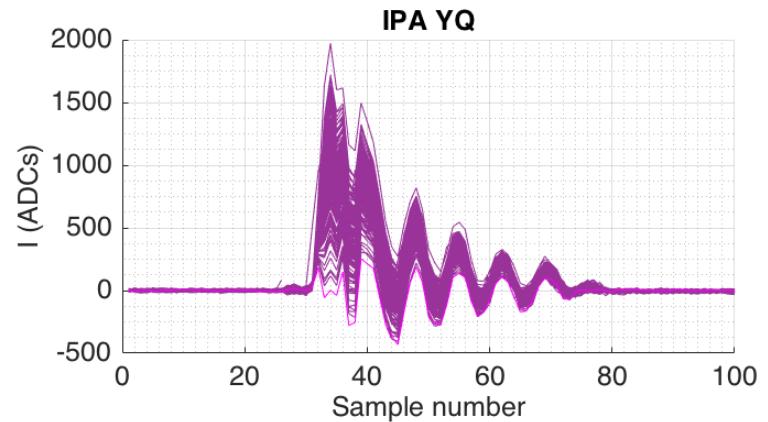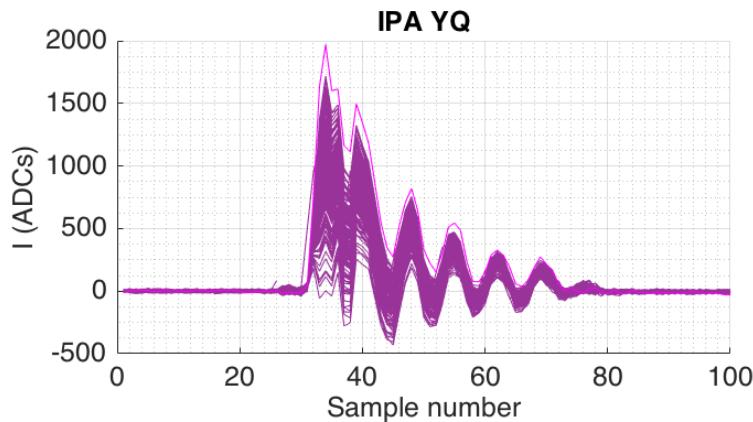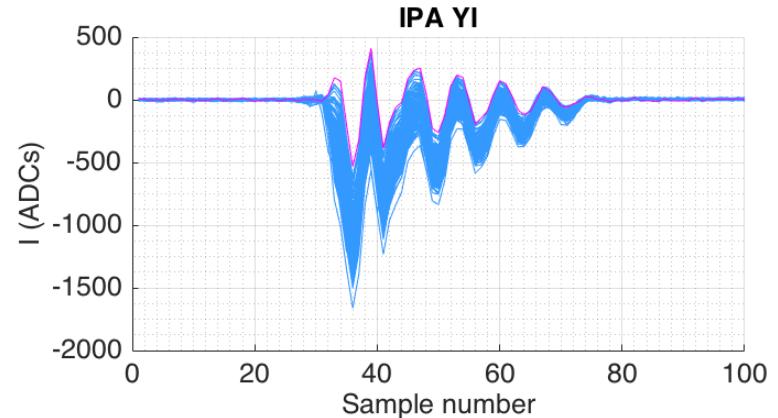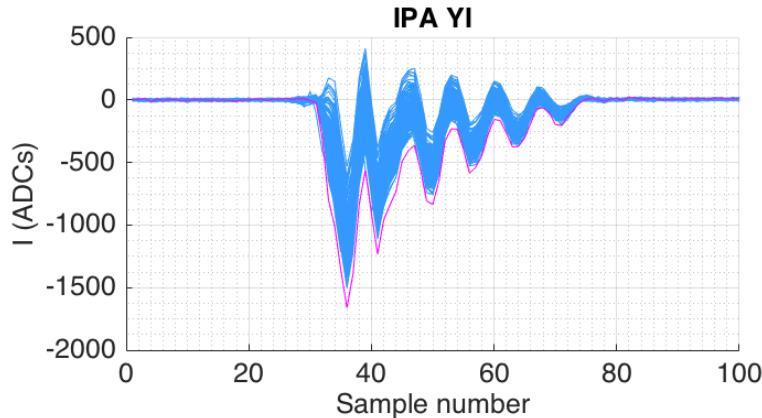
Study 1: Rolling resolution

- jitRun13: triggers 1:400
- jitRun14: triggers 401 to 2400
- jitRun15: triggers 2401 to 3400

