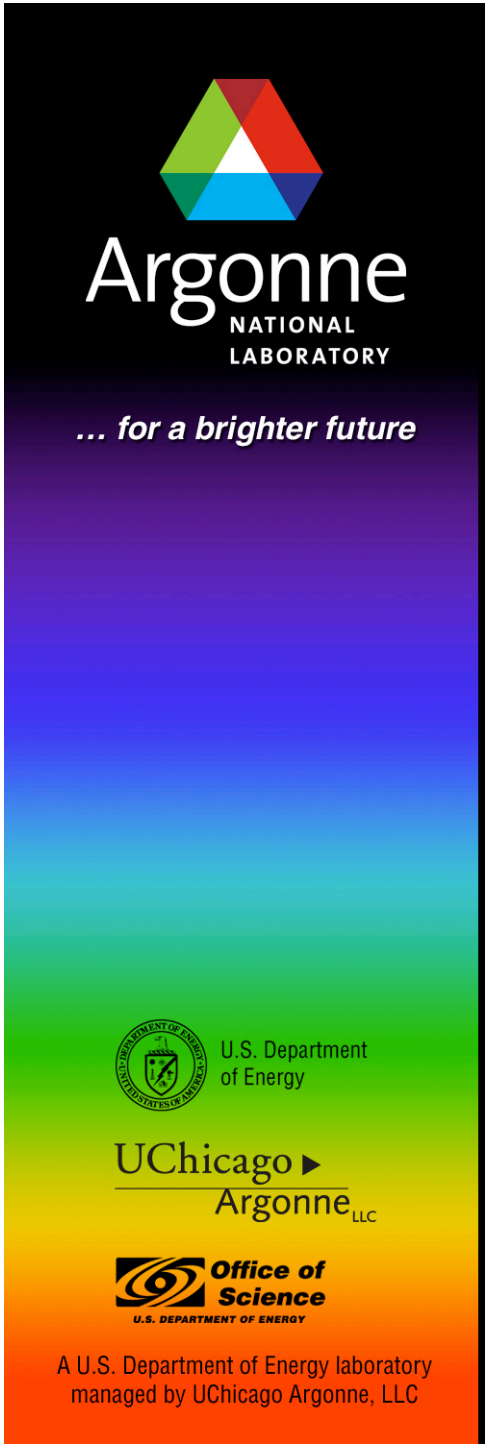


ILC Global Systems

John Carwardine, *Claude Saunders, Frank Lenkszus*

10 May 2007

Americas

ILC Schematic

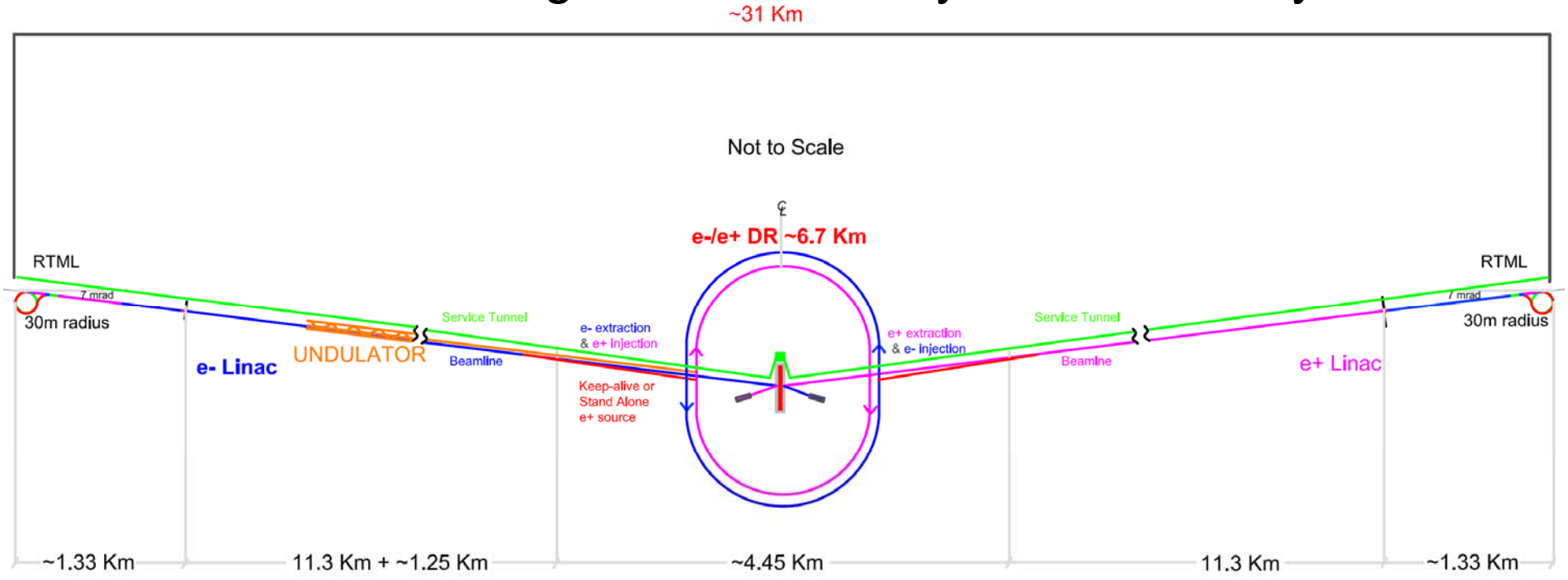
11km SC linacs operating at 31.5 MV/m for 500 GeV

Centralized injector

- Circular damping rings for electrons and positrons
- Undulator-based positron source

Single IR with 14 mrad crossing angle

Dual tunnel configuration for safety and availability



RDR Design & "Value" Costs

The reference design was "frozen" as of 1-Dec-06 for the purpose of producing the RDR, including costs.

