



# Prospects of KEK in JFY 2007

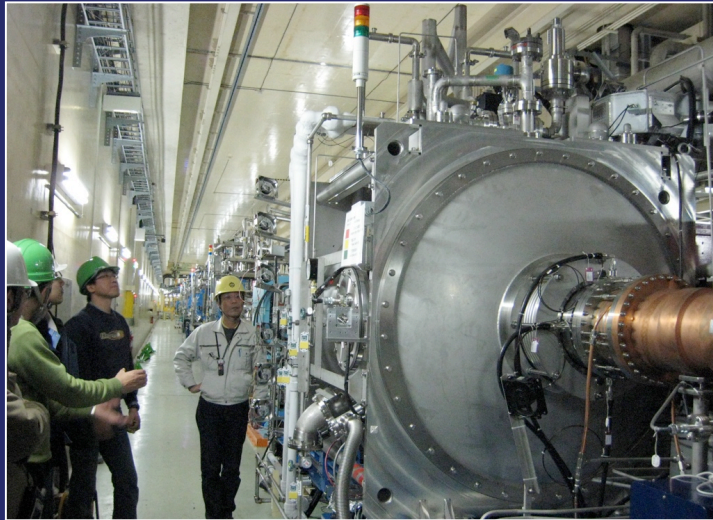
Fumihiko Takasaki (KEK)



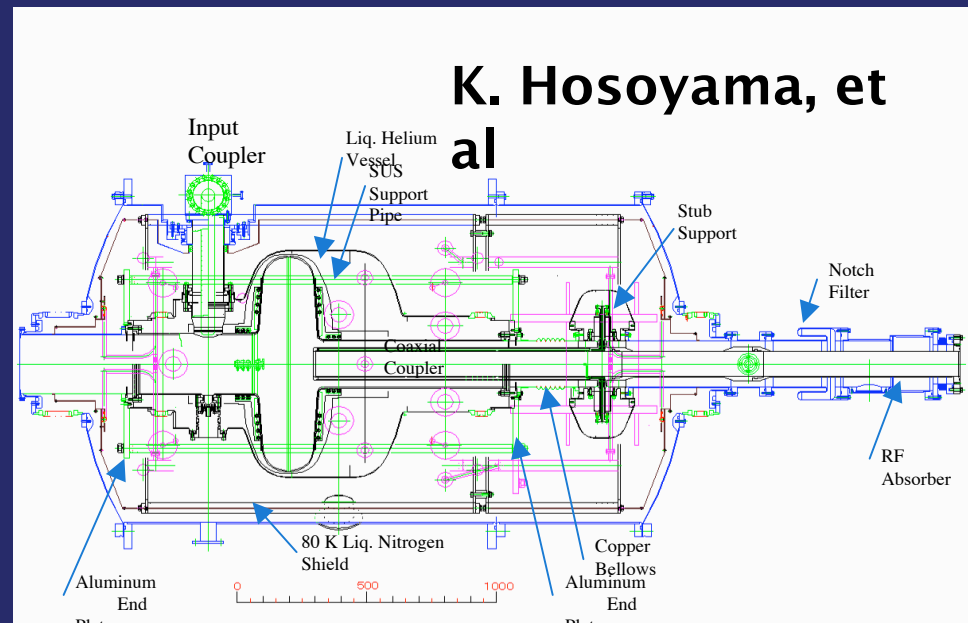
# Crab Cavities



# Crab Cavities have been installed in the KEKB tunnel. (1 cavity per ring.)



## Electron Ring (8 GeV)



## Positron Ring (3.5 GeV)

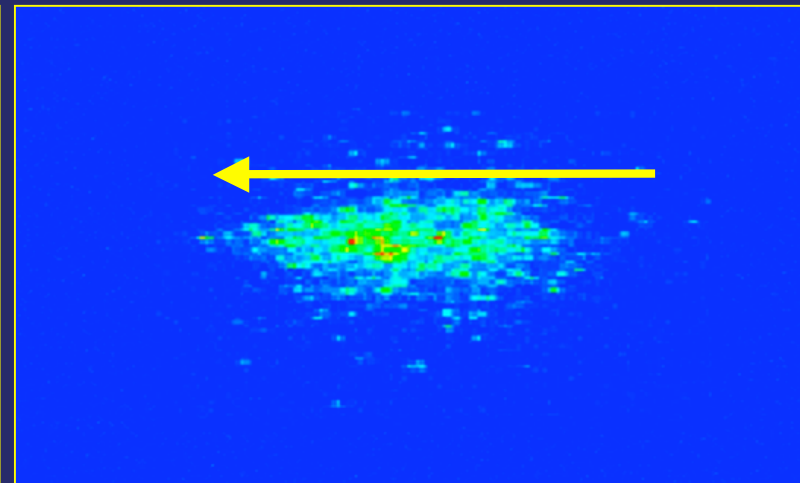
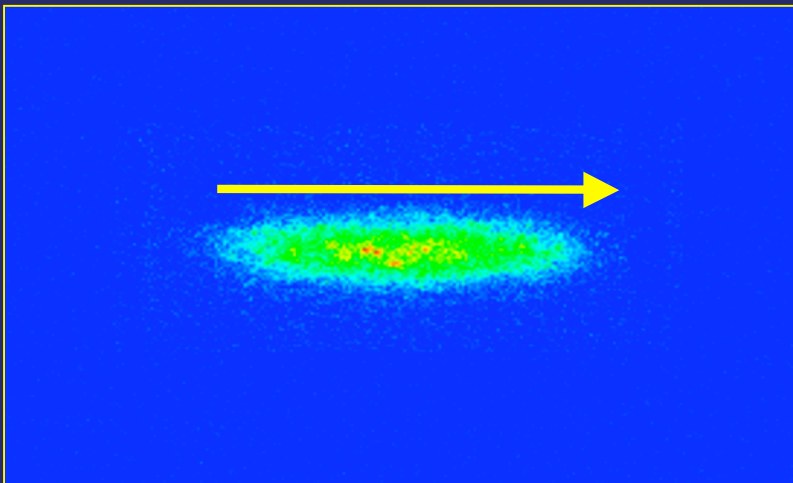


# Beams are indeed tilted!

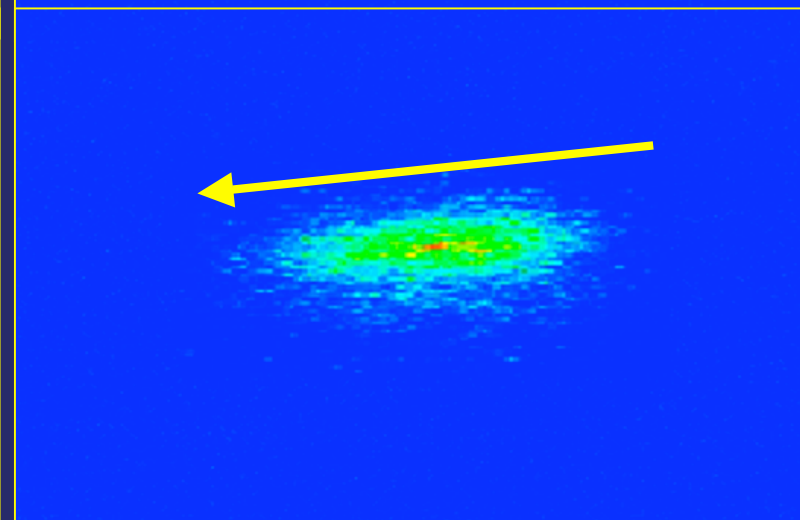
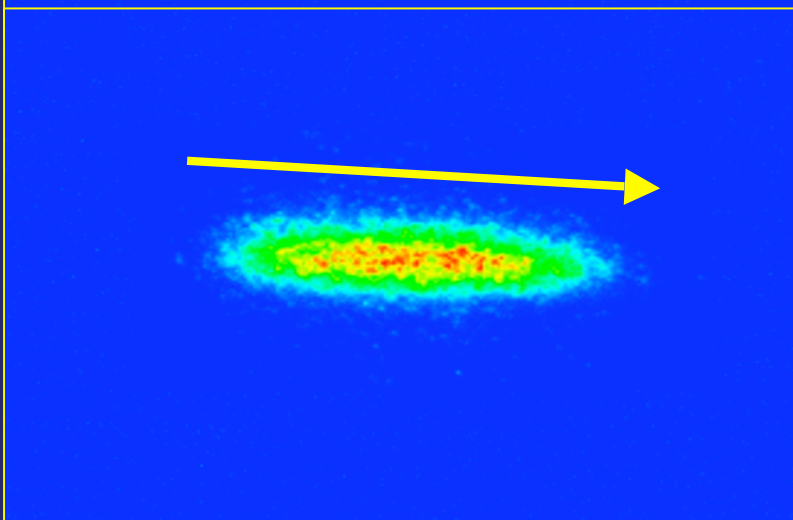
HER

LER

Crab  
OFF



Crab  
ON





**Let us congratulate the KEKB team, especially the Crab cavity team, for the successful installation and implementation of the Crab cavities.**

**We hope the luminosity will be increased as is planned.**



# What's New about KEK



# Director General

**Yoji Totsuka → Atsuto Suzuki**



# KEK : High Energy Accelerator Research Organization







# Budget in FY2007 (Oku-Yen)

	FY2006	FY2007	
<b>Civil Eng.</b>	<b>107.4</b>	<b>89.7</b>	
<b>Projects</b>	<b>158.0</b>	<b>157.1</b>	
<b>Salary, etc</b>	<b>145.9</b>	<b>140.4</b>	
<b>Total</b>	<b>412.3</b>	<b>388.9</b>	
<b>Projects</b>	<b>KEKB</b>	<b>78.8</b>	<b>74.0</b> ↓
	<b>P. Factory</b>	<b>31.0</b>	<b>30.7</b>
	<b>J-PARC</b>	<b>33.4</b>	<b>43.0</b> ↑
	<b>Japan-US</b>	<b>8.7</b>	<b>4.4</b> ↓
	<b>ATLAS</b>	<b>3.2</b>	<b>2.2</b> ↓
	<b>Others</b>	<b>2.8</b>	<b>2.8</b>



- ★ **We are in a process of establishing the JFY2007 budget at KEK. We would like to minimize the impact of budget cut in the projects other than the J-PARC. It is obviously painful to cut budgets of the projects which are working quite well.**

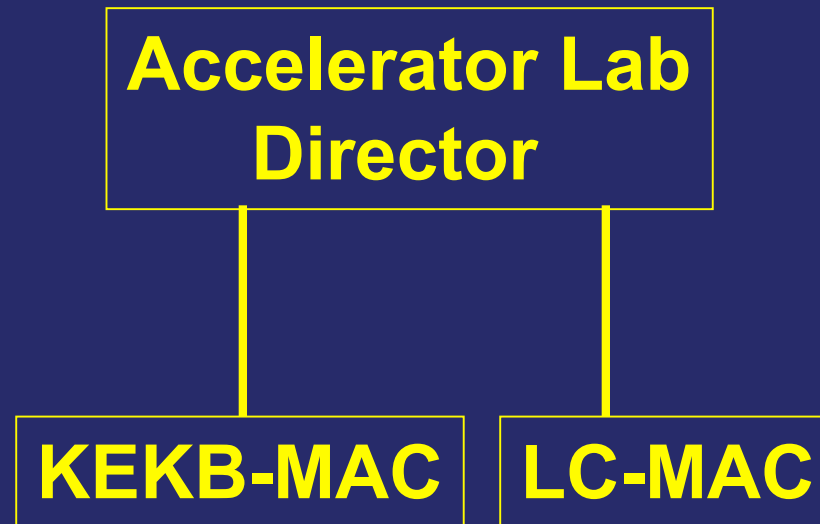
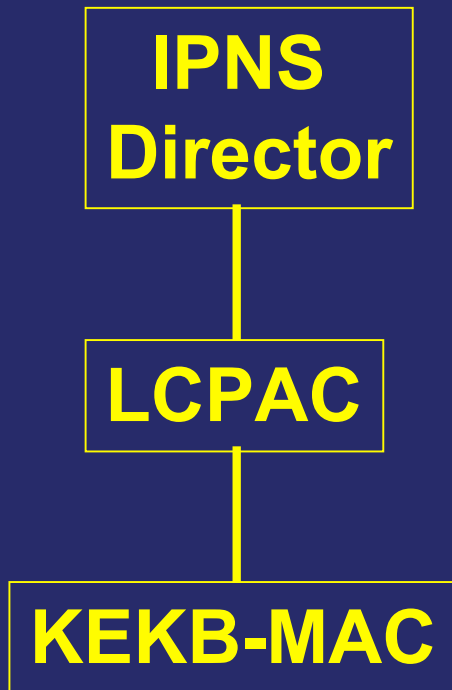
**We hope that we can come up with a good proposal which is acceptable to all parties.**



# ☆ About Advisory Committees



Clarifying and sharing the responsibility of labs.





