# ILC Workshop on Potential Experiments (ILCX2021)


# Report of Contributions

https://agenda.linearcollider.org/e/9211

Contribution ID: **2** Type: **Oral presentation using Zoom**

# Physics with far detectors at future lepton colliders

*Thursday 28 October 2021 15:30 (30 minutes)*

At the Large Hadron Collider (LHC), several far detectors such as FASER and MATHUSLA have been proposed to target the long-lived particles (LLPs) featured with displaced vertices. Naturally one question arises as to the feasibility of installing similar far detectors at future lepton colliders like the CEPC and FCC-ee. Because of the different kinematics of final state particles and the freedom to locate both the experiment hall and the detectors, the future lepton collider with an additional far detector may play a unique role in searching for LLPs. In this study, we consider various locations and designs of far detectors at future $e^-e^+$ colliders and investigate their potentials for discovering LLPs in the physics scenarios including exotic Higgs decays, heavy neutral leptons, and the lightest neutralinos. Our analyses show that the kinematical distinctions between the lepton and hadron colliders render the optimal positions of far detectors lying at the direction perpendicular to the collider beams at future $e^-e^+$ colliders, in contrast to the LHC where a boost in the forward direction can be exploited. We also find that when searching for LLPs, such new experiments with far detectors at future lepton colliders may extend and complement the sensitivity reaches of the experiments at the future lepton colliders with usual near detectors, and the present and future experiments at the LHC. In particular, we find that, for the theory models considered in
this study, a MATHUSLA-sized far detector would give a modest improvement compared to the case with a near detector only at future lepton colliders.

## 1st preferred time slot for your oral presentation

## 2nd preferred time slot for your oral presentation

**Author:** WANG, Zeren Simon (NTHU (TW))

**Presenter:** WANG, Zeren Simon (NTHU (TW))

**Session Classification:** H&O: BSM particle production & Fixed target / Dark sectors / Applications outside particle physics

**Track Classification:** Parallel sessions: Topical Groups: Session H: BSM particle production

Contribution ID: **10** Type: **Oral presentation using Zoom**

# Application of Quantum Computing and Supercomputers to HEP

*Friday 29 October 2021 13:50 (20 minutes)*

We'd like to show the status of quantum computing, in particular, the application to HEP. We'll give a summary of the usage of the supercomputers in the ATLAS experiment and our experience in Japan.

### 1st preferred time slot for your oral presentation

### 2nd preferred time slot for your oral presentation

**Author:** TANAKA, Junichi (University of Tokyo (JP))

**Presenter:** TANAKA, Junichi (University of Tokyo (JP))

**Session Classification:** A-2: Software / Computing

**Track Classification:** Parallel sessions: Detectors: Session A: Software / Computing

Contribution ID: **11** Type: **Oral presentation using Zoom**

# The search for leptophilic WIMP at ILC

*Wednesday 27 October 2021 14:20 (20 minutes)*

We consider the renormalizable leptophilic WIMP models with the scalar mediators which have lepton numbers. We perform a comprehensive analysis for such a WIMP scenario for two distinct cases with SU(2) doublet or singlet mediators considering all the relevant theoretical, cosmological and experimental constraints at present. We show that mono-photon search at ILC experiment can play a significant role to probe the yet unexplored parameter region. Furthermore, we discuss the capability of explaining the muon g-2 anomaly by combined model scenario including both the doublet and singlet mediators.

## 1st preferred time slot for your oral presentation

## 2nd preferred time slot for your oral presentation

**Author:** KATAYOSE, Taisuke (Osaka University)

**Presenter:** KATAYOSE, Taisuke (Osaka University)

**Session Classification:** H-1: BSM particle production

**Track Classification:** Parallel sessions: Topical Groups: Session H: BSM particle production

Contribution ID: **12** Type: **Oral presentation using Zoom**

# Probing heavy charged fermions at $e^+e^-$ collider using the Optimal Observable Technique

*Wednesday 27 October 2021 16:30 (20 minutes)*

In this work, we study the production of color-neutral and singly-charged heavy leptons at the proposed International Linear Collider. We use the optimal observable technique to determine the statistical accuracy to which the coupling of such fermions to the $Z$ gauge boson (vector, axial or chiral) can be measured. We also consider a UV-complete model that contains these particles as well as a dark matter candidate, and consider some observable effects involving both; the correspondence to chargino production in supersymmetric models with heavy sleptons is briefly discussed.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Author:** JAHEDI, Sahabub (Indian Institute of Technology, Guwahati)

**Presenter:** JAHEDI, Sahabub (Indian Institute of Technology, Guwahati)

**Session Classification:** H-2: BSM particle production

**Track Classification:** Parallel sessions: Topical Groups: Session H: BSM particle production

Contribution ID: **13** Type: **Oral presentation using Zoom**

# Global Interpretation of LHC indications within the GM model

*Thursday 28 October 2021 20:00 (20 minutes)*

LHC has produced several indications for new scalars. This talk intends to interpret them within the Georgi Machacek scheme and predict there cross section in e+e-. It follows a presentation delivered at LCWS21 and attemps to complete this presentation showing how the GM model needs to be amplified to take into account the various observations.

References:
[1] Indications for extra scalars at LHC? – BSM physics at future e+e– colliders
François Richard (IJCLab, Orsay). Jan 14, 2020.
e-Print: arXiv:2001.04770
[2] Evidences for a pseudo scalar resonance at 400 GeV. Possible interpretations
François Richard (IJCLab, Orsay) (Mar 16, 2020)
e-Print: 2003.07112
[3] Global interpretation of LHC indications within the Georgi-Machacek Higgs model Talk presented at the International Workshop on Future Linear Colliders (LCWS2021), 15-18 March 2021.
C21-03-15.1
François Richard(IJCLab, Orsay)(Mar 22, 2021)
Contribution to: LCWS 2021
e-Print: 2103.12639

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Author:** RICHARD, Francois (LAL Orsay)

**Presenter:** RICHARD, Francois (LAL Orsay)

**Session Classification:** H-3: BSM particle production

**Track Classification:** Parallel sessions: Topical Groups: Session H: BSM particle production

Contribution ID: **14** Type: **Oral presentation using Zoom**

# Development of hydrofluoric acid-free EP treatment of Nb cavities at KEK

*Thursday 28 October 2021 14:00 (30 minutes)*

The ILC project will require ˜8000 9-cell Nb cavities. In the fabrication process of Nb cavities, electrolytic polishing (EP) treatment is essential for the high SRF performance of the cavities. However, the electrolyte is a mixture of hydrofluoric acid and concentrated sulfuric acid, and its toxicity to the human body and environment is extremely high. HF-EP facilities become more complex to ensure chemical safety and prevent environmental leaks, and the workers are required to have advanced chemical knowledge and work experience. For that reason, EP-related expenses in the ILC project account for a very large proportion.
The HF-EP treatment of the Nb cavity in KEK was started in 2008, and a large amount of EP effluent containing fluoride has been treated. Meanwhile, we have been developing the bipolar EP (BP-EP) method in collaboration with Nomura Plating and Marui Plating. However, the BP-EP method is not energy efficient and requires a very high power programmed power supply to process a 9-cell Nb cavity. Also, since a relatively high concentration of sulfuric acid solution is used as the electrolyte, the cost reduction is limited.
Recently, the application of the plasma-EP (PEP) method, in which metal surfaces are polished by high-voltage plasma discharge, to Nb surfaces has been promising. The PEP method is chemically safe because it uses an inorganic salt aqueous solution as the electrolyte, and the polishing rate is tens of times faster than that of HF-EP. Also, the PEP method is suitable for local polishing of Nb cavities, which enables the polishing process of Ti-jacketed Nb cavities. That is expected to greatly reduce the cost of the ILC project. Now, KEK starts to establish the PEP method for Nb cavities, and some experimental concepts will be introduced in this presentation.

## 1st preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Author:** GOTO, Takeyoshi

**Co-author:** SAEKI, Takayuki (KEK)

**Presenter:** GOTO, Takeyoshi

**Session Classification:** W-1: Green ILC

**Track Classification:** Parallel sessions: Sustainability: Session W: Green ILC

Contribution ID: **15** Type: **Oral presentation using Zoom**

# The light thermal scalar dark matter with singlet scalar mediator

*Thursday 28 October 2021 10:48 (24 minutes)*

Recent direct detection experiments put the strong constraint on WIMPs at the electroweak scale, and people have started focusing on light DM scenario. For the light thermal scalar DM, it is usually constrained by the CMB observation because it annihilate at s-wave. Despite of CMB constraint, We have revealed that some parameter regions are still surviving for the model with singlet scalar mediator, which are resonant annihilation region and forbidden annihilation region. We analyze these regions quantitatively, considering theoretical and experimental constraints.

## 1st preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

## 2nd preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

**Presenter:** KATAYOSE, Taisuke (Osaka University)

**Session Classification:** O-2: Fixed target / Dark sectors / Applications outside particle physics

**Track Classification:** Parallel sessions: Transversal Task Forces: Session O: Fixed target / Dark sectors / Applications outside particle physics

Contribution ID: **16** Type: **Oral presentation using Zoom**

# Review of the Belle II Distributed Computing System

*Friday 29 October 2021 14:15 (20 minutes)*

The Belle II computing system is expected to manage the process of massive raw data, production of copious simulation and many concurrent user analysis jobs. To cope with these, we established a distributed computing model with DIRAC as a workload management system and started its operation.

It has been roughly 10 years since we started the Belle II distributed computing activity. In this presentation, we will review this system and report the current performance.

## 1st preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Author:** HARA, Takanori (High Energy Accelerator Research Organization (JP))

**Presenter:** HARA, Takanori (High Energy Accelerator Research Organization (JP))

**Session Classification:** A-2: Software / Computing

**Track Classification:** Parallel sessions: Detectors: Session A: Software / Computing

Contribution ID: **17** Type: **Oral presentation using Zoom**

# High-dimensional Anomaly Detection with Radiative Return in e+e- Collisions

*Thursday 28 October 2021 19:00 (20 minutes)*

Experiments at a future □+□– collider will be able to search for new particles with masses below the nominal centre-of-mass energy by analyzing collisions with initial-state radiation (radiative return). We show that machine learning methods based on semisupervised and weakly supervised learning can achieve model-independent sensitivity to the production of new particles in radiative return events. In addition to a first application of these methods in □+□– collisions, our study is the first to combine weak supervision with high-dimensional information by deploying a deep sets neural network architecture. We have also investigated some of the experimental aspects of anomaly detection in radiative return events and discuss these in the context of future detector design.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

10:00-12:00 JST (3:00-5:00 CEST, 21:00-23:00 EDT, 18:00-20:00 PDT)

**Author:** GONSKI, Julia Lynne (Columbia University (US))

**Presenter:** GONSKI, Julia Lynne (Columbia University (US))

**Session Classification:** H-3: BSM particle production

**Track Classification:** Parallel sessions: Topical Groups: Session H: BSM particle production

Contribution ID: **18** Type: **Oral presentation using Zoom**

# The SiD Digital ECal based on Monolithic Active Pixel Sensors

*Wednesday 27 October 2021 13:00 (20 minutes)*

Jim Brau (U. Oregon), Martin Breidenbach (SLAC), Lorenzo Rota (SLAC), et al.

The SiD Collaboration has had a long interest in the potential for improved granularity in the tracker and ECal; a study of MAPS in the SiD ECal was described in the ILC TDR. Work is progressing on the MAPS application in an upgraded SiD design, both for the ECal and tracking. A prototyping design effort is underway for a common SiD tracker/ECal design based on stitched reticules to achieve 10 x 10 $cm^2$ sensors with 25 x 100 $micron^2$ pixels. Application of large area MAPS in these systems would eliminate delicate and expensive bump-bonding. The small pixels significantly improve shower separation. Recent simulation studies confirm previous results, indicating electromagnetic energy resolution based on digital hit cluster counting provides better performance than the SiD TDR analog design based on 13 $mm^2$ pixels. Furthermore, two shower separation is excellent down to the millimeter scale. Geant4 simulation results will be presented demonstrating these expectations.

## 1st preferred time slot for your oral presentation

10:00-12:00 JST (3:00-5:00 CEST, 21:00-23:00 EDT, 18:00-20:00 PDT)

## 2nd preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

**Authors:** BRAU, Jim (University of Oregon (US)); ROTA, Lorenzo (SLAC); BREIDENBACH, Martin (SLAC)

**Presenter:** BRAU, Jim (University of Oregon (US))

**Session Classification:** B-1: Calorimeters

**Track Classification:** Parallel sessions: Detectors: Session B: Calorimeters

Contribution ID: **19** Type: **Oral presentation using Zoom**

# Two-loop corrections to the Higgs trilinear coupling in classically scale-invariant BSM models

*Thursday 28 October 2021 19:00 (20 minutes)*

The Higgs trilinear coupling provides can serve as a unique probe to investigate the structure of the Higgs sector and the nature of the electroweak phase transition, and to search for indirect signs of New Physics. Meanwhile, classical scale invariance (CSI) is an attractive idea for BSM model building, which can explain the apparent alignment of the Higgs sector and potentially relate to the hierarchy problem. A particularly interesting feature of models with CSI is that the Higgs trilinear coupling is, at one loop, universally predicted to deviate by 67% from the (tree-level) SM prediction.
In this talk, I will discuss how this result is modified at two loops. I will present results from the first explicit computation of two-loop corrections to the Higgs trilinear coupling in classically scale-invariant BSM models. Taking as example a CSI variant of a Two-Higgs-Doublet Model, I will show that the inclusion of two-loop effects allows distinguishing different scenarios with CSI, although the requirement of correctly reproducing the known 125-GeV mass of the Higgs boson severely restricts the allowed values of the Higgs trilinear coupling.

## 1st preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

## 2nd preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

**Author:** Dr BRAATHEN, Johannes (DESY)

**Co-authors:** Prof. KANEMURA, Shinya (Osaka University); Mr SHIMODA, Makoto (Osaka University)

**Presenters:** Dr BRAATHEN, Johannes (DESY); BRAATHEN, Johannes (Osaka University)

**Session Classification:** F-4: Higgs properties

**Track Classification:** Parallel sessions: Topical Groups: Session F: Higgs properties

Contribution ID: **20** Type: **Oral presentation using Zoom**

# Chronopixel Silicon CMOS Sensor Development for the ILC

A monolithic silicon CMOS pixel detector with time-stamping capability (Chronopixel) has been developed based on design goals of the International Linear Collider (ILC). Each hit is accompanied by a time tag with sufficient precision to assign it to a particular ILC bunch crossing - thus the name Chronopixel. This reduces the occupancy to negligible levels, even in the innermost vertex detector layer, yielding a robust vertex detector which operates at background levels significantly in excess of those currently foreseen for the ILC.
The Chronopixel can record and store time stamps for two hits in each pixel while using standard CMOS processing for manufacturing. Following two earlier prototype fabrication runs and tests, a third prototype design was developed to resolve earlier issues, including a high capacitance problem. This problem was traced to the TSMC 90 nm technology design rules, which led to an unacceptably large value of the sensor diode capacitance. Six different layouts for the sensor diode were tested in the third prototype, and tests demonstrated that the high capacitance problem was solved. The third prototype has also been exposed to HL-LHC radiation levels; results of these tests are also presented. Simulation of the signal formation from charge particle crossing detector with one particular sensor design also was done and results will be shown.

## 1st preferred time slot for your oral presentation

10:00-12:00 JST (3:00-5:00 CEST, 21:00-23:00 EDT, 18:00-20:00 PDT)

## 2nd preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

**Authors:** Prof. BALTAY, Charles (Yale University); Dr STROM, David (University of Oregon); Prof. BRAU, James (University of Oregon); SINEV, Nikolai (University of Oregon (US)); Dr WEBER, Christian (Yale University); Dr BAKER, Oliver (Yale University)

**Presenter:** SINEV, Nikolai (University of Oregon (US))

**Session Classification:** C-1: Tracking detectors

**Track Classification:** Parallel sessions: Detectors: Session C: Tracking detectors

Contribution ID: **21** Type: **Oral presentation using Zoom**

# New muon (g-2) result and ILC as target for Supersymmetry

*Wednesday 27 October 2021 16:50 (20 minutes)*

We confront the Minimal Supersymmetric Standard Model (MSSM) with the recent measurement of (g-2)_mu, the Dark Matter (DM) relic density, DM direct detection limits and electroweak SUSY searches at the LHC. We demonstrate that various distinct regions of the parameter space can fulfil all experimental constraints. We present predictions for the ILC to explore these regions.

## 1st preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

## 2nd preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

**Author:** SAHA, Ipsita (Kavli IPMU)

**Presenter:** SAHA, Ipsita (Kavli IPMU)

**Session Classification:** H-2: BSM particle production

**Track Classification:** Parallel sessions: Topical Groups: Session H: BSM particle production

Contribution ID: **22** Type: **Oral presentation using Zoom**

# ILC prospects in the light of recent LHC results

We examime models with extended Higgs sectors in the light of recent excesses in the BSM Higgs-boson searches at the LHC. We discuss the possibilities to investigate these scenarios at a future e+e- collider (with a special emphasis on the ILC).

## 1st preferred time slot for your oral presentation

10:00-12:00 JST (3:00-5:00 CEST, 21:00-23:00 EDT, 18:00-20:00 PDT)

## 2nd preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

**Authors:** Dr THOMAS, Biekoetter (DESY); WEIGLEIN, Georg Ralf (Deutsches Elektronen-Synchrotron (DE)); HEINEMEYER, Sven

**Presenter:** HEINEMEYER, Sven

**Session Classification:** F&H-2: Higgs properties & BSM particle production

**Track Classification:** Parallel sessions: Topical Groups: Session F: Higgs properties

Contribution ID: **23** Type: **Oral presentation using Zoom**

# Neutron Production at the ILC

*Wednesday 27 October 2021 16:42 (24 minutes)*

Neutrons are widely used for material sciences, imaging, fundamental physics and so on due to its unique properties. Recently, spallation neutron sources using megawatt class accelerators are coming up as next-generation neutron sources instead of research reactors. A spallation neutron source irradiates proton beam with energy of a few GeV into a neutron spallation target made of a heavy elemental material. Neutrons are produced via spallation reaction with kinetic energy of several MeV, and were cooled down in a moderator to 1˜100 meV, which are commonly used as cold or thermal neutrons. Produced neutrons have pulse structure. This nature is applied for TOF analysis, which is essentially outperform reactor neutron sources. However, the spallation neutron source needs huge neutron shield about 10-m diameter. It makes the neutron facilities large and costly, and also prevent to approach by the neutron source. Since both neutron target and accelerator are closing to the engendering limit, higher power neutron sources are getting more difficult. Thus, more effective way to produce neutrons is expected.
Photo-neutron production reaction using pulsed gamma beam can be a candidate of a new neutron source which works without moderator to realize short timing and compactness[1]. The International Linear Collider (ILC) is a proposed electron-positron collider whose collision energy is 200-500 GeV [2]. It is planning to build a positron source using pulsed gamma rays generated by 150-250 GeV electron beam through a helical undulator. In this talk, I will report an evaluation of its performance of the photo-neutron source using the gamma rays and possible applications.

[1] Y. Iwashita et al., “DIVERSIFIED APPLICATION OF ILC”, Proceedings of IPAC2018 9th International Particle Accelerator Conference (2018).
[2] Behnke, Ties, et al. “The International Linear Collider Technical Design Report-Volume 1: Executive Summary.” arXiv preprint arXiv:1306.6327 (2013).

## 1st preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Author:** MISHIMA, Kenji (KEK IMSS)

**Presenter:** MISHIMA, Kenji (KEK IMSS)

**Session Classification:** S: ILC application (to physics, material science, etc.)

**Track Classification:** Parallel sessions: Accelerators: Session S: ILC application (to physics, material science, etc.)

Contribution ID: **24** Type: **Oral presentation using Zoom**

# Measuring neutrino physics through light higgsinos and sneutrinos

*Wednesday 27 October 2021 17:10 (20 minutes)*

If nature is supersymmetric and not fine-tuned, higgsinos may well be within the reach of the ILC. In the NMSSM extended with right-handed neutrinos the right-handed sneutrino is a viable thermal dark matter candidate. We discuss how a light higgsino-type chargino could decay to a sneutrino and a charged lepton with a branching ratio O(10ˆ-5). Such a decay will be unobservable at the LHC, but in an electron-positron collider the decay can be observed. The measurement of the branching ratio would allow us to estimate the size of the neutrino Yukawa couplings.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Author:** WALTARI, Harri (University of Uppsala)

**Presenter:** WALTARI, Harri (University of Uppsala)

**Session Classification:** H-2: BSM particle production

**Track Classification:** Parallel sessions: Topical Groups: Session H: BSM particle production

Contribution ID: **25** Type: **Oral presentation using Zoom**

# Blockchain Technology for Scientific Supercomputing: Opportunities and Challenges

*Thursday 28 October 2021 20:15 (20 minutes)*

Blockchain is a technology used to create distributed ledgers and to achieve consensus regarding data between distributed entities. Although the technology has been used to perform extremely computationally calculations involving cryptocurrency, its use in the scientific world has been limited.

In this paper we identify several possible use cases by which blockchain could be applied to scientific computing. These use cases include creating parallel computing systems from heterogeneous service providers, allowing for researchers to publish systems that allow service based architectures, integrating exotic technologies such as quantum computing, and archiving data and calculation chains to allow for reproduciblity of results.

We further detail the limitations and deficiencies of current blockchain systems for use to aid scientific supercomputing and propose characteristics of a blockchain systems which would be neccessary to support scientific supercomputing. Specifically we propose a blockchain protocol that would allow scientists to run existing scientific code in a distributed fashion.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Author:** WANG, Joseph (Bitquant Digital Services)

**Presenter:** WANG, Joseph (Bitquant Digital Services)

**Session Classification:** A-1: Software / Computing

**Track Classification:** Parallel sessions: Detectors: Session A: Software / Computing

Contribution ID: **26** Type: **Oral presentation using Zoom**

# Probing new physics with a LUXE-type experiment at the ILC

*Wednesday 27 October 2021 19:30 (30 minutes)*

The proposed LUXE experiment (LASER Und XFEL Experiment) at DESY, Hamburg, using the 16.5 GeV electron beam from the European XFEL, aims to probe QED in the non-perturbative regime created in collisions between high-intensity laser pulses and high-energy electron or photon beams. This setup also provides a unique opportunity to probe physics beyond the standard model by leveraging the large photon flux generated at LUXE, probing axion-like-particles (ALPs) at a reach comparable to FASER2 and NA62. In this contribution we will explore the sensitivity of a LUXE-type experiment using the ILC electron beam instead of the EU.XFEL one.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Author:** SOREQ, Yotam (Technion- Israel Institute of Technology (IL))

**Co-author:** LIST, Jenny (Deutsches Elektronen-Synchrotron (DE))

**Presenter:** SOREQ, Yotam (Technion- Israel Institute of Technology (IL))

**Session Classification:** O-1: Fixed target / Dark sectors / Applications outside particle physics

**Track Classification:** Parallel sessions: Transversal Task Forces: Session O: Fixed target / Dark sectors / Applications outside particle physics

Contribution ID: **27** Type: **Oral presentation using Zoom**

# Probing non-perturbative QED in electron-LASER and photon-LASER collisions at the ILC

The LUXE experiment (LASER Und XFEL Experiment) is a new experiment in planning at DESY Hamburg using the electron beam of the European XFEL. LUXE is intended to study collisions between a high-intensity optical laser and 16.5 GeV electrons from the XFEL electron beam, as well as collisions between the optical LASER and high-energy secondary photons. The physics objective of LUXE are processes of Quantum Electrodynamics (QED) at the strong-field frontier, where the electromagnetic field of the laser is above the Schwinger limit. In this regime, QED is non-perturbative. This manifests itself in the creation of physical electron-positron pairs from the QED vacuum, similar to Hawking radiation from black holes. LUXE intends to measure the positron production rate in an unprecedented LASER intensity regime. In this contribution an overview of the LUXE experimental setup and its challenges will be given, followed by a discussion of the expected physics reach of a similar experiment using the ILC electron beam instead of the EU.XFEL one.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Author:** LIST, Jenny (Deutsches Elektronen-Synchrotron (DE))

**Presenter:** LIST, Jenny (Deutsches Elektronen-Synchrotron (DE))

**Session Classification:** S: ILC application (to physics, material science, etc.)

**Track Classification:** Parallel sessions: Accelerators: Session S: ILC application (to physics, material science, etc.)

Contribution ID: **28** Type: **Oral presentation using Zoom**

# Fermion pair production at $e^-e^+$ linear collider experiments in GUT inspired gauge-Higgs unification

*Wednesday 27 October 2021 15:30 (20 minutes)*

In gauge-Higgs unification (GHU), the 4D Higgs boson appears as a part of the fifth dimensional component of 5D gauge field. Recently, an $SO(11)$ GUT inspired $SO(5) \times U(1) \times SU(3)$ GHU model has been proposed. In the GHU, Kaluza-Klein (KK) excited states of neutral vector bosons, photon, $Z$ boson and $Z_R$ boson, appear as neutral massive vector bosons $Z'$s. The $Z'$ bosons in the GHU couple to quarks and leptons with large parity violation, which leads to distinctive polarization dependence in, e.g., cross sections and forward-backward asymmetries in $e^-e^+ \to \mu^-\mu^+, q\bar{q}$ processes.
In the talk, we discuss fermion pair production in $e^-e^+$ linear collider experiments with polarized $e^-$ and $e^+$ beams in the GUT inspired GHU. Deviations from the SM are shown in the early stage of ILC 250 GeV experiments. The deviations can be tested for the KK mass scale up to about 15 TeV.
This talk is mainly based on Phys.Rev.D102(2020)015029 collaborated with S. Funatsu, H. Hatanaka, Y. Hosotani, and Y. Orikasa.

## 1st preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

## 2nd preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

**Author:** YAMATSU, Naoki

**Presenter:** YAMATSU, Naoki

**Session Classification:** G: Top / Heavy flavour / QCD

**Track Classification:** Parallel sessions: Topical Groups: Session G: Top / Heavy flavour / QCD

Contribution ID: **29** Type: **Oral presentation using Zoom**

# Particle identification with time-of-flight

*Thursday 28 October 2021 16:42 (24 minutes)*

A particle identification is an essential tool for precision measurements at the ILC. Recent development of the fast-timing Si sensors with a time resolution below 100 ps gives a possibility for the $\pi^{\pm}$, $K^{\pm}$, $p$ separation using time-of-flight measurements. In our study we use ILD as an example to test different potential placements of the fast-timing Si sensors for instance in the SET and inner ECal layers simulating possible time resolution scenarios. In this talk we present latest results on the performance of the time-of-flight particle identification.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Author:** DUDAR, Bohdan (DESY)

**Presenter:** DUDAR, Bohdan (DESY)

**Session Classification:** A&B: Software/Computing & Calorimeters

**Track Classification:** Parallel sessions: Detectors: Session A: Software / Computing

Contribution ID: **30** Type: **Oral presentation using Zoom**

# A high-luminosity SC e+e- collider with energy recovery and multiple use of beams

*Thursday 28 October 2021 13:30 (30 minutes)*

A linear e+e- collider with energy recovery (ERLC) is considered. To avoid parasitic collisions inside the linac a twin LC is proposed. The acceleration gradient is 20 GeV/m, Q=3.10ˆ10. For 2E=250 GeV, the luminosity is about 5.10ˆ35 when working with a duty cycle 1/3 and total power P=130 MW. With the power about 250 MW, it can work in continuous mode and produce L=10ˆ36. This is a "green"collider, two orders of magnitude more efficient than the ILC.

## 1st preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

## 2nd preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

**Author:** Prof. TELNOV, Valery (Budker INP and Novosibirsk State Univ.)

**Presenter:** Prof. TELNOV, Valery (Budker INP and Novosibirsk State Univ.)

**Session Classification:** W-1: Green ILC

**Track Classification:** Parallel sessions: Sustainability: Session W: Green ILC

Contribution ID: **31** Type: **Oral presentation using Zoom**

# Photon collider at the ILC, first forty years

*Thursday 28 October 2021 15:30 (40 minutes)*

Photon collider (gamma-gamma, gamma-e), PLC, proposed in 1981, was discussed at all LC workshops as a very natural addition to linear e+e-colliders, since the beams are used only once. I will recall the physical motivation and possible parameters of the PLC and what needs to be foreseen in the design of the collider in order to have the PLC in the future (or from the very beginning?).

## 1st preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Author:** Prof. TELNOV, Valery (Budker INP and Novosibirsk State Univ.)

**Presenter:** Prof. TELNOV, Valery (Budker INP and Novosibirsk State Univ.)

**Session Classification:** V: Alternative collider modes

**Track Classification:** Parallel sessions: Alternative: Session V: Alternative collider modes

Contribution ID: **32** Type: **Oral presentation using Zoom**

# Photon collider based on the EU XFEL linac as a prototype of the PLC at the ILC

*Thursday 28 October 2021 16:10 (20 minutes)*

We consider a gamma-gamma collider with W<12 GeV based on 17 GeV linac of the EU XFEL. High-energy photons will be obtained by Compton scattering of 0.5 μm laser photons on the existing 17.5 GeV electron beams. Such a collider would be an excellent place for the development and application of modern technologies needed for the PLC: powerful lasers, optical cavities and low-emittance electron sources. The physics program would include spectroscopy of C=+ resonances in various JˆP states. Variable circular and linear polarizations will help in the determination of quantum numbers. It is shown that two-photon resonances in the 10 GeV region can be well observed in the presence of a large multi-hadron background.

