The 22nd Workshop of the LHC Higgs Working Group

Report of Contributions

https://indico.cern.ch/e/1597152

Contribution ID: **86** Type: **not specified**

bbH subgroup report: Modelling bbH production for the LHC at 13.6 TeV

Wednesday 3 December 2025 16:00 (30 minutes)

Presenter: BIELLO, Christian (ETH Zurich)

Session Classification: Plenary (WG3)

Contribution ID: **87** Type: **not specified**

The structure of quark mass corrections in the gg→HH amplitude at high-energy (15'+5')

Thursday 4 December 2025 09:00 (15 minutes)

Presenter: JASKIEWICZ, Sebastian Eryk (University of Bern)

Session Classification: WG4 parallel session

Contribution ID: **88** Type: **not specified**

New HH BSM benchmarks (15'+5')

Thursday 4 December 2025 09:20 (15 minutes)

Presenter: MÜHLLEITNER, Milada Margarete (KIT)

Session Classification: WG4 parallel session

Contribution ID: **89** Type: **not specified**

ATLAS+CMS HHH recent results (15'+5')

Thursday 4 December 2025 09:40 (15 minutes)

Presenter: STAMENKOVIC, Marko (Brown University)

Session Classification: WG4 parallel session

Contribution ID: **90** Type: **not specified**

Direct probes of the quartic Higgs self-coupling (15'+5')

Thursday 4 December 2025 10:00 (15 minutes)

Presenter: TETLALMATZI-XOLOCOTZI, Gilberto (Siegen University)

Session Classification: WG4 parallel session

Contribution ID: **91** Type: **not specified**

Direct probes of the quartic Higgs self-coupling (15'+3')

Presenter: TETLALMATZI-XOLOCOTZI, Gilberto (Siegen University)

Session Classification: WG4 parallel session

Contribution ID: **92** Type: **not specified**

Public ggxy library (12'+3')

Thursday 4 December 2025 11:00 (12 minutes)

ggxy is a C++ library which currently includes gg → HH up to NLO in QCD. It is able to produce differential distributions in about 30 minutes on a laptop, both for on-shell and MSbar top quark masses and including a 7-point scale variation. ggxy has been linked to Powheg and Herwig to enable the matching to parton showers. Runtime tests have shown that it is a faster a by a factor of 4-5 with respect to the previous implementations mainly due to the fast numerical evaluation of the one-loop 2 → 3 processes for the real corrections with Recola.

Presenter: SCHONWALD, Kay (U. of Zürich)

Session Classification: WG4 parallel session

Contribution ID: **93** Type: **not specified**

Higgs-Pair Production via Gluon Fusion: Top-Yukawa- and light-quark-induced electroweak Corrections (12'+3')

Thursday 4 December 2025 11:15 (12 minutes)

After the discovery of the Higgs boson in 2012, the measurements of the Higgs self coupling is still a challenge for current and future experiments in particle physics.
Higgs-boson pair production via gluon fusion is a loop-induced process. In order to increase the accuracy of the theoretical predictions for this process, higher-order corrections are necessary to reduce theoretical uncertainties and to describe differential distributions reliably. The next-to-leading order (NLO) corrections involve the evaluation of two-loop Feynman diagrams. In particular, for electroweak (EW) corrections, many different mass scales appear in the calculation, such as the gauge boson, bottom, top quark, and Higgs boson masses. Further complications include numerical instabilities due to virtual thresholds which require careful treatment. In my talk, I will present results for the EW corrections induced by the top-Yukawa coupling with contributions from light-quark loops without using any reduction techniques to master integrals. The calculations are done by keeping the masses as fully symbolic parameters, allowing, in the future, for a study of parametric and mass scheme/scale uncertainties.

Presenter: CARLOTTI, Sauro (Karlsruher Institut für Technologie - ITP)

Session Classification: WG4 parallel session

Contribution ID: **94** Type: **not specified**

Electroweak corrections to Higgs boson pair production: The light quark case (12'+3')

Thursday 4 December 2025 11:30 (12 minutes)

We present a fully analytic computation of the two-loop electroweak corrections to double Higgs production in gluon fusion, mediated by light quarks. The calculation is performed using the method of differential equations, employing a large mass expansion to generate boundary functions. We implement the results in the POWHEG BOX framework for phenomenological studies. The corrections to the differential cross section are found to be sizable, reaching up to −15% near the production threshold. Additionally, we investigate the sensitivity of these corrections to variations in the triple Higgs self-coupling.

Presenter: RENDLER, Philipp (Institute for Theoretical Physics, KIT)

Session Classification: WG4 parallel session

Contribution ID: **95** Type: **not specified**

SMEFT and HEFT di-Higgs Event-Level Reweighting (12'+3')

Thursday 4 December 2025 11:45 (12 minutes)

Di-Higgs (HH) production provides valuable information about loosely constrained quantities of the Higgs potential, such as the Higgs trilinear self-coupling. The measurement of these properties can confirm SM predictions or point to BSM physics, where non-resonant HH production is typically described by Effective Field Theories (EFTs).

