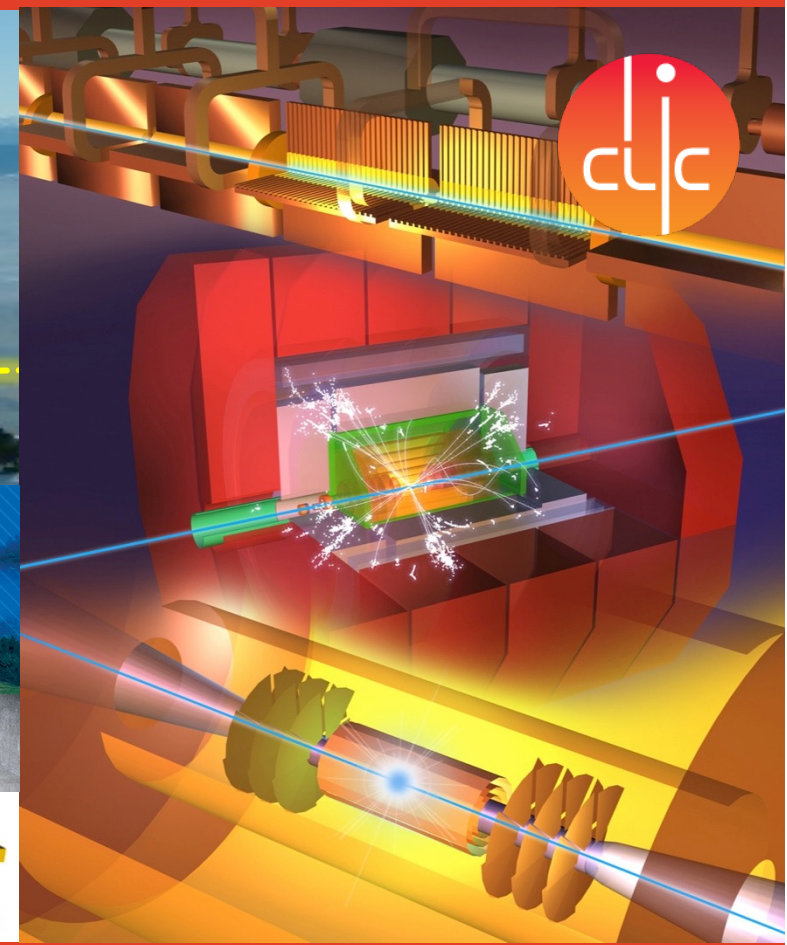


ECFA studies towards an e^+e^- Higgs/EWK/top factory



LCWS24, 8 July 2024

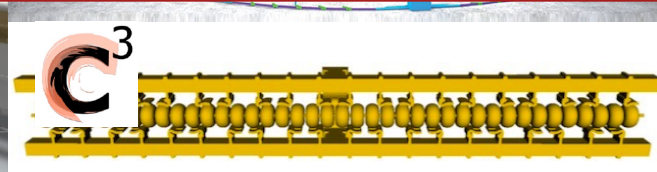
Aidan Robson

ECFA studies towards an e^+e^- Higgs/EWK/top factory



Outline

- ◆ Ongoing activities
- ◆ Planning towards report
- ◆ 3rd ECFA Workshop



LCWS24, 8 July 2024

Aidan Robson

Ongoing activities

- ◆ Organised in three WGs
 - WG1: Physics Programme
 - WG2: Physics Analysis Methods
 - WG3: Detector Technologies
- ◆ Highly active topical groups

Working meetings so far in 2024:

WG1-HTE

18 Mar 2024 e+e- to ZH angular measurements
18 Jun 2024 e+e- to ZH angular measurements

WG1-FLAV

17-18 Apr 2024 Flavour mini-workshop

WG1-GLOB

09 Feb 2024 Focus topic meeting - ttbar threshold
28 Feb 2024 Focus topic meeting - ttbar threshold
17 Apr 2024 Focus topic meeting - ttbar threshold
15 May 2024 Mini-workshop on Higgs self-coupling focus topic
25 Jun 2024 Mini-workshop on WWdiff focus topic

WG1 SRCH

15 Mar 2024 EXscalar - focus topic planning meeting
29 Apr 2024 ECFA Focus topic: LLPs - round table
29 May 2024 EXscalar - focus topic working meeting

WG1-PREC

22 Mar 2024 MiniWorkshop : Two-fermion physics
07 May 2024 W MASS expert team: discussion and kick-off of report
08 May 2024 LUMI expert team: discussion and kick-off of report
15 May 2024 BCFRAG expert team: discussion and kick-off of report
13 Jun 2024 TwoF expert team: discussion and kick-off of report

Indico category:

<https://indico.cern.ch/category/14055/>

WG2

02 Jul 2024 Focus Meeting: Technical Benchmarks

Focus Topics

◆ Much of the current activity is centred around 14 focus topics

Reminder:

◆ The focus topics are intended:

- (1) to bring people across projects to work *together* (i.e. even more than “coherently”)
- (2) to bring attention to areas where analyses and analysis tools can be developed cooperatively for the mutual benefit of all projects
- (3) to provide a clear entry point and concrete studies to attract people to join the e^+e^- effort

Focus Topics description/definition document appeared on arXiv in January:

<https://arxiv.org/abs/2401.07564>

Huge effort from expert teams & conveners [listed in backup]

- 50 pages + references
- 108 authors

The screenshot shows the arXiv abstract page for the paper 'Focus topics for the ECFA study on Higgs / Top / EW factories'. The page is from the 'High Energy Physics - Phenomenology' category. It lists the authors: Jorge de Blas, Patrick Koppenburg, Jenny List, Fabio Maltoni (editors), Juan Alcaraz Maestre, Juliette Alimena, John Alison, Patrizia Azzi, Paolo Azzurri, Emanuele Bagnaschi, Timothy Barklow, Matthew J. Basso, Josh Bendavid, Martin Beneke, Eli Ben-Haim, Mikael Berggren, Marzia Bordone, Ivanka Bozovic, Valentina Cairo, Nuno Filipe Castro, Marina Cobal, Paula Collins, Mogens Dam, Valerio Dao, Matteo Defranichis, Ansgar Denner, Stefan Dittmaier, Gauthier Durieux, Ulrich Einhaus, Mary-Cruz Fouz, Roberto Franceschini, Ayres Freitas, Frank Gaede, Gerardo Ganis, Pablo Goldenzweig, Ricardo Gonçalo, Rebeca Gonzalez Suarez, Loukas Gouskos, Alexander Grohsjean, Jan Hajer, Chris Hays, Sven Heinemeyer, André Hoang, Adrián Irlés, Abideh Jafari, Karl Jakobs, Daniel Jeans, Jernej F. Kamenik, Matthew Kenzie, Wolfgang Kilian, Markus Klute, Sandra Kortner, Karsten Köneke, Marcin Kucharczyk, Christos Leonidopoulos, Cheng Li, Zoltan Ligeti, Elisa Manoni, Giovanni Marchiori, David Marzocca, Andreas B. Meyer, Ken Mimasu, Tristan Miralles, Victor Miralles, Abdollah Mohammadi, Stéphane Monteil, Gudrid Moortgat-Pick, Zohreh Najafabadi, María Teresa Núñez Pardo de Vera, Fabrizio Palla, Michael E. Peskin, Fulvio Piccinini, Laura Pintucci, Wiesław Płaczek, Simon Plätzer, Roman Pöschl, Tania Robens, Aidan Robson, Philipp Roloff, Nikolaos Rompotis, Andrej Saibel, André Sailer, Roberto Salerno, Matthias Schott, Reinhard Schwienhorst, Felix Sefkow, Michele Selvaggi, Frank Siegert, Frank Simon, Andrzej Siodmok, Torbjörn Sjöstrand, Kirill Skovpen, Maciej Skrzypek, Yotam Soreq, Raimund Ströhmer, Taikan Suehara, Junping Tian, Emma Torro Pastor, Maria Ubiali, Luiz Vale Silva et al. (8 additional authors not shown). The abstract text states: 'In order to stimulate new engagement and trigger some concrete studies in areas where further work would be beneficial towards fully understanding the physics potential of an e^+e^- Higgs / Top / Electroweak factory, we propose to define a set of focus topics. The general reasoning and the proposed topics are described in this document.'

Focus Topics

◆ Topics sample the physics landscape (not exhaustively!)

- **HtoSS**: $e^+e^- \rightarrow Zh: h \rightarrow ss$
- **ZHang**: ZH angular distributions and CP studies
- **Hself**: Determination of the Higgs self-coupling
- **Wmass**: Mass and width of the W boson
- **WWdiff**: Full studies of WW and evW
- **TTthresh**: Top threshold - detector-level studies of $e^+e^- \rightarrow t\bar{t}$
- **LUMI**: Precision luminosity measurement
- **EXscalar**: New exotic scalars
- **LLPs**: Long-lived particles
- **EXtt**: Exotic top decays
- **CKMWW**: CKM matrix elements with on-shell and boosted W decays
- **BKtautau**: $B^0 \rightarrow K^{0*}\tau^+\tau^-$
- **TwoF**: EW precision - 2-fermion final states
- **BCfrag/Gsplit**: Measurement of b - and c -fragmentation functions and hadronisation rates and measurement of gluon splitting to bb / cc

ECFA European Committee for future Accelerators

ECFA workshops on e^+e^- Higgs/EW/Top factory

31 May 2021 to 30 September 2025
Europe/Zurich timezone

ECFA-Study - ECFA HiggsTopEW Factories - Wiki - FocusTopics

FocusTopics

The ECFA Higgs / Top / Electroweak Factory study has been set up to expand the e^+e^- community, bringing people together across the various e^+e^- projects to share expertise and tools and to work coherently on scientific and technical topics.