## 1st preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

## 2nd preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

**Author:** Prof. TELNOV, Valery (Budker INP and Novosibirsk State Univ.)

**Presenter:** Prof. TELNOV, Valery (Budker INP and Novosibirsk State Univ.)

**Session Classification:** V: Alternative collider modes

**Track Classification:** Parallel sessions: Alternative: Session V: Alternative collider modes

Contribution ID: **33** Type: **Oral presentation using Zoom**

# Diversified use of ILC: A possibility of hadron photoproduction experiments at a beam dump

*Wednesday 27 October 2021 15:30 (24 minutes)*

The ILC provides an extremely high energy electron beam with an excellent beam divergence. Thus, a linearly polarized photon beam of about 75 GeV can be produced by coherent bremsstrahlung using a thin diamond radiator. Thanks to the electron beam polarization, it is also possible to generate a circularly polarized photon beam. Such a very high energy photon beam would be useful to produce exotic hadrons with charm or bottom quarks and to investigate their natures through polarization observables. This talk will present a possibility of hadron photoproduction experiments at a beam dump as a diversified use of ILC.

## 1st preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

## 2nd preferred time slot for your oral presentation

10:00-12:00 JST (3:00-5:00 CEST, 21:00-23:00 EDT, 18:00-20:00 PDT)

**Author:** MURAMATSU, Norihito (ELPH, Tohoku University)

**Presenter:** MURAMATSU, Norihito (ELPH, Tohoku University)

**Session Classification:** S: ILC application (to physics, material science, etc.)

**Track Classification:** Parallel sessions: Accelerators: Session S: ILC application (to physics, material science, etc.)

Contribution ID: **34** Type: **Oral presentation using Zoom**

# Potential BSM searches in e-e- collisions at ILC.

*Thursday 28 October 2021 16:30 (20 minutes)*

Potential physical studies feasible with the ILD experiment operating in the e-e- mode at the ILC collider are discussed. A data sample of about 100 fb-1 collected at the e-e- collisions will allow to search for a few specific processes beyond the Standard model. A high sensitivity can be achieved for the processes proceeding through the t-channel exchange of Majorana neutrino, e-e- ⟶ W-W-, and the t-channel neutralino exchange with SUSY selectrons in the final state, e-e- ⟶ e˜-e˜-. A new method is proposed to search for heavy Higgs bosons in the vector boson fusion processes, e-e- ⟶ H0 e-e-, e-e- ⟶ H-e-nu_e, and e-e- ⟶ H– nu_e nu_e.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

10:00-12:00 JST (3:00-5:00 CEST, 21:00-23:00 EDT, 18:00-20:00 PDT)

**Author:** DRUTSKOY, Alexey (LPI, Moscow)

**Presenter:** DRUTSKOY, Alexey (LPI, Moscow)

**Session Classification:** V: Alternative collider modes

**Track Classification:** Parallel sessions: Alternative: Session V: Alternative collider modes

Contribution ID: **35** Type: **Oral presentation using Zoom**

# Subleading Logarithmic QED Initial State Corrections to $e^+e^- \to \gamma^*/Z^*$

*Thursday 28 October 2021 19:00 (24 minutes)*

Using the method of massive operator matrix elements, we calculate the subleading logarithmic QED initial state radiation corrections to the process $e^+e^- \to \gamma^*/Z^*$ in the limit of large center of mass energies $s \gg m_e^2$ up to $O(\alpha^6)$. We furthermore generalize the calculation to the leading logarithmic corrections to the forward-backward asymmetry to the same order. Given the high precision at future colliders operating at very large luminosity, these corrections are important for concise theoretical predictions.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Author:** SCHÖNWALD, Kay (KIT)

**Presenter:** SCHÖNWALD, Kay (KIT)

**Session Classification:** K&I: Modeling & precision theory & Electroweak physics

**Track Classification:** Parallel sessions: Topical Groups: Session K: Modeling & precision theory

Contribution ID: **36** Type: **Oral presentation using Zoom**

# electroweak precision observables at future electron-positron colliders

*Thursday 28 October 2021 20:36 (24 minutes)*

Future electron-positron colliders will allow us to test Standard Model physics, especially for the electroweak sector, to an unprecedented level of precision, which could reveal signs for new physics that were previously inaccessible. This requires the theory side to put effort into two aspects. First, we need to link observables predicted by models to the experimental process in a model-independent and theoretically well-defined way. Secondly, we need to carry out the relevant radiative corrections up to the new precision frontier given by the future colliders for each experimentally and theoretically well-defined precision observable. In this talk, we will address some work done, also provide an outlook on future work concerning these two aspects.

## 1st preferred time slot for your oral presentation

10:00-12:00 JST (3:00-5:00 CEST, 21:00-23:00 EDT, 18:00-20:00 PDT)

## 2nd preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

**Author:** CHEN, Lisong (PITT-PACC)

**Co-author:** Prof. FREITAS, Lisong (PITT-PACC)

**Presenter:** CHEN, Lisong (PITT-PACC)

**Session Classification:** K&I: Modeling & precision theory & Electroweak physics

**Track Classification:** Parallel sessions: Topical Groups: Session K: Modeling & precision theory

Contribution ID: **37** Type: **Oral presentation using Zoom**

# Measurements of LGAD/APD devices for application to ILD SiW-ECAL

*Wednesday 27 October 2021 13:50 (20 minutes)*

We are developing LGAD devices for ILD SiW-ECAL via collaboration with Hamamatsu.
We are testing characteristics of reach-through and inverse-type APDs produced by Hamamatsu with charged particles to estimate gain characteristics and timing resolution. Several test beams have been conducted with sub-GeV positron beam at ELPH, Tohoku University. This talk will cover results with recent test beams as well as will radioisotopes, including results of quick analysis of the latest test beam to be done in October this year.

## 1st preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Authors:** KAWAGOE, Kiyotomo (Kyushu University); KUHARA, Mami; SUEHARA, Taikan (Kyushu University); TSUMURA, Shusaku (Kyushu University); YOSHIOKA, Tamaki; ONOE, Tomoki (Kyushu University); KATO, Yu (University of Tokyo)

**Presenter:** SUEHARA, Taikan (Kyushu University)

**Session Classification:** B-1: Calorimeters

**Track Classification:** Parallel sessions: Detectors: Session B: Calorimeters

Contribution ID: **38** Type: **Oral presentation using Zoom**

# New Regime of Ultrahigh Laser and High Electron/Positron Interaction

*Wednesday 27 October 2021 15:54 (24 minutes)*

The International Linear Collider (ILC) will have electron and positron beam energies above 125 GeV. High intensity lasers have achieved unprecedented intensities of $10^{23}$ W/cm$^2$. Although typically such lasers have photons with energies in the eV range in the laboratory frame, colliding such high intensity lasers and the ultrahigh energy electron and positron beams of the ILC will result in laser photons with energies comparable the electron rest mass colliding with electrons or positrons at rest in the center-of-mass frame. Having such collisions after the interaction point will provide a unique opportunity to study high field science and applications. We will present simulation results of the interaction using the CAIN code and discuss the fundamental physics possibilities, such as generation of electron-positron cascades and generation of exotic particles, as well as possible applications such as easing the burden on the beam dumps through the reduction of the beam energies with ultrahigh intensity lasers.

## 1st preferred time slot for your oral presentation

10:00-12:00 JST (3:00-5:00 CEST, 21:00-23:00 EDT, 18:00-20:00 PDT)

## 2nd preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

**Authors:** Dr KOGA, James (National Institutes for Quantum and Radiological Science and Technology (QST)); Dr KANDO, Masaki (QST)

**Presenter:** Dr KOGA, James (National Institutes for Quantum and Radiological Science and Technology (QST))

**Session Classification:** S: ILC application (to physics, material science, etc.)

**Track Classification:** Parallel sessions: Accelerators: Session S: ILC application (to physics, material science, etc.)

Contribution ID: **39** Type: **Oral presentation using Zoom**

# Impact of overlay events on the charged IDM scalar reconstruction at CLIC

*Wednesday 27 October 2021 19:20 (20 minutes)*

The Inert Doublet Model (IDM) is one of the simplest SM extensions and introduces four new scalar particles: $H^{\pm}$, A and H; the lightest, H, is stable and hence it is a natural dark matter (DM) candidate. A set of benchmark points is considered, which are consistent with current theoretical and experimental constraints and promise detectable signals at future colliders. Discovery reach for the IDM charged scalar pair-production is considered for the semi-leptonic final state at the two high-energy CLIC stages. Five selected benchmarks were analysed with full detector simulation and the study was extended to more scenarios using Delphes fast simulation.

In the several benchmark scenarios, the small mass splitting between scalars $H^{\pm}$ and A makes the final state reconstruction vulnerable to beam-induced $\gamma\gamma \rightarrow$ hadrons overlay events. It is, however, not possible to apply the same background mitigation procedure in Delphes as implemented in the full CLIC detector simulation and reconstruction algorithms. Therefore, an approximate method of taking it into account has been developed and the results obtained this way show good agreement with the full simulation.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Author:** KLAMKA, Jan (University of Warsaw)

**Co-author:** ZARNECKI, Aleksander Filip (University of Warsaw)

**Presenter:** KLAMKA, Jan (University of Warsaw)

**Session Classification:** F&H-2: Higgs properties & BSM particle production

**Track Classification:** Parallel sessions: Topical Groups: Session H: BSM particle production

Contribution ID: **40** Type: **Oral presentation using Zoom**

# Searching for Charged via $e^+e^- \to H^+H^- \to \bar{b}cb\bar{c}$ at Linear colliders

*Wednesday 27 October 2021 10:00 (20 minutes)*

We present a search for the charged Higgs boson via $e^+e^- \to H^+H^- \to bcbc$ at the 500 GeV ILC. In a general two Higgs doublet model without $Z_2$ symmetry, extra Yukawa couplings such as $\rho_{tc}$ and $\rho_{tt}$ can drive baryogenesis, but searches at the HL-LHC may still come away empty-handed. In this report, we take $m_(H^+) = m_H = m_A = 200$ GeV with $\rho_{tc} = \rho_{tt} = 0.1$, and no h(125)-H mixing. We study the four jet final state with two b-tagged, which would clearly be overwhelmed by QCD background at LHC, but with electroweak production of $H^+H^-$ at ILC, the signal is discoverable. We find that ILC can capture this signature with significance at $20\sigma$ or better with integrated luminosity of 1 $ab^{-1}$. We also show that the mass of Hˆ+ can be recovered by requiring the two b and light jet pairs be approximately equal in mass, without assuming the mass. Thus, ILC can probe low mass Higgs bosons in multijet final states to compliment HL-LHC in the future.

## 1st preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Authors:** JAIN, Rishabh (National Taiwan University); Dr MODAK, Tanmoy (University of Heidelberg); Prof. HOU, Wei-Shu (National Taiwan University)

**Presenter:** JAIN, Rishabh (National Taiwan University)

**Session Classification:** F&H-1: Higgs properties & BSM particle production

**Track Classification:** Parallel sessions: Topical Groups: Session H: BSM particle production

Contribution ID: **41** Type: **Oral presentation using Zoom**

# Optimising top-quark threshold scan using genetic algorithm

*Wednesday 27 October 2021 16:42 (20 minutes)*

One of the important goals at the future $e^+e^-$ colliders is to measure the top-quark mass and width in a scan of the pair production threshold. However, the shape of the pair-production cross section at the threshold depends also on other model parameters, as the top Yukawa coupling, and the measurement is a subject to many systematic uncertainties. Presented in this work is the study of the top-quark mass determination from the threshold scan. The most general approach is used with all relevant model parameters and selected systematic uncertainties included in the fit procedure. Based on the procedure developed for CLIC, results assuming the ILC luminosity spectra are presented. Expected constraints from other measurements are also taken into account. It is demonstrated that the top-quark mass can be extracted with precision of the order of 30 to 40 MeV, including considered systematic uncertainties, already for 100 fb−1of data collected at the threshold. Additional improvement is possible, if the running scenario is optimised. With the optimisation procedure based on the genetic algorithm the statistical uncertainty of the mass measurement can be reduced by about 25%. Influence of the collider luminosity spectra on the expected precision of the measurement is also studied.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Authors:** ZARNECKI, Aleksander Filip (University of Warsaw); NOWAK, Kacper (University of Warsaw)

**Presenter:** NOWAK, Kacper (University of Warsaw)

**Session Classification:** G: Top / Heavy flavour / QCD

**Track Classification:** Parallel sessions: Topical Groups: Session G: Top / Heavy flavour / QCD

Contribution ID: **42** Type: **Oral presentation using Zoom**

# EDM4hep - The event data model for future collider studies

*Thursday 28 October 2021 19:25 (20 minutes)*

The Event Data Model (EDM) is at the heart of every HEP experiment software framework. It defines the language physicists can use to express their ideas and also how different software components communicate with each other. The Key4hep project aims to develop a common software stack for all future collider projects. As the common EDM for all these projects, EDM4hep is one of the corner stones of the Key4hep project. EDM4hep is implemented via the podio EDM toolkit and a prototype version, based on LCIO, has been designed. We will present some of the technical details of the implementation of EDM4hep and podio. Based on that we will discuss some of the similarities and differences between EDM4hep and LCIO. We will highlight some experiences with the usage of EDM4hep in the Key4hep framework and give an outline for future plans.

## 1st preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

## 2nd preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

**Author:** MADLENER, Thomas (Deutsches Elektronen-Synchrotron (DE))

**Presenter:** MADLENER, Thomas (Deutsches Elektronen-Synchrotron (DE))

**Session Classification:** A-1: Software / Computing

**Track Classification:** Parallel sessions: Detectors: Session A: Software / Computing

Contribution ID: **43** Type: **Oral presentation using Zoom**

# Forward Backward Asymmetry studies with heavy quarks (b/c) at ILC250

*Wednesday 27 October 2021 15:54 (20 minutes)*

The process ee->qq (with q from u to top) plays a central role in the physics programs of high energy electron-positron colliders operating from the O(100GeV) to O(1TeV) center of mass energies. Furthermore, polarised beams as available at the International Linear Collider (ILC) are an essential input for the complete measurement of the helicity amplitudes that govern the production cross section. Quarks, specially the heaviers, are likely messengers to new physics and at the same time they are ideal benchmark processes for detector optimisation. We will present detailed studies for the bottom and charm quarks production at 250GeV using ILD full simulation.
These measurements require superb primary and secondary vertex reconstruction, a high tracking efficiency to correctly measure the vertex charge and excellent hadron identification capabilities. We will show how that we can reach 0.1% - 0.5% level of experimental precision, including a comprehensive study of the systematic uncertainties. We will also outline the capabilities of indirect discovery of new physics as Randall-Sundrum models with warped extra dimensions.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Authors:** IRLES, Adrian (IFIC (CSIC/UVEG) Valencia); POESCHL, Roman (Université Paris-Saclay (FR)); RICHARD, Francois (LAL Orsay)

**Presenter:** IRLES, Adrian (IFIC (CSIC/UVEG) Valencia)

**Session Classification:** G: Top / Heavy flavour / QCD

**Track Classification:** Parallel sessions: Topical Groups: Session G: Top / Heavy flavour / QCD

Contribution ID: **44** Type: **Oral presentation using Zoom**

# The THDMa and possible e+e- signatures

*Wednesday 27 October 2021 19:00 (20 minutes)*

The THDMa is a new physics model that extends the scalar sector of the Standard Model by an additional doublet as well as a pseudoscalar singlet and allows for mixing between all possible scalar states. In the gauge eigenbasis, the additional pseudoscalar serves as a portal to the dark sector, with a priori any dark matter spin states. The option where dark matter is fermionic is currently one of the standard benchmarks for the experimental collaborations, and several searches at the LHC constrain the corresponding parameter space. However, most current studies constrain regions in parameter space by setting all but 2 of the 12 free parameters to fixed values.
I will discuss a generic scan on this model, allowing all parameters to float. All current theoretical and experimental constraints are applied. I identify regions in the parameter space which are still allowed after these have been applied and which might be interesting for an investigation at a future e+e- collider.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Author:** ROBENS, Tania Natalie (Rudjer Boskovic Institute (HR))

**Presenter:** ROBENS, Tania Natalie (Rudjer Boskovic Institute (HR))

**Session Classification:** F&H-2: Higgs properties & BSM particle production

**Track Classification:** Parallel sessions: Topical Groups: Session F: Higgs properties

Contribution ID: **45** Type: **Oral presentation using Zoom**

# Measurement of $\sigma(e^+e^- \to HZ) \times$ cal Br(H $\to ZZ^*$) at the 250 GeV ILC

*Thursday 28 October 2021 15:30 (20 minutes)*

We report on studies of the $e^+e^- \to HZ$ process with the subsequent decay of the Higgs boson $H \to ZZ^\star$, where the $ZZ^\star$ combination is reconstructed in the final states with two jets and two leptons. The analysis is performed using Monte Carlo data samples obtained with detailed ILD detector simulation assuming the integrated luminosity 2 ab$^{-1}$, the beam polarizations $calP_{e^-e^+} = (-0.8, +0.3)$, and the center-of-mass energy $\sqrt{s}$ = 250 GeV. The analysis is also repeated for the case of two 0.9 ab$^{-1}$ data samples with polarizations $calP_{e^-e^+} = (\mp 0.8, \pm 0.3)$. Contributions of the potential background processes are taken into account based on the available MC event samples. The $e^+e^- \to HZ$ process measurement allows to obtain the width of the Higgs boson in a model-independent approach.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Authors:** DRUTSKOY, Alexey (LPI, Moscow); Mr ANTONOV, Evgeny (Lebedev Physical Institute of the Russian Academy of Sciences)

**Presenter:** Mr ANTONOV, Evgeny (Lebedev Physical Institute of the Russian Academy of Sciences)

**Session Classification:** F-3: Higgs properties

**Track Classification:** Parallel sessions: Topical Groups: Session F: Higgs properties

Contribution ID: **46** Type: **Oral presentation using Zoom**

# Dark Matter and Collider Searches at ILC in $S_3$ -Symmetric 2HDM with Vector Like Leptons

*Wednesday 27 October 2021 15:30 (20 minutes)*

We study the $S_3$-symmetric two Higgs doublet model by adding two generations of vector like leptons (VLL) which are odd under a discrete $Z_2$-symmetry. The lightest neutral component of the VLL acts as a dark matter (DM) whereas the full VLL set belongs to a dark sector with no mixings allowed with the standard model fermions. We analyse the model in light of dark matter and collider searches. We show that the DM is compatible with the current relic density data as well
as satisfying all direct and indirect dark matter search constraints. We choose some representative points in the model parameter space allowed by all aforementioned dark matter constraints and propose a few collider signatures, namely di-lepton, four-lepton and mono-lepton+2jet along with transverse missing energy that can be easily tested at the International Linear Collider (ILC), in contrast to the LHC machine due to cleaner backgrounds.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Author:** Dr GHOSH, Nivedita (Harish-Chandra Research Institute)

**Co-authors:** Prof. GHOSH, Dilip Kumar (Indian Association For The Cultivation Od Science); Dr CHAKRABORTY, Indrani (IIT Kanpur); Prof. RAI, Santosh Kumar (Harish Chandra Research Institute)

**Presenter:** Dr GHOSH, Nivedita (Harish-Chandra Research Institute)

**Session Classification:** H-2: BSM particle production

**Track Classification:** Parallel sessions: Topical Groups: Session H: BSM particle production

Contribution ID: **47** Type: **Oral presentation using Zoom**

# Towards ee->ss at ILC250

*Wednesday 27 October 2021 16:18 (20 minutes)*

Linear Colliders with polarised beams provide unique opportunities to measure the helicity structure of the process ee->qq and to discover the onset of new physics.
This talk presents the status of a detailed simulation study of the process ee->ss based on the ILD concept. Particle identification of final state Kaons plays plays a crucial role for the success of the measurement and will be at the centre of the presentation. We will also review the handling of backgrounds from the light quarks u and d. The talk will finish with an outlook on the expected precisions in terms of cross sections and relevant asymmetries.

## 1st preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

## 2nd preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

**Authors:** IRLES, Adrian (IFIC (CSIC/UVEG) Valencia); POESCHL, Roman (Université Paris-Saclay (FR)); RICHARD, Francois (LAL Orsay); YAMAMOTO, Hitoshi; YAMAMOTO, Hitoshi; SANUKI, Tomoyuki (Tohoku University); OKUGAWA, Yuichi (Tohoku University)

**Presenter:** OKUGAWA, Yuichi (Tohoku University)

**Session Classification:** G: Top / Heavy flavour / QCD

**Track Classification:** Parallel sessions: Topical Groups: Session G: Top / Heavy flavour / QCD

Contribution ID: **48** Type: **Oral presentation using Zoom**

# A new (Very) Front-End Board for the ILD SiW-ECAL

*Wednesday 27 October 2021 16:20 (20 minutes)*

The Silicon-Tungsten ECAL (SiW-ECAL) of ILD will require about 10,000 detector slabs of 1.4 to 1,8 m in length. For the ease of building and testing, the slabs are made of stitched detector elements of 18×18 cm², composed of a Front-End Board (FEB), hosting the readout ASICs for 1024 channels, on which the Silicon sensors are glued.
Various types of detector elements have been successfully tested individually; the first attempt to chain them into a long slab in 2018, while globally positive, hinted at some improvements.
As its predecessor, the new FEB will handle 16 SKIROC 2A chips, amplifying, shaping, pipelining and digitizing the data generated by collisions at the International Linear Collider ILC, taking advantage of its pulsed operations to reduce the power dissipation.
This presentation describes the FEB design, adapted for long slabs composed of up to 10 FEB, to perform power supply distribution (now locally pulsed), local high voltage distribution (to reduce intervention and handling). Also, will be show preliminary results on power supply, slow control and leackage current measurements on 1 to 5 FEB chained.

## 1st preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

## 2nd preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

**Authors:** Mr NANNI, jerome (LLR –CNRS, École polytechnique, Institut Polytechnique de Paris, 91120 Palaiseau, France); BOUDRY, Vincent (LLR – Institut Polytechnique de Paris / CNRS-IN2P3); DOS SANTOS, Thibault (LLR –CNRS, École polytechnique, Institut Polytechnique de Paris, 91120 Palaiseau, France); Mr GUILLAUMAT, Rémi (LLR –CNRS, École polytechnique, Institut Polytechnique de Paris, 91120 Palaiseau, France)

**Co-authors:** BRETON, Dominique (Université Paris-Saclay (FR)); POESCHL, Roman (Université Paris-Saclay (FR)); CALLIER, Stéphane (OMEGA / IN2P3-CNRS); JEGLOT, Jimmy (Université Paris-Saclay (FR)); MAALMI, Jihane (Université Paris-Saclay (FR))

**Presenter:** Mr NANNI, jerome (LLR –CNRS, École polytechnique, Institut Polytechnique de Paris, 91120 Palaiseau, France)

**Session Classification:** B-2: Calorimeters

**Track Classification:** Parallel sessions: Detectors: Session B: Calorimeters

Contribution ID: **49** Type: **Oral presentation using Zoom**

# Challenges ahead of the ILD SiW-ECAL (cancelled)

*Wednesday 27 October 2021 16:45 (20 minutes)*

The traditional purpose of the ECAL of the ILD experiment is to measure neutrals (especially photons but also the interacting neutral hadrons) while tracking the charged particles for particle flow algorithms.
A highly granular Silicon-Tungsten ECAL (SiW-ECAL) is particularly suited for these tasks.
The SiW-ECAL faces many technical challenges: the main ones have been solved, some remains to be tackled, while new ones, such as a precise timing, still need to be fully evaluated.
It is proposed here to make a review of the art on all these issues.

## 1st preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

## 2nd preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

**Author:** BOUDRY, Vincent (LLR – Institut Polytechnique de Paris / CNRS-IN2P3)

**Presenter:** BOUDRY, Vincent (LLR – Institut Polytechnique de Paris / CNRS-IN2P3)

**Session Classification:** B-2: Calorimeters

**Track Classification:** Parallel sessions: Detectors: Session B: Calorimeters

Contribution ID: **50** Type: **Oral presentation using Zoom**

# Radiative Neutrino Mass with GeV Scale Majorana Dark Matter in Scotogenic Model

*Thursday 28 October 2021 20:20 (20 minutes)*

The experimental observations from the colliders established the standard model (SM), the most successful phenomenological framework to explain the non-gravitational interactions of fundamental particles at high energy. Non-zero neutrino mass and dark matter cast a shadow
over its success. This necessitates the extension of the SM. The most straightforward and elegant extension of the SM to explain these two phenomena is the Scotogenic model, where the SM particle
spectrum extends with three isospin singlet right-handed neutrinos and one doublet scalar while all of these being odd under Z2 symmetry. In this work, we have considered the lightest right-handed neutrino as the dark matter candidate and freeze-out mechanism for producing the observed
dark matter relic density. The charged lepton flavor violation decay processes constrain the upper side of Yukawa coupling while the observed relic density limits the lower side. We have performed a unique parameterization to attain the highest possible Yukawa coupling while satisfying LFV and DM constraints. The reduced number of free parameters and large Yukawa coupling makes the model predictability at lepton colliders very high. Collider phenomenology for possible signatures performed at lepton colliders and the required luminosities estimated for detection. The exclusion bounds on the inert charged scalars were recast at the 13 TeV LHC.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

10:00-12:00 JST (3:00-5:00 CEST, 21:00-23:00 EDT, 18:00-20:00 PDT)

**Authors:** Mr ., Avnish (Institute of Physics, Bhubaneswar, India.); Dr GHOSH, Kirtiman (Institute of Physics, Bhubaneswar - 751005.)

**Presenters:** Mr ., Avnish (Institute of Physics, Bhubaneswar, India.); Dr GHOSH, Kirtiman (Institute of Physics, Bhubaneswar - 751005.)

**Session Classification:** H-3: BSM particle production

**Track Classification:** Parallel sessions: Topical Groups: Session H: BSM particle production

Contribution ID: **51** Type: **Oral presentation using Zoom**

# HPC resources and HEP experiments

*Friday 29 October 2021 13:25 (20 minutes)*

HEP experiments are among the top users at HPC centers worldwide, where they have run in production for years. Significant effort has been invested in adapting HEP workflows to these unique platforms. Yet, we have only scratched the surface. The next generation of exascale HPC systems has the potential to revolutionize HEP computing, but only if we can re-engineer our applications to run in parallel on a range of heterogeneous "data-centric" architectures.

## 1st preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

## 2nd preferred time slot for your oral presentation

10:00-12:00 JST (3:00-5:00 CEST, 21:00-23:00 EDT, 18:00-20:00 PDT)

**Author:** CALAFIURA, Paolo (Lawrence Berkeley National Lab. (US))

**Presenter:** CALAFIURA, Paolo (Lawrence Berkeley National Lab. (US))

**Session Classification:** A-2: Software / Computing

**Track Classification:** Parallel sessions: Detectors: Session A: Software / Computing

Contribution ID: **52** Type: **Oral presentation using Zoom**

# Testing aligned two Higgs doublet models with CP violation at LHC and ILC

*Thursday 28 October 2021 14:00 (20 minutes)*

To generate the baryon asymmetry of the universe, new CP violation sources are needed beyond the Standard Model. We consider a two Higgs doublet model with the CP violation. In this model, the property of the Heavy higgs bosons relevant to the CP phases would be important. We discuss the testability of the model at LHC and ILC.

## 1st preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

## 2nd preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

**Author:** TAKEUCHI, Michihisa (Osaka Univ.)

**Presenter:** TAKEUCHI, Michihisa (Osaka Univ.)

**Session Classification:** F-2: Higgs properties

**Track Classification:** Parallel sessions: Topical Groups: Session F: Higgs properties

Contribution ID: **53** Type: **Oral presentation using Zoom**

# Searching for Lepton Portal Dark Matter at Linear Colliders

*Wednesday 27 October 2021 14:00 (20 minutes)*

In this talk, I discuss the phenomenology of a minimal model for GeV-scale Majorana dark matter (DM) coupled to the standard model lepton sector via a charged scalar singlet. The theoretical framework extends the Standard Model by two $SU(2)_L$ singlets: one charged Higgs boson and a singlet right-handed fermion. The latter plays the role of the DM candidate. We show that there is an anti-correlation between the spin-independent DM-Nucleus scattering cross-section ($\sigma_{\rm SI}$) and the DM relic density for parameters values allowed by various theoretical and experimental constraints. Moreover, we find that even when DM couplings are of order unity, $\sigma_{\rm SI}$ is below the current experimental bound but above the neutrino floor. Furthermore, we show that the considered model can be probed at High Energy lepton colliders using e.g. the mono-Higgs production and same-sign charged Higgs pair production.

## 1st preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

## 2nd preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

**Author:** Dr JUEID, Adil (Korea Institute for Advanced Studies)

**Presenter:** Dr JUEID, Adil (Korea Institute for Advanced Studies)

**Session Classification:** H-1: BSM particle production

**Track Classification:** Parallel sessions: Topical Groups: Session H: BSM particle production

Contribution ID: **54** Type: **Oral presentation using Zoom**

# Next-to-leading-order corrections to the e+e- → hZ process in extended Higgs models

*Thursday 28 October 2021 15:50 (20 minutes)*

Precision measurements of the properties of the discovered Higgs boson are one of the main programs at current and future collider experiments. At the international linear collider with the center-of-mass energy 250 GeV, e+e- → hZ is the dominant Higgs production process, and the cross section would be measured with a few percent accuracies. In this talk, we present the cross section of the e+e- → hZ process at full next-to-leading order in various extended Higgs models. In addition, by using the H-COUP program, we analyze the deviations in the cross section times decay branching ratios of the discovered Higgs boson. We discuss the discrimination of extended Higgs models at the future colliders in detail. This talk is based on arXiv:2109.02884.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Author:** Mr AIKO, Masashi

**Co-authors:** KANEMURA, Shinya (Osaka University); MAWATARI, Kentarou

**Presenter:** Mr AIKO, Masashi

**Session Classification:** F-3: Higgs properties

**Track Classification:** Parallel sessions: Topical Groups: Session F: Higgs properties

Contribution ID: **55** Type: **Oral presentation using Zoom**

# Probing extended Higgs sectors by the synergy between the LHC and the ILC

*Thursday 28 October 2021 19:40 (20 minutes)*

We discuss a possibility that the parameter space of the two Higgs doublet model is significantly narrowed down by considering the synergy between direct searches for additional Higgs bosons at the LHC and its luminosity upgraded operation and precision measurements of the Higgs boson properties at future electron-positron colliders such as the International Linear Collider.
The talk is based on Nucl.Phys.B 966 (2021) 115375 (arXiv: 2010.15057).