The RDR is a snapshot and the design will continue to evolve, due to results of the R&D, accelerator studies and value engineering

The value estimate was reviewed twice, before the RDR release

- 3 day "internal review" in Dec
- ILCSC MAC review in Jan

Summary
RDR "Value" Costs

Total Value Cost (FY07)

$4.87B Shared

+

$1.78B Site Specific

+

13.0K person-years

("explicit" labor = 22.2 M person-hrs @ 1,700 hrs/yr)

Participation with ILC Global Controls

- APS staff began participating with the ILC Global Controls efforts in Aug 2005
  - Strong technical contributions to the ILC Reference Design in FY06/07.
  - Major contributors to the ongoing development of a Controls R&D plan.
  - Close collaborations with Fermilab on ILCTA: EPICS, cavity data management.
  - Leadership appointments:
    - *RDR Global Controls Leader for Americas region in FY06/07**
    - *Global Systems Manager for Americas for FY08/09.*

- Built new collaborations with Fermilab, SLAC, DESY, KEK, U.Oxford,…

- Immediate and long-term payback to APS, eg
  - Head-start on precision timing & rf phase reference for a pico-second x-ray source.
  - Opportunity to study new technologies (eg ATCA), and to develop controls capabilities (high availability, distributed real-time control).

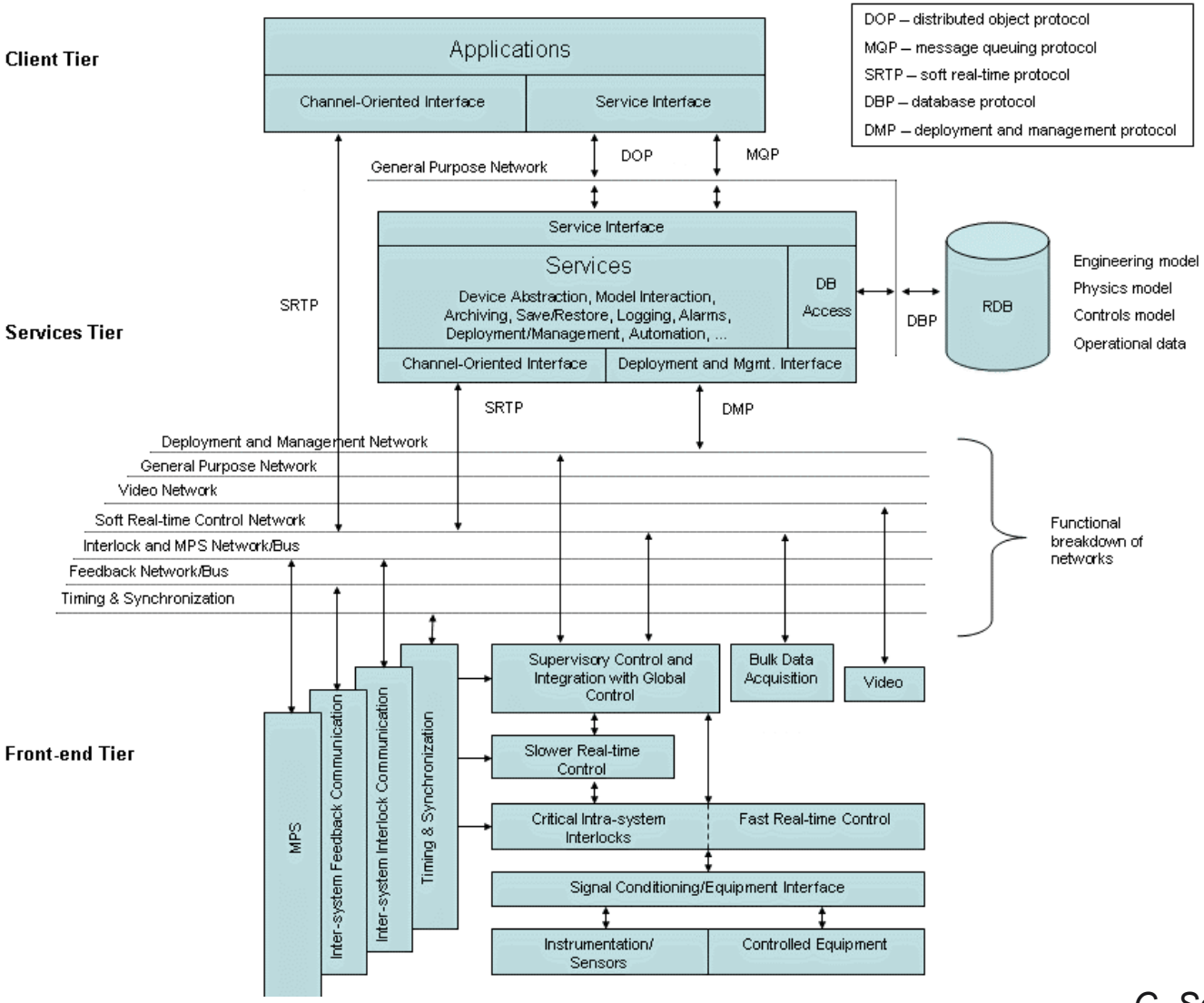
- *Strong overlap between ILC and ANL accelerator technology interests (ERL, RIA), including: cavities, HLRF, LLRF, controls, and instrumentation.*

