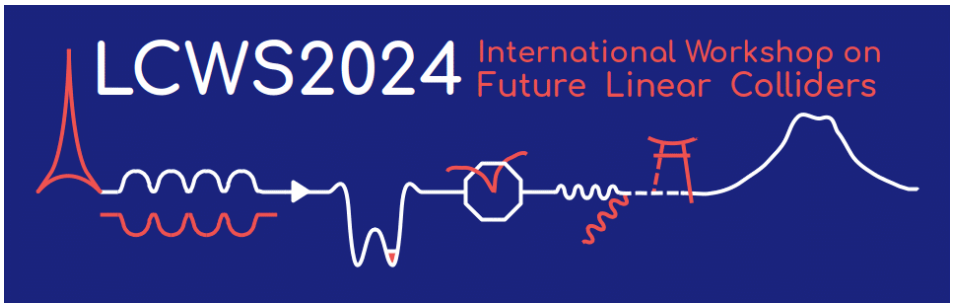
International Workshop on Future Linear Colliders, LCWS2024



Report of Contributions

https://agenda.linearcollider.org/e/lcws2024

Contribution ID: **1** Type: **Oral presentation (in person)**

Preliminary Investigation of a Higgs Factory based on Proton-Driven Plasma Wakefield Acceleration

Tuesday, 9 July 2024 09:40 (20 minutes)

A Higgs Factory is considered the highest priority next collider project by the high-energy physics community. Very advanced designs based on radio-frequency cavities exist, and variations on this approach are still being developed. Recently, also an option based on electron-bunch driven plasma wakefield acceleration has been proposed. In this article, we discuss a further option based on proton-driven plasma wakefield acceleration. This option has significant potential advantages due to the high energy of the plasma wakefield driver, simplifying the plasma acceleration stage, and due to the breadth of particle physics research it will make possible. Its success will depend on further developments in producing compact high-energy proton bunches at a high rate.

Apply for poster award

Primary author: FARMER, John Patrick (Max Planck Society (DE))

Co-authors: PUKHOV, Alexander; CALDWELL, Allen Christopher (Max Planck Society (DE))

Presenter: FARMER, John Patrick (Max Planck Society (DE))

Session Classification: Advanced Accelerator Concepts

Track Classification: Accelerator: Advanced Accelerator Concepts

Contribution ID: **2** Type: **Poster (in person)**

Exploring the Electromagnetically Interacting Dark Matter at the International Linear Collider

Monday, 8 July 2024 17:30 (20 minutes)

Dark Matter being electrically neutral does not participate in electromagnetic interactions at leading order. However, we discuss here fermionic dark matter (DM) with permanent magnetic and electric dipole moment that interacts electromagnetically with photons at loop-level through a dimension-5 operator. We discuss the search prospect of the dark matter at the proposed International Linear Collider (ILC) and constrain the parameter space in the plane of the DM mass and the cutoff scale Λ. At the 500 GeV ILC with 4 ab^{-1} of integrated luminosity we probed the monophoton channel and utilizing the advantages of beam polarization we obtained an upper bound on the cutoff scale that reaches up to $\Lambda = 3.72$ TeV.

Apply for poster award

Yes

Primary author: KUMAR SHARMA, MANISH (Birla Institute of Technology and Science pilani, Goa Campus)

Presenter: KUMAR SHARMA, MANISH (Birla Institute of Technology and Science pilani, Goa Campus)

Session Classification: Poster

Track Classification: Physics and Detector: BSM, Global Interpretations

Contribution ID: **3** Type: **Oral presentation (in person)**

The top quark EW couplings in the SMEFT

The electro-weak couplings of the top quark are directly accessible in rare "top+X" production processes at the LHC, where top quark pairs or single top quark are produced in associations with bosons. We present a new analysis of the top sector of the Standard Model EFT. The fit is based on a fully NLO parameterization and includes the most recent (differential) results from ATLAS and CMS. We show that run 2 of the LHC allows, for the first time, to overconstrain the qqttbar and two-fermion operator coefficients and yields competitive bounds. We compare the current bounds to projections for the HL-LHC and future lepton colliders, that can yield powerful constraints.

Apply for poster award

Primary authors: Dr CORNET, Fernando (Case Western Reserve); VOS, Marcel (IFIC (UVEG/CSIC) Valencia); MIRALLES LOPEZ, Marcos (Univ. of Valencia and CSIC (ES)); Dr MORENO LLACER, Maria (IFIC, (CSIC - Univ. of Valencia)); MIRALLES, Victor (INFN Roma1)

Presenter: Dr CORNET, Fernando (Case Western Reserve)

Session Classification: Top, QCD, Flavor, Precision Modelling

Track Classification: Physics and Detector: Top quark, QCD, Flavour, Precision Modelling

Contribution ID: **4** Type: **Oral presentation (in person)**

High Granularity Readout TPC R&D for Tera-Z at the Future e+e- Collider

The future linear and circular electron positron colliders were been proposed as a Higgs and a high luminosity Z factory in last few years. The detector conceptual design of a updated detector consists of a tracking system, which is Time Projection Chamber (TPC) detector as the main track with the high precision (about 100μm overall drift length at 3T magnetic field) spatial resolution device in the large 3D volume, especially for the case of the machine operating at the high luminosity Z pole (Tera-Z at 2T magnetic field). Aimed to Higgs and the flavor physics requirements, the tracking system required the high precision performance,including the spatial resolution, the momentum resolution and the good particle identification detection (PID).

TPC detection technology also required the longitudinal time resolution of about 100ns and the physics goals require the very good separation power with the cluster counting to be considered. The simulation and PID resolution show TPC technology potential to extend Tera-Z at the future e+e- collider. In this talk, the feasibility and status of high precision TPC as the main track detector for e+e collider will be presented. The simulation results of the pad/pixelated TPC technology for e+e- collider will be given. Compared with the pad readout using the simulation, the high granularity readout TPC option will obtain the better spatial resolution of single electrons, the very high detection efficiency in excellent tracking and good PID performance (less than 3σ).

Apply for poster award

Primary authors: Dr DAI, Hongliang (Institute of High Energy Physics, CAS); Dr QI, Huirong (Institute of High Energy Physics, CAS); Prof. WANG, Jianchun (Institute of High Energy Physics, CAS); Ms ZHANG, Jinxian (Institute of High Energy Physics, CAS); Dr YU, Liwen (Institute of High Energy Physics, CAS); TITOV, Maksym (Université Paris-Saclay (FR)); Dr DENG, Zhi (Tsinghua University)

Co-authors: Dr SHE, Xin (Institute of High Energy Physics, CAS); Dr CHANG, Yue (Institute of High Energy Physics, CAS)

Presenter: Dr QI, Huirong (Institute of High Energy Physics, CAS)

Session Classification: Vertex, Tracking, Timing detectors

Track Classification: Physics and Detector: Vertex, Tracking, Timing

Contribution ID: **22** Type: **Oral presentation (in person)**

Opening remarks

Monday, 8 July 2024 09:00 (10 minutes)

Presenter: ASAI, Shoji (University of Tokyo (JP))

Session Classification: Plenary

Contribution ID: **23** Type: **Oral presentation (in person)**

Physics case for Higgs and Electroweak precision

Monday, 8 July 2024 09:10 (20 minutes)

Apply for poster award

Presenter: DE BLAS MATEO, Jorge (Universidad de Granada (ES))

Session Classification: Plenary

Contribution ID: **24** Type: **not specified**

ILC status

Monday, 8 July 2024 09:30 (12 minutes)

Apply for poster award

Presenter: NAKADA, Tatsuya (EPFL - Ecole Polytechnique Federale Lausanne (CH))

Session Classification: Plenary

Contribution ID: **25** Type: **Oral presentation (in person)**

CLIC status

Monday, 8 July 2024 09:42 (12 minutes)

Presenter: STAPNES, Steinar (CERN)

Session Classification: Plenary

Contribution ID: **26** Type: **not specified**

Status of the C3 R&D

Monday, 8 July 2024 09:54 (12 minutes)

Presenter: VERNIERI, Caterina (SLAC National Accelerator Laboratory (US))

Session Classification: Plenary

Contribution ID: **27** Type: **not specified**

Physics case for e+e- at 500 GeV and above

Monday, 8 July 2024 10:06 (20 minutes)

Presenter: WEIGLEIN, Georg Ralf (Deutsches Elektronen-Synchrotron (DE))

Session Classification: Plenary

Contribution ID: **28** Type: **Oral presentation (in person)**

HALHF status

Monday, 8 July 2024 11:00 (12 minutes)

Presenter: FOSTER, Brian (University of Oxford (GB))

Session Classification: Plenary

Contribution ID: **29** Type: **not specified**

XCC status

Monday, 8 July 2024 11:12 (12 minutes)

Presenter: BARKLOW, Tim (SLAC National Accelerator Laboratory (US))

Session Classification: Plenary

Contribution ID: **30** Type: **Oral presentation (in person)**

CEPC status

Monday, 8 July 2024 11:36 (12 minutes)

Presenter: GAO, Jie (IHEP)

Session Classification: Plenary

Contribution ID: **31** Type: **Oral presentation (remote)**

FCCee status

Monday, 8 July 2024 11:48 (12 minutes)

Presenter: BENEDICT, Michael (CERN)

Session Classification: Plenary

Contribution ID: **32** Type: **Oral presentation (in person)**

Muon collider status

Monday, 8 July 2024 12:00 (12 minutes)

Presenter: SCHULTE, Daniel (CERN)

Session Classification: Plenary

Contribution ID: **33** Type: **not specified**

Higgs Factory detector R&D

Monday, 8 July 2024 12:12 (20 minutes)

Presenter: RAJAGOPALAN, Srini (Brookhaven National Laboratory (US))

Session Classification: Plenary

Contribution ID: **34** Type: **Oral presentation (in person)**

ITN: accelerator developments

Monday, 8 July 2024 14:00 (15 minutes)

Presenter: MICHIZONO, Shinichiro (KEK)

Session Classification: Accelerator Plenary

Contribution ID: **35** Type: **not specified**

CLIC: accelerator developments

Monday, 8 July 2024 14:15 (15 minutes)

Presenter: BURROWS, Philip

Session Classification: Accelerator Plenary

Contribution ID: **36** Type: **not specified**

C3: accelerator developments

Monday, 8 July 2024 14:30 (15 minutes)

Presenter: DHAR, Ankur (SLAC National Accelerator Lab)

Session Classification: Accelerator Plenary

Contribution ID: **37** Type: **not specified**

CEPC: accelerator developments

Monday, 8 July 2024 14:45 (15 minutes)

Presenter: LI, yuhui

Session Classification: Accelerator Plenary

Contribution ID: **38** Type: **Oral presentation (remote)**

FCCee: accelerator developments

Monday, 8 July 2024 15:00 (15 minutes)

Presenter: ZIMMERMANN, Frank (CERN)

Session Classification: Accelerator Plenary

Contribution ID: **39** Type: **not specified**

ECFA Higgs-EW-top factory study

Monday, 8 July 2024 14:00 (15 minutes)

Presenter: ROBSON, Aidan (University of Glasgow (GB))

Session Classification: Physics & Detector plenary

Contribution ID: **40** Type: **not specified**

Physics highlight 1, experimental challenges

Monday, 8 July 2024 14:15 (15 minutes)

Session Classification: Physics & Detector plenary

Contribution ID: **41** Type: **Oral presentation (in person)**

Physics highlight 2, experimental challenges

Monday, 8 July 2024 14:30 (15 minutes)

Session Classification: Physics & Detector plenary

Contribution ID: **42** Type: **not specified**

Beyond collider experiments at a Linear Collider

Monday, 8 July 2024 14:45 (15 minutes)

Presenter: SAKAKI, Yasuhito (KEK)

Session Classification: Physics & Detector plenary

Contribution ID: **43** Type: **not specified**

Highlights from LHC detector upgrades

Monday, 8 July 2024 15:00 (15 minutes)

Presenter: BROOIJMANS, Gustaaf (Columbia University)

Session Classification: Physics & Detector plenary

Contribution ID: **44** Type: **not specified**

Highlights from detectors for EIC

Monday, 8 July 2024 15:15 (15 minutes)

Presenter: GUNJI, Taku (University of Tokyo (JP))

Session Classification: Physics & Detector plenary

Contribution ID: **45** Type: **not specified**

Communication

Thursday, 11 July 2024 14:00 (15 minutes)

Presenter: TAKAHASHI, Rika (KEK)

Session Classification: Plenary

Contribution ID: **46** Type: **not specified**

Strategy in Europe

Thursday, 11 July 2024 14:15 (15 minutes)

Session Classification: Plenary

Contribution ID: **47** Type: **not specified**

Strategy in the US (tbc)

Thursday, 11 July 2024 14:30 (15 minutes)

Presenter: PATWA, Abid (DOE)

Session Classification: Plenary

Contribution ID: **48** Type: **not specified**

Strategy in Japan

Thursday, 11 July 2024 14:45 (15 minutes)

Presenter: NAKAYA, Tsuyoshi (Kyoyo U.)

Session Classification: Plenary

Contribution ID: **49** Type: **not specified**

Global Strategy - ICFA view

Thursday, 11 July 2024 15:00 (15 minutes)

Presenter: CAMPANA, Pierluigi (INFN e Laboratori Nazionali di Frascati (IT))

Session Classification: Plenary

Contribution ID: **50** Type: **not specified**

New Technologies for Higgs Factory Detectors

Thursday, 11 July 2024 16:00 (25 minutes)

Presenter: DEMARTEAU, Marcel (Oak Ridge National Laboratory)

Session Classification: Plenary

Contribution ID: **51** Type: **not specified**

Physics Vision

Thursday, 11 July 2024 16:25 (25 minutes)

Presenter: MURAYAMA, Hitoshi (University of California Berkeley (US))

Session Classification: Plenary

Contribution ID: **52** Type: **not specified**

Vision for a Linear Collider Facility

Thursday, 11 July 2024 16:50 (25 minutes)

Presenters: LIST, Jenny (Deutsches Elektronen-Synchrotron (DE)); STAPNES, Steinar (CERN)

Session Classification: Plenary

Contribution ID: **53** Type: **not specified**

Poster awards

Thursday, 11 July 2024 17:15 (5 minutes)

Session Classification: Plenary

Contribution ID: **54** Type: **not specified**

Closing

Thursday, 11 July 2024 17:20 (10 minutes)

Session Classification: Plenary

Contribution ID: **55** Type: **Oral presentation (in person)**

Energy recovery at a Linear Collider

Monday, 8 July 2024 11:24 (12 minutes)

Presenter: LITVINENKO, Vladimir

Session Classification: Plenary

Contribution ID: **56** Type: **Oral presentation (in person)**

Search for additional Higgs bosons and other BSM signatures at the FCC-ee

The electron-positron stage of the Future Circular Collider (FCC-ee) is a precision frontier factory for Higgs, electroweak, flavour, top quark, and QCD physics. It is designed to operate in a 91-km circular tunnel built at CERN, and will serve as the first step towards O(100 TeV) proton-proton collisions. In addition to an essential Higgs program, the FCC-ee offers unique and powerful opportunities to answer fundamental open questions and explore unknown physics beyond the Standard Model. The large data samples of Higgs bosons, W bosons, and top quarks in very clean experimental conditions will offer numerous opportunities for discoveries at different collision energies. The presentation will focus on repeating the search for additional Higgs bosons produced in pairs in the context of the inert two Higgs-doublet model, that has been performed within the CLIC context at the generator level, and extend it to the FCC-ee configuration and detector-level setup. Other physics cases with promising signatures at FCC-ee will be also briefly discussed: e.g. heavy neutral leptons, axion-like particles, and exotic decays of the Higgs boson.

Apply for poster award

Primary author: MAGNAN, Anne-Marie (Imperial College (GB))

Presenter: MAGNAN, Anne-Marie (Imperial College (GB))

Session Classification: BSM, Global Interpretations

Track Classification: Physics and Detector: BSM, Global Interpretations

Contribution ID: **57** Type: **Oral presentation (in person)**

Test-beam measurements of instrumented sensor planes for a higly compact and granular electromagnetic calorimeter

The LUXE experiment is designed to explore the strong-field QED regime in interactions of high-energy electrons from the European XFEL in a powerful laser field. One of the crucial aims of this experiment is to measure the production of electron-positron pairs as a function of the laser field strength where non-perturbative effects are expected to kick in above the Schwinger limit.

For the measurements of positron energy and multiplicity spectra, a tracker and an electromagnetic calorimeter are foreseen. Since the expected number of positrons varies over five-orders of magnitude, and has to be measured over a widely spread low energy background, the calorimeter must be compact and finely segmented. The concept of a sandwich calorimeter made of tungsten absorber plates interspersed with thin sensor planes is developed. The sensor planes comprise a silicon pad sensor, flexible Kapton printed circuit planes for bias voltage supply and signal transport to the sensor edge, all embedded in a carbon fibre support. The thickness of a sensor plane is less than 1 mm. A dedicated readout is developed comprising front-end ASICs in 130 nm technology and FPGAs to orchstrate the ASICs and perform data pre-processing. As an alternative, GaAs are considered with integrated readout strips on the sensor. Prototypes of both sensor planes are studied in an electron beam of 5 GeV. Results will be presented on the homogeneity of the response, edge effects and cross talk between channels.

Apply for poster award

Primary author: BLACKBURN, Tom (University of Gothenburg)

Presenter: BLACKBURN, Tom (University of Gothenburg)

Session Classification: Calorimetry, Muon detectors

Track Classification: Physics and Detector: Calorimetry, Muon

Contribution ID: **58** Type: **Oral presentation (in person)**

Update on CLIC positron source activities

The presentation will report on recent CLIC positron source activities.
The focus will be on flux concentrator developments and beam loading calculations of the capture LINAC.

Apply for poster award

Primary author: DOEBERT, Steffen (CERN)

Presenter: DOEBERT, Steffen (CERN)

Session Classification: Sources

Track Classification: Accelerator: Sources

Contribution ID: **59** Type: **Oral presentation (in person)**

Probing GHU models at the ILC with di-quark AFB at c.m.e. above the Z mass

We discuss the experimental prospects for measuring differential observables in b-quark and c-quark pair production at the International Linear Collider (ILC) baseline energies, 250 and 500 GeV. The study is based on full simulation and reconstruction of the International Large Detector (ILD) concept. Two gauge-Higgs unification models predicting new high-mass resonances beyond the Standard Model are discussed. These models predict sizable deviations of the forward-backward observables at the ILC running above the mass and with longitudinally polarized electron and positron beams. The capability of the ILC to probe these models via high-precision measurements of the forward-backward asymmetry is discussed.
Alternative scenarios at other energies and beam polarization schemes are also discussed, extrapolating the estimated uncertainties from the two baseline scenarios.

Apply for poster award

Primary authors: IRLES, Adrian (IFIC (CSIC/UV) Valencia); SAIBEL, Andrej (Univ. of Valencia and CSIC (ES)); RICHARD, Francois; Prof. YAMAMOTO, Hitoshi; MÁRQUEZ HERNÁNDEZ, Jesús P. (IFIC (CSIC/UV)); YAMATSU, Naoki; POESCHL, Roman (Université Paris-Saclay (FR))

Presenter: IRLES, Adrian (IFIC (CSIC/UV) Valencia)

Session Classification: BSM, Global Interpretations

Track Classification: Physics and Detector: BSM, Global Interpretations

Contribution ID: **60** Type: **Oral presentation (remote)**

Design and optimization of the Final Focus System for 7 TeV Compact Linear Collider

The Compact Linear Collider (CLIC) proposes a linear accelerator system aimed at colliding electrons and positrons at energies up to 3 TeV. To explore novel physics and enhance competitiveness with other collider projects, CLIC is considering increasing the center-of-mass energy to 7 TeV. A crucial component of the CLIC infrastructure is the Beam Delivery System (BDS), responsible for transporting lepton beams from the Main Linac exit to the Interaction Point (IP). This paper presents an overview of the studies and challenges associated with the design of the new Final Focus System (FFS), such as implementing chromaticity correction to mitigate synchrotron radiation effects, and ensuring precise transverse aberration control at the IP.

Apply for poster award

Primary author: MANOSPERTI, Enrico (Universitat Politecnica Catalunya (ES))

Co-authors: Mr PASTUSHENKO, Andrii (CERN); TOMAS GARCIA, Rogelio (CERN)

Presenter: MANOSPERTI, Enrico (Universitat Politecnica Catalunya (ES))

Session Classification: Beam Dynamics

Track Classification: Accelerator: Beam dynamics

Contribution ID: **61** Type: **Oral presentation (in person)**

Higher-order initial state radiation in e+e- annihilation

Radiative corrections due to initial state radiation in electron-positron annihilation are calculated within the QED structure function approach. NLO QED parton distribution functions are derived analytically. Results are shown in the next-to-leading logarithmic approximation up to $\mathcal{O}(\alpha^4 L^3)$ order, where $L = \ln(s/m_e^2)$ is the large logarithm. Several mistakes in previous calculations are corrected. The results are relevant for future high-precision experiments at e^+e^- colliders.

Apply for poster award

Primary author: ARBUZOV, Andrej (Joint Institute for Nuclear Research)

Co-author: Mrs VOZNAYA, Uliana (Joint Institute for Nuclear Research)

Presenter: ARBUZOV, Andrej (Joint Institute for Nuclear Research)

Session Classification: Higgs, Electroweak

Track Classification: Physics and Detector: Higgs, Electro-Weak

Contribution ID: **62** Type: **Oral presentation (remote)**

A BSM world with doubly charged scalars. Consequences for e+e- projects.

In the recent years a large set of indications for BSM scalars has been observed in LHC data. After a brief description of the most significant indications, this presentation intends to give a consistent interpretation in terms of a generalised Georgi Machacek model which predicts a doubly charged scalar indicated by ATLAS data. Consequences for currently planned e+e- colliders will be sketched. An updated description of this work can be found in Arxiv 2308.12180.

