

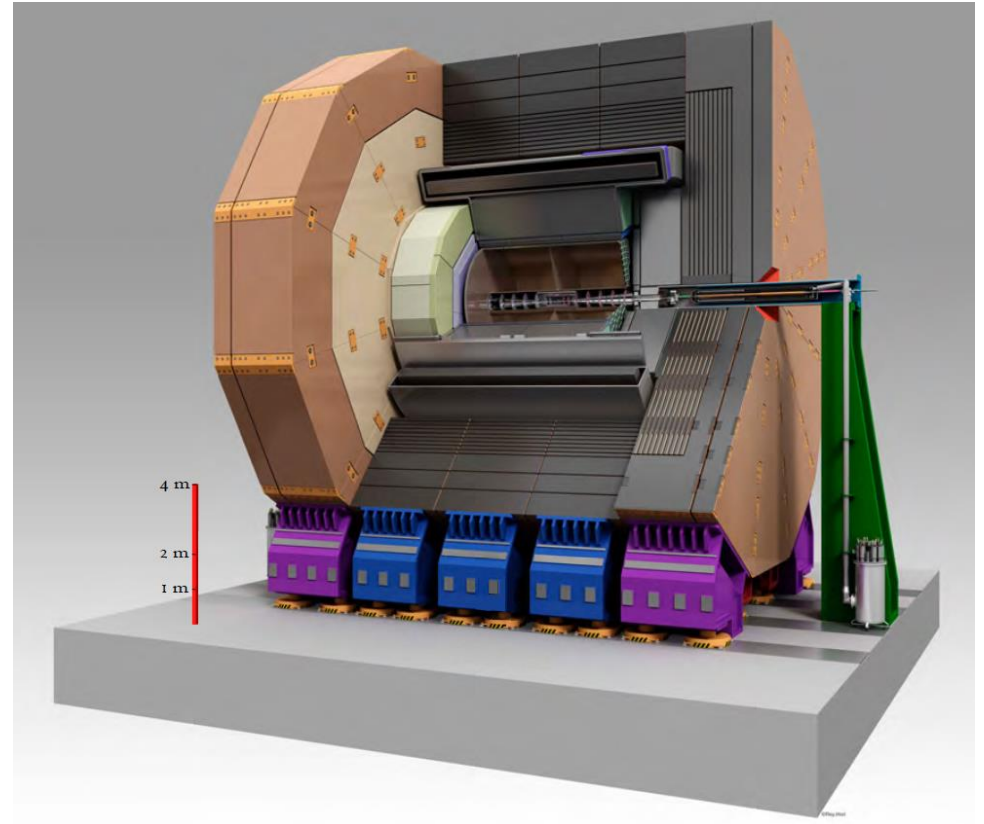


# Report status and news

Kiyotomo Kawagoe  
Ties Behnke

5.12.2023

ILD group meeting



# Agenda



## ILD group meeting

 Tuesday 5 Dec 2023, 14:00 → 15:30 Europe/Berlin

**Description** Zoom link: <https://desy.zoom.us/j/65521775393?pwd=S3B6eGxRNGQ1NnozZ205Tm9Sb2FRQT09>

Meeting ID: 655 2177 5393

Passcode: ILD

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**14:00** → 14:30 **Introduction/ news**

**Speakers:** Kiyotomo Kawagoe (Kyushu University), Ties Behnke

**14:30** → 15:00 **Report from ILD@Japan**

**Speaker:** Shinya Narita (Iwate University (JP))

# ILD meeting in January



Goal:

1. Take stock of ILD as a group and ILD as a detector concept
2. Discuss new developments in hardware and software and analysis
3. Discuss how ILD can best contribute to other collider studies:
  1. FCC
  2. CEPS
  3. HALHF
  4. Others
4. Discuss in general the future of ILD

# ILD meeting schedule



13:00	<b>Welcome, Status of ILD</b> <i>CERN</i>	<i>Kiyotomo Kawagoe et al.</i> 13:00 - 13:30
	<b>Experimentation at the FCC-ee: Challenges and Opportunities</b> <i>CERN</i>	13:30 - 14:00
14:00	<b>Experimentation at an asymmetric Higgs factory</b> <i>CERN</i>	<i>Antoine Laudrain</i> 14:00 - 14:30
	<b>IDT news</b> <i>CERN</i>	<i>Steinar Stapnes</i> 14:30 - 15:00

