# Asian Plan for ILC : Overview

Kaoru YOKOYA

DESY visit, Mar.7.2005

- Our Basic Strategy
- Plan for the Next Few Years

# Asian Organization for ILC Research

**Working groups** (same structure as in the ILCWS)

| | | |
|---|---|---|
| WG1 | Overall design | K. Kubo |
| WG2 | RF | H. Hayano |
| WG3 | Injectors | M. Kuriki |
| WG4 | Beam Delivery System | T. Sanuki |
| WG5 | Cavities | K. Saito |
| ? | Facility | A. Enomoto |
| ? | Site | R. Sugahara |

**Japan LC Office**

F. Takasaki (chair), K. Yokoya, H. Hayano, N. Toge, S. Yamashita

# Participation of Asia

9th ACFA meeting at Kolkata, India, Nov.2004

# Third ACFA Statement on Linear Collider (abridged)

9th ACFA meeting at Kolkata, India, Nov.2004

- ACFA welcomes the truly international nature of the decision on technology for the ILC. This sets the stage for international collaboration in the design efforts for the ILC.
- ACFA reconfirms the importance of hosting ILC in Asia, which will make high energy physics and accelerator science truly global.
- ACFA urges the Japanese Government to fully support the efforts of KEK and Japanese scientists to host the ILC in Japan.
- ACFA urges KEK to establish the Asian Regional Center for R&D in GDI and encourages other Asian countries to actively participate in GDI.
- With ILC entering this important phase, ACFA urges Governments of Asian countries to support participation of their scientists in GDI.

# Research in Asia

- Active participation from China and Korea
- Existing facilities and technology base
  (workshops in the labs, SC technology for nuclear fusion, etc.)
- Working Groups formed
- Many from China/Korea are visiting/going to visit KEK
- Possible production of components

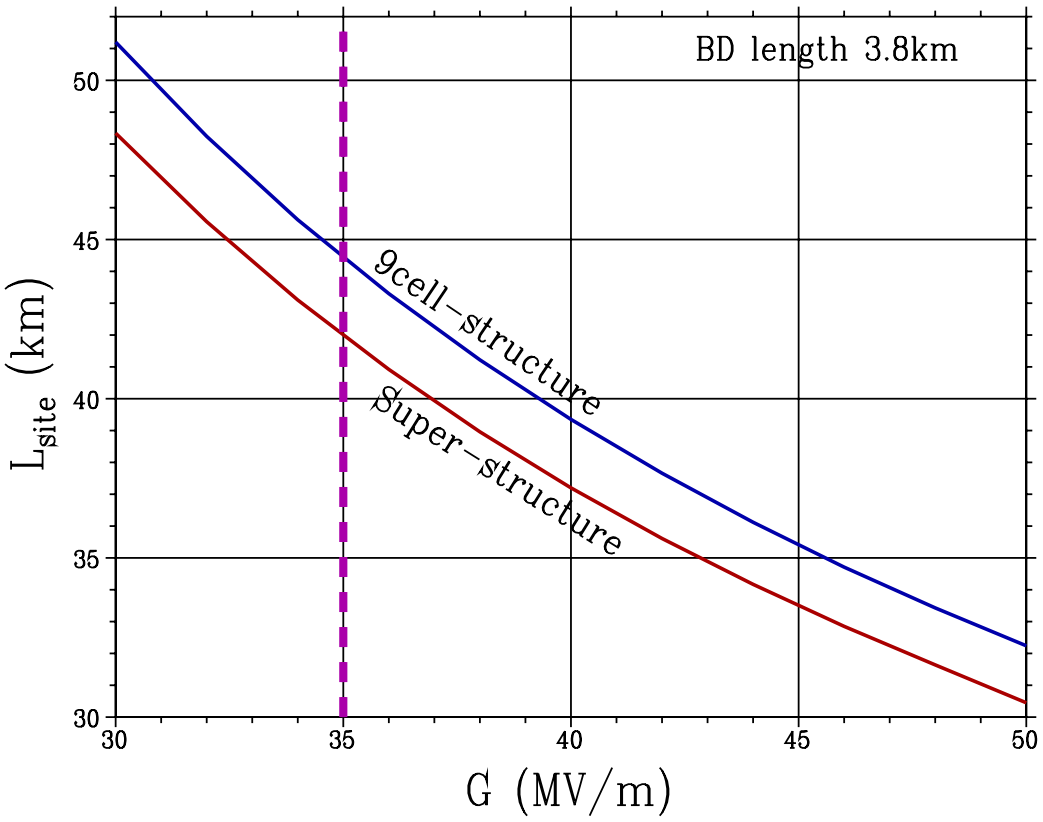
| | IHEP contact person | PAL Task Force Team |
|---|---|---|
| | | (Head) Won NAMKUNG |
| WG1 | GAO Jie | Jin-hyuk CHOI, Moo-yun CHO |
| WG2 | CHI Yun-long | Jong-seok OH, Won-ha HWANG |
| WG3 | PEI Guo-xi | Sung-ju PARK, Eun-san KIM |
| WG4 | Wang Jiu-qing | Jung-yun HUANG, Hee-seock LEE |
| WG5 | ZHAO Sheng-chu | Sang-ho KIM, Young-uk SOHN |