Apply for poster award

Primary author: Dr RICHARD, Francois (IJCLAB)

Presenter: Dr RICHARD, Francois (IJCLAB)

Session Classification: BSM, Global Interpretations

Track Classification: Physics and Detector: BSM, Global Interpretations

Contribution ID: **64** Type: **Oral presentation (in person)**

Investigating hidden sectors at future e+e- colliders through two-particle angular correlations

Exploring long-range angular correlations among emitted particles in high-energy collisions provides an opportunity to uncover physics beyond the Standard Model like Hidden Valley (HV) models.
We focus on a hidden QCD-like sector, where the interplay between HV matter and QCD partonic cascades could enhance azimuthal correlations between final-state particles. Our investigation, performed at detector level, specifically targets the detectability of these phenomena at future e+e- colliders, yielding a cleaner experimental signature as compared to the Large Hadron Collider (LHC). Remarkably, the observation of ridge structures in the two-particle correlation function may suggest the existence of New physics.

Apply for poster award

Primary authors: IRLES, Adrian (IFIC (CSIC/UV) Valencia); SARKISYAN-GRINBAUM, Edward (CERN and Texas U., Arlington); MUSUMECI, Emanuela (Univ. of Valencia and CSIC (ES)); CORREDOIRA, Imanol (Universidade de Santiago de Compostela (ES)); SANCHIS-LOZANO, Miguel-Angel (IFIC-University of Valencia); Dr PÉREZ-RAMOS, Redamy (IPSA/LPTHE); MITSOU, Vasiliki (Univ. of Valencia and CSIC (ES))

Presenter: MUSUMECI, Emanuela (Univ. of Valencia and CSIC (ES))

Session Classification: BSM, Global Interpretations

Track Classification: Physics and Detector: BSM, Global Interpretations

Contribution ID: **65** Type: **Oral presentation (in person)**

Stau searches at future e+e- colliders

The future e+e- colliders offer excellent facilities for SUSY searches. The stau, superpartner of the tau-lepton, is one of the most interesting particles for these searches, being likely the lightest of the sfermions, first one that could be observed, and it can be regarded as the worst and thus most general scenario for the searches.
The prospects for discovering stau-pair production at future e+e- factories and the resulting detector requirements will be discussed. The study takes the ILD detector concept and ILC parameters at 500 GeV as example. It includes all SM as well as beam induced backgrounds. It shows that with the chosen accelerator and detector conditions, SUSY *will* be discovered if the NLSP mass is up to just a few GeV below the kinematic limit of the collider.
Expectations for another accelerator and detectors conditions are derived. In particular the role of the hermeticity of the detector and of the ability to operate trigger-less will be discussed.

Apply for poster award

Primary authors: LIST, Jenny (Deutsches Elektronen-Synchrotron (DE)); NUNEZ PARDO DE VERA, Maria Teresa; BERGGREN, Mikael (Deutsches Elektronen-Synchrotron (DE))

Presenter: NUNEZ PARDO DE VERA, Maria Teresa

Session Classification: BSM, Global Interpretations

Track Classification: Physics and Detector: BSM, Global Interpretations

Contribution ID: **67** Type: **Oral presentation (in person)**

Searching for Charged Higgs Bosons via $e^+e^- \to H^+H^- \to c\bar{b}\bar{c}b$ at Linear Colliders

We study a search for the charged Higgs boson via $e^+e^- \to H^+H^- \to c\bar{b}\bar{c}b$ at the 500 GeV ILC. In a general two Higgs doublet model without Z_2 symmetry, extra Yukawa couplings ρ_{tc} and ρ_{tt} can drive electroweak baryogenesis, but searches at the HL-LHC may still go empty-handed if the couplings are relatively weak. Taking $m_{H^+} \simeq m_H \simeq m_A \simeq 200$ GeV, with $\rho_{tc}, \rho_{tt} \sim 0.1$ and no $h(125)$-H mixing, $H^+ \to c\bar{b}$ decay is dominant, and the $c\bar{b}\bar{c}b$ final state is likely overwhelmed by QCD background at the LHC. We show that the electroweak production of H^+H^- at the ILC can be discovered with integrated luminosity of 1 ab^{-1}. Furthermore, we show that m_{H^+} can be extracted by requiring the two pairs of b and light jets be roughly equal in mass, without assuming the mass value. Thus, ILC can probe low mass Higgs bosons in multijet final states to complement HL-LHC in the future.

Apply for poster award

Primary author: HOU, George W.-S. (National Taiwan University)

Presenter: HOU, George W.-S. (National Taiwan University)

Session Classification: Higgs, Electroweak

Track Classification: Physics and Detector: Higgs, Electro-Weak

Contribution ID: **68** Type: **Oral presentation (in person)**

X-LAB: A VERY HIGH-CAPACITY X-BAND RF TEST STAND FACILITY AT THE UNIVERSITY OF MELBOURNE

The first Southern Hemisphere X-band Laboratory for Accelerators and Beams (X-LAB) has been commissioned at the University of Melbourne. One of the key projects within this laboratory involves repurposing half of the CERN X-band test stand XBOX3, now known as Mel-BOX.
This initiative aims to validate the performance of high-gradient travelling wave accelerating structures, crucial for the Compact Linear Collider (CLIC) beam-based acceleration baseline, operating at a frequency of 12 GHz.
To assess the structures' performance under high peak power and short pulse width RF conditions, two klystron-based test facilities have been operationalised for this year. Similar to XBOX3, Mel-BOX adopts an innovative approach to combine high average power klystron units, facilitating power distribution to two testing slots with a repetition rate of up to 400 Hz. Additionally, the parameters such as repetition rate, peak power, pulse length, and pulse shape can be tailored to meet specific testing requirements. This novel method of generating high-power, high-repetition RF pulses holds promise for various applications necessitating multiple test slots.
Moreover, there are plans to leverage this technology as a foundation for developing compact accelerators tailored for medical or university applications, including radiotherapy and compact light sources.

Apply for poster award

Primary author: VOLPI, Matteo (University of Melbourne (AU))

Presenter: VOLPI, Matteo (University of Melbourne (AU))

Track Classification: Accelerator: Normal Conducting RF

Contribution ID: **69** Type: **Oral presentation (in person)**

Prospects for constraining light-quark electroweak couplings at Higgs factories

Electroweak Precision Measurements are stringent tests of the Standard Model and sensitive probes to New Physics. Accurate studies of the Z-boson couplings to the first-generation quarks could reveal potential discrepancies between the fundamental theory and experimental data. Future e+e- colliders running at the Z pole and around the ZH threshold would be an excellent tool to perform such a measurement, unlike the LHC where hadronic Z decays are only available in boosted topologies. The measurement is based on comparison of radiative and non-radiative hadronic decays. Due to the difference in quark charge, the relative contribution of the events with final-state radiation (FSR) directly reflects the ratio of decays involving up- and down-type quarks. Such an analysis requires proper modeling and statistical discrimination between photons coming from different sources, including initial-state radiation (ISR), FSR, parton showers and hadronisation. In our contribution, we show how to extract the values of the Z couplings to light quarks and present the estimated uncertainties of the measurement.

Apply for poster award

Primary authors: ZARNECKI, Aleksander Filip (University of Warsaw); JEANS, Daniel; TIAN, Junping (University of Tokyo); REUTER, Jürgen (DESY Hamburg, Germany); MEKALA, Krzysztof

Presenter: MEKALA, Krzysztof

Session Classification: Top, QCD, Flavor, Precision Modelling

Track Classification: Physics and Detector: Top quark, QCD, Flavour, Precision Modelling

Contribution ID: **72** Type: **Oral presentation (in person)**

Search for Invisible Decays of the Higgs Boson at the ILC Using key4HEP

Technologically mature accelerator and detector design and a well-understood physics program make the ILC a realistic option for the realization of a future Higgs factory. Energy staged data collection, employment of beam polarization, and capability to reach a TeV center-of-mass energy, enable unique sensitivity to New Physics deviations from the Standard Model predictions in the Higgs sector and beyond.
This presentation discusses the ILC potential to measure the branching ratio for Higgs boson decays to a final state which is invisible to detectors, $H \to ZZ^\star \to \nu\bar{\nu}\nu\bar{\nu}$. Using key4hep the underlying project is set up in a modular way and thus could be used, for example, to compare different collider detectors. Technical aspects as well as the first preliminary results will be presented.

Apply for poster award

Primary author: HENSEL, Carsten (CBPF - Brazilian Center for Physics Research (BR))

Presenter: HENSEL, Carsten (CBPF - Brazilian Center for Physics Research (BR))

Session Classification: Higgs, Electroweak

Track Classification: Physics and Detector: Higgs, Electro-Weak

Contribution ID: **73** Type: **Oral presentation (in person)**

Probing SMEFT operators using polarizations and spin correlations at current and future colliders

The standard Model (SM) is the best currently experimentally tested theory of fundamental particles and their interactions. The discovery of Higgs boson completes the particle spectrum of SM and now the particle physics have officially entered the era of precision measurement. While the SM enjoys robust experimental verification, it falls short in explaining phenomena like the naturalness problem, dark matter, strong CP problem, matter-antimatter asymmetry, and neutrino mass. Various beyond SM models, including supersymmetry, Technicolor, UED, and string theory, have been proposed to address these issues, yet experimental evidence for new particles, symmetries, or dimensions remains elusive.

In response to the null results from the experiments, a shift toward a model-independent formalism becomes imperative. The effective field theory (EFT) serves as a versatile framework, expanding the SM by introducing higher-order gauge symmetric Lorentz terms. While the gauge symmetry imposes constraints on deviations in the fermionic sector, the likelihood of significant deviations in this sector is notably reduced. However, the electroweak sector remains open to exploration. We study the potential of future electron-positron colliders, particularly the International Linear Collider (ILC), to probe higher-order operators affecting the electroweak gauge sector. The study is carried with polarized beams which aid on increasing the signal-to-background ratio.\

To maximize sensitivity to new physics signals, a diverse set of observables is crucial. Here, we delve into the significance of spin-related observables, offering numerous polarization and spin correlation options. These set of observables could also shed light on the CP structure and correlations of new physics. One has to note that the construction of vector polarization and their correlations with the tensorial polarizations demands the proper identification of final daughter of weak bosons. The tagging of daughters becomes non-trivial in case of light flavor jets and to overcome these challenges, we propose employing machine learning techniques such as artificial neural networks, boosted decision trees, and convolutional neural networks. We show for the hadronic decay of W boson an accuracy of 80% can be achieved. The 95% CL bounds on anomalous couplings is found to be tighter than the experimental values. Finally we note that besides playing a dominant role on probing higher order operators, spin-related observables can be directly used to comment on the existence of quantum entanglement at high energy.

Apply for poster award

Primary author: SUBBA, Amir (Indian Institute of Science Education and Research, Kolkata)

Presenter: SUBBA, Amir (Indian Institute of Science Education and Research, Kolkata)

Session Classification: BSM, Global Interpretations

Track Classification: Physics and Detector: BSM, Global Interpretations

Contribution ID: **75** Type: **Oral presentation (in person)**

Cavity tuner development for the ITN cryomodule at KEK

In this contribution we report on the development of a cavity tuner for a cryomodule, which is being developed and will be built and tested in the scope of the International Linear Collider (ILC) Technology Network (ITN) at KEK until 2027. We have simulated Lorentz-force detuning of the according SRF 1.3 GHz 9-cell TESLA-type cavities to understand the tuner requirements better. As a base of the ITN cavity tuner design the LCLS-II double-lever tuner was selected. In a collaboration with Fermilab we have tested the LCLS-II tuner on an LCLS-II cavity at room temperature and atmospheric pressure. Based on the gained experience, design adjustments are being considered. Slow and fast tuner driving electronics were partially selected.

Apply for poster award

Primary author: Dr OMET, Mathieu (High Energy Accelerator Research Organization (KEK))

Co-authors: YAMAMOTO, Akira; Dr KUMAR, Ashish (KEK); Mr CONTRERAS-MARTINEZ, Crispin (FNAL); UMEMORI, Kensei (KEK); DOHMAE, Takeshi; YAMAMOTO, Yasuchika (KEK); PISCHALNIKOV, Yuriy (FNAL)

Presenter: Dr OMET, Mathieu (High Energy Accelerator Research Organization (KEK))

Track Classification: Accelerator: Superconducting RF

Contribution ID: **76** Type: **Oral presentation (in person)**

Status of BSM searches at ATLAS including some future prospects at HL-LHC

Despite successfully predicting the outcome of hundreds of measurements at colliders and other experiments, the standard model of particle physics cannot be the final theory of nature. Searches for beyond-the-standard model (BSM) physics are now a major component of the research program at the ATLAS and CMS experiments at the Large Hadron Collider (LHC). This talk presents highlights of BSM searches at the LHC, including dark matter, long-lived particles, heavy resonances, leptoquarks, supersymmetric particles, BSM decays of SM particles, and other exotic phenomena. Experimental methodologies, sophisticated analysis tools including machine learning, experimental results, and phenomenological interpretations including Effective Field Theories are presented.

Apply for poster award

Primary author: BELLERIVE, Alain (Carleton University (CA))

Presenter: BELLERIVE, Alain (Carleton University (CA))

Session Classification: BSM, Global Interpretations

Track Classification: Physics and Detector: BSM, Global Interpretations

Contribution ID: **77** Type: **Oral presentation (remote)**

Top quark flavor changing neutral currents at future linear colliders

In this talk, I will discuss the potential discovery of top quark flavor changing neutral current (FCNC) at future linear colliders (LCs). First, I will discuss the theoretical predictions in a class of simplified dark matter models where the rates of top quark FCNC decays are generated by dark-sector particles. I will then discuss the sensitivity of the LCs on the top quark FCNC for some channels and some benchmark center-of-mass energies.

Apply for poster award

Primary authors: JUEID, Adil (Institute for Basic Science); Prof. KANEMURA, Shinya (Osaka University)

Presenter: JUEID, Adil (Institute for Basic Science)

Session Classification: Top, QCD, Flavor, Precision Modelling

Track Classification: Physics and Detector: Top quark, QCD, Flavour, Precision Modelling

Contribution ID: **78** Type: **Oral presentation (in person)**

Searches for BSM physics at a gamma-gamma collider with Energy < 12 GeV based on European XFEL

The possibility of a Gamma-Gamma collider extension to the Beam dump of the 17.5 GeV European XFEL has been discussed before as a first high energy collider of its sort. It would not just be to study the concept of a gamma-gamma collider but this collider would also be without competition in the region of $5—12$ GeV for gamma-gamma physics. In this range $b\bar{b}$ and $c\bar{c}$ resonances, tetraquarks as well as mesonic molecules can be observed. Furthermore some BSM processes can also be reached in this range. In this talk we want to discuss the possibility of observing ALPs at this collider as well as an extension to a mixed model of ALPs and dark photon (dark axion portal), that introduces the new couplings not as a product of the individual couplings and therefore offers a rich phenomenology.

Apply for poster award

Primary author: BERGER, Marten (University of Hamburg)

Co-authors: Prof. MOORTGAT-PICK, Gudrid (University of Hamburg); Ms WÜST, Monika (University of Hamburg)

Presenter: BERGER, Marten (University of Hamburg)

Session Classification: BSM, Global Interpretations

Track Classification: Physics and Detector: BSM, Global Interpretations

Contribution ID: **79** Type: **Oral presentation (in person)**

Luminosity Studies for the Cool Copper Collider

Achieving high instantaneous luminosity while managing the beam-induced background (BIB) is critical for the successful operation of any future electron-positron (e^+e^-) collider. In this talk, we will present the first extensive luminosity studies for a proposed linear e^+e^- collider, the Cool Copper Collider (C^3), as discussed in arXiv:2403.07093. We begin with a theoretical overview of luminosity at e^+e^- colliders and its interplay with Beamstrahlung –the leading source of BIB –and we motivate the importance of simulations for the accurate evaluation of the effect of beam-beam interactions on the attainable luminosity. Through simulations in Guinea-Pig, we then evaluate the impact of key beam parameters, such as emittance, bunch length, beta function and waist shift, on the luminosity of C^3, and tune these parameters with the objective of optimizing the luminosity, without a commensurate increase in the accompanying BIB. We then propose a new beam parameter set for C^3 which achieves a ˜40% luminosity increase while maintaining BIB levels at similar levels. Additional luminosity-enhancing scenarios through modifications in the time-structure of the beam are presented, and their sustainability implications are discussed. Finally, using a common simulation framework, we perform a comparative analysis of the luminosity and BIB characteristics of C^3 with those for ILC and CLIC. Our results indicate that C^3 achieves competitive luminosities with a narrower luminosity spectrum than CLIC and lower background rates than ILC, placing C^3 as an attractive option for realizing a compact, high-performance Higgs factory. We close our talk by showing how the developed luminosity optimization methodology can be extended to other collider proposals and by presenting preliminary results towards an automatized luminosity optimization scheme.

Apply for poster award

Primary authors: NTOUNIS, Dimitris (SLAC National Accelerator Laboratory (US)); NANNI, Emilio (SLAC National Accelerator Laboratory); VERNIERI, Caterina (SLAC National Accelerator Laboratory (US))

Presenter: NTOUNIS, Dimitris (SLAC National Accelerator Laboratory (US))

Track Classification: Accelerator: Beam dynamics

Contribution ID: **80** Type: **Oral presentation (in person)**

HNL at e+e- colliders

Neutrinos can be a key to solving several cosmological problems, such as the mystery of the baryon-antibaryon asymmetry in the universe or the origin of dark matter. The existence of their heavier partners, the so-called heavy neutral leptons (HNL), is a well-motivated scenario which could also contribute to explaining the mass-generation mechanism for light neutrinos. Future lepton colliders, including e+e- linear machines, will offer the farthest discovery reach for these particles and allow for studying their features, probing the lepton-flavour universality and constraining their Dirac or Majorana nature. In this talk, we will show how to look for HNL with masses above the Z-pole at future lepton colliders and answer the fundamental questions concerning their properties.

Apply for poster award

Primary authors: ZARNECKI, Aleksander Filip (University of Warsaw); REUTER, Jürgen (DESY Hamburg, Germany); MEKALA, Krzysztof

Presenter: MEKALA, Krzysztof

Session Classification: BSM, Global Interpretations

Track Classification: Physics and Detector: BSM, Global Interpretations

Contribution ID: **81** Type: **Oral presentation (in person)**

”Here be SUSY” - Prospects for SUSY searches at future colliders

Some say SUSY is dead, because LHC has not discovered it yet. But is this really true? It turns out that the story is more subtle. SUSY can be ‘just around the corner’, even if no signs of it has been found and a closer look is needed to quantify the impact of LHC limits and their implications for future colliders. Here, a scan of the relevant parameter space of (weak-scale) SUSY parameters, is presented.

I concentrate on properties relevant to evaluate the experimental prospects: mass differences, lifetimes and decay-modes. The observations are then confronted with estimated experimental capabilities.

I have considered what can be expected from (HL-)LHC, where it turns that large swaths of SUSY parameter space will be hard to access. For e+e- colliders, the situation is simple:
at such colliders, SUSY will be either discovered or excluded almost to the kinematic limit.

Apply for poster award

Primary author: BERGGREN, Mikael (Deutsches Elektronen-Synchrotron (DE))

Presenter: BERGGREN, Mikael (Deutsches Elektronen-Synchrotron (DE))

Session Classification: BSM, Global Interpretations

Track Classification: Physics and Detector: BSM, Global Interpretations

Contribution ID: **82** Type: **Oral presentation (in person)**

Update on CARIE high gradient photocathode test stand at LANL

This talk will report on the status of commissioning of the Cathodes And Radio-frequency Interactions in Extremes (CARIE) high gradient C-band RF photoinjector test stand at Los Alamos National Laboratory. We are assembling and testing the high gradient photoinjector capable of producing electric fields at the cathodes up to 250 MV/m. The photoinjector will be powered by a 50 MW, 5.712 GHz Canon klystron. The klystron was delivered to LANL in July of 2023, installed, and commissioned. The waveguide line from the klystron goes through a high-power circulator into a concrete vault that is rated to provide radiation protection for electron beams with beam power up to 20 kW. The all-copper photoinjector was fabricated, tuned, and is awaiting high gradient testing. The second version of the photoinjector will be built with replaceable high quantum-efficiency cathodes to test behavior of advanced photocathode materials at high gradients. Adding capability to operate the photoinjector at cryogenic temperatures is considered. The status of the facility and its high-power operation and plans for photocathode testing will be presented.

Apply for poster award

Primary author: SIMAKOV, Evgenya (LANL)

Co-authors: ALEXANDER, Anna (LANL); RAI, Deepak (LANL); XU, Haoran (LANL); ZUBORAJ, Muhammed (LANL); ANISIMOV, Petr (LANL); GRUMSTRUP, Torben (LANL); HAYNES, William B. (LANL)

Presenter: SIMAKOV, Evgenya (LANL)

Track Classification: Accelerator: Normal Conducting RF

Contribution ID: **83** Type: **Oral presentation (in person)**

X-band activities for the EuPRAXIA@SPARC_LAB Linac

Over recent years, significant efforts have been dedicated to validating the reliability and functionality of X-band technology at extremely high peak fields and accelerating gradients to achieve the realization of increasingly compact linacs. The Eupraxia@SPARC_LAB project entails the development of 1GeV Linac utilizing a X-band booster comprising 16 accelerating structures operating at a nominal gradient of 60MV/m. At the Frascati laboratories of INFN (LNF) in the last year various X-band RF components essential for the Eupraxia Linac have been developed and have been tested at nominal peak power conditions. This was made possible thanks to the use of the TEX test facility devoted specifically for the development and testing of RF devices and accelerating structures in the X-band. Recently, the first RF prototype of X-band accelerating structure designed at LNF has been manufactured and tested at high power. This report presents the results of the latest tests conducted at TEX and the preliminary results of the conditioning of the first accelerating structure prototype for the EuPRAXIA@SPARC_LAB project.

