

# 4<sup>th</sup> Meeting of the ATF Technical Board and System/Group Coordinators

Cockcroft Institute  
Daresbury, UK

28-29 May, 2007



Science & Technology  
Facilities Council

**The Cockcroft Institute**  
An International Centre for Research in  
Accelerator Science and Technology



## ATF Technical Board

The Technical Board (TB) consists of approximately 4~5 members from each of the Asian, North American and European regions. The members of the ATF Technical Board are nominated and appointed by the International Collaboration Board (ICB). The TB serves the following tasks:

- At the request of ICB, assist the Spokesperson in formulating the ATF Annual Activity Plan, which outlines the activity plans of ATF/ATF2 including the budget and beam time allocation for each Japanese fiscal year.
- Assist the ICB in assessing the scientific progress that is being made by the ATF collaboration.

# ATF Technical Board Membership

## Europe

E. Elsen, DESY

G. Blair, RHUL (Royal Holloway, University of London)

P. Burrows, Oxford University

F. Zimmermann, CERN

A. Wolski, CI

## North America

T. Raubenheimer, SLAC

M. Ross, FNAL

## Asia

K. Yokoya, KEK

N. Toge, KEK

T. Sanuki, University of Tokyo

J. Gao, IHEP

E-S. Kim, KNU



## ATF System/Group Coordinators

The System/Group Coordinators will be appointed by the Spokesperson with the approval of ICB.

The appointment of the System/Group Coordinators shall be made in a manner consistent with the ATF Annual Activity Plan.

The System/Group Coordinators will coordinate the tasks charged to the assigned Systems or Groups, and will help the Spokespersons and the Deputies to coordinate the ATF/ATF2 research programs.

In case of any small study group with less than five members, the Spokesperson or the Deputies may assume the role of Coordinator for this group on an acting basis.

## ATF System/Group Coordinators

Deputy for Beam Operation: Shigeru Kuroda (Toshiyuki Okugi)

Deputy for Hardware Maintenance: Nobuhiro Terunuma (Masao Kuriki)

Deputy for ATF2: Andrei Seryi (Toshiaki Tauchi)

Hans Weise, DESY

Frank Zimmermann, CERN

Philip Burrows, Oxford

Grahame Blair, RHUL

Philip Bambade, LAL

Marc Ross, FNAL

Janice Nelson, SLAC (not decided)

Andrei Seryi, SLAC

Bob Meller, Cornell

Jie Gao, IHEP

Eun-San Kim, KNU

Kiyoshi Kubo, KEK

Shigeru Kuroda, KEK

Nobuhiro Terunuma, KEK

Masao Kuriki, KEK

Toshiaki Tauchi, KEK

Toshiyuki Okugi, KEK

Riyuhei Sugawara, KEK

Tomoyuki Sanuki, University of Tokyo

# Agenda for 4th ATF TB/SGC Meeting, CI, 28-29 May 2007

## Review of Hardware and Instrumentation R&D at ATF Jan-May 2007:

Plan of beam extraction by using strip-line kicker with pulse bump orbit (Takashi Naito)

Laser wire R&D progress (Stewart Boogert)

FONT R&D progress (Glenn Christian)

X-SR and CSR R&D (Nobuhiro Terunuma)

IP cavity nm-resolution BPM (Yosuke Honda)

Status of ATF DR BPM upgrade (Janice Nelson)

Plan and preliminary results for fast ion instability study (Junji Urakawa)

## Proposals for new studies:

MONALISA in ATF (David Urner)

ILC LC-BEAM-3 collimator damage test (Nigel Watson)

## Status of ATF2 project (Toshiaki Tauchi and Andrei Seryi)

## TB and SGC joint discussions:

ATF2 construction schedule and beam commissioning.

