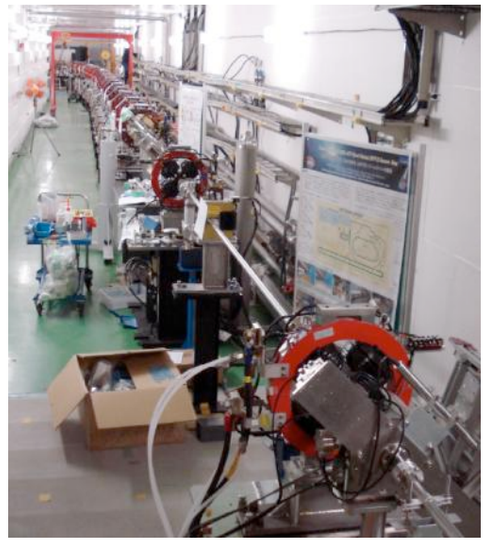
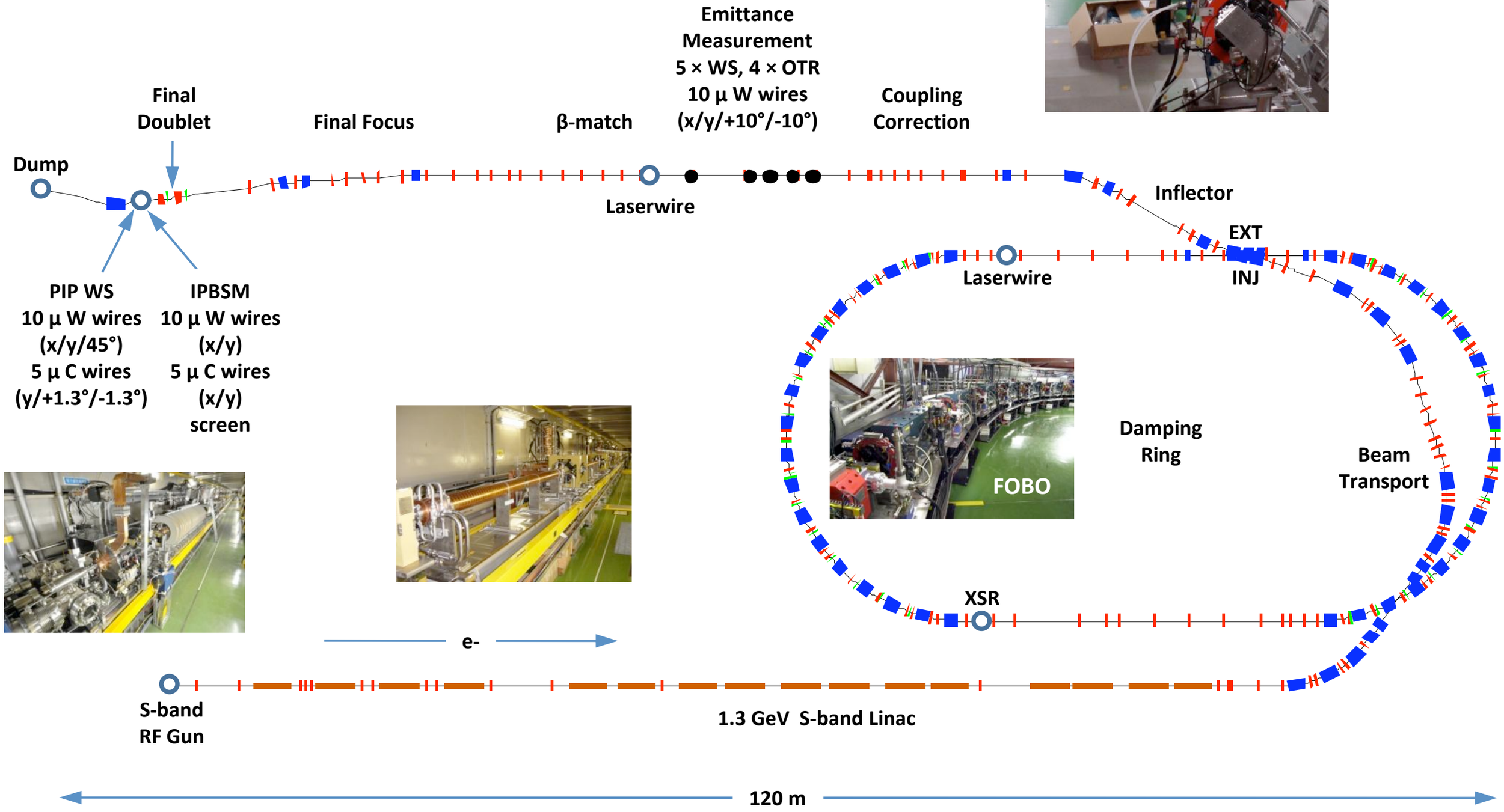
Recent Results of ATF2

T. Tauchi,

ALCPG11, 19 -23 March 2011, Eugene, USA

ATF / ATF2 Schematic Layout





2010 Autumn/Winter Run

7 2010

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

8 2010

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				

9 2010

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		

10 2010

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 2010

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 2010

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	

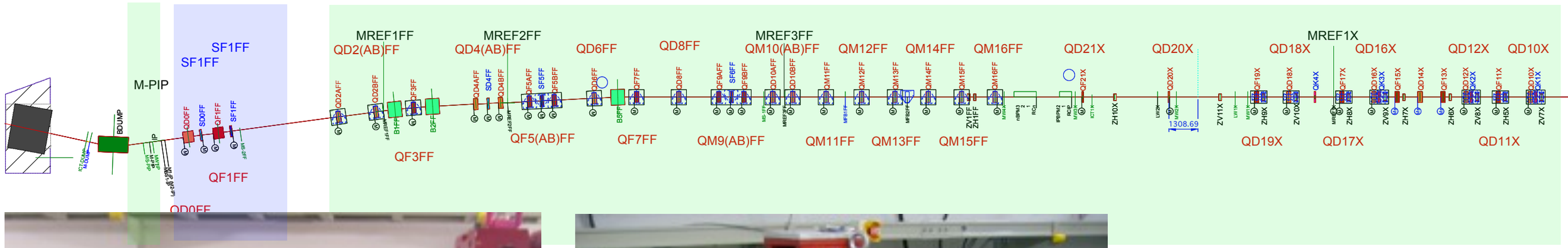
Beam operation: 7 weeks

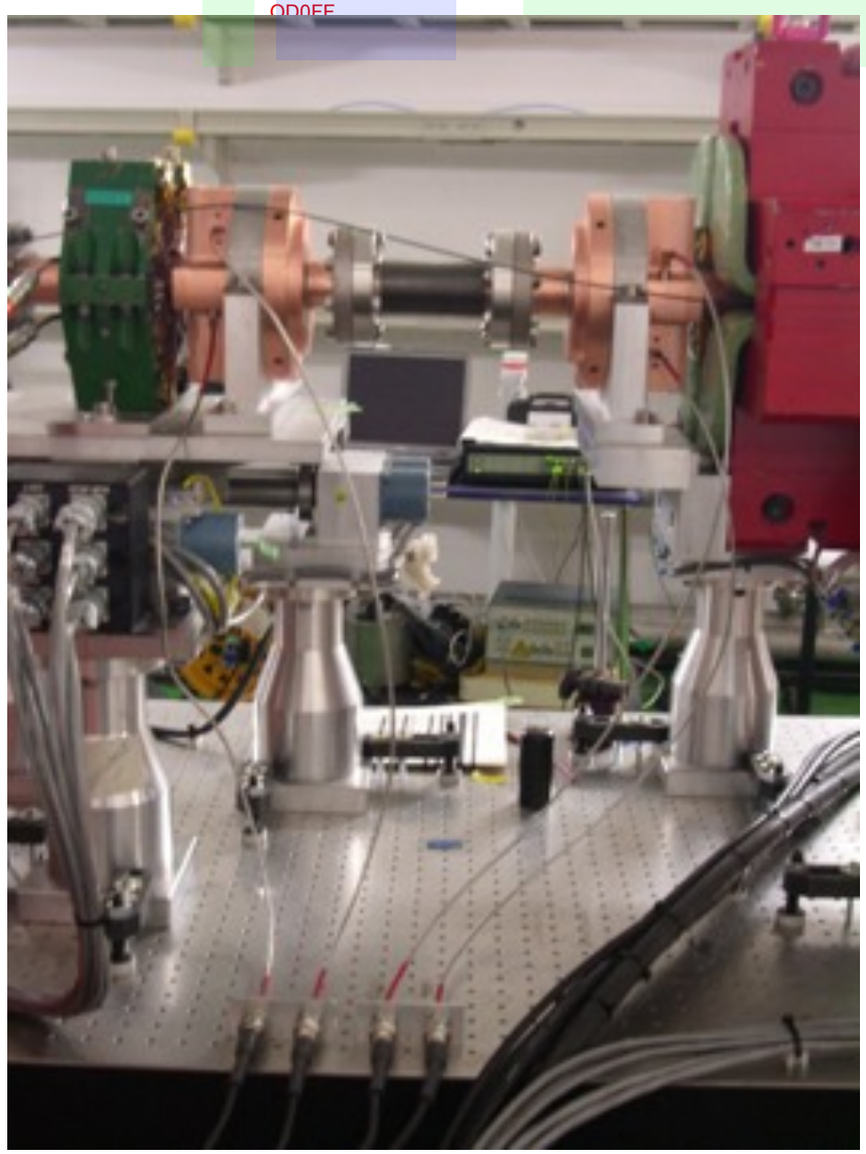
- Fast kicker mode … 2 weeks
- ATF2 continuous run … 1 week 13 - 17 December 2010

