ATF2 Status

T. Tauchi,

CLIC08 Workshop, CERN, 14-17 October 2008

References :

ATF2 Proposal, KEK Report 2005-2

ATF2 Proposal Vol.2, KEK Report 2005-9

Home page : http://atf.kek.jp/collab/ap/projects/ATF2/index.php

ATF2 Proposal Vol.1 and 2
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ATF2 beam line

Final Focus System

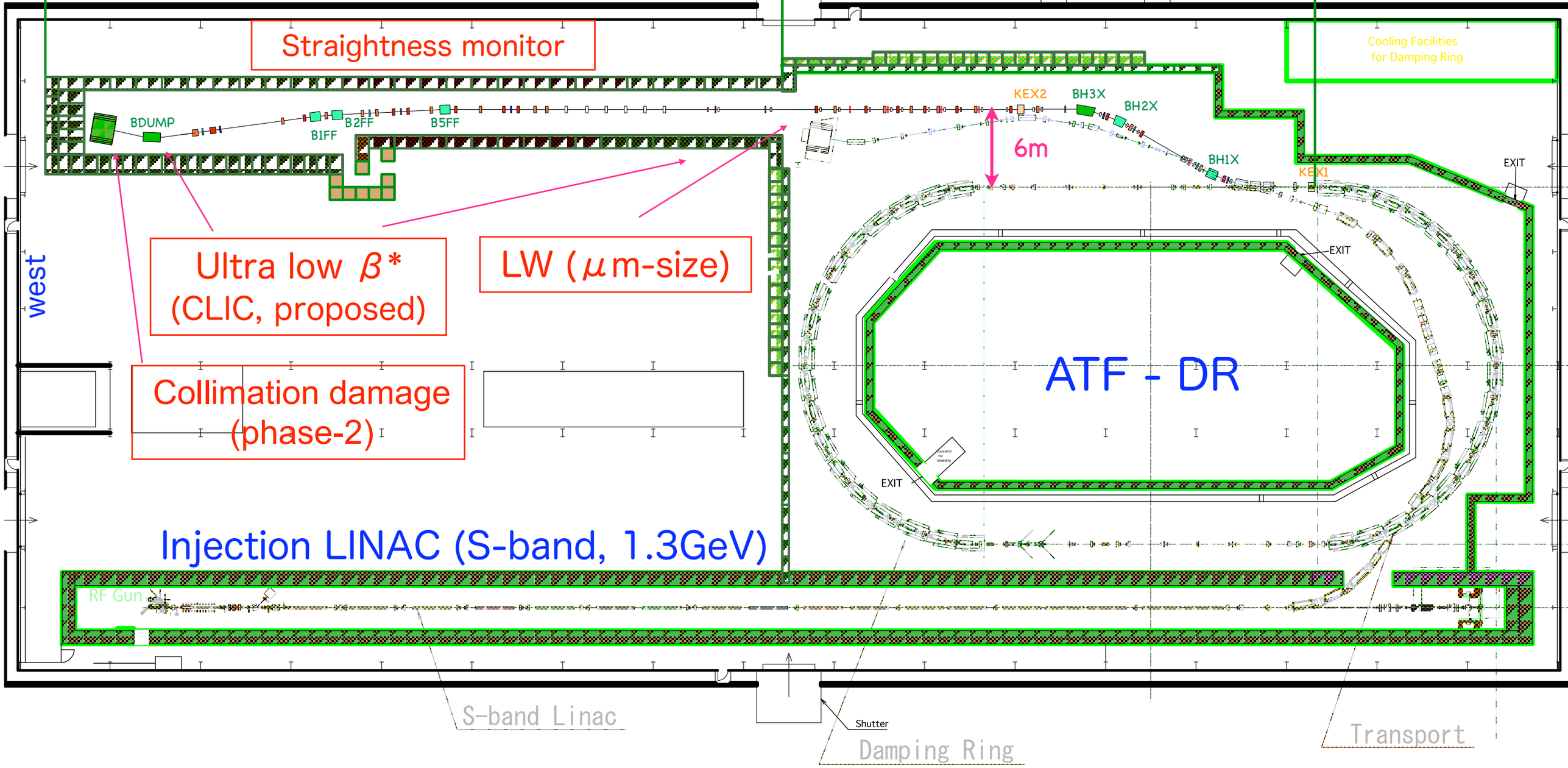
57000

β mat-ching

Diagnostic

Reconfiguration of extraction line for reduction of dispersion

41179.42

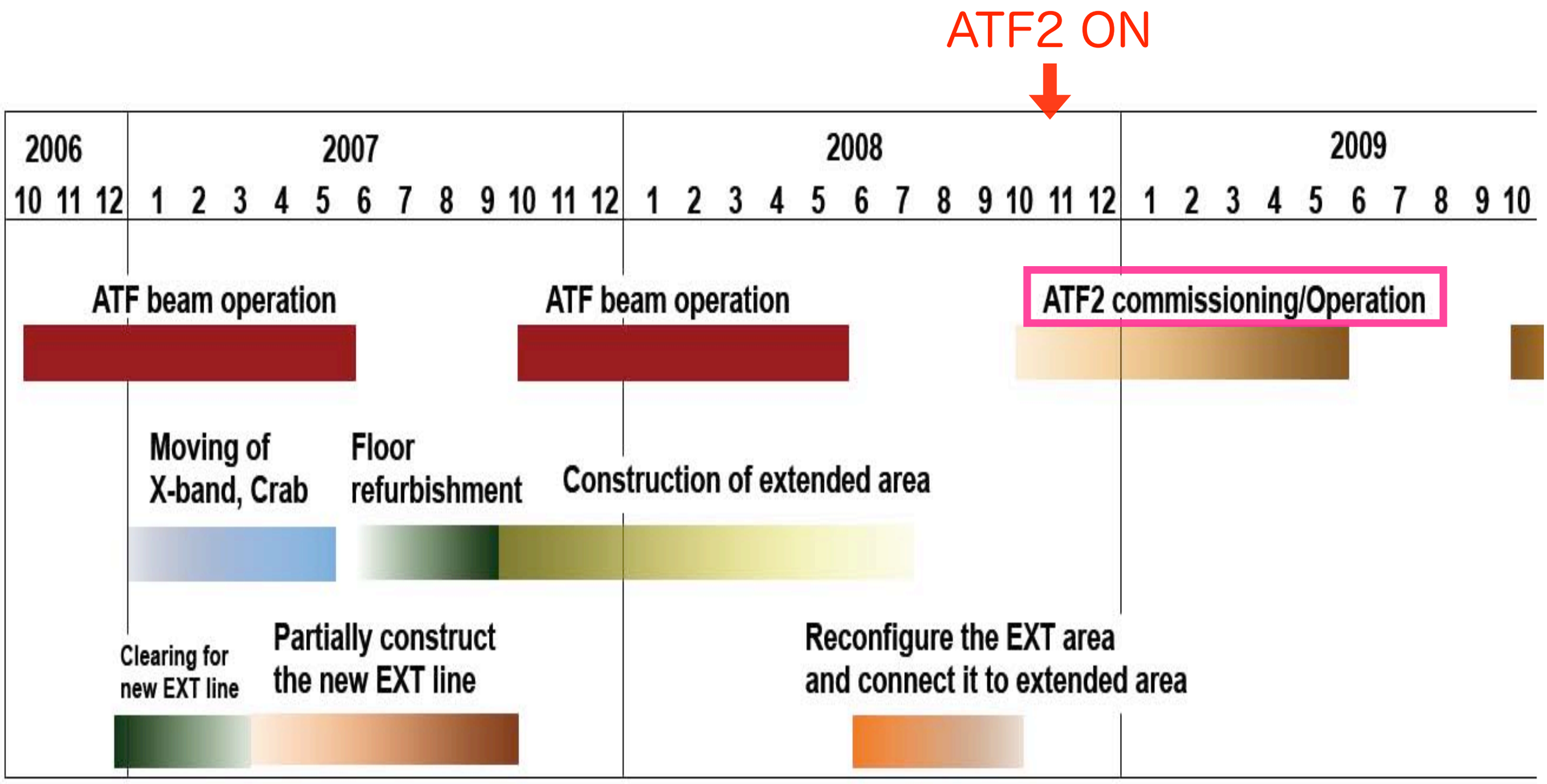


2007/Mar/02 N.Terunuma, KE

Motivation I: Chromaticity

Project	Status	β_y^* [mm]	L* [m]	L$^*/\beta_y^*$	ξ_y
FFTB	Design	0.1	0.4	4000	17000
FFTB	Measured	0.167	0.4	2400	10000
ATF2	Design	0.1	1.0	10000	19000
ATF2 pushed	Proposed	0.05	1.0	20000	38000
CLIC 500GeV	Design	0.2	4.3	21500	35000
CLIC 3TeV	Design	0.09	3.5	39000	63000
ILC	Design	0.4	3.5	8750	15000
ILC pushed	Design	0.2	3.5	17500	30000