The event-level reweighting consists of parameterizing the HH cross section in terms of the EFT parameters appearing in the squared matrix element, and then performing a fit to obtain an analytical formula for the cross section. In this way, each point in parameter space can be described without the need for Monte Carlo event generation. This approach is particularly useful for probing such large parameter spaces.

We discuss new formulas for both HEFT and SMEFT at 13 and 13.6 TeV, and the impact of higher dimensional formulas and its effects on the reweighting of NLO QCD gluon fusion samples.

Presenter: PEREIRA COELHO, Matheus (Center for Natural and Human Sciences, Federal University of ABC - UFABC)

Session Classification: WG4 parallel session

Contribution ID: **96** Type: **not specified**

Higgs pair production via gluon fusion to higher orders in HEFT (12'+3')

Thursday 4 December 2025 12:00 (12 minutes)

Higgs pair production offers the opportunity to probe correlations among the couplings of one or two Higgs bosons to fermions and gauge bosons. In this context, it serves as a powerful test of the underlying EFT framework. In this talk, we study Higgs pair production via gluon fusion within the Higgs Effective Field Theory (HEFT). We demonstrate that adopting a consistent power counting in combination with next-to-leading order (NLO) diagrams necessitates the inclusion of higher-dimensional operators beyond the leading ones. Finally, we analyze their phenomenological impact and provide a comparison to the Standard Model Effective Field Theory (SMEFT) at dimension six.

Presenter: SCHMID, Konstantin (University and INFN Padova)

Session Classification: WG4 parallel session

Contribution ID: **97** Type: **not specified**

NMSSMScanner - Performing intelligent scans in the NMSSM parameter space (12'+3')

Thursday 4 December 2025 12:15 (12 minutes)

In supersymmetric theories, the Higgs boson masses are calculated from the input parameters. Moreover, to be compatible with phenomenology, higher-order corrections have to be included in their derivation. Experimental analyses on the other hand resort to benchmarks with specific mass values. Given the large number of input parameters in the proposed supersymmetric extension, such as the NMSSM, the exploration of the parameter space, compatible with all existing constraints as well as with additional requests on the desired parameter sets, becomes difficult. We present the program package NMSSMScanner, based on the code NMSSMCALC, that applies machine learning techniques to efficiently consider all the relevant theoretical and experimental constraints. We provide sample benchmarks on the production of a pair of Higgs bosons, a SM-like plus a non-SM-like one, in various final states and with mass combinations that can be tested by the experimental groups.

Presenter: GABELMANN, Martin (U. Freiburg)

Session Classification: WG4 parallel session

Contribution ID: **98** Type: **not specified**

ATLAS HH experimental overview (20'+5')

Thursday 4 December 2025 16:00 (20 minutes)

Presenter: CAIRO, Valentina (CERN)

Session Classification: Plenary (WG4)

Contribution ID: **99** Type: **not specified**

CMS HH experimental overview (20'+5')

Thursday 4 December 2025 16:25 (20 minutes)

Presenter: WANG, Jin (Chinese Academy of Sciences)

Session Classification: Plenary (WG4)

Contribution ID: **100** Type: **not specified**

Summary of the HHH workshop in Dubrovnik (12'+3')

Thursday 4 December 2025 16:50 (15 minutes)

Presenter: LANDSBERG, Greg (Brown University)

Session Classification: Plenary (WG4)

Contribution ID: **101** Type: **not specified**

NNLO+PS HH production with top-quark mass corrections in GENEVA (12'+3')

Thursday 4 December 2025 17:10 (15 minutes)

Presenter: MARINELLI, Giulia (DESY)

Session Classification: Plenary (WG4)

Contribution ID: **102** Type: **not specified**

Workshop opening

Wednesday 3 December 2025 09:00 (15 minutes)

Presenter: GROEBER, Ramona (Università di Padova and INFN, Sezione di Padova)

Session Classification: Opening and joint LHC EFT / LHC Higgs plenary

Contribution ID: **103** Type: **not specified**

ATLAS Highlight talk (15'+5')

Wednesday 3 December 2025 09:15 (20 minutes)

Presenter: BRENNER, Lydia (Nikhef)

Session Classification: Opening and joint LHC EFT / LHC Higgs plenary

Contribution ID: **104** Type: **not specified**

CMS Highlight talk (15'+5')

Wednesday 3 December 2025 09:35 (20 minutes)

Presenter: LANGFORD, Jonathon Mark (Imperial College)

Session Classification: Opening and joint LHC EFT / LHC Higgs plenary

Contribution ID: **105** Type: **not specified**

Double Higgs Production via Vector Boson Fusion in SMEFT (15'+5')

Wednesday 3 December 2025 09:55 (20 minutes)

Presenter: RYCZKOWSKI, Michal Jakub (Università di Padova and INFN, Sezione di Padova)

Session Classification: Opening and joint LHC EFT / LHC Higgs plenary

Contribution ID: **106** Type: **not specified**

Differential observables for Higgs-strahlung process to all orders in EFT (15'+5')

Wednesday 3 December 2025 10:15 (20 minutes)

Presenter: BERA, Sourav (Tata Institute of Fundamental Research, Mumbai)