## 1st preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

## 2nd preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

**Author:** MAWATARI, Kentarou

**Presenter:** MAWATARI, Kentarou

**Session Classification:** F-4: Higgs properties

**Track Classification:** Parallel sessions: Topical Groups: Session F: Higgs properties

Contribution ID: **56** Type: **Oral presentation using Zoom**

# Sizable triple Higgs couplings in the 2HDM: Prospects for future $e^+e^-$ colliders

*Wednesday 27 October 2021 19:40 (20 minutes)*

We analyze the possible size of various triple Higgs couplings in the 2HDM (type I and II), allowed by all current theoretical and experimental constraints. We discuss how one can get access to them at future $e^+e^-$ with a center-of-mass energy of 500 GeV or more.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

10:00-12:00 JST (3:00-5:00 CEST, 21:00-23:00 EDT, 18:00-20:00 PDT)

**Authors:** ARCO, Francisco (IFT (UAM)); HEINEMEYER, Sven; HERRERO, Maria Jose (IFT (UAM))

**Presenter:** ARCO, Francisco (IFT (UAM))

**Session Classification:** F&H-2: Higgs properties & BSM particle production

**Track Classification:** Parallel sessions: Topical Groups: Session F: Higgs properties

Contribution ID: **57** Type: **Oral presentation using Zoom**

# A 96 GeV Higgs Boson in the 2HDMS and the N2HDM

*Wednesday 27 October 2021 20:20 (20 minutes)*

We analyze the possible realization of a 96 GeV Higgs boson describing the "excesses" observed at CMS in the di-photon decay channel and at LEP in the $b\bar{b}$ decay channel. We compare the realizations in the 2DMD with an additional real singlet (N2HDM) or a complex singlet (2HDMS). We discuss how these realizations can possibly resolved at future high-energy $e^+e^-$ colliders.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

10:00-12:00 JST (3:00-5:00 CEST, 21:00-23:00 EDT, 18:00-20:00 PDT)

**Authors:** LI, Cheng (DESY); MOORTGAT-PICK, Gudrid; HEINEMEYER, Sven; LIKA, Florian (DESY); PAASCH, Steven (DESY)

**Presenter:** LI, Cheng (DESY)

**Session Classification:** F&H-2: Higgs properties & BSM particle production

**Track Classification:** Parallel sessions: Topical Groups: Session F: Higgs properties

Contribution ID: **58** Type: **Oral presentation using Zoom**

# $(g-2)_\mu$ and $M_W$ predictions in the MSSM

*Wednesday 27 October 2021 19:00 (24 minutes)*

The confirmed $(g-2)_\mu$ anomaly can perfectly be fitted in the Minimal Supersymmetric Standard Model (MSSM), taking into account all experimental constraints. This requires a relatively light electroweak sector of the MSSM, which in turn can give rise to positive contributions of the $W$ boson mass, $M_W$. We analyze these predictions in view of the anticipated improved measurements of $M_W$ at the ILC and their possible impact on the allowed parameter space.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

10:00-12:00 JST (3:00-5:00 CEST, 21:00-23:00 EDT, 18:00-20:00 PDT)

**Authors:** BAGNASCHI, Emanuele (PSI); WEIGLEIN, Georg Ralf (Deutsches Elektronen-Synchrotron (DE)); HEINEMEYER, Sven; SAHA, Ipsita (Kavli IPMU); CHAKRABORTI, Manimala (Astrocent, Warsaw); BAGNASCHI, Emanuele Angelo (Universita e INFN Roma Tre (IT))

**Presenters:** BAGNASCHI, Emanuele (PSI); BAGNASCHI, Emanuele Angelo (Universita e INFN Roma Tre (IT))

**Session Classification:** I: Electroweak physics

**Track Classification:** Parallel sessions: Topical Groups: Session I: Electroweak physics

Contribution ID: **59** Type: **Oral presentation using Zoom**

# CP asymmetries of B to X_{s,d} gamma in models with three Higgs doublets

*Thursday 28 October 2021 19:20 (20 minutes)*

We study the prediction of the direct CP asymmetry in the inclusive decays of B to X_s gamma and B to X_{s+d} gamma in the context of a three-Higgs-doublet model(3HDM). The 3HDM is the simplest multi-doublet model such that the charged Higgs mixing includes a physical CP phase.
We show that the CP asymmetries can be as significant as the current experimental limit. In particular, the asymmetry for B to X_{s+d} gamma, which is effectively zero in the Standard Model, is interesting. A measurement of 2.5% or more for this observable with the full BELLE II data would give 5σ evidence for physics beyond the SM. We display parameter space in the 3HDM for which such a clear signal is possible.
The presentation is essentially based on the paper, A. G. Akeroyd, S. Moretti, T. Shindou and M. Song, Phys. Rev. D 103 (2021) no.1, 015035.

## 1st preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

## 2nd preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

**Author:** SHINDOU, Tetsuo

**Presenter:** SHINDOU, Tetsuo

**Session Classification:** F-4: Higgs properties

**Track Classification:** Parallel sessions: Topical Groups: Session F: Higgs properties

Contribution ID: **60** Type: **Oral presentation using Zoom**

# Status of the technological prototype of the CALICE highly granular SiW-ECAL

*Wednesday 27 October 2021 15:55 (20 minutes)*

A highly granular silicon-tungsten electromagnetic calorimeter (SiW-ECAL) is the reference design of the ECAL for International Large Detector (ILD) concept, one of the two detector concepts for the detector(s) at the future International Linear Collider. Prototypes for this type of detector are developed within the CALICE Collaboration. The technological prototype addresses technical challenges such as integrated front-end electronics or compact layer and readout design. During Autumn/Winter 2019/20 a stack of up to 22 layers with a dimension of ˜18×18×25cmˆ3 was compiled. A beam test at DESY is planned for November 2021.

We will present the status and latest developments of the hardware aspects of the prototype and the status of the implementation in simulation.

## 1st preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

## 2nd preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

**Authors:** JIMENEZ MORALES, Fabricio Andres (Centre National de la Recherche Scientifique (FR)); IRLES, Adrian (IFIC (CSIC/UVEG) Valencia); SIW-ECAL CALICE GROUP; POESCHL, Roman (Université Paris-Saclay (FR))

**Presenter:** JIMENEZ MORALES, Fabricio Andres (Centre National de la Recherche Scientifique (FR))

**Session Classification:** B-2: Calorimeters

**Track Classification:** Parallel sessions: Detectors: Session B: Calorimeters

Contribution ID: **61** Type: **Oral presentation using Zoom**

# H-COUP: Radiative corrections to Higgs properties toward future precision measurements

*Thursday 28 October 2021 13:00 (20 minutes)*

Precise determination for properties of the Higgs sector is one of the most important issues to clarify physics beyond the SM. For this purpose, we have developed the numerical tool H-COUP, and its version 1 (1-loop calculation for the Higgs boson couplings) and version 2 (1-loop calculation for the Higgs decay rates) have been published. We give a brief review of H-COUP and show how it works for precise calculations. We also discuss future prospects of the H-COUP project.

## 1st preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Author:** YAGYU, Kei (Toyama)

**Presenters:** YAGYU, Kei (Toyama); YAGYU, Kei (Osaka U)

**Session Classification:** F-2: Higgs properties

**Track Classification:** Parallel sessions: Topical Groups: Session F: Higgs properties

Contribution ID: **62** Type: **Oral presentation using Zoom**

# Prospects of charged Higgs in two Higgs doublet model at the LHC

*Thursday 28 October 2021 20:00 (20 minutes)*

Extension of the Higgs sector is ubiquitous in physics beyond the Standard Model (BSM), and the two Higgs Doublet Model (2HDM) is one of the simplest extensions containing two scalar doublets instead of one for electroweak symmetry breaking. In the first half of the talk, I will discuss the exclusion limits on the charged Higgs parameter space, $m_{H^\pm} - \tan\beta$, using the CMS results on the upper limits on $\sigma_{H^\pm}$BR($H^\pm \to \tau^\pm\nu$) and $\sigma_{H^\pm}$BR($H^+ \to t\bar{b}$) for $\sqrt{s} = 13$ TeV at an integrated luminosity of 35.9 fb$^{-1}$. The exclusions obtained at 13 TeV will be compared to the earlier 8 TeV results. The CMS collaboration also studied the exotic bosonic decay $H^\pm \to W^\pm A$ and $A \to \mu^+\mu^-$ for the first time and put upper limits on the BR($t \to H^+b$) for light charged Higgs. These constraints lead to exclusion of parameter space which are not excluded by the $\tau\nu$ channel. In the second half, I will talk about the prospect of looking for a fermiophobic charged Higgs via the same sign trilepton signal at the LHC. Such a fermiophobic scenario appears in Type I 2HDM
where the fermionic couplings of the charged Higgs are inversely proportional to $\tan\beta$. For a fermiophobic case, the electroweak production of charged Higgs is dominant for large $\tan\beta$ and the subsequent bosonic decay of the charged and neutral Higgs will give rise to the same sign trilepton signal which can be an excellent complementary search to explore the large $\tan\beta$ regions.

## 1st preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

## 2nd preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

**Author:** SANYAL, Prasenjit (Asia Pacific Center for Theoretical Physics)

**Presenter:** SANYAL, Prasenjit (Asia Pacific Center for Theoretical Physics)

**Session Classification:** F-4: Higgs properties

**Track Classification:** Parallel sessions: Topical Groups: Session F: Higgs properties

Contribution ID: **63** Type: **Oral presentation using Zoom**

# Leptoquarks and Zeros of Amplitude at Electron-Photon Collider

*Thursday 28 October 2021 17:10 (20 minutes)*

Though leptoquarks have gained much attention in recent time due to their ability to explain various flavour anomalies, their existence is not confirmed yet experimentally [1]. But, we find that zeros of single photon tree level amplitude [2,3] have the potential to provide information about leptoquarks (if any) at electron-photon collider [4]. It is a well known fact that the tree-level single photon amplitudes for various electroweak processes vanish at certain regions of phase space depending on the electric charges and four-momenta of the external particles [3]. On the other hand, using the technique of laser-backscattering [5], one electron-positron collider can be transformed to an electron-photon collision machine. A small number of SM backgrounds would keep the signal very clean in this collider. We have used a PYTHIA based simulation for production of leptoquark associated with a quark at electron-photon collider to obtain the results which are very encouraging.

**References**

1) I. Dorsner, S. Fajfer, A. Greljo, J. F. Kamenik and N. Kosnik, *Physics of leptoquarks in precision experiments and at particle colliders*, Phys. Rept. **641**, 1-68 (2016), doi:10.1016/j.physrep.2016.06.001.

2) K. O. Mikaelian, M. A. Samuel and D. Sahdev, *The Magnetic Moment of Weak Bosons Produced in p p and p anti-p Collisions*, Phys. Rev. Lett. **43**, 746 (1979), doi:10.1103/PhysRevLett.43.746.

3) S. J. Brodsky and R. W. Brown, *Zeros in Amplitudes: Gauge Theory and Radiation Interference*, Phys. Rev. Lett. **49**, 966 (1982), doi:10.1103/PhysRevLett.49.966.

4) P. Bandyopadhyay, S. Dutta and A. Karan, *Investigating the Production of Leptoquarks by Means of Zeros of Amplitude at Photon Electron Collider*, Eur. Phys. J. C **80**, no.6, 573 (2020), doi:10.1140/epjc/s10052-020-8083-7.

5) I. F. Ginzburg, G. L. Kotkin, V. G. Serbo and Valery I. Telnov, *Colliding $\gamma e$ and $\gamma\gamma$ beams based on the Single Pass Accelerators (of Vlepp Type)*, Nucl.Instrum.Meth. 205 (1983) 47-68.

## 1st preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

## 2nd preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

**Author:** KARAN, Anirban (IIT Hyderabad)

**Co-authors:** BANDYOPADHYAY, Priyotosh (IIT Hyderabad); DUTTA, Saunak (SGTB Khalsa College)

**Presenter:** KARAN, Anirban (IIT Hyderabad)

**Session Classification:** V: Alternative collider modes

**Track Classification:** Parallel sessions: Alternative: Session V: Alternative collider modes

Contribution ID: **64** Type: **Oral presentation using Zoom**

# Status: SiD Snowmass Studies on Higgs Properties

*Thursday 28 October 2021 10:00 (20 minutes)*

The Community Planning Exercise (aka Snowmass), sponsored by the Division of Particles and Fields of the APS, brings together international partners to investigate the state of the field and promising new possibilities for future study. In this talk we will review the current state of the studies described in the Letters of Interest (LoI) submitted for study of the Higgs boson properties with SiD, one of two detectors described in the International Linear Collider (ILC) Technical Design Report. These include sensitivity studies on invisible Higgs decays, Higgs decays to long-lived particles, CP properties in Higgs decays to tau pairs, and the Higgs self-coupling. The studies are expected to culminate with the end of Snowmass 2021 in summer 2022.

## 1st preferred time slot for your oral presentation

10:00-12:00 JST (3:00-5:00 CEST, 21:00-23:00 EDT, 18:00-20:00 PDT)

## 2nd preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

**Authors:** WHITE, Andy; POTTER, Christopher Thomas (University of Oregon (US)); BRAU, Jim (University of Oregon (US))

**Presenter:** POTTER, Christopher Thomas (University of Oregon (US))

**Session Classification:** F-1: Higgs properties

**Track Classification:** Parallel sessions: Topical Groups: Session F: Higgs properties

Contribution ID: **65** Type: **Oral presentation using Zoom**

# Update of Detector Hall and Assembly Hall

In this talk, recent developments of the design of the Detector Hall and the Assembly Hall will be presented.

## 1st preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Author:** SUGIMOTO, Yasuhiro (KEK)

**Presenter:** SUGIMOTO, Yasuhiro (KEK)

Contribution ID: **66** Type: **Oral presentation using Zoom**

# Generative Models for Hadron Shower Simulation

*Thursday 28 October 2021 15:54 (24 minutes)*

Generative machine learning models offer a promising way to simulate events. Given the already high computational cost of simulation and the expected increase in data in the high-precision era of the LHC and at future colliders, such fast surrogate simulators are urgently needed.

This contribution presents initial progress towards accurately simulating of hadronic showers in a highly granular scintillator calorimeter for future colliders. We used two generative models in this study: a Wasserstein-GAN (WGAN) and Bounded Information Bottleneck Autoencoder (BIB-AE). Then we compare the achieved simulation quality before and after interfacing with the state-of-the-art pattern recognition algorithm used by ILD, the so-called PandoraPFA. This brings generative models one step closer to practical applications.

## 1st preferred time slot for your oral presentation

10:00-12:00 JST (3:00-5:00 CEST, 21:00-23:00 EDT, 18:00-20:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Authors:** Mr HUNDHAUSEN, Daniel; EREN, Engin (DESY); BUHMANN, Erik (University of Hamburg); GAEDE, Frank; Prof. KASIECZKA, Gregor; KRUGER, Katja (Deutsches Elektronen-Synchrotron (DE)); Dr RUSTIGE, Lennart; MCKEOWN, Peter (Deutsches Elektronen-Synchrotron DESY); DIEFENBACHER, Sascha Daniel (Universität Hamburg); Mr KORCARI, William

**Presenter:** EREN, Engin (DESY)

**Session Classification:** A&B: Software/Computing & Calorimeters

**Track Classification:** Parallel sessions: Detectors: Session A: Software / Computing

Contribution ID: **67** Type: **Oral presentation using Zoom**

# Stau Searches at the ILC

*Thursday 28 October 2021 19:20 (20 minutes)*

"The direct pair-production of the tau-lepton superpartner, stau, is one of the most interesting channels to search for SUSY. First of all the stau is with high probability the lightest of the scalar leptons. Secondly the signature of stau pair production signal events is one of the most difficult ones, yielding to the 'worst' and so most global scenario for the searches. The current model-independent stau limits comes from analysis performed at LEP but they suffer from the low energy of this facility. The LHC exclusion reach extends to higher masses for large mass differences, but under strong model assumptions.
The ILC, a future electron-positron collider with energy up to 1 TeV, is a promising scenario for SUSY searches. The capability of the ILC for determining exclusion/discovery limits for the stau in a model-independent way is shown in this contribution, together with an overview of the current state-of-the-art. A detailed study of the 'worst' scenario for stau exclusion/discovery taking into account the effect of the stau mixing on stau production cross-section and efficiency is presented. For selected benchmarks, the prospect for measuring masses and polarised cross-sections will be shown. The studies were done using the sgv fast simulation adapted to the ILD detector concept at the ILC."

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Author:** NÚÑEZ PARDO DE VERA, María Teresa (DESY)

**Presenters:** NUNEZ PARDO DE VERA, Maria Teresa (DESY); NÚÑEZ PARDO DE VERA, María Teresa (DESY); NÚÑEZ PARDO DE VERA, Maria Teresa (DESY)

**Session Classification:** H-3: BSM particle production

**Track Classification:** Parallel sessions: Topical Groups: Session H: BSM particle production

Contribution ID: **68** Type: **Oral presentation using Zoom**

# Doubly-charged Higgs boson production at electron-electron colliders in the Georgi-Machacek model

*Thursday 28 October 2021 16:50 (20 minutes)*

It is possible to extend the Higgs sector in the Standard Model (SM) of particle physics in various ways, to resolve some of the open problems in the SM. One of the options is the Georgi-Machacek (GM) model, which introduces SU(2) triplet scalars in a non-trivial way. We revisit doubly-charged Higgs boson production processes in the GM model at electron-electron colliders and compare them with those at electron-positron colliders.

## 1st preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Author:** UEDA, Takahiro (Seikei University)

**Presenter:** UEDA, Takahiro (Seikei University)

**Session Classification:** V: Alternative collider modes

**Track Classification:** Parallel sessions: Alternative: Session V: Alternative collider modes

Contribution ID: **69** Type: **Oral presentation using Zoom**

# CMOS pixels sensors R&D for the ILC vertex detector

*Thursday 28 October 2021 16:10 (20 minutes)*

A Monolithic CMOS Pixel Sensors (CPS), MIMOSIS, is currently being developed in the TJ-180nm technology by IPHC/IKF/GSI to equip the Micro-Vertex Detector (MVD) of the CBM heavy ion experiment at FAIR/GSI and within the CREMLIN+ program. Thanks to its targeted performances (5 microns spatial resolution/5 micro-second time resolution) MIMOSIS will reach a milestone for the ILC vertex detector requirements. The first full size prototype (MIMOSIS-1) has been fabricated in 2020, containing both AC and DC pixels, and reached a step forward concerning the data flow that CPS can handle in this technology with a pitch smaller than 30 microns. In 2021, Mimosis-1 has been tested extensively in lab and beam at DESY II test beam facility and CERN-SPS with different sensitive layers. Charged particle detection performances (Efficiency and spatial resolution) will be presented in different configurations. Preliminary results with irradiated chips will also be discussed. Sensors adapted to the ILC requirements are expected to be directly derivable from this chip, with spatial resolution of about 4 microns, a time resolution of about 1-2 micro-seconds and an instantaneous data flow of about few GB/s while keeping the Power consumption in a range compatible with air flow cooling.

A second part of the talk will adress the development of the 65 nm process. This technology is expected to offer new perspectives and improvements in terms of granularity, time resolution, power consumption and possibly stitching to cover large area detectors. Several laboratories coordinated by CERN (ALICE ITS3 WP2 and CERN EP WP 1.2) realized a first joined submission in 2020. IPHC has contributed to this effort concentrating on different test structures and several functionnal small-size prototypes (CE_65) with analog output, offering the possibility to be tested in beam for charged particle detection. Preliminary results of the first tests of CE_65 will be presented.

## 1st preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

## 2nd preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

**Author:** BESSON, Auguste Guillaume (Centre National de la Recherche Scientifique (FR))

**Presenter:** BESSON, Auguste Guillaume (Centre National de la Recherche Scientifique (FR))

**Session Classification:** C-1: Tracking detectors

**Track Classification:** Parallel sessions: Detectors: Session C: Tracking detectors

Contribution ID: **70** Type: **Oral presentation using Zoom**

# Charged Higgs boson decays with NLO corrections in two Higgs doublet models

*Thursday 28 October 2021 20:40 (20 minutes)*

While the Higgs boson with the mass of 125GeV was discovered at the LHC experiment, the shape of the Higgs sector remains unknown.
Hence, one can consider various possibilities of extended Higgs models.
The property of the discovered Higgs boson will be precisely measured in future collider experiments such as ILC.
This requires theoretical predictions for the discovered Higgs boson should be precisely evaluated.
In addition, precise calculations of additional Higgs bosons are inevitable in case that they are discovered.
In this work, we comprehensively studied radiative corrections to charged Higgs boson decays, focusing on two Higgs doublet models (THDMs) with softly broken Z_2 symmetry.
In this talk, we explain why the radiative corrections to charged Higgs boson decays can be important, and describe which type of corrections can be significant.
We also discuss how four types of THDMs can be separated by decay patterns of the charged Higgs boson,
assuming the situation that the Higgs boson coupling with the Z boson is precisely measured at ILC.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Authors:** AIKO, Masashi; KANEMURA, Shinya (Osaka University); SAKURAI, Kodai (Tohoku University)

**Presenter:** SAKURAI, Kodai (Tohoku University)

**Session Classification:** F-4: Higgs properties

**Track Classification:** Parallel sessions: Topical Groups: Session F: Higgs properties

Contribution ID: **71** Type: **Oral presentation using Zoom**

# Primordial black holes, gravitational waves and the hhh coupling as a probe of strongly first-order electroweak phase transition

*Thursday 28 October 2021 16:50 (20 minutes)*

Recently, it has been discussed that a possibility of primordial black holes is generated from the first-order phase transition at high or low temperatures. We consider the primordial black hole production during first-order electroweak phase transition. In this talk, we discuss the comprehensive test of the model with strongly first-order electroweak phase transition at the measurement of hhh coupling at ILC, the primordial black hole and gravitational wave from first-order electroweak phase transition.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

10:00-12:00 JST (3:00-5:00 CEST, 21:00-23:00 EDT, 18:00-20:00 PDT)

**Authors:** HASHINO, Katsuya; KANEMURA, Shinya (Osaka University); TAKAHASHI, Tomo (Saga University)

**Presenter:** HASHINO, Katsuya

**Session Classification:** F-3: Higgs properties

**Track Classification:** Parallel sessions: Topical Groups: Session I: Electroweak physics

Contribution ID: **72** Type: **Oral presentation using Zoom**

# A global study of right-handed neutrinos with GAMBIT

*Friday 29 October 2021 14:02 (23 minutes)*

The complementarity of searches for new physics has become increasingly important in recent years, and therefore global analyses of BSM models, including constraints from many sources, are necessary for a full understanding on their validity. In this talk I will describe a global analysis of a model with three right-handed neutrinos using the GAMBIT tool, with constraints from cosmological sources, such as BBN, direct searches for heavy neutrinos at colliders and beam dump experiments, and a collection of indirect constraints, such as neutrinoless double beta decay and lepton flavour violation. I will also argue that searches for heavy neutral leptons, such as right-handed neutrinos, should be an important part of the research program of future experiments such as those at the ILC, as the most interesting parameter region falls within its energy reach and the results will make significant impact on our understanding of neutrino masses.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Author:** GONZALO, Tomas (RWTH Aachen)

**Presenter:** GONZALO, Tomas (RWTH Aachen)

**Session Classification:** J: Global interpretations

**Track Classification:** Parallel sessions: Topical Groups: Session J: Global interpretations

Contribution ID: **73** Type: **Oral presentation using Zoom**

# Measurement of particle energy with homogeneous calorimeter

*Wednesday 27 October 2021 13:24 (24 minutes)*

We have fond a relation between the energy deposit and track length in a homogeneous calorimeter situation with GEANT4 at high energy. The relation holds for different materials of the calorimeter from 1 to 100GeV energy range. The energy deposit and track length have a linear relation with positive intercept for both of pions and electrons. The tilt of the straight lines for pion and electron are the same independent of the injection energy. The intercept is proportional to the injection energy linearly, therefore we are able to measure the particle energy as a calorimeter. The resolution of such calorimeter is represented by two quantities and about 20%/sqrt(E).
We discuss the relation and how to realize the calorimeter in this talk.

## 1st preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

## 2nd preferred time slot for your oral presentation

10:00-12:00 JST (3:00-5:00 CEST, 21:00-23:00 EDT, 18:00-20:00 PDT)

**Author:** TAKESHITA, Tohru

**Presenters:** TAKESHITA, Tohru; TAKESHITA, Tohru (Shinshu University (JP)); TAKESHITA, Tohru (Department of Physics - Shinshu Univer)

**Session Classification:** D-1: New technologies & ideas for collider detectors

**Track Classification:** Parallel sessions: Detectors: Session D: New technologies & ideas for collider detectors

Contribution ID: **74** Type: **Oral presentation using Zoom**

# An injection molded strip stability and strip optimization for ILC scintillator ECAL

*Wednesday 27 October 2021 15:30 (20 minutes)*

We have produced and tested scintillator strips by injection molding method. The newly fabricated scintillator strip stability for ILC scintillator ECAL is studied. Here we report a stability test using beta ray source for more than 3 months. The measured MIP peak position has tendency of gradual change of -0.013%/day.
We have studied the dimple shape for scintillator strips of ILC ECAL. The response uniformity has been measured and simulated for the ILC scintillator ECAL in order to improve better uniformity.
We will present and discuss above activities at Shinshu University.

## 1st preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

## 2nd preferred time slot for your oral presentation

10:00-12:00 JST (3:00-5:00 CEST, 21:00-23:00 EDT, 18:00-20:00 PDT)

**Author:** TAKESHITA, Tohru

**Presenters:** TAKESHITA, Tohru; TAKESHITA, Tohru (Department of Physics - Shinshu Univer); TAKESHITA, Tohru (Shinshu University (JP))

**Session Classification:** B-2: Calorimeters

**Track Classification:** Parallel sessions: Detectors: Session B: Calorimeters

Contribution ID: **75** Type: **Oral presentation using Zoom**

# Flavour Non-Universal UMSSM at the Linear Colliders

*Thursday 28 October 2021 19:40 (20 minutes)*

We studied phenomenological implications of numerous Family Non-Universal U(1)′ sub-models in the minimal U(1)′ extended Supersysmmetric Model (UMSSM) possessing an extra down quark type exotic field. In doing this, we started with anomaly cancellation criteria to generate a number of solutions in which the extra U(1)' charges of the particles are treated as free parameters. We imposed existing bounds coming from colliders and astrophysical observations on the assumed sub-models and observed that current limits dictate certain orientations.

Related with potential impact of non universal charges on the Z' decays we made predictions for the existing and future experiments. We also probe the signatures of the exotic quark and the non-universality at the future Linear Colliders.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Authors:** Prof. SOLMAZ, Levent (Balikesir University); Prof. MORETTI, Stefano (University of Southampton); Dr HICYILMAZ, Yasar (Balikesir University and University of Southampton)

**Presenter:** Dr HICYILMAZ, Yasar (Balikesir University and University of Southampton)

**Session Classification:** H-3: BSM particle production

**Track Classification:** Parallel sessions: Topical Groups: Session H: BSM particle production

Contribution ID: **76** Type: **Oral presentation using Zoom**

# Studying exotic gauge bosons using ILC beam-dump

*Thursday 28 October 2021 11:12 (24 minutes)*

We discuss the prospect of detecting new gauge bosons (like the dark photon and leptophilic gauge bosons) using the ILC beam dump, assuming that muon shield, veto counter, and particle detector are installed behind the beam dump. Because the $e^{\pm}$ beams are dumped after each collision at the ILC, a large number of electrons and positrons are available for the beam dump experiment. If a new gauge boson exists, it can be produced in the beam dump, go through the shield, and decay inside the decay volume to be detected by the particle detector. We show that, with the design luminosity, parameter regions that have not been excluded by other experiments so far can be accessed by the ILC beam dump experiment. We also discuss the possibility to distinguish different models of new gauge bosons by identifying the decay products of the new gauge boson.

## 1st preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Author:** MOROI, Takeo (University of Tokyo)

**Presenter:** MOROI, Takeo (University of Tokyo)

**Session Classification:** O-2: Fixed target / Dark sectors / Applications outside particle physics

**Track Classification:** Parallel sessions: Transversal Task Forces: Session O: Fixed target / Dark sectors / Applications outside particle physics

Contribution ID: **77** Type: **Oral presentation using Zoom**

# Test-beam studies of the monolithic CMOS silicon sensor CLICTD

*Thursday 28 October 2021 15:50 (20 minutes)*

The CLIC Tracker Detector (CLICTD) is a monolithic CMOS silicon pixel sensor that targets the requirements for the tracking detector of the Compact Linear Collider (CLIC). CLICTD is characterised by a small collection diode that allows for a low sensor capacitance and consequently a high signal-to-noise ratio. The front-end design features an innovative sub-pixel segmentation scheme to reduce the digital footprint while maintaining a small sub-pixel pitch of 30 um x 37.5 um. In this contribution, recent test-beam results for CLICTD samples featuring different starting materials and sensor thicknesses are presented.