ATF2 Overall Schedule



ILC-FF (660m)

electron beam

$\sqrt{\beta_x}, \sqrt{\beta_y}\ (\sqrt{\mathrm{m}})$

$\eta_x, \eta_y\ (\mathrm{m})$

SD0 SF1 B1 B2 SD4 SF5 B5 SF6 QM11 QM16

ATF2-FF (30m)

electron beam

IP

F

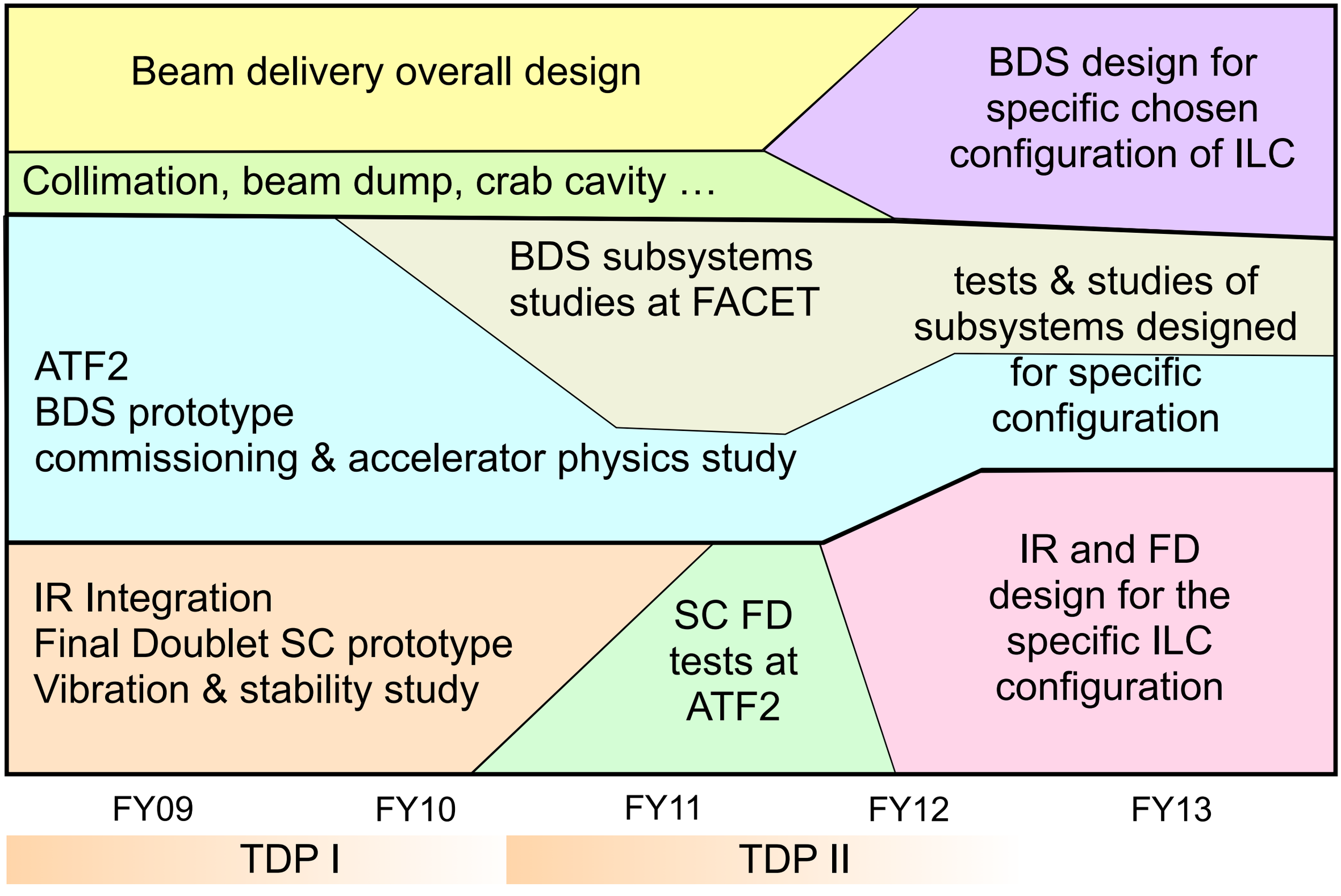
D

m

ATF2 Features

- The same number of magnets as the ILC-FF.
- The tuning knob, methods are the same,too.
- Beam instrumentation has been developed with the ILC specifications; BPMs, BSMs, movers, magnet support, laserwires, HA power supplies, FONT-feedback system etc. .
- International participation in the commissioning and operation

BDS plans


Beam delivery overall design
BDS design for specific chosen configuration of ILC
Collimation, beam dump, crab cavity …
BDS subsystems studies at FACET
tests & studies of subsystems designed for specific configuration
ATF2
BDS prototype
commissioning & accelerator physics study
IR Integration
Final Doublet SC prototype
Vibration & stability study
SC FD tests at ATF2
IR and FD design for the specific ILC configuration
FY09
FY10
FY11
FY12
FY13
TDP I
TDP II

Future prospects

ILC beam; 30(60) bunches s_b=300(150)nsec

- Fast extraction kicker R&D in 2007-
- intra-pulse feedback (FONT, Oxford university)

Final focus Q magnet test ; 2012 - 2014

- super conducting magnet (BNL)
- permanent magnet (Kyoto university)

Optional Photon facility ; 2015 - 2019

- laser and optical cavities for photon linear collider
- generation of photon beam