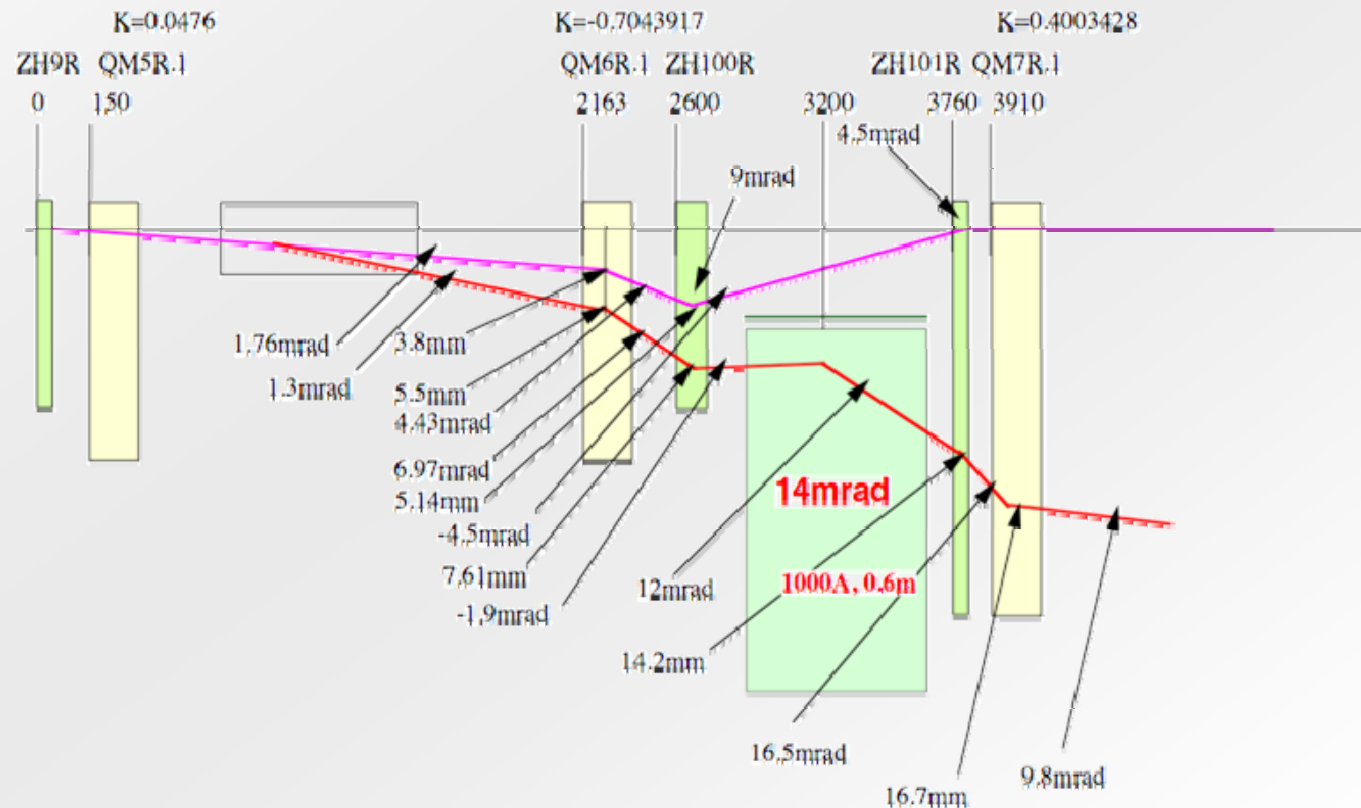
Remote participation by collaborators in ongoing research program at ATF.

# Beam extraction using fast kicker/pulse bumped orbit (T. Naito)

System required to produce beam with ILC-like time structure in ATF2 