

ATF2 Cavity BPM system summary

A. Aryshev, **S.T. Boogert**, G. Boorman, F. Cullinan, J. Frisch, A. Heo, Y. Honda, J.Y. Huang, S.J. Hwang, N. Joshi, E-S Kim, Y. I. Kim, A. Lyapin, D. McCormick, S. Molloy, J. Nelson, Y.J. Park, S.J. Park, T. Smith, J. Snuverink, T. Tauchi, N. Terunuma, G. White.

SLAC, KNU, PAL, KEK, JAI-RHUL, KEK, ATF
[https://www.pp.rhul.ac.uk/twiki/bin/view/JAI/
BeamPosition](https://www.pp.rhul.ac.uk/twiki/bin/view/JAI/BeamPosition)

Introduction

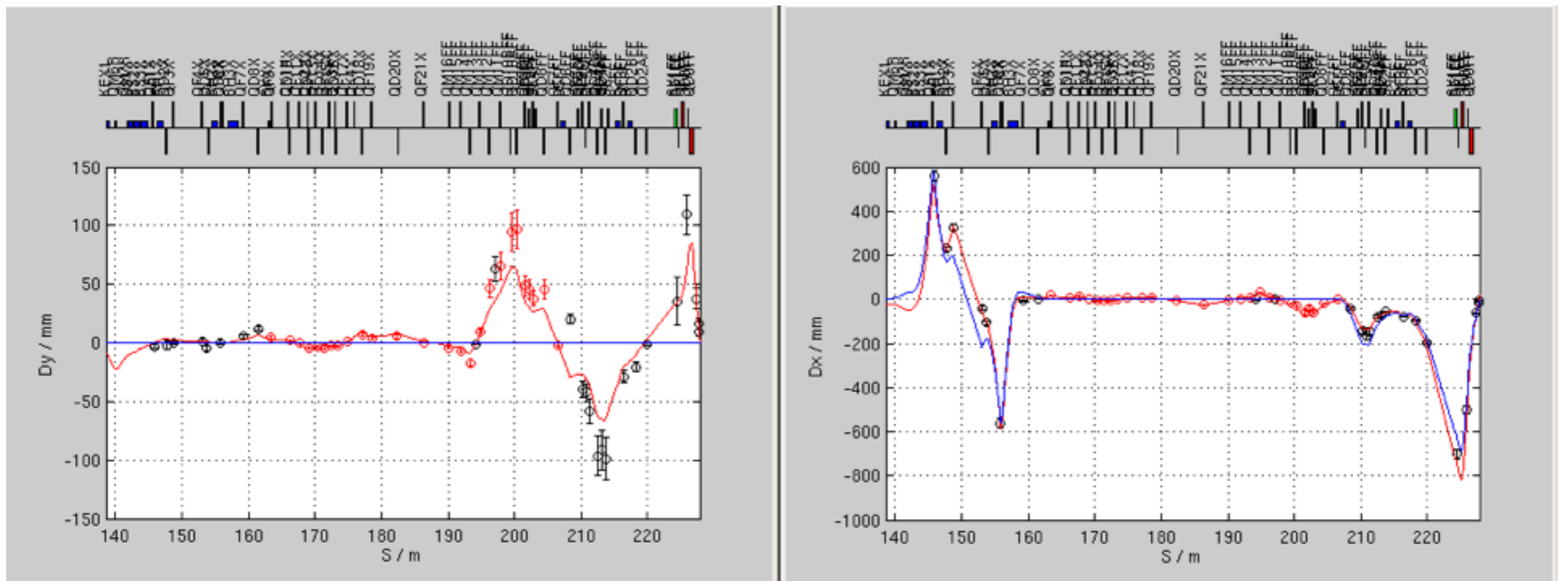
- Progress on CBPM system been slow (ATF2)
- Operation summary since last meeting
- Stability and operation
 - How long is the calibration good for?
- Wakefield problem
 - See talk by J. Snuverink (A. Lyapun EM calculations)
- Virtual focus and IP region
 - See talk by Y Kim
- ILC specific problems
 - Quicker and more reliable calibration (PCA, ICA)

Operation overview

- BPM system typically calibrated once per 3 week period. Observations
 - Orbit feedback working well : not quite sure which BPMs are used here
 - Model-Orbit comparisons are good
 - Dispersion measurements are good

