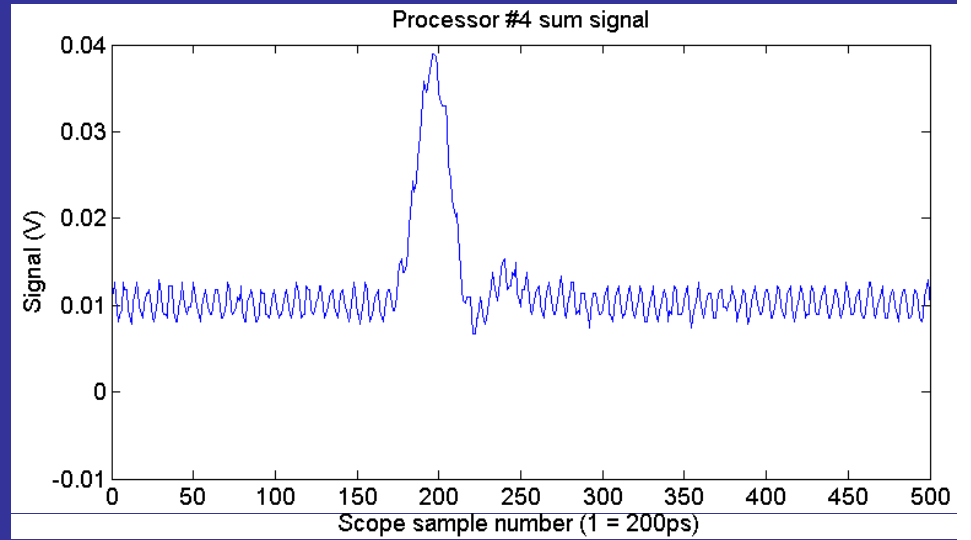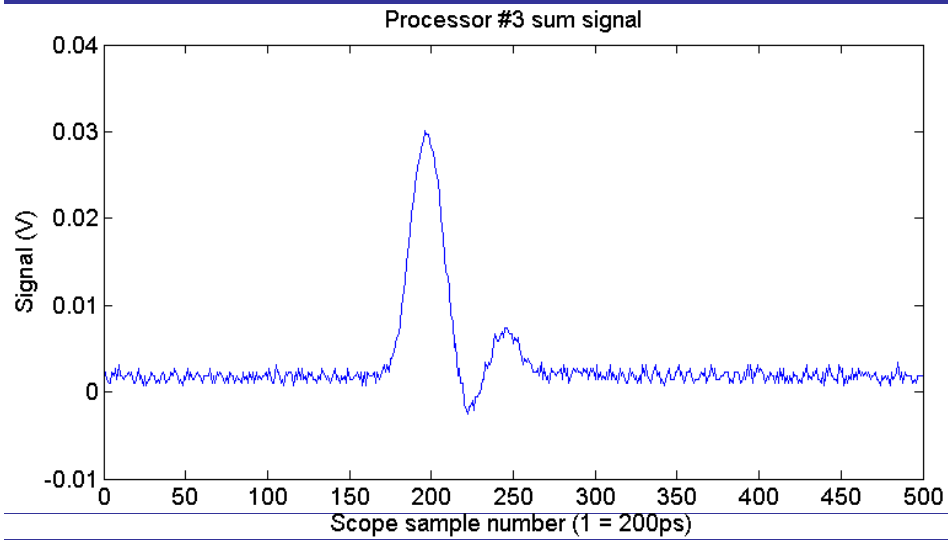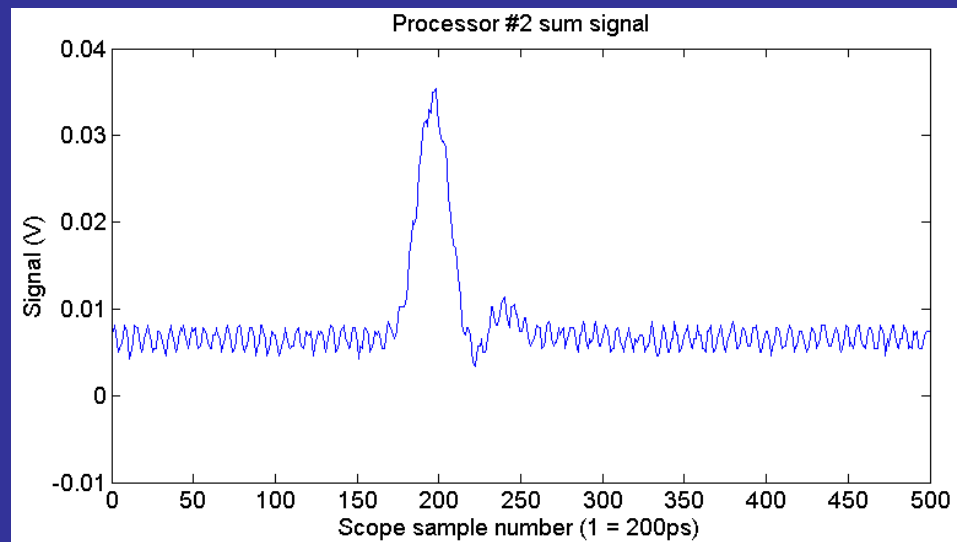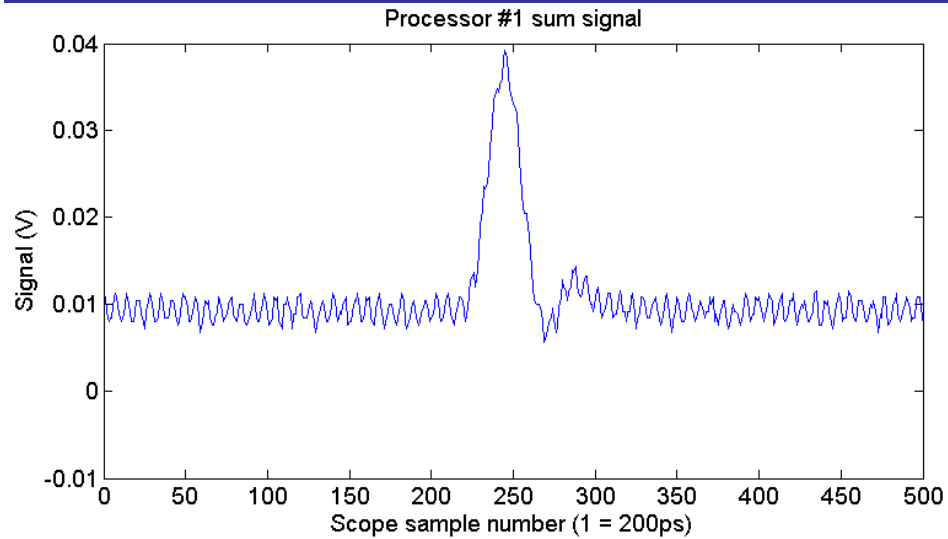# BPM processor Investigation