”Strong QED” experiments ; LEI2007, Hiroshima

- Non-perturbative QED with Laser intensity 10^{22}W/cm^2

i.e. $a_0 > 60$, $A > 3 \times 10^{25}$m/s^2 , E_{laser}>2TeV/cm

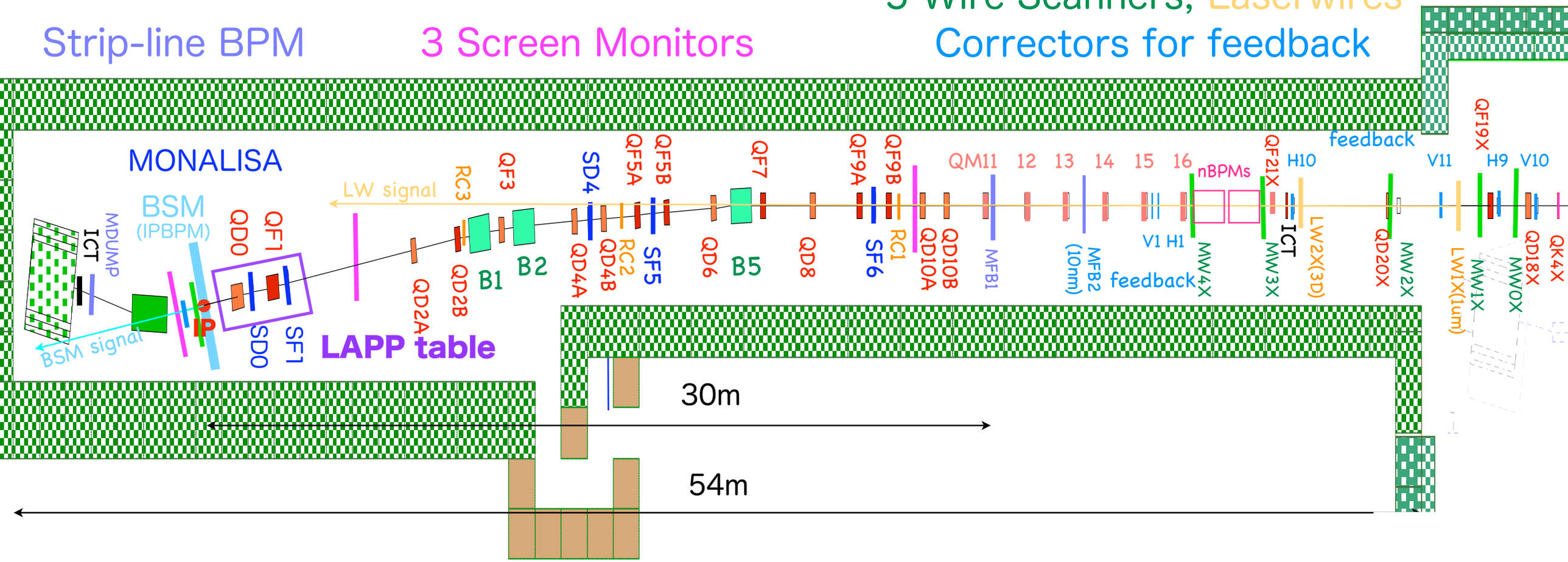
Hardware System at ATF2

22 **Q**uadrupoles, 5 **S**extupoles, 3 **B**ends in downstream of QM16
(IHEP, China) (SLAC) (SLAC, IHEP)

All Q- and S-magnets have cavity-type beam position monitors(QBPM, 100nm).
(PAL,KNU, Korea, and SLAC, RHUL for electronics)

5 Wire Scanners, Laserwires

Strip-line BPM 3 Screen Monitors Correctors for feedback

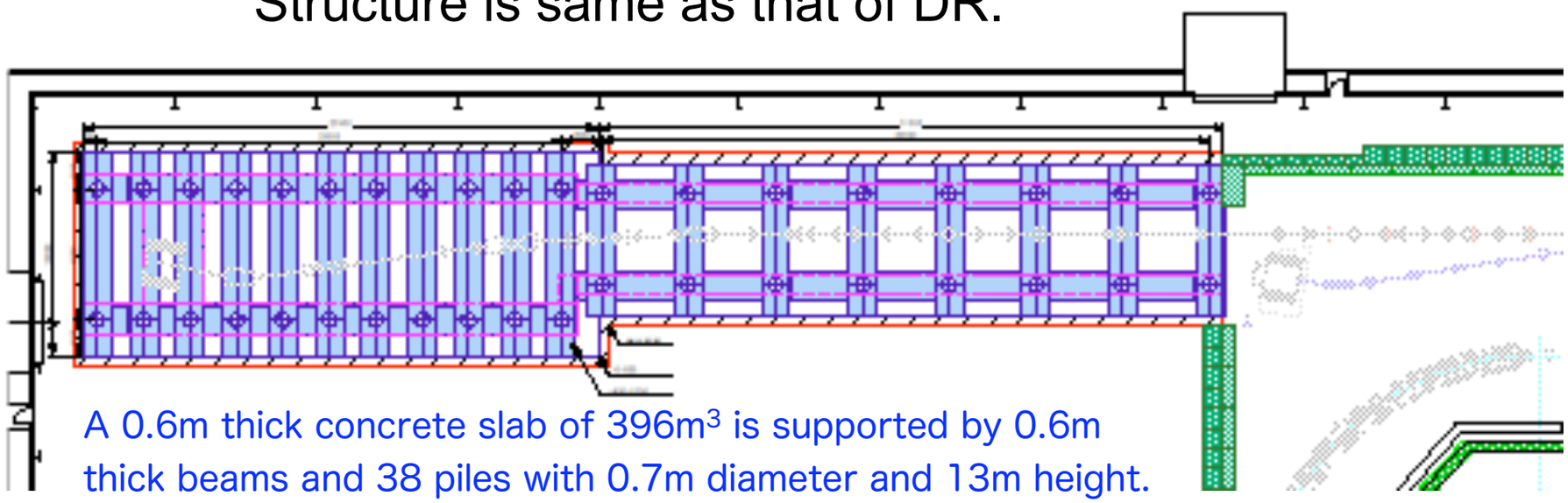


Shintake Monitor (beam size monitor, BSM with laser interferometer):Tokyo univ.
MONALISA (nanometer alignment monitor with laser interferometer):Oxford univ.
Laserwire (beam size monitor with laser beam for 1 μm beam size, 3 axies):RHUL
IP intra-train feedback system with latency of less than 150ns (FONT):Oxford univ.
Magnet movers for Beam Based Alignment (BBA):SLAC
High Available Power Supply (HA-PS) system for magnets:SLAC

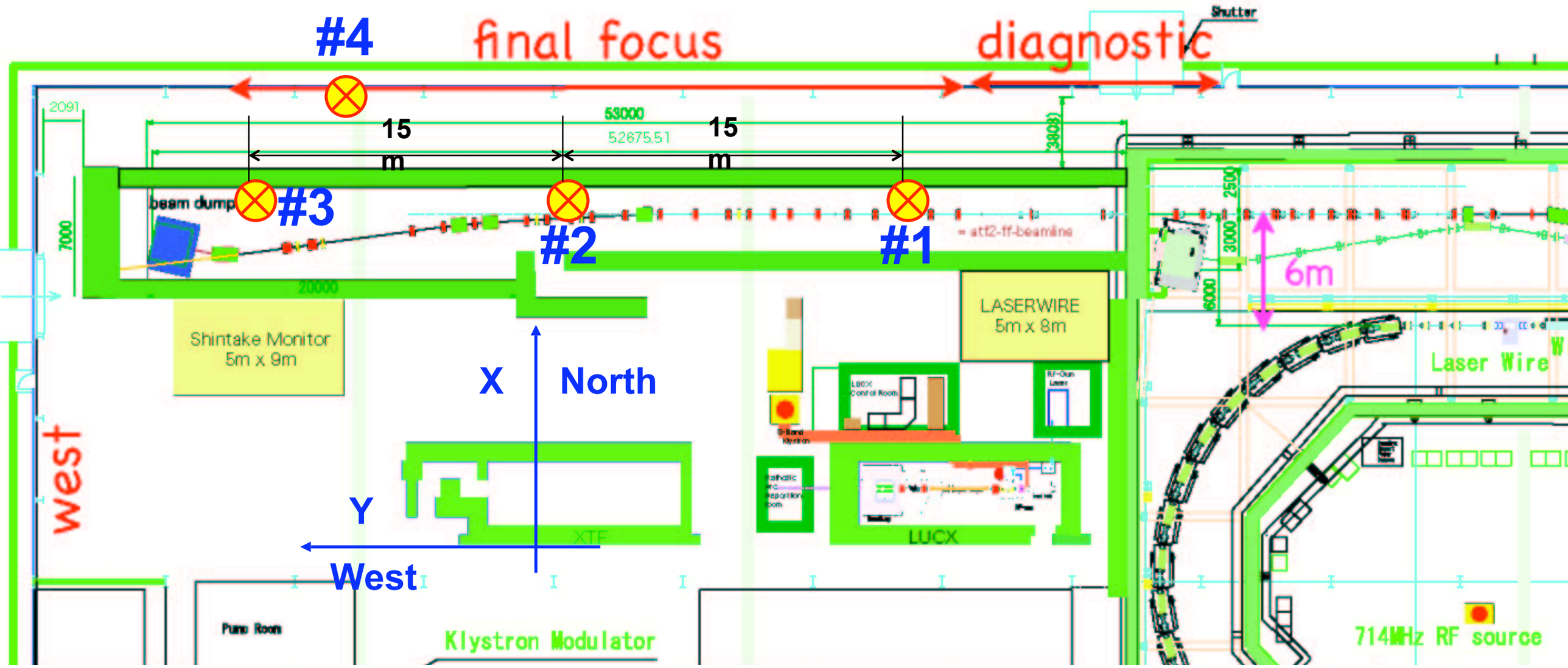
Floor structure for ATF2 beam line

Refurbishment from Jun to Sep 2007

Structure is same as that of DR.



