

# *ATF2 beam commissioning plan*

*Toshiyuki Okugi*

*2008 / 10 / 1*

*ATF2 Special Project Meeting*

*KNU, Korea*

# *ATF beam operation schedules in this JPY*

10 2008						
Su	Mo	Tu	We	Th	Fr	Sa
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3 2009						
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*- Beam operation of ATF2 will be started from November 2008.*

*-In October 2008, we will start the RF aging of new RF gun.*

*- We will start the commissioning of new RF gun  
in the first week of November 2008*

## *Priority of the Commissioning Task*

*The main task of the commissioning team is to achieve the 35nm vertical beam size at ATF2 IP.*

*But ...*

*The 1<sup>st</sup> priority of the ATF2 commissioning in 2008 is **to pass the radiation inspection**. The radiation inspection is not only for ATF, but also for all of KEK accelerators.*

*In the radiation inspection, we must operate the ATF with 10% of maximum beam power ( $2 \times 10^{10}$  20 bunches 12.5Hz). The beam intensity is far from the normal operation.*

*We must concentrate not only ATF2 beamline commissioning, but also reduction of the injection loss to DR.*

- We will install new RF gun to reduce the dark current.*
- We must stabilize the linac water system.*
- We must put more radiation shield etc. .*

# ATF Beam Schedules

*GDE meeting in Chicago  
difficult to 24 hours operation*

*radiation inspection*

## 10 2008

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## 12 2008

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- preparation of radiation inspection
- radiation inspection
- beam study time

# *The list of beam commissioning team tasks for commissioning from radiation inspection*

## *Beam deliver to the dump with small beam loss*

- Beam delivery to the dump*
- New RF gun commissioning*
- Realize the good injection efficiency ( linac stabilization etc. )*
- PLIC cable ( ?? )*

## *Hardware Commissioning for ATF2 ( including the software work )*

- Commissioning of traditional beam monitors ( stripline BPM, screen Monitor, ICT )*
- Commissioning of magnet PS*
- Commissioning of magnet mover and guarder ( beam steering test with mover )*
- Commissioning of cavity BPM ( calibration of position sensitivity with beam )*
- Commissioning of carbon wire scanner*

# Special beam time requests

## Fast kicker study

For the fast kicker study, since we must replace the extraction kicker, and make the physical aperture small for installation of the in-vacuum septum magnet, it is **difficult to do the beam study in ATF2 beamline.**

## Damping ring retuning

It is better to tune the damping ring **as early as possible**, because DR optics change affect the downstream beamline.

## Beam time for the graduate students

We have **3 graduate students**, who must write the master thesis in this physical year.

- Two of them are investigate the **IP-BSM** (Shintake monitor), and the **deadline for the thesis are the beginning of January.**
- The other student belongs to the **cavity Compton** group, and the **deadline for the thesis is early February.**

Thereby, we must keep the beam time to them.

## Dedicated beam time request from oversea collaborators

Total 6 and more dedicated beam time are requested **at the end of 2008.**

1 from Glen White ( Flight Simulator )

3 from Steve ( Flight Simulator, Eddy Current, problematic extraction BPM )

2 from Mauro Pivi ( QM7R problem, beta matching from DR to EXT )

X from Andy Wolski ( BBA )

Total 2 dedicated beam time are requested **at January 2009** for cold cavity BPM test.

DR Retuning ??