Apply for poster award

Primary author: CARDELLI, Fabio

Co-authors: LIEDL, Andrea; BUONOMO, Bruno; DI GIULIO, Claudio; ALESINI, David; DI PASQUALE, Enrico; DI RADDO, Gianluca (INFN-LNF); LATINI, Giulia; PIERSANTI, Luca (INFN-LNF); DIOMEDE, Marco; PIOLI, Stefano; LOLLO, Valerio (INFN-LNF)

Presenter: CARDELLI, Fabio

Track Classification: Accelerator: Normal Conducting RF

Contribution ID: **84** Type: **Oral presentation (in person)**

Application of laser-plasma accelerators to future linear colliders

Wednesday, 10 July 2024 14:00 (20 minutes)

Laser-driven plasma accelerators have demonstrated ultra-high accelerating gradients, offering the potential to reduce the size and cost of a future energy-frontier linear collider. In this presentation, I will discuss the design considerations for the application of laser-driven plasma-based accelerator technology to a multi-TeV linear collider. Plasma accelerators naturally accelerate short bunches using large longitudinal and transverse wakefields in plasma, and this presents unique beam dynamics challenges. I will discuss several of these challenges, including staging laser-plasma accelerators, scattering with background plasma, and beam transverse stability. Key to the realization of the collider application is the development of high average and high peak power laser systems, operating with high efficiency. Coherent combination of fiber lasers is a promising solution to achieve high average and high peak power lasers suitable for high-energy physics applications, and I will describe recent progress and outline the R&D path toward a collider based on laser-plasma accelerator technology.

Apply for poster award

Primary author: SCHROEDER, Carl (LBNL)

Co-authors: BENEDETTI, Carlo (LBNL); OSTERHOFF, Jens (LBNL); NAKAMURA, Kei (LBNL); ESAREY, Eric (LBNL)

Presenter: SCHROEDER, Carl (LBNL)

Session Classification: Advanced Accelerator Concepts

Track Classification: Accelerator: Advanced Accelerator Concepts

Contribution ID: **85** Type: **Oral presentation (in person)**

Collider Tests of Nanohertz Gravitational Waves

Recently, compelling evidence of nanohertz gravitational waves is indicated by the pulsar timing array collaborations. In this talk, I will present an MeV-scale first-order phase transition from a minimal dark sector to explain the gravitation waves, with a focus on the collider tests via a minimal Higgs portal. I will demonstrate that to explain the observed gravitational waves, the Higgs portal coupling should be so sizable that it can be probed through Higgs invisible decay at the LHC and future lepton colliders such as CEPC, ILC, and FCC-ee. It opens up a promising avenue to uncover the physical origin of the nanohertz GWs via colliders and to hear and see the minimal dark.

Apply for poster award

Primary author: Dr LI, Shaoping (Osaka U.)

Presenter: Dr LI, Shaoping (Osaka U.)

Session Classification: Higgs, Electroweak

Track Classification: Physics and Detector: Higgs, Electro-Weak

Contribution ID: **87** Type: **Oral presentation (in person)**

Prospects for light exotic scalar measurements at the e+e- Higgs factory.

Tuesday, 9 July 2024 09:00 (20 minutes)

The physics program of the Higgs factory will focus on measurements of the 125 GeV Higgs boson, with the Higgs-strahlung process being the dominant production channel at 250 GeV. However, production of extra light scalars is still not excluded by the existing experimental data, provided their coupling to the gauge bosons is sufficiently suppressed. Fermion couplings of such a scalar could also be very different from the SM predictions leading to non-standard decay paterns. Considered in the presented study is the feasibility of direct light scalar observation at future Higgs factory experiments assuming different decay channels.

Apply for poster award

Primary author: ZARNECKI, Aleksander Filip (University of Warsaw)

Co-authors: BRUDNOWSKI, Bartlomiej (Faculty of Physics, University of Warsaw); ZEMBACZYNSKI, Kamil (Faculty of Physics, University of Warsaw)

Presenter: ZARNECKI, Aleksander Filip (University of Warsaw)

Session Classification: BSM, Global Interpretations

Track Classification: Physics and Detector: BSM, Global Interpretations

Contribution ID: **88** Type: **Oral presentation (remote)**

Determination of CP-violating Higgs couplings with transversely-polarized beams at the ILC

We study possible CP-violation effects of the Higgs to Z-boson coupling
at a future e^+e^- collider, e.g. the International Linear Collider (ILC). We find that the azimuthal angular distribution of the muon pair, produced by $e^+e^- \to HZ- > H\mu^+\mu^-$, can be sensitive to such a CP-violation effect when we apply initial transversely polarized beams. Based on this angular distribution, we construct a CP sensitive asymmetry and obtain this asymmetry by Whizard simulation. By comparing the SM prediction with 2σ range of this asymmetry, we estimate the limit of the CP-odd coupling in HZZ interaction, including as well studies from unpolarized and longitudinally-polarized beams.

Apply for poster award

Primary authors: Dr LI, Cheng (Sun-Yat-Sen University); MOORTGAT-PICK, Gudrid

Presenter: Dr LI, Cheng (Sun-Yat-Sen University)

Session Classification: Higgs, Electroweak

Track Classification: Physics and Detector: Higgs, Electro-Weak

Contribution ID: **90** Type: **Oral presentation (in person)**

Advancing Timing Resolution of Strip Scintillators for Electromagnetic Calorimeters

In the upcoming generation of collider experiments, such as the proposed Linear Collider Higgs Factory, precise measurement of particle flow (PF) is pivotal for enhancing the energy resolution of jets, which consist of numerous hadrons observed in the final state. To achieve this, we focus on equipping fine-segmented electromagnetic calorimeters with high-precision time measurement capabilities, thereby facilitating improved discrimination of particles within jets and aiding in cluster reconstruction within the jet calorimeter.

In our research, we emphasize the essential role of electromagnetic calorimeters with highly-segmentation, necessitating a cell size of 5 mm x 5 mm. By enhancing each cell with high-precision time measurement, we aim to advance the accuracy of energy measurements and improve the identification of parent particles within jets. Furthermore, our approach holds promise for exploring Beyond the Standard Model (BSM) physics, particularly in the detection of long-lived particles.

To achieve these objectives, we have developed a novel configuration for the electromagnetic calorimeter, employing scintillator strips arranged orthogonally to ensure both positional resolution and a reduced number of readout channels. The scintillator strips have been read out the scintillation light at the both end edges by serially connected silicon photo-sensors. This configuration increase the photons and improve the time resolution. Various configurations are tested at the beam test at KEK. Moreover, our measurements are anticipated to refine the accuracy of time measurements within electromagnetic showers. Through electron beam tests, we have demonstrated significant improvements in time resolution performance. In this presentation, we will showcase the results of our efforts to enhance the optical readout method of the current strip scintillator for electromagnetic showers, thereby advancing the capabilities of linear collider Higgs Factory collider experiments.

Apply for poster award

Primary author: TAKESHITA, Tohru (Shinshu University (JP))

Co-author: Mr ISHITANI, Masamune (Shinshu University)

Presenter: TAKESHITA, Tohru (Shinshu University (JP))

Session Classification: Calorimetry, Muon detectors

Track Classification: Physics and Detector: Calorimetry, Muon

Contribution ID: **91** Type: **Oral presentation (in person)**

Addressing technological challenges on sensor-electronics hybridization for compact silicon tungsten electromagnetic calorimeters.

Highly compact and granular sandwich silicon tungsten calorimeters are part of the detector concepts proposed for all future Higgs Factories and for strong-field-QED (LUXE) or Dark Matter search experiments. This contribution discusses some of the technological challenges of sensor-electronics hybridization for this type of calorimeters. Different alternatives have been explored and used in the past, e.g. tab-bonding and epoxy-silver glue dots, with limited success. A joint R&D effort by different groups to study this technology's long-term viability. It comprises ageing studies, careful monitoring of PCB mechanical properties, the validation of different industrial choices for the epoxy-silver product and the optimization/automation of the process by different institutes. The challenges and status of these activities are discussed in this contribution.

Apply for poster award

Primary authors: IRLES, Adrian (IFIC (CSIC/UV) Valencia); ZERWAS, Dirk (Université Paris-Saclay (FR)); BENHAMMOU, Yan (Tel Aviv University (IL))

Presenter: IRLES, Adrian (IFIC (CSIC/UV) Valencia)

Session Classification: Calorimetry, Muon detectors

Track Classification: Physics and Detector: Calorimetry, Muon

Contribution ID: **92** Type: **Oral presentation (in person)**

Nanosecond timing MAPS

The detectors at future e+e- linear colliders will need unprecedented precision on Higgs physics measurements. These ambitious physics goals translate into very challenging detector requirements on tracking and calorimetry. Monolithic Active Pixel Sensor (MAPS) technology offers small dead areas, thin sensors, and small pixels over large areas. Future e+e- Colliders could benefit from O(ns) timing tagging, with the constraint that the overall power consumption stays within the target of few tens of mW/cmˆ2. Today some commercial imaging technologies offer the possibility of producing large, stitched sensors (with a rectangle area ˜30 cm × 10 cm). Such large sensors are very interesting from a physics point of view, but they are very challenging from an engineering point of view. A first MAPS prototype 'NAPA-p1'was designed by SLAC in CMOS Imaging 65 nm technology. The prototype has dimensions of 1.5 mm × 1.5 mm with a pixel pitch of 25 µm. This work benefits from our collaboration with CERN, capitalizing on the improved sensor' s performance after a decade of optimizations. This prototype will set the baseline for the sensor and the electronics performance which will serve future developments. This talk will feature the first measurements performed to fully characterized this prototype.

Apply for poster award

Primary authors: VERNIERI, Caterina (SLAC National Accelerator Laboratory (US)); BRAU, James; ROTA, Lorenzo (SLAC); BREIDENBACH, Martin (SLAC); VASSILEV, Mirella (Stanford U)

Presenter: VERNIERI, Caterina (SLAC National Accelerator Laboratory (US))

Session Classification: Vertex, Tracking, Timing detectors

Track Classification: Physics and Detector: Vertex, Tracking, Timing

Contribution ID: **95** Type: **Oral presentation (in person)**

Development of a half-meter scale Traveling-Wave (TW) SRF cavity

While a demonstration of TW resonance excitation in the 3-cell structure in 2K liquid helium had been prepared and carried out at Fermilab in collaboration with Euclid Techlabs, the RF design process of 0.5˜1 meter scale TW cavity was begun at Fermilab as the next step of TW development towards an accelerator-scale one. Considering the physical dimensions of existing SRF facilities (for fabrication, processing, and cryogenic testing), Fermilab has proposed a half-meter scale TW RF design consisting of a 7-cell structure and a power feedback waveguide (WG) loop. The WG loop design includes the new RF configurations for TW resonance control during a high-power operation. 1-year US-Japan collaboration program focused on EBW optimization for the TW shape iris joint within the narrow gap was awarded and the efforts had been made by KEK, Jlab, and Fermilab. 1-year LDRD program of Fermilab is awarded recently to fabricate a low-cost mockup of the WG loop with new RF configurations and validate them. Here we will present a preliminary 7-cell TW RF design and report the progress and challenges through the awarded programs.

Apply for poster award

Primary author: Dr FURUTA, Fumio (Fermilab)

Co-author: MCGEE, Kellen (Fermilab)

Presenter: Dr FURUTA, Fumio (Fermilab)

Track Classification: Accelerator: Superconducting RF

Contribution ID: **96** Type: **Oral presentation (in person)**

Drift chamber with cluster counting techniques for CEPC

The Circular Electron Positron Collider (CEPC) is a large-scale collider facility with a circumference of 100 km. It is designed to study rich physics programs, including investigations into Higgs properties, electroweak physics and flavor physics. A good identification of charged hadrons is essential for the flavor physics and benefits the determination of jet flavor and jet charge. To achieve these physics goals, a drift chamber is proposed for excellent particle identification (PID) performance with the cluster counting technique. Cluster counting measures the number of primary ionizations (dN/dx) along the particle trajectory in a gaseous detector, rather than relying on energy loss (dE/dx). This approach represents a promising breakthrough in PID. The Poissonian nature of dN/dx provides a statistically significant way to measure ionization, potentially yielding a resolution two times better than dE/dx.
A detailed PID study of the drift chamber will be presented. Simulation studies, including the detector and electronics responses, as well as the machine-learning reconstruction algorithm, are performed to optimize the detector design and performance. The PID results using dN/dx and time-of-flight show that the kaon and pion separation power, with a track length of 1.2 m, can achieve a 3σ significance for momenta less than 20 GeV/c. Mechanical design has been carried out and finite-element-analysis results demonstrate a stable design. Fast readout electronics have been developed, and a detector prototype has been tested with an electron beam. The test results validate the performance of the electronics and the feasibility of the dN/dx method.

Apply for poster award

Primary author: Dr ZHAO, Guang (IHEP)

Co-authors: HUANG, Fei; LI, Gang; LIU, Hongbin; Prof. WU, Linghui (IHEP); DONG, Mingyi (Institute of High Energy Physics, CAS); JIN, Shengjie; SUN, Shengsen; LIU, Shuaiyi; WEI, Wei; QIAN, Xiaohui; GAO, Xu; ZHAO, Yubin; TIAN, Zhefei; ZHANG, Zhenyu

Presenter: Dr ZHAO, Guang (IHEP)

Session Classification: Vertex, Tracking, Timing detectors

Track Classification: Physics and Detector: Vertex, Tracking, Timing

Contribution ID: **97** Type: **Oral presentation (in person)**

Streamlined jet tagging network assisted by jet prong structure

Attention-based transformer models have become increasingly prevalent in collider analysis, offering enhanced performance for tasks such as jet tagging. However, they are computationally intensive and require substantial data for training. In this paper, we introduce a new jet classification network using an MLP mixer, where two subsequent MLP operations serve to transform particle and feature tokens over the jet constituents. The transformed particles are combined with subjet information using multi-head cross-attention so that the network is invariant under the permutation of the jet constituents. The network structure is closely related to the multiscale nature of HEP events.

The proposed network demonstrates comparable classification performance to state-of-the-art models while boosting computational efficiency drastically. The network structure can be applied to the various collider processes.

Apply for poster award

Primary author: Prof. NOJIRI, Mihoko (IPNS, KEK)

Co-author: Dr HAMMAD, Ahmed (KEK)

Presenter: Prof. NOJIRI, Mihoko (IPNS, KEK)

Session Classification: Software, Reconstruction, Computing

Track Classification: Physics and Detector: Software, Reconstruction, Computing

Contribution ID: **98** Type: **Oral presentation (in person)**

Loop induced H±W±Z vertex in CP violating two Higgs doublet model and its impact on collider phenomenology

The two Higgs doublet model, which can serve enough CP violation and first order electroweak phase transition, is often introduced to realize electroweak baryogenesis.
If CP symmetry is violated in the two Higgs doublet model, it does not have custodial symmetry, which is remnant of global symmetry of SU(2)L × SU(2)R.
It has been known that H±W±Z vertex is induced at the loop level due to the violation of custodial symmetry.
As a consequence of breaking CP and custodial symmetry, we study loop-induced H± -> W±Z decay in the most general CP violating two Higgs doublet model.
In this talk, we discuss the relation between violations of CP and custodial symmetry and the H±W±Z vertex, and we show its impact on future colliders including ILC.

Apply for poster award

Primary authors: KANEMURA, Shinya (Osaka University); MURA, Yushi (Osaka Univ.)

Presenter: MURA, Yushi (Osaka Univ.)

Session Classification: Higgs, Electroweak

Track Classification: Physics and Detector: Higgs, Electro-Weak

Contribution ID: **99** Type: **Oral presentation (in person)**

Distributed Coupling Linac for Efficient Acceleration of High Charge Electron Bunches

Future colliders will require injector linacs to accelerate large electron bunches over a wide range of energies. For example the Electron Ion Collider requires a pre-injector linac from 4 MeV up to 400 MeV over 35 m. Currently this linac is being designed with 3 m long traveling wave structures, which provide a gradient of 16 MV/m. We propose the use of a 1 m distributed coupling design as a potential alternative and future upgrade path to this design. Distributed coupling allows power to be fed into each cavity directly via a waveguide manifold, avoiding on-axis coupling. A distributed coupling structure at S-band was designed to optimize for shunt impedance and large aperture size. This design provides greater efficiency, thereby lowering the number of klystrons required to power the full linac. In addition, particle tracking analysis shows that this linac maintains lower emittance as bunch charge increases to 14 nC and wakefields become more prevalent. We present the design of this distributed coupling structure, as well as cold test data and plans for higher power tests to verify on the structure's real world performance.

Apply for poster award

Primary authors: DHAR, Ankur (SLAC National Accelerator Lab); NANNI, Emilio (SLAC National Accelerator Laboratory); WHITE, Glen (SLAC); BAI, Mei; OTHMAN, Mohamed; TANTAWI, Sami (SLAC); LI, Zenghai (SLAC)

Presenter: DHAR, Ankur (SLAC National Accelerator Lab)

Track Classification: Accelerator: Normal Conducting RF

Contribution ID: **100** Type: **Oral presentation (in person)**

Impact of NLO QCD on Key Physics Processes at Future Higgs Factories

The majority of Monte-Carlo (MC) simulation campaigns for future Higgs factories has so far been based on the leading-order (LO) matrix elements provided by Whizard 1.95, followed by parton shower and hadronization in Pythia6, using the tune of the OPAL experiment at LEP.
In this contribution, we test the next-to-leading-order (NLO) mode of Whizard.
NLO events of $e^+e^- \to q\bar{q}$ and $e^+e^- \to \mu^+\mu^- b\bar{b}$ are generated by POWHEG matching, with parton shower and hadronization provided by Pythia8.
The NLO effect on hadron multiplicities and event shape variables of jets will be discussed and compared with MadGraph5 at hadron-level.
After passing the events through the full detector simulation of the International Large Detector concept as an example for a ParticleFlow-optimised detector, the jet energy resolution and typical kinematic quantities are compared between NLO and LO at reconstruction level.
A first assessment of which physics prospects of future e^+e^- should be studied with NLO MC in the future will be given.

Apply for poster award

Primary author: ZHAO, Zhijie (DESY)

Co-authors: LIST, Jenny (Deutsches Elektronen-Synchrotron (DE)); BERGGREN, Mikael (Deutsches Elektronen-Synchrotron (DE))

Presenter: ZHAO, Zhijie (DESY)

Session Classification: Software, Reconstruction, Computing

Track Classification: Physics and Detector: Software, Reconstruction, Computing

Contribution ID: **101** Type: **Oral presentation (remote)**

$4b + X$ via electroweak multi-Higgs production as smoking gun signal for the Type-I 2HDM at the LHC

The existence of additional Higgs bosons, besides the one discovered by the LHC, already a decade ago, is predicted by most frameworks of new physics. Observation of a second Higgs boson (charged or neutral) will thus provide a firm evidence that the underlying manifestation of the Electroweak Symmetry Breaking (EWSB) mechanism is a non-minimal one. The majority of analyses, both phenomenological and experimental ones, involving additional Higgs bosons concentrate on QCD induced production modes.
However, the QCD induced processes are not necessarily to be high in new physics models owing to the non-standard couplings of the new Higgs bosons to the fermions and gauge bosons. As a reference, I consider the Type-I two Higgs doublet model (2HDM) as a simple extension of Standard Model where the Electroweak (EW) processes dominate over the QCD processes. I would like to discuss a full detector-level Monte Carlo analysis to establish that the inclusive $4b+X$ final state via EW processes can provide simultaneous reconstruction of all the additional Higgs boson masses. I will present the algorithms for the mass reconstructions of the additional Higgs bosons.

Apply for poster award

Primary author: Dr SANYAL, Prasenjit (Konkuk University)

Presenter: Dr SANYAL, Prasenjit (Konkuk University)

Session Classification: Higgs, Electroweak

Track Classification: Physics and Detector: Higgs, Electro-Weak

Contribution ID: **102** Type: **Oral presentation (in person)**

Top mass measurement at the CEPC

The study is based on the publication of EPJC 83, 269 (2023).
We present a study of top quark mass measurements at the t\bar{t} threshold based on CEPC. A centre-of-mass energy scan near two times of the top mass is performed and the measurement precision of top quark mass, width and \alpha_S are evaluated using the t\bar{t} production rates. Realistic scan strategies at the threshold are discussed to maximise the sensitivity to the measurement of the top quark properties individually and simultaneously in the CEPC scenarios assuming a limited total luminosity of 100 fbˆ{-1}. With the optimal scan for individual property measurements, the top quark mass precision is expected to be 9 MeV, the top quark width precision is expected to be 26 MeV, and \alpha_S can be measured at a precision of 0.00039. Taking into account the uncertainties from theory, background subtraction, beam energy and luminosity spectrum, the top quark mass can be measured at a precision of 14 MeV optimistically and 34 MeV conservatively at CEPC.

Apply for poster award

Primary authors: SUN, Xiaohu (Peking University); FANG, Yaquan (Chinese Academy of Sciences (CN))

Presenter: FANG, Yaquan (Chinese Academy of Sciences (CN))

Session Classification: Top, QCD, Flavor, Precision Modelling

Track Classification: Physics and Detector: Top quark, QCD, Flavour, Precision Modelling

Contribution ID: **103** Type: **Oral presentation (in person)**

CP-violating top-Higgs coupling in SMEFT

The total cross section of the process $\mu^-\mu^+ \to \nu_\mu\bar{\nu}_\mu t\bar{t}H$ has strong dependence on the CP phase of the top Yukawa coupling. We study the cause of the strong energy dependence and identify its origin as the E/m_W growth of the weak boson fusion subamplitudes, $W^-W^+ \to t\bar{t}H$, when the two W's are longitudinally polarized. We repeat the study in the SMEFT framework where EW gauge invariance is manifest and find that the highest energy cross section is reduced to a quarter of the complex top Yukawa model result at high energies. By applying the Goldstone boson (GB) equivalence theorem, we identify the origin of this strong energy growth of the SMEFT amplitudes as associated with the dimension-6 $ttH\pi\pi$ vertex, where π's are the GB of $W^\pm$. We obtain the unitarity bound on the coefficient of the SMEFT operator by studying all $2 \to 2$ and $2 \to 3$ cross sections in the $J = 0$ channel.

