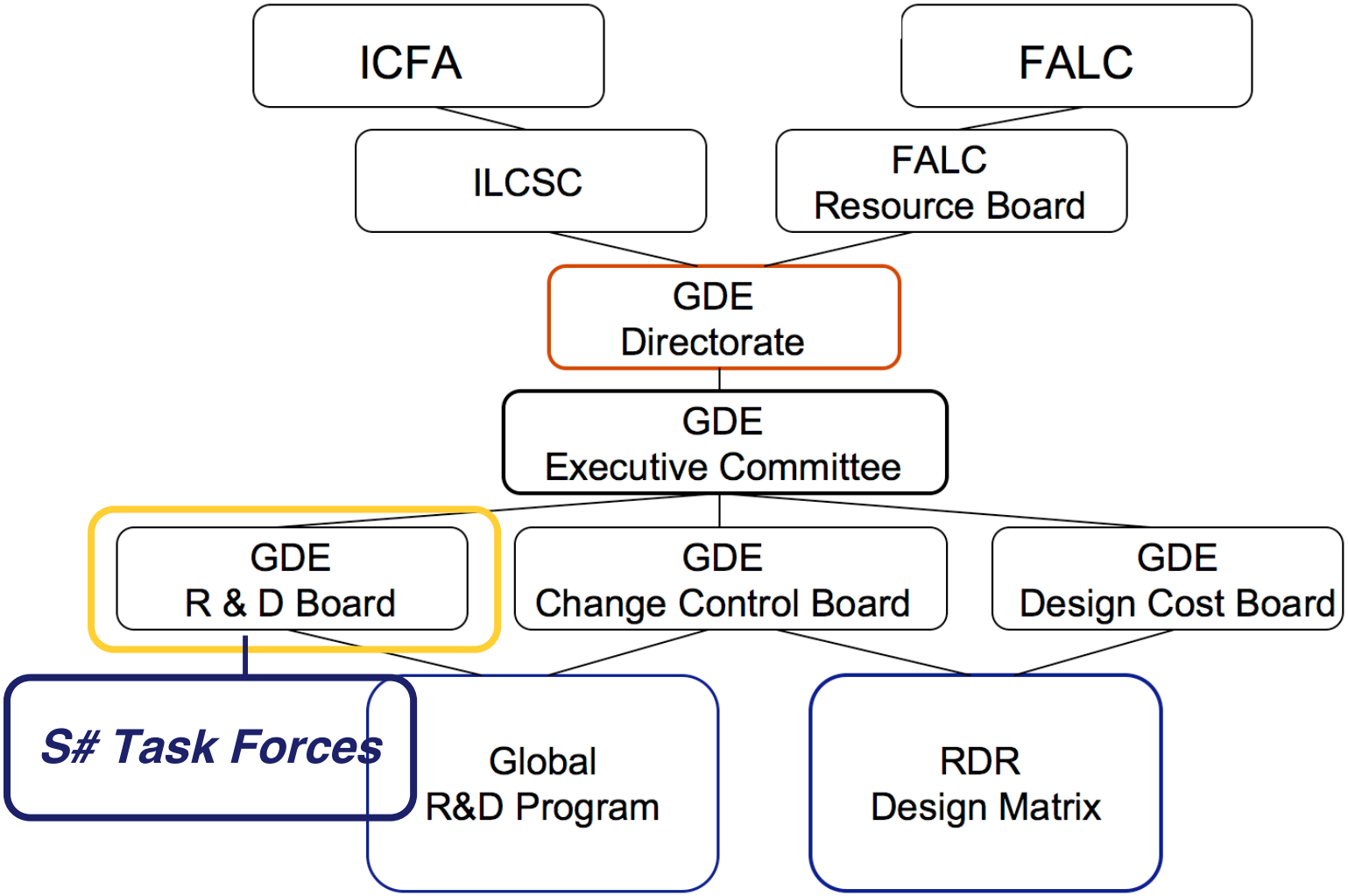
international linear collider

RDB Status Overview

H. Hayano, KEK

GDE R&D Board (RDB)

GDE RDR / R&D Organization



Mission

- ***Assess and Provide guidance for the overall R&D program.***
  - *The RDB will suggest priorities for baseline and alternatives*
  - *also detector*
  - *the balance between accelerator and detector*
- ***Develop a proposal-driven R&D plans.***
  - *define goals and milestones*
  - *evaluate resources*
- ***Conduct tracking and reviews***
  - *identify gaps in coverage*
  - *resource or technical issues*
  - *duplications*

