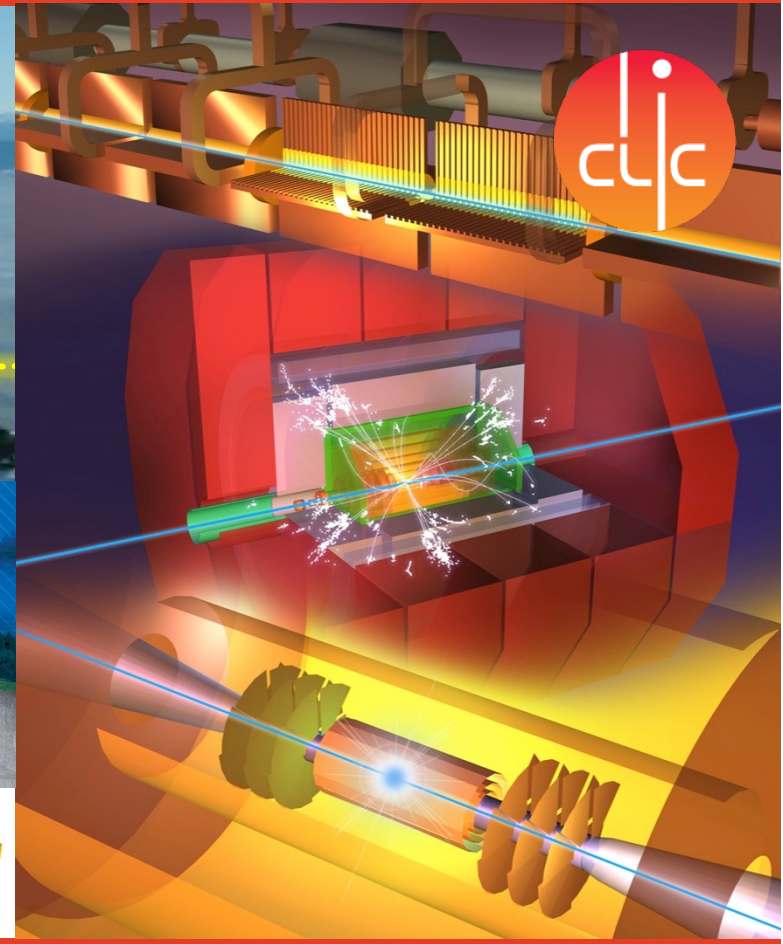


ECFA Higgs/top/EWK study: status & plans



LC Europe, 18 October 2024

Aidan Robson

3rd ECFA Workshop

The banner features a teal background with a central image of a particle detector cross-section overlaid on a photograph of Notre-Dame de Paris. On the left, there are two Feynman diagrams: one showing an electron-positron annihilation into a gluon and a Z boson, which then produce a Higgs boson and a Z boson; the other showing an electron-positron annihilation into a W and anti-W boson pair, which then produce a Higgs boson and a Z boson. Various particle symbols like e^+ , e^- , Z , Z^* , H , W , W^+ , W^- , g , and t are scattered around the diagrams and detector image. The text on the banner includes the workshop title, dates, location, and a search bar.

