

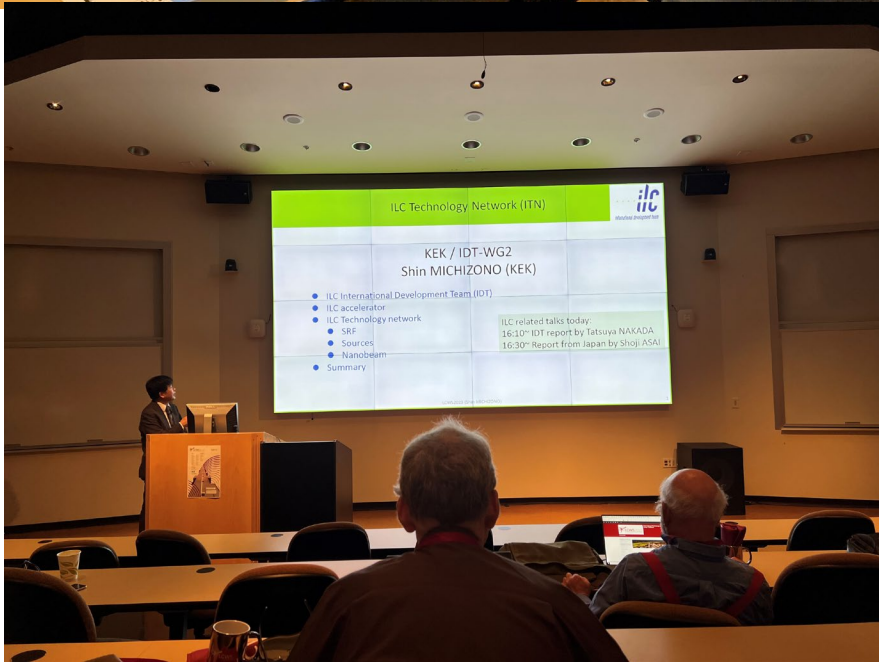
KEK / IDT-WG2 Shin MICHIZONO (KEK)

- LCWS2023
 - IDT-WG2 meeting
 - Statement

LCWS2023

220 participants joined to this workshop.





Three plenary talks on Monday.
(ILC Technology Network, IDT report, Report from Japan)
<https://indico.slac.stanford.edu/event/7467/timetable/#20230515.detailed>

Face-to-face IDT-WG2 meeting during LCWS

17 WG2 members (yellow highlighted in the next list) joined in this first face-to-face meeting.



IDT-WG2 organization

IDT WG2 Steering group

Shin Michizono (Chair)

Benno List (Deputy)

+steering members

Those in **bold** are Steering members.

ML&SRF group

Yasuchika Yamamoto	KEK
Sergey Belomestnykh	FNAL
Enrico Cenni	CEA
Peter McIntosh	STFC
Laura Monaco	INFN Milano
Akira Yamamoto	KEK
Nuria Catalan	CERN
Dimitri Delikaris	CERN
Luis Garcia Tabares	CIEMAT
Rongli Geng	ORNL
Hitoshi Hayano	KEK
Bob Laxdal	Triumpf
Matthias Liepe	Cornell
Olivier Napoly	CEA
Sam Posen	FNAL
Robert Rimmer	JLAB
Roger Ruber	JLAB
Marc C. Ross	SLAC
Kensei Umemori	KEK
Hans Weise	DESY

DR/BDS/Dump group

Toshiyuki Okugi	KEK
Philip Burrows	U. Oxford
Angeles Faus-Golfe	IJC Lab
David L. Rubin	Cornell
Nobuhiro Terunuma	KEK
Glen White	SLAC
Karsten Buesser	DESY
Andrea Latina	CERN
Kiyoshi Kubo	KEK
Jenny List	DESY
Thomas Markiewicz	SLAC
Brett Parker	BNL
Ivan Podadera	CIEMAT
Nikolay Solyak	FNAL
Kaoru Yokoya	KEK
Mikhail Zobov	INFN LNF