Members

- *Bill Willis (Chairman)*
- *Chris Damerell*
- *Eckhard Elsen*
- *Terry Garvey*
- *Hitoshi Hayano*
- *Toshiyasu Higo*
- *Tom Himel*
- *Lutz Lilje*
- *Hasan Padamsee*
- *Marc Ross*
- *Andy Wolski*

11 people

– *Two more Asian members are under consideration for regional balance*

Actions

- *Ideal R&D list with priority : publication at RDB Public Wiki*

http://www.linearcollider.org/wiki/doku.php?id=rdb:rdb_external:rdb_external_home

- *Participation in prioritization process*
  - *US Americas Team recommendation*
  - *UK PPARC program evaluation*
  - *JPN KEK JFY07 Budget Study*

- *Produce an 'R&D plan' by formulating 'S-series' task forces*

- *Start to use Project Tracking tool (database software) for internationalization of R&D*

- *Having R&D plan discussion day in this meeting parallel session*

  - *Tele-conference in Friday every week,*
  - *Frequent Face-to-face meeting*

R&D Priorities

- ***RDB priorities come from Snowmass era BCD ideal R&D***
  - ***the basis of recommendation for US, PPARC, KEK***

- ***RDR provide a new focus on needed 'development' and new R&D List***
  - ***need to make new ideal R&D list***
  - ***re-prioritization on BCD***
  - ***revisit ACD***

- ***Reconsider priorities using RDR project schedule (towards EDR)***

Tracking

- ***Internationalization of the R&D process by GDE requires***
  - ***Projectization (tracking, resource monitoring, technical milestones)***
  - ***Communication***
  - ***Reporting***
  - ***Reviews***
  - ***Progress Assessment***

Tracking Tools

- *Choice of Tools*
  - *Standard project management tool seem to be for construction project*
  - *MS project, MS Access seem to be used in many labs*
- *Project categorization*
  - *Using relational database*
    - *Project characterization*
    - *Resources allocation*
    - *Funding plan association (multiple plans/task)*
  - *Project Tracking*
    - *Task dependencies tracked in relational DB*
    - *Export facilities*
      - *Excel files*
      - *MS Project for graphical visualization*

Tracking Tool Implementation

- *Technical tools : MS Access with some additions, MS project*

- *being implemented in Key Task forces*
  - *S0/S1: High gradient*
  - *S3: Damping rings*
    - *Already well formalised*
  - *S4: Beam Delivery System*
  - *S5: Positron Source*

- *Schedule*
  - *Single user version at first*
    - *Gain experience*
  - *Expand to multi-user tool later*
    - *As requirements become clearer*

S-series Task Forces

For producing R&D plans

S0 : Cavity Gradient R&D
S1 : Cryomodule operating gradient R&D
S2 : Planning of Linac Test Facility Scale
S3 : Damping Ring R&D
S4 : Beam Delivery System R&D
S5 : Positron Source R&D
S6 : Control system R&D
S7 : RF Power Source R&D

S0/S1 Task Forces

Leader : Lutz Lilje (DESY)

