ILC-EDR Kick-off Meeting

Main Linac Integration

Organization and Tasks

Sept. 27, 2007

Akira Yamamoto

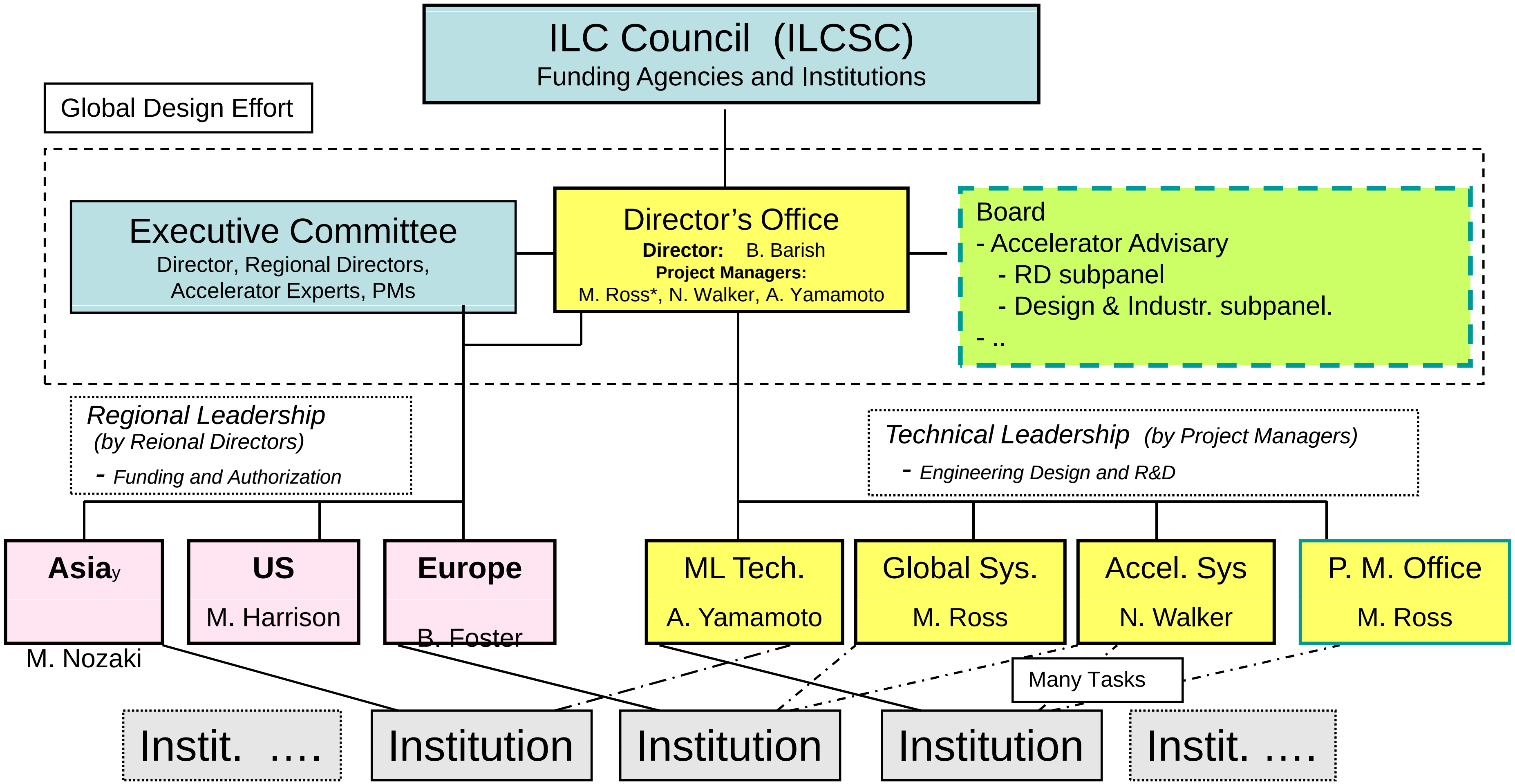
ILC-EDR Kick-off Meeting, Main Linac Integration