Dump sub-group

Nobuhiro Terunuma	KEK
Toshiyuki Okugi	KEK

Crab sub-group

Peter McIntosh	STFC
Yasuchika Yamamoto	KEK

Sources group

Kaoru Yokoya	KEK
Joe Grames	JLAB
Masao Kuriki	U. Hiroshima
Gudrid Moortgat-Pick	U. Hamburg
Jim Clarke	STFC
Steffen Doebert	CERN
Hitoshi Hayano	KEK
Benno List	DESY
Jenny List	DESY
Yoshinori Enomoto	KEK
Sabine Riemann	DESY
Peter Sievers	CERN -retired
Tohru Takahashi	U. Hiroshima

Civil engineering group

Nobuhiro Terunuma	KEK
John Andrew Osborne	CERN
Tomoyuki Sanuki	U. Tohoku

Statement on the Future of e^+e^- Higgs Factories from LCWS 2023

<https://indico.slac.stanford.edu/event/7467/page/61-statement-to-p5>

Scientists from many countries and regions are now gathered at the International Workshop on Future Linear Colliders (LCWS 2023) at the SLAC National Accelerator Laboratory. Together with colleagues from around the world, the linear collider community hereby issues the following statement:

1. Particle physics needs a new accelerator to measure the properties of the Higgs boson with high precision.

The Higgs boson is central to our understanding of the evolution of the Universe. It plays a critical role in all of the interactions studied in particle physics, and in the mysteries whose solution is central to progress in this field. Of all ways to search for physics beyond the Standard Model, precision measurements on the Higgs boson access the widest variety of new physics interactions. The “strong scientific importance” of precision Higgs measurements was emphasized in the 2014 P5 report in the US. The need for an e^+e^- Higgs factory as the next collider was called for in the 2020 update of the European Strategy for Particle Physics and in the Energy Frontier report from Snowmass 2021.

2. The particle physics community needs to realize the e^+e^- Higgs factory as soon as possible.

Data-taking at a future e^+e^- Higgs factory should follow the HL-LHC directly, requiring construction start by 2030, in parallel with HL-LHC data-taking. This will ensure that essential and unique expertise and human resources will remain available. A long delay will dissipate these resources and endanger the future of our field.

Material at IDT-WG2 face-to-face meeting

IDT Scope for ILC Realization

-success oriented and assuming no major incident-

Shin MICHIZONO
(LCWS2023)

Technology Network Phase

Preparatory Phase

Construction Phase
~10 years for the construction and commissioning



R&D and effort to gain a common view and understanding.

ILC preparation laboratory and intergovernmental discussion

2021 May

Technical Preparation and Work Packages (WPs) during ILC Pre-lab

Work Packages (WPs) for ILC Pre-Lab

2022 June

Time-critical WPs for the ILC construction

WP-Primes for Time Critical

ILC Technology Network (ITN)