Session Classification: Opening and joint LHC EFT / LHC Higgs plenary

Contribution ID: **107** Type: **not specified**

Global fit of electroweak, Drell-Yan, Higgs, top, and flavour observables (15'+5')

Wednesday 3 December 2025 11:10 (20 minutes)

Presenter: MIRALLES, Victor (University of Manchester)

Session Classification: Joint LHC EFT / LHC Higgs plenary

Contribution ID: **108** Type: **not specified**

POPxf: An Exchange Format for Polynomial Observable Predictions (15'+5')

Wednesday 3 December 2025 11:30 (20 minutes)

Presenter: MIMASU, Ken (University of Southampton)

Session Classification: Joint LHC EFT / LHC Higgs plenary

Contribution ID: **109** Type: **not specified**

Probing H$\tau\tau$ Coupling and CP properties at FCC-ee (15'+5')

Wednesday 3 December 2025 11:50 (20 minutes)

Presenter: GIAPPICHINI, Sofia (KIT - Karlsruhe Institute of Technology)

Session Classification: Joint LHC EFT / LHC Higgs plenary

Contribution ID: **110** Type: **not specified**

ATLAS+CMS Outlook talk (20'+10') [remote]

Wednesday 3 December 2025 12:10 (30 minutes)

Presenter: BULLARD, Brendon (SLAC)

Session Classification: Joint LHC EFT / LHC Higgs plenary

Contribution ID: **111** Type: **not specified**

EFT Theory Uncertainties at the LHC (25'+5')

Thursday 4 December 2025 09:00 (30 minutes)

Presenter: MONTAGNO, Francesco (IFAE Barcelona)

Session Classification: WG2 parallel session

Contribution ID: **112** Type: **not specified**

Bridging theory and experiment in the search for CP violating Higgs interactions: Parametrizations and dictionary (25'+5')

Thursday 4 December 2025 09:30 (30 minutes)

Presenter: FUENTES ZAMORO, Marta (UA Madrid)

Session Classification: WG2 parallel session

Contribution ID: **113** Type: **not specified**

CP violation in the Higgs sector: Run 3 and beyond (19'+3')

Thursday 4 December 2025 14:00 (22 minutes)

Presenter: BAHL, Henning (ITP Heidelberg)

Session Classification: Plenary (WG2)

Contribution ID: **114** Type: **not specified**

Could electron-top interactions spoil the measurement of the Higgs trilinear? A quantitative estimate at future lepton colliders (25'+5')

Thursday 4 December 2025 10:00 (30 minutes)

Presenter: TABATT, Lucine (Humboldt U. Berlin)

Session Classification: WG2 parallel session

Contribution ID: **115** Type: **not specified**

LHC Signatures of a Vector-Like Top Partner and Charged Higgs Boson in the 2HDM-II (12'+3')

Thursday 4 December 2025 09:30 (15 minutes)

I will present the collider phenomenology of a vector-like top partner (VLT) within the Type-II Two-Higgs-Doublet Model (2HDM-II) extended by a vector-like quark doublet. The study focuses on final states involving a charged Higgs boson. In this framework, the VLT predominantly decays through exotic channels, leading to signatures with high b-jet multiplicity and leptonic components. The analysis is based on Monte Carlo simulations of VLT pair production at the 14 TeV LHC, considering both fully hadronic and semi-leptonic final states. The discovery prospects are motivated by results showing that for $m_{H^\pm} = 600$ GeV, a 5σ sensitivity can be achieved for m_T up to about 1.3 TeV at 300 fb^{-1}, extending to around 1.5 TeV at higher luminosities. The study further examines how the reach depends on the charged Higgs mass, luminosity, and systematic uncertainties.

These results build upon our recent works: Phys. Rev. D 109 (2024) 055016, Phys. Rev. D 111 (2025) 095026, Eur. Phys. J. C 85 (2025) 2, and Eur. Phys. J. C 85 (2025) 500.

Presenter: BOUKIDI, Mohammed (IFJ PAN)

Session Classification: WG3 parallel session

Contribution ID: **116** Type: **not specified**

A smoking gun signature of 3HDM (12'+3') [remote]

Thursday 4 December 2025 09:15 (15 minutes)

We analyze new signals of a 3-Higgs Doublet Model (3HDM) at the Large Hadron Collider (LHC), where only one doublet acquires a Vacuum Expectation Value (VEV), preserving a Z2 parity. The other two doublets are inert and do not develop a VEV, leading to a dark scalar sector controlled by Z2, with the lightest CP-even dark scalar H1 being the DM candidate. This leads to the loop-induced decay of the next-to-lightest scalar, H2 ⟶ H1 ℓℓ (ℓ = e, μ), mediated by both dark CP-odd neutral and charged scalars. This is a smoking-gun signal of the 3HDM since it is not allowed in the 2-Higgs Doublet Model (2HDM) with one inert doublet and is expected to be important when H2 and H1 are close in mass. In practice, this signature can be observed in the cascade decay of the SM-like Higgs boson, h ⟶ H1H2 ⟶ H1H1ℓℓ into two DM particles and di-leptons or h ⟶ H2H2 ⟶ H1H1ℓℓℓℓ into two DM particles and four-leptons, where h is produced from gluon-gluon fusion (ggF). In order to test the feasibility of these channels at the LHC, we devise some benchmarks, compliant with collider, DM, and cosmological data, for which the interplay between these production and decay modes is discussed. In particular, we show that the resulting detector signatures, missing E_T + ℓℓ or missing E_T + ℓℓℓℓ, with the invariant mass of ℓℓ pairs much smaller than mZ, can potentially be extracted already from combining Run 2 and 3 data.

