



R and D Board report

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ILC GDE R and D Board

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- The Global R&D Board is responsible for assessing and providing guidance for the overall R&D program.
 - **The RDB will suggest priorities for**
 - baseline
 - alternatives
 - selective (to) further the field in the longer term.
 - **also detector**
 - **the balance between accelerator and detector**
- The RDB will develop a
 - **proposal-driven program**
 - define goals and milestones,
 - evaluate resources on a common basis (i.e. value)
 - **conduct reviews**
 - identify gaps in coverage
 - resource or technical issues,
 - duplications
 - other



Charge & Performance - 2006

- Frascati mission announced (12/05)
- ILC MAC suggestions:
 - **Produce an 'R D plan'**
 - Led to formulation of the 'S-series' task forces
 - **Inter-program prioritization**
- Regional participation in prioritization process
 - **US Americas Team recommendation**
 - **UK PPARC program evaluation**
 - **Japan (12/06 - soon)**
 - **EU / Europe – not yet**
 - **Detector RD (Beijing 2/07)**



Reality – one year later

- S# series task forces:
 - **Goals**
 - **Successes**
- Task force with charge exists for
 - **Cavities (#0), Cryomodule (#1), Test Linac (#2)**
 - **Damping Ring (#3)**
 - **Beam Delivery (#4)**
 - **Positron (#5)**
- Structural differences
 - **Example of the SRF cavity, BDS and DR areas.**
- Need:
 - **RF power, Global Systems, ?**



S0 / S1 Task Force

- Charge
 - **Provide the information needed for gradient choice**
 - **Time scales: mid 08 / end 09.**
 - Phased approach to match design / cost effort
 - **S0 – cavity → gradient and yield**
 - **S1 - cryomodule**
- Focused charge, well defined deliverable, broad base, expensive task with excellent cost / benefit



S # Task Forces: 0

- Focus on the uncertainty apparent in the process
 - **Key aspect of the technology; strong community support**
- S0 'tight loop' plan:
 - **3 cavities from each region;**
 - **Each processed 3x; tested and retested in each region**
 - Rotation
 - **27 total processing cycles (each cycle 7 to 10 days in full assembly line mode)**
- S0 'tight loop' questions:
 - **Which cavities?**
 - **EP Process capacity/ Vertical test capacity**
 - **Exchange and compatibility constraints**
 - **What are the required resources and impact on participants?**
- How will it be managed?
 - **How to ensure success (i.e. → good advice in mid 08)**



S0 timeline

- Early April MAC recommendation
 - May Charge, composition
 - June Proposal development
 - July Presentation VLCW
 - August Plan released
 - September TTC Invitation; initial J-Lab
 - October Single cell work at KEK
 - November EP at J-Lab, KEK, DESY,
publish schedule
-
- Face to face meetings; fully balanced interregional involvement



S0 issues:

- US
 - ~ 4 Accel cavities in process
 - New vendor qualification underway
 - 2007 EP only at J-Lab, 2008 add ANL
 - *Limited processing capacity in 07*
 - Need cavities for NML module assembly
- EU
 - XFEL production cycles starting
 - XFEL needs yield assessment also
 - EP system in steady use – most ‘industrial’ system existing
 - *Tight loop work must be fit into busy schedule*
- Japan
 - ‘Ichiro’ & STF baseline cavities → different...
 - *Limited number of cavities until 10.07*
 - good EP process capacity at KEK/Nomura Plating
 - Need cavities for STF cryomodule assembly
 - Ichiro HOM improvements needed
 - Flange gasket material incompatible with DESY practice
- expert SRF leadership from all 3 regions



'Production – like' part of S0

- (draft released ~ end 09/06, updated this month)
- Assess the yield
 - **To facilitate the costing process**
- To what precision?
 - **Statistical process**
 - (4x more effort to improve the yield estimate by 2x)
 - **Does the RDR cost roll up support the necessity of this task?**
- Plan (e.g. presented at ART 10.2006):
 - **125 in 08 & 218 in 09**
 - **(much smaller numbers likely for 07 ~20?)**
 - **Includes production-like processing facility creation**
- Plan – XFEL
 - **DESY 6th/7th production ~ 60 cavities, typ. for industry**
- Expensive, difficult to manage program



S0 Strategy: tradeoff between tight loop and RD

- Interwoven in S0 plan
 - **Parallel single cell rinsing studies**
 - (defined in TTC EP study 1.2005)
- Interaction with TTC
 - **TTC is the resident 'pool' of SRF expertise**
 - Thanks to DESY for the formation of this group through the TESLA effort (~10+ years)
 - Ideal group for RD, review and analysis
 - **Requested TTC perform single cell work**
 - September 2006
 - **Affirmation of interest.**