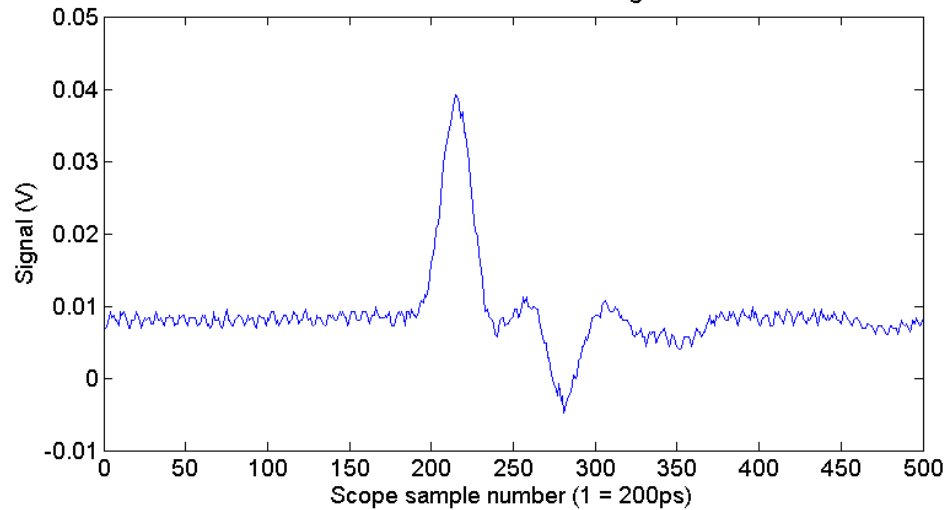## Analysis of March '08 ATF data

Setup

- 4 processors on BPM 10.
- Stripline signals split 4 ways each with a single 4 way splitter.
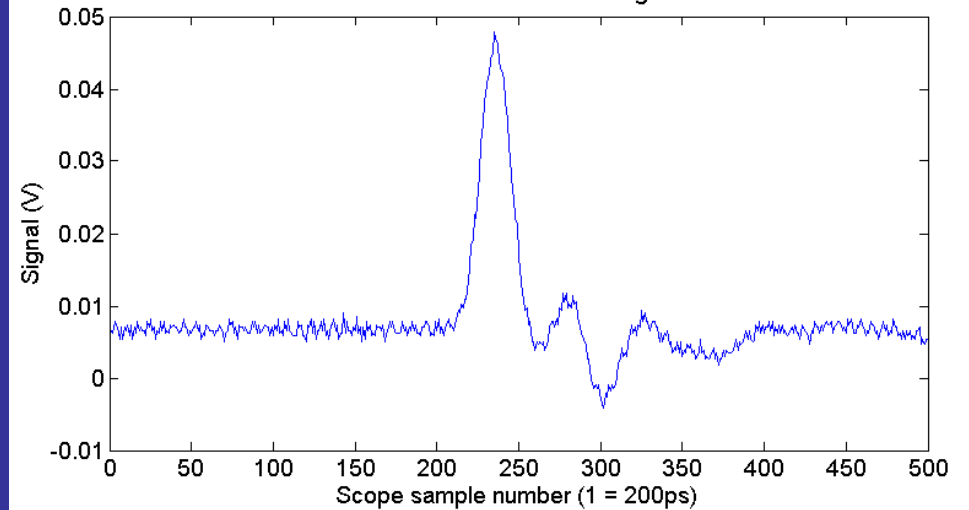- Processors calibrated against magnet ZV8X.

Sum Signals

Difference Signals

Data Analysis

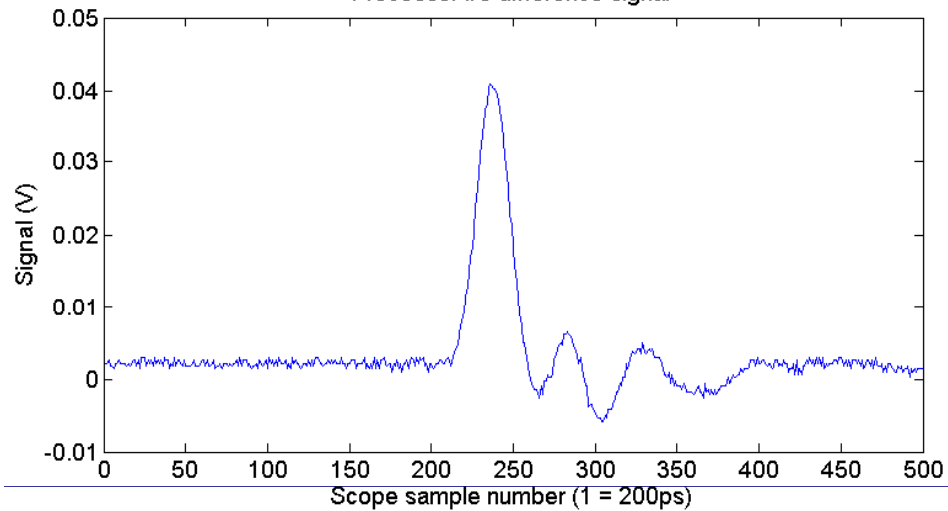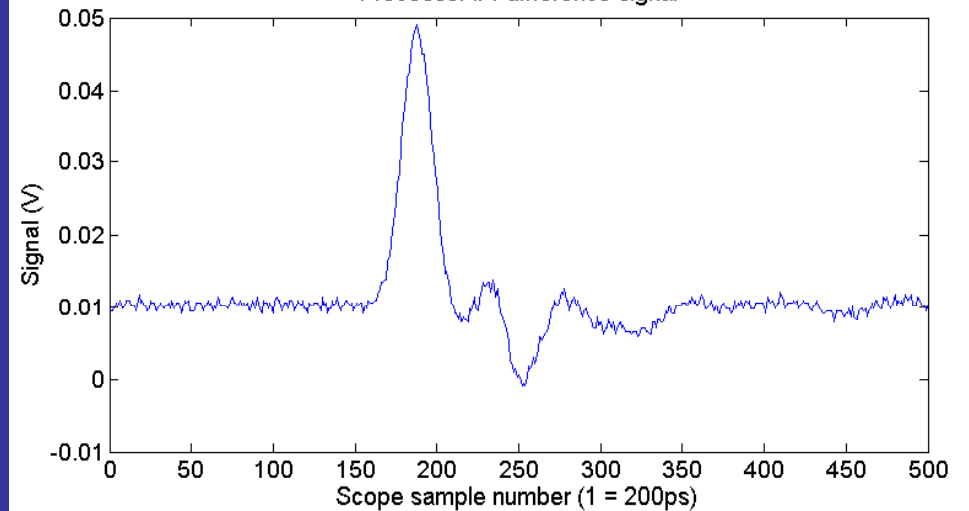- Case 1 - Example using peak value only.
- Case 2 - Example using window size of 30 samples centred about the signal peak (this case gives the best resolution results).
- Case 3 – Example using a wide window, encompassing all features after the main peak.

Calibration results (case 1)

