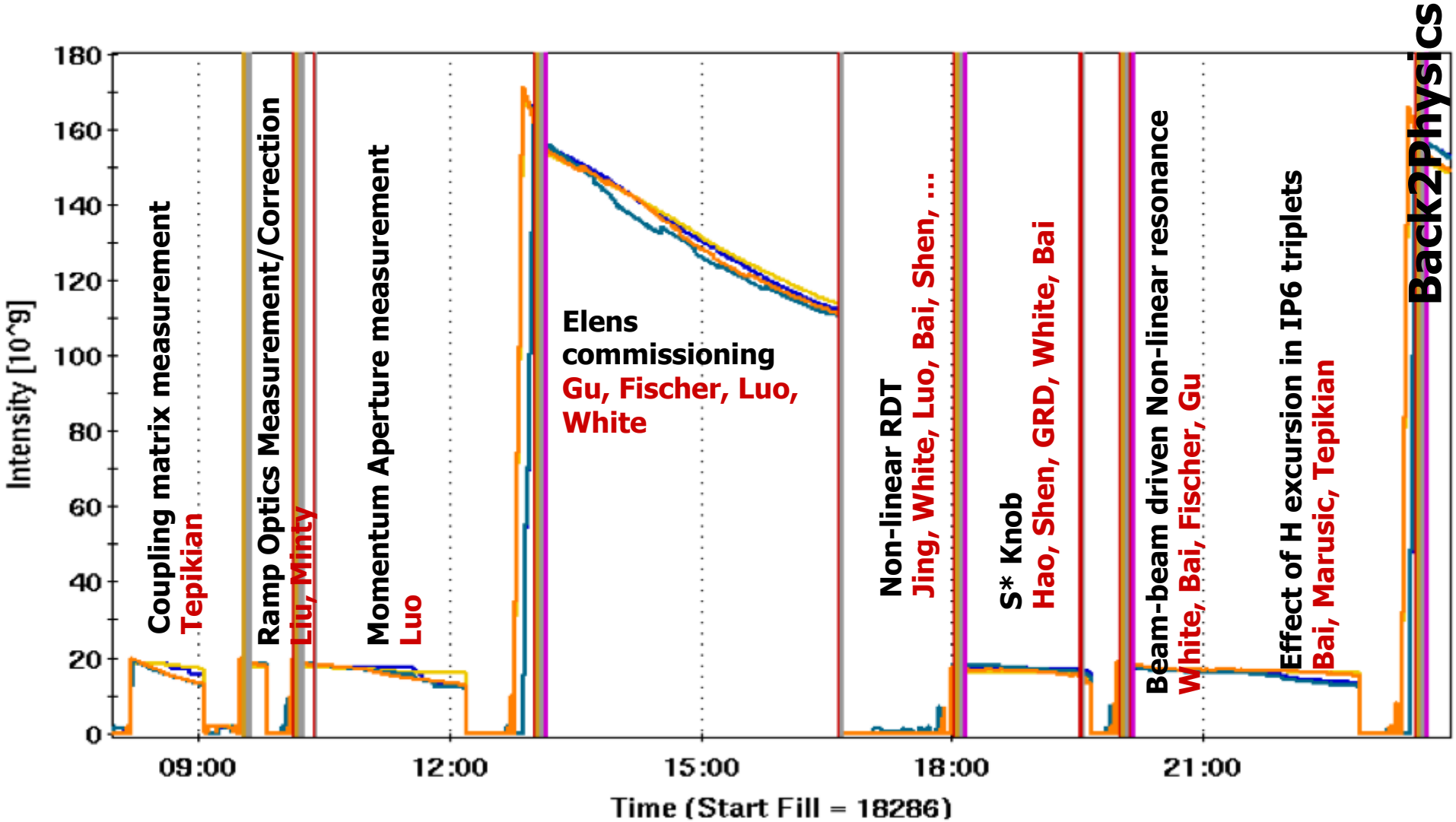
APEX RUN-14

APEX Schedule May 7, 2014

Injection	Ramp	Store	Store	Injection	Store	Store	Injection +store	
Coupling matrix measurement Tepikian	Ramp Optics Measurement/Correction Liu, Minty	Momentum Aperture measurement Luo	Elens commissioning Gu, Fischer, Luo, White	Non-linear RDT Jing, White, Luo, Bai, Shen, …	S* Knob Hao, Shen, GRD, White, Bai	Beam-beam driven Non-linear resonance White, Bai, Fischer, Gu	Effect of H excursion in IP6 triplets Bai, Marusic, Tepikian	Back2Physics
8:00am	9:00am	11:00am	12:30pm	4:30pm	5:30pm	7:30pm	8:30pm	11:00pm

