



DIRECTOR'S CORNER

The IDT's Physics and Detector Working Group after Snowmass

A Director's Corner by Jenny List, new chair of the working group

by Jenny List



The International Development Team has a new member: Jenny List from DESY has taken over the leadership of the Physics and Detector Working Group. In her first Corner, she describes the changing future collider landscape and calls for a readjustment of the priorities and the role of the Physics and Detector community. State-of-the-art technologies and excellent software are essential for any future project, but a sharpened physics case for a Higgs factory is just as essential, she says.

FEATURE

We need to talk: ILD checks performance at other Higgs factory proposals than ILC

New detector concept strategy identifies work programme for the near future

by Barbara Warmbein



One thing is pretty certain: the next big machine in particle physics is most likely going to be an electron-positron "Higgs factory" collider. What is not so certain is which of the different collider options currently being considered will be realised. The ILD collaboration, creator of one of the two detector concepts for the International Linear Collider (ILC), is now checking how ILD would perform at different colliders than ILC, and is deepening collaborations with these collider concepts. ILD released its strategy in September.

AROUND THE WORLD

Sakue Yamada received Japanese Order of Merit



Congratulations to Sakue Yamada, the ILC's former Research Director, who was decorated by the Japanese government for outstanding achievement in scientific research.

IN THE NEWS

from *CERN Courier*

7 November

Charting the future of US particle physics

In the energy frontier, a global consensus for an e+e- Higgs factory as the next collider has been reaffirmed. While some options (e.g. the International Linear Collider) have mature designs, other options (such as FCC-ee, C3, HELEN and CLIC) require further R&D to understand if they are viable.

from *nature*

3 November 2022

What's the carbon footprint of a Higgs boson? It varies — a lot

Patrick Janot at CERN and Alain Blondel, a particle physicist at the University of Geneva, used published details of five leading 'Higgs factory' designs to calculate the energy consumption per Higgs boson for each. As well as the FCC and China's proposed Circular Electron Positron Collider (CEPC), they looked at three proposals for linear colliders: a long-planned International Linear Collider (ILC) in Japan, CERN's own Compact Linear Collider (CLIC) and the Cool Copper Collider (C3), a compact US-based accelerator.

from *Iwate Nippo*

3 November

ILC推進へ国際連携深化を要望 超党派議連、文科相に決議文提出

国際リニアコライダー(ILC)の誘致に取り組む超党派のリニアコライダー国際研究所建設推進議員連盟(会長・塩谷立衆院議員)は2日、永岡桂子文部科学相に対し、計画推進に向けて国際連携をさらに深めるよう要望した。

from *NDR*

3 November

DESY: Auf der Spur der Elementarteilchen

Dort entdeckten Forscher im Jahr 2012 das lang gesuchte Higgs-Teilchen. Auch an dem Zukunftsprojekt International Linear Collider ILC, einem Linearbeschleuniger, der unter anderem das Higgs-Teilchen näher untersuchen soll, arbeitet das DESY mit. Allerdings steht die endgültige Entscheidung, ob dieses Projekt verwirklicht wird, derzeit noch aus.

from *AIP*

28 September

US Particle Physicists Look to Future at 'Snowmass' Meeting

The most technically ready design is the International Linear Collider (ILC), which would start at 250 gigaelectronvolts and could be extended to one teraelectronvolt. The project has been in limbo for years, with Japan as host waiting for financial commitments from international partners, and potential partners — including the U.S. — waiting for Japan to proceed with the project.