Tilt measurement and Alignment



#1 - #4 are tilt meters of Leica, NIVEL-20
Resolution is 1 μr

X (N-S) Tilt at ATF2

Air T (DegC)
1X
2X
3X
4X

X-tilt (mrad)
0.03
0.02
0.01
0.00
-0.01
-0.02
-0.03
-0.04

Ambient Temp. (Deg. C)
28
26
24
22
20
18
16

8
24
40
56
72
88

6/20
6/21
6/22
6/23

Time (H)

Hardware preparation

(1) 2006

Q magnets (4 in 2006, 24 in 2005, 28 in total); 27 to be used

Support-concrete bases;

type : 1(Q+Qk+ZV),2A(Q+ZH), 2B(Q+ZV),3(Q+Sx+Q) and 4(Q)

no. : 3, 3, 1, 3 and 14 ,respectively ; so 24 in total

QBPMs (28 in 2006, 11 in 2005, 39 in total) - 33 to be used

HA power supply system (39)

(2) 2007-2008

Conventional facility (including beam dump)

Bending(3), sextupole(5), skew(2) and steering(6) magnets

QC3 (2) shimmed for QC0,QF1 - 12 pole component

S-band BPMs (4), IPBPM with New Shintake monitor

Carbon IP wire scanner, Honda monitor

Rigid supports(FD system, Shintake monitor)

FONT, feedforward, laserwire, Monalisa etc.

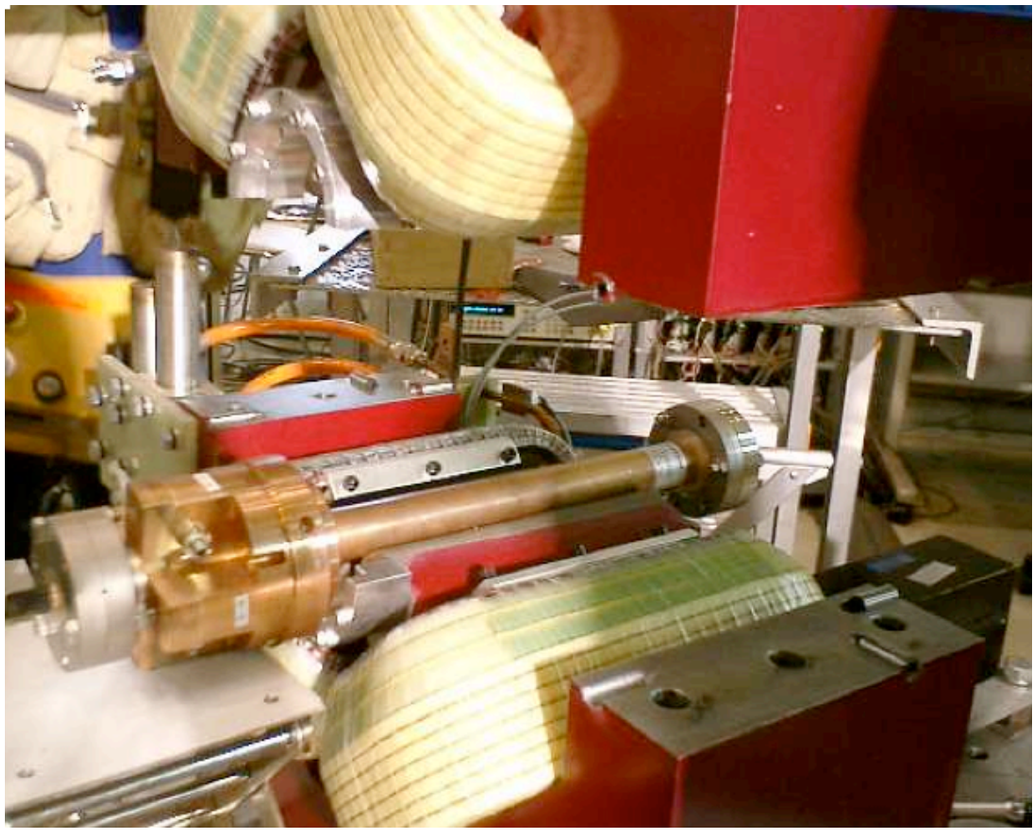
Q-magnet
(IHEP, SLAC
KEK)

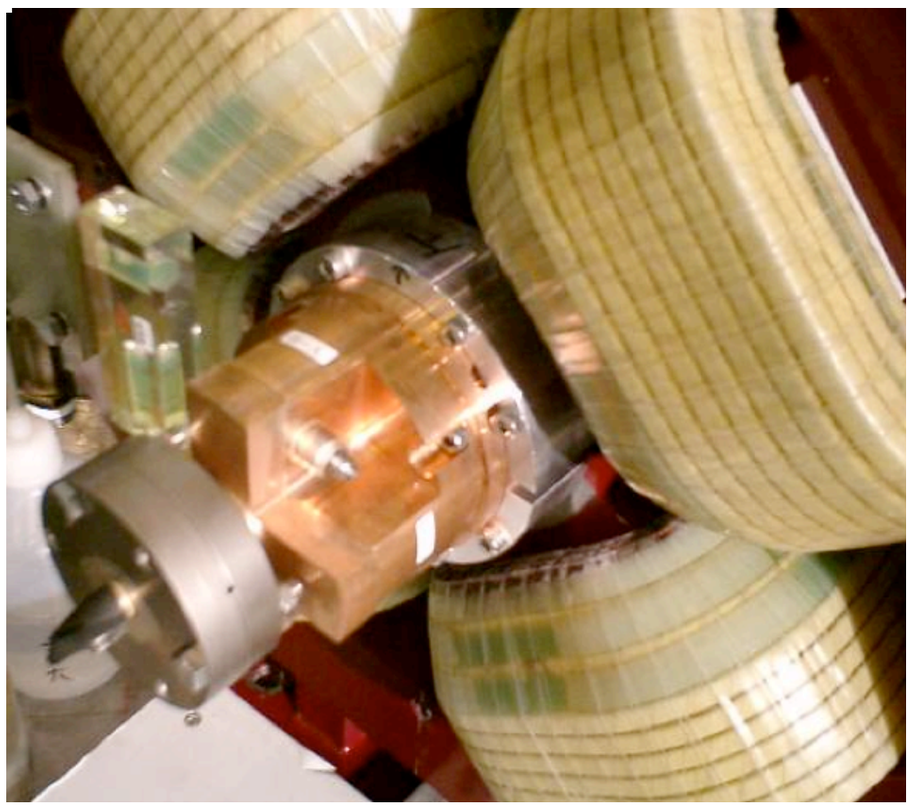
Mover
(SLAC, MPI)

Concrete
Support
(KEK)

