


Asian Planning for the ILC

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(KEK)

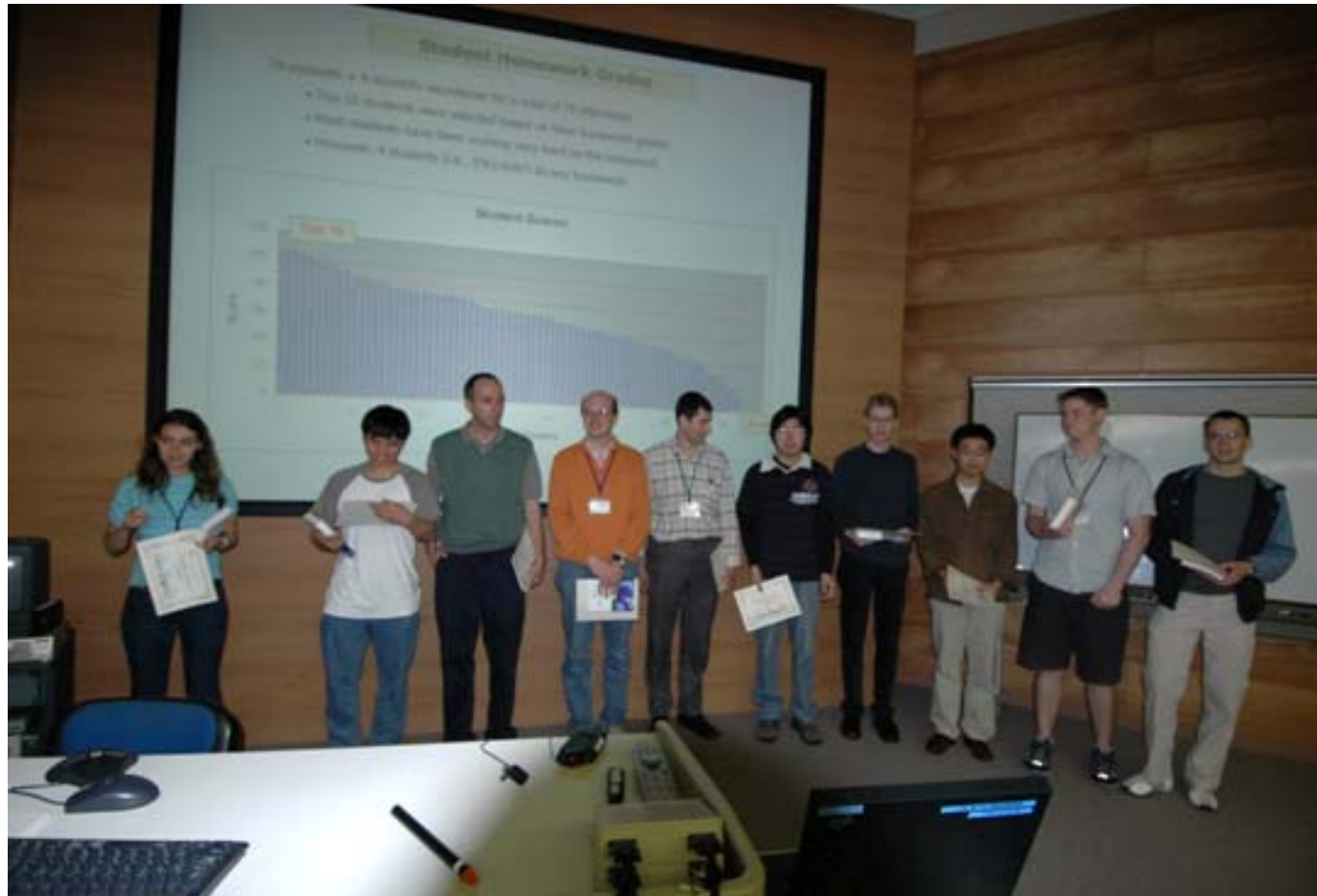
Many thanks to J. Gao (IHEP), E-S. Kim (KNU),
Y. Sohn (PAL) and V. C. Sahni (RRCAT)

 ACFA member countries/region

ILC Activities in Asia

- ILC related activities in China, India, Korea and Japan
- Different from US and Europe
 - No positive governments like US-DOE.
 - No common funds like EU-FP6.
- However, great long-term growth potential
 - High economic growth rate in China and India
 - > 50% of population in the world is in ACFA countries.
 - A great advantage not only in quantity, but also in quality

Chinese Students ILC Accelerator School studies



Chinese students obtained 3 places in top 10 students
2nd-Dr. S.L. Pei, 4th-Mr. Y.P. Sun, and 8th-Mr. Du

6 participants from China /76

ILC related works in China

Fragrant Mountain Science Meeting on ILC

The 294th meeting (Dec. 5-7, 2006, Beijing)

What is the Role of China Confronted with the International Linear Collider (ILC), a Large Scientific International Collaboration Project



Main conclusions from Chinese Scientists

After three days discussion on the importance of the ILC in understanding of the physical world, and the related Hi-Technologies, which are very useful for China in its sustainable development, participants concluded unanimously that

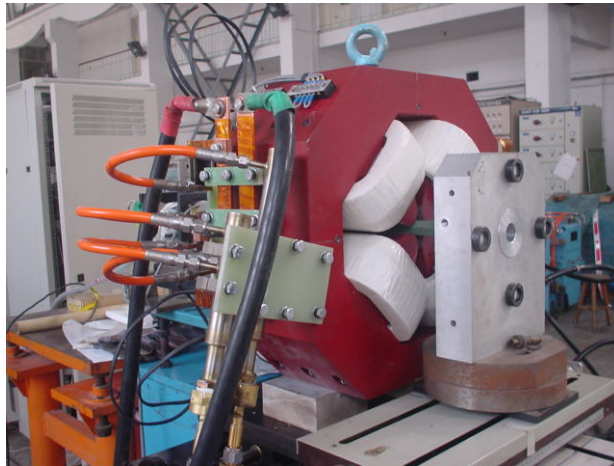
1) ILC has the potential to answer the very important fundamental questions in physics.