from *Astronomy*

25 October

Podcast: How particle accelerators came to be

This Higgs machine would be a linear collider around 20 kilometers in length. There's an ongoing debate about which country might have the resources to host it

from *Nikkei*

18 October

経団連と東北経済連合会、科学技術で連携強化

経団連と東北経済連合会(東経連)は18日、仙台市で経済懇談会を開き、科学技術分野の連携を強化する共同宣言をまとめた。——共同宣言では次世代放射光施設「ナノテラス」に加え、国際熱核融合実験炉(ITER)関連、福島イノベーション・コースト構想、次世代加速器「国際リニアコライダー(ILC)」の推進支援を掲げた。

from *Iwate Nippo*

14 October

概算要求倍額を評価 推進議連で国際チーム中田達也議長

国際リニアコライダーの日本誘致を推進する超党派のリニアコライダー国際研究所建設推進議員連盟(会長・塩谷立衆院議員)は13日、国会内で総会を開き、ILC国際推進チームの中田達也議長が講演した。文部科学省が2023年度予算の概算要求でILCに関連し前年度当初予算から倍増の9億7千万円を盛り込んだことについて、中田氏は「倍というのはインパクトが大きい」と期待感を示した。

from *Physics*

6 October

A "Retro" Collider Design for a Higgs Factory

But an outsider might wonder why another Higgs-factory proposal is being added to the particle-physics menu. A similar factory design—the International Linear Collider (ILC)—has been in the works for years, but that project is presently stalled, as the Japanese government has not yet confirmed its support for building the facility in Japan. Waiting in the wings are several other large particle-physics proposals, including CERN's Future Circular Collider and China's Circular Electron Positron Collider.

from *Physics Today*

October 2022

US particle physicists envision future of the field

The most technically ready design is the International Linear Collider (ILC), which would start at 250 GeV and could be extended to 1 TeV. The project has been in limbo for years, with Japan as host waiting for financial commitments from international partners, and potential partners—including the US—waiting for Japan to proceed with the project

from *Physics World*

13 September

CERN's proposed 100 km-circumference 'Higgs factory' has lower environmental impact than competing designs, finds study

There are currently five proposals for a high-energy positron–electron collider, with the International Linear Collider (ILC) in Japan, the Cool Copper Collider (C3) in the US and the Compact Linear Collider at CERN all based on linear accelerators. The FCC and the China Electron Positron Collider (CEPC) in China, meanwhile, are circular colliders.

from *Kopalnia Wiedzy*

14 September

100-kilometrowa „fabryka bozonów” z CERN mniej obciąża środowisko niż inne akceleratory

Międzynarodowa społeczność fizyków zastanawia się obecnie nad budową trzech akceleratorów liniowych – International Linear Collider (ILC) w Japonii, Cool Copper Collider (C3) w USA oraz Compact Linear Collider w CERN – i dwóch kołowych – FCC i China Electron Positron Collider (CEPC) w Chinach. Naukowcy podają argumenty za konkretnymi rozwiązaniami, a Janot i Blondel postulują, by “w przyszłych projektach z dziedziny fizyki wysokich energii uwzględnić nie tylko koszt i wydajność akceleratora, ale również jego ślad węglowy na każdy uzyskany wynik naukowy”, stwierdzają naukowcy.

from *Scientific American*

8 September

Physicists Struggle to Unite around Future Plans

The nearest-term possibility for such a Higgs factory is the International Linear Collider, which would be built in Japan. Though it is shovel-ready, the project has been delayed for years, and in February it was dealt another, possibly fatal blow when the Japanese government refused to allow it to go forward.

from *Stony Brook Univ. News*

7 September

Nobel Laureate Barry Barish Appointed Stony Brook University President's Distinguished Endowed Chair in Physics

From 2005 to 2013 Barish was director of the Global Design Effort of the International Linear Collider (ILC), a proposed 31-kilometer- (19-mile-) long linear particle accelerator. The ILC is the highest priority future project for particle physics worldwide.

from *Iwate Nippo*

31 August

I L C 関連予算9.7億円要求 文科省来年度

文部科学省は30日、2023年度予算の概算要求を発表し、国際リニアコライダー（ILC）の関連で22年度当初予算から倍増の9億7千万円を盛り込んだ。先端加速器の性能向上に向け、海外研究機関との技術開発を着実に進める。

from *Prospect*

29 August

Is particle physics at a dead end?