The focus topics are specific areas in which the ECFA study could reach significantly beyond the state-of-the-art understanding of the physics potential of future e^+e^- Higgs / top / EW factories. The topics do not aim to comprehensively map the physics program of a future Higgs factory. Instead, they should serve to:

- complete the current overall picture where (most) necessary;
- give guidance to people who would like to contribute to the ECFA study;
- highlight processes particularly suitable for studying the interplay of the three working areas of the ECFA study: physics potential, analysis methods, and detector performance.

The topics can therefore act as a vehicle for new engagement and collaboration. They are intended as a basis that could be expanded later. The initiative should build on existing analysis tools and samples that can be shared among the projects and developed cooperatively, and it therefore highlights where existing examples, including analysis code and datasets, are strongly encouraged and thoroughly documented.

Focus Topics

- HtoSS: $e^+e^- \rightarrow Zh$
- ZHang: ZH angular distributions and CP studies
- Hself: Determination of the Higgs self-coupling

<https://gitlab.in2p3.fr/ecfa-study/ECFA-HiggsTopEW-Factories/-/wikis/FocusTopics>

BCFrag/Gsplit

in2p3 gitlab chosen for straightforward access via eduGain (can use institutional login; does not require full CERN account)

◆ Example focus topic description:

3 HtoSS — $e^+e^- \rightarrow Zh: h \rightarrow s\bar{s}$ ($\sqrt{s} = 240/250$ GeV)

Expert Team: John Alison, Matthew Basso, Valentina Cairo, Valerio Dao, Loukas Gouskos, Karsten Köneke, Yotam Soreq, Taikan Suehara, Caterina Vernieri

The core of the physics program at Higgs factories is the determination of the absolute Higgs-strahlung (Vh) cross-section with the least possible model-dependence along with measurements of the Higgs boson couplings to fermions. Both aspects have been studied throughout the last European Strategy Update [29] and more recently in the context of the 2021 Snowmass exercise [5, 30]. The study of the coupling of the Higgs boson to the light quarks, in particular to the strange quarks, was considered nearly impossible due to the small branching ratio and the difficulty in identifying the flavour of quark-initiated jets (flavour-tagging). Nevertheless, the exploration of the Higgs coupling to the strange quark y_s has emerged as an area of interest, given also its tight connections with detector technologies and layout optimization. Sensitivity to inclusive $h \rightarrow s\bar{s}$ would allow for a complete exploration of the second-generation couplings, and go beyond the current LHC limited reach for y_s via $h \rightarrow \phi\gamma$ decays [31].

At the LHC, in addition to the small branching fraction, the rare $h \rightarrow s\bar{s}$ decays are inaccessible by the current detector capabilities. In fact, one of the most powerful handles to identify a strange-quark-initiated jet (strange-tagging) is the possibility to distinguish between kaons and pions at tens of GeV in momentum. This relies on dedicated detector subsystems which are not available at the LHC multi-purpose detectors. Furthermore, the overwhelming multi-jet production of the strange, up, and down quark couplings with inclusive $h \rightarrow q\bar{q}$ decays dominates the $h \rightarrow b\bar{b}$ decay mode. Therefore, future Higgs factories present a unique opportunity to probe new physics frontiers with the strange quark and to design detectors that enable

Along with the SM scenario, this signature offers to test several Beyond the Standard Model (BSM) theories that allow for extended Higgs sectors. Models with additional Higgs bosons and Yukawa couplings which need not be directly proportional to the SM fermion masses are of particular interest. The possible mechanisms leading to modified Yukawa couplings, see Refs. [33, 34].

As an example, a second class of BSM models exists where the 125 GeV Higgs boson is produced dominantly to the third generation [35–37]. This results in very different decay branching ratios for the additional heavy Higgs bosons (H). The largest production mode of the neutral Higgs boson is from a $c\bar{c}$ initial state, while the charged Higgs bosons would be predominantly produced from a $u\bar{d}$ initial state. The most interesting decay modes include $H/A \rightarrow c\bar{c}, t\bar{t}, \mu\bar{\mu}$ [38, 39], and $H^\pm \rightarrow c\bar{b}, c\bar{s}$ [42], and $\mu\nu$.