Time gap: 67 seconds

Time gap: 8 minutes and 7 seconds
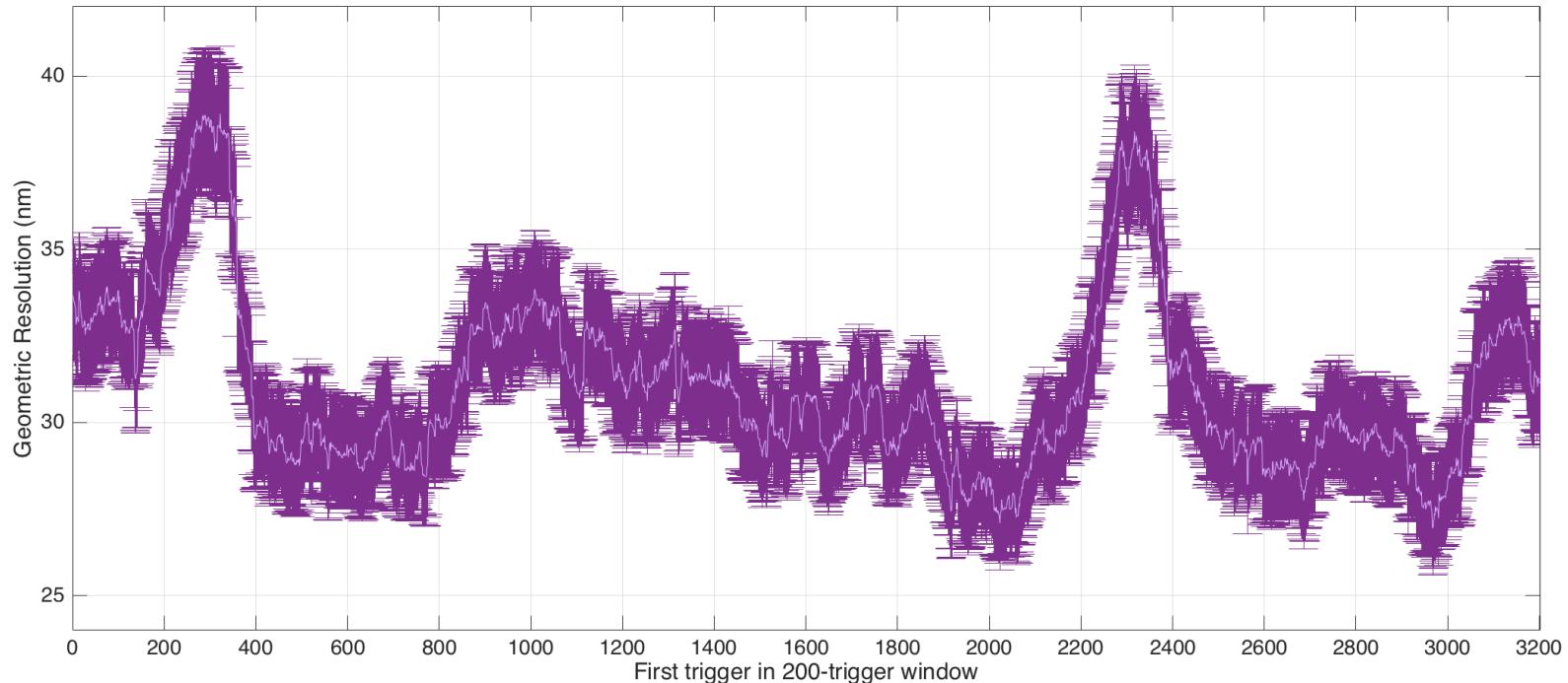
Study 1: Res & position