12:00am

APEX Overview



Coupling Matrix Measurement

Tepikian

- This program reproduces simulated data from MADX with ±σ of about 10^{-5}
- Two possible places of failure
  - The model of the beginning and end of the line doesn't match the real machine
  - The measurement of the tunes and ΔQ_{min} isn't good enough
- Selected IP2 since there are no experimenter solenoids on this IP
  - This simplifies the model needed for this method
- Shown below are two runs on each ring
  - From measured data large ±σ

Yellow-IP2-Au14-v0::injection-18286-2014-05-07-08-46-50.ctm -- Coupled Transfer Matrix

Summary | Model | Solver

IP2	Stone:	Au14-v0::injection	Fill#: 18286
Yellow	Time:	2014-05-07 08:46:50.700000	Bρ: 81.1137653725

Measured Base Tunes

Type	Q_1	Q_2	ΔQmin
Value	0.234487	0.225557	0.001469

Measured Tweak Tunes

Quad	Device	ΔKL	Type	Q_1	Q_2	ΔQmin
q1b	yo1-qd1	0.000600	Value	0.237241	0.221978	0.001646
q2b	yo1-qf2	0.000600	Value	0.240572	0.223279	0.001819
q3b	yo1-qs3	-0.000400	Value	0.235673	0.224687	0.006923
q3e	yi2-qs3	0.000400	Value	0.235199	0.224782	0.005138
q2e	yi2-qd2	0.000600	Value	0.237456	0.220807	0.001251
q1e	yi2-qf1	0.000600	Value	0.238686	0.223539	0.001436

Summary

Name	Value	±σ	Name	Value	±σ
α_1	0.27382049	0.3661	α_2	-0.27733302	0.4987
β_1	10.645403	3.778	β_2	12.530406	6.415
S_1^w	2.7116186	3.264	S_2^w	-3.2269025	5.241
β_1^w	9.9029058	3.97	β_2^w	11.635479	6.664
a	-0.059796084	0.1594	b	-1.1131397	1.989
c	0.0059387134	0.02157	d	-0.017698257	0.1085

Open | Save | Measure | Evaluate | Edit Tunes Off | Quit

Blue-IP2-Au14-v0::injection-18286-2014-05-07-08-53-21.ctm -- Coupled Transfer Matrix

Summary | Model | Solver

IP2	Stone:	Au14-v0::injection	Fill#: 18286
Blue	Time:	2014-05-07 08:53:21.410000	Bρ: 81.1137653725

Measured Base Tunes

Type	Q_1	Q_2	ΔQmin
Value	0.234517	0.229266	0.000872

Measured Tweak Tunes

Quad	Device	ΔKL	Type	Q_1	Q_2	ΔQmin
q1b	bo2-qd1	0.000600	Value	0.236977	0.225803	0.000783
q2b	bo2-qf2	0.000600	Value	0.239536	0.226984	0.000573
q3b	bo2-qs3	-0.000400	Value	0.236060	0.227575	0.006420
q3e	bi1-qs3	0.000400	Value	0.236140	0.227889	0.006758
q2e	bi1-qd2	0.000600	Value	0.236487	0.224431	0.000822
q1e	bi1-qf1	0.000600	Value	0.238429	0.227248	0.001036

Summary

Name	Value	±σ	Name	Value	±σ
α_1	0.28403737	0.6672	α_2	-0.75239586	1.115
β_1	10.919385	5.377	β_2	13.235212	9.437
S_1^w	2.869972	5.906	S_2^w	-6.3585476	5.232
β_1^w	10.104206	6.108	β_2^w	8.4510667	10.88
a	0.13774356	1.156	b	0.25897028	9.944
c	0.0086878694	0.1934	d	0.08824513	0.4706