* Received FY06 funds under LDRD WP-03791

ILC Global Controls summary costs for RDR

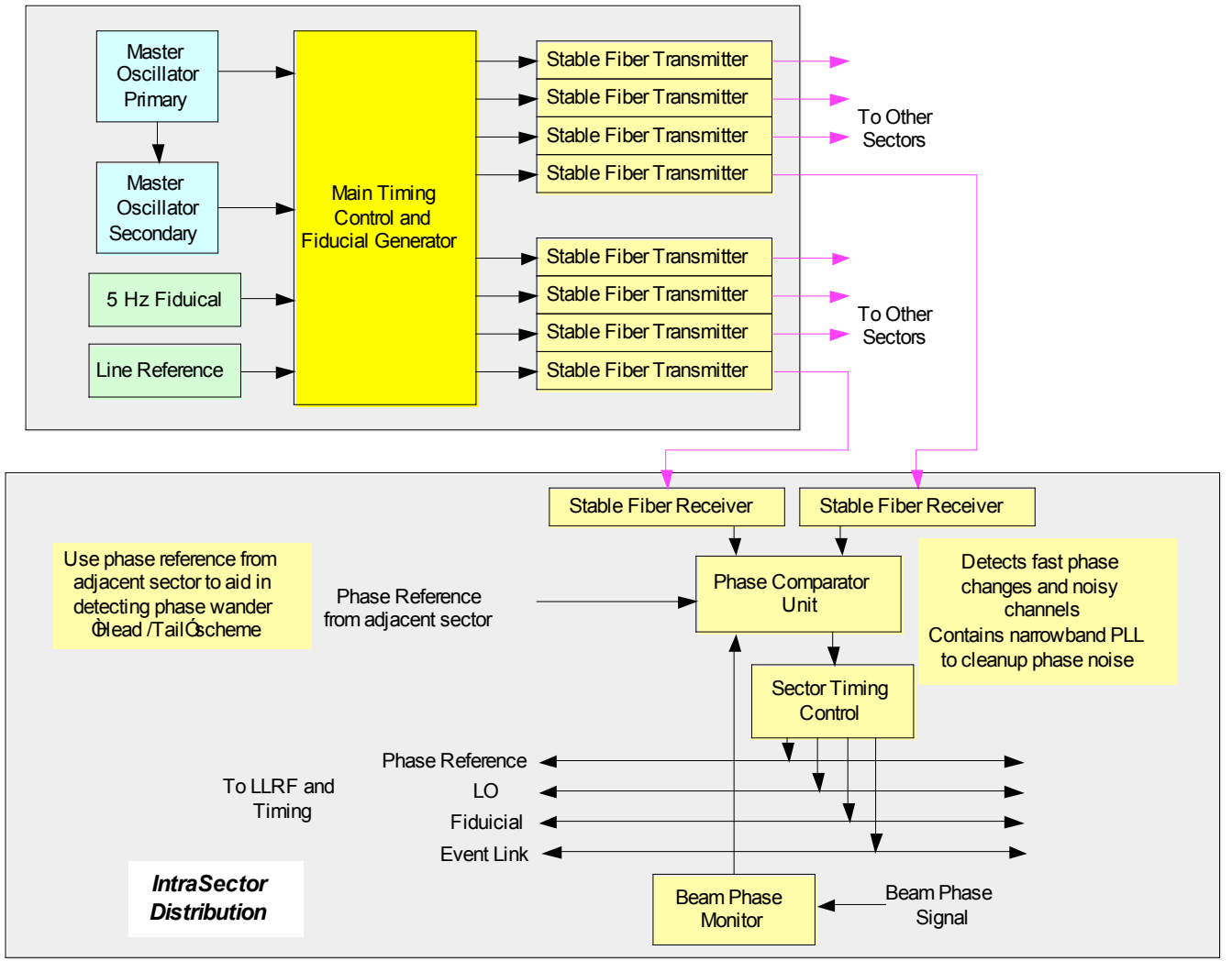
Controls & LLRF 11.8.06 **(Manpower estimates are unchanged)**	**FTE Yr**	**Revised M&S ($K)**	**Original M&S ($K)**	**Saving (%)**
Totals	**754**	**$ 275,588**	**$ 397,295**	**30%**
Control System Engineering	547	$ 10,080	$ 10,080	
Global Control System Equipment		$ 23,788	$ 40,936	42%
RF Phase & Timing Distribution System		$ 41,774	$ 48,233	13%
Protection Systems Equipment		$ 30,914	$ 30,914	
Front-end Control System Equipment		$ 84,787	$ 106,605	20%
Control LLRF Rack/Relay Equipment	75	$ 3,400	$ 3,400	
LLRF Engineering	132	$ 2,640	$ 2,640	
LLRF Equipment *(Includes $49M from scope changes)*		$ 78,205	$ 154,487	49%

