

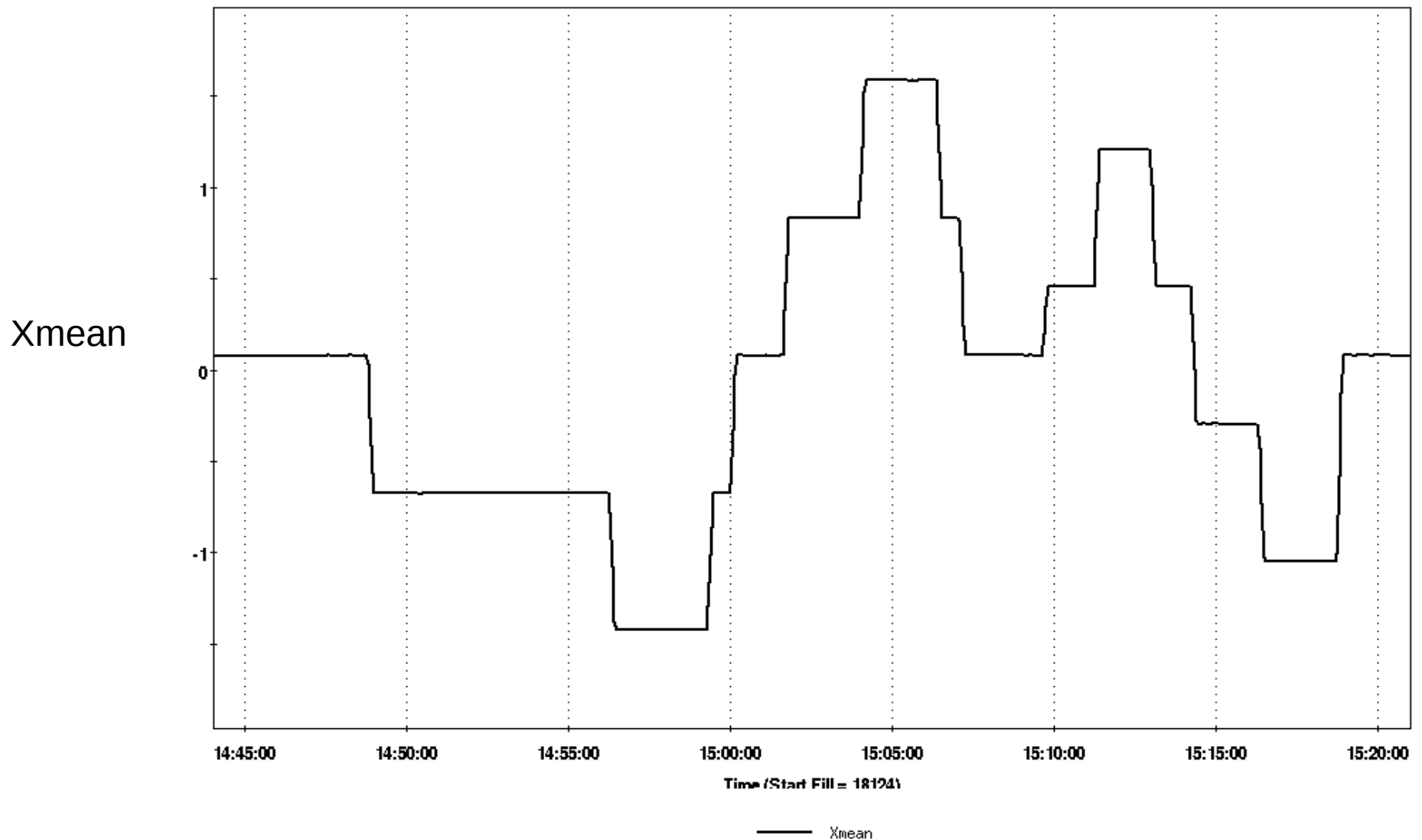
# Momentum Aperture

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2014 April 11, Friday, APEX meeting