To be held at Fermilab, Sept. 27-28, 2007

V-070710

ILC Project Management

as a proposal for the organization toward EDR



ILC Project Management and Sharing Responsibilities

- Project Managers

  responsible for

  – Leading the world-wide technical development effort
    - efficiently and effectively
  – Setting technical direction and executing the project toward realization of the ILC
    - Day-to-day project execution and commucniation

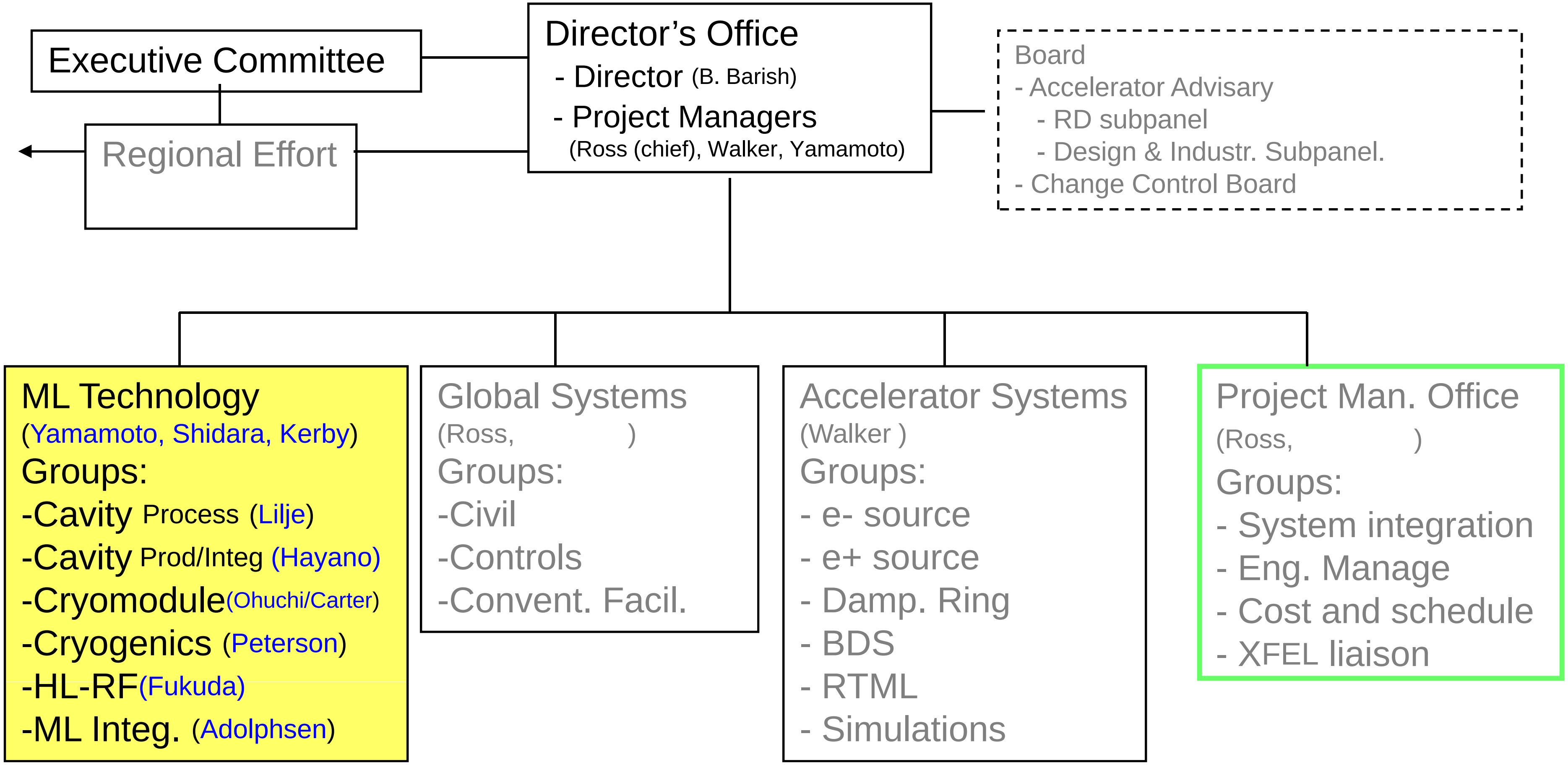
- Regional Directors & Institutional Leaders

  responsible for

  – Promoting, funding and authorizing the cooperation programs.
    - Formaly responsible for institutional activities, funding and oversiting the technical progress,