## 1st preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

## 2nd preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

**Author:** DORT, Katharina (CERN, Justus-Liebig-Universitaet Giessen (DE))

**Presenter:** DORT, Katharina (CERN, Justus-Liebig-Universitaet Giessen (DE))

**Session Classification:** C-1: Tracking detectors

**Track Classification:** Parallel sessions: Detectors: Session C: Tracking detectors

Contribution ID: **78** Type: **Oral presentation using Zoom**

# Mo-99 production at cERL in KEK

*Wednesday 27 October 2021 17:06 (24 minutes)*

Medical RI production is a very promising application of superconducting (SC) linear accelerator. SC LINAC can easily generate large averaged current beam of higher energy than those from industrial electron sources for the electron beam (EB) processing where RI production must be avoided. ILC type long pulsed SC LINAC has great cost efficiency due to low duty factor where RF heat load can almost be negligible. For the target design, pulsed operation requires treatment for thermal impulse that is negligible in the continuous wave (CW) accelerators. If we have large space, newly developing Nb3Sn based low gradient SC accelerator can be available with conductive cooling system without liquid helium. Nuclear fission reactor can generate medical RI with very high specific radioactivity from low enriched uranium, but large radioactive nuclear waste generated at the same time. Hadron accelerators seems to have subjects of short of beam power for yield and generation of unwanted RI that become contamination. Comparing with advantages and disadvantages, SC LINAC of mA or sub-mA class averaged current with dozens MeV energy seems to be very suitable for medical RI production. In this presentation, we show the advantage of ILC type SC LINAC for medical RI production and results of the test production of Mo-99 at cERL (CW SC LINAC) in KEK.

## 1st preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Author:** HARADA, Kentaro (KEK)

**Presenter:** HARADA, Kentaro (KEK)

**Session Classification:** S: ILC application (to physics, material science, etc.)

**Track Classification:** Parallel sessions: Accelerators: Session S: ILC application (to physics, material science, etc.)

Contribution ID: **79** Type: **Oral presentation using Zoom**

# New No-Lose Theorem for Higgs Coupling Measurements

*Thursday 28 October 2021 11:20 (20 minutes)*

We obtain the upper bound on the new physics scale as a function of the Higgs coupling deviation factor by considering the perturbative unitarity of $2 \to 2$ scattering amplitudes among the longitudinally polarized electroweak gauge bosons and the Higgs bosons.
We estimate the unitarity bound in a new effective field theory which parameterizes the sizable non-decoupling effects from the new physics in the Higgs self-couplings. Our effective field theory is contracted based on the experimental fact that the Higgs couplings to electroweak bosons/fermions are consistent with those predicted in the SM within O(10%) error.

## 1st preferred time slot for your oral presentation

10:00-12:00 JST (3:00-5:00 CEST, 21:00-23:00 EDT, 18:00-20:00 PDT)

## 2nd preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

**Authors:** NAGAI, Ryo (Nagoya University); KANEMURA, Shinya (Osaka University)

**Presenter:** NAGAI, Ryo (Nagoya University)

**Session Classification:** F-1: Higgs properties

**Track Classification:** Parallel sessions: Topical Groups: Session F: Higgs properties

Contribution ID: **80** Type: **Oral presentation using Zoom**

# The bottom quark mass and the Higgs boson

*Wednesday 27 October 2021 17:06 (20 minutes)*

We present a new measurement of the bottom quark mass based on the determination of Higgs decay rates to bottom quarks. The current measurements by ATLAS and CMS yield a value for the bottom quark at the scale of the Higgs boson mass mb(mH) = 2.6 GeV, with an uncertainty of less than 15%. The theory uncertainty has been investigated in detail and is found to be a fraction of the current experimental uncertainty. The prospects for this measurement at the ILC are excellent, with the statistical uncertainty reaching several tens of MeV. Confronting this determination at high scale with the PDG world average for mb(mb) based on low-energy measurement and the measurement of mb(mZ) at LEP and using SLC data, we find strong evidence for the scale evolution of the bottom quark, as predicted by the renormalization group equations in QCD.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Authors:** APARISI, Javier; VOS, Marcel (IFIC (UVEG/CSIC) Valencia)

**Presenter:** APARISI, Javier

**Session Classification:** G: Top / Heavy flavour / QCD

**Track Classification:** Parallel sessions: Topical Groups: Session G: Top / Heavy flavour / QCD

Contribution ID: **81** Type: **Oral presentation using Zoom**

# Study of photon-associated Higgs production at the ILC

*Thursday 28 October 2021 16:30 (20 minutes)*

In the Standard Model（SM）, $h\gamma Z$ coupling is a loop induced coupling, therefore it might receive relatively large correction from Beyond Standard Model（BSM）physics. It is very challenging to measure at the HL-LHC, where only $3\sigma$ significance is expected for branching ratio of $h \to \gamma Z$.
On the other hand, $h\gamma Z$ coupling is potentially very sensitive to new physics, for example some new heavy particles contributing to the loop, therefore it is interesting to know how well this coupling can be measured at the International Linear Collider (ILC). More over, it is found $h\gamma Z$ coupling plays an important role in a framework of effective field theory, for example in $e^+e^- \to Zh$ process it is necessary to know the contribution from s-channel with photon. It turns out that the anomalous $h\gamma Z$ , $h\gamma Z$ , $hZZ$ and $hWW$ couplings come from a few common set of dimension-6 operators, and $h\gamma Z$ coupling measurement can provide very useful constraints on those operators.
In this talk, we will report the study of $h\gamma Z$coupling using production channel $e^+e^- \to \gamma h$, with final results based on the full simulation of ILD. Results will be given for an integrated luminosity of 900 $fb^{-1}$ for polarization at $E_{CM} = 250GeV$.

## 1st preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

## 2nd preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

**Author:** Ms AOKI, Yumi (SOKENDAI,KEK)

**Presenter:** Ms AOKI, Yumi (SOKENDAI,KEK)

**Session Classification:** F-3: Higgs properties

**Track Classification:** Parallel sessions: Topical Groups: Session I: Electroweak physics

Contribution ID: **82** Type: **Oral presentation using Zoom**

# Study of spatial resolution in the time direction for ILC-TPC

*Thursday 28 October 2021 20:00 (20 minutes)*

In order to understand the spatial resolution in time direction (z resolution), we are investigating factors that can affect z resolution. Hit position in the z direction is determined by pulse arrival timing and hence depends on the pulse shape. We studied the dependence of the pulse shape on drift distance and magnetic field.
In this talk, we will report the preliminary results from this study.

## 1st preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

## 2nd preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

**Author:** Ms AOKI, Yumi (SOKENDAI,KEK)

**Presenter:** Ms AOKI, Yumi (SOKENDAI,KEK)

**Session Classification:** C-3: Tracking detectors

**Track Classification:** Parallel sessions: Detectors: Session C: Tracking detectors

Contribution ID: **83** Type: **Oral presentation using Zoom**

# Exploring Right Handed Neutrinos at ILC

*Wednesday 27 October 2021 13:20 (20 minutes)*

We study search for Right Handed Neutrino at ILC. The process we focus on is the Z′ boson mediated Right Handed neutrino (RHN) pair production process. The advantage of RHN pair production process is back ground free process. In final state, RHN pair production shows the same sign leptons.
We generated this process, investigate event properties, develop reconstruction and selection strategies and evaluate the sensitivity at ILC. In our study, we use the Delphes simulation of a parametrized ILC detector to analyze RHN production. We also include the full simulation SM backgrounds used by Geant4 and evaluate the likelihood of the charge misidentification in the background processes.

## 1st preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Author:** NAKAJIMA, Jurina (SOKENDAI/KEK)

**Co-authors:** JEANS, Daniel; FUJII, Keisuke; DAS, Arindam

**Presenter:** NAKAJIMA, Jurina (SOKENDAI/KEK)

**Session Classification:** H-1: BSM particle production

**Track Classification:** Parallel sessions: Topical Groups: Session H: BSM particle production

Contribution ID: **84** Type: **Oral presentation using Zoom**

# Analyzing the Higgs potential in gauge-Higgs unification with a flat extra dimension

*Wednesday 27 October 2021 11:00 (20 minutes)*

We investigate the structure of the Higgs potential in gauge-Higgs unification with a flat extra dimension. As a viable gauge-Higgs unification model, we take the one where the Standard Model Higgs doublet is embedded into a higher-dimensional SU(3)w gauge multiplet and relax five-dimensional Lorentz symmetry. In this model, the deviation in the triple Higgs boson coupling from its SM prediction is shown to be smaller than 10% for compactification scales larger than the experimental bound around 5 TeV. We also generalize about the analysis of the Higgs potential to other gauge-Higgs unification models with a flat extra dimension. It is shown that in this class of models the shape of the Higgs potential around the vacuum quickly approaches that of the minimal Higgs potential with one Higgs doublet as the compactification scale increases. An observable deviation in the triple Higgs boson coupling at the ILC will compel us to significantly extend such gauge-Higgs unification models. This is based on collaboration with Mr. Shin Suzuki published in Phys. Lett. B822, 136637 (2021).

## 1st preferred time slot for your oral presentation

10:00-12:00 JST (3:00-5:00 CEST, 21:00-23:00 EDT, 18:00-20:00 PDT)

## 2nd preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

**Author:** Dr KAKIZAKI, Mitsuru (University of Toyama)

**Presenter:** Dr KAKIZAKI, Mitsuru (University of Toyama)

**Session Classification:** F&H-1: Higgs properties & BSM particle production

**Track Classification:** Parallel sessions: Topical Groups: Session H: BSM particle production

Contribution ID: **85** Type: **Oral presentation using Zoom**

# Testing the neutrino mass generation mechanism at the electron positron colliders

*Wednesday 27 October 2021 13:00 (20 minutes)*

The neutrinos have tiny mass which is not predicted in the Standard Model. Therefore the extension of the SM is unavoidable. A plethora of scenarios have been proposed to explain the origin of the tiny neutrino mass which include tree level, quantum level and gauge extensions of the SM. In this talk we will discuss about the simple tree level neutrino mass models. Such models can include SM singlet heavy neutral fermionic, $SU(2)$ triplet fermionic and $SU(2)$ triplet scalar particles to describe the origin of the tiny neutrino mass and flavor mixing reproducing the neutrino oscillation data. There is another simple but interesting thought is to extend the SM using a general $U(1)$ gauge group which demands the addition of three generations of the right handed neutrinos to get the anomaly free framework. After the $U(1)$ symmetry breaking, the Majorana mass term of the RHNs are generated which can explain the origin of the tiny neutrino mass. In this talk we will discuss a variety of production channels of such beyond the SM particles at the $^{-+}$ colliders which are responsible for the generation of the tiny neutrino mass.

## 1st preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Author:** DAS, Arindam

**Presenter:** DAS, Arindam

**Session Classification:** H-1: BSM particle production

**Track Classification:** Parallel sessions: Topical Groups: Session H: BSM particle production

Contribution ID: **86** Type: **Oral presentation using Zoom**

# Probing then minimal $U(1)_X$ model at future electron-positron collider via fermion pair production

*Wednesday 27 October 2021 15:50 (20 minutes)*

The minimal $(1)$ extension of the Standard Model (SM) is a well-motivated new physics scenario, where the anomaly cancellation requirement dictates the new neutral gauge boson $(')$ couplings with the SM fermions in terms of two scalar charges ( and $_{\Phi}$). In this paper, we investigate the SM charged fermion pair production mechanism for different values of these scalar charges in the $(1)$ scenario at future electron-positron colliders, i.e. $^{+-} \rightarrow$ . Apart from the standard photon and  boson exchange for this process, this model features a -channel (or both  and -channel for $= ^{-}$) $'$-boson exchange, which interferes with the SM processes. Considering the dilepton and dijet signatures from the heavy resonance we estimate the bounds on the $U(1)$ coupling $(')$ and the $'$ mass $(')$. Considering the LEP-II results and prospective International Linear Collider (ILC) bounds on the effective scale for the four fermion interaction we estimate the reach on $'/'$ for different center of mass energies. We study the angular distributions, forward-backward ($\mathcal{A}_{\rm FB}$), left-right ($\mathcal{A}_{\rm LR}$) and left-right forward-backward ($\mathcal{A}_{\rm LR,\ FB}$) asymmetries of the  final states which can show substantial deviations from the SM results, even for a multi-TeV . This provides a powerful complementary way to probe the heavy $'$ parameter space beyond the direct reach of the Large Hadron Collider (LHC), as well as an effective way to determine the $(1)$ charges.

## 1st preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Author:** DAS, Arindam

**Presenter:** DAS, Arindam

**Session Classification:** H-2: BSM particle production

**Track Classification:** Parallel sessions: Topical Groups: Session H: BSM particle production

Contribution ID: **87** Type: **Oral presentation using Zoom**

# Probing electroweak phase transition via relatively heavy additional Higgs bosons at ILC

*Thursday 28 October 2021 14:40 (20 minutes)*

In this talk, we will discuss the electroweak first-order phase transition in the Two Higgs Doublet Model. First, we show that an upper bound on the mass of the second Higgs boson can be obtained by combining the sphaleron decoupling condition with perturbative unitarity and vacuum stability. This upper bound is obtained even though the h(125) coupling is standard model-like. Second, we show that both precise measurements of the triple Higgs boson coupling at ILC and gravitational wave observations through LISA, DECIGO, and BBO are important to distinguish whether the mass of the additional Higgs bosons is relatively light or heavy.

## 1st preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Author:** TANAKA, Masanori (Osaka University)

**Co-author:** KANEMURA, Shinya (Osaka University)

**Presenter:** TANAKA, Masanori (Osaka University)

**Session Classification:** F-2: Higgs properties

**Track Classification:** Parallel sessions: Topical Groups: Session F: Higgs properties

Contribution ID: **88** Type: **Oral presentation using Zoom**

# Measuring Higgs Boson Self-couplings with 2->3 VBS Processes

*Wednesday 27 October 2021 19:24 (24 minutes)*

We study the measurement of Higgs boson self-couplings through 2⟶3 vector boson scattering (VBS) processes in the framework of Standard Model effective field theory (SMEFT) at both proton and lepton colliders. The SMEFT contribution to the amplitude of the 2⟶3 VBS processes, taking WLWL⟶WLWLh and WLWL⟶hhh as examples, exhibits enhancement with the energy A(BSM)/A(SM)~Eˆ2/Λˆ2, which indicates the sensitivity of these processes to the related dimension-six operators in SMEFT. Simulation and analysis of the full processes with backgrounds at future muon colliders are performed to constraint on c6 and cΦ1. The results are optimistic and comparable to di-Higgs production with 2->2 VBS.

## 1st preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Authors:** LU, Chih-Ting (KIAS); CHEN, Junmou; WU, Yongcheng (Carleton University)

**Presenter:** CHEN, Junmou

**Session Classification:** I: Electroweak physics

**Track Classification:** Parallel sessions: Topical Groups: Session I: Electroweak physics

Contribution ID: **89** Type: **Oral presentation using Zoom**

# Status of the DoTPiX development:

*Wednesday 27 October 2021 14:36 (24 minutes)*

During last year, we made significant progress about the material structures that make the fabrication of a DoTPiX pixel and pixel array a reachable goal. The trend is to obtain a small pixel reaching the 1 micrometre x 1 micrometre scale. The structure was simulated as early as 2017 (N. Fourches, IEEE TED 2017) to assess tits electrical and detector capabilities. A work-group was founded with IRFU and other CNRS laboratories. We will present the successive steps needed for a successful implementation of the DoTPiX on a silicon substrate, with the justifications of the use of a quantum well. . To say the needed epitaxial process which is in course of development at University Paris-Saclay, with full characterisation of the CVD epi-layers. The next step is the evaluation of a NMOS process (LAAS) which will host the DoTPiX structures, with n-channel MOS device characterization. After this technology bottleneck (process) fixed DoTPiX pixels arrays will be made for in-lab characterization.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Author:** Dr FOURCHES, Nicolas (CEA/IRFU University Paris_Saclay)

**Presenter:** Dr FOURCHES, Nicolas (CEA/IRFU University Paris_Saclay)

**Session Classification:** D-1: New technologies & ideas for collider detectors

**Track Classification:** Parallel sessions: Detectors: Session D: New technologies & ideas for collider detectors

Contribution ID: **90** Type: **Oral presentation using Zoom**

# Possibility of multi-step electroweak phase transition in the two Higgs doublet models

*Thursday 28 October 2021 17:10 (20 minutes)*

In this talk, we discuss whether a multi-step electroweak phase transition (EWPT) occurs in two Higgs doublet models (2HDMs). We examine parameter regions in CP-conserving 2HDMs and find certain areas where the multi-step EWPTs occur. In addition, we compute the Higgs trilinear coupling in the parameter region where the multi-step EWPTs occur, which has the tendency to be large in a certain region comparing that for the 1-step EWPTs. Especially, when the first step of the 2-step EWPT is strongly first order, we find the deviation of the coupling from that in the SM is more than about 50%, which can be detected in the ILC operating at 500 GeV.

## 1st preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

## 2nd preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

**Author:** SHIBUYA, Hiroto (Kanazawa University)

**Presenter:** SHIBUYA, Hiroto (Kanazawa University)

**Session Classification:** F-3: Higgs properties

**Track Classification:** Parallel sessions: Topical Groups: Session I: Electroweak physics

Contribution ID: **91** Type: **Oral presentation using Zoom**

# Higgs boson pair production at NNLO in the large top quark mass approximation

*Thursday 28 October 2021 13:40 (20 minutes)*

We consider the next-to-next-to-leading order (NNLO) total cross section of Higgs boson pair production at LHC in the large top quark mass approximation.
At hadron collider, the partonic cross section consists of various initial states such as gluon-gluon, gluon-quark, quark-quark, and we calculated all of them analytically within this approximation.
We found that, in some cases, the corrections of 1/mtˆ4 and 1/mtˆ6 which we compute here enhance the NNLO cross section significantly.

## 1st preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Author:** MISHIMA, Go (Tohoku Univ.)

**Presenter:** MISHIMA, Go (Tohoku Univ.)

**Session Classification:** F-2: Higgs properties

**Track Classification:** Parallel sessions: Topical Groups: Session F: Higgs properties

Contribution ID: **92** Type: **Oral presentation using Zoom**

# Top electro-weak couplings, from the LHC to the ILC

*Friday 29 October 2021 13:23 (23 minutes)*

As the heaviest particle of the model, with a mass close to the electroweak scale, the top quark is an interesting candidate to look for hints of new physics. The electroweak couplings of the top quarks are specially relevant in many extensions of the Standard Model. Indeed, as the top quark was not produced in the previous generation of electron-positron colliders most of its electro-weak couplings can only be constrained with the data from the Large Hadron Collider. In order to analyse if there is still room for new physics in the electro-weak couplings of the top quark, we perform a global fit to these couplings. Following the Standard Model Effective Field Theory formalism we have constrained the Wilson coefficients of the dimension-six operators that affect the top quark electro-weak couplings. In this work we consider, for the first time, the QCD corrections at NLO for most of the processes included. Furthermore, we have included recently measured processes, such as $tZq$ and $t\gamma q$, and the first differential measurements in $t\bar{t}Z$ and $t\bar{t}\gamma$ production. A special effort is made to understand the uncertainties due to the truncation of the EFT expansion and due to the poorly known correlations among measurements. The results of the fit to LHC run 2 data are compared to prospects for electron-positron colliders operating above the top quark pair production threshold, considering in particular the ILC runs at 500 GeV and 1 TeV. As the main result, we present bounds on the relevant operator coefficients based on current data and on future prospects.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Authors:** MIRALLES, Victor (IFIC-UV); MIRALLES LÓPEZ, Marcos; Dr MORENO LLACER, Maria (IFIC, (CSIC - Univ. of Valencia)); VOS, Marcel (IFIC (UVEG/CSIC) Valencia); PEÑUELAS, Ana; PERELLÓ ROSELLÓ, Martín (Instituto de Física Corpuscular (IFIC) - Valencia)

**Presenter:** MIRALLES, Victor (IFIC-UV)

**Session Classification:** J: Global interpretations

**Track Classification:** Parallel sessions: Topical Groups: Session G: Top / Heavy flavour / QCD

Contribution ID: **93** Type: **Oral presentation using Zoom**

# Search for new light particles using MeV photon beam at the ILC

*Thursday 28 October 2021 16:30 (30 minutes)*

As a postron source at the ILC, it is discussed to use pair creation processes by a $\mathcal{O}(\mathrm{MeV})$ photon beam, which is generated from the high-energy electron beam. The current design expects that the photon flux would be as intense as $10^{17}$ photons / s, being the strongest MeV photon source available on the ground.
We propose to use this photon beam for the search for new light particles. As a benchmark model, we discuss the dark photon and the QCD axion. The use of the energetic photon beam opens a new window for relatively heavy mass regions, i.e. $\leq \mathcal{O}(100)\,\mathrm{eV}$. We have found that our proposal can constrain not only new parameter regions as a ground experiment but also some physical parameter region of the QCD axion.

## 1st preferred time slot for your oral presentation

10:00-12:00 JST (3:00-5:00 CEST, 21:00-23:00 EDT, 18:00-20:00 PDT)

## 2nd preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

**Authors:** FUKUDA, Hajime; OTONO, Hidetoshi (Kyushu University); SHIRAI, Satoshi (Kavli IPMU)

**Presenter:** FUKUDA, Hajime

**Session Classification:** H&O: BSM particle production & Fixed target / Dark sectors / Applications outside particle physics

**Track Classification:** Parallel sessions: Transversal Task Forces: Session O: Fixed target / Dark sectors / Applications outside particle physics

Contribution ID: **94** Type: **Oral presentation using Zoom**

# Summary of the new 250 GeV MC samples production for ILD physics

*Thursday 28 October 2021 19:50 (20 minutes)*

In July 2021, we have completed first planned production of the new high statistics 250 GeV MC samples for the ILD physics study using latest generator, simulator, and reconstruction packages. In this talk, we will summarize the first round of mass production with the summary of produced samples, utilization of ILCDirac, storage occupancy, and the plan of our next production in the ILD.

## 1st preferred time slot for your oral presentation

10:00-12:00 JST (3:00-5:00 CEST, 21:00-23:00 EDT, 18:00-20:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Author:** ONO, Hiroaki (Nippon Dental University)

**Presenter:** ONO, Hiroaki (Nippon Dental University)

**Session Classification:** A-1: Software / Computing

**Track Classification:** Parallel sessions: Detectors: Session A: Software / Computing

Contribution ID: **95** Type: **Oral presentation using Zoom**

# Tau reconstruction in $e^+e^- \to \tau^+\tau^-$ at the ILC250

*Wednesday 27 October 2021 19:48 (24 minutes)*

The International Linear Collider (ILC) is a next-generation electron-positron linear collider proposed to search for new physics beyond the Standard Model.
In the ILC, the International Large Detector (ILD) has been proposed as a detector for the precise measurement of final state particles. Collision of electron and positron generates tau lepton pair in ILC experiment. This process can be used to search for new interactions, also making use of our ability to measure the tau polarisation. Correct reconstruction of the tau decay mode is important for the tau polarisation measurement.
In this study, we explicitly extract neutrino momentum to calculate optimal polarimeters which is the cosine of the angle the polarimeter vector makes to the tau flight direction including the momenta of neutrino, charged and neutral pions.
The aim of this study is reconstruction of tau spin in order to measure polarisation to investigate new physics and to estimate how well we can reconstruct these polarimeter distributions using fully simulated, reconstructed, and selected events.

## 1st preferred time slot for your oral presentation

10:00-12:00 JST (3:00-5:00 CEST, 21:00-23:00 EDT, 18:00-20:00 PDT)

## 2nd preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

**Author:** Mr YUMINO, Keita (SOKENDAI)

**Co-author:** JEANS, Daniel

**Presenter:** Mr YUMINO, Keita (SOKENDAI)

**Session Classification:** I: Electroweak physics

**Track Classification:** Parallel sessions: Topical Groups: Session I: Electroweak physics

Contribution ID: **96** Type: **Oral presentation using Zoom**

# CMOS Upgrade to the Belle II Vertex Detector

*Thursday 28 October 2021 15:30 (20 minutes)*

The success of the Belle II experiment at KEK (Japan) relies on the very high instantaneous luminosity, close to 6x10ˆ35 cm-2 s-1, expected from the SuperKEKB collider. The beam conditions to reach such luminosity levels generate a large rate of background particles in the inner detection layers of Belle II. The hit rate in the innermost vertex detector layer will exceed 100 MHz/cm2 translating into radiation levels of 100 Mrad TID and fluences reaching 5x1014 neq cm-2. This beam-induced background creates stringent constraints on the vertex detector, in addition to the requirements coming from the physics performance needed.

Belle II has started to define a vertex detector upgrade program to make it more robust and performant even in the presence of high backgrounds facilitating the SuperKEKB running at high luminosity, coupled to an accelerator consolidation in the timeframe of 2026-2027.

In this context, the Belle II collaboration is considering the possibility to install an upgraded all-layer monolithic pixel vertex detector on the time scale around 2026 and R&D activities on fully depleted CMOS sensors have started. Such an upgrade should provide a sufficient safety factor with respect to the background rate expected at the nominal luminosity and possibly enhance performances with improved vertex resolution and higher tracking efficiency at low momentum range.

New CMOS monolithic technologies for pixel sensors offer a combination of granularity, speed, low material budget and radiation tolerance. In particular, latest developments on the TJ-Monopix2 family make this development to match Belle II requirements and will be the baseline to exploit the design of a fully pixelated 5 layer vertex detector, called VTX.

This talk will review the context of the proposed VXD upgrade with monolithic technologies in Belle II, providing details of the technological proposal, system integration and discussing performance expectations from simulations.

## 1st preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

## 2nd preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

**Presenter:** VOGT, Marco (University of Bonn)

**Session Classification:** C-1: Tracking detectors

**Track Classification:** Parallel sessions: Detectors: Session C: Tracking detectors

Contribution ID: **97** Type: **Oral presentation using Zoom**

# Status report on Whizard 3 for the ILC

*Thursday 28 October 2021 19:48 (24 minutes)*

We summarize the status of the multi-purpose event generator Whizard 3 for ILC physics. The focus will be on the UFO interface for BSM models and NLO SM automation. We also cover the top threshold and a few aspects on performance and usage.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Author:** BREDT, Pia (DESY Hamburg)

**Presenter:** BREDT, Pia (DESY Hamburg)

**Session Classification:** K&I: Modeling & precision theory & Electroweak physics

**Track Classification:** Parallel sessions: Topical Groups: Session I: Electroweak physics

Contribution ID: **98** Type: **Oral presentation using Zoom**

# Influence of dark matter spin on detection possibility at future $e^+e^-$ colliders

*Thursday 28 October 2021 20:40 (20 minutes)*

It is commonly believed that Dark Matter (DM) should exist in the form of new, Beyond-the-Standard-Model stable particles.

Despite continued efforts, such particles have not yet been detected, which means that interactions between DM and SM must be very weak. Dark particles, even if they are already produced at existing colliders, evade detection due to tiny signal-to-background ratio.

However, future $e^+e^-$ colliders (e.g. ILC), provide large luminosity and collision energy as well as very clean collision environment (which means low background). They may potentially lead to a breakthrough in the search for dark particles.

In this talk, I will estimate the maximal possible cross section for DM production, calculated within simple (but QFT-consistent) models of Higgs-mediated dark matter of different spins. The estimations will be based on current theoretical constraints and experimental limits on DM-SM interaction strength. For each considered value of DM spin, I will present allowed parameter space and compare the expected signal to the background, determining whether dark particles could be discovered at high confidence level.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Author:** IGLICKI, Michał (University of Warsaw)

**Presenter:** IGLICKI, Michał (University of Warsaw)

**Session Classification:** H-3: BSM particle production

**Track Classification:** Parallel sessions: Topical Groups: Session H: BSM particle production

Contribution ID: **99** Type: **Oral presentation using Zoom**

# Electroweak Baryogenesis in Higgs aligned 2HDM and its prediction at the ILC

*Wednesday 27 October 2021 10:40 (20 minutes)*

The scenario of electroweak baryogenesis in the CP violating extended Higgs model has been strongly limited by current EDM experiments, hence it is difficult to generate the observed baryon density in our universe. Recently, in the CP violating Two Higgs doublet model, which has the SM like coupling of the 125GeV Higgs and the yukawa sector avoiding FCNC, it was shown that the EDM constraints can be avoided by the destructive interference between two independent additional CP phases. Using this idea, we have calculated the baryon density in this model and found the benchmarks which explain the observed baryon density satisfying the current experimental data. We will show the results and discuss the predictions in the ILC and other future experiments.