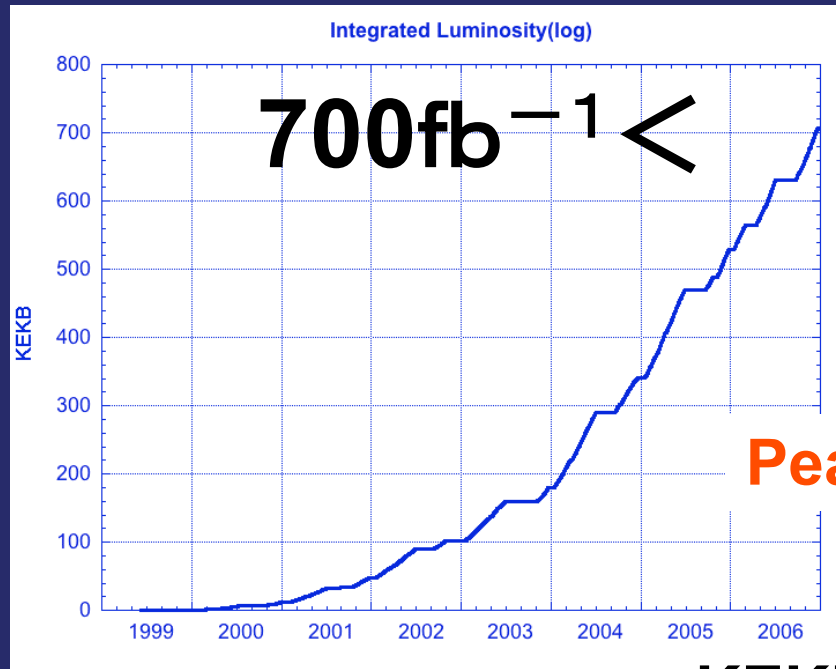
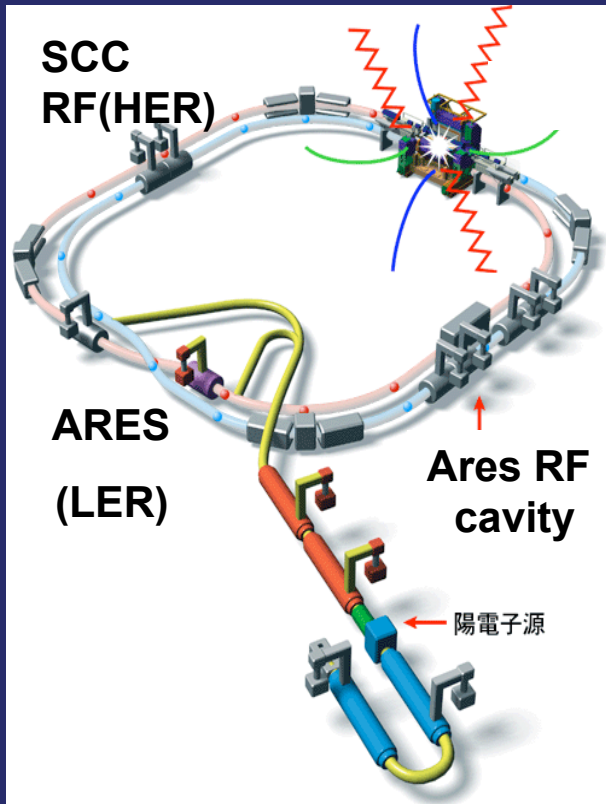
**We hope that this committee  
provides us with  
recommendations for the KEKB  
accelerator, especially for further  
improvement of the KEKB  
luminosity.**



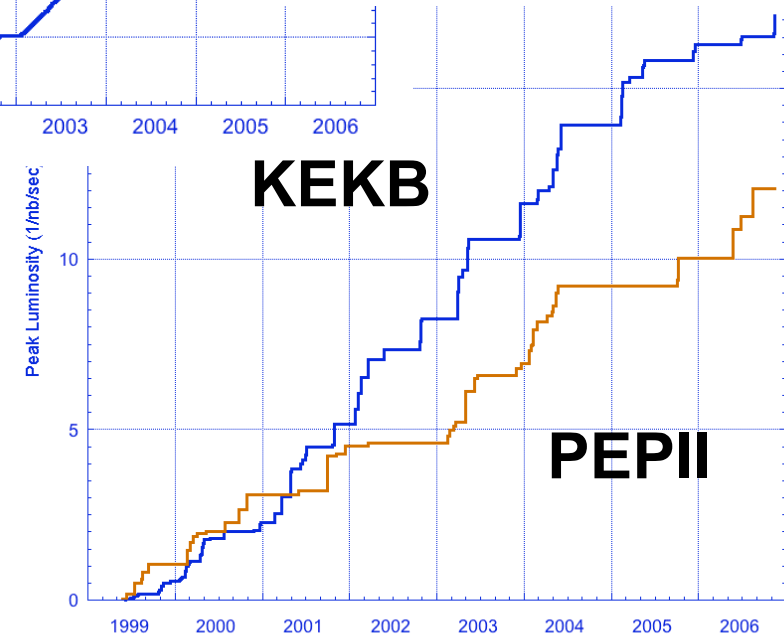
# Some Slides on Scientific Activities at KEK



# KEKB Electron-Positron Collider



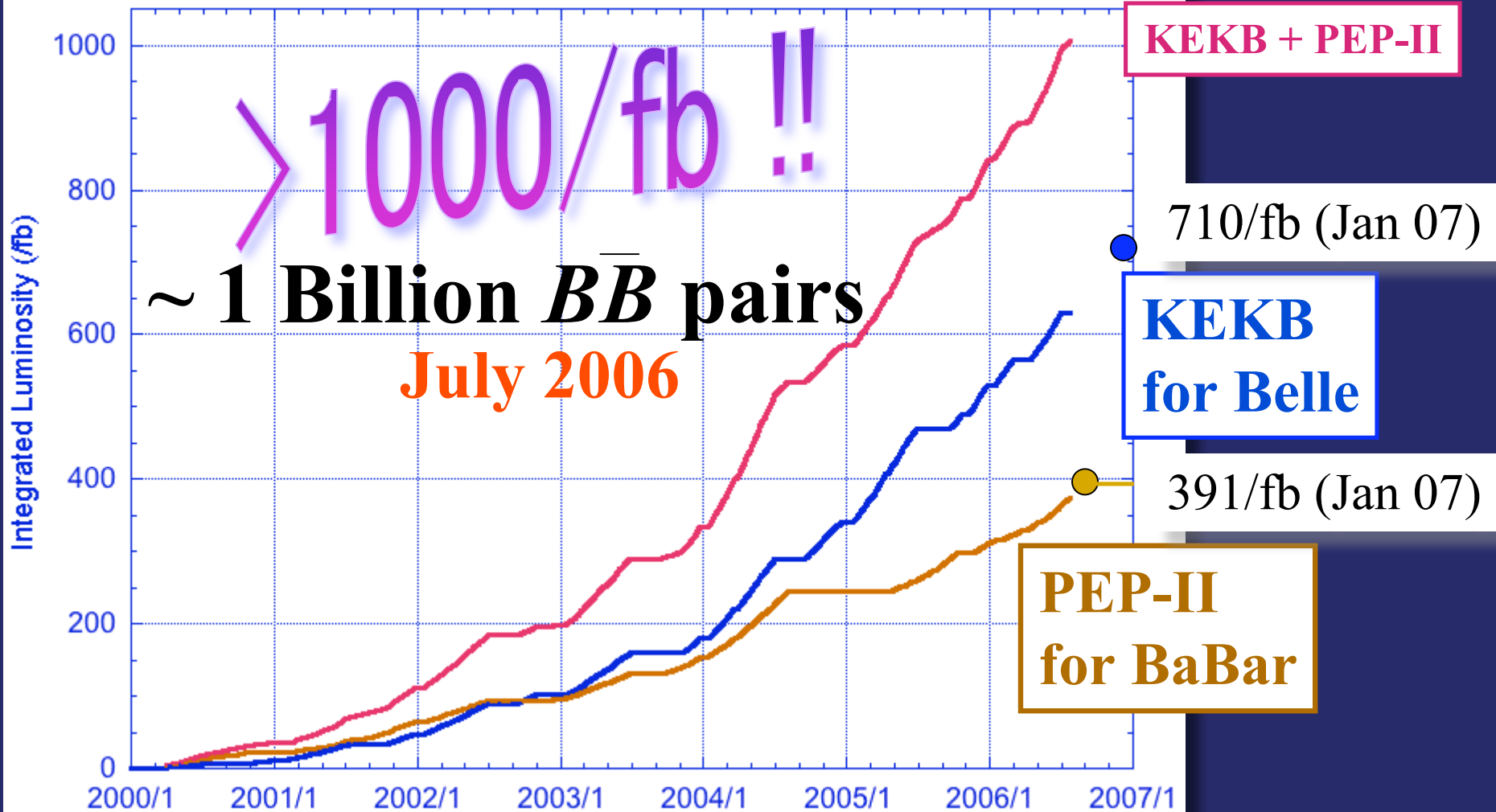
**Peak Luminosity**





# Integrated Luminosity

World Integrated Luminosity (KEKB+PEP-II)



KEKB + PEP-II

710/fb (Jan 07)

KEKB  
for Belle

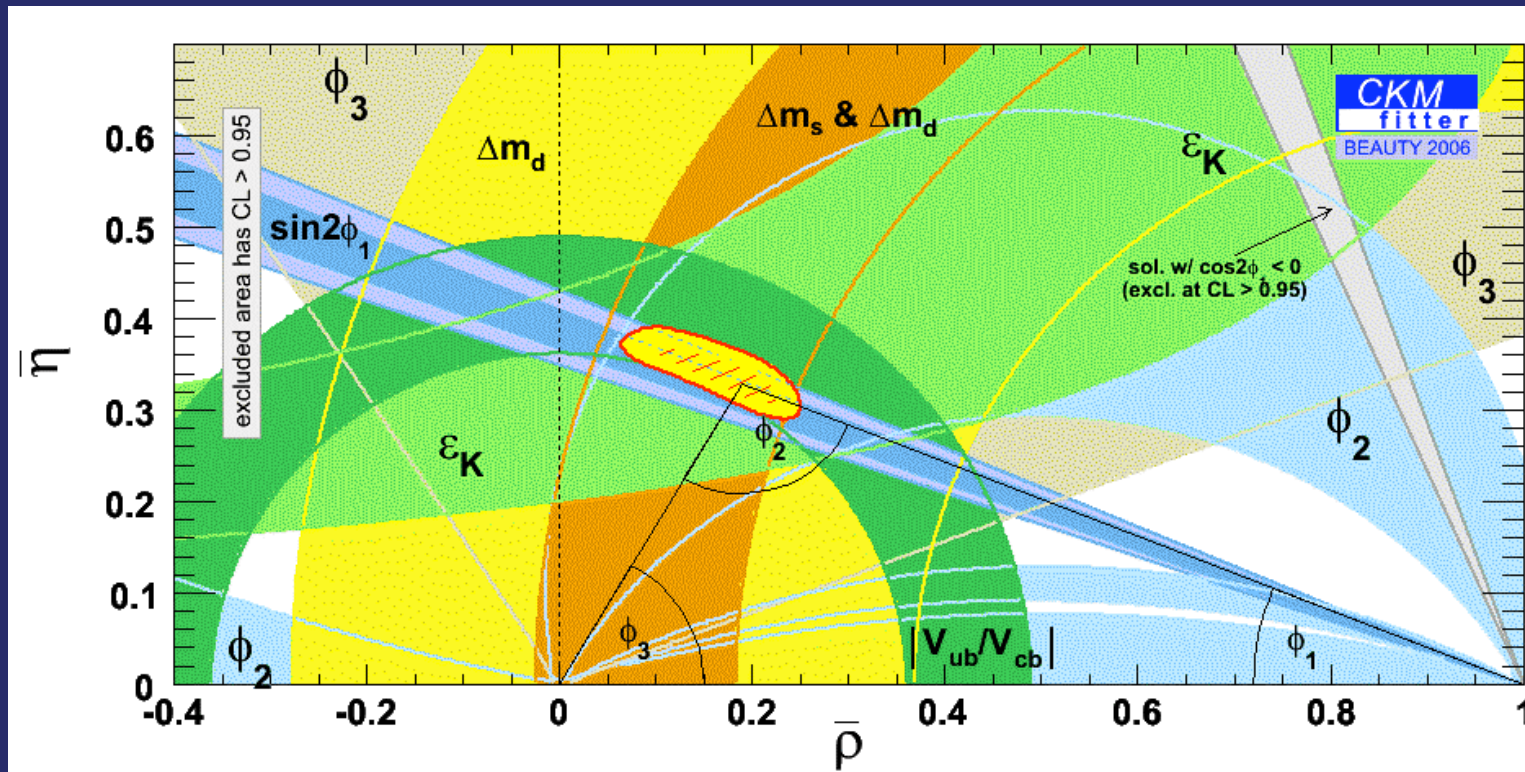
391/fb (Jan 07)

PEP-II  
for BaBar



# New Physics Results

## Quark Mixing Parameters: (Sep.2006)

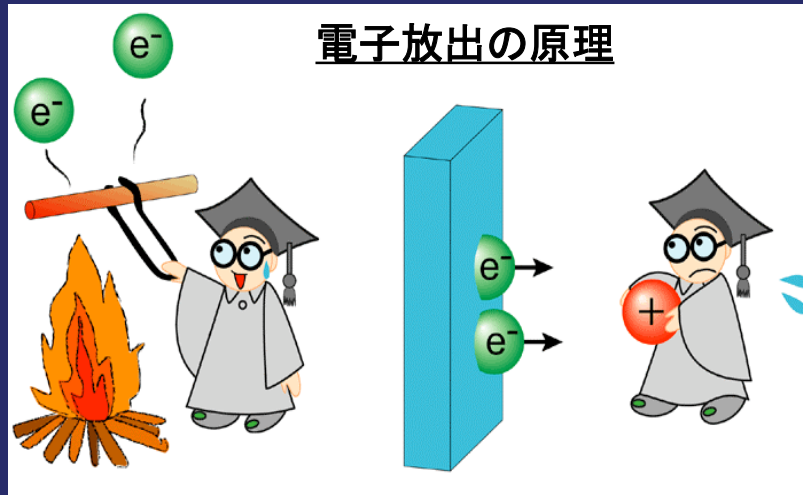


**Belle + Babar + CDF + D0**





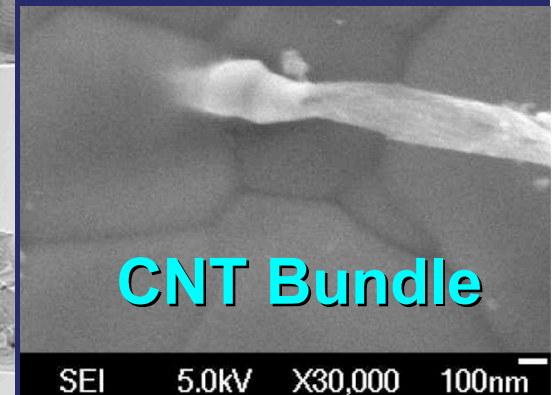
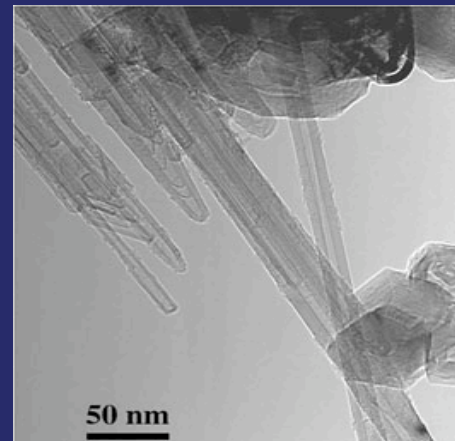
# Carbon Nano-tube as the electron Emmitter of the Electron Gun



