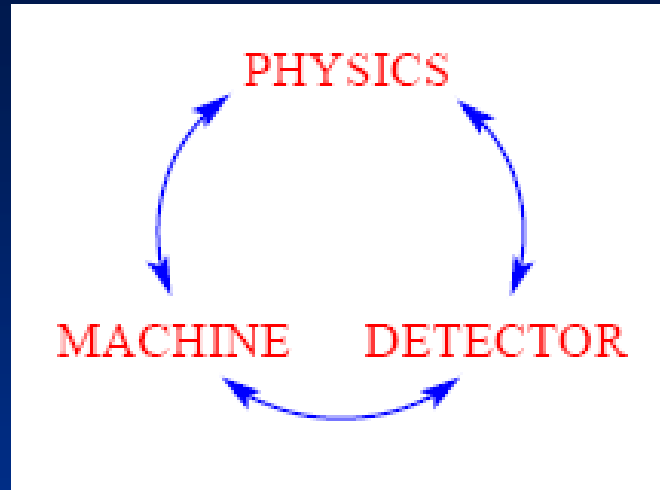
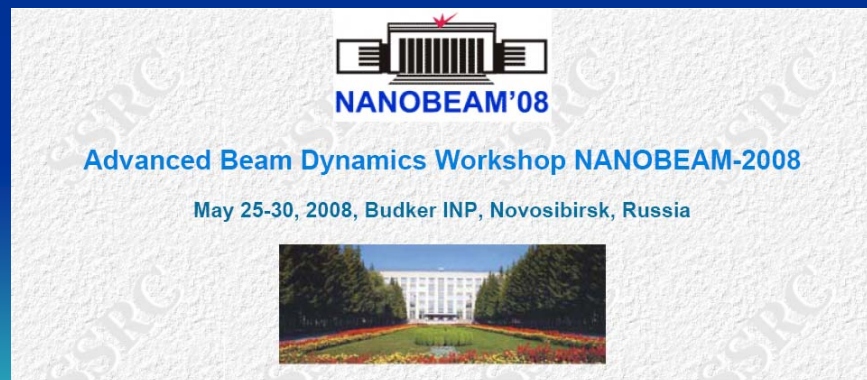
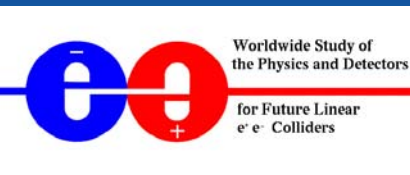


ILC Detectors and



Detector View of MDI



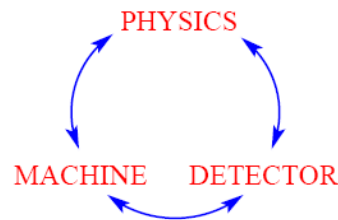
It started at the LC92,LC93 workshops in Garmisch-Partenkirchen,SLAC to emphasize the correlation between the three, and ended up in a contribution to Nanobeam02...

INTERACTION-REGION ISSUES

Ron Settles*, Max-Planck-Institut für Physik, 80805 Munich, Germany

Abstract

The jobs at hand concern everybody in the LC business. Establishing and controlling the e^+e^- luminosity at a level



of $10^{34} \text{ cm}^{-2} \text{ s}^{-1}$ in the interaction region (IR), i.e., from the final quadrupoles to the interaction point (IP), will require a sophisticated interplay of several technologies dealing with gymnastics on nanometer-sized colliding beams. An overview of the issues is given in this contribution to Session[4] of the Nanobeam Workshop[1]-[9].

