International Development Team

IDT WG2 Activities

Benno List, DESY

ILC Europe Meeting

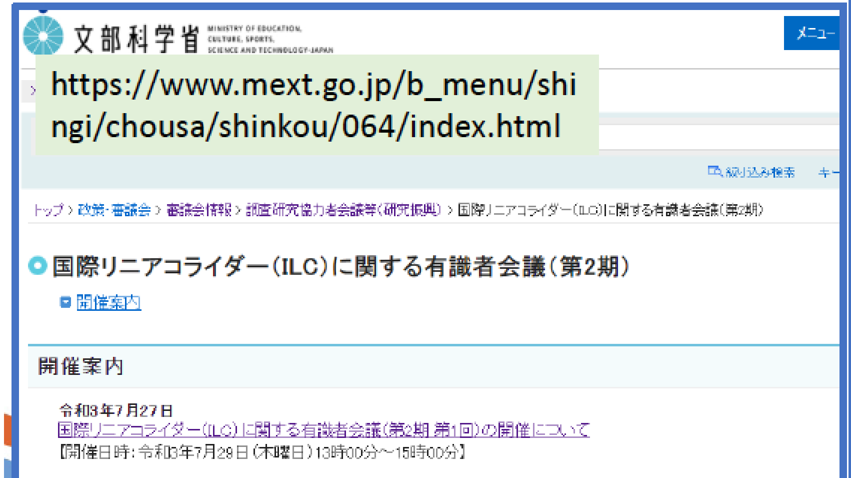
2.9.2021

ILC advisory panel

The MEXT made an announcement about the ILC advisory panel today.
The meeting will be held online on Thursday, July 29 from 1PM to 3PM.
The agenda is.

- Management of the ILC advisory panel
- How to proceed with ILC advisory panel
- Recent trends in the ILC project
- Perspectives on checking the progress of various issues related to the ILC project
- Others

Membership (and chairperson), and schedule will be shown at this meeting.


文部科学省 MINISTRY OF EDUCATION, CULTURE, SPORTS, SCIENCE AND TECHNOLOGY-JAPAN

メニュー

https://www.mext.go.jp/b_menu/shingi/chousa/shinkou/064/index.html

絞り込み検索

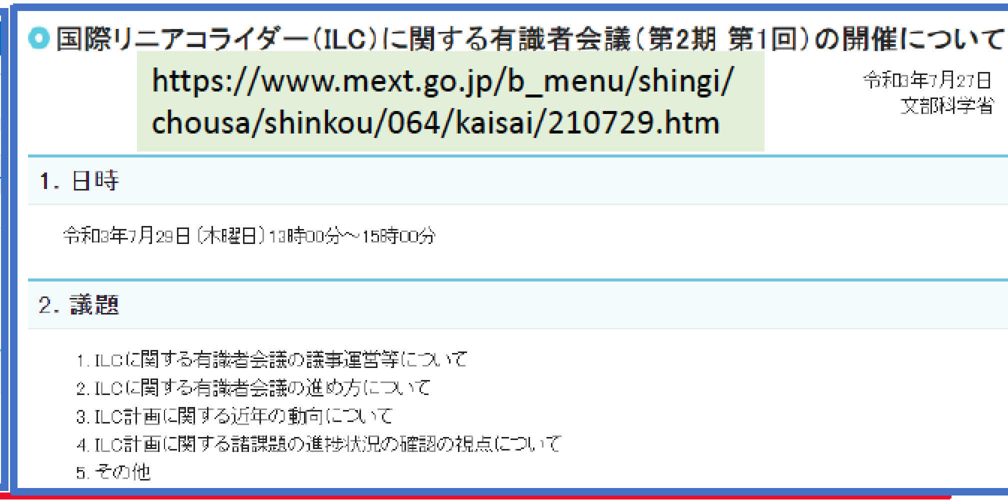
トップ > 政策・審議会 > 審議会情報 > 調査研究協力者会議等（研究振興） > 国際リニアコライダー（ILC）に関する有識者会議（第2期）

国際リニアコライダー（ILC）に関する有識者会議（第2期）

開催案内

開催案内

令和3年7月27日
国際リニアコライダー（ILC）に関する有識者会議（第2期 第1回）の開催について
【開催日時：令和3年7月29日（木曜日）13時00分～15時00分】


国際リニアコライダー（ILC）に関する有識者会議（第2期 第1回）の開催について

https://www.mext.go.jp/b_menu/shingi/chousa/shinkou/064/kaisai/210729.htm

令和3年7月27日
文部科学省

1．日時

令和3年7月29日（木曜日）13時00分～15時00分

2．議題

1. ILCに関する有識者会議の議事運営等について
2. ILCに関する有識者会議の進め方について
3. ILC計画に関する近年の動向について
4. ILC計画に関する諸課題の進捗状況の確認の視点について
5. その他

ILC advisory panel

First advisory panel was held on July 29.
https://www.mext.go.jp/kaigisiryo/2021/mext_00253.html

Charges of the panel:
(1) Prospects for international research cooperation and cost sharing
(2) Academic significance and understanding of the public and scientific community
(3) Clarification of technical feasibility
(4) Reasonableness of cost estimates
(5) Prospects for training and securing human resources
(6) Other issues related to ILC

See the note on Aug.3 in the WG2 mailing list

Schedule:
The panel is planned to be concluded by the end of 2021, or at latest by the end of March 2022.
2nd panel (120 min.)
-Overview of the ILC project and the history to date [5+5].
-IDT proposal [15+20].
-Technical feasibility and validity of cost estimate (accelerator) [20+25].
-Discussions among expert committee members [30].