ATF2 BPM layout

S-Band BPMs

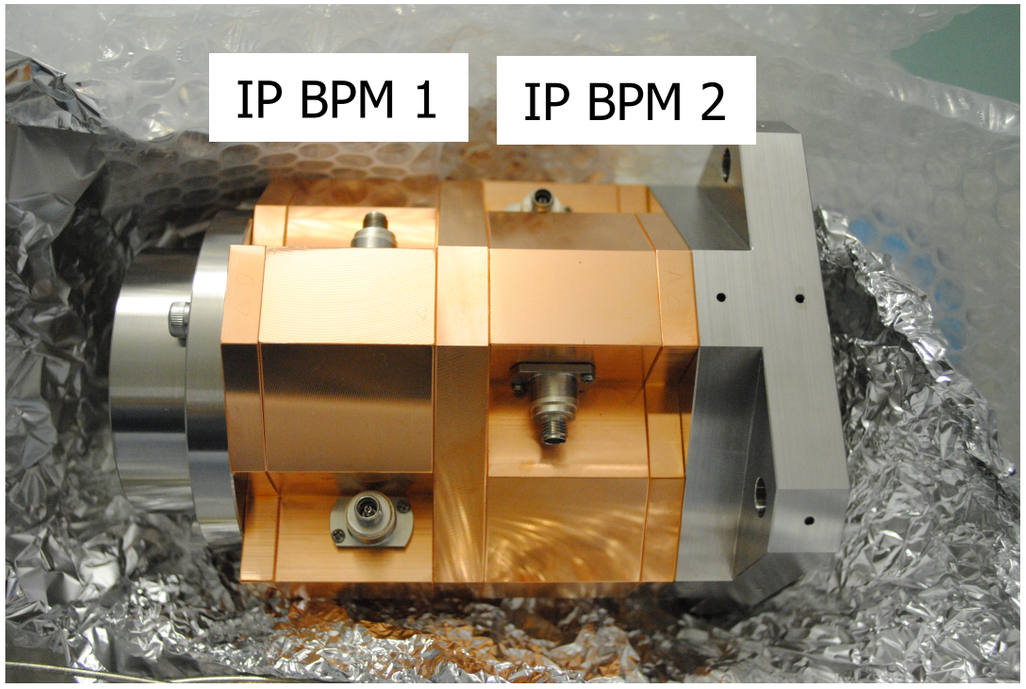
C-Band BPMs

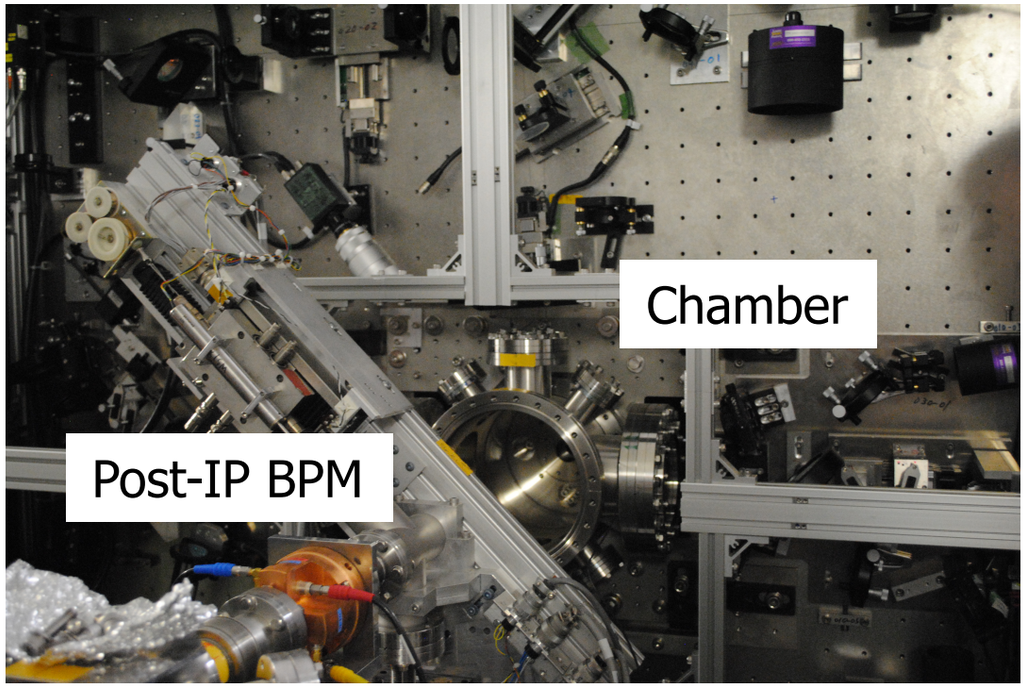


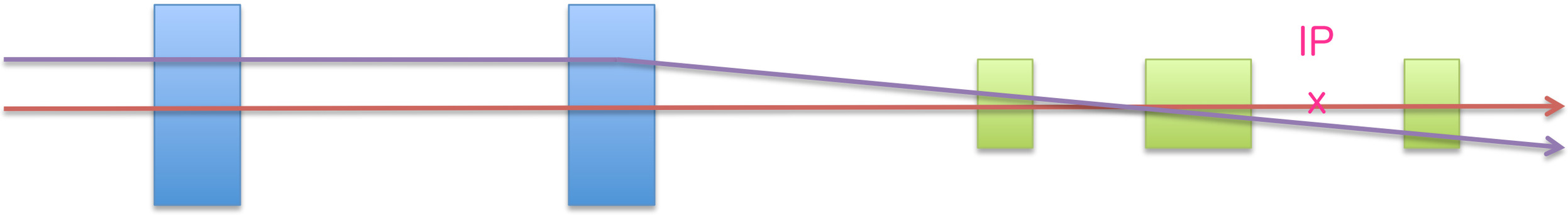


Orbit Monitor at IP

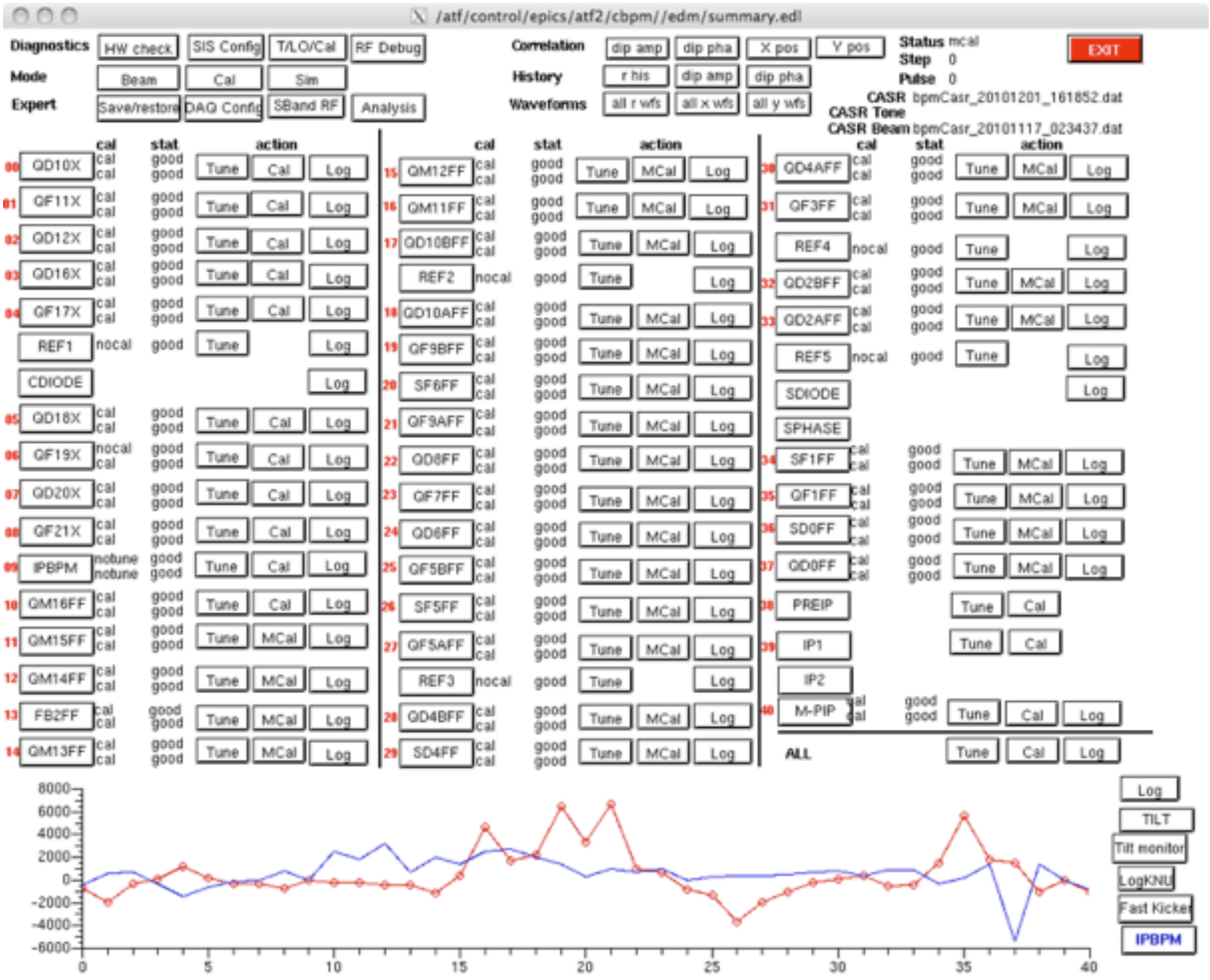
- IP BPM installed : September, 2010







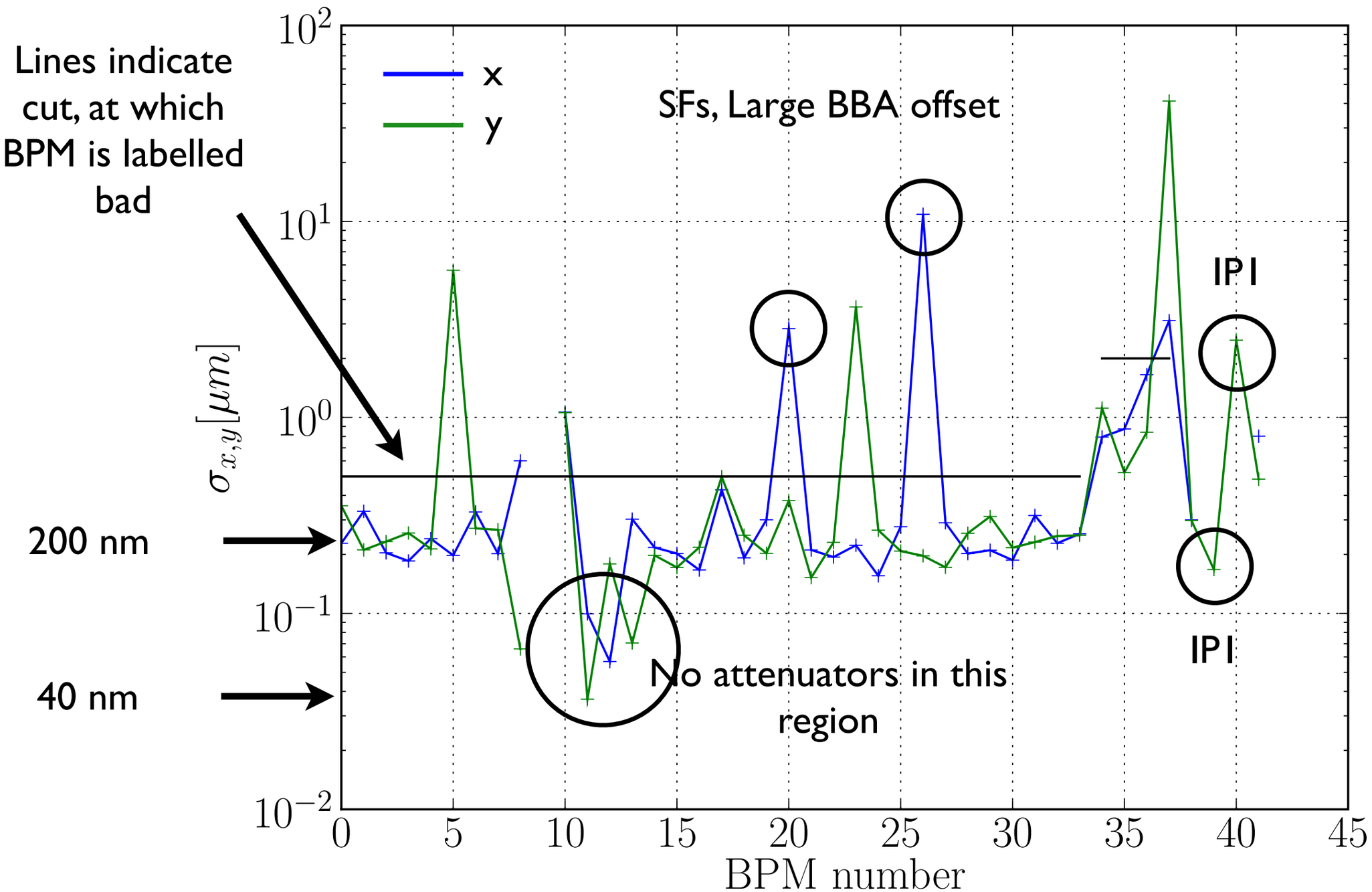
Full BPM system



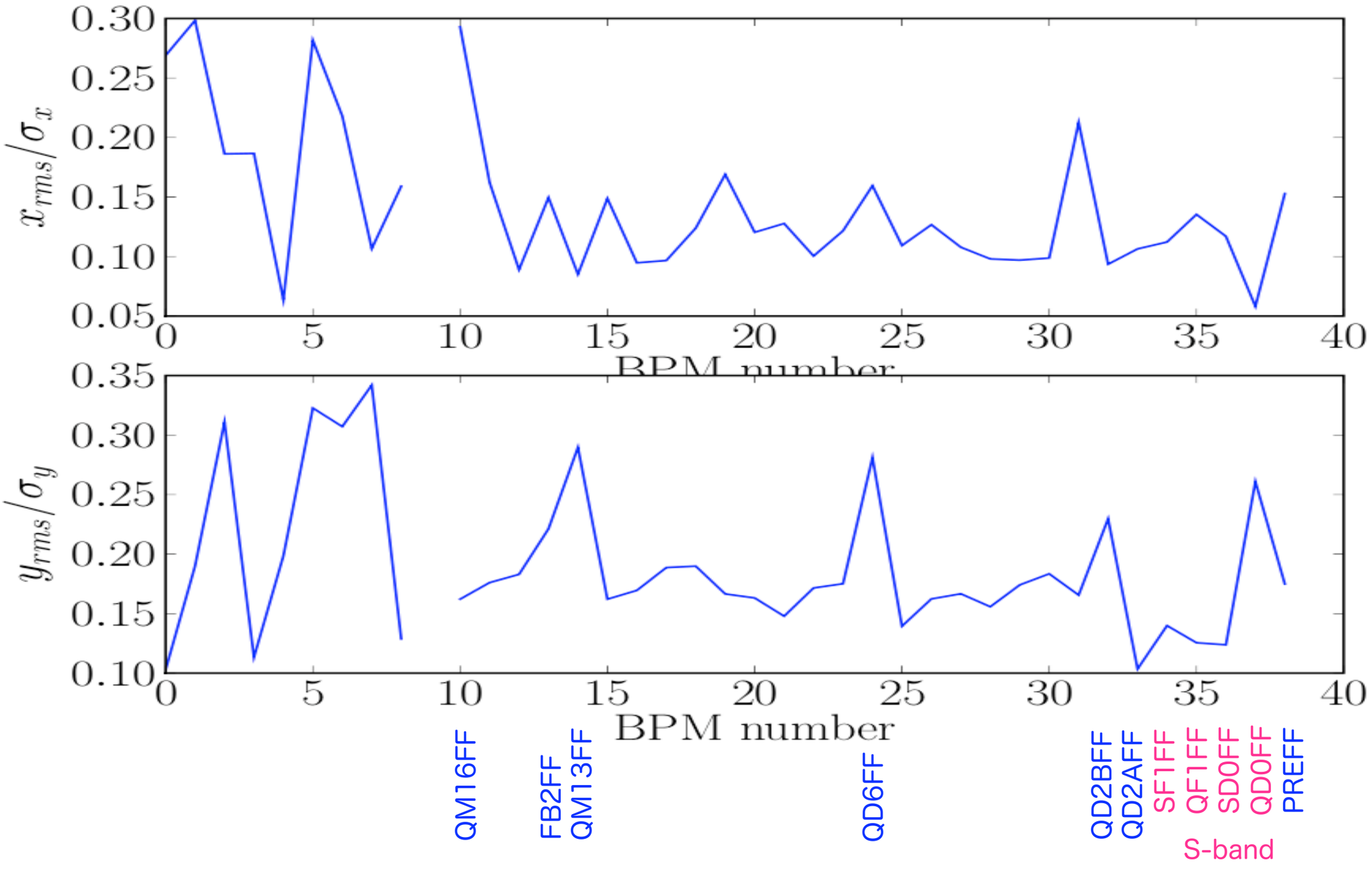
IP calibration 20110202

Boogert/Lyapin/Kim/Cullinan

presented at ALCPG11, 22 March 2-11

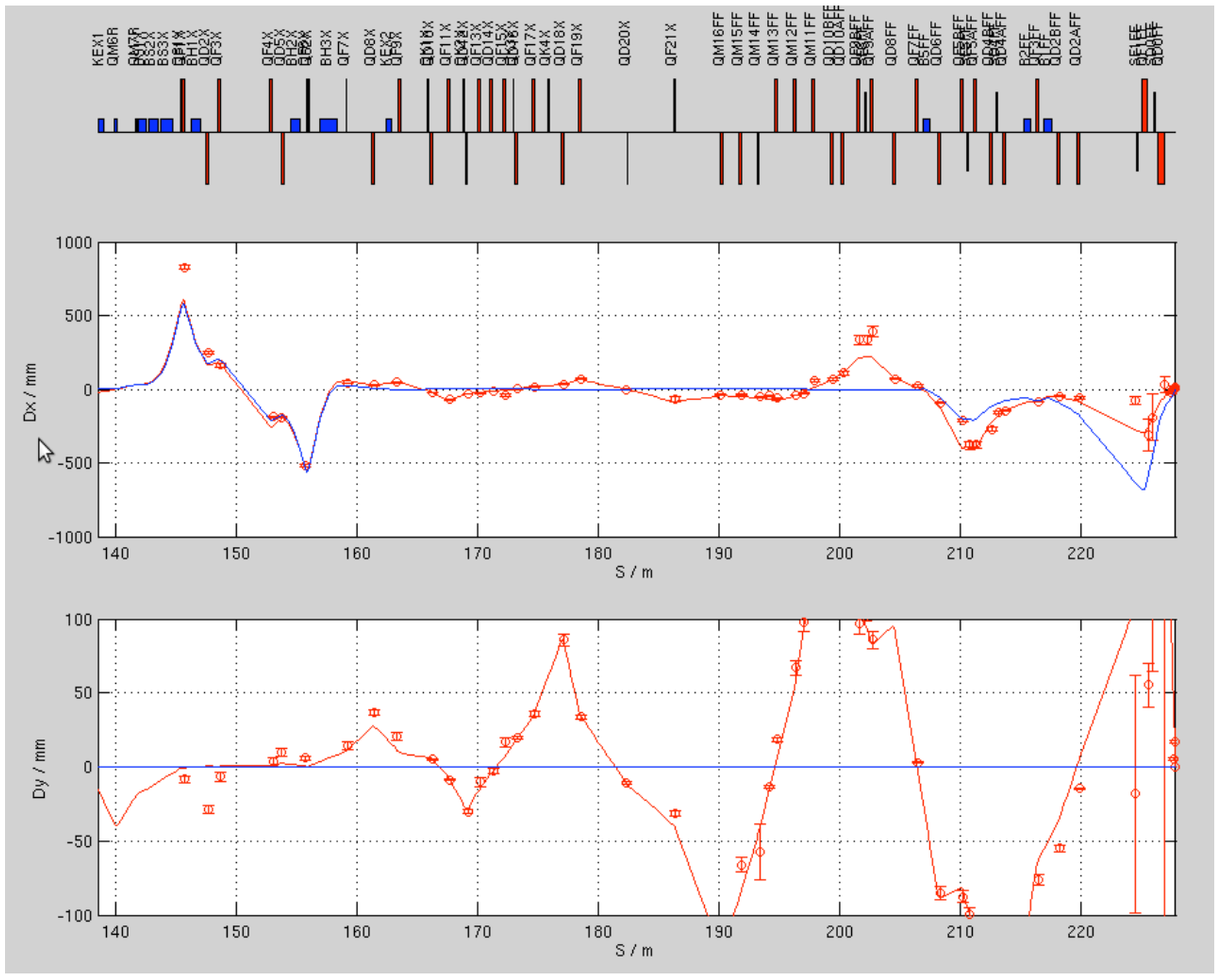


Jitter Analysis



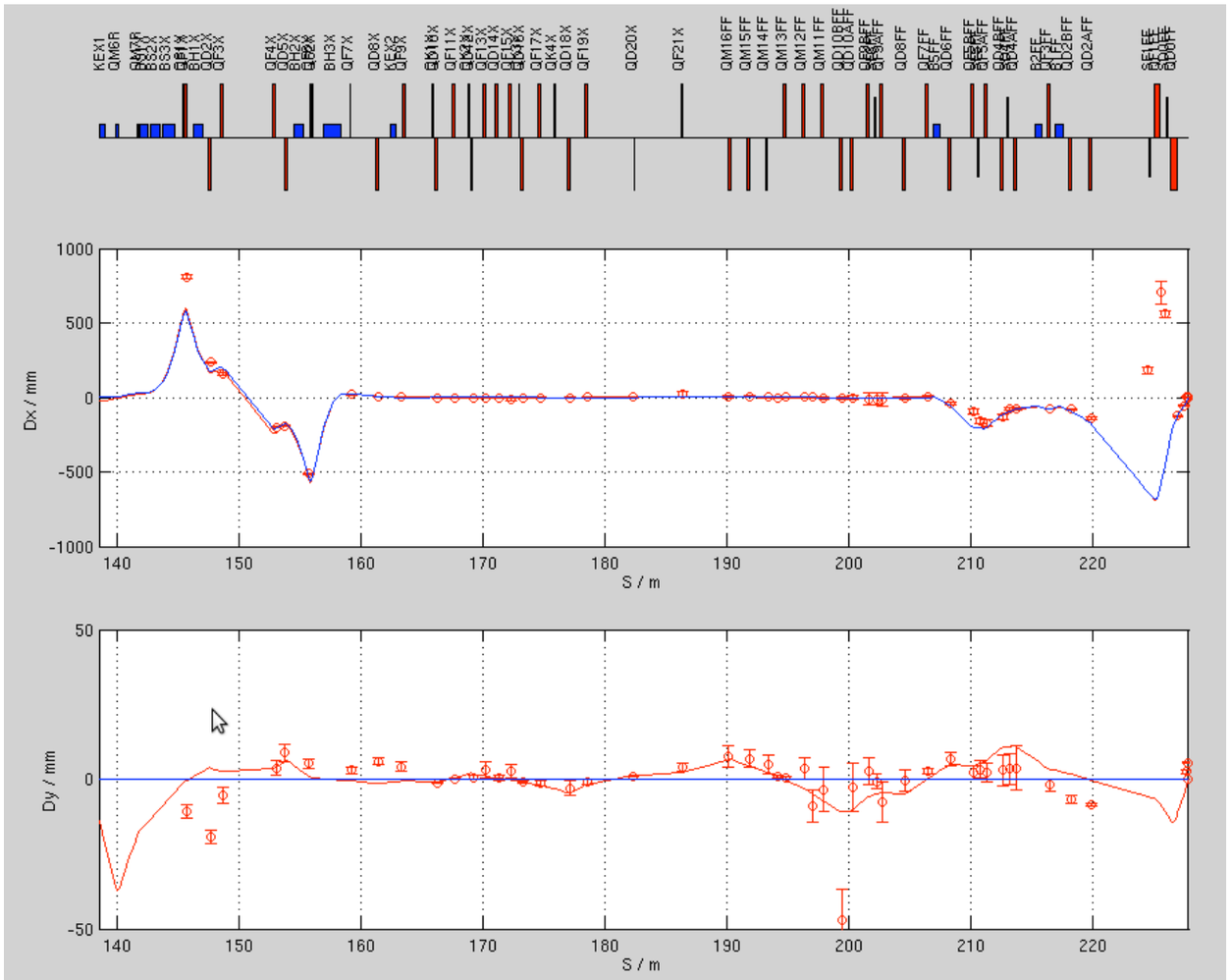
Dispersion Correction (December 7, 2010)

Before Correction



Fitted dispersion values for BEAMLINE element 1923 (IP):
eta x = 6.84 +- 0.134 mm
eta x' = 64.5 +- 2.02 mrad
eta y = 0.405 +- 0.00726 mm
eta y' = -236 +- 3.78 mrad

After Correction



Fitted dispersion values for BEAMLINE element 1923 (IP):
eta x = 0.487 +- 0.152 mm
eta x' = 140 +- 2.31 mrad
eta y = -0.0163 +- 0.00544 mm
eta y' = 12.6 +- 1.93 mrad