...and I shall follow the circle clockwise for this talk:

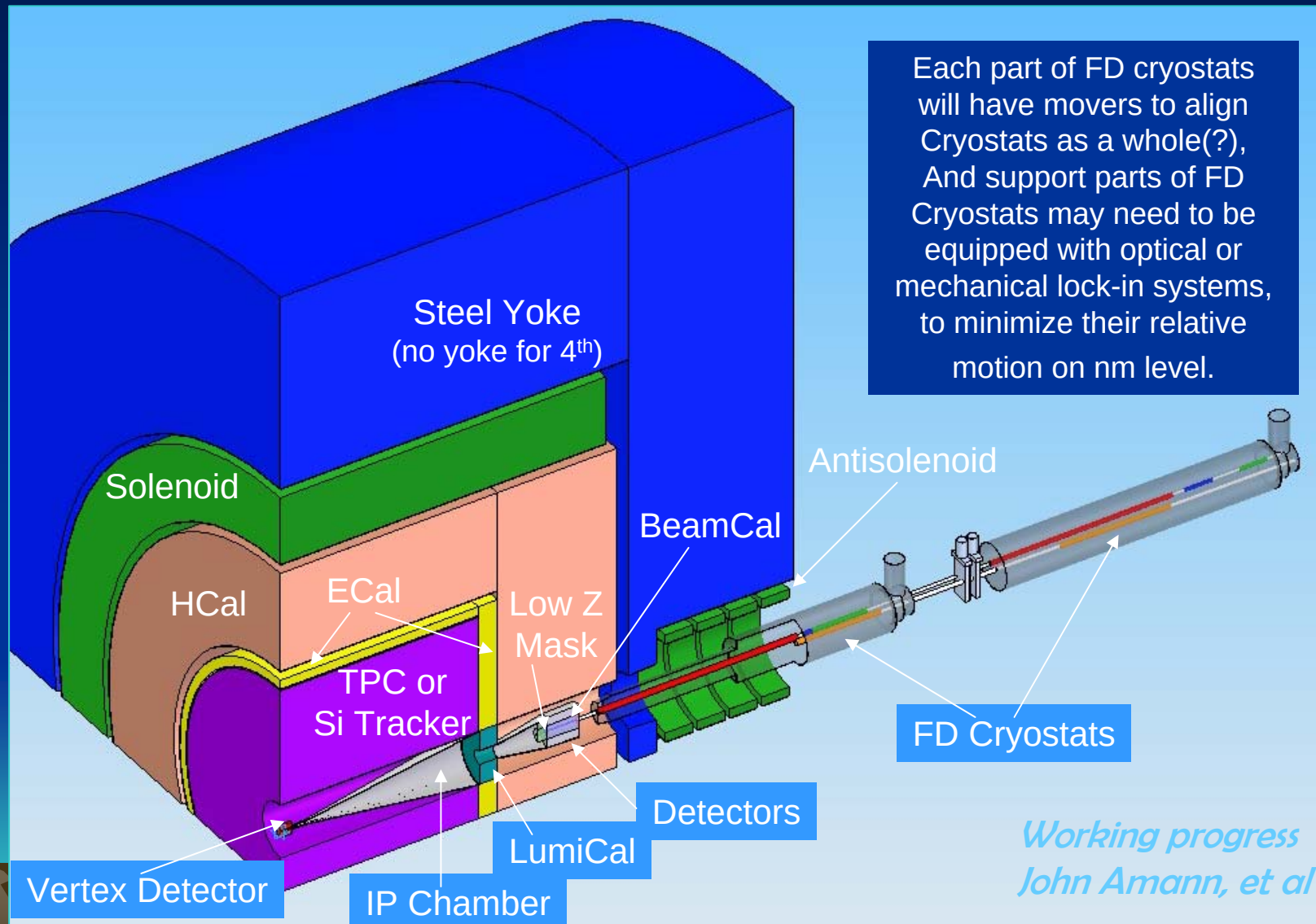
0-Machine...

1-Physics...

2-Detector...

3-MDI...

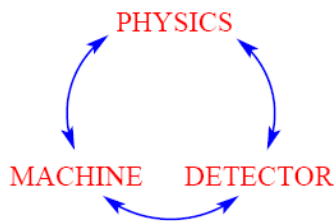
In addition to my own, I have borrowed some slides from several colleagues for this talk, to give a better feel for the activities...Thanks to them!



Combination of detector and machine elements. "Detector view of MDI"? Nanobeam02 paper...

Abstract

The jobs at hand concern everybody in the LC business. Establishing and controlling the e^+e^- luminosity at a level



of $10^{34} \text{ cm}^{-2}\text{s}^{-1}$ in the interaction region (IR), i.e., from the final quadrupoles to the interaction point (IP), will require a sophisticated interplay of several technologies dealing with gymnastics on nanometer-sized colliding beams. An overview of the issues is given in this contribution to Session[4] of the Nanobeam Workshop[1]-[9].