Presenter: DEY, Atri (DIAS)

Session Classification: WG3 parallel session

Contribution ID: **117** Type: **not specified**

Using machine learning to predict large pseudoscalar H125 couplings to fermions (12'+3')

Thursday 4 December 2025 09:00 (15 minutes)

Theories with multiple Higgs doublets allow Higgs couplings to significantly deviate from Standard Model values, enabling indirect probes of extra scalars. The observed couplings already place stringent limits on such theories. In this talk, I will review the situation in models with two Higgs doublets and then extend into three Higgs doublets. For more than two doublets, there are five possible types of models that avoid flavor changing neutral couplings at tree level by the addition of a symmetry. Using a machine learning optimization algorithm, we efficiently explore all five possible types of coupling choices and all five mass orderings of the neutral scalar bosons. We identify the model choices that allow a purely pseudoscalar coupling in light of all recent experimental limits, including direct searches for CP-violation, thus motivating increased effort into improving the experimental precision.

Presenter: BOTO, Rafael (Instituto Superior Técnico)

Session Classification: WG3 parallel session

Contribution ID: **118** Type: **not specified**

Search for an invisible scalar in $t\bar{t}$ final states at the LHC (12'+3')

Thursday 4 December 2025 09:45 (15 minutes)

We present a phenomenological study where an invisible scalar mediator is produced in association with a top-quark pair at the Large Hadron Collider (LHC). Using a $t\bar{t}$ experimental-like analysis, we search for light scalar particles that could be hidden in the $t\bar{t}$ final state. The signal process $pp \to t\bar{t}Y_0$ is generated within a simplified dark matter (DM) model implemented in MadGraph5_aMC@NLO, where the scalar mediator Y_0 couples to both Standard Model (SM) and DM particles. Scenarios with CP-even and CP-odd couplings of Y_0 to the top quarks are investigated for different mediator masses, ranging from very light scalars ($\sim$ 0 GeV) up to values close to the Higgs boson mass (125 GeV). The analysis focuses on the dileptonic decay channel of the $t\bar{t}$ system, reconstructed through a kinematic fit without reconstructing the mediator. CP angular observables were used to probe the CP-nature of the mediator-top coupling, which allowed to set confidence level (CL) limits on the corresponding Yukawa couplings as a function of the mediator mass.

Presenter: CAPUCHA, Rodrigo (Centro de Física Teórica e Computacional, FCUL)

Session Classification: WG3 parallel session

Contribution ID: **119** Type: **not specified**

Distinguishing $A \to HZ$ and $H \to AZ$ with top-quark spin correlations (12'+3')

Thursday 4 December 2025 10:00 (15 minutes)

We propose angular observables sensitive to top-quark spin correlations to distinguish between the pseudoscalar $A \to HZ$ and the scalar $H \to AZ$ signals (where and denote CP-odd and CP-even Higgs bosons, respectively) in $Zt\bar{t}$ final states at the LHC. Current searches performed by ATLAS and CMS are insensitive to the CP nature of BSM scalar states in the case of identical production cross sections. In the context of the CP-conserving two-Higgs-doublet model, we demonstrate that, for a benchmark scenario with masses of 800 and 600 GeV, angular variables sensitive to top-quark spin correlations can differentiate between the two scenarios, even when the production rates are identical. These searches are of great interest in probing parameter space regions that predict a strong first-order electroweak phase transition.

Based on: JHEP 06 (2025) 170 [arXiv:2502.03443], by F. Arco, T. Biekötter, P. Stylianou and G. Weiglein

Presenter: ARCO, Francisco (DESY)

Session Classification: WG3 parallel session

Contribution ID: **120** Type: **not specified**

Charged Higgs Pairs at the LHC: A NLO Analysis (12'+3')

Thursday 4 December 2025 10:15 (15 minutes)

Charged Higgs-pair production at hadron colliders provides an option to obtain information about the trilinear couplings involving charged Higgs states of BSM Higgs potentials. We analyze the corresponding production modes, Drell–Yan-like production, gluon fusion and vector-boson fusion at next-to-leading order with respect to the corresponding uncertainties originating from the scale dependence, the parton-density functions and strong coupling α_s at the LHC. We observe a significant reduction of the scale dependences after including the related radiative corrections. This analysis allows for a sophisticated interpretation of experimental measurements, once charged Higgs states will be observed.