Beam must be centered in QF1X/QF6X/QS1X/QS2X

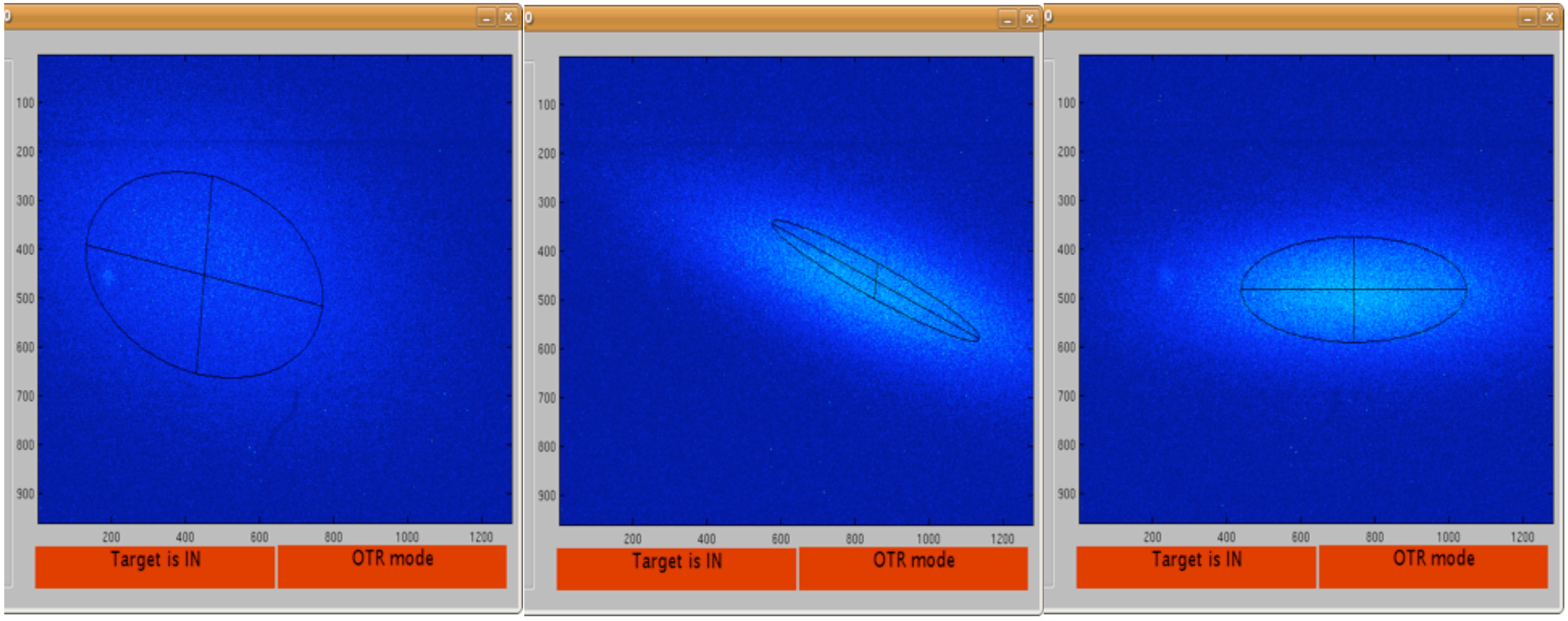
Horizontal EXT Emittance Measurements

Date	N_{wire}	Emit (nm)	BMAG
Dec 14 2010	4	1.784 ± 0.130	1.10 ± 0.04
Dec 9 2010	4	1.686 ± 0.102	1.08 ± 0.05
Nov 2010 (?)	EXT kicker controller replaced		
May 18 2010	4	1.905 ± 0.078	1.08 ± 0.03
Apr 21 2010	4	1.212 ± 0.065	1.26 ± 0.03
Mar 17 2010	BS3X rolled ~4 mrad (CCW)		
Feb 25 2010	4	1.868 ± 0.336	1.15 ± 0.12
Feb 17 2010	4	negative	
Feb 3 2010	4	1.626 ± 0.095	1.10 ± 0.06
Jan 28 2010			

Vertical EXT Emittance Measurements

Date	N_{wire}	Emit (pm)	BMAG
Dec 14 2010	5	27.6 ± 1.8	1.09 ± 0.04
Dec 9 2010	4	29.3 ± 3.1	1.05 ± 0.02
Nov 2010 (?)	EXT kicker controller replaced		
May 18 2010	5	11.7 ± 2.3	1.43 ± 0.25
Apr 21 2010	5	15.4 ± 2.0	1.78 ± 0.17
Mar 17 2010	BS3X rolled ~4 mrad (CCW)		
Feb 25 2010	5	22.08 ±0.9	1.19 ± 0.03
Feb 25 2010	5	38.33 ± 1.1	1.10 ± 0.02
Feb 17 2010	5	22.6 ± 1.4	1.15 ± 0.04
Feb 3 2010	5	16.1 ± 0.7	1.06 ± 0.03
Jan 28 2010	5	31.6 ± 1.2	1.03 ± 0.01

Multi-OTR system

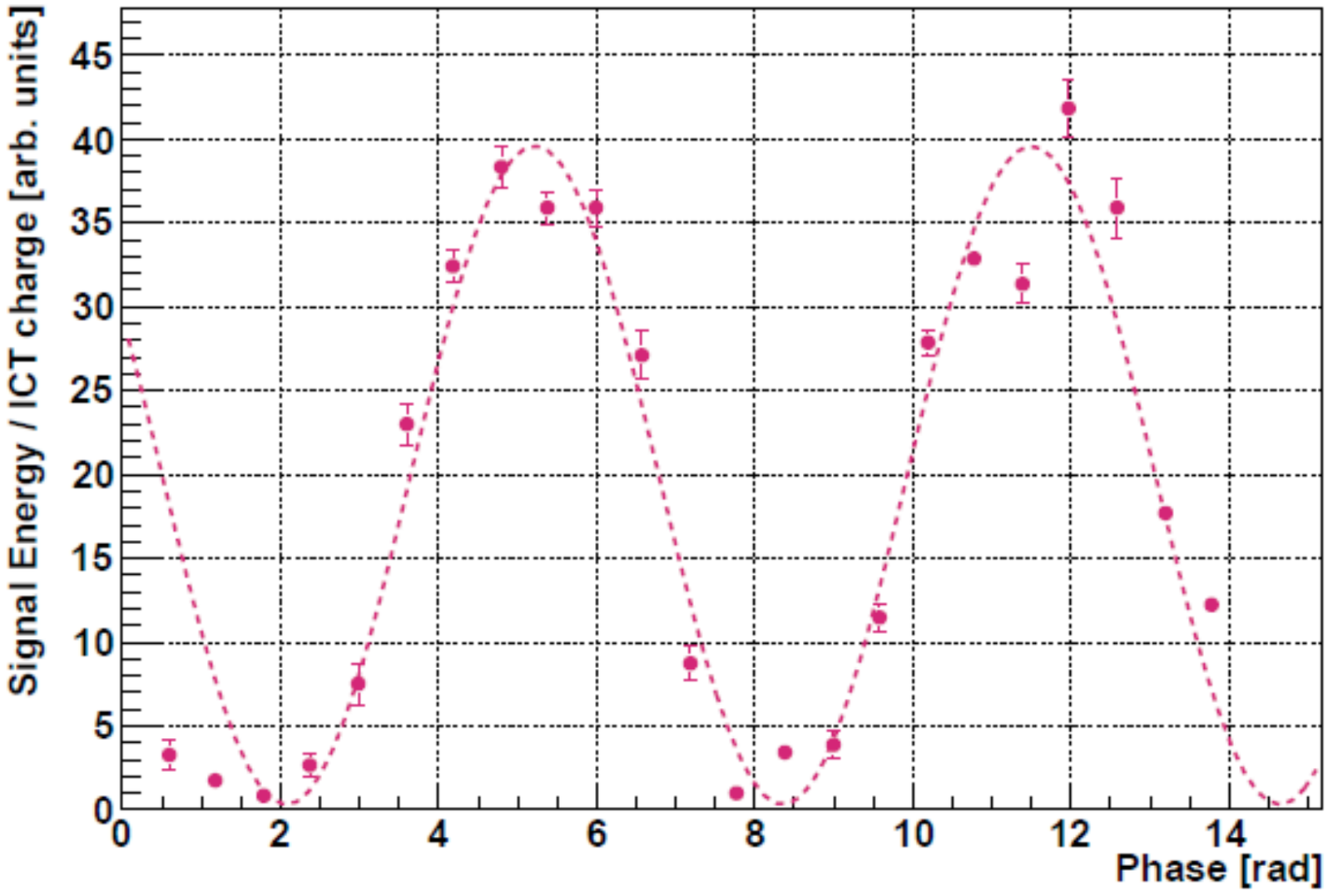


before corrections **after dispersion correction** **after coupling correction**

Cont. Tuning Week Summary

Monday	•DR setup + tune (ε_y = 14pm) •mOTR setup, tuning (ε_y<34 pm EXT, 27pm MW) •EXT Emit meas + cor •EXT Disp meas + cor
Tuesday	•IP C wire measurements •Sext BBA •BPM checks + diagnostics •IP σ_y < 2um
Wednesday	•IPBSM 2 degree mode •Start $\sigma_{y\,=}$ **1.8 um** •<x'y> scan, σ_y = **1.3um** •IPBSM 6 degree mode •σ_y = **1.0 um** •<x'y> scan, σ_y = **804 +/- 133 nm** •Waist_y scan, σ_y = **720 +/- 53 nm**
Thursday	•IPBSM tune, σ_y = **612 +/- 103 nm** •+ 4 hours, σ_y = 482,394,594,498 = **492 +/- 82 nm** •<xy> scan σ_y = 327,401,375 = **368 +/- 38 nm**

Results of the continuous run in December, 2010



Interference scan plot for one of the smallest beam sizes measured at 5.96 degree on Dec 16, 2010.

$\sigma_y^* = 280 \pm 90$ nm

$M_{meas} = 0.918 \sim 0.984$

$\beta_x^* = 10$mm

$\beta_y^* = 0.1$mm

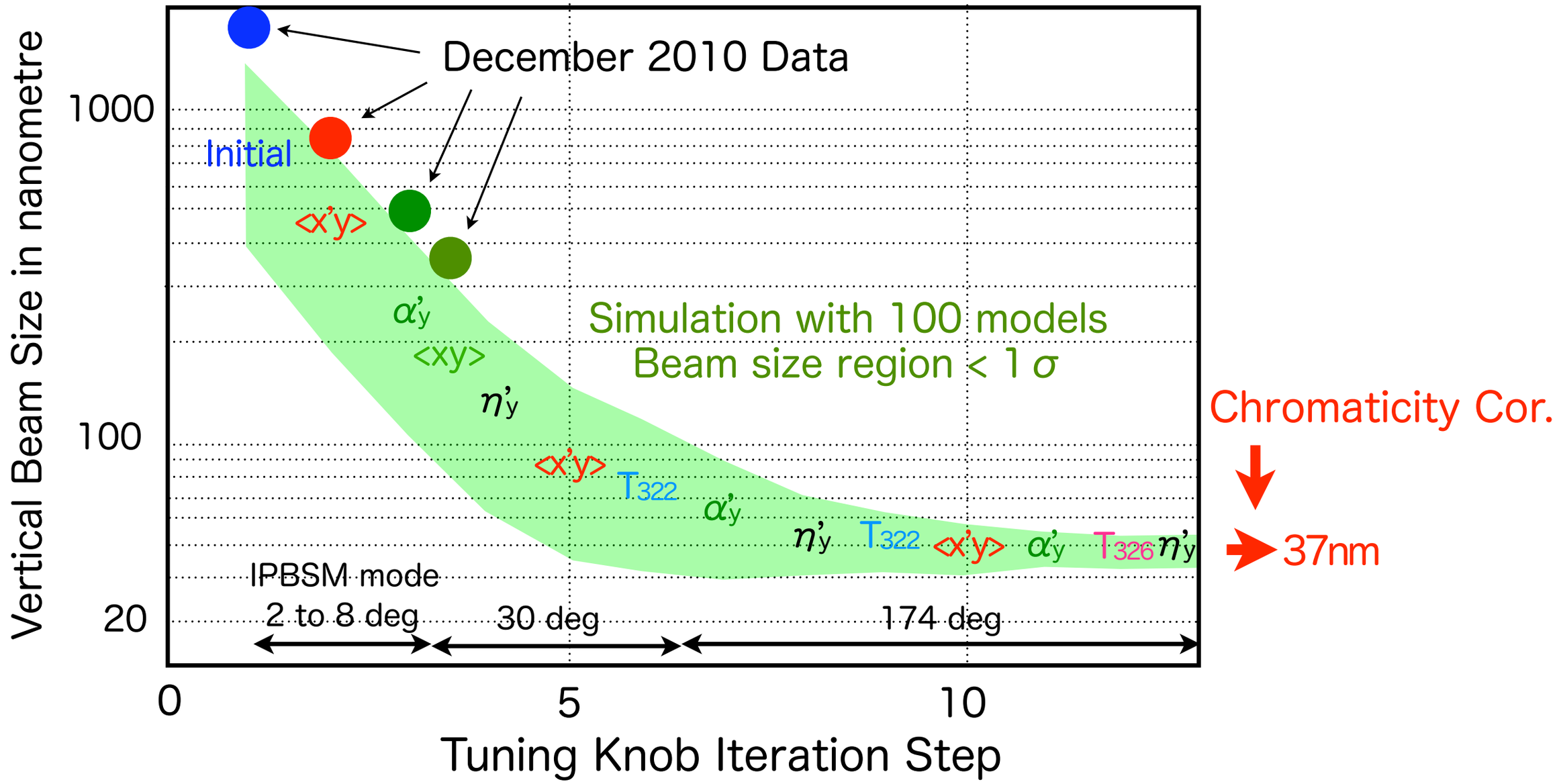
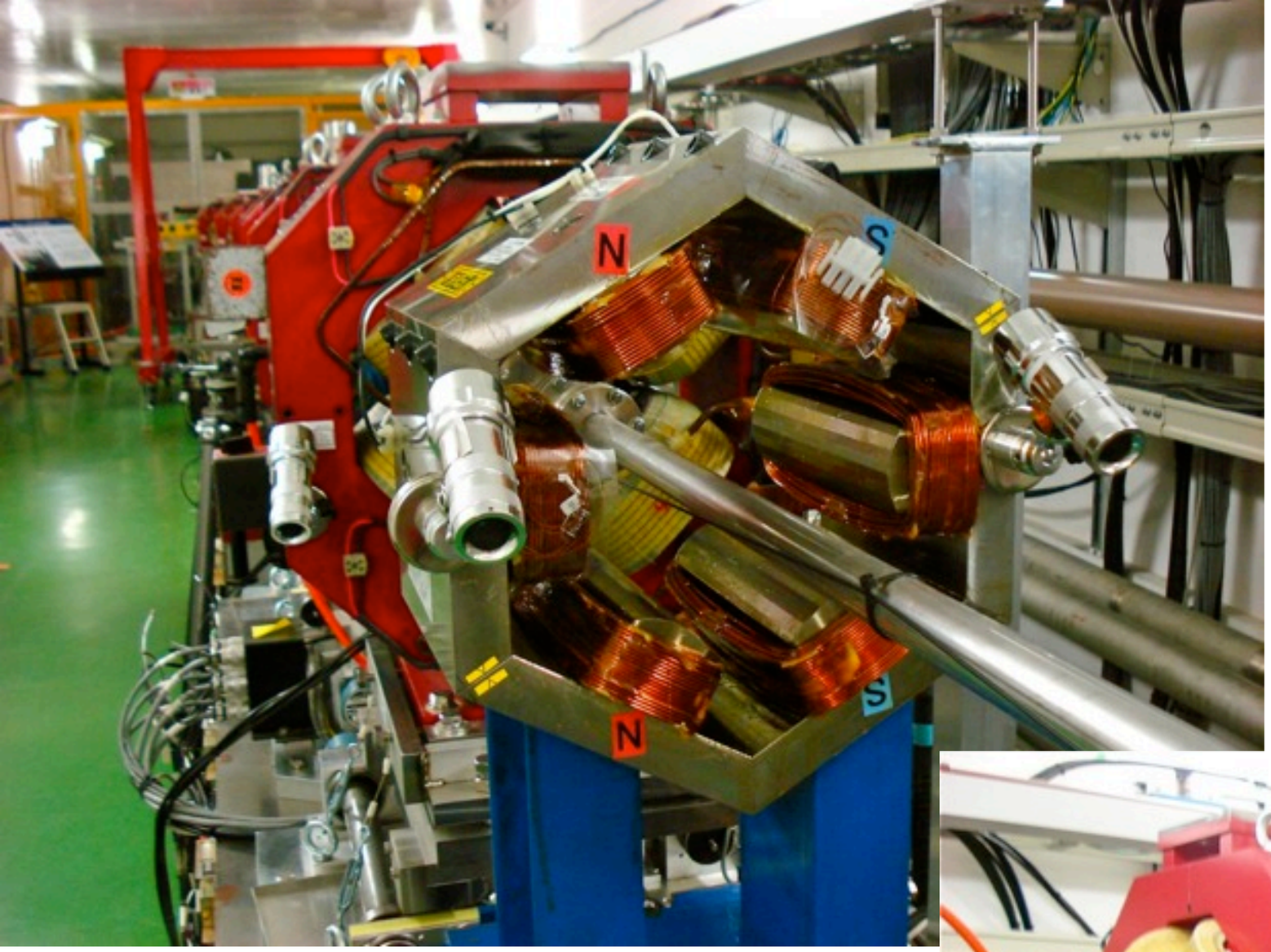
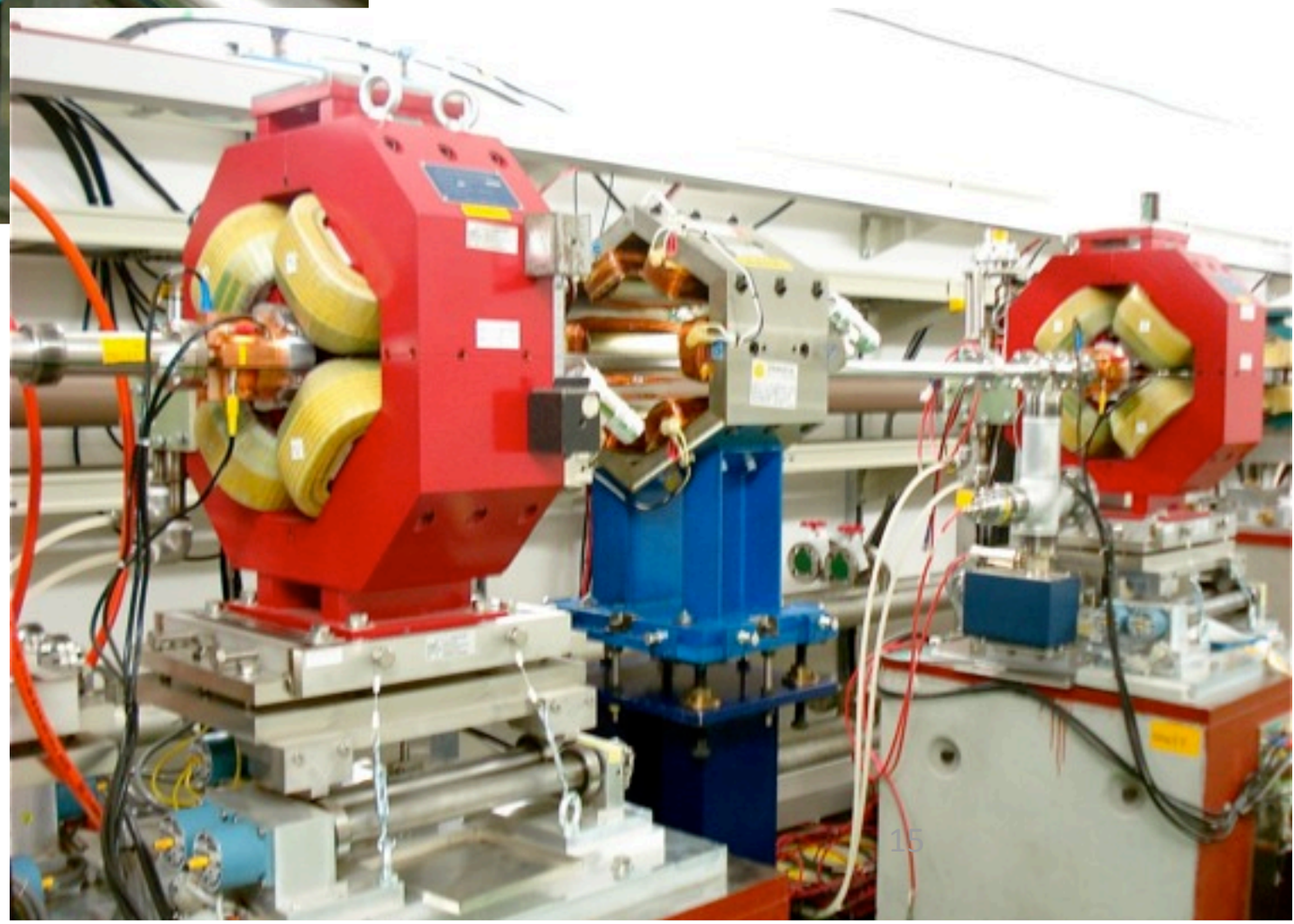
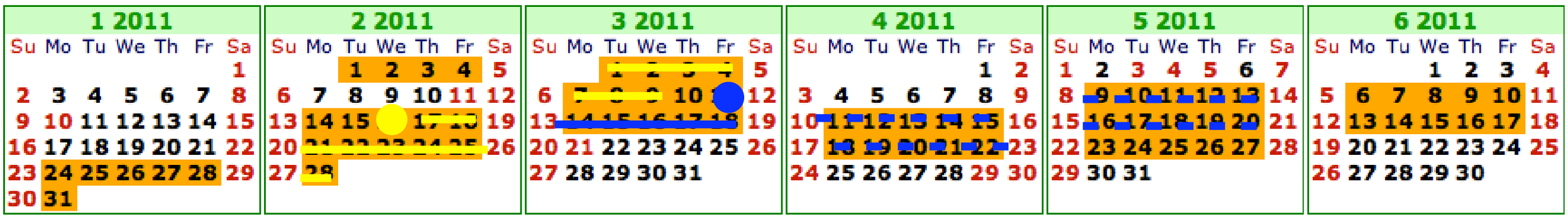