# Off-momentum Beta-beat Measurement

Blue Arc BPM Orbit Statistics

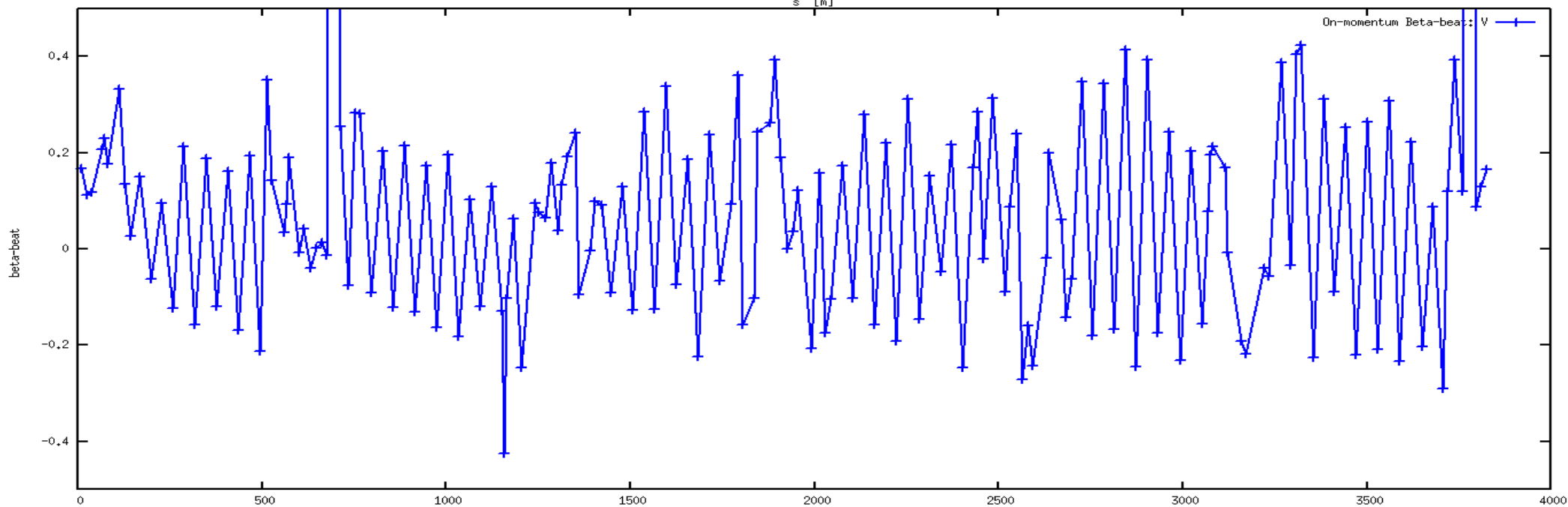
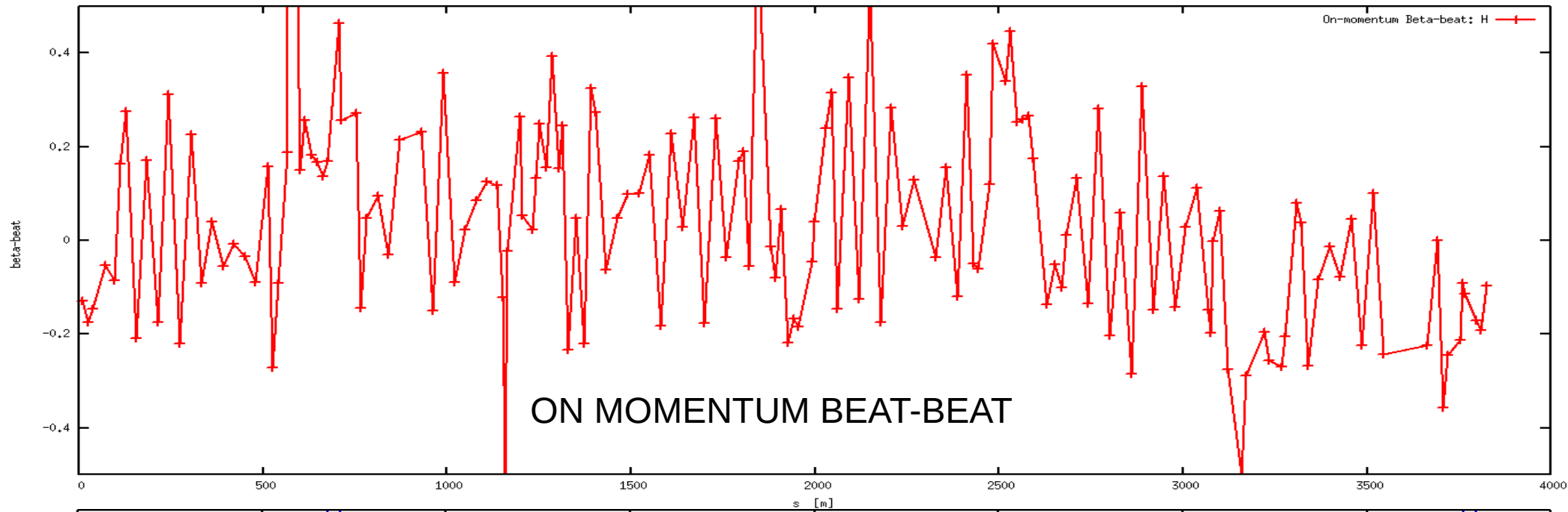