Many very correlated tasks!!

1 INTRODUCTION

One way to break down the tasks at the IR is to categorize them according to: **V**ibration, **O**ptics, **I**nstrumentation, **B**ackgrounds/masking and **E**ngineering, as illustrated in Fig.1. The tasks are highly correlated as evidenced by the repetition in the descriptions below.

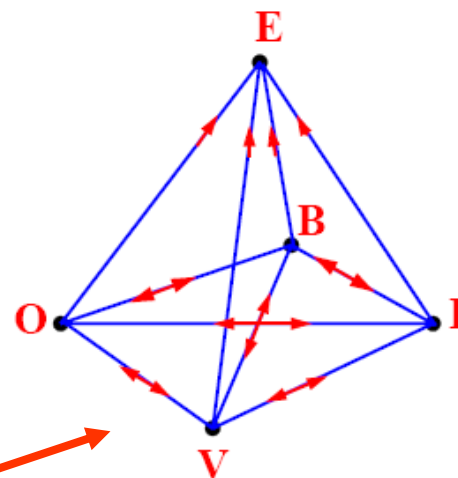


Figure 1:

A detailed account of the LC technological status, including topics in this paper, has been prepared by the International Linear Collider Technical Review Committee (ILCTRC) chaired by Greg Loew[8].

Combining MDI/Integration makes a lot of sense, as the IRENG07 workshop, the ILD task list and Andrei's/Toshiaki's lists today show, maybe something like:

- Vibration—det&hall design to avoid unwanted (μm -mm!) vibrations
- Optics—machine, BDS design/layout (details in Andrei's and Toshiaki's talks today)
- Instrumentation/diagnostics—fast feedback, beamcal e.g.
- Background—beam induced bgrd, inner detector design
- Engineering—
 - Detector design/integration
 - MDI magnets (antiDID)
 - IR hall/push-pull design (Andrei's talk today)
 - Shielding
 - Etc...

No Conclusion

- Many correlated/challenging issues
- Nevertheless progress by our excellent and highly motivated machine physicists is evolving well
- Iterating on engineering designs
- W.I.P., 'interface' (= 'integration?') document April 2009 will be very significant (will it give 'Master Lists'?)

ATF Experimental Program and ATF2 Construction Status

T. Tauchi,

Nanobeam 2008, BINP, Novosibirsk, 26-30 May 2008

References :