Structural differences e.g.: ILC Beam Test Facilities

- 3 construction projects underway
 - **STF (KEK – Asia) #1,2**
 - Cryogenic linac test
 - **NML (Fermilab – Americas) # 1,2**
 - same
 - **ATF2 (KEK – interregional) #4**
 - Beam delivery optics, tuning test
- Consideration of damping ring test facility (s)
 - **DESY, Cornell (#3)**
 - Address issues not touched at ATF (KEK) – like e+
- In addition ATF and TTF (Flash) (#1,2,3)
- Prioritization wrt single purpose RD



S # Task Forces: #3 Damping Ring

- Charge → **2 roles:**
 - advise the RDB on the damping rings R&D plan,
 - support the coordination of R&D activities
- Broad program
- Difficult deliverable definitions
- Diverse base
- Difficult tasks
 - → **hands-on management**
- Ongoing RDB / S3 responsibility
- What about the test facility proposals???



S3 issues –DR Test Facilities:

1. What is the proposed R&D program, and how does it address the R&D needs of the ILC?
 - **Justification for the test facility**
 2. Are there other facilities that could be used to carry out each element of the program?
 - **Justification for THIS test facility**
 3. What resources are needed to carry through the program?
 - **Cost / benefit of the proposed RD**
 - (need RDR)
 4. What is the timescale of the research?
 5. What are the risks involved?
- Parallel with S2
 - **test facilities are much smaller.**



Structural differences:

S2 (string test) and industrialization 'gap'

- Charge:
 - **Recommend a string test strategy;**
 - **follow up responsibility not defined;**
- S2 and TTF/XFEL
 - **Interaction with design effort**
- Extremely expensive
- Poorly quantified deliverables
- Duplication / competition / standardization
- Cross threaded with mass-production issues and 'regional interest' issues
- R or D?
- Political management
 - **Gap between design/cost effort and R and D**



S2 is a referendum on the readiness of SRF 'systems' for ILC

- Also on the interdependencies of ILC / XFEL
 - XFEL system design / projectization effort now underway
- The more CM changes we make, more we need S2 for technical v/v development reasons
- For example:
 - XFEL will develop and test cryomodule type 3'
 - ILC is designing CM type 4
 - Cost reduction may mandate additional design effort – CM5
 - Is a separate string test needed for the new type? Why?
 - Are the changes cost effective, including the cost / risk of the system test?



Internationalization of the RD process

- Project as a whole is predicated on success of links forged doing RD
- The RDB activities exhibit a strong international, balanced, involvement
 - **Within GDE structure**
- Diversity of technical approach
 - **Important advantage of 'globalized' development**
- Competition vs the strengthening of partnerships
- 'Regional interest'
- Value and cost of technical partnerships
 - **What is the intrinsic cost of collaboration?**



Gaps

- RDR should provide a new focus on needed 'development';
 - **also need to revisit ACD**
- RDB priorities come from Snowmass era evaluation of critical RD
 - **With fresh cost information, we will be able to reassign priorities**
- In the next ~ months, identify:
 - **Gaps**
 - **Poor cost/benefit RD**
- Reconsider priorities using RDR project schedule



Tracking issues

- Ownership of the R D process by GDE requires
 - **Projectization (tracking, resource monitoring, technical milestones)**
 - **Communication**
 - **Reporting**
 - **Reviews**
 - **Progress Assessment**
- Late 06:
 - **Ranking**
 - **Proto-projectization**
 - **Planning**
- The concept of ranking based on scoring



Tracking Tools & Issues

- Choice of Tools
 - **Standard project tracking tools seem too formal for requirements at this stage**
- 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 at hand
- Key projects being implemented
 - **S0/S1**
 - **S3: Damping rings**
 - Already well formalised
 - **S5**
 - Positron Source
- Schedule
 - **Single user version end of year**
 - Gain experience
 - **Expand to multi-user tool later**
 - As requirements become clearer



The utilization and promotion of the test facilities.

- TTF:
- Frascati 12/05:
 - **Strong criticism of the effective use of time at DESY TTF**
 - (FLASH commissioning process)
- KEK 9/06:
 - **Strong performance improvements at TTF/FLASH make a wide variety of tests compatible with VUV user operation**
 - e.g. High gradient 'alternating pulse' operation
- Synergy with the FEL.
- ATF:
 - **Transition from DR to BDS to DR test facility**
 - **2x yearly Technical Board reviews**



Future GDE / LC meetings: Focus on RD

- With the release of RDR, we recommend a GDE / LC meeting(s) with significant RD focus
 - **Involve that half of the community**
 - **Provide visibility to a substantial effort**
 - **Launch the TDR process**
- Agenda coming...