200-trigger resolution against same axes as the position trigger by trigger at IPA,B, C.
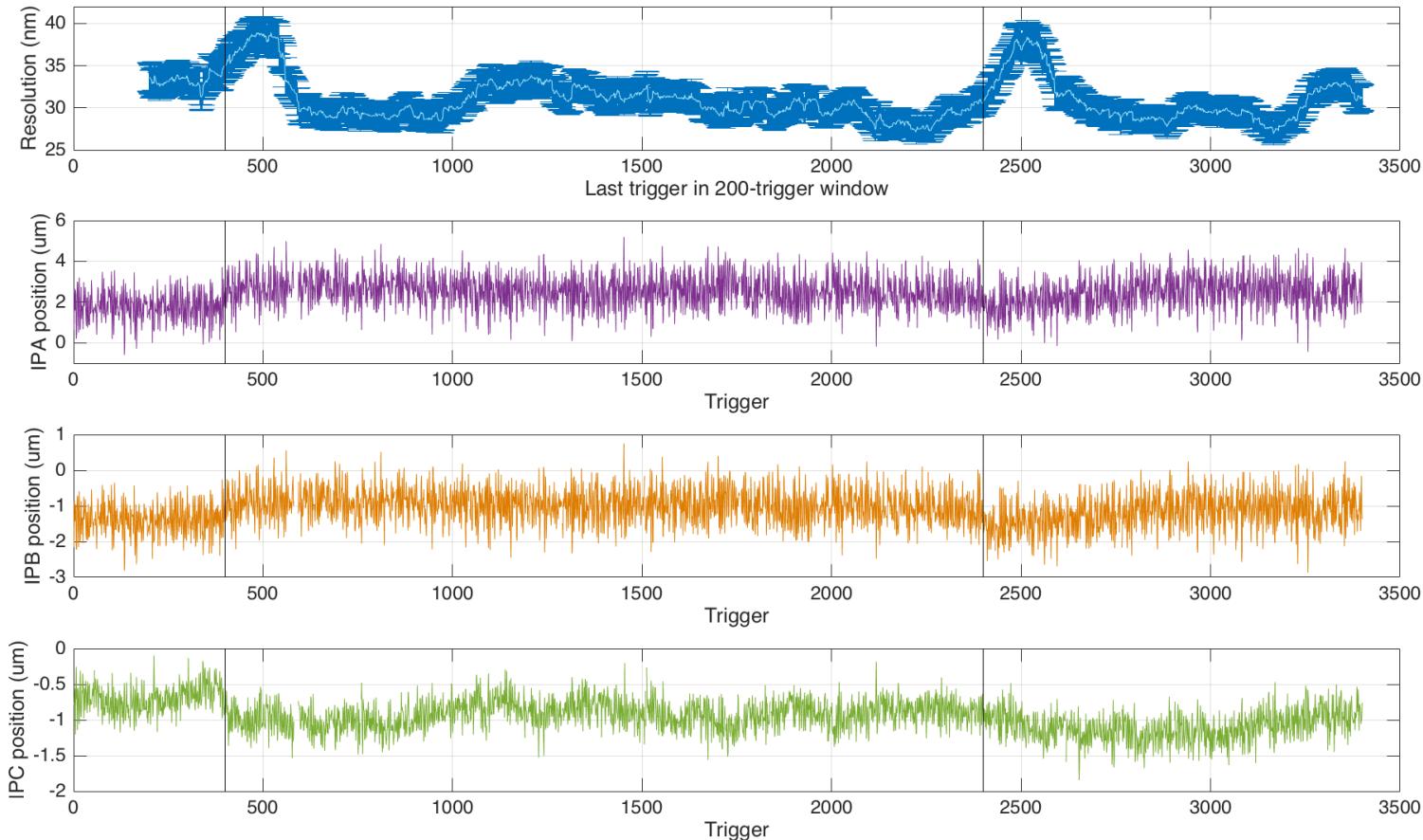
Study 1: Res & position

Superimposed mean position for each 200-window block.
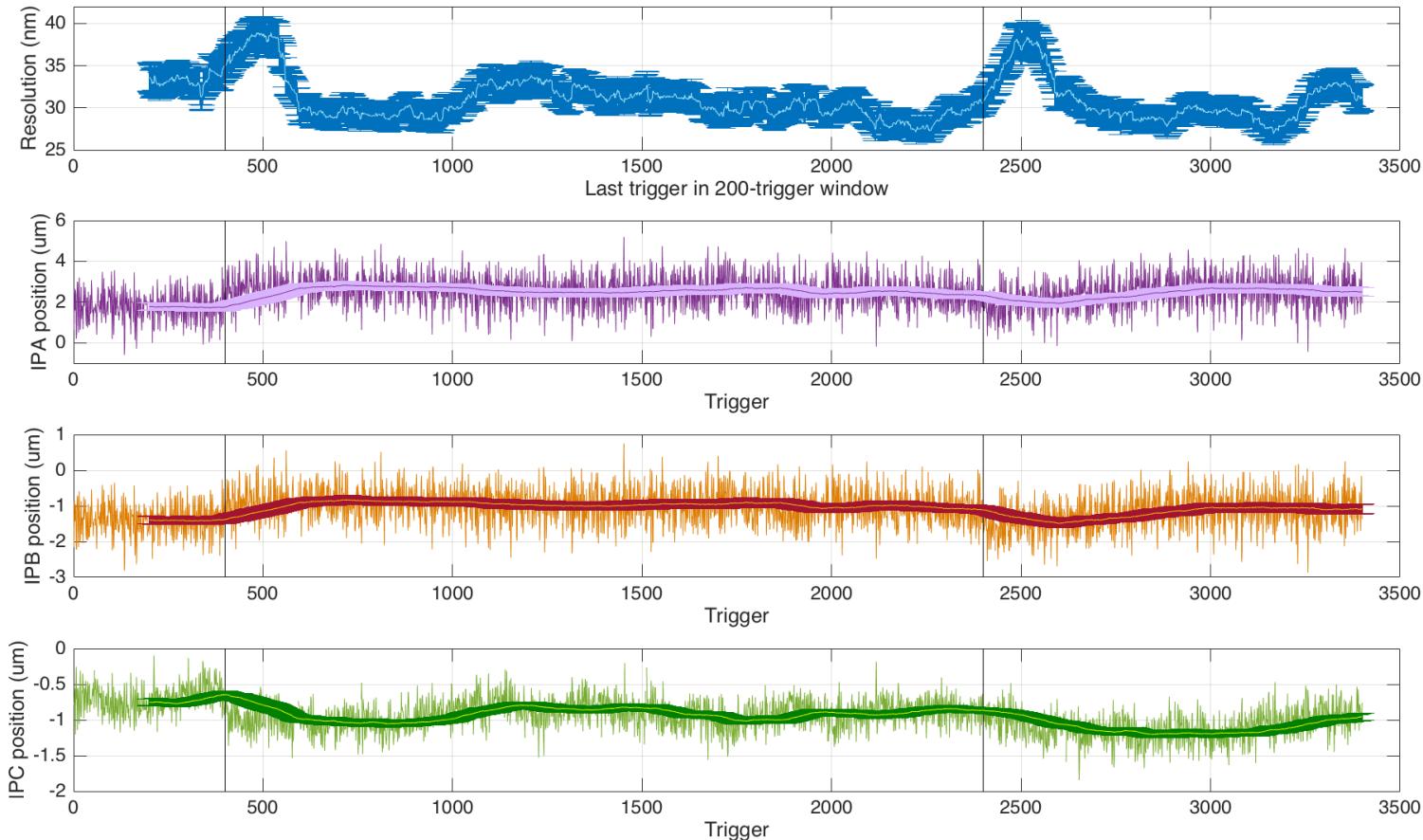
Study 1: Res & residual