by single-bunch extraction from ATF damping ring.

Will use two fast ( $\sim 3$  ns) kickers, pulsed orbit bump, and septum.

On schedule for beam tests in Spring 2008.

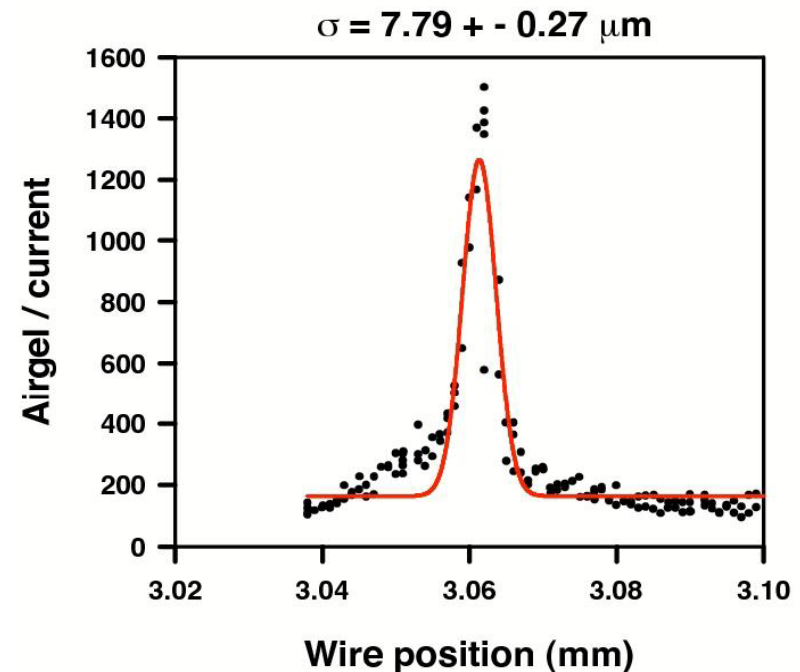
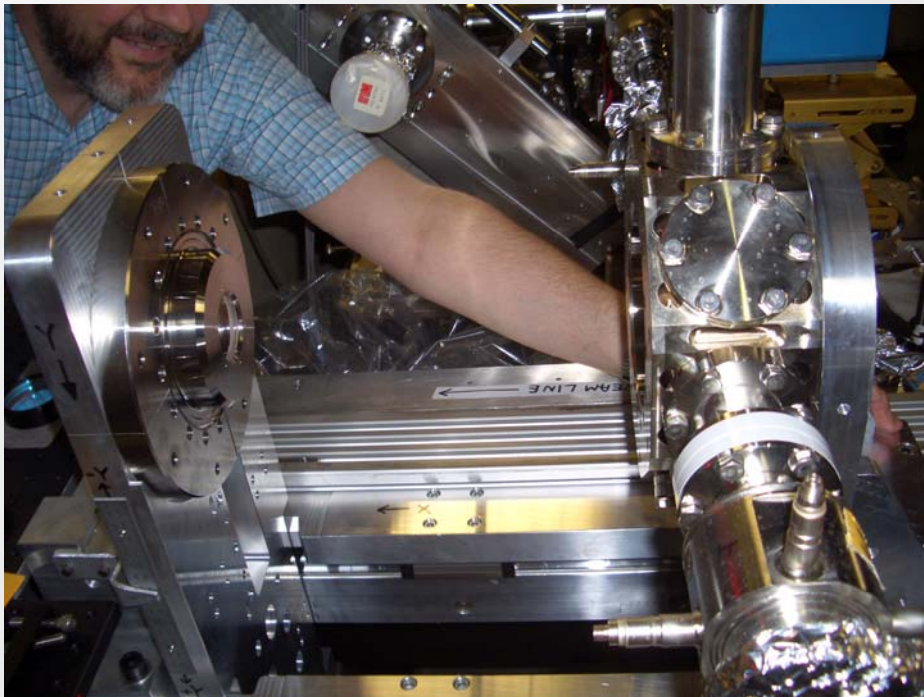