Project Management Structure

(baseline)



Project Management Structure

Area: Main Linac Technology (to be completed)

Regional/Intsitutional Effort:

- Director-US: Mike Harrison
- Director-EU: B. Foster
- Director-AS: M. Nozaki

Technical Effort (ML (SCRF) Technology):

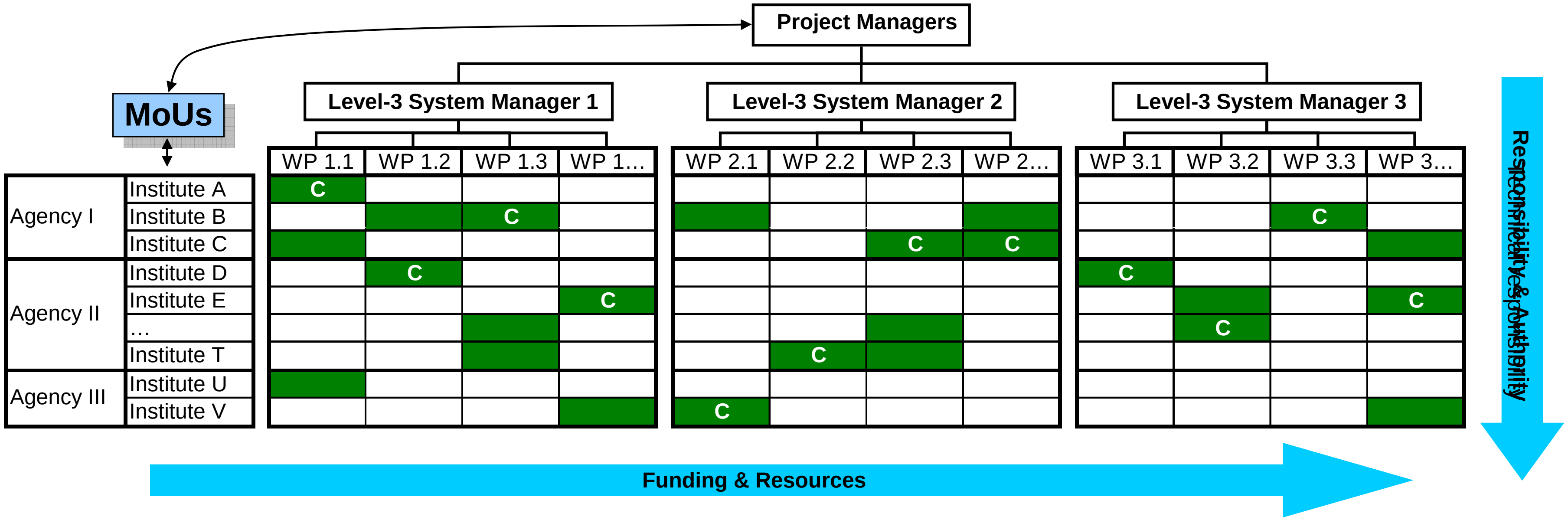
- Project Manager: A. Yamamoto
- Associate Managers: T. Shidara, J. Kerby,

* Group leader, ** Co-leader

Regions	Institute	Institute Leaders	Cavity (Process) L. Lilje*	Cavity (Prod./Int.) H. Hayano*	Cryomodule N. Ohuchi* -H. Carter**	Cryogenics T. Peterson*	HLRF S. Fukuda*	ML Integr. C. Adolphsen
US	Cornell Fermilab SLAC ANL J-lab	H.Padamsee R. Kephart T.Raubenhaimer	H.Padamsee	C.Adolphsen	H.Carter	T.Peterson	R. Larsen	C. Adolphsen
EU	DESY CERN Saclay Orsay INFN Spain	R.Brinkman J. Delahaye O. Napoly A.Variola C. Pagani	L.Lilje	C. Pagani	Parma Franco Pal.	Tavian		
AS	KEK Korea Inst. IHEP India Inst.	K.Yokoya	Noguchi, Saito	Hayano	Tsuchiya/ Ohuchi	Hosoyama/ Nakai	Fukuda	

Technical Responsibilities :

(from RDR Chapter 7)



- Green indicates a commitment:
  - institute will deliver
- MoUs facilitate connection:
  - Project Management (authority and responsibility) and institutions (funding and resources).
- The 'C' → coordinating role in a WP
  - Each WP has one coordinator.