Member : H. Padamsee, J. Mammosser,
M. Ross, K. Saito, T. Higo, H. Hayano

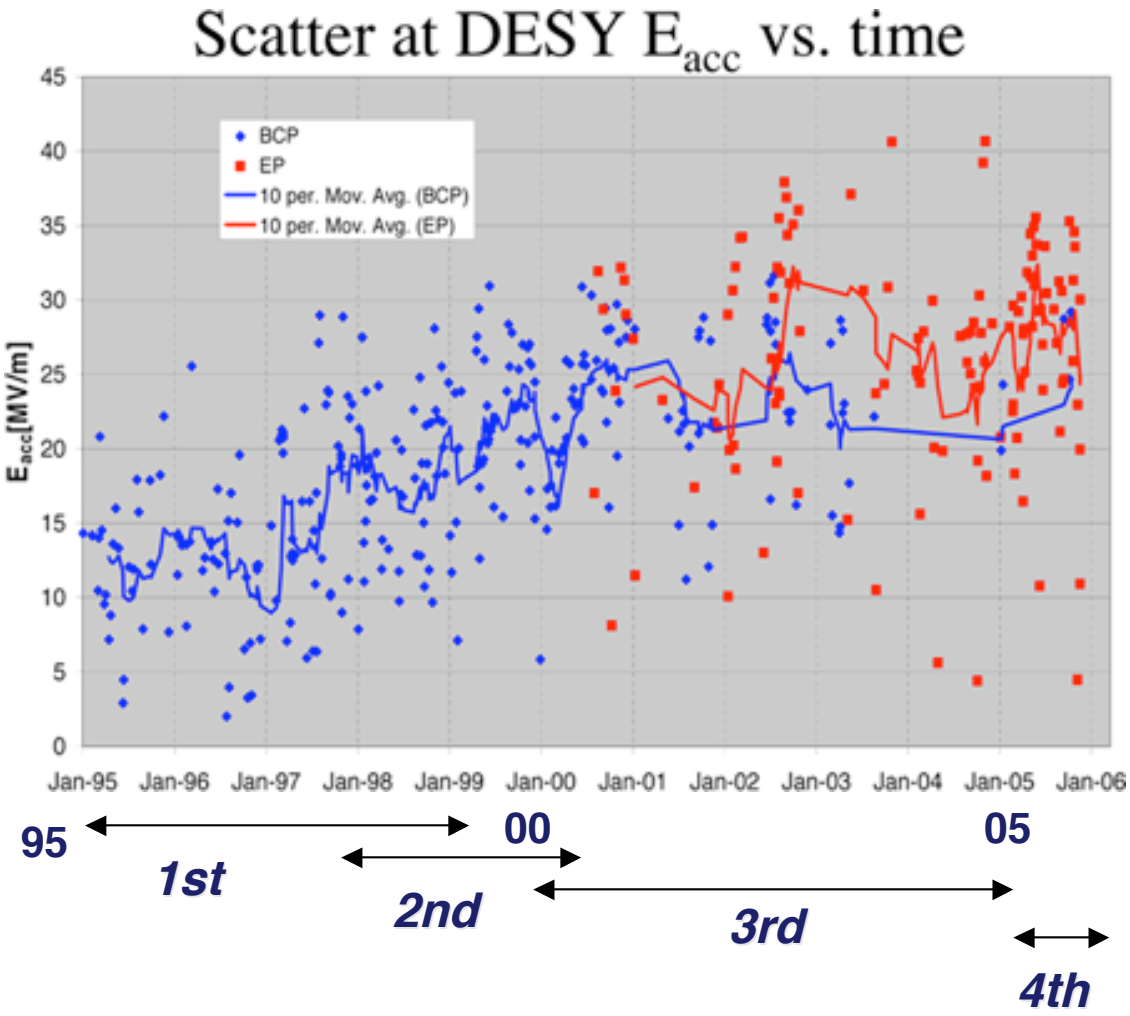
Mission S0 :achieve ILC baseline qualification gradient
35MV/m@Q_0=1x10^{10}
S1 :achieve 31.5MV/m operational gradient
in the cryomodule

Meeting : Tele-conference every other week,
face-to-face several times in a year.
(DESY, FNAL, Vancouver, Knoxville, KEK, Valencia)

Document :
http://www.linearcollider.org/wiki/doku.php?id=rdb:rdb_external:rdb_s1_home

for tight loop, production-like, etc.

Gradient of SC Cavity developed by DESY



4 Production Cycles
with 26~33 cavities each;
(total >100 cavities)

1st : no eddy-curr and BCP+1400
2~20MV/m by field emission
and defect
welding not matured

2nd : eddy-curr and BCP+1400
15~30MV/m by field emission

3rd : eddy-curr scan and
22: BCP+1400, 15~32MV/m
11: EP+1400(or800) 10~40MV/m
limited by field emission
and Q-disease, etc

4th : Eddy-cur scan and EP+800
15~35MV/m by field emission
5~10MV/m by Q-disease

5th Production cycle underway

S0 Goal

Ultimate Goals;

1. for sufficiently large number of Process & Test,
   achieve gradient 35MV/m@Q_0=1x10^{10} with 90% yield
   (time scale of completion : middle of 2009)

2. for sufficiently large final sample (>30)
   achieve gradient 35MV/m@Q_0=1x10^{10} with 95% yield
   (>35MV/m with > 80% yield at 1st test,
   re-process for the rest 20%, then get >95% yield)

S0 Plan to Achieve Goal

Following staging is adopted;

Tight loop test (2 phases):

to achieve <10% gradient spread for new 10 process
with 3~4 cavities/region, 3~4 successive treatment at home,
send them to other region

*results of single cell will be implemented to this tight loop.