## Extraction line laser wire (S. Boogert)

Aims for fast beam-size measurement in extraction line with micron precision.

Extensive characterisation of system performance and various improvements and upgrades made over the past year, including installation of new (custom) lens.

Beam-size measurement of  $8\text{ }\mu\text{m}$  demonstrated. Laser upgrade in summer 2007 planned, in order to reduce laser waist size.



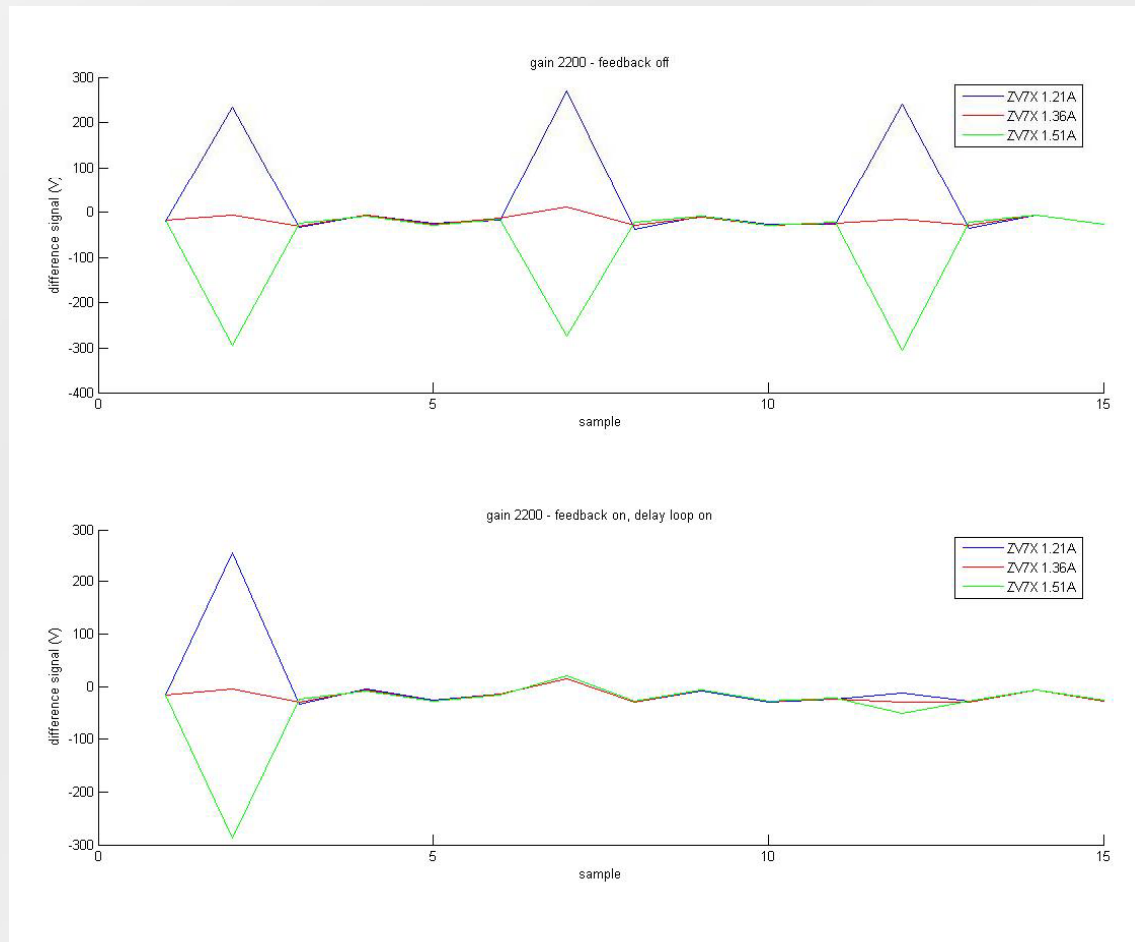


# FONT4 R&D Progress (G. Christian)

Aims to develop digital technology for feedback at ILC IP on nanosecond timescales.

Current system goal is for total latency of 140 ns or less.

This goal has now been demonstrated in beam tests in the ATF extraction line, using bunches with 154 ns separation.

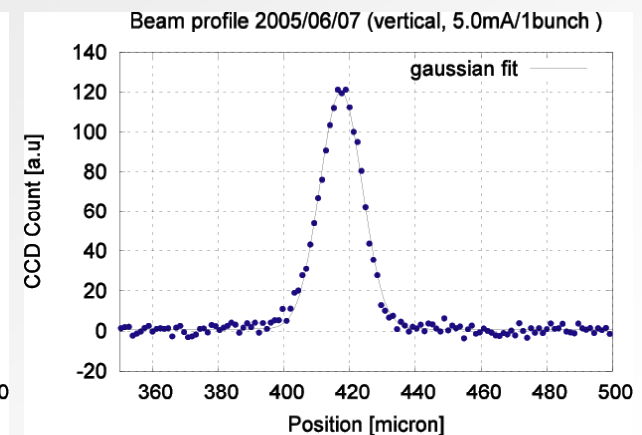
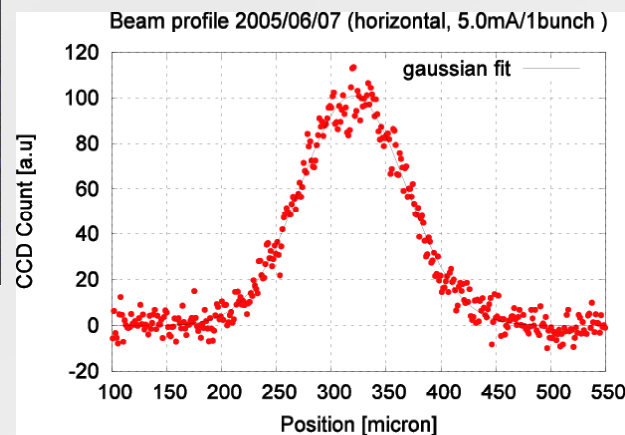
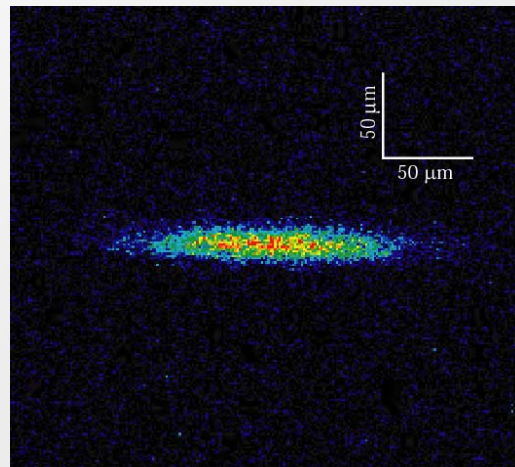


# X-ray synchrotron radiation beam-size monitor (N. Terunuma)

Aims to develop a fast ( $\sim$  ms) beam-size monitor with micron resolution, for damping ring tuning and maintenance of optimum performance.

Earlier studies (2005) revealed orbit oscillations at a frequency of 100 Hz, and amplitude of around  $10\text{ }\mu\text{m}$  in the vertical.

Following grounding and shielding work on the ATF electrical systems, the amplitudes of orbit oscillations have been reduced substantially.