# Data Analysis

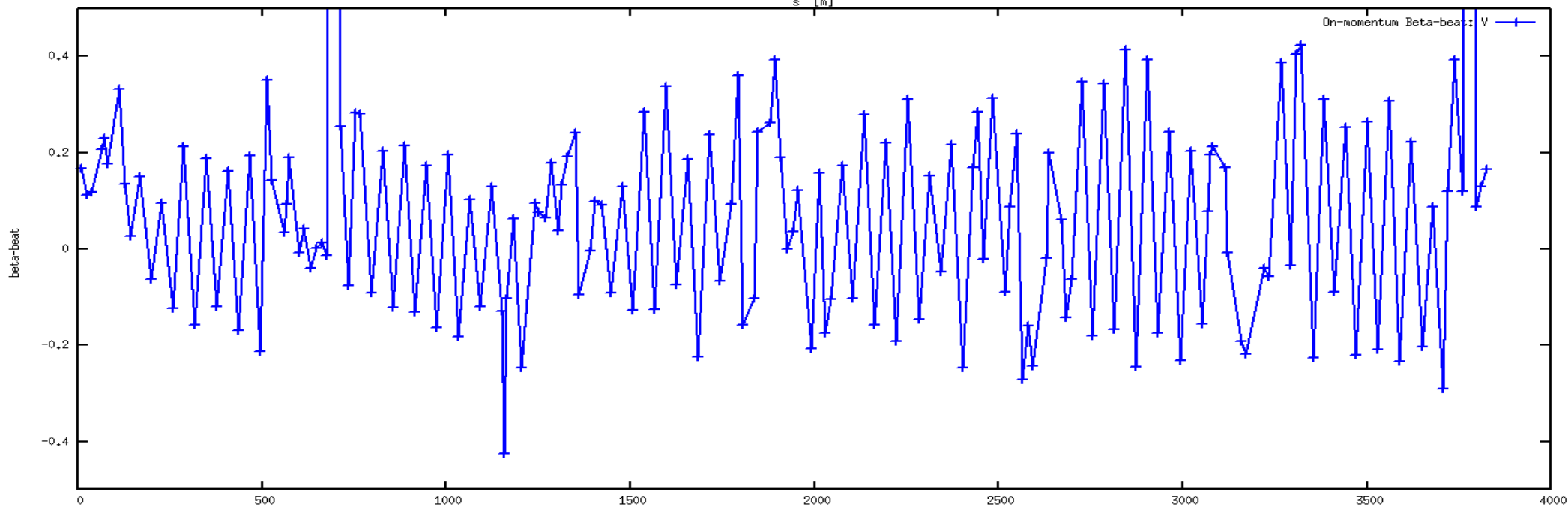
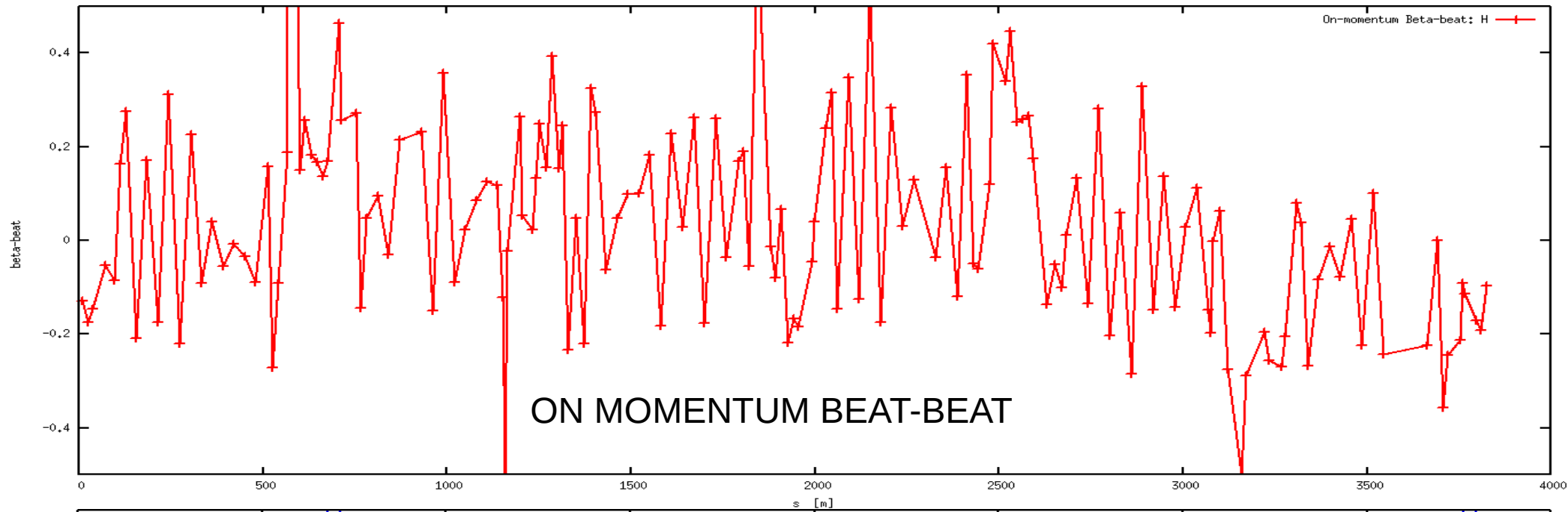
s	0mm	0.25m	(-0.25mm)	(-0.5mm)	(-0.75mm)	(-1.0mm)
7.993125	79.0234876667	76.86899	82.684537	86.184503	89.023547	90.320108
25.023783	758.751453333	724.7492	724.2519266	794.70214	809.35191333	830.33456
36.899612	551.454073333	523.50783	532.2187233	595.49833	595.63199666	622.62285
73.198741	22.319044	21.093132	21.644519	23.285904	22.647776	26.244587
95.853354	32.844674	33.745634	28.75959633	30.540467	27.535047333	27.858863
113.00311	8.465403	13.037833	11.126683	10.895358	9.8414496333	10.540129
126.11219	60.175568	58.402531	60.57127266	63.313920	60.307535333	66.350868
154.946	33.3957606667	45.616605	32.529243	34.153232	31.856514666	31.296426
184.60313	53.0007393333	51.923141	56.89340633	58.774595	62.108972333	62.623413
214.26027	36.9646313333	36.894801	35.52217633	33.773967	32.304824666	32.185054
243.9174	55.0419173333	49.728744	56.023445	56.00561	59.053924333	59.131665
273.57453	33.048452	34.05424	35.43056466	33.895893	34.312786	34.046456
303.23167	54.67903	54.608277	55.00752866	55.79093	56.936853666	57.083726
332.8888	36.2373543333	39.656265	38.36703633	38.508431	40.403932333	40.813183
362.54593	48.0805473333	51.584221	48.15963066	48.737400	48.945138333	48.233055
392.20306	39.443009	38.133463	44.08666666	44.187929	45.495238333	49.142597
421.8602	44.2550783333	47.927383	44.69314933	43.057639	42.818915333	40.285268
451.51733	43.1492113333	40.576426	48.695384	48.776133	50.992725333	54.485337
481.17446	41.2621936667	44.237795	39.966669	38.931611	37.014462	34.935715
513.33293	55.5940373333	55.062973	59.481933	63.371589	65.140199666	68.129613
526.44177	6.62220786667	8.9757633	4.868710966	6.8787756	7.0593295333	6.7500671
543.59167	36.9978986667	38.577809	34.180242	35.984430	33.085981	32.431864
566.24628	26.5882766667	26.668405	23.10117766	24.576665	27.102798333	27.740395
572.80065	11.1538881667	28.945231	7.589420433	2.7552904	4.3192099333	3.0743443
602.54541	740.4923	717.13567	791.7187966	787.65423	803.11873	813.69642
614.42124	1069.25393333	976.86023	1065.409666	1100.0708	1117.8479333	1136.0599
631.11865	118.005256667	112.4867	117.30079	121.04314	120.93043666	126.13622
647.7714	115.388673333	102.16609	115.3775566	115.89737	118.70818333	118.3532
664.46881	971.462516667	939.47319	1038.36561	1054.3000	1056.2849666	1071.3953