-- global collaboration program---

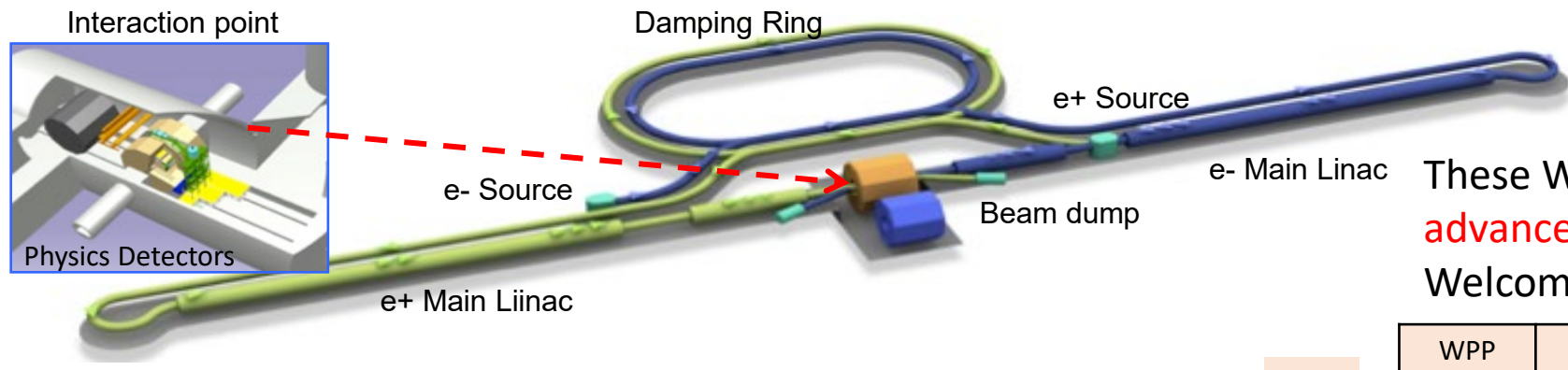
- **Acc. R&Ds** focusing on
 - SRF
 - e- & e+ Sources
 - Nano-beam
- Synergy with other colliders

KEK obtained a budget for these R&Ds and started the activity from **this April**.

<http://doi.org/10.5281/zenodo.4742018>

https://agenda.linearcollider.org/event/9735/contributions/50816/attachments/38190/59968/Time-Critical_WPsV8b.pdf

WP-Primes at ILC Technology Network



These WPs can be applied to various **advanced accelerators**.
Welcome to join!

- Creating particles
 - polarized electrons / positrons
- High quality beams
 - Low emittance beams
 - Small beam size (small beam spread)
 - Parallel beam (small momentum spread)
- Acceleration
 - superconducting radio frequency (SRF)
- Getting them collided **Final focus**
 - nano-meter beams
- Go to **Beam dumps**

