ILC
Global Design Effort

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GDE

Caltech

ILC Timeline

2005 2006 2007 2008 2009 2010

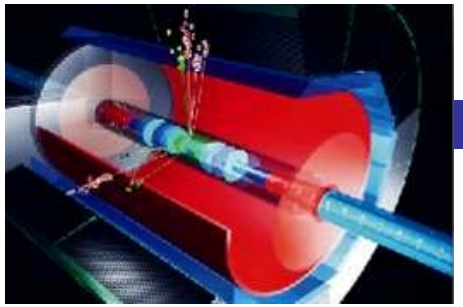
Global Design Effort

Project

Baseline configuration

Reference Design

Technical Design

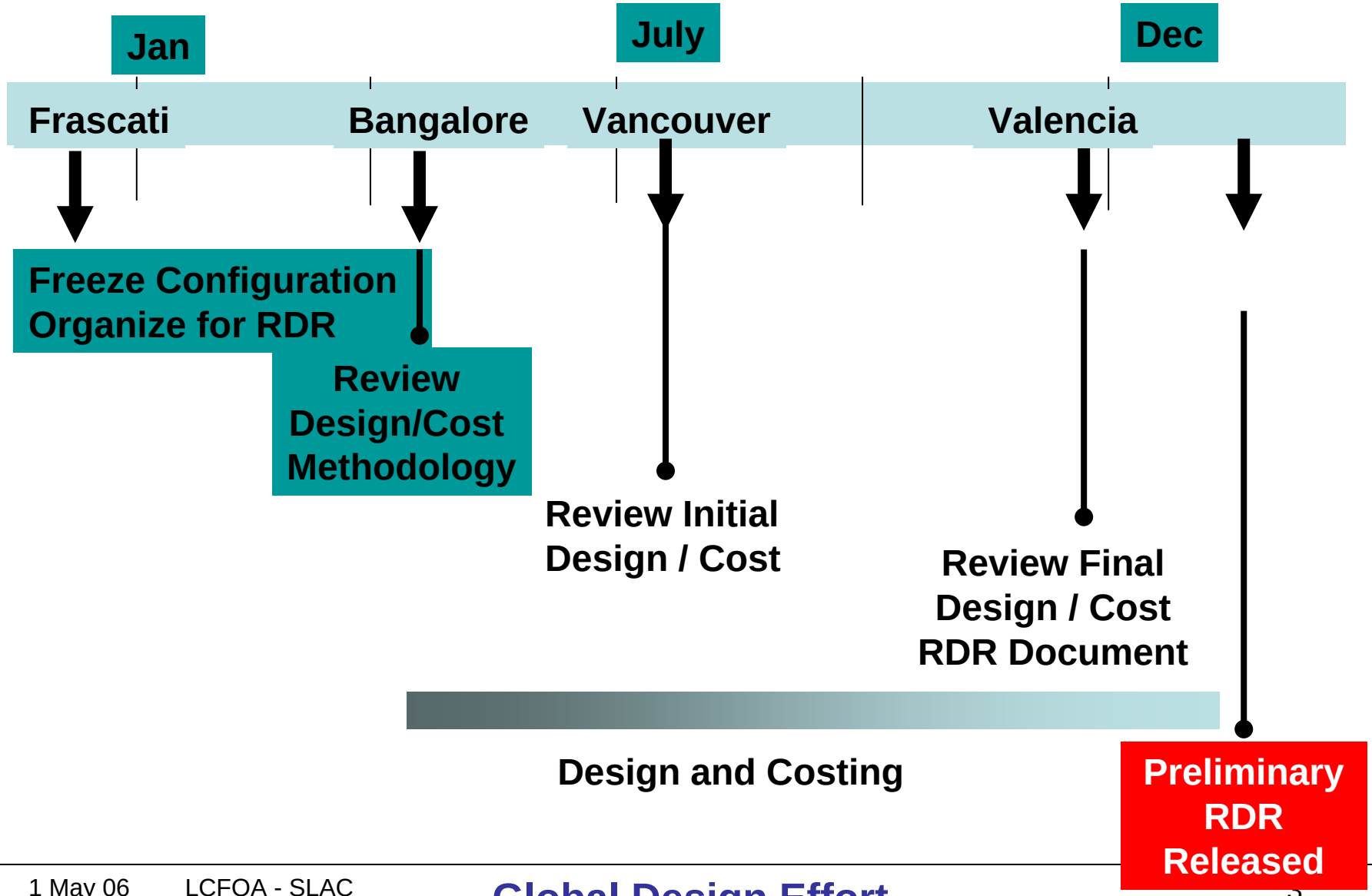


ILC R&D Program

Expression of Interest to Host

International Mgmt

From Baseline to a RDR 2006



Global Design Effort

- The Mission of the GDE
  - Produce a design for the ILC that includes a detailed design concept, performance assessments, **reliable international costing, an industrialization plan** , siting analysis, as well as detector concepts and scope.
  - Coordinate worldwide prioritized proposal driven R & D efforts (to demonstrate and improve the performance, **reduce the costs**, attain the required reliability, etc.)

Baseline Configuration Document

- Our ‘Deliverable’ by the end of 2005

- A structured electronic document
  - Documentation (reports, drawings etc)
  - Technical specs.
  - Parameter tables
  - Revisions and Evolution through Change Control Process

http://www.linearcollider.org/wiki/doku.php?id=bcd:bcd_home

Baseline Configuration Document

- **ILC Configuration Main**

- **What's New**
- March 28, 2006 - RTML section has been updated (v.Mar.28 2006)
- March 23, 2006 - Missing figure in the “Number of Tunnels” section under the GDE White Papers has bee restored.
- March 16, 2006 - Conventional Facilities & Siting Section has been updated (v.Mar. 16 2006)
- March 3, 2006 - RTML and Parameters Sections have been updated (v.Mar.3 2006)

- **Change Configuration Communication**
- Change Configuration Procedure (v.0.5, Feb. 3, 2006)
- Archives of public communications regarding BCD Change Control.
- Change Configuration History

