Towards KEK-Jlab Collaboration Program on SRF@ILC

Nobu Toge (KEK)

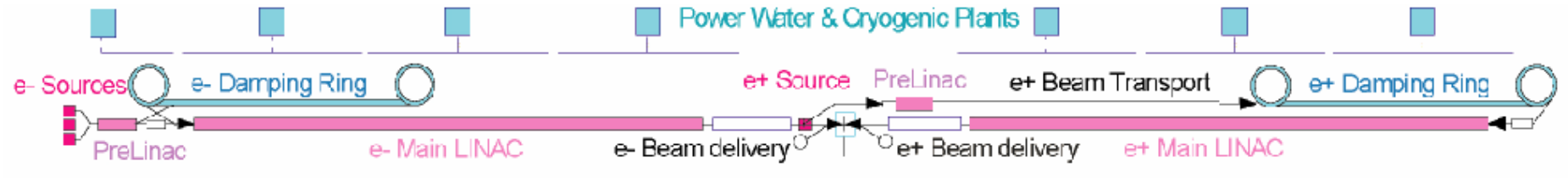
February 7, 2005

International Scenario for ILC as put forward by ILCSC/ICFA

- Feb. 2005: Site decision of Central GDI (Global Design Initiative) and appointment of its director.
- Spring 2005: Regional GDI formation.
- Aug. 2005: 2nd ILC Workshop (US). Freeze the design outline to present in CDR.
- Dec. 2005: Complete CDR.

- Dec? 2007: Complete TDR.
- 2008: Site decision, budget approval.
- 2009: Ground breaking.
- 2014: Start commissioning

Technical Issues with ILC



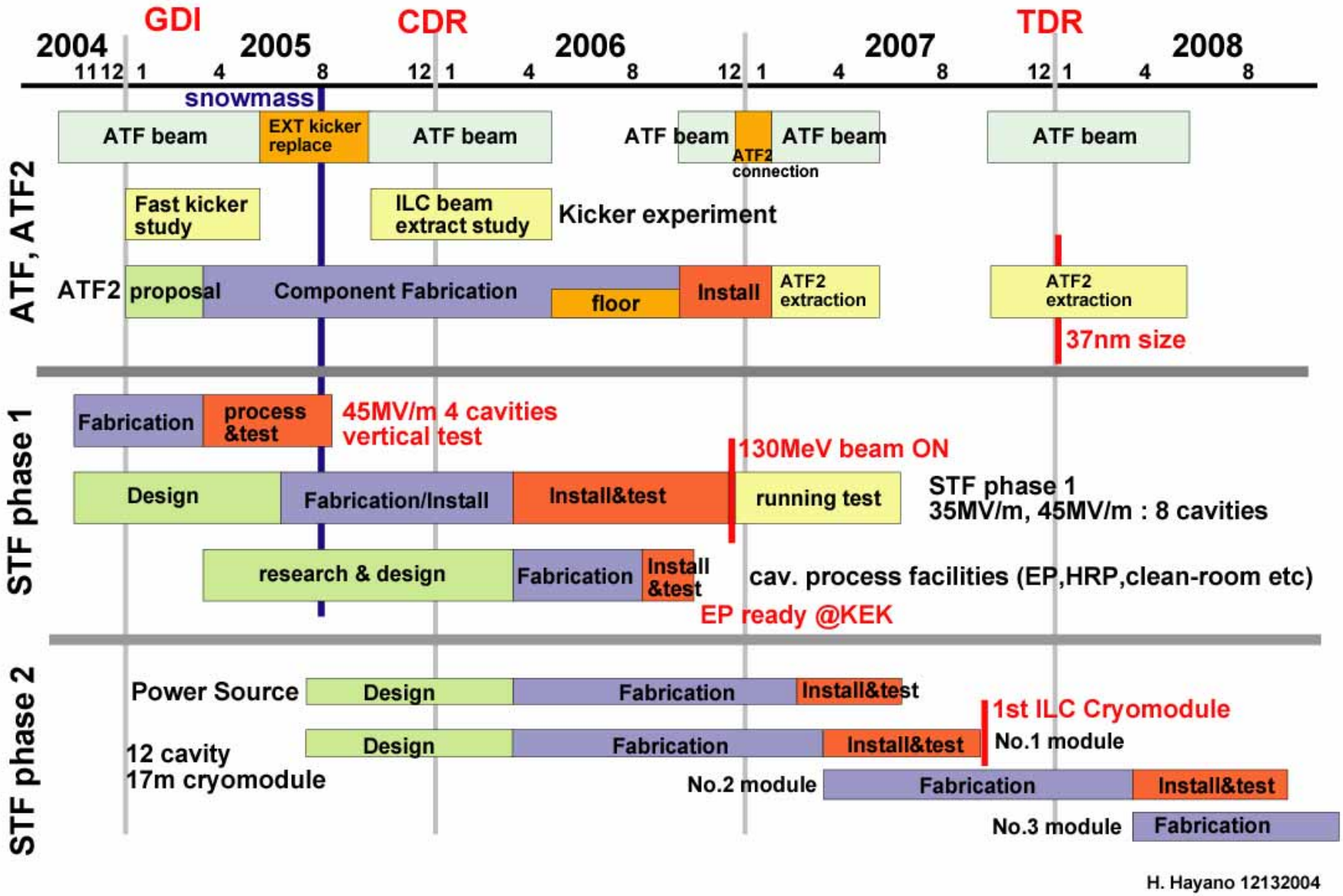
- Overall design of the entire system configuration and parameter choices are subject to internal discussion under GDI. Well-known issues are:
- Long machine pulse (1.4ms) → long pulse train (337ns x 2820 = 950 μ.sec) → long 5 GeV damping rings (17km).
- Long damping rings are not "long enough" → compressed bunch storage (sb = 20ns instead of 337ns) → "Fast-kicker" challenge
- High gradient SC cavities (~20000 units) : ~ 23MV/m OK, ~35MV/m may be OK, how about ~40MV/m or higher? ← site selection, operational margins
- How to produce positron beams: 2E10 particles x 2820 bunches at 5Hz.
- Issues that have not been highlighted recently, because of the ITRP-competition: beam delivery operational issues.