How the position residual varies with time as compared to the 200-trigger resolution window.
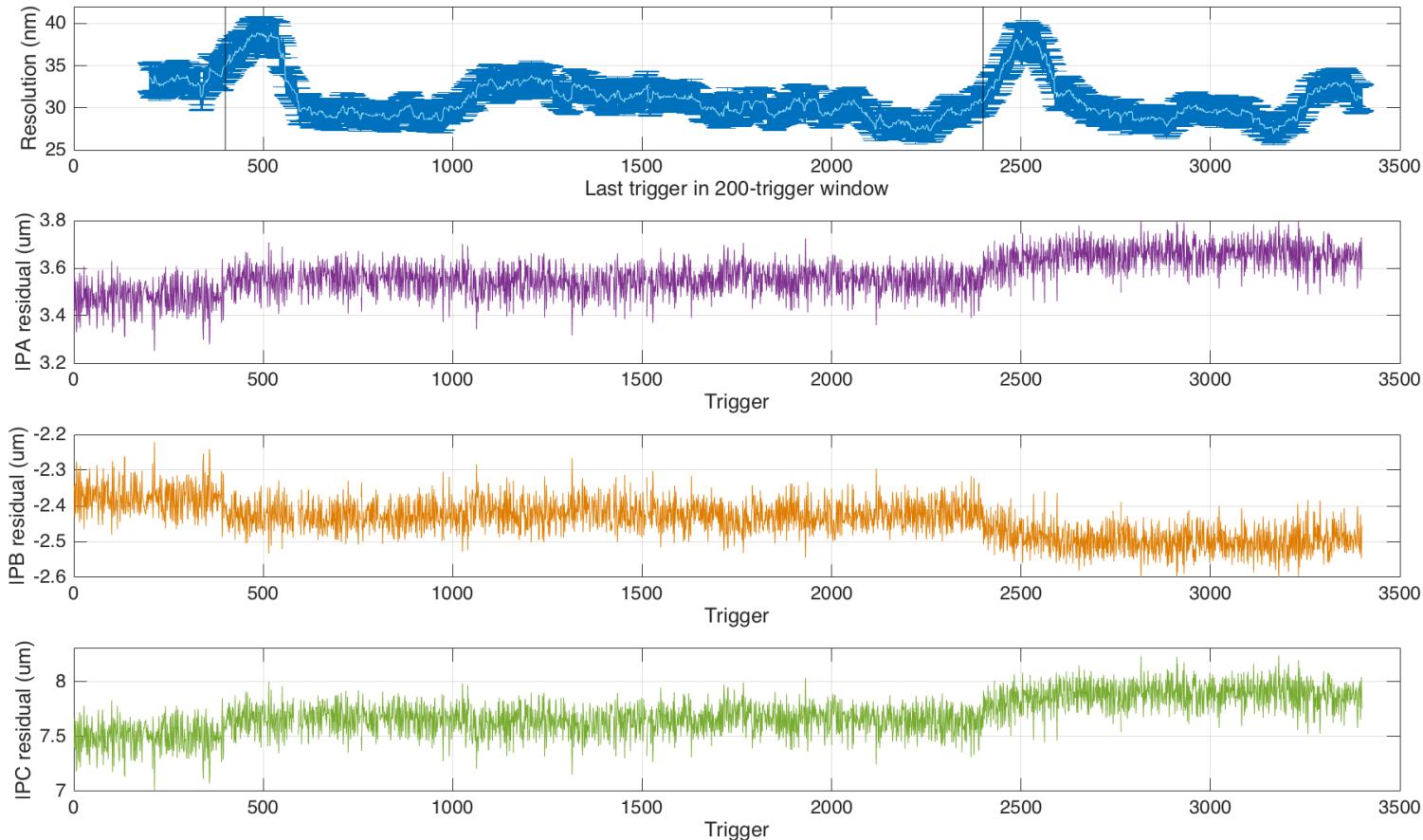
Study 1: Theta for different files

