LC計画推進委員会（第30回）・議事（案）

【日時】 5月15日（金）14:30〜17:00
【場所】 3号館1階セミナーホール

次回候補日： 7月6日 （月）

議題：

1. 技術報告 (!4:30 ~ 15:30)
   1) PAC からの報告 山本
   2) ALCW からの報告（加速器） 横谷
      （物理/測定器） 藤井
2. 一般報告およびディスカッション (15:30 ~ 17:00)
   1) ILC に関する国際・国内情勢 山内
   2) 日本学術会議からの報告 相原
   3) ILC 戦略会議からの報告 山下
   4) LC推進室からの報告 山本
      ＊ 文科省・H26 委託調査報告の紹介
   4) 高エネルギー研究者会議・LCB からの報告 駒宮
   5) 文科省・ILC に関する有識者会議の審議状況 徳宿
   6) 今年度のILC 推進に関するディスカッション 全員

Report from ILC-PAC

LAC-Orsay, 15-04-13,14

Akira Yamamoto

Report at KEK LC 計画推進委員会
2015-5-15

ILC PAC,
at LAL-Orasy, 150413~14

Functions

- The Linear Collider Board (LCB) is responsible for the oversight of Linear Collider activities and of the Linear Collider experimental program.
- The ILC Program Advisory Committee (PAC) provides advice to the LCB on all technical aspects of the LC accelerator and detector activities.

Charge for the 13/14 April 2015 PAC meeting

- Currently, the government of Japan is studying whether to host the International Linear Collider in Japan.
- The Linear Collider Collaboration (LCC), under the LCB, is providing input to this process.

Charge to the Review Committee

1. Assess the level of resources needed to keep the project viable until a Japanese government decision is made.
2. Given the finite resources currently available, are the LCC's priorities appropriate?
3. Are the conventional facilities design and other site specific issues for the Japanese preferred site progressing satisfactorily?
4. Are there adequate test facilities available to answer outstanding technical questions?
5. Is the planning for the detectors proceeding satisfactorily to produce viable designs?
6. Is there an appropriate amount of synergy between CLIC and ILC activities?
7. Comment on the technical viability of the various proposed ILC running scenarios.
8. Does the PAC have any comments on LCC's proposed ILC governance plan?

PAC Agenda: 13 April

08:45 –	Executive Session	
09:15 –	Welcome	
09:30 –	ILC Accelerator Overview	L. Evans
10:20 –	Break	
10:40 –	Recent Progress on ILC in Japan	S. Komamiya
11:30 –	ILC Status	M.Harrison
12:20 –	Executive Session	
13:00 –	Lunch	
14:00 –	ILC SRF	H. Hayano/ A. Yamamoto
14:40 –	ILC Conventional Facilities	M. Miyahara
15:20 –	Break	
15:40 –	XFEL Cavity Production	N. Walker / O. Napoly
16:20 –	ILC Lab Organization	B. Foster
17:00 –	ILC E. Phasing & Running Scenarios	J. Brau
17:40 –	Executive Session	

PAC Agenda: 14 April

09:00 –	CLIC	S. Stapnes
09:40 –	ILC Physics & Detectors Overview	H. Yamamoto
10:20 –	Break	
10:35 –	ILC Physics Case	C. Grojean
11:15 –	SiD Status and Plans	M. Stanitzki
11:40 –	ILD Status and Plans	H. Videau
12:05 –	ILC Detector Cost, Manpower & Planning	S. Yamada
12:30 –	Lunch	
13:30 –	Executive Session	
14:35 –	Closeout	

PAC Meeting April 2015

ILC STATUS

Program status

System tests

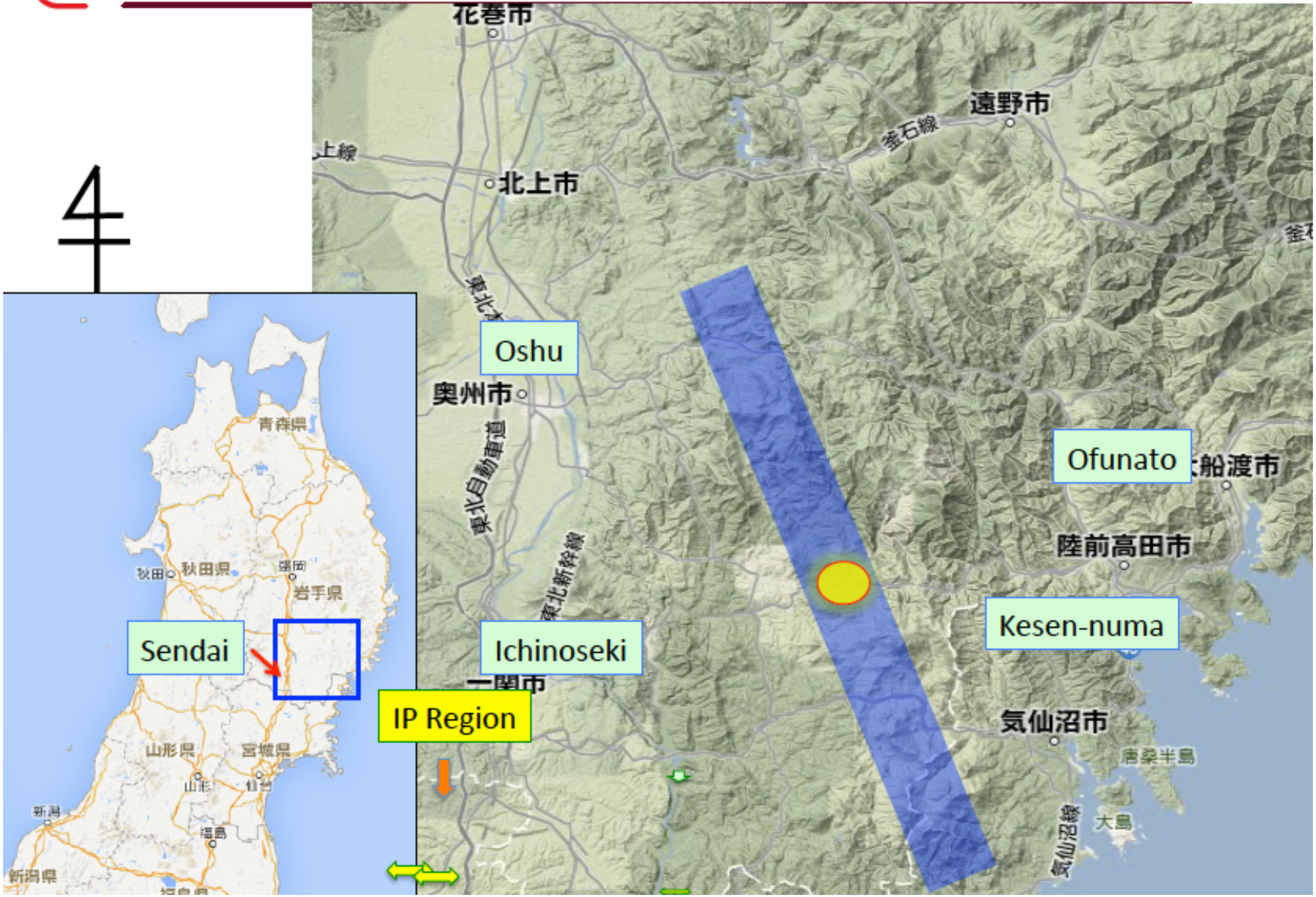
Baseline Changes

PAC Charge Response

Mike Harrison

LINEAR COLLIDER COLLABORATIC

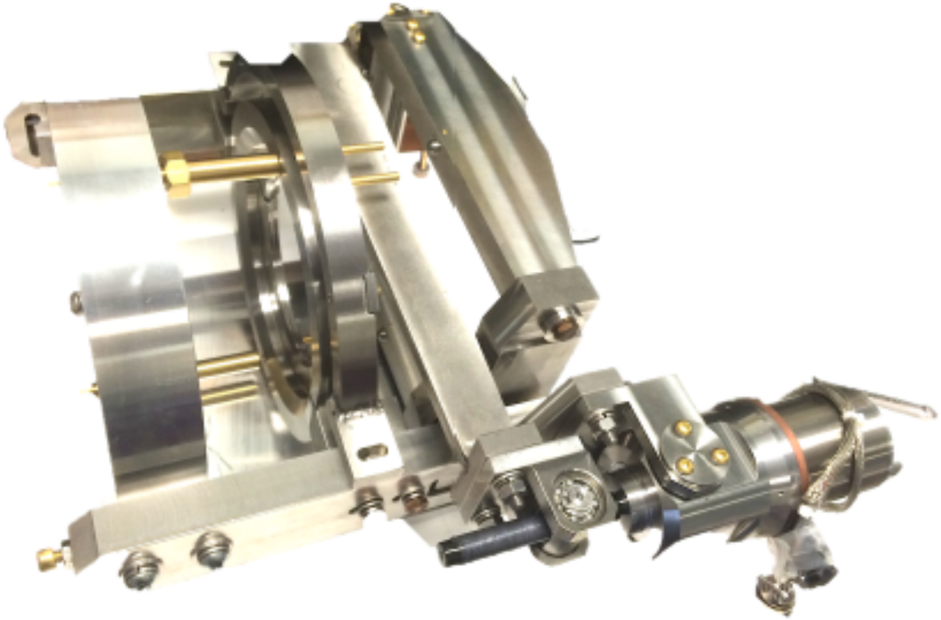
Site Specific design: the “preferred” site