## Critical Reaserch Areas

- **Establishment of the technology for accelerating gradient 35MV/m**
  - Technologies for cost reduction
  - Technologies for mass production
- **Pursuit of possible higher accelerating gradient**
  - Larger operational margin of gradient
  - Wider possibility of site selection
- **Beam technology development using KEK-ATF**
  - Unique storage ring to reach ILC emittance
  - Make full use of ATF capabilities

# 'Higher Gradient'

- 45km site needed for 1TeV with 35MV/m
- There are a few site candidates in Japan $\gtrsim$45km, but higher gradient desirable for flexible choice
- 40km if 40MV/m
- Use 45MV/m as target operation gradient for document consistency. Actual value may be different.
- This value includes operation margin



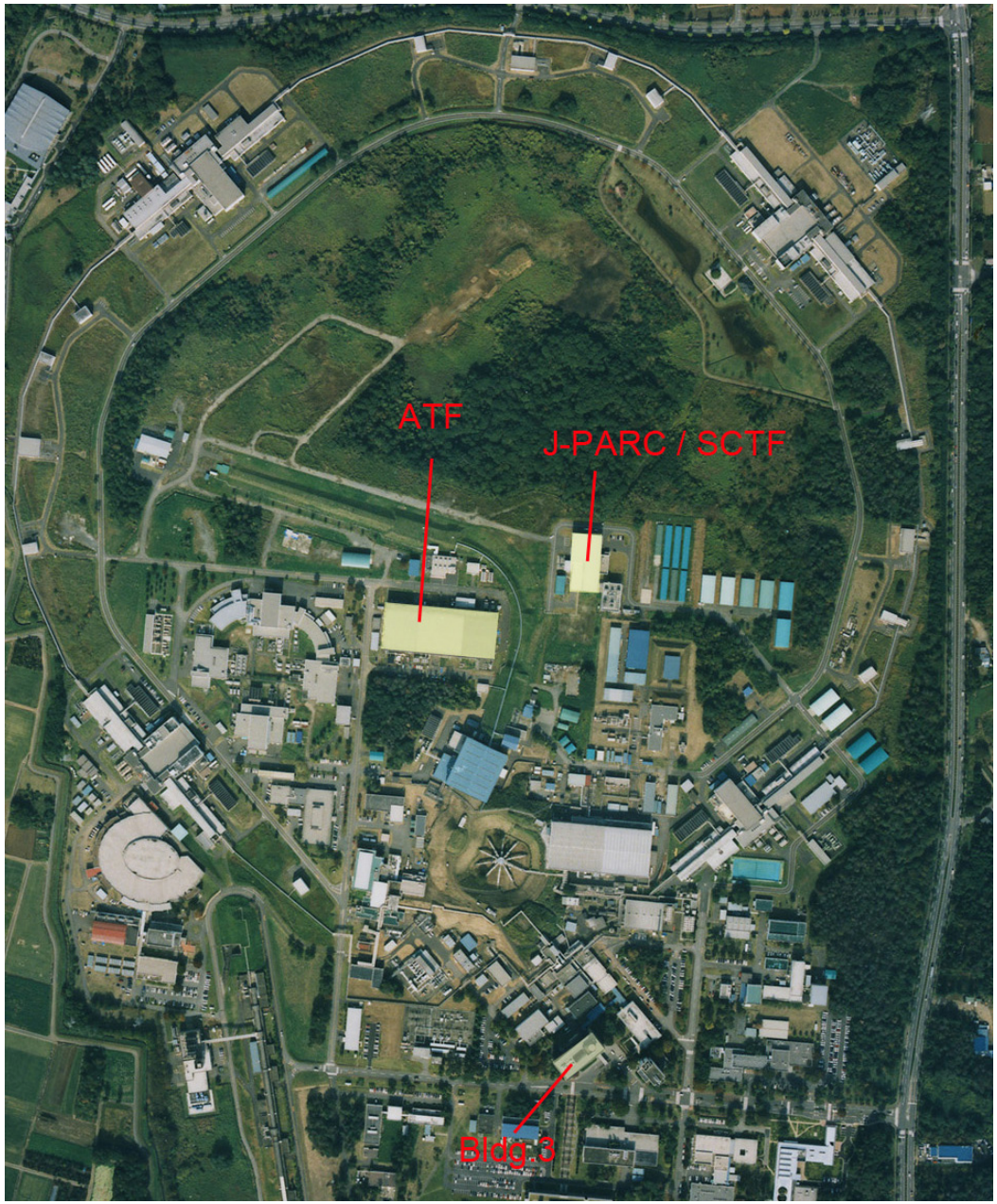
## **Development of 45MV/m** ($\Rightarrow$ Saito)

- Single-cell test soon
- 9-cell cavity design done. Fabrication starting.
- Individual vertical test of four 9-cell cavities **by Sep.2005**
  - Just in time for CDR completion
  - In existing facilities (AR east)
  - If expected performance not obtained,
    $\Rightarrow$ change to slower plan for ILC 2nd stage
- Cryomodule test by end of 2006 $\Rightarrow$ STF Phase 1
- Industrial design by TDR

**STF** ($\Rightarrow$ Hayano)

Superconducting RF Test Facility

- Linac R&D building for JPARC
- Emptied by summer 2005
- 93m tunnel underground
- Reuse existing facilities
  - Refregerator from AR east
  - Power supply and modulator