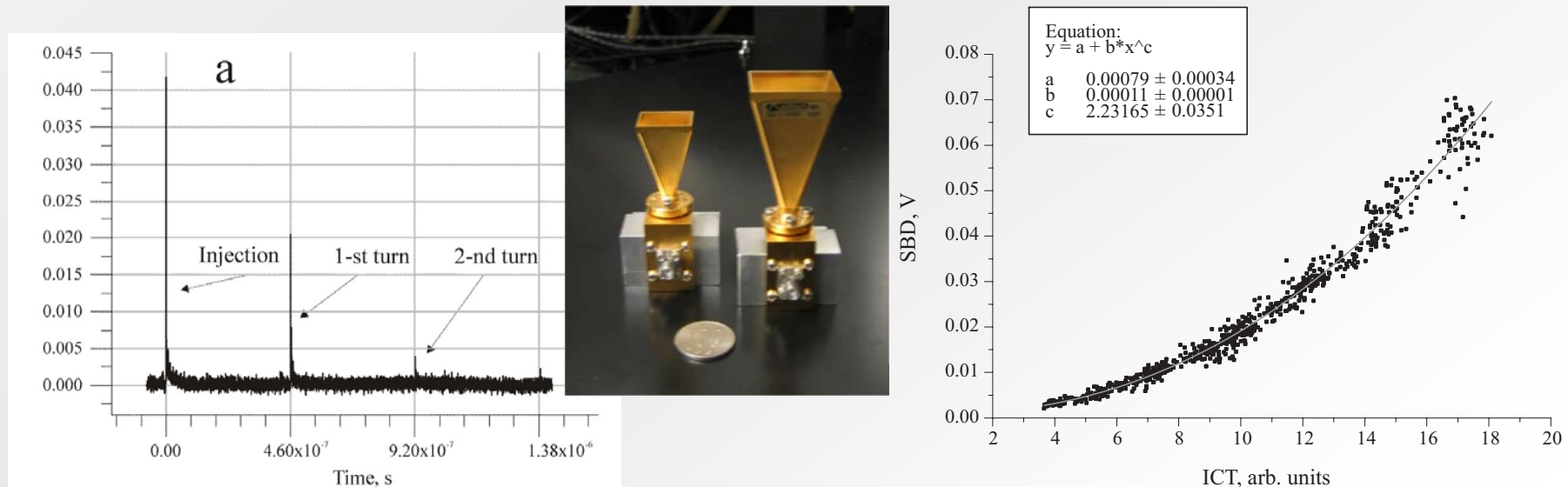


# Coherent Synchrotron Radiation (A. Aryshev)

CSR has the potential to impact beam stability in the ILC damping rings. The project at the ATF aims to characterize CSR effects in the storage ring, and validate theoretical models.

Using a Schottky Barrier Diode, mm-wavelength signals have been detected from the beam in a dipole in the first few turns after injection. The strength of the signal increases as the square of the bunch charge as expected for coherent radiation; but wake fields may also display this behaviour.

Tuning the injection systems on the mm-wavelength signal has been shown to be an effective technique for optimizing injection into the ATF damping ring.



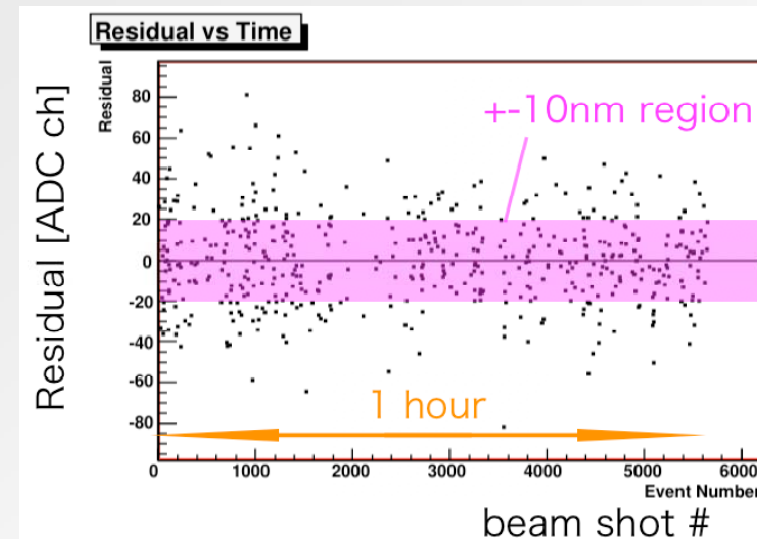
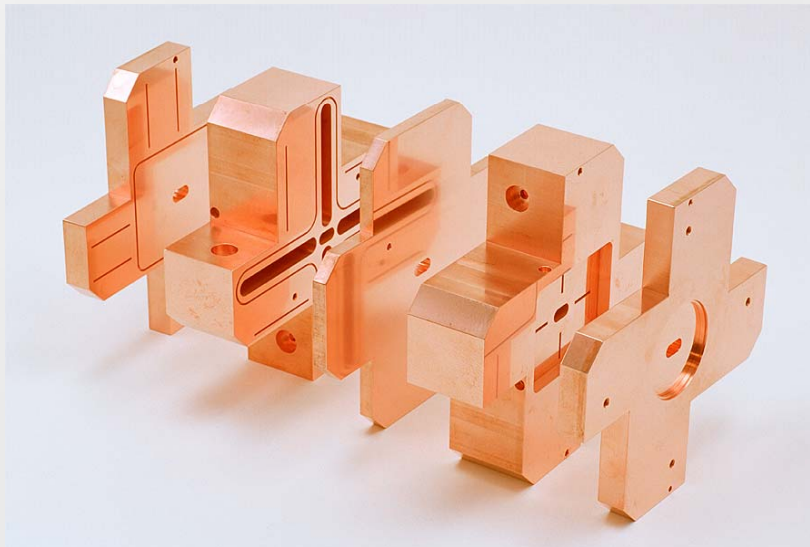
# IP cavity nm-resolution BPM (Y. Honda)

Aim is to develop a cavity BPM with nm resolution, which can be used at the IP of ATF2, to confirm achievement of the goal of delivering beam with stability on the nm level.