Figure 10-1： Performance of beam size tuning at IP. The experimental data in December 2010 are plotted together with the expectations ones. First data shows the initial beam size before any correction with the beam size measurement by the IPBSM, and <x'y>, α'y, <xy>, η'y, T322 and T326 are tuning knobs of horizontal angle, the vertical waist, coupling, vertical dispersion, second order aberrations of horizontal angle (T322) and dispersion (T326), respectively.



A Skew Sextupole magnet was installed at upstream of QF5B in January, 2011.
power supply : ±20A
(w/o cooling)





First priority is ATF2-37 nm until the end of March.

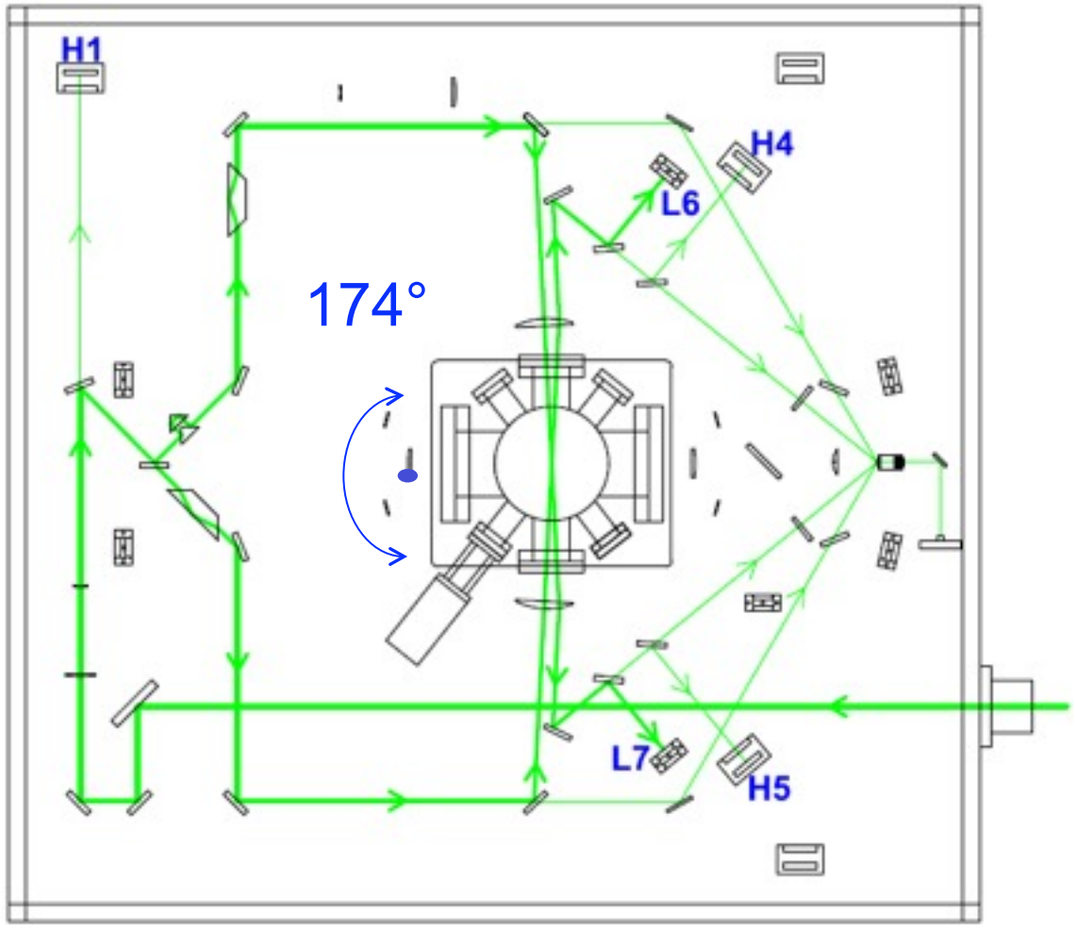
… 7 weeks

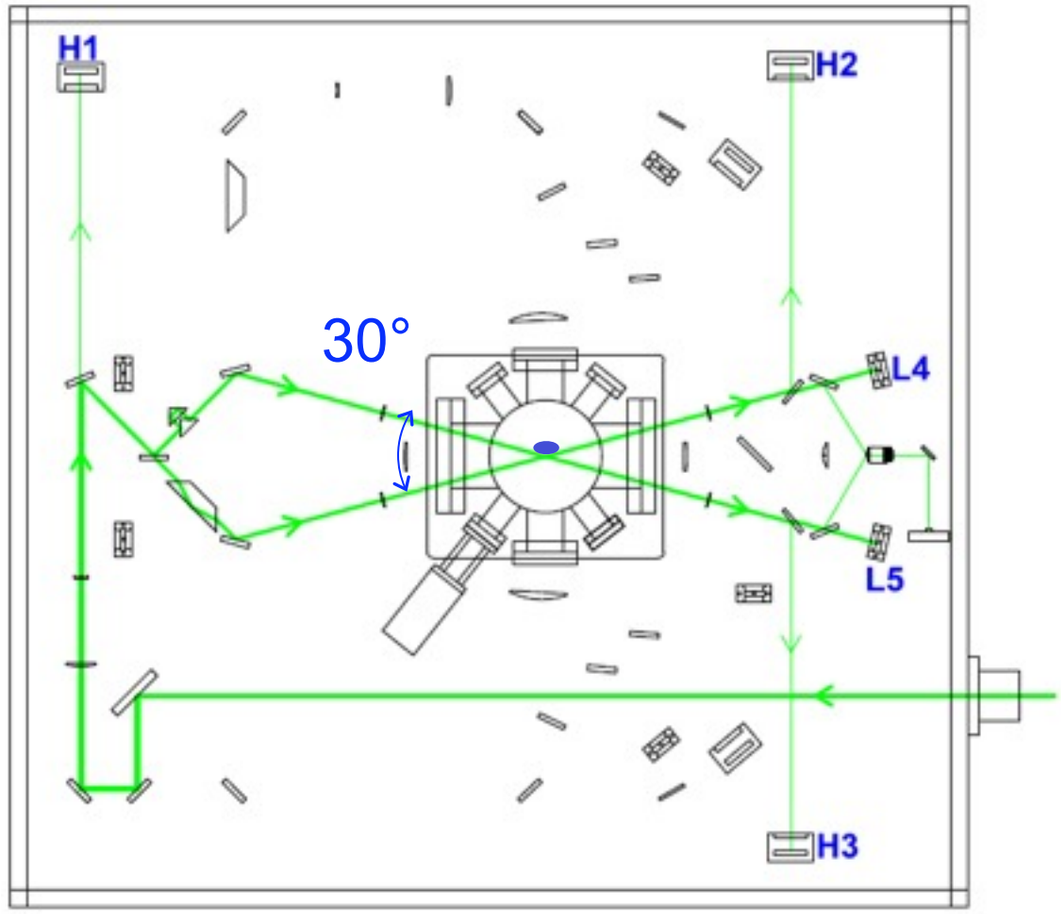
However ;

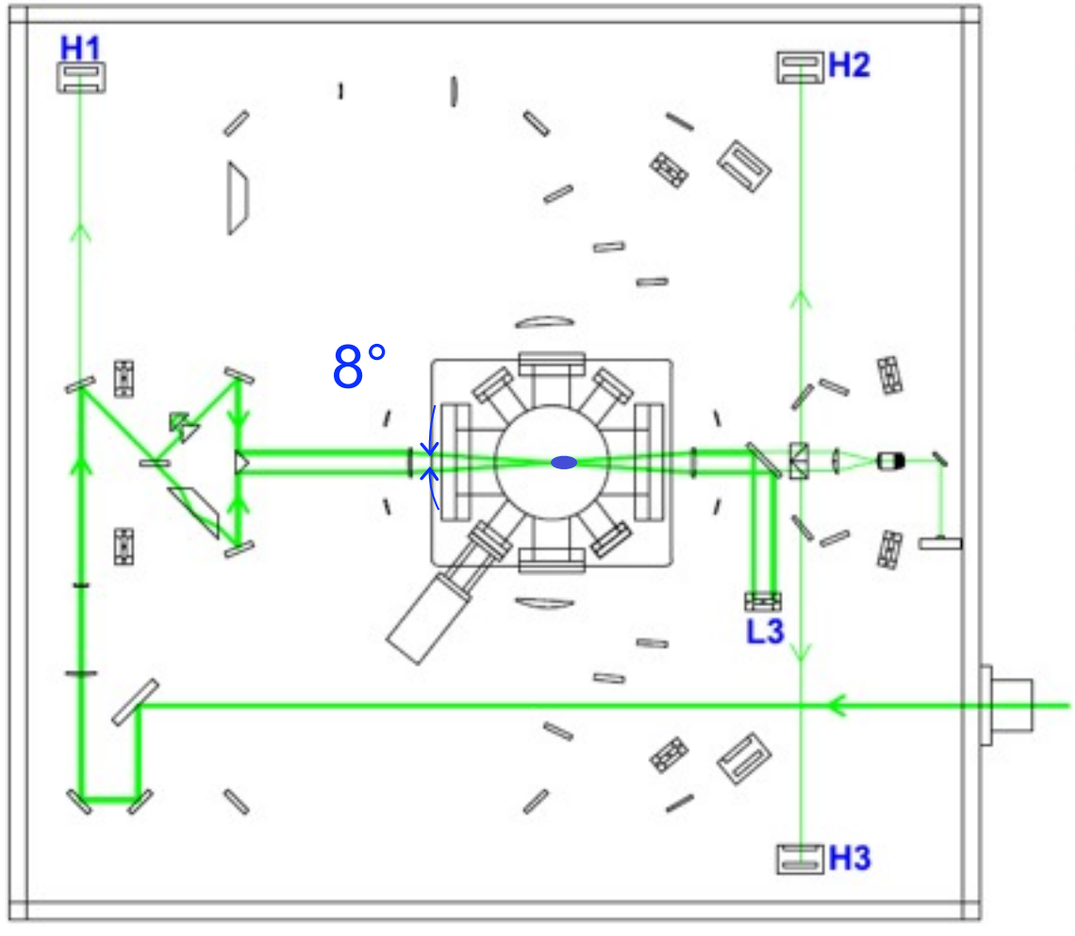
16 Feb.　fire at the modulator #0 at the ATF-LINAC

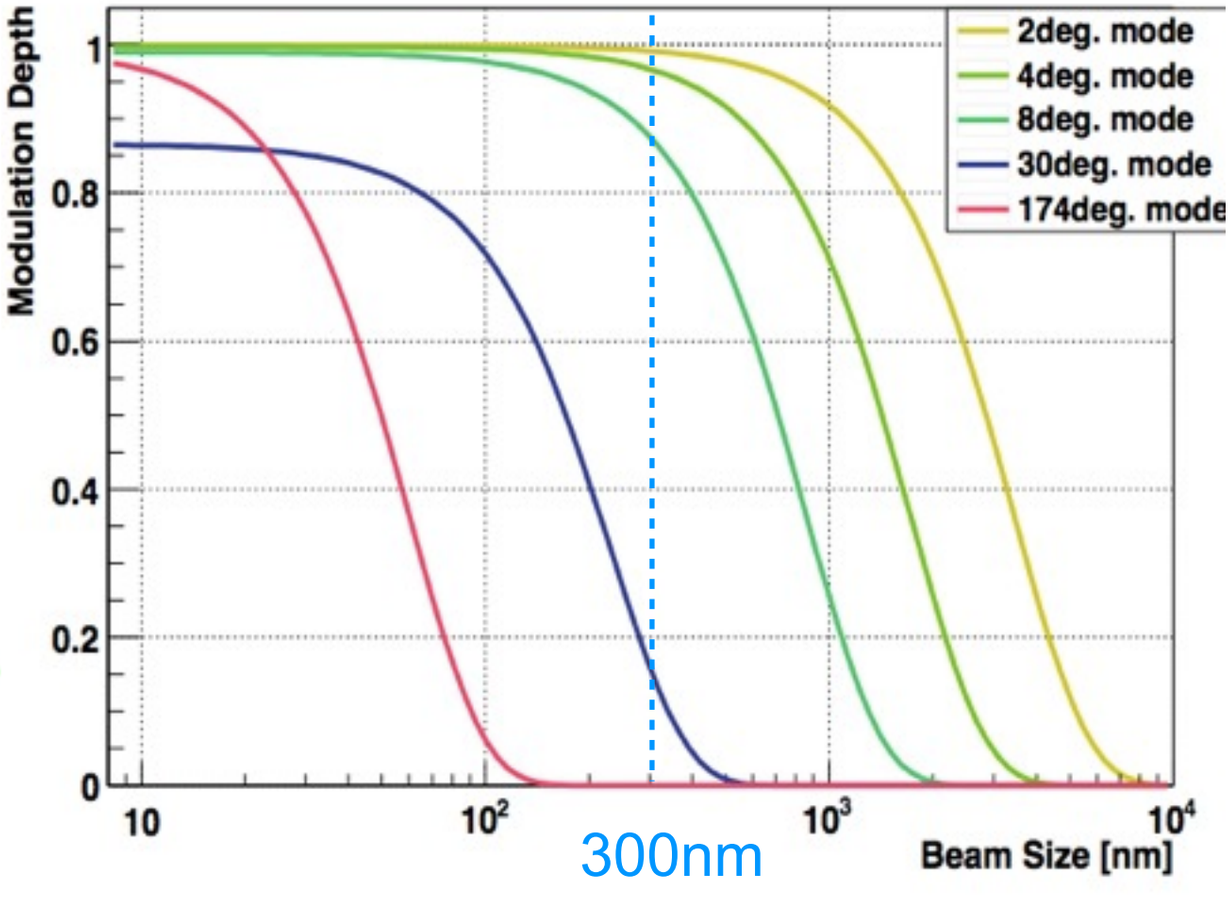
10 Mar.　resume the ATF operation and ATF2 beam tuning