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

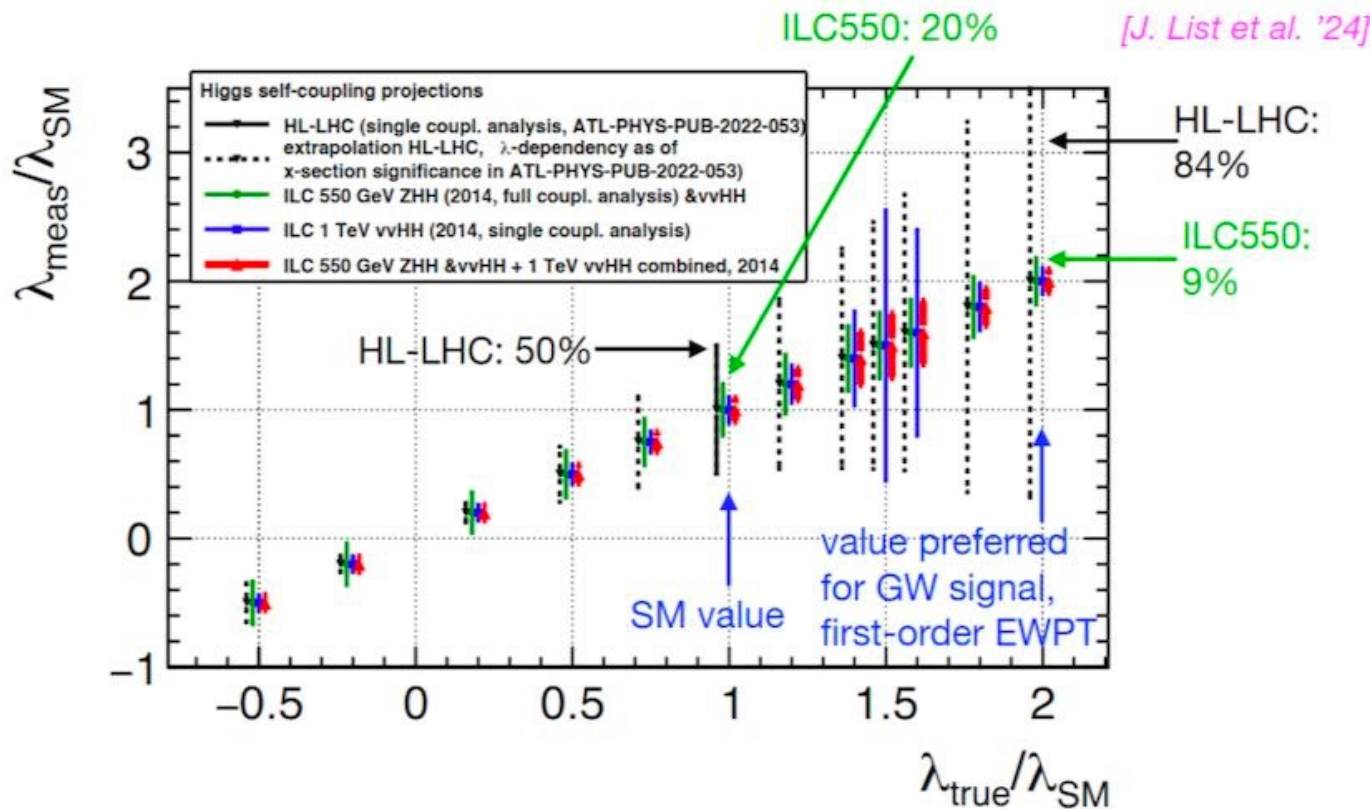
- ◆ 3rd ECFA workshop took place last week <https://indico.in2p3.fr/event/32629/overview>
- ◆ More than 200 participants [in person]
- ◆ 120 talks – plus two online overflow sessions this week <https://indico.cern.ch/event/1459975/>
<https://indico.cern.ch/event/1466526/>
- ◆ Lively discussions especially in parallel sessions
- ◆ Thanks to everyone who contributed
- ◆ **Special thanks to subgroup conveners for all their work preparing the programme**

3rd ECFA Workshop

◆ Too much shown to pick highlights!

Higgs self-coupling:

- ongoing work on models that can deviate significantly from SM predictions for otherwise allowed points
- plus developments in experimental sensitivity!