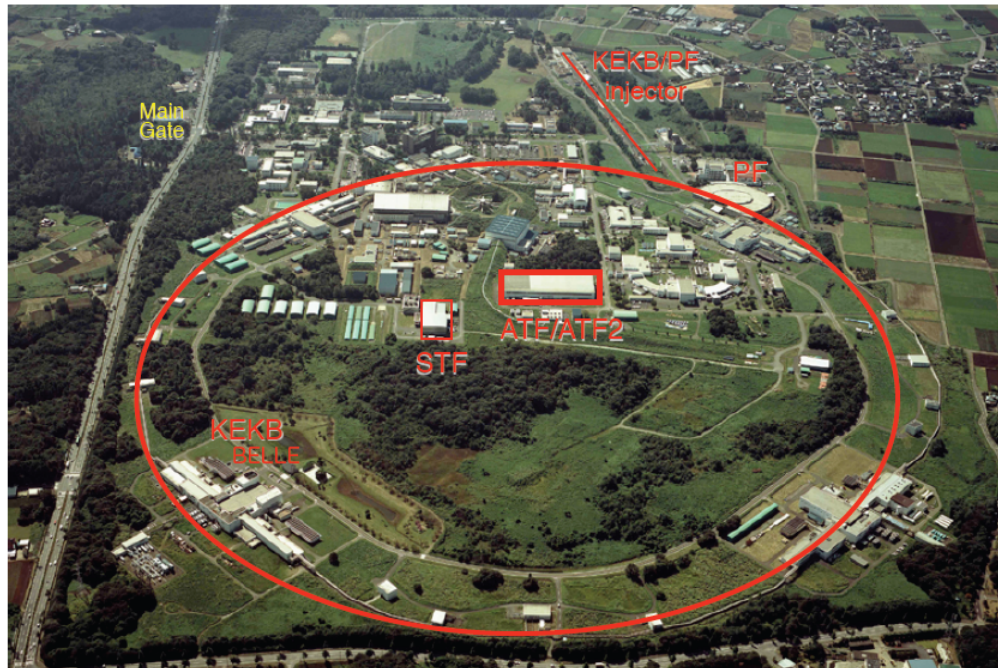
ATF2 Proposal, KEK Report 2005-2

ATF2 Proposal Vol.2, KEK Report 2005-9

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

KEK High Energy Accelerator Research Organization

in Tsukuba site, Japan



ATF Accelerator Test Facility, KEK

N.Ternuma, LC project committee, 7 Aug.2007

1997-2008

Extraction line :utilization of low emittance beam
beam instrumentation, collimator damage

Cavity BPM
nanometer res.

FONT
fast feedback (ns)

Pulsed Laser Wire Scanner
for beam size monitor (μm)

ODR, OTR
single shot meas.

Beam Dynamics

CSR

LW, Cavity Compton

Damping Ring

ultra low emittance beam
dynamics -fast ion instability
beam instrumentation(BPM,LW)

Fast kicker
rise time < 3ns

XSR

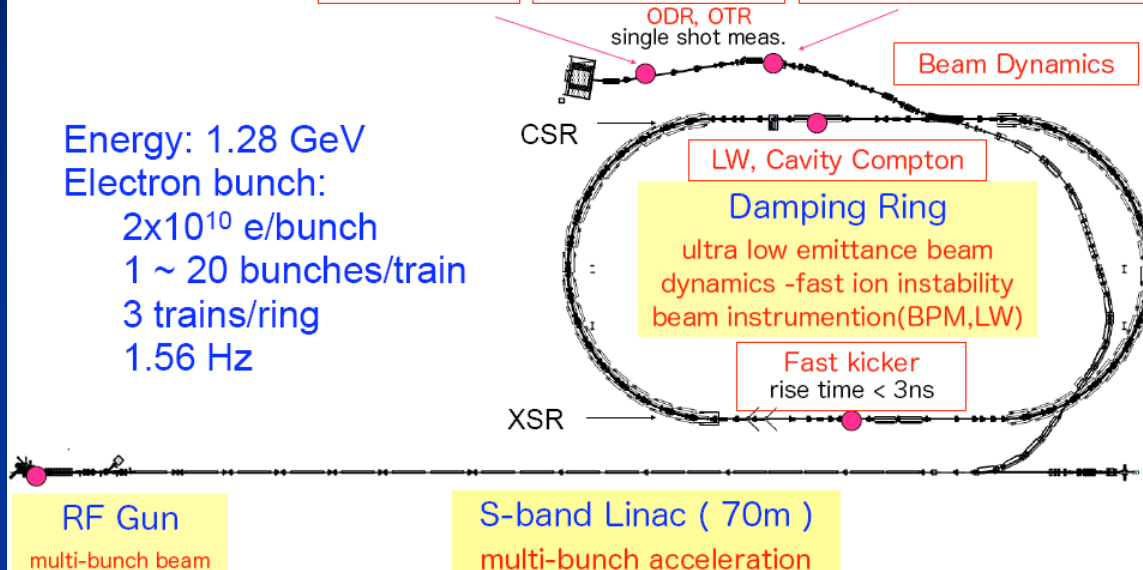
Energy: 1.28 GeV
Electron bunch:
 2×10^{10} e/bunch
1 ~ 20 bunches/train
3 trains/ring
1.56 Hz