Control System Functional Model



C. Saunders, N. ARnold

ILC Timing and RF Phase Reference



F. Lenkszus

High Availability and Electronics Platform Areas

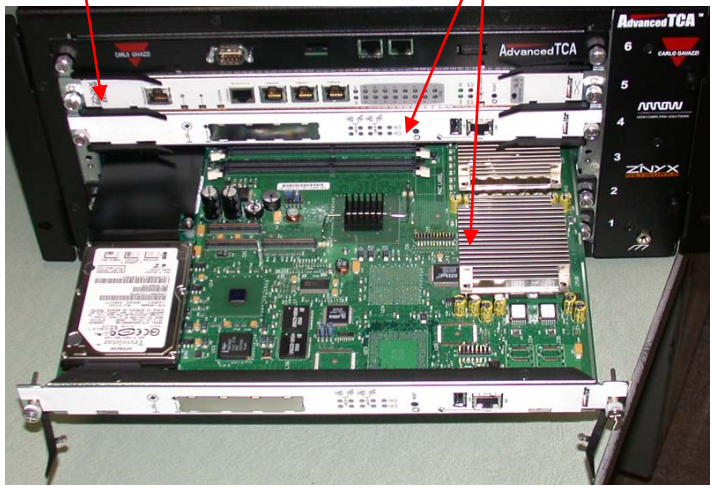
- High Availability
  - NOT just redundancy
  - Conflict avoidance
  - Model-based resource monitoring (IPMI and SNMP)
  - Model-based configuration management
  - Automated diagnosis
  - Adaptive control
  - Controller redundancy and failover

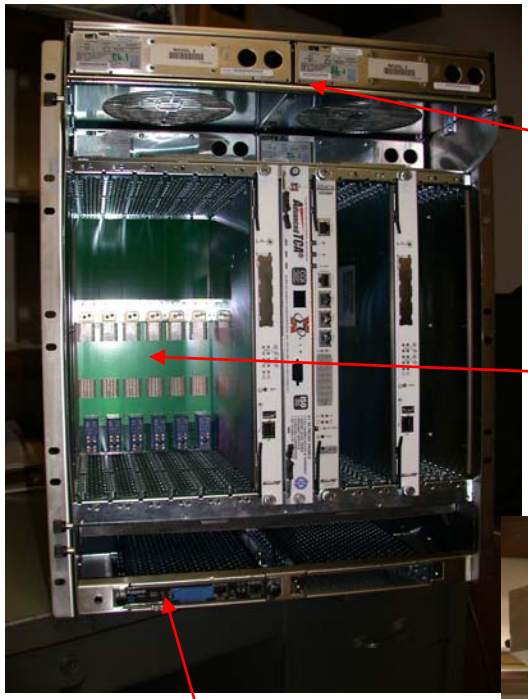
- Electronics Platform
  - ATCA (Advanced Telecommunications Computing Architecture)
    - *BPM digitizer under development at Fermilab*
  - uTCA
    - *AMC cards for analog I/O (how to route I/O to back of chassis?)*
  - Shelf Management (IPMI over RMCP, IPMB, IPMC, BMC, etc…)
  - Analog electronics environment characterization