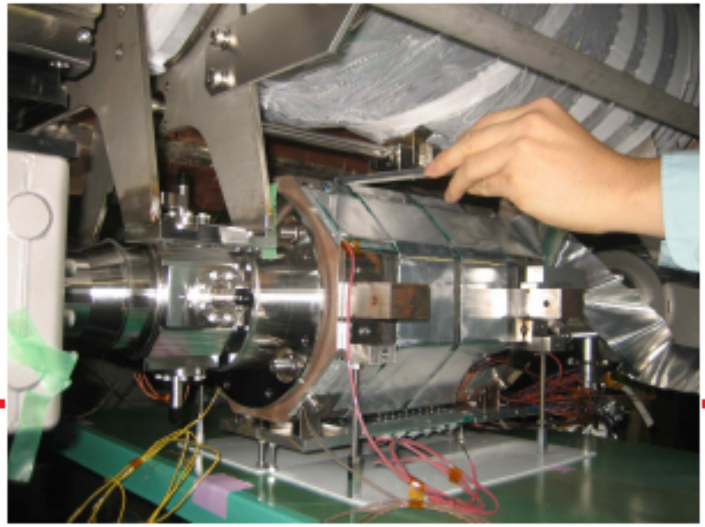
LINEAR COLLIDER COLLABORATION

SRF Technology Development

Cavity Input Coupler



Cavity tuner



Splitable Quadrupole

LCC-ILC Accelerator Organization

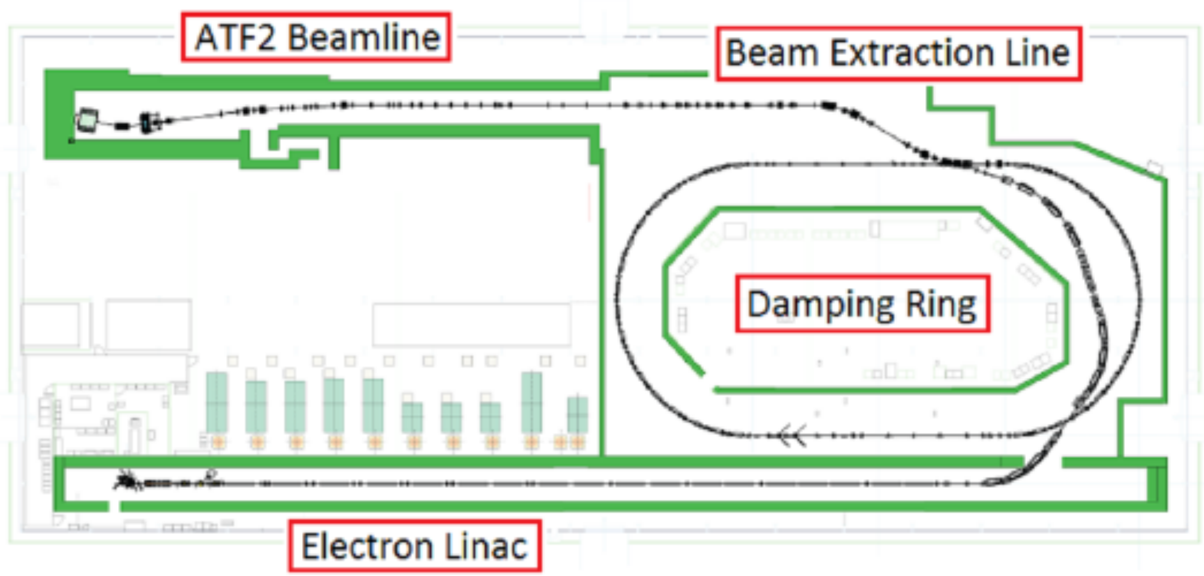
LINEAR COLLIDER COLLABORATION

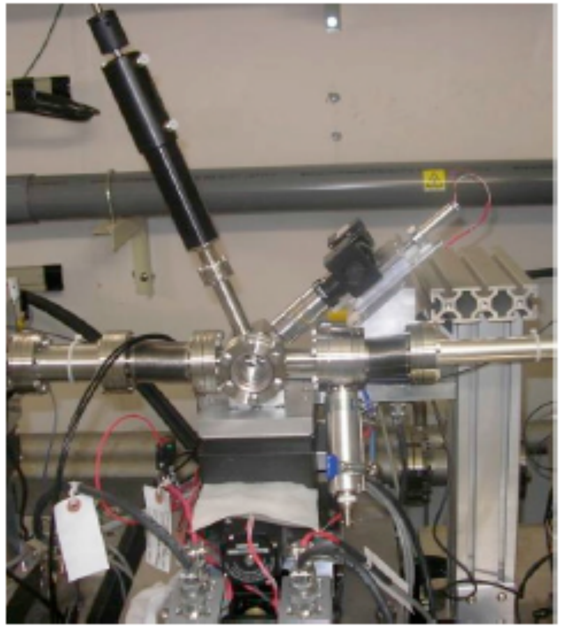
LCC-ILC Director: M. Harrison, Deputies: N. Walker and H. Hayano *KEK LC Project Office Head: A. Yamamoto

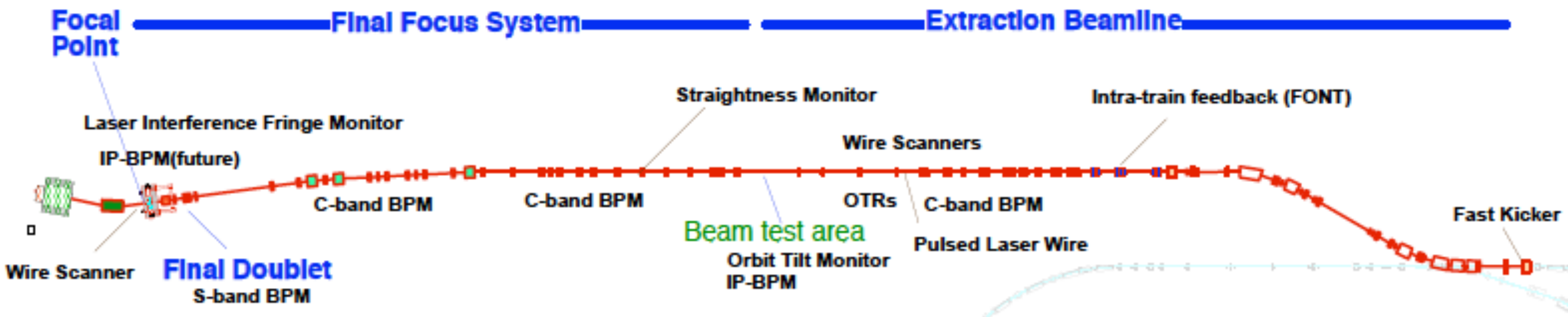
Sub-Group	Global Leader Deputy/Contact p.	KEK-Leader* Deputy	Sub-Group	Global Leader Deputy/Contact P.	KEK-Leader* Deputy
Acc. Design Integr.	N. Walker (DESY) K. Yokoya(KEK)	K. Yokoya	SRF	H. Hayano (KEK) C. Ginsburg (Fermi), E. Montesinos (CERN)	H. Hayano Y. Yamamoto
Sources (e-, e+)	W. Gai (ANL) M. Kuriki (Hiroshima U.)	J. Urakawa T. Omori	RF Power & Cntl	S. Michizono (KEK) TBD (AMs , EU)	Michizono T. Matsumoto
Damping Ring	D. Rubin (Cornell) N. Terunuma(KEK)	N. Terunuma	Cryogenics (incl. HP gas issues)	H. Nakai: KEK T. Peterson (Fermi), D. Delikaris (CERN)	H. Nakai Cryog. Center
RTML	S. Kuroda (KEK) A. Latina (CERN)	S. Kuroda	CFS	A. Enomoto (KEK) V. Kuchler (Fermi), J. Osborne (CERN),	A. Enomoto M. Miyahara
Main Linac (incl. B. Compr. & B. Dynamics)	N. Solyak (Fermi) K. Kubo (KEK)	K. Kubo	Radiation Safety	T. Sanami (KEK) TBD (AMs, EU)	T. Sanami T. Sanuki
BDS	G. White (SLAC), R. Tomas (Cern) T. Okugi(KEK)	T. Okugi	Electrical Support (Power Supply etc.)	TBD	TBD
MDI	K. Buesser (DESY) T. Tauchi (KEK)	T. Tauchi	Mechanical S. (Vac. & others)	TBD	TBD
			Domestic Program, Hub Lab. Facilities	TBD	H. Hayano T. Saeki