Presenter: SPIRA, Michael (Paul Scherrer Institute)

Session Classification: WG3 parallel session

Contribution ID: **121** Type: **not specified**

LHC Constraints on Vector-like Quarks within the Two-Higgs-Doublet Model Framework (12'+3') [remote]

Thursday 4 December 2025 11:00 (15 minutes)

We investigated the collider phenomenology of Vector-like Quarks (VLQs) - specifically the top (T) and bottom (B) quarks within the framework of the Two-Higgs-Doublet Model Type II (2HDM-II), considering both singlet and doublet representations. While current LHC searches constrain VLQs decaying exclusively into Standard Model (SM) final states, the presence of additional scalars in the 2HDM-II opens new exotic decay channels, such as $T \to H^+b$, $T \to Ht$, $T \to At$, $B \to Hb$, and $B \to Ab$, which can substantially modify the derived exclusion limits. Our findings show a significant weakening of the LHC mass bounds when decays into BSM Higgs bosons dominate: for the singlet T quark (coupling $\propto \cot\beta$), the mass bound relaxes from ≈ 1.43 TeV to ≈ 1.28 TeV, while for the TB doublet, the limit dramatically drops from $\approx$ 1.54 TeV to $\approx$ 0.99 TeV (with $\mathcal{BR}(T \to H^+b) \sim 98\%$). Similarly, for the B quark, the singlet case (2HDM-II+B) limit decreases to ≈ 1.3 TeV. The most pronounced weakening is observed for the BY doublet, where the limit falls from 1.55 TeV to ≈ 0.98 TeV (due to high $\mathcal{BR}(B \to Hb)$ and $\mathcal{BR}(B \to Ab)$). These findings underline the crucial impact of exotic decay channels on experimental constraints for New Physics at the LHC.

This work builds upon our recent results published in Eur.Phys.J.C 85 (2025) 11, 1275 and JHEP 03 (2025) 020.

Presenter: SALIME, Khawla (Cadi Ayyad University, Marrakech)

Session Classification: WG3 parallel session

Contribution ID: **122** Type: **not specified**

Strong First-Order Phase Transitions and Exotic Intermediate Phases in the CP-Conserving 2HDM (12'+3')

Thursday 4 December 2025 11:15 (15 minutes)

Extended scalar sectors can significantly influence the cosmological evolution of the early universe. The additional scalar degrees of freedom allow for strong first-order phase transitions (SFOPT) into the electroweak-broken vacuum, which induce gravitational waves that, for sufficiently strong signals, might be detectable in the near future. Additionally, the universe might have undergone exotic intermediate phases such as charge-breaking or CP-violating phases via a multi-step phase transition.

In this talk, the parameter space of the CP-conserving 2-Higgs-Doublet Model is investigated with the recent version 3 of the code BSMPT. Within this model, we study the viability of SFOPTs in light of the recent experimental data from Higgs measurements and exotic Higgs searches. We furthermore present selected benchmark points involving different phase histories such as single- and multi-step phase transitions possibly involving intermediate charge-breaking and CP-violating phases, and study their features such as the size of the trilinear Higgs couplings as well as the strength of their gravitational wave signals.

Presenter: BORSCHENSKY, Christoph (Karlsruhe Institute of Technology)

Session Classification: WG3 parallel session

Contribution ID: **123** Type: **not specified**

Electroweak Baryogenesis with BARYONET: Theory and Applications (12'+3')

Thursday 4 December 2025 11:30 (15 minutes)

I will present BARYONET, an open-source framework for computing the baryon asymmetry of the Universe within electroweak baryogenesis (EWBG). Starting from the semiclassical WKB approach, where spatially varying complex masses across expanding bubble walls generate CP-violating forces, we derive and solve the transport equations governing chemical potentials and velocity perturbations, leading to a quantitative prediction of the baryon asymmetry.
The framework is validated against established formalisms and applied to benchmark scenarios, including singlet extensions, Two-Higgs-Doublet Models, and Higgs–ϕ^6 setups. Alongside the implementation, we provide an updated and transparent treatment of key EWBG ingredients such as diffusion constants, interaction rates, and sphaleron processes. BARYONET thus offers an automated, reproducible pipeline connecting theoretical derivations with collider and gravitational-wave phenomenology. I will also present preliminary results on the interplay between collider constraints and the regions of parameter space that yield the observed baryon asymmetry in singlet(s) extensions of the Standard Model.

Based on arxiv:2510.21915.

Presenter: BARNI, Giulio (IFT Madrid)

Session Classification: WG3 parallel session

Contribution ID: **124** Type: **not specified**

V-associated production & vector boson fusion of Higgs bosons as an LHC signature of CP violation (12'+3')

Thursday 4 December 2025 11:45 (15 minutes)

Many well-motivated extensions of the Standard Model predict new, entirely bosonic sources of CP violation (CPV). In these scenarios, the simultaneous observation of carefully selected bosonic processes emerges as a simple yet powerful method to unambiguously reveal the presence of CPV. The present study, which establishes a promising framework of CPV searches for the upcoming HL-LHC era, showcases this method by exploring the detectability of such generic CPV signatures within the economical Complex Two-Higgs Doublet Model (C2HDM). Specifically, we assess the observation prospects for viable combinations of gluon fusion, vector boson fusion and V-associated production processes which unequivocally signal the existence of CP-violating couplings within the bosonic spectrum of the model.

Based on arXiv:2507.05942.