Another example, models exhibiting spontaneous flavour violation (SFV) [43] with new Yukawa couplings either to the up or the down quarks with no relation to the SM Yukawa couplings. The two Higgs doublet model with up-type SFV could thus have large couplings to the d quarks [44, 45]. If the observed 125 GeV Higgs boson is an admixture of a SM-like Higgs boson and a new Higgs state, its couplings to the first- or second-generation quarks can be significantly enhanced, predicted in the SM, leading to large deviations in the Higgs boson branching ratios.

In the past years, preliminary proof-of-concept investigations at future colliders have been performed. Some of them [46] focus primarily on strange-tagging algorithms and software tools that include also their application to $h \rightarrow s\bar{s}$ searches, interpretations in BSM framework, and detector designs. The assumptions and the detector concepts used in these studies differ from the fast simulation approach targeting the IDEA detector concept at the FCC was used in the results presented in Ref. [48] rely on full simulation samples of the ILD detector concept but assume truth-based Particle Identification (PID) information. These choices were particularly relevant at the time the studies were performed. Nevertheless, all the results show the need and motivate more in-depth explorations and future harmonization. In order to advance

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ECFA HtoSS expert team has identified possible directions, which are listed below:

Theoretical, phenomenological and MC generator targets

Expanding the BSM interpretations of the studies that have already been published, simulation-based analyses targeting specific BSM scenarios would enlarge the physics reach and tagging at future colliders. In particular, we welcome studies in the following directions:

- Detailed understanding of how to extract the Higgs-strange coupling strength from a $h \rightarrow s\bar{s}$ measurement, given contributions from Dalitz decays, e.g. $h \rightarrow g^*(\rightarrow s\bar{s})g$ or $h \rightarrow \gamma^*(\rightarrow s\bar{s})\gamma$.
- BSM models predicting deviations in $h \rightarrow s\bar{s}$, e.g., SUSY or composite Higgs — see Refs. [33, 34];
- BSM models predicting, for example, charged Higgs bosons with large branching ratios in final states including strange quarks, e.g., 2HDM $H^\pm \rightarrow cs$ BR $\approx 50\%$;
- $s\bar{s}$ vs. $b\bar{b}$ in BSM models: gain from $s\bar{s}$;
- BSM flavour structure and $h \rightarrow s\bar{s}$ signal.

Target physics observables

Several physics quantities will be investigated:

- $e^+e^- \rightarrow Zh$ with $h \rightarrow s\bar{s}$ ($Z \rightarrow \text{anything}$) at $\sqrt{s} = 240/250$ GeV (this has been the focus so far, but it will be relevant to explore also higher centre-of-mass energies, which, in addition to different Higgs production modes);
- projected precision on the branching fraction and the differential cross-section in $\cos\theta$ for $h \rightarrow s\bar{s}$;
- flavour-changing decays are very rare in the SM, for example, $\text{BR}(h \rightarrow bs) \simeq 10^{-7}$. New physics models, which can be encapsulated by an EFT, allow larger values.

Target analysis techniques

The performed proof-of-concept studies [46, 48] showed that to improve the results there will be a need for more powerful background rejection techniques as well as a potentially more global approach in the extraction of the Higgs couplings. Two areas of particular interest will be:

- diboson background suppression;
- signal extraction (fit discriminant variables, counting experiments, etc.).

Target methods to be developed

In collaboration with the Reconstruction and Detector groups, the impact from the following methods will have to be evaluated when estimating the analysis sensitivity reach, including:

- control of strange-tagging related systematic uncertainties;
- reconstruction of in-flight decays, e.g., $K_S^0 \rightarrow \pi^+\pi^-$;
- strangeness-tagging with ML techniques and compared with anti- b -tagging techniques;
- s vs \bar{s} separation;
- complementarity of particle identification (ID) techniques for charged hadrons in momentum space (from dN/dx , dE/dx , ToF, RICH);
- understanding the contribution from $g \rightarrow s\bar{s}$ (from single jets) to strange-tagging performance and analysis sensitivity.

7

Theoretical, pheno & MC generator targets
 Target physics observables
 Target analysis techniques
 Target methods to be developed
 Target detector performance aspects
 Generation & simulation needs
 Existing tools / examples

Target detector performance aspects

The obtained results will inform the community on two crucial aspects:

- dependence of the precision on physics observables on particle ID, strange-tagging, and reconstruction capabilities;
- technology benchmarks for sub-detectors.

Generation and Simulation needs

Full simulation samples will be needed to perform the studies listed above. Samples for $e^+e^- \rightarrow f\bar{f}h$ at $\sqrt{s} = 240/250$ GeV and 350/380/550 GeV are available as indicated in the general samples listed in the motivation. In the years to come, it will be important to iterate with simulation experts on $s\bar{s}$ correlations and fragmentation uncertainties in order to account for more realistic systematic uncertainties.