Speakers are not decided yet. (negotiation with MEXT)

Slide preparation taskforce

- In order to prepare the slides at the ILC advisory panel, "slide preparation taskforce" was organized. (Chair: Prof. Kawagoe (Kyushu U.))
- Not only the accelerator, but also other presentations will be advised by this taskforce.
- From accelerator, Michizono, Terunuma, Kuriki, Sanuki are the members.
- Concerning the accelerator related presentations, these drafts are under preparation

(a) Basic information about ILC progress (up to now)

Since most of the advisory panel members are non-expert (of the accelerators), we have to include basic information about the ILC technology.

(b) Response to the previous ILC advisory panel and SCJ
  - Response to the issues pointed out
  - Activities from 2018 to 2021

Based on the information at each group on July.

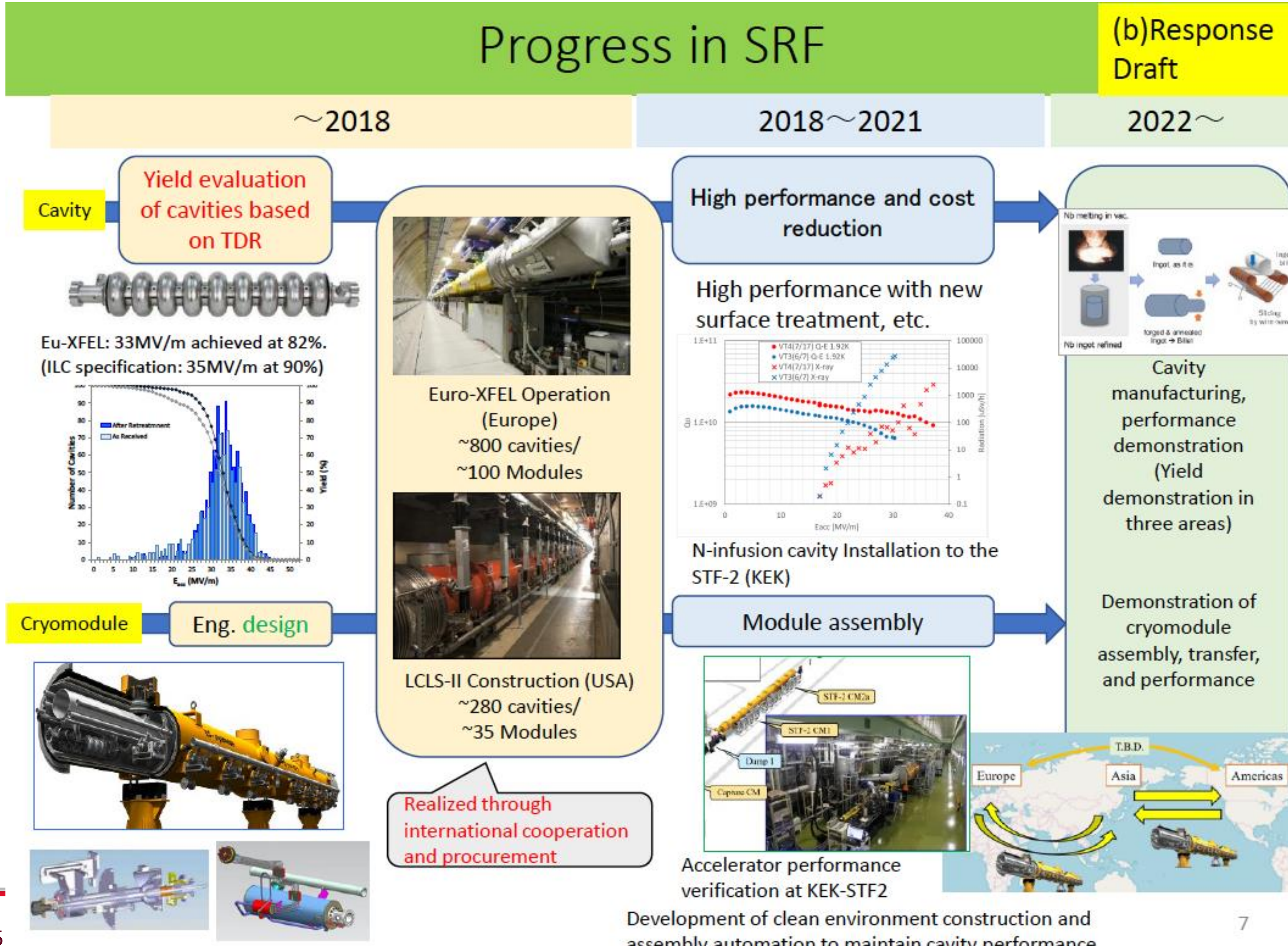
(c) WPs during pre-lab (corresponding to the issues raised by ILC advisory panel and SCJ)

Based on "Pre-lab proposal"

(d) In addition, I asked some of the IDT-WG2 members to prepare the ILC related activities (~2018, 2018~2021, and future potential for the WPs). (USA, England, France, Spain, CERN etc.)

Total presentation time for them will be less than 30 min. (Even though we will submit various materials, the presentation slides themselves are ~30.)

Please understand that this task force handles the editing of the slides.