Dispersion measurement

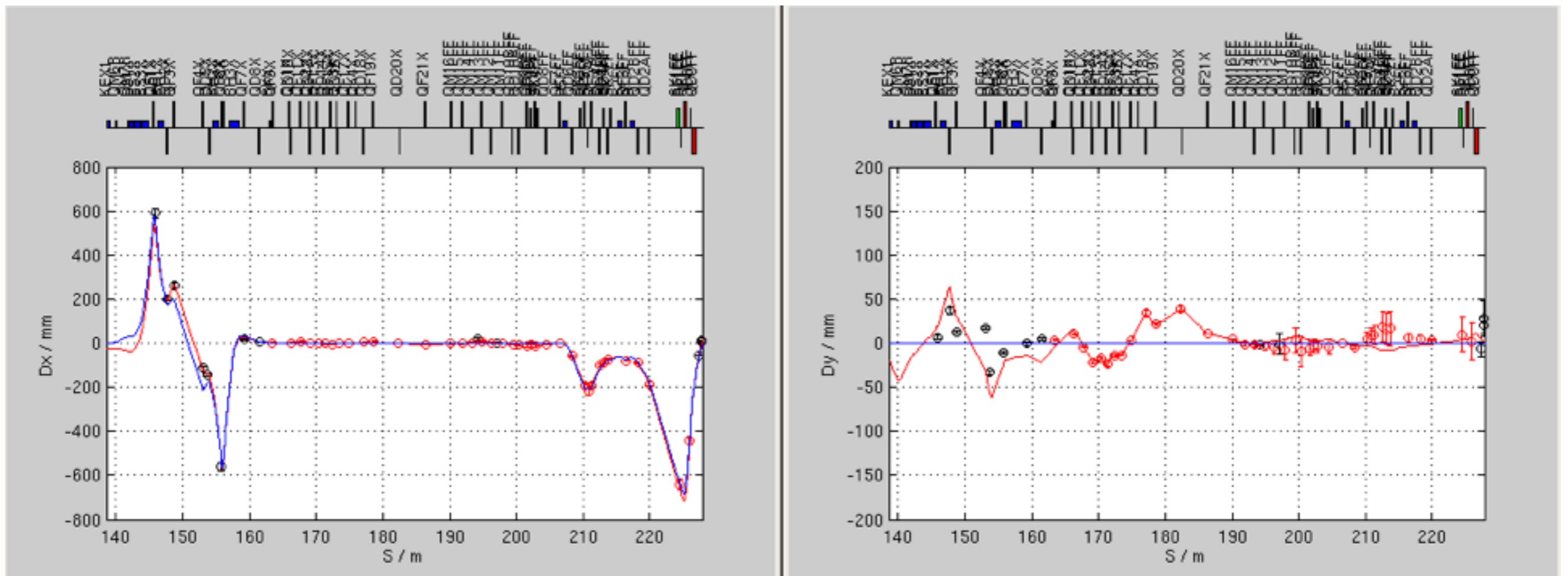
- Example dispersion measurement
 - Looks quite good