2) Accelerator and detector technologies contain a lot of Hi-technology. Many of them can be used in other large science projects in China in the future, and they will be the driving force for the development of relevant industries in China.

3) ILC is an excellent platform of education. China's active participation in ILC collaboration will help training high level scientists and engineers capable for making good contributions in international collaborations, and is also good for training high level leading scientists.

4) China should play an important role in the ILC collaboration as an active partner.

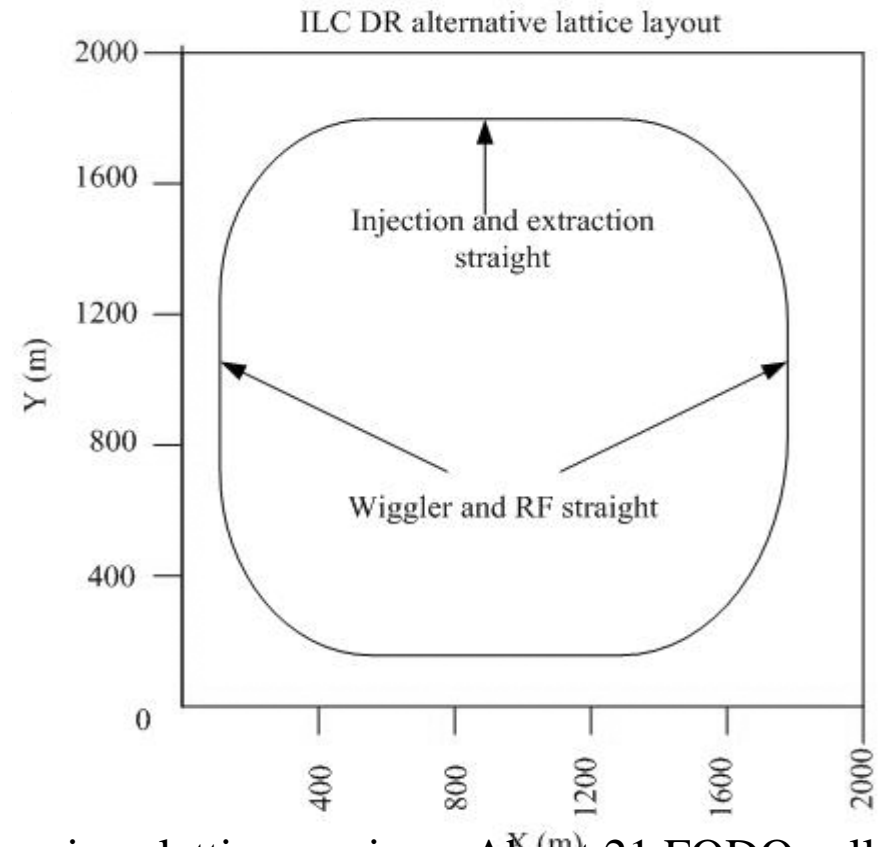
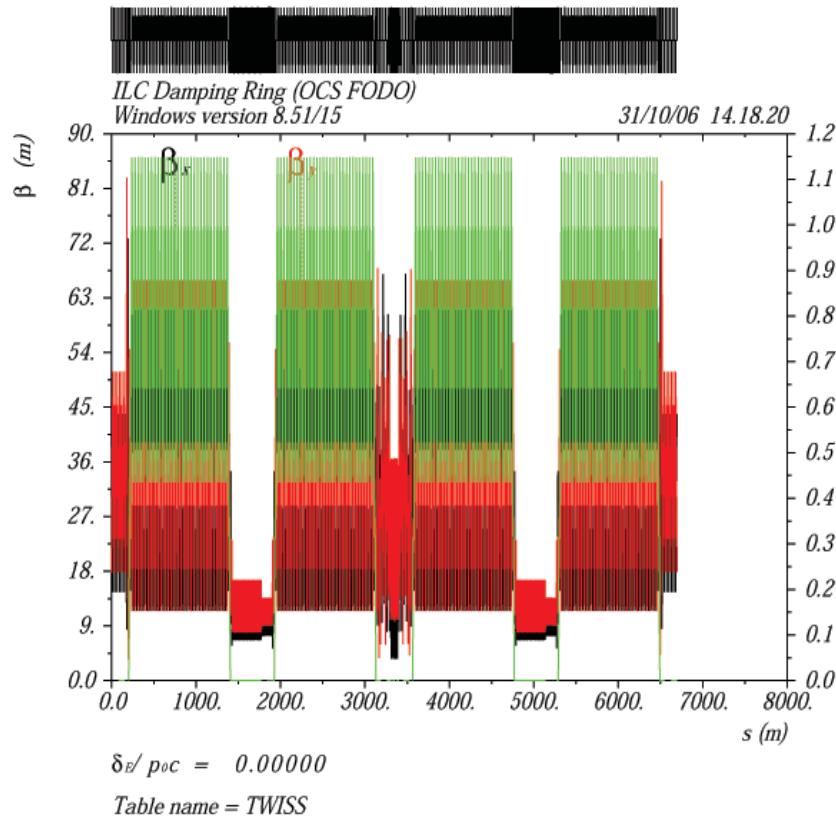
IHEP (China) made ATF2 magnets (ILC-IHEP group)



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ILC-IHEP contribute to ILC Damping Ring Design and push the number of shafts from 8 to 2(ILC-IHEP group)



There are 120 arc cells in all, as in the previous lattice versions. About 21 FODO cells which is similar with the RF cell are inserted into the wiggler straights to maintain the circumference of 6695.057 m.