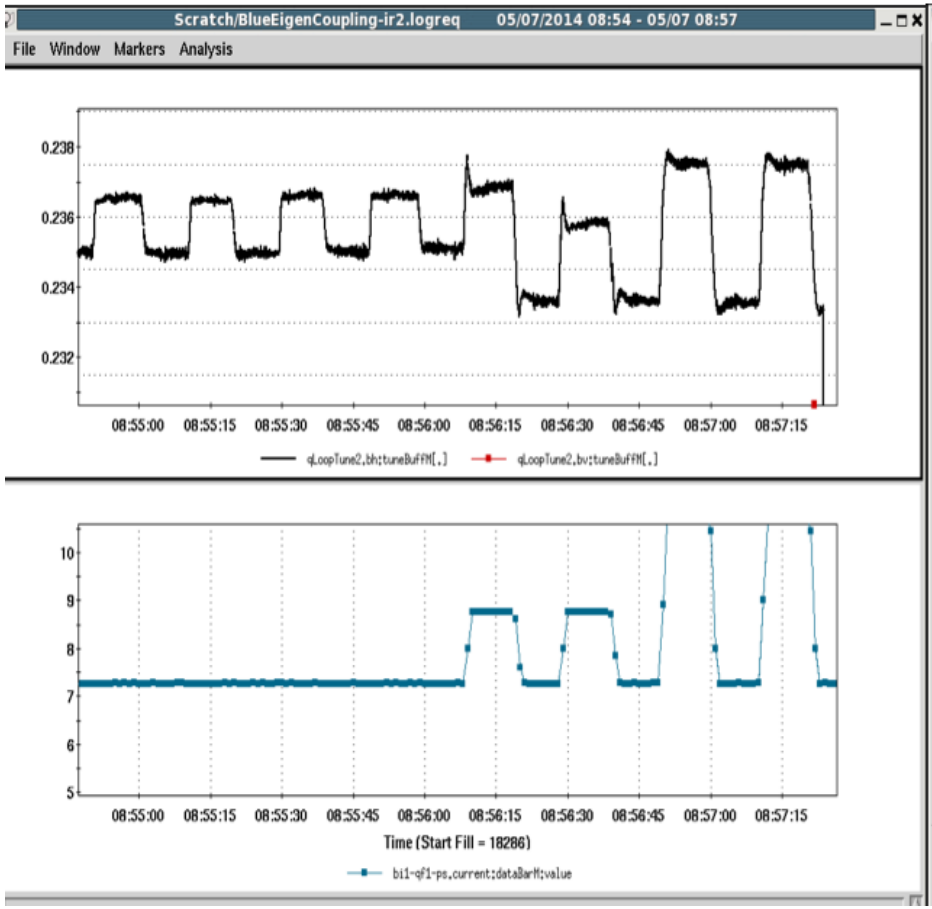
Open | Save | Measure | Evaluate | Edit Tunes Off | Quit