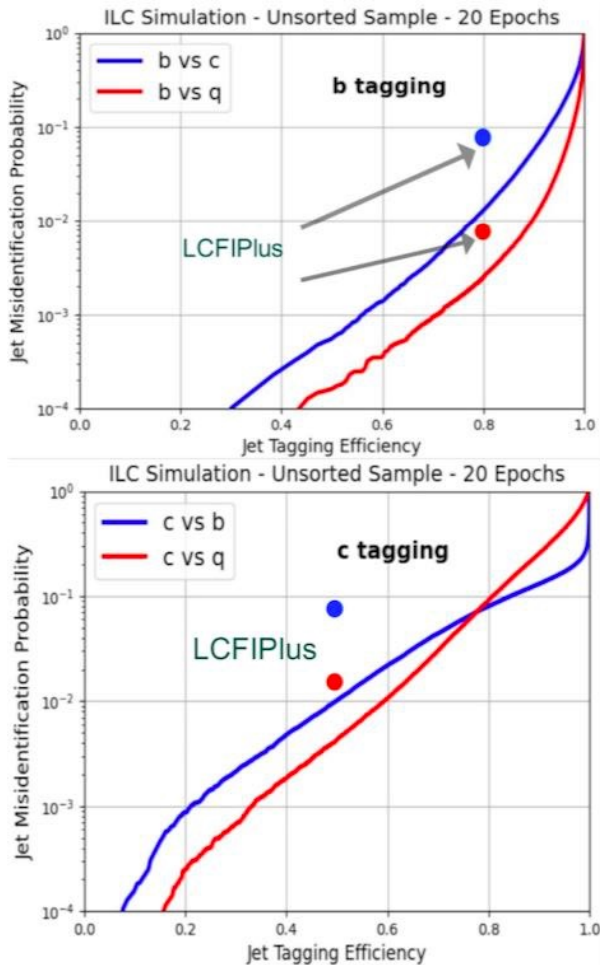


3rd ECFA Workshop

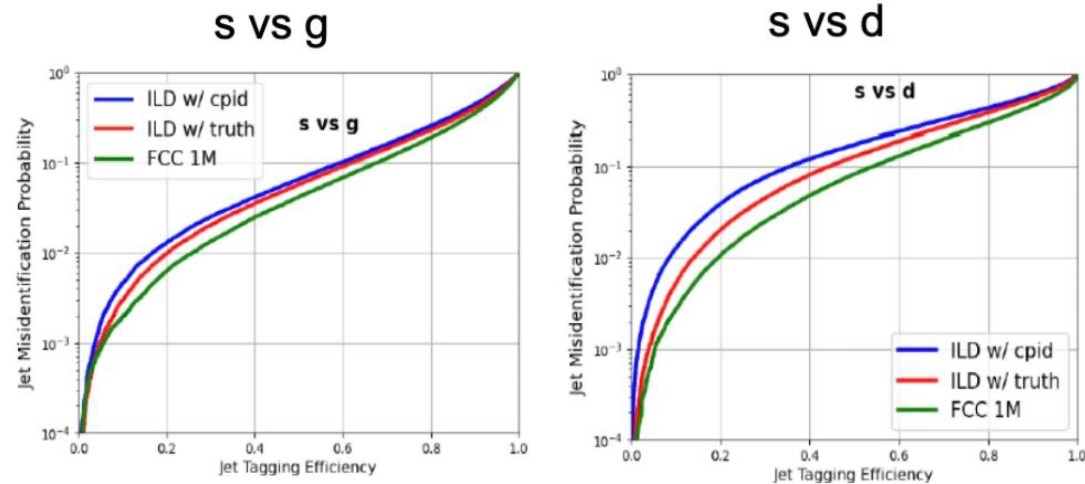
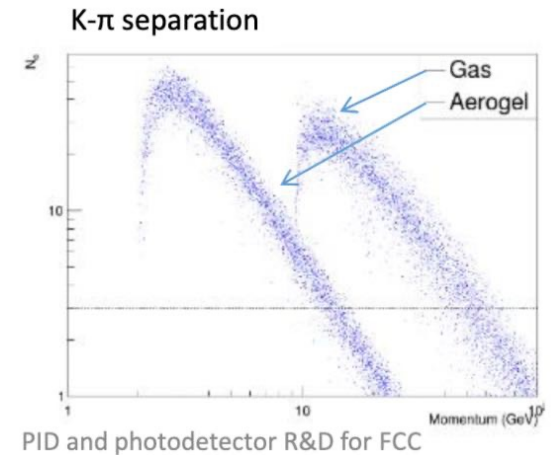
◆ Too much shown to pick highlights!

