ilc newsline

DIRECTOR'S CORNER

Snowmass is rebooting

by Andy Lankford

Now is the time to get involved in the strategic process that determines the future of particle physics in the US: Snowmass. “Have your say in the future of the field”, writes Andy Lankford, for example by contributing to the white paper or attending the central meeting. It is an opportunity to show the breadth of scientific possibilities the ILC has in store.

AROUND THE WORLD

ILC-Japan: rebuilding trust and support for the ILC

by Rika Takahashi

ILC-Japan, a new promoting body for the International Linear Collider project, was launched this spring. ILC NewsLine interviewed Shoji Asai, chair of ILC-Japan, to learn more about it.

FEATURE

Thinking outside the tunnel

by Barbara Warmbein

Hitoshi Murayama likes crazy ideas. Especially when they are exactly the right amount of crazy to just possibly be turned into a reality. He asked the wider community to present exactly those kinds of ideas for the recent ILCX meeting – here’s an overview of what was discussed.

IN THE NEWS

from *Iwate Nichi Nichi*
27 October 2021
宇宙の成り立ち研究　鈴木厚人氏（岩手県立大学長）　素粒子物理学切り開く
県立大学長の鈴木厚人氏の文化功労者受賞決定を受け滝沢市の同大では26日、鈴木氏に花束を贈るなどして集まった学生とともに祝福した。ILCに関しては「世界中が注目している。研究分野以外でも日本の先進的な取り組みの発端になると思うので、何とか日本への建設を実現したい」と改めて意欲を示した。

from *Niigata Nippo*
26 October 2021
文化功労者に新潟市出身の鈴木氏
政府は26日、2021年度の文化功労者を発表し、新潟県関係では、新潟市出身の岩手県立大学長で素粒子物理学の鈴木厚人氏が選ばれた。―ＩＬＣ計画の国内誘致について「日本が国際的研究の中心となるチャンス」と意気込んだ。

from *Iwate Nippo*
5 October, 2021
コロナ対策「切れ目なく」　鈴木新財務相インタビュー
財務相に就任した鈴木俊一氏は―国際リニアコライダー（ＩＬＣ）の日本誘致については「課題をクリアすれば財政支出はあり得る」と述べ、費用分担に関する政府間協議の進展を期待した。

from *Iwate Nippo*
1 September 2021
ＩＬＣ関連予算4.8億円を要求　文科省来年度
文部科学省は30日、2022年度予算の概算要求を発表し、ILC関連で計4億8千万円を盛り込んだ。21年度当初予算と同額。コスト削減に向けた研究開発を米国やドイツ、フランスと共同で一層推進する。

from *Iwate Nippo*
30 July 2021
ＩＬＣ計画の課題整理、意見提言へ　文科省・有識者会議が再開
文部科学省のILCに関する第２期の有識者会議（座長・観山（みやま）正見岐阜聖徳学園大学長、委員14人）は29日、初会合を開いた。ILC計画の最新動向や課題を整理し、年内から本年度内をめどに意見を取りまとめて政府に示す。

PREPRINTS

ARXIV PREPRINT

2111.02713
The h(125) decays to c cbar, b bbar, b sbar, photon photon and gluon gluon in the light of the MSSM with quark flavor violation

2111.02386
New physics searches with the International Large Detector at the ILC

2111.01277
IR-Improved Amplitude-Based Resummation in Quantum Field Theory: New Results and New Issues

2110.15115
Charged Hadron Identification with dE/dx and Time-of-Flight at Future Higgs Factories

2110.12830
CP violation in the Higgs sector at ILC

2110.12240
Exploring B-physics anomalies at colliders

2110.09965
Updating the SiD Detector concept

2110.08799
CP violation in the rare Higgs decays via exchange of on-shell almost degenerate Majorana neutrinos, H→vkNj→vkℓ−UD¯ and H→vkNj→vkℓ+U¯D

2109.14634
High energy lepton colliders as the ultimate Higgs microscopes

2109.11134
Use of Z polarization in e+e−→ZH to measure the triple-Higgs coupling

2109.10936
Catch ’em all: Effective Leptophilic WIMPs at the e+e− Collider

2109.10693
Energy correlation of bottom quarks from decays of top quarks in electron−positron annihilation

2109.06802
Measuring neutrino dynamics in NMSSM with a right-handed sneutrino LSP at the ILC

2108.11927
Discovering Axion-Like Particles with Photon Fusion at the ILC

2108.11904
ILC Upgrades to 3 TeV

2108.08867
Measurement of σ(e+e−→HZ)×Br(H→ZZ∗) at the 250 GeV ILC

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DIRECTOR'S CORNER

Snowmass is rebooting

Andy Lankford | 26 November 2021

The Snowmass/P5 process is starting up again in the United States. Now is the time to participate if you are not already involved: attend Snowmass working group meetings, mark the 2022 Community Summer Study in your calendar, educate yourself, and make your own views known. Snowmass and P5, which stands for Particle Physics Project Prioritization Panel, are profoundly important. It is essential that the P5 panel make a strong positive statement for U.S. participation in the ILC.