RF Gun

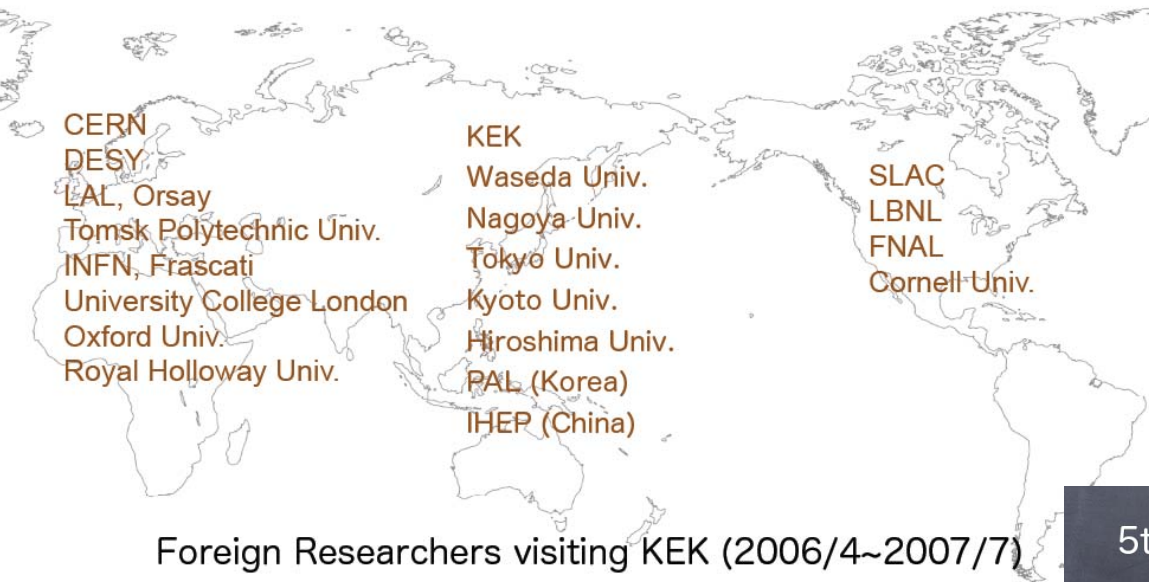
multi-bunch beam

S-band Linac (70m)