A lot of developments in **flavour tagging**

ParticleTransformer
on ILD full simulation
– significant performance
improvement over
previous-generation tools



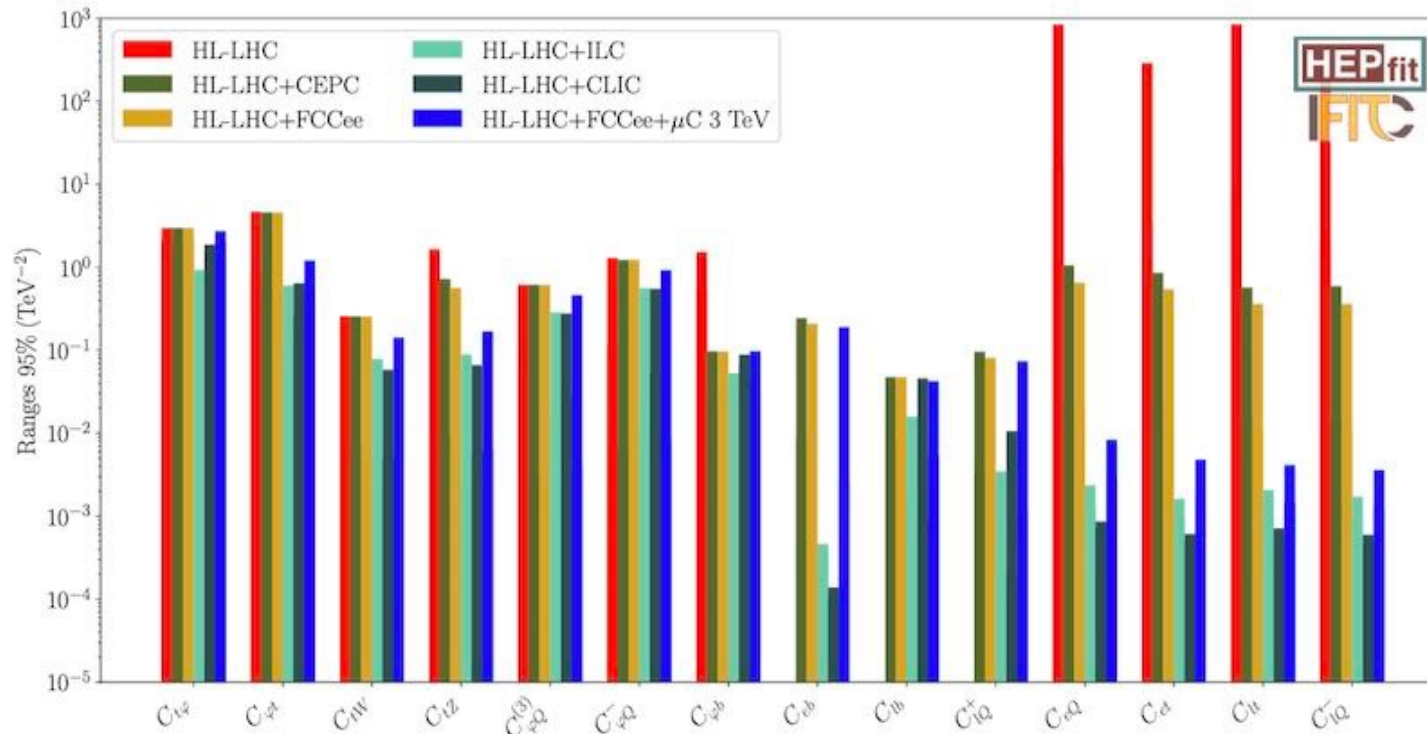
Much work towards
strange-tagging, including
new detector options