Presenter: LOZANO ONRUBIA, Alvaro (IFT UAM-CSIC)

Session Classification: WG3 parallel session

Contribution ID: **125** Type: **not specified**

Probing Strong First-Order Electroweak Phase Transition scenarios in 2HDM with FCC-ee/CEPC (12'+3')

Thursday 4 December 2025 12:00 (15 minutes)

We investigate the potential of future electron-positron colliders, such as FCC-ee and CEPC, to probe 2-Higgs-doublet models (2HDMs) that facilitate a strong first-order electroweak phase transition (SFOEWPT), a necessary condition for electroweak baryogenesis. Focusing on a 2HDM in the CP-conserving limit, we identify parameter regions consistent with an SFOEWPT and evaluate their compatibility with projected precision electroweak and Higgs measurements, as well as searches for exotic Higgs bosons. We show that radiative corrections to $e^+e^- \to hZ$ production introduce deviations in the cross section that are resolvable with the anticipated sub-percent precision at lepton colliders even when experimental outcomes of the LHC and Z pole measurements are in agreement with the SM. This underscores the opportunities of a precision lepton collider to explore BSM quantum corrections to the Higgs sector more broadly.

Based on arXiv:2506.18555.

Presenter: ., Anisha (Karlsruhe Institute of Technology)

Session Classification: WG3 parallel session

Contribution ID: **126** Type: **not specified**

WG1 - Introduction

Wednesday 3 December 2025 14:00 (5 minutes)

Presenters: CALANDRI, Alessandro (Università & INFN, Firenze); KARLBERG, Alexander (University of Oxford); MISTLBERGER, Bernhard (SLAC); ARNOLD, Hannah (Stony Brook University)

Session Classification: Plenary (WG1)

Contribution ID: **127** Type: **not specified**

ggF (17'+5')

Wednesday 3 December 2025 14:05 (22 minutes)

Presenter: JONES, Stephen (IPPP Durham)

Session Classification: Plenary (WG1)

Contribution ID: **128** Type: **not specified**

VBF (17'+5')

Wednesday 3 December 2025 14:27 (22 minutes)

Author: FERRARIO RAVASIO, Silvia (Università degli Studi di Torino)

Presenter: FERRARIO RAVASIO, Silvia (Università degli Studi di Torino)

Session Classification: Plenary (WG1)

Contribution ID: **129** Type: **not specified**

VH (17'+5') [remote]

Wednesday 3 December 2025 14:49 (22 minutes)

Presenter: CHATTERJEE, Suman (DESY)

Session Classification: Plenary (WG1)

Contribution ID: **130** Type: **not specified**

VH

Presenter: CHATTERJEE, Suman (Deutsches Elektronen-Synchrotron (DE))

Session Classification: Plenary (WG1)

Contribution ID: **131** Type: **not specified**

Off-Shell

Session Classification: Plenary (WG1)

Contribution ID: **132** Type: **not specified**

Report from the Extended Higgs Sector (theory+experiment)

Wednesday 3 December 2025 16:30 (30 minutes)

Presenters: ROMPOTIS, Nikolaos (University of Liverpool); BIEKOETTER, Thomas (IFT Madrid)

Session Classification: Plenary (WG3)

Contribution ID: **133** Type: **not specified**

Report from the NMSSM subgroup

Wednesday 3 December 2025 17:00 (30 minutes)

Presenter: MÜHLLEITNER, Milada Margarete (KIT)

Session Classification: Plenary (WG3)

Contribution ID: **134** Type: **not specified**

[WG1] ttH NNLO+PS (7'+3')

Session Classification: Cross-topic plenary

Contribution ID: **135** Type: **not specified**

[WG1] Two-loop QCD corrections to ZH and off-shell Z boson pair production in gluon fusion (7'+3')

Session Classification: Cross-topic plenary

Contribution ID: **136** Type: **not specified**

[WG1] gg→ZH : updated predictions at NLO QCD including SMEFT contributions (7'+3')

Session Classification: Cross-topic plenary

Contribution ID: **137** Type: **not specified**

[WG1] ttH NNLO+PS (7'+3')

Friday 5 December 2025 14:00 (10 minutes)

Author: BIELLO, Christian (ETH Zurich)

Presenter: BIELLO, Christian (ETH Zurich)

Session Classification: Lightning session for LHCHWG Report 5

Contribution ID: **138** Type: **not specified**

[WG1] Two-loop QCD corrections to ZH and off-shell Z boson pair production in gluon fusion (7'+3')

Friday 5 December 2025 14:10 (10 minutes)

https://arxiv.org/pdf/2509.07072

Author: GRAU, Dominik (KIT)

Presenter: GRAU, Dominik (KIT)

Session Classification: Lightning session for LHCHWG Report 5

Contribution ID: **139** Type: **not specified**

[WG1] gg→ZH : updated predictions at NLO QCD including SMEFT contributions (7'+3')

Friday 5 December 2025 14:20 (10 minutes)

Author: CAMPILLO AVELEIRA, Benjamin (KIT)

Presenters: CAMPILLO AVELEIRA, Benjamin (KIT); HEINRICH, Gudrun (KIT)