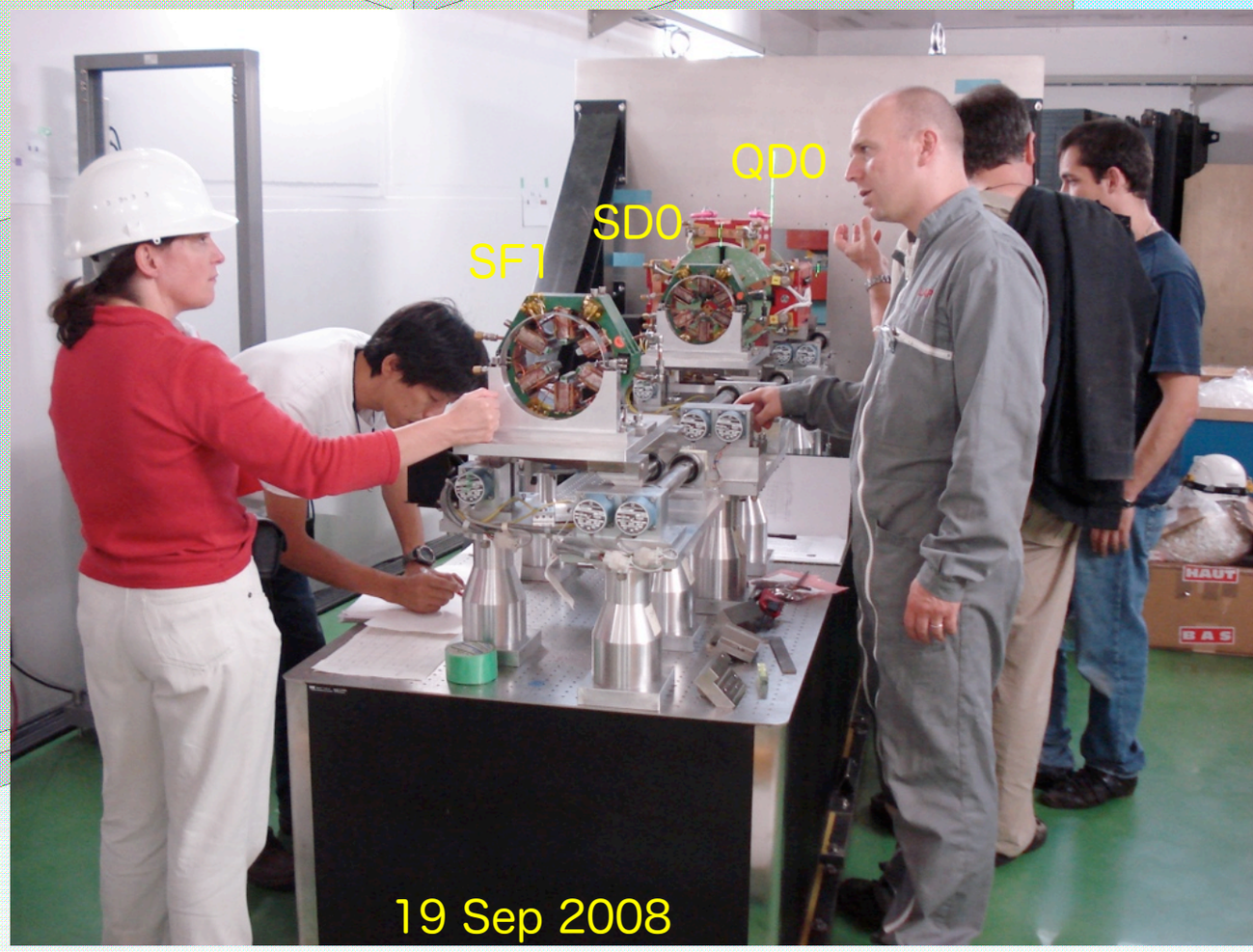
2007 4 25

QBPM in a Q-magnet
(KEK, PAL, SLAC)

