Summary of Optics and Commissioning Session

Session Chairs
Andrei Seryi (SLAC) , Rogelio Tomas (CERN)
Shigeru Kuroda (KEK), **Toshiyuki Okugi (KEK)**

ATF2 Optics Version 3.6 Issues

Skew quadrupole Issues

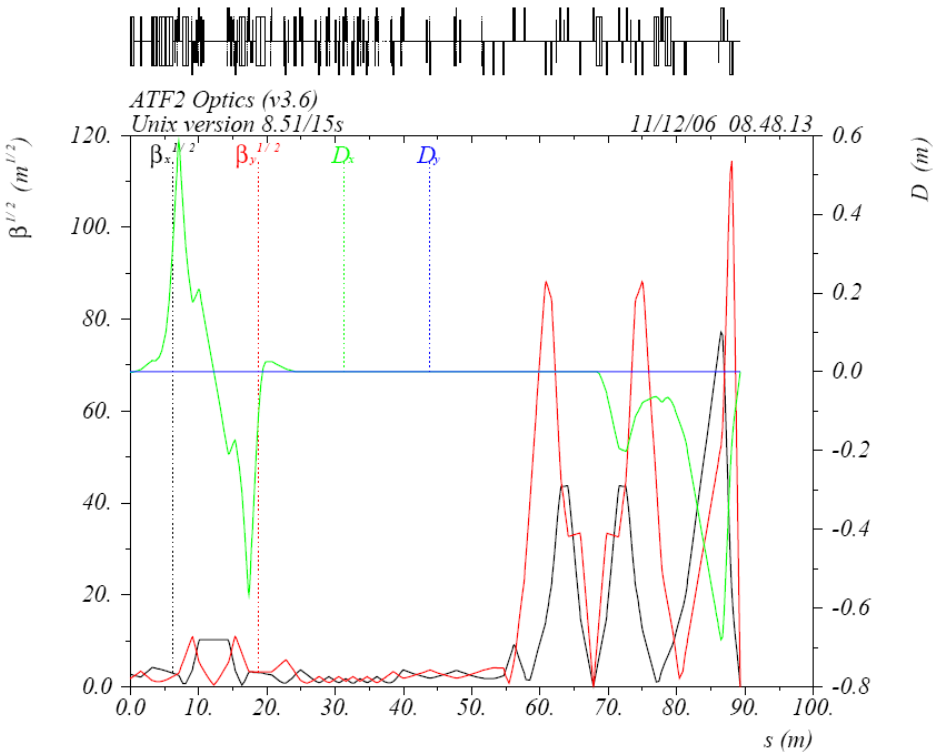
Beam Tuning Issues

International Collaboration

ATF2 Optics Version 3.6 Issues

Version 3.6 Changes

- Andrei's latest FF optics with reduced U3224
- EXT skew quadrupoles for vertical dispersion correction
- octupoles will be removed
- Cherrill's latest designs for FF magnets (coming soon)
- and other things that come out of this meeting …



Presented by M.Woodley

ATF2 Optics Version 3.6 Issues

TABLE 2: ATF2 EXT quadrupoles and sextupoles ("**version 3.6**")