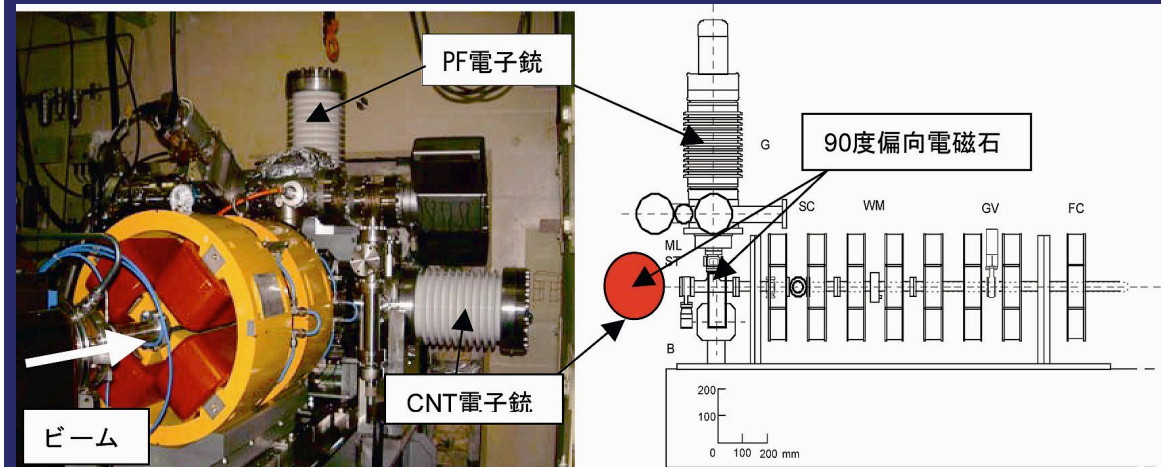
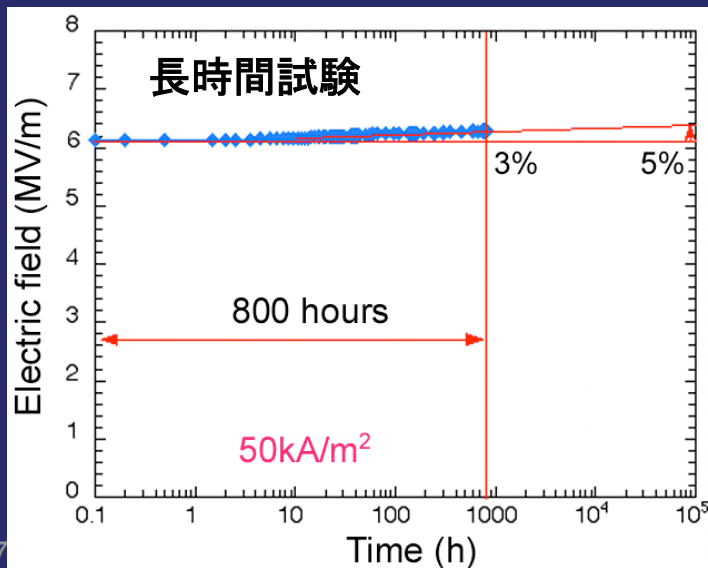
電子放出の原理

熱電子放出

電界電子放出



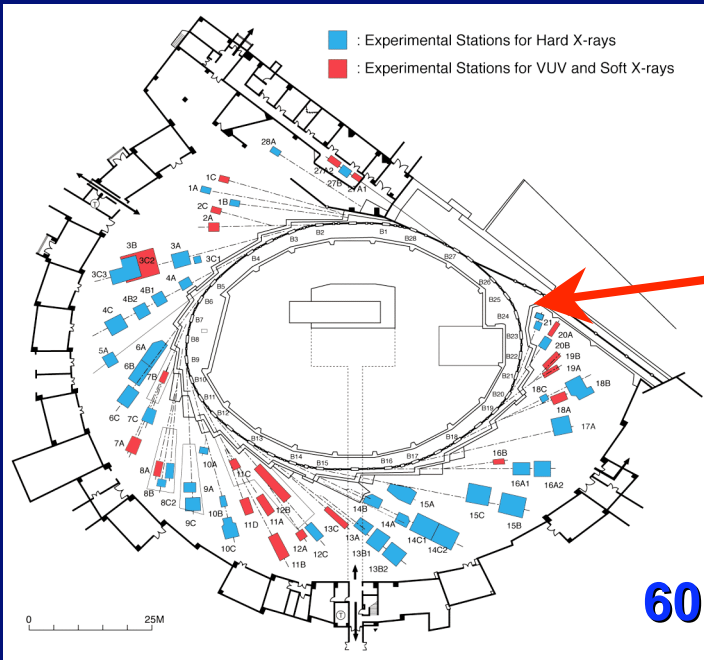
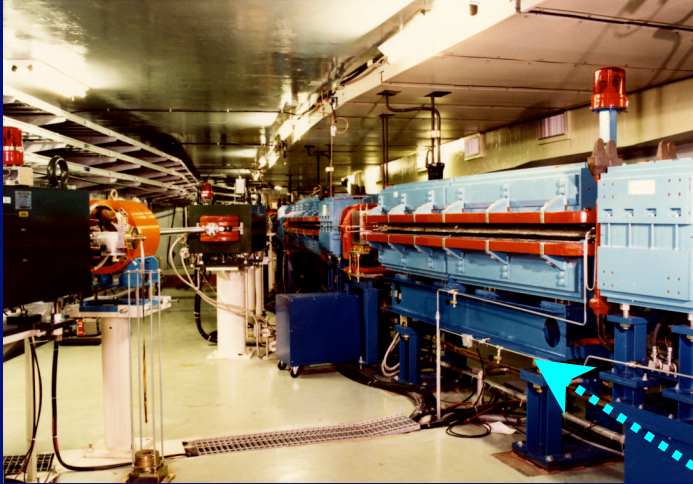
300kA/m<sup>2</sup> with < 8 MV/m





# Photon Factory

PF: 2.5 GeV, 450 mA  
PF-AR: 6.5 GeV, 50 mA  
: Single Bunch

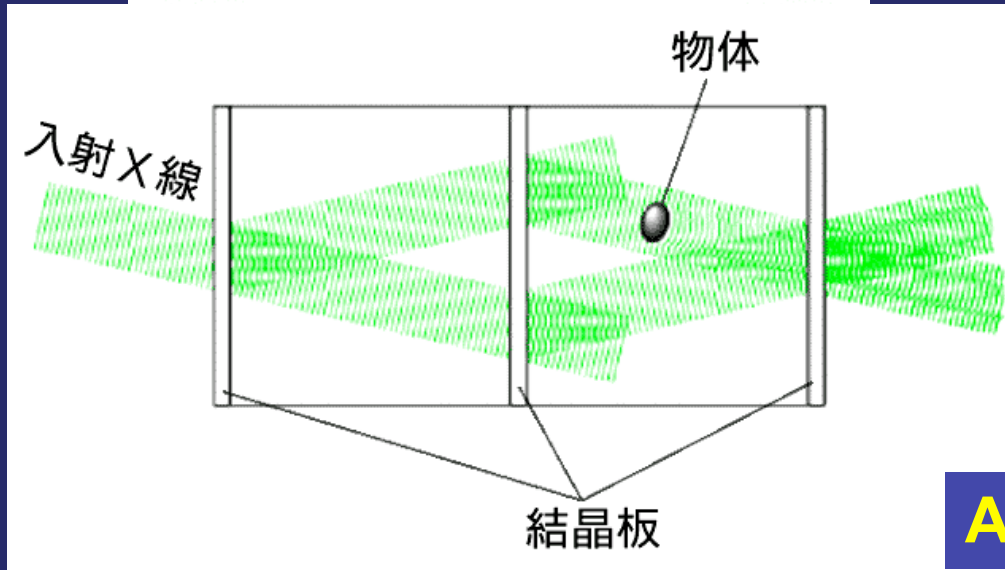
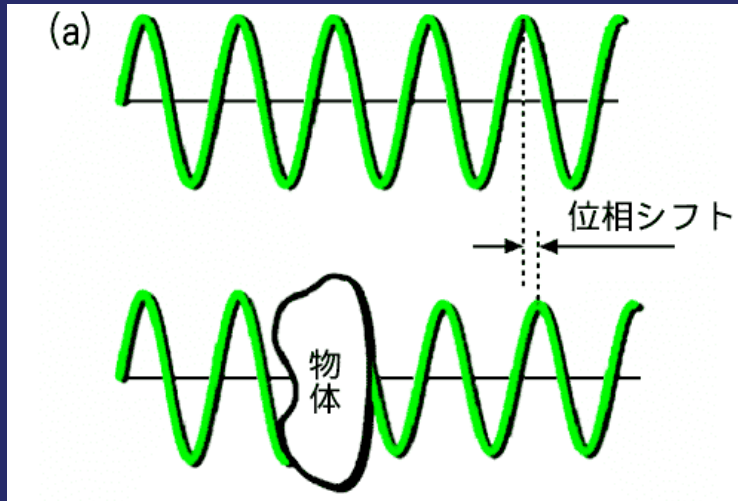


60 stations : active



# Phase-Contrast X-ray Imaging

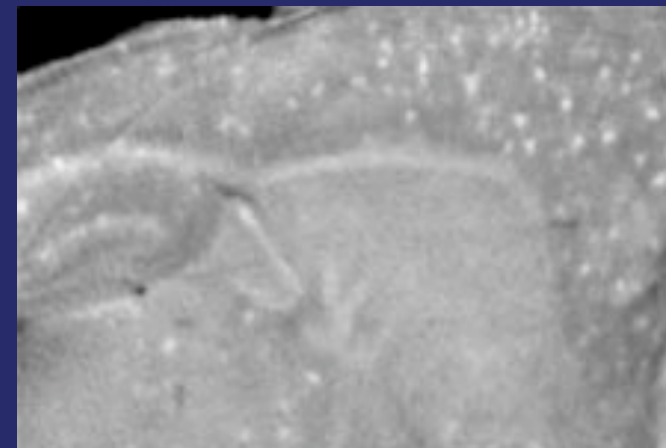
T.U., Hitachi, Astellas, KEK



Normal Brain



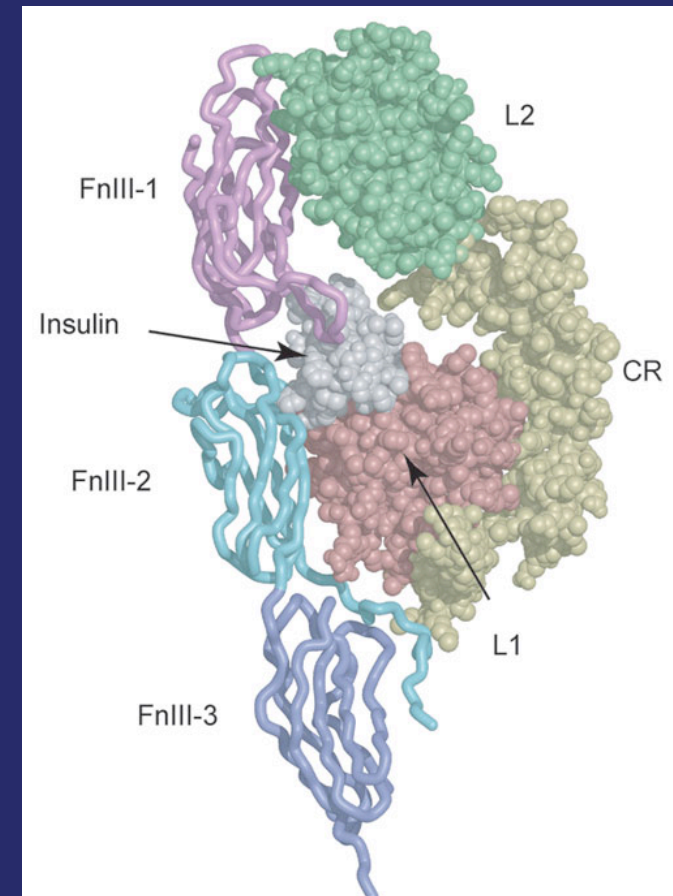
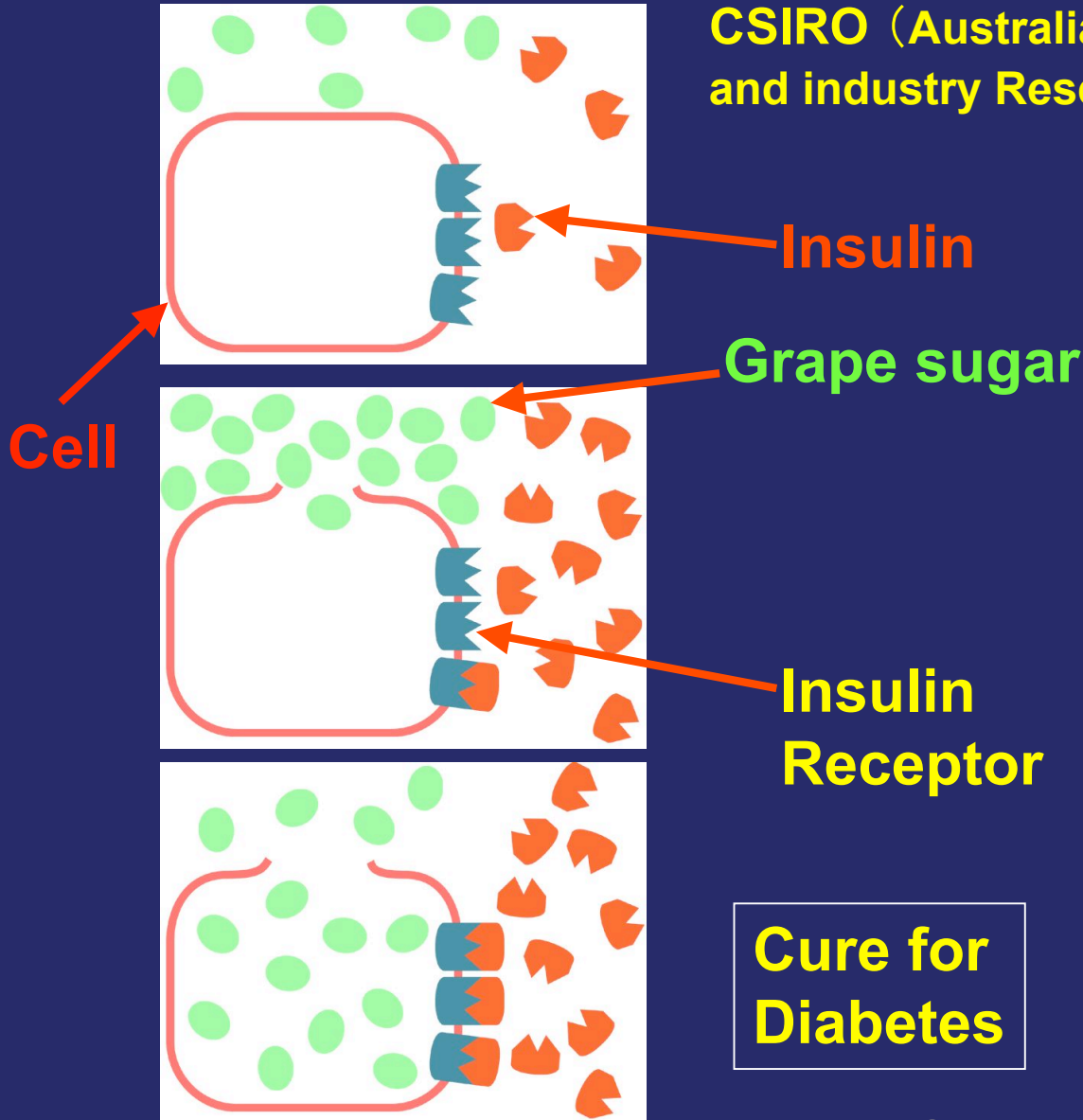
Alzheimer's Diseased Brain





