

Plans on ILD physics studies (and discussion)

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ILD Physics Coordination

Physics working groups and conveners

PHYSICS COORDINATION

Coordinator

Taikan Suehara

Deputy Coordinator

Graham W. Wilson

Thanks a lot to Filip for long-time dedication as the physics coordinator!

This part to be revisited (aligning FCC physics grouping?)

HIGGS / EW

Higgs and Electroweak Physics

Conveners

Junping Tian

Ivanka Bozovic-Jelisavcic

TOP / QCD / HF

Top, QCD and Heavy Flavour

Conveners

Roman Pöschl

Adrian Irles

BSM / NP

Beyond the Standard Model and New Physics

Convener

Mikael Berggren

Member structure compiled from ILD coordination materials published in 2024–2025

Analysis and software meetings

- Bi-weekly analysis/software meeting
 - One of the most active efforts in ILD: to be continued
 - Every other Wednesday 14:00 CERN time (to keep or to change?)
 - Any overlap with FCC meetings?
 - Welcome to join at ild-detector-optimisation@desy.de
 - Can subscribe from <https://lists.desy.de/sympa/>
 - <https://agenda.linearcollider.org/category/131/>
- Also having (closed) physics conveners meeting
 - On interleaved Wednesday (time to be determined)

Objectives for ILD physics studies

- Physics studies for FCC-ee
 - Need to think of relation with FCC-ee physics studies
- Physics studies for linear colliders
 - High energy studies: e.g. ZHH/nnHH, BSM studies
 - Advanced concepts: e.g. HALHF, ERL, photon collider, muC?
- Detector optimization/validation
 - Focus on key physics topics suitable...
 - To demonstrate advantages of ILD
 - To optimize design of ILD (by comparing performance with different config)

FCC-ee physics studies: how we relate?

- FCC physics group has analysis meetings
 - Each study should present the study to the FCC meetings
 - ILD software/analysis meeting can be more casual?
 - To check simulation issues in more detail
 - ...or too much overlap?
- Analysis of FCC benchmark channels should include ILD
 - Production may be done central at FCC?
 - Need robust FCC-ILD model/reco/calibration with FCC generator config
- We may have a strategy for ILD?

Potential of ILD for FCC

- Continuous tracking (TPC)
 - Can benefit long-lived particle search?
 - Hadron PID (maybe pixel TPC necessary)
- Fully particle-flow calorimeter
 - Jet energy resolution (e.g. Higgs to invisible by hadronic recoil)
 - Off-axis photon by calo pointing?
 - Particle separation (decay ID of b/c/tau?)

Consideration of ILD configuration

- Timing layers – still not included in the baseline ILD
 - Outer trackers (mainly for PID)
 - Extreme resolution necessary (LGAD or SPAD?)
 - Calorimeters (for PID&PFA, off-timing photons?)
 - Even moderate resolution should help, but huge # of channels, cooling?)
- Pixel TPC (for better PID?)
- Ultra-granular calorimeter (MAPS CAL)
- Forward detectors?

Studies for LC

- Update key analyses with AI-based reconstruction
 - Higgs self coupling, other Higgs couplings, any BSM?
- Missing analyses?
 - Higgs exotic? (e.g. scalar pair to $4b/2b+DM$, H to bs , ...)
 - Triple-gauge coupling at high energy?
- Ultra-high energy and different collider modes?
 - Clarify physics cases for advanced configurations
 - Multi-TeV studies (what should be done?)
 - HALHF, photon colliders, ERLs,...

List of ongoing ILD studies

Sorry if your contribution is missed!
(please point out)

- Covered by today's talks
 - Higgs hadronic branching ratio + Higgs to $b\bar{s}$ (Tokyo, Iwate)
 - hhh coupling at 550/1000 GeV (DESY, Tokyo, SLAC, Nagoya)
 - CP violation in $t\bar{t}H$ (DESY, Glasgow)
 - Higgs to invisible (DESY)
 - Z to $\tau\tau$ (CIEMAT, IFIC)
 - Exotic Scalar (Warsaw, DESY)
- Not covered today
 - Mass of bottom quark by $H \rightarrow b\bar{b}$ (informed by Marcel)
 - Others?