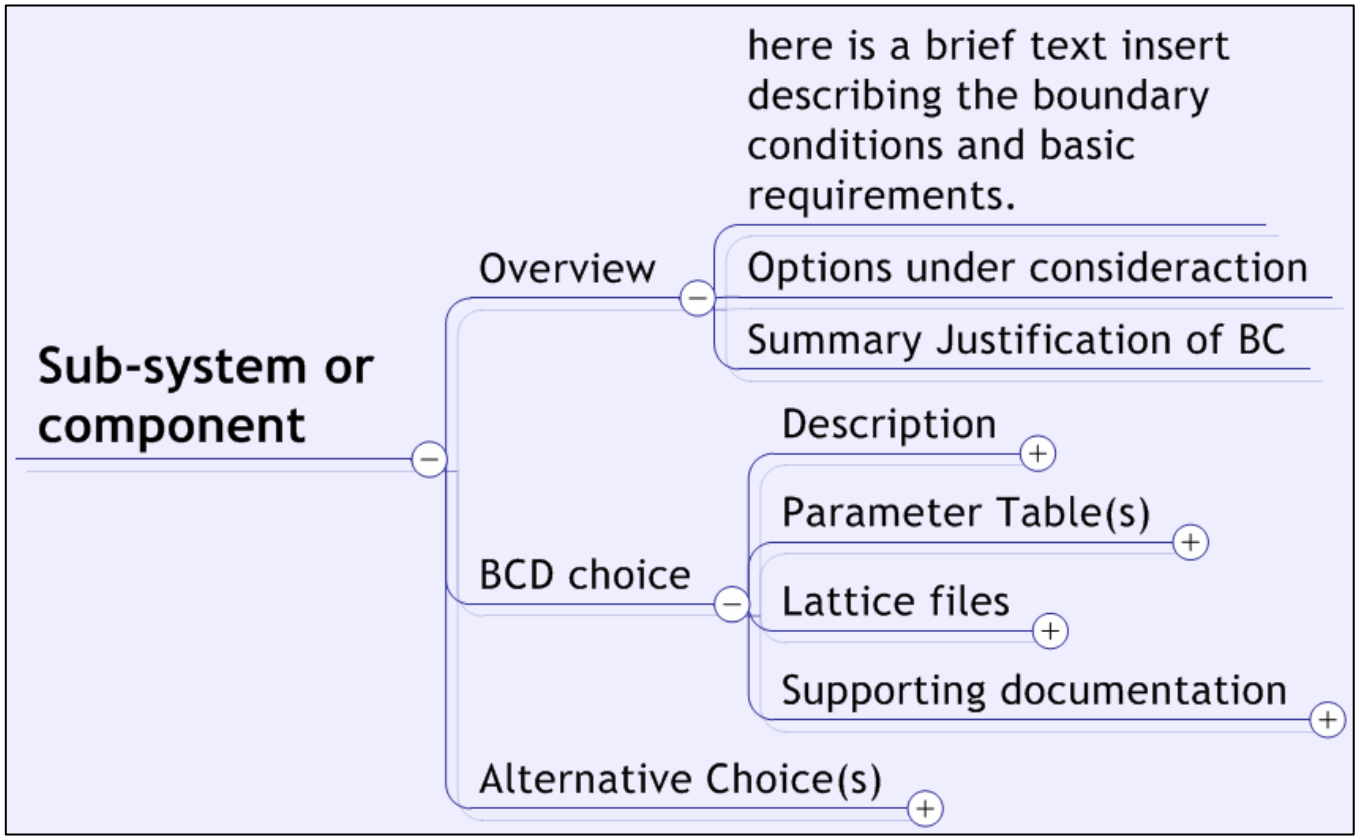
Baseline Configuration Document

- **Latest Official Version of BCD**
- **BCD in MSWord files:**

- **All-in-one-file**
  - Single PDF File (2582kB, Updated Mar.28, 2006)
  - Single MSWord File (5103kB, Updated Mar.28, 2006)

- **By Area Nodes:**
  - General Parameters (233kB, Updated Mar. 3, 2006)
  - Electron Source (296kB)
  - Positron Source (316kB)
  - Damping Rings (554kB, Updated Feb.27, 2006)
  - Ring to Main Linac (313kB, Updated Mar.28, 2006)
  - Main Linacs (455kB)
  - Beam Delivery (543kB)
  - TeV Upgrade Scenario (26kB)

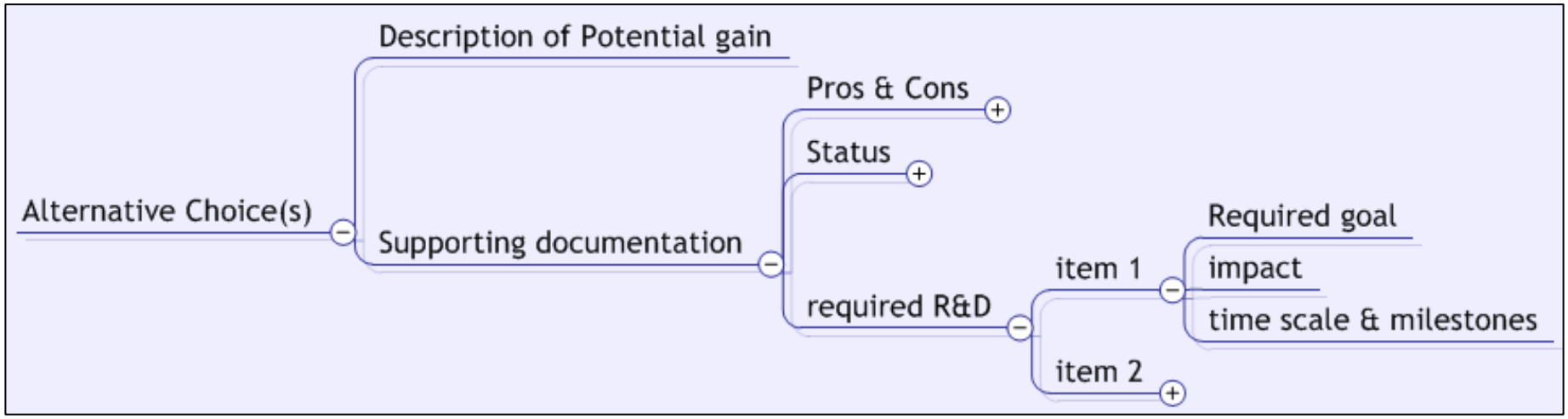
Structure of the BCD



Summary-like overview for those who want to understand the **choice** and the **why**

Technical documentation of the **baseline**, for engineers and acc. phys. making studies towards RDR

Alternatives Section(s)



Note - **ACD is part of the BCD**

Reference Design

- Reorganized the GDE toward Design / Cost Effort
- **A global effort to design / cost the ILC is underway**
- Configuration Control; **International Costing**; Industrialization; Siting

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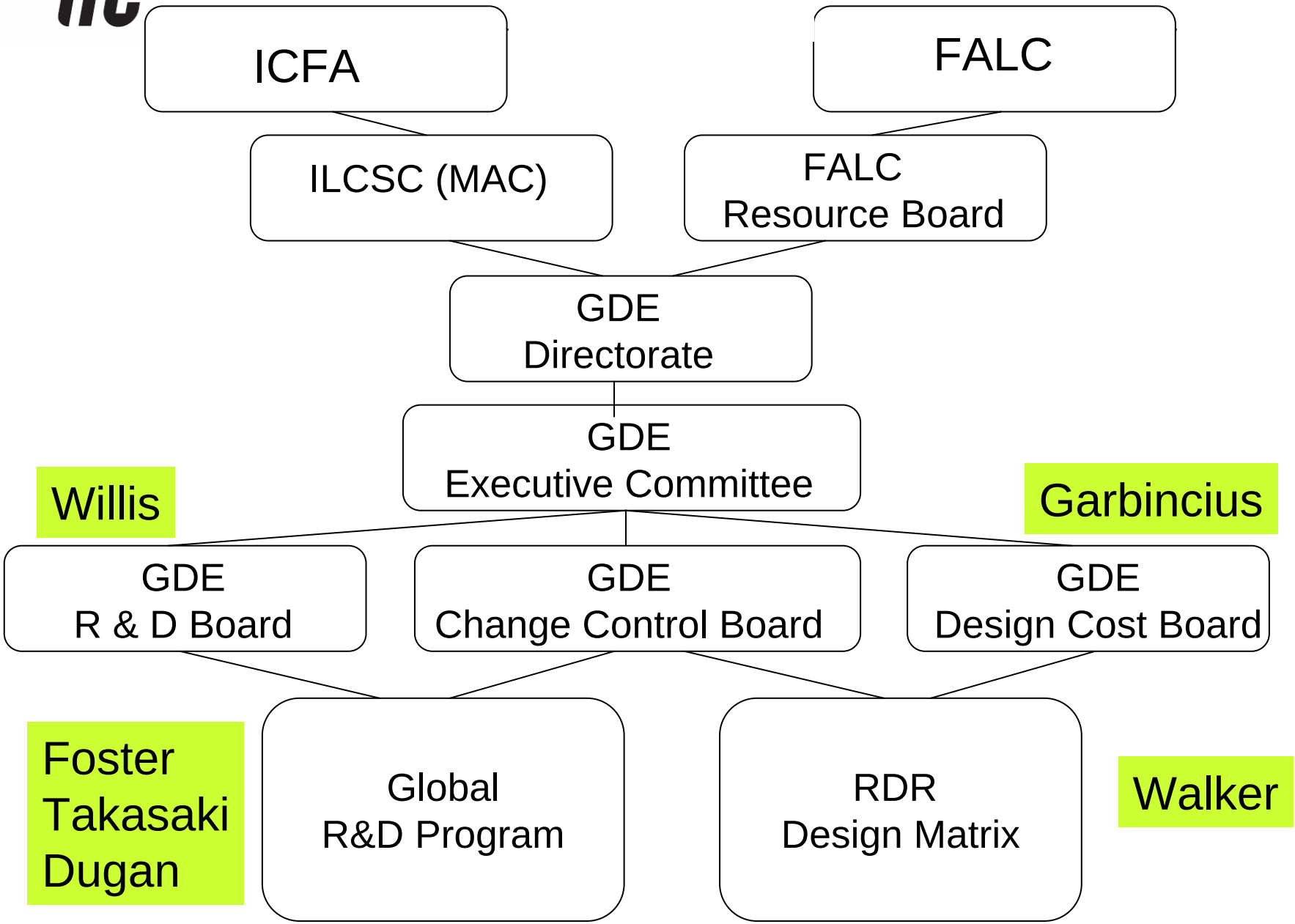
- A sound design must be established with convincing and affordable costing.
- Review and guidance for the Global R&D program to demonstrate the ILC, improve over the baseline and reduce costs.