3rd ECFA Workshop

◆ *Too much shown to pick highlights!*

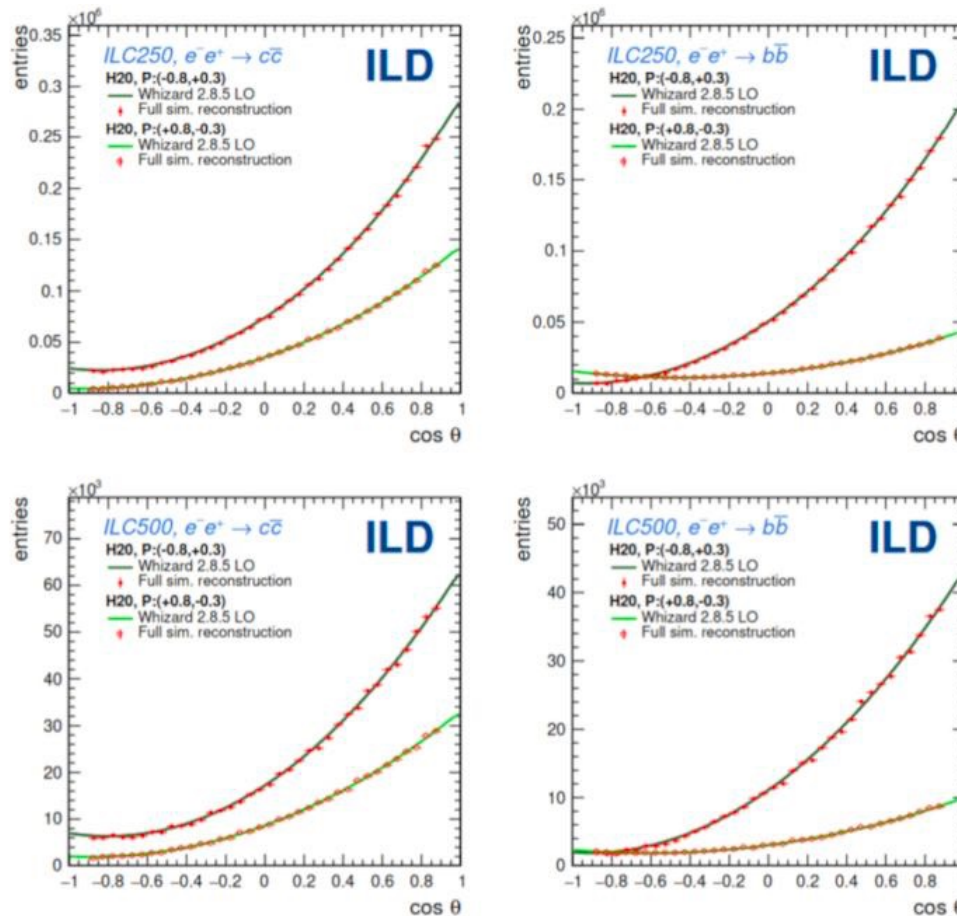
Top – new/updated global fitting of top and bottom operators
Preliminary results: excellent bounds on operators affecting EW interactions of the top quark



3rd ECFA Workshop

◆ Too much shown to pick highlights!

Two-fermion production – new results achieving per-mil level statistical uncertainties and reduced experimental systematics – sensitive probe for new physics