Existing tools / examples

There are several existing tools and analysis codes available. At the time of writing, this includes examples for ILC and FCC-ee. However, due to ongoing developments, in case you would like to get actively engaged, please contact us directly (see below), such that we can point you to the up-to-date tools and code repositories.

Contact & Further Information

- gitlab wiki: <https://gitlab.in2p3.fr/ecfa-study/ECFA-HiggsTopEW-Factories/-/wikis/FocusTopics/HtoSS>
- sign up for egroup: ECFA-WHF-FT-HtoSS@cern.ch via <http://simba3.web.cern.ch/simba3/SelfSubscription.aspx?groupName=ecfa-whf-ft-HtoSS>
- and/or email the coordinators of this ECFA WG1 focus topic: <mailto:ECFA-WHF-FT-HtoSS-coordinators@cern.ch>

Just a few examples to illustrate joined work – for the full picture come to the workshop!

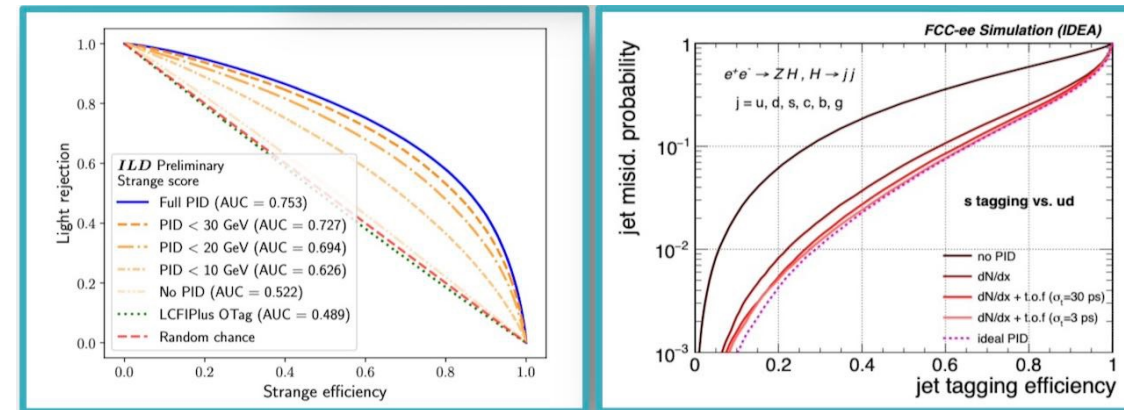
Example status: $H \rightarrow ss$

- ◆ Topic has been gathering increasing interest and crosses all 3 WGs: physics sensitivity, algorithm development, & detector design optimisation

For Snowmass, ~only ILD-based studies were complete from RICH to PID to analysis; now studies at FCC and CEPC evolved from tagger-only to include analysis and RICH

Example active points:

- ❖ fragmentation models – changing at generation level in Pythia 8 to assess sensitivity
- ❖ PID reco: adding dN/dx plot to the combination (PID vs p) so that a comparison can be made with the RICH performance → update ILD studies with reconstructed PID
- ❖ RICH: detector designs are evolving into full Geant 4 simulation now, and first $H \rightarrow ss$ events are being run through → analyse how this impacts Particle Flow performance
 - for detector design options considering tradeoff of cooling and material
 - important study as it motivates addition of new detector systems

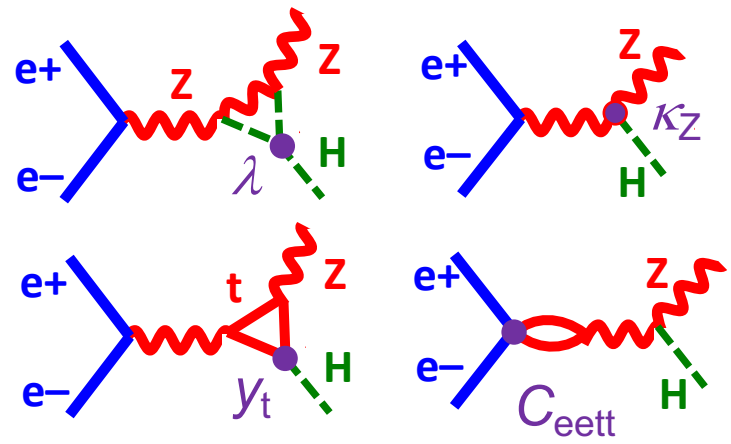


**Clear strong benefit from cross-project collaboration.
Not all studies will be complete by ESPPU, but some important updates for report**

Just a few examples to illustrate joined work – for the full picture come to the workshop!

