A1

Engineering and Industrialization in STF-Plan

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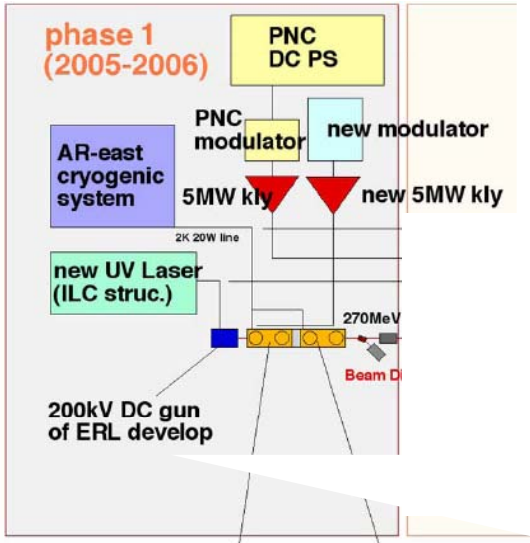
Slide 1

A1 Administrator, 9/27/2007

Outline

- Overview of STF in KEK
- STF-II
- STF-III
- BCD/ACD WP
- Industrialization
- Summary

Overview of STF (KEK Superconducting RF Test Facility)



STF (Superconducting RF Test Facility)

STF-0.5(Under progress)

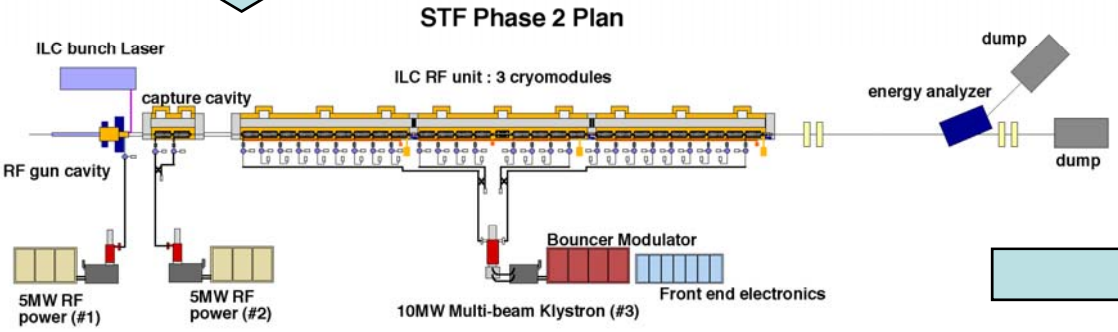
One 35MV/m-cavity in a 5m-long Cryomodule

+

One 45MV/m-cavity in a 5m-long Cryomodule

STF-1.0 (2007-2008:Delaying)

Configuration See left figure Necessary Infrastructures for STF (including EP, CP …) will be introduced.



Required RF Components

STF-1.0 (1.3GHz,L-band)

5MW Klystron x 2

Pulse Modulators

for 5-MW Klystron & for 10-MW Klystron

Power Distribution System (PDS)

for 8-Cavity System

LLRF (Analogue control, Digital control)