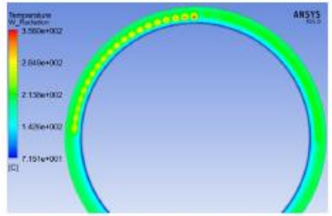
Shin Michizono, IDT WG2 Meeting, 24.8.2021

Progress in positron source

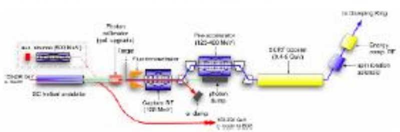
(b)Response Draft

～2018 tech. design

High-speed rotating positron target, Technology Design

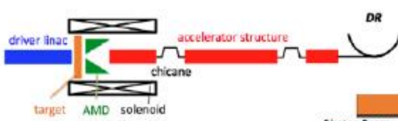


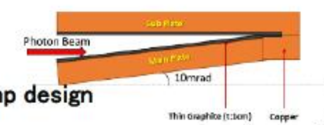
Target thermal simulation



e+ source total design

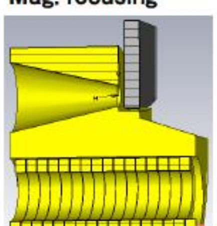
Undulator prototype



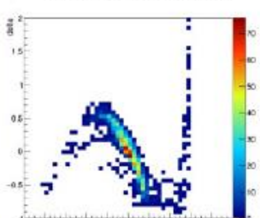


Photon dump design

Mag. focusing



Paricle simulation

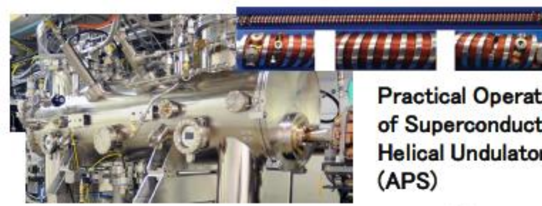


2018～2021 tech. verification

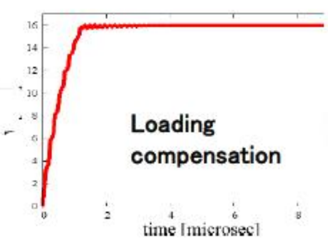
Target Prototyping
Vacuum characteristics
Testing

Target before and after radiation:

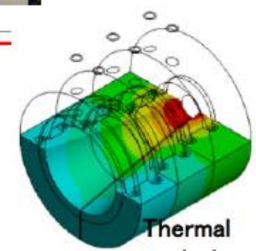
Ti target beam test



Practical Operation of Superconducting Helical Undulator (APS)



Loading compensation

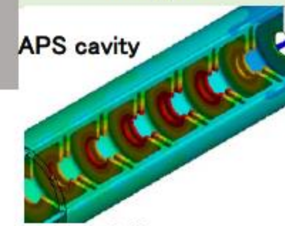


Thermal analysis

Plan A:Undulator scheme
Plan B:e-driven scheme (same tunnel)
Plan C:e-driven scheme (extra tunnel)

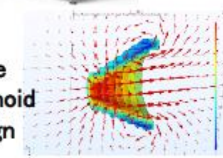
2022～Detailed design.

APS cavity

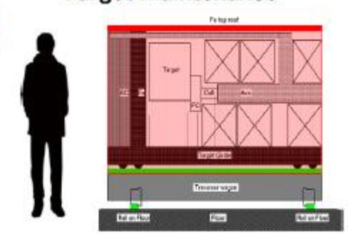


RF stability test

Pulse solenoid design



Target maintenance



Shin Michizono, IDT WG2 Meeting, 24.8.2021

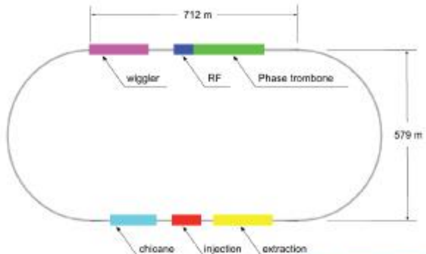
Progress in DR

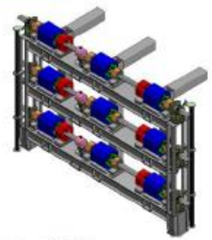
(b)Response Draft

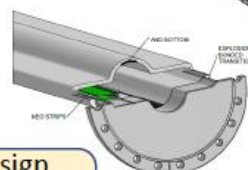
～2018	2018～2021	2022～

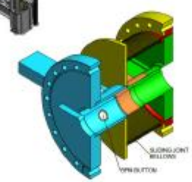
DR — Eng. design → Final design

Design based on experience with circular accelerators around the world.

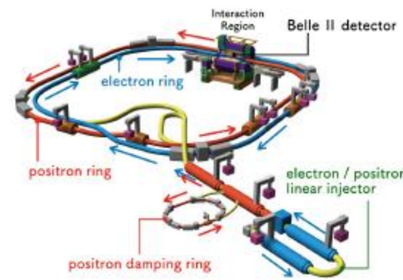


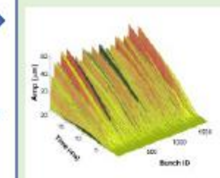






Maturing technology for beams in the latest ring accelerators such as SuperKEKB

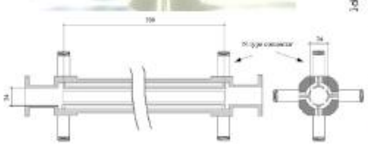


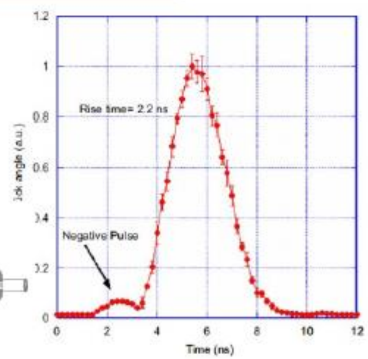


Final design

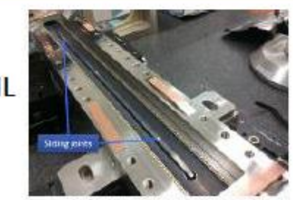
Inj./Ext. — Eng. Design Equipment verification → Stable op.