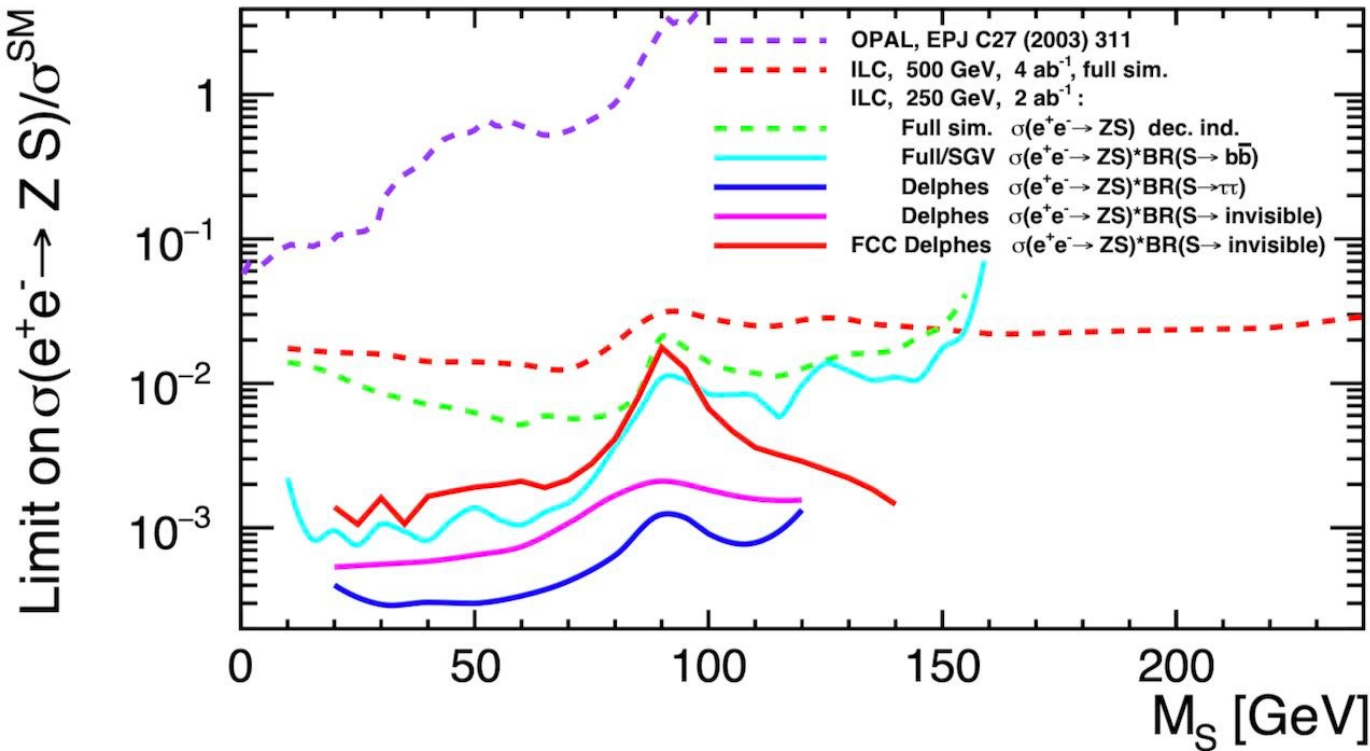


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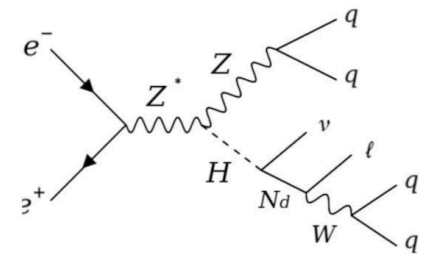
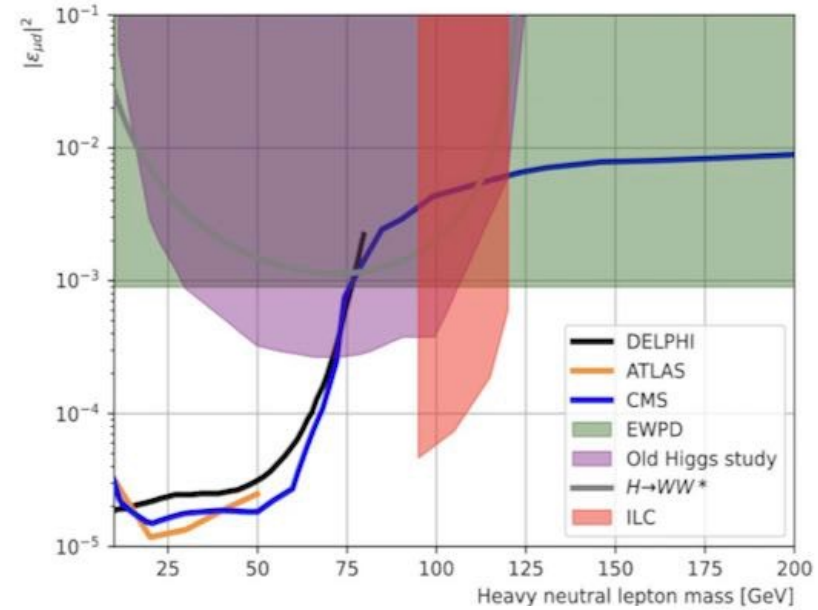
3rd ECFA Workshop

◆ *Too much shown to pick highlights!*

Searches: many new/updated studies



Scalar-strahlung $e^+e^- \rightarrow ZS$, $S \rightarrow$ various final states



Heavy Neutral Leptons

Report Planning

Now: try to capture the huge amount of activity in a useful report

- ◆ *Concept: a synoptic outline of the physics case and the ECFA study activities, drawing particular attention to the work that has spanned projects, concepts, and WGs, helping to strengthen and build the e^+e^- community.*

The report should:

- be self-contained and reasonably comprehensive
(but not ab initio and not extensively repeating material from previous reports)
 - and be concise enough that it's a document that people can actually read
- ◆ Activities encouraged to write individual notes/papers
-> report will largely summarise and reference them