STF-2.0

10MW MBK

Pulse Modulator

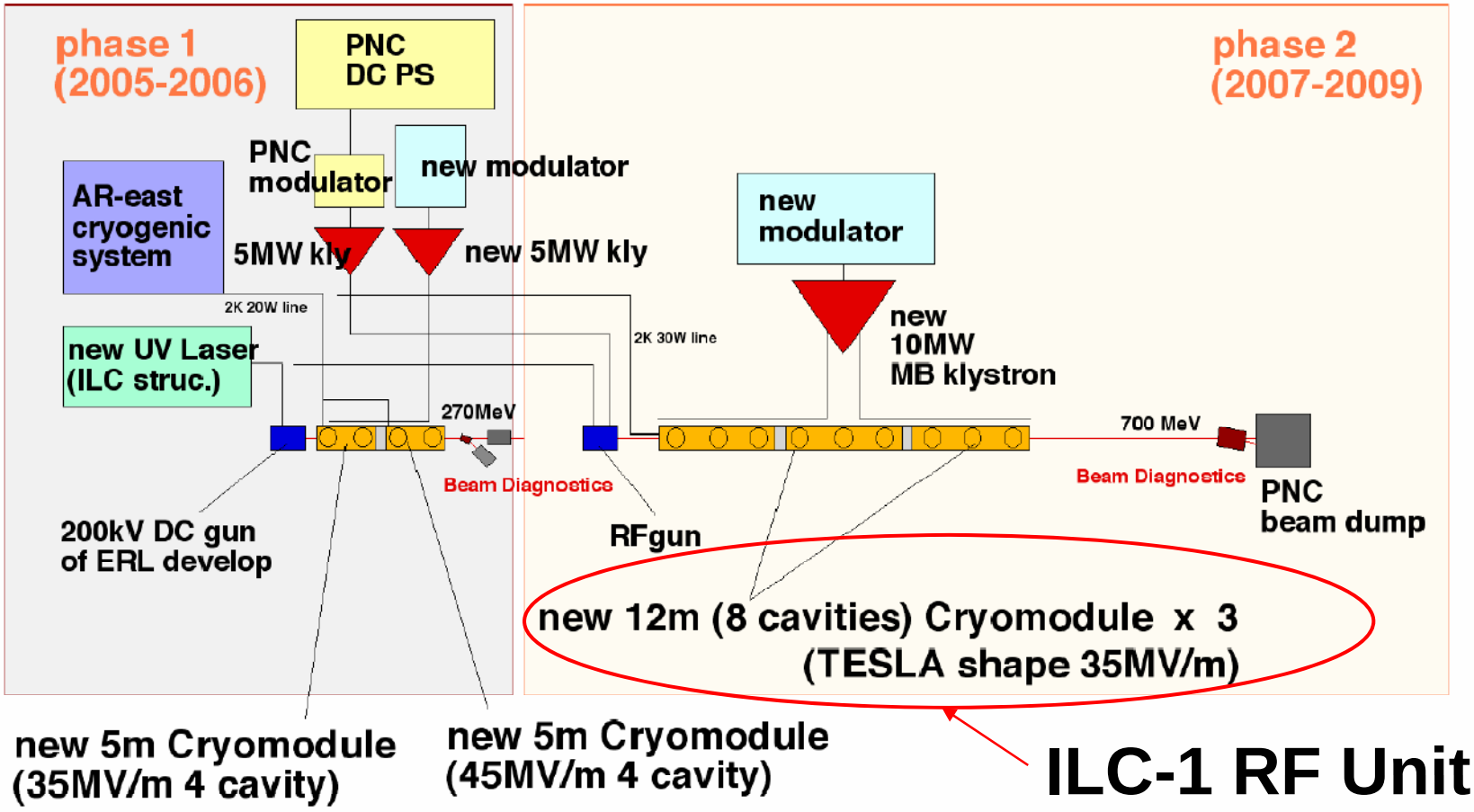
PDS for 26-cavity system

LLRF

STF-Phase 3.0

