ATF2 December Shifts 2

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2-BPM Feedback

gainScan2_10dB_0.8

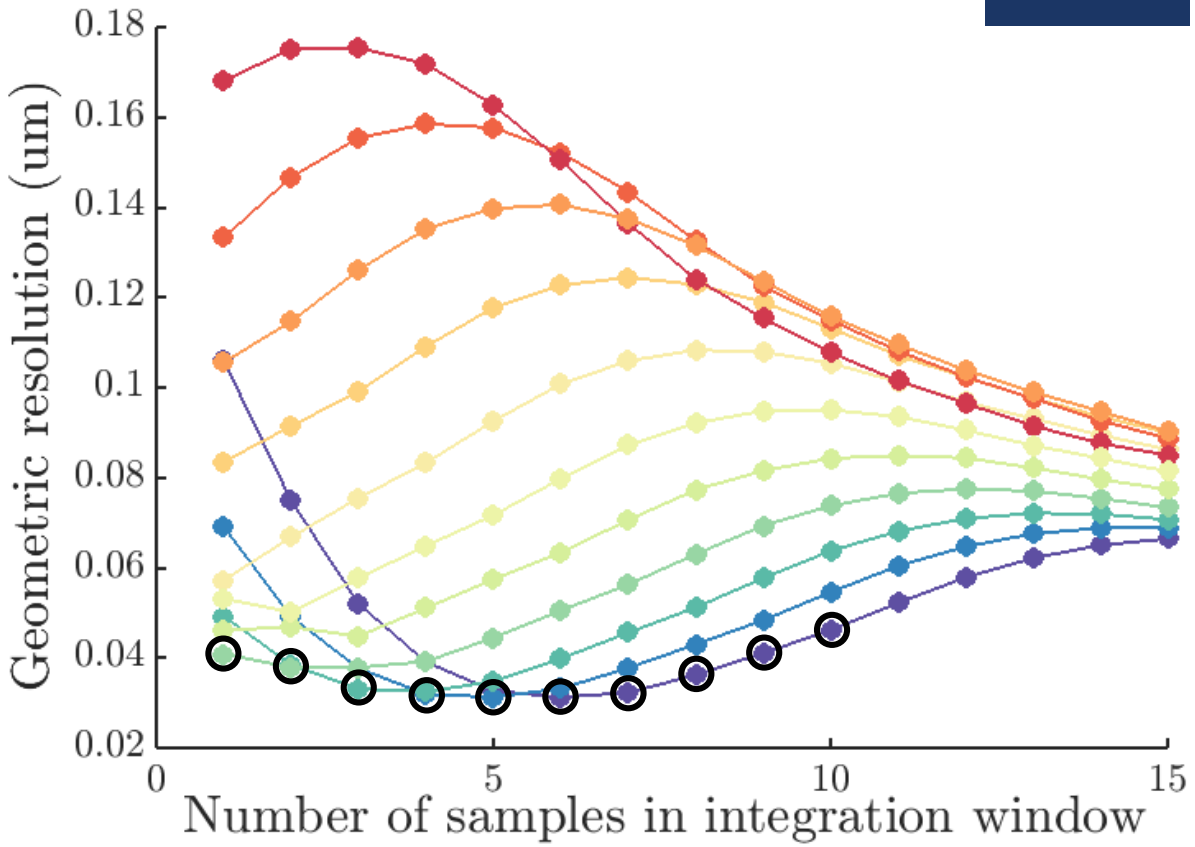
Calibration file: AQD0FFyScan8

How important was the integration?

- I have looked at the file which gave us best performance in 2-BPM mode and analysed how predicted feedback performance depends on the integration window and how it depends on the resolution.
- I wanted to characterise how much of an effect the integration had in achieving 40.9 nm stabilisation.
- First, for each integration window width, I optimised the location of the window to bring the best resolution…

Optimising each Width of Integration Window

Window width	Res. (nm)	Samples in window
1	40.8	38
2	37.9	38 to 39
3	33.1	37 to 39
4	31.9	36 to 39
5	31.2	36 to 40
6	31.2	35 to 40
7	32.3	35 to 41
8	36.2	35 to 42
9	41.0	35 to 43
10	46.1	35 to 44



Colour: the first sample in the integration window.