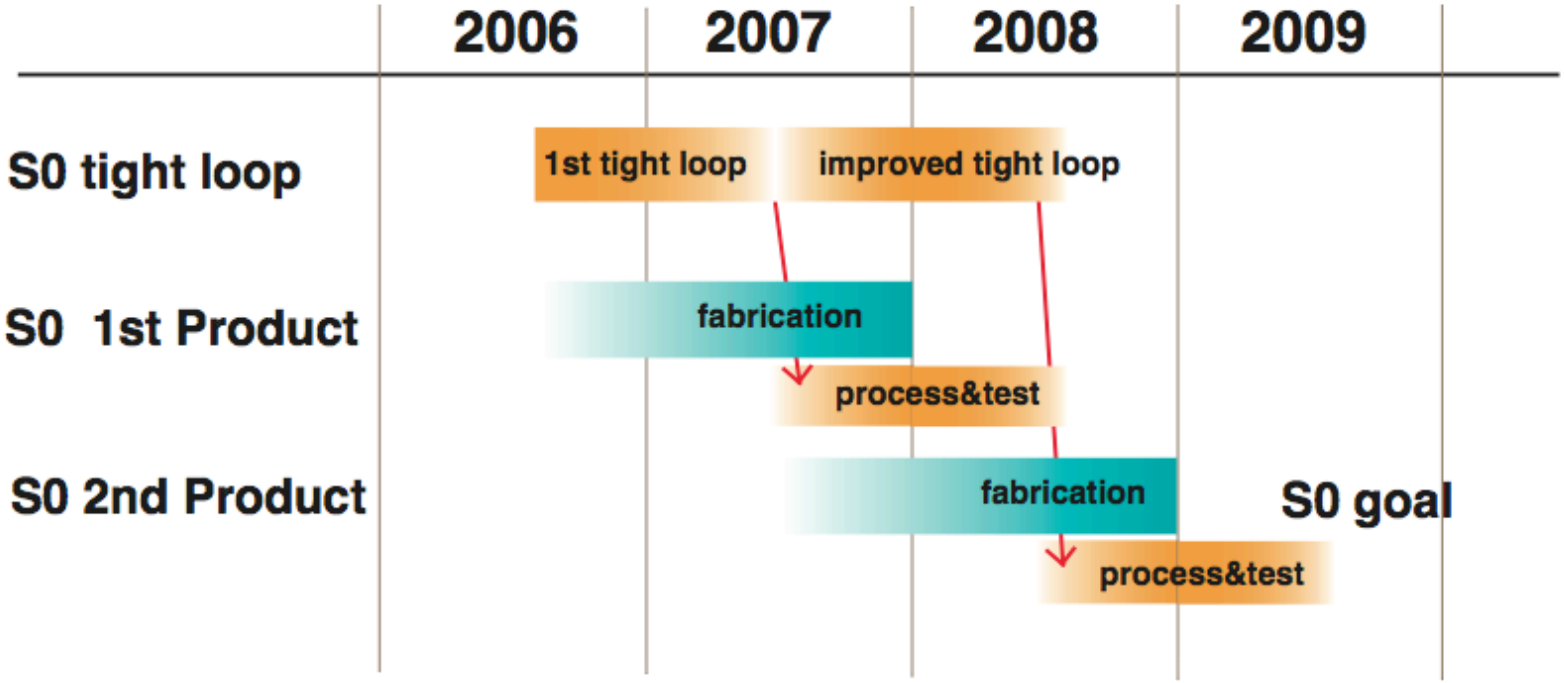
1st production-like process:

produce >20 cavities/region and
test up to 3~4 process to achieve ultimate goal

2nd production-like process:

produce another >20 cavities/region and
test to achieve ultimate goal (limit to max 2 process)