Difference from processor 1 VS Position from mag current

Cal const = -2.18e3 +/-5.78

y crossing = 1.5

$\chi^2/NDF = 37.38$

Difference from processor 2 VS Position from mag current

Cal const = -2.26e3 +/-9.67

y crossing = 1.9

$\chi^2/NDF = 37.48$

Difference from processor 3 VS Position from mag current

Cal const = -2.53e3 +/-5.38

y crossing = 1.91

$\chi^2/NDF = 13.32$

Difference from processor 4 VS Position from mag current

Cal const = -2.55e3 +/-8.51

y crossing = 1.8

$\chi^2/NDF = 32.91$

Calibration results (case 2)
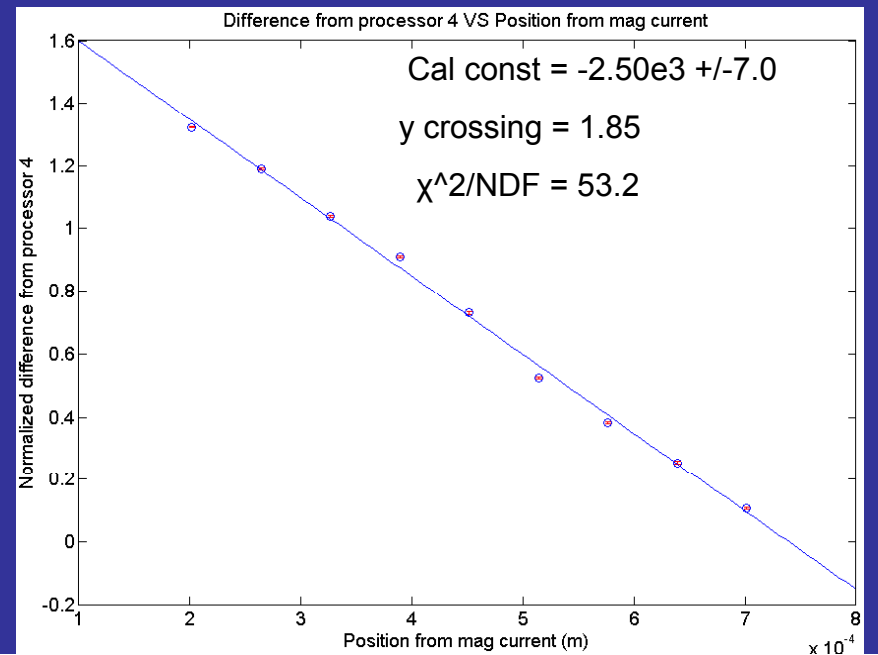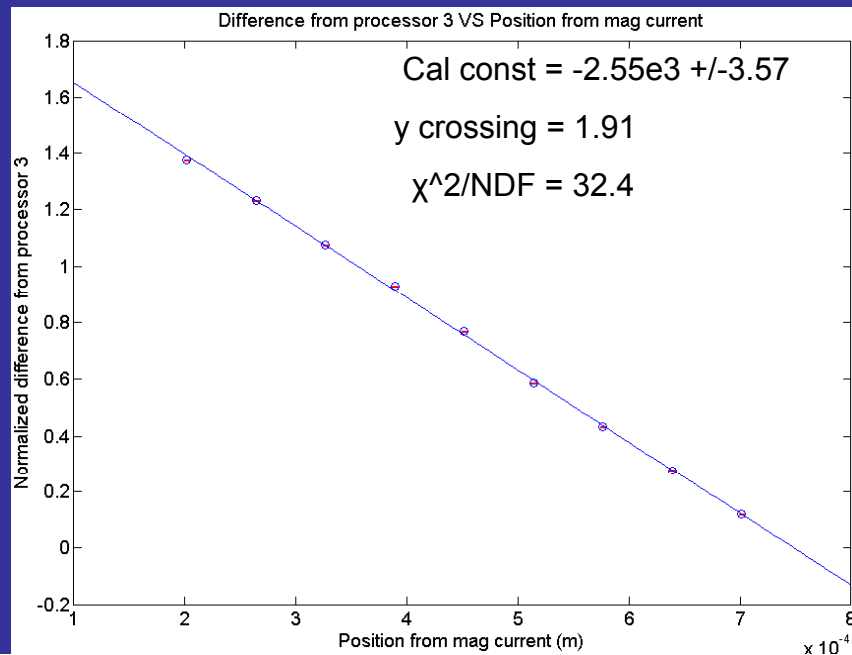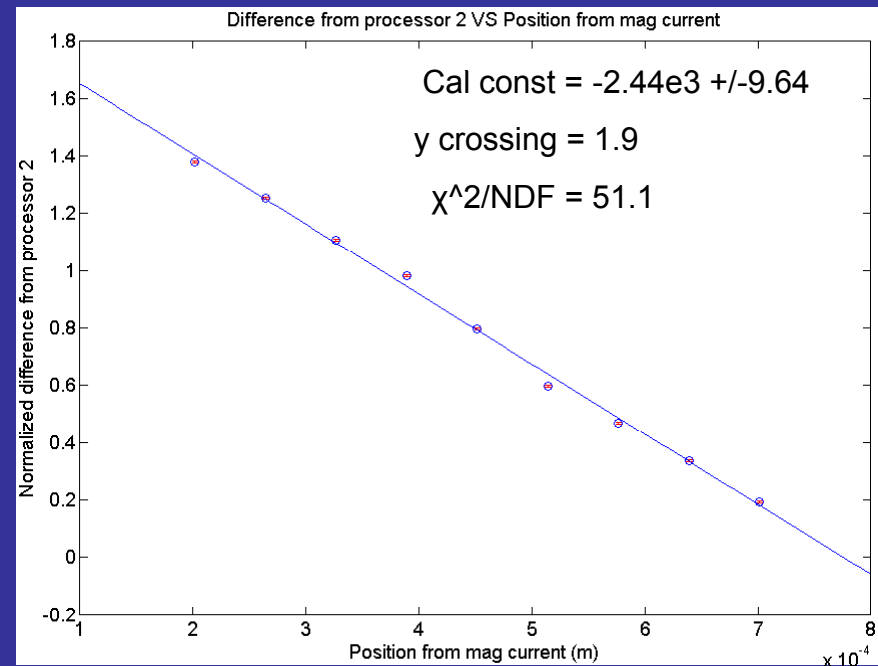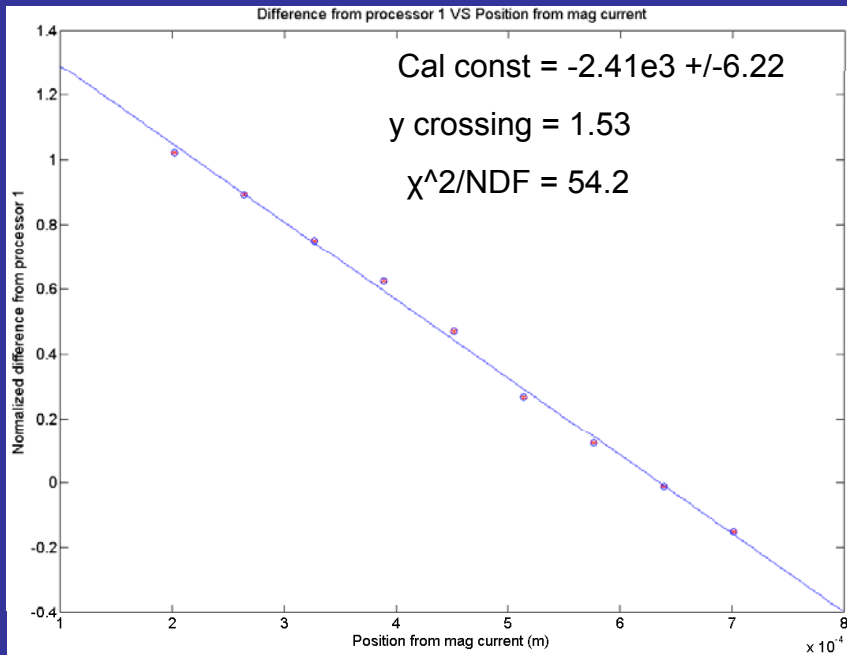
Calibration results (case 3)