# ATF Beam Schedules

SLAC team request

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Fast Kicker

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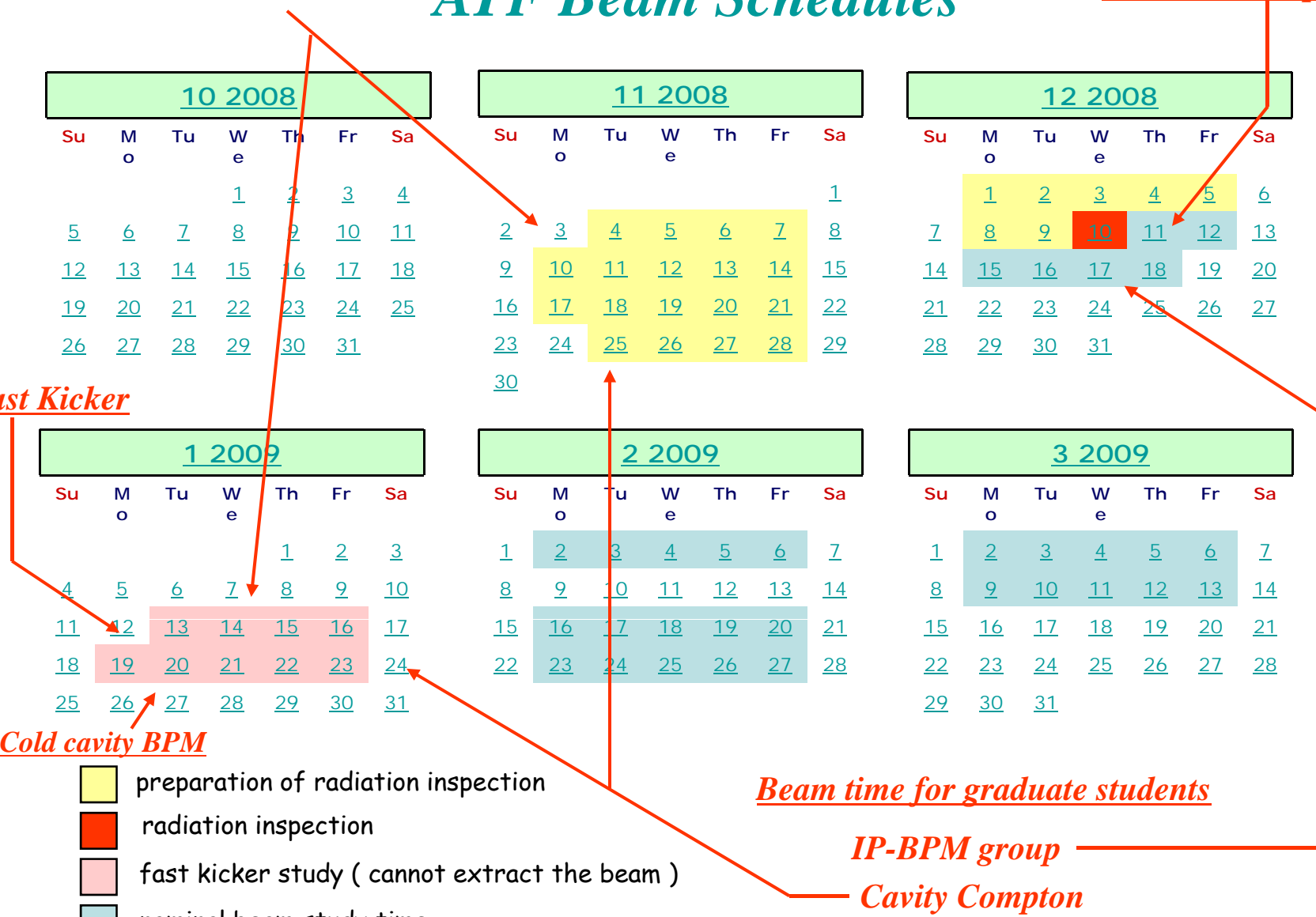
Cold cavity BPM

- preparation of radiation inspection
- radiation inspection
- fast kicker study ( cannot extract the beam )
- nominal beam study time