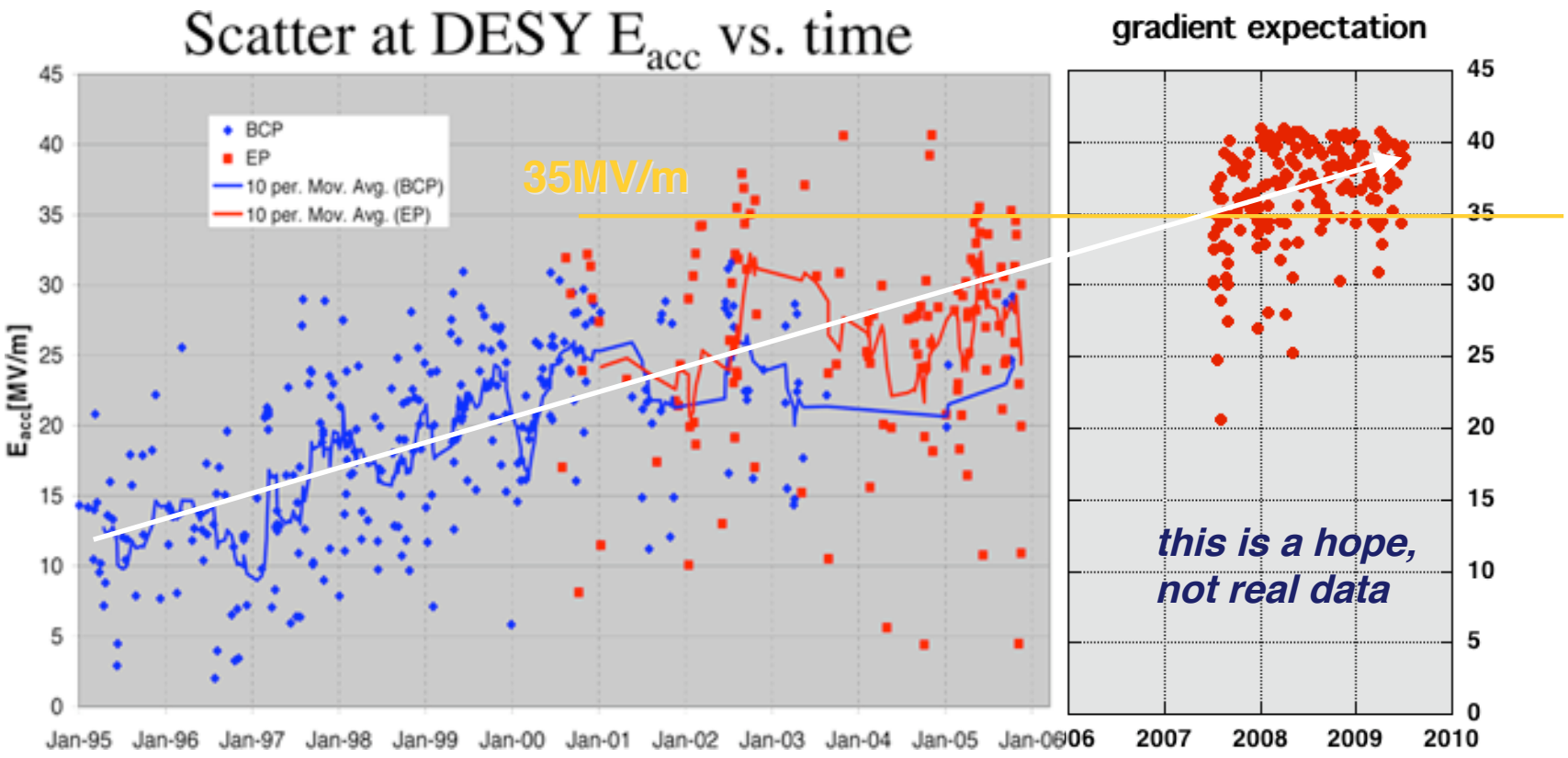
S0 plan; possible schedule



1st production-like: >60 cavities,
2nd production-like: >60 cavities

Total >120 cavities / 3 years

Expected Gradient development



Single region
~100 cavities

Three regions
~120 cavities

Proposals of 9-cell cavity fabrication to support S0

XFEL; *45 on order, some of them for S0 study,*
KEK is proposing to send 3 cavity to KEK (tight loop)

US; *4 from Accel + 4 from AES,*
8(Accel)+6(AES)+4(Jlab) on order,
3 of them go to S0 tight loop
Send 3 cavities to KEK (tight loop) was agreed (FNAL-KEK)

KEK; *4 TESLA-like + 4 ICHIRO for STF 1 on going,*
4 TESLA-like + 4 ICHIRO for STF 1.5 (proposal),
10 (??) cavities for production-like (proposal),
3 of ICHIRO will go to S0 tight loop
(ICHIRO single cell study is on going.)*

Detail Schedule of S0 was made assuming above cavities.