Americas

ATCA Starter Kits

5-Slot Crate w/ Shelf Manager
Fabric Switch
Dual IOC Processors

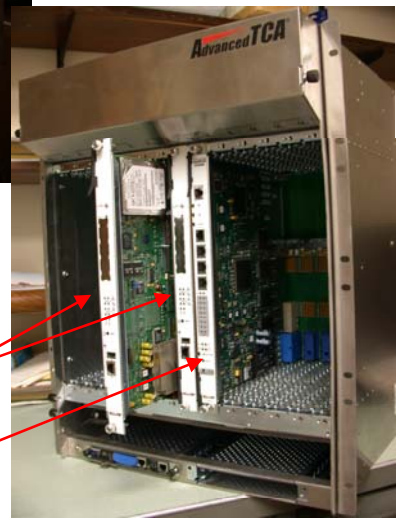




4 Hot-Swappable Fans

16 Slot Dual Star Backplane

Shelf Manager



Dual IOC's Fabric Switch

Dual 48VDC Power Interface

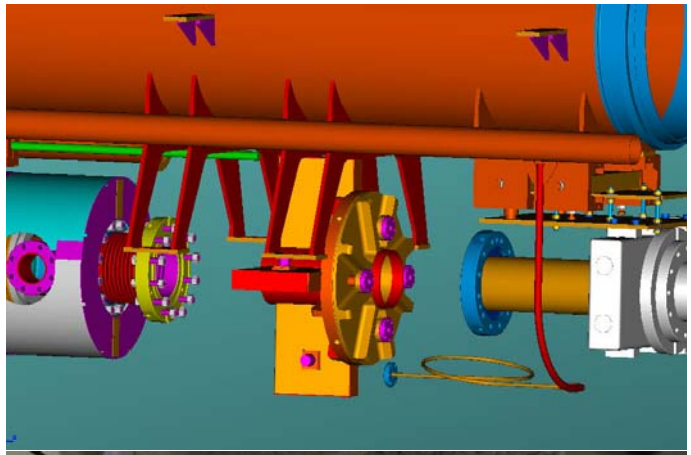
Rear View

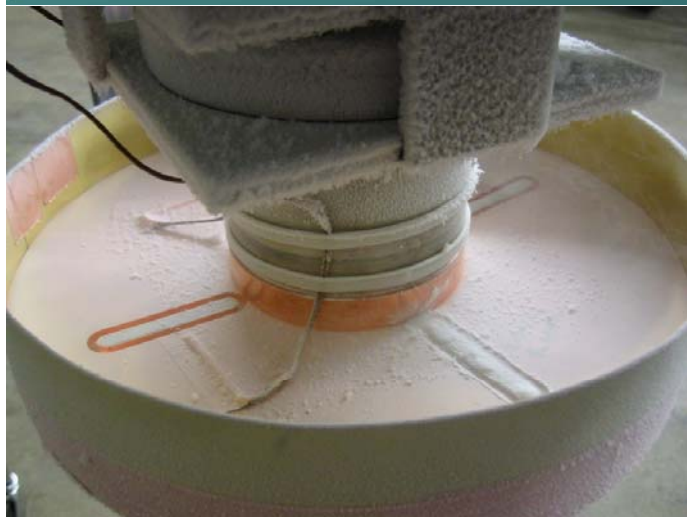
Anticipated participation in FY08

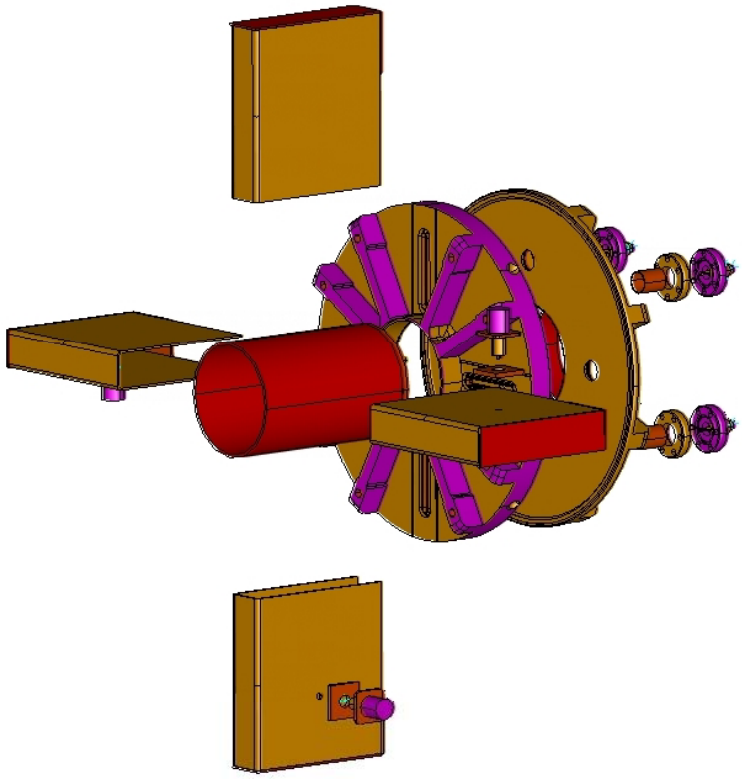
- Continue to lead the Americas program for Global Controls.
- Begin role as Americas “Level-2 Program Manager” for Global Systems
  - LLRF, Instrumentation, Controls, Commissioning, Installation, Survey/Alignment.
- Lead R&D work packages on High Availability control systems
- Opportunities to begin new collaborations on Instrumentation, LLRF, S&A.

Americas

Cold L-Band Cavity BPM R&D



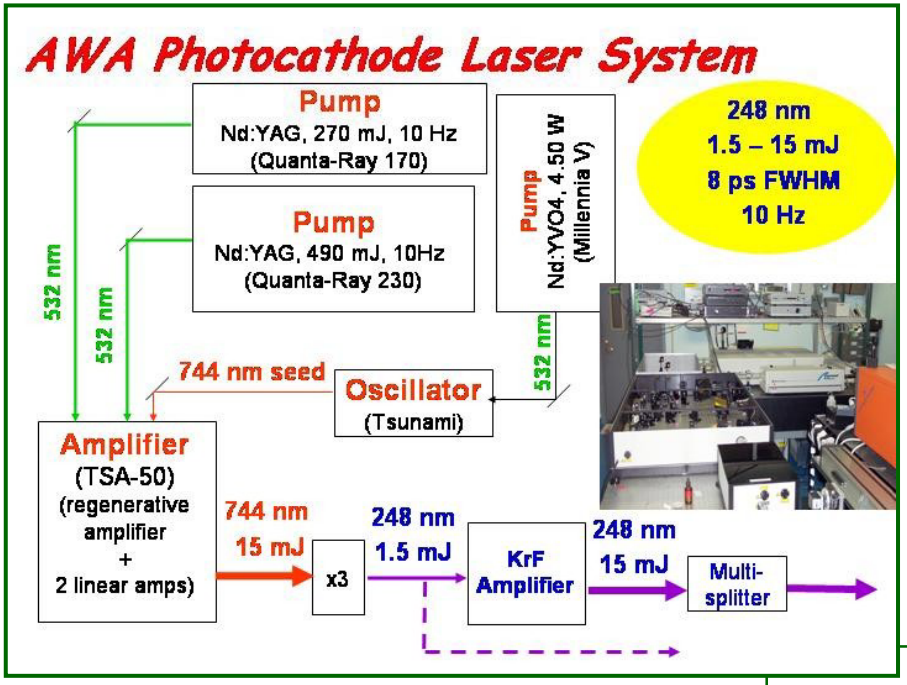


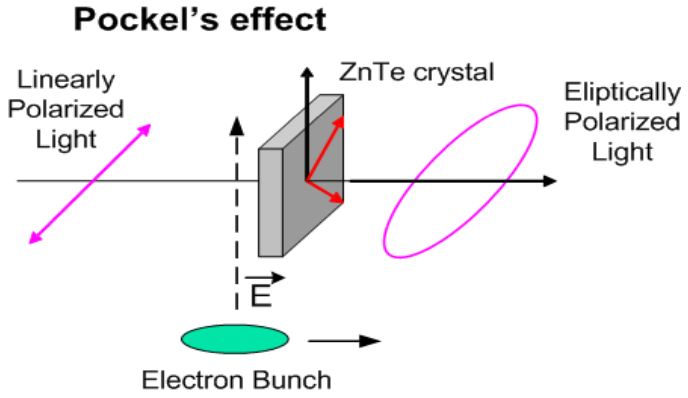


Goal: Development of a **cold CM-free L-Band cavity BPM** with 1 μm single bunch resolution