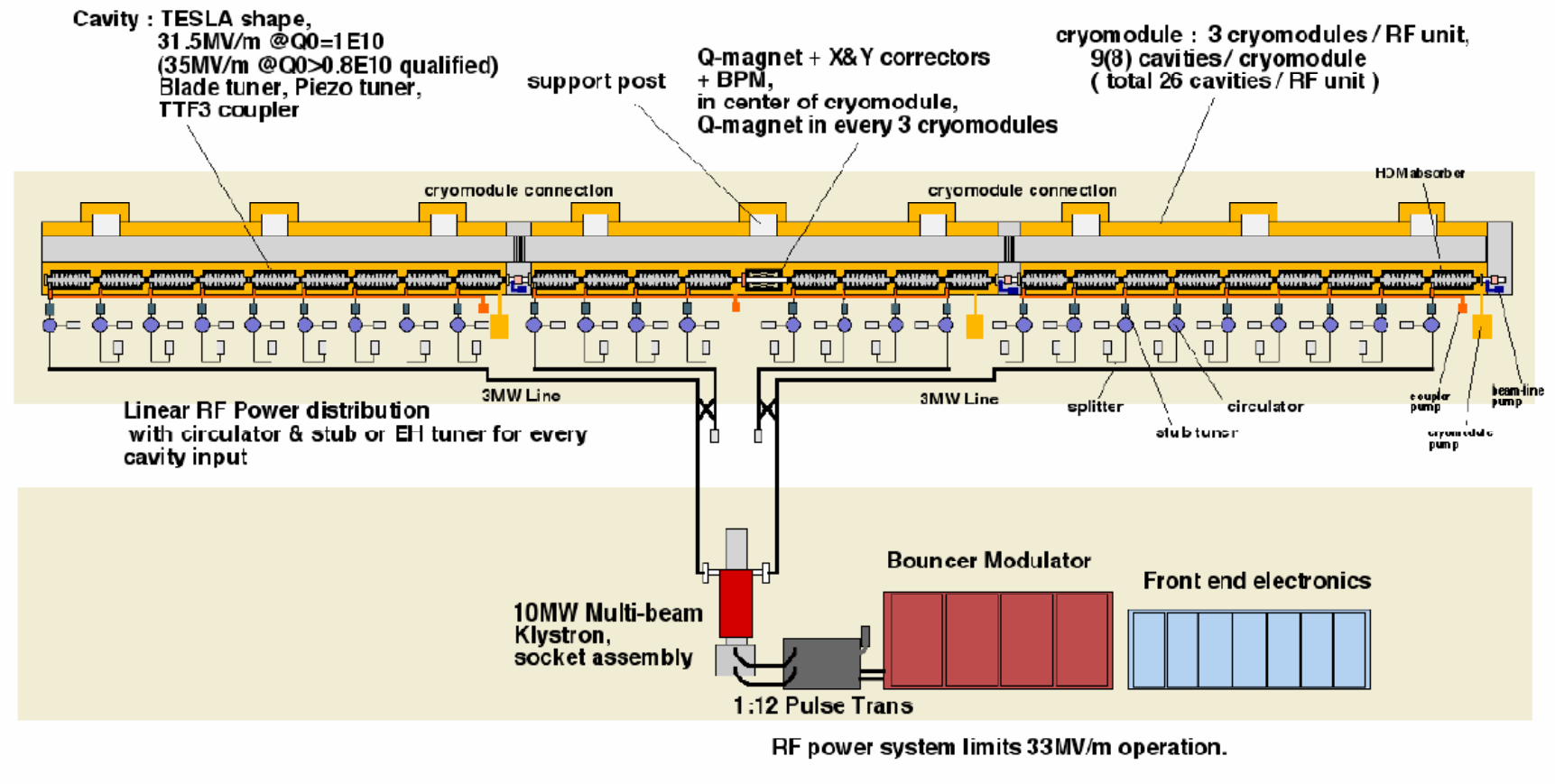
Official plan of STF-2.0 in KEK

Plan of Superconducting RF Test Facility (STF)