Required Capabilities to Achieve S0 Goal

Realize *clean environment, clean procedure,*
clean EP, clean HPR, UPW,
selection of non-defect, no-contaminated Nb,
good welding procedure,
material study (single, large grain)

Install various diagnostics;

9-passband meas. Capability
Temp.-map
X-ray-map,
Inner surface inspection,
Eddy current scan, etc

Following checks are required;

hydrogen contamination check (Q-disease)
Q vs. T check (residual resistance)
9-passband spectrum check (deformation)
9-passband meas. (find wrong cell)

New Lab-Capabilities to Achieve S0 Goal

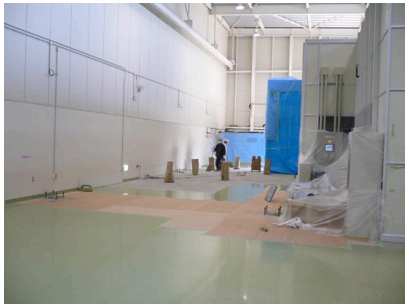
New infrastructure is under construction

US ; new EP in ANL/FNAL
new clean-room in FNAL
new vertical stand in FNAL

KEK ; new EP in STF
new clean-room in STF
new vertical stand in STF

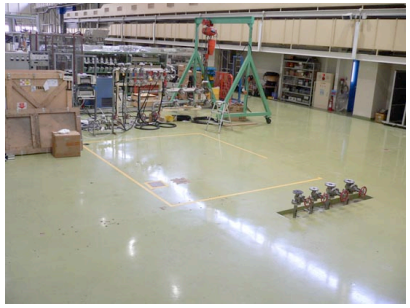
ANL/FNAL-EP

FNAL-clean room



STF-EP place

STF-clean room



STF-VT place

FNAL-VT

S1 Goal

Ultimate Goal;
31.5MV/m@Q_0=1x10^{10} as operational gradient
at least 3 cryomodules include fast tuner, etc

Intermediate goal: achieve it by single cryomodule with tweaking WG-config

Final goal: use of 'S0' passed cavities, or by exchanging cavities, with operation of a few weeks

Plan to achieve S1 goal

Cryomodule Plan:

DESY: Module 6 at CMTB

FNAL: 1 type III+ (from DESY) in 2007
1 type III+ and 1 type IV in 2008
3 type IV in 2009

KEK: 2 short cryomodule (STF phase 1) in 2007
3 type IV (STF phase 2) in 2009

Candidates of S1 intermediate goal:
DESY module 6,
FNAL 1st type III+,
KEK connected 2 short cryomodule.

S2 Task Forces

Leader : T. Himel (SLAC) & H. Padamsee(Cornel)
member : H. Weise, B. Kephart, C. Adolphsen
N. Toge, H. Hayano
(S.Nagaitsev, N.Solyak, L.Lilje, M.Ross, D. Shulte, K.Kubo)

Mission :make a report of required Linac Test Facility

meeting : Tele-conference every week,
face-to-face in Vancouver, KEK, Valencia.

document :
S2charge_workplan5.doc
S2_report_v5.doc
http://www.linearcollider.org/wiki/doku.php?id=rdb:rdb_external:rdb_s2_home

S2 goals and charge

- ***Determine nature and scale of main linac system test***
- ***Examine needed test with setting the goals, specification and timeline***
- ***Examine the relationship between future industrialization needs and planning for further test***

Concise S2 report

Lessons learned from SRF acc. operation:

CEBAF, LEP-II, Cornel, TRISTAN, KEKB, TTF(FLASH)

Reasons of system tests:

28 items of possible reason are listed, and examined.
such as; component reliability test, beam base feedback test, ...
for minimum number of RF unit, for beam required, for being in string required, test possibility at TTF, etc.

phase 1: 1 RF unit system test
phase 2: continuation of test for performance improvement
and industry produced modules (5 RF unit one year operation)

Milestones and timeline for system tests:

2009~2011: phase 1 1 RF unit test (type 3,4 -> DFM cryomodules)
~2013: phase 2 several RF unit test (final ILC unit, multiple manufacturers)

Cost estimation of system tests:

total sum for phase 1 (9 cryomodules + 2 RF system)
with non-beam facility and beam facility ~86M$

S3 Task Forces

Leader : A. Wolski (Cockcroft Inst.)

member : E. Elsen, J. Gao, S. Guiducci, T. Mattison,
M. Palmer, M. Pivi, J. Urakawa, M. Venturini,
M. Zisman

Mission : Develop coordinated plan for Damping Ring R&D

meeting : Tele-conference every week,
face-to-face in Cornel in Sep.'06,
will be in Frascati Mar. '07.