Beam extraction verified.

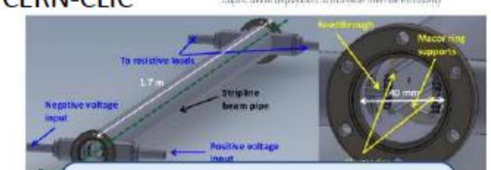


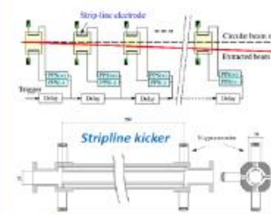


LBNL



CERN-CLIC





Stable op.

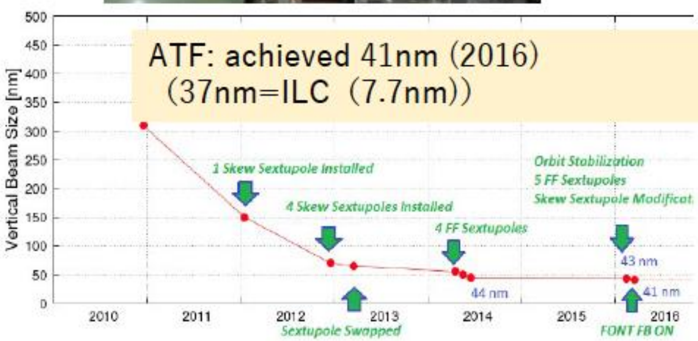
Fast kicker technology for other accelerators

Shin Michizono, IDT WG2 Meeting, 24.8.2021

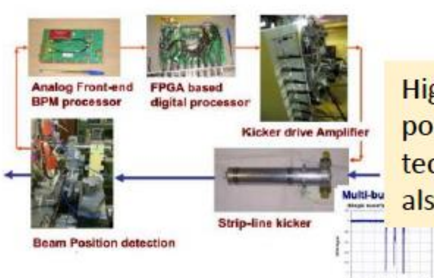
Progress in final focus

(b)Response Draft

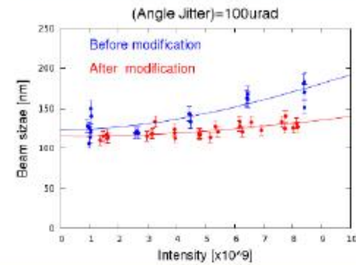
～2018	2018～2021	2022～
Tech. design completed Spec. almost achieved	Wakefield effect	Detailed design Stable operation demonstration



ATF: achieved 41nm (2016)
(37nm=ILC (7.7nm))

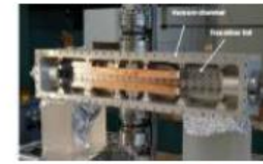


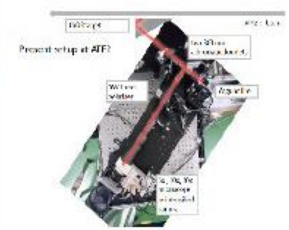
High-speed beam position control technology was also demonstrated.



Beam induced electromagnetic field effect evaluation test was conducted at ATF.
-No problem with ILC beam
-A technique to reduce the influence of the beam induced electromagnetic field was demonstrated.

ATF International Review (Committee)
-The committee highly evaluated the achievements of ATF so far.
-The committee pointed out the importance of continuing research to contribute to the detailed design of the ILC final convergence.





Modify the beam monitor system, etc. at ATF to demonstrate stable operation。

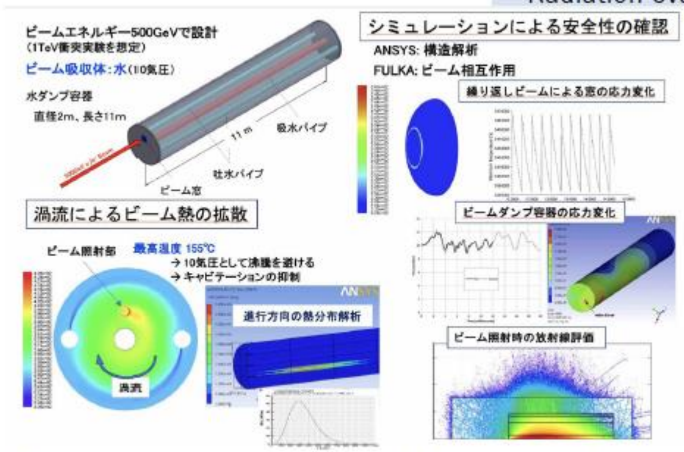
Shin Michizono, IDT WG2 Meeting, 24.8.2021