name	magnet name	magnet type	power supply	Imax p.s.	KLmax	KL	NOTEs
SF1X	-------	1.38S3.00	------	10	24.5	7.1038	FFTB sextupole
QF1X	QD3Xmag	Hitachi 5	QD3Xps	100	2.1050	1.0702	
QS1X	-------	----------	------	----	4.6122e-3	0.0	new magnet?
QD2X	QF3Xmag	Hitachi 5	QF3Xps	100	2.1050	-0.9410	
SD2X	-------	2.13S3.00	------	10	6.5	-6.2996	FFTB sextupole
QF3X	QF4Xmag	Hitachi 5	QF4Xps	100	2.1050	0.6696	
QF4X	QD4Xmag	Hitachi 5	QD4Xps	100	2.1050	0.6840	
SD3X	-------	2.13S3.00	------	10	6.5	6.2996	FFTB sextupole
QD5X	QD5Xmag	Hitachi 5	QD5Xps	100	2.1050	-0.9276	
QS2X	-------	----------	------	----	4.6122e-3	0.0	new magnet?
QF6X	QF5Xmag	Hitachi 5	QF5Xps	100	2.1050	1.1264	
SF4X	-------	1.38S3.00	------	10	24.5	-7.4491	FFTB sextupole
QF7X	QD1Xmag	Hitachi 2	QD1Xps	100	0.6657	0.3751	
QD8X	QD7Xmag	Hitachi 5	QD7Xps	100	2.1050	-0.5948	
QF9X	QF6Xmag	Hitachi 5	QF6Xps	100	2.1050	0.7347	
QK1X	QD6Xmag	Tokin 3393	QD6Xps	40	0.1237	0.0	convert old QD6X?
QD10X	-------	IHEP	------	100	2.1	-1.0237	
QF11X	-------	IHEP	------	100	2.1	1.0237	
QK2X	QK2Xmag	IDX skew	QK2Xps	5	2.5363e-2	0.0	
QD12X	-------	IHEP	------	100	2.1	-1.0237	
QF13X	QD8Xmag	Hitachi 4	QD8Xps	200	2.0650	1.3683	
QD14X	QF7Xmag	Hitachi 4	QF7Xps	100	1.0488	-1.0152	
QF15X	QD9Xmag	Hitachi 4	------	---	2.0650	1.3683	in series with QF13X
QK3X	QK3Xmag	IDX skew	QK3Xps	5	2.5363e-2	0.0	
QD16X	-------	IHEP	------	100	2.1	-1.0237	
QF17X	-------	IHEP	------	100	2.1	1.0237	
QK4X	QK4Xmag	IDX skew	QK4Xps	5	2.5363e-2	0.0	
QD18X	-------	IHEP	------	100	2.1	-0.6833	
QF19X	-------	IHEP	------	100	2.1	0.6552	
QD20X	QD2Xmag	Hitachi 2	QD2Xps	100	0.6657	-0.2989	
QF21X	QF1Xmag	Hitachi 2	QF1Xps	100	0.6657	0.2989	

note: QF2X (Hitachi 1) and one IHEP quadrupole are left over

ATF2 Optics Version 3.6 Issues

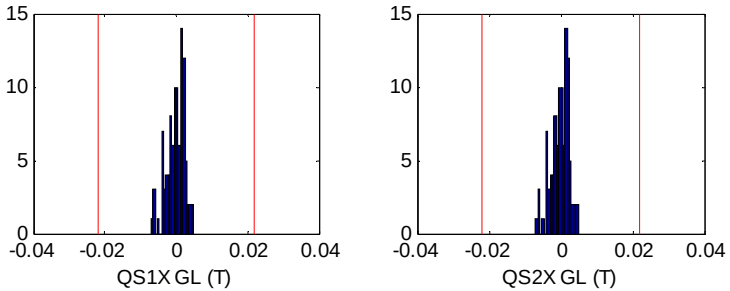
Discussion and …

- BH3 (Sumitomo Heavy Industries type “C”) … can it run at 110% of it’s present strength?
  - Yes, but we have to take care the sector type of the edge shape.
- need to get another FFTB “1.38S3.00” sextupole from SLAC for EXT
  - We need more detail study.
- cavity BPMs on EXT quads with no movers (QD18X, QF19X, QD20X, QF21X)?
  - Yes, we don’t need additional devices.
- kicker cables (kickers are 8.2 m / 35 ns further apart)
  - One possibility is to move the kicker PS.
- compact laserwire package design (laserwire chamber + wire scanner + BPM(s))
  - See the summary of relocation session.
- where to put: KEK BPM triplet, nanoBPM, FONT4, ODR, … ?
  - See the summary of relocation session.
- MAD deck for FF is still sketchy … need to put in BPMs, movers, etc.
- need to do more misalignment/correction and performance simulations (including realistic wire scanner resolutions, extraction channel errors, …)

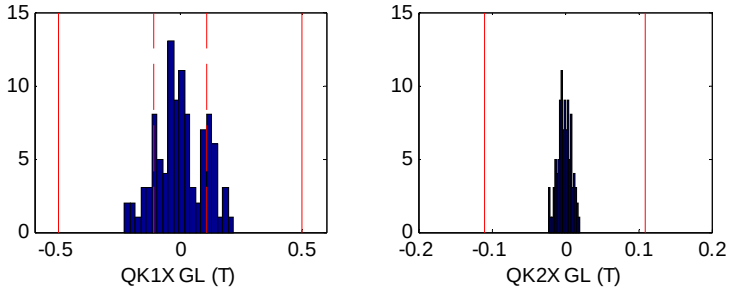
Skew quadrupole Issues

Mark Woodley estimated
the strength of skew quadrupoles

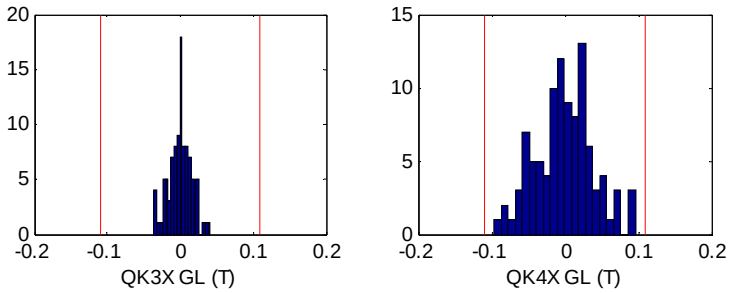
use QS1X and QS2X for η_y correction
(BPM resolution = 5 μ m)