Two BPMs have been fabricated, the detection electronics developed, and the BPMs have been installed, calibrated and tested in the ATF extraction line.

Resolution of around 8 nm has been demonstrated at a bunch charge of  $7 \times 10^9$ .

Further developments are planned to improve time resolution capability for multibunch mode.



# ATF damping ring BPM upgrade (J. Nelson)

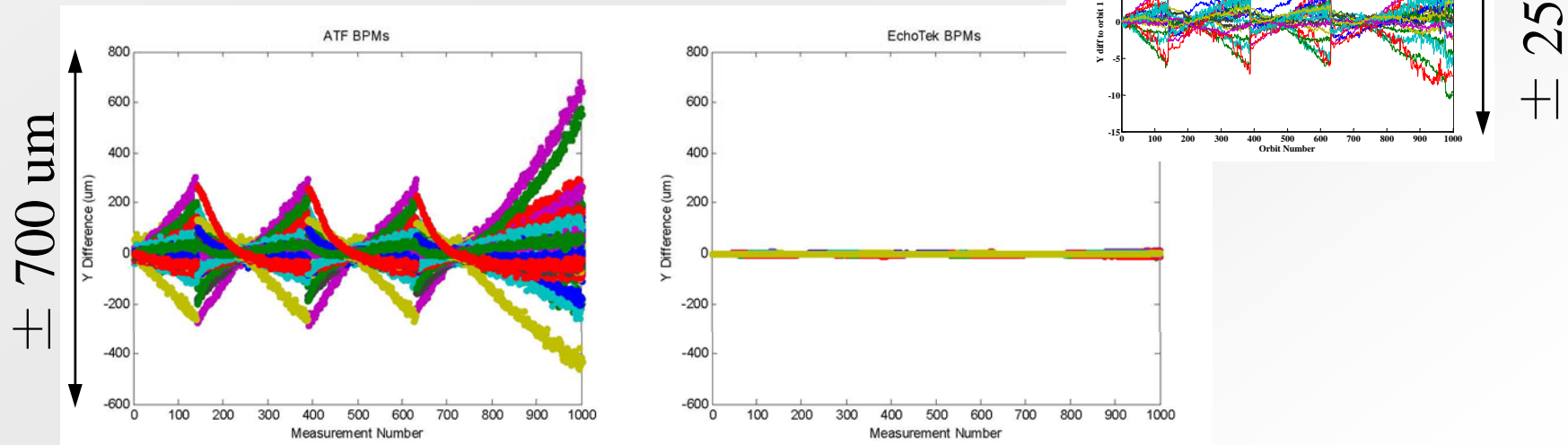
Improved BPM performance at ATF is needed in order to demonstrate the goal of 2 pm for the ILC damping ring vertical emittance.

Progress continues with installing and testing Echotek BPM electronics at the ATF.

Digital electronics provides high-resolution ( $\sim \mu\text{m}$ ) turn-by-turn measurements with good stability and low systematics.

Currently, twenty BPMs (ten in each arc) have been installed, with recent modules provided by Fermilab.

Significant improvements are already seen in BBA data collection and analysis.