Accelerator Development for ILC at KEK (and in Japan and Asia)

- KEK would like to do the most meaningful things which contribute best to the world ILC efforts *and* to our long-term strategic position.
  - Make maximum use of existing facility: ATF → ATF/ATF2 at KEK
  - Start-up STF at KEK: Minimum essential infrastructure for SRF-based linacs first (may expand it later for a fuller facility).
    - → Three regional test facilities; TTF (DESY), SMTF (FNAL), STF (KEK)
  - Do these in the context of “new” international cooperation.

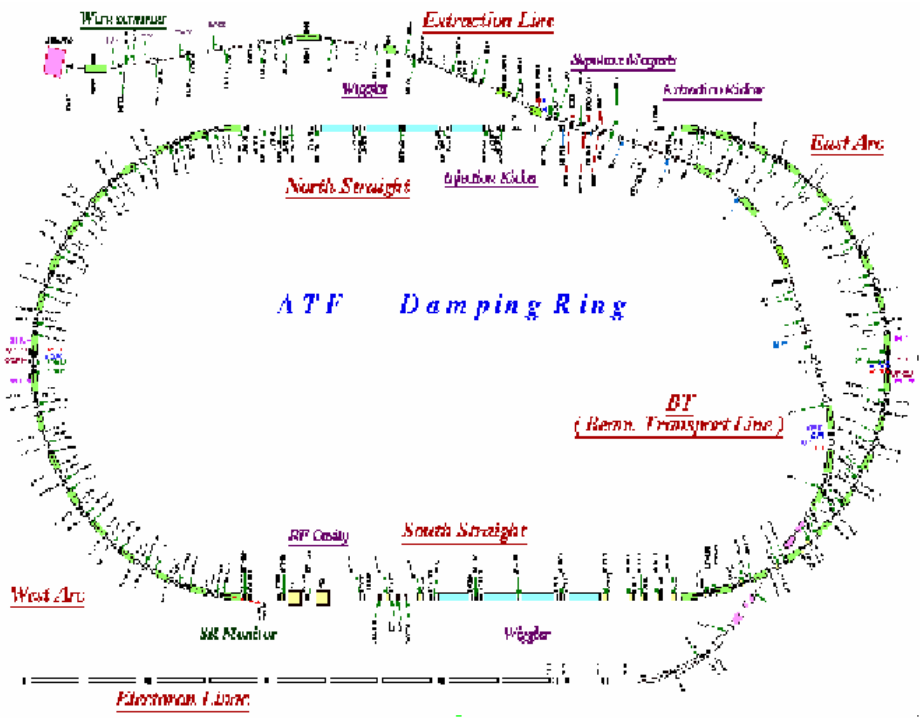
- Also work on:
  - Industrialization / cost reduction.
  - Domestic + Asian promotion of active collaborative programs.