Apply for poster award

Primary authors: BARGER, Vernon; HAGIWARA, Kaoru; ZHENG, Ya-Juan

Presenter: ZHENG, Ya-Juan

Session Classification: BSM, Global Interpretations

Track Classification: Physics and Detector: BSM, Global Interpretations

Contribution ID: **106** Type: **Oral presentation (in person)**

Finding kink signatures of LLPs in TPC at ILC

Some types of LLPs can be indentified by kinked tracks. The Time Projection Chamber (TPC) being designed for ILD at ILC provides almost continuous tracking. This should give excellent potential for kink finding. I will review the current kink finder algorithm, and present a new kink finding method.

Apply for poster award

Primary author: NAKAJIMA, Jurina (SOKENDAI/KEK)

Co-author: JEANS, Daniel

Presenter: NAKAJIMA, Jurina (SOKENDAI/KEK)

Session Classification: Software, Reconstruction, Computing

Track Classification: Physics and Detector: Software, Reconstruction, Computing

Contribution ID: **107** Type: **Oral presentation (in person)**

New renormalization scheme in extended Higgs sectors for Higgs precision measurements

We propose a new renormalization scheme in extended Higgs sectors for the coming new era of the Higgs precise measurements at future lepton colliders. In this new scheme, we use a precisely measured value of the discovered Higgs boson coupling, e.g., hZZ, as an input of the renormalization condition. We demonstrate how the other Higgs boson couplings (e.g., hWW) can be predicted. in this new renormalization scheme in the 2 Higgs doublet model as a simple but important example.

Apply for poster award

Primary authors: KANEMURA, Shinya (Osaka University); KIKUCHI, Mariko (Nihon University); YAGYU, Kei (Osaka University)

Presenter: YAGYU, Kei (Osaka University)

Session Classification: Higgs, Electroweak

Track Classification: Physics and Detector: Higgs, Electro-Weak

Contribution ID: **108** Type: **Oral presentation (in person)**

The fabrication of the 1.3 GHz single-cell cavity utilizing the different grain size niobium materials

As the part of research into the manufacturing methods for SRF cavities used in ILC(International Linear Collider), two 1.3 GHz single-cell cavities have been fabricated by utilizing fine and medium grain size niobium materials, respectively, with the same manufacturing equipment. The fine grain size niobium material typically exhibits a grain size level equivalent to ASTM 5-6, whereas the medium grain size corresponds to ASTM 0-3 levels. The forming of the half cell shapes has been conducted using the same deep drawing die and press machine. The machining for cavity part fabrication and the welding for assembly have been carried out using identical jigs and equipment. We present the fabrication processes and the test results for cavities in detail.

Apply for poster award

Primary author: Dr HAN, Junho (Kiswire Advanced Technology Co., Ltd.)

Co-authors: Mr PARK, Heesu (Kiswire Advanced Technology Co., Ltd.); Dr KANG, Seonghoon (Korea Institute of Materials Science); Prof. KO, Byeong-Rok (Korea University); Prof. KIM, Eun-San (Korea University)

Presenter: Dr HAN, Junho (Kiswire Advanced Technology Co., Ltd.)

Track Classification: Accelerator: Superconducting RF

Contribution ID: **109** Type: **Oral presentation (in person)**

New collider implications on a strongly first order EWPT.

In order to understand the early history of the universe, and to test baryogenesis models, determining the nature of the electroweak phase transition is imperative. The order and strength of this transition is strongly correlated to relatively large deviations in the hhh coupling. In models where a considerable part of the hhh coupling deviation is caused by charged particle loops, the $h\gamma\gamma$ coupling is also expected to deviate considerably. In this talk, by using a model-independent approach, I explain how to obtain conditions that are sufficient for a strongly first order phase transition. After the $h\gamma\gamma$ is determined with precision at the HL-LHC, these conditions can be tested at Future Linear Colliders by measurements of the hhh coupling, to conclusively determine the nature of the electroweak phase transition and the viability of electroweak baryogenesis on models with new charged scalars.

Apply for poster award

Primary authors: TANAKA, Masanori (Osaka University); FLORENTINO, Ricardo; KANEMURA, Shinya (Osaka University)

Presenter: FLORENTINO, Ricardo

Session Classification: Higgs, Electroweak

Track Classification: Physics and Detector: Higgs, Electro-Weak

Contribution ID: **110** Type: **Oral presentation (in person)**

Cryomodule Test Buncer for ITN

ITN is an acronym for “ILC Technology Network”.
It is an international framework for the technological development outlined in the Work Package(WP).
KEK plans to produce one cryomodule equipped with eight superconducting 9-cell cavities for WP1 and 2 from 2023 and perform performance measurements in 2027.
A test facility will be required to perform the measurements.
We are preparing the cryogenics for the facility.
The refrigerator (Linde LR280) currently operating at KEK will be dedicated to that.
The helium transfer line was designed.
The design was based on KEKB’s transport line design, but it was slightly modified because ILC does not use liquefied nitrogen for the radiation shield.
The 2K refrigerator, purification filter, and other equipment are also considered. We will report on the status of those.

Apply for poster award

Primary author: NAKANISHI, Kota (KEK)

Co-authors: NAKAI, Hirotaka (KEK); Mr HARA, Kazufumi (KEK); Dr SHIMIZU, Hirotaka (KEK); Mr HONMA, Teruya (KEK); Ms KESSOKU, Shiori (KEK)

Presenter: NAKANISHI, Kota (KEK)

Track Classification: Accelerator: Superconducting RF

Contribution ID: **111** Type: **Oral presentation (remote)**

Monte Carlo Simulations of an electromagnetic sampling calorimeter with semiconductor sensors

The simulation of particle generation, their interaction with detector materials, and the resulting detector response has become increasingly crucial in recent experiments. Semiconductor+W calorimeters, known for their high compactness and granularity, are integral components of proposed detector designs for upcoming Higgs Factories as well as experiments targeting strong-field-QED (LUXE) or forthcoming smaller-scale experiments. This contribution focuses on optimizing the ECAL electromagnetic calorimeter, foreseen to the LUXE experiment to achieve higher energy resolution, using a Geant4-based application. Additionally, a fundamental aspect of this effort involves simulating the responses of Si or GaAs -type sensors. This simulation not only contributes to the initial detector design but also serves as an indispensable tool for predicting the detector's performance. Incident electrons with energies ranging from 2.0 to 18.0 GeV were directed towards ECAL surface, their interactions with materials assesed and the results are presented. Furthermore, detailed configurations of the sampling electromagnetic calorimeter and the Geant4 simulation package are discussed.

Apply for poster award

Primary authors: Dr NEAGU, Alina-Tania (Institute of Space Science - Subsidiary of INFLPR); Dr GHENESCU, Marian-Traian (Institute of Space Science - Subsidiary of INFLPR); POTLOG, Petru-Mihai (Institute of Space Science - Subsidiary of INFLPR); Dr GHENESCU, Veta (Institute of Space Science - Subsidiary of INFLPR)

Presenter: POTLOG, Petru-Mihai (Institute of Space Science - Subsidiary of INFLPR)

Session Classification: Calorimetry, Muon detectors

Track Classification: Physics and Detector: Calorimetry, Muon

Contribution ID: **112** Type: **Oral presentation (in person)**

Long-lived particle searches with the ILD experiment

Future e^+e^- colliders, with their clean environment and triggerless operation, offer a unique opportunity to search for long-lived particles (LLPs). Considered in this contribution are prospects for LLP searches with the International Large Detector (ILD) providing almost continuous tracking in Time Projection Chamber (TPC) as the core of its tracking systems. The ILD has been developed as a detector concept for the ILC, but is also applicable to other Higgs Factory options.

The considered signature for neutral LLP production is a highly displaced decay vertex, which we search for in the TPC. Based on the full detector simulation, we study decays of both light and heavy LLPs. For the heavy, $\mathcal{O}$(100 GeV) LLPs, the most challenging scenarios are those with a small mass splitting between LLP and the dark matter candidate, resulting in only a very soft displaced track pair in the final state, not pointing to the interaction point. As the opposite extreme scenario we consider the production of light, $\mathcal{O}$(1 GeV) pseudo\-scalar LLP, which decays to two highly boosted and almost colinear displaced tracks. Backgrounds both from soft beam-induced processes and hard physical events are taken into account. Different tracking system design options and their impact on the LLP reconstruction are discussed.

Assuming a single displaced vertex signature, the limits on signal production cross-section are presented for a wide range of LLP lifetimes and a set of masses or mass splittings. These limits are to a large extent model-independent, reflecting kinematic properties of the considered signature. They can be used to set limits on particular models, also for more complex signatures involving displaced vertices.

Apply for poster award

Primary author: KLAMKA, Jan (University of Warsaw)

Co-authors: ZARNECKI, Aleksander Filip (University of Warsaw); JEANS, Daniel

Presenter: KLAMKA, Jan (University of Warsaw)

Session Classification: BSM, Global Interpretations

Track Classification: Physics and Detector: BSM, Global Interpretations

Contribution ID: **113** Type: **Oral presentation (in person)**

Prospects of measuring quantum entanglement in H->tautau at a future e+e- Higgs factory

Final states with spin-correlations allow the measurement of quantum entanglement at collider energies. The $H \to \tau\tau$ process is an excellent probe for this, due to the scalar nature of the Higgs boson, and the direct access to the τ-lepton helicity through the angular distributions of the τ-lepton decay products. We will present the prospects of such a measurement a future e^+e^- Higgs factory using Delphes simulation samples for the signal and the relevant background processes. The construction of observables sensitive to quantum entanglement of the τ-τ system will be discussed together with the impact of reconstruction and event selection effects on the sensitivity.

Apply for poster award

Yes

Primary author: Mr BREUNING, Cedric (University of Bonn)

Co-authors: GREFE, Christian (University of Bonn (DE)); DESCH, Klaus (University of Bonn (DE)); BECHTLE, Philip (Universitaet Bonn (DE))

Presenter: Mr BREUNING, Cedric (University of Bonn)

Session Classification: Higgs, Electroweak

Track Classification: Physics and Detector: Higgs, Electro-Weak

Contribution ID: **114** Type: **Oral presentation (remote)**

Probing BSM neutral gauge boson in high and low energy experiments

Over a period of time neutral BSM gauge boson is becoming important in the high energy as well as low energy experiments. In this talk we would like to present my recent works where we studied Z', a neutral chiral gauge boson under a general $U(1)$ extension of the Standard Model. In this scenario, there are three generations of right handed neutrinos are introduced which can generate tiny neutrino mass after the breaking of general $U(1)$ gauge group. Studying a variety of low and high energy scattering and beam-dump experiments we will show the current parameter space of the general U(1) coupling as a function of the Z' mass for different U(1) charges.

Apply for poster award

Primary author: DAS, Arindam

Presenter: DAS, Arindam

Session Classification: BSM, Global Interpretations

Track Classification: Physics and Detector: BSM, Global Interpretations

Contribution ID: **115** Type: **Oral presentation (remote)**

Searching for heavy neutral leptons in electron positron colliders

The origin of neutrino mass is a long standing puzzle. Plethora of models have been proposed to explain the origin of small neutrino mass. Among them tree level seesaw and inverse seesaw scenarios are the simplest ones where Standard Model (SM) is extended by SM-singlet heavy Right Handed Neutrinos (RHNs). If the RHN masses are $\mathcal{O}$(TeV) scale, they could be produced in lepton colliders through the mixing between the light-heavy neutrino mixing ($|V_{\ell N}|^2$) depending on the center of mass energy. Such RHNs can decay into a variety of models involving leptons and jets. Studying such finals states from the RHNs we will show the projected bounds on the plane containing $|V_{\ell N}|^2$ and the mass of the RHN and compare with existing bounds.

Apply for poster award

Primary author: DAS, Arindam

Presenter: DAS, Arindam

Session Classification: Higgs, Electroweak

Track Classification: Physics and Detector: Higgs, Electro-Weak

Contribution ID: **118** Type: **Oral presentation (in person)**

Cold Copper High Gradient Single-Cell Structure Tests

We will present results from high gradient structure testing of C-band single-cell copper (Cu) and copper silver (CuAg) accelerating structures at 77 K. C-band accelerators have been of particular interest in recent years due to their ability to provide high gradients and transport high charge beams for applications ranging from colliders to medical technologies. These technologies are made possible by new advances in high gradient technologies that can suppress the breakdown rates by using distributed coupling, cryogenic cooling, and copper alloys. Previous work has shown each of these separately to significantly improve the maximum achievable gradient. In this work, for the first time, we combine all three methods in an ultra-high gradient structure and benchmark the difference between Cu and CuAg. These structures are tested at 77K simultaneously through a hybrid manifold while breakdown statistics were collected. In addition, we will show that at gradients exceeding 200 MeV/m the presence of significant beam loading caused a suppression in the quality factor as a function of time.

Apply for poster award

Primary authors: KRASNYKH, Anatoly; DHAR, Ankur; NANNI, Emilio (SLAC National Accelerator Laboratory); SCHNEIDER, Mitchell

Presenter: NANNI, Emilio (SLAC National Accelerator Laboratory)

Track Classification: Accelerator: Normal Conducting RF

Contribution ID: **120** Type: **Oral presentation (remote)**

Multi-bunch beam dynamics studies in the C3 main linac

The Cool Copper Collider (C3) is a novel electron-positron linear collider concept that utilizes a cryogenically-cooled copper accelerator technology. It is designed to accelerate 133 bunches of electrons/positrons from 10 GeV to 125 GeV while preserving the beam quality. In order to achieve the target beam's luminosity, careful studies of the long-range higher order modes (HOM) wakefield effects must be taken into account for the design of the accelerating structure. Here we present the analysis of the beam dynamics studies for the long range HOM wakefields. We will show the accelerator operating parameters and important frequency bands that deteriorate the beam. After that, we present detuning and damping results which are then used to guide the design of the accelerating structure.

Apply for poster award

Primary authors: TAN, Wei-Hou (SLAC); LI, Zenghai (SLAC); NANNI, Emilio (SLAC National Accelerator Laboratory)

Presenter: TAN, Wei-Hou (SLAC)

Session Classification: Beam Dynamics

Track Classification: Accelerator: Beam dynamics

Contribution ID: **122** Type: **Oral presentation (in person)**

Exploring new physics by loop-corrected decays of additional Higgs bosons

In order to test and discriminate the extended Higgs models, it is quite important to include radiative corrections to the analyses for the synergy between the precise measurements of the discovered Higgs boson (h125) and the direct searches for additional Higgs bosons. Deviations of couplings of h125 from the standard model (SM) predictions give the upper limit on masses of additional Higgs bosons, and change predictions of decay rates of additional Higgs bosons. Precise calculations including loop corrections are clearly important for comparison with precise measurements of the h125 couplings in future collider experiments. We calculate the loop-corrected correlation between the branching ratio of additional Higgs bosons and the deviation in the h125 $\to$ ZZ$_*$ decay from the SM prediction in the two Higgs doublet model,
and show that loop corrections can significantly change the correlation predicted at LO. We perform the calculations of loop corrections based on Fortran code "H-COUP version 3" (http://www-het.phys.sci.osaka-u.ac.jp/~hcoup/) with some modifications for the renormalization conditions.

Apply for poster award

Primary authors: KIKUCHI, Mariko (Nihon University); KANEMURA, Shinya (Osaka University); YAGYU, Kei (Toyama); SAKURAI, Kodai (Tohoku University); Dr AIKO, Masashi

Presenter: KIKUCHI, Mariko (Nihon University)

Session Classification: Higgs, Electroweak

Track Classification: Physics and Detector: Higgs, Electro-Weak

Contribution ID: **123** Type: **Oral presentation (remote)**

Unconventional Searches of Exotic particles at Future Linear Colliders

Current collider experiments, such as LHC have been studying the production of the BSM particles and their decay to the Standard Model particles. These searches have placed strong constraints on different BSM models as well as on the mass of BSM particles. The situation demands to look for alternative scenarios. BSM theories such as the Pati Salam Model, Composite Higgs, and others suggest that the interaction among different BSM particles exists such that the exotic particle of one type decays to the exotic particle of type two first then to the SM particles. This in turn reveals exciting new signatures. Now, due to the long decay chain, a large number of particles are present at the final state. If the final state is accompanied by a large number of jets, then linear colliders offer a much cleaner environment to study them. Moreover, photon-photon fusion also provides a large cross-section. In this talk, I will discuss some of these alternative searches of exotic fermion and scalars at future colliders such as the International Linear Collider and photon photon collider.

Apply for poster award

Primary author: Dr KUMAR, Nilanjana (CCSP, SGT University, India)

Presenter: Dr KUMAR, Nilanjana (CCSP, SGT University, India)

Session Classification: BSM, Global Interpretations

Track Classification: Physics and Detector: BSM, Global Interpretations

Contribution ID: **124** Type: **Poster (in person)**

A New Method for Measuring the Higgs Mass at ILC

Monday, 8 July 2024 17:40 (20 minutes)

The Higgs mass as one of the fundamental parameters in the Standard Model has been already measured pretty well by the data collected so far at the LHC. However in some cases of looking for small deviations from the SM, current precision or projection of the Higgs mass measurement at the LHC or HL-LHC may not be good enough. One prominent example is for the SM prediction of the Higgs partial decay width to WW*or ZZ*, in which the Higgs mass uncertainty becomes one of the leading sources of parametric theory error. It is expected that at future e+e- colliders we can improve the Higgs mass precision significantly by the well-known "recoil mass method" , at least statistically. This research proposes a new method which may complement to the recoil mass method in terms of systematic errors. The new method employs the signal channel of Higgs decaying to a pair of fermions, in particular tau leptons, and makes use of transverse momentum conservations alone instead of the 4-momentum conservation in the recoil mass method. The key experimental observables will be just the momentum directions of tau leptons without any input from energy measurement, and the momentum directions can possibly be measured by reconstructing the decaying vertex of the tau leptons. This new method can in principle be applied at the LHC as well. We will explore this method by performing realistic detector simulation and physics analysis at the ILC.

Apply for poster award

Yes

Primary author: BERGER, Thomas

Co-author: TIAN, Junping (University of Tokyo)

Presenter: BERGER, Thomas

Session Classification: Poster

Track Classification: Physics and Detector: Higgs, Electro-Weak

Contribution ID: **125** Type: **Poster (in person)**

Optimal Collision Energy for Higgs Precision Measurements at the ILC250

Monday, 8 July 2024 17:40 (20 minutes)

The ILC is currently proposed to be running at 250 GeV at the initial stage, based on the fact that the cross section of the leading Higgs production channel (ZH) peaks at more or less 250 GeV. Due to the effects of beamstraglung and initial state radiation which shift the effective center of mass energies, the more optimal collision energy has not been known yet. First, we will carry out analyses of the ZH cross section measurement and evaluate the impact of the collision energy by a scan between 240 to 260 GeV. Second, the effects of anomalous Higgs couplings between Higgs and ZZ are momentum-dependent, thus very much sensitive to the collision energies. More over, having the anomalous HZZ couplings measured at a couple of energy points may provide significant improvement due to the large correlation between anomalous and SM-like HZZ couplings. We will carry out such studies and propose a new scenario of collision energy for the ILC250.

Apply for poster award

Yes

Primary author: MARIA, Andrea Siddharta

Co-author: TIAN, Junping (University of Tokyo)

Presenter: MARIA, Andrea Siddharta

Session Classification: Poster

Track Classification: Physics and Detector: Higgs, Electro-Weak

Contribution ID: **126** Type: **Poster (in person)**

Study of Majorana Right Handed Neutrino (RHN) production at ILC

Monday, 8 July 2024 17:40 (20 minutes)

We study Majorana Right Handed Neutrinos (RHN) production at ILC. Various extensions of the SM aim to explain the origin of the tiny neutrino mass; one of them is by the introduction of RHN. When we assume that RHN is a Majorana particle, RHN pair production is allowed in e−e+ collisions. We focus on this RHN pair production based on a minimal U(1)B−L model. A distinctive signature is a pair of same sign leptons, which is almost free of SM backgrounds.
In our study, we used full detector simulation to analyze RHN production at ILC. We generated this process, investigated its properties, developed reconstruction and selection strategies and evaluated the sensitivity at ILC. Considering full SM backgrounds, we derived exclusion limits on minimal U(1)B−L parameters at ILC.

Apply for poster award

Yes

Primary author: NAKAJIMA, Jurina (SOKENDAI/KEK)

Co-authors: DAS, Arindam (UA); JEANS, Daniel; FUJII, Keisuke; OKADA, Nobuchika (University of Alabama); YONAMINE, Ryo (KEK); Dr OKADA, Satomi (The University of Alabama)

Presenter: NAKAJIMA, Jurina (SOKENDAI/KEK)

Session Classification: Poster

Track Classification: Physics and Detector: BSM, Global Interpretations

Contribution ID: **127** Type: **Oral presentation (in person)**

Traveling Wave Demonstration in SRF Cavity With a Feedback Waveguide

Conventional SRF cavities are used in standing wave regime and are limited by surface fields to ˜50 MV/m. In order to overcome this limit, Superconducting Traveling Wave (SCTW) cavity was proposed as it allows to achieve ˜1.5 times higher accelerating gradient operating at lower phase advance per cell, thus improving transit time factor. However, power recirculation through a feedback waveguide is required to maintain cavity efficiency. Funded by the U.S. Department of Energy's SBIR program, Euclid Techalbs, in collaboration with Fermilab, demonstrated in the past the surface processing capability of a single-cell prototype with a feedback waveguide. Subsequently, a 3-cell prototype was designed and fabricated to demonstrate a traveling wave regime in SRF cavity with a feedback waveguide at cryogenic temperatures and the highest gradients. Here we present our recent results of traveling wave demonstration in the 3-cell prototype, tested in 2K liquid helium at Fermilab.