# Fast ion instability: recent results and future plans (J. Urakawa)

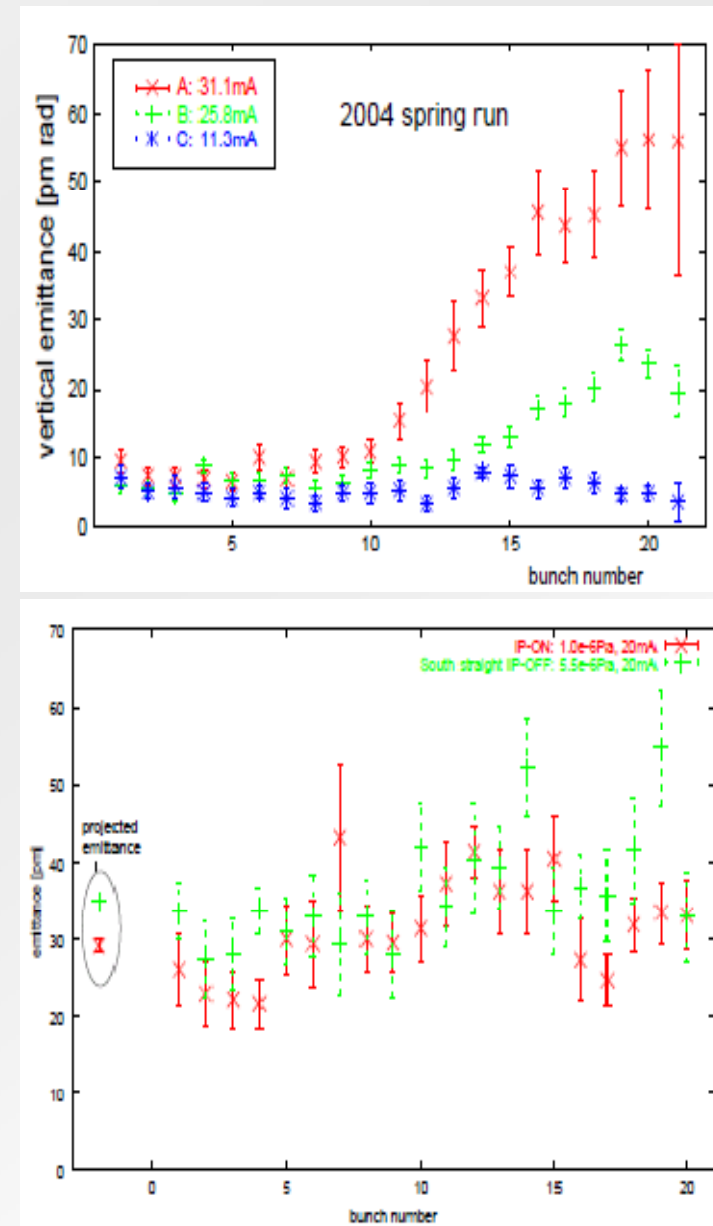
Fast ion instability is a serious concern for the ILC damping rings.

Experiments at ATF in 2004 showed beam-size blow-up along the bunch train, as a function of beam current and vacuum pressure.

The experiments were repeated in early 2007, but no clear blow-up was observed.

The difference may be due to the vertical emittance, which was around 5 pm in 2004, and 20 - 30 pm in 2007.

The experiments will be continued later in 2007, with (it is hoped) much lower vertical emittance, and with a “gas inlet vacuum chamber” to provide a local pressure bump.



## Proposal: MONALISA (D. Urner)

MONALISA aims to demonstrate monitoring of the relative position of a final doublet quadrupole and the Shintake monitor in ATF2 at the nanometre level.

Ultimately, the goal would be to monitor the position of the IP BPM at the same level, as part of the overall goals for nanometre beam stability in the second phase of ATF2.

The vacuum pipes required for the laser beams in the monitoring system have the potential to introduce forces on the final doublet quadrupoles and the Shintake monitor. This issue needs to be carefully considered as part of the plan. Initial studies are required to understand the potential impact, and to demonstrate that no adverse effects will result.

# Proposal: LC-BEAM-3 collimator damage test (N. Watson)

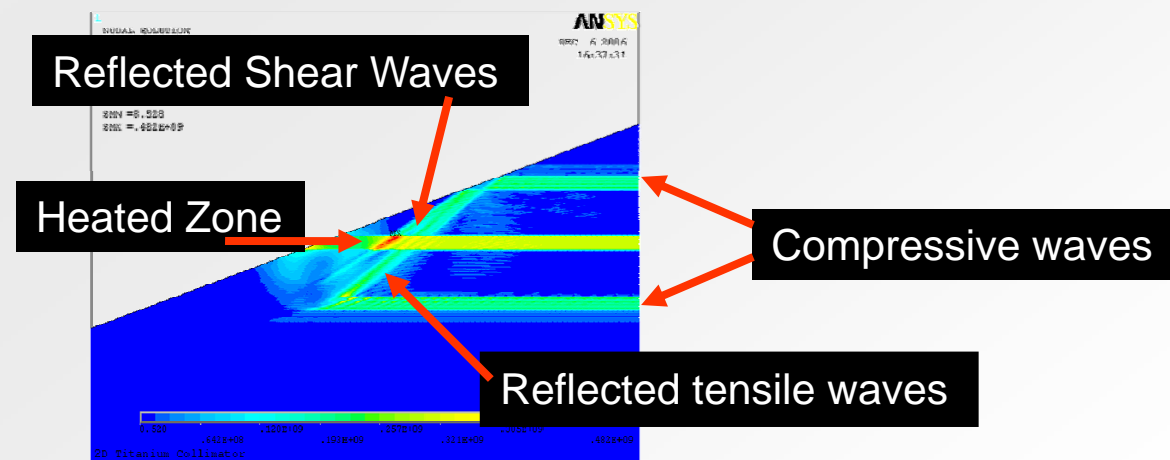
The goal is to collect data on the effect of beam impact on candidate materials for the ILC collimators, including titanium alloy.