GDE RDR / R&D Organization



Elements of the ILC R&D Program

- R&D in support of the BCD
  - **Technical developments, demonstration experiments, industrialization, etc.**
- Proposal-driven R&D in support of alternatives to the baseline
  - **Proposals for potential improvements to the baseline, resources required, time scale, etc.**
  - **Guidance from Change Control Board**
- Develop a prioritized DETECTOR R&D program aimed at technical developments needed to reach combined design performance goals

RDB Board Members and Areas

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

AREAS

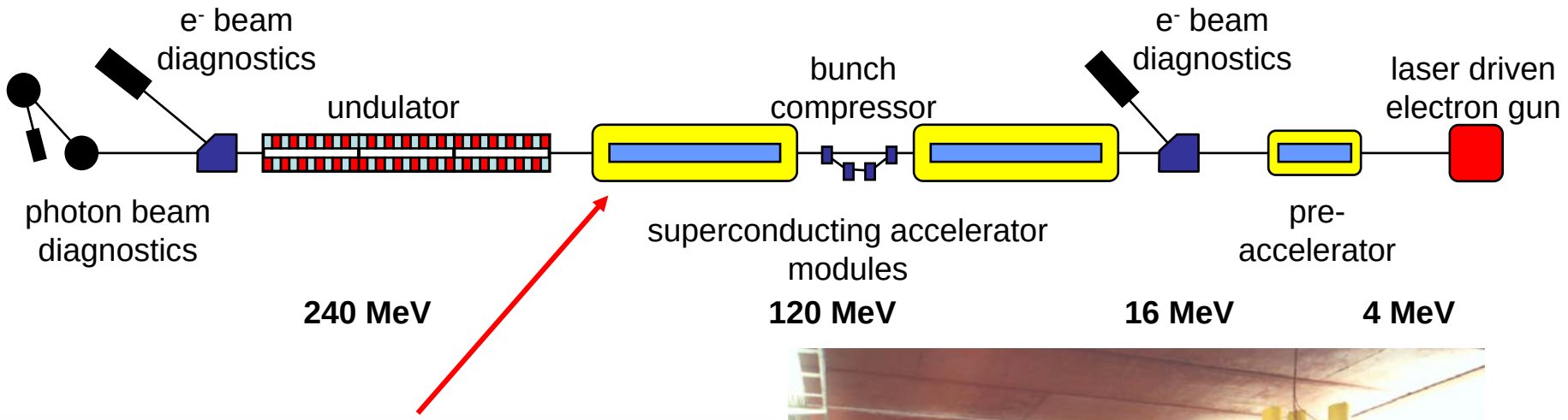
SC CAVITIES,
CRYOGENICS,
BEAM DELIVERY,
INJECTOR,
LINAC PERFORMANCE,
INSTRUMENTATION,
CRYOMODULES,
DAMPING RINGS,
POWER SOURCE,
CONTROLS,
HIGH AVAILABILTY,

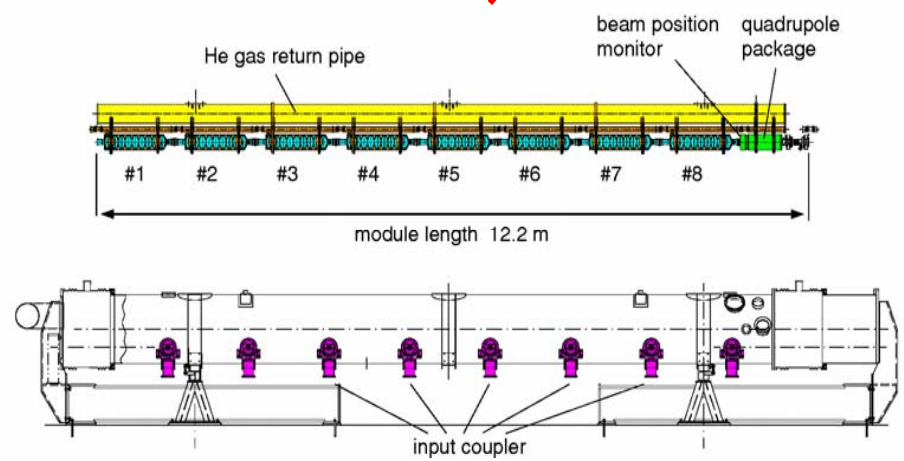
*****DETECTORS*****

GDE Role in Coordinating / Prioritizing

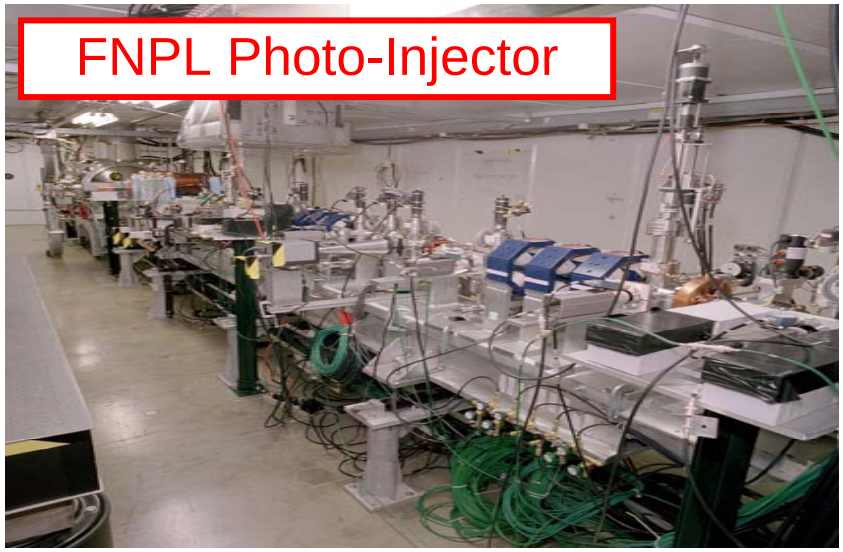
- Large Test Facilities
  - **SCRF Test Facilities**
    - Use of DESY TTF? Duplication of new facilities?