## 1st preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

## 2nd preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

**Authors:** ENOMOTO, Kazuki (Osaka University); MURA, Yushi (Osaka Univ.); KANEMURA, Shinya (Osaka University)

**Presenter:** MURA, Yushi (Osaka Univ.)

**Session Classification:** F&H-1: Higgs properties & BSM particle production

**Track Classification:** Parallel sessions: Topical Groups: Session F: Higgs properties

Contribution ID: **100** Type: **Oral presentation using Zoom**

# Performance of the FASTPIX sub-nanosecond CMOS pixel sensor demonstrator

*Thursday 28 October 2021 16:50 (20 minutes)*

Within the ATTRACT FASTpix project, a monolithic pixel sensor demonstrator chip has been developed in a modified 180 nm imaging CMOS process technology, targeting sub-nanosecond timing measurements for single ionising particles. It features a small collection-electrode design on a 30 micron deep epitaxial layer and contains 32 mini matrices of 68 hexagonal pixels each, 4 transmitting an analog output signal and 64 transmitting binary hit information, with pixel pitches ranging from 8.66 to 20 micron. Various process- and design variations are explored, aiming at accelerating the charge collection and making it uniform over the pixel area. Signal treatment of the analog waveforms as well as reconstruction of Time-of-Arrival and Time-over-Threshold information is carried out off-chip.
This contribution introduces the design of the sensor and readout system, and presents first performance results achieved in measurements with particle beams.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Author:** BUSCHMANN, Eric (CERN)

**Presenter:** BUSCHMANN, Eric (CERN)

**Session Classification:** C-1: Tracking detectors

**Track Classification:** Parallel sessions: Detectors: Session C: Tracking detectors

Contribution ID: **101** Type: **Oral presentation using Zoom**

# A common software for future colliders: The Key4hep turnkey software stack

*Thursday 28 October 2021 19:00 (20 minutes)*

Software tools are foundational for the development of future collider experiments. Detector optimization and physics performance studies crucially depend on the availability of performant and reliable software libraries. The Key4hep project aims at providing infrastructure, interfaces, and a common stack of easy-to-use software tools for future, or even present, High Energy Physics projects. Key4hep is to a large extent based on software tools that are already very actively used in the community - like ROOT, Geant4 and DD4hep or those that are currently under active development like EDM4hep or ACTS. The Key4hep project is supported by, among others, the HEP Software Foundation, CERN, DESY and the AIDAinnova project and has active developers from all large future collider projects: CEPC, CLIC, FCC, and ILC. In this talk we present an overview of the Key4hep project and describe the adaptation processes of the different future experiments, in particular the consolidation of different fast and full simulation workflows in the Gaudi framework, thereby showing that Key4hep is a viable long term solution as baseline software for high energy experiments that will facilitate the scientific exchange and make similar studies easier and more efficient.

## 1st preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

## 2nd preferred time slot for your oral presentation

10:00-12:00 JST (3:00-5:00 CEST, 21:00-23:00 EDT, 18:00-20:00 PDT)

**Authors:** SAILER, Andre (CERN); HEGNER, Benedikt (CERN); HELSENS, Clement (CERN); WENXING, Fang; GAEDE, Frank; GANIS, Gerardo (CERN); TENG, Li (Shandong University); TAO, Lin (IHEP); FERNANDEZ DECLARA, Placido (CERN); MADLENER, Thomas (Deutsches Elektronen-Synchrotron (DE)); Dr VOLKL, Valentin (CERN); HUANG, Xingtao (Shandong University); XIAOMEI, Zhang; JIAHENG, Zou

**Presenter:** FERNANDEZ DECLARA, Placido (CERN)

**Session Classification:** A-1: Software / Computing

**Track Classification:** Parallel sessions: Detectors: Session A: Software / Computing

Contribution ID: **102** Type: **Oral presentation using Zoom**

# Angular Conditioning of Generative Models for Fast Calorimeter Shower Simulation

*Thursday 28 October 2021 15:30 (24 minutes)*

Detector simulation is a key cornerstone of modern high energy physics. Traditional simulation tools are reliant upon Monte Carlo methods, which consume significant computational resources and are projected to be a major bottleneck at the high luminosity stage of the LHC and for future colliders. Calorimeter shower simulation has been a focus of fast simulation efforts, as it is particularly intensive from a computational stand point due to a large number of particle interactions with the detector material.

Deep generative models hold promise as a potential solution, offering drastic reductions in compute times. Recent work in our group in the context of the ILD concept has demonstrated the suitability of various generative models for accurately reproducing showers displaying key physics properties in a highly granular calorimeter. While this initial work focused on the specific case of a particle incident perpendicular to the calorimeter face, a practical simulator must incorporate arbitrary angles of incidence and simulate them correctly. This talk will address ongoing efforts to add conditioning on the incident angle of the particle.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Author:** MCKEOWN, Peter

**Presenter:** MCKEOWN, Peter

**Session Classification:** A&B: Software/Computing & Calorimeters

**Track Classification:** Parallel sessions: Detectors: Session A: Software / Computing

Contribution ID: **103** Type: **Oral presentation using Zoom**

# New approach to validation of simulations with highly granular calorimeters using machine learning technique

*Thursday 28 October 2021 16:18 (24 minutes)*

An estimation of detector performance for future particle physics experiments relies both on prototypes tests and on detector simulation quality. Though the most used packages like Geant4 demonstrate quite good agreement, at percent level, for many observables, they are not perfect yet in the description of topological aspects of hadronic shower development, which are important for Particle Flow reconstruction. Highly granular calorimeters provide a wide spectrum of calorimetric observables and help to go deeper in our understanding of the source of discrepancies between data and simulations. In this work, we show the relationships between observables, which are available in the highly granular CALICE analogue hadron calorimeter, and properties of secondaries generated by Geant4 during hadronic shower propagation. In the new approach proposed, several calorimetric observables are used as inputs to a neural network and the output/target variable is one of the properties of secondary particles in a shower. The regression model is trained using a supervised learning. The achieved performance of the model and perspectives of its implementation for validation of hadronic shower simulations at secondaries level are discussed.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Author:** Dr CHADEEVA, Marina (P.N. Lebedev Physical Institute of RAS)

**Presenters:** Dr CHADEEVA, Marina (P.N. Lebedev Physical Institute of RAS); CHADEEVA, Marina (National Research Nuclear University MEPhI (RU))

**Session Classification:** A&B: Software/Computing & Calorimeters

**Track Classification:** Parallel sessions: Detectors: Session A: Software / Computing

Contribution ID: **104** Type: **Oral presentation using Zoom**

# Probing Dark Sectors With Invisible Vector Meson Decays

*Thursday 28 October 2021 11:36 (24 minutes)*

Fixed target experiments such as NA64 and LDMX use missing energy-momentum to detect the production of dark matter and other long-lived states. The most studied production mechanism is dark Bremsstrahlung through a vector mediator. In this work, we explore a complementary source of missing energy-momentum signals: Bremsstrahlung photons can convert to hard vector mesons in exclusive photoproduction processes, which then decay to dark matter or other invisible particles. We find that existing NA64 data can improve the leading constraints on invisible light vector meson decays, while a future run of LDMX could improve them by up to $5$ orders of magnitude. For the examples of a dark photon and a $U(1)_B$ gauge boson mediator, accounting for meson decays substantially enhances these experiments' sensitivity, especially to thermal relic dark matter of mass $m_\chi > 0.1\,\mathrm{GeV}$. We also comment on their implications for ILC beam-dump experiments.

## 1st preferred time slot for your oral presentation

10:00-12:00 JST (3:00-5:00 CEST, 21:00-23:00 EDT, 18:00-20:00 PDT)

## 2nd preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

**Authors:** Mr SCHUSTER, Philip (SLAC); Mrs TORO, Natalia (SLAC); Mr ZHOU, Kevin (Stanford)

**Presenter:** Mr ZHOU, Kevin (Stanford)

**Session Classification:** O-2: Fixed target / Dark sectors / Applications outside particle physics

**Track Classification:** Parallel sessions: Transversal Task Forces: Session O: Fixed target / Dark sectors / Applications outside particle physics

Contribution ID: **105** Type: **Oral presentation using Zoom**

# Phenomenology of spin - 3/2 particles at lepton collider

We study the phenomenology of Standard Model Gauge singlet spin - 3/2 Majorana fermion at the future electron - positron collider. The exotic spin - 3/2 fermion interacts with the Standard Model particles via effective operators with mass dimension 7 or higher. After writing down the complete set of dimension - 7 operators involving the exotic spin - 3/2 fermion, we studied the production, decay and signature of the spin - 3/2 fermion at the proposed electron - positron collider.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

**Author:** SAHU, Rameswar (Institute of physics)

**Co-author:** GHOSH, Kirtiman (Institute of Physics, Bhubaneswar - 751005.)

**Presenter:** SAHU, Rameswar (Institute of physics)

**Session Classification:** H-1: BSM particle production

**Track Classification:** Parallel sessions: Topical Groups: Session H: BSM particle production

Contribution ID: **106** Type: **Oral presentation using Zoom**

# A model for tiny neutrino masses, dark matter, and baryon asymmetry and its phenomenology at the ILC

*Wednesday 27 October 2021 13:40 (20 minutes)*

The origin of tiny neutrino masses, dark matter, and baryon asymmetry of the universe is still a mystery, and there is no doubt that there is new physics beyond the Standard Model. In a previous work, a new physics model at TeV-scale where all of them can be explained has been proposed, however the authors neglected CPV phases, and on the baryon asymmetry, they only showed the possibility of the strongly 1st order phase transition for the electroweak baryogenesis. We have extended this model to include CPV phases and evaluated neutrino masses, dark matter, and the baryon number asymmetry generated by the electroweak baryogenesis. In this talk, I will introduce this model and discuss the phenomenology at current and near future experiments including the ILC.

## 1st preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

## 2nd preferred time slot for your oral presentation

10:00-12:00 JST (3:00-5:00 CEST, 21:00-23:00 EDT, 18:00-20:00 PDT)

**Authors:** ENOMOTO, Kazuki (Osaka University); AOKI, Mayumi; KANEMURA, Shinya (Osaka University)

**Presenters:** ENOMOTO, Kazuki (Osaka University); AOKI, Mayumi; KANEMURA, Shinya (Osaka University)

**Session Classification:** H-1: BSM particle production

**Track Classification:** Parallel sessions: Topical Groups: Session H: BSM particle production

Contribution ID: **107** Type: **Oral presentation using Zoom**

# Digital Hadron Calorimetry

*Wednesday 27 October 2021 19:25 (20 minutes)*

Particle Flow Algorithms (PFAs) attempt to measure each particle in a hadronic jet individually, using the component or detector subsystem providing the best energy/momentum resolution. Calorimeters that can fully exploit the power of PFAs emphasize spatial granularity over single particle energy resolution. In this context, the CALICE collaboration developed the Digital Hadron Calorimeter (DHCAL).

The DHCAL uses Resistive Plate Chambers as active media and is read out with 1 x 1 cm2 pads and digital (1-bit) resolution. The DHCAL was tested with steel and tungsten absorber structures, as well as with no absorber structure, at the Fermilab and CERN test beam facilities over several years. The test program yields a unique dataset of electromagnetic and hadronic interactions with unprecedented spatial resolution. In addition to conventional calorimetry, the DHCAL offers detailed measurements of event shapes, rigorous tests of simulation models and various analytical tools to improve calorimetric performance.

Here we report on the results from the analysis of DHCAL data and comparisons with the Monte Carlo simulations across various test campaigns.

## 1st preferred time slot for your oral presentation

10:00-12:00 JST (3:00-5:00 CEST, 21:00-23:00 EDT, 18:00-20:00 PDT)

## 2nd preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

**Authors:** BILKI, Burak (Beykent University (TR)); XIA, Lei (Argonne National Laboratory (US)); Dr JOSE, Repond; ONEL, Yasar (University of Iowa (US))

**Presenter:** BILKI, Burak (Beykent University (TR))

**Session Classification:** B-3: Calorimeters

**Track Classification:** Parallel sessions: Detectors: Session B: Calorimeters

Contribution ID: **108** Type: **Oral presentation using Zoom**

# Aligned Higgs couplings originated from the twisted custodial symmetry at high energies

*Thursday 28 October 2021 20:20 (20 minutes)*

We study the scenario of the two Higgs doublet model, where the Higgs potential respects the twisted custodial symmetry at a high energy scale. In this scenario, experimental data for the Higgs boson couplings and those for the electroweak precision observables can be explained even when the masses of the extra Higgs bosons are near the electroweak scale. We also discuss the predictions on the mass spectrum of the additional Higgs bosons and also those on the coupling constants of the standard-model-like Higgs boson, which make it possible to test this scenario at the current and future collider experiments. This talk is based on JHEP 02 (2021) 046 [arXiv:2009.04330].

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Author:** Mr AIKO, Masashi

**Co-author:** KANEMURA, Shinya (Osaka University)

**Presenter:** Mr AIKO, Masashi

**Session Classification:** F-4: Higgs properties

**Track Classification:** Parallel sessions: Topical Groups: Session F: Higgs properties

Contribution ID: **109** Type: **Oral presentation using Zoom**

# Physics potential and technologies for ”five-dimensional particle imaging device”

*Wednesday 27 October 2021 19:24 (24 minutes)*

Picosecond timing measurements have become to one of the hottest topic in the detector development. We are considering to utilize the latest timing measurement technologies to combine with our ILD concept, including application of LGADs to silicon-tungsten ECAL and 100ps-level timing measurements at scintillator calorimeters. The updated detector can be called as “5D particle imaging device” showing combination of high granular detector elements and picosecond timing resolution. We would like to discuss possible detector design and challenges of the updated concept as well as possible physics impact of adding the new dimension to the detector.

## 1st preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

## 2nd preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

**Authors:** SUEHARA, Taikan (Kyushu University); KAWAGOE, Kiyotomo (Kyushu University); ISHIKAWA, Akimasa (KEK); NARITA, Shinya (Iwate University (JP)); OOTANI, Wataru (ICEPP, Univ. of Tokyo); YAMASHITA, Satoru (U. Tokyo); INAMI, Kenji (Nagoya University); SANUKI, Tomoyuki (Tohoku University)

**Presenter:** SUEHARA, Taikan (Kyushu University)

**Session Classification:** D-2: New technologies & ideas for collider detectors

**Track Classification:** Parallel sessions: Detectors: Session D: New technologies & ideas for collider detectors

Contribution ID: **111** Type: **Oral presentation using Zoom**

# Impact of light dark matter on Higgs physics

*Wednesday 27 October 2021 10:20 (20 minutes)*

We explore a novel possibility that dark matter has a light mass below 1 GeV in a lepton portal dark matter model. There are Yukawa couplings involving dark matter, left-handed leptons and an extra scalar doublet in the model. In the light mass region, dark matter is thermally produced via its annihilation into neutrinos. In order to obtain the correct relic abundance, a neutral scalar is required to be light while charged scalars need to be heavier than the electroweak scale. Such a mass spectrum is realized by adjusting quartic couplings in the scalar potential or introducing an extra singlet scalar. We discuss constraints of the light dark matter from Higgs physics, as well as dark matter searches.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

**Author:** OMURA, Yuji (Kindai University)

**Presenter:** OMURA, Yuji (Kindai University)

**Session Classification:** F&H-1: Higgs properties & BSM particle production

**Track Classification:** Parallel sessions: Topical Groups: Session F: Higgs properties

Contribution ID: **112** Type: **Oral presentation using Zoom**

# Status of the MUonE experiment

*Wednesday 27 October 2021 20:12 (24 minutes)*

The MUonE experiment aims at a competitive determination of the leading hadronic contribution to the muon anomalous magnetic moment, completely independent from the other existing results. It could have a crucial role to clarify the comparison of the $a_\mu$ measurement with the Standard Model, given the recent Fermilab result, and the tension between the accepted theory prediction and a new Lattice QCD calculation.
The novel method requires a precise measurement of the hadronic component of the running electromagnetic coupling, which can be extracted from the shape of the differential cross section of $\mu e$ elastic scattering, obtained by the 160 GeV CERN muon beam on fixed target.
The project status is presented, in view of the test run on a reduced detector, which is starting in Fall 2021 and will be completed in 2022.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Author:** ABBIENDI, Giovanni (Universita e INFN, Bologna (IT))

**Presenter:** ABBIENDI, Giovanni (Universita e INFN, Bologna (IT))

**Session Classification:** I: Electroweak physics

**Track Classification:** Parallel sessions: Topical Groups: Session I: Electroweak physics

Contribution ID: **113** Type: **Oral presentation using Zoom**

# Decoding the Charged Lepton Yukawa from the Higgs measurements

*Thursday 28 October 2021 13:20 (20 minutes)*

Higgs couplings to charged leptons forms an important measurement to understand not only the Standard Model but also physics beyond Standard Models including, multihiggs models , supersymmetric models etc. In the present work, We focus on the complementarity between the direct and indirect measurements in fixing the charged Lepton Yukawa couplings including flavour violating couplings. We show that the present limits from LHC are already competing with the indirect flavour violating measurements in some cases. We then comment on future possible measurements of these couplings including those from FCC-ee, ILC etc. We then extend our analysis to two Higgs doublet models of type III.

## 1st preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Authors:** SARKAR, Ratan (IISc Bangalore); KUMBHAKAR, Suman (IISc Bangalore); VEMPATI, Sudhir (IISc Bangalore)

**Presenters:** SARKAR, Ratan (IISc Bangalore); KUMBHAKAR, Suman (IISc Bangalore); VEMPATI, Sudhir (IISc Bangalore)

**Session Classification:** F-2: Higgs properties

**Track Classification:** Parallel sessions: Topical Groups: Session F: Higgs properties

Contribution ID: **114** Type: **Oral presentation using Zoom**

# Neutral and Doubly-Charged Scalars at Future Lepton Colliders

Many new physics scenarios beyond the Standard Model (BSM) often necessitate the existence of new neutral and/or charged scalar fields, which might couple to the SM charged leptons and thus give some BSM signals while evading all existing constraints. We show that future lepton colliders provide a clean environment to probe these BSM including some interesting lepton flavor violating (LFV) signals. We study the distributions of the final state leptons to distinguish the BSM contributions from neutral and doubly-charged scalars each other, as well as from the irreducible SM background at future lepton colliders, such as ILC and CLIC.

## 1st preferred time slot for your oral presentation

10:00-12:00 JST (3:00-5:00 CEST, 21:00-23:00 EDT, 18:00-20:00 PDT)

## 2nd preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

**Author:** XU, Fang

**Co-authors:** DEV, Bhupal; ZHANG, Yongchao

**Presenter:** XU, Fang

**Session Classification:** F&H-1: Higgs properties & BSM particle production

**Track Classification:** Parallel sessions: Topical Groups: Session F: Higgs properties

Contribution ID: **116** Type: **Oral presentation using Zoom**

# Development of highly granular scintillator strip electromagnetic calorimeter

*Wednesday 27 October 2021 14:15 (20 minutes)*

Highly granular electromagnetic calorimeter based on scintillator strip with SiPM readout (Sc-ECAL) is under development in the framework of the CALICE collaboration for future electron-positron colliders such as ILC and CEPC. The detection layers with scintillator strips ($45\ \mathrm{mm} \times 5\ \mathrm{mm} \times 2\ \mathrm{mm}$ each) coupled to SiPMs are stacked alternately in an orthogonal orientation. This technique achieves an effective transverse segmentation of $5 \times 5\ \mathrm{mm}^2$, and allows to significantly reduce the number of readout channels. After the validation of the concept with the physics prototype, the fully integrated technological prototype with 32 layers has been constructed to demonstrate the performance of Sc-ECAL with more realistic technical implementation. The assembly of the prototype has been completed, and the calibrations for the detection layers are in progress using the cosmic-ray and LED. The performance of the prototype is evaluated using the cosmic-ray shower, and test beam which is planned at the IHEP. The status and prospects of the R&D of Sc-ECAL will be reported.

## 1st preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

## 2nd preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

**Author:** TSUJI, Naoki (The University of Tokyo)

**Presenter:** TSUJI, Naoki (The University of Tokyo)

**Session Classification:** B-1: Calorimeters

**Track Classification:** Parallel sessions: Detectors: Session B: Calorimeters

Contribution ID: **118** Type: **Oral presentation using Zoom**

# Forward calorimeters for a future electron-positron collider

*Wednesday 27 October 2021 19:50 (20 minutes)*

The FCAL collaboration is preparing large-scale prototypes of special calorimeters to instrument the very forward region at a future electron-positron collider, in particular ILC. The forward region sets challenging requirements on several detector parameters, such as detector compactness, radiation hardness, or ASICs readout parameters. Prototype detector planes assembled with dedicated FE and ADC ASICs were built using silicon or GaAs sensors and installed in an electron test beam. The status of the FCAL R&D activity with emphasis on physics and technological challenges is given.
This talk covers the latest status of the luminometer prototype development and selected performance results obtained in test-beam measurements against the expected performance in simulation.

## 1st preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

## 2nd preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

**Author:** Dr NEAGU, Alina (Institute of Space Science)

**Co-author:** GHENESCU, Veta (Institute of Space Science (RO))

**Presenter:** Dr NEAGU, Alina (Institute of Space Science)

**Session Classification:** B-3: Calorimeters

**Track Classification:** Parallel sessions: Detectors: Session B: Calorimeters

Contribution ID: **119** Type: **Oral presentation using Zoom**

# Scattering amplitudes in generalized Higgs effective field theory

*Thursday 28 October 2021 11:40 (20 minutes)*

The HEFT is the most general effective field theory with non-linearly realized electroweak symmetry, but it cannot treat the production or decay processes of new particles. In the previous work, we extend the HEFT so that it includes the arbitrary number of neutral and charged scalar fields. In some of the BSM models such as composite Higgs models, however, the SM fermion partners are predicted in addition to the new scalar matter fields at low energy region, and in order to treat these additional fermions in a consistent manner, we have to extend the HEFT so that it includes not only new scalars but also these new fermion fields.

In the recent work, we formulate the generalized HEFT including new fermion fields as well as new scalar fields. We calculate scattering amplitudes in a basis-independent manner and find that their high energy behaviors are controlled by the geometrical quantity in the extended target space, such as Riemann curvature tensors.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

10:00-12:00 JST (3:00-5:00 CEST, 21:00-23:00 EDT, 18:00-20:00 PDT)

**Authors:** TSUMURA, Koji (Kyushu University); TANABASHI, Masaharu (Nagoya U.); NAGAI, Ryo (Osaka U); UCHIDA, Yoshiki (Kyushu University)

**Presenter:** UCHIDA, Yoshiki (Kyushu University)

**Session Classification:** F-1: Higgs properties

**Track Classification:** Parallel sessions: Topical Groups: Session I: Electroweak physics

Contribution ID: **120** Type: **Oral presentation using Zoom**

# H to hh decay in extended Higgs sectors with a nearly alignment scenario

*Thursday 28 October 2021 10:20 (20 minutes)*

Searches for extra Higgs bosons are quite important for a direct test of models with extended Higgs sectors. On the other hand, recent LHC data indicates that properties of the discovered Higgs boson are consistent with the SM Higgs boson within the error.
This favors a nearly alignment scenario in models with extended Higgs sectors, where the discovered Higgs boson couplings are almost the same as those of the SM Higgs boson at tree level.
We show that in such an alignment scenario the decay branching ratio of a heavy Higgs boson into the SM-like Higgs bosons can significantly be modified at one-loop level
as compared with the tree level prediction. In particular, we discuss two Higgs doublet models as an important example.

## 1st preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Authors:** YAGYU, Kei (Osaka U); MARIKO, Kikuchi (Nihon U.); KANEMURA, Shinya (Osaka U.)

**Presenter:** YAGYU, Kei (Osaka U)

**Session Classification:** F-1: Higgs properties

**Track Classification:** Parallel sessions: Topical Groups: Session F: Higgs properties

Contribution ID: **121** Type: **Oral presentation using Zoom**

# Jet energy calibration using e+e- → γZ process at the ILC

*Wednesday 27 October 2021 13:25 (20 minutes)*

The International Large Detector (ILD) is a detector concept for the International Linear Collider (ILC). ILD is a general purpose detector designed to fully reconstruct almost all events. A particular emphasis has been put on excellent jet energy resolution (JER), by optimizing the detector for efficient particle flow reconstruction. Excellent understanding of the absolute jet energy scale (JES) is needed to fully profit from excellent JER. We have developed a data-driven method to extract the absolute JES using the e+e- -> γZ process. This method makes use of measured jet masses and jet and photon directions to extract jet energies without reference to the directly measured energies. Comparing the extracted and directly measured jet energies will allow a very precise control of the JES to 10 MeV or better for ˜100 GeV jets. We present the result of a full-simulation demonstration of this new method, including an evaluation of the achievable JES accuracy and its dependence on jet energy, direction and flavor.

## 1st preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Author:** MIZUNO, Takahiro (Sokendai)

**Co-authors:** TIAN, Junping (University of Tokyo); FUJII, Keisuke

**Presenter:** MIZUNO, Takahiro (Sokendai)

**Session Classification:** B-1: Calorimeters

**Track Classification:** Parallel sessions: Detectors: Session B: Calorimeters

Contribution ID: **122** Type: **Oral presentation using Zoom**

# Power Incident on the ILC helical undulator vacuum chamber

*Wednesday 27 October 2021 21:30 (30 minutes)*

In the international linear collider (ILC), a high-intense electron beam passes through a helical undulator to produce a multi-MeV circularly polarized photon beam before it is directed to the interaction point (IP). The photon beam hits a thin rotating target to produce electron positron pairs. A maximum active undulator length of 231 m is foreseen to be appropriate for the ILC 250 GeV center-of-mass energy. Since the photon produced by the undulator is created with an opening angle, some of these photons will strikes the superconducting undulator wall. Therefore, photon masks must be placed along the undulator line to keep the power deposited into the undulator walls at an acceptable level (1 W/m). This talk will discuss the power deposited into the undulator walls. Masks inserted in the undualor line are discussed assuming ideal and realistic undulator fields; as material copper or tungsten are considered in detail.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Author:** ALHARBI, Khaled (Hamburg University, DESY, KACST)

**Presenter:** ALHARBI, Khaled (Hamburg University, DESY, KACST)

**Session Classification:** R-1: Machine - Sources

**Track Classification:** Parallel sessions: Accelerators: Session R: Machine - Sources

Contribution ID: **123** Type: **Oral presentation using Zoom**

# Off diagonal charged scalar couplings with the Z boson

*Wednesday 27 October 2021 20:00 (20 minutes)*

Models with scalar doublets and charged scalar singlets have the interesting property that they have couplings between one $Z$ boson and two charged scalars of different masses. This property is often ignored in phenomenological analysis, as it is absent from models with only extra scalar doublets. We explore this issue in detail, considering $h \to Z\gamma$, $B \to X_s\gamma$, and the decay of a heavy charged scalar into a lighter one and a $Z$ boson. We propose that the latter be actively searched for at the future collider experiments, using the scalar sector of the Zee-type models as a prototype and proposing benchmark points which obey all current experimental data.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Authors:** ROMÃO, Jorge; FLORENTINO, Ricardo; SILVA, João Paulo

**Presenter:** FLORENTINO, Ricardo

**Session Classification:** F&H-2: Higgs properties & BSM particle production

**Track Classification:** Parallel sessions: Topical Groups: Session F: Higgs properties

Contribution ID: **124** Type: **Oral presentation using Zoom**

# Status and plans for the CALICE AHCAL

*Wednesday 27 October 2021 19:00 (20 minutes)*

The Analog Hadron Calorimeter (AHCAL) concept developed by the CALICE collaboration is a highly granular sampling calorimeter with 3*3 cmˆ2 plastic scintillator tiles individually read out by silicon photomultipliers (SiPMs) as active material. A large technological prototype has been built and tested in particles beams at DESY and CERN in 2018, and analyses of this data set are well progressed.
Since then, the hardware developments and tests are focused on two areas:
- an alternative readout ASIC (KLauS) which supports operation in power-pulsing mode as well as continuous readout,
- an alternative scintillator geometry (Megatiles) where the segmentation of larger scintillator plates into small tiles is achieved by grooves filled with reflective material.
In addition, dedicated studies have been performed with individual tiles in order to understand the effects dominating the time resolution.

The talk will present an overview of the analyses as well as the hardware developments.

## 1st preferred time slot for your oral presentation

10:00-12:00 JST (3:00-5:00 CEST, 21:00-23:00 EDT, 18:00-20:00 PDT)

## 2nd preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

**Author:** KRUEGER, Katja (DESY)

**Presenter:** LAUDRAIN, Antoine (Johannes Gutenberg Universitaet Mainz (DE))

**Session Classification:** B-3: Calorimeters

**Track Classification:** Parallel sessions: Detectors: Session B: Calorimeters

Contribution ID: **125** Type: **Oral presentation using Zoom**

# A tapered pulsed solenoid as optical matching device for the undulator-based ILC positron source

*Wednesday 27 October 2021 22:30 (30 minutes)*

Future high energy colliders like the ILC require high intensity positron beams to achieve their targeted high luminosities. The intensity of positron beams is partially defined by the amount of positrons that can be provided by the positron source, which arises from the amount of originally produced positrons and the fraction that can be captured and transported, the so-called yield. In current positron source designs devices like the flux concentrator and the quarter wave transformer are used to match the positrons which are extracted from the positron target into the first accelerating structure. As these conventional devices exhibit a limited positron yield and pose high challenges on the target design due to the large forces and eddy currents that they induce on it, alternative matching devices are under investigation. In this contribution we present conceptual studies of a tapered, pulsed solenoid as matching device for the ILC positron source. The principal setup, simulated positron yield and heat load on the target, as well as approaches on how to improve them are discussed.