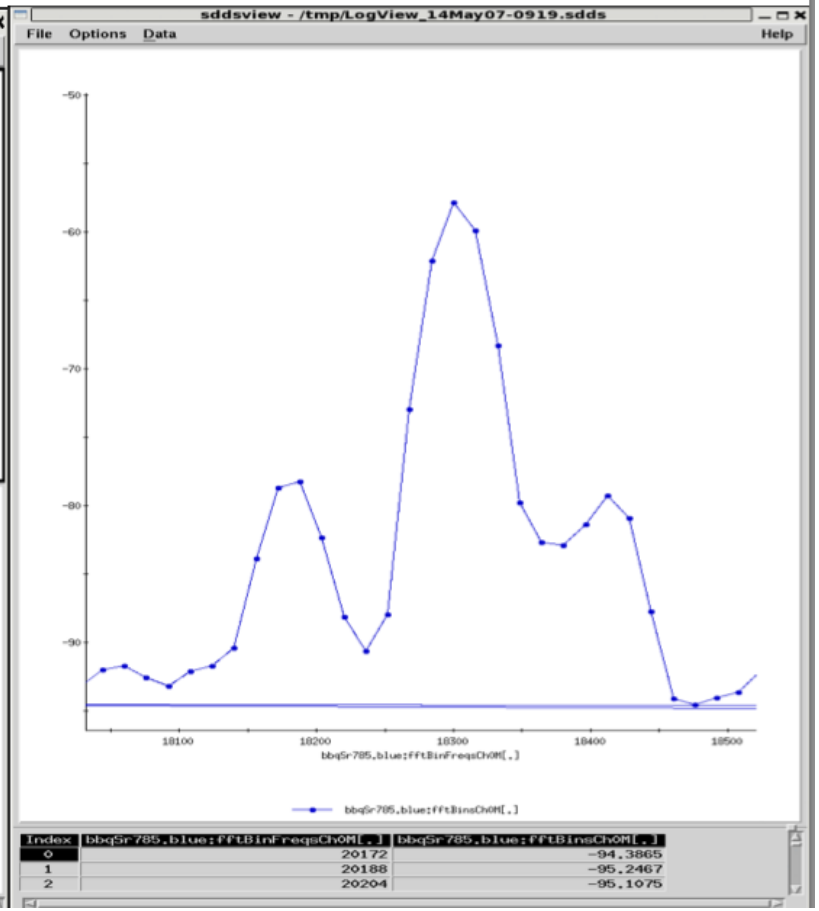
Coupling Matrix Measurement

Tepikian

- There are 120*Hz* side-bands in the spectrum
- To avoid the BBQ PLL locking onto the side-band rather than the main peak:
  - Perhaps the quadrupole changes could be applied more slowly so that PLL can track the proper peak

M. Minty





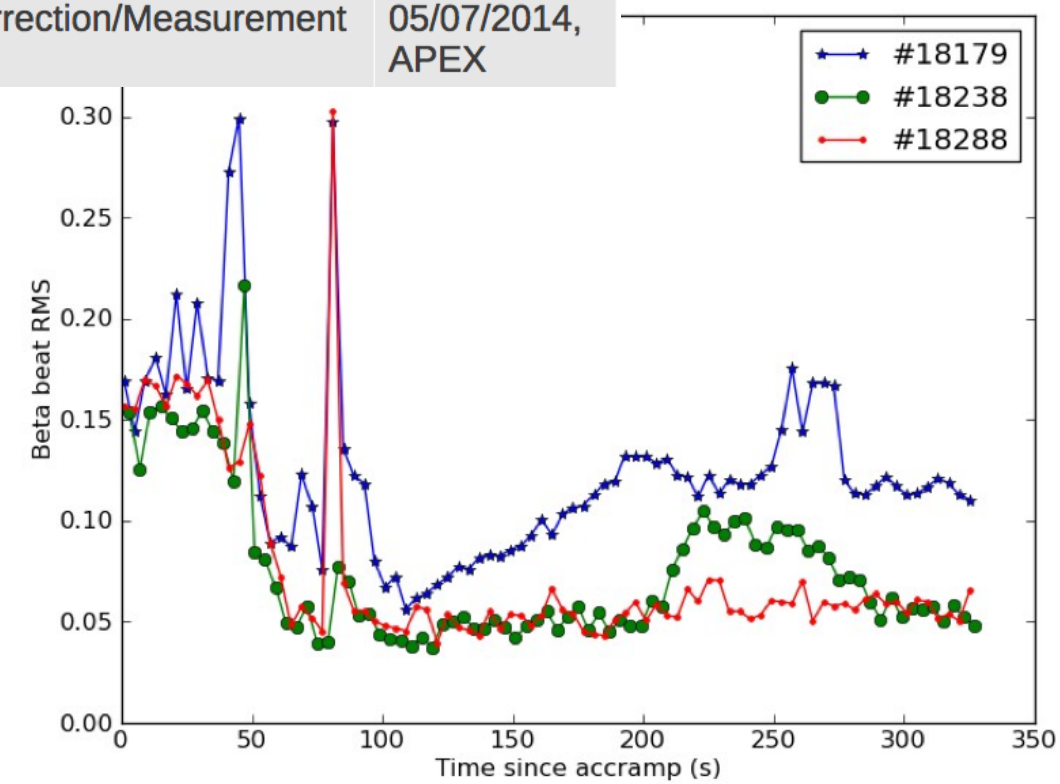
APEX

RUN-14

Ramp Optics Correction

C. Liu, M. Minty, A. Marusic

Fill	Blue ring	Yellow ring	Date
18179	Measurement only	Measurement only	04/08/2014, MD
18238	Measurement only	Correction/Measurement	04/23/2014, APEX
18287	Measurement only	Measurement only	05/07/2014, APEX
18288	Correction/Measurement	Further Correction/Measurement	05/07/2014, APEX



Ramp Optics Correction

C. Liu, M. Minty, A. Marusic

Summary

- Successful implementation of ramp optics correction in both rings
- IPM reported emittance much more reasonable for ramps with corrected optics
- Turn around time for implementation is less than time from beam dump to a new ramp