Calibration VS Integration window
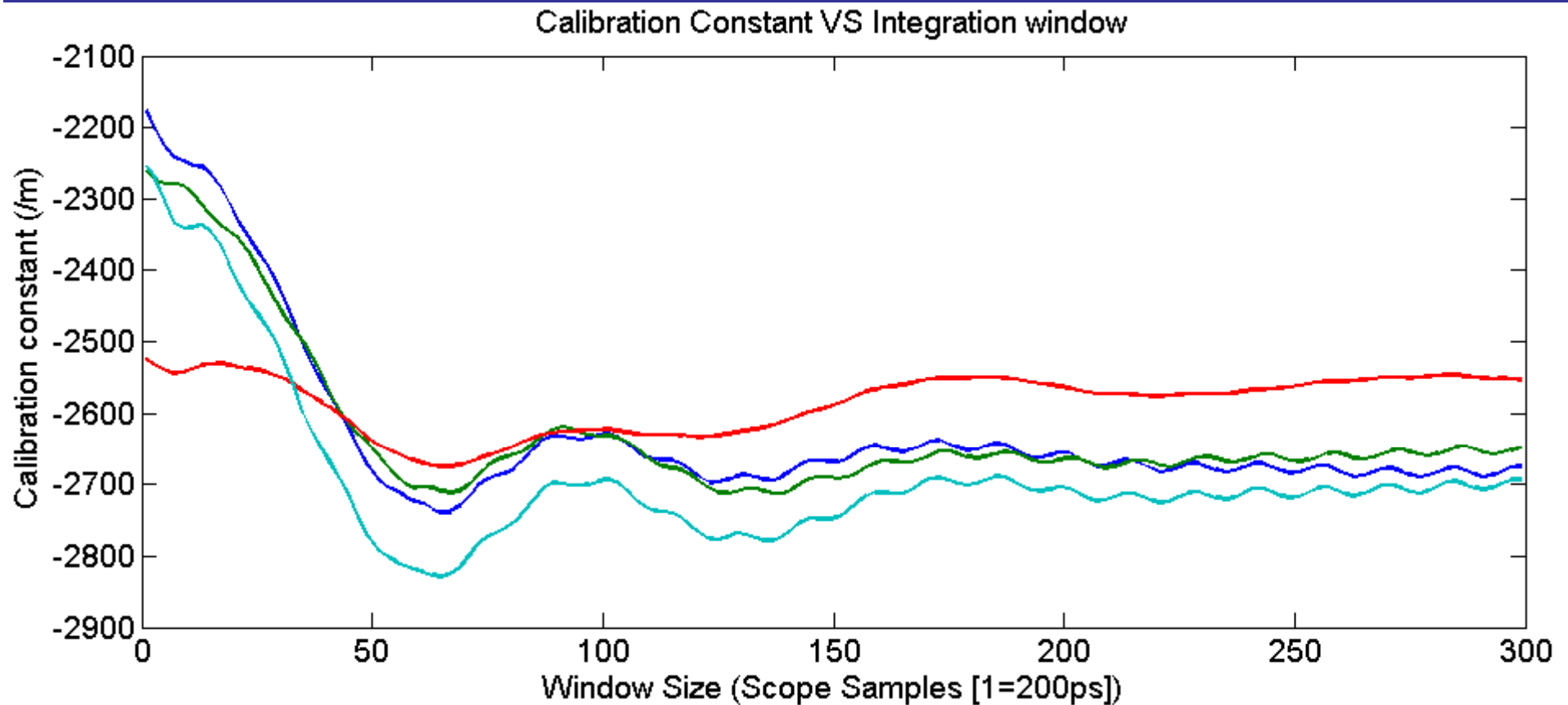
Resolution results (case 1)

Resolution results (case 2)

Processor 1 Residual

Resolution = 4.3um

Mean: 4.8087e-006
Sigma: 4.4449e-006
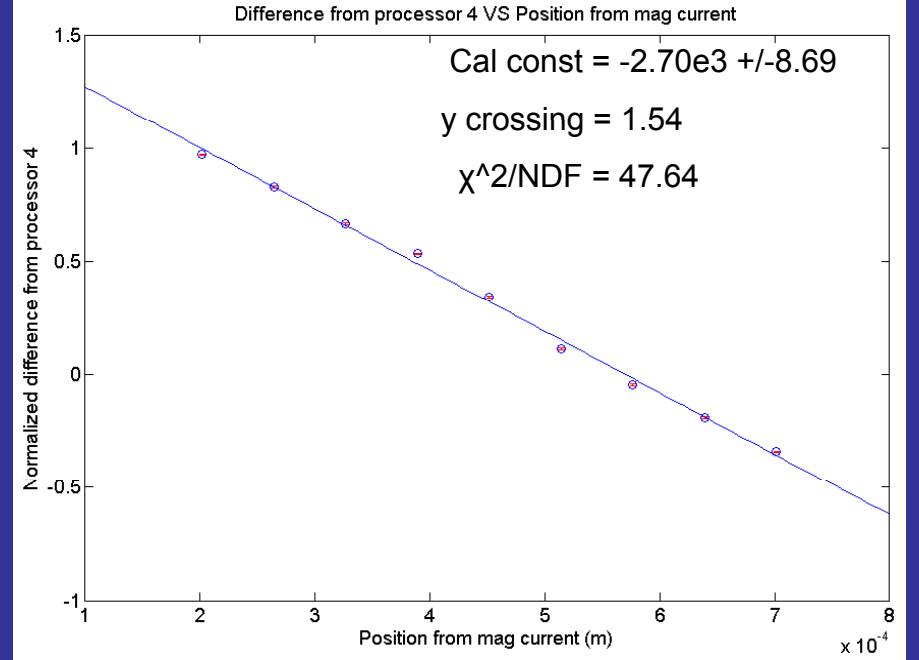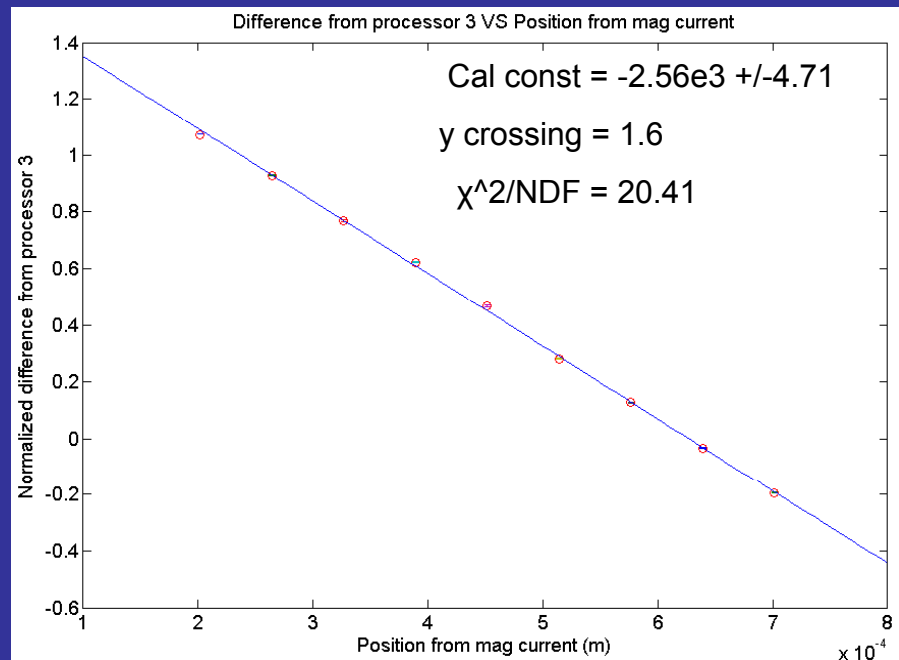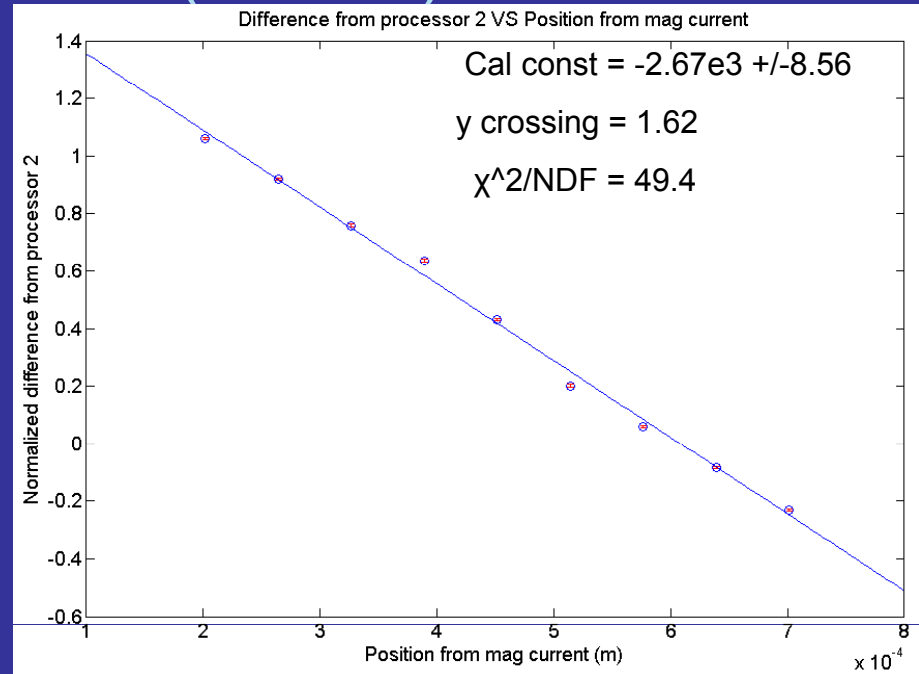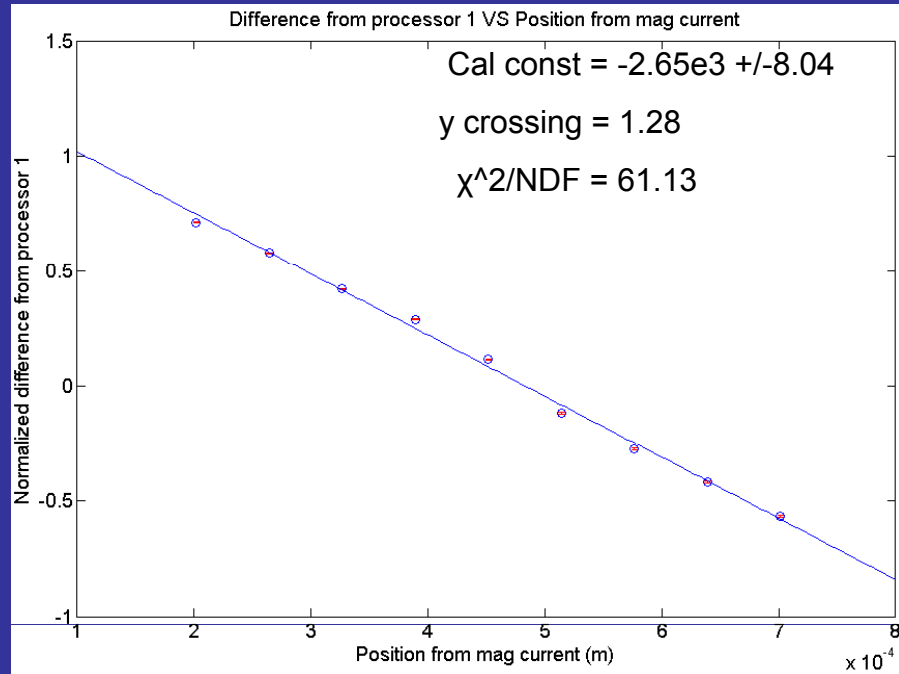Max: 38.8274
Chi2/ndf: 0.041692