QS1X, QS2X
GLmax = 0.022 T
(20% IDX @ 5 amp)



QK1X
GLmax = 0.5 T
(Tokin 3393 @ 38 amp)



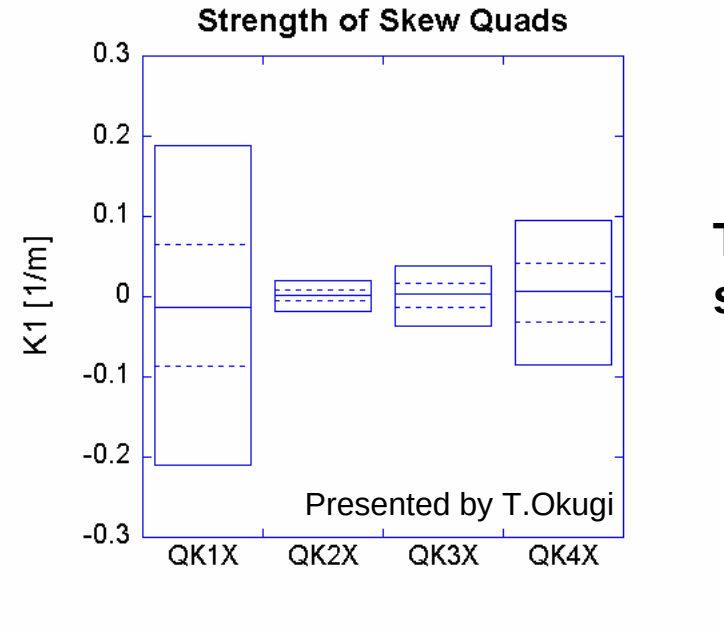
QK2X, QK3X, QK4X
GLmax = 0.11 T
(IDX @ 5 amp)

Presented by M.Woodley

Skew quadrupole Issues

Toshiyuki Okugi estimated
the strength of skew quadrupoles

applying local bump
for dispersion correction



The results were almost twice stronger than these results.

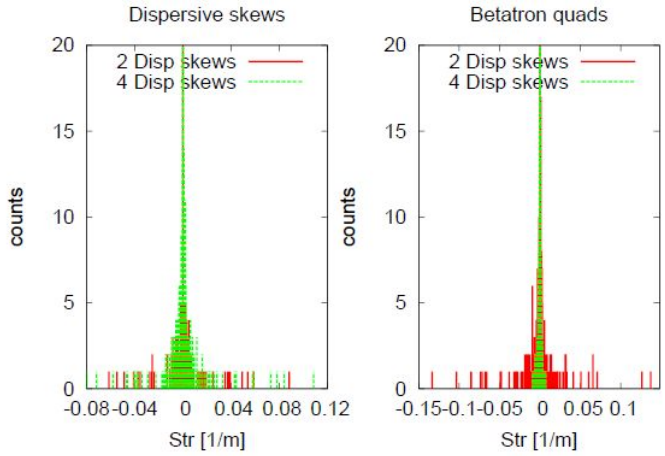
Skew quadrupole Issues

Rogelio Tomas checked
the strength of skew quadrupoles

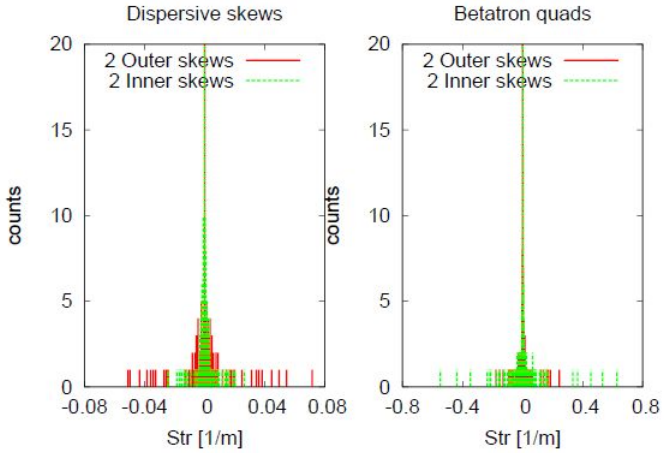
at the same location presented
in 2nd ATF2 project meeting.