Polynomial fitting to get  $d\beta/d\delta$  is on going.

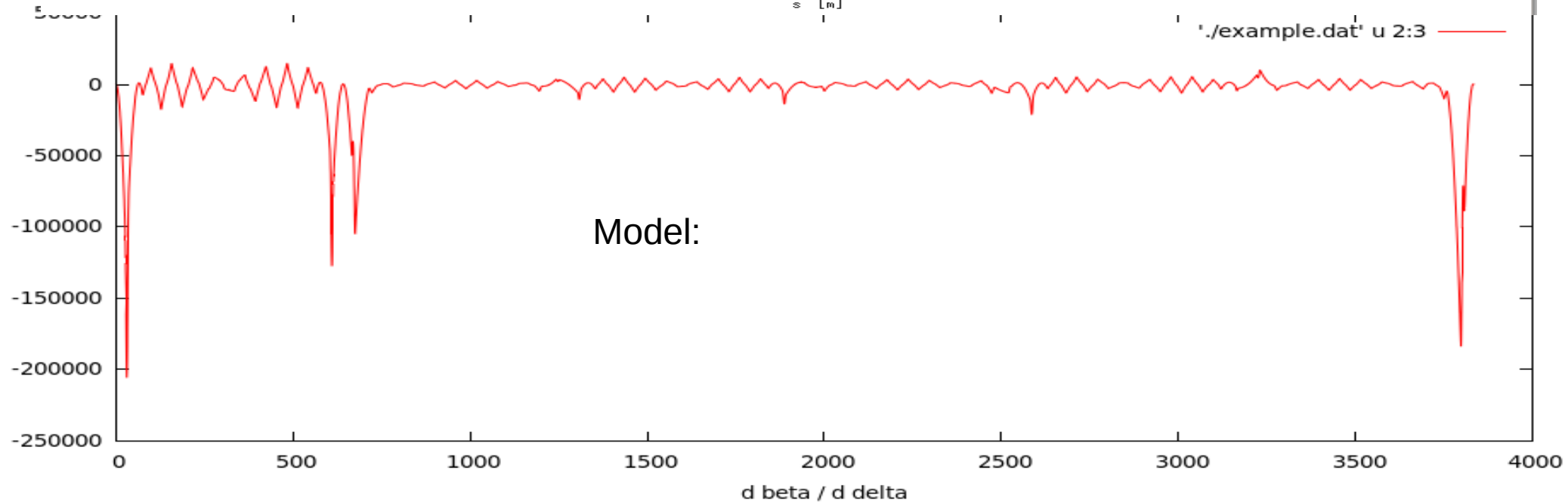
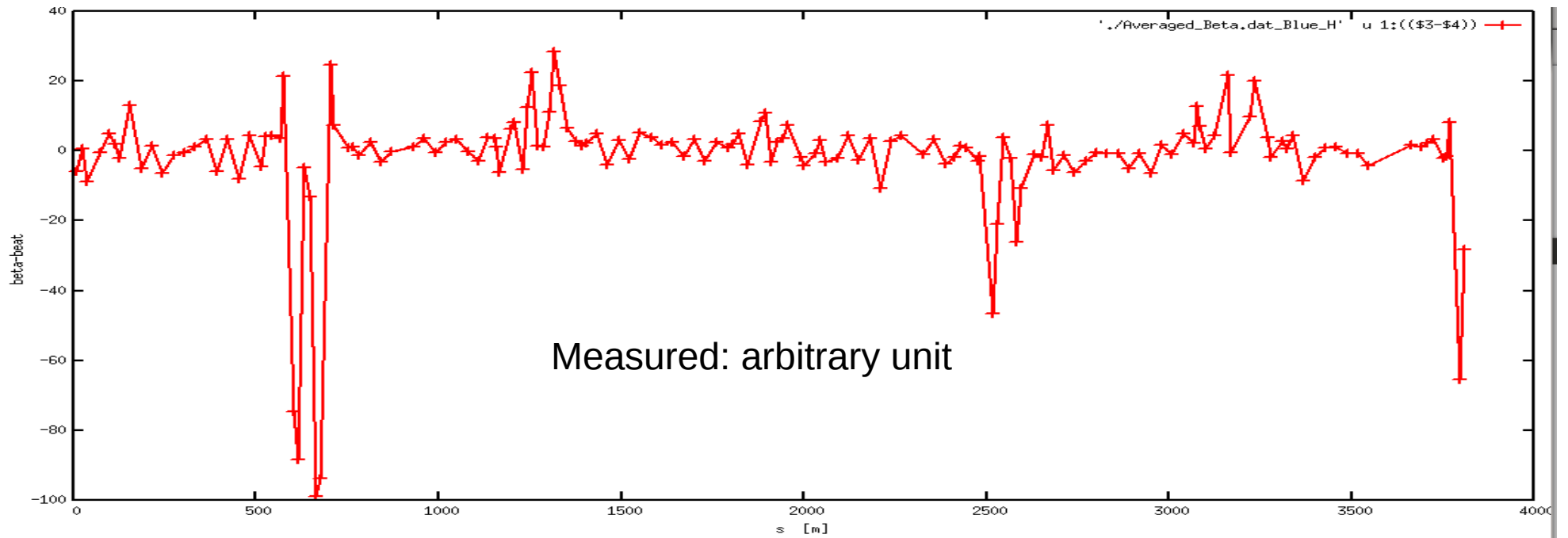
# Comparing with Model