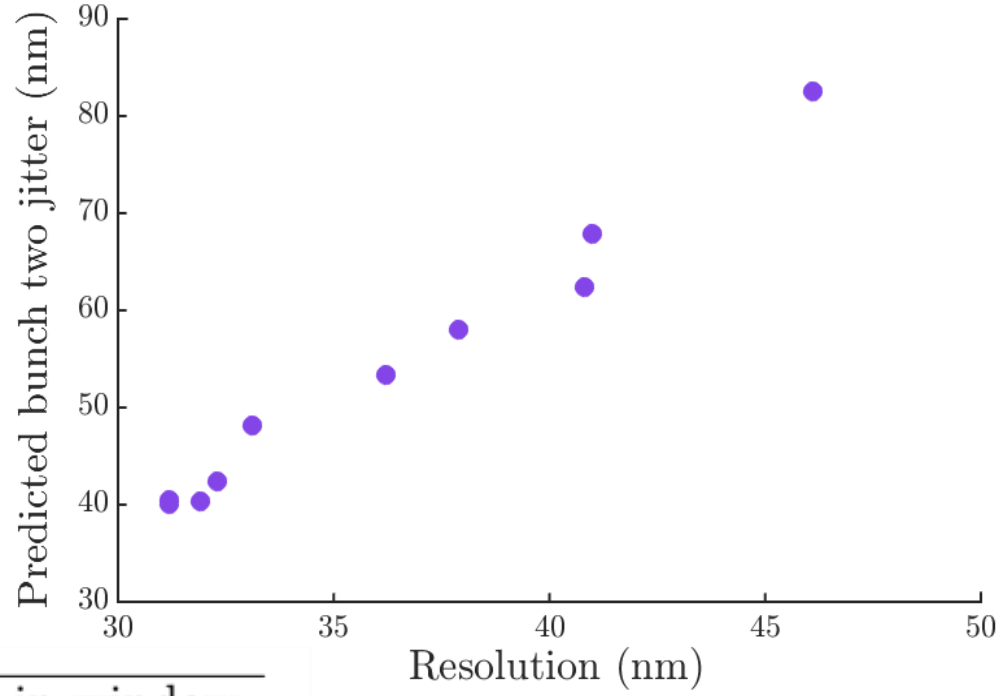
35 36 37 38 39 40 41 42 43 44 45

Predict feedback performance

- Predict the feedback performance for each optimised integration window, using the measured bunch jitters and bunch to bunch position correlation.
- Does predicted feedback performance depend on integration window?
- How much does it depend on the resolution? How much are we resolution limited?
- How does the predicted performance compare with the actual performance?

$$\sigma_{Y_2}^2 = \sigma_{y_1}^2 + \sigma_{y_2}^2 - 2\sigma_{y_1}\sigma_{y_2}\rho_{12}$$

- Predicted stabilisation performance for integration windows 1 sample to 10 samples, plotted against the resolution measured for that window.
- Each window has been located so as to optimise the resolution for that window.
- Gradient of plot 2.74.



Window width	Res. (nm)	Pred. performance (nm)	Samples in window
1	40.8	62.4	38
2	37.9	58.0	38 to 39
3	33.1	48.2	37 to 39
4	31.9	40.4	36 to 39
5	31.2	40.1	36 to 40
6	31.2	40.4	35 to 40
7	32.3	42.4	35 to 41
8	36.2	53.4	35 to 42
9	41.0	67.9	35 to 43
10	46.1	82.5	35 to 44

Matches the window at which feedback was actually performed for this data file.

Actual stabilisation: 40.9±4.1 nm.

Effect of Charge Jitter

Position-Charge Correlation

- The gains used are valid for a single value of the charge but there is charge jitter.
- Will this introduce second order errors in the kick calculated for bunches with a slightly different charge?
- If this is an issue, the position of the feedback on (bunch two) triggers should correlate with the charge….

Bunch 2 Position-Charge Correlation