## 1st preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

## 2nd preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

**Authors:** Dr TENHOLT, Carmen (Helmholtz-Zentrum HEREON); Dr MENTINK, Matthias (CERN)

**Co-authors:** LOISCH, Gregor (DESY); MOORTGAT-PICK, Gudrid; Dr SIEVERS, Peter (CERN); Dr FUKUDA, Masafumi (KEK); Dr OKUGI, Toshiyuki (KEK); Dr YOKOYA, Kaoru (KEK)

**Presenters:** Dr TENHOLT, Carmen (Helmholtz-Zentrum HEREON); Dr MENTINK, Matthias (CERN)

**Session Classification:** R-1: Machine - Sources

**Track Classification:** Parallel sessions: Accelerators: Session R: Machine - Sources

Contribution ID: **126** Type: **Oral presentation using Zoom**

# Center-of-mass energy determination using dimuon events at ILC

*Wednesday 27 October 2021 20:36 (24 minutes)*

Precision measurements of masses from both center-of-mass energy scans and using beam energy and momentum constraints rely on knowledge of the absolute center-of-mass energy scale and the luminosity spectrum, $\mathrm{dL/d}\sqrt{s}$. A key method is the $\sqrt{s}_p$ technique that uses the tracker muon momenta measurements in $e^+e^- \to \mu^+\mu^-(\gamma)$ events to determine both $\sqrt{s}$ and the related luminosity spectrum. The talk will describe recent studies aimed at evaluating this method using fully reconstructed ILC events at $\sqrt{s} = 250$ GeV including detector effects, crossing-angle, beam-energy-spread, beamstrahlung, overlay, ISR, FSR, backgrounds, and investigations of vertex fitting. The same event sample is also used to evaluate sensitivity to the Z mass and width.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

**Author:** WILSON, Graham

**Presenter:** WILSON, Graham

**Session Classification:** I: Electroweak physics

**Track Classification:** Parallel sessions: Topical Groups: Session I: Electroweak physics

Contribution ID: **127** Type: **Oral presentation using Zoom**

# Di-Higgs production ($\gamma\gamma \to hh$) in Composite Models

*Thursday 28 October 2021 14:20 (20 minutes)*

In Standard Model (SM) Higgs Boson pair production initiated by photons ($\gamma\gamma \to hh$) loop generated process and thereby is very sensitive to any new couplings and particles that may come in loops. Composite Higgs Models (CHMs) provide an alternate mechanism to address the hierarchy problem of SM where Higgs could be a bound state of a strongly interacting sector instead of being an elementary field. These set of models apart from modifying the SM Higgs couplings could also introduce new effective couplings that can have substantial impact on the loop processes. In this work we have studied the impact of Composite Higgs models in $\gamma\gamma \to hh$ (Di-Higgs) production process.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Author:** HARADA, Daisuke (KEK / Graduate University for Advanced Studies)

**Presenter:** HARADA, Daisuke (KEK / Graduate University for Advanced Studies)

**Session Classification:** F-2: Higgs properties

**Track Classification:** Parallel sessions: Topical Groups: Session F: Higgs properties

Contribution ID: **128** Type: **Oral presentation using Zoom**

# ILC Positron Target: Material Analyses

*Wednesday 27 October 2021 22:00 (30 minutes)*

The ILC target materials, Ti-Alloys, radiated at MAMI with a PEDD corresponding to expectations at the ILC, have been analyzed in detail via synchrotron diffraction methods. The methods and the results are discussed in detail in this talk.

## 1st preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

## 2nd preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

**Authors:** Dr LOTT, Dieter (Helmholtz Zentrum Hereon); Mr LENGLER, Tim (Helmholtz Zentrum Hereon ); MOORTGAT-PICK, Gudrid; RIEMANN, Sabine (Deutsches Elektronen-Synchrotron (DE))

**Presenters:** Dr LOTT, Dieter (Helmholtz Zentrum Hereon); Mr LENGLER, Tim (Helmholtz Zentrum Hereon ); MOORTGAT-PICK, Gudrid; RIEMANN, Sabine (Deutsches Elektronen-Synchrotron (DE))

**Session Classification:** R-1: Machine - Sources

**Track Classification:** Parallel sessions: Accelerators: Session R: Machine - Sources

Contribution ID: **129** Type: **Oral presentation using Zoom**

# Particle Tracking Detectors in High-voltage CMOS Technology

*Thursday 28 October 2021 16:30 (20 minutes)*

High-voltage CMOS detectors are based on innovative structure where a pixel consists of a single collection electrode with readout electronics placed in it. High-voltage CMOS detectors can be thinned to about 50μm, they have relatively low current consumption and high spatial resolution. Since they are implemented in a commercial CMOS process, the production of large area sensors is inexpensive. The latest pixel detector designs designed for tracking detectors at electron-electron colliders will be presented.

## 1st preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

## 2nd preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

**Author:** PERIC, Ivan (KIT - Karlsruhe Institute of Technology (DE))

**Co-authors:** Dr EHRLER, Felix (KIT); Dr ZHANG, Hui (KIT); Mr SCHIMASSEK, Rudolf (KIT)

**Presenter:** PERIC, Ivan (KIT - Karlsruhe Institute of Technology (DE))

**Session Classification:** C-1: Tracking detectors

**Track Classification:** Parallel sessions: Detectors: Session C: Tracking detectors

Contribution ID: **130** Type: **Oral presentation using Zoom**

# Quest for Dark Matter at International Linear Collider

*Wednesday 27 October 2021 16:10 (20 minutes)*

Future accelerators like ILC or CLIC are with immense possibilities to improve our understanding of nature's fundamental building blocks and to discover new particles, e.g., WIMPs along with other physics phenomena. In scenarios where dark matter does not or feebly couple with quarks, we can consider the dominant couplings of them with charged leptons. We consider the pair production of fermion dark matter (freeze-out) at 1TeV ILC using a class of higher-dimensional leptophilic operators. Depending upon the visible particles to identify the events, we probe mono-photon and mono-Z (with Z decays leptonically and hadronically) channels. We also employ the beam polarisation scheme of ILC and present the $3\sigma$ sensitivity at $1000\text{fb}^{-1}$ in terms of the new physics (NP) scale $\Lambda$, for the three channels. I will discuss here how these operators perform in the quest for dark matter signature and how constrained the parameter space stand considering different experimental bounds.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Authors:** Dr GUHA, Atanu (IISER Pune); Mr KUNDU, Saumyen (BITS Pilani, K.K. Birla Goa Campus); Dr DEV, Bhupal (Washington University in St. Louis); Prof. DAS, Prasanta Kumar (BITS Pilani, K.K. Birla Goa Campus)

**Presenters:** Dr GUHA, Atanu (IISER Pune); Mr KUNDU, Saumyen (BITS Pilani, K.K. Birla Goa Campus); Dr DEV, Bhupal (Washington University in St. Louis); Prof. DAS, Prasanta Kumar (BITS Pilani, K.K. Birla Goa Campus)

**Session Classification:** H-2: BSM particle production

**Track Classification:** Parallel sessions: Topical Groups: Session H: BSM particle production

Contribution ID: **131** Type: **Oral presentation using Zoom**

# Update on the Development of the Active Plasma Lens as an Alternative Optical Matching Device

*Wednesday 27 October 2021 23:00 (30 minutes)*

The optical matching device (OMD) is responsible for matching the positron beam, produced in the target, according to the damping ring acceptance. This makes the OMD a crucial component for the number of positrons available in the collision experiments. The active plasma lens (APL) is a current-carrying plasma with the potential of being an innovative alternative for traditional OMD concepts as, for instance, the quarter wave transformer (QWT). This is due to its azimuthal magnetic field, which leads notably to focusing in both planes and due to minimal eddy currents inside the rotating target. Furthermore the plasma is transparent for incoming beams. Simulations with the ASTRA code suggest an increase in number of captured positrons by up to $40\%$ relative to the ILC's current QWT design. Recently a German funding grant has been approved for further theoretical and experimental research, including setting-up a prototype experiment.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Authors:** MOORTGAT-PICK, Gudrid; FORMELA, Manuel; Mr FLOETTMANN, Klaus (DESY); Mr HAMANN, Niclas (Universität Hamburg)

**Presenters:** MOORTGAT-PICK, Gudrid; FORMELA, Manuel; Mr FLOETTMANN, Klaus (DESY); Mr HAMANN, Niclas (Universität Hamburg)

**Session Classification:** R-1: Machine - Sources

**Track Classification:** Parallel sessions: Accelerators: Session R: Machine - Sources

Contribution ID: **132** Type: **Oral presentation using Zoom**

# Timing reconstruction with deep learning

*Thursday 28 October 2021 17:06 (24 minutes)*

Pico-sec timing reconstruction is one of the hot topics of the detector development. We are working on timing reconstruction in calorimeters with utilizing hits as many as possible to be averaged. It needs precise tracking in the calorimeters to precisely calculate flight length inside the calorimeters. Since the tracks in the calorimeters are much more complicated than those in trackers, deep learning techniques such as graph neural network should be powerful. We will present the status of the current development. Our other efforts on application of deep learning for event reconstruction will be briefly discussed as well.

## 1st preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

## 2nd preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

**Authors:** KAWAGOE, Kiyotomo (Kyushu University); KUHARA, Mami; SUEHARA, Taikan (Kyushu University); TSUMURA, Shusaku (Kyushu University); YOSHIOKA, Tamaki; ONOE, Tomoki (Kyushu University)

**Presenter:** KUHARA, Mami

**Session Classification:** A&B: Software/Computing & Calorimeters

**Track Classification:** Parallel sessions: Detectors: Session A: Software / Computing

Contribution ID: **133** Type: **Oral presentation using Zoom**

# System integration of E-Driven positron source

*Thursday 28 October 2021 23:10 (30 minutes)*

System description of E-Driven positron source is summarized including the electron driver, target station, capture linac, positron booster, and ECS.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

10:00-12:00 JST (3:00-5:00 CEST, 21:00-23:00 EDT, 18:00-20:00 PDT)

**Author:** KURIKI, Masao (Hiroshima U./KEK)

**Presenter:** KURIKI, Masao (Hiroshima U./KEK)

**Session Classification:** R-2: Machine - Sources

**Track Classification:** Parallel sessions: Accelerators: Session R: Machine - Sources

Contribution ID: **134** Type: **Oral presentation using Zoom**

# Target R&D of E-Driven positron source

*Thursday 28 October 2021 22:00 (40 minutes)*

R&D status of positron production target of E-Driven positron source is presented.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

10:00-12:00 JST (3:00-5:00 CEST, 21:00-23:00 EDT, 18:00-20:00 PDT)

**Author:** OMORI, tsunehiko (KEK)

**Presenter:** OMORI, tsunehiko (KEK)

**Session Classification:** R-2: Machine - Sources

**Track Classification:** Parallel sessions: Accelerators: Session R: Machine - Sources

Contribution ID: **135** Type: **Oral presentation using Zoom**

# E-driven positron source R&D by industry-government-academia collaboration

*Thursday 28 October 2021 21:30 (30 minutes)*

R&D effort of E-Driven positron source is being studied as a tight collaborative work among industry, government, and academia. As an example, thermal effect on the target, flux concentrator, beam collimator, and the 1st capture cavity is analyzed in this framework. We present the latest results of this study.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

10:00-12:00 JST (3:00-5:00 CEST, 21:00-23:00 EDT, 18:00-20:00 PDT)

**Author:** TAKAHASHI, Tohru

**Presenter:** TAKAHASHI, Tohru

**Session Classification:** R-2: Machine - Sources

**Track Classification:** Parallel sessions: Accelerators: Session R: Machine - Sources

Contribution ID: **136** Type: **Oral presentation using Zoom**

# Beam-loading Compensation on Capture Linac of E-Driven Positron Source

*Thursday 28 October 2021 22:40 (30 minutes)*

The beam loading compensation on the capture linac of E-Driven positron source is discussed.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

10:00-12:00 JST (3:00-5:00 CEST, 21:00-23:00 EDT, 18:00-20:00 PDT)

**Author:** KONNO, Shun

**Presenter:** KONNO, Shun

**Session Classification:** R-2: Machine - Sources

**Track Classification:** Parallel sessions: Accelerators: Session R: Machine - Sources

Contribution ID: **137** Type: **Oral presentation using Zoom**

# Towards a Pixel TPC

*Thursday 28 October 2021 19:40 (20 minutes)*

We have developed a gaseous pixel detector based on four Timepix3 chips that can serve as a building block for a large detector plane. To provide the required gas amplification a fine grid has been deposited on the chip surface by wafer post-processing (GridPix technology). The precisely aligned grid holes and chip pixels having a pitch of 55 μm and the high time resolution of 1.56 ns of the Timepix3 chip enable the reconstruction of each individual ionization electron where the accuracy is dominated by diffusion. The QUAD was designed to have minimum electrical field inhomogeneities and distortions, achieving a tracking precision in the pixel plane with systematics of better than 10 microns. Due to the high efficiency to detect the ionization electrons a precise measurement of the energy loss dE/dx can be performed. The QUAD detector has all services located under the detection surface. In this way multiple QUADs can be simply put together to create a detection surface of arbitrary dimensions. Using the 8 QUADs a module was constructed with a readout system. The module was tested inside the PCMAG magnet in an electron beam at DESY in June 2021 where a silicon telescope was used to provide accurate tracking. In the presentation details about the construction of the QUAD and module will be discussed. The results from the QUAD will be reviewed. An idea to improve the gating for a Gridpix device will be presented. Simulation results for the performance of a full pixel TPC in ILD will be presented. Finally, first preliminary results for the module in the DESY testbeam will be shown.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Authors:** KAMINSKI, Jochen (University of Bonn); KLUIT, Peter (Nikhef National institute for subatomic physics (NL))

**Co-authors:** VAN DER GRAAF, Harry (NIKHEF-Unknown-Unknown); HARTJES, Frederik (Nikhef National institute for subatomic physics (NL)); LIGTENBERG, Kees (Nikhef); RAVEN, Gerhard; TIMMERMANS, Jan (Nikhef National institute for subatomic physics (NL)); BILEVYCH, Yevgen; DESCH, Klaus (University of Bonn (DE))

**Presenters:** KAMINSKI, Jochen (University of Bonn); KLUIT, Peter (Nikhef National institute for subatomic physics (NL))

**Session Classification:** C-3: Tracking detectors

**Track Classification:** Parallel sessions: Detectors: Session C: Tracking detectors

Contribution ID: **138** Type: **Oral presentation using Zoom**

# A new Readout Scheme of Gaseous Detectors

*Thursday 28 October 2021 19:20 (20 minutes)*

A new readout scheme allowing the exploitation of Resistive Plate Chamber (RPC) spatial precision and using a limited number of electronic channels is proposed. The new scheme which exploits the spread of the RPC induced charge on several adjacent inter-connected pads, allows the simultaneous detection of several particles without ambiguity.
In this scheme, pads are connected in rows through buried vias in rear layers in an original way so the charge induced by the passage of one particle is shared among pads belonging to different directions. The pads of one row are connected to one electronic channel.
The position of the particle is determined by the intersection of the rows associated to the fired pads and the ambiguity is eliminated by the fact that more than two crossing rows with two different directions are concerned.
The new scheme allows to instrument large detectors with a reduced number of electronics channels without reducing the spatial resolution obtained with pads read out individually.
We will present the results obtained on a cosmic ray bench built with 60 cm x 70 cm RPC read out with the new readout scheme and we will discuss our plan to use the new scheme to instrument large gaseous detectors.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Author:** LAKTINEH, Imad (Centre National de la Recherche Scientifique (FR))

**Presenter:** LAKTINEH, Imad (Centre National de la Recherche Scientifique (FR))

**Session Classification:** C-3: Tracking detectors

**Track Classification:** Parallel sessions: Detectors: Session C: Tracking detectors

Contribution ID: **139** Type: **Oral presentation using Zoom**

# Merging of ISR and EPA structure functions with matrix element calculations

*Thursday 28 October 2021 20:12 (24 minutes)*

One of the challenges in times of preparing for a next large-scale collider is to properly model its performance. For physical analyses, event generation of signal and background events is often crucial to estimate discovery reach of the machine for New Physics. In many cases, not only should beam collision background samples be analysed, but also there is a need to include background events produced in other ways. At e+e- colliders, a significant part of the generated background samples can require usage of photon structure functions. Even though the ISR and EPA functions are widely used for this purpose, one should be aware of their constraints. In my talk, I will show why this issue can be important for ILC physics potential studies and I will present possible approaches to merging of the structure functions with full matrix element calculations.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

10:00-12:00 JST (3:00-5:00 CEST, 21:00-23:00 EDT, 18:00-20:00 PDT)

**Author:** MEKALA, Krzysztof

**Presenter:** MEKALA, Krzysztof

**Session Classification:** K&I: Modeling & precision theory & Electroweak physics

**Track Classification:** Parallel sessions: Topical Groups: Session K: Modeling & precision theory

Contribution ID: **141** Type: **Oral presentation using Zoom**

# High precision QED calculations

*Thursday 28 October 2021 19:24 (24 minutes)*

While QED is a simpler theory than QCD, there are issues related to mass effects and collinear emissions that are specific to higher-order calculations in QED. We discuss our recent approach to tackle these problems, present a first complete NNLO QED calculation for a massive 2->2 process and discuss the impact of these developments on physics at a linear collider.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Author:** SIGNER, Adrian (PSI / UZH)

**Presenter:** SIGNER, Adrian (PSI / UZH)

**Session Classification:** K&I: Modeling & precision theory & Electroweak physics

**Track Classification:** Parallel sessions: Topical Groups: Session K: Modeling & precision theory

Contribution ID: **142** Type: **Oral presentation using Zoom**

# Basic policy of Green ILC activities at Kitakami ILC candidate site

*Thursday 28 October 2021 13:00 (30 minutes)*

Carbon neutrality by 2050 is one of the most urgent issues in the world, and the ILC aiming to start operation in 2035 should be in line with this global policy. The basic policy of Green ILC activities is not to achieve carbon neutrality within the ILC facility, but to achieve carbon neutrality in the region where the ILC is located. The key to achieving this goal is to cooperate with local companies and municipalities in three areas: (1) developing energy-saving technologies, (2) increasing the ratio of renewable energy, and (3) improving the CO2 absorption rate. The industrial aspect will prevail in (1) and (2), but there is no choice but to rely on forests for (3). The area of the candidate site has a high percentage of forest, and therefore high potential, so the construction of ILC-related facilities should be in line with forest industry management that maximizes CO2 absorption.

## 1st preferred time slot for your oral presentation

10:00-12:00 JST (3:00-5:00 CEST, 21:00-23:00 EDT, 18:00-20:00 PDT)

## 2nd preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

**Author:** Prof. YOSHIOKA, Masakazu (Iwate/Iwate prefectural/Tohoku University)

**Presenter:** Prof. YOSHIOKA, Masakazu (Iwate/Iwate prefectural/Tohoku University)

**Session Classification:** W-1: Green ILC

**Track Classification:** Parallel sessions: Sustainability: Session W: Green ILC

Contribution ID: **171** Type: **Oral presentation using Zoom**

# Computing in the US Snowmass Process

*Friday 29 October 2021 13:00 (20 minutes)*

The Particle Physics Community Planning Exercise ("Snowmass") in the United States aims to identify a strategy for future particle physics in the US and elsewhere. This study includes both the physics cases for experiments and facilities and the technologies that are needed to support such ambitions, including computing. I will discuss the areas under review in the Snowmass computing working group, issues of particular interest, timelines, and how to contribute to the process.

## 1st preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Author:** ONYISI, Peter (University of Texas at Austin (US))

**Presenter:** ONYISI, Peter (University of Texas at Austin (US))

**Session Classification:** A-2: Software / Computing

**Track Classification:** Parallel sessions: Detectors: Session A: Software / Computing

Contribution ID: **172** Type: **Oral presentation using Zoom**

# Homogeneous Hadron Calorimetry for superior di-jet mass resolution

*Wednesday 27 October 2021 14:12 (24 minutes)*

One of the physics challenges for new detectors at an e+e- linear collider is to distinguish W and Z vector bosons in their hadronic decay mode. This requires a di-jet mass resolution of the order of the natural width of these bosons and hence a jet energy resolution of about 3%. For hadron calorimetry this means that the required energy resolution be a factor of about two better than previously achieved to date by any large-scale experiment. A novel approach to achieving superior hadronic energy resolution is based on a homogeneous hadronic calorimeter (HHCAL) detector concept, including both electromagnetic and hadronic parts, with separate readout of the Cherenkov and scintillation light. By calibrating the dual readout response to electromagnetic showers, the correlation between the Cherenkov and scintillation signals can be used to obtain superior hadronic energy resolution. This HHCAL detector concept has a total absorption nature, so its energy resolution is not limited by sampling fluctuations. It also has no traditional boundary between the ECAL and HCAL, so it does not suffer from the effects of dead material in the middle of hadronic showers. With the dual-readout approach, measuring both Cherenkov and scintillator light, the contribution to the energy resolution by large fluctuations in the determination of the electromagnetic fraction of a hadronic shower can be vastly reduced. The missing nuclear binding energy can then be corrected shower-by-shower, resulting in good energy resolution for hadronic jets. In addition, by choosing optimal calorimeter cell sizes, particle flow techniques can be used to further improve the dual readout calorimeter performance. Active materials, such as scintillating crystals, glasses or ceramics, may be used to construct an HHCAL.

## 1st preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

## 2nd preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

**Author:** Dr MAGILL, Stephen (Argonne National Laboratory)

**Presenter:** Dr MAGILL, Stephen (Argonne National Laboratory)

**Session Classification:** D-1: New technologies & ideas for collider detectors

**Track Classification:** Parallel sessions: Detectors: Session D: New technologies & ideas for collider detectors

Contribution ID: **173** Type: **Oral presentation using Zoom**

# A dual-readout electromagnetic calorimeter for future e+e- Higgs factories

*Wednesday 27 October 2021 13:00 (24 minutes)*

In the past, homogeneous electromagnetic calorimeters have allowed precision measurements of electrons and photons, while high-granularity, dual-readout, and compensating calorimeters have been considered promising paths for improving hadronic measurements. In this talk, the possibility of using a homogeneous high-granularity crystal electromagnetic calorimeter using SiPMs with a spaghetti hadronic calorimeter using clear and scintillating fibers is explored using simulation. By employing wavelength and timing measurements in both calorimeters, the excellent electromagnetic resolution typical of crystal calorimeters is preserved, and the excellent hadronic resolutions are enabled for important physics measurements at future Higgs factories. We also discuss past studies and future plans.

## 1st preferred time slot for your oral presentation

10:00-12:00 JST (3:00-5:00 CEST, 21:00-23:00 EDT, 18:00-20:00 PDT)

## 2nd preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

**Author:** ZHU, Junjie (University of Michigan (US))

**Co-authors:** BELLONI, Alberto (University of Maryland); AKCHURIN, Nural (Texas Tech University); CHEKANOV, Sergei (Argonne National Laboratory); DEMARTEAU, Marcel (Oak Ridge National Laboratory); ENO, Sarah (U. Maryland); ZHOU, Bing (University of Michigan); NEWMAN, Harvey; MAGILL, Stephen Robert (Argonne National Laboratory (US)); KUNORI, Shuichi (Texas Tech University); JUNG, Andreas (Purdue University); QIAN, Jianming (University of Michigan); TULLY, Christopher (Princeton University); HIRSCHAUER, James (Fermi National Accelerator Laboratory); HARRIS, Philip (MIT); FREEMAN, James (Fermi National Accelerator Laboratory); WENZEL, Hans (FNAL); HIROSKY, Bob (University of Virginia (US)); ZHU, Ren-Yuan (California Institute of Technology (CALTECH))

**Presenter:** ZHU, Junjie (University of Michigan (US))

**Session Classification:** D-1: New technologies & ideas for collider detectors

**Track Classification:** Parallel sessions: Detectors: Session D: New technologies & ideas for collider detectors

Contribution ID: **201** Type: **Oral presentation using Zoom**

# Welcome and situation in Japan

*Tuesday 26 October 2021 21:30 (15 minutes)*

**1st preferred time slot for your oral presentation**

**2nd preferred time slot for your oral presentation**

**Presenter:** Prof. YAMAUCHI, Masanori (KEK)

**Session Classification:** Plenary session (Day 1)

**Track Classification:** Plenary sessions: Plenary session (Day 1)

Contribution ID: **202** Type: **Oral presentation using Zoom**

# Report of the International Development Team

*Tuesday 26 October 2021 21:45 (15 minutes)*

### 1st preferred time slot for your oral presentation

### 2nd preferred time slot for your oral presentation

**Presenter:** NAKADA, T. (EPFL, Lausanne)

**Session Classification:** Plenary session (Day 1)

**Track Classification:** Plenary sessions: Plenary session (Day 1)

Contribution ID: **203** Type: **Oral presentation using Zoom**

# Recent physics highlights

*Tuesday 26 October 2021 22:00 (20 minutes)*

### 1st preferred time slot for your oral presentation

### 2nd preferred time slot for your oral presentation

**Presenter:** PESKIN, Michael

**Session Classification:** Plenary session (Day 1)

**Track Classification:** Plenary sessions: Plenary session (Day 1)

Contribution ID: **204** Type: **Oral presentation using Zoom**

# Report on ILC machine status

*Tuesday 26 October 2021 22:20 (20 minutes)*

### 1st preferred time slot for your oral presentation

### 2nd preferred time slot for your oral presentation

**Presenter:** MICHIZONO, Shinichiro (KEK)

**Session Classification:** Plenary session (Day 1)

**Track Classification:** Plenary sessions: Plenary session (Day 1)

Contribution ID: **205** Type: **Oral presentation using Zoom**

# WG3 / MDI

*Tuesday 26 October 2021 22:45 (20 minutes)*

### 1st preferred time slot for your oral presentation

### 2nd preferred time slot for your oral presentation

**Presenter:** POESCHL, Roman (Université Paris-Saclay (FR))

**Session Classification:** Plenary session (Day 1)

**Track Classification:** Plenary sessions: Plenary session (Day 1)

Contribution ID: **206** Type: **Oral presentation using Zoom**

# Beam dump / Fixed target

*Tuesday 26 October 2021 23:05 (20 minutes)*

### 1st preferred time slot for your oral presentation

### 2nd preferred time slot for your oral presentation

**Presenter:** PERELSTEIN, Maxim (Cornell)

**Session Classification:** Plenary session (Day 1)

**Track Classification:** Plenary sessions: Plenary session (Day 1)

Contribution ID: **207** Type: **Oral presentation using Zoom**

# Applications outside particle physics (soft error)

*Tuesday 26 October 2021 23:25 (20 minutes)*

**1st preferred time slot for your oral presentation**

**2nd preferred time slot for your oral presentation**

**Presenter:** HASHIMOTO , Masanori (Kyoto Univ.)

**Session Classification:** Plenary session (Day 1)

**Track Classification:** Plenary sessions: Plenary session (Day 1)

Contribution ID: **208** Type: **Oral presentation using Zoom**

# Applications outside particle physics (light source): 20 min allocated / the session ends 0:05 JST

*Tuesday 26 October 2021 23:45 (14 minutes)*

**2nd preferred time slot for your oral presentation**

**1st preferred time slot for your oral presentation**

**Presenter:** FALCONE, Roger (UC Berkeley)

**Session Classification:** Plenary session (Day 1)

**Track Classification:** Plenary sessions: Plenary session (Day 1)

Contribution ID: **211** Type: **Oral presentation using Zoom**

# SiD: status, concrete R&D and long-term wishes

*Wednesday 27 October 2021 21:30 (35 minutes)*

**1st preferred time slot for your oral presentation**

**2nd preferred time slot for your oral presentation**

**Presenter:** POTTER, Christopher Thomas (University of Oregon (US))

**Session Classification:** Plenary session (Day 2)

**Track Classification:** Plenary sessions: Plenary session (Day 2)

Contribution ID: **212** Type: **Oral presentation using Zoom**

# ILD: status, concrete R&D and long-term wishes

*Wednesday 27 October 2021 22:05 (35 minutes)*

**1st preferred time slot for your oral presentation**

**2nd preferred time slot for your oral presentation**

**Author:** IRLES, Adrian (IFIC (CSIC/UVEG) Valencia)

**Presenter:** IRLES, Adrian (IFIC (CSIC/UVEG) Valencia)

**Session Classification:** Plenary session (Day 2)

**Track Classification:** Plenary sessions: Plenary session (Day 2)

Contribution ID: **213** Type: **Oral presentation using Zoom**

# FCC-ee / CEPC

**1st preferred time slot for your oral presentation**

**2nd preferred time slot for your oral presentation**

**Session Classification:** Plenary session (Day 2)

**Track Classification:** Plenary sessions: Plenary session (Day 2)

Contribution ID: **214** Type: **Oral presentation using Zoom**

# New concepts / New technologies

*Wednesday 27 October 2021 22:40 (35 minutes)*

### 1st preferred time slot for your oral presentation

### 2nd preferred time slot for your oral presentation

**Author:** VOS, Marcel (IFIC (UVEG/CSIC) Valencia)

**Presenter:** VOS, Marcel (IFIC (UVEG/CSIC) Valencia)

**Session Classification:** Plenary session (Day 2)

**Track Classification:** Plenary sessions: Plenary session (Day 2)

Contribution ID: **215** Type: **Oral presentation using Zoom**

# Discussion forum including tradeoffs among concepts (Moderator: Dr. Claude Vallée)

*Wednesday 27 October 2021 23:15 (44 minutes)*

**1st preferred time slot for your oral presentation**

**2nd preferred time slot for your oral presentation**

**Author:** VALLEE, Claude (CPPM)

**Presenter:** VALLEE, Claude (CPPM)

**Session Classification:** Plenary session (Day 2)

**Track Classification:** Plenary sessions: Plenary session (Day 2)

Contribution ID: **221** Type: **Oral presentation using Zoom**

# WG3 / Software general overview

*Thursday 28 October 2021 21:30 (25 minutes)*

### 1st preferred time slot for your oral presentation

### 2nd preferred time slot for your oral presentation

**Presenter:** JEANS, Daniel

**Session Classification:** Plenary session (Day 3)

**Track Classification:** Plenary sessions: Plenary session (Day 3)

Contribution ID: **222** Type: **Oral presentation using Zoom**

# HEP computing challenges and the HSF

*Thursday 28 October 2021 21:55 (25 minutes)*

**1st preferred time slot for your oral presentation**

**2nd preferred time slot for your oral presentation**

**Presenter:** STEWART, Graeme A (CERN)

**Session Classification:** Plenary session (Day 3)

**Track Classification:** Plenary sessions: Plenary session (Day 3)

Contribution ID: **223** Type: **Oral presentation using Zoom**

# WG3 / Physics

*Thursday 28 October 2021 22:20 (10 minutes)*

### 1st preferred time slot for your oral presentation

### 2nd preferred time slot for your oral presentation

**Author:** ROBSON, Aidan (University of Glasgow (GB))

**Presenter:** ROBSON, Aidan (University of Glasgow (GB))

**Session Classification:** Plenary session (Day 3)

**Track Classification:** Plenary sessions: Plenary session (Day 3)

Contribution ID: **224** Type: **Oral presentation using Zoom**

# ILC prospects in extended Higgs models in the light of recent LHC results

*Thursday 28 October 2021 22:30 (25 minutes)*

**1st preferred time slot for your oral presentation**

**2nd preferred time slot for your oral presentation**

**Author:** HEINEMEYER, Sven

**Presenter:** HEINEMEYER, Sven

**Session Classification:** Plenary session (Day 3)

**Track Classification:** Plenary sessions: Plenary session (Day 3)

Contribution ID: **225** Type: **Oral presentation using Zoom**

# Top-quark electroweak physics and the LHC-ILC interplay prospects

*Thursday 28 October 2021 22:55 (25 minutes)*

**1st preferred time slot for your oral presentation**

**2nd preferred time slot for your oral presentation**

**Author:** MORENO LLACER, Maria (IFIC, (CSIC - Univ. of Valencia))

**Presenter:** MORENO LLACER, Maria (IFIC, (CSIC - Univ. of Valencia))

**Session Classification:** Plenary session (Day 3)

**Track Classification:** Plenary sessions: Plenary session (Day 3)

Contribution ID: **226** Type: **Oral presentation using Zoom**

# Young Scientists Forum (Moderator: Prof. Michael Peskin)

*Thursday 28 October 2021 23:20 (39 minutes)*

**1st preferred time slot for your oral presentation**

**2nd preferred time slot for your oral presentation**

**Presenters:** GONSKI, Julia Lynne (Columbia University (US)); DUDAR, Bohdan (DESY); PESKIN, Michael; DHARANI, Sukeerthi; KOBAYASHI, Satoru (The University of Tokyo(ICEPP)); SUGIZAKI, Kaito