Long-term Plan of KEK ILC-study

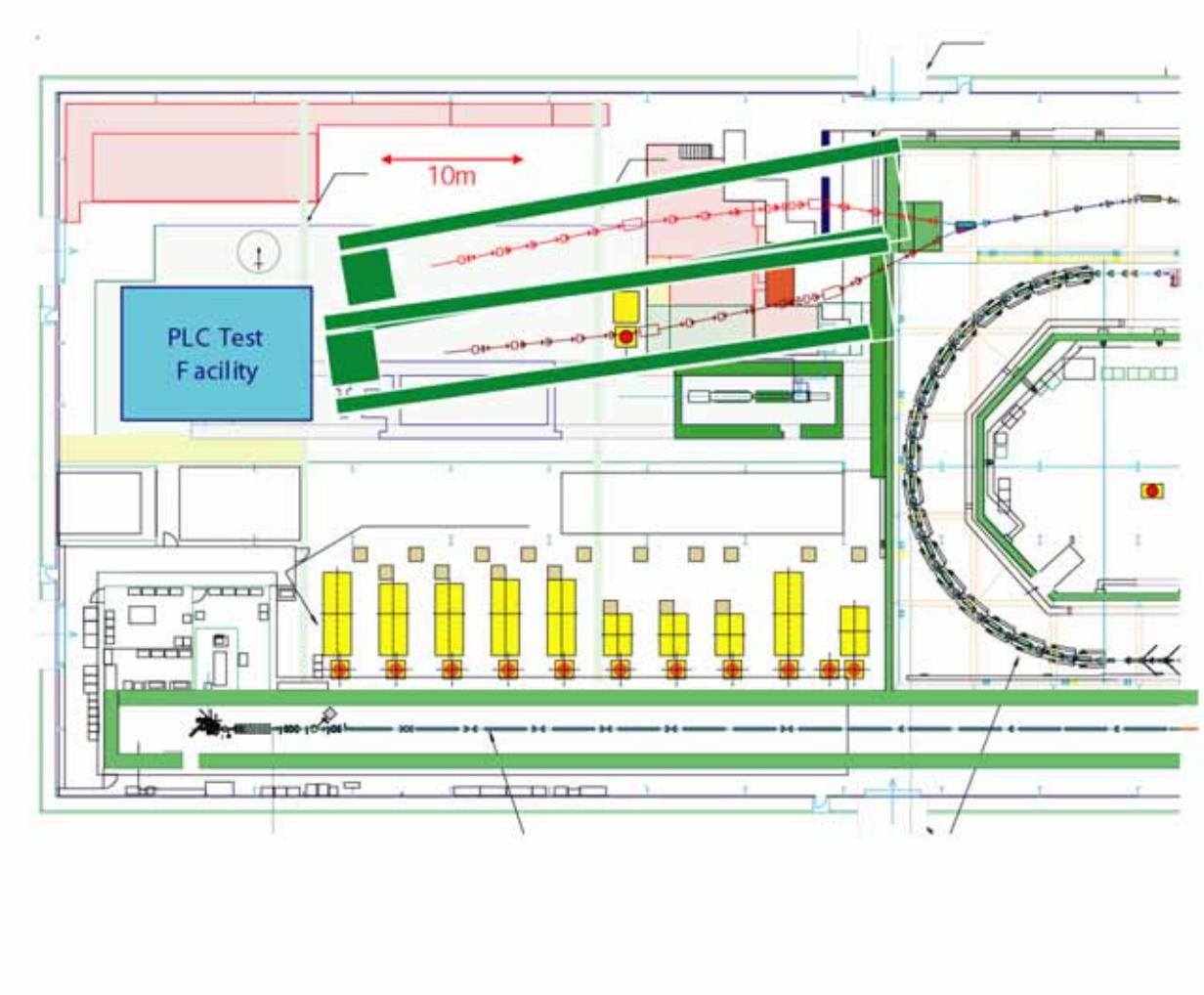


Injector topics to address at/around around ATF

- Beam instrumentation and control (ATF)
  - Left-over issues from JFY2004.
  - Stabilize beam extraction for next-step programs.
- ILC beam injector issues
  - Fast kicker drivers.
  - Positron production target choice, i.e. undulator-photons on thin targets or electrons on metal targets.

