

GDE R&D Board

E.Elsen



R&D board charge & activities

- Coordinate worldwide, prioritized proposal-driven R&D efforts
 - collect all the data on resources, with no double-counting and place data in one site,
 - track items of work that should be done, but are not yet planned,
 - instigate new collaborative work to fill the gaps and take advantage of worldwide opportunities in ILC related research.
 - advise regions (regional directors) on matters of R&D with a view on global activities
 - coordinate R&D globally in critical areas
- R&D board is not concerned with
 - producing the TDR nor with
 - requests of Regional interest groups

R&D board members

Bill Willis (chair)

Chris Damerell

Eckhard Elsen

Hitoshi Hayano

Toshiyasu Higo

Tom Himel

Terry Garvey

Lutz Lilje

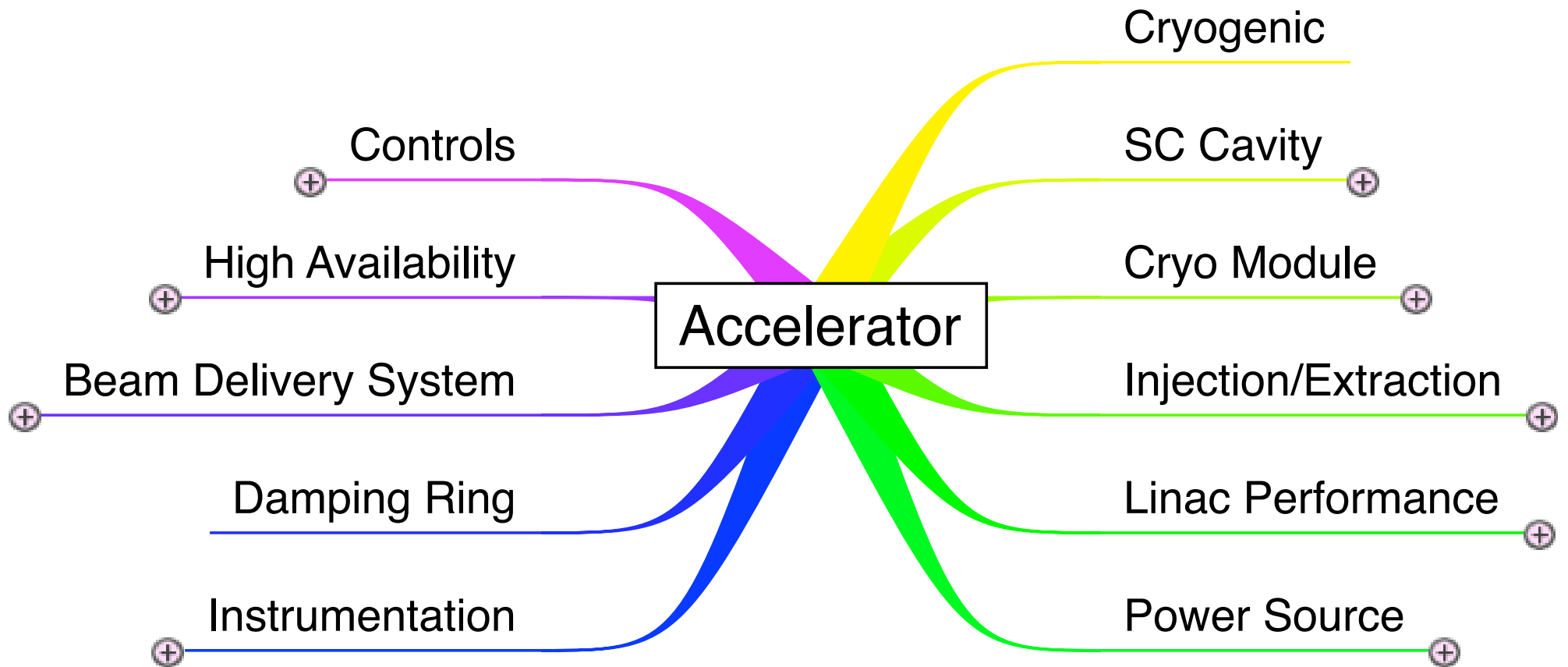
Hasan Padamsee

Marc Ross

Andy Wolski

Board has been meeting ~weekly mostly in teleconferences but also in person including visit to FNAL and ANL.