Main Linac Integration Groups

Organization for EDR-tasks

		Cavity Cryomodule Cryogenics Vacuum	HLRF LLRF Control	Beam dynamics, Quadrupoles, Diagnositic	,,,	,,,
US	Cornell Fermilab SLAC ANL J-lab					
EU	DESY CEA-Saclay -Olsay INFN Spain CERN					
AS	KEK Korea Inst. IHEP India Inst.					

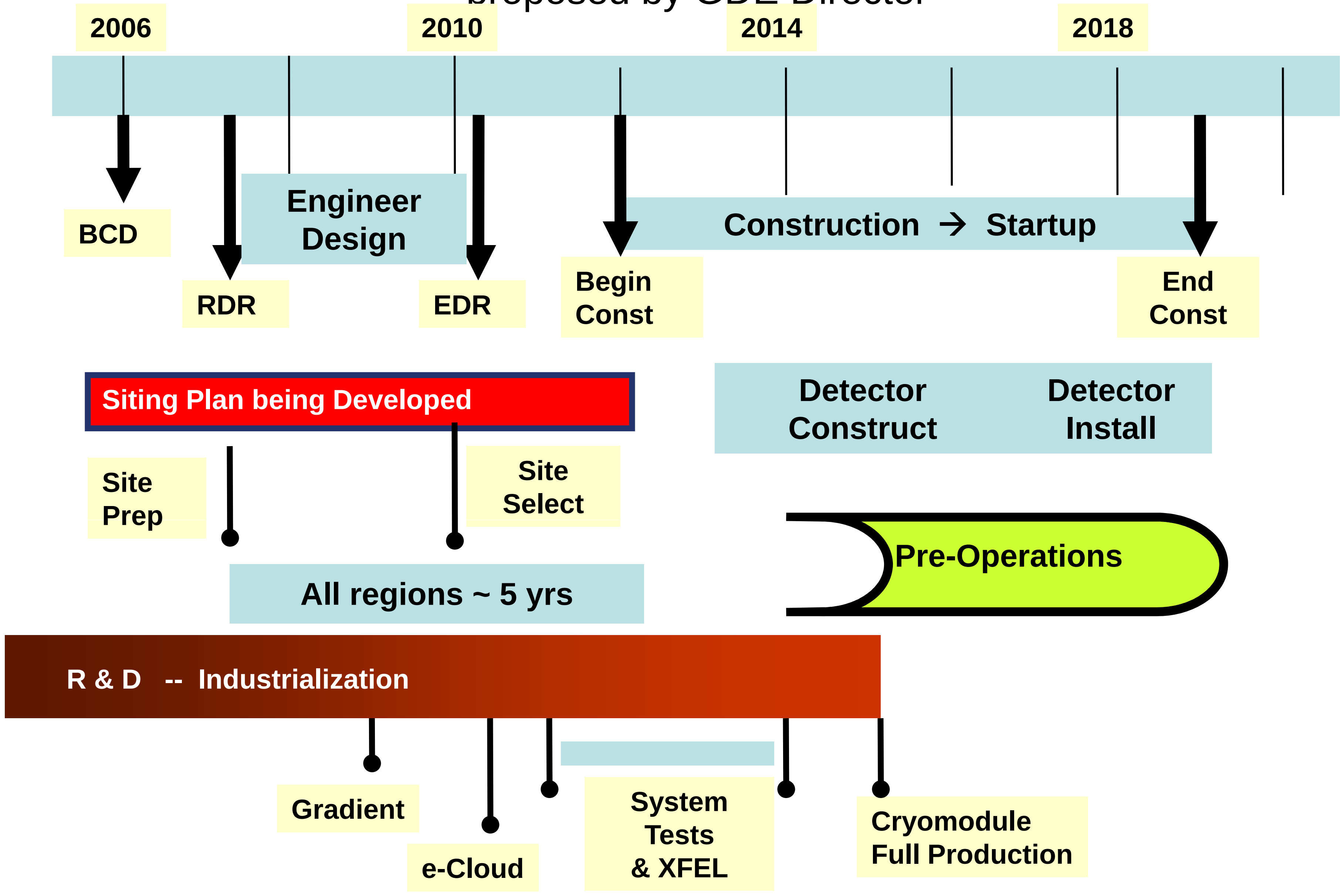
Technical efforts to EDR

- Complete the critical R&D
  - as identified by the (R & D Board and) S0, S1, S2 task forced and ..
- Establish the base-line design,
  - Technologies to be chosen and to be demonstrated through pre-mass-production
  - Learn industrialization
    - Obtain the maximum benefit from the realized project

- Proceed alternate design and development
  - As technology back-up to achieve the ILC design goal,
    - with “Plug-compatible” concept, and
    - for maximizing performance/cost (value-engineering)

Technically Driven Timeline

proposed by GDE Director



2007/08 EDR Milestones

07-8:	Korea ILCSC:
	» New EDR organization start,
07-9, 10:	EDR Kick Off Meetings
07-10:	Fermilab ILC-GDE meeting
	» Establish initial Base-line for ED phase
	» EDR Work Packages to be discussed
08-1,2	EDR-R&D Meetings
08-3	Tohoku (Japan) GDE Meeting

M.L.I. – EDR Tasks and Discussions in KOM

- Base-line Design and interface parameters to be verified,
  - Functional parameters and interface conditions to be unified,