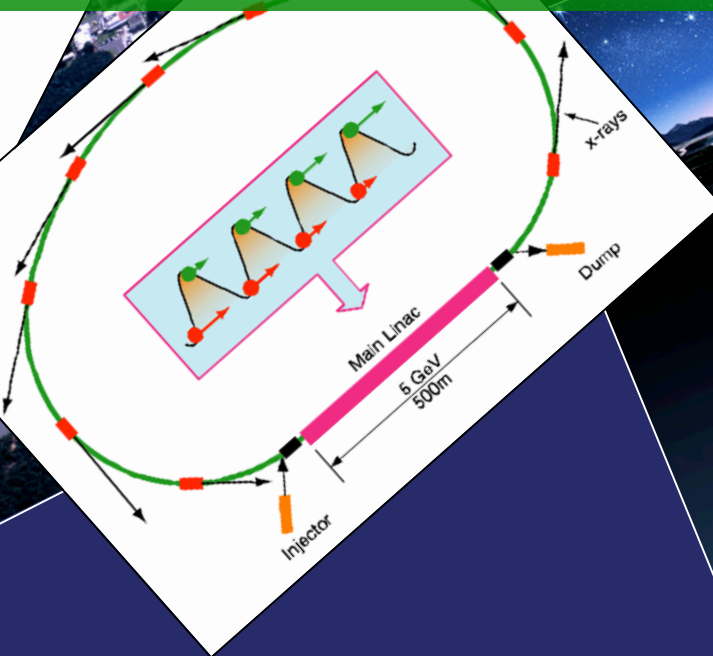
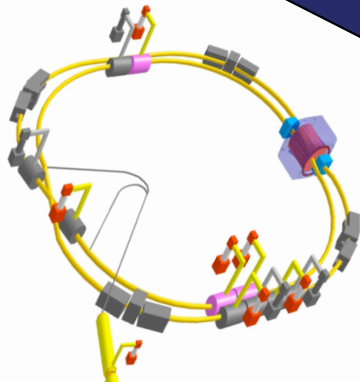
# Structure of the Insulin Receptor

CSIRO (Australia's commonwealth science and industry Research organization), KEK





# Future Program





# ATF : Accelerator Test Facility

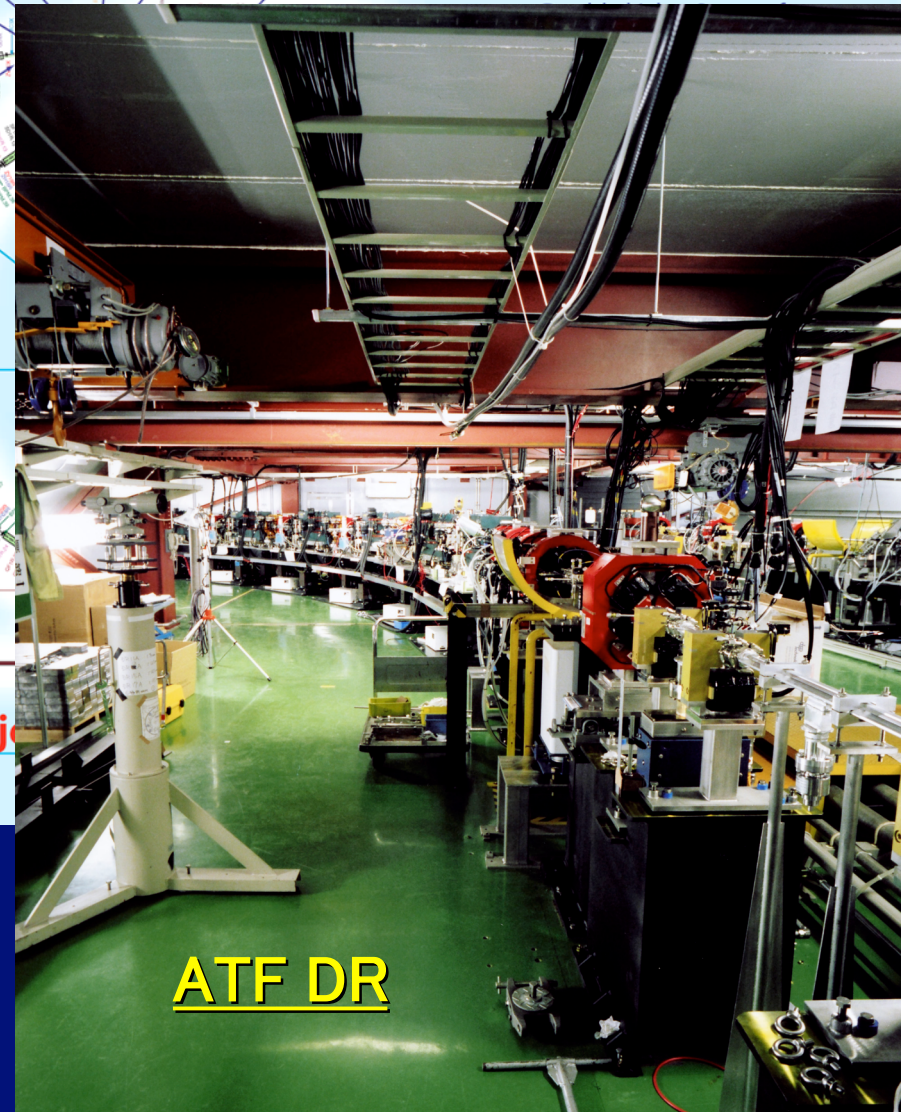
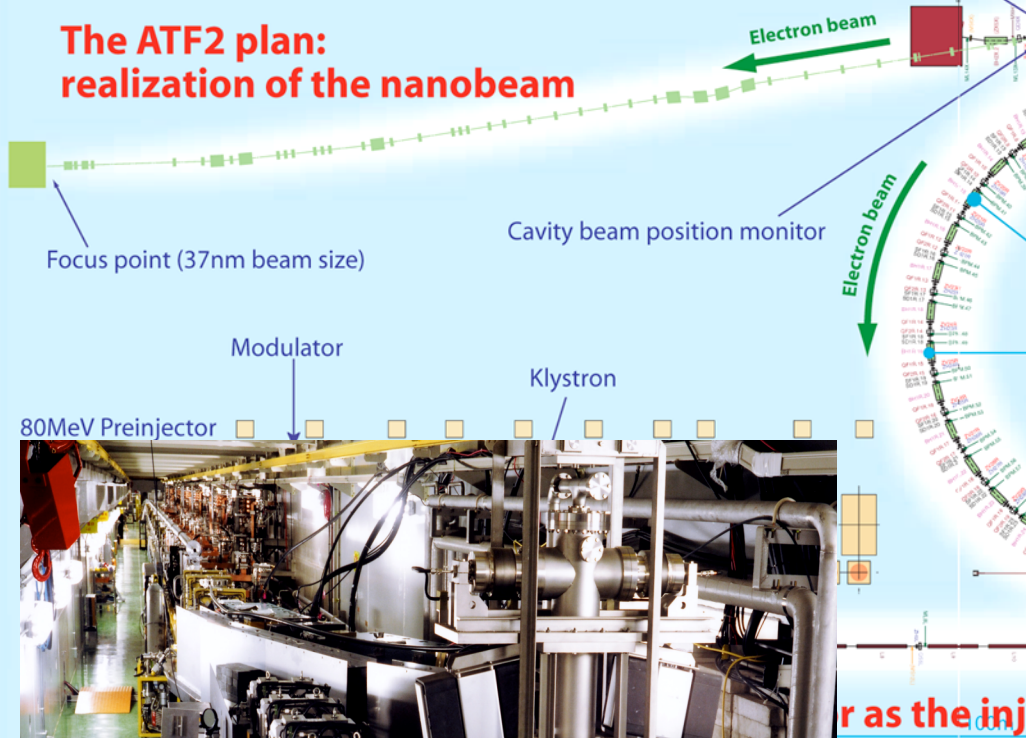
Fast feedback kicker for beam position stabilization  
Optical diffraction beam size monitor  
Stripline beam position monitor

Tungsten(Carbon)  
Wire Scanner

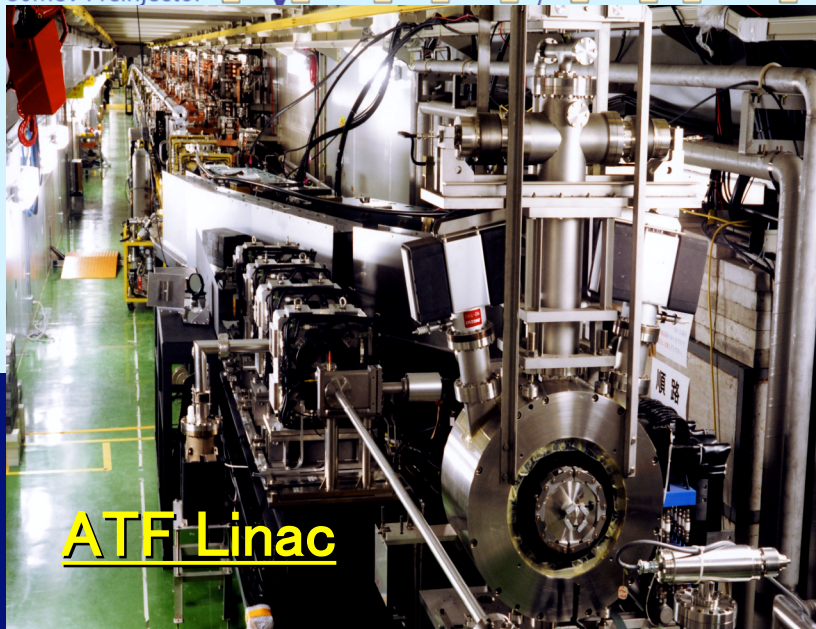
Cavity beam position monitor  
Laser wire

**The diagnostic line for the extracted low emittance beam**

**The ATF2 plan: realization of the nanobeam**



**ATF DR**



**ATF Linac**



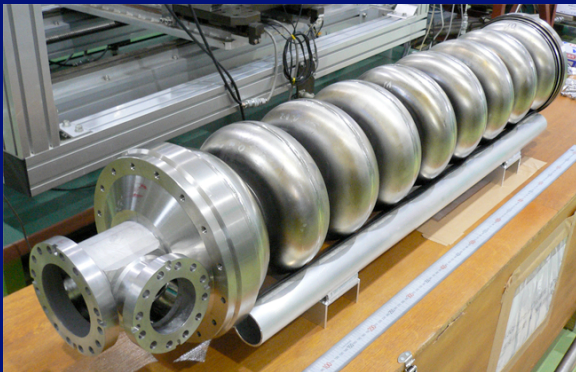
# STF Phase-I (2005 - 2007)

- First test at KEK of cryomodule assembling of all components

- 2 cryomodules (connected each other) contain 4 cavities of TESLA-type and LL-type

(LL: low-loss)