Meanwhile, some researchers hope that plans for a large international project, the International Linear Collider (ILC), spearheaded by physicists in Japan, might also go forward. Rather than moving in circles, the particles in the ILC (electrons and positrons) would be accelerated in a straight line along two 20km accelerators before being smashed together. “The ILC technology is now ready and proven,” says Suzie Sheehy, an accelerator physicist at the Universities of Oxford and Melbourne.

from *NHK*

16 August

秋葉復興大臣 就任後岩手県初訪問 知事と震災復興で意見交換

今月10日の内閣改造で初入閣した秋葉賢也復興大臣が就任後初めて岩手県を訪れ、達増知事と震災からの復興について意見を交わしました。—▽漁業や水産加工業の状況や、▽岩手県が取り組んでいるILC=国際リニアコライダーの誘致について意見が交わされたということです。

PREPRINTS

ARXIV PREPRINTS

[2210.14639](#)

Stau searches and measurements with the ILD concept at the International Linear Collider

[2210.08690](#)

The potential of the ILC beam dump for high-intensity and large-area irradiation field with atmospheric-like neutrons and muons

[2209.07565](#)

Probing light dark sector at future lepton colliders via (dark) Higgs invisible decays

[2209.05827](#)

Accelerators for Electroweak Physics and Higgs Boson Studies

[2209.03281](#)

Center-of-mass energy determination using $e^+e^- \rightarrow \mu^+\mu^- (\gamma)$ events at future e^+e^- colliders

[2208.14466](#)

The trap in the early Universe: impact on the interplay between gravitational waves and LHC physics in the 2HDM

[2208.12368](#)

RF Accelerator Technology R&D: Report of AF7-rf Topical Group to Snowmass 2021

[2208.10466](#)

The carbon footprint of proposed e^+e^- Higgs factories

[2208.06286](#)

Simulated Lorentz Force Detuning Compensation With A Double Lever Tuner On A Dressed ILC/1.3 GHZ Cavity At Room Temperature

[2208.05452](#)

Double Higgs production at TeV e^+e^- colliders with Effective Field Theories: sensitivity to BSM Higgs couplings

DIRECTOR'S CORNER

The IDT's Physics and Detector Working Group after Snowmass

A Director's Corner by Jenny List, new chair of the working group

[Jenny List](#) | [17 November 2022](#)

Recently, Hitoshi Murayama has been appointed as chair of the next Particle Physics Project Prioritization Panel in the US, and therefore stepped down from his role as chair of the Physics and Detector Working Group of the International Development Team, also known as IDT-WG3. I would like to express my deep gratitude to Hitoshi for all his contributions to the IDT and to formulating and communicating the ILC's science case – and wish him the best success with the new challenges ahead! At the same time, Claude Vallée wished to end his term. I would also like to thank Claude for the close and enjoyable collaboration during our joint time as deputy chairs.



Participants of the ECFA workshop on Higgs, electroweak and top factories. Image: DESY

Now I am very happy to welcome three new members: Carsten Hensel from the CPBF in Rio de Janeiro, Brasil, joins the Speaker's Bureau, and Shinya Narita from Iwate University, Japan, and Jinlong Zhang from Argonne National Lab, US, strengthen the Detector and Technology R&D group. The role of the deputy WG3 chairs will be taken jointly by Michael Peskin for the Physics Opportunities group, Daniel Jeans for the Software and Computing group, Roman Pöschl for the MDI group and Jinlong Zhang for the Detector and Technology R&D group. I look forward to collaborating even more closely with all of them!

After the end of the Snowmass community study in the US, to which CEPC, CLIC, FCCee and ILC submitted strong reports, and with the work of the ECFA Higgs Factory study in Europe gaining momentum, it is now time to re-adjust the IDT-WG3's role and priorities. The landscape for e^+e^- Higgs factories is evolving: the conclusions of the Snowmass Energy Frontier report highlight the need to build a Higgs Factory as soon as possible. New Higgs factory technology proposals have been put forward, most prominently C^3 (the "cool copper collider"). These new proposals still require fundamental R&D. In Japan, the ILC-Japan organisation has been broadening the community involved in ILC, encouraged by a potential doubling of the KEK ILC R&D budget in the next fiscal year. CERN is investing in the FCC feasibility study, emphasising FCCee, a large circular e^+e^- collider, that after an electroweak precision physics programme would evolve into a Higgs factory. Beyond the individual projects, the ECFA detector R&D roadmap is being implemented by new R&D collaborations at CERN, and the ECFA Higgs Factory study is fostering work on science questions common to all Higgs factory proposals, including analysis methods and detector aspects.