<http://atf.kek.jp/twiki/bin/view/ATFlogbook/Log20121130o>

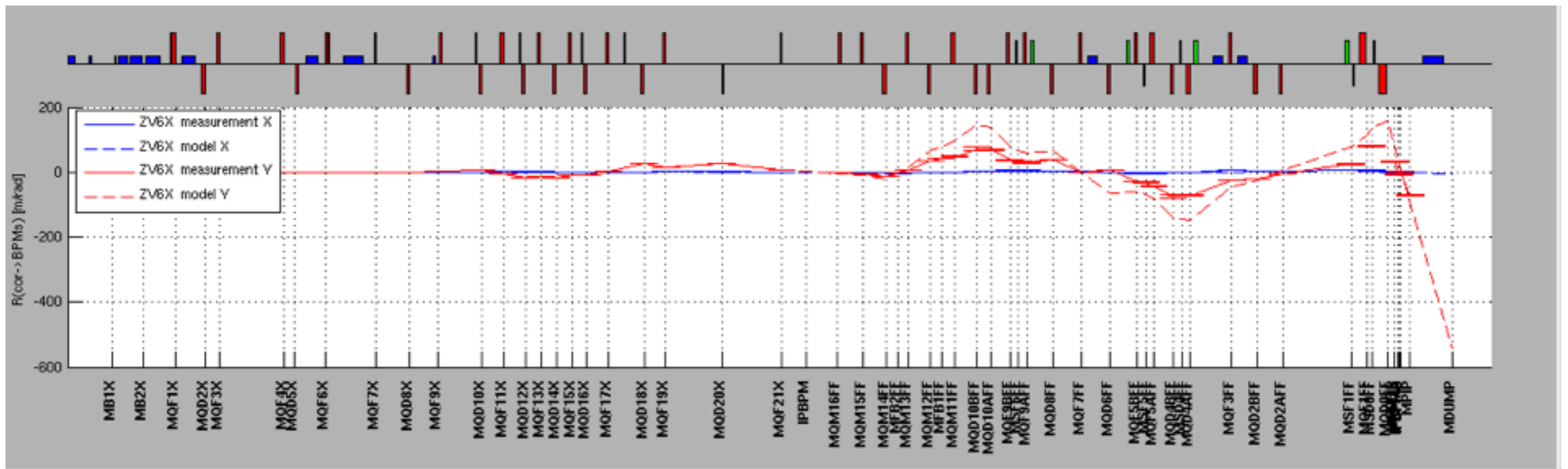
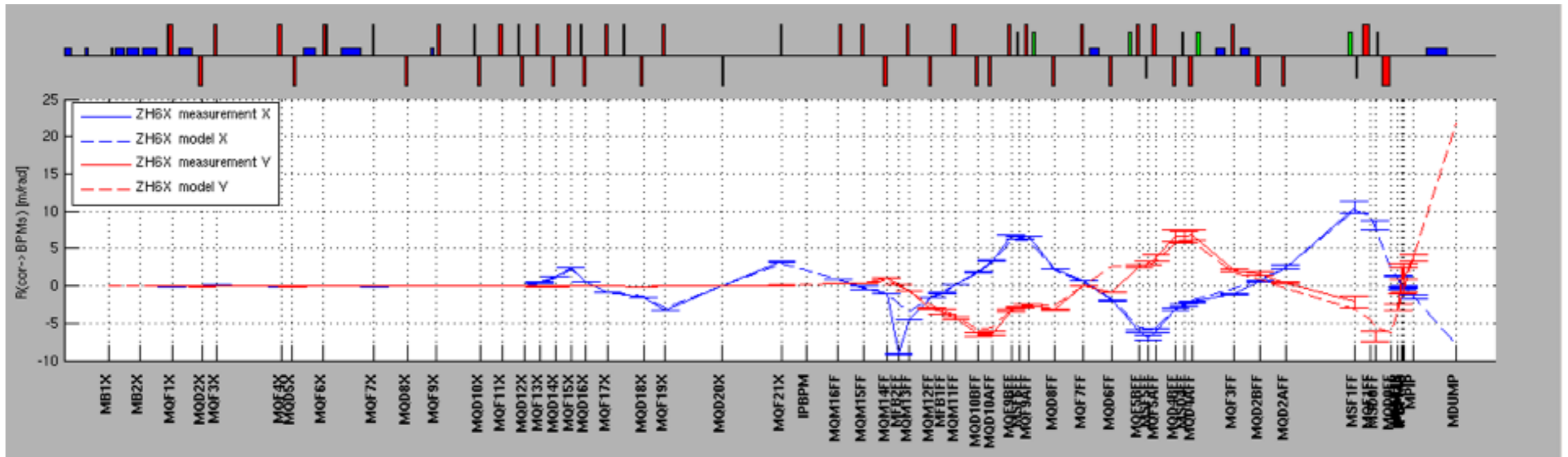
Dispersion measurement