LINEAR COLLIDER COLLABORATION

Nano-beams at ATF2 - KEK



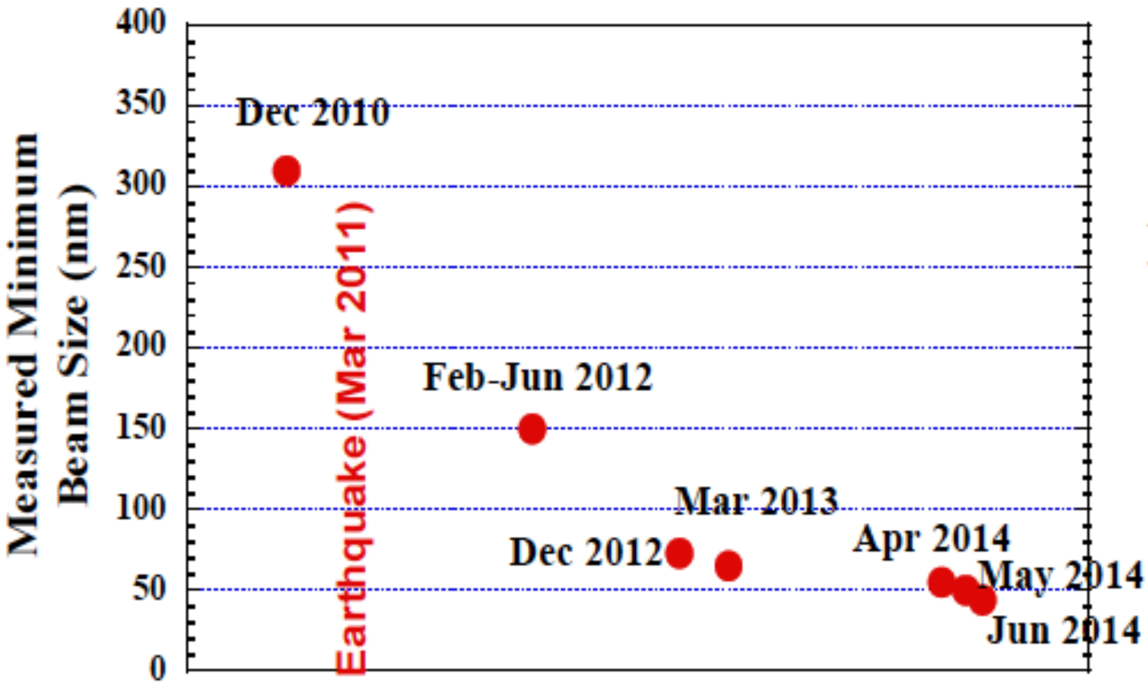


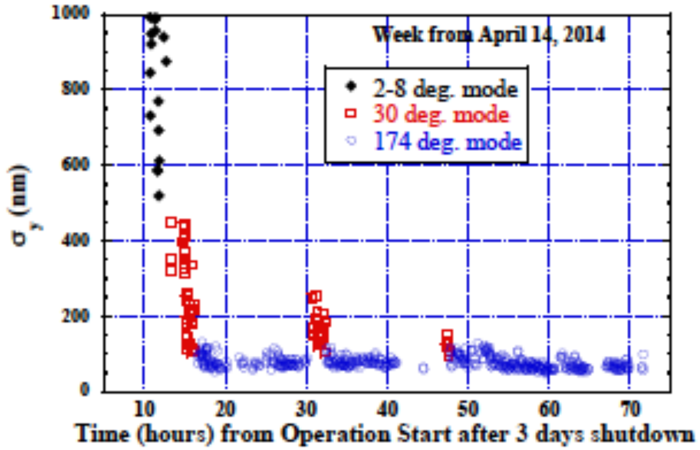


Beam Delivery system optics, instrumentation test-bed, tuning and feedback demonstration.
Common interests for both CLIC & ILC

Progress in Beam Size at ATF2

IPAC2014, K. Kubo
ICHEp2014, S. Kuroda





Beam Size 44 nm observed,
(Goal : **37** nm
corresponding to **6** nm at ILC)

Starting to look at wakefields in response to intensity effects

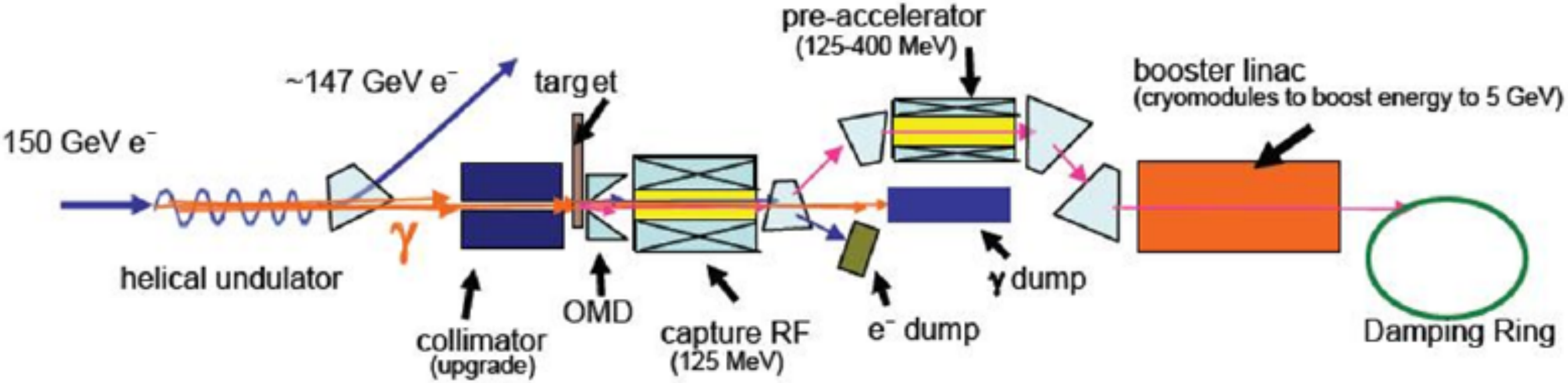
ILC Accelerator Design: Post-TDR Updates

TDR baseline is under change management control

		Propose (Creator)	Review	Decide	Implement
CR-001	Add return "Dogleg" to target by-pass	2014/08/27 (K.Yokoya)	done	Rejected	
CR-002	Adapt equal L* for both detectors	2014/09/02 (G. White)	done	Defered to Review Panel	L* to be settled to ~ 4.1 m
CR-003	Detector hall with vertical shaft access	2014/09/16 (K. Buesser)	done	Accepted	
CR-004	Collision point timing adjustment & tunnel extension	2014/12/18 (N. Walker)	In progress		
Pipeline	Cryogenic layout, tunnel X-section				

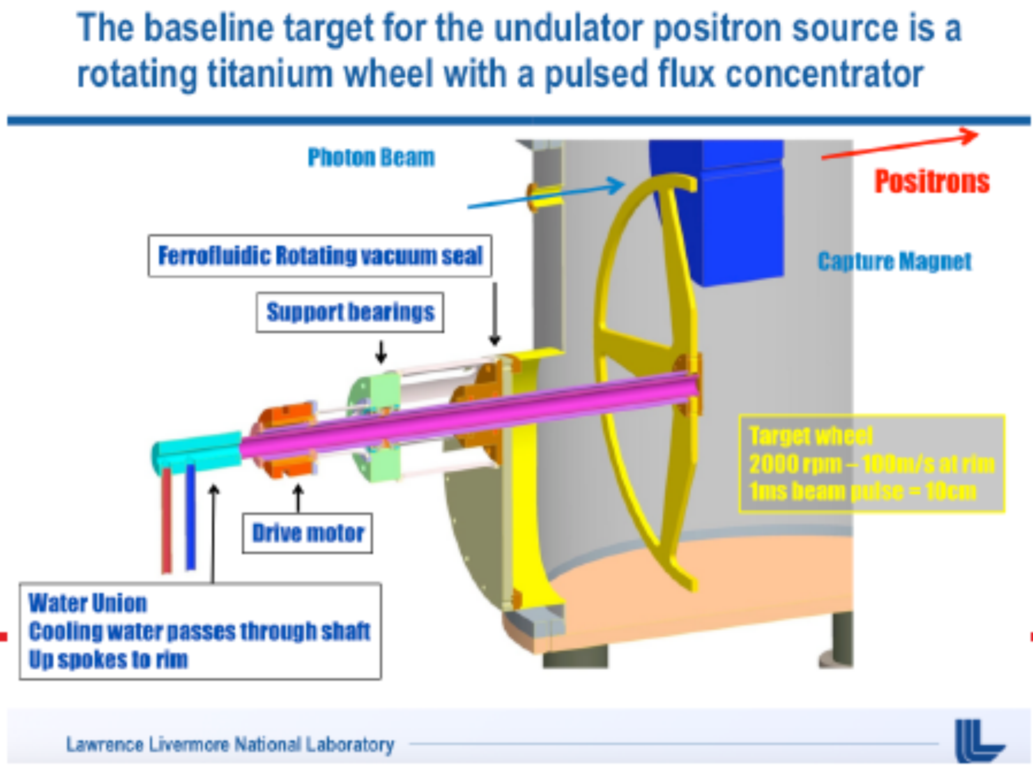
Proposal → Expert review → Decision → Documentation update

Positron production remains an issue



The R&D program was suspended when the US effort was terminated post-GDE.