Corr. method	Disp skews	Max Disp str	Max Bet str
Simultaneous	2 outer	0.10	0.15
Simultaneous	4	0.12	0.02
Two step	2 inner	0.03	0.7
Two step	2 outer	0.08	0.3

Simultaneous Dy & coupling correction 4



Two step correction 5

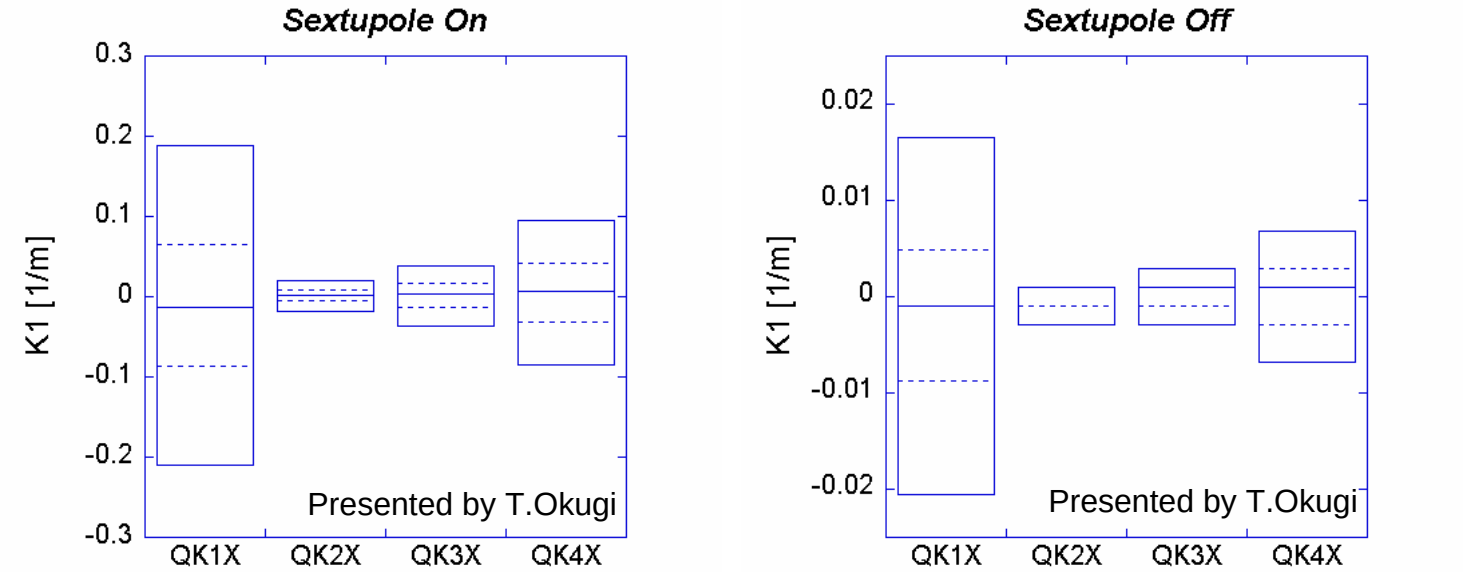


Presented by R. Tomas

Skew quadrupole Issues (Homework)

Toshiyuki Okugi estimated
the strength of skew quadrupoles again

All sextupoles off



Strengths of the skew quadrupoles were reduced by 1/10.

Main coupling source was vertical offset at sextupoles and bends for strong sextupole fields.

Further homeworks - Find the good sextupole setting.