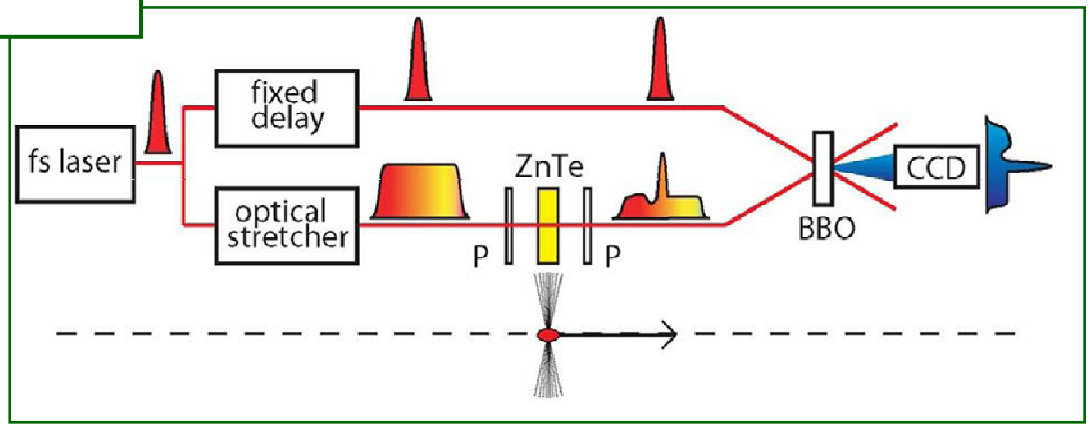
EOS Bunch Length Measurement

Americas



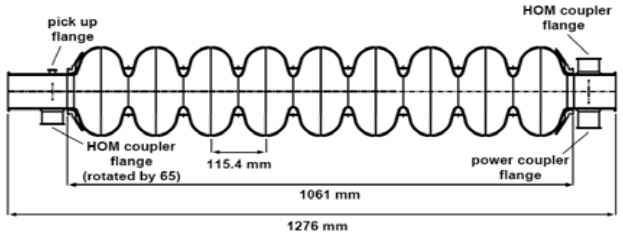


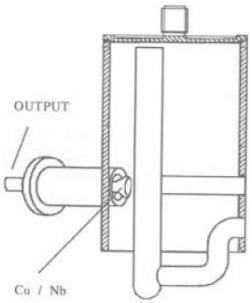
Electro-optical sampling (EOS) by temporal decoding

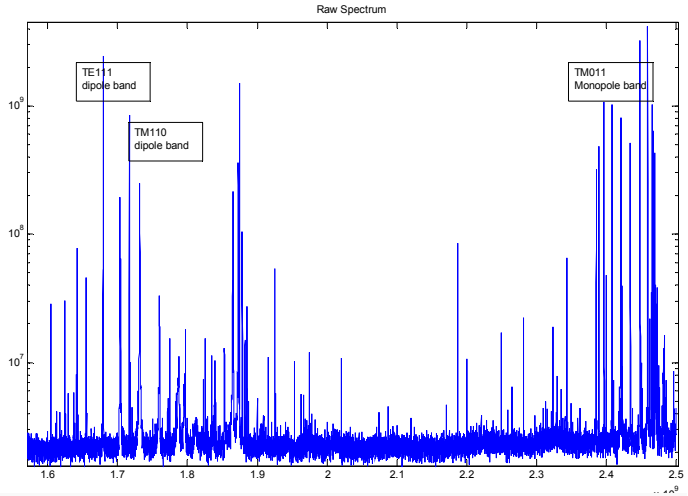


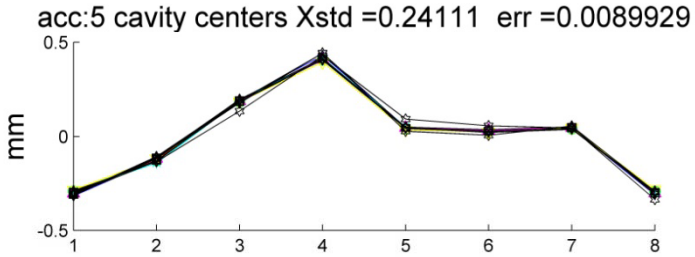
EOS Studies Collaboration
at the ANL Advanced Wakefield Accelerator (AWA)
Goal: Bunch length measurement R&D

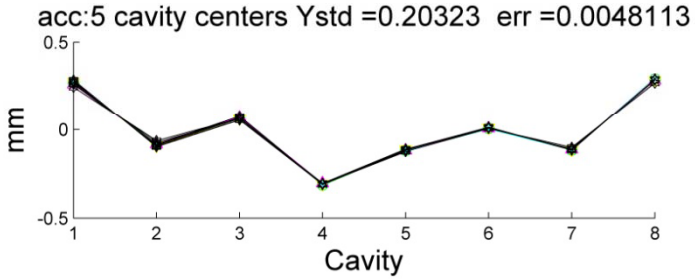
3.9.1+5.8.5 - HOM BPM Studies (FLASH)