# ILD meeting schedule



	<b>An ILD detector variant at CEPC</b>	<i>Manqi RUAN</i>
	<i>CERN</i>	08:30 - 09:00
09:00	<b>CLD: A detector for the FCC-ee</b>	
	<i>CERN</i>	09:00 - 09:30
10:00	<b>Coffee break</b>	
	<i>CERN</i>	10:00 - 10:30
11:00	<b>Plenary: Software and Analysis Tools</b>	
	<i>CERN</i>	10:30 - 12:00
12:00	<b>Linking ILD to the DRD Organisation</b>	<i>Didier Contardo</i>
	<i>CERN</i>	12:00 - 12:20

# ILD meeting schedule



	<b>ECFA Focus topics/ ILD Involvement</b>	
	<i>CERN</i>	08:30 - 09:00
09:00	<b>Priorities for the future analyses in ILD</b>	
	<i>CERN</i>	09:00 - 09:30
	<b>Highlights</b>	
	<i>CERN</i>	09:30 - 10:00
10:00		
	<b>Coffee break</b>	
	<i>CERN</i>	10:30 - 11:00
11:00	<b>Plenary: ILD organisation: Interface to other Higgs factory initiatives</b>	
	<i>CERN</i>	11:00 - 11:45
12:00	<b>Plenary: The Future of ILD: discussion</b>	
13:00	<i>CERN</i>	11:45 - 13:15

# ICFA Seminar



13th ICFA Seminar on  
**Future Perspectives in High-Energy Physics**

28 November – 1 December 2023  
DESY, Hamburg



Seminar organized every 3-5 years, at different places around the world, by ICFA  
Attendance by invitation, 2023 218 participants, including many lab directors and  
representatives of funding agencies.







# Schedule



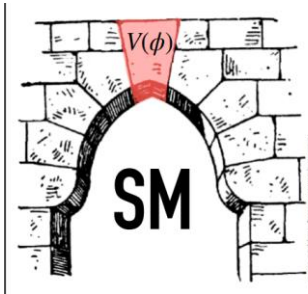
	Electroweak physics at the LHC (Including top mass and top properties)	Qiang Li	09:15 - 09:40
	Characterizing the Higgs boson - present and future	Sarah Helm	09:40 - 10:05
10:00	Searches for BSM Higgs bosons and di-Higgs production	Roger Wolf	10:05 - 10:30
	Higgs theory perspective	Daniel de Florian	10:30 - 10:55
11:00	Coffee break		11:00 - 11:30
	The Theory Landscape of Dark Matter	Yonit Hochberg	11:30 - 11:55
12:00	Status of WIMP Searches: from deep underground and the sky	Jianglai Liu	11:55 - 12:20
	Searches for axions and other low-mass dark matter candidates	Axel Lindner	12:20 - 12:45

Broad survey of the field

- Current status
- Future initiatives
- Main directions of the fields

Talks and  
round table discussion

# Where are we going?



the Higgs potential



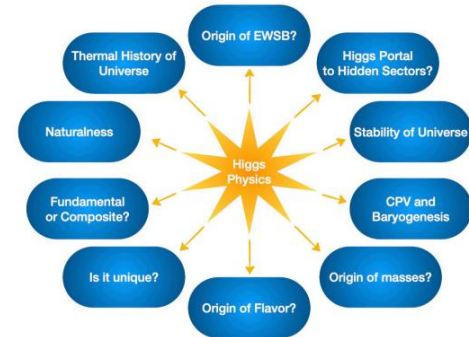
*Dear Santa Claus,*

*We have been good these past decades. Please could you now bring us*

- a dark matter candidate
- an explanation for the fermion masses
- an explanation of matter-antimatter asymmetry
- an axion, to solve the strong CP problem
- a solution to fine tuning the EW scale
- a solution to fine tuning the cosmological constant

*Thank you, Particle Physicists*

*ps: please, no anthropics*



At any future collider:

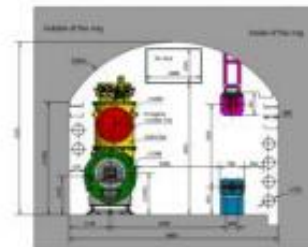
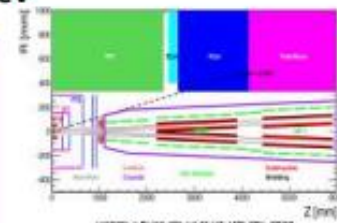
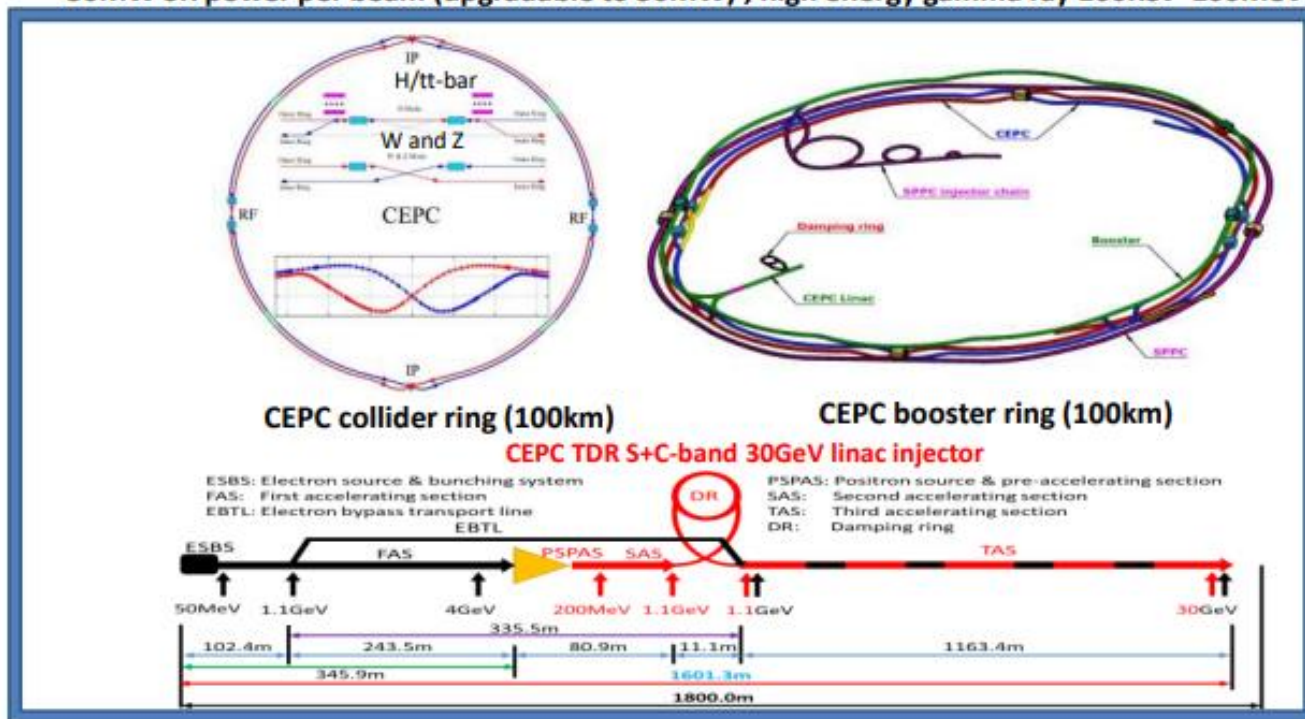
“The guaranteed discovery: The Higgs Potential”

# CEPC Status: reported by J. Gao

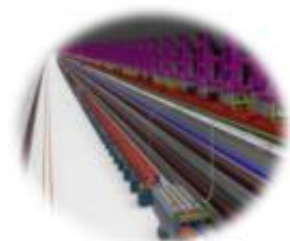


## CEPC Higgs Factory and SppC Layout in TDR

CEPC as a Higgs Factory: H, W, Z, upgradable to ttbar, followed by a SppC (a Hadron collider) ~125TeV  
 30MW SR power per beam (upgradable to 50MW), high energy gamma ray 100Kev~100MeV