Position (m)

Processor 2 Residual

Resolution = 3.16um

Mean: -9.5234e-007
Sigma: 3.0551e-006
Max: 46.5752
Chi2/ndf: 0.052693

Position (m)

Processor 3 Residual

Resolution = 2.7um

Mean: -8.0643e-007
Sigma: 2.7186e-006
Max: 44.3382
Chi2/ndf: 0.0086881

Position (m)

Processor 4 Residual
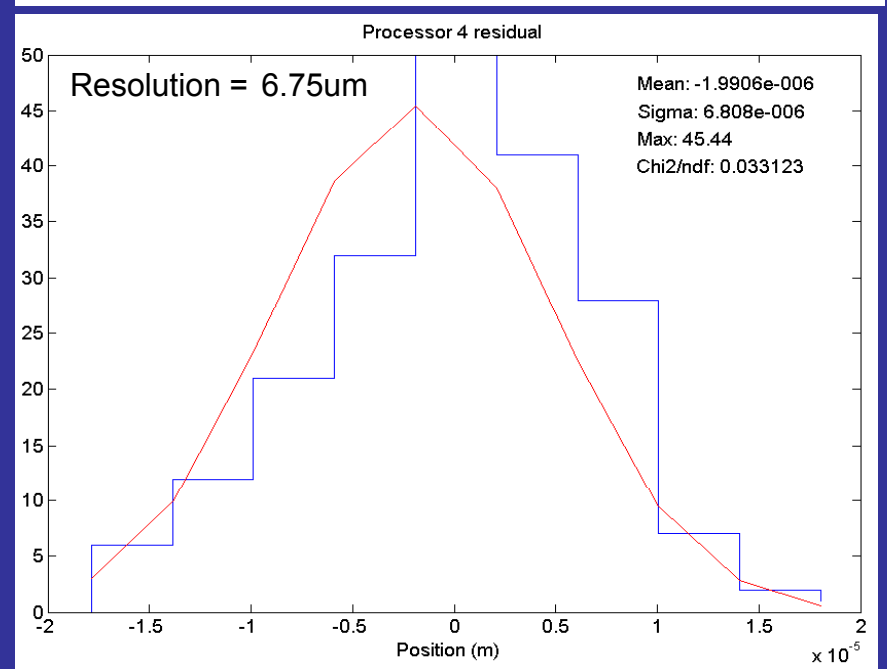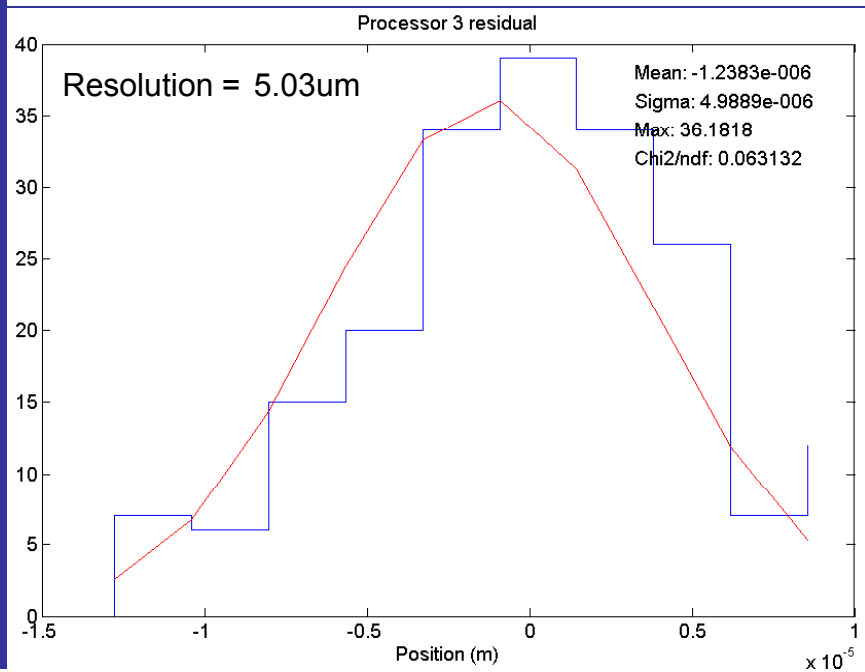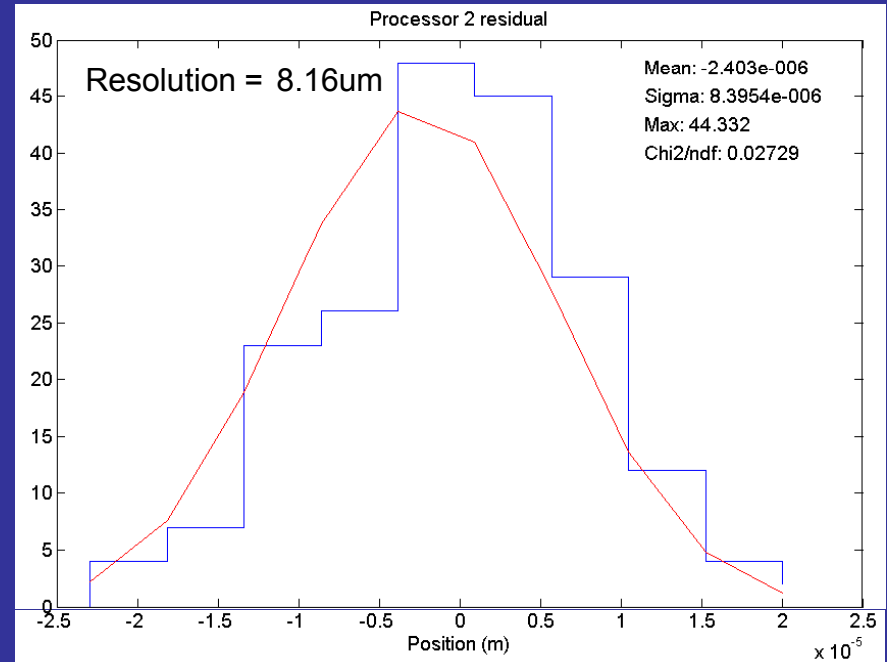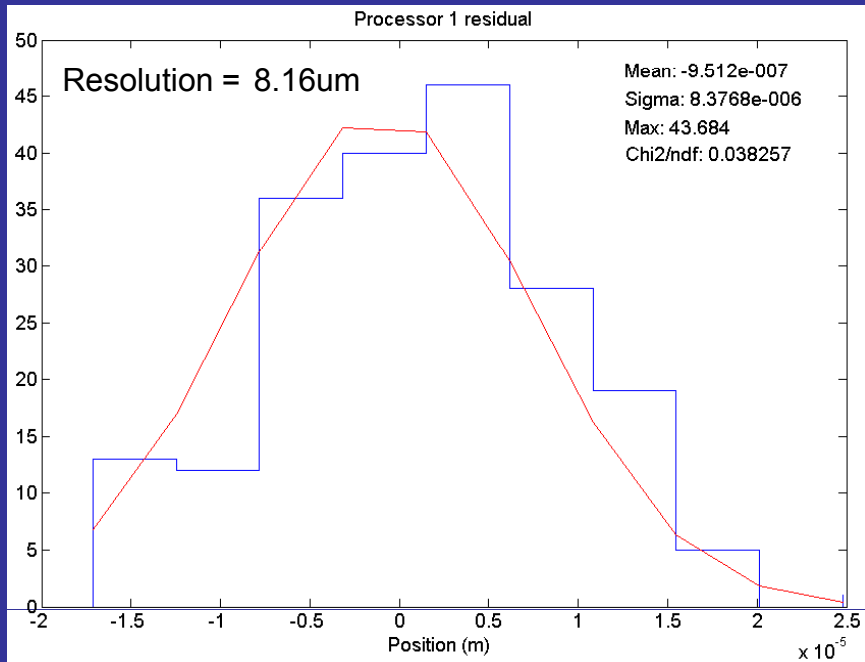
Resolution = 3.56um