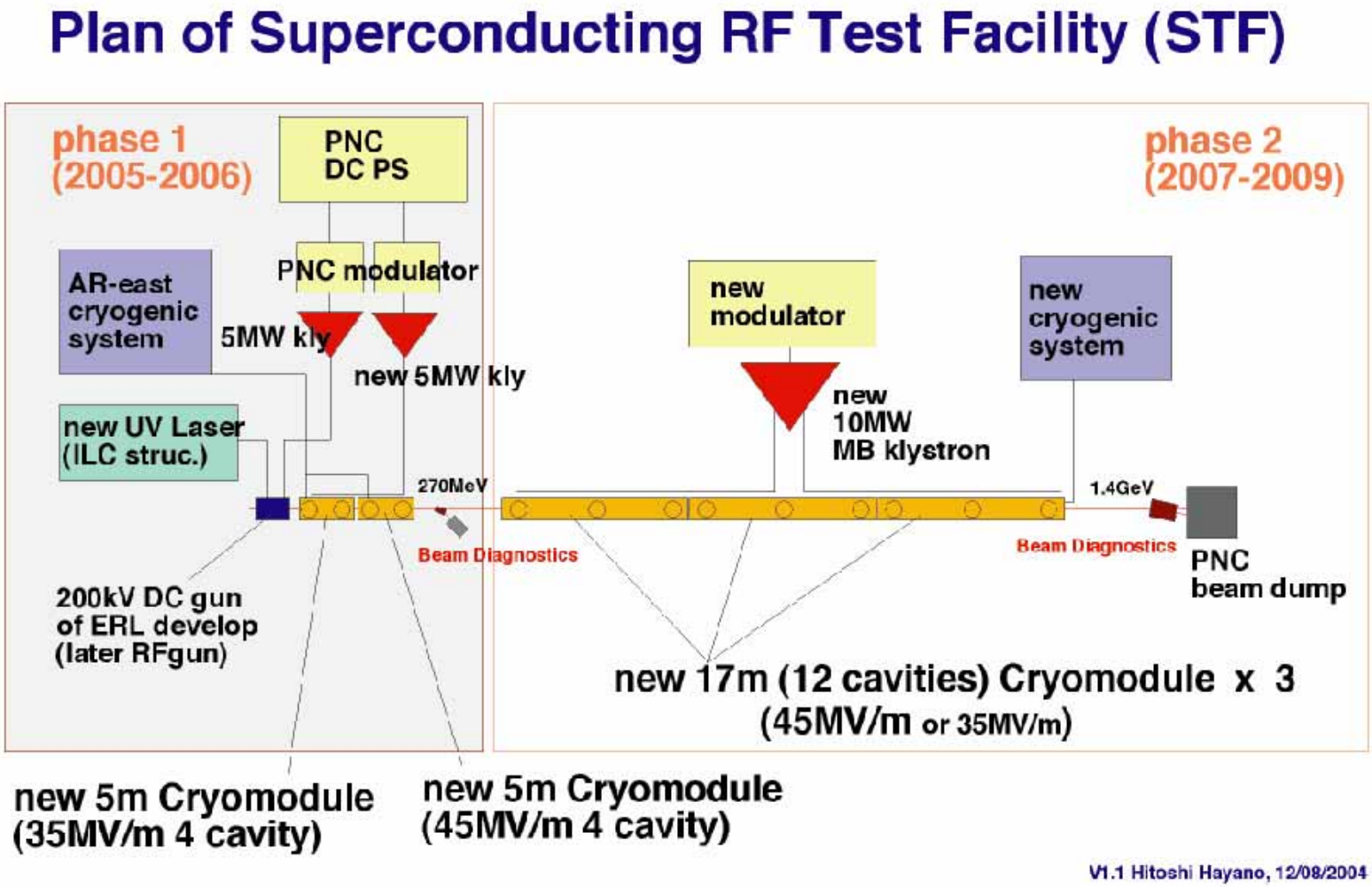


ATF2



- FFS/Beam Delivery is one of the subjects which have been on the backseat for a while, due to warm-vs-cold competition.
- Proper attention is much needed and now is the time.
- ATF beam is uniquely suited for this activity.
- Issue: Reproducible ~nm-scale beam size (37nm at ATF2), and to stabilize its beam center (~2nm).
- Which means: Lots of practical engineering details and their proper execution in an international collab environment.
- Could be an ILC collaboration prototype.

STF



- SRF linac test facility with unique focus on LC.
- Build and learn.
- Form the team.
- Critical base for international collaboration.
- Phase-1 operation to start in late 2006.
- Phase-2 execution contingent on GDI management and other aspects.

Accelerator Development for ILC at KEK (and in Japan and Asia) – cont 2

- KEK is trying to expand its collaboration program with –
  - Asian nations:
    - China, Korea (delegate visited in Jan. 2005)
    - India (discussion being initiated)
  - Europe:
    - DESY (delegate visiting in March, 2005)
    - Italy (delegate visiting in mid-Feb, 2005)
  - US/North America:
    - SLAC (delegate visited in Jan. 2005, TR visited KEK in Jan. 2005)
    - FNAL (delegated visited in in Feb. 2005)
    - JLAB (today)
    - Cornell, ANL (discussion being initiated)

Accelerator Development for ILC at KEK (and in Japan and Asia) – cont 3

Funding sources:

1. KEK internal budget (MEXT → KEK)
2. Japan-US collaboration program (MEXT/JSPS → KEK → program representatives)
3. Other competitive funds

We are trying to increase both 1 and 2 with the justification gound that KEK must contribute to ILC accelerator programs from the long-term context of international collaboration in HEP.

Accelerator Development for ILC at KEK (and in Japan and Asia) - cont 4

- In JFY 2005 some Japanese hardware components will be contributed to US programs. Some funds will be sent to US to build components to be used at ATF/ATF2.
- Yet, a bulk part (>80%) of the requested Japan-US budget in JFY05 will be spent to build-up the essential HW infrastructure in Japan first,
- Which, we believe, will eventually benefit the world (inc. US) LC programs.
- And we intend to operate our programs in that spirit.

Specifics of KEK LC program Execution vs JA-US organization and programs

- KEK asked SLAC and FNAL to “represent” the US side on LC-accelerator collaboration in Japan-US program on HEP, which means,
- SLAC and FNAL will organize their labs for this collaboration, and
- SLAC and FNAL will help other US institutes participate in this collaboration.
- Details are currently being worked out.
- And we value the inputs from all who are interested in participating.