- Errors for C-band BPMs whilst ramp is on look larger
- Low vertical dispersion



<http://atf.kek.jp/twiki/bin/view/ATFlogbook/Log20121204d>

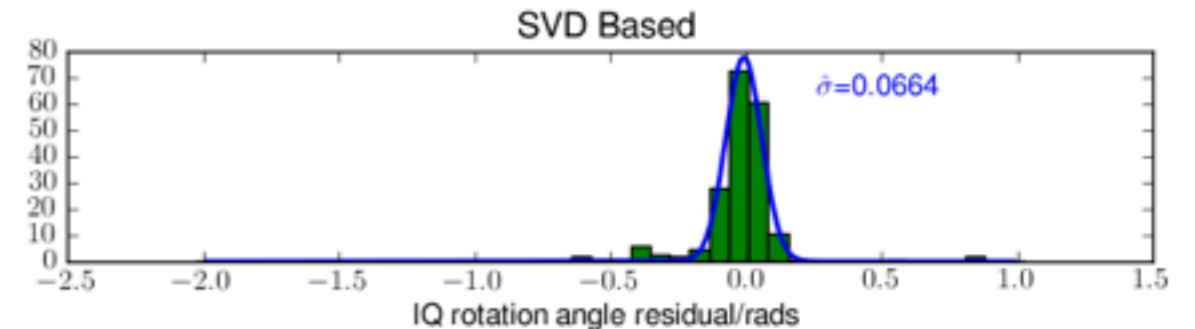