Apply for poster award

Primary author: KOSTIN, Roman (Euclid Techlabs)

Co-authors: KANAREYKIN, Alexei (Euclid Techlabs); Dr FURUTA, Fumio (Fermilab); MCGEE, Kellen (Fermilab); Mr AVRAKHOV, Pavel (Euclid Techlabs); BELOMESTNYKH, Sergey (Fermilab); KHABIBOULLINE, Timergali (Fermilab); YAKOVLEV, Vyacheslav (Fermilab)

Presenter: KOSTIN, Roman (Euclid Techlabs)

Track Classification: Accelerator: Superconducting RF

Contribution ID: **128** Type: **Oral presentation (in person)**

Smartcell X-Band Normal Conducting Accelerator Structure Prototype Fabrication

This presentation details the design and fabrication process of a prototype of a normal-conducting X-band accelerator structure, which we denominate Smartcell. These structures, achieved through brazing/bonding techniques, are crucial components for future linear colliders.
We will cover the brazing/bonding geometry, materials selection and their implications, variations in heat cycles, and atmospheres employed during brazing/bonding. The impact of copper quality and annealing procedures implemented before, during, and after machining will be discussed specifically on how they can influence the machinability, microstructure, and ultimately the performance of the final component.
The presentation will showcase the behaviour of five mock-ups, including the results and conclusions obtained through optical examination, metrology, and SEM analysis. We will also discuss silicon carbide RF properties and characterization throughout the fabrication process.

Apply for poster award

Primary author: MORALES SANCHEZ, Pedro (CERN)

Co-author: CATALAN LASHERAS, Nuria (CERN)

Presenter: MORALES SANCHEZ, Pedro (CERN)

Track Classification: Accelerator: Normal Conducting RF

Contribution ID: **131** Type: **Poster (in person)**

W pair production at lepton colliders in the Feynman Diagram gauge

Monday, 8 July 2024 17:40 (20 minutes)

We study the W pair production at future lepton colliders. For the production of longitudinally polarized W bosons, it is well known that large gauge cancellation occurs among the amplitudes, especially at high energies, because of the energy growth of each amplitude. In this study, we adopt a recently-proposed gauge fixing, so-called Feynman-Diagram gauge and revisit the process to show such energy growth is absent in the FD gauge.

Apply for poster award

Yes

Primary author: FURUSATO, Hiroyuki (Iwate University)

Presenter: FURUSATO, Hiroyuki (Iwate University)

Session Classification: Poster

Track Classification: Physics and Detector: Higgs, Electro-Weak

Contribution ID: **133** Type: **Poster (in person)**

Particle-flow reconstruction with Transformer

Monday, 8 July 2024 17:40 (20 minutes)

Transformers are one of the recent big achievements of machine learning, which enables realistic communication on natural language processing such as ChatGPT, as well as being applied to many other fields such as image processing. The basic concept of a Transformer is to learn relation between two objects by an attention mechanism. This structure is especially efficient with large input samples and large number of learnable parameters.
We are studying this architecture applied to the particle flow, which reconstructs particles by clustering hits at highly-segmented calorimeters and assign charged tracks to the clusters.
We apply the structure inspired from a translation task, which uses the Transformer as both an encoder and a decoder. An original sentence is provided to the encoder input leading to a translated sentence as output of the decoder. The latter is initially provided with a start token and then recursively uses its own output as inputs to obtain the final translated sentence.
We supply hits and tracks to the encoder as input, and a start token to the decoder to obtain the first cluster. Truth clusters information are provided at learning stage to compare with the decoder output.
Detailed implementation of the network as well as initial results of particle flow reconstruction using this method will be shown in the presentation.

Apply for poster award

Yes

Primary authors: WAHLEN, Paul (ICEPP, The University of Tokyo); SUEHARA, Taikan (ICEPP, The University of Tokyo)

Presenter: WAHLEN, Paul (ICEPP, The University of Tokyo)

Session Classification: Poster

Track Classification: Physics and Detector: Software, Reconstruction, Computing

Contribution ID: **134** Type: **Oral presentation (in person)**

X-band dielectric assist accelerating structure.

A dielectric assist accelerating (DAA) structure, which consists special dielectric cell structures operating in the TM02n mode, is greatly superior in power efficiency compared with the conventional normal conducting copper structures. On the other hand, DAA structures stays at a low achievable accelerating gradient due to multipactor and breakdowns. To overcome these problems, we try to develop X-band standing-wave DAA structures and work to understand the physics of the breakdown phenomena occurring inside them.

A two-cell DAA structure composed by sapphire cell structures has been developed. The unloaded Q was measured to be above 60,000 at room temperature, in good agreement with the simulation results. This DAA structure is to be tested using the X-band high power test facility, Nextef2 at KEK. In the high-power test, we plan to perform a short pulse RF excitation using step pulse input in DAA structures to verify the potential of them to generate a high accelerating field. In this conference, we will present the status and progress in the development of the X-band DAA structure.

Apply for poster award

Primary author: SATOH, Daisuke (National Institute of Advanced Industrial Science and Technology (AIST))

Co-authors: TETSUO, Abe (KEK); AKEMOTO, Mitsuo (KEK); MATSUMOTO, Shuji (KEK); TAKATOMI, Toshikazu (KEK); HIGO, Toshiyasu (KEK); HIGASHI, Yasuo (KEK)

Presenter: SATOH, Daisuke (National Institute of Advanced Industrial Science and Technology (AIST))

Track Classification: Accelerator: Normal Conducting RF

Contribution ID: **135** Type: **Oral presentation (in person)**

Testing the gauged U(1)B-L model for loop induced neutrino mass with dark matter at future colliders

We present a new viable benchmark scenario under the current experimental data for the model which can explain the tiny mass of active neutrinos and dark matter. Majorana masses of right handed neutrinos are given by the spontaneous breaking of the U(1)B-L gauge symmetry at the TeV scale, and tiny neutrino mass are radiatively induced by quantum effects of particles of the dark sector including the dark matter candidates. We first show the benchmark points which satisfy current experimental data, and then discuss how this model can be tested at future experiments including electron-position linear colliders.

Apply for poster award

Primary author: YING, GUOHAO (Osaka University)

Co-authors: KANEMURA, Shinya (Osaka University); MURA, Yushi (Osaka Univ.)

Presenter: YING, GUOHAO (Osaka University)

Session Classification: Higgs, Electroweak

Track Classification: Physics and Detector: Higgs, Electro-Weak

Contribution ID: **136** Type: **Oral presentation (in person)**

Cavity Beam Position Monitor Development for the ILC Main Linac

For future particle colliders, cavity Beam Position Monitors (cBPMs) have emerged as the optimal solution for precisely measuring the beam position, crucial for guiding and stabilizing high-energy beams with nanometer precision, thus enhancing luminosity at the interaction point. Resonant BPMs operate under the principle of detection of specific field configurations (resonant modes) induced by an off-centered beam within a cavity.

Development is underway for a cryostat accommodating a reentrant cBPM and a superconducting (SC) quadrupole for the ILC Main Linac. Initially, the cBPM and its associated electronics readout system will undergo testing at ATF under ambient conditions and subsequently at STF for cryogenic temperature tests. Alignment of the SC quadrupole and cBPM centers within the cryostat is crucial for precise beam position determination. Moreover, the BPM prototype must be capable of measuring the beam position on a bunch-by-bunch basis with temporal and spatial resolutions of less than 6 ns (for STF) and 1 μm, respectively.

Currently, electromagnetic simulations are being conducted using the commercial software CST Studio Suite to evaluate BPM performance and converge towards a system that meets the aforementioned requirements.
Additionally, a numerical method called BI-RME 3D is being employed to simulate the effect of a well-defined beam on the cBPM, providing estimates of voltages and waveforms observed at the output ports.
The selection of the read-out electronic system is critical to effectively down-convert the frequency of the rapidly decaying signal (less than 6 ns) while preserving a spatial resolution of under 1 μm. Looking ahead, initial tests are aimed to be conducted at ATF using an existing prototype developed by CEA-Saclay (France), along with the corresponding readout system, by the end of 2024.

The presentation aims to provide an overview of the cBPM working principle and the progress made towards the new model.

Apply for poster award

Yes

Primary author: PEDRAZA MOTAVITA, Laura Karina (IFIC (Universidad de Valencia - CSIC))

Co-authors: Mr GIMENO MARTÍNEZ, Benito (IFIC (Universidad de Valencia - CSIC)); Ms FUSTER MARTÍNEZ, Nuria (IFIC (Universidad de Valencia - CSIC)); Mr ESPERANTE, Daniel (IFIC (Universidad de Valencia - CSIC))

Presenter: PEDRAZA MOTAVITA, Laura Karina (IFIC (Universidad de Valencia - CSIC))

Track Classification: Accelerator: Beam dynamics

Contribution ID: **137** Type: **Oral presentation (remote)**

Overview on low mass scalars at e+e- facilities - theory

Many new physics scenarios render a low mass scalar candidate. I will briefly discuss the current status of such models, and give an short overview on current studies for such models at Higgs factories, including efforts within the ongoing ECFA effort.

Apply for poster award

Primary author: ROBENS, Tania Natalie (Rudjer Boskovic Institute (HR))

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

Session Classification: BSM, Global Interpretations

Track Classification: Physics and Detector: BSM, Global Interpretations

Contribution ID: **140** Type: **Oral presentation (in person)**

Cavity Beam Position Monitor Development for the ILC Main Linac

For future particle colliders, cavity Beam Position Monitors (cBPMs) have emerged as the optimal solution for precisely measuring the beam position, crucial for guiding and stabilizing high-energy beams with nanometer precision, thus enhancing luminosity at the interaction point. Resonant BPMs operate under the principle of detection of specific field configurations (resonant modes) induced by an off-centered beam within a cavity.

Development is underway for a cryostat accommodating a reentrant cBPM and a superconducting (SC) quadrupole for the ILC Main Linac. Initially, the cBPM and its associated electronics readout system will undergo testing at ATF under ambient conditions and subsequently at STF for cryogenic temperature tests. Alignment of the SC quadrupole and cBPM centers within the cryostat is crucial for precise beam position determination. Moreover, the BPM prototype must be capable of measuring the beam position on a bunch-by-bunch basis with temporal and spatial resolutions of less than 6 ns (for STF) and 1 μm, respectively.

Currently, electromagnetic simulations are being conducted using the commercial software CST Studio Suite to evaluate BPM performance and converge towards a system that meets the aforementioned requirements.
Additionally, a numerical method called BI-RME 3D is being employed to simulate the effect of a well-defined beam on the cBPM, providing estimates of voltages and waveforms observed at the output ports.
The selection of the read-out electronic system is critical to effectively down-convert the frequency of the rapidly decaying signal (less than 6 ns) while preserving a spatial resolution of under 1 μm. Looking ahead, initial tests are aimed to be conducted at ATF using an existing prototype developed by CEA-Saclay (France), along with the corresponding readout system, by the end of 2024.

The poster aims to provide an overview of the cBPM working principle and the progress made towards the new model.

Apply for poster award

Yes

Primary author: PEDRAZA MOTAVITA, Laura Karina (IFIC (Universidad de Valencia - CSIC))

Presenter: PEDRAZA MOTAVITA, Laura Karina (IFIC (Universidad de Valencia - CSIC))

Track Classification: Accelerator: Beam dynamics

Contribution ID: **142** Type: **Oral presentation (remote)**

Feasibility study on the search for an exotic decay of the Higgs boson into two light pseudoscalars in e+e- collider

A feasibility study is conducted to search for an exotic decay of the Standard Model Higgs boson decaying into a pair of light pseudoscalar bosons in the Cool Copper Collider (C3) experiment. The Higgs boson is produced in association with a Z boson and the decay products consist of a pair of b-quarks and tau leptons. The pseudoscalar bosons are probed over a mass range spanning from 20 to 60 GeV. A simplified algorithm is devised to reconstruct the tau lepton in its hadronic decay mode. A limit on the branching ratio of the Higgs boson to a pair of light pseudoscalars is presented assuming 1 fb-1 of data.

Apply for poster award

Primary authors: MOHAMMADI, Abdollah (University of Wisconsin Madison (US)); NEE, CHENG-HSU (UW-Madison); DASU, Sridhara (UW-Madison)

Presenter: NEE, CHENG-HSU (UW-Madison)

Session Classification: BSM, Global Interpretations

Track Classification: Physics and Detector: BSM, Global Interpretations

Contribution ID: **145** Type: **Oral presentation (in person)**

New developments in the Whizard event generator

We give a status report on new developments within the WHIZARD event generator. Important new features comprise NLO electroweak automation (incl. extension to BSM processes like SMEFT), loop-induced processes and new developments in the UFO interface. We highlight work in progress and further plans, such as the implementation of electroweak PDFs, photon radiation, the exclusive top threshold and features for exotic new physics searches.

Apply for poster award

Primary authors: REUTER, Jürgen (DESY Hamburg, Germany); BREDT, Pia (DESY Hamburg); Dr HÖFER, Marius (KIT); KILIAN, Wolfgang (University of Siegen); Mr KREHER, Nils (University of Siegen); Dr LÖSCHNER, Maximilian (DESY); MEKALA, Krzysztof; OHL, thorsten; Mr STRIEGL, Tobias (University of Siegen); ZARNECKI, Aleksander Filip (University of Warsaw)

Presenter: REUTER, Jürgen (DESY Hamburg, Germany)

Session Classification: Top, QCD, Flavor, Precision Modelling

Track Classification: Physics and Detector: Top quark, QCD, Flavour, Precision Modelling

Contribution ID: **146** Type: **Oral presentation (in person)**

Heavy Neutral Leptons (HNL) at e+e- colliders - theory

In this talk I will review the models motivating searches for heavy neutral leptons at future e+e- colliders by linking their properties to different frameworks for neutrino mass generation and mixing. Several different regimes of prompt decays vs. long-lived HNLs vs. displaced tracks will be discussed together with their experimental signatures.

Apply for poster award

Primary author: REUTER, Jürgen (DESY Hamburg, Germany)

Presenter: REUTER, Jürgen (DESY Hamburg, Germany)

Session Classification: BSM, Global Interpretations

Track Classification: Physics and Detector: BSM, Global Interpretations

Contribution ID: **148** Type: **Oral presentation (in person)**

BSM Triple Higgs couplings at the ILC/CLIC

To explain the baryon asymmetry in the universe a First Order Electroweak Phase Transition (FOEWPT) in the early universe is favored. This requires a BSM Higgs sector, which introduces additional Higgs bosons as well as the corresponding additional trilinear Higgs couplings (THCs). Taking the 2HDM as a concrete example, we discuss how such BSM THCs might be accessible at the ILC/CLIC via di-Higgs production. We also briefly analyze the effect of higher-order corrections to the THCs.

Apply for poster award

Primary authors: ARCO, Francisco; MUEHLLEITNER, Margarete (Karlsruhe Institute of Technology); HEINEMEYER, Sven (Consejo Superior de Investigaciones Cientificas (CSIC) (ES))

Presenters: ARCO, Francisco; HEINEMEYER, Sven (Consejo Superior de Investigaciones Cientificas (CSIC) (ES))

Session Classification: BSM, Global Interpretations

Track Classification: Physics and Detector: BSM, Global Interpretations

Contribution ID: **150** Type: **Oral presentation (in person)**

High Power RF Testing of REBCO Samples

SRF materials such as niobium have been extremely useful for accelerator technology but require low temperature operation ˜4K. The development of high temperature superconductors (HTS) is promising due to their operating temperatures being closer to that of liquid nitrogen ˜77K. This work hopes to determine the high-power RF performance of such materials at X-band (11.424 GHz). We have tested two kinds of REBCO coatings, film deposited, and tapes on a copper substrate. Testing was done in a hemispherical TE mode cavity due to its ability to maximize the magnetic field on the sample and minimize electric field. We will report on conductivity vs temperature measurements at low and high power, as well as preliminary tests of a TM01 cavity which could utilize REBCO tapes. We have observed quenching within these REBCO samples and explain the evidence which implies that the quenching is most likely due to reaching the critical current and due to average applied heat load for powers up to 1.6 kW.

Apply for poster award

Primary authors: DHAR, Ankur (SLAC National Accelerator Lab); Dr LE SAGE, Greg (SLAC National Accelerator Lab); SCHNEIDER, Mitchell

Co-authors: NANNI, Emilio (SLAC National Accelerator Laboratory); NOT SUPPLIED, JOFFRE GUTIERREZ ROYO; GOLM, Jessica (CERN); KRKOTIC, Patrick (CERN); CALATRONI, Sergio (CERN); WUENSCH, Walter (CERN)

Presenter: DHAR, Ankur (SLAC National Accelerator Lab)

Track Classification: Accelerator: Superconducting RF

Contribution ID: **151** Type: **Oral presentation (in person)**

HOM Detuning and Damping of C-Band Distributed Coupling Structure

Standing wave structures typically operate at the pi-mode. Evidently the cell length of such a structure is half a wavelength. However, maximal shunt impedance per unit length was found to be at a cell length of 3/8 wavelength, which corresponds to phase advance per cell of 135 degrees. A distributed coupling structure at 5.712 GHz was developed based on the high efficient 135/degree phase advance design. For practical linear collider designs, the structure must include HOM detuning and damping to mitigate long-range wakefields effects. Due to the high cutoff frequency of the cell iris, effective detuning and damping of the dipole HOMs at frequencies up to 40 GHz is required. In this presentation we will present HOM detuning and damping schemes to meet the long-range wakefield requirements of a linear collider design.

Apply for poster award

Primary author: LI, Zenghai (SLAC)

Co-authors: NANNI, Emilio (SLAC); SHUMAIL, Muhammad (SLAC); TAN, Wei-Hou (SLAC)

Presenter: LI, Zenghai (SLAC)

Track Classification: Accelerator: Normal Conducting RF

Contribution ID: **152** Type: **Oral presentation (in person)**

The SiD Digital ECal Based on Monolithic Active Pixel Sensors

Unprecedented precision is needed to address the Higgs physics with detectors at future e+e- colliders. Linear colliders offer low duty cycles and low backgrounds, that greatly assist achieving these goals. The SiD Collaboration is developing an application of Monolithic Active Pixel Sensor (MAPS) technology for tracking and electromagnetic calorimetry (ECal). This technology offers high granularity, thin sensors, fast responses (<nsec), and small dead areas. The low collider duty cycle enables gaseous cooling for tracking and passive heat removal for calorimetry.

A MAPS prototyping effort (NAPA-p1) is led by SLAC in collaboration with CERN. This is aimed at the linear collider tracking requirements, with complementary application to the ECal requirements. The device testing status is covered in an abstract submitted to the LCWS "Vertex, Tracking, Timing" track. This calorimetry talk will briefly summarize that work, and concentrate on the ECal design and system level considerations, as well as the ECal performance simulations.

Small pixels significantly improve shower separation in the ECal. Detailed simulation of ECal performance confirms previous results, indicating electromagnetic energy resolution based on digital hit cluster counting provides better performance than the 13 mm^2 pixels SiD TDR analog design. Furthermore, two particle separation in the ECal is excellent down to the millimeter scale. Geant4 simulation results with optimized analysis based on machine learning has been studied to optimize these expectations.

Apply for poster award

Primary author: BRAU, Jim (University of Oregon (US))

Co-authors: VERNIERI, Caterina (SLAC National Accelerator Laboratory (US)); ROTA, Lorenzo (SLAC); BREIDENBACH, Martin (SLAC); VASSILEV, Mirella (Stanford U)

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

Session Classification: Calorimetry, Muon detectors

Track Classification: Physics and Detector: Calorimetry, Muon

Contribution ID: **153** Type: **Oral presentation (in person)**

Searches for Long-Lived Particles at the Future FCC-ee

The electron-positron stage of the Future Circular Collider, FCC-ee, is a frontier factory for Higgs, top, electroweak, and flavour physics. It is designed to operate in a 100 km circular tunnel built at CERN, and will serve as the first step towards ≥ 100 TeV proton-proton collisions. In addition to an essential and unique Higgs program, it offers powerful opportunities to discover direct or indirect evidence of physics beyond the Standard Model. Direct searches for long-lived particles at FCC-ee could be particularly fertile in the high-luminosity Z run and at other collision energies. Several physics cases producing long-lived signatures at FCC-ee are highlighted in this contribution: heavy neutral leptons (HNLs), axion-like particles (ALPs), and exotic decays of the Higgs boson.

Apply for poster award

Primary author: DE FILIPPIS, Nicola (Politecnico e INFN, Bari (IT))

Presenter: DE FILIPPIS, Nicola (Politecnico e INFN, Bari (IT))

Session Classification: BSM, Global Interpretations

Track Classification: Physics and Detector: BSM, Global Interpretations

Contribution ID: **155** Type: **Oral presentation (in person)**

Fragmentation functions at future lepton colliders

Fragmentation functions (FFs) are essential non-perturbative inputs for precision calculations of hadron production cross sections in high energy scattering from first principle of QCD. They are usually extracted from global analysis on world data from single inclusive hadron production at lepton colliders, semi-inclusive DIS and pp collisions, e.g., as in recent NPC23 analysis. Future lepton colliders operated at several center of mass energies will provide high-quality hadron multiplicity data from Z boson to W boson pair as well as Higgs boson production, and ensure an accurate and precise determination of FFs based solely on data from lepton colliders. Projection for several scenarios of future leptons colliders are considered and compared to FFs from most recent global determination.

Apply for poster award

Primary author: Prof. GAO, Jun (Shanghai JiaoTong University)

Presenter: Prof. GAO, Jun (Shanghai JiaoTong University)

Session Classification: Top, QCD, Flavor, Precision Modelling

Track Classification: Physics and Detector: Top quark, QCD, Flavour, Precision Modelling

Contribution ID: **156** Type: **Oral presentation (in person)**

Test beam experiment of the large prototype of high granularity scintillator calorimeter for future electron-positron colliders -performance evaluation -

Future electron-positron colliders, including the International Linear Collider (ILC) and the Circular Electron Positron Collider (CEPC), are currently proposed for the precise measurement of the Higgs boson. These projects require high-resolution scintillator calorimeters to achieve fine granularity. Our research focuses on the development of potential calorimeter options, namely the Scintillator Electromagnetic Calorimeter (Sc-ECAL) and the Analog Hadron Calorimeter (AHCAL). These are sampling calorimeters that use plastic scintillator cells as detection layers, with absorber layers that generate showers and detection layers that capture particles from these showers alternately arranged. To demonstrate the capabilities of these calorimeters, a prototype consisting of 32 layers of ECAL and 40 layers of HCAL, reflecting the actual device design, was constructed. Between April and June 2023, a beam test using this integrated prototype was conducted at CERN. The tests involved muons (10, 100, 120 GeV), electrons (0.5–250 GeV), and pions (1–350 GeV) to evaluate the energy response and resolution of ScECAL and AHCAL for electrons and pions. This presentation will outline each detector and the beam test, and report the analysis results concerning the performance of the detectors during the beam tests.