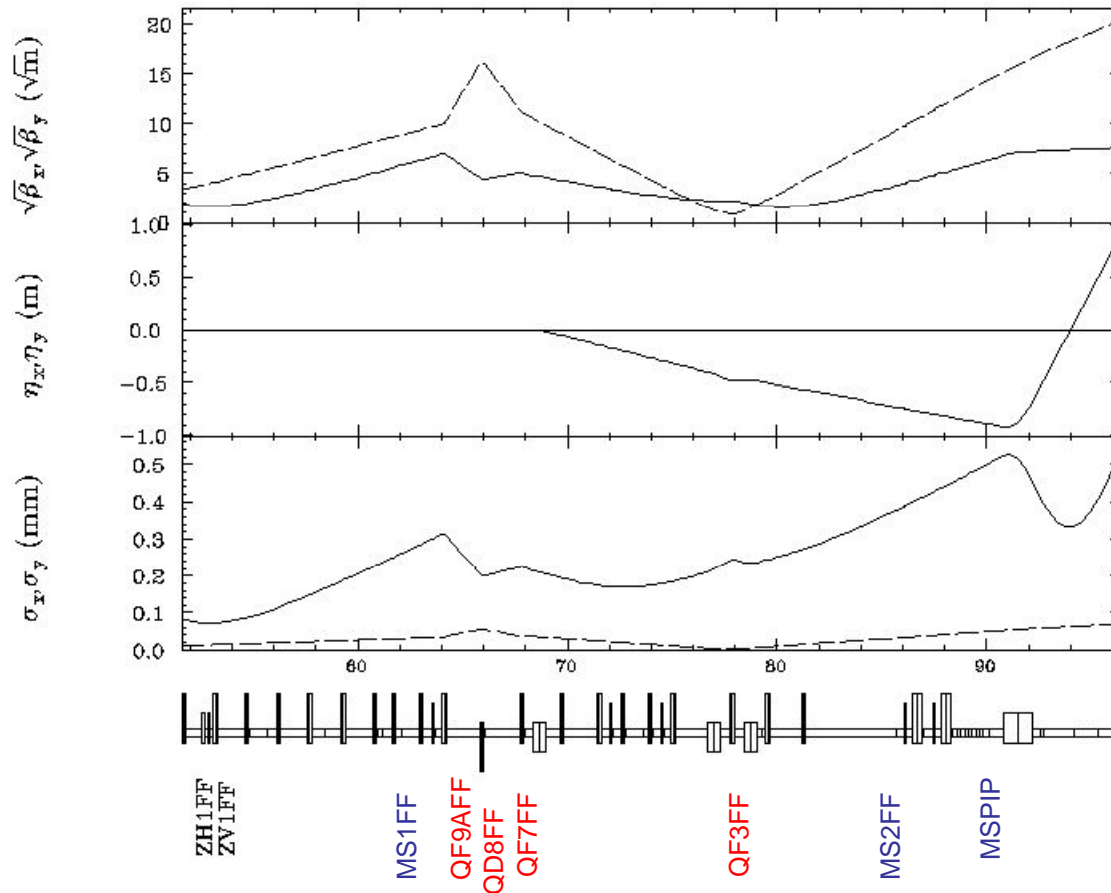
Beam time for graduate students

IP-BPM group

Cavity Compton



# Special Optics for Radiation Inspection



*Extraction section*

*same to the nominal*

*Final focus section*

*turn on only 4 quads*

**QF9AFF 0.293 1/m**  
**QD8FF -0.387 1/m**  
**QF7FF 0.144 1/m**  
**QF3FF 0.195 1/m**

## Advantage

*Small beam size through all of beam line*

*Small number of hardware*

*Possible to be BPM calibration, and first step of BBA*

*Possible to be mechanical alignment of bending magnet rotation*

*Fix the strength of the bending magnet and easy to make a orbit reference*

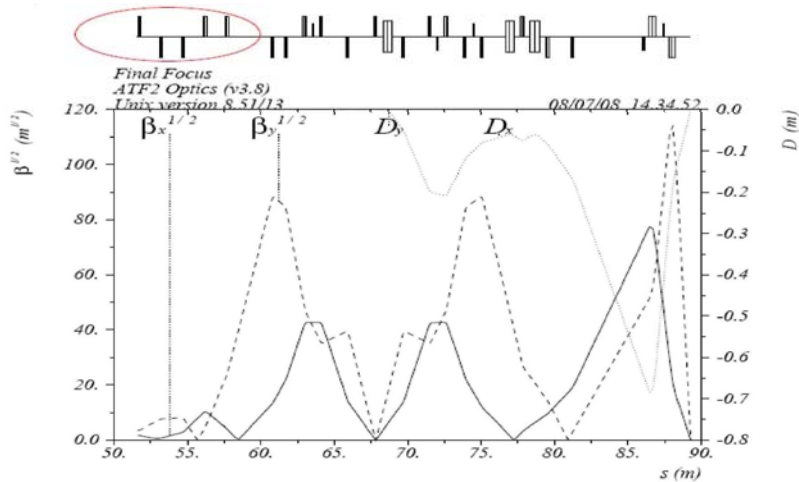
## Disadvantage

*Small number of beam steering knob*



# Proposed beam Optics after Radiation Inspection

Proposed by S. Bai, IHEPP



$\beta_x = 4 \text{ cm}$   
 $\beta_y = 8 \text{ cm}$

*long Rayleigh length*

*Beam size at IP*

$\sigma_x = 8.9 \text{ micron}$  ( 3 times larger than nominal )