What should be the priorities for IDT-WG3 in this complex landscape? Certainly, we need to share the knowledge that we have gained in many years of research on linear colliders and ILC, and we need to strengthen the support for a Higgs factory in our community, especially among early-career researchers around the globe. Taking over from the Snowmass process in the US, the ECFA Higgs factory study provides an important forum in which we should engage. The pros and cons of the various projects need to be discussed on scientific grounds, without retreating to political and strategic arguments outside the realm of science too quickly – and at the same time emphasising the great opportunities offered by *all* Higgs factory proposals.

Pushing the boundaries of detector technologies or developing sophisticated software algorithms based on human and machine intelligence offer lots of exciting research opportunities relevant beyond a single future collider project. Especially in the current difficult times with scarcer resources than ever, we must take on the challenge to realise investments in our future – at an appropriate level. This, however, requires even more effort to sharpen our scientific case and to communicate it to colleagues in other fields of science, to policy makers and society. Just “higher precision” is not a sufficient argument – we need to tell exciting stories about the huge fundamental questions of our universe, in an easily understandable and appealing way.

Today, we do not yet know whether an ILC in Japan will be realised. But we do know that the Higgs boson is our spaceship to boldly go where no human has gone before in exploring the origin of the universe and of our own existence – and that we need an e^+e^- collider as its warp drive. Let’s engage and make it happen!

[INTERNATIONAL DEVELOPMENT TEAM](#) | [P5](#) | [PHYSICS AND DETECTORS](#) | [SNOWMASS](#) | [WG3](#)

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FEATURE

We need to talk: ILD checks performance at other Higgs factory proposals than ILC

New detector concept strategy identifies work programme for the near future

[Barbara Warmbein](#) | [17 November 2022](#)

One thing is pretty certain: the next big machine in particle physics is most likely going to be an electron-positron “Higgs factory” collider. What is not so certain is which of the different collider options currently being considered will be realised. The ILD collaboration, creator of one of the two detector concepts for the International Linear Collider (ILC), is now checking how ILD would perform at different colliders than ILC, and is deepening collaborations with these collider concepts. ILD released its strategy in September.



Members of the ILD collaboration at their recent meeting in Hamburg, Germany.

ILD’s deep roots in the world of the ILC are not only evident from its name (ILD stands for “International Large Detector”), but from its fundamental design. From the very start, ILD has been optimised for the ILC environment, with collision energies of up to 1 TeV, a power-pulsing scheme adapted to the ILC’s bunch train beam structure, and an overall focus on complete particle and event reconstruction in the particle flow concept, down to very small angles. The collaboration stresses that it continues to be convinced that ILC is the technically most construction-ready option for a Higgs factory currently under consideration, and that ILC will remain at the core of ILD. However, it recognises the importance to make the case for a Higgs factory more globally, and to demonstrate experimental capabilities independent of a particular collider technology. As stated in the ILD Strategy Document, “We are interested in a detector which can deliver the science, independent of where this experiment could take place.”

“The ILD concept we have proposed in the design report is the result of a large amount of work on designing a detector and understanding its performance. It is essentially ready to be built, should the ILC move forward,” says ILD spokesperson Ties Behnke from DESY in Germany. “ILD however is not static. It is a platform for new technological developments, and is constantly evolving to push detector technologies for Higgs factories forward. We are now looking at aspects of the ILD concept which might need to be changed, should ILD operate at other Higgs factory colliders.”

The other electron-positron (e+e-) Higgs factory options on the table are the compact linear collider CLIC, the Future Circular Collider at CERN in the e+e- configuration, FCC-ee, and the Circular Electron Positron Collider CEPC – or even newer proposals like the Cool Copper Collider. “ILD could contribute unique expertise to many aspects of these proposals. Already in the past collaboration among detector developers has been strong, so we are by no means starting from scratch,” says Behnke.