Apply for poster award

Yes

Primary authors: MURATA, Tatsuki; TAKATSU, Taisei (ICEPP)

Presenter: TAKATSU, Taisei (ICEPP)

Session Classification: Calorimetry, Muon detectors

Track Classification: Physics and Detector: Calorimetry, Muon

Contribution ID: **157** Type: **Poster (in person)**

Possible effects of the composite dark matter at the linear collider

Monday, 8 July 2024 17:40 (20 minutes)

The existence of dark matter is currently one of the strong motivations for beyond the standard model. We consider the model of the composite dark matter. Our model assumes that meson-like dark matter (call it dark mesons) is a bounded state of dark quark (ψ) and anti-dark quark ($\bar{\psi}$) pairs, where ψ and $\bar{\psi}$ have a confining force at work. Confining force is based on the QCD-like $SU(N)$ hidden color gauge theory. This dark matter sector connects to the Standard model via a real singlet scalar particle. The $SU(N)$ hidden color gauge sector in the dynamical chiral symmetry breaking generates Nambu-Goldstone bosons ($\tilde{\pi}$ dark meson) and massive composite scalar bosons ($\tilde{\sigma}$ dark meson) simultaneously. A real singlet scalar particle gives the current mass for the dark quark. The current mass for dark quark breaks explicitly chiral symmetry. Nambu-Goldstone bosons are massive, meaning they are dark matter candidates. We use an effective theory for dark matter interactions in the framework of the linear sigma model. In the dark mesons of $SU(N)$ hidden color, the chiral partner of the $\tilde{\pi}$ meson is the $\tilde{\sigma}$ meson (iso scalar-scalar). $\tilde{\sigma}$ is also a candidate as dark matter. We will investigate the missing energy for the final state of our model at HL-LHC and the future linear collider.

Apply for poster award

Primary authors: MURAKAMI, Yuko (Hiroshima University); Dr SEKIGUCHI, Motoo (Kokushikan University); Dr WADA, Hiroaki (Kokushikan University); Dr WAKAYAMA, Masayuki (Chiba Institute of Technology)

Presenter: MURAKAMI, Yuko (Hiroshima University)

Session Classification: Poster

Track Classification: Physics and Detector: BSM, Global Interpretations

Contribution ID: **158** Type: **Oral presentation (in person)**

Classifying importance regions in Monte Carlo simulations with machine learning

In this work, we attempt to classify regions in a multidimensional parameter space according to their importance during a simulation. Considering that the parameter space could be high dimensional and the simulated process could result in arbitrary shapes, we involve a neural network in the process of guessing such shapes without running the full simulation for every point. We illustrate the process with a few examples, including scattering processes with several outgoing particles and compare with other known techniques for Monte Carlo simulations.

Apply for poster award

Primary authors: Dr BAN, Kayoung (Korea Institute for Advanced Study); Prof. PARK, Myeonghun (Seoultech); RAMOS, Raymundo (Korea Institute for Advanced Study)

Presenter: RAMOS, Raymundo (Korea Institute for Advanced Study)

Session Classification: Software, Reconstruction, Computing

Track Classification: Physics and Detector: Software, Reconstruction, Computing

Contribution ID: **159** Type: **Oral presentation (in person)**

Third family quark mass hierarchy and FCNC in the universal seesaw model

We study the quark sector of the universal seesaw model with $SU(2)_L \times SU(2)_R \times U(1)_{Y'}$ gauge symmetry in the massless limit of the two lightest quark families. This model aims to explain the mass hierarchy of the third family quark by introducing a vector-like quark partner for each quark. In addition to the Standard Model Higgs doublet, we also introduce one right-handed Higgs doublet. In this presentation, we show the Z, Z', h, H FCNC for the third family quark (t, b) and the heavy partner (t', b').

Apply for poster award

Primary author: PANULUH, Albertus (Hiroshima University)

Co-author: MOROZUMI, Takuya (Hiroshima University)

Presenter: PANULUH, Albertus (Hiroshima University)

Session Classification: Top, QCD, Flavor, Precision Modelling

Track Classification: Physics and Detector: Top quark, QCD, Flavour, Precision Modelling

Contribution ID: **160** Type: **Poster (in person)**

WIMP search at future lepton collider

Monday, 8 July 2024 17:40 (20 minutes)

Minimal dark matter is one of the most motivated dark matter candidates, and many analyses at collider experiments for this model have been discussed. In our work, we considered the search for minimal dark matter at future high-energy lepton collider experiments. We found that the indirect search, which measures the quantum correction to the muon elastic scattering, is much more sensitive than the direct search. We also discussed the usefulness of the polarised muon beam in this search.

Apply for poster award

Yes

Primary authors: NIKI, Atsuya (University of Tokyo); Dr FUKUDA, Hajime (University of Tokyo); Mr WEI, Shang-Fu (University of Tokyo); Prof. MOROI, Takeo (University of Tokyo)

Presenter: NIKI, Atsuya (University of Tokyo)

Session Classification: Poster

Track Classification: Physics and Detector: BSM, Global Interpretations

Contribution ID: **161** Type: **Oral presentation (in person)**

Higher-order effects in the trilinear Higgs coupling for future collider experiments

Although the Higgs boson has been discovered, the couplings with the Higgs boson have room for deviation from the Standard Model (SM) prediction. Each extended Higgs model is characterized by its Higgs potential. Nearly aligned models where the shape of the Higgs potential is described by one classical field include the classical scale invariance model (CSI), the pseudo-Nambu-Goldstone model, the tadpole-induced model, and so on. This classification enables us to scrutinize numerous numbers of models efficiently by measuring the trilinear Higgs coupling with high precision. In this study, we calculate the trilinear Higgs couplings including loop contributions from the top quark and new particles for various Higgs potentials, and investigate the feasibility of future collider experiments. For several benchmark parameters, we show that the High-luminosity LHC and the ILC are capable of discriminating several extended Higgs models. We present the result of work in progress.

Apply for poster award

Primary author: OHZAWA, Shuhei (University of Toyama)

Co-authors: Dr KAKIZAKI, Mitsuru (University of Toyama); Prof. HIROSHIMA, Nagisa (Yokohama National University)

Presenter: OHZAWA, Shuhei (University of Toyama)

Session Classification: Higgs, Electroweak

Track Classification: Physics and Detector: Higgs, Electro-Weak

Contribution ID: **162** Type: **Oral presentation (remote)**

Application of Particle Transformer to quark flavor tagging in the ILC project

International Linear Collider (ILC) is a next-generation e+e- linear collider to explore Beyond-Standard-Models by precise measurements of Higgs bosons. Jet flavor tagging plays a vital role in the ILC project by identification of H->bb,cc,gg,ss to measure Higgs coupling constants and of HH->bbbb and bbWW which are the main channels to measure the Higgs self-coupling constant. Jet Flavor Tagging relies on a large amount of jet information such as particle momenta, energies, and impact parameters, obtained from trajectories of particles within a jet. Since jet flavor tagging is a classification task based on massive amounts of information, machine learning techniques have been utilized for faster and more efficient analysis for the last several decades.

In recent years, a novel machine learning architecture from natural language processing called Transformer has been developed, and it has been showing state-of-the-art performances in multiple fields. Particle Transformer (ParT) is a software that applies the Transformer architecture to jet analysis, including jet flavor tagging. In this study, we apply ParT to ILD full simulation data to improve the efficiency of jet flavor tagging.

Our research focused on evaluating the performance of ParT compared to the previously used flavor tagging software, LCFIPlus, and optimizing network architectures and input parameters. Specifically, we verified performance stability through multiple training runs, assessed the performance when independently embedding charged particles and neutral particles, and evaluated the dependence on data size and number of learnable parameters. We will also report on the status of performance study of strange tagging using ParT with ILD full simulation, which can be applied on analysis of Higgs-strange coupling.

Apply for poster award

Primary author: TAGAMI, Risako (University of Tokyo (JP))

Co-authors: ISHINO, Masaya (University of Tokyo (JP)); SUEHARA, Taikan (ICEPP, The University of Tokyo)

Presenter: TAGAMI, Risako (University of Tokyo (JP))

Session Classification: Software, Reconstruction, Computing

Track Classification: Physics and Detector: Software, Reconstruction, Computing

Contribution ID: **163** Type: **Oral presentation (in person)**

Development of particle flow algorithm with GNN for Higgs factories

Particle flow plays an important role in precise measurement of Higgs bosons at future lepton colliders such as ILC and FCCee. Various detector concepts are designed to maximize the effect of particle flow to be able to separate each particle s inside jets and improve the resolutions. For the standard particle flow algorithm, PandoraPFA is used for long in ILC studies. It is a multi-step reconstruction algorithm consisting of clustering, track-cluster association, and various refinement processes. We have studied machine learned particle flow model using Graph Neural Network based algorithm developed in the context of CMS HGCAL clustering. This model utilizes GravNet as GNN architecture and Object Condensation loss function for training. Since the HGCAL algorithm only performs clustering at the calorimeter, we developed track-cluster matching feature inside the network to realize full PFA. Details of initial implementation of the track-cluster matching algorithm as well as performance evaluation with multiple tau events and jet vents will be shown. We also report the comparison result between computational performance of the machine learned algorithm and the PandoraPFA.

Apply for poster award

Yes

Primary authors: SUEHARA, Taikan (ICEPP, The University of Tokyo); MURATA, Tatsuki

Presenter: MURATA, Tatsuki

Session Classification: Software, Reconstruction, Computing

Track Classification: Physics and Detector: Software, Reconstruction, Computing

Contribution ID: **164** Type: **Oral presentation (in person)**

Status of high granular scintillator calorimeter for future electron positron colliders

Several future Higgs factories are planned for the precision Higgs physics to search for the new physics. The highly granular calorimeters play a crucial role on the precision Higgs measurement. The highly granular Sc-ECAL is based on a scintillator strip readout by a SiPM to realize the 5 mm × 5 mm cell size by aligning the strips orthogonally in x-y configuration. In order to demonstrate the performance of the Sc-ECAL and the scalability to the full-scale detector, the technological prototype has been developed with full 32 layers. In 2022 and 2023, the combined beam test of the Sc-ECAL and the CEPC-AHCAL, which is the scintillator based HCAL designed for the Circular Electron Positron Collider, is conducted at CERN SPS and PS beam lines to demonstrate the full calorimeter performance and the per-channel calibrations and performance demonstration are successfully done. This presentation describes the status the Sc-ECAL analysis of the combined beam test.

Apply for poster award

Primary authors: TAKATSU, Taisei (ICEPP); MURATA, Tatsuki

Presenter: MURATA, Tatsuki

Session Classification: Calorimetry, Muon detectors

Track Classification: Physics and Detector: Calorimetry, Muon

Contribution ID: **165** Type: **Oral presentation (in person)**

Collider phenomenology of the TeV-scale model with a common origin of neutrino mass, dark matter and baryon asymmetry

The origins of tiny neutrino mass, dark matter and baryon asymmetry of the Universe remain big mysteries in particle physics. To explain all these phenomena, a new physics model with a Higgs sector extended at the TeV scale was proposed by Aoki, Kanemura and Seto. However, CPV phases were neglected for simplicity, and the baryon number production via electroweak baryogenesis had not been evaluated. We have revisited this model including CPV phases and have investigated several phenomena including neutrino mass generation, dark matter relic abundance and electroweak baryogenesis. Future high-energy linear colliders are expected to play a crucial role in probing this model. In this talk, we will present some benchmark scenarios of the model where neutrino mass, dark matter and the baryon asymmetry can be simultaneously explained while satisfying all the theoretical and experimental constraints and discuss their predictions in future linear collider experiments.

Apply for poster award

Primary authors: AOKI, Mayumi; ENOMOTO, Kazuki (Korea Advanced Institute of Science and Technology); KANEMURA, Shinya (Osaka University); TANIGUCHI, Sora (Osaka University)

Presenter: ENOMOTO, Kazuki (Korea Advanced Institute of Science and Technology)

Session Classification: BSM, Global Interpretations

Track Classification: Physics and Detector: BSM, Global Interpretations

Contribution ID: **166** Type: **Oral presentation (in person)**

Excellent time resolution and high rate capable Cherenkov detector for next-generation calorimetry

Several future collider experiments are proposed for precise measurement of Higgs that require calorimeter technology with excellent jet energy resolution. To fulfill the requirement, this study aims to develop next-generation calorimetry that combines "particle flow calorimetry" and "dual-readout calorimetry". For the aspect of particle flow calorimetry, highly segmented readouts are implemented in the active layers. At the same time, for the aspect of dual-readout calorimetry, two different kinds of signal generation: scintillation and Cherenkov radiation are used to improve energy reconstruction for hadrons. This study also turns the spotlight on the timing measurement of the calorimeter. It is to establish a detector technology of picosecond-level time resolution for a large detection area and to investigate the impact of timing information as additional input for particle flow or cut for background reduction. As a result, the proposed calorimetry precisely measures not only energy but also position and timing and opens access to the "5D calorimeter".
To realize such a concept, a Cherenkov detector with highly segmented readouts and picosecond-level timing resolution that can cover a large area is required. Cherenkov light generated by charged particles is converted to photoelectrons by a photocathode and subsequently amplified by the Resistive Plate Chamber (RPC) is one candidate for such a detector. Notably, the amplification layer utilizes an RPC with a Diamond-like Carbon (DLC) electrode, providing high-rate capability overcoming the conventional drawbacks of RPCs.
This presentation describes the demonstration of the detector concept of the Cherenkov detector.

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Yes

Primary author: LI, Weiyuan (The University of Tokyo)

Co-authors: GATTO, Corrado; JEANS, Daniel; HAHN, Eileen; OGAWA, Hiroyasu; MATSUOKA, Kodai; LOS, Sergey; SUEHARA, Taikan (ICEPP, The University of Tokyo); KAMIYAMA, Taiki (University of Tokyo); TAKESHITA, Tohru; Dr OOTANI, Wataru (ICEPP, Univ. of Tokyo)

Presenter: LI, Weiyuan (The University of Tokyo)

Session Classification: Calorimetry, Muon detectors

Track Classification: Physics and Detector: Calorimetry, Muon

Contribution ID: **167** Type: **Oral presentation (in person)**

Double Higgs production in composite two Higgs doublet model

The precise measurement of the 125 GeV Higgs boson is one of the powerful ways to probe new physics. In particular, it is known that a large deviation from the SM predictions can appear in the di-Higgs production process e.g., via new physics effects of the triple Higgs boson coupling.
In this talk, we discuss the theoretical behavior of the di-Higgs production cross section in the composite two Higgs doublet model.
We then discuss how new particles of the model (additional Higgs bosons and heavy top quark partners) affect this process.

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Primary authors: CURTIS, Stefania De; ROSE, Luigi Delle; EGLE, Felix; Prof. MÜHLLEITNER, Milada Margarete; Prof. MORETTI, Stefano; SAKURAI, Kodai (Tohoku University)

Presenter: SAKURAI, Kodai (Tohoku University)

Session Classification: Higgs, Electroweak

Track Classification: Physics and Detector: Higgs, Electro-Weak

Contribution ID: **168** Type: **Oral presentation (in person)**

The new Sherpa 3.0 event generator

Accurate and fully differential predictions are crucial inputs for the precise experimental analyses at linear colliders and are typically provided by parton shower Monte Carlo programs. The event generator Sherpa with its focus on the inclusion of higher-order EW and QCD effects is available in a new version 3.0 this year and we will summarise its new features in particular where they relate to linear colliders.

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Primary authors: PRICE, Alan (Jagiellonian University); SIEGERT, Frank (Technische Universitaet Dresden (DE))

Presenter: SIEGERT, Frank (Technische Universitaet Dresden (DE))

Session Classification: Top, QCD, Flavor, Precision Modelling

Track Classification: Physics and Detector: Top quark, QCD, Flavour, Precision Modelling

Contribution ID: **169** Type: **Oral presentation (in person)**

The 95 GeV Higgs at e^+e^- colliders

Several searches for Higgs bosons below 125 GeV show an excess around $m_\phi = 95.4$ GeV. These include in particular $gg \to \phi \to \gamma\gamma$ at CMS and ATLAS and $e^+e^- \to Z^* \to Z(\phi \to b\bar{b})$ at LEP. We discuss BSM Higgs sectors that can accommodate these excesses. We demonstrate that such a light Higgs boson can be analyzed in detail at e^+e^- colliders.

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Primary authors: WEIGLEIN, Georg Ralf (Deutsches Elektronen-Synchrotron (DE)); HEINEMEYER, Sven (Consejo Superior de Investigaciones Cientificas (CSIC) (ES)); Dr BIEKOETTER, Thomas (KIT)

Presenters: WEIGLEIN, Georg Ralf (Deutsches Elektronen-Synchrotron (DE)); HEINEMEYER, Sven (Consejo Superior de Investigaciones Cientificas (CSIC) (ES))

Session Classification: BSM, Global Interpretations

Track Classification: Physics and Detector: BSM, Global Interpretations

Contribution ID: **170** Type: **Oral presentation (in person)**

Longitudinally-split side-coupled high-shunt-impedance C-band structure fabricated in two halves

Side-coupled structures operated with $\pi/2$ mode have been widely used particularly for compact linacs. The structure has various advantages; however, there are some difficulties in fabrication due to many complicated parts to be bonded in the conventional fabrication method. On the other hand, longitudinally-split structures are easy to fabricate due to the small number of parts (two halves or four quadrants). In recent years, in collaboration with Mitsubishi Heavy Industries, we have been developing longitudinally-split side-coupled C-band structure fabricated in two halves with a high shunt impedance based on our successful experience on the quadrant-type X-band CLIC prototype structure development. We report the status and results of this project.

Apply for poster award

Primary author: TETSUO, Abe (KEK)

Presenter: TETSUO, Abe (KEK)

Track Classification: Accelerator: Normal Conducting RF

Contribution ID: **172** Type: **Oral presentation (in person)**

Longitudinal structure optimization for the high density electromagnetic calorimeter

High density electromagnetic sandwich calorimeters with high readout granularity are considered for many future collider and fix-targer experiments. Optimization of the calorimeter structure from the point of view of the electromagnetic shower energy, position and direction measurement is one of the key aspects of the design. However, mostly uniform sampling structures were considered so far. We developed a semi-analytical approach to study calorimeter performance based on the detailed Geant 4 simulation, which also allows to compare the expected performance for different non-uniform longitudinal readout structures. This methodology enables us to find out the best calorimeter instrumentation pattern upon a specified usage scenario or optimization goal.

Apply for poster award

Primary author: ZARNECKI, Aleksander Filip (University of Warsaw)

Co-authors: BORYSOV, Oleksandr (Deutsches Elektronen-Synchrotron (DE)); HUANG, Shan (Tel Aviv University - LUXE); ZEMBACZYNSKI, Kamil (Faculty of Physics, University of Warsaw)

Presenter: ZARNECKI, Aleksander Filip (University of Warsaw)

Session Classification: Calorimetry, Muon detectors

Track Classification: Physics and Detector: Calorimetry, Muon

Contribution ID: **173** Type: **Oral presentation (in person)**

DuTiP Vertex Detector for Belle II Upgrade and ILC

Belle II ugpgrade is expected around 2028 to mitigate the high background induced by electron and positron beams. We have invented a new pixel detector concept named Dual Timer Pixel (DuTiP) for the vertex detector upgrade. This pixel detector concept can be also used for the layer 7 and 8 of the ILD vertex detector. The first prototype was fabricated with lapis semiconductor 200 nm FD-SOI technology and characterization is ongoing. We will present the status and prospects of the development.

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Primary author: ISHIKAWA, Akimasa (KEK)

Presenter: ISHIKAWA, Akimasa (KEK)

Session Classification: Vertex, Tracking, Timing detectors

Track Classification: Physics and Detector: Vertex, Tracking, Timing

Contribution ID: **174** Type: **Oral presentation (remote)**

Impact of quark flavor violating SUSY on h(125) decays at future lepton colliders

We study the CP-even neutral Higgs boson decays h -> c \bar{c}, b \bar{b}, b \bar{s}, \gamma \gamma, g g in the Minimal Supersymmetric Standard Model (MSSM) with general quark flavor violation (QFV) due to squark generation mixings, identifying the h as the Higgs boson with a mass of 125 GeV. We compute the widths of the h decays to c \bar c, b \bar b, b \bar s (s \bar b) at full one-loop level. For the h decays to \gamma \gamma and g g we compute the widths at NLO QCD level. For the first time, we perform a systematic MSSM parameter scan for these widths respecting all the relevant theoretical and experimental constraints, such as those from B-meson data, and the 125 GeV Higgs boson data from recent LHC experiments, as well as the limits on Supersymmetric (SUSY) particle masses from the LHC experiments. We also take into account the expected SUSY particle mass limits from the future HL-LHC experiment. In strong contrast to the usual studies in the MSSM with Minimal Flavor Violation (MFV), we find that the deviations of these MSSM decay widths from the Standard Model (SM) values can be quite sizable and that there are significant correlations among these deviations. Furthermore, we point out that the experimental measurement uncertainties as well as the MSSM prediction uncertainties tend to cancel out significantly in the width ratios, making the measurement of these width ratios a very sensitive probe of virtual SUSY loop effects in these h decays at future lepton colliders. All of these sizable deviations in the h decays are mainly due to large scharm-stop mixing and large sstrange-sbottom mixing. Such sizable deviations from the SM can be observed at high signal significance in future lepton colliders such as ILC, CLIC, CEPC, FCC-ee and muon collider even after the failure of SUSY particle discovery at the HL-LHC. In case the deviation pattern shown here is really observed at the lepton colliders, then it would strongly suggest the discovery of QFV SUSY (the MSSM with general QFV).
References:
Phys. Rev. D 91 (2015) 015007; JHEP 1606 (2016) 143; IJMP A34 (2019) 1950120; PoS(ICHEP2022) 536; PoS(EPS-HEP2023) 487.