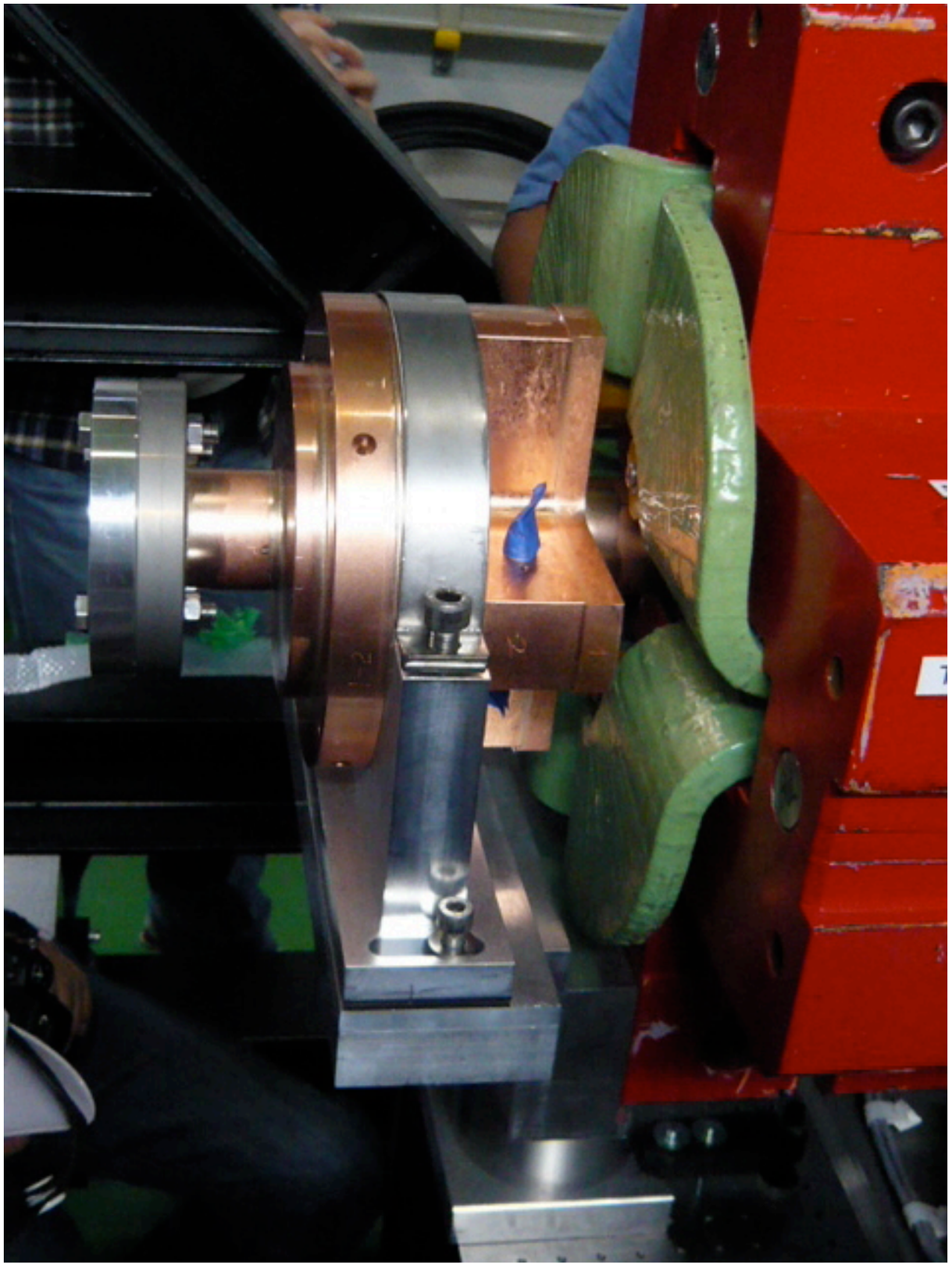


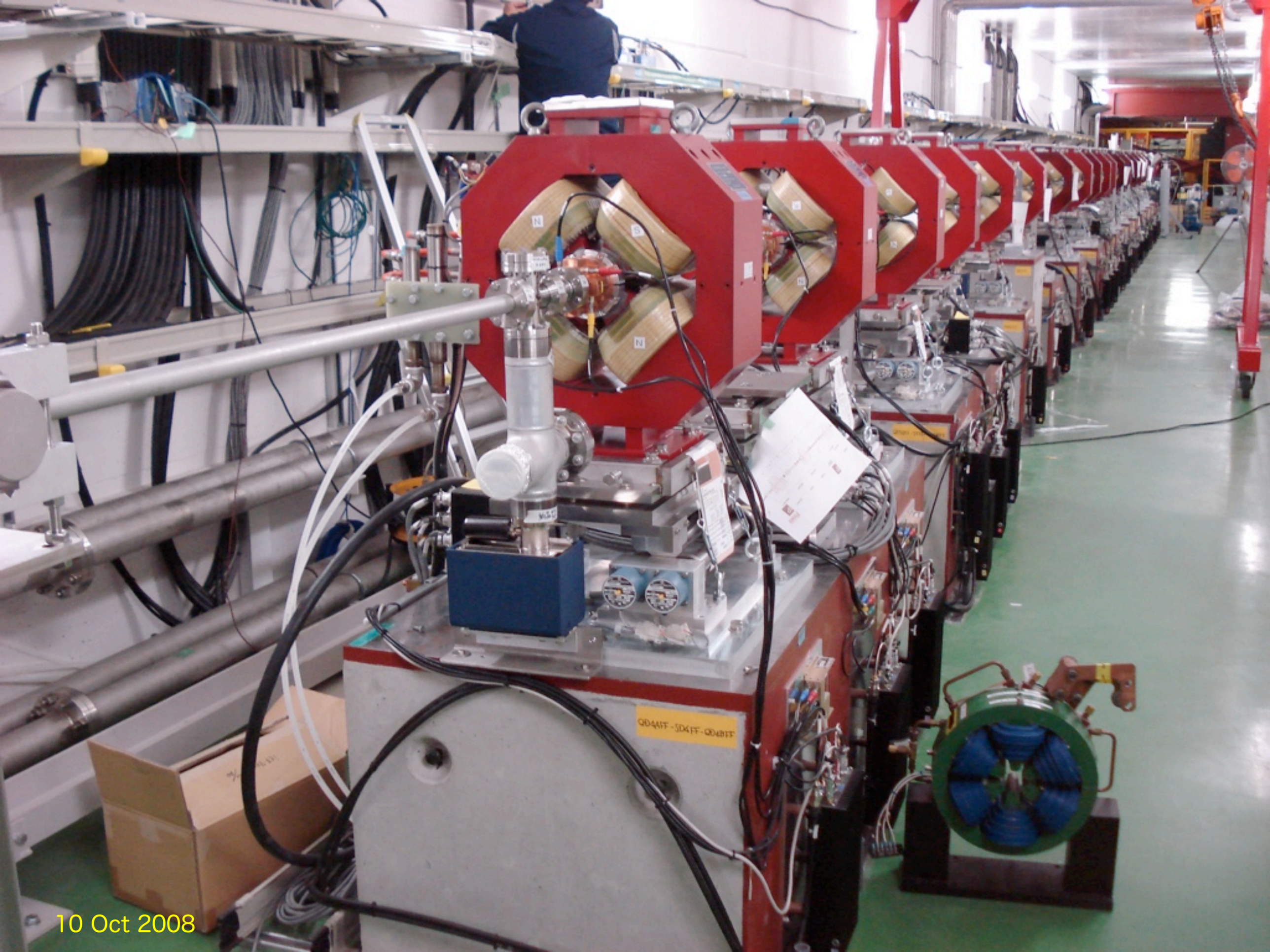


FD system from LAPP, now at KEK



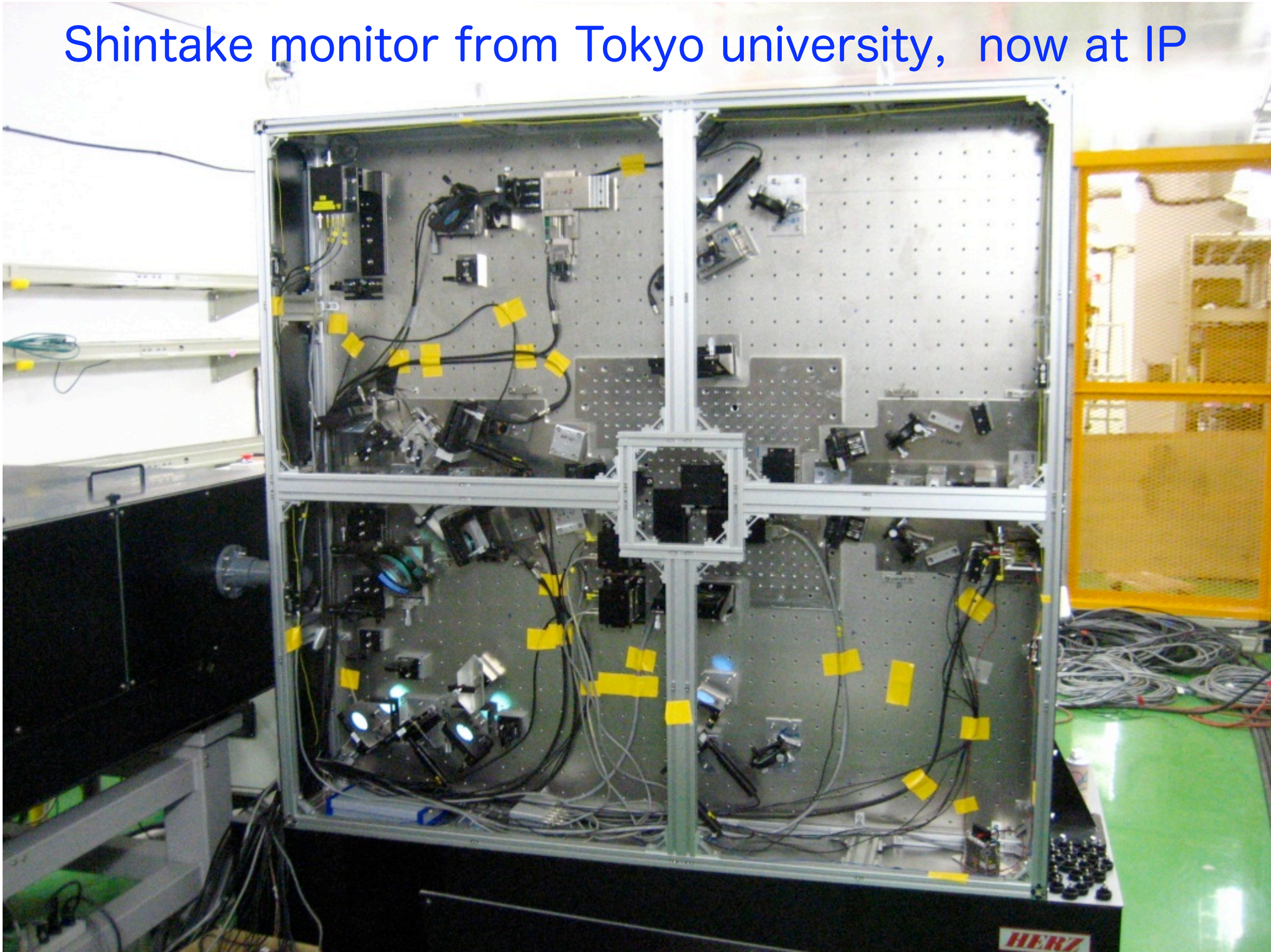
S-ban BPMs were just installed in QD0,QF1, 14 Oct.08 !