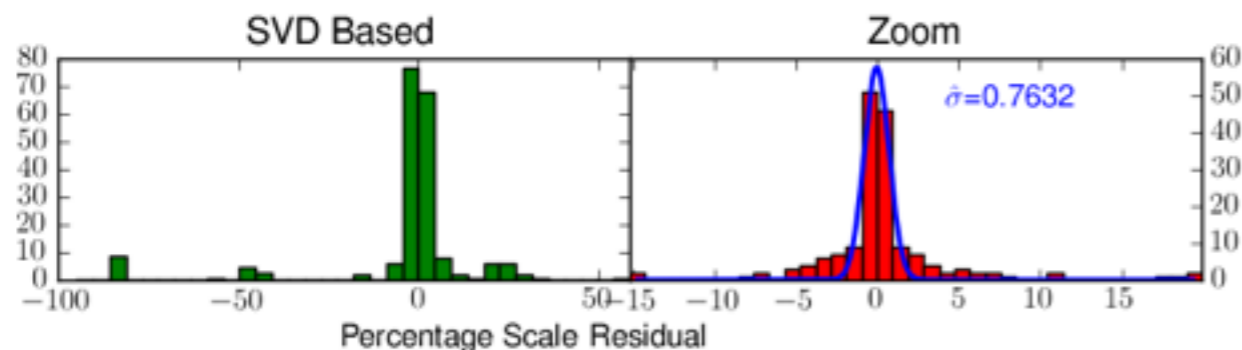
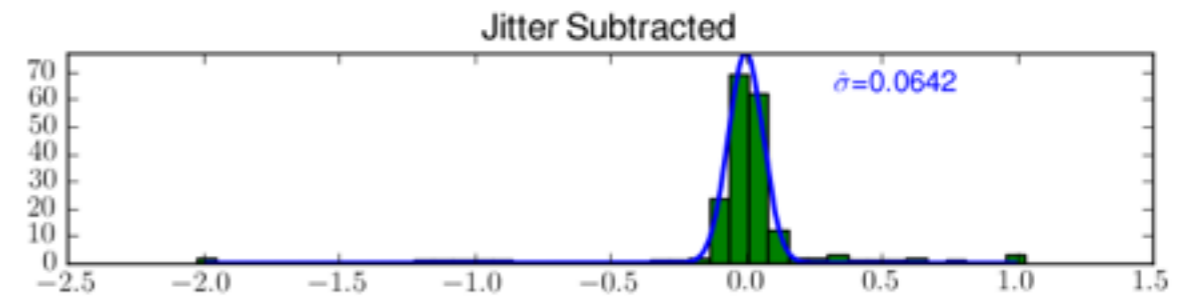
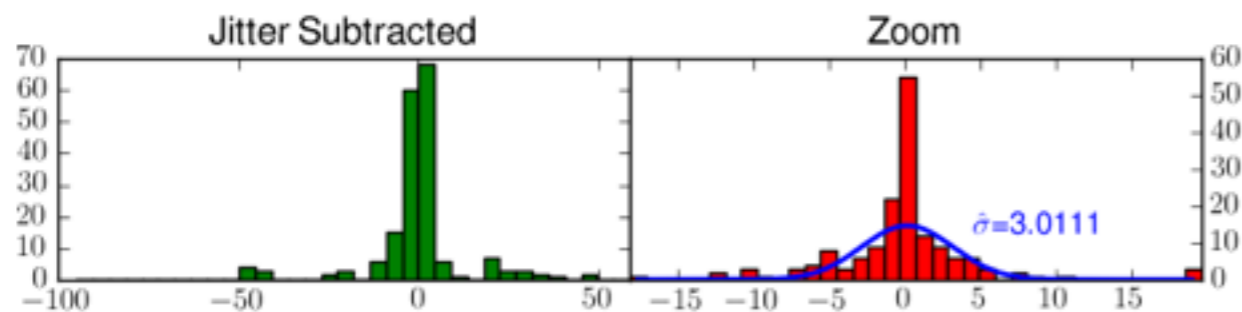
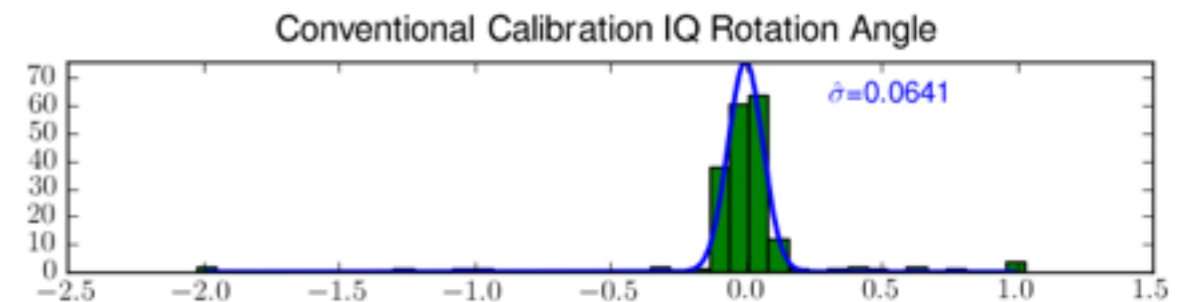
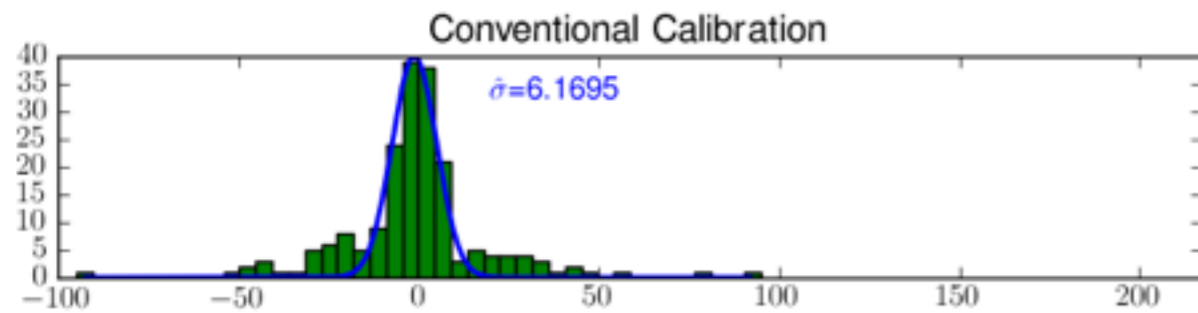
Orbit response