Players so far identified and the specifics of the program:

Participating Parties;

KEK, U.Tokyo, Nagoya U., Hiroshima U., NIRS

SLAC, FNAL, LBNL, LLNL

Participating Members:

Approximately 60 each from Japan and from US.

Now, the details follow …

Program Contact Persons 1

- ATF low-emittance related topics

High resolution BPMs:	N.Terunuma	M.Ross (SLAC)
Beam stablization FDBK:	T.Tauchi	M.Ross (SLAC)
Xy-coupling issues:	T.Okugi	M.Ross (SLAC)
Beam studies overall:	K.Kubo	A.Wolski (LBNL)
		S.Mishra (FNAL)
		L.Emery (ANL)
“nano-BPMs”	T.Tauchi	M.Ross (SLAC)

Program Contact Persons 2

- ATF2 – Final Focus Testing at ATF

Conventional Facilities:	J.Urakawa	A.Seryi (SLAC)
Magnets and Vacuum:	T.Tauchi	A.Seryi (SLAC)
Optics, Tuning, Commissioning		
	S.Kuroda	A.Seryi (SLAC)
Support and Alignment	R.Sugahara	M.Riss (SLAC)
Instrumentation		M.Ross (SLAC)
		P.Piot (FNAL)

Program Contact Persons 3

- Injector system R&D

Positron source	M.Kuriki	J.Sheppard (SLAC)
		P.Hurh (FNAL)
		N.Mokhov (FNAL)
Fast kickers	T.Naito	M.Ross (SLAC)
		S.Mishra (FNAL)
Electron source	J.Urakawa	J.Sheppard (SLAC)
		P.Piot (FNAL)
2ndary e- emission	K.Kanazawa	M.Pivi (SLAC)

Program Contact Persons 4

- SRF Cavities

1.3GHz SC Cavities	K.Saito	H.Carter (FNAL)
Cavity/coupler designs	K.Saito	C.Adolphsen (SLAC)
		N.Solyak (FNAL)
Meas critica RF mag F	K.Saito	S.Tantawi (SLAC)
		P.Bauer (FNAL)
Nb/Cu Seamless Cavity	K.Ueno	
Surface treatment	Y.Higashi	A.Rowe (FNAL)