ILC—IHEP and KEK Collaboration on Ning Xia large grain single cell cavity



Beijing University made Chinese large grain SC



Beijing University made Chinese large grain
2-cell SC



Beijing University prepare to make Chinese Ning Xia Single Crystal SC

90微米BCP1:1:2, (样片)



冲压后的半cell



Tsinghua University

Compton Scattering experiment



ILC-IHEP Collaboration with KEK the ILC-IHEP group visitors sent to KEK in 2006

SC: GE Ming Qi, XU Qing Jin, ZONG Zhan
Guo, ZHAI Ji Yuan

LLRF for SC: GENG Zhe Qiao

Positron source: LI Xiao Ping

Beam dynamics: PEI Shi Lun, ZHU Xiong Wei

Instrumentation: ZHAO Jin Xia, YUE Jun Hui

Magnet Measurement: CHEN Wan, SUN Xian Jin

Duration 1-3 Month/person

Totally:12 visitors

ILC Related R&D Activities in the Following Years

1. Beam dynamics (main linac)
 2. ATF2 optics optimization and experiments
 3. Damping ring lattice, vacuum chamber, magnets, power sources, etc.
 4. Control system
 5. Positron source
 6. Superconducting cavity
 7. Low Level RF
 8. Cryomodule
 9. Instrumentation
 10. Solid state modulator of 120kW of 5-10 Hz ,1.3ms
-

Man Power and Budget Available Now and in the Near Future

For man power, right now about 30 people, mainly young students, and in the near future, we expect 50 person (some work part time), but with some experienced people.

As for budget

- ILC in general 3 Million RMB
- Positron source 400k RMB
- Solid state modulator 5 Million RMB

...

In the near future, we expect 10-15Million RMB budget for Chinese ILC related accelerator R&D works.

1Euro=10RMB

ILC related works at CHEP/KNU

Performed R&D activities for BCD and RDR

□ RTML

- Alternative bunch compressor

- ✓ Lattice design and optimization
- ✓ Estimations of tolerances due to errors
- ✓ Control of emittance growth

□ Damping ring

- ✓ Fast-ion instability in damping ring
- ✓ Lattice design for electron damping ring

Performed R&D activities for BCD and RDR

□ Beam diagnostics

- ✓ IP-BPM for ATF2
 - body design
 - electronics design



□ Single-cell ICHIRO rf cavity

- ✓ performance comparison of fine and large grains with Saito group

R&D activities for EDR

□ Damping rings

- ✓ **Electron damping ring (on going with KEK and ANL)**
 - **Fast-ion beam instability**
 - **Lattice design and optimizations**

- ✓ **Positron damping ring (on going)**
 - **E-CLOUD beam instability**

R&D activities for EDR

□ Beam diagnostics

✓ IP-BPM (on going with ATF2)

- Fabrication of cavity body
- Fabrication of electronics
- Testing and installation at ATF2 in 2007

✓ S-band BPM (on going with ATF2)

- Designs of cavity body and electronics
- Fabrications of cavity body and electronics
- Testing and installation at ATF2

R&D activities for EDR

□ ICHIRO rf cavity

- performs S0 tasks with Saito group
- ✓ R&D on single-cell rf cavity (on going)
 - high-gradient accelerations with fabrications of 6 cavities
- ✓ R&D on 9-cell rf cavity (FY2007 ~ FY2009)
 - high-gradient accelerations with fabrications of 2~3 cavities
- ✓ R&D on multipacting effects (on going)
 - design investigation to reduce the effects

R&D activities for EDR

□ RTML (on going)

✓ bunch compressor

- Optimization and improvement of performances

□ ATF and STF (planned)

- Optics studies with beam diagnostics at ATF2
- Fast-ion instability at ATF DR
- R&D of BPM for main linac at STF

Accelerator men power and budgets at CHEP/KNU

- ❑ Official budgets from MOST in FY2006 to FY2008
: 0.3 M \$ / year (without salary)
(official budget for ILC accelerator of CHEP/KNU)
- ❑ Expecting budgets from MOST
: ILC RF cavity R&D facilities
CHEP/KNU proposed 15 M\$ to MOST in Oct. FY2006
- ❑ Korea's ILC Collaboration Fund Application
to the MOST (submitted in FY2006)
: for Accelerator, Detector and Particle physics
Joint request from many Univ. and Institutes in Korea
- ❑ Available accelerator men powers in FY2007
: 6 FTEs + 3 Part time

ILC related works at PAL



Activities in 2006-2007

1. Organizing SRF Task Force Team

- Members (7 dedicated)
 - 1-beam dynamics
 - 1-analysis in electromagnetics and mechanics,
 - 1-design and manufacturing, 1-welding, 1-chemistry
 - 1-RF high power, 1-RF low level