Progress in beam dump

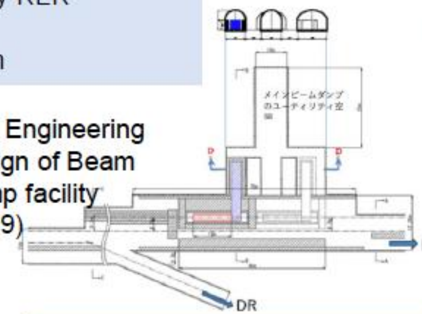
(b)Response Draft

～2018	2018～2021	2022～
Basic design (by researchers abroad)	Design revalidation and materialization of facility design	Maintenance equipment design Detailed design

Design revalidation by KEK
-Structural Analysis
- Radiation evaluation

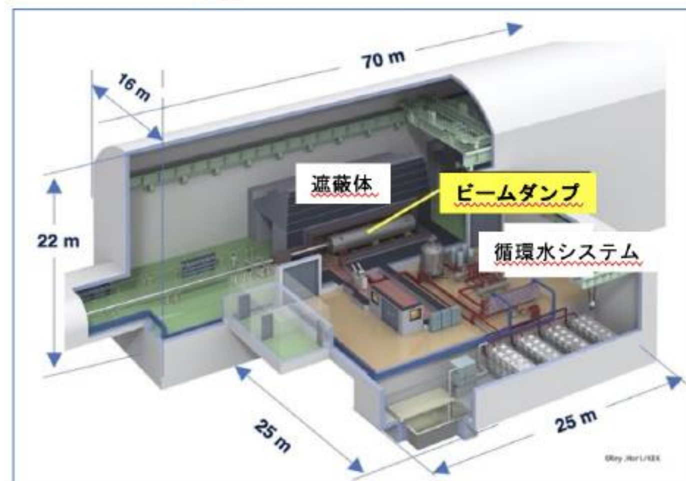


Civil Engineering Design of Beam Dump facility (2019)



- Testing of main components of circulating water system
- Beam window replacement device
- Safety design

Detailed system design



Consultations with beam target/dump experts from around the world beyond ILC

LHC beam dump (2017)

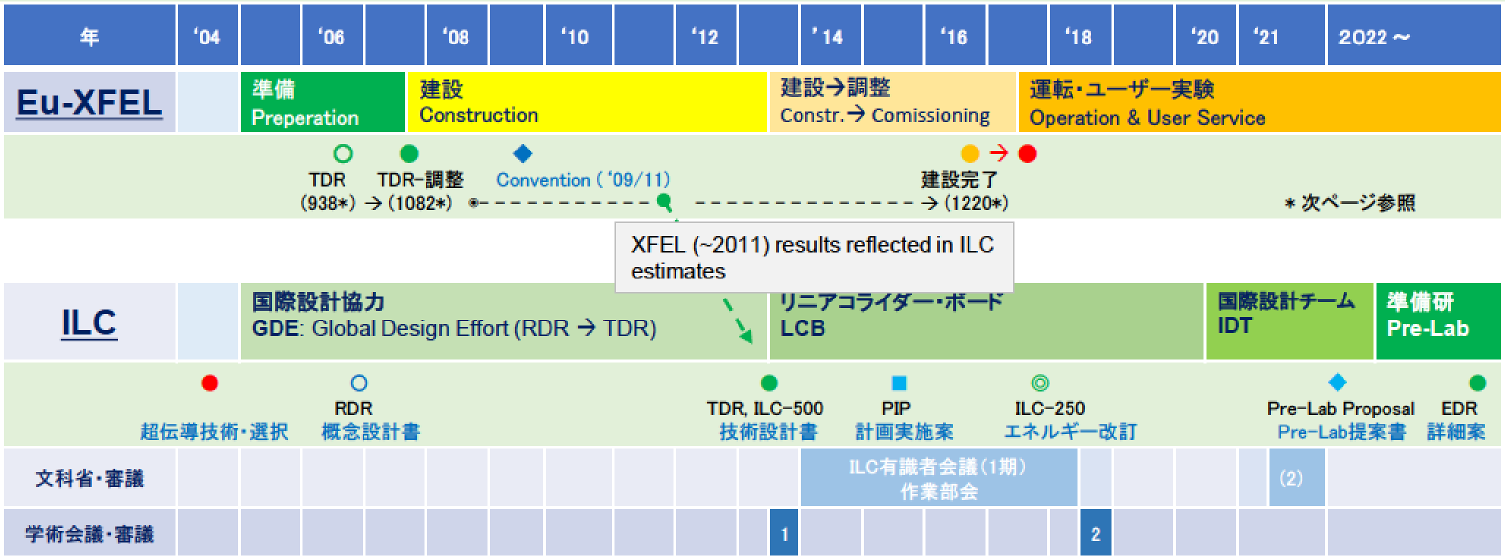
RADIATE collaboration

Shin Michizono, IDT WG2 Meeting, 24.8.2021

European XFEL construction in ILC preparation

(b)Response Draft

The European XFEL construction was completed in 2017 within the scope of the original budget r[illegible] (TDR-adjusted) plus the additional budget approved in 2015 (+13%).
The ILC accelerator construction cost estimate reflects the original European XFEL construction budget adjusted in 2008 (TDR-adjusted) and the progress of budget execution until 2011.