# Comparing with Model



# Off-momentum Beta-beat



# 24-family Chromaticity Correction

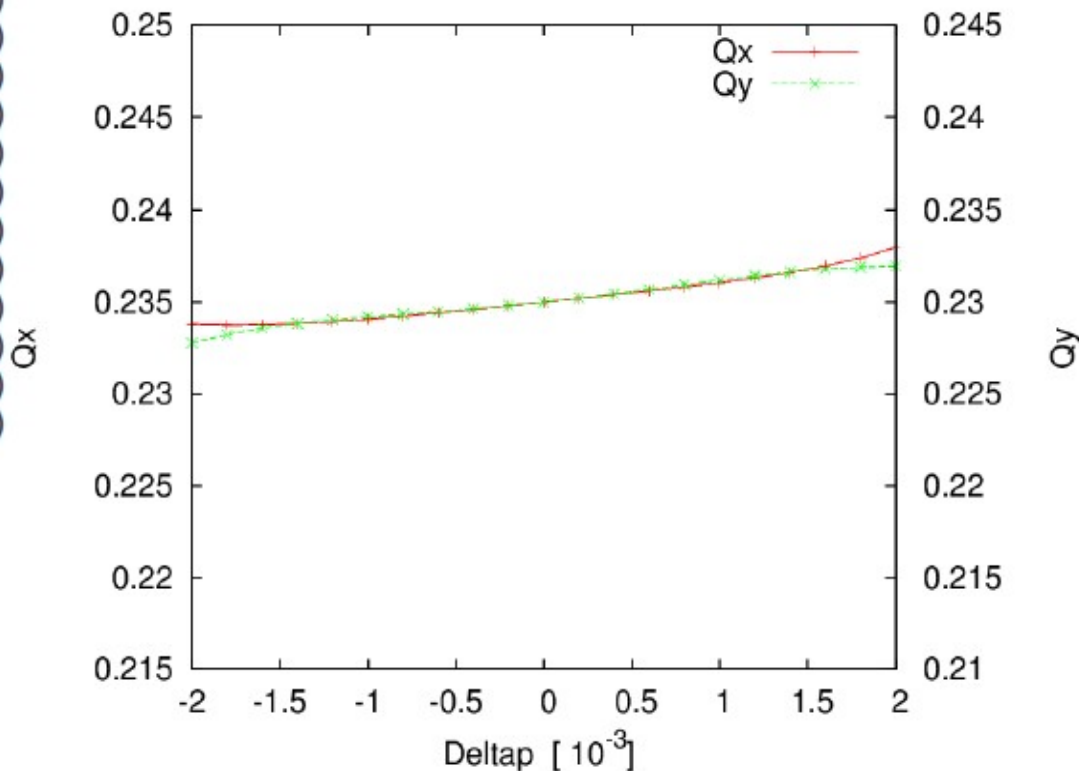
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Set_KL( rhic, "SFP00608", "K2L", 0.462074657867436
Set_KL( rhic, "SFM00608", "K2L", 0.066392783532564
Set_KL( rhic, "SDP00608", "K2L", -0.42345244838529
Set_KL( rhic, "SDM00608", "K2L", -0.55338052601470
Set_KL( rhic, "SFPI0810", "K2L", 0.063829596753154
Set_KL( rhic, "SFMI0810", "K2L", 0.464637844646846
Set_KL( rhic, "SDPI0810", "K2L", -0.65260050425744
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Set_KL( rhic, "SFP01012", "K2L", -0.087948240356571
Set_KL( rhic, "SFM01012", "K2L", 0.616415681756574
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Set_KL( rhic, "SDM01012", "K2L", -0.53095671078336
Set_KL( rhic, "SFPI1202", "K2L", 0.58706506425651
Set_KL( rhic, "SFMI1202", "K2L", -0.05859762285651
Set_KL( rhic, "SDPI1202", "K2L", -0.51865318320642
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Set_KL( rhic, "SFP00204", "K2L", 0.373815915663989
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Set_KL( rhic, "SDM00204", "K2L", -0.52495698704398
Set_KL( rhic, "SFPI0406", "K2L", 0.474429734762877
Set_KL( rhic, "SFMI0406", "K2L", 0.054037706637122
Set_KL( rhic, "SDPI0406", "K2L", -0.28951186466393
Set_KL( rhic, "SDMI0406", "K2L", -0.68732110973606
    