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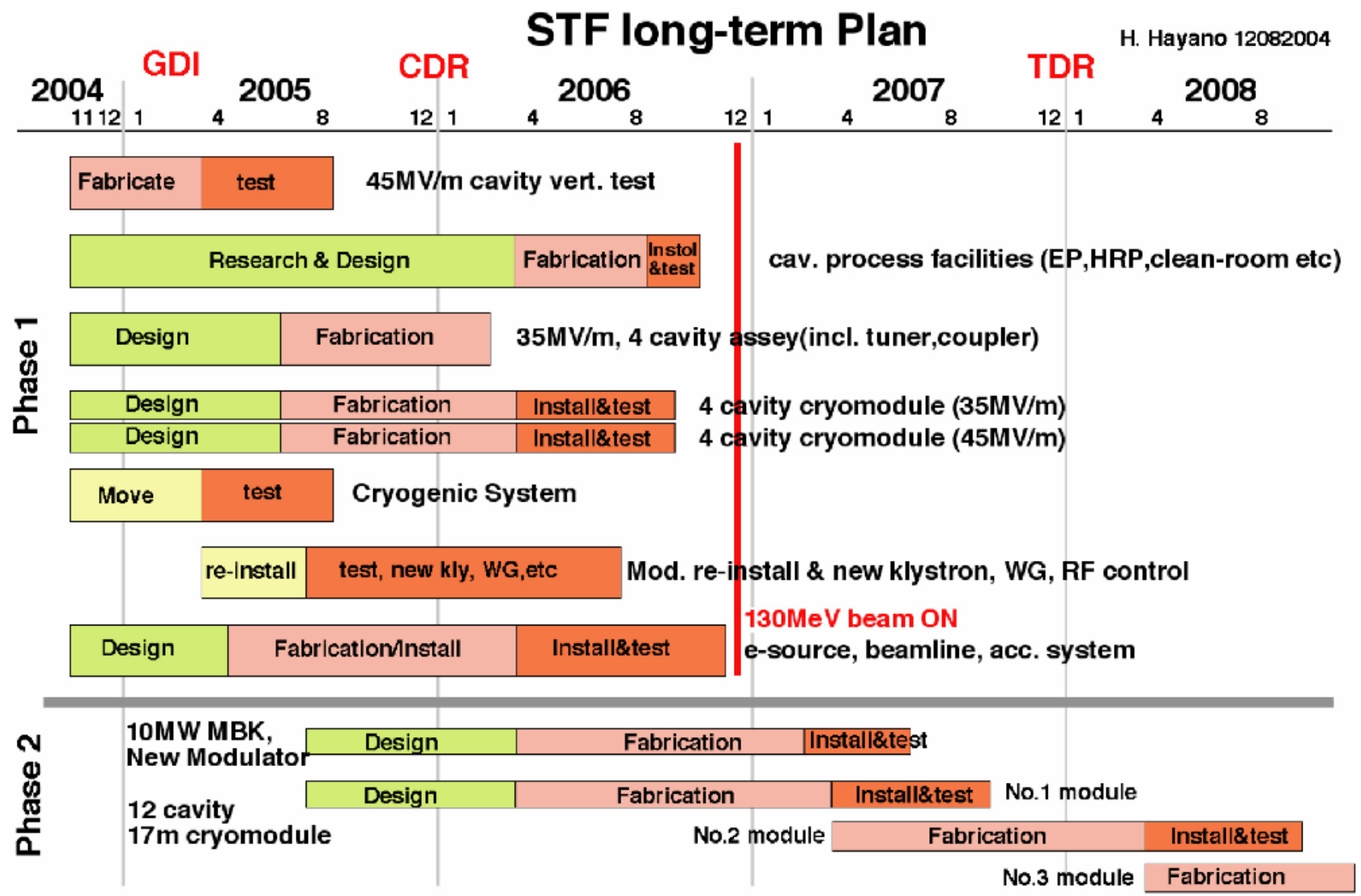
Program Contact Persons 5

- STF/SMTF

Cryogenics	K.Hosoyama	A.Klebaner (FNAL)
Cryostats	K.Tsuchiya	H.Carter (FNAL)
	S.Noguchi	T.Peterson (FNAL)
Clean room	K.Saito	T.Arkan (FNAL)
STF I&C	H.Hayano	M.Ross (SLAC)
		H.Edwards (FNAL)
Injectors	S.Ohsawa	P.Piot (FNAL)
		M.Ross (SLAC)
RF sources	S.Fukuda	C.Jensen (FNAL)
LLRF	S.Michizono	B.Chase (FNAL)


STF long-term Plan
H. Hayano 12082004
GDI
CDR
TDR
2004
2005
2006
2007
2008
11 12 1 4 8 12 1 4 8 12 1 4 8 12 1 4 8
Fabricate
test
45MV/m cavity vert. test
Research & Design
Fabrication
Instol &test
cav. process facilities (EP,HRP,clean-room etc)
Phase 1
Design
Fabrication
35MV/m, 4 cavity assey(incl. tuner,coupler)
Design
Fabrication
Install&test
4 cavity cryomodule (35MV/m)
Design
Fabrication
Install&test
4 cavity cryomodule (45MV/m)
Move
test
Cryogenic System
re-install
test, new kly, WG,etc
Mod. re-install & new klystron, WG, RF control
130MeV beam ON
Design
Fabrication/Install
Install&test
e-source, beamline, acc. system
Phase 2
10MW MBK,
New Modulator
Design
Fabrication
Install&test
Design
Fabrication
Install&test
No.1 module
12 cavity
17m cryomodule
No.2 module
Fabrication
Install&test
No.3 module
Fabrication