We had not shown a working target due to failures of the ferro-fluidic vacuum seal



ILC SRF

Hitoshi Hayano (KEK), and

Akira Yamamoto (KEK-CERN)

1. Introduction
2. Advances of ILC-SRF since TDR published, 2013
3. Plan for preparing the ILC SRF
4. Summary

Outline

1. Introduction

2. Advances of ILC-SRF since TDR published, 2013

3. Plan for preparing the ILC SRF

4. Summary

SRF Main Linac Parameters, Demonstrated

Characteristics	Parameter	Unit	Demonstrated
Average accelerating gradient	31.5 (±20%)	MV/m	DESY, FNAL, JLab, Cornell, KEK,
Cavity Q_0	10^{10}		
(Cavity qualification gradient	35 (±20%)	MV/m)	
Beam current	5.8	mA	DESY-FLASH, KEK-STF
Number of bunches per pulse	1312		DESY
Charge per bunch	3.2	nC	
Bunch spacing	554	ns	
Beam pulse length	730	ms	DESY-FLASH, KEK-STF
RF pulse length (incl. fill time)	1.65	ms	DESY-FLASH, KEK-STF, FNAL-ASTA
Efficiency (RF→beam)	0.44		
Pulse repetition rate	5	Hz	DESY, KEK
FF beam size (y)	5.9	nm	Closing at KEK-ATF
Peak beam power per cavity at 31.5 MV/m	190	kW	

Advances in SRF Technology highlighted, since 2013

- **EXFEL**: exceeded ~ 3/4 of 800 cavity production, and ~ 1/3 of 100 cryomodule assembly and test
  - (to be reported by Nick Walker and Olivier Napoli)
- **Fermilab** ASTA: CM2 reached the ILC specification gradient (35 V/m),

  the first e- beam acceleration, and

  basic research: high-Q with N2 doping.
- **JLab**: New SRF laboratory functioning,

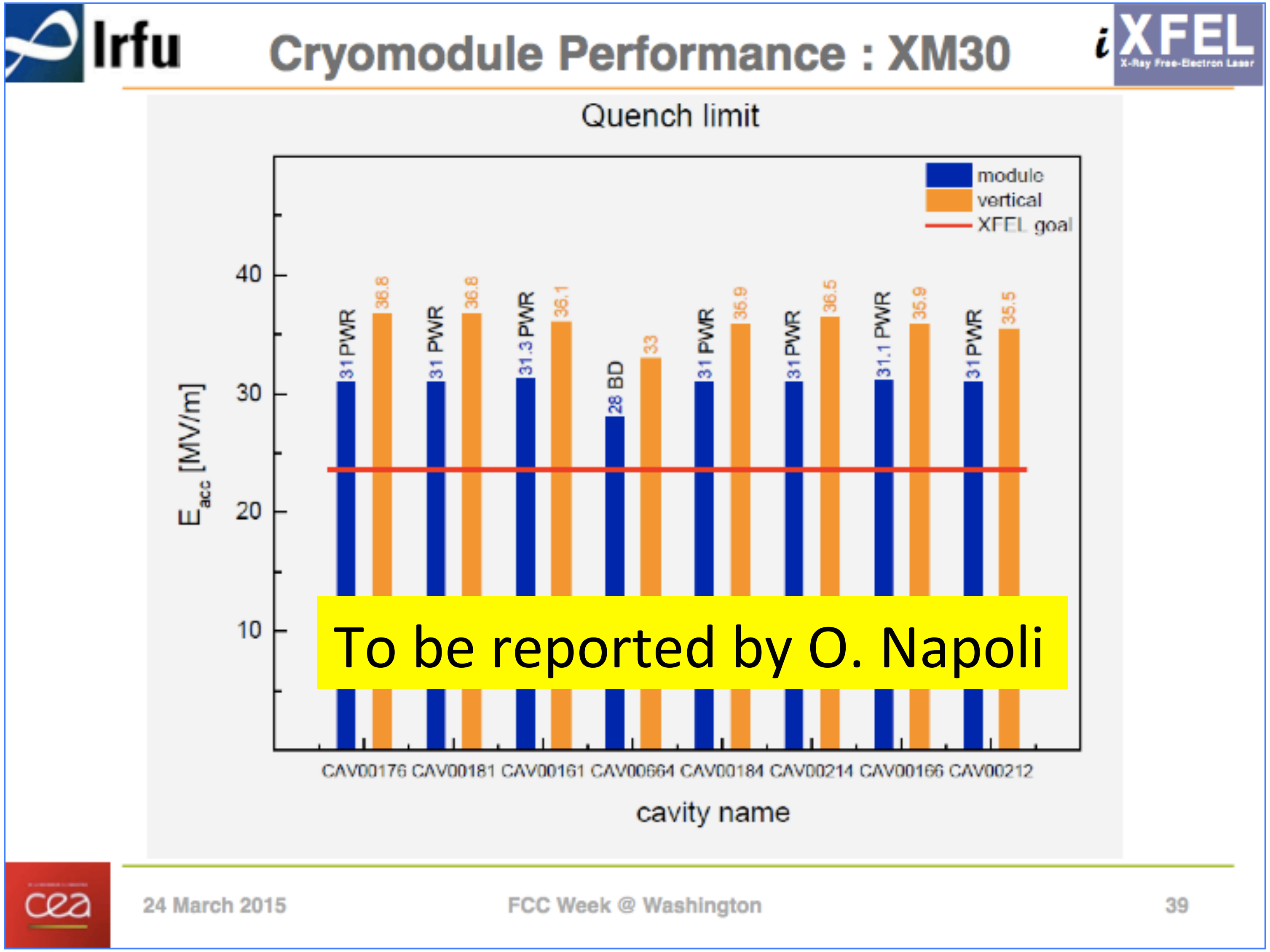
  basic research: Jlab-PKU-OTIC 1-cell cavity reached > 45 MV/m
- **IHEP:** New SRF facility in commissioning.

  Collaboration with ADS is reinforcing the facility investment
- **KEK**: the first in-house built cavity reached the ILC specification (>35 MV/m),

  STF2: completed CM1+CM2a installation into the beam line
- **SLAC**-LCLS: started the project in cooperation of the US DOE laboratories

An Excellent Result from E-XFEL CM Test

O. Napoly



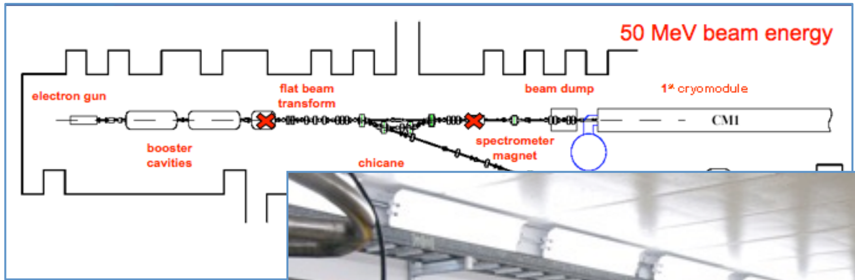
CM2 reached <31.5 MV/m > at Fermilab in 2014

CERN Courier December 2014

ACCELERATORS

ILC-type cryomodule makes the grade

For the first time, the gradient specification of the International Linear Collider (ILC) design study of 31.5 MV/m has been achieved on average across an entire ILC-type cryomodule made of ILC-grade cavities. A team at Fermilab reached the milestone in early October. The cryomodule, called CM2, was developed to advance superconducting radio-frequency technology and infrastructure at laboratories in the Americas region, and was assembled and installed at Fermilab after initial vertical testing of the cavities at Jefferson Lab. The milestone – an achievement for scientists at Fermilab, Jefferson Lab, and their domestic and international partners in superconducting radio-frequency (SRF) technologies – has been nearly a decade in the making, from



CM2 in its home at Fermilab's NML building, as part of the future Advanced Superconducting Test Accelerator. (Image credit: Fermilab.)

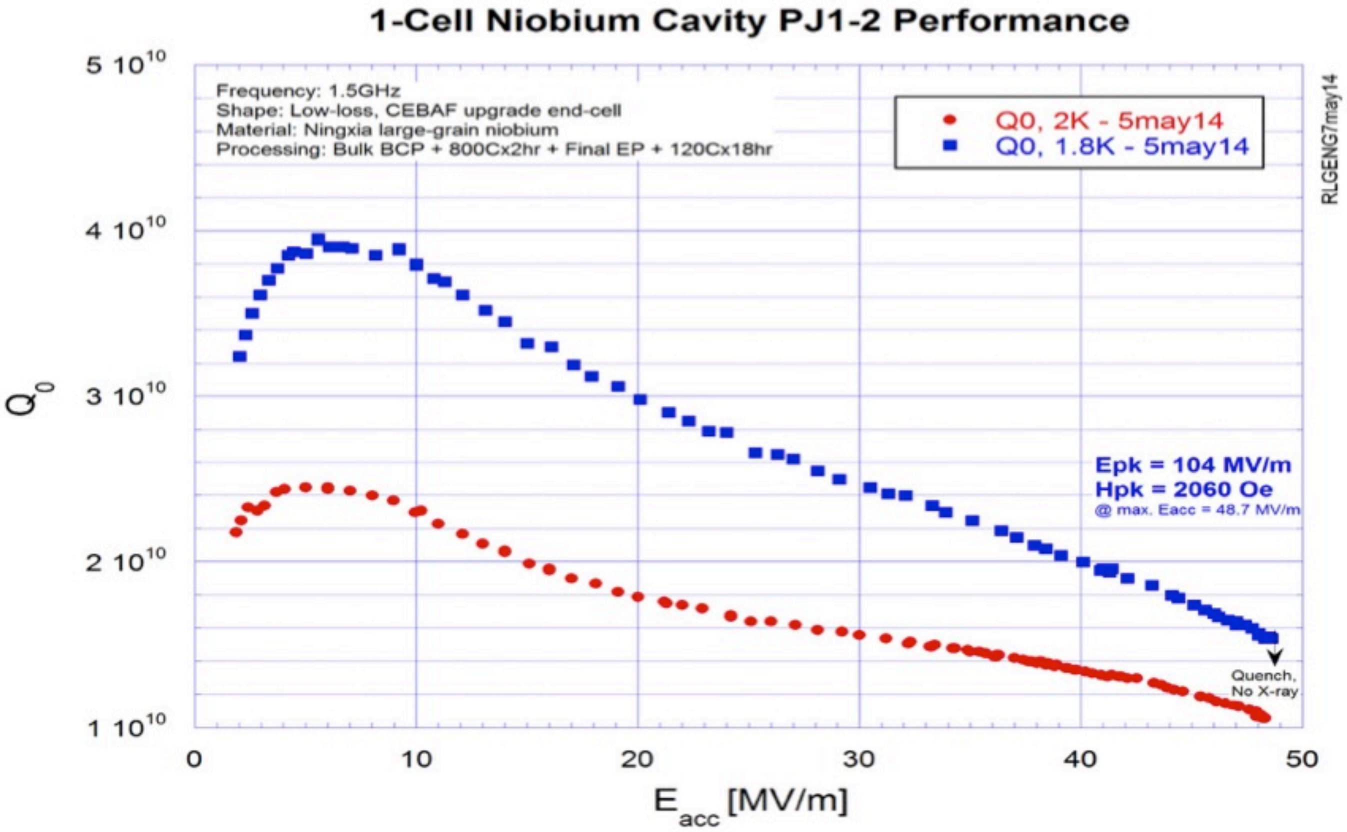
Cavity	Gradient (MV/m)
1	31.9
2	30.8
3	31.8
4	31.7
5	31.5
6	31.3
7	31.6
8	31.4