Example status: Higgs self-coupling

◆ Critical parameter; progress in single- and double-Higgs approaches



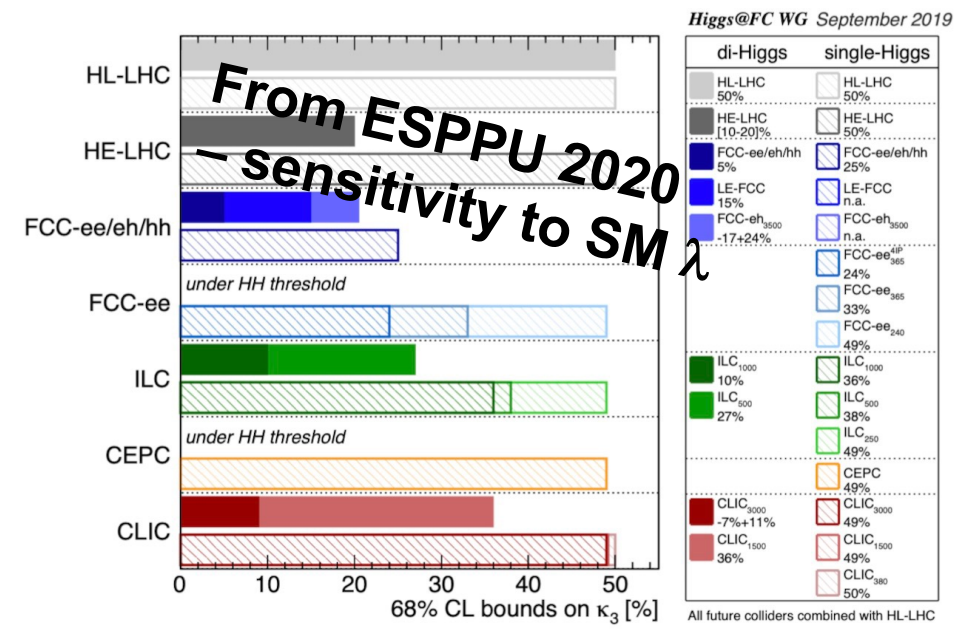
Single-Higgs; issue is separating λ from other new physics; advances on:

- ❖ Potential on using differential cross-sections or splitting data-taking in different \sqrt{s} around 240GeV to separate from other contributions to κ_Z
- ❖ Fully accounting for LHC input on top-Yukawa y_t
- ❖ New theoretical calcns. on 4-fermion couplings e.g. C_{eett}

Double-Higgs; main question is how to improve experimental analysis; ongoing efforts on

- ❖ jet clustering
 - ❖ flavour tagging
 - ❖ advanced analysis
- as well as sensitivity under non-SM scenarios

ECFA study brings all contributors together
Projections from ESPPU 2020 will be updated



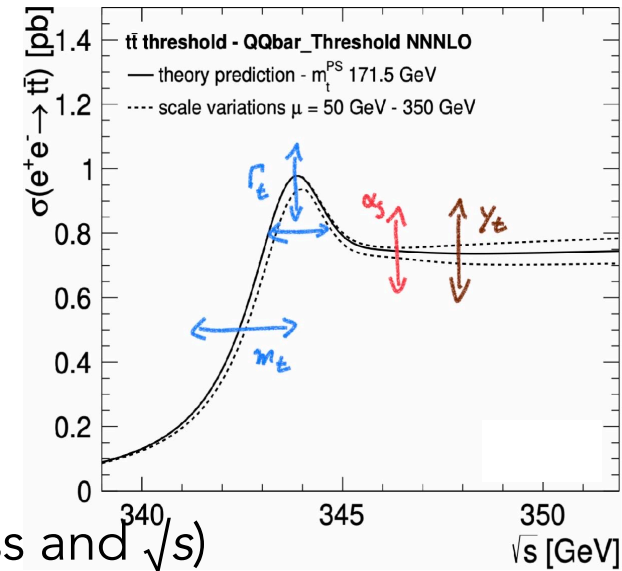
Just a few examples to illustrate joined work – for the full picture come to the workshop!

Example status: Top physics

◆ Threshold scan for top properties

Example active points:

- ❖ Recent studies to optimize scan parameters
- ❖ Discussion of machine aspects and luminosity spectra (inputs from FCCee/CEPC/ILC/CLIC/C³ spectra)
- ❖ Assessment of dominant theory uncertainties (Q_qthreshold)
- ❖ New study of experimental uncertainties (demonstrate efficient and clean selection independent of mass and \sqrt{s})



◆ Top couplings

Specific studies underway by several groups:

- ❖ Update collider operation scenarios
- ❖ Study interplay with the Higgs/EW sector
- ❖ Re-evaluate anomalous top coupling sensitivities at circular colliders
- ❖ Provide inputs on top operators to Higgs self-coupling study
- ❖ Connect with interesting new work on entangled top quark pairs & role in SMEFT ?

Enlarging active community from collaborative work

Should have significant new elements on properties and couplings for report

Just a few examples to illustrate joined work – for the full picture come to the workshop!