Session Classification: Lightning session for LHCHWG Report 5

Contribution ID: **140** Type: **not specified**

[WG2] CPV benchmarks (7'+3')

Friday 5 December 2025 14:40 (10 minutes)

Author: SANTOS, Rui (ISEL and CFTC-UL)

Presenter: SANTOS, Rui (ISEL and CFTC-UL)

Session Classification: Lightning session for LHCHWG Report 5

Contribution ID: **141** Type: **not specified**

[WG3] Charged Higgs Pairs at the LHC: A NLO Analysis (7'+3')

Friday 5 December 2025 14:50 (10 minutes)

Author: BIERMANN, Lisa (PSI)

Presenter: BIERMANN, Lisa (PSI)

Session Classification: Lightning session for LHCHWG Report 5

Contribution ID: **142** Type: **not specified**

Updates from PDF global fits (20'+10') [remote]

Friday 5 December 2025 11:00 (30 minutes)

Presenter: THORNE, Robert Samuel (University College London)

Session Classification: Cross-topic plenary

Contribution ID: **143** Type: **not specified**

Higgs physics at Future Colliders (20'+10')

Friday 5 December 2025 12:15 (30 minutes)

Presenter: SCIANDRA, Andrea (Brookhaven National Laboratory)

Session Classification: Cross-topic plenary

Contribution ID: **144** Type: **not specified**

WG1 Higgs XS&BR: Outlook and Plans (10'+5') [remote]

Friday 5 December 2025 16:00 (15 minutes)

Presenter: CALANDRI, Alessandro (Università & INFN, Firenze)

Session Classification: Summary and closeout

Contribution ID: **145** Type: **not specified**

WG2 Higgs Properties: Outlook and Plans (10'+5')

Friday 5 December 2025 16:15 (15 minutes)

Presenter: JOVICEVIC, Jelena (Institute of Physics, University of Belgrade)

Session Classification: Summary and closeout

Contribution ID: **146** Type: **not specified**

WG3 BSM Higgs: Outlook and Plans (10'+5')

Friday 5 December 2025 16:30 (15 minutes)

Presenter: SANTOS, Rui (ISEL and CFTC-UL)

Session Classification: Summary and closeout

Contribution ID: **147** Type: **not specified**

WG4 HH and multi-Higgs: Outlook and Plans (10'+5')

Friday 5 December 2025 16:45 (15 minutes)

Presenter: RUIZ MARTINEZ, Arantxa (Univ. of Valencia and CSIC)

Session Classification: Summary and closeout

Contribution ID: **148** Type: **not specified**

Closing words from the Steering Committee (10'+5')

Friday 5 December 2025 17:00 (15 minutes)

Presenter: BARONE, Gaetano (Brown University)

Session Classification: Summary and closeout

Contribution ID: **149** Type: **not specified**

[WG4] ggF HH QCD and EW higher-order corrections and theory uncertainties (7'+3')

Friday 5 December 2025 15:10 (10 minutes)

Author: BONETTI, Marco (Eberhard Karls Universität Tübingen)

Presenter: BONETTI, Marco (Eberhard Karls Universität Tübingen)

Session Classification: Lightning session for LHCHWG Report 5

Contribution ID: **150** Type: **not specified**

Higgs decays in the SMEFT at NLO (19'+3')

Thursday 4 December 2025 14:22 (22 minutes)

Presenter: FORSLUND, Matthew (Princeton Center for Theoretical Science)

Session Classification: Plenary (WG2)

Contribution ID: **151** Type: **not specified**

SMEFT, Anomalous Couplings and CPV from CMS and ATLAS (19'+3')

Thursday 4 December 2025 14:44 (22 minutes)

Presenter: WINTERBOTTOM, Daniel (Imperial College)

Session Classification: Plenary (WG2)

Contribution ID: **152** Type: **not specified**

Summary from the Higgs coupling measurements (Run 2 summary and available results from Run 3) from ATLAS and CMS (19'+3')

Thursday 4 December 2025 15:05 (22 minutes)

Presenter: ORDEK, Serhat (Deutsches Elektronen-Synchrotron)

Session Classification: Plenary (WG2)

Contribution ID: **153** Type: **not specified**

Search for anomalous HVV coupling in the gamma gamma final state (19'+3')

Thursday 4 December 2025 11:22 (22 minutes)

Presenter: DE RIGGI, Federica (Sapienza Università & INFN, Roma1)

Session Classification: WG2 parallel session

Contribution ID: **154** Type: **not specified**

Higgs-top coupling measurements from ATLAS and CMS (19'+3') [remote]

Thursday 4 December 2025 11:44 (22 minutes)

Presenter: VECCHIO, Valentina ⊠ (University of Manchester)

Session Classification: WG2 parallel session

Contribution ID: **155** Type: **not specified**

Higgs to charm coupling (19'+3')

Thursday 4 December 2025 12:06 (22 minutes)

Presenter: LEE, Ming-Yan (Rheinisch Westfaelische Tech. Hoch.)