Cryomodule test at Fermilab reached < 31.5 > MV/m, exceeding ILC specification

Courtesy : R. Geng

JLab-PKU-OTIC Cooperation

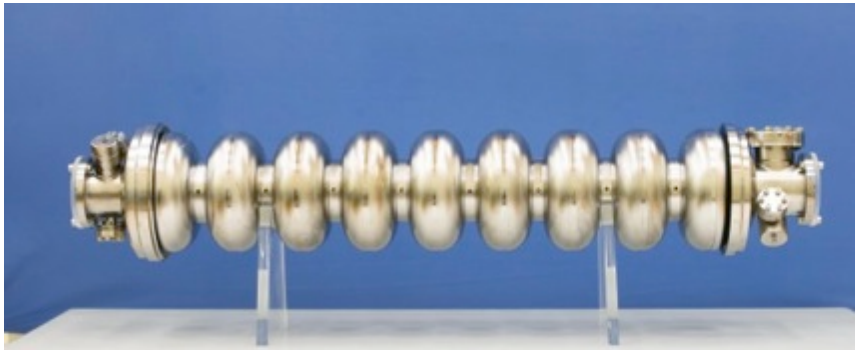
1-Cell LG cavity fabricated by OTIC (China) using Ningxia large grain Nb material, and processed/tested by JLab

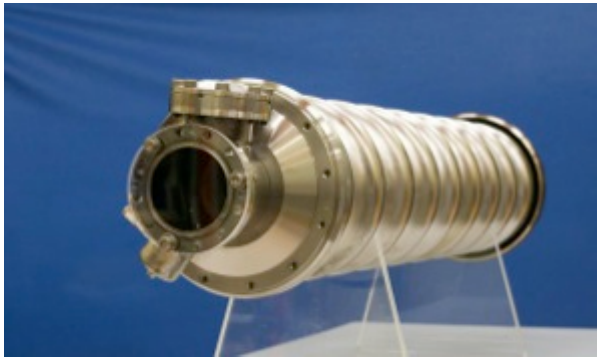


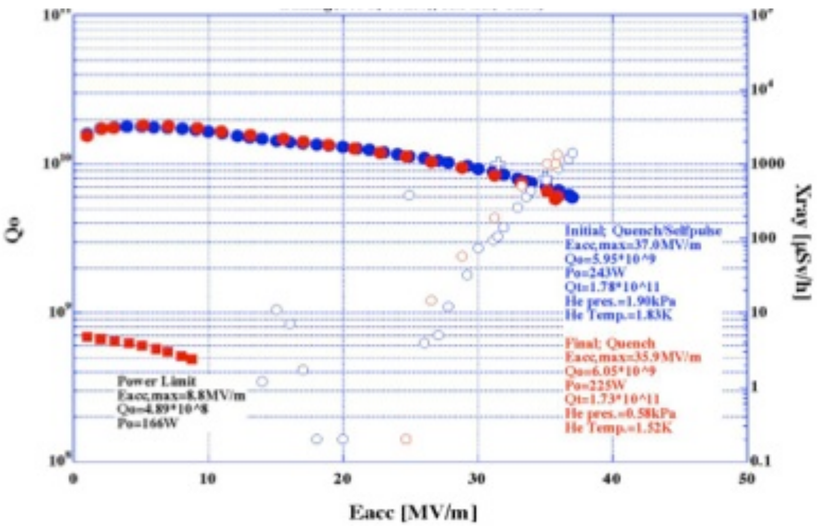
KEK (in-house) 9-Cell Cavity (KEK-01)

Courtesy : M. Yamanaka

completed, and tested, April, 2014







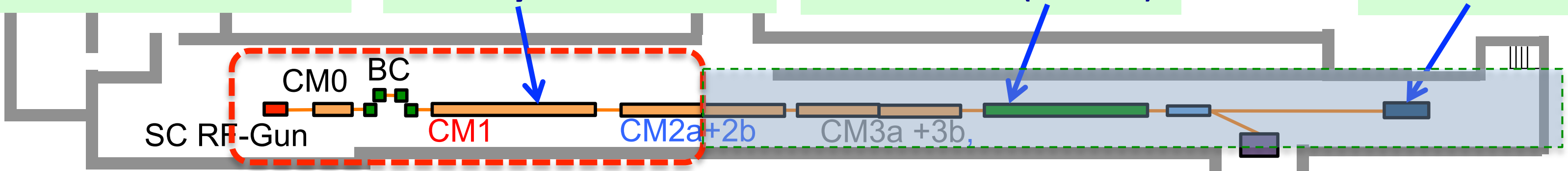
Reached 36 MV/m at Q = 7 x10^9 at the first vertical RF Test at 1.9 K, April, 2014

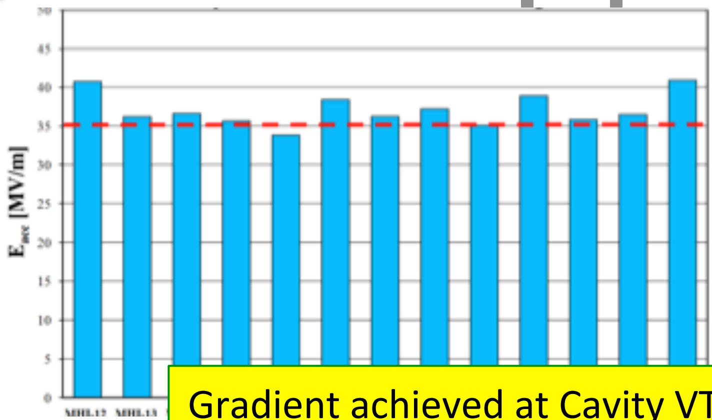
KEK-STF2 is to be a SRF Beam Accelerator Facility

Objective:
- High Gradient (31.5 MV/m)
- =>Demonstration of full cryomodule
- Pulse and CW operation
- Better efficiency power sources
- (SRF electron gun in future)

Plan:
- Multiple CM for system study
- In-house Cavity to be installed in cooperation with industry
- Wide range application including Photon Science

Electron Gun | **Full Cryomodules** | **Undulators** (in future) | **Detector**





Gradient achieved at Cavity VT:
35 MV/m (+/-20%) with the yield ~ 90 %

ILC Hub-Laboratories/Consortiums to be established

Function for Qualification	Europe	Americas	Asia
SRF Cavity qualification/test	DESY-AMTF	FNAL,Jlab	KEK-STF
Power-Input Coupler conditioning	LAL-Orsay	SLAC	KEK-STF
Cryomodule Assembly	Saclay	FNAL, Jlab	KEK/ILC
Cryomodule qualification/test	DESY-AMTF	FNAL	KEK/ILC
Current status	EXFEL in progress 100module 800cavities	LCLS-II to be realized 35module 280cavities	STF Full-CM facility in progress

TDR (Ecm=500GeV)
1850 cryomodule, 18,000 cavities (~ 6 years construction)
=> ~100 CM/year/region, ~1,000 cavities/year/region

A Plan for Preparing ILC SRF

[Pre. Green-Sign necessary] for preparation w/ authorizing a site, budget

Period		Pre-Prep	Pre-Prep	Prep. 1	Prep. 2	Prep. 3	Prep. 4	Construction //	Beam
Time : year (anticipated)		1st		3rd				7th	16th
MEXT	Experts Committee								
Stage	Pre-prep (w/o specific funding)			Preparation (4 yrs w/ specific funding)				Construction (9 yrs)	Beam op.
ADI	Acc. Design & Integ. Parameters fixed, based on a specofoc mode-site			Engineering Design optimized					
CFS	Pre. Land-survey, Env. Assess. & Acc. Layout			L. survey, Env. Assess., Land-prep., Basic plan, Eng. design/drawing			Procurement process		
SRF	Cav. Production technology Prep. Hub-lab functioning SRF beam-tech. demonstrated			Mass production technology Hub-lab functioning SRF beam-technology advanced			Procurement process		
Nano-beam	FF nano-beam size & stability demonstrated			FF: Smaller nano-beams & stability established			Same as above		
e-e+ Sources	Technology demonstrated.			Prototype demonstrated					