APEX

RUN-14

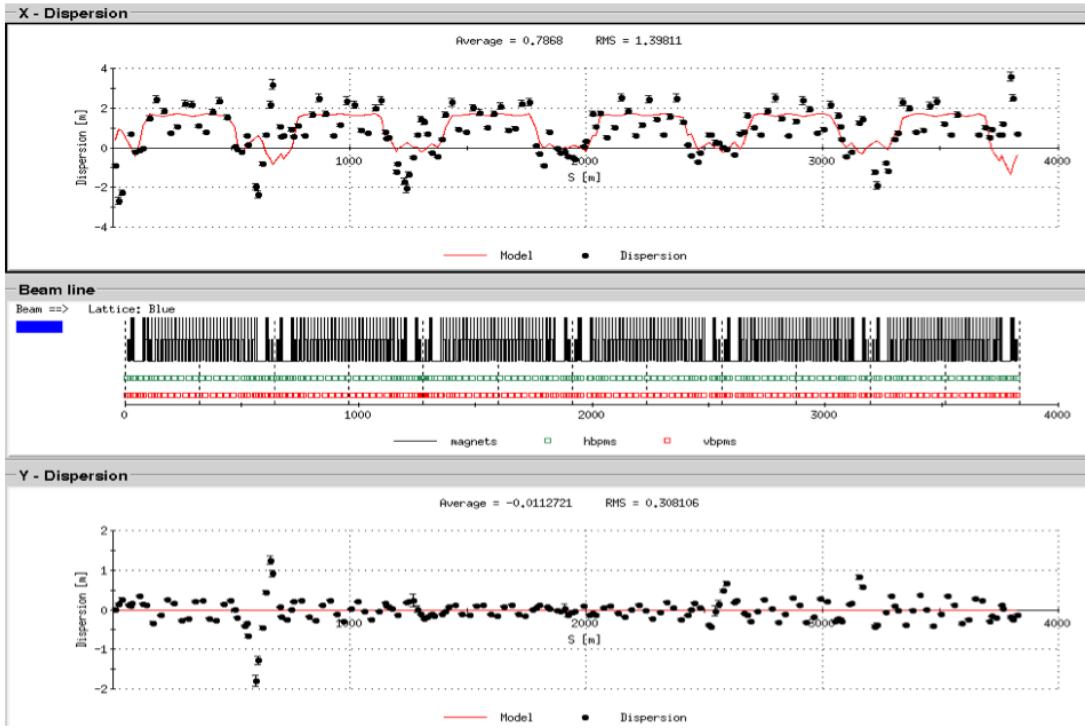
Off-momentum Beta-beat Correction

Al, Chuyu, Michiko, Yun

1) With the beam left from ramp optics correction, we had about 1.5 hours of Blue ring as schedule.

2) Chuyu applied store gradient error corrections. We first measured off-momentum betas with sextupole corrections with 24 families.

3) After applied 24 sextupole family correction, we observed a large beam loss in Blue. Correction Failed.



After correction: Qx' ~ 16 and Qy' ~ -3.
Together with a huge dispersion deviation from model.

Off-momentum Beta-beat Correction

Al, Chuyu, Michiko, Yun

1) Reason of failed nonlinear chromaticity correction: not taking into 20mm H orbit bumps in arcs.