Research areas



Detector R&D

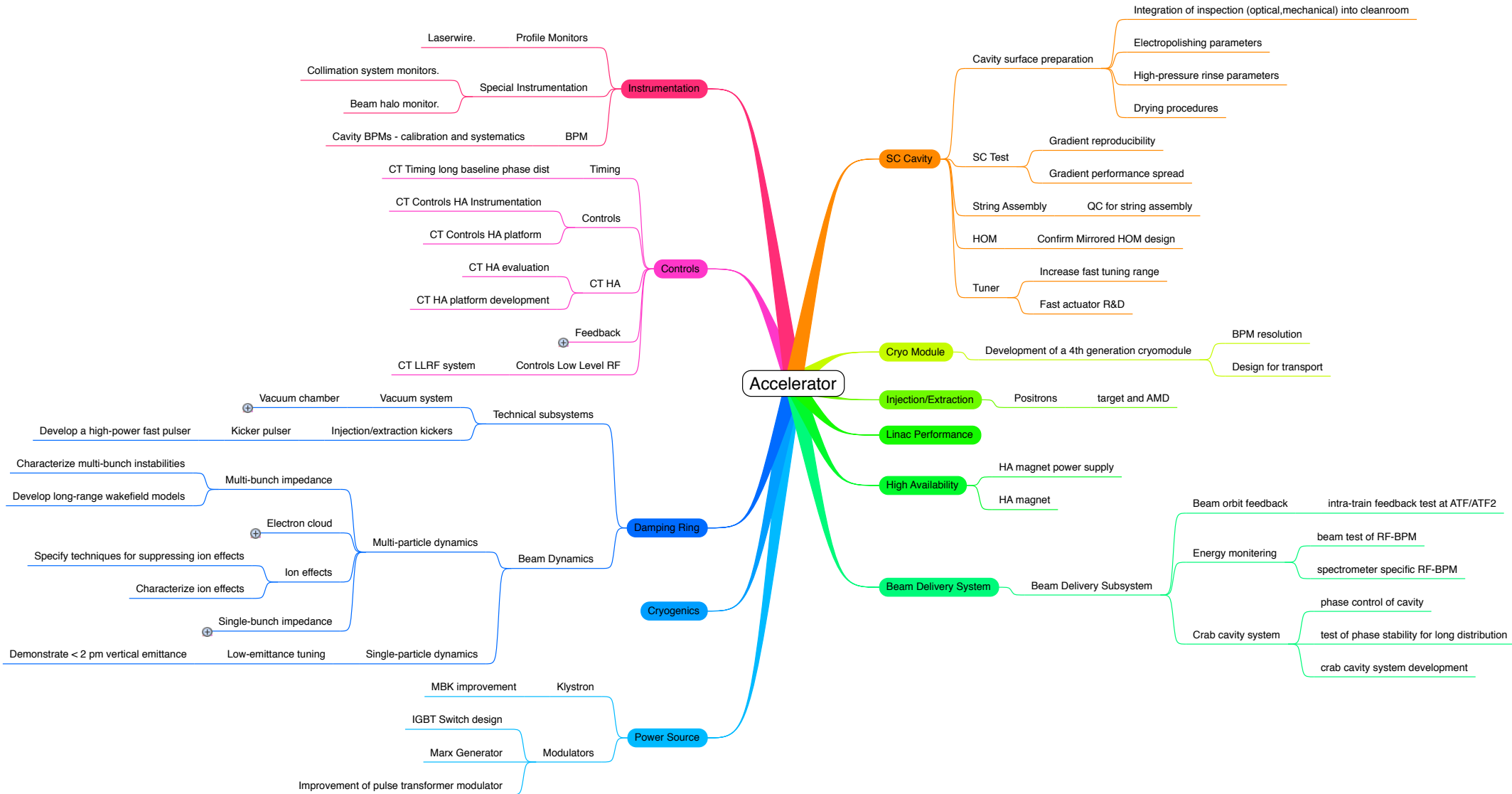
- Detector R&D groups have long implemented effective mechanisms of regional oversight
 - internal organisation
 - some level of regional review (e.g. DESY PRC)
 - looking into globalising the review including milestones for advancing detector techniques
- Detector R&D panel represented by C Damerell on R&D board