SRF-linac worldwide (lepton-photon):

EXFEL	EXFEL construction	EXFEL beam operation	
LCLS	LCLS preparation	LCLS Construction	LCLS beam operation

Main issues in the ILC Preparation Phase

分野 (field)	課題 (Issues/Subjects)	協力体制 (Global Cooperation)
施設設計 **CFS**	候補地特性を反映した地質環境調査: Site-specific CFS design, env. assess. 基本計画、詳細設計、図面整備 General plan, eng. Design, drawings	JP-CFSがコアとなり国際連携、候補地域との連携 JP-CFS to take a central role in cooperation with global experts and regional experts.
加速器設計 Acc. Design Int.	詳細設計・パラメータ最適化 Engineering design, Parameter optim.	LCC-ILCを中心とした国際連携による検討 LCC-ILC to take a central role with global cooperation
SRF技術 SRF	製造・性能検証技術、 Fabrication and Testing technology 性能の安定化 Stabilization of the performance	Tesla Tech. Collab., as common community - KEK-STF: Hub-Lab function - EXFEL: mass production and testing - LCLS : mass production and testing
ナノビーム技術 Nano-beam	低エミッタンス、極小ビームの安定的実現、運用 Ultra low emittance, nano-beam to be realized and stabilized	ATF Collab. As common community - KEK-ATF to be maximized in use, as a global unique facility for next generation training as well as the advance studies.
研究所運営 Management	新国際研究所の設立準備 Preparation for the int'l ILC laboratory	今後の検討課題 A main Issue for the ILC to be prepared

LINEAR COLLIDER COLLABORATION

ILC 加速器建設にむけた研究所人材構想

[人・年(FTE) 国際協力分担の仮定を含む]

[A HR proposal for the ILC preparation, linked to the construction

Stage	Preparation				Construction									Sum
	1	2	3	4	1	2	3	4	5	6	7	8	9	
<u>Prep.</u>	<u>77</u>	<u>96</u>	<u>116</u>	<u>134</u>										<u>423</u>
CFS-jp	4+4	5+5	6+6	7+7										22+22
CS-ww	1	1	2	2										6
Acc -jp	30+20	35+25	40+30	45+35										150+110
Acc-ww	10	15	20	25										70
Admin.	8	10	12	13										
Const.					410	922	1208	1350	1589	1480	1374	1106	679	10,118
Install.							80	80	80	768	1140	683	522	3,353
Sum					410	922	1288	1430	1669	2248	2514	1789	1201	13,471

New estimate

Given in TDR

Average/yr: ~ 1,100

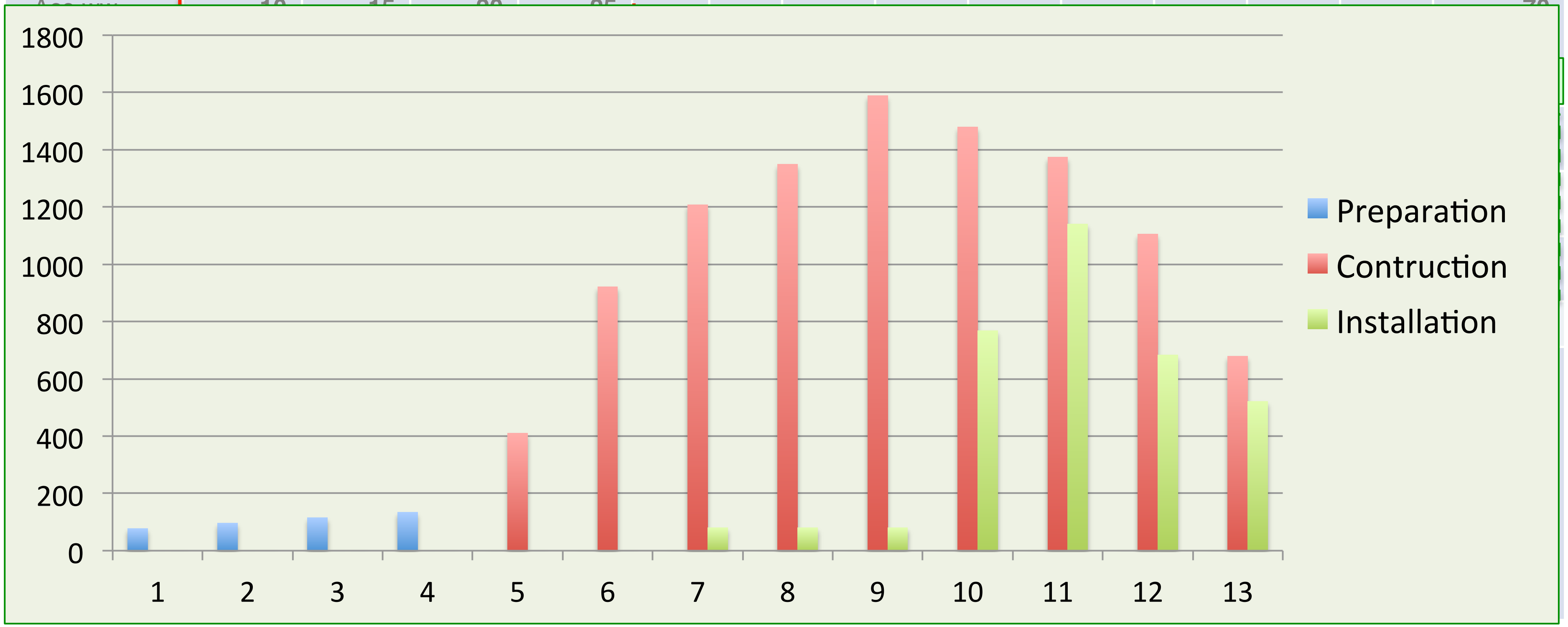
Notes: HR required for the ILC preparation (CFS, Acc., and administration):
- HR in the 1st preparation year to be filled from the existing staff in fraction of ~80%),
- HR needs to be gradually increased to reach a factor 1/5 ~ 2, during the prep. phase,
- The guideline is to provide 10 %level in fraction to the staff required for the ILC laboratory,
- The global collaborators anticipated from a fraction of 5 % to 20% of existing ones,
- The Japanese HR needs to be boosted/complemented by using "sub-contract,
  - Worldwide fraction in japan,
  - CFS: ~ 90 % , Acc. 60^70%, and (1/3~1/2 to be subcontracted)

~~ILC 加速器建設にむけた研究所人材構想~~

[人・年(FTE) 国際協力分担の仮定を含む]

[A HR proposal for the ILC preparation, linked to the construction

Stage	Preparation				Construction									Sum
	1	2	3	4	1	2	3	4	5	6	7	8	9	
Prep.	77	96	116	134										423
CFS-jp	4+4	5+5	6+6	7+7										22+22
CS-ww	1	1	2	2										6
Acc -jp	30+20	35+25	40+30	45+35										150+110



ILC Conventional Facilities

Victor R Kuchler
John Andrew Osborne
Masanobu Miyahara

International Linear Collider (ILC)
Global CFS Group

2015/4/13 ILC PAC Meeting @LAL Orsay 1

CFS Work after TDR

Change Request proposed

1. Detector Hall with Vertical Shaft access (CR-0003)
2. Extension of the ML-tunnel length (CR-0004)

Change Request anticipated in Future

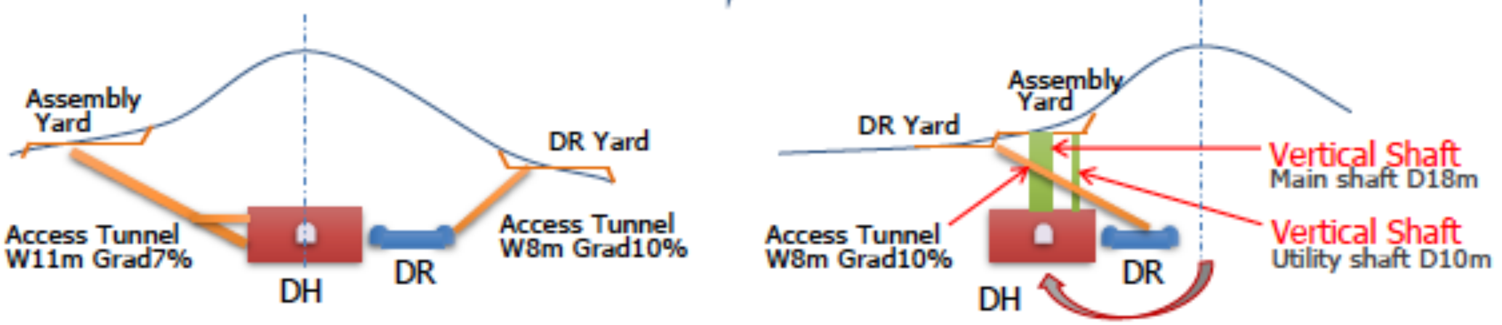
1. ML Shield-wall thickness impact
2. BDS Tunnel configuration
3. Cryogenics facilities Layout