document :

https://wiki.lepp.cornell.edu/ilc/bin/view/Public/DampingRings/
https://wiki.lepp.cornell.edu/ilc/bin/view/Public/DampingRings/S3TaskForce/WebHome

Prioritized list of R&D objectives, Summaries of R&D activities, Summaries of resources, Drafts of two Damping Ring R&D Plan Work Packages

S3 Achievements

- *Convened membership, and identified areas of responsibility.*
- *Reviewed full list of R&D objectives, including setting priorities.*
- *Compiled data on R&D resources.*
- *Organized Damping Rings R&D Meeting at Cornell in September 2006, which provided important input for the R&D plan.*
- *Initiated "sub-topic" phone meetings to coordinate R&D in very high priority areas across institutions.*
- *Agreed a template for R&D Plan Work Packages.*
- *Prepared initial drafts of two Work Packages.*
- *Agreed date and focus topics for next R&D Meeting.*

S3 Membership and Responsibilities

- *Eckhard Elsen*
- *Jie Gao*
- *Susanna Guiducci*
  - *Feedback systems*
- *Tom Mattison*
  - *Kickers*
- *Mark Palmer*
  - *Normal-conducting magnets*
  - *Superconducting magnets*
  - *Damping Rings RF*
  - *Instrumentation and Diagnostics*
  - *Supports and alignment systems*
  - *Systems integration*
- *Mauro Pivi*
  - *Multi-particle dynamics*
- *Junji Urakawa*
  - *Instrumentation and diagnostics*
- *Marco Venturini*
  - *Multi-particle dynamics*
- *Andy Wolski*
  - *Vacuum*
- *Mike Zisman*
  - *Single-particle dynamics*
  - *Vacuum*
  - *Supports and alignment systems*
  - *Systems integration*

Damping Rings R&D WBS

1 Parameter optimization
2 Beam dynamics
  2.1 Single-particle dynamics
  2.2 Multi-particle dynamics
  2.3 Integrated dynamics studies
3 Technical subsystem or component development
  3.1 Vacuum
  3.2 Permanent magnets
  3.3 Normal conducting magnets
  3.4 Superconducting magnets
  3.5 Kickers
  3.6 Damping ring RF systems
  3.7 Instrumentation and diagnostics
  3.8 Feedback systems
  3.9 Control systems
  3.10 Supports and alignment systems
  3.11 Collimation
  3.12 Beam dumps
  3.13 Multiple systems
4 Experimental studies and test facilities
  4.1 Experimental studies
  4.2 Test facility development

R&D Meeting at Cornell, 26-28/9/2006

- *The meeting focused on three "Very High Priority" topics:*
  - *Injection/extraction kickers*
  - *Electron cloud*
  - *Impedance and impedance-driven instabilities*
- *There was a special session devoted to discussion of the proposed test facilities:*
  - *CESR-TA*
  - *HERA-DR*
  - *damping ring studies at KEK-B*
- *46 participants attended the meeting.*
- *All talks are posted on the Damping Rings wiki page:*
  - *https://wiki.lepp.cornell.edu/ilc/bin/view/Public/DampingRings/*
- *The three summary talks gave a "first pass" on coordinated R&D plan work packages, including milestones, resources, personnel etc.*

Future Goals

- *Continue the telephone meetings to coordinate activities on specific R&D topics.*
- *Organize the next Damping Rings R&D Meeting.*
  - *The meeting will be held at Frascati, 5-7 March 2007.*
  - *The meeting will focus on three very high priority topics:*
    - *lattice design and dynamic aperture;*
    - *low-emittance tuning;*
    - *ion effects.*
- *Complete a draft of the coordinated R&D Plan.*
  - *Database information needs to be updated.*
  - *We hope to complete the first draft of the R&D plan, consisting of those Work Packages that include Very High Priority R&D Objectives, in the next two or three months.*
  - *How do we ensure consistency with the new organization being discussed by the GDE Executive Committee?*

S4 Task Forces

Leader : A. Seryi (SLAC)

member : D. Angal-Kalinin, H. Yamamoto,
C. Damerell, M. Ross, H. Hayano

Mission : coordinate Beam Delivery System R&D

meeting : Tele-conference every other week,
face-to-face in Vancouver, KEK, Valencia.

document : 'S4_charge_draft3.doc' is under discussion.