Ideal list

- excerpt from the list
- full list available from R&D board wiki page

	A	B	C	D	J	K
	Key	depending on	Short Title	Priorit	Status	Full Description
1	Accelerator		Accelerator			
2	CR	Accelerator	Cryogenic	moderate		
3	SC	Accelerator	SC Cavity			
4	SC_Shapes	SC	SC Cavity Shapes			Explore new cavity shapes such as LL and RE to decrease Hpk/Eacc.
5						
6	SC_Shapes_LL	SC_Shapes	Low-loss cavity shape			
7	SC_Shapes_LL_wake	SC_Shapes_LL	LL wake field analysis	high	in progress	Carry out complete wake field analysis computationally and check with measurements
8	SC_Shapes_LL_gradient	SC_Shapes_LL	LL gradient	high	in progress	Achieve gradient and Q expectations up to at least 35MV/m first in 9-cell cavity tests.
9	SC_Shapes_LL_module	SC_Shapes_LL	LL performance in modules	moderate	in progress	Achieve gradient and Q expectations up to at least 35MV/m in modules with beam. Check Wake fields and HOM damping in modules with beam.
10	SC_Shapes_RE	SC_Shapes	Re-entrant cavity shape			
11	SC_Shapes_RE_wake	SC_Shapes_RE	RE wake field analysis	high	in progress	Carry out complete wake field analysis computationally and check with measurements
12	SC_Shapes_RE_gradient	SC_Shapes_RE	RE gradient	high	in progress	Achieve gradient and Q expectations up to at least 35MV/m first in 9-cell cavity tests.
13	SC_Shapes_RE_module	SC_Shapes_RE	RE performance in modules	moderate	undefined	Achieve gradient and Q expectations up to at least 35MV/m in modules with beam. Check Wake fields and HOM damping in modules with beam.
14	SC_Shapes_Susu	SC_Shapes	Superstructure with superconducting joint	moderate	in progress	Explore the 'superstructure' concept to improve the packing fraction and reduces the number of couplers. Develop a superconducting joint to join superstructure cavity pairs after processing, to avoid handling with > 2m structures.
15	SC_Materials	SC	SC Materials			
16	SC_Materials_Fine_Grain	SC_Materials	Standard fine-grain material			
17	SC_Materials_Fine_Grain_Industry_P	SC_Materials_Fine_Grain	Nb industrial process optimization	high	in progress	Understand and optimize the industrial production process, e.g. number of melts to reach the specified RRR/impurity content for cost savings,
18	SC_Materials_Fine_Grain_Mech_Prop	SC_Materials_Fine_Grain	Fine-grain mechanical properties	high	in progress	Explore the mechanical properties of fine grain rolled sheet material
19	SC_Materials_Fine_Grain_Sheet_QC	SC_Materials_Fine_Grain	Nb sheet QC	high	in progress	Explore better sheet quality control measures than present eddy current scanning to allow detection of <100 um size defects on starting Nb
20	SC_Materials_Fine_Grain_Postpurific	SC_Materials_Fine_Grain	Need for post-purification with electropolish	high	in progress	Establish or eliminate the need for post purification which increases RRR and gives higher performance in the presence of defects, but lowers yield strength.
21	SC_Materials_Fine_Grain_Tantalum_S	SC_Materials_Fine_Grain	Relax Tantalum impurity specification	moderate	in progress	Explore whether Ta impurity spec can be relaxed to lower material costs.
22	SC_Materials_Large_Grain	SC_Materials	Large or single-grain material			
23	SC_Materials_Large_Grain_Sliding	SC_Materials_Large_Grain	Large or single-grain slicing techniques	high	in progress	Explore cost savings in Nb material from the large or single-crystal sliced directly from the ingot. Develop fast, inexpensive sheet slicing techniques.
24	SC_Materials_Large_Grain_Properties	SC_Materials_Large_Grain	Large or single-grain material properties	moderate	in progress	Improve understanding of mechanical, etching and oxidation properties with crystal orientation. Important topics are: acceptable yield strength of material cut directly from ingot, uniformity during forming of half cells, slippage of grains during forming, vacuum leaks through grain boundaries, grain boundary problems during EBW.