Tools development – Technical Benchmarks

◆ Technical Benchmarking Project

led by Alan Price (Jagiellonian University, Krakow)

e+e- studies have long lifetime; MCs go through many changes

→ need benchmarks / standard candles for comparison/validation

Goal: provide a framework to perform technical tests of MC generators for all possible future Higgs factories

❖ Identify possible deviations between generators

→ lead to discussions with WG1 and generator authors

Included so far:

- ❖ Babayaga (Latest)
- ❖ KKMC (v5 cpp release)
- ❖ Madgraph (3.5.4)
- ❖ Sherpa (2.2.15)
- ❖ Whizard (3.1.4)

Example cross-sections

Dedicated python package developed, using common tools Key4hep and EDM4hep, considering:

various processes:

2-fermion, ZH, WW, tt, gg

various setups:

ISR / no ISR; simple fiducial cuts; several \sqrt{s}

various kinematic distributions

Process	\sqrt{s} (GeV)	Generator	Cross Section (pb)
$\mu^+\mu^-$	240	MadGraph5_aMC@NLO	3.8332 ± 0.0112228
		Whizard	4.4799 ± 0.0677174
$\mu^+\mu^-$	350	SHERPA-MC	1.7548 ± 0.00297814
		MadGraph5_aMC@NLO	1.72647 ± 0.00184034
$\gamma\gamma$	91.2	Whizard	1.78481 ± 0.00846396
		MadGraph5_aMC@NLO	51.941 ± 0.027225
		Babayaga	49.1597 ± 1.10742
$t\bar{t}$	350	SHERPA	52.1944 ± 0.00260813
		MadGraph5_aMC@NLO	0.186168 ± 0.000132046
ZH	241.123	Whizard	0.186629 ± 0.000826694
		SHERPA	0.184721 ± 0.000179541
		MadGraph5_aMC@NLO	0.19851 ± 0.00054668
ZH	241.123	Whizard	0.198518 ± 0.00069897
		SHERPA	0.197514 ± 0.00230028

Very valuable new tool for community, with strong engagement from MC generator authors

Report Planning

- ◆ *Synoptic outline of the physics case and the ECFA study activities, drawing particular attention to the joined work, cross-concept and cross-WG*
 - self-contained and reasonably comprehensive
 - but not ab initio and not extensively repeating material from previous reports
 - and concise enough that it's a document that people actually want to read
- ◆ Hope many activities will have individual notes/papers → really encourage this
→ plan is largely to summarise and reference them
- ◆ Physics analysis tools and detector technologies sections will sit alongside physics topics, cross-referencing where closely linked

Timeline

- ◆ The Strategy acceleration has removed significant real working time from the study
 - *this is a problem*: hard to attract new people; some studies will not be complete
- ◆ October ECFA workshop is deadline to present new material that should receive full consideration for inclusion (and authors will be asked for 1-2 page summary & plots)
- ◆ Intensive writing straight after October workshop
- ◆ Draft complete mid-December 2024
- ◆ Circulate to community, R-ECFA & IAC until ~end January 2025
- ◆ Finalize by early March 2025

Proposed Structure

4 Contents

5 1 Introduction

- 6 1.1 Physics Landscape Overview
- 7 1.2 Higgs Factories Overview
- 8 1.2.1 Runplans

9 2 Common Developments

- 10 2.1 Software Ecosystem
- 11 2.2 Generators
- 12 2.3 Beamstrahlung & Luminosity Spectra
- 13 2.4 FOCUS TOPIC: Luminosity
- 14 2.5 Technical Benchmarks
- 15 2.6 Simulation
- 16 2.7 Reconstruction

17 3 Developments in Higgs Physics

- 18 3.1 FOCUS TOPIC: ZH production and angular studies
- 19 3.1.1 CP-odd coupling sensitivity
- 20 3.1.2 CP-even coupling sensitivity
- 21 3.1.3 Entanglement sensitivity
- 22 3.2 Rare Higgs couplings
- 23 3.2.1 FOCUS TOPIC: $H \rightarrow ss$
- 24 3.2.2 $H \rightarrow ee$
- 25 3.2.3 Invisible Higgs decays
- 26 3.2.4 Flavour-violating Higgs decays
- 27 3.3 FOCUS TOPIC: Higgs self-coupling
- 28 3.3.1 Introduction
- 29 3.3.2 Progress in theory
- 30 3.3.3 Progress in single-Higgs approach
- 31 3.3.4 Progress in di-Higgs approach

32 4 Developments in Electroweak Physics & QCD

- 33 4.1 Photon interactions
- 34 4.2 Z boson interactions
- 35 4.3 Gauge boson self-couplings
- 36 4.4 FOCUS TOPIC: W_{mass}
- 37 4.5 FOCUS TOPIC: WW_{diff}
- 38 4.6 FOCUS TOPIC: 2fermion