**Session Classification:** Plenary session (Day 3)

**Track Classification:** Plenary sessions: Plenary session (Day 3)

Contribution ID: **231** Type: **Oral presentation using Zoom**

# ICFA Status

*Friday 29 October 2021 21:30 (15 minutes)*

### 1st preferred time slot for your oral presentation

### 2nd preferred time slot for your oral presentation

**Presenters:** HENDERSON, Stuart (JLab director / ICFA chair); HENDERSON, Stuart (Oak Ridge National Laboratory)

**Session Classification:** Plenary session (Day 4 Final)

**Track Classification:** Plenary sessions: Plenary session (Day 4)

Contribution ID: **232** Type: **Oral presentation using Zoom**

# Japan Status

*Friday 29 October 2021 21:45 (15 minutes)*

### 1st preferred time slot for your oral presentation

### 2nd preferred time slot for your oral presentation

**Presenter:** MORI, Toshinori

**Session Classification:** Plenary session (Day 4 Final)

**Track Classification:** Plenary sessions: Plenary session (Day 4)

Contribution ID: **233** Type: **Oral presentation using Zoom**

# Snowmass Update

*Friday 29 October 2021 22:00 (15 minutes)*

### 1st preferred time slot for your oral presentation

### 2nd preferred time slot for your oral presentation

**Author:** HAN, Tao (Univ. Pittsburgh)

**Presenter:** HAN, Tao (Univ. Pittsburgh)

**Session Classification:** Plenary session (Day 4 Final)

**Track Classification:** Plenary sessions: Plenary session (Day 4)

Contribution ID: **234** Type: **Oral presentation using Zoom**

# ECFA detector roadmap

*Friday 29 October 2021 22:15 (15 minutes)*

### 1st preferred time slot for your oral presentation

### 2nd preferred time slot for your oral presentation

**Presenter:** ALLPORT, Philip Patrick (University of Birmingham (GB))

**Session Classification:** Plenary session (Day 4 Final)

**Track Classification:** Plenary sessions: Plenary session (Day 4)

Contribution ID: **235** Type: **Oral presentation using Zoom**

# ECFA Higgs factory study

*Friday 29 October 2021 22:30 (15 minutes)*

**1st preferred time slot for your oral presentation**

**2nd preferred time slot for your oral presentation**

**Presenter:** JAKOBS, Karl (Univ. Freiburg / ECFA chair)

**Session Classification:** Plenary session (Day 4 Final)

**Track Classification:** Plenary sessions: Plenary session (Day 4)

Contribution ID: **236** Type: **Oral presentation using Zoom**

# Communication on the case for at least a future collider beyond the LHC

*Friday 29 October 2021 22:45 (15 minutes)*

**1st preferred time slot for your oral presentation**

**2nd preferred time slot for your oral presentation**

**Presenter:** MURAYAMA, Hitoshi (University of California Berkeley (US))

**Session Classification:** Plenary session (Day 4 Final)

**Track Classification:** Plenary sessions: Plenary session (Day 4)

Contribution ID: **237** Type: **Oral presentation using Zoom**

# Panel discussion on global view of future "realistic" landscape of colliders (Moderator: Prof. Tatsuya Nakada)

*Friday 29 October 2021 23:05 (45 minutes)*

**1st preferred time slot for your oral presentation**

**2nd preferred time slot for your oral presentation**

**Presenters:** NAKADA, Tatsuya (EPFL / IDT-EB Chair); ASAI, Shoji (Univ. Tokyo / ILC-Japan); BASSLER, Ursula (IN2P3 / CERN Council President); HENDERSON, Stuart (JLab Director / ICFA Chair); JAKOBS, Karl (Univ. Freiburg / ECFA Chair); PESKIN, Michael (SLAC); WANG, Yifang (IHEP Beijing Director)

**Session Classification:** Plenary session (Day 4 Final)

**Track Classification:** Plenary sessions: Plenary session (Day 4)

Contribution ID: **251** Type: **Oral presentation using Zoom**

# Outlook

*Friday 29 October 2021 23:50 (9 minutes)*

### 1st preferred time slot for your oral presentation

### 2nd preferred time slot for your oral presentation

**Presenter:** ASAI, Shoji (University of Tokyo (JP))

**Session Classification:** Plenary session (Day 4 Final)

**Track Classification:** Plenary sessions: Plenary session (Day 4)

Contribution ID: **281** Type: **not specified**

# Summary talk (Software)

*Friday 29 October 2021 15:30 (20 minutes)*

### 1st preferred time slot for your oral presentation

### 2nd preferred time slot for your oral presentation

**Author:** MADLENER, Thomas (Deutsches Elektronen-Synchrotron (DE))

**Presenter:** MADLENER, Thomas (Deutsches Elektronen-Synchrotron (DE))

**Session Classification:** Plenary session (Summary 1)

Contribution ID: **282** Type: **not specified**

# Summary talk (Calorimetry / New ideas)

*Friday 29 October 2021 17:10 (20 minutes)*

**1st preferred time slot for your oral presentation**

**2nd preferred time slot for your oral presentation**

**Author:** SUEHARA, Taikan (Kyushu University)

**Presenter:** SUEHARA, Taikan (Kyushu University)

**Session Classification:** Plenary session (Summary 1)

Contribution ID: **283** Type: **not specified**

# Summary talk (Tracking / New technologies)

*Friday 29 October 2021 15:50 (20 minutes)*

**1st preferred time slot for your oral presentation**

**2nd preferred time slot for your oral presentation**

**Presenter:** ARAI, Yasuo (KEK)

**Session Classification:** Plenary session (Summary 1)

Contribution ID: **284** Type: **not specified**

# Summary talk (Higgs)

*Friday 29 October 2021 16:10 (20 minutes)*

**1st preferred time slot for your oral presentation**

**2nd preferred time slot for your oral presentation**

**Presenter:** KANEMURA, Shinya (Osaka University)

**Session Classification:** Plenary session (Summary 1)

Contribution ID: **285** Type: **not specified**

# Summary talk (BSM)

*Friday 29 October 2021 16:30 (20 minutes)*

### 1st preferred time slot for your oral presentation

### 2nd preferred time slot for your oral presentation

**Author:** MATSUMOTO, Shigeki (IPMU, Univ. of Tokyo)

**Presenter:** MATSUMOTO, Shigeki (IPMU, Univ. of Tokyo)

**Session Classification:** Plenary session (Summary 1)

Contribution ID: **286** Type: **not specified**

# Summary talk (Top / Heavy flavor / QCD / Electroweak)

*Friday 29 October 2021 16:50 (20 minutes)*

**1st preferred time slot for your oral presentation**

**2nd preferred time slot for your oral presentation**

**Presenters:** IRLES, Adrian (IFIC (CSIC/UVEG) Valencia); WILSON, Graham

**Session Classification:** Plenary session (Summary 1)

Contribution ID: **287** Type: **not specified**

# Summary talk (Global interpretation / Modeling & precision theory)

*Friday 29 October 2021 19:00 (20 minutes)*

**1st preferred time slot for your oral presentation**

**2nd preferred time slot for your oral presentation**

**Author:** LI, Zhao

**Presenter:** LI, Zhao

**Session Classification:** Plenary session (Summary 2)

Contribution ID: **288** Type: **not specified**

# Summary talk (MDI, CFS, BDS, physics)

*Friday 29 October 2021 19:20 (20 minutes)*

**1st preferred time slot for your oral presentation**

**2nd preferred time slot for your oral presentation**

**Author:** BUESSER, Karsten (DESY)

**Presenter:** BUESSER, Karsten (DESY)

**Session Classification:** Plenary session (Summary 2)

Contribution ID: **289** Type: **not specified**

# Summary talk (Machine SRF)

*Friday 29 October 2021 19:40 (20 minutes)*

### 1st preferred time slot for your oral presentation

### 2nd preferred time slot for your oral presentation

**Authors:** BURT, Graeme Campbell (Lancaster University (GB)); YAMAMOTO, Yasuchika (KEK)

**Presenters:** BURT, Graeme Campbell (Lancaster University (GB)); YAMAMOTO, Yasuchika (KEK)

**Session Classification:** Plenary session (Summary 2)

Contribution ID: **290** Type: **not specified**

# Summary talk (Machine Sources)

*Friday 29 October 2021 20:00 (20 minutes)*

**1st preferred time slot for your oral presentation**

**2nd preferred time slot for your oral presentation**

**Author:** KURIKI, Masao (Hiroshima U./KEK)

**Presenter:** KURIKI, Masao (Hiroshima U./KEK)

**Session Classification:** Plenary session (Summary 2)

Contribution ID: **291** Type: **not specified**

# Summary talk (Fixed target / ILC applications)

*Friday 29 October 2021 20:20 (20 minutes)*

**1st preferred time slot for your oral presentation**

**2nd preferred time slot for your oral presentation**

**Presenters:** IWASHITA, Yoshihisa (Kyoto U.); PERELSTEIN, Maxim (Cornell)

**Session Classification:** Plenary session (Summary 2)

Contribution ID: **292** Type: **not specified**

# Summary talk (Alternative collider modes / Green ILC)

*Friday 29 October 2021 20:40 (20 minutes)*

**1st preferred time slot for your oral presentation**

**2nd preferred time slot for your oral presentation**

**Authors:** TELNOV, Valery (Budker INP and Novosibirsk State Univ.); SAEKI, Takayuki (KEK)

**Presenters:** TELNOV, Valery (Budker INP and Novosibirsk State Univ.); SAEKI, Takayuki (KEK)

**Session Classification:** Plenary session (Summary 2)

Contribution ID: **300** Type: **Oral presentation using Zoom**

# RF power system of ILC by all solid-state amplifiers.

*Thursday 28 October 2021 16:10 (20 minutes)*

1300MHz Solid State Amplifier that can provide 200kW of 1.6m sec pulse width at 10pps max becomes available with reasonable cost. The latest LDMOS silicon semiconductor devices, NXP's 800W-CW and 1600W-Pk devices, have been implemented and tested successfully.
This amplifier can feed each cavity, which eliminates the complex RF distribution system required for high power Klystrons (MBKs). Though the LLRF system may become a little complex, the adjustments for cavities become independent, which will add a variety of flexibilities in the operation.

## 1st preferred time slot for your oral presentation

10:00-12:00 JST (3:00-5:00 CEST, 21:00-23:00 EDT, 18:00-20:00 PDT)

## 2nd preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

**Author:** Mr KOBANA, Riichiro (R&K Company Limited)

**Presenter:** Mr KOBANA, Riichiro (R&K Company Limited)

**Session Classification:** W-2: Green ILC

**Track Classification:** Parallel sessions: Sustainability: Session W: Green ILC

Contribution ID: **301** Type: **Oral presentation using Zoom**

# Kinematic fitting for ParticleFlow Detectors at Future Higgs Factories

*Thursday 28 October 2021 16:10 (20 minutes)*

In many analyses in Higgs, top and electroweak physics, the kinematic reconstruction of the final state is improved by constrained fits. This is a particularly powerful tool at $e^+e^-$ colliders, where the initial state four-momentum is known and can be employed to constrain the final state. A crucial ingredient to kinematic fitting is an accurate estimate of the measurement uncertainties, in particular for composed objects like jets. This contribution will show how the particle flow concept, which is a design-driver for most detectors proposed for future Higgs factories, can — in addition to an excellent jet energy measurement — provide detailed estimates of the covariance matrices for each individual particle-flow object (PFO) and each individual jet. Combined with information about leptons and secondary vertices in the jets, the kinematic fit enables to correct $b$- and $c$-jets for missing momentum from neutrinos from semi-leptonic heavy quark decays. The impact on the reconstruction of invariant di-jet masses and the resulting improvement in $ZH$ vs $ZZ$ separation will be presented, using the full simulation of the ILD detector concept.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Author:** RADKHORRAMI, Yasser (DESY)

**Presenter:** RADKHORRAMI, Yasser (DESY)

**Session Classification:** F-3: Higgs properties

**Track Classification:** Parallel sessions: Topical Groups: Session F: Higgs properties

Contribution ID: **302** Type: **Oral presentation using Zoom**

# GDE and History (Akira Yamamoto and Kirk)

*Thursday 28 October 2021 21:30 (10 minutes)*

**1st preferred time slot for your oral presentation**

**2nd preferred time slot for your oral presentation**

**Presenter:** YAMAMOTO, Akira (KEK)

**Session Classification:** Q-2: Machine - SRF

Contribution ID: **304** Type: **Oral presentation using Zoom**

# Renewed CM design (Yuriy Orlov)

*Thursday 28 October 2021 21:40 (20 minutes)*

**1st preferred time slot for your oral presentation**

**2nd preferred time slot for your oral presentation**

**Presenter:** ORLOV, Yuriy (FNAL)

**Session Classification:** Q-2: Machine - SRF

Contribution ID: **305** Type: **Oral presentation using Zoom**

# SRF Tuner developed by FNAL for LCLS II Project is strong candidate for ILC (Yuriy Pischalnikov)

*Thursday 28 October 2021 22:00 (20 minutes)*

**1st preferred time slot for your oral presentation**

**2nd preferred time slot for your oral presentation**

**Presenter:** PISCHALNIKOV, Yuriy (FNAL)

**Session Classification:** Q-2: Machine - SRF

Contribution ID: **306** Type: **Oral presentation using Zoom**

# High Pressure Gas Safety Regulation in Japan (Kensei Umemori)

*Thursday 28 October 2021 22:20 (15 minutes)*

**1st preferred time slot for your oral presentation**

**2nd preferred time slot for your oral presentation**

**Presenter:** UMEMORI, Kensei (KEK)

**Session Classification:** Q-2: Machine - SRF

Contribution ID: **307** Type: **Oral presentation using Zoom**

# Different material joint (Ti-SS and Al-SS) (Takeshi Dohmae)

*Thursday 28 October 2021 22:35 (10 minutes)*

**1st preferred time slot for your oral presentation**

**2nd preferred time slot for your oral presentation**

**Presenter:** DOHMAE, Takeshi (KEK)

**Session Classification:** Q-2: Machine - SRF

Contribution ID: **308** Type: **Oral presentation using Zoom**

# Pipe standard and CAD software used for CM drawing (Taro Konomi)

*Thursday 28 October 2021 22:45 (5 minutes)*

**1st preferred time slot for your oral presentation**

**2nd preferred time slot for your oral presentation**

**Presenter:** KONOMI, Taro (KEK)

**Session Classification:** Q-2: Machine - SRF

Contribution ID: **309** Type: **Oral presentation using Zoom**

# RF distribution system (Toshihiro Matsumoto)

*Thursday 28 October 2021 22:50 (10 minutes)*

**1st preferred time slot for your oral presentation**

**2nd preferred time slot for your oral presentation**

**Presenter:** MATSUMOTO, Toshihiro (KEK)

**Session Classification:** Q-2: Machine - SRF

Contribution ID: **310** Type: **Oral presentation using Zoom**

# Progress of auto cleaning system (Stephane Berry)

*Thursday 28 October 2021 23:00 (15 minutes)*

**1st preferred time slot for your oral presentation**

**2nd preferred time slot for your oral presentation**

**Presenter:** BERRY, Sthephane (IRFU/CEA)

**Session Classification:** Q-2: Machine - SRF

Contribution ID: **311** Type: **Oral presentation using Zoom**

# Discussion

*Thursday 28 October 2021 23:15 (15 minutes)*

**Session Classification:** Q-2: Machine - SRF

Contribution ID: **312** Type: **Oral presentation using Zoom**

# Crab Cavity introduction,specifications and development update (Peter McIntosh)

*Wednesday 27 October 2021 21:30 (15 minutes)*

**1st preferred time slot for your oral presentation**

**2nd preferred time slot for your oral presentation**

**Presenter:** MCINTOSH, Peter (STFC/UKRI)

**Session Classification:** Q-1: Machine - SRF

Contribution ID: **313** Type: **Oral presentation using Zoom**

# Crab Cavity Design Options: Elliptical/Racetrack design (Graeme Burt)

*Wednesday 27 October 2021 21:45 (20 minutes)*

**1st preferred time slot for your oral presentation**

**2nd preferred time slot for your oral presentation**

**Presenter:** BURT, Graeme (Univ. Lancaster)

**Session Classification:** Q-1: Machine - SRF

Contribution ID: **314** Type: **Oral presentation using Zoom**

# Crab Cavity Design Options: RF Dipole (RFD) design (Jean Delayen)

*Wednesday 27 October 2021 22:05 (20 minutes)*

**1st preferred time slot for your oral presentation**

**2nd preferred time slot for your oral presentation**

**Presenter:** DELAYEN, Jean (ODU)

**Session Classification:** Q-1: Machine - SRF

Contribution ID: **315** Type: **Oral presentation using Zoom**

# Crab Cavity Design Options: Double Quarter Wave (DQW) design (Silvia Verdu Andres)

*Wednesday 27 October 2021 22:25 (20 minutes)*

**1st preferred time slot for your oral presentation**

**2nd preferred time slot for your oral presentation**

**Presenter:** VERDU ANDRES, Silvia (BNL)

**Session Classification:** Q-1: Machine - SRF

Contribution ID: **316** Type: **Oral presentation using Zoom**

# Crab Cavity Design Options: Wide Open Waveguide (WoW) design (Binping Xiao)

*Wednesday 27 October 2021 22:45 (20 minutes)*

**1st preferred time slot for your oral presentation**

**2nd preferred time slot for your oral presentation**

**Presenter:** XIAO, Binping (BNL)

**Session Classification:** Q-1: Machine - SRF

Contribution ID: **317** Type: **Oral presentation using Zoom**

# Crab Cavity Design Options: Quasi-waveguide Multicell Resonator (Andrei Lunin)

*Wednesday 27 October 2021 23:05 (20 minutes)*

**1st preferred time slot for your oral presentation**

**2nd preferred time slot for your oral presentation**

**Presenter:** LUNIN, Andrei (FNAL)

**Session Classification:** Q-1: Machine - SRF

Contribution ID: **318** Type: **Oral presentation using Zoom**

# Next steps and plans (Peter McIntosh)

*Wednesday 27 October 2021 23:25 (10 minutes)*

**1st preferred time slot for your oral presentation**

**2nd preferred time slot for your oral presentation**

**Presenter:** MCINTOSH, Peter (STFC/UKRI)

**Session Classification:** Q-1: Machine - SRF

Contribution ID: **319** Type: **Oral presentation using Zoom**

# Discussion

*Wednesday 27 October 2021 23:35 (24 minutes)*

**Session Classification:** Q-1: Machine - SRF

Contribution ID: **320** Type: **Oral presentation using Zoom**

# CP Violation in Higgs-$\tau - \tau$ Coupling

*Thursday 28 October 2021 11:00 (20 minutes)*

We demonstrate how probes of CP-violating observables in Higgs di-tau decays at prospective future lepton colliders could provide a test of weak scale baryogenesis with significant discovery potential. Measurements at the Circular Electron Positron Collider, for example, could exclude a CP phase larger than $2.9^\circ$ ($5.6^\circ$) at 68\% (95\%) C.L. assuming the Standard Model value for the magnitude of the tau lepton Yukawa coupling. Conversely, this sensitivity would allow for a $5\sigma$ discovery for 82\% of the CP phase range $[0,2\pi)$. The reaches of the Future Circular Collider-ee and International Linear Collider are comparable. As a consequence, future lepton colliders could establish the presence of CP violation required by lepton flavored electroweak baryogenesis with at least $3\sigma$ sensitivity. Our results illustrate that Higgs factories are not just precision machines but can also make $\mathcal{O}(1)$ measurement of the new physics beyond the Standard Model.

## 1st preferred time slot for your oral presentation

10:00-12:00 JST (3:00-5:00 CEST, 21:00-23:00 EDT, 18:00-20:00 PDT)

## 2nd preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

**Author:** PASQUINI, Pedro (Shanghai Jiao Tong University)

**Presenter:** PASQUINI, Pedro (Shanghai Jiao Tong University)

**Session Classification:** F-1: Higgs properties

**Track Classification:** Parallel sessions: Topical Groups: Session F: Higgs properties

Contribution ID: **321** Type: **Oral presentation using Zoom**

# Probing Extended Scalar Sectors with Precision $e^+e^- \to Zh$ and Higgs Diphoton Studies

*Thursday 28 October 2021 10:40 (20 minutes)*

We compute the one-loop corrections to $\sigma(e^+e^- \to Zh)$ arising from representative extended Standard Model scalar sector scenarios. According to the new scalar SU(2)L representations, we consider the inert doublet, real and complex triplet, quintuplet, and septuplet models. With the sub-percent level precision expected for prospective future $e + e-$ collider measurements of $\sigma(e^+e^- \to Zh)$, studies of the Higgsstrahlung process will probe extended scalar sector particle spectrum and interactions in a manner complementary to direct searches at the Large Hadron Collider and possible future pp colliders. We also compare with the sensitivity of future Higgs diphoton decay rate measurements. We find that the $\sigma(e^+e^- \to Zh)$ and $\Gamma(h \to \gamma\gamma)$ complementarity is particularly pronounced for the complex triplet model.

## 1st preferred time slot for your oral presentation

10:00-12:00 JST (3:00-5:00 CEST, 21:00-23:00 EDT, 18:00-20:00 PDT)

## 2nd preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

**Author:** ZHOU, Jia (University of Massachusetts, Amherst)

**Presenter:** ZHOU, Jia (University of Massachusetts, Amherst)

**Session Classification:** F-1: Higgs properties

**Track Classification:** Parallel sessions: Topical Groups: Session F: Higgs properties

Contribution ID: **322** Type: **Oral presentation using Zoom**

# Imprint of quark flavor violating SUSY in h(125) decays at ILC

*Wednesday 27 October 2021 11:20 (20 minutes)*

We study the Higgs boson decays h -> c cbar, b bbar, b sbar, photon photon and gluon gluon in the Minimal Supersymmetric Standard Model (MSSM) with general quark flavor violation (QFV), identifying the h with the Higgs boson with a mass of 125 GeV. We compute the widths of the h decays to c cbar, b bbar, b sbar (s bbar) at full one-loop level in the MSSM with QFV. For the h decays to photon photon and gluon gluon we compute the widths at NLO QCD level. We perform a systematic MSSM parameter scan respecting all the relevant constraints, i.e. theoretical constraints from vacuum stability
conditions and experimental constraints, such as those from K- and B-meson data and electroweak precision data, as well as recent limits on Supersymmetric (SUSY) particle masses and the 125 GeV Higgs boson data from LHC experiments.

## 1st preferred time slot for your oral presentation

10:00-12:00 JST (3:00-5:00 CEST, 21:00-23:00 EDT, 18:00-20:00 PDT)

## 2nd preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

**Author:** HIDAKA, Keisho (Tokyo Gakugei University)

**Presenter:** HIDAKA, Keisho (Tokyo Gakugei University)

**Session Classification:** F&H-1: Higgs properties & BSM particle production

**Track Classification:** Parallel sessions: Topical Groups: Session F: Higgs properties

Contribution ID: **323** Type: **Oral presentation using Zoom**

# The Deep Junction LGAD: A New Approach to High-Granularity 4D Tracking

*Wednesday 27 October 2021 13:48 (24 minutes)*

Conventional LGADs, of the type to be used in the timing layers of the upgraded ATLAS and CMS detectors, are unable to provide granularity finer than the millimeter scale. As a result, a number of refined approaches are under development to overcome limiting junction termination requirements and allow for granularity at the 100 um scale or finer. One such approach, the Deep Junction LGAD, will be presented here, including both the conceptual and practical aspects of its design, as well as the status of R&D towards production of the first prototypes.

## 1st preferred time slot for your oral presentation

10:00-12:00 JST (3:00-5:00 CEST, 21:00-23:00 EDT, 18:00-20:00 PDT)

## 2nd preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

**Author:** SCHUMM, Bruce

**Presenter:** SCHUMM, Bruce

**Session Classification:** D-1: New technologies & ideas for collider detectors

**Track Classification:** Parallel sessions: Detectors: Session D: New technologies & ideas for collider detectors

Contribution ID: **324** Type: **Oral presentation using Zoom**

# Beam dump experiments with thick and thin shielding at the ILC

*Wednesday 27 October 2021 20:00 (30 minutes)*

We consider an opportunity for beam dump experiments at ILC beam dumps. Visible decay signatures from new light particles produced in the beam dumps are considered. Typical sensitivities to new particles for experimental setups with thick or thin shields are shown.

## 1st preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

## 2nd preferred time slot for your oral presentation

10:00-12:00 JST (3:00-5:00 CEST, 21:00-23:00 EDT, 18:00-20:00 PDT)

**Author:** SAKAKI, Yasuhito

**Presenter:** SAKAKI, Yasuhito

**Session Classification:** O-1: Fixed target / Dark sectors / Applications outside particle physics

**Track Classification:** Parallel sessions: Transversal Task Forces: Session O: Fixed target / Dark sectors / Applications outside particle physics

Contribution ID: **325** Type: **Oral presentation using Zoom**

# Fixed-target experiment using ILC main beam dump

*Wednesday 27 October 2021 20:30 (30 minutes)*

We perform a feasibility study of fixed-target experiments using ILC positron and electron beam dumps. Both visible and invisible decay signatures from new light particles produced in the beam dumps are considered. We show typical sensitivities to new particles for the ILC positron and electron beam dump experiments.

## 1st preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

## 2nd preferred time slot for your oral presentation

10:00-12:00 JST (3:00-5:00 CEST, 21:00-23:00 EDT, 18:00-20:00 PDT)

**Author:** UEDA, Daiki

**Presenter:** UEDA, Daiki

**Session Classification:** O-1: Fixed target / Dark sectors / Applications outside particle physics

**Track Classification:** Parallel sessions: Transversal Task Forces: Session O: Fixed target / Dark sectors / Applications outside particle physics

Contribution ID: **326** Type: **Oral presentation using Zoom**

# Physics reach of a long-lived particle detector at Belle II

*Thursday 28 October 2021 16:00 (30 minutes)*

This talk summarizes a study of realistic design options for a far detector at the Belle II experiment, dubbed GAZELLE. We have quantified the sensitivity of such a detector to long-lived particles produced in e+e- collisions for three benchmark scenarios: axion-like particles, heavy neutral leptons, and a dark matter scenario with a light scalar. GAZELLE will moderately improve the sensitivity to the couplings of these long-lived particles, compared to the excellent sensitivity of the Belle II detector itself. Our general findings can help to design far detectors at the ILC, FCC-ee or CEPC.

## 1st preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

## 2nd preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

**Author:** WESTHOFF, Susanne

**Presenter:** WESTHOFF, Susanne

**Session Classification:** H&O: BSM particle production & Fixed target / Dark sectors / Applications outside particle physics

**Track Classification:** Parallel sessions: Transversal Task Forces: Session O: Fixed target / Dark sectors / Applications outside particle physics

Contribution ID: **327** Type: **Oral presentation using Zoom**

# QED beyond Schwinger fields with ILC fixed target beams

*Thursday 28 October 2021 10:00 (24 minutes)*

TBA

### 1st preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

### 2nd preferred time slot for your oral presentation

10:00-12:00 JST (3:00-5:00 CEST, 21:00-23:00 EDT, 18:00-20:00 PDT)

**Author:** PESKIN, Michael (SLAC)

**Presenter:** PESKIN, Michael (SLAC)

**Session Classification:** O-2: Fixed target / Dark sectors / Applications outside particle physics

**Track Classification:** Parallel sessions: Transversal Task Forces: Session O: Fixed target / Dark sectors / Applications outside particle physics

Contribution ID: **328** Type: **Oral presentation using Zoom**

# Muon Production at the ILC

*Wednesday 27 October 2021 16:18 (24 minutes)*

Conventional muon beams are produced using proton beams and are used in material sciences such as $\mu$SR and elemental analysis, and fundamental physics experiments such as muon g-2 measurements and precision measurements of muoniums. These muon beams have high intensity but poor emittance, and their kinetic energies are $O(1)$ MeV. On the other hand, muon beams with a low emittance on the order of 10 GeV can be produced by using a high-energy electron/positron beam at the ILC. This is expected to have a wide range of applications such as radiography of huge structures, which has been conventionally performed with cosmic-ray muons, with high resolution using accelerator-generated muons. This talk will overview the way to produce muons from electron/positron beams at the ILC.