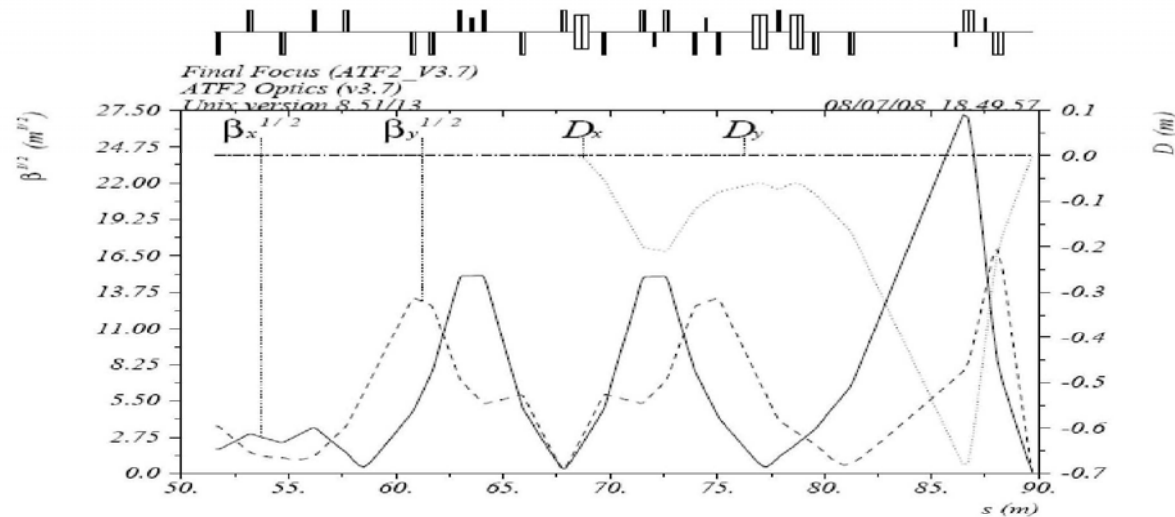
$\sigma_y = 0.96 \text{ micron}$  ( 30 times larger than nominal )

*enough for IP-BPM study*

*Maximum beam size*

$\sigma_x = 0.9 \text{ mm}$  at QF1FF *easy to tune*

$\sigma_y = 60 \text{ micron}$  at QD0FF *with small radiation loss*



*Strength of QM series was modified from nominal optics.*

# *The list of beam commissioning team tasks*

*For Commissioning from February 2009 ??*

## *Optics Modeling ( ORM ? )*

- *Measurement of the quadrupole strength error and optics modeling of the extraction and ATF2 beamline*
- *BBA ( with/without Mover )*

## *Beam diagnostics at extraction line*

- *Dispersion correction*
- *Coupling correction*
- *Beta Matching*
- *Emittance growth study from DR to EXT*

## *Hardware Development*

- *IP-BSM ( continued )*
- *IP BPM*
- *Laser Wire Development*

## *Feedback Study*

- *Orbit Feedback ( long term )*
- *Intra-train feedback*
- *IP feedback*

## *IP beam size tuning with IP BSM*

## *Summary of the present ATF2 commissioning plan*

- *The 1st priority of the ATF2 commissioning **until radiation inspection** is to pass the inspection.*
  - *The beam optics is used with small number of hardware devices and make beam size trough all over the beamline small.*
  - *If possible, we will retune the DR optics, and do the cavity Compton experiment.*
- *In December 2008, we will change the ILC-like large beta optics ( B. Sha optics ) for*
  - *checking the all of the hardware devices.*
  - *testing of the beam steering only with mover for ILC-like optics.*
  - *testing of the beam size tuning with ( Carbon ) wire scanner.*
  - *making the beam size enough to small for IP-BSM detector test.*
- *In January 2009, we will exchange the extraction kicker to the fast stripline kicker and make the first trial of the fast kicker R&D.*
  - *If possible, we will retune the DR optics, and do the cavity Compton experiment.*
- *From February 2009, we will start the most of the main ATF2 study.*