```

## Optics Summary:

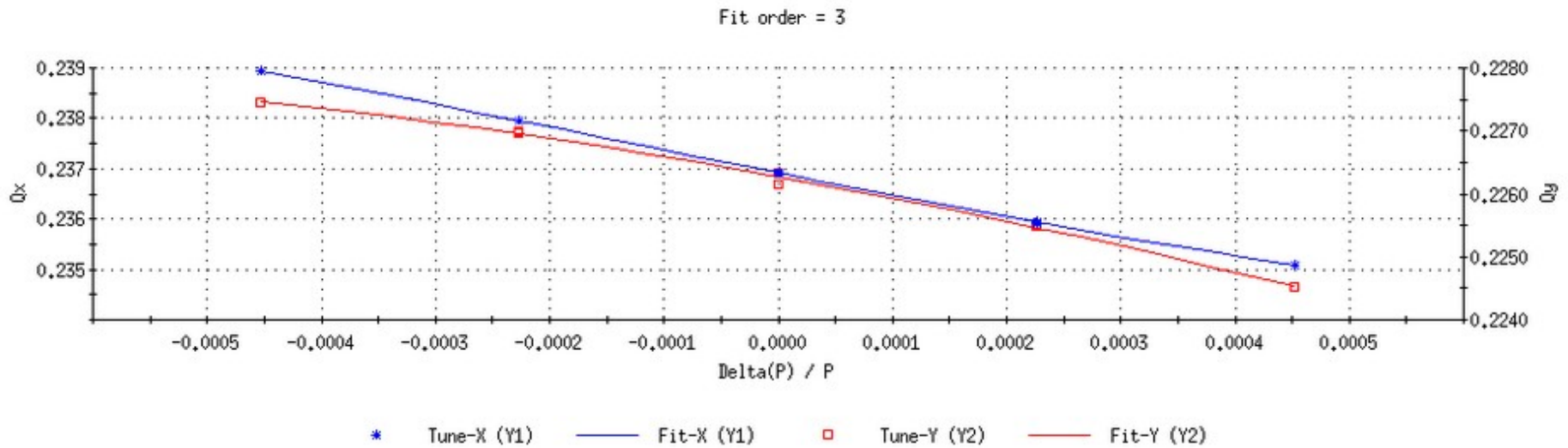
```

Length: 3833.84518145942
Tunes : 28.235002417903 29.2300018942838
Chrom1: 1.00191359146532 1.00053144444417
Chrom2: 20.1500267437359 277.10395918143
Chrom3: -16593.3868814942 -8538.32438051091
Beta* : 0.682289085986664 0.695178420486285
Alfa* : -0.0558646799823889 -0.00501466973171189
Eta_x* : 0.0167258832273102 0.0451217219279008
Eta_y* : 0 0
Beta_max: 1949.4288297368 1915.53954582064
    