multi-bunch acceleration



ATF International Collaboration

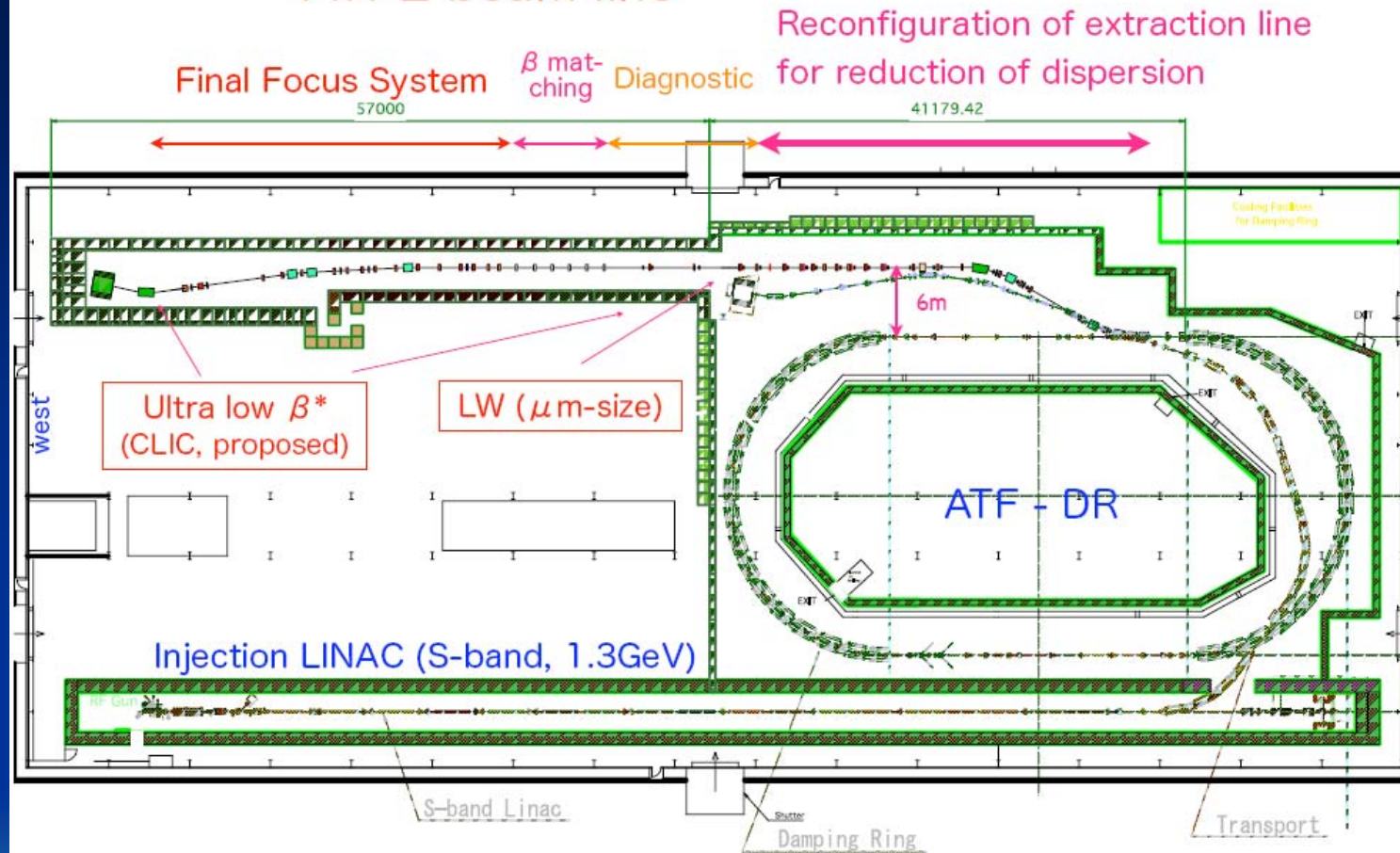


Foreign Researchers visiting KEK (2006/4~2007/7)
23 institutes, 71 people, total 2085 people · day
(full-year researchers are excluded)

5th ATF2 Project Meeting, 19-21 Dec. 2007



ATF2 beam line



2007/Mar/02 N.Terunuma, KEK

ATF2 Final Goal

Ensure collisions between nanometer beams; i.e. luminosity for ILC experiment

Reduction of Risk at ILC

Optics and beam tuning
Stabilization

FACILITY construction, first result	ATF2/KEK; 1.3GeV 2005-08-09?	FFTB/SLAC; 47GeV 1991-93-94
Optics	Local chromaticity correction scheme; very short and longer L^* ($\beta^*_y=100\mu\text{m}$, $L_{FF}=30\text{m}$)	Conventional (separate) scheme; non-local and dedicated CCS at upstream; high symmetry in x, y ; i.e. orthogonal tuning ($\beta^*_y=100\mu\text{m}$, $L_{FF}=185\text{m}$)
Design beam size	$2.3\mu\text{m}$ / 34nm , aspect=82 ($\gamma \varepsilon_y=3 \times 10^{-8} \text{ m}$)	$1.92\mu\text{m}$ / 52nm , aspect=37 ($\gamma \varepsilon_y=2 \times 10^{-6} \text{ m}$)
Achieved	?	70nm (beam jitter remains !)