- Missions
 - R&D for SRF
 - Constructing SRF test Lab. (100W, 1.3-1.5GHz)
 - Activities in ILC and SRF societies



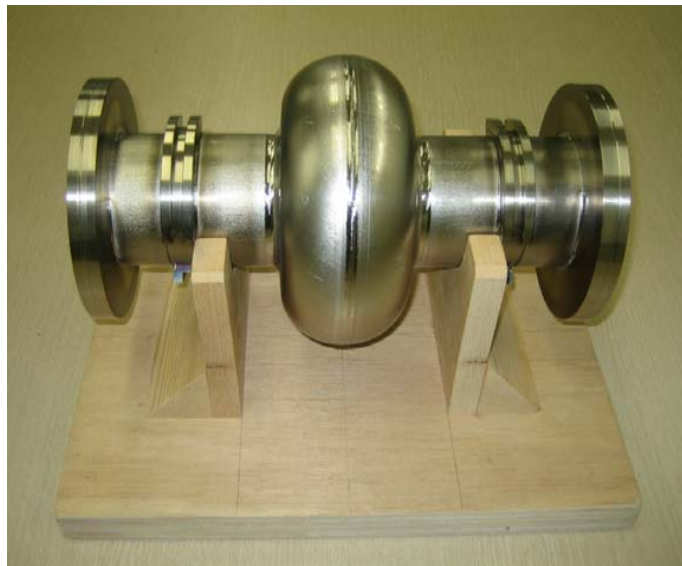
Activities in 2006-2007

2. R&D 3rd harmonic SRF cavity for PLS

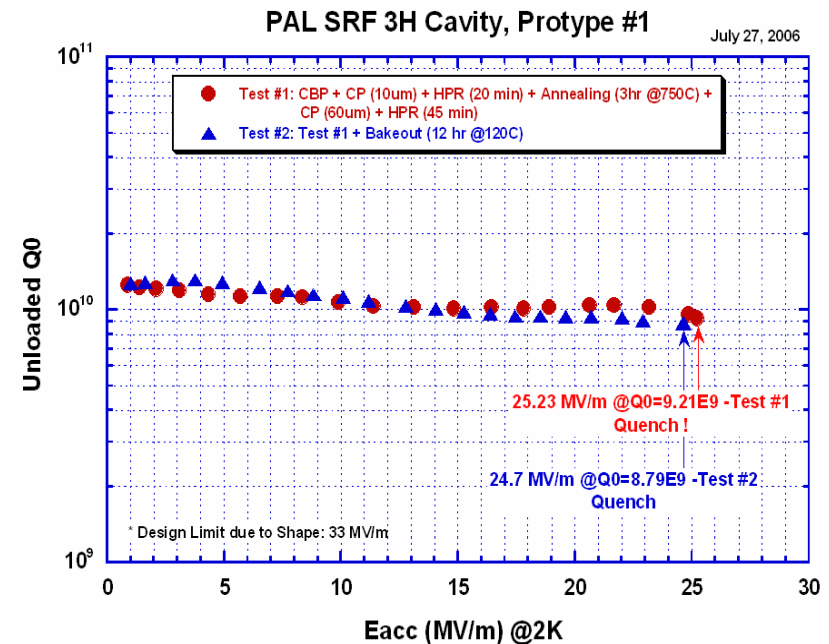
- Design and fabrication of prototype cavity
 - Done in PAL
- Surface treatment (preparation)
 - Done in KEK (K.Saito)
 - CBP, CP, annealing and HPR, no EP
- Vertical test
 - Done in JLab. (P. Kneisl)
 - Max $E_{acc}=25.2\text{MV/m}$ @ $Q_0=9.3\times 10^9$, @2K
 - Frequency=1499.8 MHz



Prototype 3rd Harmonic SRF Cavity for PLS



Prototype 3rd H Cavity



Vertical test, Eacc



Activities in 2006-2007

3. R&D for ILC ACD (ICHIRO) Cavity

- Trial fabricating 9-cell cavity under collaboration with KEK (#1 PAL-IC)
 - Fabricating dies and jigs & fixtures
 - Test fabrication of half cells and dumbbells, reviewed by KEK
 - Fabrication half cells and dumbbells for 9-cell cavity
 - End groups and integrating welding will be done in KEK
- 2nd trial, #2 PAL-IC
 - All manufacturing processes will be done in PAL
 - 2nd quarter in 2007



Trial Fabricating 9-cell Cavity, #1 PAL-IC

[Will be done March in 2007]



“ILC R&D Program in PAL, Korea” in ILC GDE Meeting – February 4-7, 2007 IHEP



Activities in 2006-2007

4. Constructing SRF Test Lab.

- Lab. capability
 - Frequency: 1.25-1.55 GHz
 - RF Power: ~100 W
 - Temperature control: 4.5-1.5 K
 - Test cryostat for cavity with 1-3 cells @1.3GHz
- Schedule
 - Construction & installation: July 2006 - July 2007
 - Commissioning with single-cell cavity: August 2007
 - Normal operation: November 2007



Budgets

- Budget in 2005-2006: *392,000 USD*
 - R&D of 3rd harmonic cavity: *70,000 USD*
 - R&D of ILC ACD (ICHIRO) cavity: *112,000 USD*
(70,000 USD from industry.)
 - Construction of SRF Lab.: *210,000 USD*

- Budget in 2007: *195,000 USD*
 - R&D of 3rd harmonic cavity: *20,000 USD*
 - R&D of ILC ACD (ICHIRO) cavity: *125,000 USD*
(75,000 USD from industry.)
 - Construction of SRF Lab.: *50,000 USD*

ILC related works in India

ILC in India

- Still in an exploratory phase
- Interested in R&D of ;
 - Cryomodule
 - RRCAT-FNAL collaboration started
 - Different samples of niobium material and their gradient
 - In collaboration with J-LAB
 - RF modulator
 - With Dr. Mishra

ILC related works in Japan

Japanese Strategy of HEP

We, the Japanese HEP community, recognize that physics at the energy frontier is of primary importance. With this understanding, we give the highest priority to the realization of the ILC. Before the ILC experiment commences, we will also promote flavor physics that is complementary to physics at the energy frontier. We should pursue the above two goals as a single master plan.