  - What have to be achieved and what have to be maintained,
  - What can be plug-compatibly improved,
  - How the tasks can be shared among sub-groups,
- Critical Goal:
  - Technology to achieve E-op = 31.5 MV/m
    - Otherwise, need to reduce the gradient or adjust the machine design
    - Need a vital program of both R&D and demonstrations
- Important Work at Main Linac Integration tasks
  - System optimization for the best “value engineering”, such as
    - Beam dynamics and quadrupoles system design,
    - Cryomodule design to be optimzed with cryogenics system design

Summary for Charges

- Functional performances and Interfaces to be verified,
- EDR design work and R&D (goal)
  - Basic R&D to be completed
  - Learning mass production
- Discussions towards
  - “unified design/specification” and/or “”plug-compatible design/specification
- Task sharing and schedule

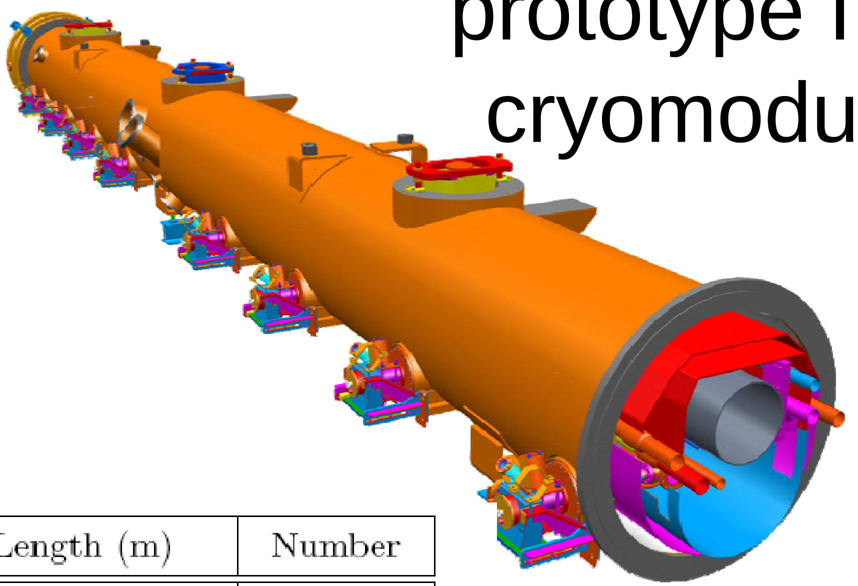
Appendix

For discussions

Cavities & Cryomodules

Producing Cavities

4th generation prototype ILC cryomodule



Subdivision	Length (m)	Number
Cavities (9 cells + ends)	1.326	14,560
Cryomodule (9 cavities or 8 cavities + quad)	12.652	1,680
RF unit (3 cryomodules)	37.956	560
Cryo-string of 4 RF units (3 RF units)	154.3 (116.4)	71 (6)
Cryogenic unit with 10 to 16 strings	1,546 to 2,472	10
Electron (positron) linac	10,917 (10,770)	1 (1)