Data on performance of different materials under impact of high-energy electron bunches are needed in parallel with collimator wakefield studies, to optimize the design of the ILC collimators.

The ATF extraction line provides a unique opportunity to perform these tests in a relevant regime of beam energy and beam size.

Fractures and the impact of shock waves are a concern.

Data are required to validate models of mechanical response to the energy deposition, including shock waves.

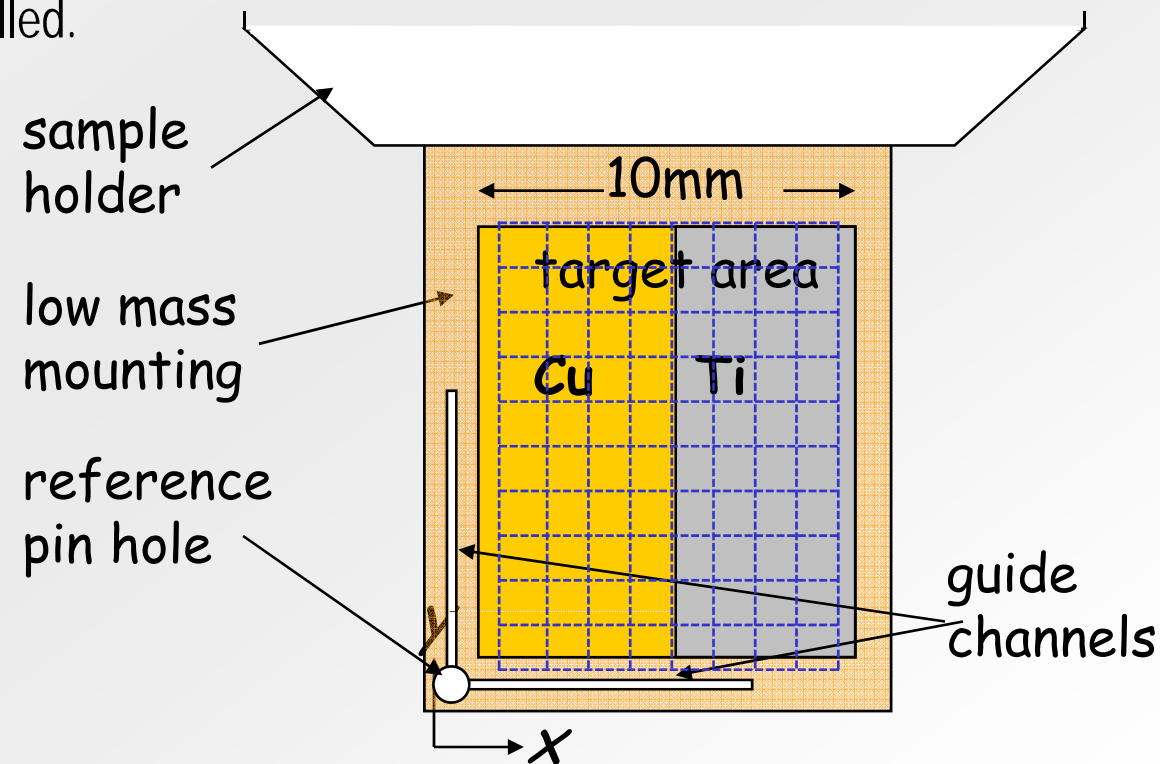


## Proposal: LC-BEAM-3 collimator damage test (N. Watson)

Initial experiments would involve locating a movable sample of candidate materials in the ATF extraction line, to be impacted by the beam.

Further experiments would allow measurement of the potentially damaging shock waves in a sample generated by a bunch impact.

For these experiments to be carried out, the radiation rules at ATF need to be modified (expected in the next few months), and the radiation that will be generated by the tests must be carefully modelled.



## Discussion: Remote participation in ATF studies

Workers at SLAC participated in BBA studies at ATF in February 2007.

Computer connection (“desktop sharing”) provided by WebEx.

Audio/video connection provided by Skype.

ATF rules restrict remote “control” of the machine, for reasons of personnel and machine protection.

Experience was frustrating at times, but ultimately very successful.

Several options exist for IT tools to support:

- sharing data;
- remote participation.

Experiments should continue, but should not be too ambitious too quickly.





## Conclusions

The ATF continues to provide a unique facility for an active R&D program on instrumentation and beam dynamics.

The R&D program at ATF is focused on critical issues for the ILC.

There continue to be important developments. Two new proposals:

- MONALISA for ATF2
- beam collimator damage tests

were approved by the Technical Board and System/Group Coordinators, subject to certain conditions.

IT tools are becoming available to support data sharing and remote participation in experiments. Initial tests have been encouraging, and it is hoped there will be increasing opportunities for remote participation by ATF collaborators.