<http://atf.kek.jp/twiki/bin/view/ATFlogbook/Log20121206o>

Calibration stability

- April 2012 : Repeated calibrations over 3 weeks
 - Scale < 1%
 - IQ rotation 0.06 rad (have measured 0.02)

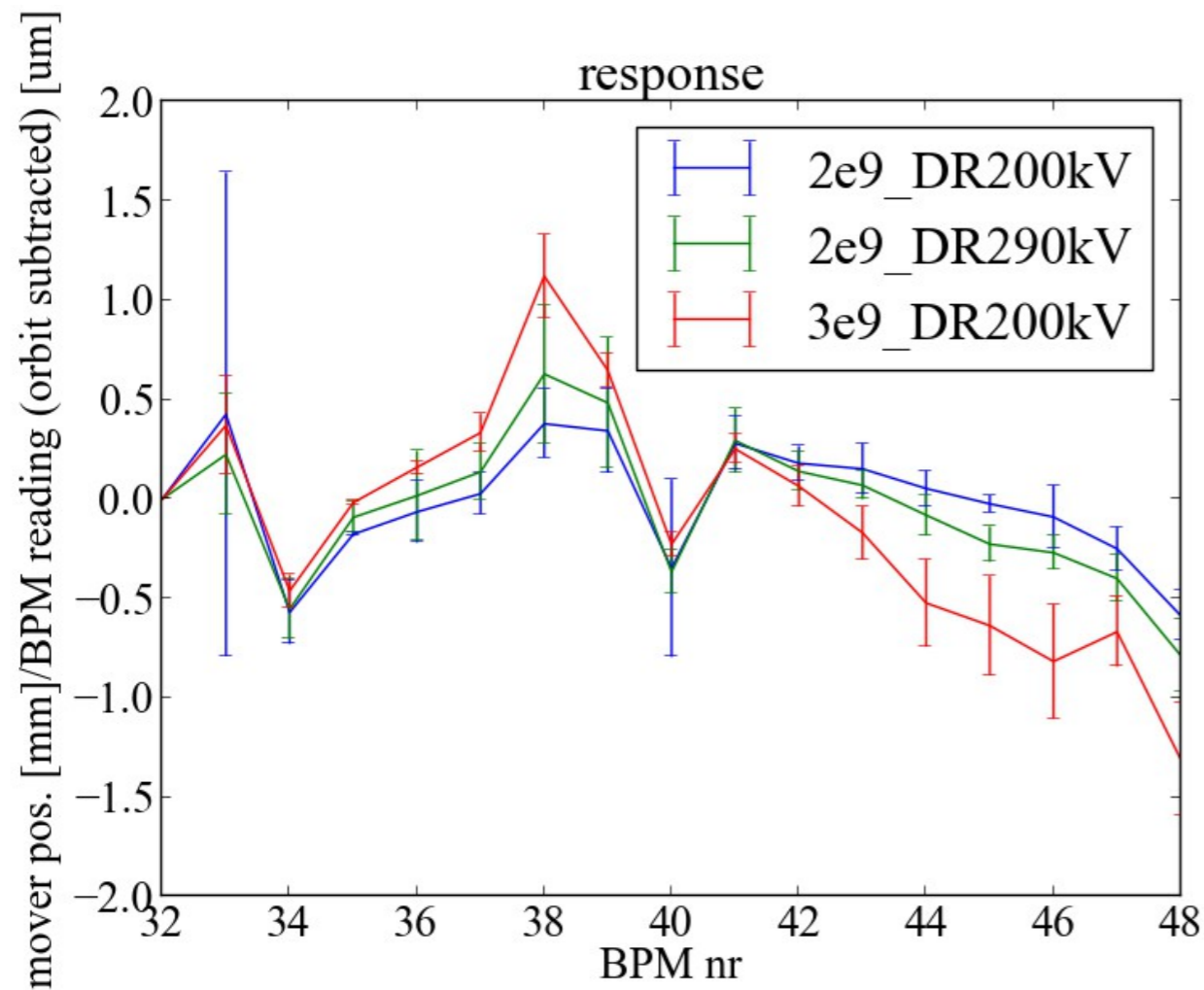


https://www.pp.rhul.ac.uk/twiki/bin/view/JAI/AtfBpmNewLogBook_20120608

Speeding up calibrations

- Resolution
 - 250 nm with attenuators
 - 50 nm without attenuators
- Typical offsets (1% calibration uncertainty)
 - ~500 μm , so uncertainty due to calibration 5 μm
 - 250 nm resolution, so calibration range required 25 μm
 - Much less than usual 250 μm
 - IQ rotation?
 - Possible to move BPMs this range with low impact on rest of machine?

Wakefield? problem



- Move 2 reference cavities at high beta location
- Observe down-stream kick
- Complex measurement even if system was designed to make the measurement

Recent operation overview

10 2012						
Su	Mo	Tu	We	Th	Fr	Sa
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

11 2012						
Su	Mo	Tu	We	Th	Fr	Sa
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

12 2012						
Su	Mo	Tu	We	Th	Fr	Sa
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

- 2012/10/17, 25 – modified cavity calibration log file (Add waveform), few mover calibration for test
- 2012/11/07 – Tuned all CBPMs, mover calibration
- 2012/11/28 - SVD mover calibration, bump calibration, IPA, IPB
- 2012/12/04 - QMI3FF, MFB2FF calibration
- 2012/12/18 – MFB2FF calibration

Outstanding issues

- MFB2FF - IP
- Larger error whilst DR ramp is on
- Speeding up calibrations

- Require some dedicated time for study
 - Stability measurements
 - Small range calibrations (25 to 50 um)
 - Orbit kicks, effect at IP
 - Novel signal processing
 - BBA/Wakes/Steering etc

Summary

- System working well
 - Cannot be too quantitate right now
 - BBA precision?
 - Effect of systematic effects on dispersion measurement
 - Feedbacks
- Need coherent 3 week period to complete data taking just for BPM system