S4 Charge

- ***Provide oversight for the overall coordination and progress of the BDS R&D program.***
- ***Advise to RDB on the BDS R&D program.***

- ***The environment, in which the Task Force is operating, is described by the following assumptions:***
  - ***Overall coordination and progress of international R&D and design work in BDS area is the responsibility of BDS area leaders.***
  - ***Everyday responsibility for specific R&D work in BDS belongs to the leaders of particular work packages, which often involve two or more international partners.***

S4 R&D Plans

- ***Plans being developed earlier:***
  - ***"R&D plans for Beam Delivery area",***
    D.Angal-Kalinin, A.Seryi, H.Yamamoto,
    in preparation, started August 17, 2006
  - ***"Program for ILC Beam Delivery system for FY08-09,***
    American region",
    A.Seryi, M.Harrison, B.Parker,
    in preparation, started September 1, 2006

- ***S4 task force involvement push forward in creation and prioritization of such plans***

List of the most important R&D

- *IR superconducting magnets, their integration into the IR, and a design study to ensure their mechanical stability.*
- *Crab cavities, and related systems to provide phase stability.*
- *Design, construction, commissioning and operation of BDS facility (ATF2).*
- *Accelerator physics design work which enable performance optimization.*
- *BDS tuning methods and associated diagnostics at a BDS facility (ATF2).*
- *Laser wires for beam diagnostics.*
- *Intra-train feedback.*
- *measurements of collimator wake-field and their validation with codes.*
- *Collimator beam damage and damage detection.*
- *Beam dump design and study of beam dump window survivability.*
- *MDI type hardware such as energy spectrometers.*

High Priority R&D

- *Includes items which enable performance optimization and development of engineering aspects of the design.*
- *Become the highest priority as we come to the second half of EDR (08-09) and moving closer to the project start.*
  - *design work for cost-performance optimization*
  - *engineering design of collimators*
  - *engineering design of beam dumps*
  - *engineering design of vacuum chamber*
  - *engineering integrated design and development of IR region*
  - *engineering design of magnets, septa and kickers*
  - *design of machine protection system*
  - *design work to ensure mechanical stability of components*

S5 Task Forces

Leader : E. Elsen (DESY)
member : J. Clarke, M. Kuriki, J. Sheppard

Mission : Positron Source R&D, not yet documented.

meeting : positron meeting in CERN, Novosibirsk, RAL,
S5 formulation in RAL, start discussion in Beijing.

To be done:

- ***Define the charge***
- ***Define the members***
- ***Define the objectives***
- ***Update the (currently very coarse) R&D list***
- ***Implement project tracking in the area***
- ***Propose a prioritization***

S6 Task Forces

Not yet formalized. But S6 will be coming soon;

Leader : J. Carwardine (ANL)
member : S. Simrock, S. Michizono,
…… ,
M. Ross

Mission : coordinate Control System R&D,
not yet documented

meeting : ILC Control (not S6) Tele-conference every week.

http://www.linearcollider.org/wiki/doku.php?id=ilc_controls:ilc_controls_home

S7 Task Forces

Leader : T. Garvey (Orsay)
member : C. Adolphsen, R. Larsen, S. Choroba,
S. Fukuda, H. Hayano

Mission : Compile RF Power Source R&D plan
and make a report.

meeting : HLRF (not S7) Tele-conference every week,
S7 face-to-face in DESY, Valencia.

document : DESY meeting report is available at;
http://www.linearcollider.org/wiki/doku.php?id=rdb:rdb_external:rdb_external_home

Klystron meeting at DESY

SLAC klystron development plan:

10MW MBK (vertical),
sheet beam klystron,
high efficiency 5MW klystron

** discussion of priorities for recommendation to US regional director*

DESY XFEL plan for MBK development:

10MW horizontal MBK.
procurement from CPI : SLAC can contribute
procurement from Toshiba : KEK can contribute

KEK plan for MBK:

10MW vertical MBK collaboration with SLAC
then, 10MW vertical or horizontal MBK for STF phase 2
36 beam klystron development plan

RDB role toward EDR

- *With the release of RDR, significant focus on R&D is required in the next.*
  - *Task Forces should play important role for 'R&D plan' and its coordination*
  - *Discussion of 'R&D plan' will be in this meeting*
  - *RDB should reconsider ideal R&D list and their priorities*
  - *RDB should reconsider ACD priorities with a look of possible future replacement of BCD*
  - *Tracking tools should be utilized for coordination and communication*
- *RDB and Task forces role will become more important …*
- *Details of Task forces activities are the following talks.....*

finish

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