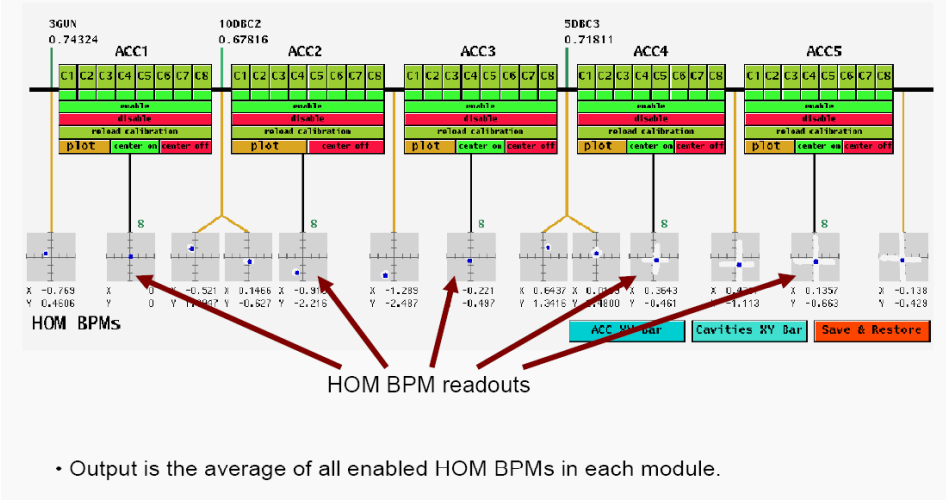




HOM Studies Collaboration

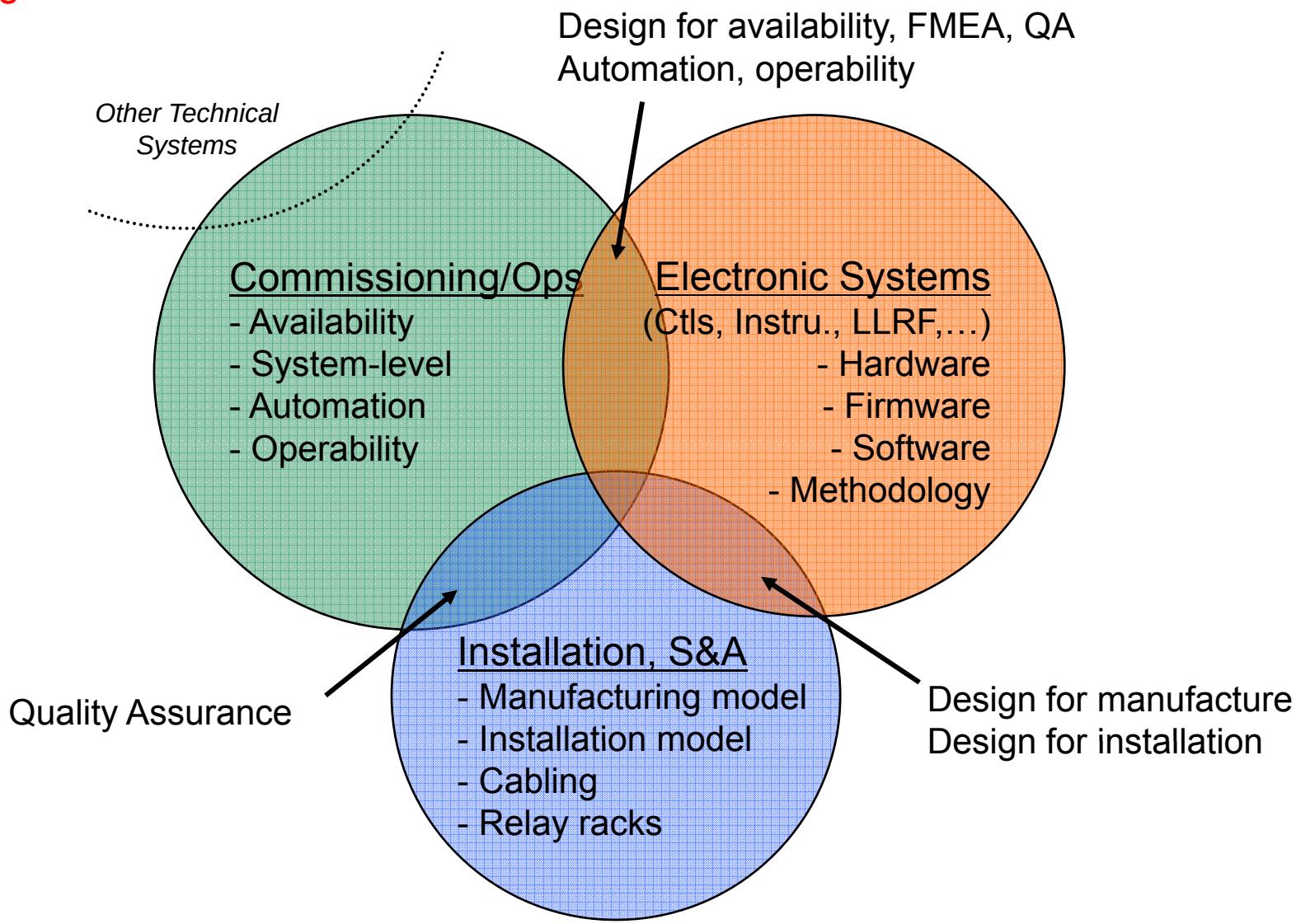
- Beam-based cavity alignment
- HOM BPM system (~ 5 μm res.)
- Broadband beam phase detection

Integrated with DOOCS



• Output is the average of all enabled HOM BPMs in each module.