The above HEP plan was presented at a sub-committee of the Science Council of Japan. The sub-committee started working to scrutinize it together with astrophysics programs.

A report is expected to be issued in Summer.

ILC in Japan

- R&D
 - ATF is in operation since 1994.
 - ATF-II collaboration is based on a multi-lateral MoU.
 - Many collaborators from all around the world.
 - STF is under construction
 - Facility, S0 and cryomodule
 - R&D using KEKB is under study.

 - RDB has reviewed our R&D program
 - Priority has been given to each program
 - Taking the priority in account, budget request was submitted to KEK management last week for the next fiscal year.

ILC in Japan

- Resources
 - ~ 40 FTE
 - + ? from KEKB group in the near future
 - ~ 10 oku-yen/year for ILC-related R&D
 - “Core Univ. program” for exchange of people (until 2010)
 - ~ 5000 person-day/year with China, India and Korea
 - Application for new funds
 - R&D (100 \sim 200 oku-yen (M\$) before construction)
 - Needs a formal governmental recognition
 - Support from Diet members, but...
 - “Top 10”
 - A new program to create ~ 10 top-level centers of research
 - $\sim 0(10 \text{ oku-yen(M$)/y} + 50 \text{ researchers})$ for ~ 10 years,
 - KEK is preparing a proposal, not an ILC dedicated plan though
 - a new exchange program between Asian countries
 - ~ 3000 man-yen (~ 300 K\$) /year for 3 years



Cryogenic liquefier

STF Building plane view

STF棟 (旧陽子リニアック棟) 平面図

Cryogenic System (from AR East)

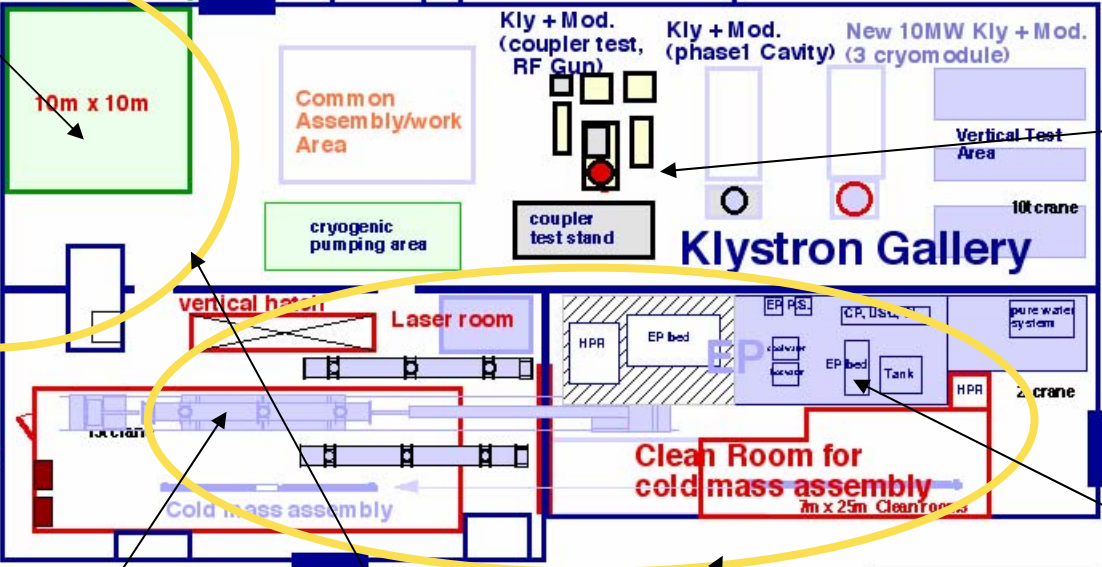


Control Room



5m x 15m

Cryogenic Compressor (from AR-East)

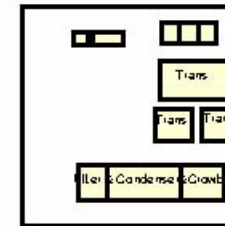


Cryomodule Assemble Area



Klystron Gallery

Cavity Process (EP) & assemble Area (clean rooms)