## 1st preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

## 2nd preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

**Authors:** SHIMOMURA, Koichiro (KEK); YAMAZAKI, Takayuki (KEK)

**Presenter:** YAMAZAKI, Takayuki (KEK)

**Session Classification:** S: ILC application (to physics, material science, etc.)

**Track Classification:** Parallel sessions: Accelerators: Session S: ILC application (to physics, material science, etc.)

Contribution ID: **329** Type: **Oral presentation using Zoom**

# Test of a 3D-printed cooling plate for a TPC using 2-phase CO2

*Thursday 28 October 2021 19:00 (20 minutes)*

A cooling plate has been realized using Aluminum additive manufacturing. It was tested at DESY using a TRACI closed-loop $CO_2$ compressor ensuring a circulation of 2-phase $CO_2$ under a pressure of 60 bars at a temperature of 19 degrees in a Micromegas TPC readout module.
The temperature of the front-end readout cards was continuously monitored for several days using 6 probes. This system allowed to lower the temperature of the electronic from 50 degrees to 24-26 ℃, and to maintain it with a stability of O(0.1 ℃) over several days.
Prospects for the cooling of the ILD TPC are addressed.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Authors:** ATTIE, David (CEA Irfu); COLAS, Paul (Université Paris-Saclay (FR)); SCHAEFER, Oliver (DESY Hamburg); Mr TELLIER, Olivier (CEA/Irfu); DIENER, Ralf (DESY); GANJOUR, Serguei (Université Paris-Saclay (FR))

**Presenter:** COLAS, Paul (Université Paris-Saclay (FR))

**Session Classification:** C-3: Tracking detectors

**Track Classification:** Parallel sessions: Detectors: Session C: Tracking detectors

Contribution ID: **330** Type: **Oral presentation using Zoom**

# Pixel detector hybridization and integration with Anisotropic Conductive Films

*Wednesday 27 October 2021 19:48 (24 minutes)*

An alternative pixel-detector hybridization technology based on Anisotropic Conductive Films (ACF) is under development to replace the conventional fine-pitch flip-chip bump bonding. The new process takes advantage of the recent progress in industrial applications of ACF and is suitable for time- and cost-effective in-house processing of single devices. This new bonding technique developed can also be used for the integration of hybrid or monolithic detectors in modules, replacing wire bonding or solder bumping techniques. This contribution introduces the new ACF hybridization and integration technique, and shows the first test results from Timepix3 hybrid pixel assemblies and from the integration of ALPIDE monolithic pixel sensors to flex circuits.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Author:** VICENTE BARRETO PINTO, Mateus (Universite de Geneve (CH))

**Co-author:** DANNHEIM, Dominik (CERN)

**Presenter:** VICENTE BARRETO PINTO, Mateus (Universite de Geneve (CH))

**Session Classification:** D-2: New technologies & ideas for collider detectors

**Track Classification:** Parallel sessions: Detectors: Session D: New technologies & ideas for collider detectors

Contribution ID: **331** Type: **Oral presentation using Zoom**

# Development of iLGAD sensors at IMB-CNM: challenges and future applications

*Wednesday 27 October 2021 19:00 (24 minutes)*

In this contribution, we are going to present the last developments on Inverse Low Gain Avalanche Detectors (iLGADs) at IMB-CNM. This iLGAD sensor concept is one of the most promising technologies for enabling the future 4D tracking paradigm that requires both precise position and timing resolution. In the iLGAD concept, based on the LGAD technology, the readout is done at the ohmic contacts, allowing for a continuous unsegmented multiplication junction. This architecture provides a uniform gain over all the active sensor area. This concept was successfully demonstrated in a first generation of 300 μm thick iLGAD sensors. In the second
generation, we have fabricated thick iLGAD sensors optimizing the periphery for X-Ray irradiations. Currently, we are developing a third generation based on 50 μm thick pixelated iLGADs optimized for timing detection, with a periphery design
able to sustain high electric fields and a simpler single-side manufacturing process.
In addition, we are developing a new LGAD concept which is the Proton Low Gain Avalanche Detector (pLGAD), which will be applied for low-energy particle detection.

## 1st preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

## 2nd preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

**Author:** DOBLAS MORENO, Albert (Consejo Superior de Investigaciones Cientificas (CSIC) (ES))

**Co-authors:** VILA ALVAREZ, Ivan (Universidad de Cantabria (ES)); HIDALGO, Salvador (Consejo Superior de Investigaciones Cientificas (CSIC) (ES))

**Presenter:** DOBLAS MORENO, Albert (Consejo Superior de Investigaciones Cientificas (CSIC) (ES))

**Session Classification:** D-2: New technologies & ideas for collider detectors

**Track Classification:** Parallel sessions: Detectors: Session D: New technologies & ideas for collider detectors

Contribution ID: **332** Type: **Oral presentation using Zoom**

# Introduction

*Tuesday 26 October 2021 17:00 (10 minutes)*

### 1st preferred time slot for your oral presentation

### 2nd preferred time slot for your oral presentation

**Presenter:** TITOV, Maksym (Université Paris-Saclay (FR))

**Session Classification:** Plenary session (Industry forum)

Contribution ID: **333** Type: **not specified**

# Round table on SLC Backgrounds

**Presenters:** BREIDENBACH, Martin (SLAC); BURROWS, Philip; MARUYAMA, Takashi (SLAC); MARKIEWICZ, Thomas (SLAC); USHER , Tracy (SLAC)

**Session Classification:** L&M&P-1: MDI-CFS / MDI-BDS & physics / Detector engineering

**Track Classification:** Parallel sessions: Transversal Task Forces: Session M: MDI-BDS & physics

Contribution ID: **334** Type: **not specified**

# Beam backgrounds at LEP

*Wednesday 27 October 2021 14:00 (30 minutes)*

**Presenter:** BURKHARDT, Helmut

**Session Classification:** L&M&P-2: MDI-CFS / MDI-BDS & physics / Detector engineering

**Track Classification:** Parallel sessions: Transversal Task Forces: Session M: MDI-BDS & physics

Contribution ID: **335** Type: **not specified**

# Beam backgrounds at HERA

*Wednesday 27 October 2021 13:30 (30 minutes)*

**Presenter:** SCHNEEKLOTH, Uwe (DESY)

**Session Classification:** L&M&P-2: MDI-CFS / MDI-BDS & physics / Detector engineering

**Track Classification:** Parallel sessions: Transversal Task Forces: Session M: MDI-BDS & physics

Contribution ID: **336** Type: **not specified**

# Beam Backgrounds at SuperKEKB

*Wednesday 27 October 2021 14:30 (30 minutes)*

**Presenter:** NATOCHII, Andrii (University of Hawaii at Manoa)

**Session Classification:** L&M&P-2: MDI-CFS / MDI-BDS & physics / Detector engineering

**Track Classification:** Parallel sessions: Transversal Task Forces: Session M: MDI-BDS & physics

Contribution ID: **337** Type: **not specified**

# [Photo session #2]

*Friday 29 October 2021 23:00 (5 minutes)*

### 1st preferred time slot for your oral presentation

### 2nd preferred time slot for your oral presentation

**Author:** ALL PARTICIPANTS

**Presenter:** ALL PARTICIPANTS

**Session Classification:** Plenary session (Day 4 Final)

**Track Classification:** Plenary sessions: Plenary session (Day 4)

Contribution ID: **338** Type: **not specified**

# [Photo session #1]

*Tuesday 26 October 2021 22:40 (5 minutes)*

### 1st preferred time slot for your oral presentation

### 2nd preferred time slot for your oral presentation

**Author:** ALL PARTICIPANTS

**Presenter:** ALL PARTICIPANTS

**Session Classification:** Plenary session (Day 1)

**Track Classification:** Plenary sessions: Plenary session (Day 1)

Contribution ID: **339** Type: **Oral presentation using Zoom**

# Top, Higgs, Diboson and Electroweak Fit to the Standard Model Effective Field Theory

*Friday 29 October 2021 13:00 (23 minutes)*

The search for effective field theory deformations of the Standard Model (SM) is a major goal of particle physics that can benefit from a global approach in the framework of the Standard Model Effective Field Theory (SMEFT). For the first time, we include LHC data on top production and differential distributions together with Higgs production and decay rates and Simplified Template Cross-Section (STXS) measurements in a global fit, as well as precision electroweak and diboson measurements from LEP and the LHC, in a global analysis with SMEFT operators of dimension 6 included linearly. We present the constraints on the coefficients of these operators, both individually and when marginalised, in flavour-universal and top-specific scenarios, studying the interplay of these datasets and the correlations they induce in the SMEFT. We then explore the constraints that our linear SMEFT analysis imposes on specific ultra-violet completions of the Standard Model, including those with single additional fields and low-mass stop squarks. We also present a model-independent search for deformations of the SM that contribute to between two and five SMEFT operator coefficients. In no case do we find any significant evidence for physics beyond the SM. Our underlying ⊠⊠⊠⊠⊠⊠⊠ public code provides a framework for future generalisations of our analysis, including a quadratic treatment of dimension-6 operators.

## 1st preferred time slot for your oral presentation

10:00-12:00 JST (3:00-5:00 CEST, 21:00-23:00 EDT, 18:00-20:00 PDT)

## 2nd preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

**Author:** MIMASU, Ken (King's College London)

**Presenter:** MIMASU, Ken (King's College London)

**Session Classification:** J: Global interpretations

**Track Classification:** Parallel sessions: Topical Groups: Session J: Global interpretations

Contribution ID: **340** Type: **Oral presentation using Zoom**

# New ideas for K/pi discrimination at the ILC

*Wednesday 27 October 2021 20:12 (24 minutes)*

One of the most interesting yet-to-be answered questions in Particle Physics is the nature of the Higgs Yukawa couplings and their universality. Key information in our understanding of this question arises from studying the coupling of the Higgs boson to second generation quarks. Some puzzles in the flavor sector and potential additional sources of CP violation could also have their origins in an extended Higgs sector.
Rare Higgs decay modes to charm or strange quarks are very challenging or nearly impossible to detect with the current experiments at the Large Hadron Collider, where the large multi-jet backgrounds inhibits the study of light quark couplings with inclusive h → ⊠⊠ decays. Future e+e- machines are thus the perfect avenue to pursue this research.
Studies were initiated in the context of Snowmass2021 (https://indico.slac.stanford.edu/event/6617/contributions/1442/attac
EF1_EF2-IF3_IF0_Valentina_Maria_Martina_Cairo-047.pdf) with particular emphasis on the Higgs coupling to strange quarks and the related flavour tagging challenges, which gave light to an interesting investigation of detector layouts. In this talk, we present a first examination of suitable technologies, such as a modern ring imaging Cherenkov system, for ILC detectors to provide K/pi discrimination in the momentum range needed for tagging strange-jets, with efficient rejection of light-quark jets.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

**Author:** CAIRO, Valentina (SLAC National Accelerator Laboratory)

**Co-authors:** DAMERELL, Christopher (Science and Technology Facilities Council STFC (GB)); SU, Dong (SLAC National Accelerator Laboratory (US)); BASSO, Matthew (University of Toronto); VAVRA, Jerry (SLAC National Accelerator Laboratory)

**Presenter:** CAIRO, Valentina (SLAC National Accelerator Laboratory)

**Session Classification:** D-2: New technologies & ideas for collider detectors

**Track Classification:** Parallel sessions: Detectors: Session D: New technologies & ideas for collider detectors

Contribution ID: **341** Type: **Oral presentation using Zoom**

# Overview of the AAA Activities

*Tuesday 26 October 2021 17:10 (20 minutes)*

**Presenter:** TAKAHASHI, Tohru

**Session Classification:** Plenary session (Industry forum)

Contribution ID: **342** Type: **not specified**

# Development of positron source components using HIP technologies through industry-government-academia collaboration

*Tuesday 26 October 2021 17:30 (25 minutes)*

**Presenter:** Mr NAGASAWA, Yutaka (Metal Technology Co. Ltd.)

**Session Classification:** Plenary session (Industry forum)

Contribution ID: **343** Type: **not specified**

# The possible collaborations on ILC Pre-lab in accelerator technologies from China from Academic and industries

*Tuesday 26 October 2021 17:55 (20 minutes)*

**Presenter:** GAO, Jie (IHEP)

**Session Classification:** Plenary session (Industry forum)

Contribution ID: **344** Type: **not specified**

# Acceleration technology: A Sustainable Approach to Cleaner Indian Rivers

*Tuesday 26 October 2021 18:15 (20 minutes)*

**Author:** VARMA, Raghava (IIT- Indian Institute of Technology (IN))

**Presenter:** VARMA, Raghava (IIT- Indian Institute of Technology (IN))

**Session Classification:** Plenary session (Industry forum)

Contribution ID: **345** Type: **not specified**

# ILC industry capabilities in Europe, some examples from recent SFR projects

*Tuesday 26 October 2021 18:50 (20 minutes)*

**Presenters:** LIST, Benno (DESY); STAPNES, Steinar (CERN)

**Session Classification:** Plenary session (Industry forum)

Contribution ID: **346** Type: **not specified**

# Document on industrial interests on ILC in Spain

*Tuesday 26 October 2021 19:10 (20 minutes)*

**Presenter:** FERNÁNDEZ, Erik (INEUSTAR)

**Session Classification:** Plenary session (Industry forum)

Contribution ID: **347** Type: **not specified**

# CERN Industrial Experience

*Tuesday 26 October 2021 19:30 (30 minutes)*

**Presenter:** LARA ARNAUD, Christina (CERN)

**Session Classification:** Plenary session (Industry forum)

Contribution ID: **348** Type: **not specified**

# Review of Accelerator Technologies in the US

*Tuesday 26 October 2021 20:00 (30 minutes)*

**Presenter:** COLBY, Eric (US DOE-SC-RDAP)

**Session Classification:** Plenary session (Industry forum)

Contribution ID: **349** Type: **Oral presentation using Zoom**

# Global SMEFT Fits for Snowmass 2022

Comparing the capabilities of precision measurements at various future colliders is one of the important goal of Snowmass process. A team of us are working on a white paper for global SMEFT fits based on the input measurements supplied from future collider communities. In this talk we will introduce the status of this white paper about the scope and strategy of global fits, with a focus on what kind of implications might come out for future colliders.

## 1st preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

## 2nd preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

**Author:** TIAN, Junping (University of Tokyo)

**Presenter:** TIAN, Junping (University of Tokyo)

**Session Classification:** J: Global interpretations

**Track Classification:** Parallel sessions: Topical Groups: Session J: Global interpretations

Contribution ID: **350** Type: **Oral presentation using Zoom**

# SMEFT global fits of Higgs, EW and di-boson data & Snowmass 2022 efforts

*Friday 29 October 2021 14:25 (35 minutes)*

With the completion of the Standard Model, there is no guarantee that new particles can be found at current or future colliders. Meanwhile, precision measurements of the Higgs and electroweak bosons at future lepton colliders offer a great opportunity for probing new physics beyond the Standard Model. The Standard Model Effective Field Theory (SMEFT) provides an ideal framework for a model-independent interpretation of these measurements. In this talk, I will try to provide an overview on the global SMEFT analyses at future lepton colliders, and highlight some of my own work. I will discuss some interesting aspects of the analyses, such as the indirect determination of the triple Higgs coupling via its loop contribution.

## 1st preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Author:** GU, Jiayin (Fudan University)

**Presenter:** GU, Jiayin (Fudan University)

**Session Classification:** J: Global interpretations

**Track Classification:** Parallel sessions: Topical Groups: Session J: Global interpretations

Contribution ID: **352** Type: **Oral presentation using Zoom**

# LUXE-NPOD: new physics searches with an optical dump at LUXE

*Wednesday 27 October 2021 19:00 (30 minutes)*

First we briefly introduce the basic concept of LUXE as an experiment. The proposed LUXE experiment (LASER Und XFEL Experiment) at DESY, Hamburg, using the 16.5 GeV electron beam from the European XFEL, aims to probe QED in the non-perturbative regime created in collisions between high-intensity laser pulses and high-energy electron or photon beams. This setup also provides a unique opportunity to probe physics beyond the standard model by a super efficient way to convert an incoming electron flux to an amplified photon flux, which we denote as optical dump. This augmented by a physical dump, placed downstream the beam, allow us to probe models of weakly interacting, spin-0 particles, coupled to photons with upercented precision at the LUXE experiment.

## 1st preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

## 2nd preferred time slot for your oral presentation

10:00-12:00 JST (3:00-5:00 CEST, 21:00-23:00 EDT, 18:00-20:00 PDT)

**Author:** PEREZ, Gilad (Weizmann Institute)

**Presenter:** PEREZ, Gilad (Weizmann Institute)

**Session Classification:** O-1: Fixed target / Dark sectors / Applications outside particle physics

**Track Classification:** Parallel sessions: Transversal Task Forces: Session O: Fixed target / Dark sectors / Applications outside particle physics

Contribution ID: **353** Type: **Oral presentation using Zoom**

# Physics Potential of beam dump experiments

*Thursday 28 October 2021 10:24 (24 minutes)*

TBA

### 1st preferred time slot for your oral presentation

13:00-15:00 JST (6:00-8:00 CEST, 0:00-2:00 EDT, 21:00-23:00 PDT)

### 2nd preferred time slot for your oral presentation

10:00-12:00 JST (3:00-5:00 CEST, 21:00-23:00 EDT, 18:00-20:00 PDT)

**Author:** MOORTGAT-PICK, Gudrid

**Presenter:** MOORTGAT-PICK, Gudrid

**Session Classification:** O-2: Fixed target / Dark sectors / Applications outside particle physics

**Track Classification:** Parallel sessions: Transversal Task Forces: Session O: Fixed target / Dark sectors / Applications outside particle physics

Contribution ID: **354** Type: **not specified**

# Let's measure the F2-gamma Structure -function

*Wednesday 27 October 2021 20:15 (20 minutes)*

A higher energy eplus-eminus collider than LEP should have a better luminometer , optimised to measure the acollinearity and energies of the leptons in Bhabha scattering events. Building upon what we did with OPAL, such a luminometer could be used to make even more accurate measurements of Q-squared in deep-inelastic gamma-gamma scattering up to much higher values than LEP could reach. A new central hadron detector would give better measurements of the invariant-mass-squared W-squared of the recoiling hadrons and give better accuracy for x=Q-squared/(Q-squared + W-squared).
The work still to be done includes writing and testing a Monte Carlo generator for fragmentation of the final state hadrons, so that the structure function can be unfolded from the observed distributions of x and Q-squared, in the way used by my former student Edmund Clay in the last of our published OPAL F2-gamma analyses. His thesis is available as a ps.gz file on the UCL HEP group website. The only other extra work would be to write a simulation program for the performance of the luminometer as a tagger. The hard work for this may already have been done in optimising the luminosity measurement, maybe by Sailer from DESY, forCLIC. ILC ,CLIC or FCC eplus-eminus should all be similar.

**Author:** MILLER, David (UCL)

**Presenter:** MILLER, David (UCL)

**Session Classification:** B-3: Calorimeters

Contribution ID: **355** Type: **Oral presentation using Zoom**

# Sustainability issues

*Thursday 28 October 2021 15:50 (20 minutes)*

The available amount of renewable energy sources (RES) such as wind and solar power undergoes daily and seasonal variations. To use theses sources in the best possible way, a corresponding modulation of the power requirement from the accelerator is beneficial. In the talk, some initial thoughts are presented about possible ways to modulate the ILC's power by changing between different operating modes and use energy buffers.

## 1st preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Author:** LIST, Benno (DESY)

**Presenter:** LIST, Benno (DESY)

**Session Classification:** W-2: Green ILC

**Track Classification:** Parallel sessions: Sustainability: Session W: Green ILC

Contribution ID: **356** Type: **Oral presentation using Zoom**

# Tunnel Heat Recovery - Green ILC

*Thursday 28 October 2021 15:30 (20 minutes)*

The drive to reduce carbon emissions and reliance on oil and gas has led to the increase in the use of renewable energy heating systems. Ground source heat pump systems are an example of these renewable systems, and tunnels as a way of connecting building heat pump systems to the energy stored in the soil and air. Thermal tunnel energy segments were designed on the Crossrail project, London, UK. This demonstrated how energy consumption as well as CO2 emissions can be reduced by such systems. This talk will discuss the challenges and opportunities for heat recovery adoption in tunnels, including heat and ventilation interfaces, linking the tunnel heat to adjacent buildings in cost effective ways, and the potential it could provide for green energy production on major tunnelling projects such as ILC, CLIC and FCC. The context of this alongside other green tunnelling initiatives which can contribute to net zero outcomes shall also be discussed.

## 1st preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

## 2nd preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

**Authors:** Mr CHEN, Alex (Arup); LOO, Yung Kwan; Mr NICHOLSON, Duncan (Arup); Mr SASAKI, Jin (Arup); OSBORNE, John Andrew (CERN)

**Presenter:** OSBORNE, John Andrew (CERN)

**Session Classification:** W-2: Green ILC

**Track Classification:** Parallel sessions: Sustainability: Session W: Green ILC

Contribution ID: **357** Type: **Oral presentation using Zoom**

# High Efficiency Klystrons development.

*Thursday 28 October 2021 16:30 (25 minutes)*

The increase in efficiency of RF power generation for the future large-scale accelerators such as CLIC, ILC, FCC, CEPC and others is considered as a high priority issue. The vast majority of existing commercial high RF power klystrons operates in the electronic efficiency range between 40% and 50%. Only a few klystrons available on the market are capable of operating with 65% efficiency or above. Since 2014, a thorough High Efficiency (HE) klystron development program was established at CERN. Specialized computer tools, different bunching technologies and klystron topologies were studied and established since then and used for the development of different HE klystrons. We will report on the HE klystron development status and CERN, and present a potential candidate of the HE (85%) 10 MW L-band klystron for ILC.

## 1st preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

## 2nd preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

**Author:** SYRATCHEV, Igor (CERN)

**Presenter:** SYRATCHEV, Igor (CERN)

**Session Classification:** W-2: Green ILC

**Track Classification:** Parallel sessions: Sustainability: Session W: Green ILC

Contribution ID: **358** Type: **not specified**

# Discussion (if needed)

*Friday 29 October 2021 15:00 (10 minutes)*

**Presenter:** HEINEMEYER, Sven

**Session Classification:** J: Global interpretations

Contribution ID: **359** Type: **Oral presentation using Zoom**

# Discussion

*Thursday 28 October 2021 16:55 (35 minutes)*

### 1st preferred time slot for your oral presentation

15:30-17:30 JST (8:30-10:30 CEST, 2:30-4:30 EDT, 23:30-1:30 PDT)

### 2nd preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

**Session Classification:** W-2: Green ILC

Contribution ID: **360** Type: **Oral presentation using Zoom**

# Microchannel Cooling for LHCb

*Wednesday 27 October 2021 20:36 (24 minutes)*

The LHCb vertex detector, VELO, is being upgraded for the LHC Run3. The new hybrid pixel vertex detector will be capable of 40 MHz readout and will be installed in the secondary vacuum of the LHC at a closest proximity of 5.1 mm to the beams during stable collisions. The pixel detector requires a highly thermally efficient and lightweight cooling system. For this purpose a silicon plate with internal microchannels has been chosen as the backbone of the module, with evaporative $CO_2$ as the coolant. The reasons for this choice will be presented along with the principal development steps for the design, production and quality assurance of the microchannel plates. The alternatives to microchannel cooling will be discussed along with an overview of cooling solutions which could be considered for future upgrades.

## 1st preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

## 2nd preferred time slot for your oral presentation

19:00-21:00 JST (12:00-14:00 CEST, 6:00-8:00 EDT, 3:00-5:00 PDT)

**Author:** COLLINS, Paula (CERN)

**Presenter:** COLLINS, Paula (CERN)

**Session Classification:** D-2: New technologies & ideas for collider detectors

**Track Classification:** Parallel sessions: Detectors: Session D: New technologies & ideas for collider detectors

Contribution ID: **361** Type: **not specified**

# Update of Detector Hall and Assembly Hall

*Wednesday 27 October 2021 15:30 (30 minutes)*

**Presenter:** SUGIMOTO, Yasuhiro (KEK)

**Session Classification:** L&M&P-3: MDI-CFS / MDI-BDS & physics / Detector engineering

Contribution ID: **362** Type: **Oral presentation using Zoom**

# Conceptual plan of ILC solenoid magnet on-site manufacture

*Wednesday 27 October 2021 16:00 (30 minutes)*

**Presenter:** MAKIDA, Yasuhiro (KEK)

**Session Classification:** L&M&P-3: MDI-CFS / MDI-BDS & physics / Detector engineering

Contribution ID: **363** Type: **Oral presentation using Zoom**

# Recent activities in Tohoku

*Wednesday 27 October 2021 16:30 (30 minutes)*

**Presenter:** SANUKI, Tomoyuki (Tohoku University)

**Session Classification:** L&M&P-3: MDI-CFS / MDI-BDS & physics / Detector engineering

Contribution ID: **364** Type: **Oral presentation using Zoom**

# Round table on SLC background

*Wednesday 27 October 2021 13:00 (30 minutes)*

**Presenters:** BREIDENBACH, Martin (SLAC); BURROWS, Philip; MARUYAMA, Takashi (SLAC); MARKIEWICZ, Thomas (SLAC); USHER , Tracy (SLAC)

**Session Classification:** L&M&P-2: MDI-CFS / MDI-BDS & physics / Detector engineering

Contribution ID: **365** Type: **Oral presentation using Zoom**

# Chronopixel Silicon CMOS Sensor Development for the ILC

*Thursday 28 October 2021 17:10 (20 minutes)*

A monolithic silicon CMOS pixel detector with time-stamping capability (Chronopixel)has been developed based on design goals of the International Linear Collider (ILC). Each hit is accompanied by a time tag with sufficient precision to assign it to a particular ILC bunch crossing - thus the name Chronopixel. This reduces the occupancy to negligible levels, even in the innermost vertex detector layer, yielding a robust vertex detector which operates at background levels significantly in excess of those currently foreseen for the ILC. The Chronopixel can record and store time stamps for two hits in each pixel while using standard CMOS processing for manufacturing. Following two earlier prototype fabrication runs and tests, a third prototype design was developed to resolve earlier issues, including a high capacitance problem. This problem was traced to the TSMC 90 nm technology design rules, which led to an unacceptably large value of the sensor diode capacitance. Six different layouts for the sensor diode were tested in the third prototype, and tests demonstrated that the high capacitance problem was solved. The third prototype has also been exposed to HL-LHC radiation levels; results of these tests are also presented. Simulation of the signal formation from charge particle crossing detector with one particular sensor design also was done and results will be shown.

**Presenter:** SINEV, Nikolai (University of Oregon (US))

**Session Classification:** C-1: Tracking detectors

Contribution ID: **366** Type: **Oral presentation using Zoom**

# Keynote Talk

*Thursday 28 October 2021 19:00 (30 minutes)*

**Presenter:** KATSUDA, Toshihiko (KEK)

**Session Classification:** N: Communication

Contribution ID: **367** Type: **Oral presentation using Zoom**

# Round table: Science Communication by scientists in region

*Thursday 28 October 2021 19:35 (40 minutes)*

**Presenters:** ROBSON, Aidan (University of Glasgow (GB)); BELL, Aimi (Ichinoseki ILC); WAYAMA, Amanda (Iwate Prefectural Government); WARMBEIN, Barbara (Deutsches Elektronen-Synchrotron (DE)); BROCK, Chip (U. Michigan state); JEANS, Daniel; MURAYAMA, Hitoshi (University of California Berkeley (US)); NAKAJIMA, Jurina (SOKENDAI/KEK); YAGI, Natsumi (Iwate Pref.); DOW, Veronica (Oshu ILC Promotion)

**Session Classification:** N: Communication

Contribution ID: **368** Type: **Oral presentation using Zoom**

# Suggestion from visual communication perspective

*Thursday 28 October 2021 20:15 (10 minutes)*

**Presenter:** MCLEOD, Gary (University of Tsukuba)

**Session Classification:** N: Communication

Contribution ID: **369** Type: **Oral presentation using Zoom**

# Discussion

*Thursday 28 October 2021 20:25 (30 minutes)*

**Session Classification:** N: Communication

Contribution ID: **370** Type: **Oral presentation using Zoom**

# Closing

*Thursday 28 October 2021 20:55 (5 minutes)*

**Session Classification:** N: Communication

Contribution ID: **371** Type: **not specified**

# Micro-channel cooling for LHCb

*Thursday 28 October 2021 20:20 (30 minutes)*

**Presenter:** COLLINS, Paula (CERN)

**Session Classification:** C-3: Tracking detectors

Contribution ID: **372** Type: **not specified**

# Precision Z physics at the LHC in the flavorful SMEFT

*Friday 29 October 2021 13:46 (16 minutes)*

We study the forward-backward asymmetry $A_{FB}$ in $pp \to l^+l^-$ at the Z peak within the Standard Model Effective Field Theory (SMEFT). We find that this observable provides per mille level constraints on the vertex corrections of the Z boson to quarks, which close a flat direction in the electroweak precision SMEFT fit. Moreover, we show that current $A_{FB}$ data is precise enough so that its inclusion in the fit improves significantly LEP bounds even in simple New Physics setups. This demonstrates that the LHC can
compete with and complement LEP when it comes to precision measurements of the Z boson properties.

**Presenter:** BRESO, Victor (IFIC)

**Session Classification:** J: Global interpretations

Contribution ID: **373** Type: **Oral presentation using Zoom**

# Awareness survey report

*Thursday 28 October 2021 19:30 (5 minutes)*

**Presenter:** TAKAHASHI, Rika (KEK)

**Session Classification:** N: Communication