11 Mar.　Great Eastern Japan Earthquake　(M9.0)


H1
H4
L6
174°
L7
H5


H1
H2
30°
L4
L5
H3


H1
H2
8°
L3
H3


Modulation Depth
1
0.8
0.6
0.4
0.2
0
10
10^2
10^3
10^4
Beam Size [nm]
2deg. mode
4deg. mode
8deg. mode
30deg. mode
174deg. mode
300nm

IPBSM

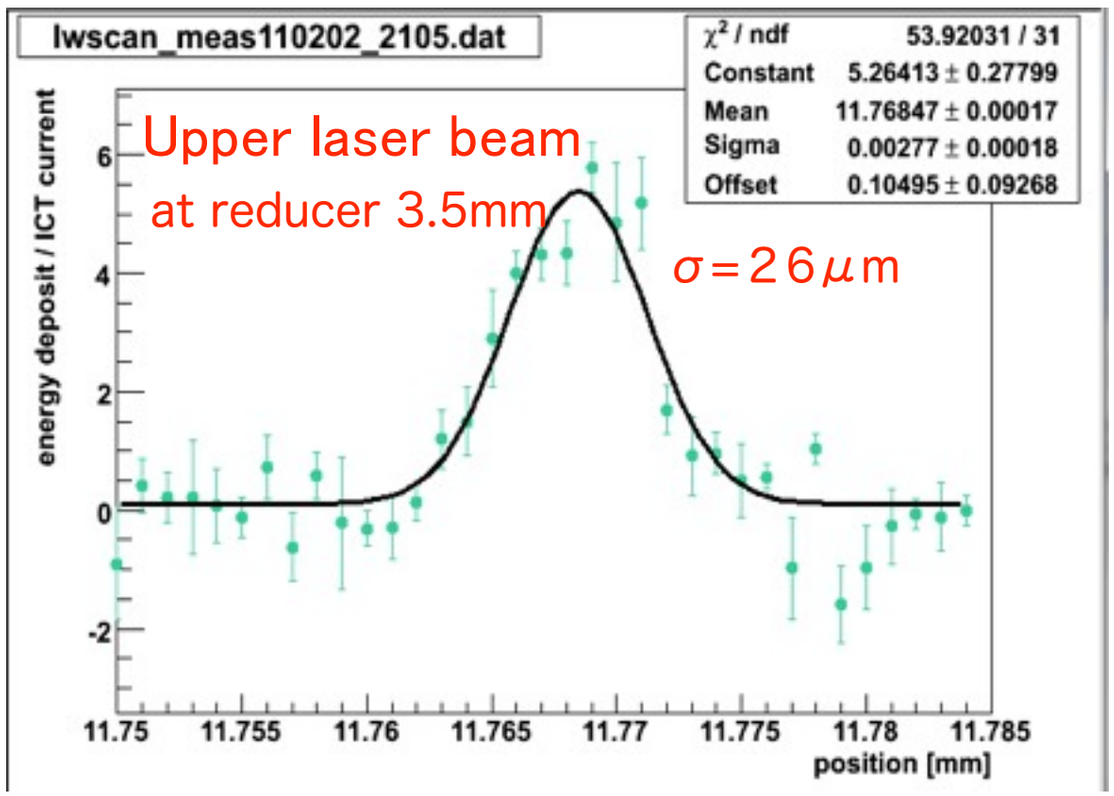
Signal & BG levels : May and Dec 2010

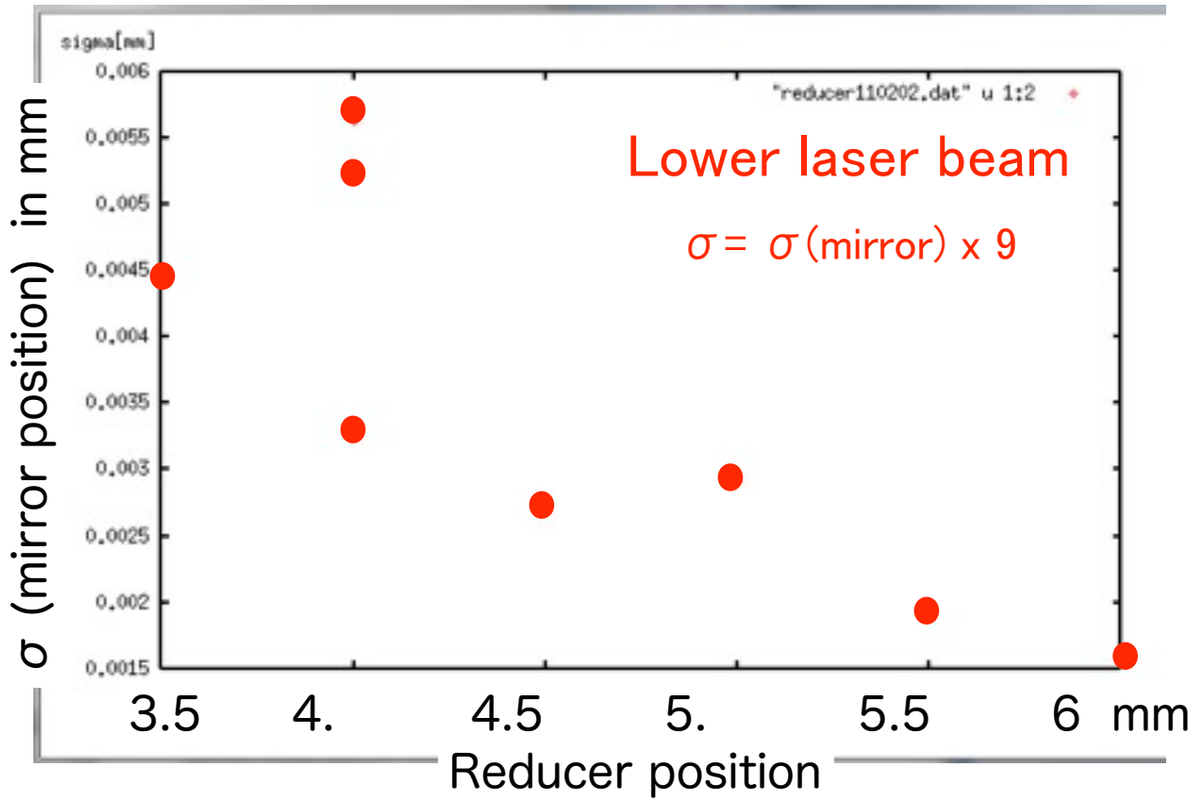
	Optics	Signal [GeV]	BG [GeV]	Beam Current [10^9 e^-]
May, 2010	**Beta x 10 optics**	**150**	**15**	**~ 4**
Dec, 2010	**nominal**	**15* - 60**	**100**	**~ 3**

* After problem of unfocused laser , especially at 30 deg.

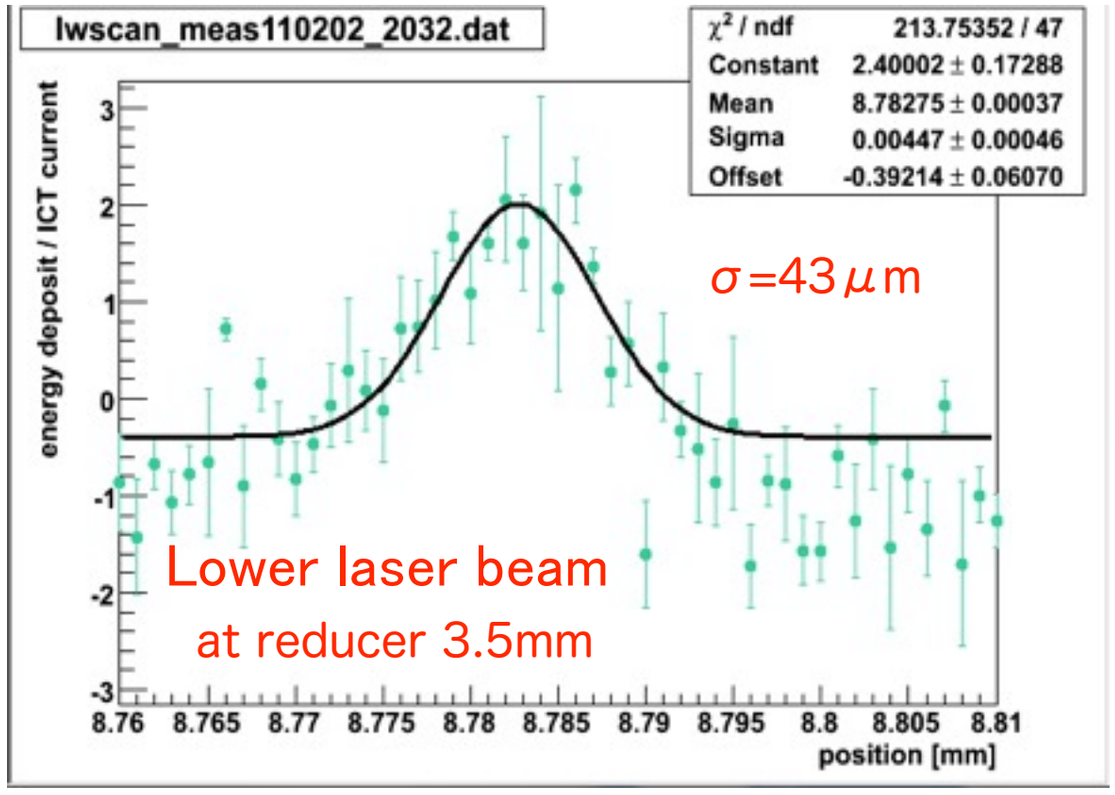
IPBSM : reducer scan at 30 degree mode, 2 February 2011

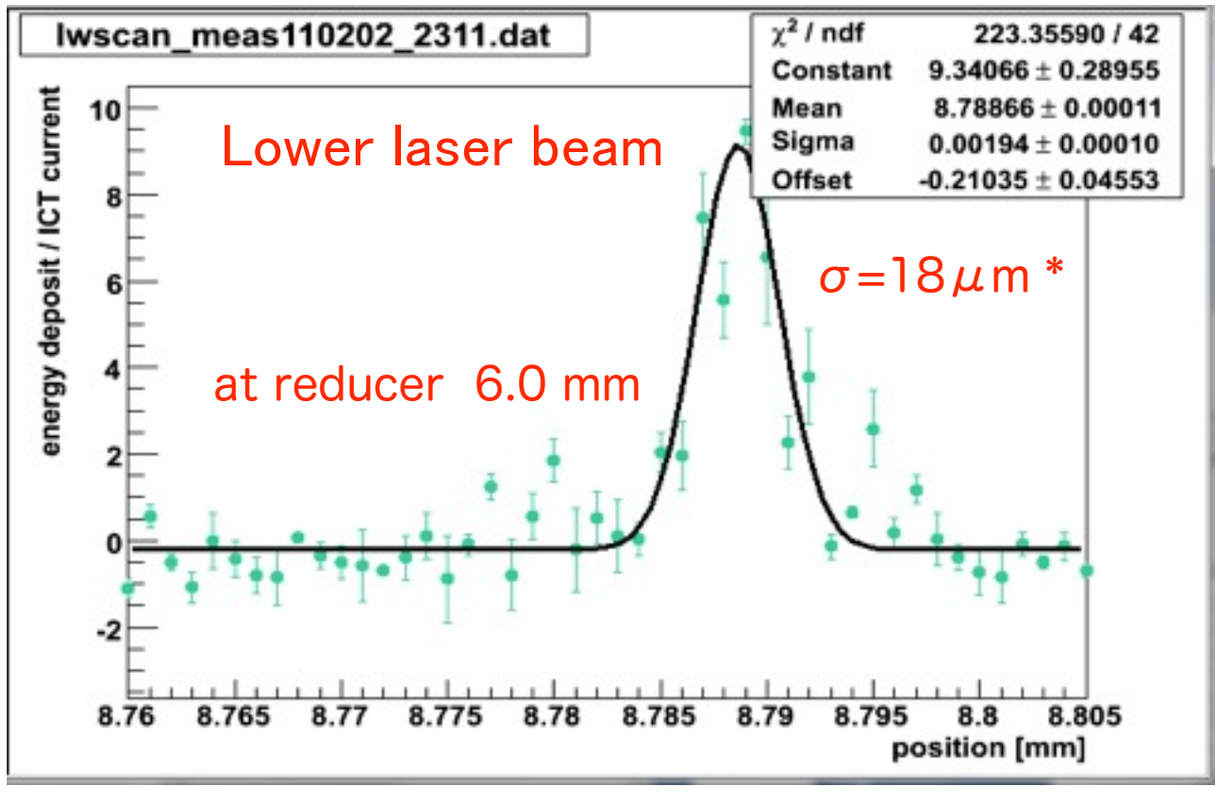
after optical alignment in the reducer by alignment laser