Fit to the I and Q values from the separate jitter runs to see how theta changes with time at the three BPMs.

- jitRun13: triggers 1:400   ⟵   *Time gap: 67 seconds*
- jitRun14: triggers 401 to 2400   ⟵   *Time gap: 8 minutes and 7 seconds*
- jitRun15: triggers 2401 to 3400

Study 1: theta with time

How theta for 200 triggers varies with time as compared to the 200-trigger resolution window.
Also plotted as solid straight line is the theta value from the corresponding calibration file.
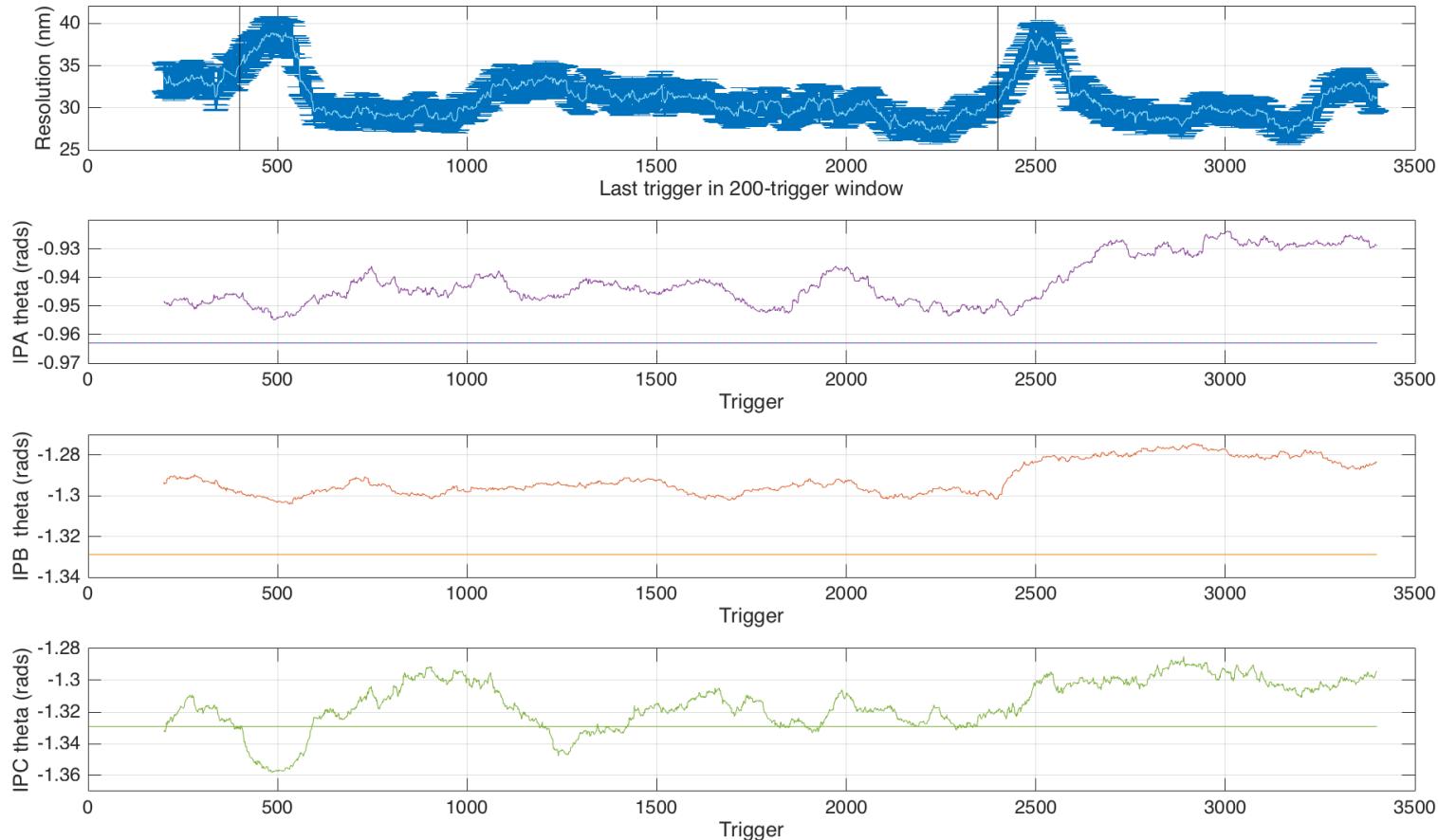
Study 2: jitRun9 (~40nm)

