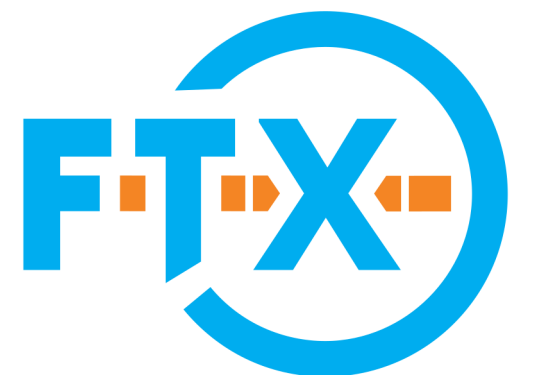




News from IDT-WG3

Physics, software, Detec for R&D and MDI - and ECFA Higgs Factory Study

Jenny List (DESY)
ILC Europe Meeting, April 22 2021



WG3 - Physics Potential and Opportunities

Michael Peskin, Aidan Robson, and Junping Tian (WG3 Physics conveners); Jenny List (WG3 deputy chair)

- Welcoming as topical group conveners:
 - **Higgs:** Shinya Kanemura (Osaka), Patrick Meade (Stony Brook), Chris Potter (Oregon), Georg Weiglein (DESY), TBA
 - **Top/Heavy Flavour/QCD:** Adrian Irlles (Valencia), Hua-Xing Zhu (Zhejiang), TBA (experimentalist), TBA (theorist)
 - **BSM:** Mikael Berggren (DESY), Shigeki Matsumoto (IPMU), Werner Porod (Würzburg), Simone Pagan Griso (LBNL)
 - **Electroweak:** Taikan Suehara (Kyushu), Wolfgang Kilian (Siegen), Graham Wilson (Kansas), TBA
 - **Global Interpretations:** Tim Cohen (Oregon), Christophe Grojean (DESY), Sven Heinemeyer (Santander), Sunghoon Jung (Seoul)
 - **Modelling and Precision Calculation:** Gudrun Heinrich (KIT), Stefan Hoeche (Fermilab), Juergen Reuter (DESY), Zhao Li (IHEP)
- first meeting with all Topical Group Conveners held on April 20
- **first public & scientific meeting planned for May 27, 15:00-17:00 CEST:**
 - short presentation from each Topical Group on their program / plans
 - 1h Mini-Symposium on Muon $g-2$ and implications for $e+e-$
 - plan to hold public scientific meetings about once per month, each organised by 2-3 Topical Groups
- **sign-up for mailing lists, overall WG3 and topical lists:** <https://agenda.linearcollider.org/event/9154/>

WG3 - Software & Computing

Frank Gaede, Jan Strube, and Daniel Jeans (WG3 Software&Computing conveners); Jenny List (WG3 deputy chair)

- sent out letters to software&computing groups at major US labs inviting discussion about possible contributions
=> several positive, interested responses so far, following up
- web presence:
 - <https://linearcollider.org/wg3/software-and-computing/>
 - computing documents available under zenodo:
 - Computing requirements for the ILC (2016):
<https://zenodo.org/record/4659567>
 - Computing for the ILD experiment (2015):
<https://zenodo.org/record/4659571>
 - for more dynamic / technical information:
<https://github.com/Linearcollider/IDT-WG3-SoftComp/>

WG3 - MDI & Detector R&D

Katja Krüger, David Miller, Marcel Vos, Petra Merkel (Detector R&D);

Roman Pöschl, Karsten Büßer, Yasuhiro Sugimoto (MDI); Claude Vallée (WG3 deputy chair)

- **MDI:**

- complementing **Detector Hall and IP Campus panels:**

Tom Markievicz / Marcel Stanitzki for SiD, CLICdp still open

- setting up transversal task force on “**Impact of Beam Delivery System on detector design and physics reach**” -> Roman Pöschl

- **Detector R&D:**

- setting up transversal task force for “**Coordination of performance studies including emerging technologies and alternative detector solutions**”

- start thinking about a common set of rules and tools for performance evaluation of detector and technology options
- perform a survey of short-term openings for PhD and postdoc position for detector performance evaluations

WG3 - Speakers Bureau

Ivanca Bosovic, Kiyotomo Kawagoe, Alain Bellerive

- organising basic set of abstracts for major conferences
- in close communication with ILD / SiD
- can be contacted if ILC talk needed

LIST OF IDT WG₃ TALKS

IDT WG3 Speakers Bureau
idt-wg3-sb@kek.ap

LHCP2021, 9th Edition of the Large Hadron Collider Physics Conference

<https://indico.cern.ch/event/905399/>
7-12 June 2021, Paris, France

Poster:

- New ideas on detector technology for the ILC experiments

EPS-HEP 2021, European Physical Society conference on high energy physics

<https://www.eps-hep2021.eu/>
Online conference, July 26-30 2021

Parallel talks:

- ILC Higgs physics potential
- Higgs invisible and rare decays at ILC
- t-quark physics at ILC
- Probing dark matter with ILC
- CP violation in the Higgs sector at ILC

US-Japan Hawaii Symposium of the US-Japan Science and Technology Cooperation Program

<https://conference-indico.kek.jp/event/119/overview>
Online conference, 21-23 April 2021