Note: ILC-PIP: ILC Project Implementation Plan (2015), TDR: Technical Design Report, CDR: Conceptual Design Report, EDR, Engineering Design Report（詳細技術設計書）

The ILC has been developing accelerator design and technology based on the superconducting technology selected in 2004, and published as the basic technical design document (ILC-TDR) in 2013. In 2017, the ILC250 plan was revised to focus on Higgs Factory, and preparations are underway for further detailed design and technology maturation. During this period, the European Free Electron Laser Facility (Eu-XFEL), which is based on the same superconducting technology and is 1/10th the size of the ILC project, was constructed and completed in 2017. The construction of the Eu-XFEL was completed in 2017.
The construction of the Eu-XFEL was completed in 2017 within the scope of the original budget revised in 2008 (TDR-adjusted) plus the additional budget approved in 2015 (+13%). The breakdown of the additional measures is "soaring civil engineering costs due to the economic boom" and "additional labor costs due to the extension of the construction period (within one year)" accounting for >2/3, while the cost increase of the accelerator itself is limited to <1/3 (see below).
The ILC accelerator construction cost estimate reflects the original Eu-XFEL construction budget adjusted in 2008 (TDR-adjusted) and the progress of budget execution until 2011. Referring to the later additional measures (XFEL reserve fund, approved in 2015), the ILC accelerator construction budget can be risk-responsive by reserving Contingency (10%: ILC-PIP proposal and recommendations of the first phase and expert panel) and taking measures according to the construction progress

European XFEL construction budget evolution (based on 2005 Euro)

(b)Response Draft

The construction of Eu-XFEL was completed in 2017 within the scope of the original budget revised in 2008 (TDR-adjusted) plus the additional budget approved in 2015 (+13%).

	TDR for Pre-XFEL start-up	TDR adjusted for Full-Performance	Update in mid. constr.	Update Final	Ratio
	2006~2007	Feb. 2008			
Agreement/approval	July 2007 (Collab. Agree.)	Nov. 2009 (Council)	2012 (Council)	2015 (Council)	
Preparation	39M€	39M€	→ 39M€		
Construction	849M€	986M€	→ 986M€		
Commisioning	50M€	50M€	→ 50M€		
Risk budget (for 98% success)	---	(+78M€: only proposal)	+ 78M€ (budgeting)		
Additional				+66M€	
Total construction	938M€ →	1,082M€ →	1,160M€ →	1,226M€ 1,226M€	+13 % * +6% **

Notes.
*Eu-XFEL construction started, increase rate against total initial budget center value (probability of success: 50%): 13 %.
Additional factors: "Temporary price hike due to booming civil engineering and construction costs" + "Labor cost increase due to construction delay": ≥ 2/3 (of +13%), "Increasing cost of accelerator elements": ≤ 1/3 (of +13%), {Increase ratio of accelerator to original budget: ≤ 12%}
** (Reference) Construction cost increase relative to budget at start of construction (98% certainty of success): 6%.

https://www.xfel.eu/organization/leadership/council/basic_documents/index_eng.html
https://www.xfel.eu/news_and_events/news/index_eng.html?openDirectAnchor=1273&two_columns=0

IDT–WG2

(c) WPs Draft

The Accelerator Division (WG2) of the International Development Team (IDT) has about 50 accelerator researchers from 19 research institutes in 9 countries around the world participating in discussions on ILC accelerator development research.

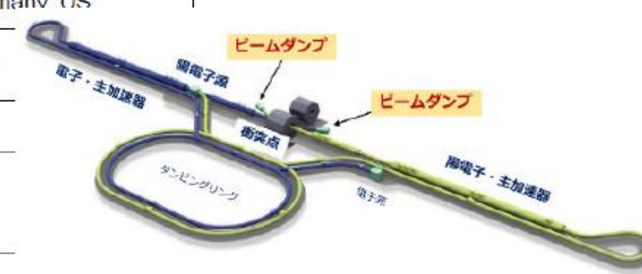
ILC international working group (2019)

(c) WPs Draft

The ILC International Working Group presented a technical preparation plan for the technical issues pointed out by the MEXT advisory panel and the Science Council of Japan.
The report outlines the necessary technical issues that should be addressed through international cooperation, as well as potential partners for international cooperation.

Component	Issue	Summary of tasks	Candidates for collaboration
SCRF Cavity	Mass production incl. automation	Performance statistics, mass production technology	France, Germany, US
	Cryomodule transport	Performance assurance after transport	France, German
Positron Source	Rotating target	Exchanging target, system design	CERN, France, Germany, US + industry-academia efforts
	Magnetic focusing system	System design	France, Germany, Russia, US
	Photon dump[23]	System design	CERN, Germany, US
Damping Ring	Fast kicker	Test of long-term stability, system design	CERN, Italy
	Feedback	Test at SuperKEKB	Italy
Interaction Region	Beam focus/position control	Test of long-term stability	CERN, UK
Beam Dump	Total system	System design	CERN, US
	Beam window, cooling water circulation	Durability, exchangeability, earthquake-resistance	CERN, US + industry-academia efforts

Report is available from
https://www.kek.jp/ja/newsroom/2019/10/02/1000/
Based on this, the IDT-WG2 discussed the issues.