Mean: -1.1925e-006
Sigma: 3.4583e-006
Max: 47.6862
Chi2/ndf: 0.032122

Position (m)

Resolution results (case 3)

Processor 1 residual

Resolution = 7.01um

Mean: 1.7104e-005
Sigma: 7.3828e-006
Max: 39.0168
Chi2/ndf: 0.026393

Position (m)

Processor 2 residual

Resolution = 5.55um

Mean: -1.6142e-006
Sigma: 5.7373e-006
Max: 45.1092
Chi2/ndf: 0.018661

Position (m)

Processor 3 residual

Resolution = 5.28um

Mean: -1.3189e-006
Sigma: 5.0441e-006
Max: 46.4449
Chi2/ndf: 0.054088

Position (m)

Processor 4 residual

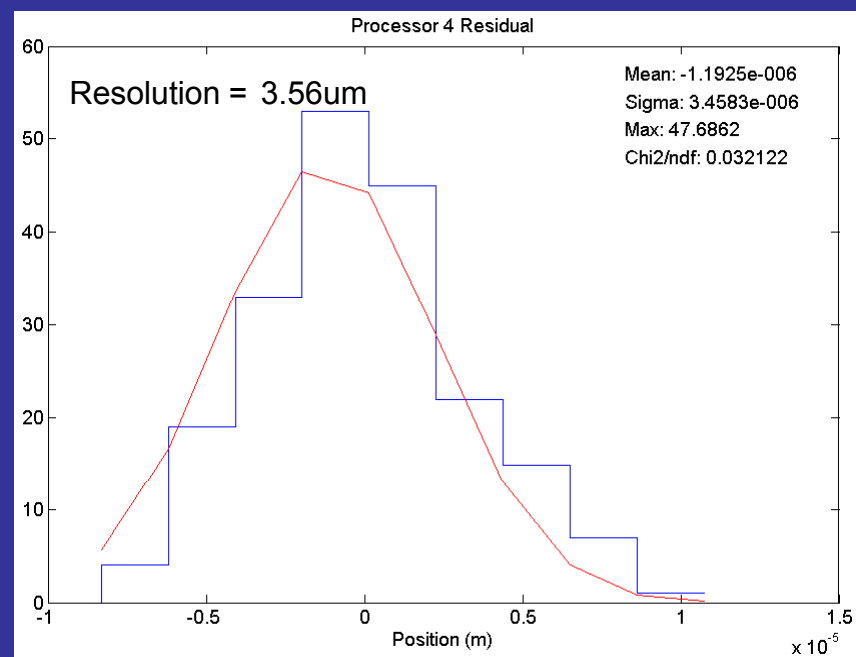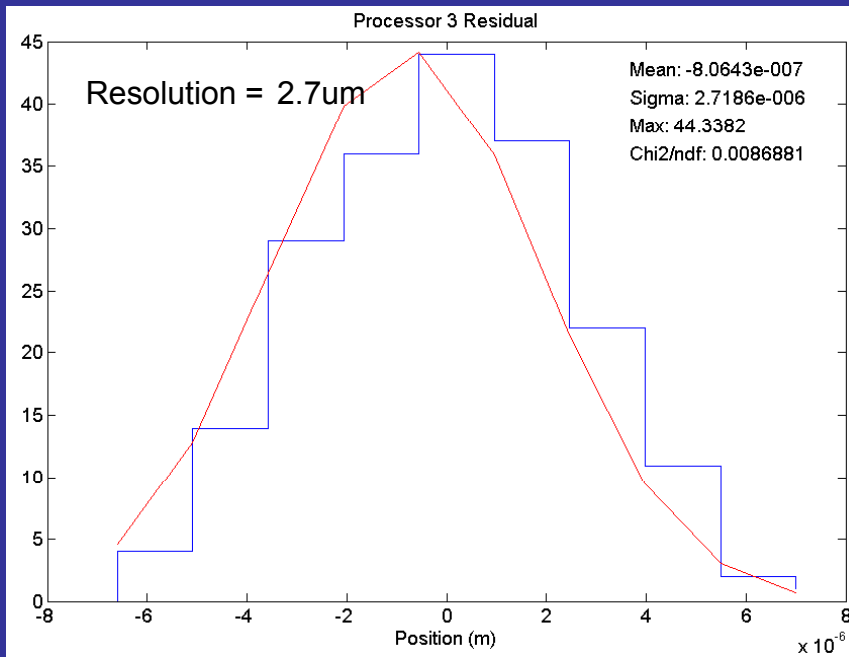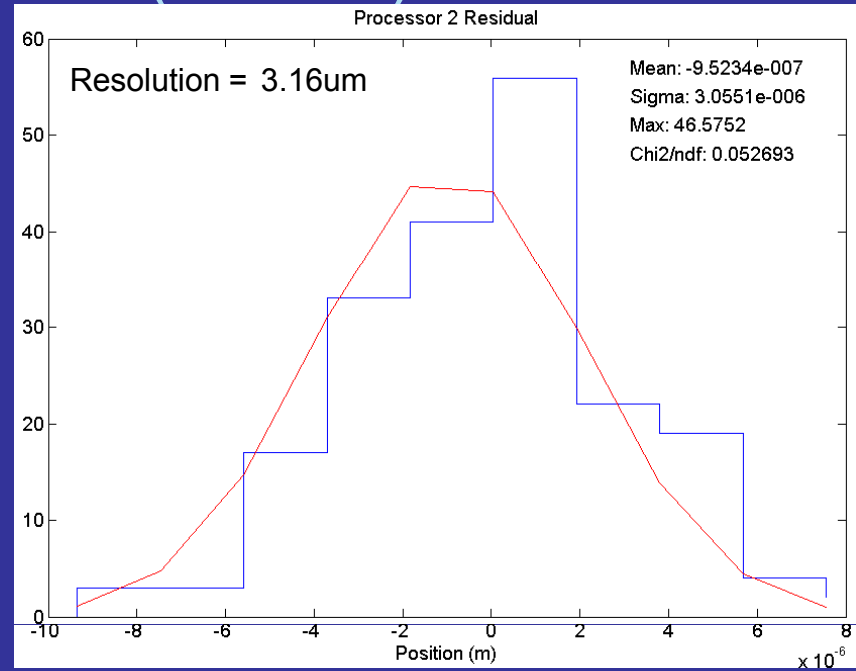Resolution = 6.45um