TESLA Test Facility Linac - DESY





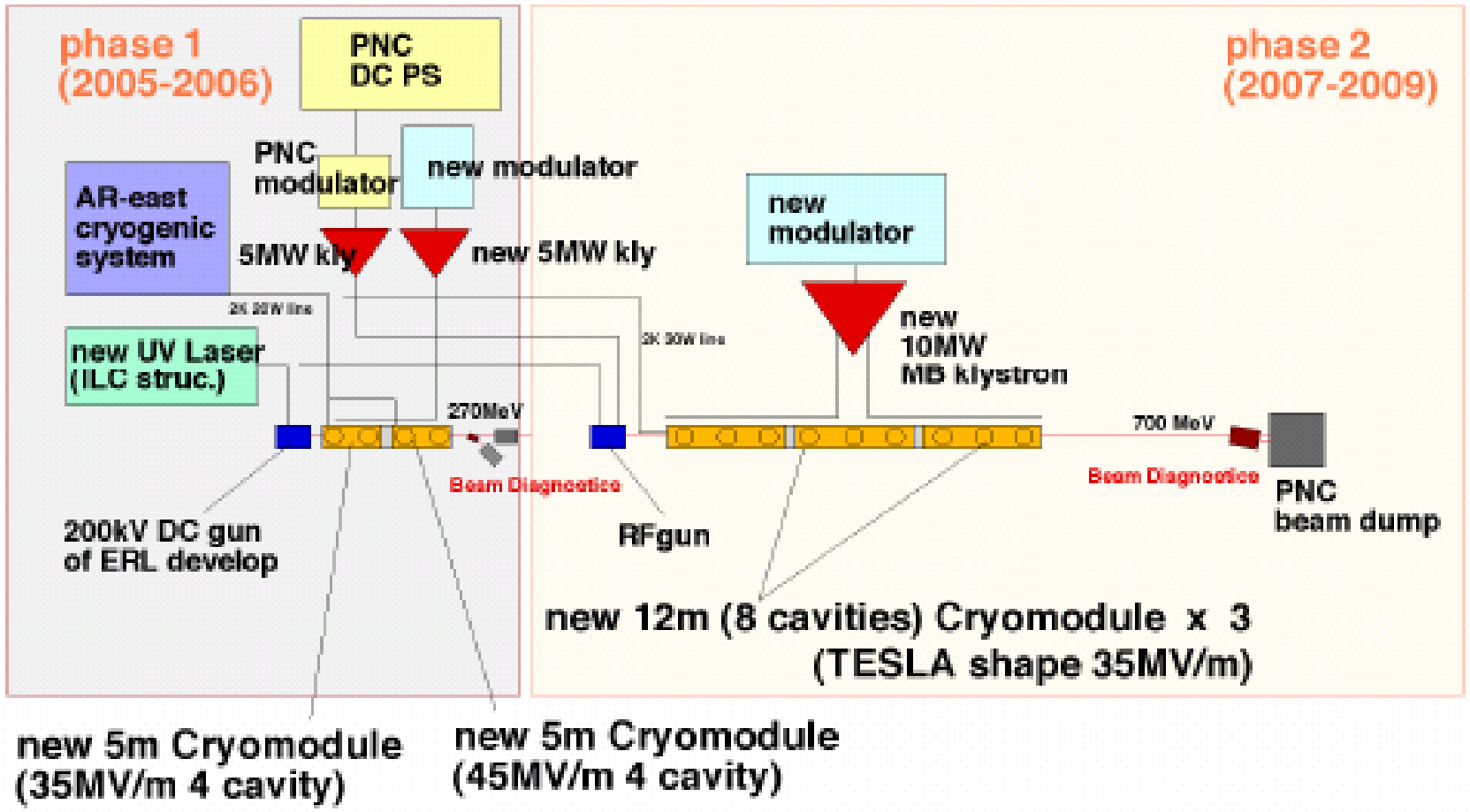
Fermilab – SCRF Test Facility



- ILC cryomodule string test facility planned for the New Muon Lab
- Upgraded FNPL will provide beam tests of ILC cryomodules (FY08 and 09)

ILC R&D KEK STF

Plan of Superconducting RF Test Facility (STF)



GDE Role in Coordinating / Prioritizing

- Large Test Facilities
  - **SCRF Test Facilities**
    - Use of DESY TTF? Duplication of new facilities?
- Areas Needing Increased Efforts
  - **SCRF Fabrication Facilities**
    - Develop and demonstrate production with yield and cost
  - **10 KW Klystron development**

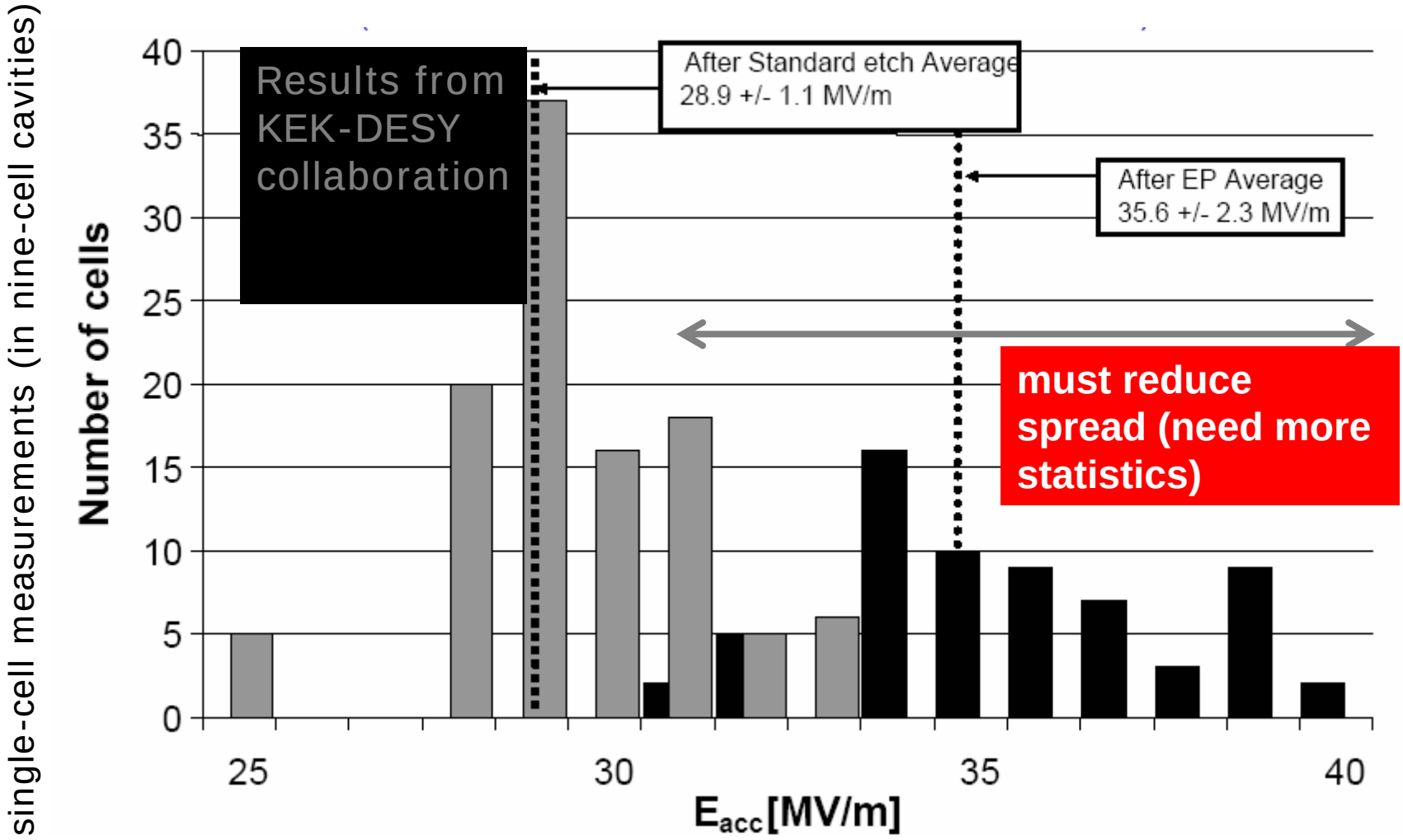
SRF Cavity Gradient

	Cavity type	Qualified gradient	Operational gradient	Length*	energy
		MV/m	MV/m	Km	GeV
initial	TESLA	35	31.5	10.6	250
upgrade	LL	40	36.0	+9.3	500