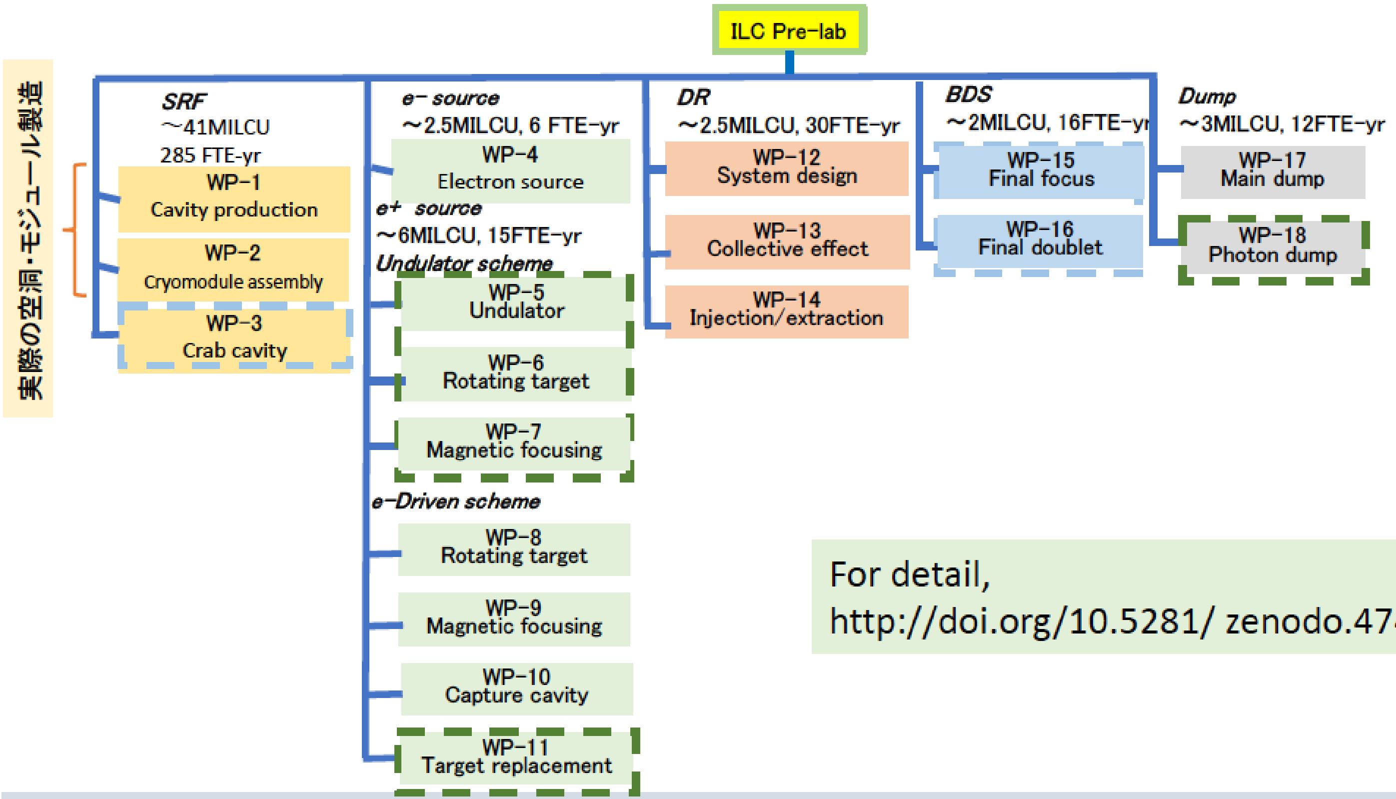


Shin Michizono, IDT WG2 Meeting, 24.8.2021

Technical preparation

(c) WPs Draft

The IDT−WG2 discussed the technical issues pointed out by the MEXT advisory panel and the Science Council of Japan (SCJ), and summarized them in the "Technical Proposal Document" (TPD).



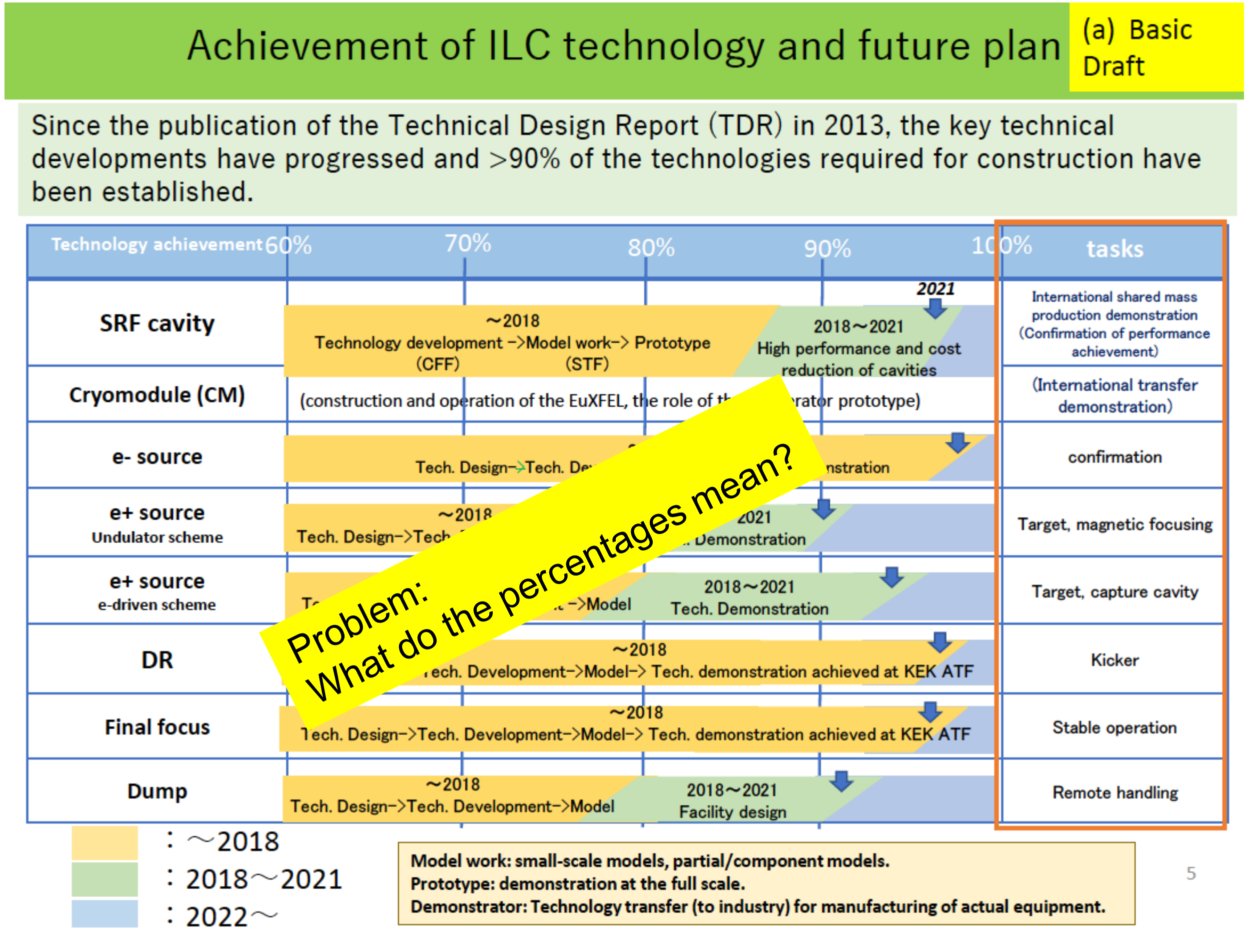
For detail,
http://doi.org/10.5281/ zenodo.4742018