Study of the phase trigger by trigger shows a few clear outliers.

Try removing these from jitRun9 and see the impact on the resultant resolution.
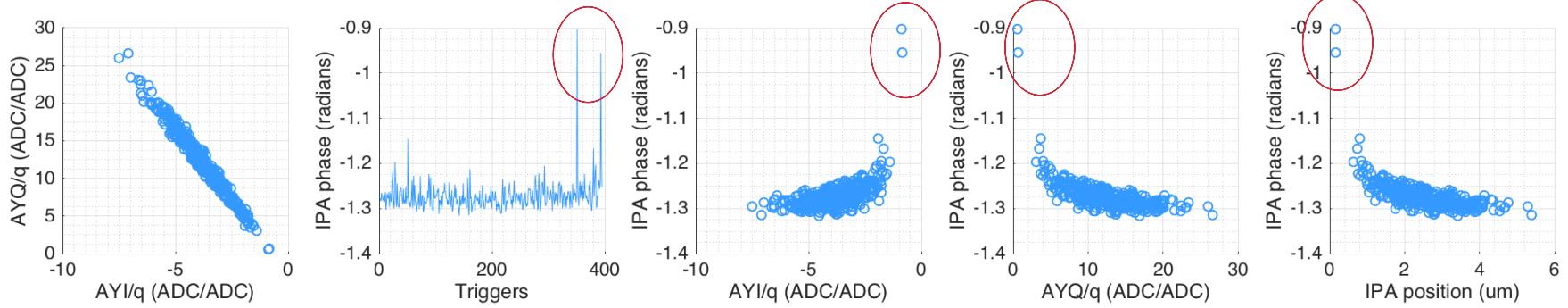
Resolution only changes from 40.8 to 40.5 nm.
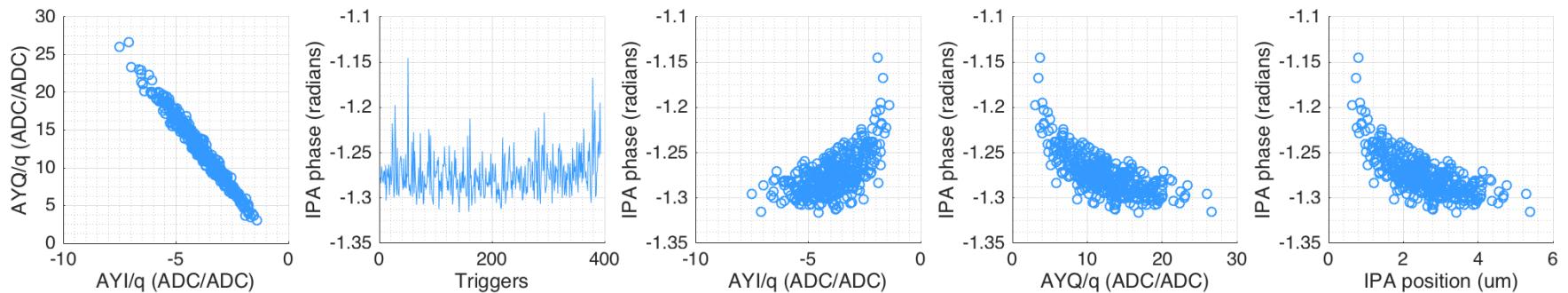
Study 2: jitRun9 (~40nm)

Try looking at the spread of Q/I with time. Colour coded with triggers 1:400.

Compare to the calibration for calculating theta – fit to calibration plotted in black.