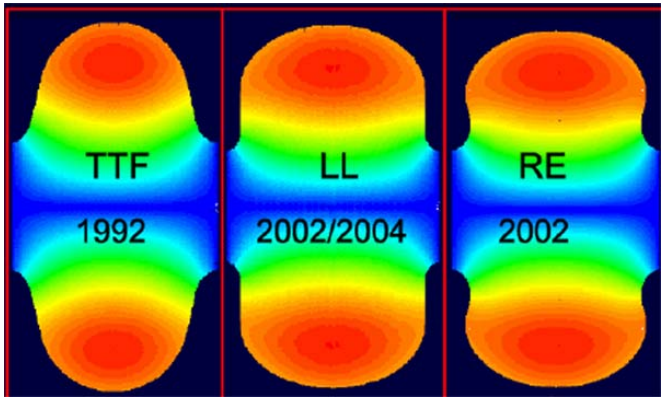
Total length of one 500 GeV linac ≈ 20km

* **assuming 75% fill factor**

Gradient


single-cell measurements (in nine-cell cavities)
Number of cells
40
35
30
25
20
15
10
5
0
25
30
35
40
E_{acc}[MV/m]
Results from KEK-DESY collaboration
After Standard etch Average
28.9 +/- 1.1 MV/m
After EP Average
35.6 +/- 2.3 MV/m
must reduce spread (need more statistics)

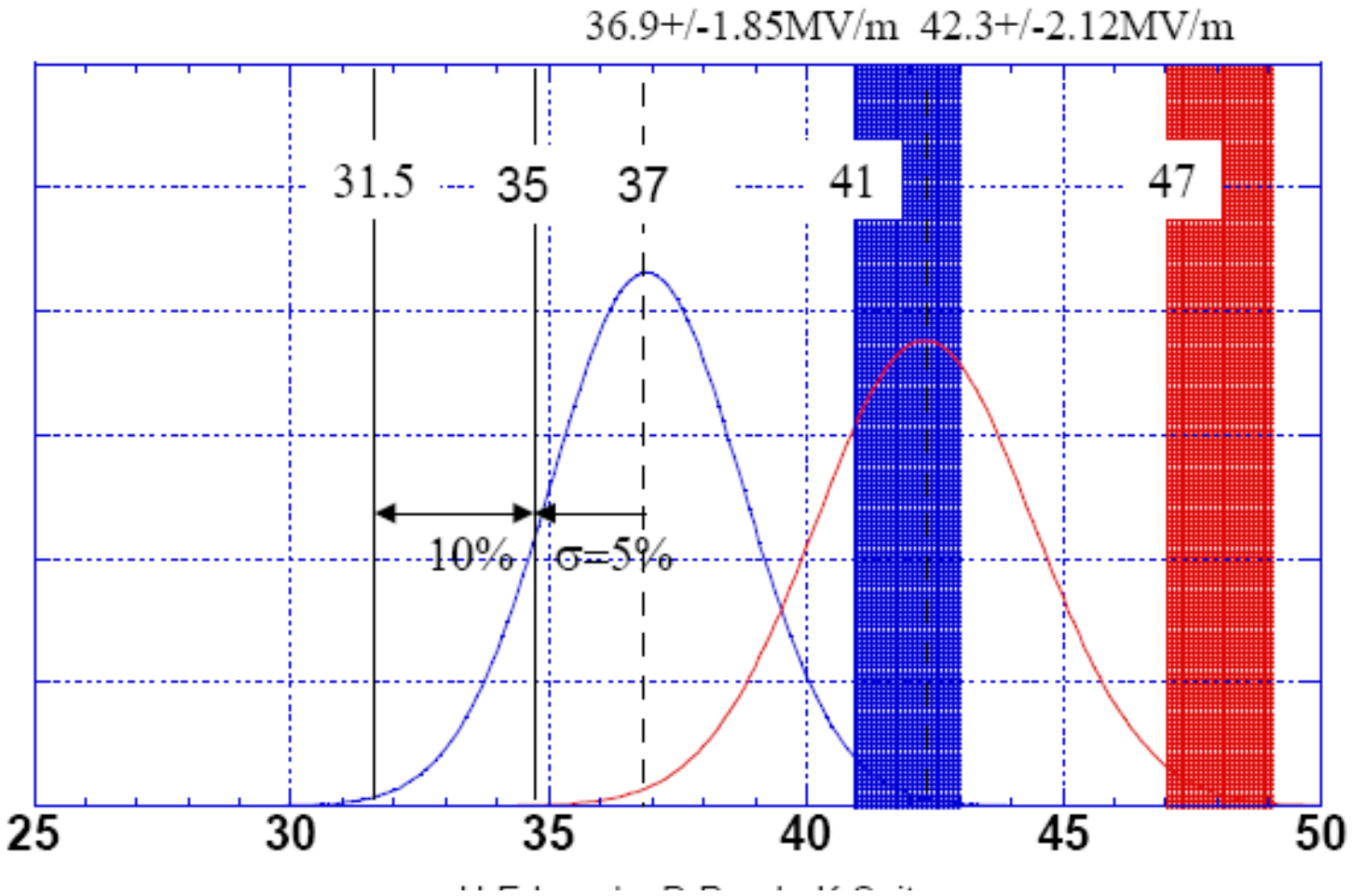
Superconducting RF Cavities



Chemical Polish

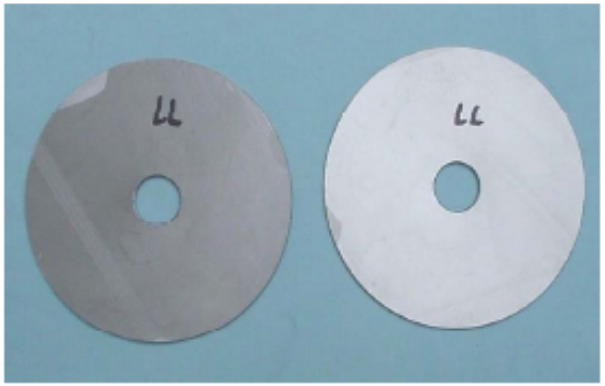
Electro Polish

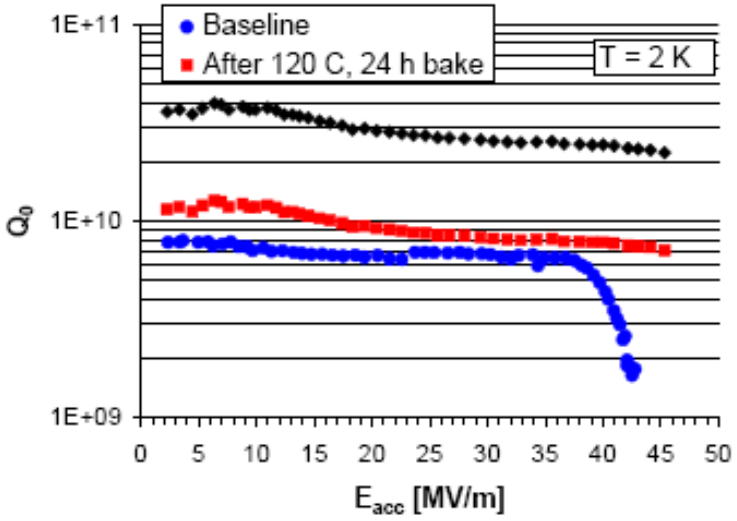
Baseline Gradient



Large Grain Single Crystal Nb Material

Nb Discs





E_{peak}/E_{acc} = 2.072

H_{peak}/E_{acc} = 3.56 mT/MV/m

RF Power: Baseline Klystrons

Thales

CPI

Toshiba

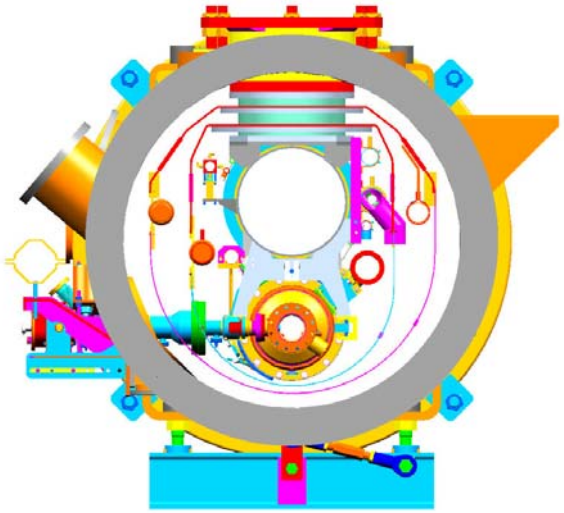
Specification:

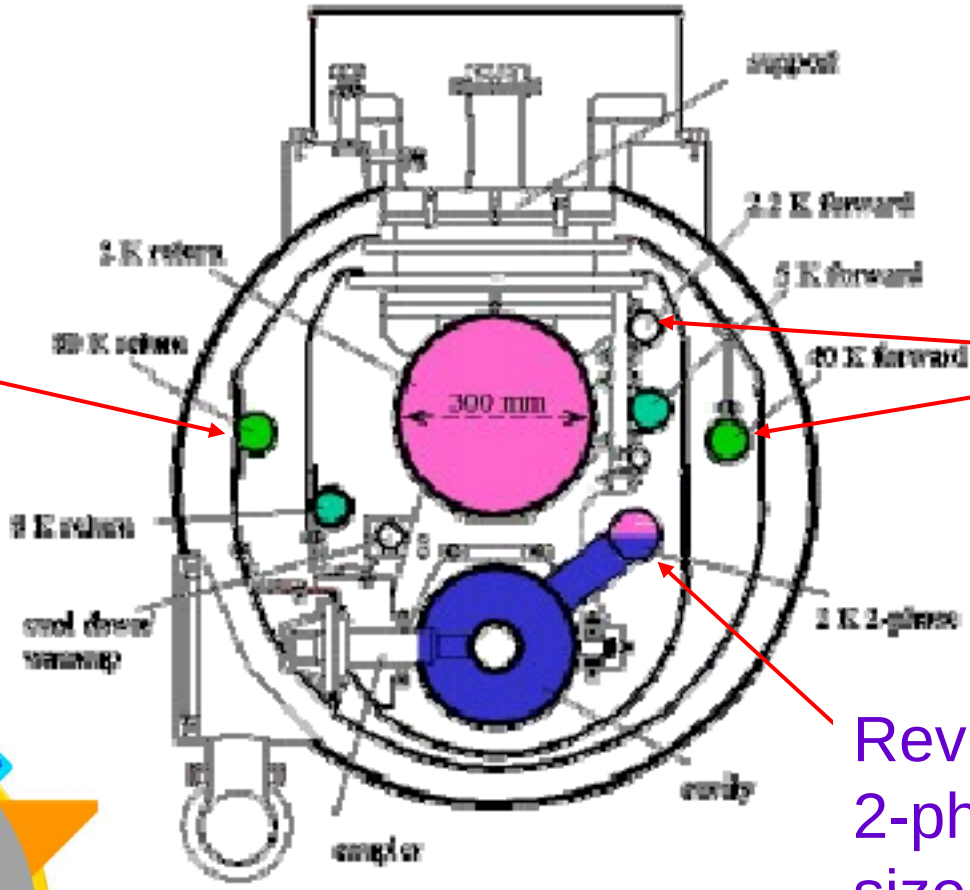
10MW MBK

1.5ms pulse

65% efficiency

ILC Cryomodule





Increase diameter beyond X-FEL

Increase diameter beyond X-FEL

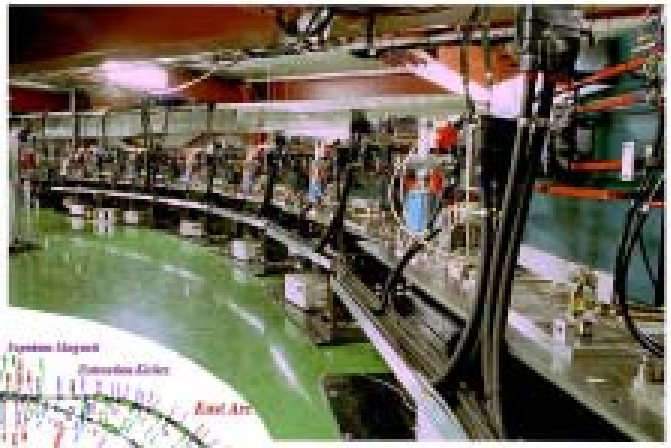
Review 2-phase pipe size and effect of slope

GDE Role in Coordinating / Prioritizing

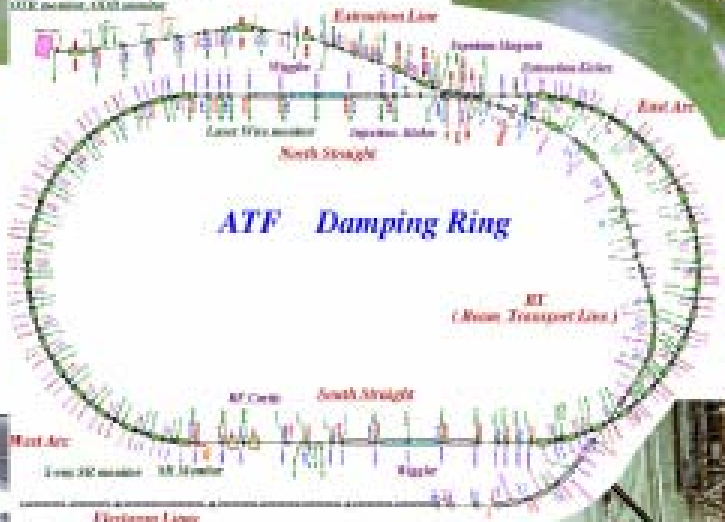
- Large Test Facilities
  - **SCRF Test Facilities**
    - Use of DESY TTF? Duplication of new facilities?
- Missing Areas
  - **SCRF Fabrication Facilities**
    - Develop and demonstrate production with yield and cost
  - **10 KW Klystron development**
- Large Scale System Tests / Demonstration
  - **What is needed before construction can begin**