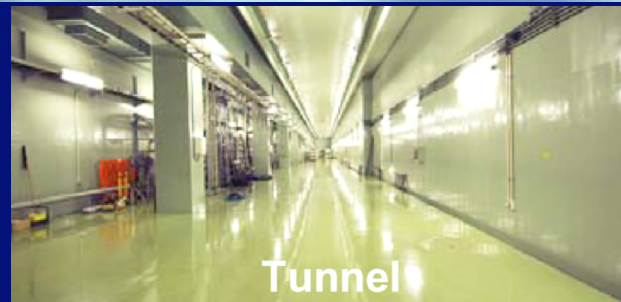
35MV/m TESLA cavity



45MV/m KEK type



Klystron Gallery



Tunnel

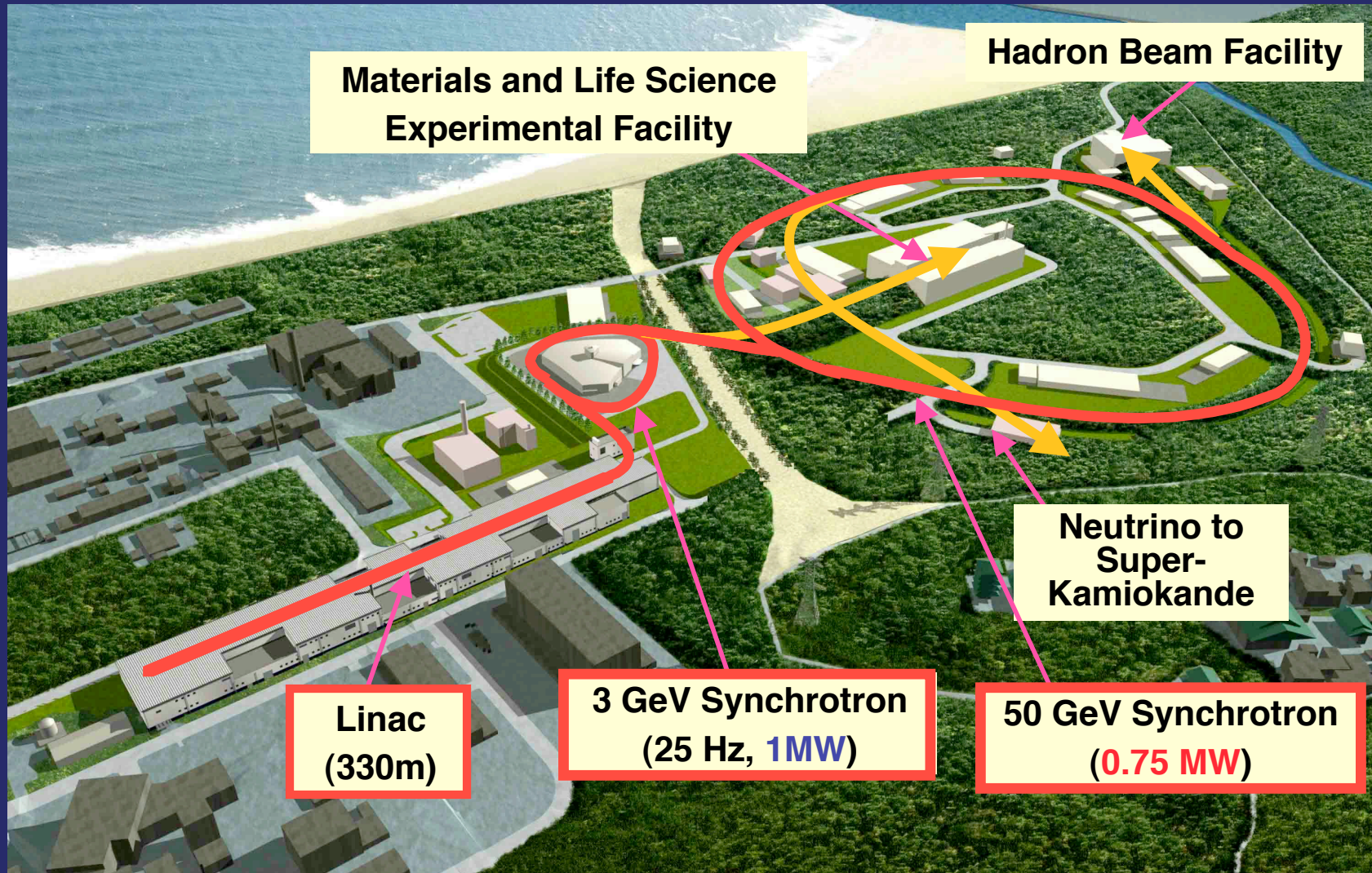


STF Building



# J - PARC ( Tokai )

**J-PARC = Japan Proton Accelerator Research Complex**



**Joint Project between KEK and JAEA**





# Super-KEKB Factory : $8 \times 10^{35}/\text{cm}^2/\text{s}$

Crab cavities

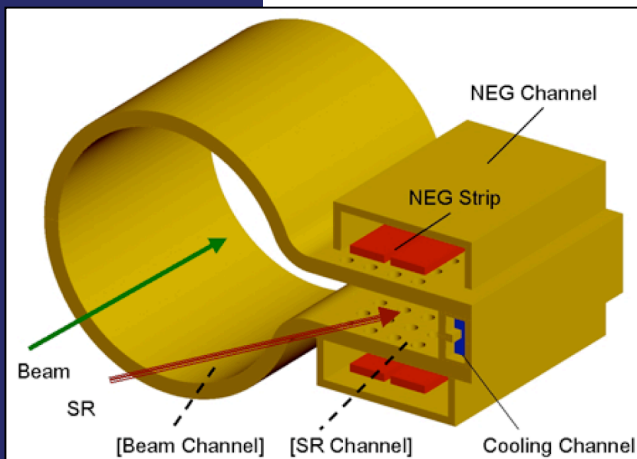
Interaction Region

Crab crossing  
 $\theta=30\text{mrad}$ .  
 $\beta y^*=3\text{mm}$   
New QCS

New Beam pipe  
(high-current proof)

More RF power

Damping ring



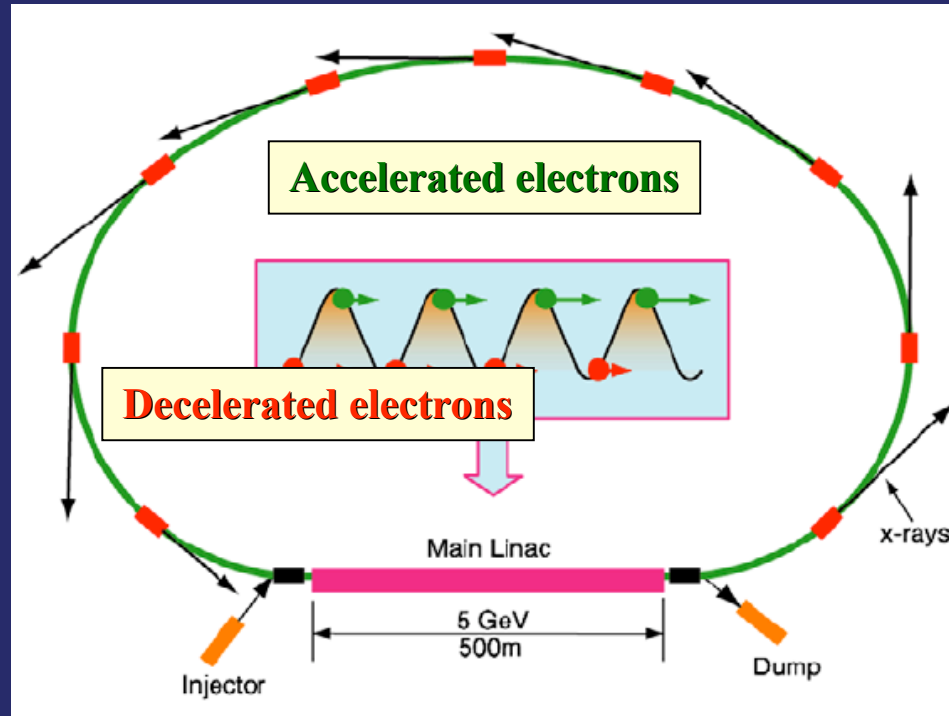
Linac upgrade  
C-band

**~500 M\$ project**



# Future Project for Photon Factory : Energy Recovery Linac (ERL)

target year of  
construction  
:  
2011  
(~500 M\$)



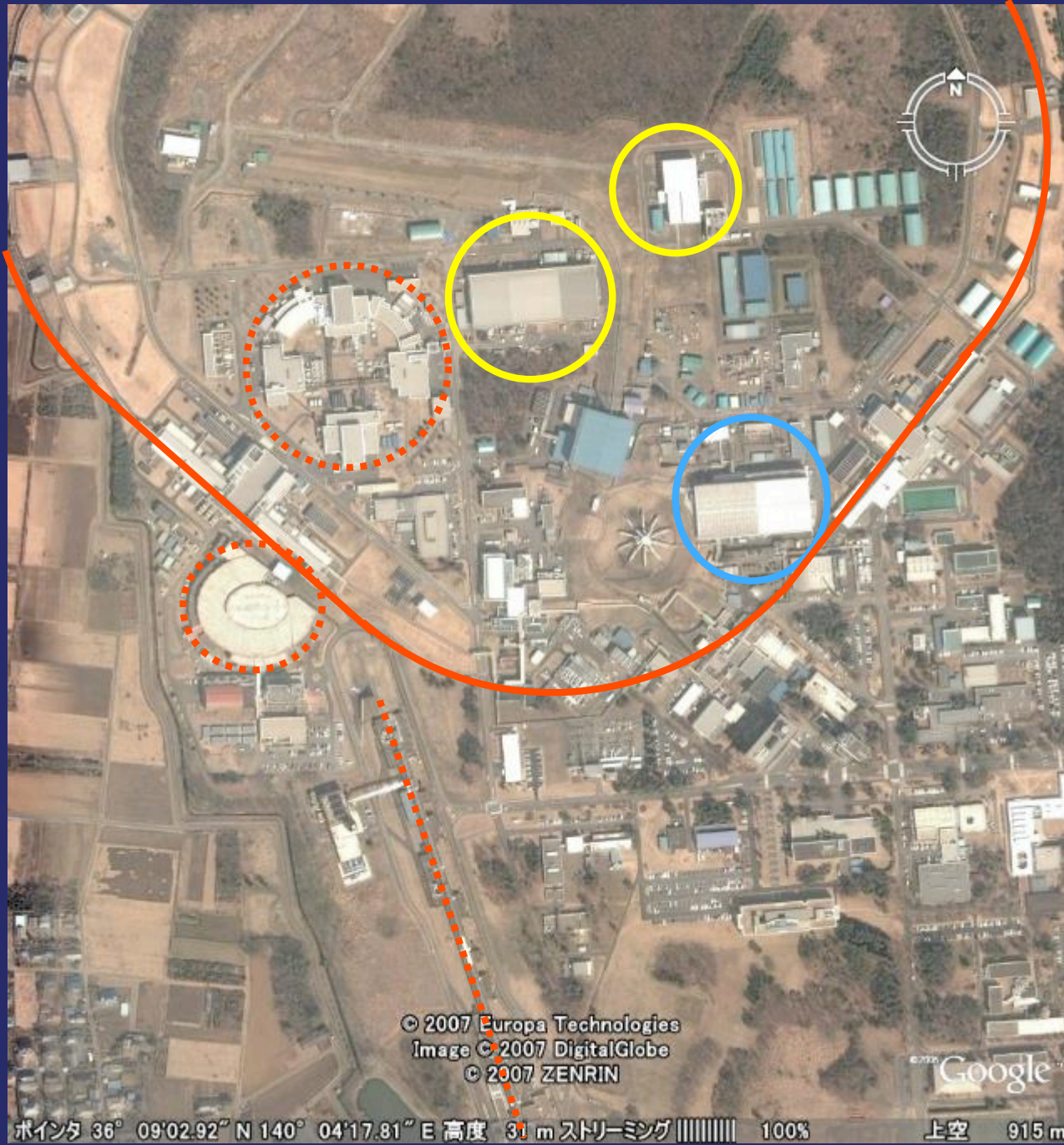
	average brilliance	peak brilliance	repetition rate (Hz)	coherent fraction	bunch width (ps)	# of BLs
ERL	$\sim 10^{23}$	$\sim 10^{26}$	1.3G	~20%	0.1~1	~30
XFEL	$10^{22} \sim 10^{23}$	$\sim 10^{33}$	100~1K	100%	0.1	1 ~ 5



# Future Scenario

Totsuka -06

- KEK should keep both proton and electron accelerators
- Protons → J-PARC
  - Neutrinos, Kaons, Neutrons, Muons
- Electrons
  - $e^+e^-$  collider → ILC
  - Super B factory : Depend on the Progress of the ILC
  - ERL





# Summary

## ★ J-PARC

- KEK will do its best for the timely completion of the accelerators.

## ★ KEKB/BELLE, PF, KENS, MSL

- Being all very active and successful.

## ★ Post J-PARC scenario of KEK

- Keep protons and electrons.
- Start to think about the ERL.
- Work for the realization of the ILC.
- Super-B : Depend on progress of the ILC.