ML (SCRF) Technology Design Parameters

As of Sept. 27, 2007

To be integrated

Cavity

RF properties	Frequency	1.3 GHz					
	Gradient	31.5 MV/m 35 MV/m	Opertaion Vertical test				
	Q0	1.0 E10 0.8 E10	@ 31.5 MVm @ 35 MV/m				
	HOM dumping		Q R/Q				
	Short range wake						
	T-operation	2.0 K					
Physical Prop.	Length	-- m					
	Aperture	-- mm					
	Alignment acc.	300 um					
	Material	Nb					
	Wall thickness	2.8 mm					
	Stiffness						
	Flange/seal		Material?				
	Pressure						
	Lorentz F detune. at E-max	1.00 kHz					
	Out. Dia. He vessel						
	Mag. shielding		Inside/outside				

Coupler

Power Req.	Operation	400 kW	For 1,300 us				
	Processing	100 kW	Up to 400 us				
		600 kW	> 400 us				
Processing time	Warm	--- hours,					
	Cold	--- hours					
Heat loads	2K						
	4 K						
	40/80 K						
Cavity vac. Integ.		2	# of windows				
			biss				
							R
RF properties	Qext	Yes/No	tunable				
	Tuning range	1- 10 E6	If tunable				
Physical prop.	Position	See cav. lentgh					
	Flange		compatible				
Instrumentation			Vac. level				
			Spark detection				
			Electron current				
			temperature				

Tuner

Slow tuner							
	Tuning range	600 kHz					
	Hysteresis						
	Allowed Power-off Holding require.						
	Physical envelope						
	Mag. Shielding	2 mG	At cabity surface				
	Survive Freq. Change in lifetime of machine		Could be total number of steps in 20 year, ~ 20 mio. Steps in TESLA?				
Fast tuner	Tuning range	1 kHz	Oever flat-top				
	Survive Freq. Change in lifetime of machine		Number of pulses over 20 years.				
							R

Cryomodule

			8 cav+ 1 quad.	9 cav.	9 cav. + 2 q	6 cav. 6 q	….
Number			627	1188	6	4	
Heat load	2K						
	5K						
	50 - 80 K						
Phys. Prop.							
Vacuum Ves.	Lengh Out. Diameter Inner diameter						
	Connection flange to input coupler	Dimension Position Tolerance					
	Connection flanges to Next cryomodule	Dimension Tolerance					
He jacket	Length Outdiameter Inner diameter Support position						
Cooling pipes	Outer diameter Inner diameter Location Maximum pressure						
Thermal rad. S.	Number of shield	One or two					
Support post	Number of post						R
Quardupole mag.	Field gradien Lengt Number of correctors, Alignment, Tolerance, Vibration,						A

Cryogenics

Cryomodule							
				Pressure		Temperature	
						Nominal range	
		Line	MAWP	Min.	Max.	Min.	Max
			kPa	kP	kP	K	K
	1.3 GHz RF cav.	B, G.	400	2.7	3,600	1.95	2.05
	Subcooled He	A	2,200	130		2.2	
	Cold thermal int.	C.D,	2,200	500	550	5.0	8.0
	Warm therm. int.	E, F	2,200	1,800	2,000	40	80
	Warmup/cool d.	H	400			2.2	300
				Uncertainty		Plant Ov. Cap.	
Cryoplant	Efficiency		Min. % carnot	Static	dynamic	Factor	
	2 K level		22 %	1.10	1.10	1.4	
	4- 8 K level		24	1.10	1.10	1.4	
	40 - 80 K		28	1.10	1.10	1.4	

HLRF

Beam Dynamics (Q. BPM..)