For EP, Clean Room

V7.2 H. Hayano, 7/10/2006

Infra-structure for SC-RF production

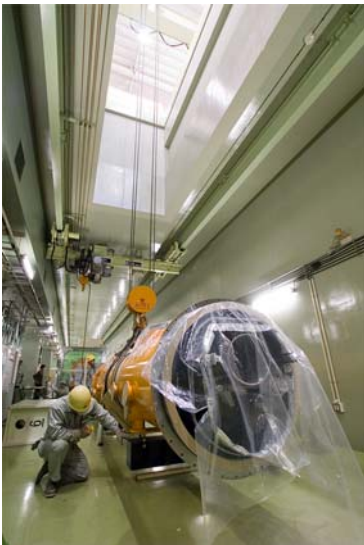
STF phase 0.5 Cryomodule into Tunnel



carrying down
the cryomodule



cryomodule sit in the tunnel



Beam pipe connection



Cryomodule installation

SC Infra-structure

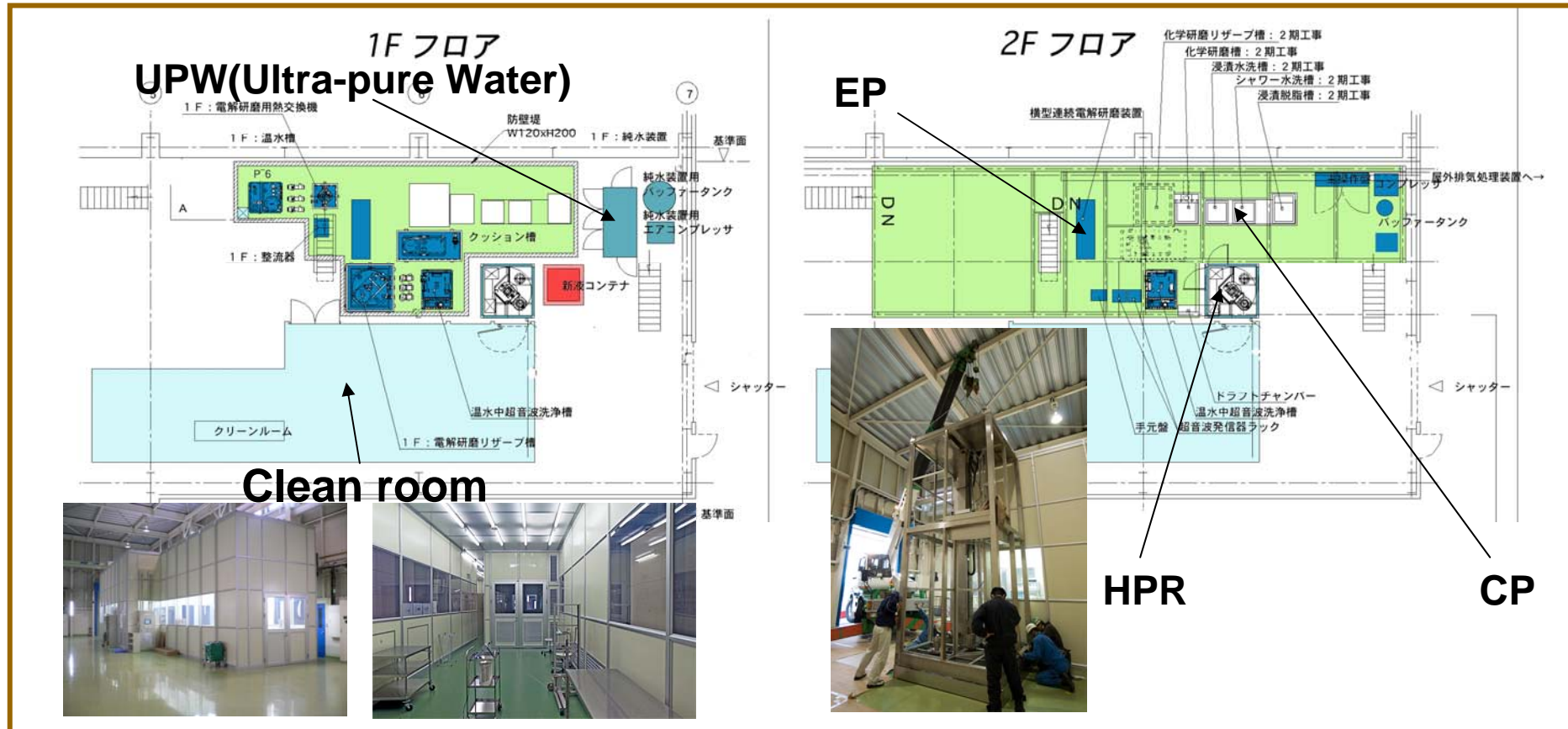
Clean room: in operation for use of short cryomodule assembly.

UPW: in operation.