29th November 2007



Q-manipulators Installation, 10th January 2008

Movers
built at
MPI-
Munich in
~1992



Beam Dump, 31st March 2008



Shintake mon. optics start, 14th May 2008



cabling and piping, 14th May 2008



HA-PS Installation, 14th May 2008



Laser hut construction(LW), 14th May 2008



QBPM phase fine-adjustment, 21st May 2008

Component	Sub-component	Number	Comments	Status	Present	New	2007	plan in
Magnet	Quadrupole	28	with QD0,QF1	production	27	1	1	0
	Sextupole	5	4 with 50mm aperture and 2 with 32mm aperture	design	0	5	5	0
	Octupole	0			0	0	0	0
	Bend	3	FF-bends =3	production	0	3	3	0
	H. Steering	4	horizontal with 5A bipolar PS	1 added in v3.7	4	0	0	0
	V. Steering	2	vertical with 5A bipolar PS		2	0	0	0
	Skew Q	2	QK2X, QK3X	v3.7 optics	0	2	0	2
	Cable of ext.kicker	2	re-location of two kickers is alternative solution		0	2	0	2
Magnet Support	Movers	27	20Q-magnets, QD0,QF1 and 5 sextupoles	SLAC	27	0	0	0
	Base (Qs)	23	for each magnet except for the FD support	production	0	23	23	1
	Bends	3	support system (3 bases and 3 interface plates)	design ?	0	3	3	0
	FD support	1	stable tables for QD0,QF1,SD0,SF1	CERN/LAPP	1	0	0	0
Power Supply	HA system	38	8(ExtQ), 6(MatQ), 5(Sext), 0(Oct), 16(FFQ), 3(B) ; 6 bipolar for QM11FF - QM16FF.	production		38	38	0
	Bipolar PS	2	bipolar and 20A for QK1X, QK2X	v3.7 optics		2	0	2
Vacuum	Beam pipe (m)	93.154	ATF extraction line at present and ATF2 beam line (50.613m)	production	0	93.154	46.577	46.577
BPM	Q-BPM for Q & Sext.	33	QD10-12X,16-17X,QD18-21X, IHEP-Qs in FF	production	39	-6	0	-6
	Q-BPM (s-band)	4	with larger diameter (40mm) ,final doublet system	design	0	4	0	4
	stripline	14	for commissioning and at extraction line	production	14	0	0	0
	IP-BPM	3	2nm resolution for position jitter at IP (	production/prototype	0	3	2	1
Wire scanner	Metal wire	5	exsit at the extraction line - relocation	existing	5	0	0	0
	Laserwire	5	upgrade of the metal wire scanners	R&D	0	5	0	1
IP - BSM	Shintake monitor	1	upgrade of the FFTB monitor, 532nm laser: 35-350nm	upgrade/ new design	1	0	0	0
	BSM-support	1	rigid and independent support	design	0	1	1	0
	Urakawa monitor	1	laser cavity type	R&D	0	1	0	0
Fast orbit correction	Feedforward	1	from DR to extraction line	R&D, design	0	1	1	0
	Feedback	1	intra-train fast feedback based on digital circuit	R&D	0	1	1	0
Pulse to pulse feedback	V and H correctors	4	orbit correction at the extraction line	proposed	0	4	0	4
	lum BPMs	4	orbit correction at the extraction line	proposed	0	4	0	4
Commissioning tools	Screen monitor	4		KEK	4	0	0	0
	Carbon wire scanner	1	beam size monitor at IP : up to 1um	SLAC	1	0	0	0
	Honda monitor	1	beam size monitor at IP : 350nm - 1um	proposed	0	1	0	1
	PLIC loss monitor	1	fiber with PMT readout	proposed	0	1	0	1
ICT	beam loss	2	beam current monitor		1	1	0	1
Beam dump	ATF2 Beam dump	1	design is the same as the ATF one		0	1	1	0

**Movers
built at
MPI-
Munich in
~1992**

Asian Contributions

- (1) Optics, beam tuning and commissioning
KEK, IHEP, KNU
- (2) Shintake monitor (beam size monitor at IP)
KEK, University of Tokyo
- (3) Quadrupole magnets: 28 in total
design (KEK, IHEP, SLAC), production (IHEP),
magnetic field measurement (KEK, IHEP)
- (4) Cavity BPMs (QBPMs) with 100nm resolution ; 39 in total
design (KEK, PAL), production (PAL)
digital readout electronics (SLAC)
- (5) IPBPM with 2nm resolution ; a IPBPM in BSM and a quartet at IP
design (KEK), production (KEK), electronics (KEK)
lower Q type R&D (KNU)
- (6) S-band BPM (at the FD system , i.e. for QD0, SD0, QF1, SF1)
design and production (KNU) in collaboration with RHUL(UK)

American Contributions

- Participation in optics design
- Electronics for Q-BPMs (33 +1)
- Participation in design and measurements of Q-magnets (being made at IHEP)
- Movers for beamline magnets (28)
- High availability power supplies (38)
- Quads for final doublet (2)
- Sextupole magnets (5)
- Final focus bends (3)
- Participation in commissioning and operation