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◆ Editor names are already associated with many sections

Draft: 07.10.2024 – 07:14

◆ 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

Timeline

- ◆ 20/10 Deadline for physics studies to submit 2-page summary
- ◆ 20/10 – 10/11 Compilation and editing by WG1 subgroup conveners / nominated editors, and WG2/3 editors (as well as coordinators & chief editors)
10/11 is the deadline for WG1 subgroup conveners finish their part!
- ◆ 10/11 – 27/11 Editing by WG1 coordinators, WG2/3 editors & coordinators, and chief editors.
27/11 is deadline for complete draft to be handed over to chief editors.
- ◆ 27/11 – 18/12 Editing by chief editors only
- ◆ 18/12 Circulation of version 1 to contributors and R-ECFA
- ◆ 17/1 Deadline to receive comments on version 1
- ◆ 24/1 Deadline to receive final results/plots from contributors
- ◆ February Incorporation of comments, final results, and references
- ◆ 21/2 Final version to R-ECFA
- ◆ 7–8/3 R-ECFA approval during country visit
followed by submission to arXiv

WG1 Physics Programme: 2-page summaries

- ◆ Physics studies are asked to provide a 2-page summary as input to the report
- ◆ Must use template: <https://www.overleaf.com/read/sqtfdqjvndnqd#386e64>
- ◆ What's expected: a brief self-contained description plus results, as a table / 1 or 2 plots.
- ◆ **Each study should upload a zip file of the full source plus a pdf by 20th October!**
Upload location: <https://indico.cern.ch/event/1455398/>

The screenshot shows the Indico event page for "Contributions to ECFA Higgs/top/ew report". The event is scheduled for 20 October 2024 in the Europe/Zurich timezone. A search bar is present at the top right. On the left, there is a navigation menu with "Overview" selected. The main content area contains the following text: "Please upload a 2-page writeup of your contribution to the ECFA Higgs/top/EW report. The template to be used is at [overleaf template](https://www.overleaf.com/read/sqtfdqjvndnqd#386e64). Please download the template zip or clone it, and start from there." Below this, it says "Then submit:" followed by a list: "(1) a zip file that should contain the tex document source and figure(s)" and "(2) AND a compiled pdf." A note states: "We need both of these things to help to compile all the contributions on a short timescale – thanks." There are icons for a clock, a link, and a document. The clock icon is followed by "Starts 20 Oct 2024, 09:00" and "Ends 20 Oct 2024, 21:00" in the Europe/Zurich timezone. The link icon is followed by "Template". The document icon is followed by "The call for abstracts is open" and "You can submit an abstract for reviewing." A blue button labeled "Submit new abstract" is located at the bottom right of the main content area.

- ◆ *It's fully understood that results may not be final by 20th October, but this deadline is necessary to allow the report to be prepared. There will be an opportunity to update the results (latest 24th January; see timeline).*

WG2 Physics Analysis Tools

- ◆ WG2 report sections adopt a more top-down approach
... but the spirit is the same: all help and additional input is very welcome.
- ◆ Editors for the broad topics span projects for maximum coverage, and will solicit input for their sections.
But you are also welcome to contact them with offers of text and help!:

Topic	Section editors
Software Ecosystem	Andre Sailer, Frank Gaede, Gerardo Ganis
Generators	Carlo Carloni Calame, Juergen Reuter, Marco Zaro
Technical Benchmarks	Alan Price
Beamstrahlung & Luminosity Spectra	Thorsten Ohl, Daniel Schulte
Simulation	Andre Sailer, Brieuc Francois, Daniel Jeans
Reconstruction	Loukas Gouskos, Taikan Suehara, Ulrich Einhaus

Coordinated overall by WG2 coordinators, Patrizia, Dirk & Fulvio

WG3 Detector Technologies

- ◆ WG3 acts as a bridge between DRDs and HTE factory detector concepts
- ◆ Detector technologies chapter will (very!) compactly summarize the main R&D directions, challenges, and recent results specifically towards HTE factory detectors
- ◆ As with WG2, WG3 chapter adopts a more top-down approach
- ◆ In particular, trying to avoid duplication with other reports towards ESPPU