Sources

Damping ring

Main linac

Final focus

SRF

e-, e+ Sources

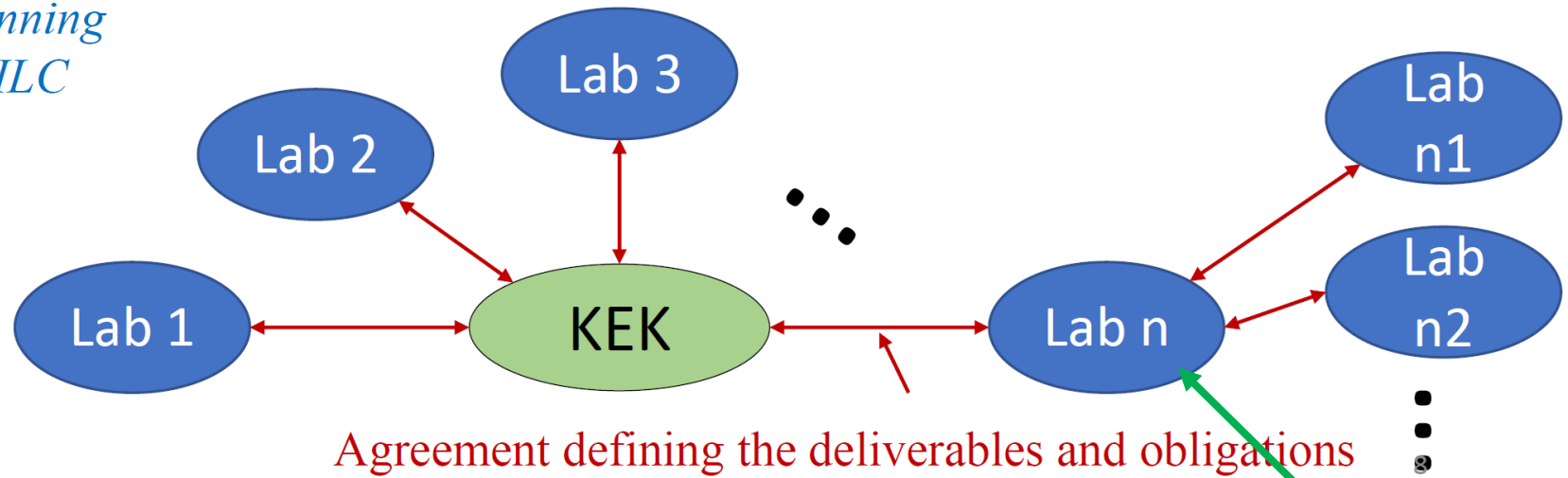
Nano-Beam

WPP	1	Cavity production
WPP	2	CM design
WPP	3	Crab cavity
WPP	4	E- source
WPP	6	Undulator target
WPP	7	Undulator focusing
WPP	8	E-driven target
WPP	9	E-driven focusing
WPP	10	E-driven capture
WPP	11	Target replacement
WPP	12	DR System design
WPP	14	DR Injection/extraction
WPP	15	Final focus
WPP	16	Final doublet
WPP	17	Main dump

Current situation

ILC Technology Network (ITN), based on **bilateral agreements between KEK and partner laboratories worldwide**, has been launched **to execute important work packages**, based on its own organisation. (See also presentations by S. Michizono and S. Asai)

NB: IDT-WG2 will continue planning and overall coordination of the ILC accelerator development,



Tatsuya NAKADA
(LCWS2023)

ITN in progress

For **WPP-1&2 (SRF cavity, CM)**, we have already started technical discussions with researchers in Europe and the USA. For **WPP-15 (Final Focus System)**, discussions are deepening at LCWS, and European participation in ATF experiments is expected from June operation.

WP-prime 1: SRF Cavity (Scoping the Industrial-Production Readiness)

Referring European XFEL and LCLS-II experiences

- Research with single-cell cavities to establish the best production process including:
 - Advanced Nb sheet production method
 - Advanced surface treatment recipe
- Globally common design with compatible High Pressure Gas Safety (HPGS) regulation
- 24 nine-cell cavities are to be developed for industrial-production readiness
 - 8 cavities (4 / batch) in each region
 - Production process encouraged to be optimized in each region
 - Cavity performance expected: $E_{acc} < 35 \text{ MV/m} > (+/- 20\%)$, $Q_0 = 1.0 \times 10^{10}$, Yield = $\geq 90\%$
 - RF performance/success yield to be examined (including 2nd pass and further)
 - 3rd pass to be examined if effective

	# of cavities to be produced		
	Americas	Europe	JP/Asia
single-cell	2	2	2 (+4)
nine-cell	8	8	8 (+4)

WP-prime 2: Cryomodule (CM) Design (Scoping the CM Global Transfer and Performance Assurance)

Referring European XFEL and LCLS-II experiences

- Unify cryomodule (CM) design with ancillaries, based on globally common engineering design, drawings & data-base
- Establish globally compatible safety design base to be approved/authorized by HPGS regulations individually in each region, most likely referring ASME guidelines to be compatible with Japanese regulations.

Region Regulation	Americas ASME	Europe Eu-EN, TÜV	Japan/Asia JP-HPGS Act
CM tech. design base	LCLS-II	Euro-XFEL	KEK-STF, AST-IFMIF
ILC CM design	Common CM design globally compatible to HPGS regulation in all regions, and most likely ASME guidelines to be compatible with Japanese regulations.		

WP-prime 15: System design of ILC FFS

ATF collaboration

- ATF2 beamline is the only existing test accelerator in the world to test the final focus system (FFS) of linear colliders.
- The following 3 research topics are important topics to be pursued at the ATF.
 - wakefield mitigation
 - correction of higher-order aberration
 - training for ILC beam tuning
- The technical research at ATF2 beamline has proceeded, and should continue to be based on the ATF international collaboration, or its extension (welcome to new collaborators).

Maximum search algorithms to be applied to beam tuning (Machine Learning)

Wakefield test station

Octupole magnets for higher-order aberration