```



12 variables, fitting off-momentum tunes,  
less than 30 mins.  
Have to put zero strengths for some SFs.

# Applied Correction with 24 Families



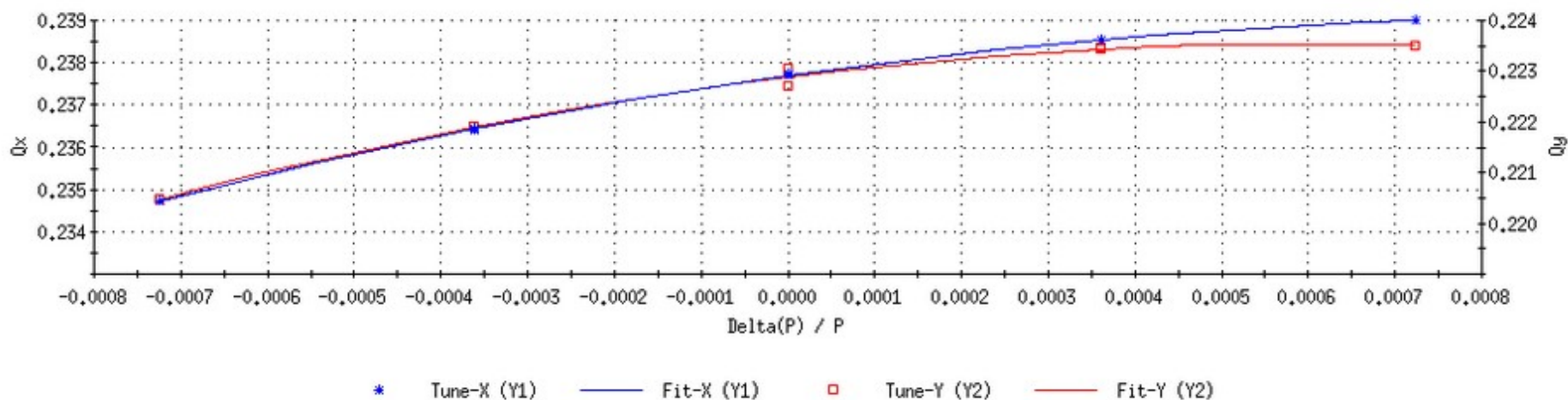
Row	Delta(p)/p	Skew q1	BBQ X	Tune X #1	Tune X #2	Select	Skew q2	BBQ Y	Tune Y #1	Tune Y #2	Select
1	-0.00045268	-0.00363207	0.238943	-999	-999	BBQ	0.00405904	0.227442	-999	-999	BBQ
2	-0.00022634	-0.0034349	0.237951	-999	-999	BBQ	0.00246618	0.226989	-999	-999	BBQ
3	-0.00022634	-0.00338715	0.237941	0.255859	0.206055	BBQ	0.0024666	0.226964	0.225586	0.216797	BBQ
4	0	-0.0032075	0.236931	-999	-999	BBQ	0.000915634	0.226319	-999	-999	BBQ
5	0	-0.00326658	0.2369	-999	-999	BBQ	0.000889278	0.226148	-999	-999	BBQ
6	0.00022634	-0.00322537	0.235952	-999	-999	BBQ	-0.000646908	0.22547	-999	-999	BBQ
7	0.00022634	-0.00342859	0.235927	-999	-999	BBQ	-0.000803188	0.225509	-999	-999	BBQ
8	0.00045268	-0.00367907	0.235097	0.255859	0.206055	BBQ	-0.00267623	0.224511	0.225586	0.216797	BBQ
0	0	0	0	0	0	BBQ	0	0	0	0	BBQ
0	0	0	0	0	0	BBQ	0	0	0	0	BBQ
0	0	0	0	0	0	BBQ	0	0	0	0	BBQ

	Corr	Tune	+Sigma	Chrom[1]	+Sigma	Chrom[2]	+Sigma	Chrom[3]	+Sigma
Horizontal	0.999962	0.236916	5.23163e-06	-4.49	0.02	507	68	1.20325e+06	260492
Vertical	0.998281	0.226276	2.66626e-05	-3.30	0.10	-1391	347	307534	1.32757e+06
Skew-q1	0.941482	-0.00325526	2.7873e-05	0.26	0.10	-1983	363	-1.54586e+06	1.38784e+06
Skew-q2	0.999797	0.000916441	2.04186e-05	-6.92	0.07	-1075	266	-2.53259e+06	1.01668e+06

Without corrections: (Q"x, Qy")=(2200, -500)



Fit order = 3



Row	Delta(p)/p	Skew q1	BBQ X	Tune X #1	Tune X #2	Select	Skew q2	BBQ Y	Tune Y #1	Tune Y #2	Select
1	-0.000724287	-0.00550883	0.234726	-999	-999	BBQ	0.00200162	0.220474	-999	-999	BBQ
2	-0.000362144	-0.00548536	0.236401	-999	-999	BBQ	0.000373625	0.221899	-999	-999	BBQ
3	-0.000362144	-0.00527904	0.236431	0.255859	0.206055	BBQ	0.000280562	0.221897	0.225586	0.216797	BBQ
4	0	-0.00484536	0.23772	-999	-999	BBQ	-0.00155119	0.223032	-999	-999	BBQ
5	0	-0.00474639	0.237696	-999	-999	BBQ	-0.00148685	0.222705	-999	-999	BBQ
6	0.000362144	-0.00429869	0.238533	-999	-999	BBQ	-0.00349283	0.22343	-999	-999	BBQ
7	0.000362144	-0.00434697	0.238543	-999	-999	BBQ	-0.0035137	0.223447	-999	-999	BBQ
8	0.000724287	-0.00391407	0.238999	0.255859	0.206055	BBQ	-0.00598897	0.223502	0.225586	0.216797	BBQ
0	0	0	0	0	0	BBQ	0	0	0	0	BBQ
0	0	0	0	0	0	BBQ	0	0	0	0	BBQ
0	0	0	0	0	0	BBQ	0	0	0	0	BBQ

	Corr	Tune	+Sigma	Chrom[1]	-Sigma	Chrom[2]	+Sigma	Chrom[3]	+Sigma
Horizontal	0.999948	0.237695	6.85479e-06	2.92	0.02	-1594	35	51231.8	83327.9
Vertical	0.996553	0.222882	4.1221e-05	2.14	0.09	-1695	210	-93004.2	501090
Skew-q1	0.992189	-0.00484771	3.45021e-05	1.58	0.08	227	175	-919360	419414
Skew-q2	0.999883	-0.00148595	1.85335e-05	-5.21	0.04	-947	94	-578807	225296

# Summary

- 1) Measured off-momentum beta-beat on uncorrected 0.7mm store lattice.
- 2) Applied corrections with 24 sextupole families, but did not observed much improvement in second order chromaticities.
- 3) Measurement results differ with model predications.

# Appendix:

Fill # 18124

Radial= -0.5mm:

```
-rw-rw-r--. 1 archive archive 5450236 Mar 26 14:50 tbt.Wed_Mar_26_14:50:12_2014.sdds  
-rw-rw-r--. 1 archive archive 5450236 Mar 26 14:50 tbt.Wed_Mar_26_14:50:47_2014.sdds  
-rw-rw-r--. 1 archive archive 5450236 Mar 26 14:54 tbt.Wed_Mar_26_14:54:40_2014.sdds
```

Radial= -1.0mm:

```
-rw-rw-r--. 1 archive archive 5450236 Mar 26 14:56 tbt.Wed_Mar_26_14:56:54_2014.sdds  
-rw-rw-r--. 1 archive archive 5450236 Mar 26 14:57 tbt.Wed_Mar_26_14:57:49_2014.sdds  
-rw-rw-r--. 1 archive archive 5450236 Mar 26 14:58 tbt.Wed_Mar_26_14:58:12_2014.sdds
```

Radial= 0mm:

```
-rw-rw-r--. 1 archive archive 5450236 Mar 26 15:00 tbt.Wed_Mar_26_15:00:20_2014.sdds  
-rw-rw-r--. 1 archive archive 5450236 Mar 26 15:00 tbt.Wed_Mar_26_15:00:42_2014.sdds  
-rw-rw-r--. 1 archive archive 5450236 Mar 26 15:01 tbt.Wed_Mar_26_15:01:00_2014.sdds
```

Radial= 0.5mm

```
-rw-rw-r--. 1 archive archive 5450236 Mar 26 15:02 tbt.Wed_Mar_26_15:02:33_2014.sdds  
-rw-rw-r--. 1 archive archive 5450236 Mar 26 15:02 tbt.Wed_Mar_26_15:02:44_2014.sdds  
-rw-rw-r--. 1 archive archive 5450236 Mar 26 15:03 tbt.Wed_Mar_26_15:03:01_2014.sdds
```

Radial= 1.0mm

```
-rw-rw-r--. 1 archive archive 5450236 Mar 26 15:04 tbt.Wed_Mar_26_15:04:49_2014.sdds  
-rw-rw-r--. 1 archive archive 5450236 Mar 26 15:05 tbt.Wed_Mar_26_15:05:03_2014.sdds  
-rw-rw-r--. 1 archive archive 5450236 Mar 26 15:05 tbt.Wed_Mar_26_15:05:23_2014.sdds
```

Radial= 0mm

```
-rw-rw-r--. 1 archive archive 5450236 Mar 26 15:08 tbt.Wed_Mar_26_15:07:59_2014.sdds  
-rw-rw-r--. 1 archive archive 5450236 Mar 26 15:08 tbt.Wed_Mar_26_15:08:10_2014.sdds  
-rw-rw-r--. 1 archive archive 5450236 Mar 26 15:08 tbt.Wed_Mar_26_15:08:25_2014.sdds
```

Radial= 0.25mm

```
-rw-rw-r--. 1 archive archive 5450236 Mar 26 15:10 tbt.Wed_Mar_26_15:09:59_2014.sdds  
-rw-rw-r--. 1 archive archive 5450236 Mar 26 15:10 tbt.Wed_Mar_26_15:10:06_2014.sdds  
-rw-rw-r--. 1 archive archive 5450236 Mar 26 15:10 tbt.Wed_Mar_26_15:10:27_2014.sdds
```

Radial= 0.75mm

```
-rw-rw-r--. 1 archive archive 5450236 Mar 26 15:11 tbt.Wed_Mar_26_15:11:44_2014.sdds  
-rw-rw-r--. 1 archive archive 5450236 Mar 26 15:12 tbt.Wed_Mar_26_15:11:58_2014.sdds  
-rw-rw-r--. 1 archive archive 5450236 Mar 26 15:12 tbt.Wed_Mar_26_15:12:18_2014.sdds
```

Radial= -0.25mm

```
-rw-rw-r--. 1 archive archive 5450236 Mar 26 15:15 tbt.Wed_Mar_26_15:15:14_2014.sdds  
-rw-rw-r--. 1 archive archive 5450236 Mar 26 15:15 tbt.Wed_Mar_26_15:15:27_2014.sdds  
-rw-rw-r--. 1 archive archive 5450236 Mar 26 15:15 tbt.Wed_Mar_26_15:15:45_2014.sdds
```

Radial= -0.75mm

```
-rw-rw-r--. 1 archive archive 5450236 Mar 26 15:16 tbt.Wed_Mar_26_15:16:50_2014.sdds  
-rw-rw-r--. 1 archive archive 5450236 Mar 26 15:17 tbt.Wed_Mar_26_15:16:59_2014.sdds  
-rw-rw-r--. 1 archive archive 5450236 Mar 26 15:17 tbt.Wed_Mar_26_15:17:47_2014.sdds
```