IPA
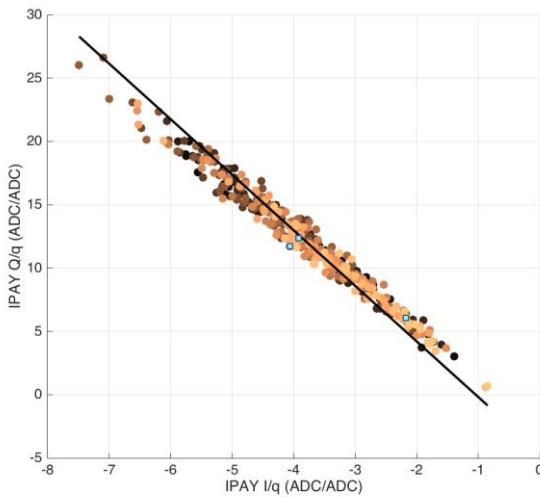
Calibration theta: -1.347 rads

JitRun theta: -1.312 rads

Delta theta: 0.035 rads

IPB
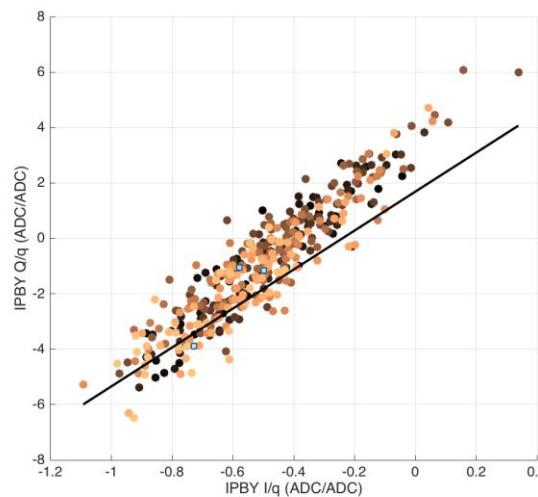
Calibration theta: 1.430 rads

JitRun theta: 1.456 rads

Delta theta: 0.026 rads

IPC
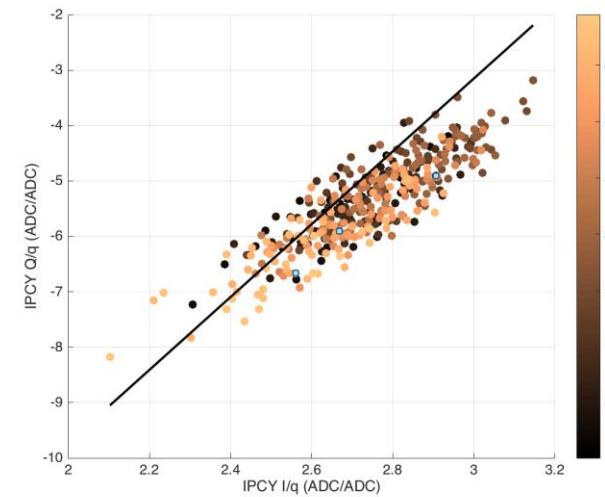
Calibration theta: 1.420 rads

JitRun theta: 1.335 rads

Delta theta: **0.085 rads**

Study 2: jitRun8 (~20nm)

Try looking at the spread of Q/I with time. Colour coded with triggers 1:400.

Compare to the calibration for calculating theta – fit to calibration plotted in black.