# Back up Slides



2006

2008

2010

2012

2014

2016

2018

2020

**KEKB**

**KEKB upgrade experiment**

**ILC R&D**

Budget transfer

**ILC construction experiment**

**J-PARC  $\nu$ , n construction**

**J-PARC  $\nu$ , K experiment**

**J-PARC n,  $\mu$  experiment**

Budget transfer

**J-PARC R&D upgrade experiment**

**PF upgrade**

**PF**

**ERL prototype**

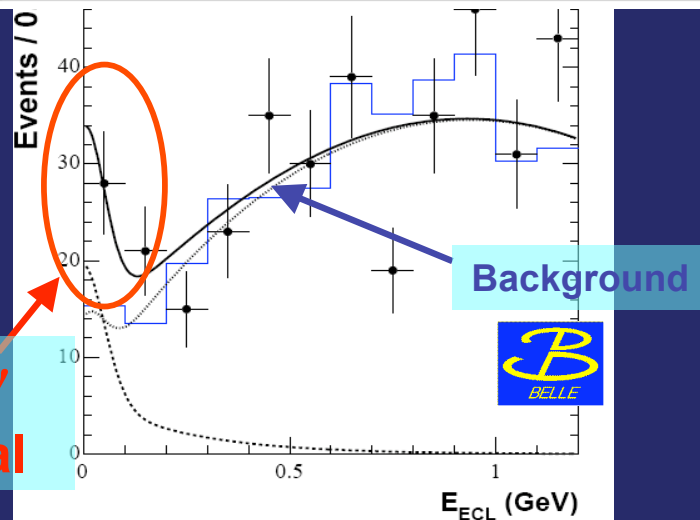
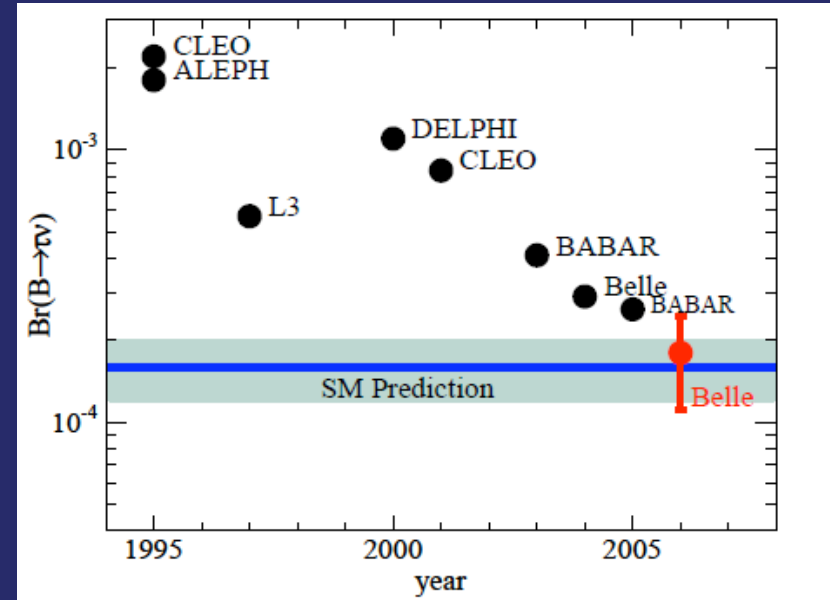
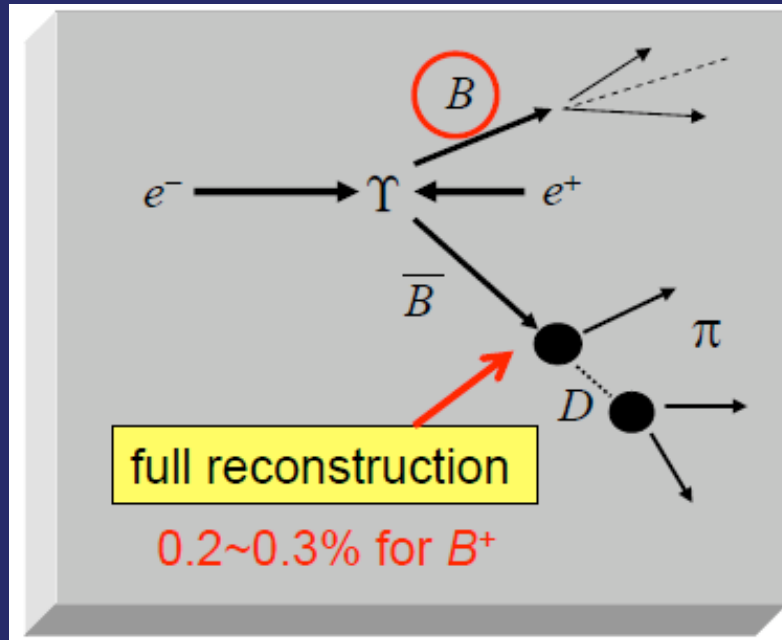
Budget transfer

**ERL construction experiment**

**Version 2**

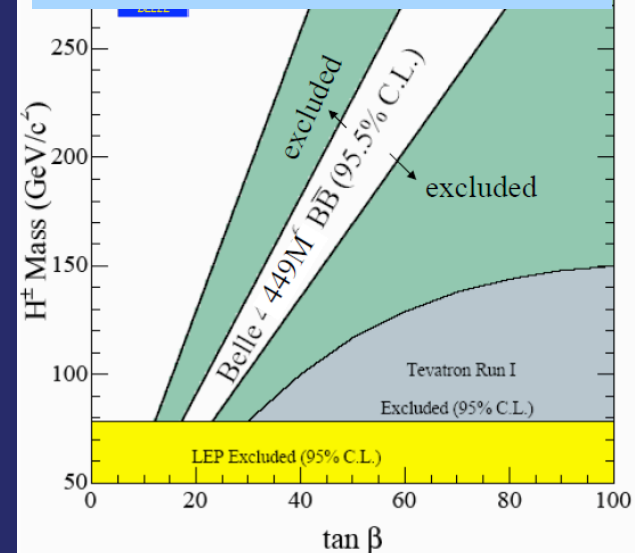


# First measurement of $B \rightarrow \tau \nu$



$$\mathcal{B}(B^+ \rightarrow \tau^+ \nu) = (1.79 \pm 0.56 \pm 0.39 \pm 0.49 \pm 0.46) \times 10^{-4}$$

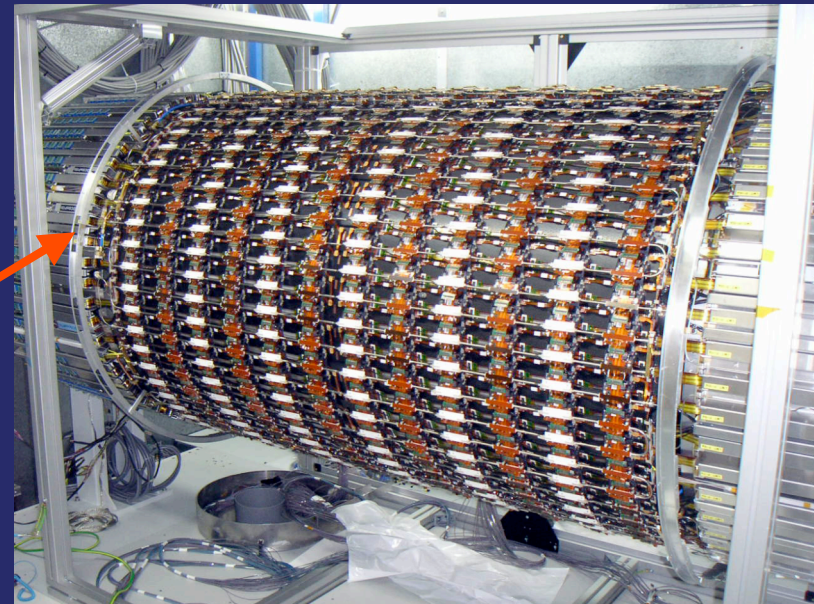
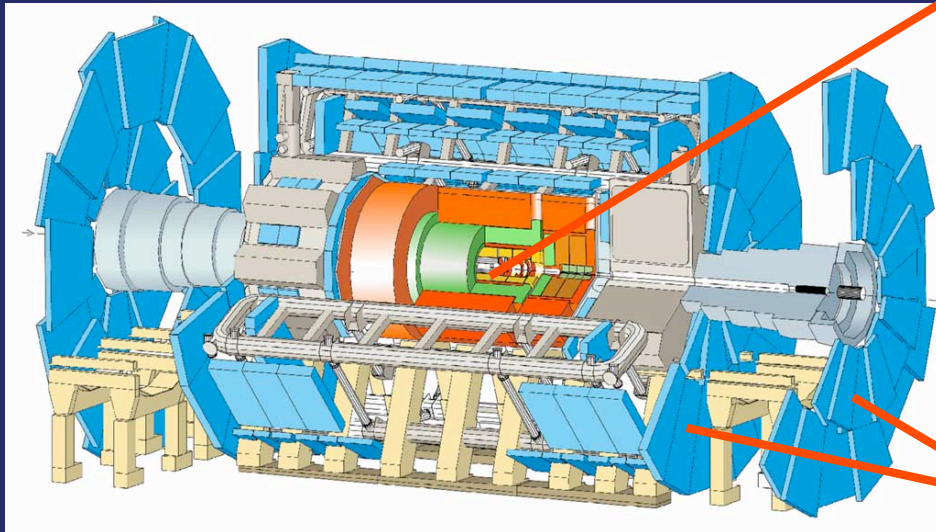
## Constraints on $H^\pm$



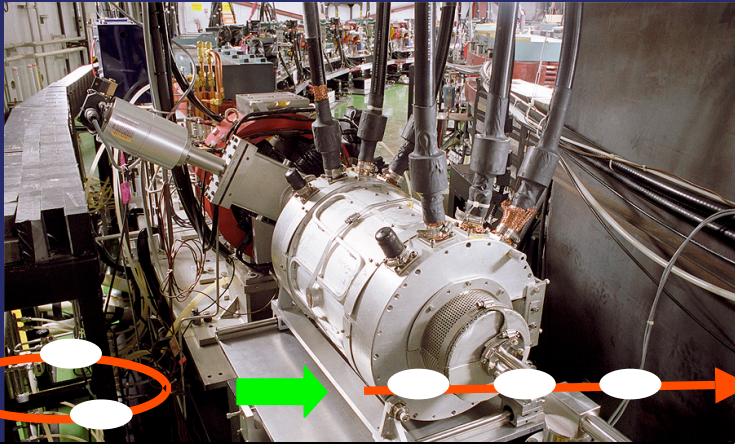




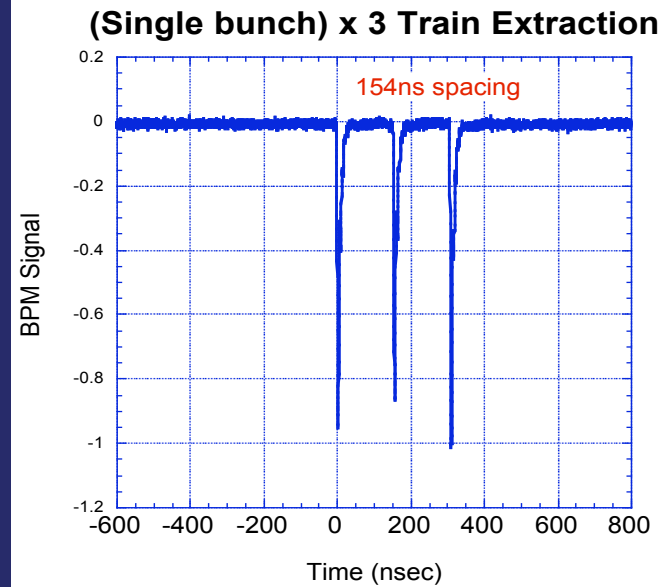
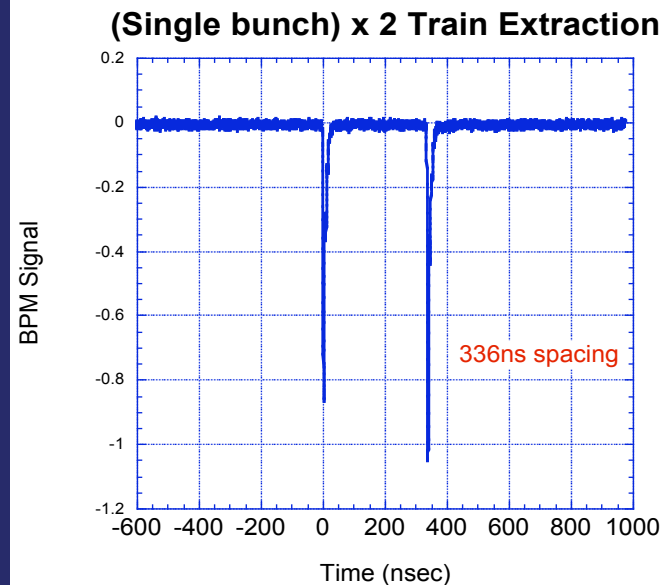
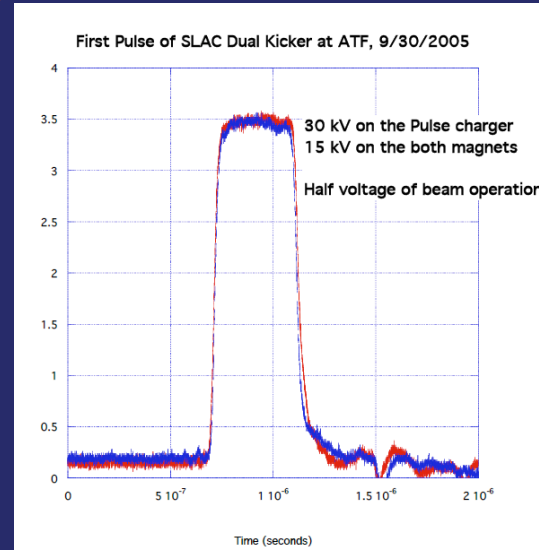
# ATLAS



# Extraction kicker system with 300ns flat-top



extract 3 bunches by 300ns flat-top



New beam mode  
for EXT-line  
and ATF2.

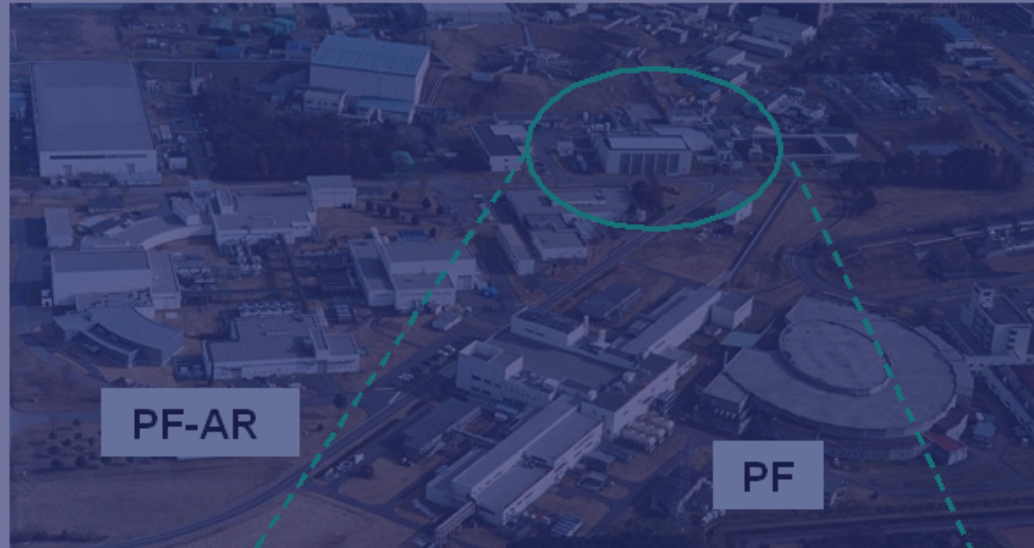
ILC like bunch  
spacing

~154 ns

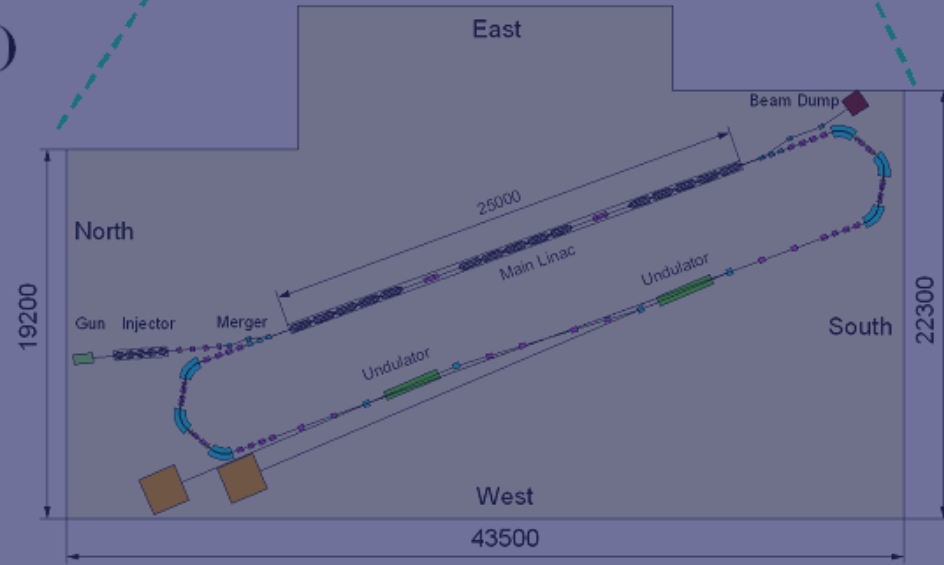
~336 ns



# TEST facility for ERL



(a)