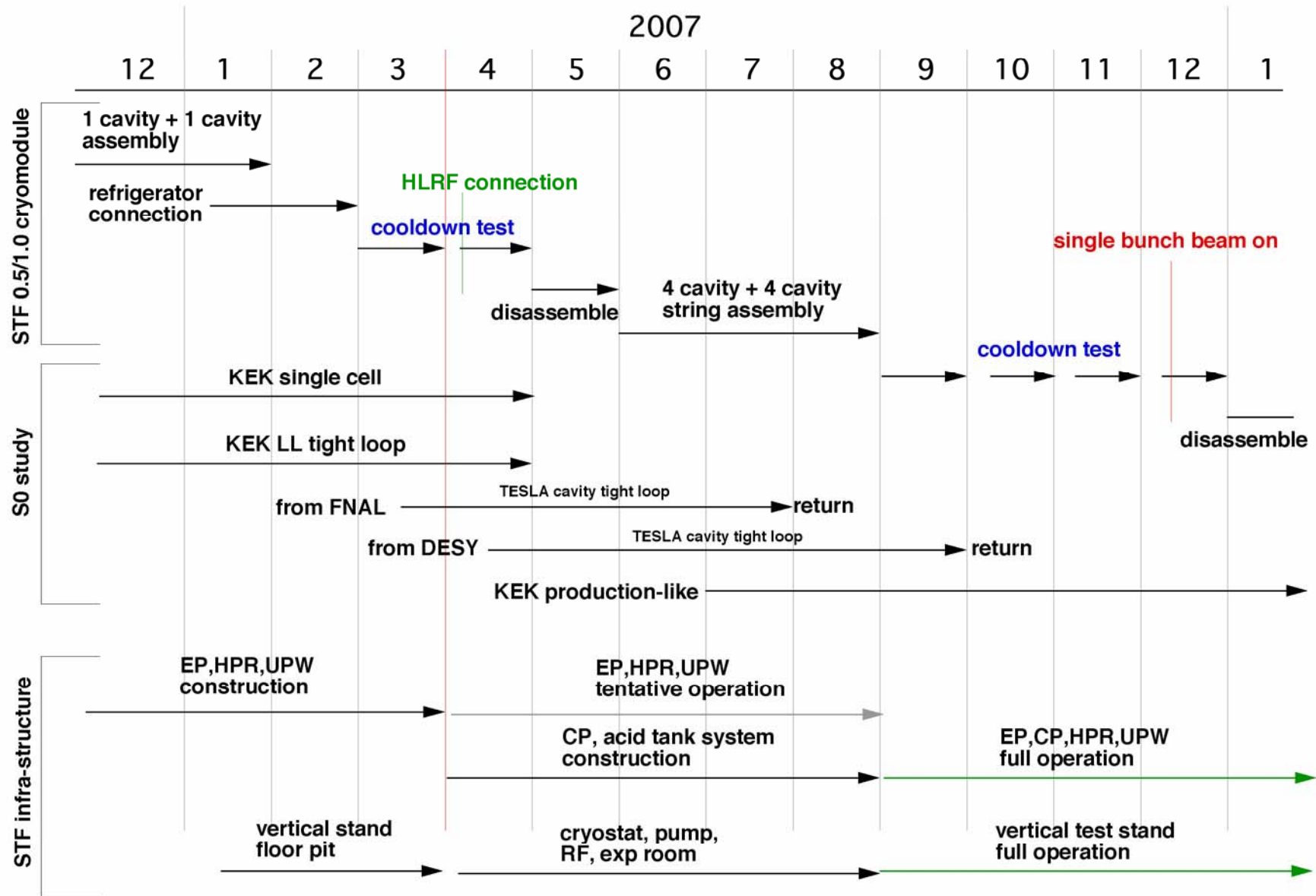
HPR: under construction. will be completed in Jan. 2007.

EP: under construction. will be completed in Mar. 2007.

CP & acid tank system: will be constructed in JFY2007.