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Primary authors: Prof. HIDAKA, Keisho (Tokyo Gakugei University); Dr EBERL, Helmut (HEPHY Vienna); Dr GININA, Elena (HEPHY Vienna)

Presenter: Prof. HIDAKA, Keisho (Tokyo Gakugei University)

Session Classification: Higgs, Electroweak

Track Classification: Physics and Detector: Higgs, Electro-Weak

Contribution ID: **177** Type: **Poster (in person)**

Laser and plasma accelerator research for high energy physics at the BELLA Center

Monday, 8 July 2024 17:40 (20 minutes)

The BELLA Center has been pursuing laser and laser-plasma accelerator (LPA) research for high energy physics. One of the ultimate goals is to provide a building block for future linear colliders. At the flagship 1-Hz 1-PW laser facility, the development of a 10-GeV class LPA module is ongoing, and such modules in series are envisioned as the path to a high energy collider at TeV energies and beyond. To achieve the desired luminosities required for such a collider, high repetition-rate (tens of kHz) laser sources are needed. To meet these requirements, the BELLA Center is pursuing a promising technology based on the coherent combining of fiber lasers. In this presentation, the current status of those researches are discussed.

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Primary author: NAKAMURA, Kei (Lawrence Berkeley National Laboratory)

Co-authors: Dr PICKSLEY, Alexander (Lawrence Berkeley National Laboratory); Dr GONSALVES, Anthony (Lawrence Berkeley National Laboratory); GEDDES, Cameron (Lawrence Berkeley National Laboratory); SCHROEDER, Carl; ESAREY, Eric (LBNL); OSTERHOFF, Jens (Lawrence Berkeley National Laborator); Dr VAN TILBORG, Jeroen (Lawrence Berkeley National Laboratory); Dr ZHOU, Tong (Lawrence Berkeley National Laboratory)

Presenter: NAKAMURA, Kei (Lawrence Berkeley National Laboratory)

Session Classification: Poster

Track Classification: Accelerator: Advanced Accelerator Concepts

Contribution ID: **178** Type: **Oral presentation (in person)**

RF breakdown studies at nanosecond timescales using structure wakefield acceleration

High-energy particle accelerators are crucial to the next big discovery in particle physics. To reduce the size and cost of particle accelerators, increasing the accelerating gradient (energy gain per unit length for the particle beam) is of critical importance. Advanced accelerator concepts (AACs) hold the promise of revolutionary future particle colliders with dramatically higher gradients than what conventional accelerator technologies allow. One advanced concept, structure wakefield acceleration (SWFA), aims to raise the gradient and the efficiency by confining the microwave energy in a short and intense pulse. The SWFA concept has inspired a new approach to generate nanosecond RF pulses with a high peak power (on the order of a few hundred megawatts). By using the short RF pulses to study RF breakdown on the nanosecond time scale, we have demonstrated that the short pulse length could potentially mitigate the impact of RF breakdown, and the beam-driven short-pulse acceleration technique could enable a new class of compact accelerators.

Apply for poster award

Primary author: LU, Xueying (Northern Illinois University / Argonne National Lab)

Presenter: LU, Xueying (Northern Illinois University / Argonne National Lab)

Track Classification: Accelerator: Normal Conducting RF

Contribution ID: **179** Type: **Oral presentation (in person)**

Advanced structures R&D for structure wakefield acceleration at the Argonne Wakefield Accelerator

Wednesday, 10 July 2024 14:40 (20 minutes)

Research and development on novel structures is at the core of advancing structure wakefield acceleration (SWFA), and is critical to future AAC-based linear colliders. In this talk, I will present recent progress on the R&D of advanced radiofrequency (RF) structures for Structure Wakefield Acceleration, metamaterial structures, and sub-terahertz structures. The experiments were performed at the Argonne Wakefield Accelerator (AWA) facility, where we capitalized on the capability of generating shaped-electron bunches to improve SWFA performance.

Apply for poster award

Primary author: LU, Xueying (Northern Illinois University / Argonne National Lab)

Presenter: LU, Xueying (Northern Illinois University / Argonne National Lab)

Session Classification: Advanced Accelerator Concepts

Track Classification: Accelerator: Advanced Accelerator Concepts

Contribution ID: **180** Type: **Oral presentation (in person)**

The Quest of Building a TPC Field Cage

For ILD, one of the detector concepts for the proposed International Linear Collider, a time projection chamber (TPC) is foreseen as the central tracking detector. The R&D effort within the LCTPC collaboration has been centred around a common infrastructure setup operated at the DESY II Test Beam Facility. This setup includes a large field cage as test bed for the different readout technologies to be studied under comparable conditions. A second iteration of this field cage has recently been constructed to improve on the shortcomings noticed with its predecessor. The construction was repeatedly delayed and interrupted due to the COVID-19 pandemic but these delays yielded insights that may not otherwise have been observed during an ordinary course of operations. Methods and findings from the build process will be reported.

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Primary author: SCHAEFER, Oliver (DESY Hamburg)

Presenter: SCHAEFER, Oliver (DESY Hamburg)

Session Classification: Vertex, Tracking, Timing detectors

Track Classification: Physics and Detector: Vertex, Tracking, Timing

Contribution ID: **181** Type: **Oral presentation (remote)**

Decoding Higgs Boson Branching Ratios from Event Shape Variables

In this talk I will discuss a novel strategy [1] for the simultaneous measurement of Higgs-boson branching ratios into gluons and light quarks at a future lepton collider operating in the Higgs-factory mode. The method is based on template fits to global event-shape observables, and in particular fractional energy correlations, thereby exploiting differences in the QCD radiation patterns of quarks and gluons. This is
orthogonal to measurements based on traditional tagging methods based mainly on displaced vertices and allows for an extraction of limits on both Higgs boson to gluon- and light quark branching ratios separately. I will also comment on state of the art calculations for the relevant observables based on [2].

[1] Eur.Phys.J.C 84 (2024) 1, 83
[2] arXiv:2403.06929

Apply for poster award

Primary author: REICHELT, Daniel

Presenter: REICHELT, Daniel

Session Classification: Higgs, Electroweak

Track Classification: Physics and Detector: Higgs, Electro-Weak

Contribution ID: **182** Type: **Oral presentation (remote)**

The Alaric parton shower algorithm

Parton showers are important tools in the event generation chain for future collider. Recently, their formally achieved accuracy has been under extended scrutiny. In this talk I will present a novel take on dipole parton showers [1], resulting in the design of a new parton shower called Alaric that is implemented in the Sherpa framework. I will discuss its resummation properties and show analytic and numerical proofs of its NLL accuracy. I will discuss the latest developments, see [2], and their implications for final state evolution.

[1] JHEP 10 (2023) 091
[2] arXiv:2404.14360

Apply for poster award

Primary author: REICHELT, Daniel

Presenter: REICHELT, Daniel

Session Classification: Top, QCD, Flavor, Precision Modelling

Track Classification: Physics and Detector: Top quark, QCD, Flavour, Precision Modelling

Contribution ID: **183** Type: **Oral presentation (in person)**

Searching for heavy neutral leptons through exotic Higgs decays at the ILC

In this study we investigate the feasibility of detecting heavy neutral leptons (N_d) through exotic Higgs decays at the proposed International Linear Collider (ILC), specifically in the channel of $e^+e^- \to qq\ H$ with $H \to \nu N_d \to \nu\ lW \to \nu l\ qq$. Analyses based on full detector simulations of the ILD are performed at the center-of-mass energy of 250 GeV for two different beam polarization schemes with a total integrated luminosity of 2 ab^{-1}. A range of heavy neutral lepton masses between the Z boson and Higgs boson masses are studied. The 2σ significance reach for the joint branching ratio of $BR(H \to \nu N_d) \cdot BR(N_d \to lW)$ is about 0.1\%, nearly independent of the heavy neutral lepton masses, while the 5σ discovery is possible at a branching ratio of 0.3%. Interpreting these results in terms of constraints on the mixing parameters $|\varepsilon_{id}|^2$ between SM neutrinos and the heavy neutral lepton, it is expected to have a factor of 10 improvement from current constraints.

Apply for poster award

Primary authors: TIAN, Junping (University of Tokyo); ISHINO, Masaya (University of Tokyo (JP)); THOR, Simon

Presenter: THOR, Simon

Session Classification: BSM, Global Interpretations

Track Classification: Physics and Detector: BSM, Global Interpretations

Contribution ID: **184** Type: **Oral presentation (in person)**

Physics Considerations for 10-30 TeV e+e-, γγ, and μ+μ- Colliders

Tuesday, 9 July 2024 09:00 (20 minutes)

After the program of Higgs boson physics at a linear collider is completed, we expect that the long, straight tunnel can be used with advanced acceleration methods, such as plasma wakefield, to create a higher-energy collider in the 10's of TeV CM region. This might be an e+e- or a γγ collider. (Circular) muon colliders are also discussed for this energy regime. I will discuss the physics goals of these machines, the luminosity requirements, and the trade-offs among the μ+μ-, e+e-, and γγ options.

Apply for poster award

Primary author: PESKIN, Michael

Presenter: PESKIN, Michael

Session Classification: Advanced Accelerator Concepts

Track Classification: Accelerator: Advanced Accelerator Concepts

Contribution ID: **185** Type: **Poster (in person)**

A CP violating top-Higgs coupling with SMEFT in the Feynman-Diagram gauge

Monday, 8 July 2024 17:40 (20 minutes)

We calculate the cross section for the process $\mu^-\mu^+ \to \nu_\mu \bar{\nu}_\mu t\bar{t}H$ with complex top Yukawa coupling, which can be obtained by adding a gauge invariant dimension-6 operator to the Standard Model (SM) Lagrangian. The Feynman-Diagram (FD) gauge and the unitary (U) gauge amplitudes give exactly the same cross section, and subtle gauge theory cancellation among diagrams in the U gauge at high energies is absent in the FD gauge, as has been observed for various SM processes. In addition, we find that the total cross sections at high energies are dominated by a single, or a set of non-vanishing Feynman amplitudes with the higher dimensional vertices in the FD gauge.

Apply for poster award

Primary authors: HAGIWARA, Kaoru; KANZAKI, Junichi; MATTELAER, Olivier; MAWATARI, Kentarou; ZHENG, Ya-Juan

Presenter: ZHENG, Ya-Juan

Session Classification: Poster

Track Classification: Physics and Detector: BSM, Global Interpretations

Contribution ID: **186** Type: **Oral presentation (in person)**

A Wakefield Resilient, High Shunt Impedance Accelerating Structure for the Cold Copper Collider

The initial proposed design of the Cold Copper Collider (C3) is based on a distributed coupling accelerating (DCA) rf structure where the phase advance between the accelerating standing wave cavities is π. In these cavities the aperture radius is 2.624 mm and the corresponding shunt impedance is 300 MΩ/m with 77K copper walls. We propose a novel DCA rf structure with 3π/4 phase advance between the individually fed cavities aperture radius of 3.55mm for the same shunt impedance and the peak field constraints. Because of this 35% larger aperture, this rf structure is much more resilient to both short-range and long-range wakefield effects. The researchers at SLAC have already proposed and designed a 3π/4 DCA with four feeding waveguide manifolds. The implementation of four waveguide manifolds is, however, mechanically challenging. Here, we present a novel 3π/4 DCA for C3 which is based on only two waveguide manifolds. This rf structure comprises of 56 cavities where cavities are fed in pairs through a standard π phase advance rf manifold. This is achieved by pairing the cavities as, first and third, second and forth, and so on. With such pairing, the phase advance between the two cavities in a pair is π/2 and the phase advance between successive pairs is π. The copper cavities are designed to give a coupling coefficient of 1.82 at 77K temperature, as required for critical coupling to accelerate 190 mA with 70 MV/m gradient.

Apply for poster award

Primary authors: NANNI, Emilio (SLAC National Accelerator Laboratory); SHUMAIL, Muhammad (SLAC); LI, Zenghai (SLAC)

Presenter: SHUMAIL, Muhammad (SLAC)

Track Classification: Accelerator: Normal Conducting RF

Contribution ID: **187** Type: **Oral presentation (remote)**

Status and Plans for the C3 Quarter Cryomodule

To achieve target performance of the C3 accelerator, many elements will need to be manufactured, assembled, and aligned in use to very tight tolerances. Testing of accelerating structure manufacturing, alignment, mounting, and liquid nitrogen cooling will be performed at SLAC using an accelerator length of approximately 2 meters. This talk will review progress and plans toward commissioning a Quarter Cryo-Module "QCM"test system including the design of a 1 meter length of accelerating structure and the support and alignment system required for test. This system review will include details of the vacuum insulated cryostat sized to allow testing 2 sections of 1m long accelerating structure with quad and BPM supported on a frame representative of a system that could be used in the C3 target cryo-module containing 8 meters of accelerating structure. It is intended that the QCM system will be used to evaluate a series of accelerating structures, supports, and measurements techniques. Some of the initial plans will be reviewed in this talk.

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Primary authors: VERNIERI, Caterina (SLAC National Accelerator Laboratory (US)); NANNI, Emilio (SLAC National Accelerator Laboratory); Mr ANDY, Haase (SLAC National Accelerator Laboratory / Stanford University); BREIDENBACH, Martin (SLAC); SHUMAIL, Muhammad (SLAC); LI, Zenghai (SLAC)

Presenter: Mr ANDY, Haase (SLAC National Accelerator Laboratory / Stanford University)

Track Classification: Accelerator: Normal Conducting RF

Contribution ID: **188** Type: **Oral presentation (remote)**

High Gradient Testing of a Meter-Scale Distributed-Coupling C3 Accelerating Structures

In this paper we report on the design, fabrication, tuning and high-power RF testing of the fundamental accelerating structure for the Cool Copper Collider (CCC). The results presented here cover the temperature range from room temperature to liquid nitrogen boil off: 20oC - 77 K

At room temperature, RT, with a N2 gas purge of 1 atmosphere, the CCC structure was tuned to a resonance frequency of < fo> = 5.693 420 GHz, at 77K the structure tuned frequency is reported as < fo> = 5.712 057 667 GHz. The repeatability of the CCC structure to undergo both vacuum pump down and thermal cycles from RT to LN2 will be presented.

For the high-power RF testing the CCC structure was immersed in liquid nitrogen at the Radiabeam C-Band test facility. High Power RF breakdown data will be present along with our future experimental plans.

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Primary authors: DHAR, Ankur (SLAC National Accelerator Lab); PALMER, Dennis (SLAC National Accelerator Laboratory / Stanford University); NANNI, Emilio (SLAC National Accelerator Laboratory); BROZENETS, Valery (SLAC National Accelerator Laboratory / Stanford University)

Presenter: PALMER, Dennis (SLAC National Accelerator Laboratory / Stanford University)

Track Classification: Accelerator: Normal Conducting RF

Contribution ID: **190** Type: **Oral presentation (in person)**

Jet origin identification for electron positron Higgs factory

To enhance the scientific discovery power of high-energy collider experiments, we propose and realize the concept of jet origin identification that categorizes jets into 5 quark species (b, c, s, u, d), 5 anti-quarks (¯b, ¯c, ¯s, ¯u, ¯ d), and the gluon. Using state-of-the-art algorithms and simulated ν¯νH,H ⟶jj events at 240 GeV center-of-mass energy at the electron-positron Higgs factory, the jet origin
identification simultaneously reaches jet flavor tagging efficiencies ranging from 67% to 92% for bottom, charm, and strange quarks, and jet charge flip rates of 7% to 24% for all quark species.
We apply the jet origin identification to Higgs rare and exotic decay measurements at the nominal luminosity of the Circular Electron Positron Collider (CEPC), and conclude that the upper limits on the branching ratios of H ⟶ s¯s, u¯u, d ¯ d, and H ⟶ sb, db, uc, ds can be determined to 2×10−4 to 1×10−3 at 95% confidence level.
We also discussed its application on EW and Flavor Physics measurements at future electron-positron Higgs factory.

Apply for poster award

Primary author: RUAN, Manqi (IHEP-LLR/CERN)

Presenter: RUAN, Manqi (IHEP-LLR/CERN)

Session Classification: Software, Reconstruction, Computing

Track Classification: Physics and Detector: Software, Reconstruction, Computing

Contribution ID: **191** Type: **Oral presentation (in person)**

Design of the ILC electron-driven positron source and utilization of black-box optimization

The International Linear Collider (ILC) represents the next generation of electron-positron colliders, designed to operate at center-of-mass energies ranging from 250 GeV, with plans to extend up to 1 TeV in the future. This opens up a broad spectrum of possibilities for exploring physics beyond the Standard Model. The ILC requires advanced engineering technology and meticulous design to generate large quantities of positrons. In the design of the ILC electron-driven positron source, simulation tools such as Geant4, GPT, and SAD are employed. In a significant shift from the previous human-intensive, step-by-step optimization procedures, we have now embraced black-box optimization methods, including Bayesian optimization, to streamline and enhance the parameter optimization of the positron source accelerator system. This methodological evolution has not only boosted efficiency but also redirected more resources towards further design improvements. By incorporating machine learning techniques from the initial stages of accelerator design, we anticipate the development of accelerators that are not only more efficient but also significantly more precise. Here, we present the current status of the ILC electron-driven positron source and its design methodology.

Apply for poster award

Primary author: KUROGUCHI, Shunpei (Hiroshima U.)

Co-authors: TAJINO, Hiroki; URAKAWA, Junji (KEK); YOKOYA, Kaoru; ZACHARY, Liptak (Hiroshima University); FUKUDA, Masafumi (KEK: High energy accelerator research organization); KURIKI, Masao; TAKAHASHI, Tohru; Mr MORIKAWA, Yu (KEK); OMORI, tsunehiko (KEK); Dr ENOMOTO, yoshinori (KEK)

Presenter: KUROGUCHI, Shunpei (Hiroshima U.)

Session Classification: Sources

Track Classification: Accelerator: Sources

Contribution ID: **192** Type: **Oral presentation (remote)**

Towards production readiness with the Key4hep software stack for future colliders

Physics studies for future colliders require a reliable software environment. For many years this has been delivered by iLCSoft for the linear collider communities. In the last five years a common effort of several communities, including ILC, CLIC, FCC and CEPC, have collaborated on the Key4hep software stack to deliver a common software stack for all future collider communities. This software stack has been used for physics studies already and is reaching production readiness.

This presentation an overview of the current status of Key4hep, giving special emphasis on the developments that are particularly relevant for the linear collider communities. We will show the seamless integration of existing reconstruction and analysis software that have been developed in the last 15 years by the linear collider communities. Additionally, we will lay out the path forward from a software perspective and report on experiences from migrating the standard ILD reconstruction chain towards Key4hep. Additionally, we show some new developments for ILD that are currently ongoing within Key4hep. Finally, we report on currently ongoing developments and future plans.

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Primary authors: SAILER, Andre (CERN); HEGNER, Benedikt (CERN); FRANCOIS, Brieuc (CERN); GAEDE, Frank; GANIS, Gerardo (CERN); STEWART, Graeme A (CERN); XINGTAO, Huang (Shandong University); ZOU, Jiaheng (Chinese Academy of Sciences); CARCELLER, Juan Miguel (CERN); SMIESKO, Juraj (CERN); REICHENBACH, Leonhard (CERN / University of Bonn (DE)); FILA, Mateusz Jakub (CERN); KO, Sang Hyuon (Seoul National University); SASIKUMAR, Swathi (CERN); LIN, Tao (IHEP); LI, Teng (Shandong University); MADLENER, Thomas (Deutsches Elektronen-Synchrotron (DE)); LI, Weidong (IHEP); FANG, Wenxing (IHEP); ZHANG, Xiaomei (IHEP)

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

Session Classification: Software, Reconstruction, Computing

Track Classification: Physics and Detector: Software, Reconstruction, Computing

Contribution ID: **196** Type: **Oral presentation (in person)**

Fast Timing for Particle ID

The identification of certain charged hadron species, e.g. Kaons and protons, plays an important role in many physics analyses. Time-of-flight measurements can contribute to identifying these particles if both the length of the flight path as well as the time of arrival can be determined with sufficient precision. This contribution will discuss the recent progress on both aspects, and in particular compare classic as well as machine-learning based algorithms in order to estimate the time-of-arrival at the calorimeter front from the time measurements of individual hits in a shower or MIP trace.

Apply for poster award

Primary authors: DUDAR, Bohdan (DESY); GAEDE, Frank; LIST, Jenny (Deutsches Elektronen-Synchrotron (DE)); HELMS, Konrad

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

Session Classification: Software, Reconstruction, Computing

Track Classification: Physics and Detector: Software, Reconstruction, Computing

Contribution ID: **197** Type: **Oral presentation (remote)**

Capture Cavities for the CW Polarized Positron Source Ce+BAF

The initial design of the capture cavities for the continuous wave (CW) polarized positron beams at Jefferson Lab (Ce+BAF) is presented. A chain of standing wave multi-cell copper cavities inside a solenoid tunnel are selected to bunch/capture positrons. The cavity design strategy is presented to accommodate constrains from the large phase distribution of the incident beams, RF power, radiation and RF heating, beam loading, etc. to improve the capture efficiency. A matrix of design parameters' range are given for future system optimization when the the capture cavities are considered together with other sub-systems and beam dynamics. The contents will also be useful for other CW cavity design for beams with large phase space distribution.