The Snowmass organisers have invited the international particle physics community to participate in and to provide input to the Snowmass/P5 planning process. They recognise that the field of particle physics is global and collaborative. The U.S. funding agencies encourage their community to contribute to this important process.

Snowmass/P5 primer

The Snowmass/P5 process is a two-step process used by the particle physics community and its U.S. funding agencies, Department of Energy (DOE) and National Science Foundation (NSF) to formulate the strategic plan for U.S. particle physics. The planning process for the coming ten to twenty years that started in 2020 was interrupted by the COVID-19 pandemic. After an interlude of many months, work is starting back up where it left off. Working groups are restarting meetings in a virtual mode. A plenary “Snowmass Day” was held on 24 September (https://indico.fnal.gov/event/50538/) “to get all the frontiers and participants back together on the same page and refocus our attention to the Snowmass activities”.

Snowmass is the first step in the planning process. It is a community-driven study of the scientific opportunities organised by the American Physical Society’s Division of Particles and Fields (DPF), with the participation of the APS Division of Physics and Beams (DPB) and the APS Division of Astrophysics (DAP), as well as the Division of Nuclear Physics (DNP) and the Division of Gravitational Physics (DGRAV). Named after a historic series of weeks-long summer studies held in Snowmass, Colorado, starting in 1982, Snowmass now consists of a series of plenary and working group meetings convened over an extended period of a year or more. It culminates in the Community Summer Study embracing the full scientific, technical, and social breadth of the field. The 2022 Snowmass Community Summer Study will be held at the University of Washington from 17 to 22 July 2022. (https://snowmass21.org/)

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AROUND THE WORLD

ILC-Japan: rebuilding trust and support for the ILC

Rika Takahashi | 26 November 2021

ILC-Japan, a new promoting body for the International Linear Collider project, was launched this spring. ILC NewsLine interviewed Shoji Asai, chair of ILC-Japan, to learn more about it.

What is ILC-Japan? How is it different from former organisations like the ILC Steering Panel?

Asai: The objective of ILC-Japan and the ILC Steering Panel are basically the same; to realise the International Linear Collider in Japan.

The panel was established by the Japan High Energy Physics Committee that represents the Japan Association of High Energy Physicists (JAHEP) to help the ILC International Development Team (IDT) to facilitate transition into the pre-lab phase. The panel has been conducting various grassroots efforts. However, it is organised and run by scientists, most of whom are working on the ILC project, which is a relatively small group of people.

The main objective of the ILC-Japan is to widen the promotional community to involve scientists in different projects and research areas such as ATLAS, SuperKEKB, or neutrino research, as well as theorists.

Another important objective is to coordinate supporters around the ILC project. Since the ILC is a very large project that is not limited to science, many parties are concerned: funding agencies, politics, industries, parties on the candidate site and the international research community. ILC-Japan will function as the representative of the Japanese community, to work with stakeholders.

What kind of activities has ILC-Japan been working on so far?

Right now, we are preparing a report for the expert panel organised by the Ministry of Education, Culture, Sports, Science and Technology MEXT, which was restarted this July to review the previous discussions with an updated status of the project. We are working hard to bring out the best support from the members of the expert panel.

Another very difficult task is to assist government officials in carrying out the international talks. At this time, neither the Japanese government nor its foreign counterpart are ready to discuss the cost-sharing for the ILC. But without this discussion, the impasse cannot be resolved. So, I think what we should be doing is create an opportunity to start the talks on a more informal basis, just to build a relationship of trust. Because the community has presented the cost-sharing model in the past, it appears to be viewed as a fixed requirement outside the community, but that is not the case. We really need to dispel misunderstandings in order to move forward. Also, we should start the discussion with younger scientists of all projects for the future.

What do you see as the most difficult issue to resolve in order for the ILC to be realised?

The biggest challenge is changing the atmosphere. I think that the MEXT and other academic researchers (not only non-particle physicists but some part of particle physicists) consider that our community can not carry out this great project. They feel that our cost-sharing and human resource planning is unrealistic.

These negative comments by other academic researchers definitely have an impact on the MEXT decision and the tone of the media. It is important that these concerns be addressed.

To do so, we need to change the way we communicate. We need to return to the starting point once again. As scientists, we need to focus on the scientific importance to gain a better understanding of the ILC. In my opinion, we are lacking support from the particle physics community in Japan, so we are trying to set up an environment to discuss ILC science with scientists outside of the ILC community. I believe this will help bring back the passion for the physics case of the ILC. Furthermore, diversity of Physics Program is also important to obtain wide support. ILC Lab should be open for the various physics programs.

What can the international science community do for ILC realisation?

Although the world is recovering from the COVID-19 pandemic, the environment surrounding basic science has completely changed, and maintaining their social security system is the most urgent issue for each country. Also, global environmental awareness is growing, and we need to work hard to make accelerators, which consume so much energy for operation, sustainable. These conditions have made it difficult for us to secure robust support for ILC. The situation has completely changed, and we have to reconsider; What accelerator science can do for our earth and our world.