Invited overview:

- Future prospect of high energy physics, H. Murayama

20th Lomonosov Conference on Elementary Particle Physics

<https://lomcon.ru/>
19 - 25 of August 2021, Moscow, Russia

Invited overview:

- Why do we need ILC?, J. List

ECFA Study on “Physics, Experiments & Detectors (PED) at Higgs and top/EW Factories”

K. Jakobs & International Advisory Committee

- three WGs on
 - physics potential (WG1):
James Wells, Fabio Maltoni, Juan Alcaraz, JL
 - physics analysis methods (WG2):
Dirk Zerwas, Patrizia Azzi, Fulvio Piccinini
 - detectors (WG3 - will come later, after Roadmap Panel)
- first meeting of WG1 & WG2 on April 9
- aiming for kickoff WS in June (~3h, virtual), **tentative** list of topics:
 - “Theoretical challenges for future e+e- colliders”
 - “Challenges in global interpretation of data from future e+e- colliders and interplay with HL-LHC”
 - “Experimental challenges at future e+e- colliders”
 - “Physics Event Generators, BeamConditions, Standard Candles and Luminosity”
 - “Physics Performance (Reco Pflow, Kinematic fit, tracking, PID)”
 - “Detector Simulation (FastSim and Full Sim etc)”
 - “Software Framework and EDM”
- workshop series in the next 2-3 years
- yellow reports or so at the end

IDT comment: once these WGs are really defined, IDT-WG3 will identify liasons for each topic

ECFA Study WG1

Mandate

The Working Group is expected to

- Set up a forum on physics potential of future Higgs and top/EW factories to collect, compare and harmonise the work of the different project-specific coordinated efforts, as well as independent theoretical and experimental research on the subject. The perspectives of the (HL-)LHC on physics targets, that are in common or in synergy with those of the future Higgs and top/EW factory, are part of the mandate.
- Identify thematic areas or specific topics where concrete work should be organised in the context of the ECFA Working Group, in coordination with the existing project-specific Working Groups. The main focus should be on problems that are common to several Higgs and top/EW factories, and/or relevant to identify synergies. Small thematic groups/task forces could be appointed to carry out concrete work and deliver notes and/or original publications.
- Propose ideas for new observables, new experimental tests, new ancillary measurements

Studies relating to a common approach to systematic uncertainties and the ultimate achievable precision are likely to be undertaken jointly between this group and the Physics Analysis Methods working group.

In consultation with the IAC, the group conveners will define a work programme, and identify (if/when needed) lead people to take forward each activity. The conveners will facilitate regular working group meetings towards the preparation of general ECFA workshops.

Work on some of the items above has been initiated in the “Higgs@FutureColliders” ECFA Working Group (<https://arxiv.org/abs/1905.03764>).

A tentative list of focus areas include, but is not limited to:

- EFT (global) interpretation of Higgs factory measurements, including EW, Z pole and top physics, and its impact on concrete new physics scenarios and models.
- Extend the study of the impact also on specific models that cannot be matched onto EFT.
- Exploration of different flavour scenarios and interplay with flavour data.
- Identification of measurements that HL-LHC can do in order to increase the physics potential of the future Higgs and top/EW Factory.
- HL-LHC precision physics interplay with the Higgs and top/EW factory potential, including the not-yet-complete assessment of the high- p_T probes potential at the HL-LHC. Comparative attention should also be paid to the potential of other future colliders.
- Requirements for accuracy in theoretical calculations and parametric uncertainties, and perspectives to achieve it.
- Perspectives for experimental uncertainties.
- Broad exploration of the new physics discovery potential of the future Higgs and top/EW factory, including the search for Feebly Interacting Particles also in connection with “Physics Beyond Colliders” activities.
- Availability and development of Monte Carlo generators required to achieve the physics goals.

ECFA Study WG2

Mandate

The ECFA PED working group on Physics Analysis Methods provides a forum for sharing experiences and exploring synergies in a united effort towards a future e+e- Higgs and top/EW Factory project, around focused development of analysis tools and approaches that can benefit all involved.

The group will engage with the wider collider physics community, paying particular attention to linking the various existing e+e- efforts, by sharing technical and scientific expertise, and to making connections to related expertise and people involved in (HL-)LHC. The activities of the group should broaden the active base of people contributing to e+e- studies.

The group will encourage the use of common software (key4hep and edm4hep) in order to build on existing resources and to facilitate exchange of ideas, implementation of code, and comparisons of algorithm and detector performance.

Areas where this group could identify synergies and define specific topics for study include, but are not limited to:

- Monte Carlo generators for e+e- precision EW, Flavour, Higgs, and top physics
- Software framework
- Fast simulation and the limitations of such techniques
- Track and vertex reconstruction algorithms
- Jet algorithms / jet reconstruction
- Constrained kinematic fits
- Particle-flow reconstruction and global event description
- Requirements on particle identification
- Flavour tagging algorithms
- Importance of timing information
- Luminosity measurement

Studies relating to a common approach to systematic uncertainties and the ultimate achievable precision are likely to be undertaken jointly between this group and the Physics Potential working group.

In consultation with the IAC, the group conveners will define a work programme, and identify lead people to take forward each activity. The conveners will facilitate regular working group meetings towards preparation of general ECFA workshops.