The desired outcomes of this work programme are concrete developments on how specific aspects of ILD and technologies used in ILD could be applied to non-ILC concepts. Eventually detector variants of ILD could be developed, which would ensure that ILD would deliver the same performance at a different collider “With the rather generic software suite ILD has developed and its strong involvement in the global key4hep software initiative, ILD is very well placed to move quickly and decisively,” says Daniel Jeans (KEK), who is software coordinator of ILD together with Frank Gaede (DESY) and chair of the ILD institute assembly, which recently approved the new strategy.

The tracking region is one of the areas identified for further study. The very forward tracking region in particular, a region near the beampipe and the collision point, is very different from collider to collider and poses very different challenges. Here major adjustments of the ILD concept will be needed, to operate ILD e.g. at the FCC-ee.

A key component of the ILD is a large-volume time projection chamber, which, combined with an advanced silicon tracker, offers excellent tracking performance and in addition good particle identification capabilities. Whether such a TPC could operate at the other collider options needs to be studied in detail, and might well require rather different technical solutions.

Another challenge is the bunch structure. The ILC beam comes in bunch trains, which leaves time for the detector systems to be switched off between bunches in order to save power and reduce subdetectors’ cooling requirements. At a circular collider beam bunches come in a continuous stream, so ILD has to rethink its approach to thermal management, while minimising additional in-active material, which would compromise the precision of the detector.

Particle flow remains the central design element of the ILD detector. Its performance is closely tied to aspects of the detector like granularity, tracker performance, and overall hermeticity of the detector. All of these aspects might be rather different at different collider options, and the degree to which these changes impact the eventual science delivered by the experiment needs careful scrutiny.

ILD profits from a well-developed collaboration structure and a well-developed suite of software tools and algorithms, which allow the group to do sophisticated and reliable studies of the detector performance rather quickly.

After agreeing internally on its new strategy, ILD is now actively reaching out to detector concept groups at other collider options, aiming to establish cooperation. The strategy was for the first time publicly presented at the recent ECFA meeting on Higgs/ Top/ EW factories at DESY in Hamburg.

[DETECTOR CONCEPTS](#) | [DETECTOR R&D](#) | [FCC](#) | [HIGGS FACTORY](#) | [ILD](#)

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AROUND THE WORLD

Sakue Yamada received Japanese Order of Merit

I want the ILC! by Sakue Yamada #mylinearcollider



Yamada's message for the ILC videotaped for [#mylinearcollider campaign](#), in which scientists around the world expressed their support for the ILC project

On 3 November, the Japanese government announced the recipients of the Autumn Conferment of Decoration, and Sakue Yamada, Professor Emeritus of KEK, Professor Emeritus of The University of Tokyo, and former Research Director for Global Design Effort for the ILC, received [the Order of the Sacred Treasure](#), Gold Rays with Rosette in the 2022 Fall Decoration.

The Order of the Sacred Treasure, Gold Rays with Rosette is one of the Japanese orders of merit. It is given to individuals who have performed duties that are recognised as important and have achieved high performance, based on an evaluation of the complexity, difficulty, and level of responsibility of their public duties. Yamada received the Order for distinguished service in the field of education and research.

Congratulations, Sakue!

PROF. SAKUE YAMADA

After graduating in physics from the University of Tokyo under the supervision of [Prof. Masatoshi Koshihira](#), Nobel laureate in physics in 2002, Yamada mainly worked in particle physics research in collaborations at DESY using its colliders DORIS, PETRA and HERA, as well as LEP at CERN during the detector design period. Yamada acted as Director of Institute of Particle and Nuclear Studies (IPNS) of KEK from 1997 to 2003. As the first IPNS Director, he played a leading role in achieving world-class results in the proton synchrotron and international joint-use experiments at KEKB, as well as in fostering young researchers by establishing the Department of Particle and Nuclear Science at [the Graduate University for Advanced Studies \(SOKENDAI\)](#). He also played a significant role in ILC activities as the Research Director from 2007, completing the Technical Design Report in 2012 together with the then GDE Director, Barry Barish.