What we can do is to show worldwide readiness. As there is a concern about securing human resources to realise the ILC, we need to demonstrate that there really is worldwide support and passion for the project. Let's show worldwide collaborations and ILC advanced technologies change the future.

I know many scientists are frustrated but, we have to wait until the wind blows, and I wish many colleagues around the world will help us by giving us your ideas and insights how we can achieve our goal.

What does the ILC mean to you?

The JLC, the linear collider project planned in Japan in the 1990's, was my first involvement in the collider experiment. I was originally an atomic physicist studying posironim. One day, professor Shuji Orito, who was my supervisor at the time, told me to study scalar top quark at the 1Tev JLC collider experiment. It was in the middle of March, and I needed to prepare a slides for Prof. Orirto who gave a presentation at the international conference in Hawaii in May. I still remember sending him plots by Fax until just before his presentation. It was my initiation into the linear collider project.

I joined the LEP-II project at CERN in 1994, then the ATLAS experience at the LHC, I have been working on circular machine experiments for a long time. Now, getting back to the linear collider community, I'd like to do something for the linear collider again by spending my last decade or so as a scientist.

The main objective of the ILC to study the structure of vacuum using the Higgs particle is already important and valuable, but I envision the ILC laboratory more than that. We are planning to start the ILC as a Higgs factory, but I would like to make the ILC into more comprehensive laboratory where the research for not only particles but expand to space-time or vacuum, eventually.

Thank you very much.

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FEATURE

Thinking outside the tunnel

Barbara Warmbein | 26 November 2021

Lots of new ideas for physics at the ILC discussed during ILCX

If you think that the International Linear Collider (ILC) is going to be a one-trick pony for studying the Higgs boson, think again. In fact, think research for self-driving cars, think dark matter with axions or dark photons, customs X-rays in a tunnel, photon beams to create tetraquarks and pentaquarks, energy recovery… all these ideas and more were presented and discussed at the recent ILCX 2021 meeting, called into being by ILC International Development Team (IDT) physics and detectors chair Hitoshi Murayama.

"The ILC hasn't been built yet and it would be a waste of time and creative energy not to think of all the things we could do with it," Murayama says. "We better have new ideas for the near-term and the long-term future of this project." Some 600 people registered to the virtual meeting that was advertised as being "about all possible experimental opportunities at the ILC laboratory" and brought together experimental, theoretical, and accelerator physicists from inside and outside the ILC community.

More than just a Higgs factory: ILCX showed the many possibilities for the future ILC.

One of these newcomers to the community is Susanne Westhoff, a junior professor for theoretical physics at Heidelberg University in Germany. She presented an idea for an experiment that would look for particles that live for a relatively long time, interact very little and could tell us more about mysterious phenomena like dark matter. "New long-lived particles might very well exist," she says. "They are hard to catch in the lab with conventional tools, but they can tell us so much about our Universe, especially when we combine data from colliders with ideas from cosmology." One such particle candidate could be the dark photon, a potential messenger particle for dark matter.

Originally proposed as a "tag-along" experiment for Belle II at KEK in Japan, she says her experiment might also work, possibly with bigger potential, at other colliders like the ILC or FCC-ee. She and her students are currently studying the best possible place and technology for such a detector. There are several scenarios – a detector placed underground in a new cavern, or a detector above ground. At best they should be the size of a swimming pool and use relatively cheap and almost off-the-shelf silicon detector technology. She is also studying how likely it is that the ILC's proposed detectors themselves could discover new long-lived particles.

The beam dump played a big role in many experiment ideas presented at ILCX. Normally it is just what it says: the place where the beams get dumped and forgotten after they've been brought to collision. Why not let it hit a target and see if that produces light particles like axions, which are also candidates for dark matter? Or put a self-driving car (or at least its control unit) in the way of the dumped beam to study and eventually solve the problem of possible malfunctions due to ionising radiation that the self-driving cars could be affected by while on the road? Or turn the beam dump into a muon tomograph to X-ray lories for customs purposes? Or how about not dumping the beam at all but decelerating it after collision to extract the massive amount of power still stored inside in order to use it for powering the research campus or neighbouring towns?

We can also extract the beam to simulate Hawking radiation from the black hole in a controlled laboratory experiment. Instead of strong gravitational field near the black hole horizon, we can create a strong electric field using a collision of high-energy electrons and powerful laser. Once the field exceeds the "Schwinger field", we expect to see an avalanche of electron position pairs akin to Hawking radiation. Or use photons from the undulator build for the positron source and look for axions "shining through the wall." Or another extracted beam to create "tetra quark" and "penta quark" states.

"I am very happy that so many creative ideas came out of the meeting, which shows the potential the ILC has in many directions," concludes Murayama. "But for me, the best thing that came out was that we have expanded our community and met new people and

their ideas.”