ILC R&D KEK ATF → ATF2

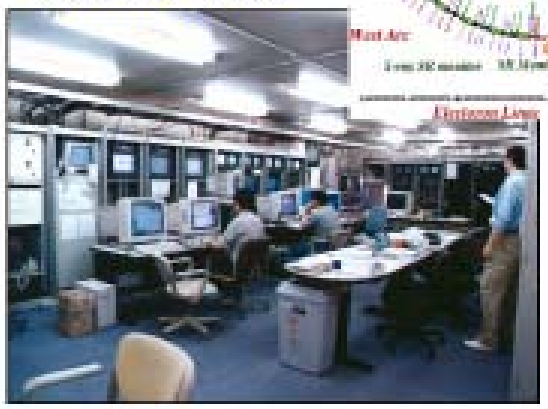
Extraction Line



Damping Ring

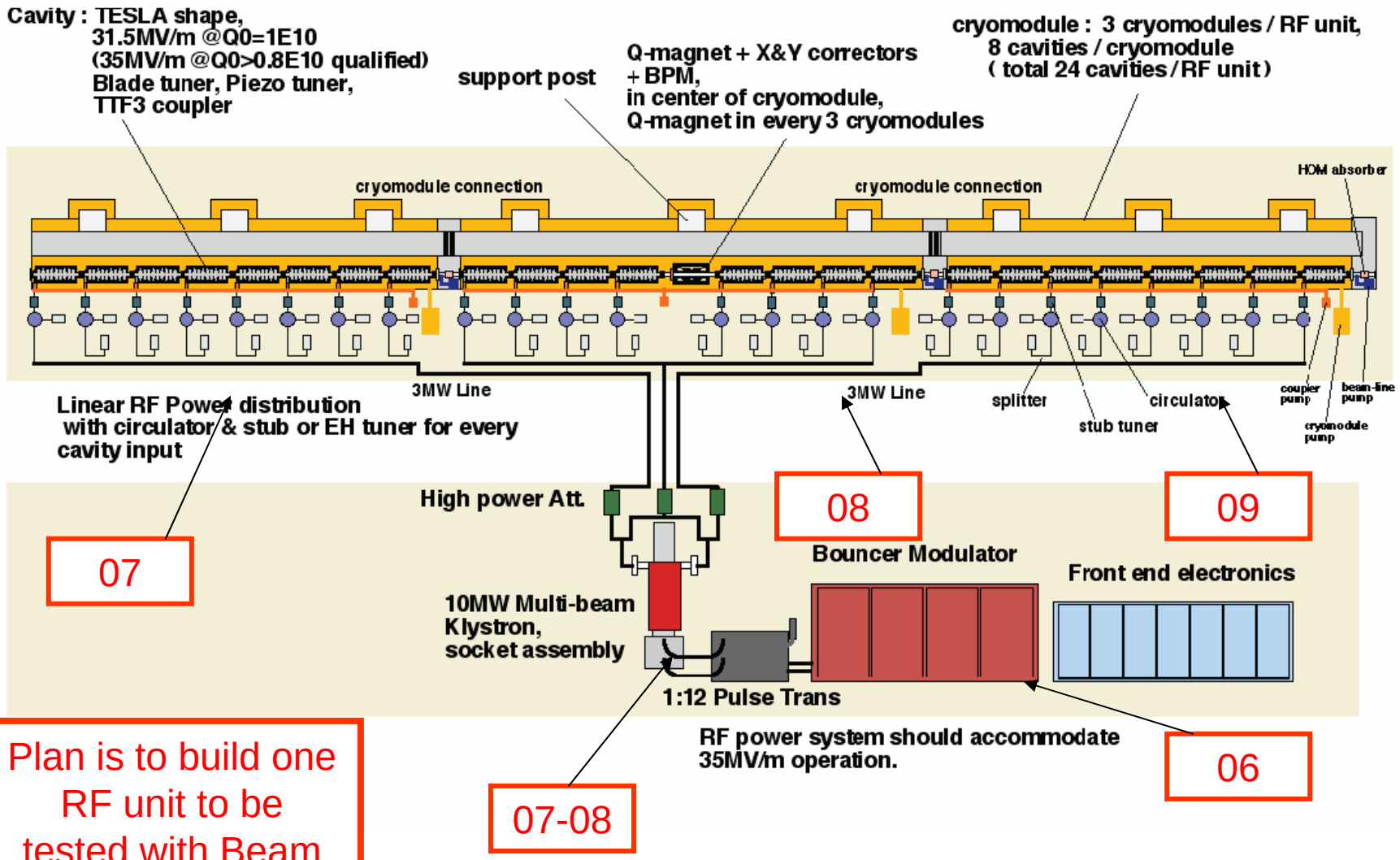


Control Room



Linac

ILC RF unit at Fermilab



Plan is to build one RF unit to be tested with Beam by 2009.

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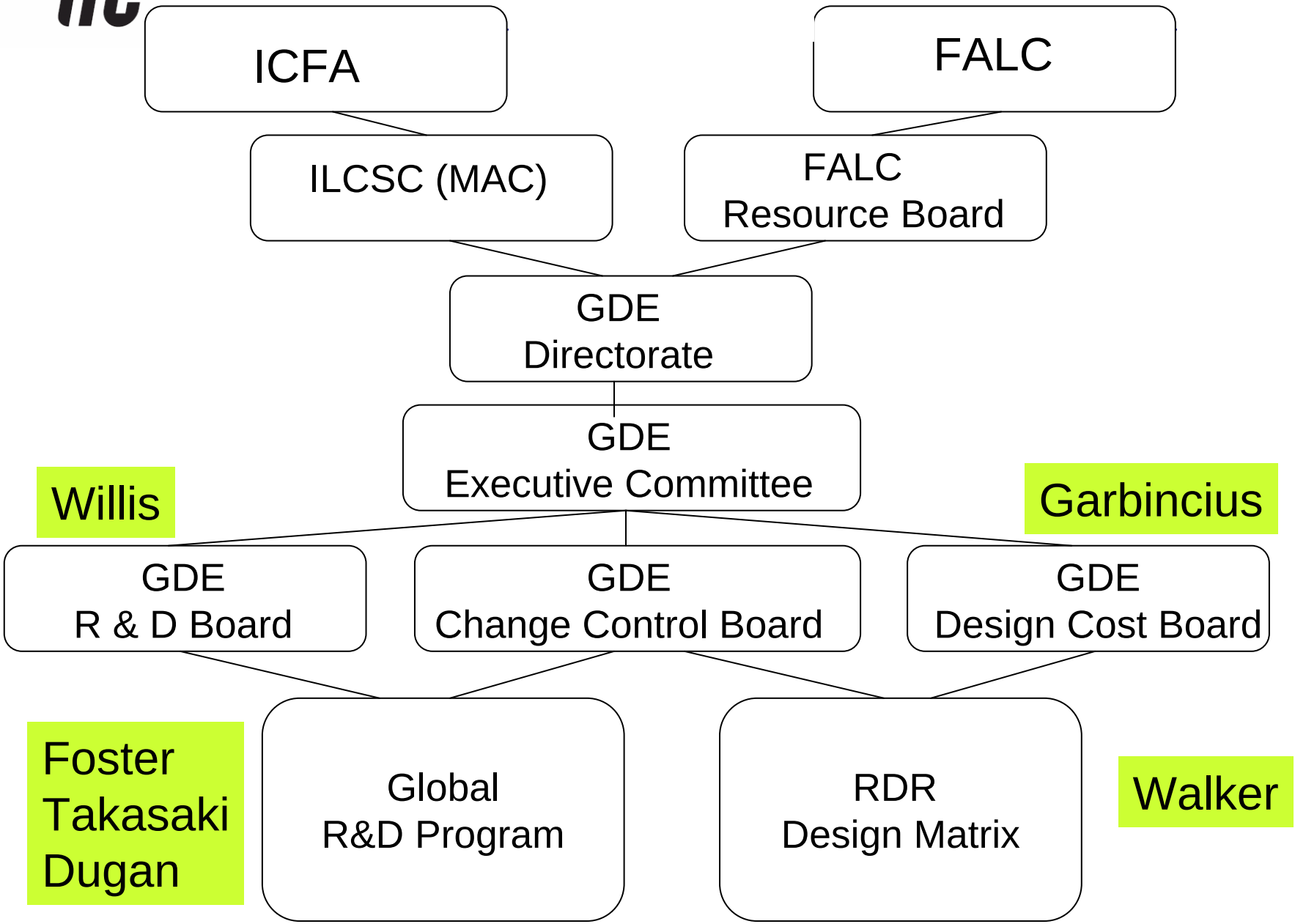
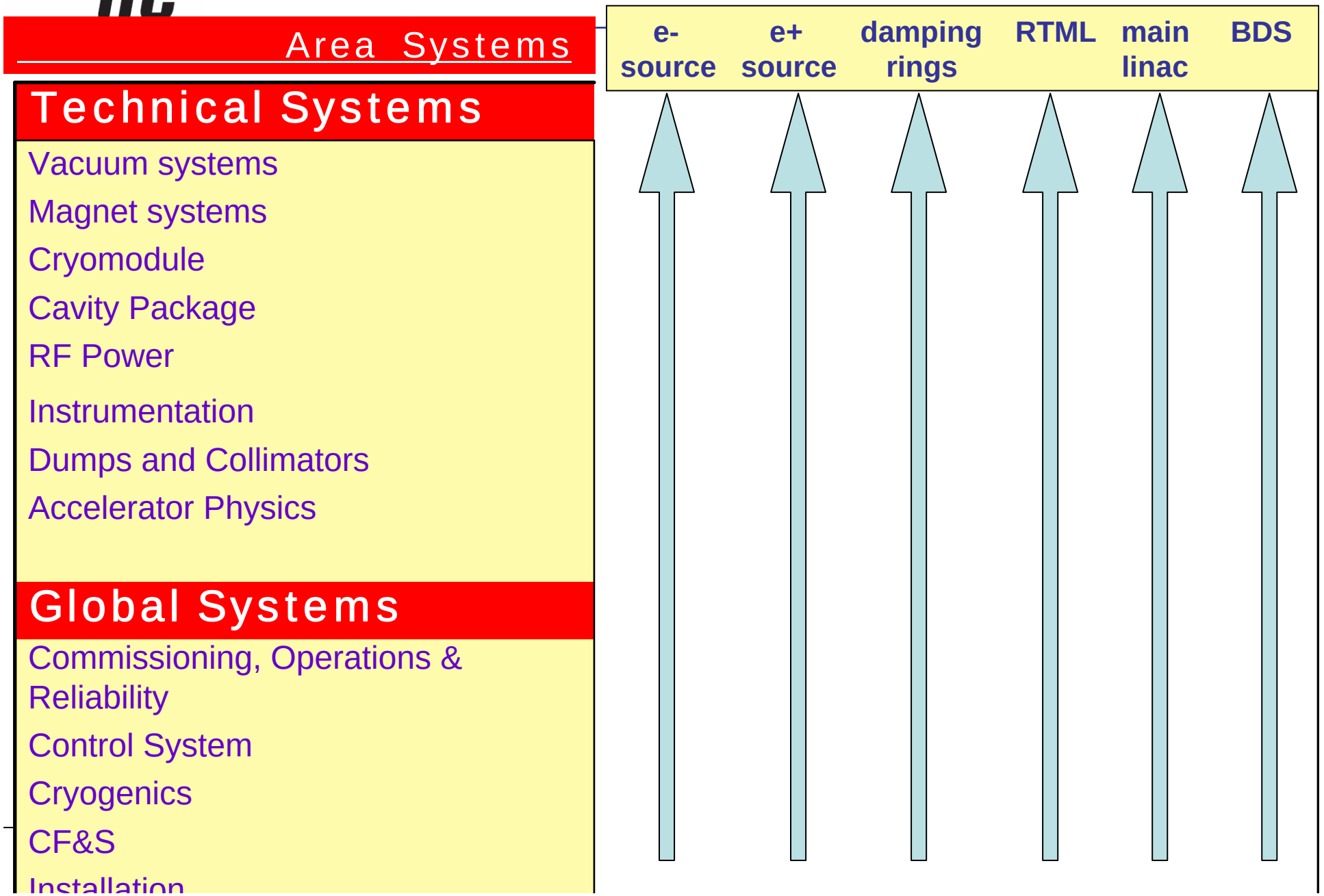
    - Develop and demonstrate production with yield and cost
  - **10 KW Klystron development**
- Large Scale System Tests / Demonstration
  - **What is needed before construction can begin**
- Preparing for Contruction Project
  - **Design, Costing and Industrialization**