◆ Sections:

- Introduction
- Common Developments
- Developments in Higgs Physics
- Developments in Electroweak Physics & QCD
- Developments in Top Physics
- Global Interpretations
- Direct Searches for New Particles
- Flavour
- New Detector Technologies

Proposed Structure

- ◆ Will concentrate on recent material, given in context of longer-term studies
- ◆ Scope of physics content of report goes well beyond Focus Topics; depends on area

Example: Searches →

7 Direct Searches for New Particles

7.1	Phenomenological Introduction	.....
7.1.1	General motivation for BSM	.....
7.1.2	Possible scenarios with focus on direct signatures	.....
7.1.3	Possible search strategies	.....
7.1.4	Expected search landscape after HL-LHC	.....
7.2	Focus topic: Exotic scalar searches	.....
7.3	Focus topic: Long lived particles	.....
7.4	Focus topic: Exotics top decays	.....
7.5	Further topics	.....
7.5.1	Heavy Neutral Leptons	.....
7.5.2	Dark Photons (?)	.....
7.5.3	SUSY searches	.....
7.5.4	Dark Matter	.....
7.5.5	Exotic Z decays (?)	.....
7.5.6	Exotic Higgs boson decays (including invisible)	.....
7.5.7	Two-particle angular correlations in the search for new physics	.....
7.6	Detector and running option considerations	.....
7.6.1	Role of polarization	.....
7.6.2	Key detector design issues	.....
7.6.3	Key challenges in systematics	.....

- ◆ Detailed structure of each chapter currently lies with topical conveners; next stage is to assign coordinating names to subsections

3rd ECFA Workshop on Higgs/Top/EWK factories

<https://indico.in2p3.fr/event/32629/overview>



3rd ECFA workshop on e⁺e⁻ Higgs, Top & ElectroWeak Factories

9–11 October 2024

9–11 Oct 2024
Campus des Cordeliers, Paris, Metro Odeon
Europe/Paris timezone

Enter your search term

Overview
Committees
Timetable
Registration
Participant List
Payment of Registration

Dear Colleagues,

The third 3rd ECFA workshop on Higgs, ElectroWeak and Top factories will take place in the center of Paris in an

The Workshop will last from Wednesday, September 11th, 16:00.

Aim for real 'working workshop' as with previous editions
Registration & abstract submission OPEN
– abstract submission deadline for talks, 15th July
– abstract submission deadline for posters, September
Early registration deadline end July
ECRs who submit poster get reduced registration fee
(Students also get reduced registration fee)

Summary

- ◆ Significant ongoing activity
- ◆ Timeline to ESPPU is challenging
 - but the report should contain some significant new input
 - and a physics report that has agreement cross-project is an important step towards the strategy Briefing Book
- ◆ 3rd workshop takes place 9–11 October in Paris and is shaping up well – please come to it!

Backup

Focus Topics Expert Teams

- ◆ Focus topic definitions have been developed by 'expert teams' from across projects, driven by the WG1 coordinators & conveners (next slide)
- ◆ Note: expert team members participating as 'consultants' – not necessarily active in topics at the moment!

Expert Teams

EXscalar (SRCH)	LLPs (SRCH)	EXtt (SRCH)	HtoSS (HTE)	ZHang (HTE(GLOB))	TwoF (HTE)
Filip Zarnecki	Rebeca Gonzalez Suarez	Nuño Castro	Valentina Cairo	Ivanka Bozovic	Adrian Irles
Mikael Berggren	Juliette Alimena	Marina Cobal	Taikan Suehara	Markus Klute	Daniel Jeans
Sven Heinemeyer	Jan Hajer	Gauthier Durieux	Loukas Gouskos	Sandra Kortner	Freya Blekman
Abdollah Mohammadi	Marcin Kucharczyk	Roberto Franceschini	Matt Basso	Cheng Li	Mogens Dam
Tania Robens	Emma Torro Pastor	María Teresa Núñez Pardo de Vera	Caterina Vernieri	Gudrid Moortgat-Pick	Jorge de Blas
Nikolaos Rompotis	Sarah Louise Williams	Kirill Skovpen	Valerio Dao	Ken Mimasu	Eram Rizvi (tbc)
	Filip Zarnecki	Marcel Vos	John Alison		Emanuele Bagnaschi
			Yotam Soreq		
Hself (Glob)	WWdiff (Glob)	TTthres (Glob(HTE))	BCFrag/Gsplit (FLAV/PREC)	Wmass (PREC)	LUMI (PREC)
Junping Tian	Patrizia Azzi	Marcel Vos	Eli Ben-Haim	Paolo Azurri	Ayres Freitas
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