1 DH with Vertical Shaft Access ILC-CR-0003

- Change Review Panel Members: K. Yamamoto, V. Kuchler
- Current Status: Approved by CMB

Overview of the Change Request

TDR Baseline	New Baseline
■ Assembly Place: Surface Building/AH	■ Assembly Place: Underground/DH
■ Access way to DHl underground	■ Access way to DH underground
- only Inclined Access Tunnel (AT)	- mainly Vertical Shaft (VS)
- Transport. by special long trailer	- Transport. by Gantry Crane



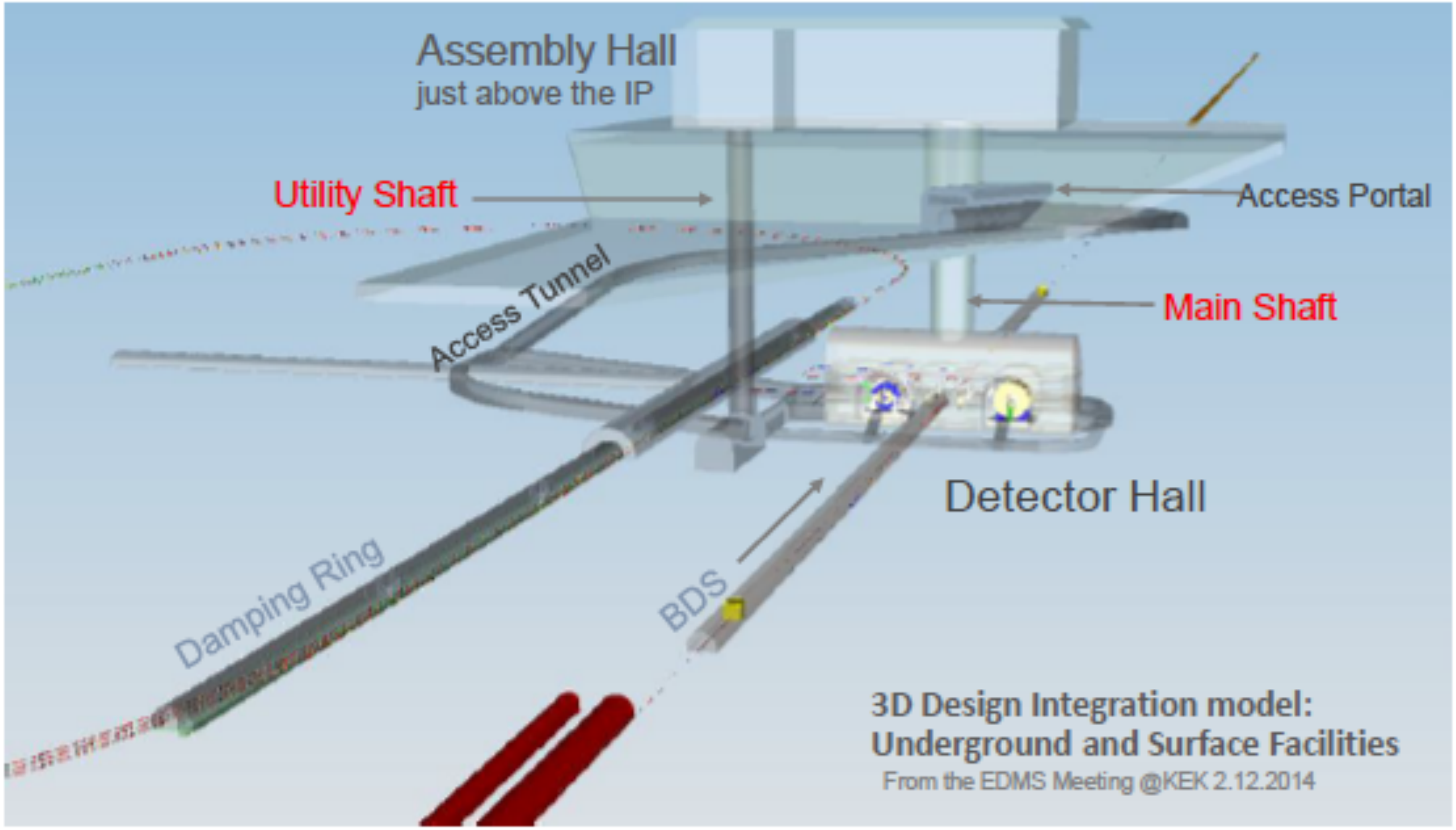
LINEAR COLLIDER COLLABORATION

ilc international linear collider

CFS Work after TDR

New Baseline Layout

DH with Vertical Shaft Access



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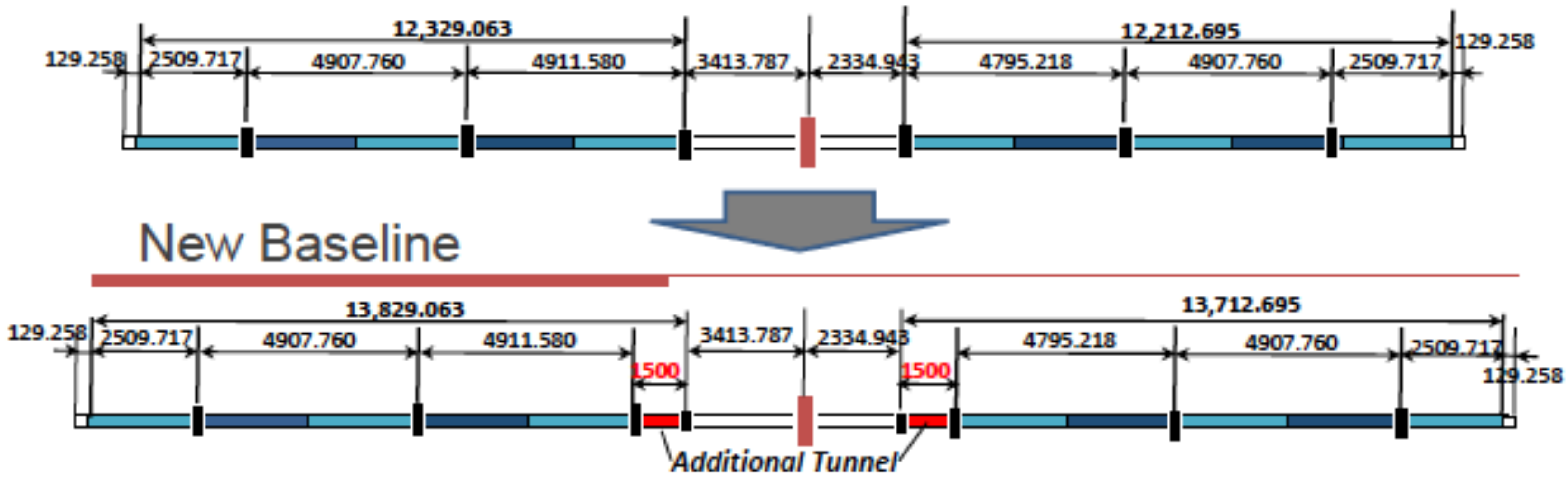
2 Extension of the ML Tunnel — ILC-CR-0004

- Change Review Panel Members: V Kuchler (chair), N Waker, H Nakai, T Sanuki, M Miyahara
- Current Status: Under Discussion Change Implementation Team

Under Discussion

TDR Baseline

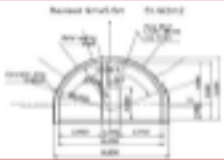
New Baseline



Outline of the Change Request

- **Extension of Main Linac Tunnel:**
  - Both the Electron and Positron ML Tunnels by approximately 1.5 km.
  - Electron Linac Length: 12.3km →13.8 km,
  - Positron Linac Lebgth: 12.2 km → 13.7 km
- **Rational:**
  - Adjust the total beam-line path length on the Positron side in order to fulfill the **timing constraint** by the baseline method of positron production

Cost Impact of the Change Request 0004

	Assumption Section		Cost
Change Request 0004		Section: 9m x H5.5m Shield wall: 1.5m Tunnel Length: 3km	Unit cost: 1,900 kJPY/m Total cost: 5,700 MJPY

- Current Status: Under Discussion
- Further detailed discussion will be planed at ALWC2015

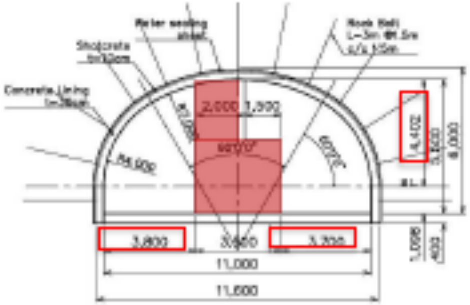
1 ML Shield wall thickness impact — Pre-study

- Radiation shield issue will be decided by necessity of person's access
- Scheme change depends on the management scenario of beam operation.