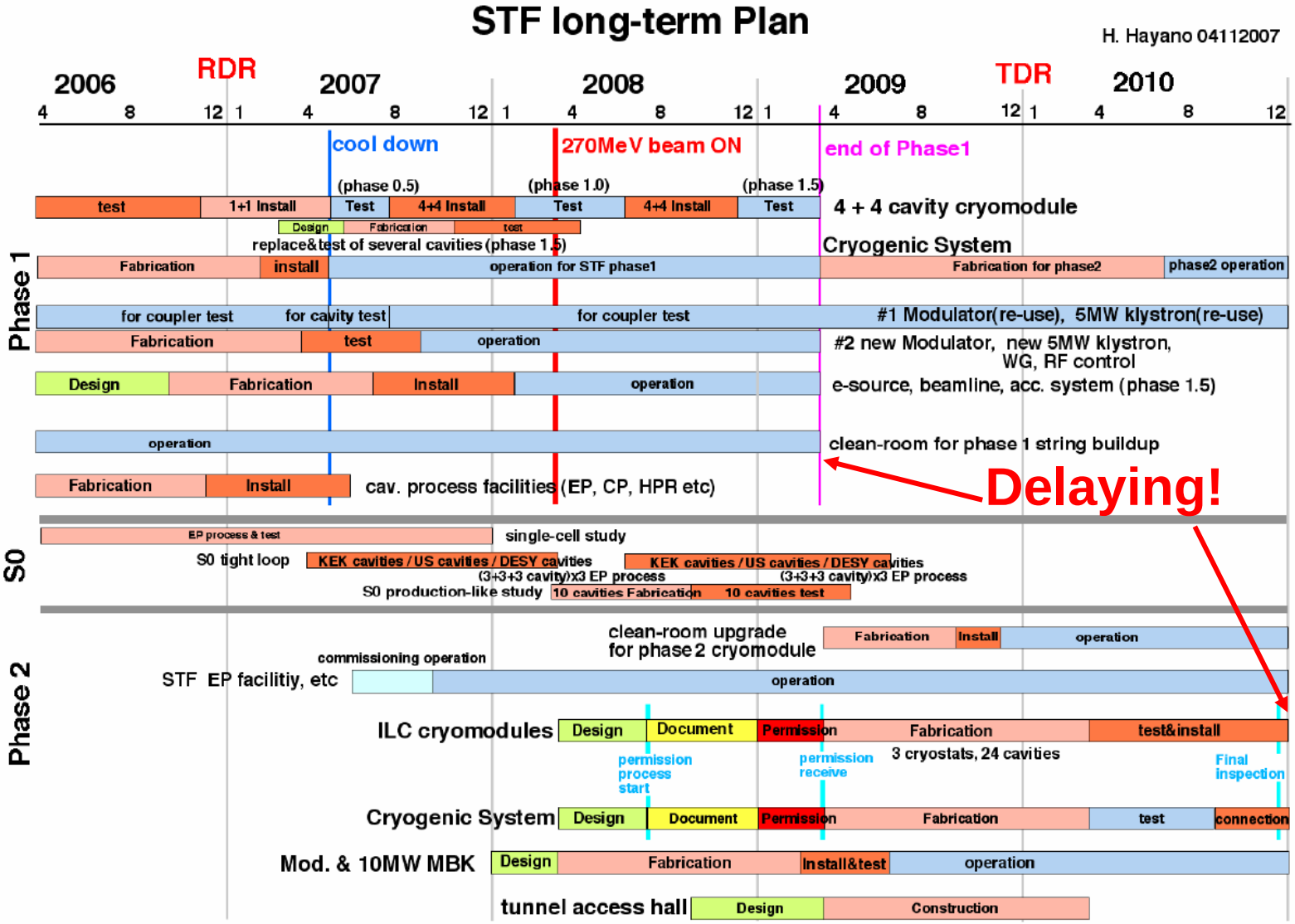


RF Layout of ILC Main Linac

Total 560 Unit(38kM)



Official Time Schedule for STF-2.0 in KEK



Main Goal of STF (First Attempt)

Phase 1 (2005 -2007),

Build up ILC SC-RF technology and experts,
Establish 35MV/m cavity,
Establish 45MV/m cavity,
Build up SC-RF infra-structure.

Phase 2 (2007 - 2009),

Build ILC Main Linac RF unit,
Achieve ILC BCD performance,
Operate the unit for long time,
Establish engineering design detail and basis of cost estimation.

STF Plan Revised, Derivative and Next Stage

- Phase 1 (2005-2007)

  Technical master of ILC SCRF, Completion of Infrastructure and development

------->Phase 0.5 : 1 cavity in each short cryostat (cool down: Nov. 2007)

Phase 1.0 : 4 cavities in each short cryostat (cool down: Feb-Apr. 2008)

Phase 1.5 : replacement of 4? Cavities by improved new 4? cavities (cool down: Fev.2009)

- Phase 2 (2008-2010)

  Construction and operation of ILC ML RF

------->Design Start Apr. 2008/ Fabrication in 2009 -2010/Completion end of 2010

- Phase 3 (2010-2012)

  Aiming for the Industrialization of ILC Components in Japan

WP's for the STF-2.0 and for the next plan

- In STF-1.0, first priority was construction of RF-source using the old components to test the cavities and couplers. R&D was not fully executed.
  - **Modulator: 3 IGBT(IEGT) SW modulators with bouncer circuits**
  - **Klystron: 2 Single-beam klystron, No MBK due to the budget restrict.**
  - **PDS: Minimum layout using past properties.**
- In STF-2.0, Full one unit of ILC RF system

------> BCD or ACD? Budget is limited, and choice is important !