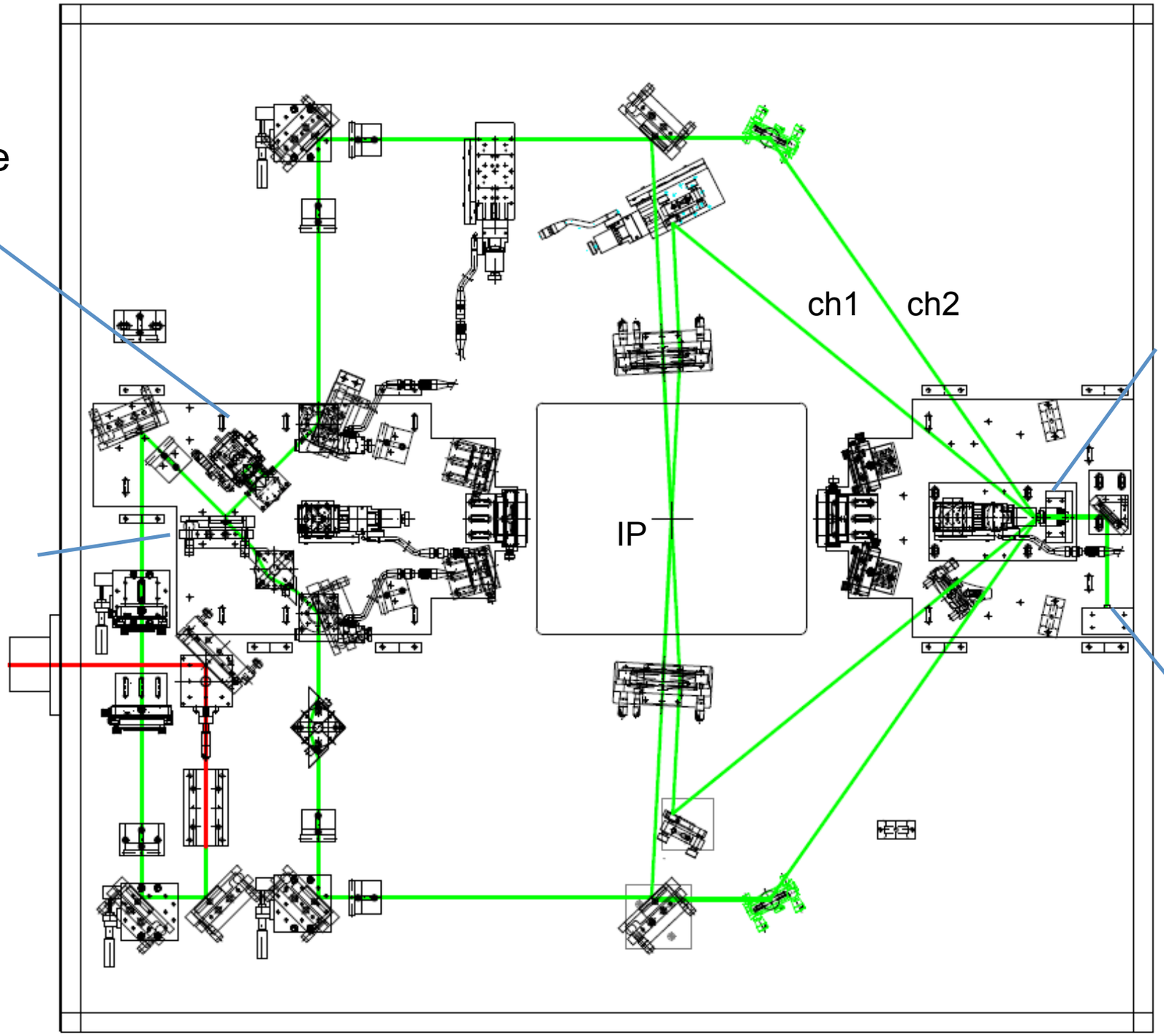

QD4AFF - SD4FF - QD4BFF
10 Oct 2008

10 Oct 2008

Shintake monitor from Tokyo university, now at IP

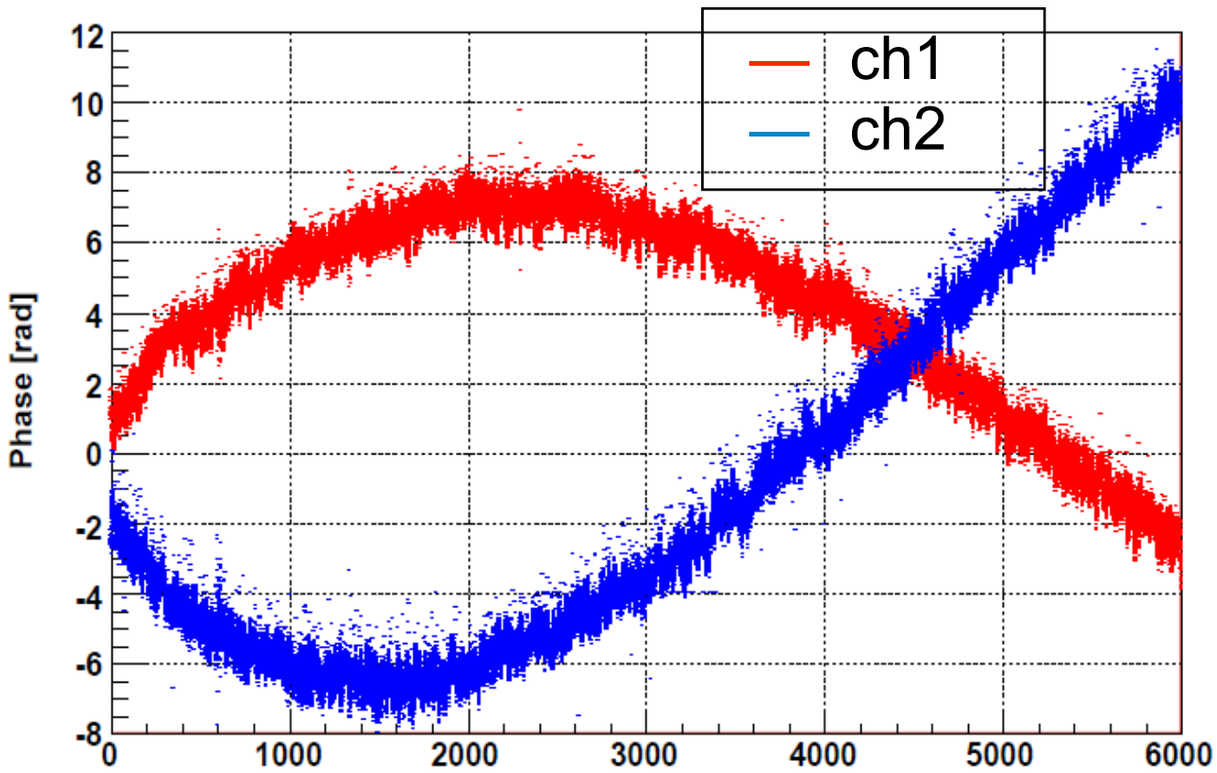


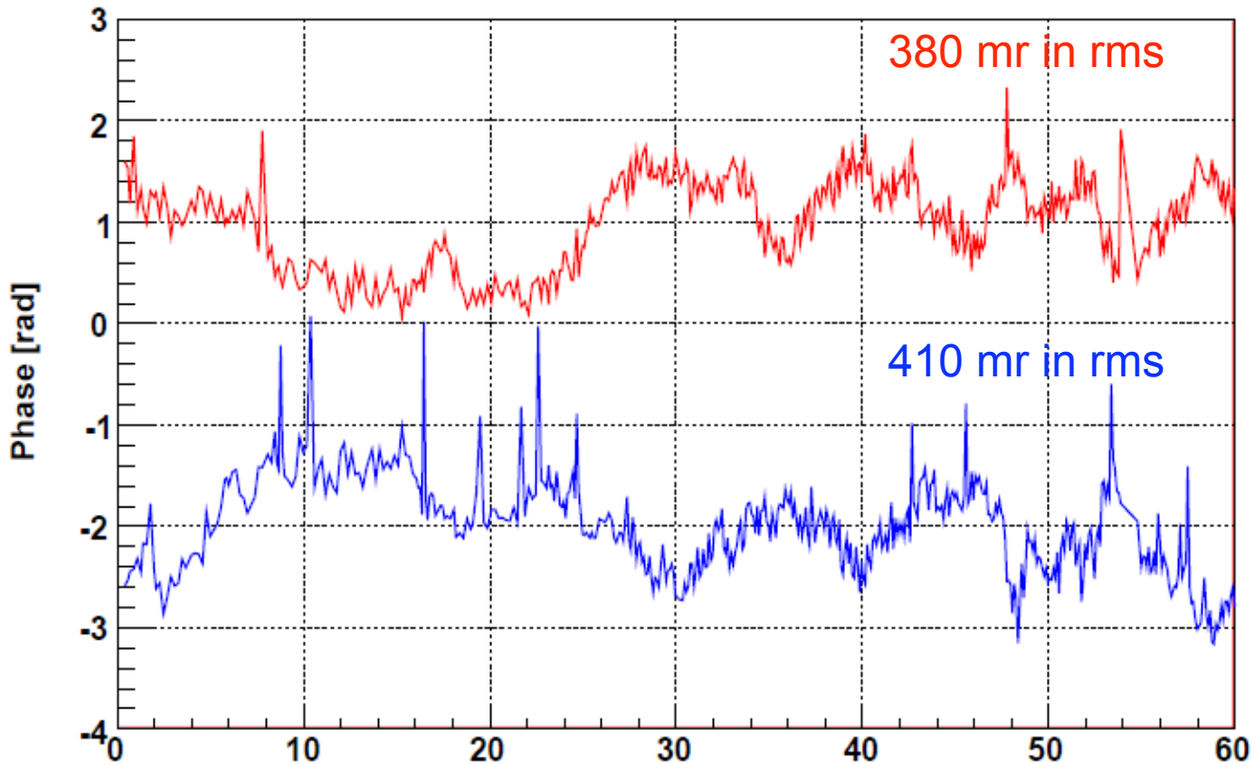
Measurement Setup
（in 174 degree crossing angle mode）