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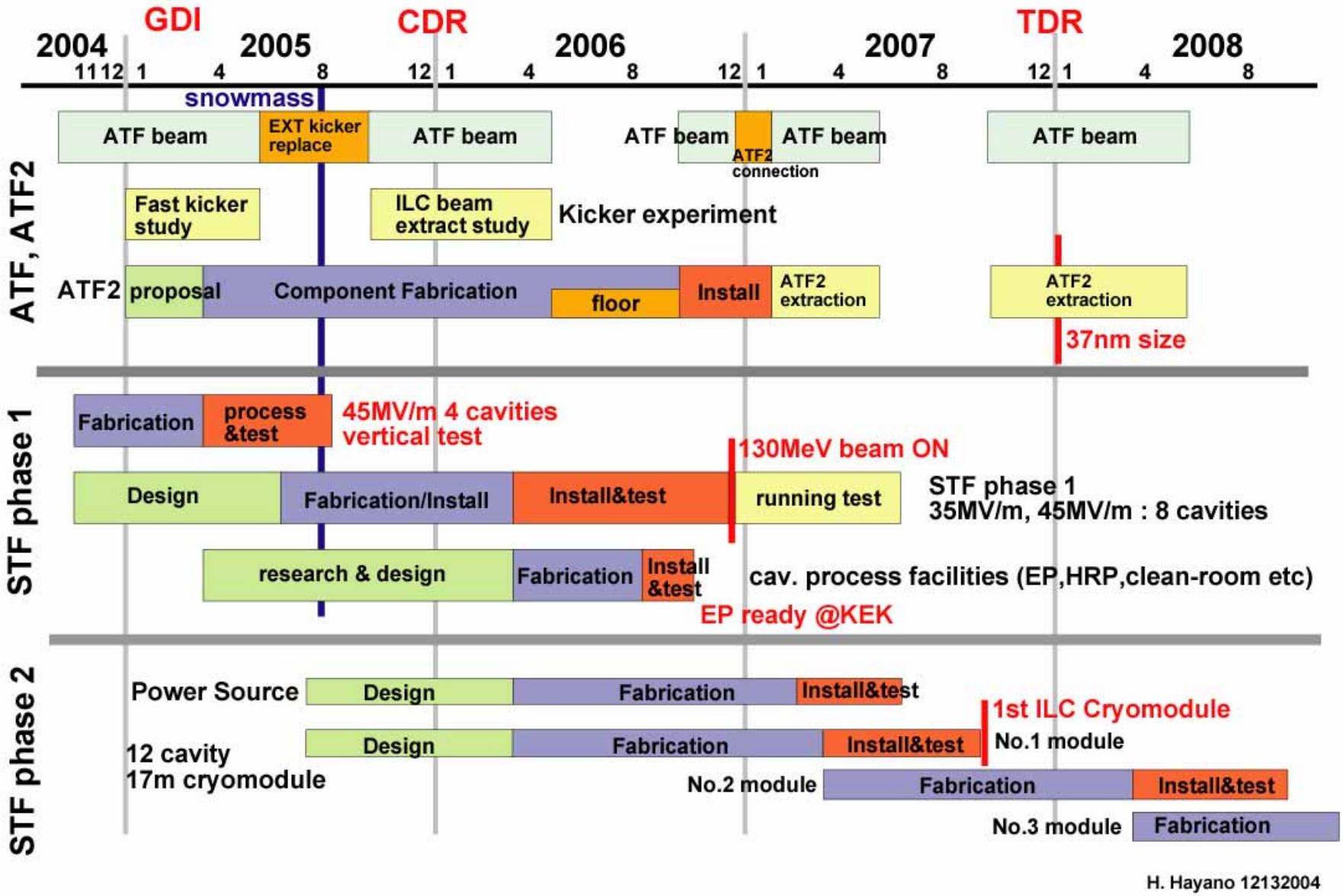

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