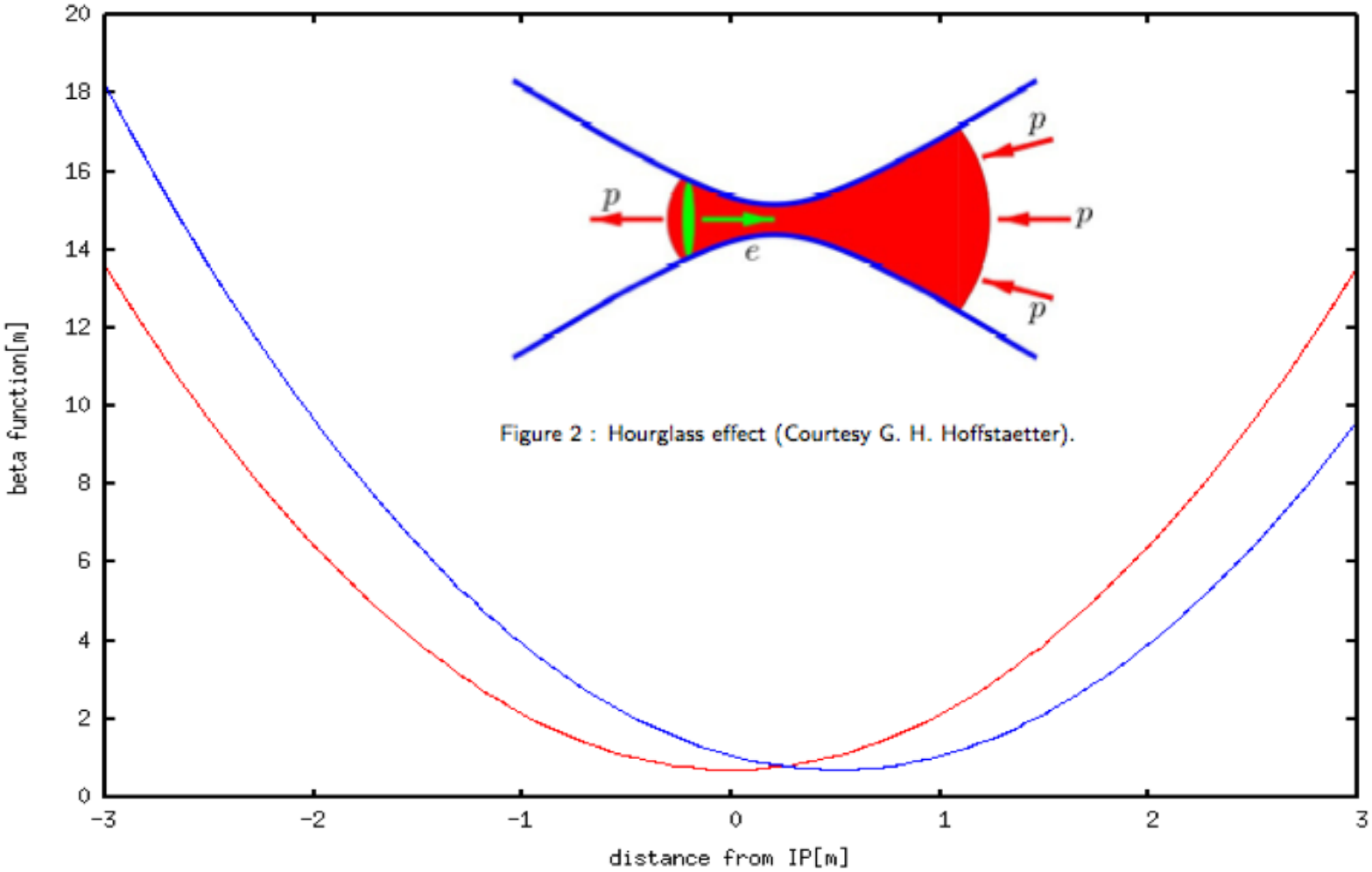
2) Observations with 24 family corrections are largely reproduced with 20mm H orbit bumps in arcs through offline modeling.

3) Pondering how to apply nonlinear chrom corrections with Star prefiring prevention arc bumps.

It seems to me that nonlinear chromaticity correction should be included into the lattice design phase.