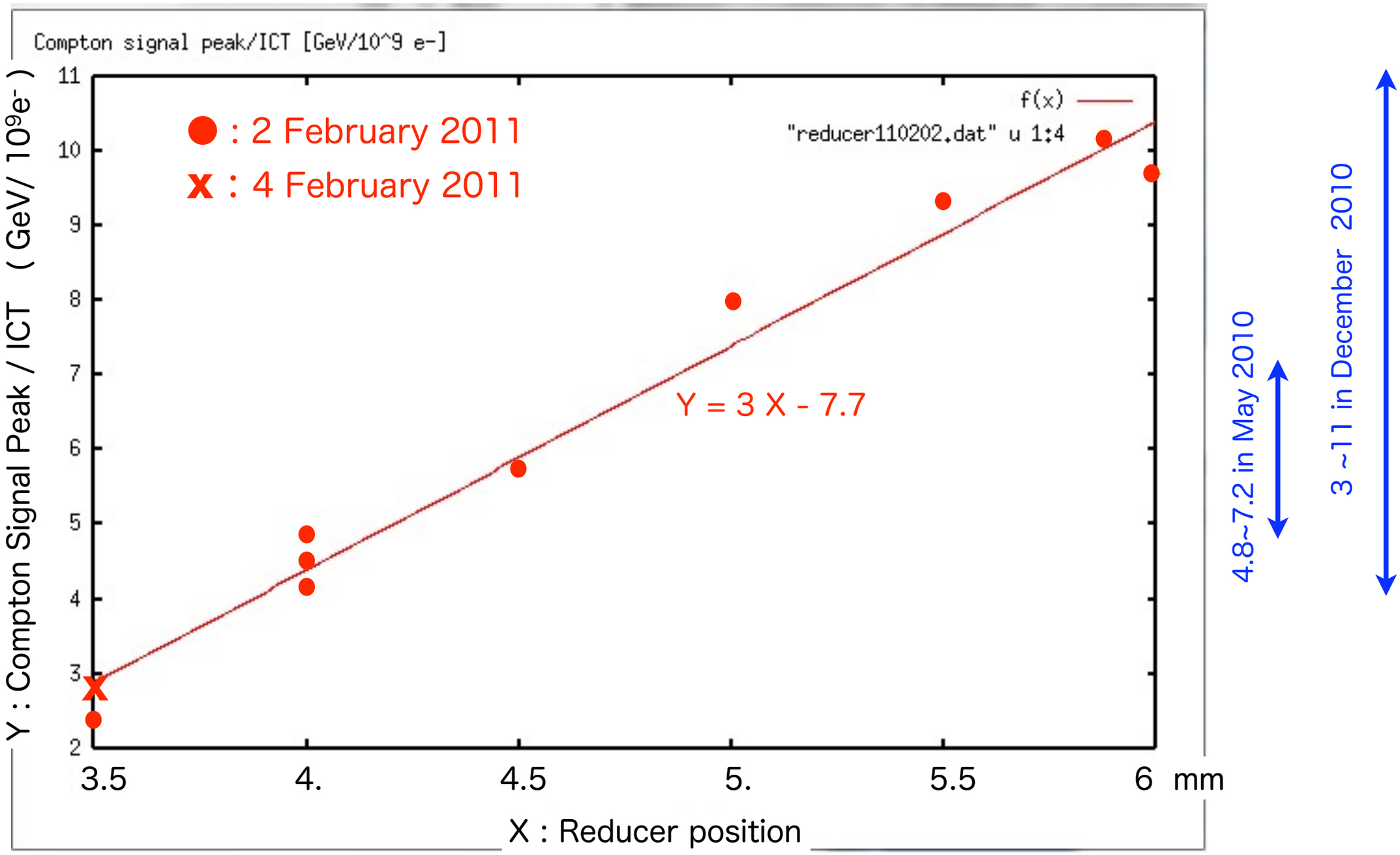


note: σ =27.1 μm by the slit scan, so σ_{min}=21 μm



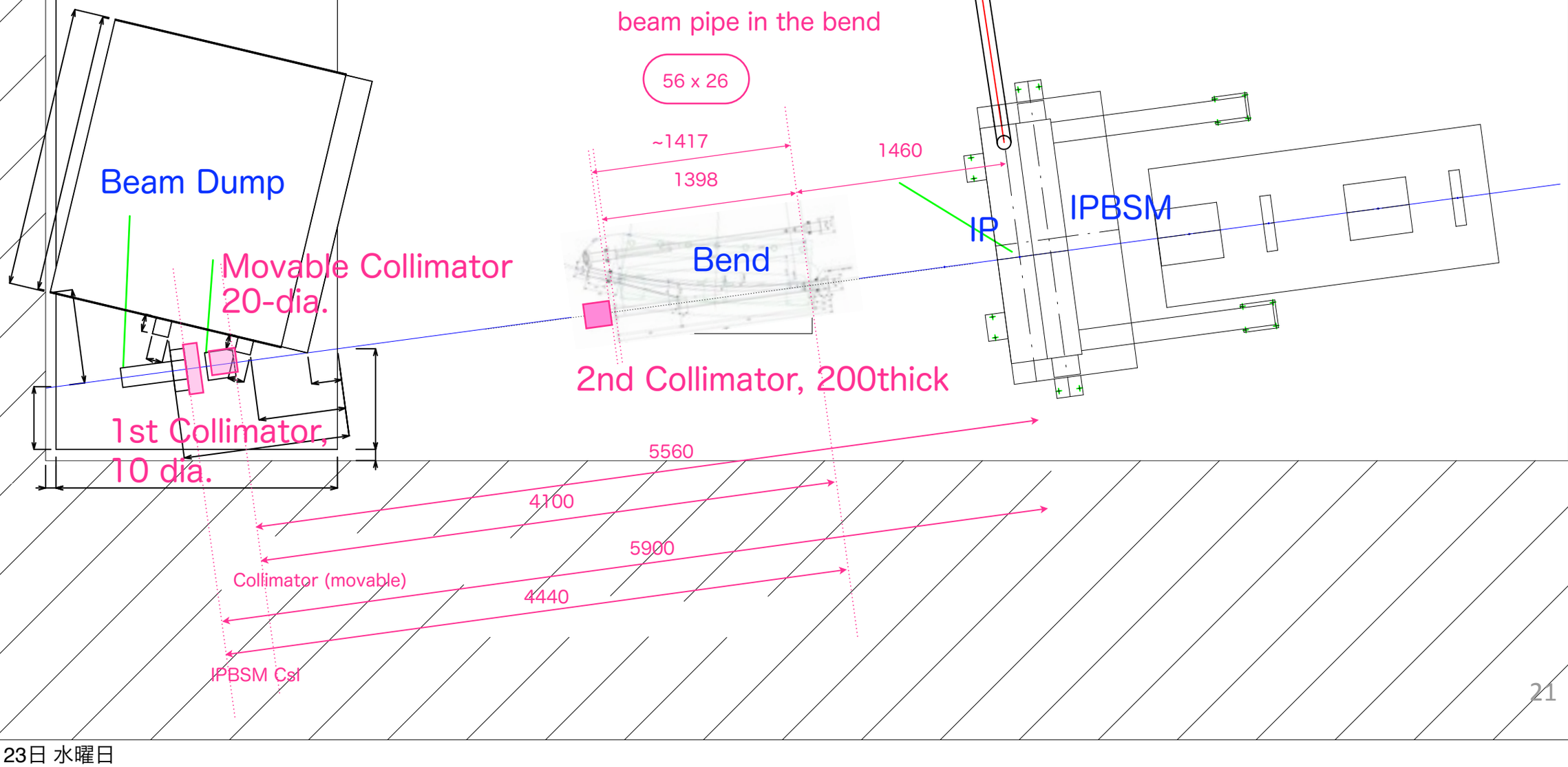


IPBSM : reducer scan at 30 degree mode, 2 February 2011



note: σ varied from 43 to 15 μm as the reducer from 3.5 to 6mm

Adjustment of the 2nd Collimator



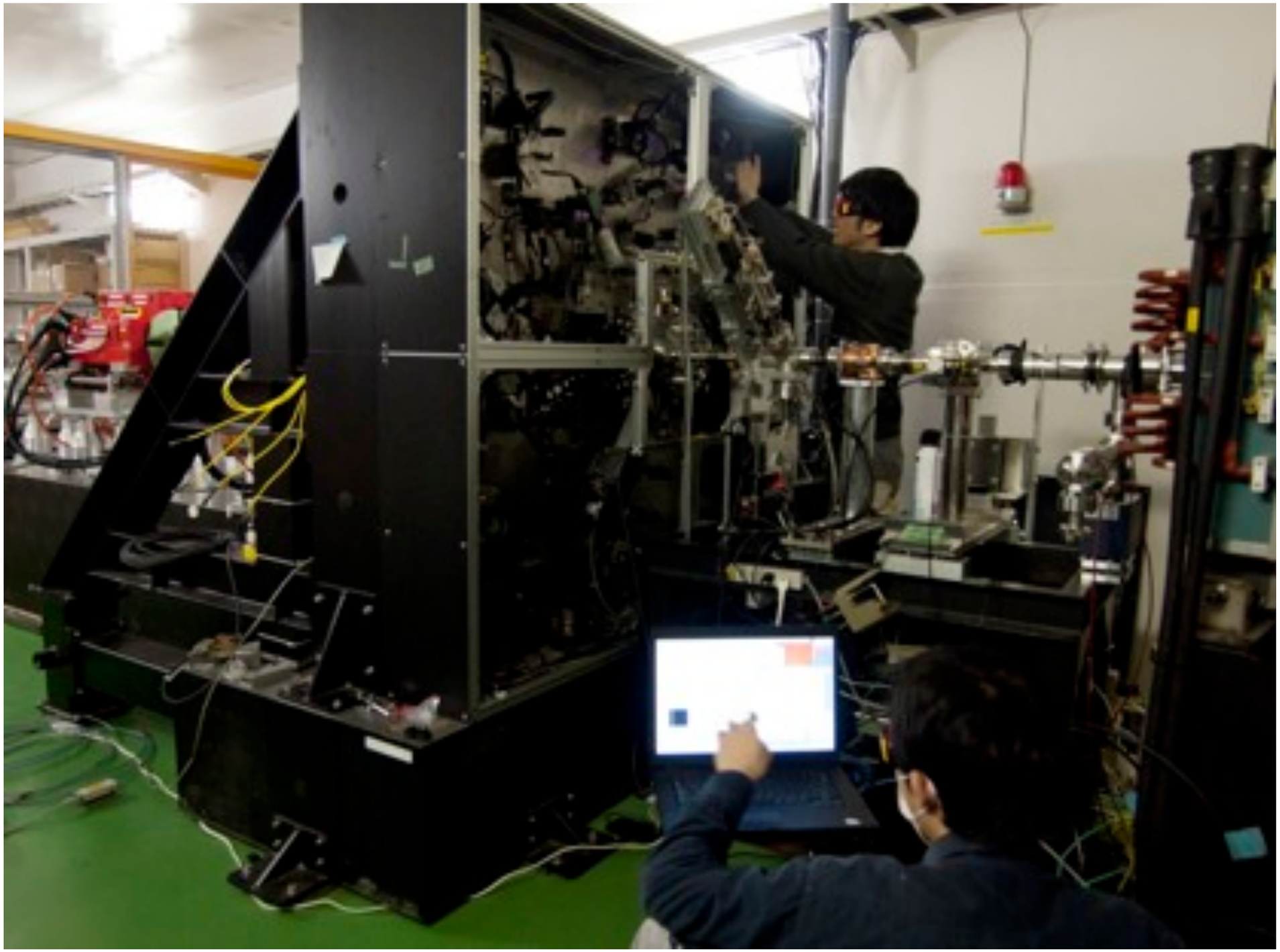
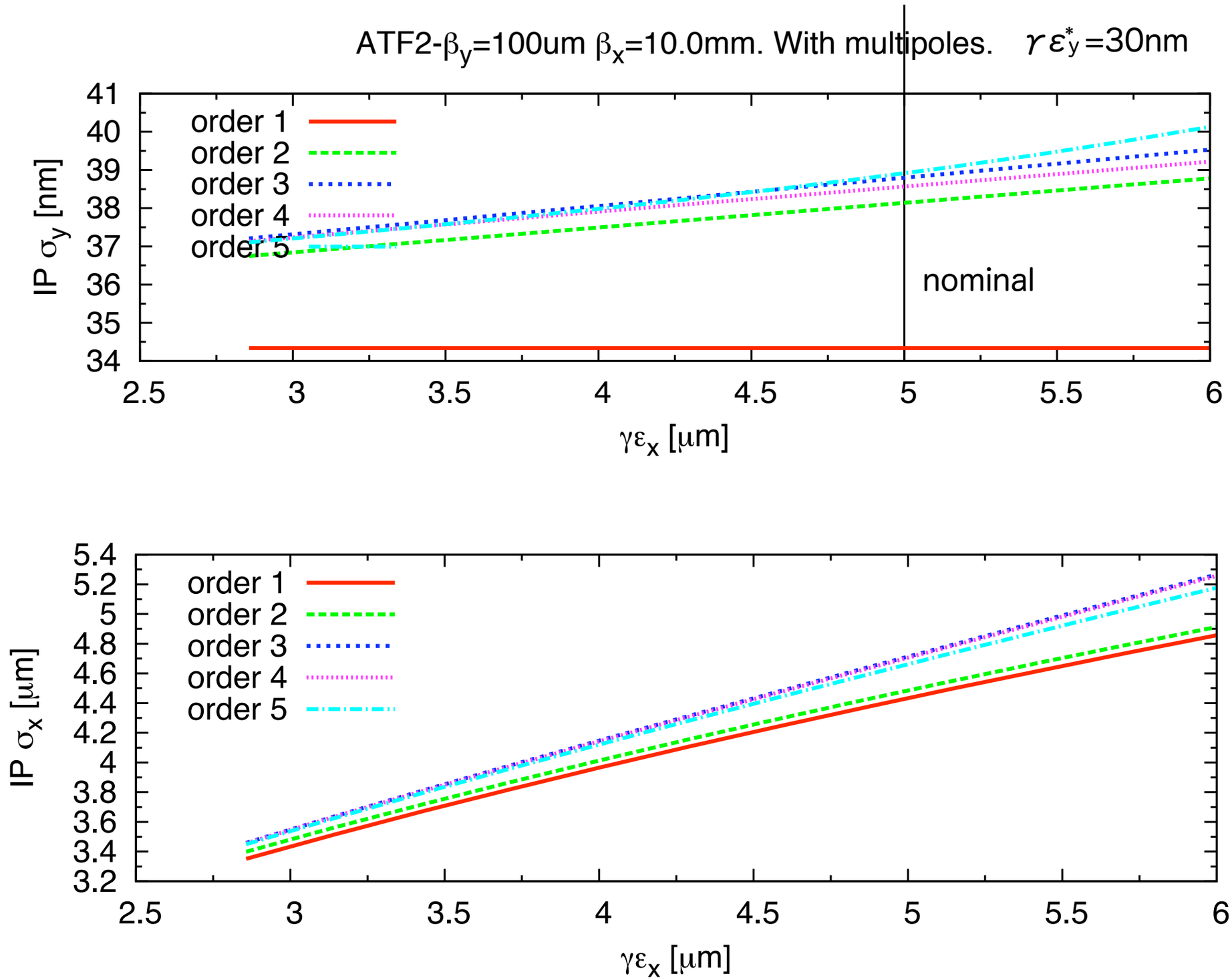


Figure 10-2 : Two students (University of Tokyo) were adjusting the laser optics system at the black optical table of the IPBSM for the ATF2 beam tuning run in March 2011, where the final focus quadrupole magnet (QF1) is also seen in red color at the upstream.

Estimation of multipole components in the QEA magnets for the re-matched optics

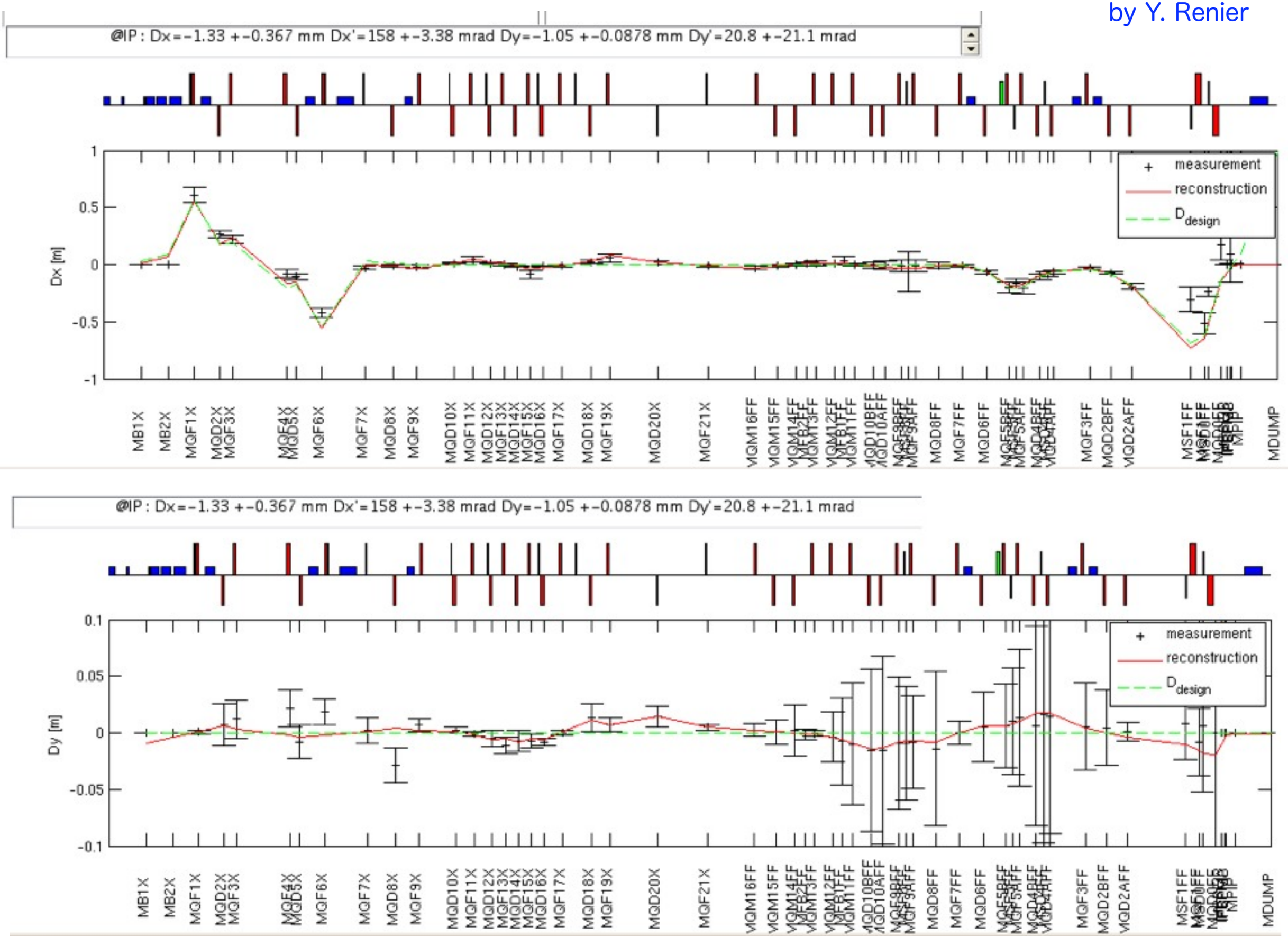
by Edu M. Lacoma

with powering a skew sextupole



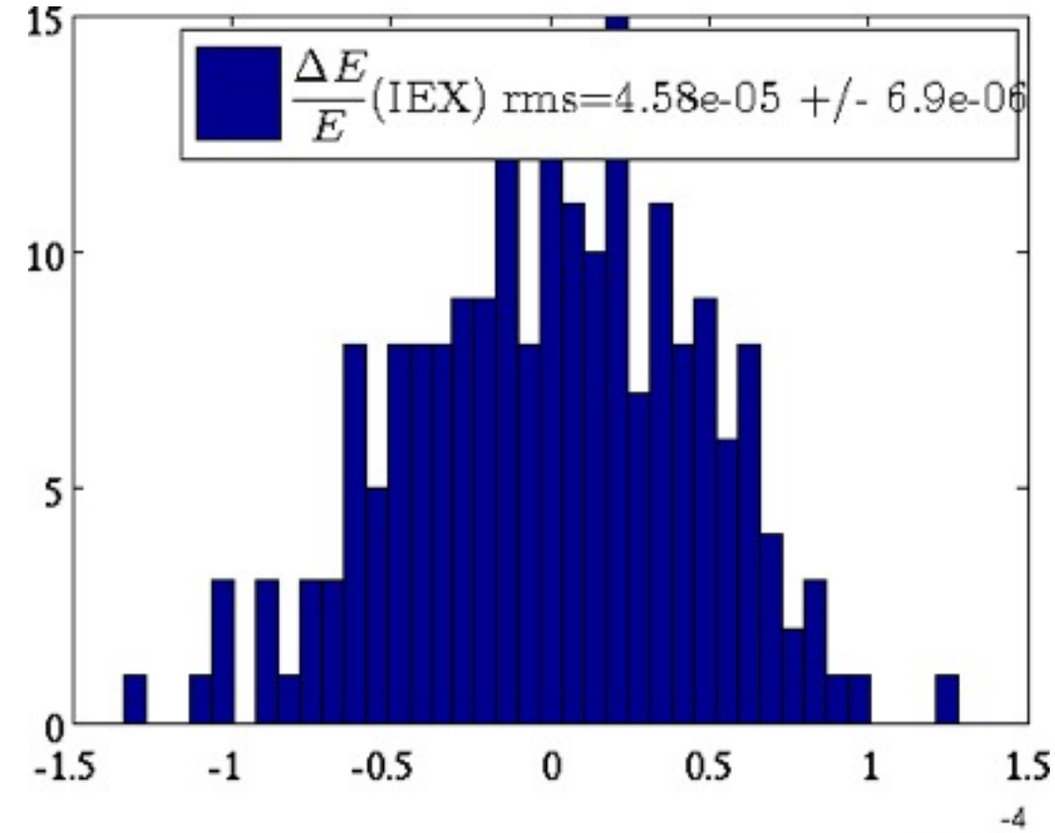
Dispersion without the DR RF ramp from the SVD analysis