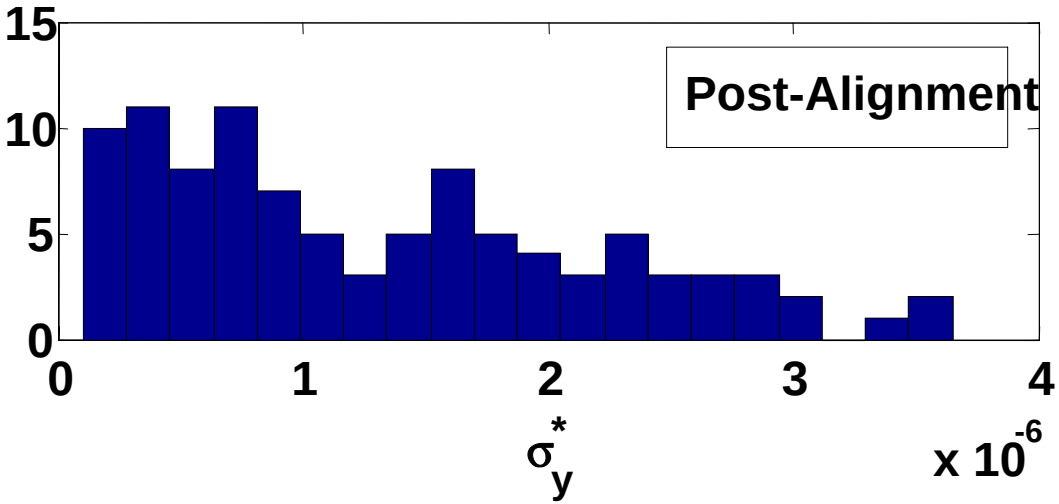
- **small chromaticity**
- **small 2nd order dispersion,**
- **small betatron coupling**

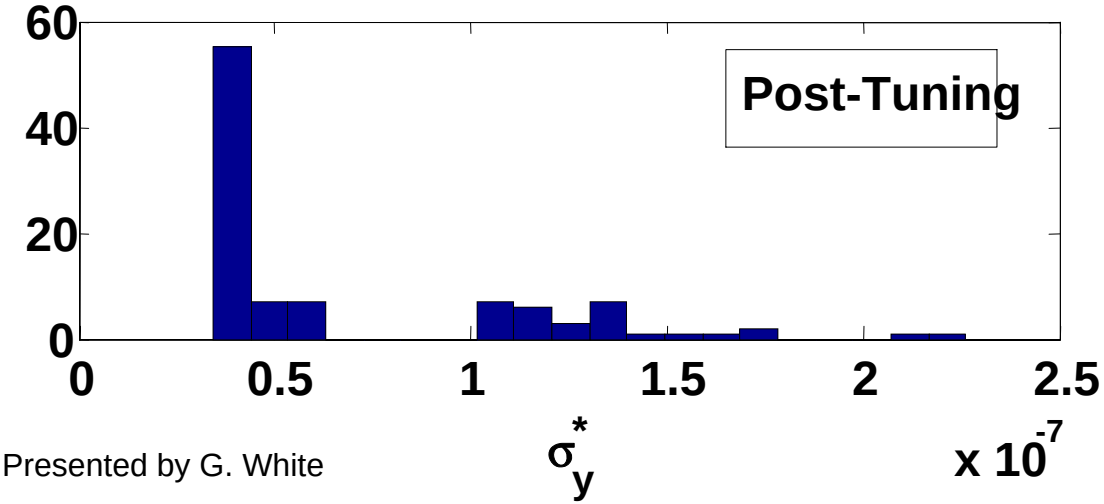
Beam Tuning Issues

Glen White investigated the tuning method.

> 100nm with IP-BPM

< 100nm with Shintake monitor





Presented by G. White

- More work needed getting all seeds to converge.
  - Evaluate order of knob application.
  - More averaging per scan.
- Convergence typically in <20 iterations:
  - Assuming 1 min per IP spot-size measurement (90 bunches @ 1.5Hz), 10 scan points per knob iteration and 1 cycle through Sext tilt/dB scans:
  - If completely automated, tuning would take ~ 4.5 Hours.
- Need to add Ground Motion, component jitter, incoming beam orbit + energy jitter, BPM scale and magnet strength drifts…

Beam Tuning Issues

Toshiyuki Okugi presented about the commissioning devices, and we discussed …

Conclusion

We need the additional BSMs around IP.

- Carbon wire scanners with 1micron resolution.
- Honda monitors with 0.3micron resolution.

We need the sweeping magnet for the position scan for IP BSM.

- Shintake monitor have the phase scanning system.
- Honda monitor plan to make the position change mechanism.
  However, we need the sweeping magnet as backup devices.
- The sweeping magnet is also useful for the carbon wire scanner.

International Collaboration

CERN, Valencia Univ., Orsay, Daresbury, SLAC and …
are interested in the ATF2 commissioning.

Especially for

CERN is interested in the continuous design of the new extraction line, commissioning and tail folding.
- A few collaborators will join to the design and simulation work for ATF2 next year.

Orsay is interested in the commissioning and long time stability.
Orsay is also interested in the present ATF extraction line optics study.

SLAC is interesting in the continuous design of the new extraction line, commissioning, beam size tuning and so on (may be everything).