CERN/France Contributions

- Development and implementation of the beam correction algorithms; e.g. GM model
- Beam line modeling with an optimised version of the GEANT4 simulation
- Stabilisation of critical mechanical support structures for the Final Focus magnets
- Development of specific beam instrumentation

DESY Contributions

- Stabilisation study for the FD system and the site (ground motion at the ATF2 floor)
- Laserwire; interest in Compton detector and in data taking + analysis (part of EUROTeV)
- Fast kicker to produce the ILC like bunch structure at ATF2 in the future.
- Remote operations or monitoring (GAN)

UK Contributions

- (1) Optics, beam tuning and commissioning
Daresbury lab.
- (2) Laserwire
RHUL, Oxford University
- (3) Beamline simulation by BDSIM (Geant4)
RHUL
- (4) Fast feedback system, FONT and feedforward system
Oxford University, Daresbury lab.
- (5) Monalisa ; Compact Straightness Monitor (CMS) at IP
Oxford University
- (6) S-band BPM (Design, Electronics system)
RHUL, Oxford University

Hardware Issues due to budget shortage in JFY2008

The highest priority is to transfer beam to the dump at ATF2.

- (1) There are 14 stripline BPMs in total at new extraction line and ATF2. The cables have to be reused from present ones. It is not clear that their lengths are enough. Some of them may have no cables.
- (2) Who provides a PLIC cable system for beam loss monitor at ATF2 ? - Originally, SLAC could do.
- (3) There is only one ICT. MC1X will not be available behind QD20X.
- (4) There are 4 skew quadrupoles for the coupling correction. At present, only QK1X and QK4X are available together with 20A power supplies. Who provides two remained skew quadrupoles. ?
- (5) Honda monitor and sweeping magnet is not funded.
- (6) Laser tracker system (Raika co.) is close to the lifetime (> 15 years old). It may affect beam line alignment in this summer. Is it available as rental or who can purchase it ?

Software Issues

Coordination is important for international collaboration.

- (1) Commissioning strategy, tools
The commissioning group will provide them.
- (2) Flight simulator for modeling the beam line and tuning.
Demonstration was done at the present extraction line.
Preliminary results will be presented here.
- (3) Magnet movers and QBPMs etc.
Corresponding sub groups have responsibilities.
- (4) Remoto 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.

Site work Issues

Scheduling is very important particularly in this summer.

- (1) The re-organization and modification of extraction line will be completed **by end of July**, which includes;
 - All the magnets will be aligned.
 - After the movement of two extraction kickers,
we need to check the HV-system probably in **July**.
- (2) Commissioning of Shintake monitor system with no beam
 - High power laser system in restrictive area, - **August**
 - The laser system will move in a laser hut, **September**.
- (4) Installation of the FD system, **September**
 - Major components will be shipped from LAPP to KEK,
including the table, 4 magnets and s-band BPMs with supports

ATF2 will be commissioned in early November 2008.

Recent progress and near future plan

- (1) Re-configuration will be started in early June.
- (2) Concrete shields and beam dump have been completed in April.
- (3) All magnets except for 4 FD-ones have been installed at ATF2 beam line.
- (4) Power cables and cooling pipes have been installed.
- (5) The HA-PS system has arrived at KEK, 1st May.
- (6) S band BPMs (4) will be fabricated by end of June at KNU.
The electronics is provided by UK group.
- (7) Shintake monitor has been installed at IP. The optics system is setting up
and it will be commissioned in May.
- (8) FD system will be arrived in early September from LAPP.

Meeting schedule

- (1) Weekly meeting, Wednesday
- (2) **Project meeting, 26-28 May, during Nanobeam 2008, Novosibirsk and Webex.**
- (3) 6th TB and SGC Joint meeting , 11-12 June
- (4) Mini-workshop on the ATF2 flight simulator, 18-20 June, LAL, Webex

Conclusion

- ATF2 is a well-organized world collaboration...
- ...working on a fundamentally-important issue which must be solved for any future acceleration technique
- Given the past history of MPI-Munich (movers built, muon cooling, plasma-wake-field studies, it would seem that the BDS would be a logical part of its future activities...
- And could join the ATF2 collaboration (and would be welcome)...