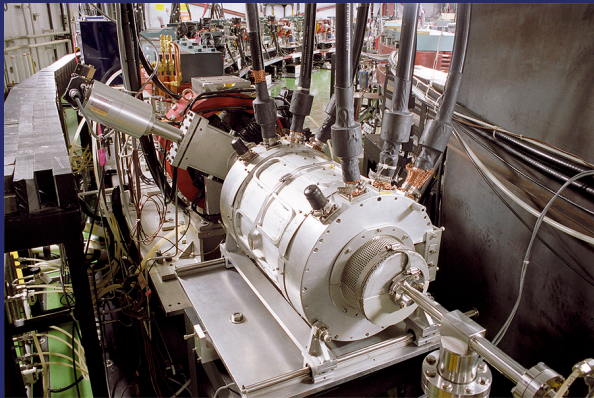


(b)

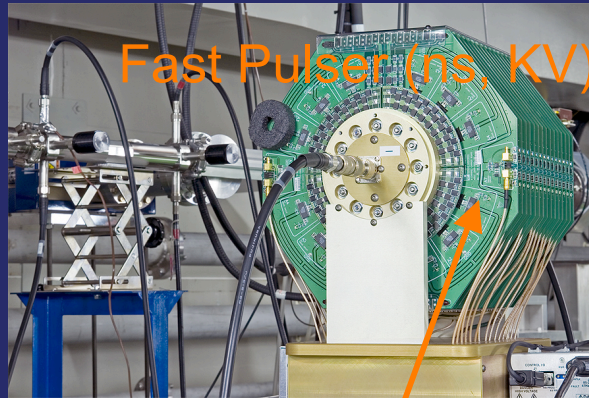
KEKB MAC



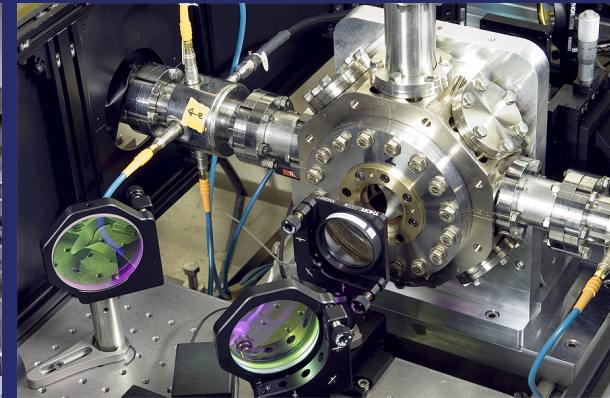
# ATF Highlights



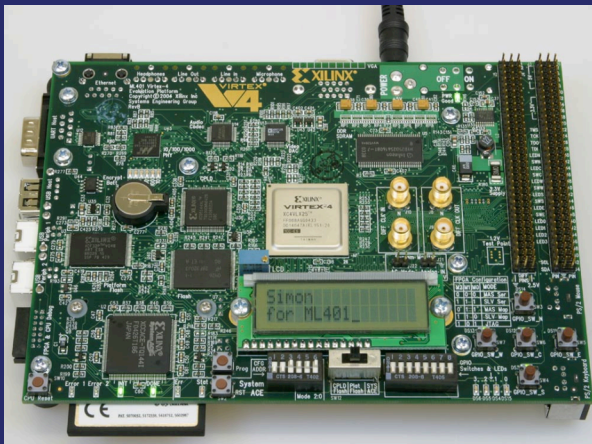
SLAC-Type Extraction kicker  
(KEK, SLAC)



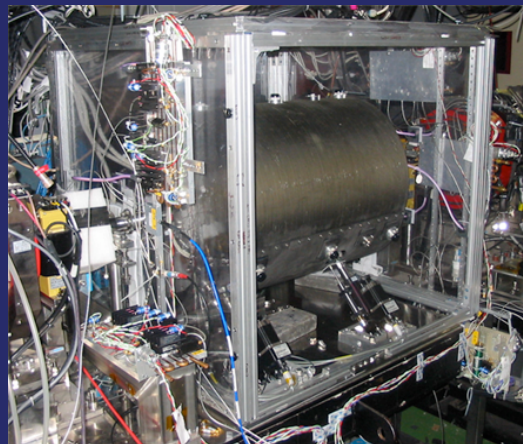
Fast Pulser (ns, KV)  
ILC Fast Kicker Study  
(KEK, SLAC, LLNL)



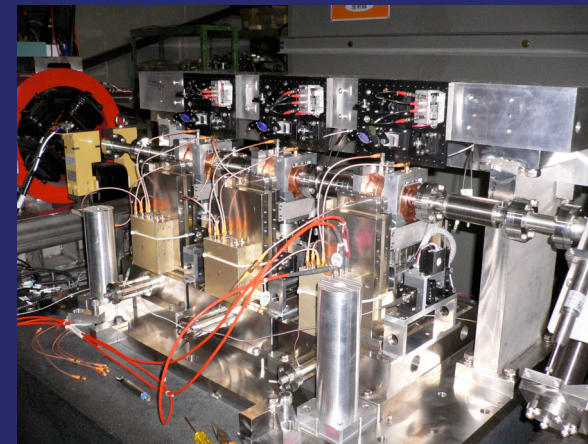
Laser Wire at Extraction Line  
(RHUL LW group)



Digital Board development  
For ILC IP feedback  
(FONT collaboration)



SLAC nm resolution BPM  
(SLAC, LLNL, KEK)

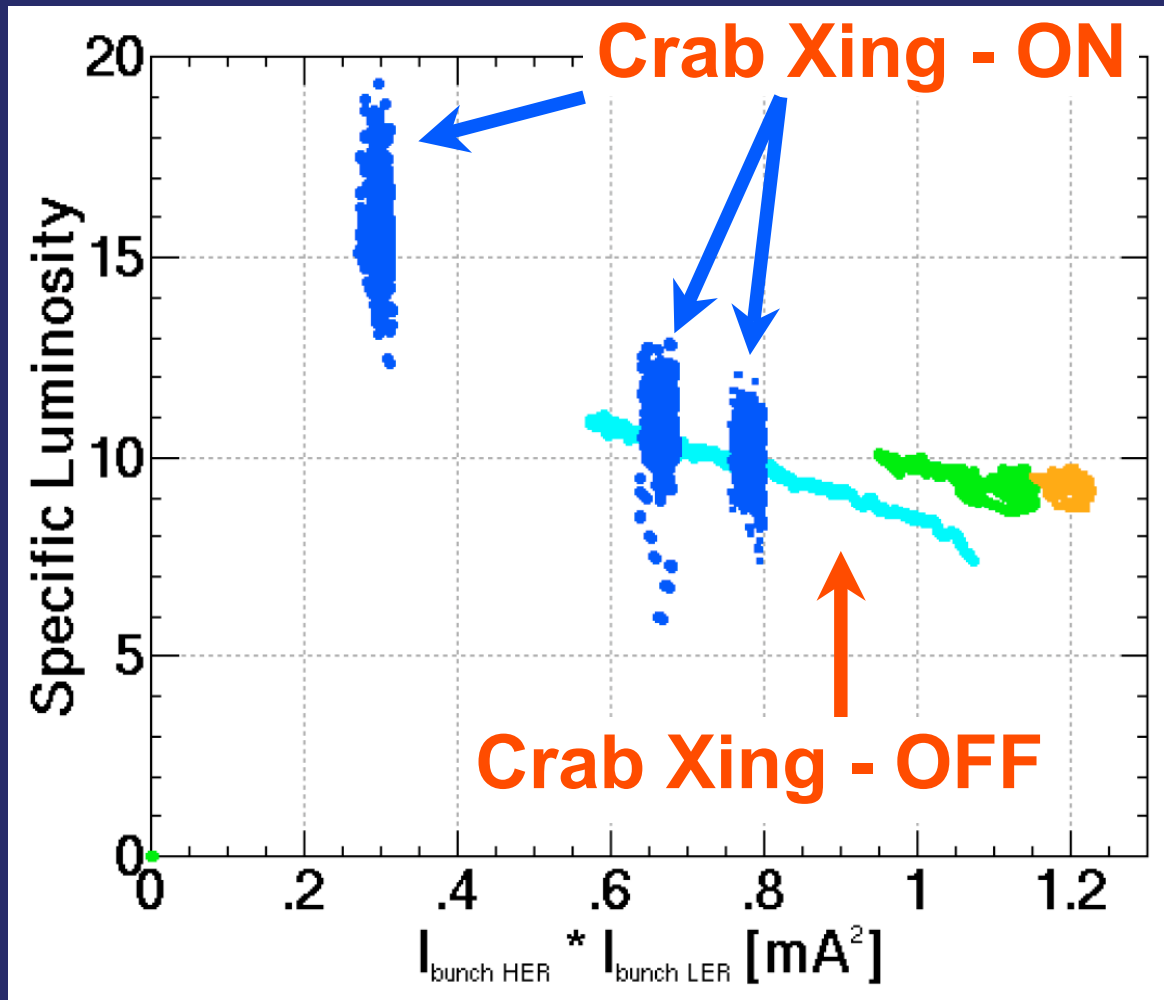


KEK nm resolution BPM  
(KEK)



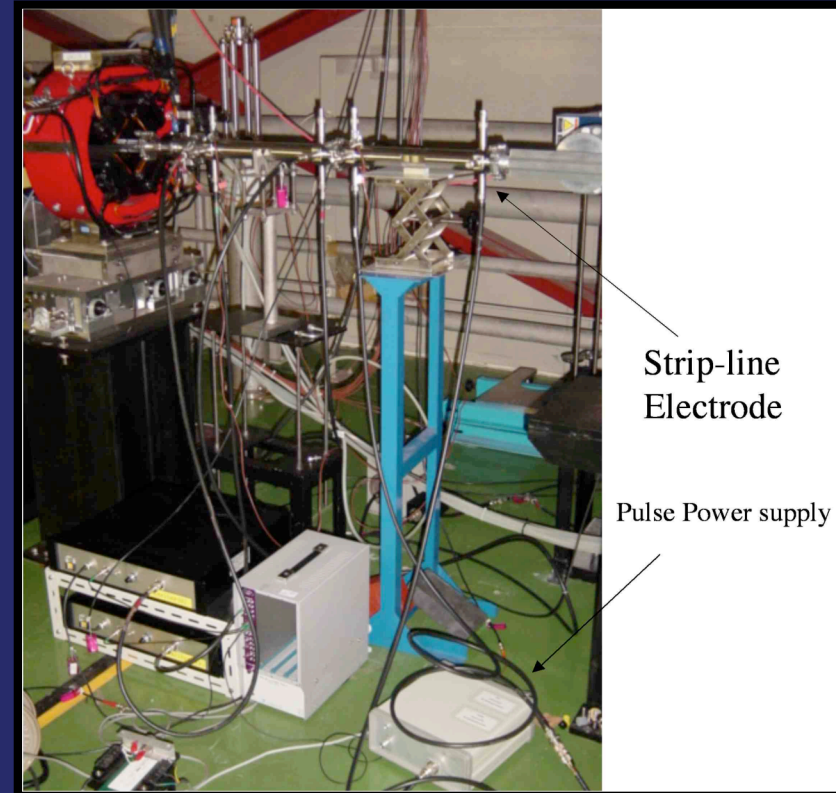
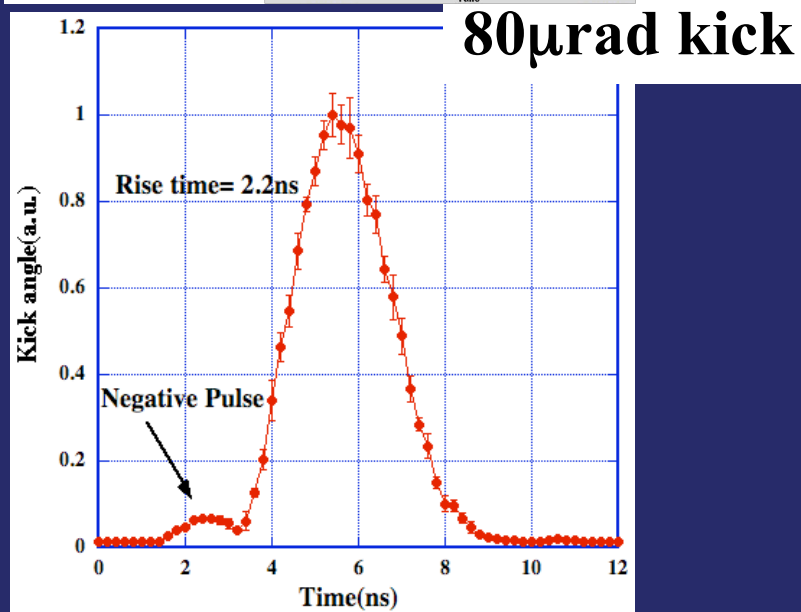
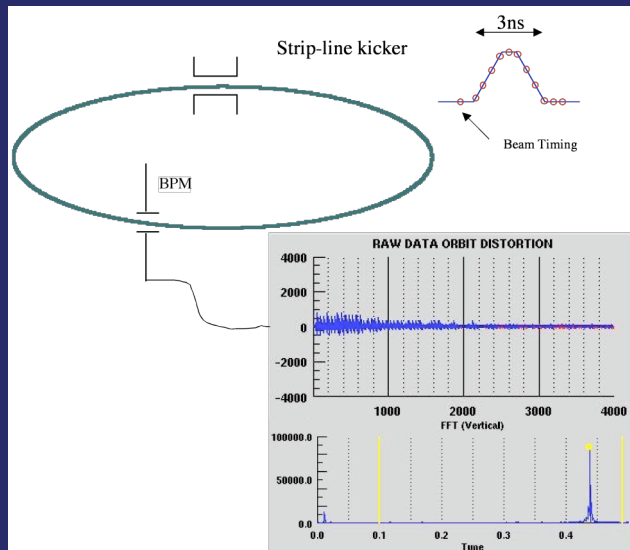
# Preliminary Results of the Specific Luminosity