  - **Modulator: Marx modulator Technology Learning, DFM model Running**
    R&D : Search the lower voltage Marx Generator
  - **Klystron: Running of Horizontal MBK developed at DESY**
    R&D : Super MBK, Collaborative work for SBK
  - **PDS: Realistic but simple/cheap PDS**
    R&D-----> hybrid WG components, No circulator, etc.
    Demonstration of all adjusted PDS on Cryomodule
  - **Control Try to have a Common Specification of protection and interlock**

WP for Modulator

(WP1) For STF-2.0, we make Marx Modulator the first priority. For DFM,

(WP1-1) Procurement or Manufacturing Prototype Marx modulator

***we collaborate with SLAC, while how to carry out is not determined*.**

(WP1-2) Running and evaluation at STF-2.0 Bench

(WP2) BCD modulator DMF(model for production) as the back-up of WP1.

(WP2-1) BCD modulator DMF

(WP2-1) IEGT or IGBT Study--→reinforce No.1 modulator replaced with new SW such as IEGT.

(WP3) Lower Voltage (50kV) Marx modulator (which combines with super MBK) considering the tunnel spacing, reliability and ease installation.

(Ambitious ACD and Next step of WP1)

(WP4) Possibility to use other types of modulator

(WP5) Common specification and common module development for the control, safety and interlock. DFM should be developed.

WP for Klystron

(WP1) For STF-2.0, complete evaluation of horizontal MBK is the first priority.

(WP1-1) Procurement or a horizontal MBK and accumulate the running data, check the reliability.

we collaborate with SLAC for running of the co-procured vertical MBK.

(WP2) ACD of KEK, Super SBK, in-house manufacturing for 1/n beam model and show the feasibility of lower voltage

(WP2-1) 1/6 beam model manufacturing and tested in No.2 modulator.

(WP2-2) Next step

(WP3) If sheet beam is successful, we will collaborate to use and check the reliability test in STF.

If lower Voltage (50kV) SBK is available, more

(WP4) Korean want to design and look for the possibility of high power IOT.

WP for PDS

In STF 1.0, KEK's PDS comprises of minimum components. Except for the 5MW circulator, we had an effort to manufacture almost all components in Japan (ex. 500kW circulator). It is necessary to develop phase-shifter, variable tap-off etc. and we also try to manufacture all components in Asia region.

There are some points which should be discussed about the PDS.

(a) Water-cooling channel is necessary or not. (for cheaper price)

(b) All WR770 is possible or not. (for simplicity)

(c) All system pressurized or separated by windows between high pressure part and atmosphere part? (price, flexibility of the flexible WG)

(d) If pre-adjustment is done on the cryomodule before installation, is it necessary to have a phase shifter?

(e) For the simplicity, is it possible to change the distance of the coupler to have a n*lamda.

(f) What is the best device as the variable tap-off.

WP for PDS (cont)

(WP-1) Study the PDS for eliminating the circulator.

Is it possible to evaluate the effect of cross-talk without beam?

(WP-2) Search the best way of the PDS including the tree-like PDS and linear PDS.

(WP-3) Search the most simple and cheep PDS such as the no-circulator, no-phase-shifter, only having a pre-fixed variable tap-off or pre-fixed Q-tuner.

(WP-4) Establishment of the welding of aluminum WG in the tunnel.

(WP-5) Exercise of the pre-adjustment on the cryomodule

(WP-6) Design the system having one hybrid components and simple straight and bend WG.

(WP-7) Reliable arc-sensor

For Industrialization

- Purpose of STF-3.0 is to establish the industrialization in Japan (Asia).
- We made almost all components in Japan: modulator, klystron (for the case of MBK), PDS.
- We have started to have an information of Korea's company status.
- We have looking for the liaison in China and India.
- Scheme for Asian industrialization: support half of money from KEK? In kind corporation? Hoe to transfer the technology?
  (These are different from central technology of SCRF.)
- For STF-2.0, preparation to DFM(specification of DFM) is taken into consideration.
- How to conduct bids for STF-3.0 is important.

Summary

- KEK's STF plans are described.
- Possible WP's are listed up for STF-2.0 and STF3.0.
- Establishing the completion and evaluation of the ILC technology (BCD /ACD) are achieved in STF-2.0
- Industrialization basis is achieved in the STF-3.0. Asian industrialization are also taken into consideration.