HA Integration



Americas

FY08-09 ILC plan, by institution

BY INSTITUTION	FY08 FTE	FY08 M&S	*FY08 Total*	FY09 FTE	FY09 M&S	*FY09 Total*
Fermilab	111.05	$17,969	*$40,692*	146.02	$33,823	*$66,651*
SLAC	65.21	$6,884	*$20,515*	91.25	$15,769	*$36,362*
Argonne	8.11	$665	*$3,268*	10.67	$1,161	*$4,456*
Berkeley	4.29	$383	*$1,699*	8.22	$698	*$3,339*
Brookhaven	4.15	$628	*$1,801*	11.20	$181	*$2,805*
Jefferson Lab	1.85	$265	*$1,014*	3.95	$440	*$1,999*
Livermore	2.61	$219	*$1,288*	4.65	$625	*$2,603*
Cornell (SRF only)	0.95	$210	*$505*	1.25	$285	*$677*
GDE	1.33	$0	*$787*	1.33	$0	*$824*
ART	2.25	$0	*$646*	2.25	$0	*$678*
Michigan	0.00	$0	*$590*	1.00	$100	*$663*
Los Alamos	2.50	$250	*$896*	2.50	$300	*$980*
Detectors			*$7,000*			*$8,000*
Reserve			*$2,699*			*$4,962*
TOTAL	204.29	$27,472	*$83,400*	284.29	$53,382	*$135,000*

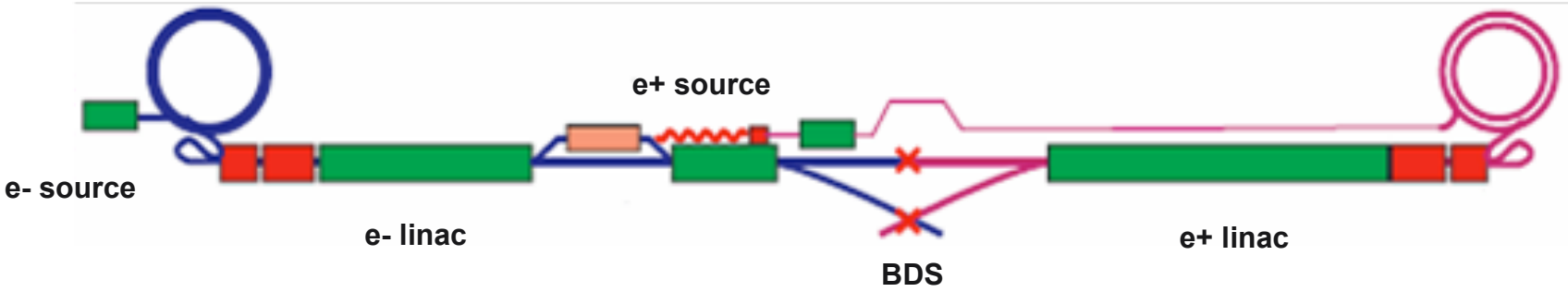
Americas

ILC Engineering Design phase

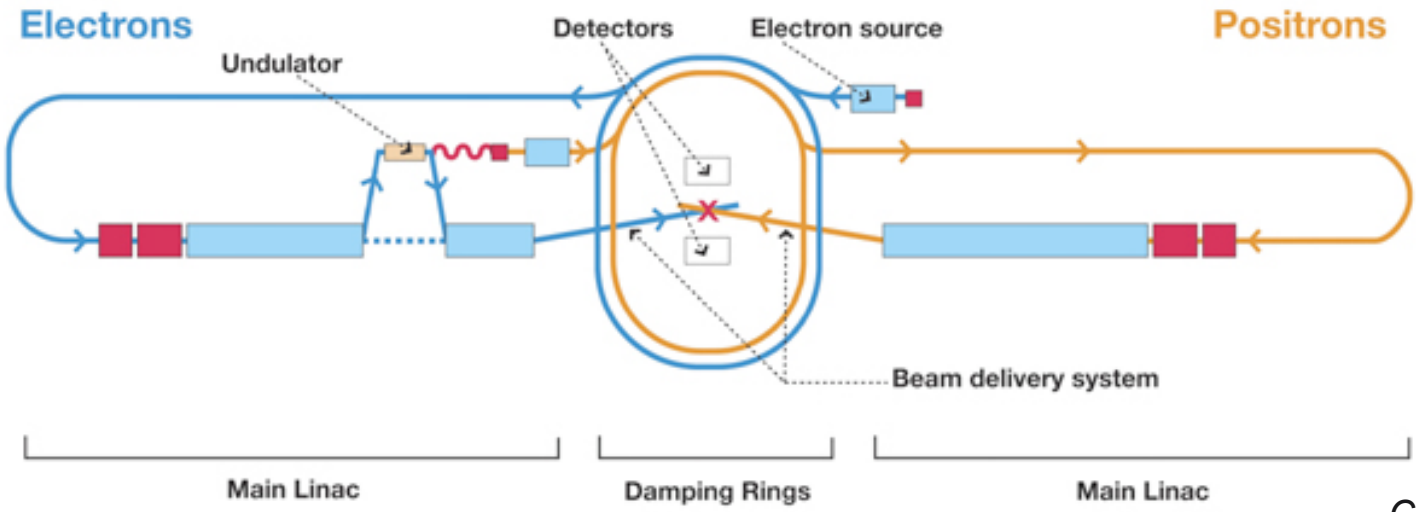
- The next steps for the GDE involve developing the Engineering Design Report (EDR) and coordinating the associated R&D program.
- The GDE EC will establish a Project Management office to direct the EDR phase activities. Selection of a project manager is underway.
- The EC has established an EDR Planning task force to study project structures for the EDR phase.
- The global R&D program is a key part of the EDR phase, since the EDR must guide and be supported by the R&D program.
- The global R&D plans, as articulated by the GDE R&D Board, will be presented by Marc Ross later this morning.

ILC Design Changes since June 2006

- Was



- Now



C. Saunders