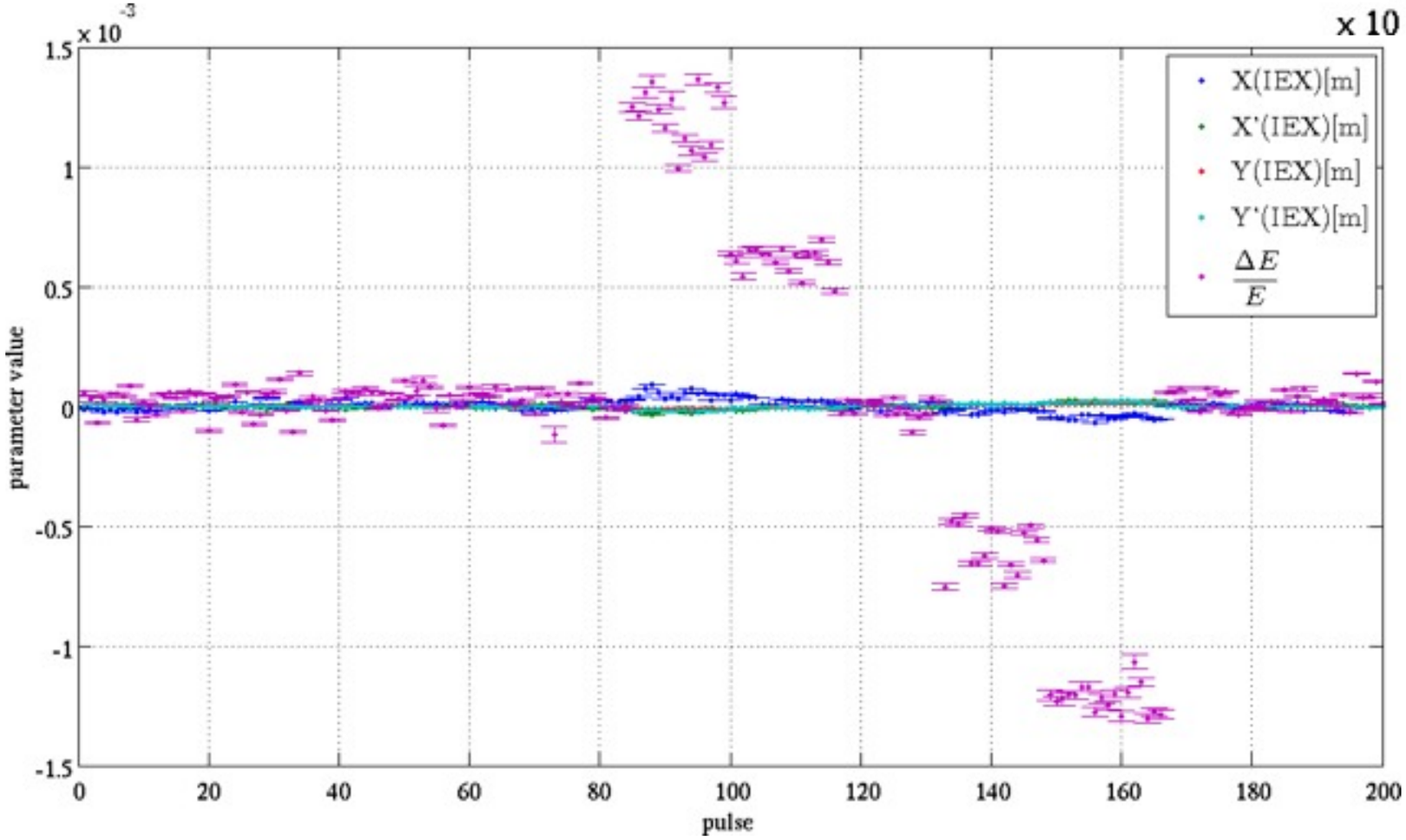
by Y. Renier



Energy spread from the SVD analysis

by Y. Renier



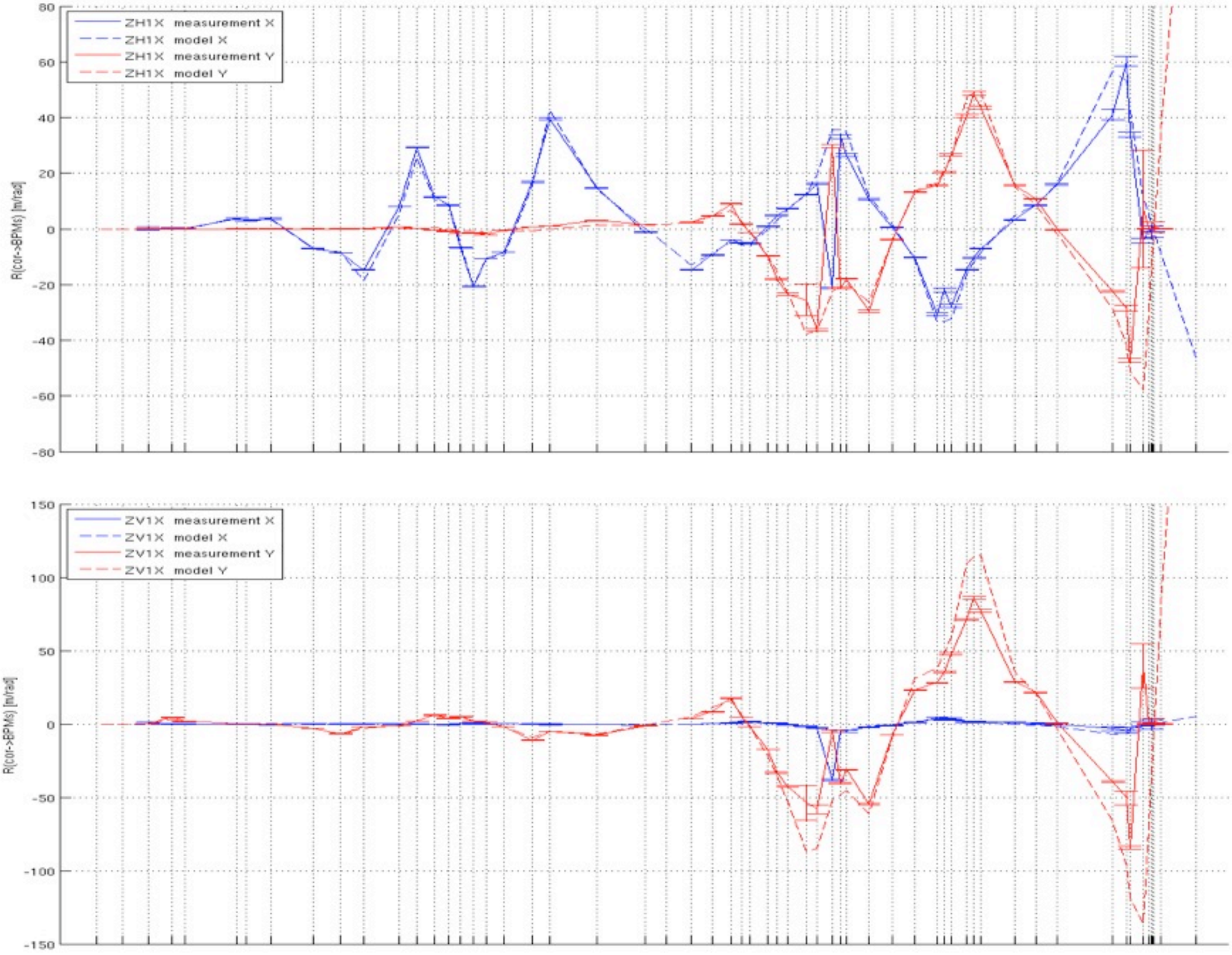


It is the parameter reconstruction function of time during a dispersion measurement. It is just to show the reconstruction works well as the steps in delta_f ramp are clearly visible (5 steps of 1kHz, from -2kHz to +2kHz).

As expected, for large parameter variation the error bars are larger,

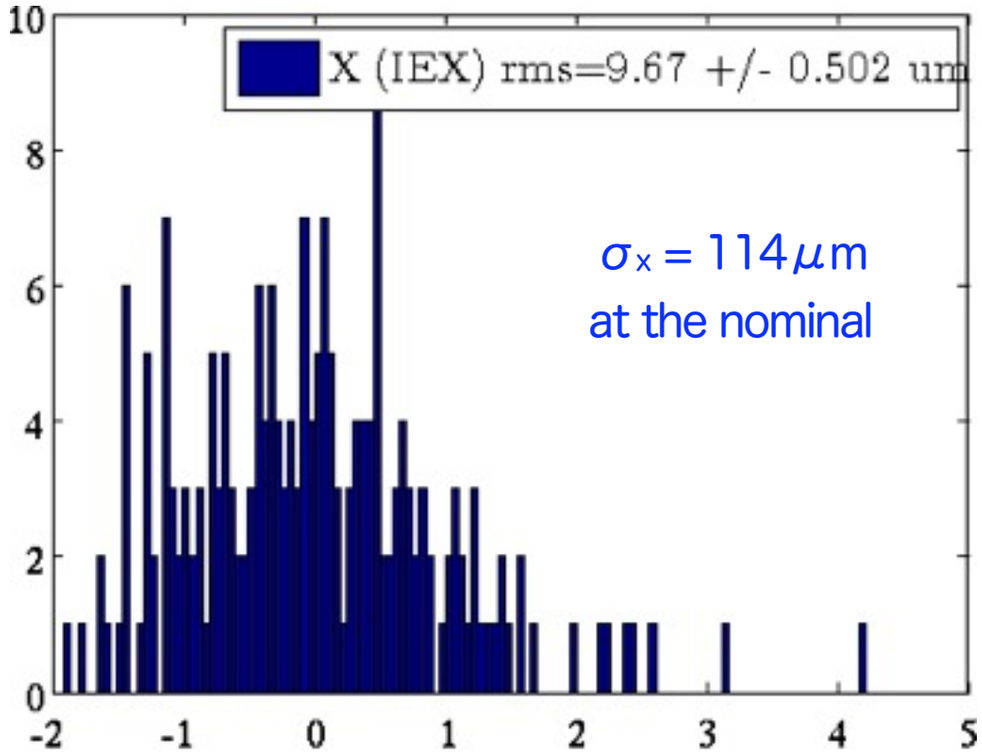
Response by a steering magnet from the SVD analysis

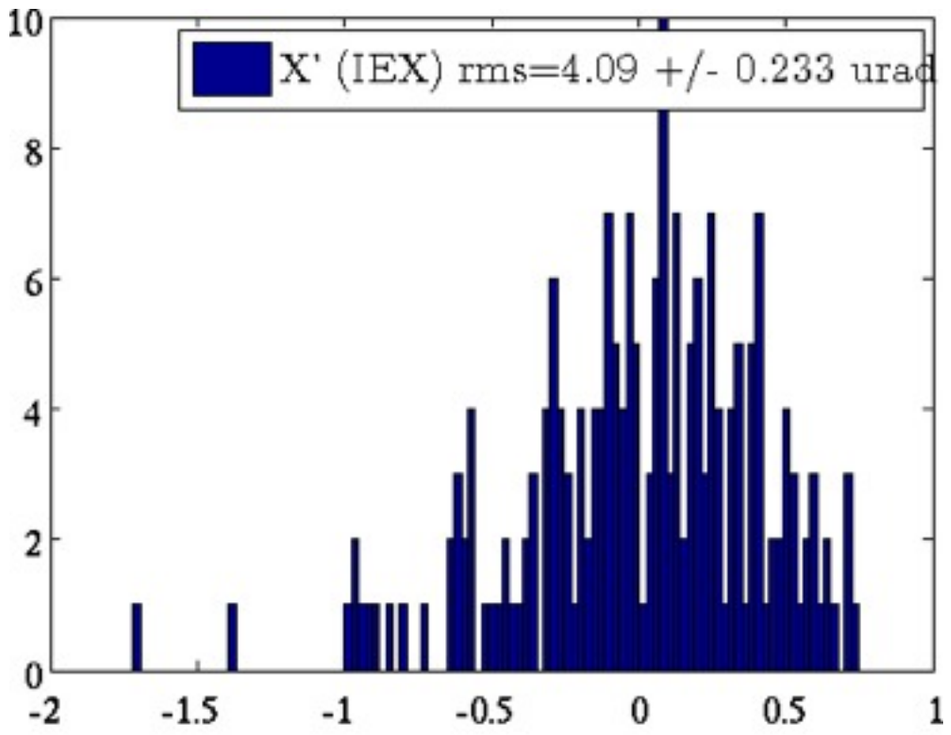
by Y. Renier

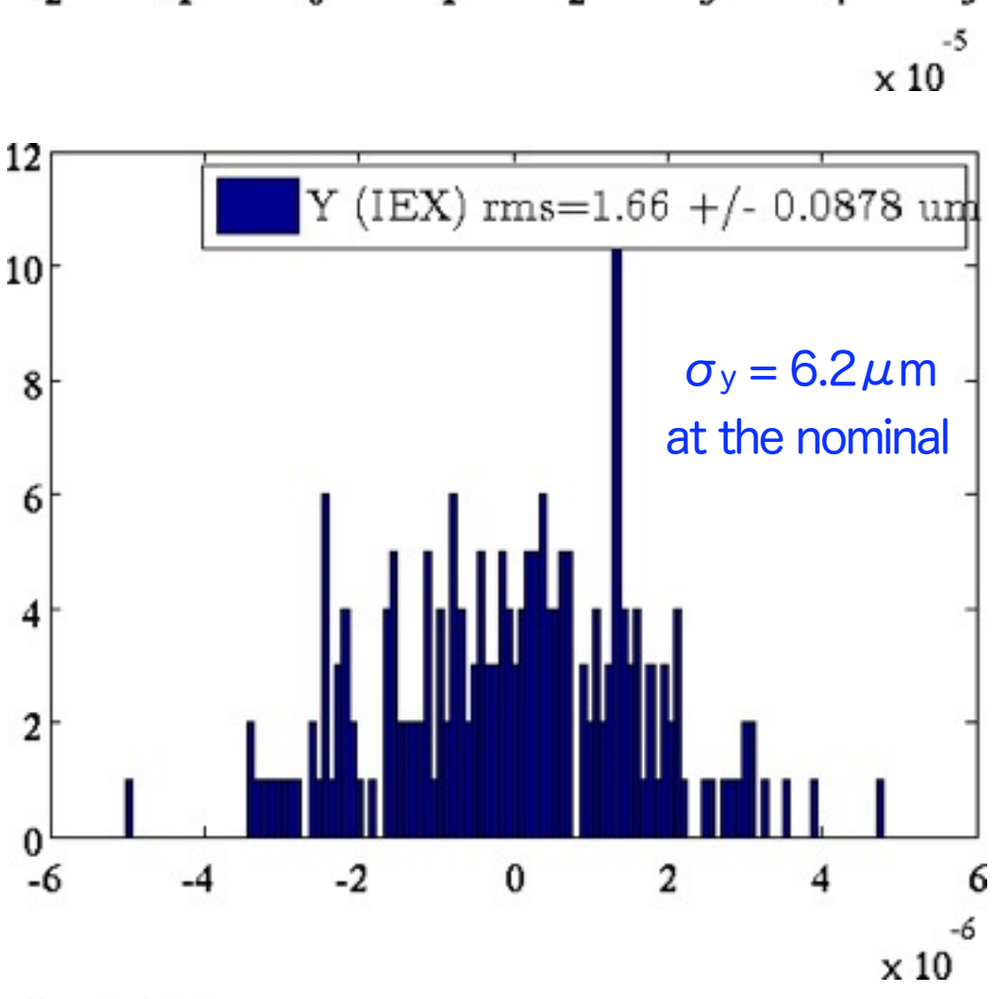


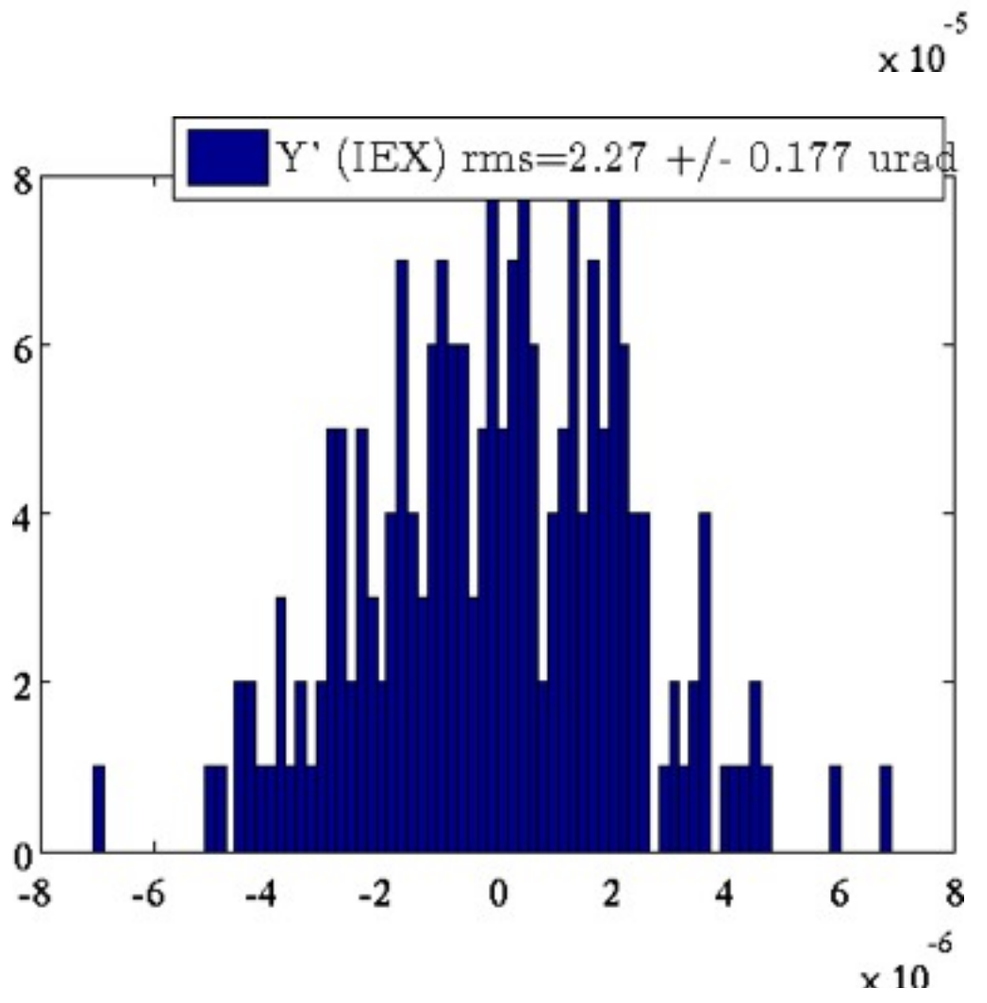
Jitters at the IEX from the SVD analysis