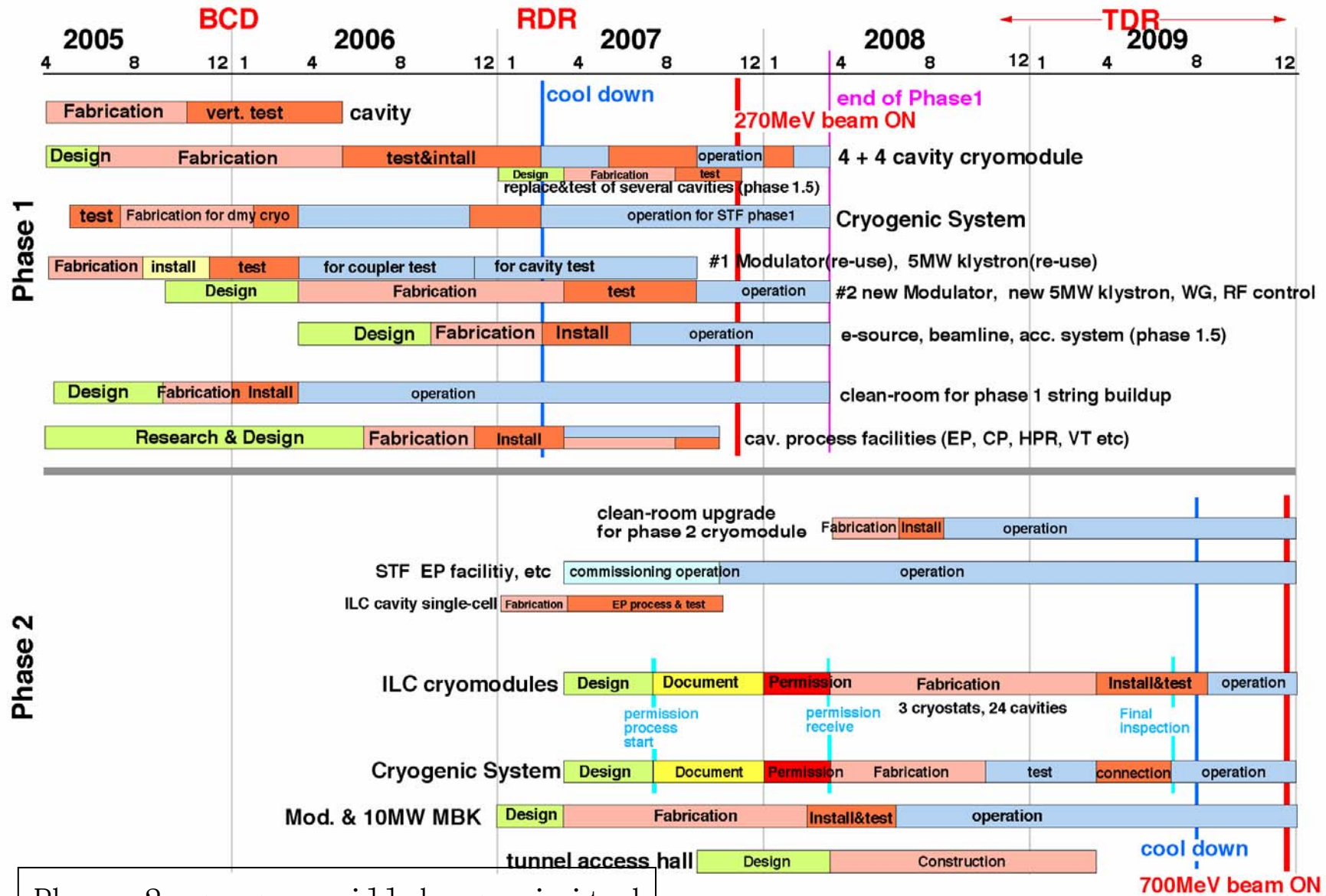


KEK-SRF 2007 schedule



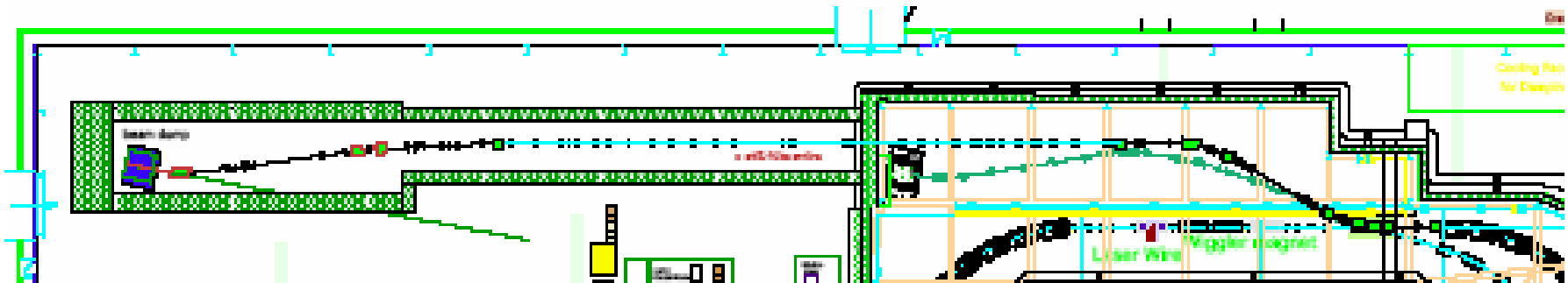
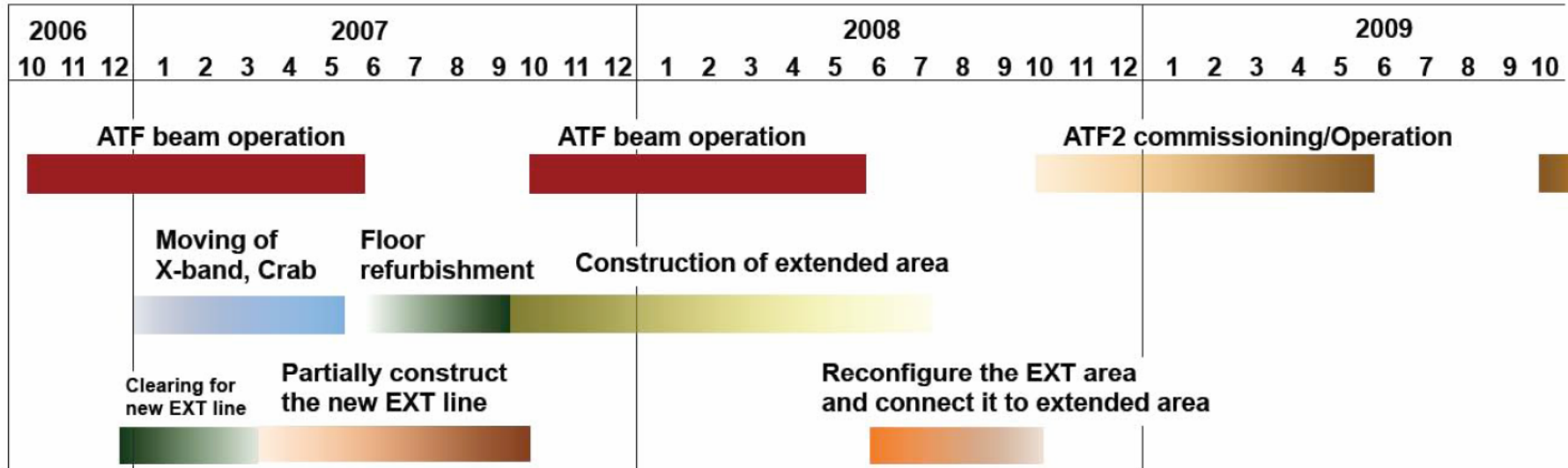
STF long-term Plan

H. Hayano 12172006



Phase 2 program will be revisited

ATF2 construction schedule



- ATF2 beam will come in October, 2008.

Summary

- Asian activity for the ILC grows slowly but steadily.
- Budget is tight and most of resources come from “ILC-related” funds.
 - High-tech nature of the R&D is important in each country.
 - We should consider this situation in assigning R&D program in the EDR phase.
- Many young researchers in Asia are gaining experience by working at existing facilities.
 - They will surely play a central role in construction/operation period of the ILC.