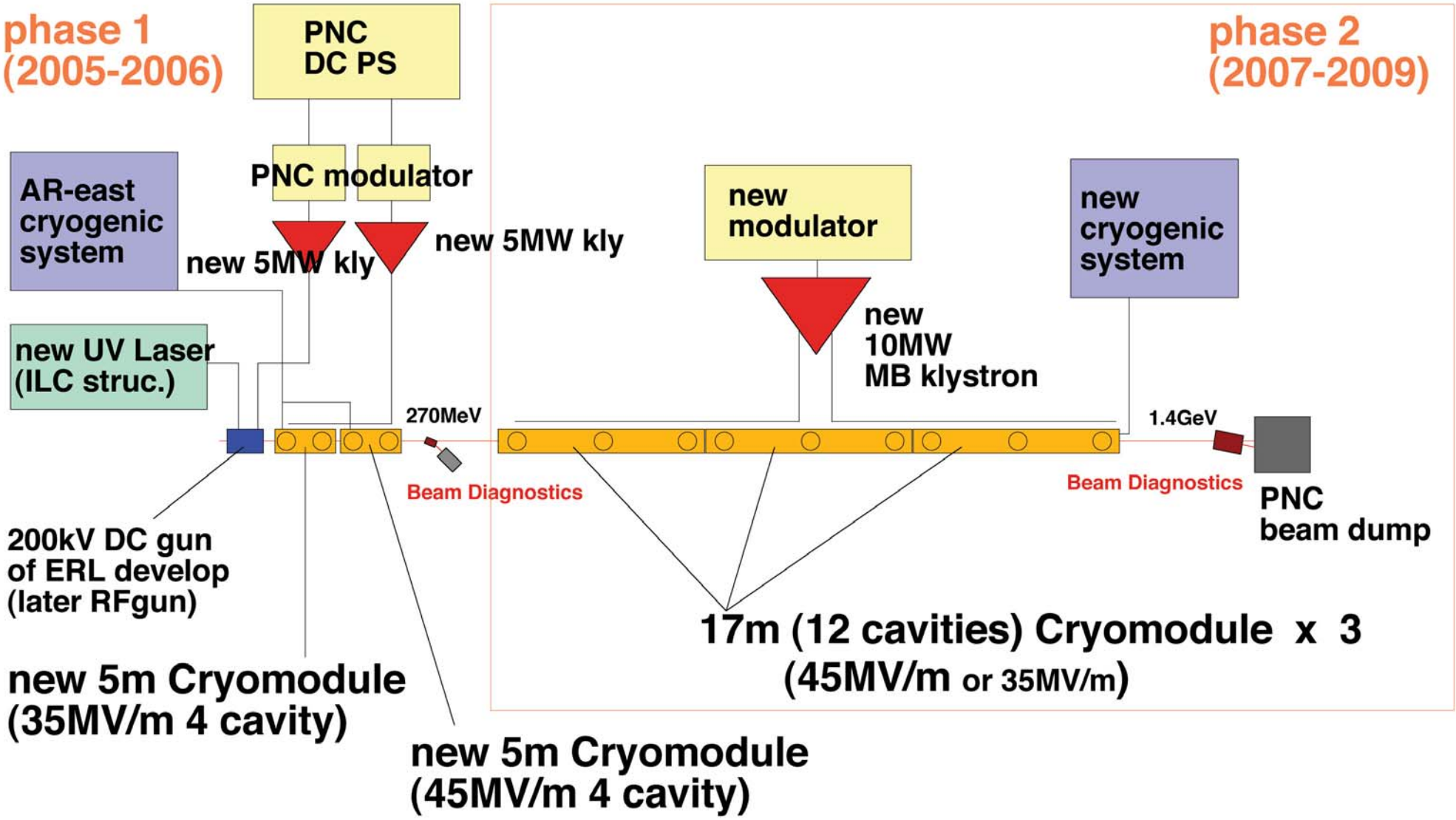


# Purpose of STF

- Establish **industrial design** of Linac unit (35MV/m and 45MV/m)
- Promote Asian/Japanese industrial level for ILC component production
- Form Asian base for international collaboration
- Enlist/educate new comers

Applications of superconducting technology to other area such as **FEL** and **ERL** are also in the scope after ILC R&D.

# Plan of Superconducting Cavity Test Facility (STF)




V1.0 Hitoshi Hayano, 11/07/2004

# STF Phase 1 (2005-2006)

- Crymodule for 4 45MV/m cavities
- Crymodule for 4 35MV/m cavities
- RF source and cryogenic system (mostly recycled)
- Electron beam and its diagnostics system
- Synthetic test of 35MV/m & 45MV/m cryomodules with beam

## **Other items with STF Phase 1** ($\Rightarrow$ Saito)

- **Electro-polishing Facility**
  - Phase 1 cavities can be processed in present (aged) facility
  - Need to refresh the facility for future
  - Needed whatever actually goes with Phase 2
  - Can electro-polish cavities to be used overseas
- **Cost reduction of cavity fabrication**
  - **Nb/Cu-clad, seamless cavity**
  - Potentially bring about significant cost reduction
  - Development can be done in parallel with cryomodule test