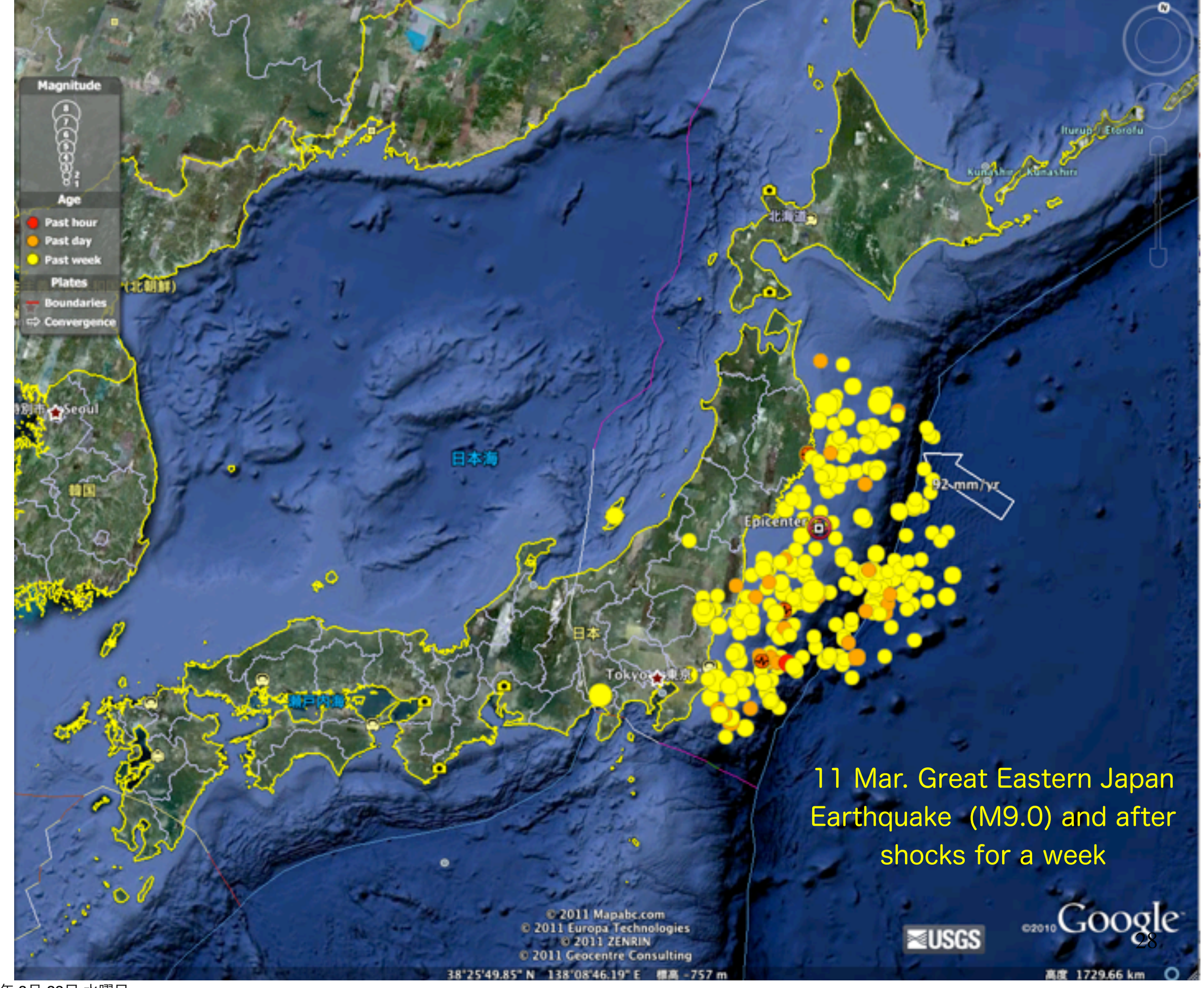
by Y. Renier



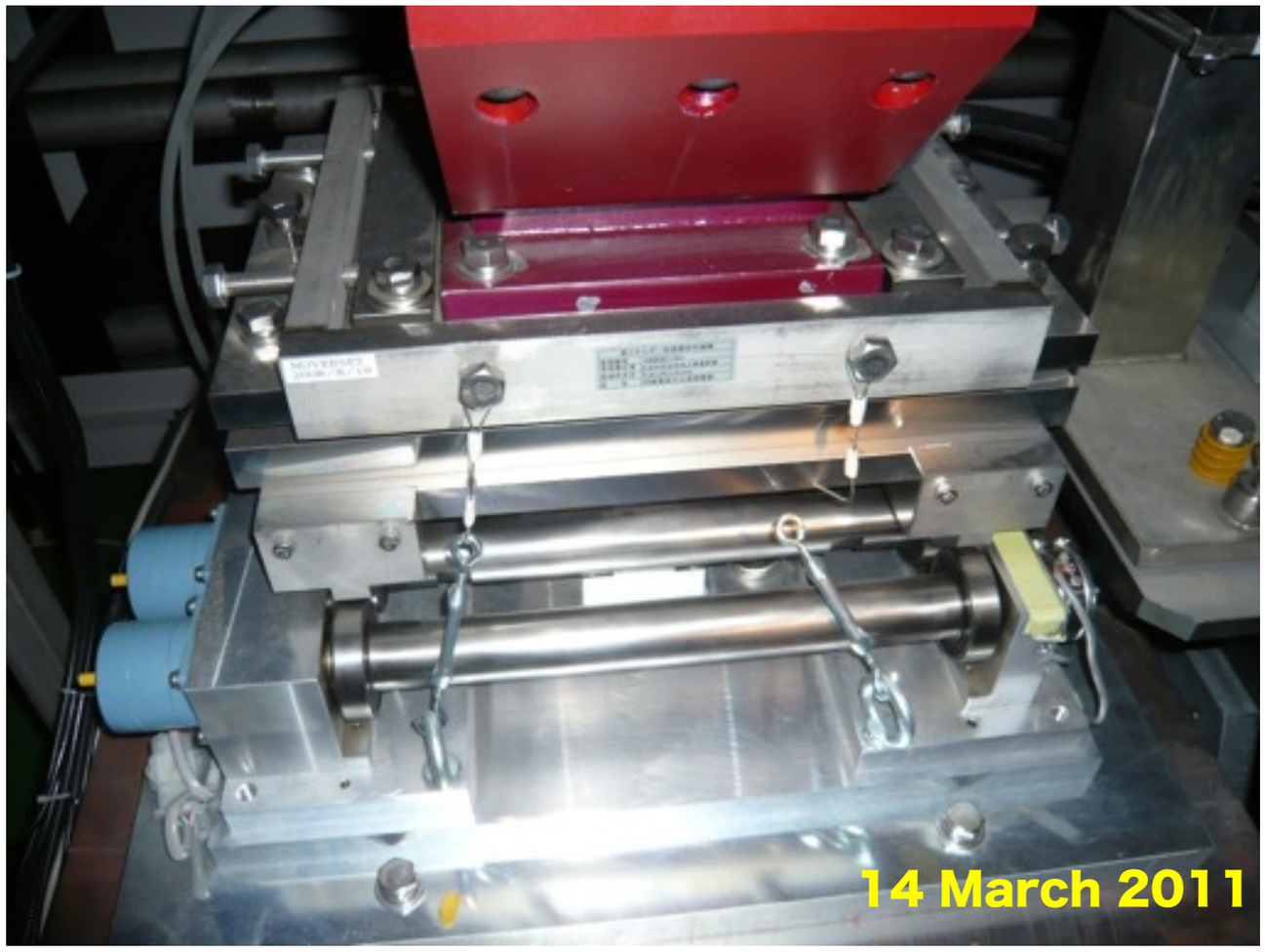




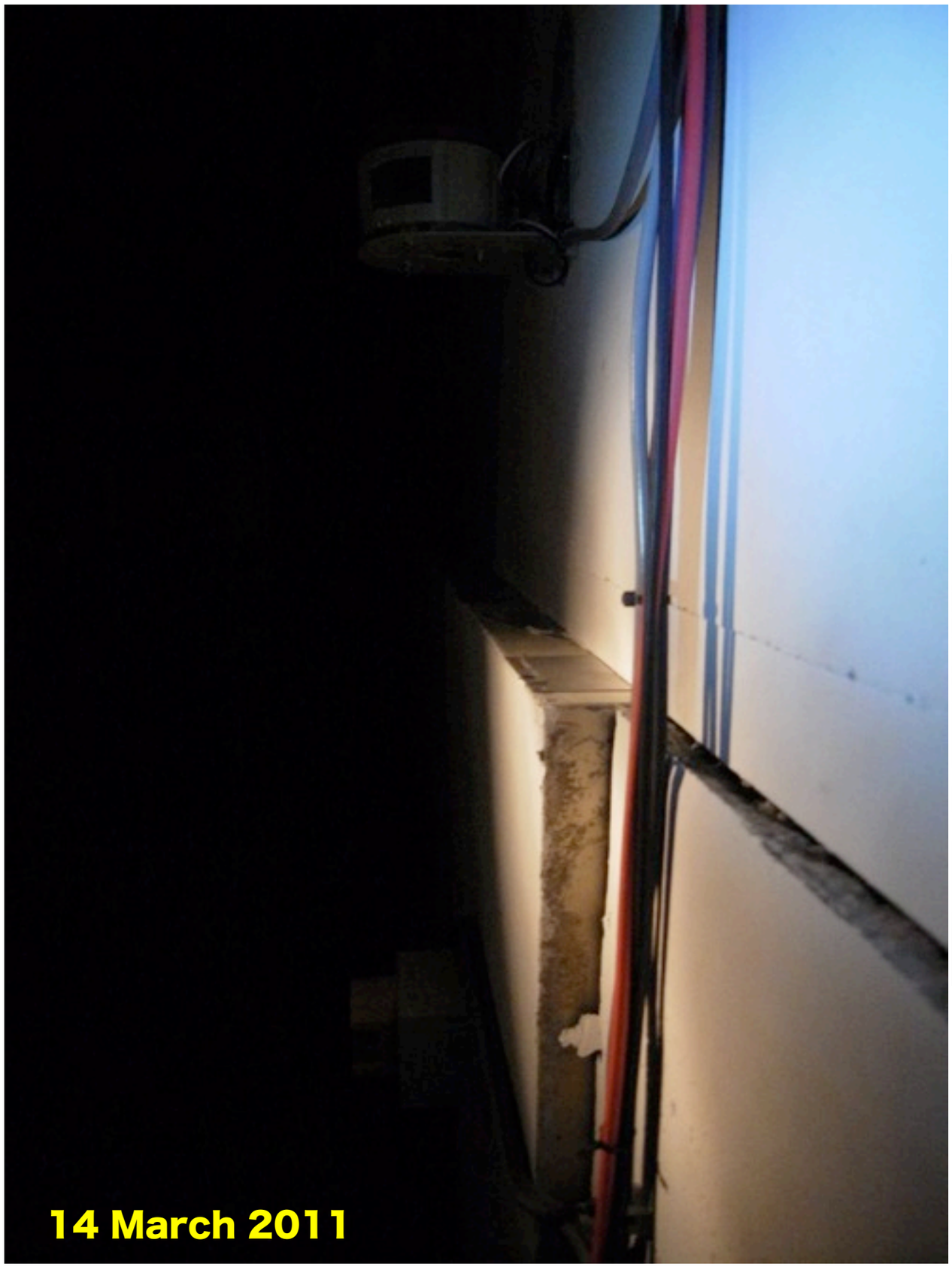


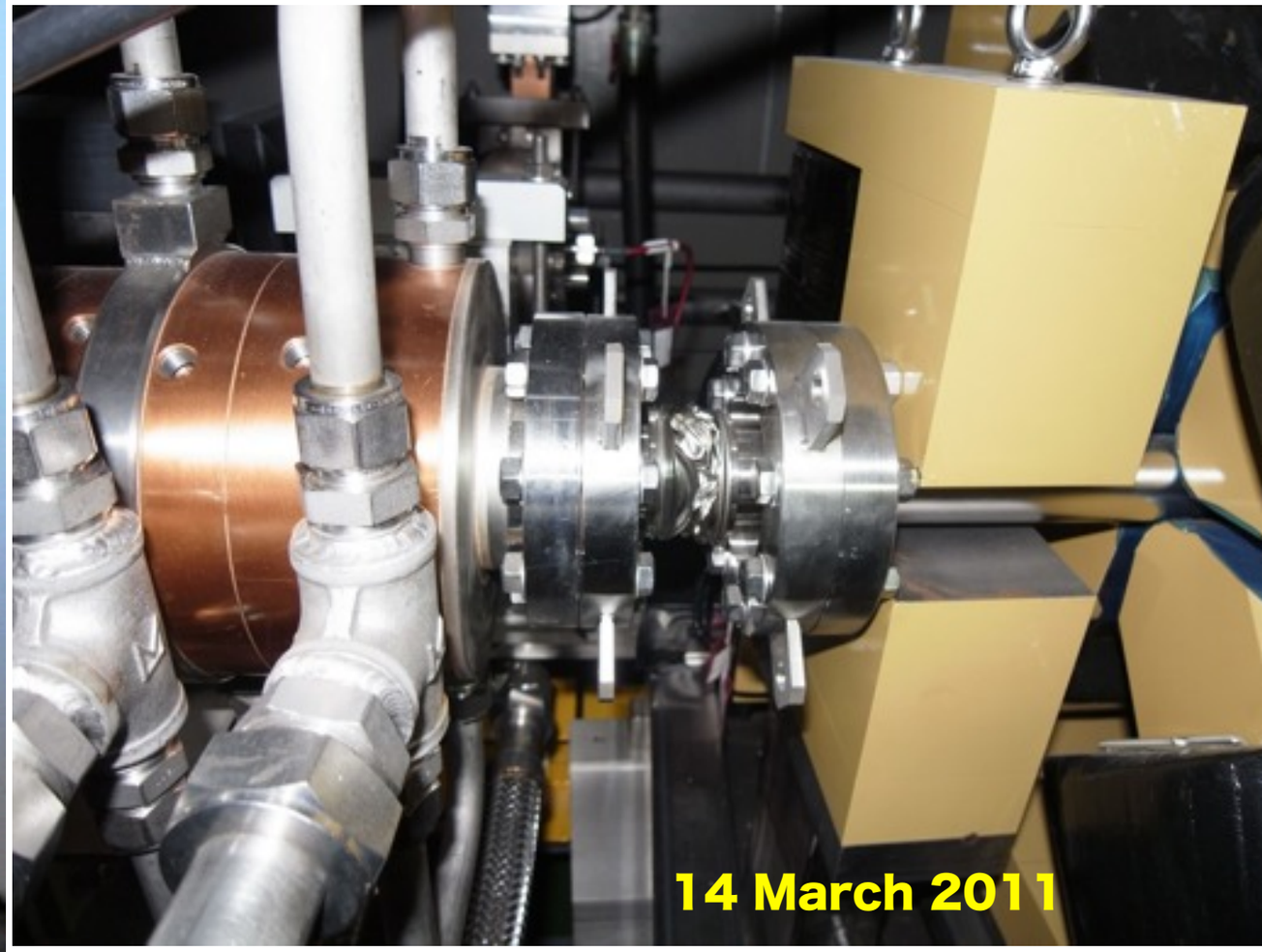


11 Mar. Great Eastern Japan Earthquake (M9.0) and after shocks for a week



2011年 3月 23日 水曜日





2011年 3月 23日 水曜日

Check List made at the 11th ATF2 project meeting,

SLAC, 1/13-14, 2011

(1) 2 movers for matching quads, x/y movement seems to be largely coupled

(2) no BBA of SF1/SD0 for 12A limit (cooling)

(3) EXT : DR orbit around the extraction (3 septum's)

(4) Dispersion measurement by BPMs without the DR-RF ramp

(5) IPBSM : focussing of laser beams at 30 degree mode (lower beam at 8 deg.)

(6) BG of IPBSM as a function of beta*_x : Is it main dependence ?

(7) Simulation of FFS with all higher multipole components corrected (KEK)