Mean: -2.0943e-006
Sigma: 6.5736e-006
Max: 42.0218
Chi2/ndf: 0.030123

Position (m)

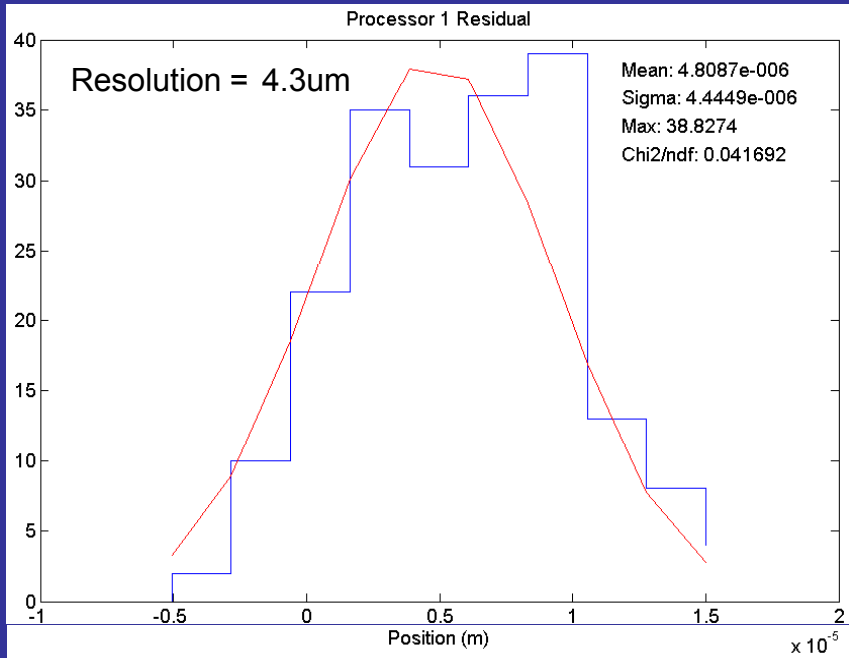# Resolution VS Integration window
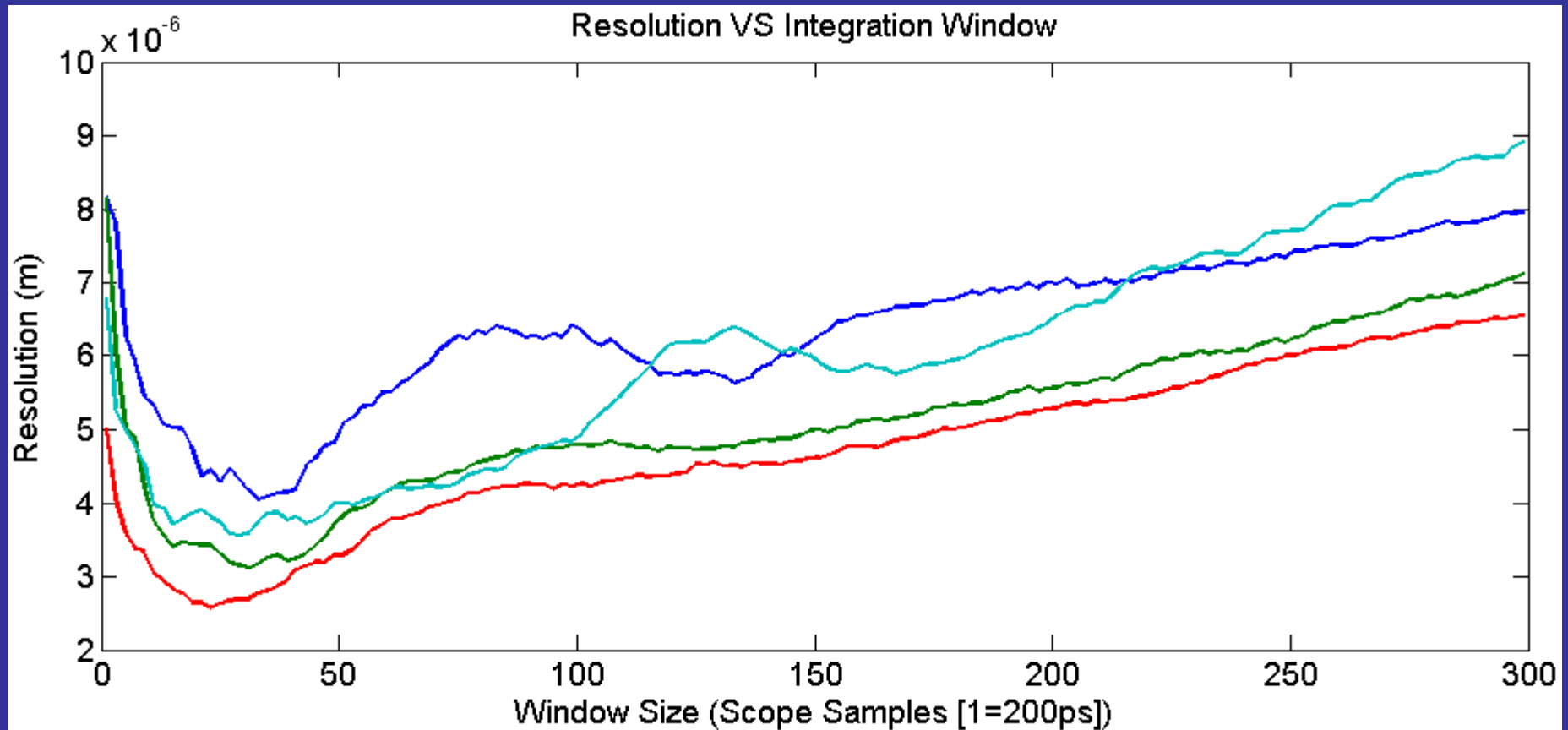
Cal curve y crossing VS window size