APEX Experiment s* Knob

Hao, GRD, White, Duan, Bai

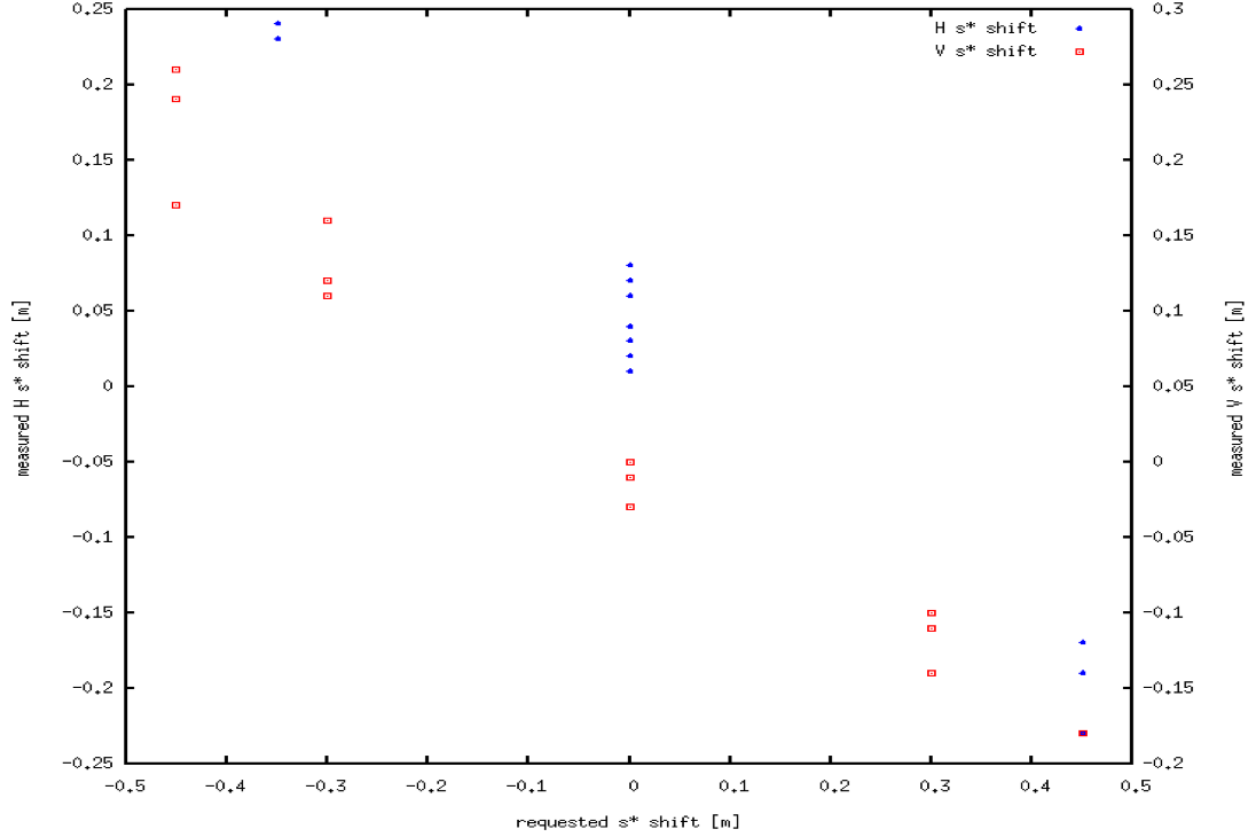


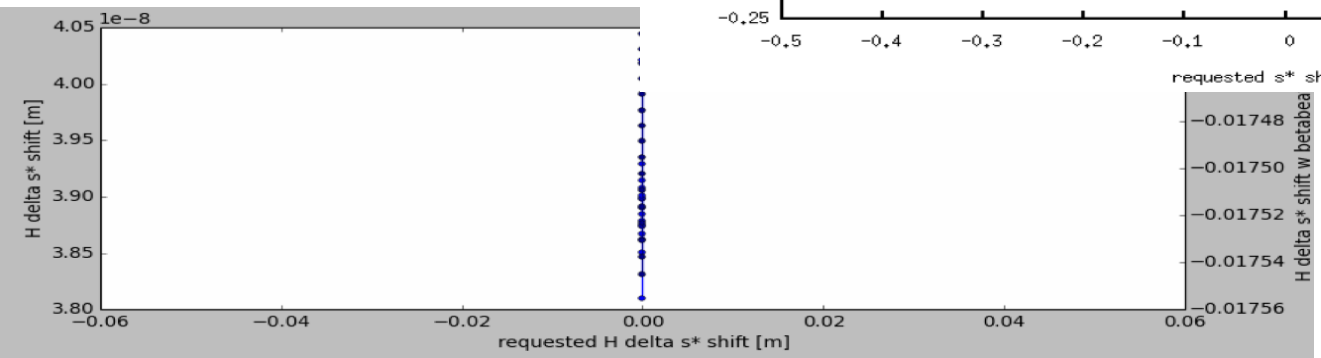
APEX

