

**WG1-PREC “Precision in theory and experiment”**

# **MiniWorkshop: Z-coupling precision**

Monday 13th November 2023

## **Introduction**

Paolo Azzurri (INFN Pisa), Ayres Freitas (Univ. Pittsburgh),

Adrian Irlles (IFIC CSIC/UV), Andreas B. Meyer (DESY)

**ECFA Higgs Factory Working Group WG1 on Physics Potential**

# ECFA Higgs/EW/Top Factory Workshop

**Aim:** ...bring together the efforts of various e+e- projects, to share challenges and expertise, to explore synergies and to respond coherently to this high-priority strategy item.

- foster collaboration across projects
- between experimentalists and theorists
- facilitate entry for “newcomers”

**Timeframe:** we aim to provide input in ~2025 to the next European Strategy Update

**Entry point:** <https://gitlab.in2p3.fr/ecfa-study/ECFA-HiggsTopEW-Factories>

# ECFA Higgs Factory Study - WG1 Physics Potential

## Subgroup WG1-PREC “Precision in theory and experiment”

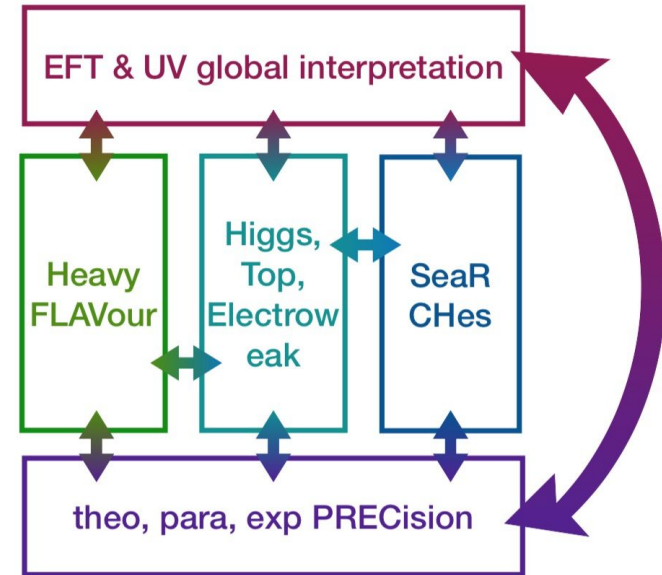
- One of the five subgroups of ECFA-WHF-WG1
- Addressing very high-precision observables

## Topics:

- Precision calculations and theoretical, parametric uncertainties
- Experimental syst. Uncertainties

## Interplay:

- Other WG1 subgroups, in particular HTE, FLAV, and GLOB
- Interface with WG2 for object performance, generator and simulation for high-precision measurements



# ECFA Higgs/EW/Top Factory Workshop

This meeting is part of a series of mini-workshops.

## Previous meetings

- high-precision measurements: <https://indico.cern.ch/event/1129966/> (8 March 2022)
- parametric uncertainties:  $\alpha_s$  <https://indico.cern.ch/event/1131344/> (10 March 2022)
- parametric uncertainties:  $\alpha_{\text{QED}}$  <https://indico.cern.ch/event/1173700/> (14 July 2022)
- collision energy <https://indico.cern.ch/event/1206598/> (2 Nov 2022)
- luminosity <https://indico.cern.ch/event/1218043/> (16 Dec 2022)
- cross section lineshapes <https://indico.cern.ch/event/1271343/> (14 April 2023)

# ECFA Higgs/EW/Top Factory Workshop

2 large ECFA-Higgs/Top/EW factory workshops

2022- DESY <https://indico.desy.de/event/33640>

2023 - Paestum <https://agenda.infn.it/event/34841>

# ECFA Higgs/EW/Top Factory Workshop

**Focus topic document (to appear soon)**

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

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  $e^+e^-$  colliders.

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.

# ECFA Higgs/EW/Top Factory Workshop

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

Focus Topics coordinated by the PREC subgroup:

\* **Luminosity** -> [wiki](#)

\* **b and c fragmentation and gluon splitting** → [wiki](#)

\* **W boson mass**



**Systematic uncertainties to  
Z-couplings**

More details in the presentations at Paestum <https://agenda.infn.it/event/34841/timetable/?view=standard#b-32448-parallel-focus-topics>

Join the mailing lists

<http://simba3.web.cern.ch/simba3/SelfSubscription.aspx?groupName=ecfa-whf-ft-lumi>

<http://simba3.web.cern.ch/simba3/SelfSubscription.aspx?groupName=ecfa-whf-ft-wmass>

<http://simba3.web.cern.ch/simba3/SelfSubscription.aspx?groupName=ecfa-whf-ft-bcfrag>

# TwoF Focus Topic

## Work-in-progress

2-fermion final states at Z-pole and beyond -> [wiki](#)

Studies of the projections for measurements of the different electroweak couplings in  $e^+e^-$  -> ff focusing on final states where significant improvements are foreseen (heavy quarks, s-quarks, taus)

**E-group ECFA-WHF-FT-TwoF@cern.ch**

[subscribe](#)

**Closely related to today's workshop**



# Today:

3:00 PM → 3:10 PM

## Introduction

**Speakers:** Adrian Irlles (IFIC CSIC/UV), Andreas Meyer (DESY), Ayres Freitas, Paolo Azzurri (Universita & INFN Pisa (IT))

🕒 10m

3:10 PM → 3:30 PM

## A leap in electroweak precision - Opportunities and Challenges

**Speaker:** Christoph Paus (Massachusetts Inst. of Technology (US))

🕒 20m

3:35 PM → 3:55 PM

## Effective weak mixing angle measurement at the CEPC

**Speakers:** Manqi Ruan (Chinese Academy of Sciences (CN)), Zhenyu Zhao (University of Science and Technology of China (CN))

🕒 20m

4:00 PM → 4:20 PM

## Precision KKMC predictions for Z-boson SM and anomalous couplings

**Speaker:** Zbigniew Andrzej Was (Polish Academy of Sciences (PL))

🕒 20m

4:25 PM → 4:45 PM

## ILC at the Z-Pole - A reminder

**Speaker:** Roman Poeschl (Université Paris-Saclay (FR))

🕒 20m

# Links

## Email list

For future WG1-PREC events, please subscribe here, and/or forward the link to interested colleagues:

<http://simba3.web.cern.ch/simba3/SelfSubscription.aspx?groupName=ecfa-whf-wg1-prec>

(this link and email list also works for non-cern accounts)

## WG1 portal page on indico

<https://indico.cern.ch/event/1044297/page/23971-wg1-group-activities>

## WG1 seminars and events

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

## WG1 twiki page

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