Cal const error VS window size

Summary of measured processor properties

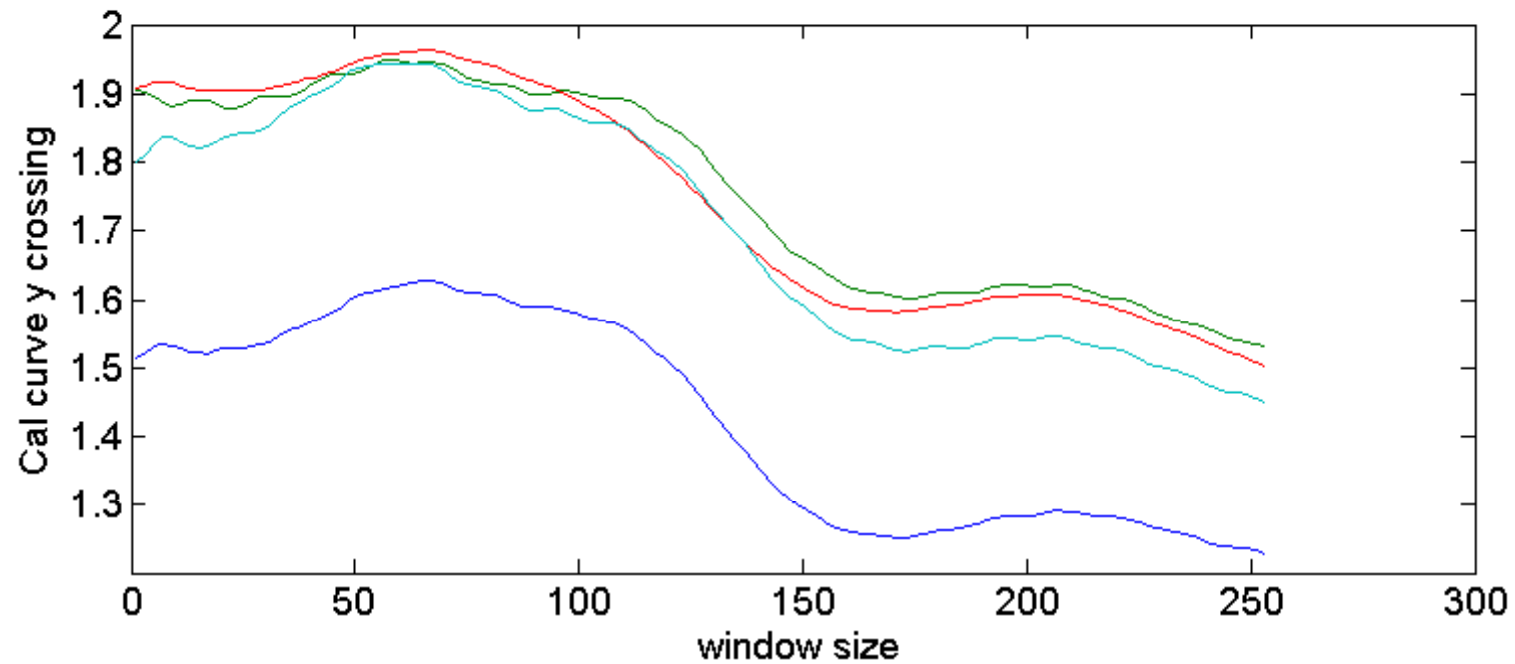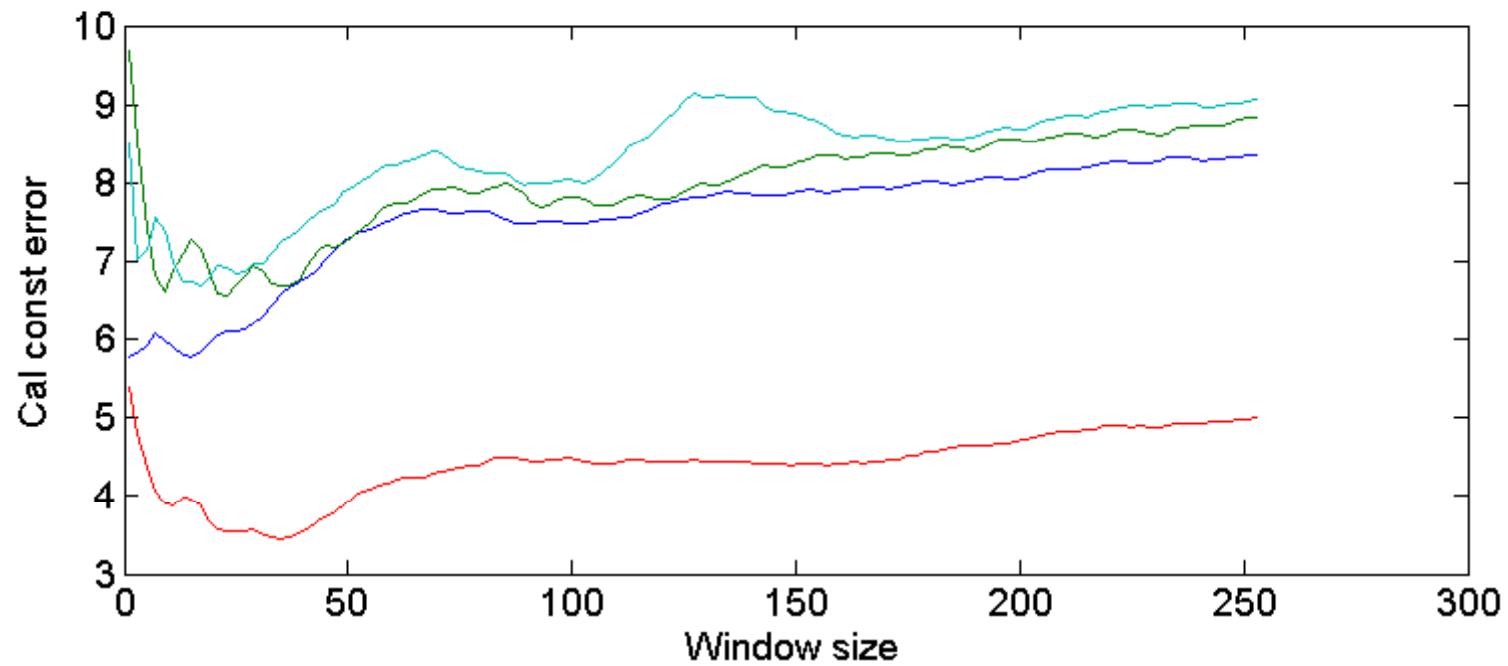| Processor #	Case #	1	2	3	4
Calibration constant (x 1e3)	1	-2.18	-2.26	-2.53	-2.55
	2	-2.41	-2.44	-2.55	-2.5
	3	-2.65	-2.67	-2.56	-2.7
Error on Calibration constant (+/-)	1	5.78	6.67	5.38	8.51
	2	6.22	6.94	3.57	7
	3	8.04	8.56	4.71	8.69
y crossing	1	1.5	1.9	1.91	1.8
	2	1.53	1.9	1.91	1.85
	3	1.28	1.62	1.6	1.54
χ^2/NDF (calibration curve fit)	1	37.38	37.48	13.32	32.91
	2	54.2	51.1	32.4	53.2
	3	61.13	49.4	20.41	47.64
Resolution (um)	1	8.16	8.16	5.03	6.79
	2	4.3	3.16	2.7	3.56
	3	7.01	5.55	5.28	6.45
χ^2/NDF (resolution gaussian fit)	1	0.038	0.027	0.063	0.033
	2	0.042	0.053	0.0087	0.032
	3	0.026	0.019	0.054	0.03