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Primary author: WANG, Shaoheng (Jefferson Lab)

Co-authors: USHAKOV, Andriy (Jefferson Lab); WANG, Haipeng; GRAMES, Joseph (JLab); Dr RAUT, Nabin (Jefferson Lab); RIMMER, Robert (JLab); ROBLIN, Yves

Presenter: WANG, Shaoheng (Jefferson Lab)

Track Classification: Accelerator: Normal Conducting RF

Contribution ID: **199** Type: **Oral presentation (in person)**

Status of the drift chamber project for the IDEA detector proposal for FCC-ee

The future circular electron-positron collider FCCee is receiving much attention in the context of the FCC Feasibility Study currently in progress in preparation for the next EU strategy update. The most recent status of the R&D of the drift chamber project for the IDEA detector concept is presented. We discuss the physics requirements, the technical solutions chosen to address them, the performance of the cluster counting technique to improve the particle identification capability of the detector by using testbeam data, and the further steps on the path of the construction of a full-lenght prototype.

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Primary author: DE FILIPPIS, Nicola (Politecnico e INFN, Bari (IT))

Presenter: DE FILIPPIS, Nicola (Politecnico e INFN, Bari (IT))

Session Classification: Vertex, Tracking, Timing detectors

Track Classification: Physics and Detector: Vertex, Tracking, Timing

Contribution ID: **201** Type: **Oral presentation (in person)**

Challenges and breakthroughs in recent RF Solid State PA design by Radial Combiner design with Initiatives for SDGs

R&K, an independent company, has achieved production of 2.3 million 1.9GHz microwave power amplifiers for mobile-comm's-base-stations and then also supplies wideband power amplifiers for automobile EMC testing for domestic automobile industries. Then 16 years ago, we started new design and producing some hundreds kW RF SSA for accelerator applications instead of Klystron / tube alternatives.

The measure characteristics of this amplifier is possible to design a band in a very wide frequency range available from few MHz to 14 GHz, and there is also max-power-changing capability in few kW to few MW design available even after system completed. Recently, SSA has gained significant advantages over vacuum tubes in terms of size, low power consumption, high efficiency, low cost, and adaptive power design. In addition to these, we have found that SSA has very low phase noise and low envelope noise that cannot be achieved with vacuum tubes.

All these points suggest a strong trend toward solid-state amplifiers and a move away from vacuum tube systems, even for power amplifiers used in particle accelerators. There is no doubt that all these improved performances will eventually lead to a strong trend towards his SDGs.

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Primary author: Mr KOBANA, Riichiro (R&K Company Limited)

Presenter: Mr KOBANA, Riichiro (R&K Company Limited)

Track Classification: Accelerator: Superconducting RF

Contribution ID: **202** Type: **Oral presentation (remote)**

Global EFT fits for future colliders

We present SMEFiT3.0, an updated global SMEFT analysis of Higgs, top quark, and diboson production data from the LHC complemented by electroweak precision observables (EWPOs) from LEP and SLD. We consider recent inclusive and differential measurements from the LHC Run II and estimate the impact of HL-LHC measurements on the SMEFT parameter space when added on top of SMEFiT3.0, through dedicated projections extrapolating from Run II data. We quantify the significant constraints that measurements from two proposed high-energy circular colliders, the FCC-ee and the CEPC, would impose on both the SMEFT parameter space and on representative UV-complete models. The framework presented in this work may be extended to other future colliders and running scenarios, providing timely input to ongoing studies towards future high-energy particle physics facilities.

Apply for poster award

Primary author: VRYONIDOU, Eleni (University of Manchester (GB))

Presenter: VRYONIDOU, Eleni (University of Manchester (GB))

Session Classification: BSM, Global Interpretations

Track Classification: Physics and Detector: BSM, Global Interpretations

Contribution ID: **204** Type: **Oral presentation (remote)**

Update of the CLIC RTML

The CLIC RTML was simulated and optimised for the 380 GeV energy stage. Some remaining problems in the RTML design were solved and the baseline design was finalised. The cost for the BC2 and the bunch phase shift effect were minimised.Static imperfections were studied with the emittance budget well achieved after BBA corrections. Jitter amplification was also studied. The possibility of using X-band or C-band booster linac was also studied.

Apply for poster award

Primary author: ZHAO, Yongke (CERN)

Co-author: LATINA, Andrea (CERN)

Presenter: ZHAO, Yongke (CERN)

Session Classification: Beam Dynamics

Track Classification: Accelerator: Beam dynamics

Contribution ID: **205** Type: **Oral presentation (in person)**

ttbar-threshold: Focus topics for the ECFA study on Higgs / Top / EW factories

I present the status of the ECFA Higgs/EW/Top Factory workshop activities for the ttbar-threshold focus topic (see https://arxiv.org/pdf/2401.07564).
An expert team has been setup aiming to provide a firm basis for the projected precision of the top quark mass and width measurements from a scan of the center-of-mass energy through the top quark pair production threshold. The prospects for measurements of top quark electro-weak couplings are included in the study, too. The goal is to provide a realistic estimate of statistical uncertainties, and systematic uncertainties from theory and experiment.

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Primary author: VOS, Marcel (IFIC (UVEG/CSIC) Valencia)

Presenter: VOS, Marcel (IFIC (UVEG/CSIC) Valencia)

Session Classification: Top, QCD, Flavor, Precision Modelling

Track Classification: Physics and Detector: Top quark, QCD, Flavour, Precision Modelling

Contribution ID: **206** Type: **Oral presentation (remote)**

Tracking Performance Study for Future Circular Collider (FCCee) with CLD Detector

The Future Circular Collider electron-positron (FCCee) feasibility study involves assessing the capabilities and performance of potential detector configurations. This study focuses on the impact of various detector parameters on tracking performance. Specifically, the influence of different geometries, material budgets, and magnetic field strengths on the precision and efficiency of tracking performance within the CLIC-Like Detector is investigated.

Tracking performance is evaluated using full simulations. The effects on track reconstruction efficiency and resolution are assessed by adjusting the detector geometry and material. Additionally, the influence of magnetic field strengths on tracking accuracy is explored.

This study provides valuable insights into optimising the design parameters of the FCCee detector to achieve high tracking performance, contributing essential information for the ongoing FCCee feasibility study and future collider detector development.

Keywords: FCCee feasibility study, CLD, Full simulation, tracking performance, detector geometry

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Primary author: SADOWSKI, Gaelle (Centre National de la Recherche Scientifique (FR))

Co-authors: ANDREA, Jeremy (Centre National de la Recherche Scientifique (FR)); BESSON, Auguste Guillaume (Centre National de la Recherche Scientifique (FR)); EL BITAR, Ziad (Centre National de la Recherche Scientifique (FR))

Presenter: SADOWSKI, Gaelle (Centre National de la Recherche Scientifique (FR))

Session Classification: Vertex, Tracking, Timing detectors

Track Classification: Physics and Detector: Vertex, Tracking, Timing

Contribution ID: **207** Type: **Oral presentation (in person)**

Searching for new physics in WW and single-W events

Pair- and single-production of W bosons provide many opportunities to look for new physics via precision measurements, for instance via scrutinizing the involved triple-gauge vertices or by measuring CKM matrix elements in an environment very complementary to B hadron decays. This contribution presents the ongoing work based on full simulation of the ILD detector concept, exploiting the O(10ˆ8) W bosons produced during the 250 GeV stage of the ILC.

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Primary authors: FILIPE, Andre (DESY); LIST, Jenny (Deutsches Elektronen-Synchrotron (DE)); REICHENBACH, Leonhard (CERN / University of Bonn (DE)); EINHAUS, Ulrich (DESY)

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

Session Classification: Higgs, Electroweak

Track Classification: Physics and Detector: Higgs, Electro-Weak

Contribution ID: **208** Type: **Oral presentation (remote)**

Towards an update of the ILD ZHH analysis

The double Higgs-strahlungs process ee -> ZHH allows to access the Higgs self-coupling at energies above ˜450 GeV. It exhibits a very different BSM behaviour than fusion-type processes like gluon-gluon fusion at LHC (and future hadron colliders) and WW / ZZ fusion at higher energy lepton colliders. Therefore it adds unique information to the picture, in particular should the value of the Higgs self-coupling differ from its SM prediction. The last full evaluation of the ILC's potential to measure this process is more than 10 years old, and many of the reconstruction tools received very significant improvements since. This contribution will present the ongoing work in ILD to update the ZHH projections for the next European Particle Physics Strategy Update.

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Primary authors: BLIEWERT, Bryan; VERNIERI, Caterina (SLAC National Accelerator Laboratory (US)); NTOUNIS, Dimitris (SLAC National Accelerator Laboratory (US)); LIST, Jenny (Deutsches Elektronen-Synchrotron (DE)); TORNDAL, Julie Munch (DESY); TIAN, Junping (University of Tokyo)

Presenter: BLIEWERT, Bryan

Session Classification: Higgs, Electroweak

Track Classification: Physics and Detector: Higgs, Electro-Weak

Contribution ID: **209** Type: **Poster (in person)**

ScandiNova modulators for electron-driven positron source in ILC project

The International Linear Collider (ILC) is an electron-positron linear collider to explore physics beyond the Standard Model of particle physics in the center of mass energy of 250 GeV to 1 TeV.
In the TDR, to make a positron, a helical undulator of more than 150 m long will be planning to insert in the main electron linac.
And in parallel, to mitigate the risks associated with the project, a backup system by using electron-driven positron source has been studying. In this paper, we will describe the solid state modulator with klystron, called “RF unit”, which maybe possible to realize the ILC positron source.

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Primary author: YUSHIRO, Osamu (ScandiNova Systems KK)

Co-author: Mr PEPITONE, kevin (ScandiNova Systems AB)

Presenters: YUSHIRO, Osamu (ScandiNova Systems KK); Mr PEPITONE, kevin (ScandiNova Systems AB)

Track Classification: Accelerator: Normal Conducting RF

Contribution ID: **210** Type: **Oral presentation (in person)**

Progress of research on corrugated wakefield structures in PAL working group.

Wednesday, 10 July 2024 15:00 (20 minutes)

Our research group, composed of Pohang Accelerator Laboratory, Korea University, Northen Illinois Universiy, and Argonne Wakefield Accelerator Facility, is researching on wakefields generated in corrugated structures. Main goal of our research is to make several applications such as a THz source in the GW scale, wakefield accelerators and IR-FELs.
As a first step, we designed and fabricated structures in the 200 GHz frequency range, and their performance were validated by the experimental results in AWA. In the first experiment, even with a fabrication tolerance of around 10 micrometers, the simulation results matched well with the experimental results. We are developing more precise fabrication methods by lithography for higher output power and frequency. As the second step, we are preparing to fabricate corrugated structures around 425 GHz and demonstrate GW-level THz output.

Apply for poster award

Primary author: KONG, Hyung-sup (Pohang Accelerator Laboratory)

Co-authors: Dr CHEN, Gongxiaohui (Argonne National Laboratory); HA, Gwanghui (Northern Illinois University); Dr KWAK, Ho Jae (Pohang Accelerator Laboratory); Ms KIM, Jina (Pohang Accelerator Laboratory); Dr KO, Jinjoo (Korea University Sejong Campus); Dr POWER, John (Argonne National Laboratory); Dr KIM, JongHyun (Pohang Accelerator Laboratory); Mr SEO, Min Kyu (Korea University Sejong Campus); Prof. PARK, S.H. (Korea University Sejong Campus); Dr DORAN, Scott (Argonne National Laboratory); Mr KIM, Seung-hwan (Pohang Accelerator Laboratory); Dr SHIN, Seunghwan (Korea Photon Source); Dr LIU, Wanming (Argonne National Laboratory)

Presenter: KONG, Hyung-sup (Pohang Accelerator Laboratory)

Session Classification: Advanced Accelerator Concepts

Track Classification: Accelerator: Advanced Accelerator Concepts

Contribution ID: **212** Type: **Oral presentation (in person)**

Recent updates of BSM searches at CMS and future prospects at HL-LHC

This talk covers recent highlights of BSM searches from the CMS experiment and future prospects at HL-LHC.

Apply for poster award

Primary author: LEE, Jeongeun (Seoul National University (KR))

Presenter: LEE, Jeongeun (Seoul National University (KR))

Session Classification: BSM, Global Interpretations

Track Classification: Physics and Detector: BSM, Global Interpretations

Contribution ID: **214** Type: **Oral presentation (in person)**

Luminosity Spectra of Multi-TeV PWFA Gamma-Gamma Colliders

Tuesday, 9 July 2024 09:20 (20 minutes)

There is growing interest in the gamma-gamma configurations of multi-TeV PWFA colliders since they do not require positrons or flat beams and may have the same particle physics potential as multi-TeV electron positron or muon anti-muon colliders. In this report the CAIN Monte Carlo is used to study the luminosity spectra of several gamma-gamma configurations assuming a round beam 15 TeV PWFA electron electron collider with a geometric luminosity of 1.5e36 cm-2 s-1. As a starting point, the parameters for optical laser and X-ray laser gamma gamma Higgs factory designs are scaled to 15 TeV center-of-mass energy. Wide variations in the luminosity spectra are observed as the laser wavelength is varied. Large beam-beam electromagnetic fields strengths – approaching 60% of the Schwinger field in some cases –play a major role in determining the size and shape of the gamma-gamma luminosity spectra.

Apply for poster award

Primary author: BARKLOW, Tim (SLAC National Accelerator Laboratory (US))

Presenter: BARKLOW, Tim (SLAC National Accelerator Laboratory (US))

Session Classification: Advanced Accelerator Concepts

Track Classification: Accelerator: Advanced Accelerator Concepts

Contribution ID: **215** Type: **Oral presentation (in person)**

Reimagining Linear Collider Luminosity Measurement

Our recent work has shown that a novel, much higher granularity forward calorimetry concept can enable much more detailed and precise reconstruction than the baseline designs based on LEP luminometers, together with the capability of electron/positron/photon separation.

This new calorimeter concept is designed primarily to maximize the acceptance for $e^+e^- \to \gamma\gamma$ as an alternative luminosity process, where it serves to define the inner edge of the acceptance (there is no outer edge - as the complete detector is used in the measurement), while continuing to provide the standard luminosity measurement from small angle Bhabhas. It will also serve as a general forward electromagnetic calorimeter helping ensure hermeticity and detecting individual electrons, positrons and photons.

In this contribution we will highlight the Bhabha rejection capability in the context of the $e^+e^- \to \gamma\gamma$ luminosity measurement and investigate the utility of a Bhabha "mini-tracker" consisting of a few planes of upstream thin silicon detectors. This will further refine the e^+/e^- polar angle measurement, improve Bhabha rejection (for $\gamma\gamma$), and, last-but-not-least, help mitigate the beam-induced electromagnetic deflection that biases the Bhabha acceptance by providing high precision longitudinal vertex information in Bhabha events than can be used in diagnosing this beam/final-state e^+/e^- effect.

Apply for poster award

Primary author: WILSON, Graham

Co-author: Mr MADISON, Brendon (University of Kansas)

Presenter: WILSON, Graham

Session Classification: Top, QCD, Flavor, Precision Modelling

Track Classification: Physics and Detector: Top quark, QCD, Flavour, Precision Modelling

Contribution ID: **216** Type: **Oral presentation (remote)**

Photon and Electron Reconstruction in an Ultra-High Granularity Luminosity Calorimeter

Our recent work has shown that a novel, ultra-high granularity, forward calorimetry concept can enable much more detailed and precise reconstruction than the compact baseline designs based on LEP luminometers, together with the capability of electron/positron/photon separation.
In this contribution we will highlight the significantly more precise measurements of photon four-vectors using both much better sampling for high performance energy resolution ($4\%/\sqrt{E}$) and the use of the energy deposition around the initial photon conversion point rather than the traditional shower center-of-gravity based estimates. We will also include related results on shower fitting.

Apply for poster award

Primary author: MADISON, Brendon (University of Kansas)

Co-author: WILSON, Graham

Presenter: MADISON, Brendon (University of Kansas)

Session Classification: Calorimetry, Muon detectors

Track Classification: Physics and Detector: Calorimetry, Muon

Contribution ID: **217** Type: **Oral presentation (in person)**

SRF programs towards High-Q/High-G cavities in IJCLab

IJCLab has been leading development and deployment of low-beta SRF cavities for proton and heavy ion accelerators.
We are launching a new project for sustainable Energy Recovery Linac (iSAS/PERLE) with state-of-the-art SRF cavities at 800 MHz.
Our proposal includes advanced heat treatment of such cavities to reach excellent quality factor at high fields.
In this talk, we overview the status of this activity and its technical synergy with other SRF projects, such as FCCee, EIC, and ILC.

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Primary author: MIYAZAKI, Akira (CNRS/IN2P3/IJCLab Université Paris-Saclay (FR))

Presenter: MIYAZAKI, Akira (CNRS/IN2P3/IJCLab Université Paris-Saclay (FR))

Track Classification: Accelerator: Superconducting RF

Contribution ID: **218** Type: **Oral presentation (in person)**

Higgs Production at \muˆ+ \muˆ+ Colliders

Muon colliders offer exciting new opportunities to explore the Standard Model and beyond by unifying the energy and precision frontiers, thus also facilitating deeper insight into the Higgs sector central to the Standard Model. In this work, motivated by recent developments in anti-muon cooling, we explore the prospects of Higgs production at \muˆ+ \muˆ+ colliders. At high energies, Higgs production is dominated by WW-fusion, which for \muˆ+ \muˆ+ colliders occurs via splitting of an intermediate photon into a Wˆ+ Wˆ- pair. However, collinear photon emissions lead to numerical instabilities that make computations using event generators difficult. We therefore propose splitting the phase-space into the sum of a non-collinear region calculable using event generators, and a collinear region approximated by a parton distribution function for the photon. We thus find that the cross-section for Higgs-production at \muˆ+ \muˆ+ colliders is almost as big as for \muˆ+ \muˆ- colliders, and in particular for polarized anti-muons, is only smaller by a factor of about two. Hence, we argue that \muˆ+ \muˆ+ colliders offer a great opportunity as Higgs factories to be constructed in the not-too-distant future.

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Primary authors: TAKAURA, Hiromasa (KEK); Mr TREUER, Lukas (KEK, The Gaduate U. Adv. Studies (SOKENDAI)); TAKAI, Ryoto (KEK, The Gaduate U. Adv. Studies (SOKENDAI)); KITANO, Ryuichiro; MATSUDO, Ryutaro (KEK); OKAWA, Shohei (KEK); HAMADA, Yu (DESY)

Presenter: Mr TREUER, Lukas (KEK, The Gaduate U. Adv. Studies (SOKENDAI))

Session Classification: Higgs, Electroweak

Track Classification: Physics and Detector: Higgs, Electro-Weak

Contribution ID: **219** Type: **Oral presentation (remote)**

Metrology in the integrated luminosity measurement at ILC

Possibility that the ILD detector might be realized at a future e+e- collider calls for quantification of precision of the integrated luminosity measurement, assuming here the ILC operating scenarios at the Z-pole, 250 GeV, 500 GeV and 1 TeV center-of-mass energies. This is the first comprehensive study of the systematic uncertainties in integrated luminosity measurement at ILC, rising from metrology (detector positioning and alignment, beam properties and delivery to the IP), after the generic estimates given in LC-DET-2005-004.

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Primary authors: Dr SMILJANIC, Ivan (VINCA Institute of Nuclear Sciences, University of Belgrade (RS)); BOZOVIC-JELISAVCIC, Ivanka (University of Belgrade (RS))

Co-author: Dr KACAREVIC, Goran (VINCA Institute of Nuclear Sciences, University of Belgrade (RS))

Presenter: Dr SMILJANIC, Ivan (VINCA Institute of Nuclear Sciences, University of Belgrade (RS))

Session Classification: Calorimetry, Muon detectors

Track Classification: Physics and Detector: Calorimetry, Muon

Contribution ID: **221** Type: **Oral presentation (remote)**

Resonant emittance mixing of flat beams in plasma accelerators

Wednesday, 10 July 2024 14:20 (20 minutes)

Plasma accelerators sustain large field gradients and could enable future x-ray sources and compact linear colliders. The development of performant open-source simulation methods allows for the investigation of open challenges towards these applications, including the acceleration of beam with high quality and the staging of multople plasma accelerators towards high energies. This presentation will discuss recent studies on these topics. In particular, to achieve the required high luminosity, linear colliders rely on flat beams to avoid potentially deleterious beamstrahlung effects. We show that flat beams in plasma accelerators can be subject to beam quality degradation due to emittance mixing caused by transverse coupling in the wakefields. When there is a resonance between the betatron oscillations in the horizontal and vertical planes for the beam particles in a coupled wakefield, the transverse emittances fully exchange, leading to a round beam. Depending on the mechanism causing the resonance, the use of laser drivers, flat particle beam drivers, or hollow plasma channels can avoid the resonance and mitigate the emittance deterioration.

Apply for poster award

Primary author: THÉVENET, Maxence (DESY)

Presenter: THÉVENET, Maxence (DESY)

Session Classification: Advanced Accelerator Concepts

Track Classification: Accelerator: Advanced Accelerator Concepts

Contribution ID: **223** Type: **Oral presentation (remote)**

Plasma processing development for SPIRAL2 quarter-wave resonators: experimental and simulation studies

Plasma processing stands as an in-situ technique for mitigating field emission and multipacting effects in the long-term operation of superconducting accelerating cavities. While extensively explored and applied to elliptical cavities, its application to quarter-wave resonators (QWRs) represents a relatively recent area of investigation. At IJCLab, ongoing efforts focus on refining plasma processing techniques tailored for SPIRAL2 QWRs. This talk will center on our experimental findings, compared with numerical simulations of a simplified system featuring 2D axisymmetric geometry and employing a basic plasma chemistry composed of pure argon, instead of Ar/O2(10%). This strategic simplification makes it possible to reduce the calculation time while also providing an understanding of the dynamics of the plasma within the cavity. The simulations have been conducted using COMSOL Multiphysics.

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Primary author: CHENEY, Camille (IJCLAB)

Presenter: CHENEY, Camille (IJCLAB)

Track Classification: Accelerator: Superconducting RF

Contribution ID: **224** Type: **not specified**

Energy Upgrades of a linear Higgs factory

Monday, 8 July 2024 15:15 (15 minutes)

Presenter: NANNI, Emilio (SLAC National Accelerator Laboratory)

Session Classification: Accelerator Plenary