IPA
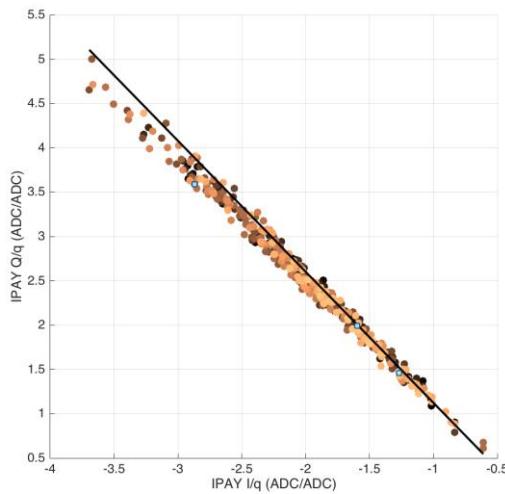
Calibration theta: -0.976 rads

JitRun theta: -0.943 rads

Delta theta: 0.033 rads

IPB
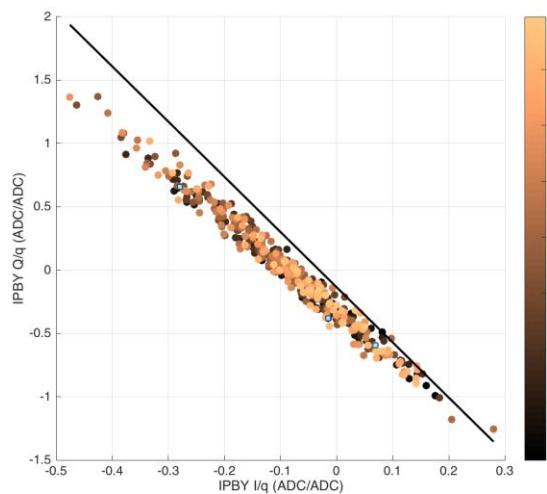
Calibration theta: -1.345 rads

JitRun theta:-1.306 rads

Delta theta: 0.039 rads

IPC
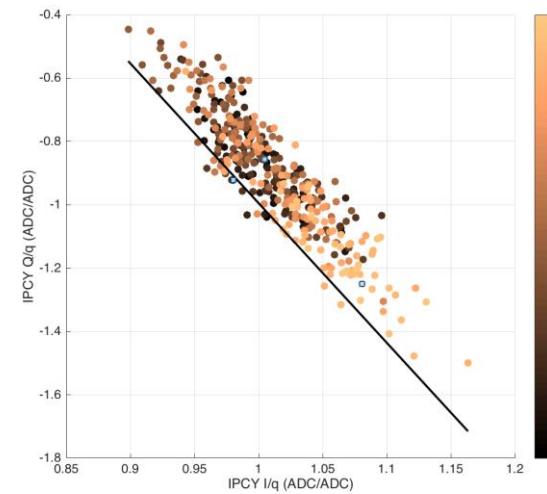
Calibration theta: -1.348 rads

JitRun theta: -1.3296 rads

Delta theta: 0.018 rads

Study 2: Fitting improvements

jitRun8

IPA

| Coefficient	Geometric	Fit(3)	I'(3)	I'Q'(5)	I'Q'q(6)
I	1.464	1.438	1.849	1.852	1.852
I	-0.464	-0.467	0.794	0.783	0.782
const	0.000	0.003	-0.004	-0.004	-0.004
Q	0.000	0.000	0.000	-0.065	-0.062
Q	0.000	0.000	0.000	-0.464	-0.452
q	0.000	0.000	0.000	0.000	0.000
Res	20.662	19.870	19.656	19.368	19.365
Res_s	0.733	0.705	0.710	0.699	0.699

IPB

Coefficient	Geometric	Fit(3)	I'(3)	I'Q'(5)	I'Q'q(6)
I	0.683	0.692	0.538	0.540	0.540
I	0.317	0.318	-0.421	-0.418	-0.418
const	0.000	-0.002	0.002	0.002	0.002
Q	0.000	0.000	0.000	-0.035	-0.034
Q	0.000	0.000	0.000	0.209	0.205
q	0.000	0.000	0.000	0.000	0.000
Res	20.662	19.879	19.963	19.642	19.640
Res_s	0.733	0.705	0.713	0.702	0.702

IPC

Coefficient	Geometric	Fit(3)	I'(3)	I'Q'(5)	I'Q'q(6)
I	-2.156	-1.859	1.093	1.091	1.088
I	3.156	2.631	-1.989	-1.972	-1.967
const	0.000	0.006	0.005	0.005	0.004
Q	0.000	0.000	0.000	-0.252	-0.262
Q	0.000	0.000	0.000	0.111	0.124
q	0.000	0.000	0.000	0.000	0.000
Res	20.662	21.310	18.195	17.820	17.808
Res_s	0.733	0.756	0.646	0.633	0.633

jitRun9

IPA

Coefficient	Geometric	Fit(3)	I'(3)	I'Q'(5)	I'Q'q(6)
I	1.464	1.539	-1.871	-1.876	-1.874
I	-0.464	-0.562	-0.830	-0.789	-0.797
const	0.000	0.004	-0.019	-0.015	-0.020
Q	0.000	0.000	0.000	-0.037	-0.036
Q	0.000	0.000	0.000	1.021	0.671
q	0.000	0.000	0.000	0.000	0.006
Res	40.829	26.149	27.385	25.966	25.072
Res_s	1.453	0.930	0.996	0.944	0.912

IPB

Coefficient	Geometric	Fit(3)	I'(3)	I'Q'(5)	I'Q'q(6)
I	0.683	0.646	-0.531	-0.527	-0.527
I	0.317	0.353	-0.429	-0.401	-0.405
const	0.000	-0.002	-0.010	-0.008	-0.010
Q	0.000	0.000	0.000	-0.067	-0.080
Q	0.000	0.000	0.000	0.625	0.452
q	0.000	0.000	0.000	0.000	0.003
Res	40.829	26.180	25.967	24.475	23.623
Res_s	1.453	0.931	0.931	0.878	0.847

IPC

Coefficient	Geometric	Fit(3)	I'(3)	I'Q'(5)	I'Q'q(6)
I	-2.156	-1.430	-0.968	-0.969	-0.996
I	3.156	2.143	-1.764	-1.753	-1.812
const	0.000	0.006	-0.019	-0.019	-0.024
Q	0.000	0.000	0.000	0.259	0.142
Q	0.000	0.000	0.000	0.038	-0.014
q	0.000	0.000	0.000	0.000	0.006
Res	40.829	28.964	20.258	19.991	19.258
Res_s	1.453	1.030	0.722	0.712	0.686