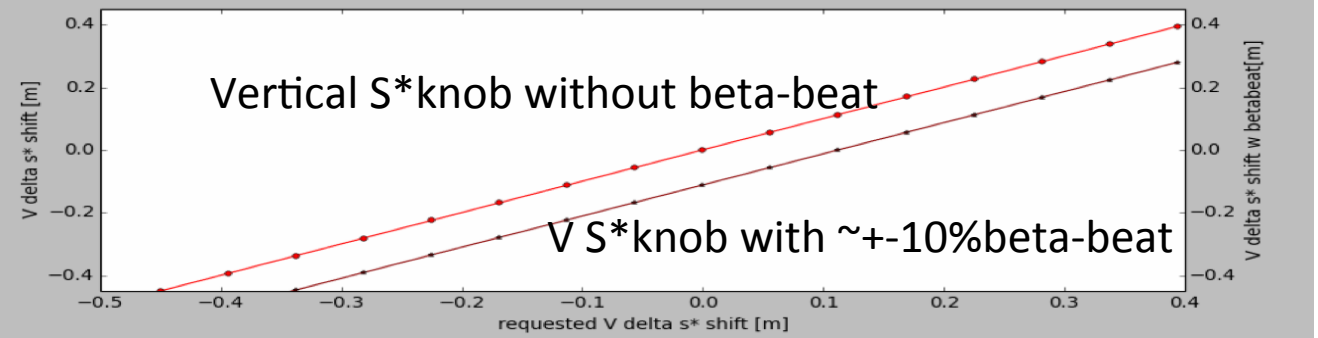
RUN-14

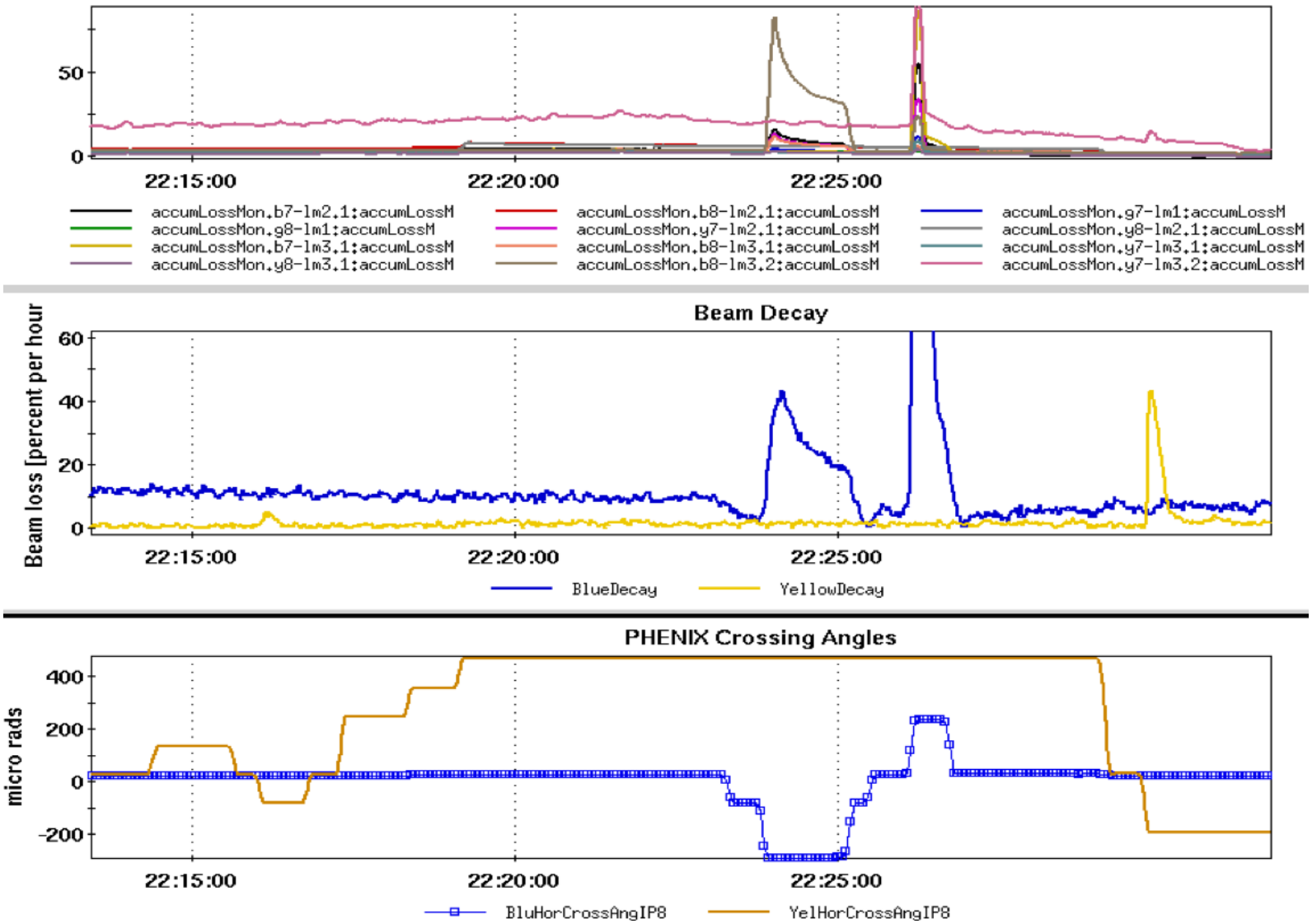
APEX Exp

Hao, GRD, W







APEX RUN-14

IP8 Triplet Aperture Scan at Store
Al, Tepikian, Bai