Topic

Experimental conditions

Discussion on the evolution of detector concepts from linear to circular

Mid-term R&D plans towards HTE factories, from DRD collaborations

- Vertex & Tracking
- Calorimetry & PID
- Integration, Mechanics & Cooling

Organised by WG3 coordinators, Felix, Giovanni & Mary-Cruz

The next phase

- ◆ We have seen a huge amount of activity and many beautiful results over the course of the ECFA Study
 - ◆ It's a challenge to capture all this in a useful and readable report in a short timescale
 - ◆ The next 2 months will be very intensive involving a lot of interaction among contributors, conveners, editors!
- ◆ Thanks to everyone involved, in advance!!!**

Backup

Coordinator and convener contacts:

- ◆ **WG1: Physics programme** conveners Fabio Maltoni, Jenny List, Jorge de Blas, Patrick Koppenburg
ECFA-WHF-WG1-coords@cern.ch
- ◆ **WG2: Physics analysis methods** conveners Patrizia Azzi, Fulvio Piccinini, Dirk Zerwas
ECFA-WHF-WG2-coords@cern.ch
- ◆ **WG3: Detector technologies** conveners Felix Sefkow, Mary Cruz Fouz, Giovanni Marchiori
ECFA-WHF-WG3-coords@cern.ch
- ◆ **study chief editors** Aidan Robson, Christos Leonidopoulos

WG1 activity area conveners: **WG1-PREC (Precision in theory & experiment):**

Ayres Freitas (Pittsburgh), Paolo Azzurri (Pisa),
Adrian Irlles (Valencia), Andreas Meyer (DESY)
ecfa-whf-wg1-prec-conveners@cern.ch

WG1-GLOB (Global interpretations in (SM)EFT and UV complete models):

Sven Heinemeyer (IFCA/IFT), Alexander Grohsjean (DESY),
Junping Tian (Tokyo), Marcel Vos (Valencia), Jorge de Blas (Granada)
ecfa-whf-wg1-glob-conveners@cern.ch

WG1-HTE (TOP-HIGGS-EW and connection with LHC):

Chris Hays (Oxford), Karsten Koeneke (Freiburg),
Fabio Maltoni (Louvain)
ecfa-whf-wg1-hte-conveners@cern.ch

WG1-FLAV (Heavy Flavours):

David Marzocca (Trieste), Stephane Monteil (Clermont Ferrand),
Pablo Goldenzweig (KIT)
ecfa-whf-wg1-flav-conveners@cern.ch

WG1-SRCH (Feebly interacting particles, direct low mass searches):

Roberto Franceschini (Rome III), Rebeca Gonzalez (Uppsala),
Filip Zarnecki (Warsaw)
ecfa-whf-wg1-srch-conveners@cern.ch

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
Gauthier Durieux	Timothy Barklow	Patrizia Azzi	Maria Ubiali	Josh Bendavid	Ivanka Bozovic
Jose Goncalo	Jorge de Blas	Martin Beneke	Andrzej Siodmok	Martin Beneke	Mogens Dam
Sven Heinemeyer	Ansgar Denner	Jorge de Blas	Simon Plaetzer	Stefan Dittmaier	Fulvio Piccinini
Michael Peskin	Alexander Grohsjean	Matteo Defranchis	Loukas Gouskos	Simon Plätzer	Wiesław Płaczek
Philipp Roloff	Wolfgang Kilian	Gauthier Durieux	Torbjörn Sjöstrand	Matthias Schott	André Sailer
Roberto Salerno	Frank Siegert	Roberto Franceschini		Raimund Ströhmer	Maciej Skrzypek
		Andre Hoang		Graham Wilson	Graham Wilson
CKMWW (FLAV)	BKtautau (FLAV)	Adrian Irles		Jorge de Blas	
U. Einhaus	T. Miralles	Yasuhiro Kiyoy			
M. Selvaggi	S. Monteil	Andrej Saibel			
P. Goldenzweig	A. Wiederhold	Reinhard Schwienhorst			
M. Bordone	M. Kenzie	Frank Simon			
D. Marzocca	E. Manoni	Filip Zarnecki			
	P. Goldenzweig				
	J. Kamenik				