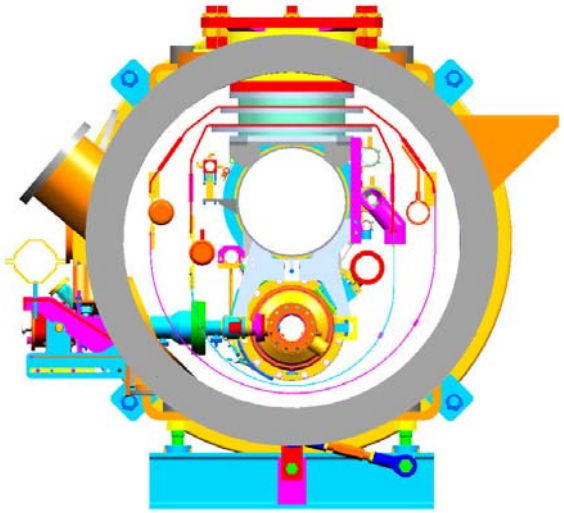
GDE RDR / R&D Organization

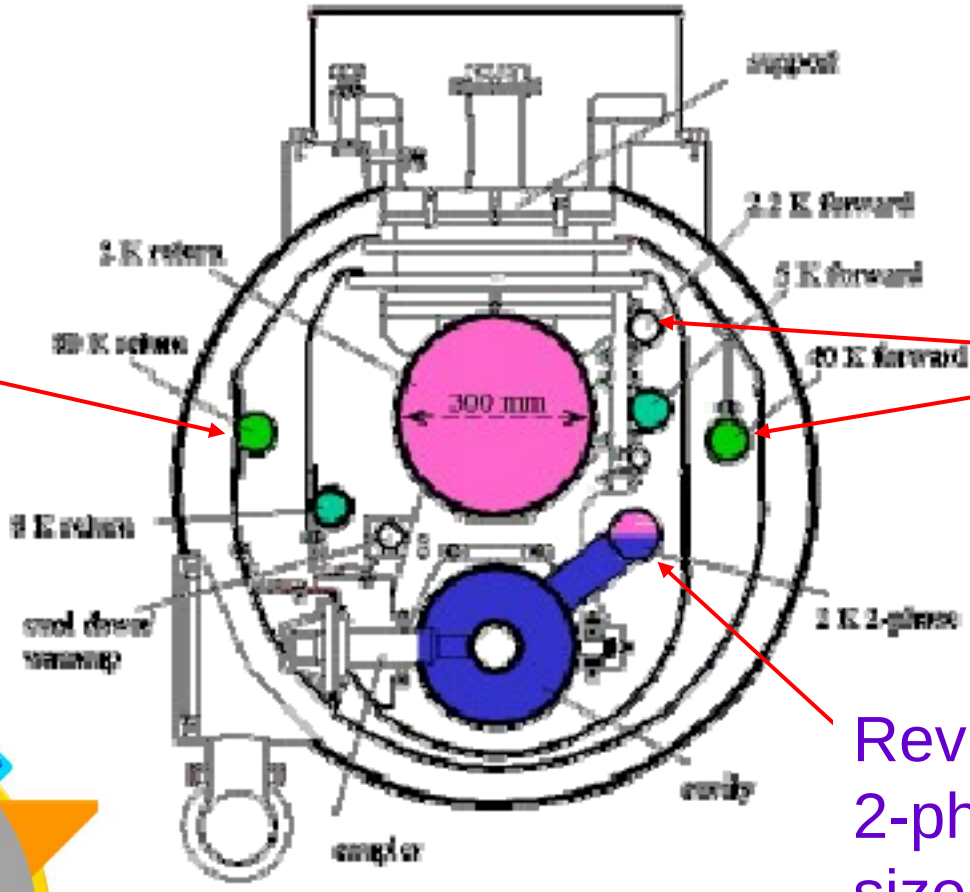


Cost Roll-ups



ILC Cryomodule





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How to involve industry?

- Large Scale Project Characterization
  - **Large Project Management**
  - **Precision Engineering**
  - **International Coordination**
  - **Costing** 
- Industrialization toward Fabrication
  - **Civil Construction & Infrastructure** 
  - **Cryogenics**
  - **Superconducting RF structures, couplers, etc** 
  - **Electronics and Control Systems**
  - **Large Scale Computing**

ILC as a Global Project

- Strong U.S. endorsements
  - **Increased support in FY07 budget request**
  - **Strong support from EPP2010**

- ILC is a Global Effort
  - **Design will be established internationally**
  - **Costing and Construction Plan will be international**
  - **R&D priorities will be set internationally and strong efforts to coordinate internationally**
  - **Industrialization will be done internationally**