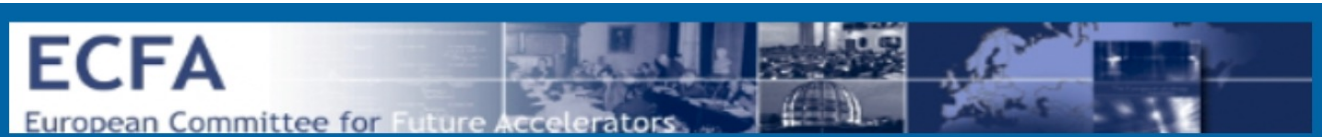
The Way Ahead



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

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.

Time frame: 31st May 2021 – ca December 2023
community-wide plenary ECFA workshops in 2022 and 2023
final "ECFA report"

Top-level indico page: https://indico.cern.ch/event/1044297/

Registration for today's event will be used as basis for a **central mailing list / e-group**

Conveners and contacts (don't hesitate to send us a message!):

- WG1 (Physics Potential): Juan.Alcaraz@cern.ch, Jenny.List@desy.de, Fabio.Maltoni@uclouvain.be, James.Wells@umich.edu
- WG2 (Physics Analysis Methods): Patrizia.Azzi@cern.ch, Fulvio.Piccinini@cern.ch, Dirk.Zerwas@in2p3.fr
- WG3 (Detector R&D): tbd after finalisation of ECFA Detector R&D Roadmap

WG1 – Physics Potential: Mandate

- **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-pT 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.

WG2 – Physics Analysis Methods: Mandate

- 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

We are not alone – relationships with other activities

A lot of work is ongoing in

- the collider project organisations
- the detector concept groups
- R&D / software collaborations => e.g. KEY4HEP central as joined software basis for all projects!
- Snowmass
- …

⇒ **We are not duplicating these, but we foster joined discussions and studies**
- across projects
- between experimentalists and theorists
- facilitate entry for “newcomers”

Important:
- **focus on collaboration on the scientific / technical level, exploit synergies**
- nevertheless, studies in areas of machine-parameter phase-space accessible only by some of the projects are of course not excluded!

Until & between the Plenary Workshops

Organize smaller events:
- Seminar series
- Topical workshops

Seminar series:
- ~monthly, mostly theory / physics topics

Topical workshops:
- Remote zoom: ½ day maximum
- Presence (+remote): 1+ day,
  in nice easy access places: Louvain, Madrid, Pavia, Padua, CERN, Orsay, DESY….
- Informal, intense discussions

Topics:
- Scope defined in mandates of the groups
- What is most urgent to discuss?
  => your input welcome!

Examples for topical workshops:
- Specific **reconstruction** topics: ACTS, kinematic fitting, PID, jet clustering, …
- Specific **experimental** topics: luminosity measurement, control of experimental systematics, standard candles for detector performance, …
- Specific **physics topics**: Higgs properties, M_W , A_{FB}, …
- Specific **theory** questions: precision calculations, event generators
- Global **interpretation**: EFT fitting, UV complete BSM models, …
- **Interplay with HL-LHC**
- How to **promote the need for a next collider** to other scientists / general public / politicians?

Examples for seminars:
- "BSM Higgs decays with colinear photons / leptons / quarks"
- “From top observables to top Yukawa coupling”

Next steps - how can YOU get involved?

- Registration of this event will be used as nucleus general **e-group** => you'll hear from us!
- **Working already on relevant topics ? => Let us know!**
- All events will be announced under https://indico.cern.ch/event/1044297/

Now is time for your comments / questions!

- Set-up a shared area – twiki or so ?
- More specific topical mailing lists ?
- Sub-groups on some topics ?
- Tutorials ?
- What else would be useful? Chat channel? Mattermost / slack / .. ?

In the future: Please contact conveners anytime by email if you have questions or proposals!

BACKUP

WG2 Way Ahead

SOFTWARE KEY4HEP:

- **KEY4HEP federates FCC, ILC, CLIC**
- **in use or medium term migration plan**
- **Build on this effort**

Topical Meetings:
Not restricted to WG2, common with WG1(, WG3) as needed
Topics chosen to build up and upon the tools/structure/software

Initial ideas (start autumn 2021): Generators, Simulation, Standards for Systematic errors and Standard Candles for Algorithm Performance,...