# STF Phase 2 (2007-2009)

- 3 Cryomodules each containing 12 cavities (35 or 45MV/m)
- Reinforcement of RF and cryogenic systems
- Synthetic test with a beam

**Many uncertaintyies for Phase 2**

- Detailed plan in the 2nd half of 2005
  (Some components must be prepared in JFY2006)
- GDI will be functional by that time
- Collaboration/competition with TTF2/SMTF-ILC
- A few full-spec RF units needed for TDR somewhere in the world
- STF Phase 2 is desired for Asian industrial level

# International Collaboration on Linac

- Cavities
  - Japan is in a high level in the world
    - ⋆ Has been developing high gradient technology
    - ⋆ Has contributed to the world
  - International collaboration in individual items
    - ⋆ Design, field calc.(DESY, SLAC)
    - ⋆ Electro-polishing work and technology transfer (JLab, SNS)
    - ⋆ Planning to provide with EP cavities for SMTF ...
- Other than cavities
  - **Introduction of TESLA technologies and possible partial improvements in Japan**
  - Wider range of collaboration for STF Phase2

## **ATF** ($\Rightarrow$ Kuriki)

- Beam dynamics study
  - Fast ion instability
  - Dynamic aperture with wiggler, etc
- Development of diagnostics devices (Laser wire, cavity BPM etc.)
- Improvements of the extracted beam
  - Emittance of the present extracted beam still large compared with ring emittance / ILC emittance
  - Stabilization of the extracted beam
    (Also needed for experiments using extraccted beam)
- Development and test of **fast extraction kicker**
- Owe very much on internaltional collaboration, especially Japan-US collaboration

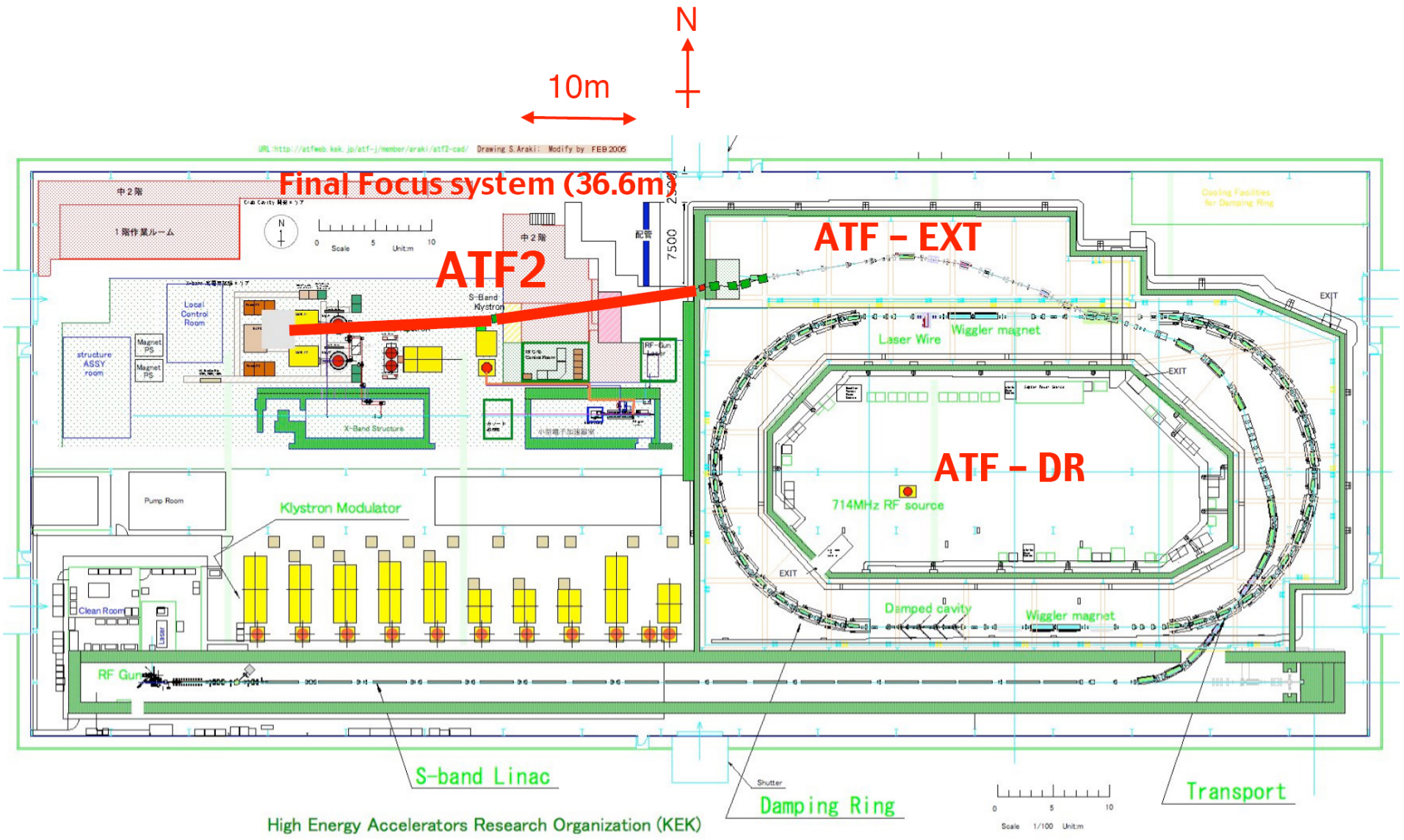
# Extension of ATF Extraction Line : ATF2