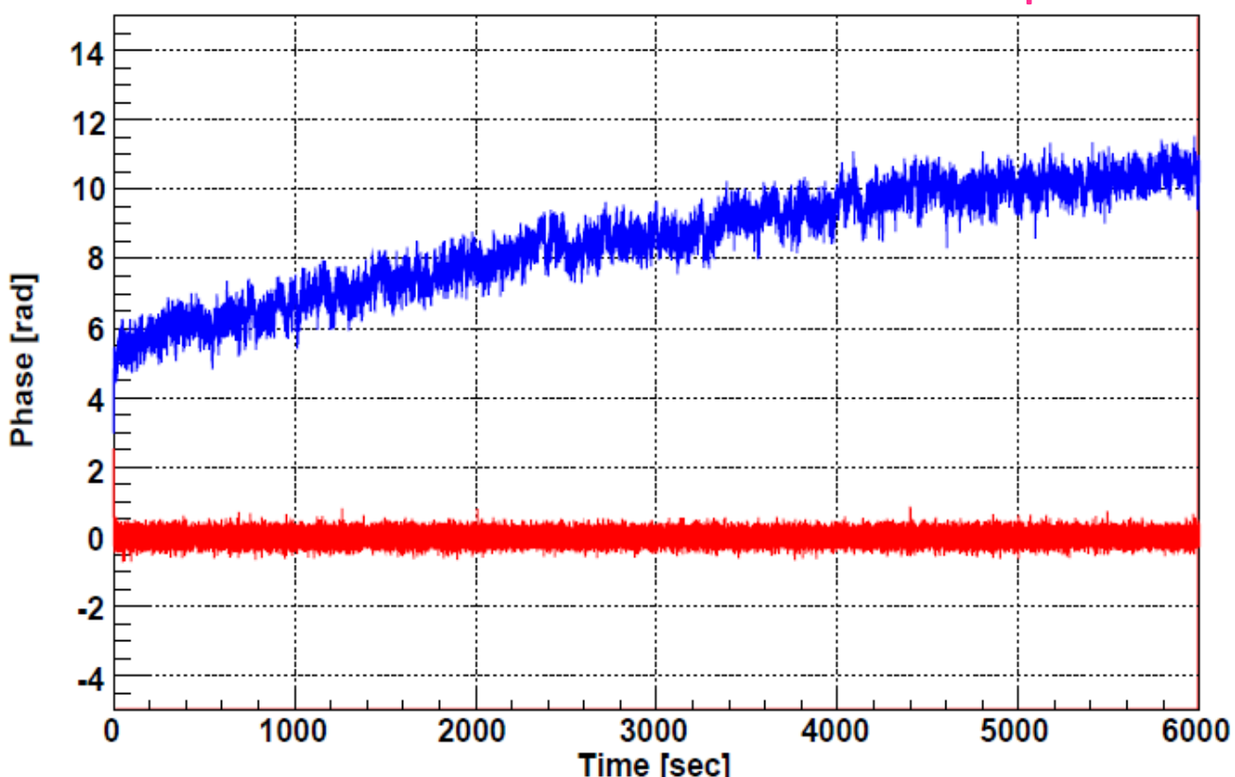
Phase Measurement Results

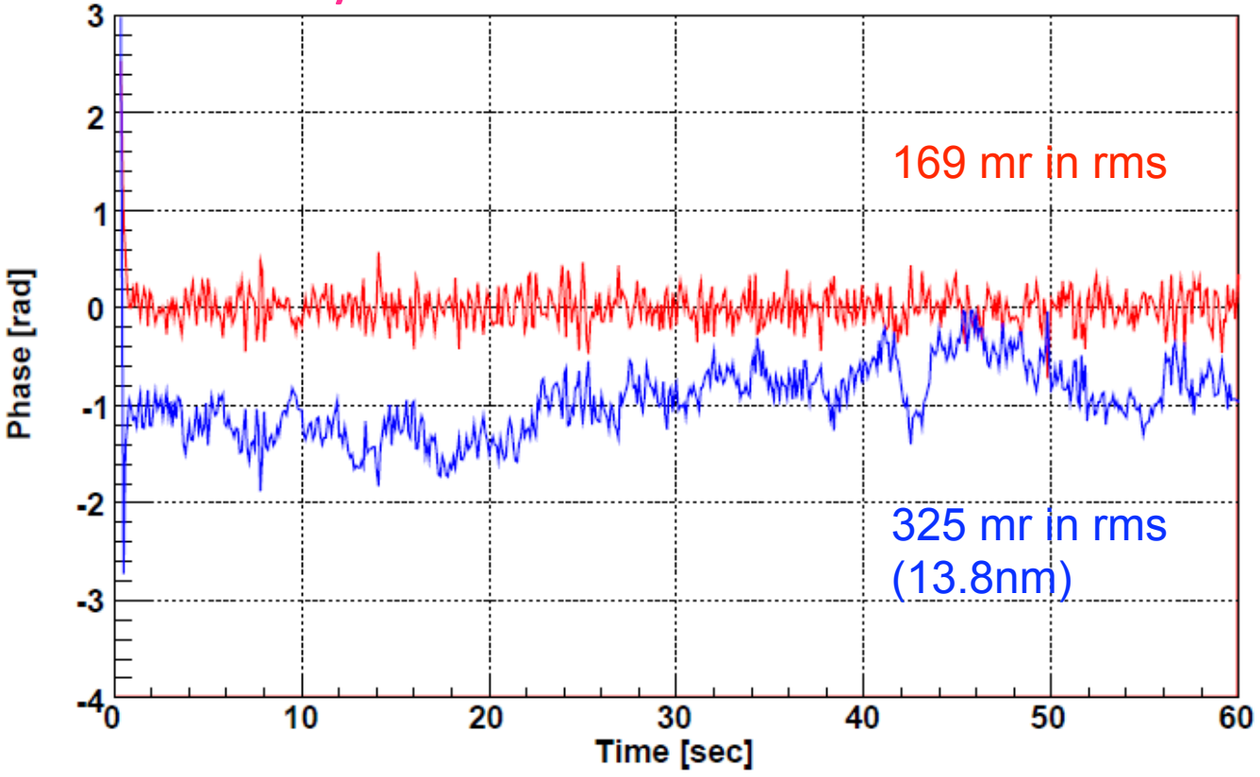
pulse repetition frequency is 10 Hz





with phase stabilization by ch1





Software Issues

Coordination is important for international collaboration.

(1) Commissioning strategy, tools
The commissioning team was organized.

(2) Flight simulator for modeling the beam line and tuning.
Demonstration has been done at the present extraction line.

(3) Magnet movers and QBPMs etc.
Corresponding sub groups have responsibilities.

(4) Remote participation
international-capable phone line, good video equipment will be prepared. Also, ATF data server, eLog system will be improved.
Both are KEK's responsibility.

ATF Beam Schedules

RF gun and linac, injection …

DR Retuning

ATF2 hardware commissioning

If possible, beam study

10 2008

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 2008

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 2008

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			

1 2009

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

2 2009

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

3 2009

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				

Cold cavity BPM

Beam time for graduate students

IP-BSM group

Cavity Compton

- *preparation of radiation inspection*
- *radiation inspection*
- *fast kicker study (cannot extract the beam)*
- *nominal beam study time*
- *special meeting to discuss the detail schedules in December 2008*

Summary

ATF2 will be commissioned in November 2008.

Progress in 2008

(1) Re-configuration has been completed in tihs summer.

(2) Concrete shields and beam dump have been completed in April.

(3) All magnets except for 2 skew Qs have been installed at ATF2 beam line.

(4) Power cables and cooling pipes have been installed.

(5) The HA-PS system has been installed.

(6) S band BPMs (4) were fabricated at KNU, which were installed 14 Oct.2008 .
The electronics is provided by UK group.

(7) Shintake monitor has been installed at IP. The optics system was commissioned with the pulsed laser in this summer.

Meeting schedule

(1) Weekly meeting with ILC-Webex, Wednesday

(2) A special meeting for schedule, 22 November, KEK, Webex

(3) ATF2 Project meeting, 15 -18 December, 2008