CEPC Civil Engineering





# CEPC Project Development towards Construction

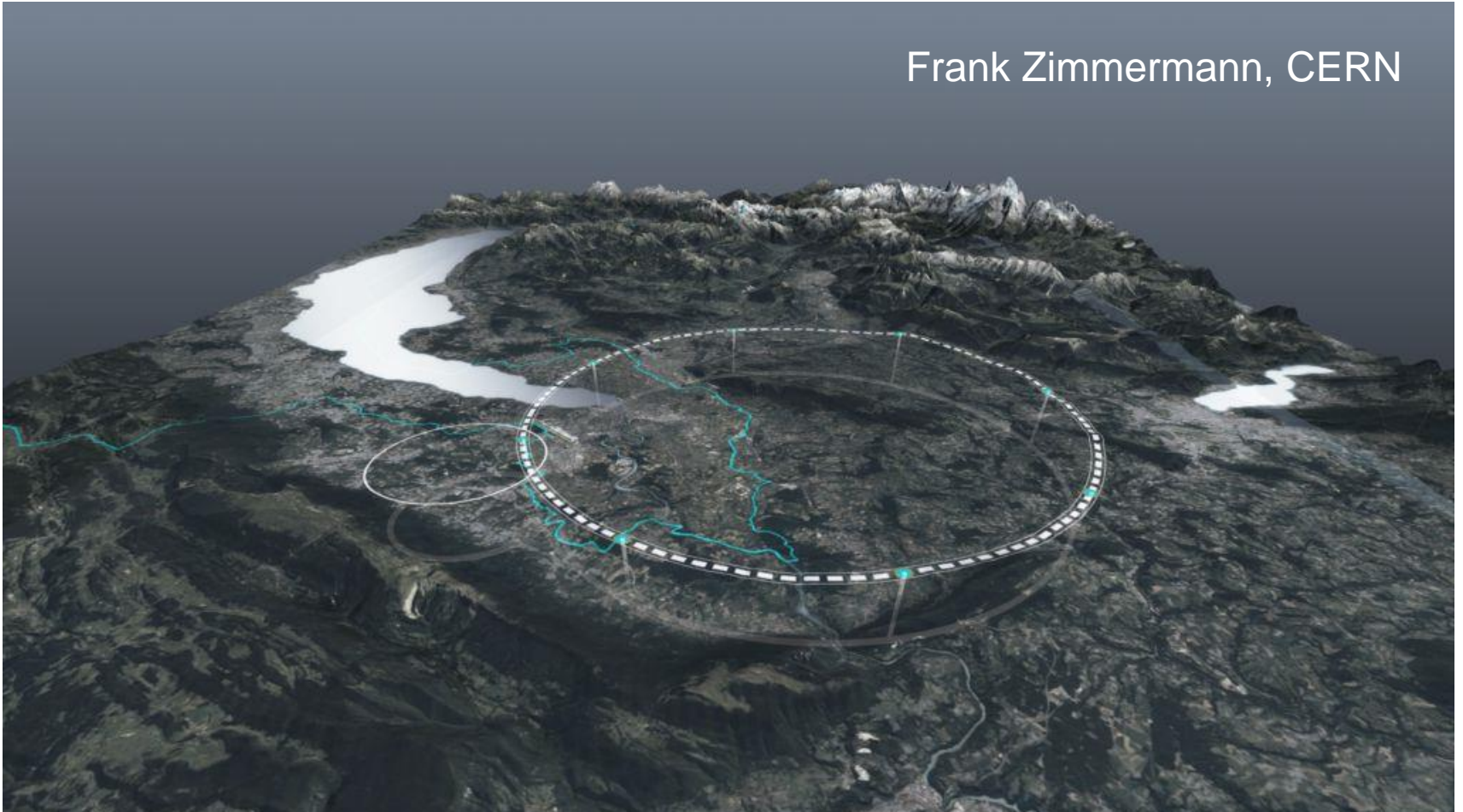
- **TDR has been completed** (review + revision) to be **formally released at the end of Dec. 2023**
- **CAS is planning for the 15<sup>th</sup> 5-years plan for large science projects**, and a steering committee has been established, **chaired by the president of CAS**
- **High energy physics and nuclear physics**, as one of the 8 groups, has been working on this for a year:
  - Setting up rules and the standard (based on scientific and technological merits, strategic value and feasibility, R&D status, team and capabilities, etc.), established domestic and international advisory committees
  - Collected 15 proposals and selected 9, based on the above-mentioned standard
  - Evaluations and ranking by committees after oral presentations by each project
- **CEPC is ranked No. 1, with the smallest uncertainties, by every committee**
- **A final report has been submitted to CAS for consideration**





# CERN Future Circular Collider Study

Frank Zimmermann, CERN



# FCC timeline: technically driven



Frank Zimmermann, CERN

<b>2025-2026</b>	<b>Permits and authorization for complementary site investigations</b>
	Tendering for environmental impact and <u>authorisation</u> processes contract, tendering for subsurface investigations
<b>2027-28</b>	<b>Complementary subsurface investigations</b>
	Tendering for CE consultants, environmental impact studies, public concertation
<b>2028</b>	<b>Project approval</b>
	Award of CE consultant contracts
<b>2029-30</b>	<b>Tender design</b>
	Preparing calls for tenders for CE construction, Project <u>authorisations</u> in France and Switzerland obtained, preparations of infrastructures for construction
<b>2031 mid 2032</b>	<b>Construction design, Tendering for construction</b>
<b>mid 2032</b>	<b>Award of CE construction contracts</b>
	Preparation of site completed (road access, electricity, water...)
<b>2033</b>	<b>Ground breaking</b>