- Stable collision of 5nm beams is essential in ILC
- SLAC-FFTB realized 60nm beam by ∼1997
- Extension of ATF extraction line can produce ∼35nm beam

This beam size itself is not a big progress but, with **nanoBPM technology** being developed at ATF, a stabilization test down to nanometer is possible

## Time Scale

- The first step should be in time for TDR
- But very useful for ILC design even after TDR
  - Final Focus Design work will continue after ILC ground breaking (with constraints such as total length and crossing angle)
- Can experience tuning work (Minimize ILC commissioning time)


N
10m
Final Focus system (36.6m)
ATF2
ATF – EXT
ATF – DR
Local Control Room
structure ASSY room
Magnet PS
Magnet PS
S-Band Klystron
X-Band Structure
Pump Room
Klystron Modulator
Clean Room
RF Gun
Laser Wire
Wiggler magnet
714MHz RF source
Damped cavity
Wiggler magnet
EXIT
S-band Linac
Damping Ring
Transport
Shutter
High Energy Accelerators Research Organization (KEK)

# Purposes of ATF2

(A) **Small beam size**

(A1) Obtain $\sigma_y$ ∼35nm
(Note: The principles of chromaticity correction are different between FFTB and ILC)

(A2) Maintain for long time

(B) **Stabilization of beam center**

(B1) Down to $\lesssim$2nm by nanoBPM (cavity BPM)

(B2) Bunch-to-bunch feedback of ILC-type beam (∼300nm interval) when fast kicker extraction is ready

**But technological ones are not all**... ATF2 should be

- World center of beam-handling technology
- Recruit/education center for new comers

as the present ATF is.

# International Collaboration on ATF2

- Design study going on by international collaboration
  - ILC WG4, MDI group, ATF
  - Mini-workshops: Dec.11 at KEK, Jan.5 at SLAC
  - Submit proposal to PAC in May
  - Complete design by BDIR workshop in June
- Budget
  - Total ∼3.0 Oku Yen (floor, beamline, diagnostics)
  - Desirable to share the expenses among Asia, North America, Europe (except for infrastructure ∼0.6 Oku Yen)
  - Miniature of ILC (1/1000)
  - Basic agreements with SLAC
  - Have to start discussion with Europe
- Present plan
  - Floor construction in summer 2006 (start installation ∼Sep.2006)
  - Start operation in Jan.2007

# long-term Plan of KEK ILC-study