Very high priority items



Future plans for R&D list

- Extending functionality
 - updating mechanisms
 - tracking progress and assignment of tasks
 - key institutes
- Reporting
 - including cross correlations

Will move to relational database to provide web based reports.
- initially static
- eventually interactive

Machine Advisory Committee (MAC) on R&D board

- Emphasizes the development of a global R&D plan with
 - priorities,
 - resource assessment
 - timelines with milestones
- including all regions

R&D board has reacted to
the recommendations

Priority topics identified

- Klystron program – report by T.Garvey after DESY ML meeting
 - Inspired by TRC - G Loew report's ranking but going well beyond
 - S0 Cavity production
 - S1 Module fabrication
 - S2 String tests
 - S3 Damping rings
 - S4 Beam Delivery Systems
- } task forces related to SC RF

Role of task forces S0-2

- task force (experts from the area) develop a global plan for their area including
 - resource allocation
 - timelines
 - milestones
- The plan is presented to the GDE EC for
 - review and
 - implementation

Other task forces (Si, $i > 2$)

- Primary goal
 - coordinated plan and usage of the available resource
 - identification of critical areas
 - milestones

The detailed action of the R&D board will depend on the specific area.

Interacting with the regions

- A global R&D plan requires regionally adapted actions for implementation
 - centralized, year-to-year funding in US
 - diverse and peer reviewed ~3 year funding in Europe
 - "competing" funding in Japan
- As long as we do not have a global budget for R&D the actions will differ from region to region; ILC has to adapt to these circumstances
 - specific actions under guidance of the regional directors
 - understand local dependencies and use them to the global advantage
 - be pro-active when new opportunities arise, e.g. FP7

Accompanying the FY07 US process

- \$US 100 M request in research projects with roughly half that amount likely to be funded
 - R&D board explained its priorities
 - irrespective of institution
 - irrespective of qualification
 - pointing to complementary or parallel developments elsewhere
 - Priorities of R&D board where assigned to US list as additional input, item by item
 - note that the US list is different from the global list
 - note that infrastructure actions, management and TDR activities have not been evaluated

European R&D – part I

- approved EC programs on 3+ year time scales
 - EUROTeV (05-07) – mostly ILC, some flexibility
 - CARE (04-07/08) – SC RF ancillary program with some ILC focus
 - EUDET (06-09) - detector, mostly ILC
- Prepare for Framework Programme 7 (FP7) (2007-2013)
 - preparation presently focussed on extending SC RF infrastructure in Europe
 - a proposal will require strong endorsement from GDE R&D board to succeed
 - may be complemented by "small" infrastructure measures for instrumentation, diagnostics, source, etc.
 - final acceptance in peer review beyond GDE control

European R&D – part II – national programs

- UK: LC ABD
 - 2004-2007 and renewal 2007-2010
- DESY:
 - FLASH
 - module 6 test this fall, > 30 MeV/m
 - instrumentation, diagnostics
 - XFEL
 - cavity development
- LAL
 - coupler development

Selected larger national activities that will require guidance and attention to best benefit the ILC in Europe.

There are other smaller activities on their way where input is equally welcome.

Asian R&D

- KEK
 - R&D board emphasises the importance of an independent SC RF program
 - Development of cavity production capability
 - Maintaining and extending electropolishing capability
 - Nomura (industrial partner, facilities aged)
 - KEK (developing own facility)
 - R&D board is looking forward to refining statements towards plans as they emerge (S0-S2)

Test facilities

- R&D board has not yet made a global assessment of test facilities worldwide
 - ATF & ATF2
 - FLASH (VUV-FEL)
 - XFEL
 - Damping rings (CESR-TF, HERA, etc.)
- In general participation in these programs has been seen favourably not the least to exercise collaboration for the ILC

Summary

- R&D board is moving from
 - ideal R&D plan to
 - realistic R&D plan (adapted to resources, technical capabilities and timelines)
- Specific measures
 - implementation of tasks forces (S0, S1, S2 etc.) which give guidance to the regional activities
 - emphasising regional research activities where new activities need support