- The technical proposal was reviewed by a review committee (chair:Tor Raubenheimer (Director of Accelerator Division, SLAC National Accelerator Laboratory).
- The total global cost of the project is about 60 MILCU* and about 360 FTE−year. (This does not include the cost of the infrastructure for the WPs.)
- The cost will be shared internationally as in−kind contribution.

Shin Michizono, IDT WG2 Meeting, 24.8.2021

Technological Readiness: First draft

Shin Michizono, IDT WG2 Meeting, 24.8.2021



Discussion: Use Technology Readiness Levels?

Technology Readiness Level

Rel. Level	TRL	DOE (US)	Horison2020 (EU)	ILC (proposed)	SRF	Others
Basic technology research	1	- Basic principle observed and reported	**Basic principle** observed and reported	GDE (Global Design Effort for TDR)	技術選択：Technology selection 概念設計： Reference design → 技術・コストレビュー： Technology & Cost Estimate Review → **RDR** (Reference Design Report)	
	2	- Technology concept and/or application formulated CD0	**Technology concept** formulated			
Research to prove feasibility	3	- Analytical and exp. critical function and/or charact. **proof of concept**	Experimental **proof of concept**		技術設計： Technical design 要素技術開発： Component development 要素・モデルワーク: Comp. model-work → 技術・コストレビュー： Technology and Cost-Estimate Review → **TDR** (Technical Design Report)	
Technology development	4	- Component and/or system validation in Lab. environment. CD1	Technology **validation in Lab**.			
	5	- Lab-scale, similar system validation in relevant env., (industry ,,) CD2	Technology **validated** in relevant environment (**industrially** relevant,,,)	LCC—IDT	要素技術実証 Component technology validation Comp. Prototype	
Technology demonstration	6	- Engineering pilot-scale, similar (prototypical) system validation in rel. env.(industry ,,,) CD3	Technology **demonstrated** in relevant environment (**industrially** relevant ,,,)	LCC—IDT / Pre-Lab	加速器での実証 → **Eu-XFEL** **国際分担・量産技術、国際移送・性能実証** Prod. Readiness, Trans.	加速器での実証 → **KEK-ATF & Others** **課題技術実証** Tech. Readiness
System commissioning	7	- Full-scale, similar (prototypical) system demonstrated in a relevant environment	**System prototype** demonstration in operational environment	Construction	工業化プレシリーズ Industrial Pre-series 量産 Mass production 組み込み Installation コミッショニング Commissioning	システムプロト実証、 System Prototoype 建設 Construction 組み込み Installation コミッショニング Commissioning
	8	- Actual system completed and qualified through test & demonstration CD4	**System completed** and qualified			
System operation	9	- Actual system operated over the full range of expected condition	Actual **system** proven in **operational** environment (competitive manufacturing ,,,)	Operatio	加速器運転・物理実験 Acc. Operation and Physics	

5

…Probably not:
- Not common in Japan
- Assessment is a separate nontrivial task
- Go for a graphical “progress bar” without explicit quantification -> in preparation

DOE G 413.3-4A
https://www.directives.doe.gov/terms_definitions/technology-readiness-level
Horizon2020 TRL
https://ec.europa.eu/research/participants/data/ref/h2020/other/wp/2018-2020/annexes/h2020-wp1820-annex-g-trl_en.pdf

ILCX

- Planing on accelerator side just beginning
- No dedicated accelerator plenary envisaged
- Topical workshops in parallel to physics plenaries (not decided yet):
  - Crab cavities
  - Cryomodule design workshop
- Sources session under consideration
- BDS/DR/Dump and CFS: Joint sessions with MDI
- Green ILC Session