# Steinar Stapnes on Linear Colliders

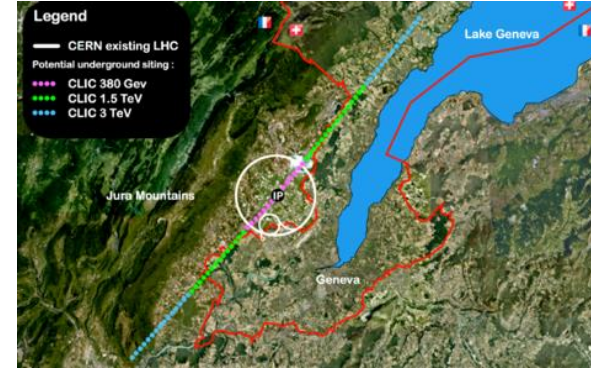
## ILC in Japan



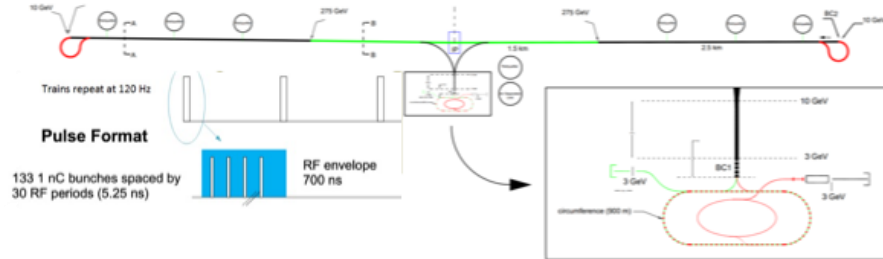
### Initially $e^+e^-$ collisions at least at 250 GeV

- Linear colliders: 11 (Higgs)  $\rightarrow$  50 (max) km for higher energies later
- Four different RF solutions drive the designs

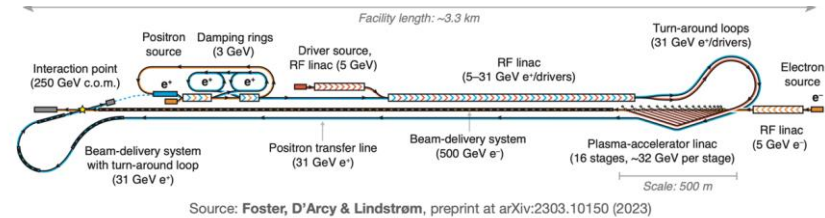
## CLIC at CERN



## C3 - US based study (initially)



## HALHF – anywhere



- > Overall length:  $\sim 3.3$  km  $\Rightarrow$  fits in **~any major particle-physics lab**
- > Length dominated by  $e^-$  beam-delivery system

# Steinar: An adaptable e+e- LC facility for the world



A LC facility can be extended in length for higher energies, using the same or improved versions of the same technology, e.g. as suggested for ILC, CLIC, C3 and HALHF.

- It is also possible and realistic to change to more performant (usually higher gradient) technologies in an upgrade, e.g. from ILC to CLIC or C3, maybe even plasma
- Starting point for fast implementation: ILC has the most mature linac technology for large scale implementation, that is also well established in all regions and in industry - it is based on a 20-21km long and ~9-10m wide tunnel
- The physics at higher energies – Higgs sector and extended models with increased reach and precision, top in detail well above threshold, searches and hopefully new physics – will open for a very exciting long term e+e- programme
- Such a programme can run in parallel with future hadron and/or muon colliders that can be developed, optimised and implemented as their key technologies mature

# Strategy discussion



Round table discussion:

- Fabiola Gianotti (CERN)
- Shoji Asai (KEK)
- Jifang Wang (IHEP)
- Lia Meringa (FNAL)
- Moderators Ursula Bassler, Nigel Smith



CERN clearly put its priority on FCC (ee and hh)

KEK continues to push for ILC@Japan

China pushes CEPC, is actively lobbying for international participation (but there is no junctim on international participation)

US is relatively open on collider discussions, no very clear position (but P5 recommendation will come our Dec 8)

# Conclusion



A strategy for the next decade(s) in particle physics is taking shape

Currently a lot of emphasis is put on circular colliders, but other options are not off the table

A decision on where to go

- Within science will happen within the next few years (P5, ESP, ...)
- It is not clear how politics will follow
- ILD can make very important contributions to detectors and science at these new facilities

# Outlook



**NO** ILD group meeting in January

ILD in-person/ hybrid meeting at CERN **Jan 15-17**

ILD group meeting on **February 6, 14:00** hours Paris time