Session Classification: WG2 parallel session

Contribution ID: **156** Type: **not specified**

[WG4] BSM benchmarks and interference effects (7'+3') [remote]

Friday 5 December 2025 15:00 (10 minutes)

Author: RADCHENKO SERDULA, Kateryna (DESY)

Presenter: RADCHENKO SERDULA, Kateryna (DESY)

Session Classification: Lightning session for LHCHWG Report 5

Contribution ID: **157** Type: **not specified**

Search for H -> bb and H -> cc at LHCb and future prospects (15'+5') [remote]

Wednesday 3 December 2025 15:11 (20 minutes)

Presenter: HAN, Qundong (Università & INFN, Padova)

Session Classification: Plenary (WG1)

Contribution ID: **158** Type: **not specified**

ttH (17'+5')

Friday 5 December 2025 09:00 (22 minutes)

Presenter: WUCHTERL, Sebastian (CERN)

Session Classification: Plenary (WG1)

Contribution ID: **159** Type: **not specified**

Off-shell (17'+5')

Friday 5 December 2025 09:22 (22 minutes)

Presenter: RONTSCH, Raoul Horst (University of Milan and INFN, Milan)

Session Classification: Plenary (WG1)

Contribution ID: **160** Type: **not specified**

All-hadronic VH measurements from ATLAS and CMS (15'+3') [remote]

Thursday 4 December 2025 09:00 (18 minutes)

Presenter: ZHENG, Zhi (SLAC)

Session Classification: WG1 parallel session

Contribution ID: **161** Type: **not specified**

Charge asymmetry measurement in WH(->tautau) at CMS (15'+3')

Thursday 4 December 2025 09:18 (18 minutes)

Presenter: TREVISANI, Nicolò (KIT)

Session Classification: WG1 parallel session

Contribution ID: **162** Type: **not specified**

Scattering amplitudes for 3-loop Higgs+Jet production (15'+3')

Thursday 4 December 2025 11:00 (18 minutes)

arXiv:2504.06490

Presenter: CHEN, Xiang (University of Zurich)

Session Classification: WG1 parallel session

Contribution ID: **163** Type: **not specified**

Interference effects in gluon-fusion Higgs boson production (15'+3') [remote]

Thursday 4 December 2025 11:18 (18 minutes)

arXiv:2312.12384

Presenter: DEVOTO, Federica (SLAC)

Session Classification: WG1 parallel session

Contribution ID: **164** Type: **not specified**

Including QED effects in global PDF's (15'+3') [remote]

Thursday 4 December 2025 12:12 (18 minutes)

arXiv:2508.06603

Presenter: HOBBS, Timothy J (Argonne National Laboratory)

Session Classification: WG1 parallel session

Contribution ID: **165** Type: **not specified**

Higgs off-shell measurements at CMS using Run 2 data (15'+3')

Thursday 4 December 2025 11:36 (18 minutes)

Presenter: FERNANDEZ MANTECA, Pedro (CERN)

Session Classification: WG1 parallel session

Contribution ID: **166** Type: **not specified**

Measurement of ttH(->multilepton) production at ATLAS (15'+3')

Thursday 4 December 2025 09:36 (18 minutes)

Presenter: BRAHIMI, Nihal (CNRS/IN2P3 LAPP)

Session Classification: WG1 parallel session

Contribution ID: **167** Type: **not specified**

Gluon fusion background for VBF (15'+3') [remote]

Thursday 4 December 2025 11:54 (18 minutes)

Presenter: PREUSS, Christian (University of Goettingen)

Session Classification: WG1 parallel session

Contribution ID: **168** Type: **not specified**

ttH cross-section at NNLO+NNLL (15'+3') [remote]

Thursday 4 December 2025 09:54 (18 minutes)

arxiv:2503.15043

Presenter: KULESZA, Anna (ITP Muenster)

Session Classification: WG1 parallel session

Contribution ID: **169** Type: **not specified**

Path for deriving uncertainties for STXS 1.3 (10'+15') [remote]

Friday 5 December 2025 11:30 (25 minutes)

Presenter: HEIM, Sarah (Deutsches Elektronen-Synchrotron)

Session Classification: Cross-topic plenary

Contribution ID: **170** Type: **not specified**

H+HF/Hbb across WG3 and WG4 (15'+5')

Friday 5 December 2025 11:55 (20 minutes)

Presenters: MAZZEO, Elena (CERN); MANZONI, Stefano (CERN)

Session Classification: Cross-topic plenary

Contribution ID: **171** Type: **not specified**

VHbb CP analysis (19'+3') [remote]

Thursday 4 December 2025 11:00 (22 minutes)

Presenter: BARRUÉ, Ricardo (Marietta Blau Institute for Particle Physics, Vienna)

Session Classification: WG2 parallel session

Contribution ID: **172** Type: **not specified**

[WG1] H+c/H+b associated production (7'+3')

Friday 5 December 2025 14:30 (10 minutes)

Presenter: BEVILACQUA, Tiziano (University of Zürich)

Session Classification: Lightning session for LHCHWG Report 5

Contribution ID: **173** Type: **not specified**

Report 5 cross-section summary (15'+15')

Friday 5 December 2025 09:44 (30 minutes)

Presenter: KARLBERG, Alexander (University of Oxford)

Session Classification: Plenary (WG1)