Mar. 2, 2007





# Beam Kick test of ILC Fast kicker

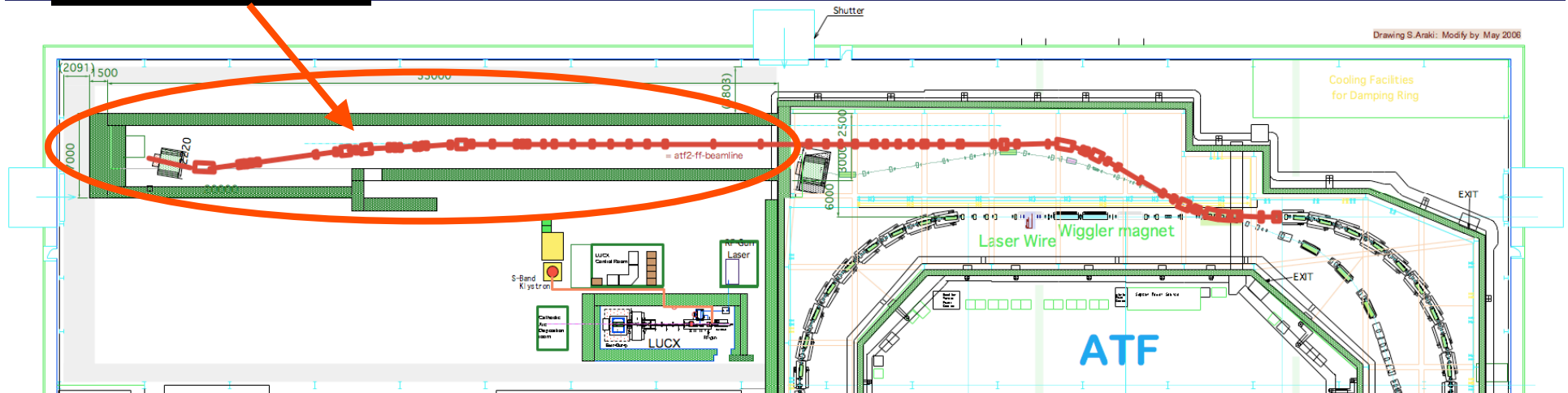


rise time improvement test at ATF DR  
rise time improvement by using wave-  
form compensator. 3ns  $\rightarrow$  2.2ns

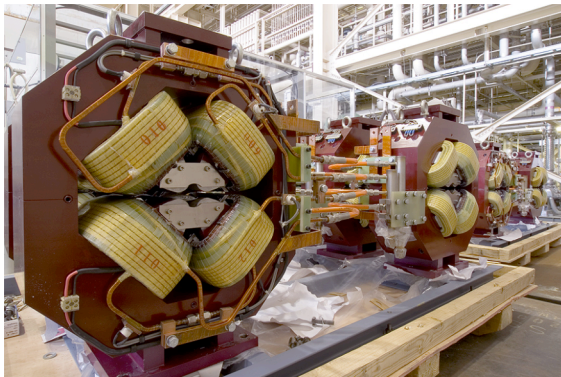


# ATF2 Project

**ATF2 beam line**



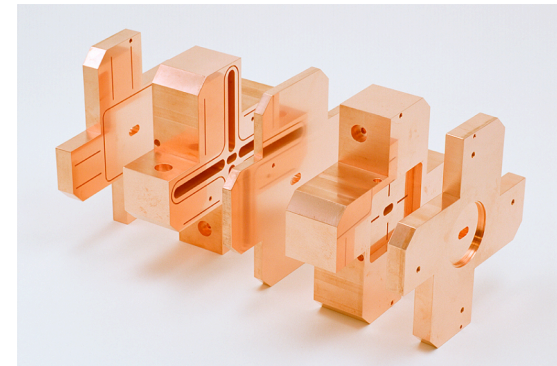
**ATF2 schedule : floor reinforcement Jun. 2007**  
**start installation Oct. 2007**  
**completion Feb. 2008**



**Q-magnet from IHEP  
(IHEP, SLAC, KEK)**



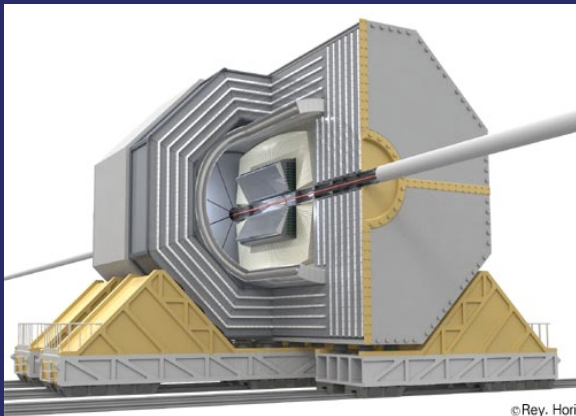
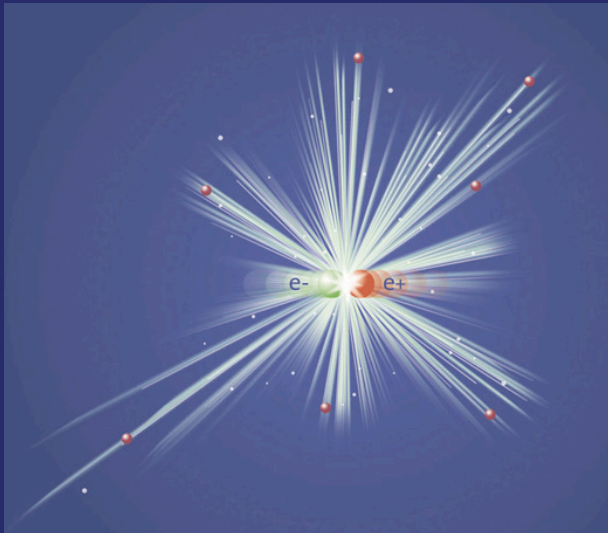
**Cavity-BPM for Q-magnet  
from PAL (PAL, KEK)**



**1 nm resolution BPM for IP  
(KEK)**



# Future Project for Particle Physics : ILC (International Linear Collider)



© Rev. Hori

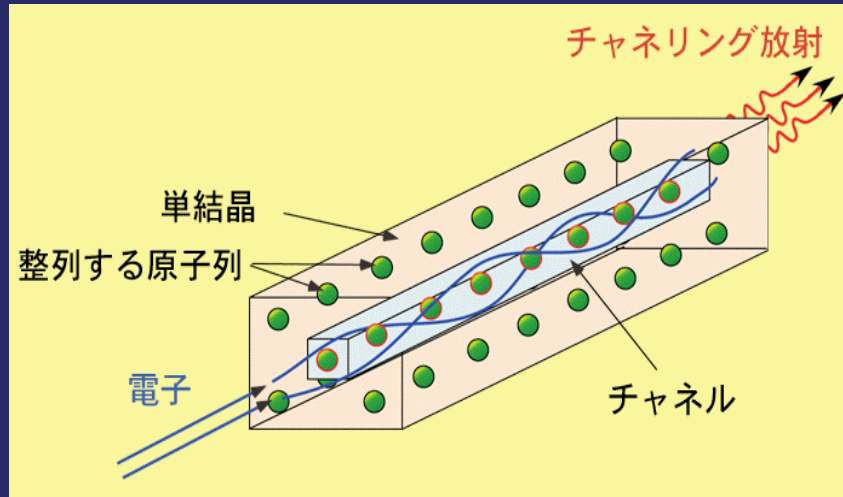


© 2005 Engenr Numata

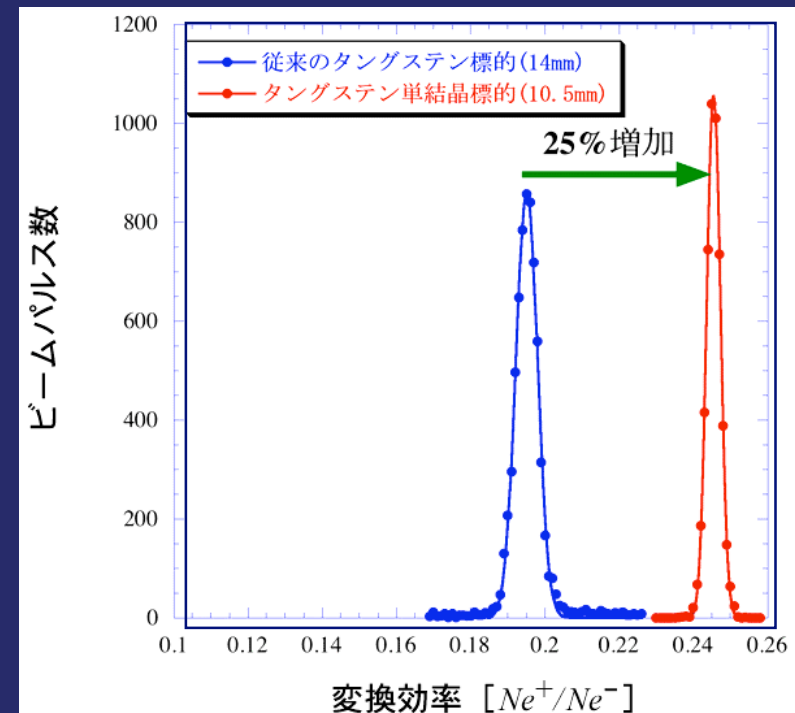
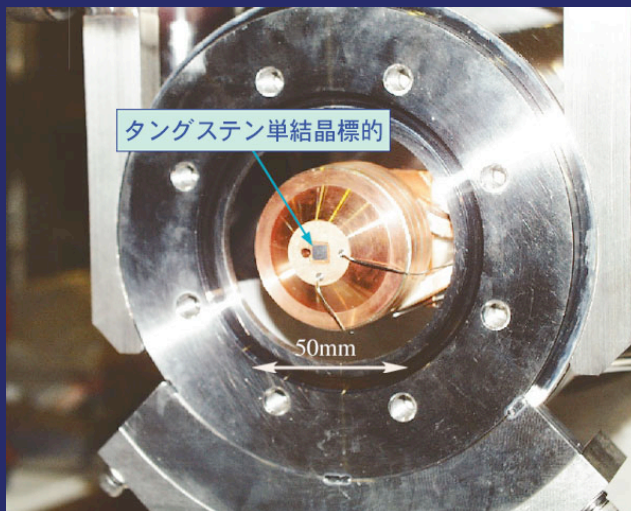




# Positron Source with the Tungsten single crystal



TMU, Saga L.S., KEK,  
Tomsk T.U., Olsay





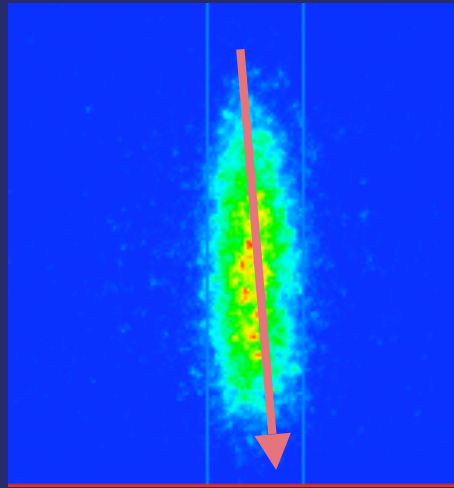
# Beams have indeed tilted!

- Observation with Streak Cameras (H. Ikeda, et al) -

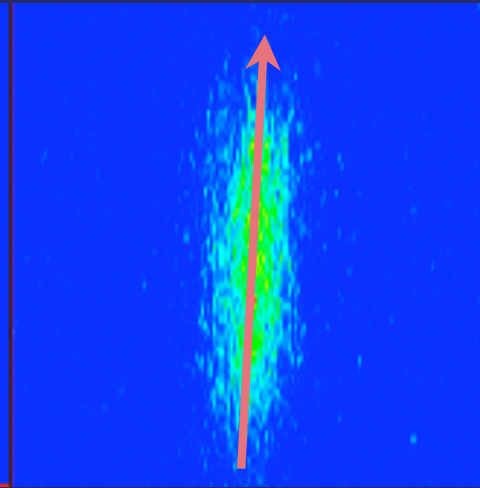
Longitudinal



Inner side  
of the Ring

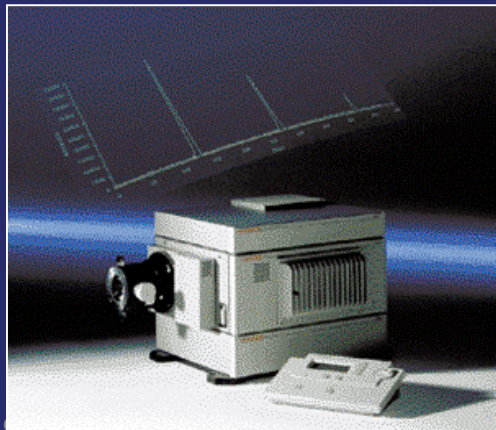


Electron



Outer side  
of the Ring

Positron



Streak Camera and its  
Schematic Diagram