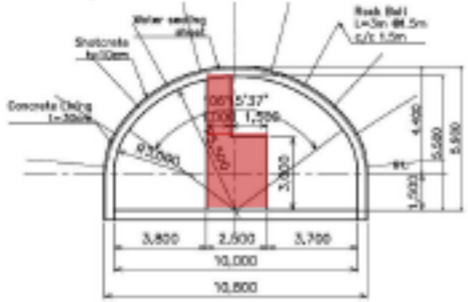
Common Dimensions

- Beam line : Width 3.8m
- Klystron gallery: Width 3.7m
- Tunnel Inner height : 5.5m

Baseline SW3.5m

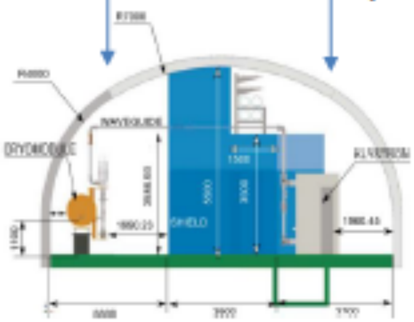


Option-1 SW2.5m

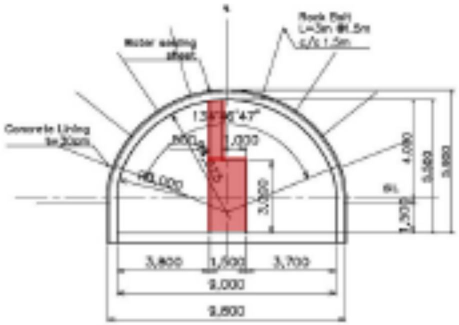


Beam Line

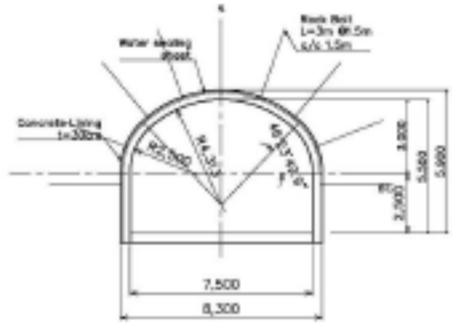
Klystron Gallery



Option-2 SW1.5m



Option-3 No SW



ARUP Work

TOT Development on the ILC CFS

TOT: Tunnel Optimization Tool

User defined Input :

- ILC main alignment information and access tunnel positions in 3D space.
- Sets of Requirements for Access tunnel/ portal locations to achieve

TOT carries out :

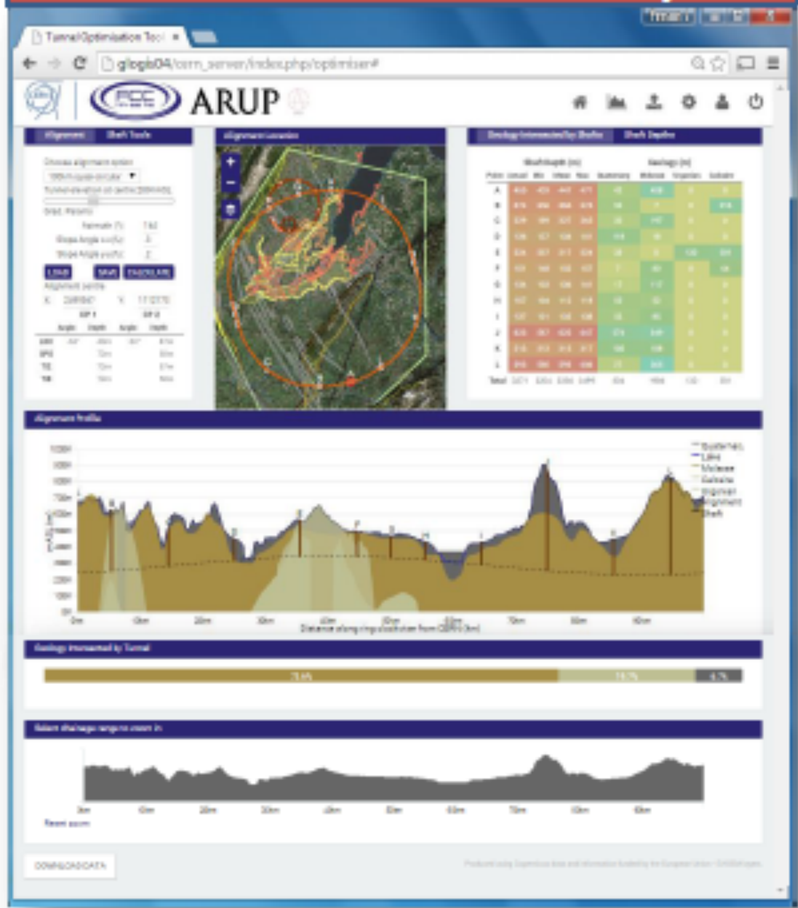
- Data analytics to create a set of summary outputs and visual decision aids.
- Series of analytics to give a range of Optimum Access tunnel positions onto a fixed LINAC position

Status of Contract: CERN & KEK

- On going the contract procedure

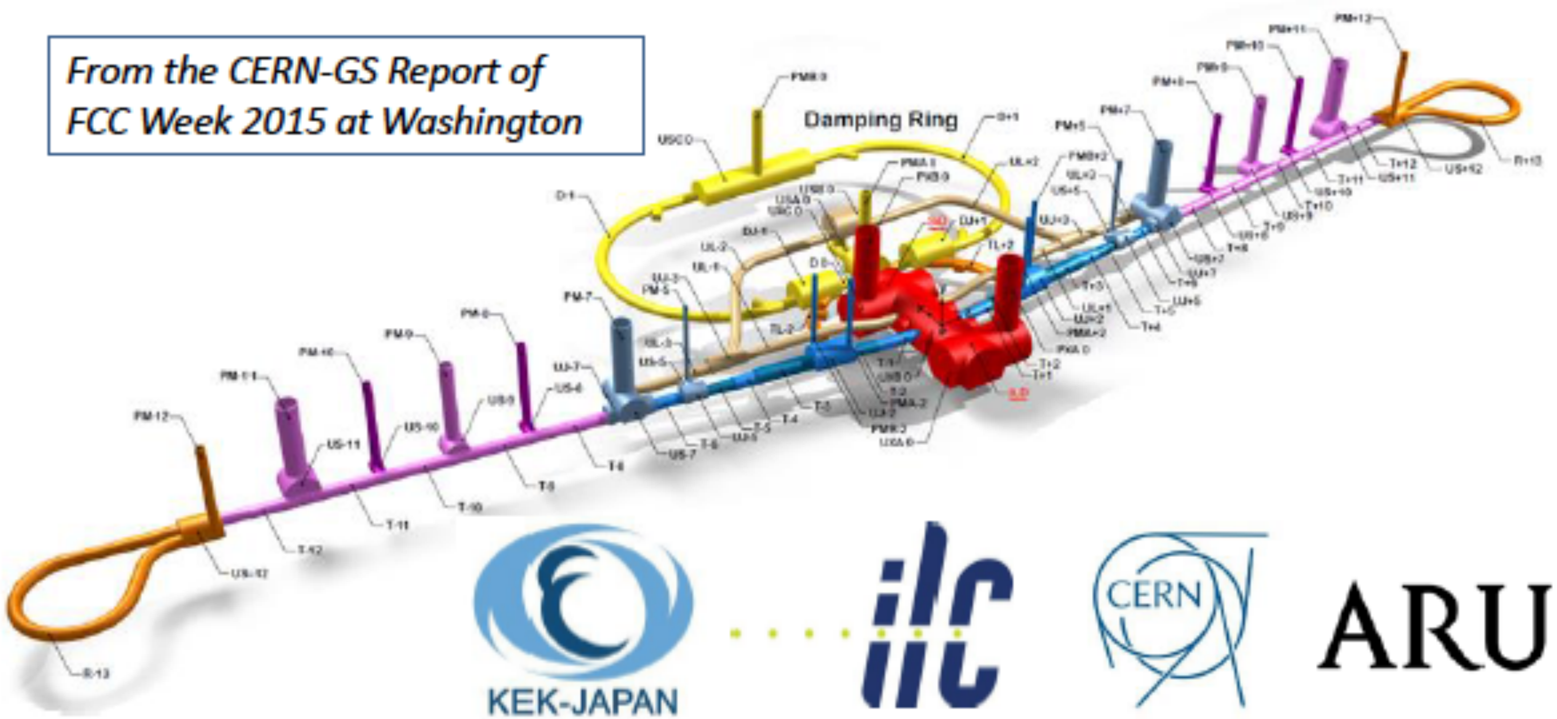
From the report/John Osborne(CERN) in FCC-Week 2015

Reference: TOT on the FCC Project



ILC & TOT

From the CERN-GS Report of
FCC Week 2015 at Washington



KEK-JAPAN

ARUP

CERN & Arup will work with KEK & ILC to upgrade and adapt the Tunnel Optimisation Tool to provide the same benefits for the ILC tunnel that have been brought to the FCC feasibility study

John Osborne (CERN-GS) ILC PAC Meeting @LAL Orsay 31

The 1st ILC PAC Review

Close out presentation

April 14, 2015

PAC Members: (Accelerator & Project)

Norbert Holtkamp (SLAC) (Chair)

Michel Davier (LAL) (Chair)

Hans Weise (DESY)

Robert Orr (Tronto)

Mark Palmer FNAL

Philippe Lebrun (CERN)

Osamu Kamigaito (RFBF Riken)

Moo Hyun Cho (PAL Korea)

Eisuke Tada (JAEA/ITER)

Shinichi Akutagawa (Kobe University)

PAC Members: (Experiments)

Joe Lykken (FNAL) (absent)

Peter Jenni (CERN/ATLAS) (absent)

Tomio Kobayashi (KEK, since April, 2015)

Hesheng Chen (IHEP, Beijing)