



Higgs Performance meeting

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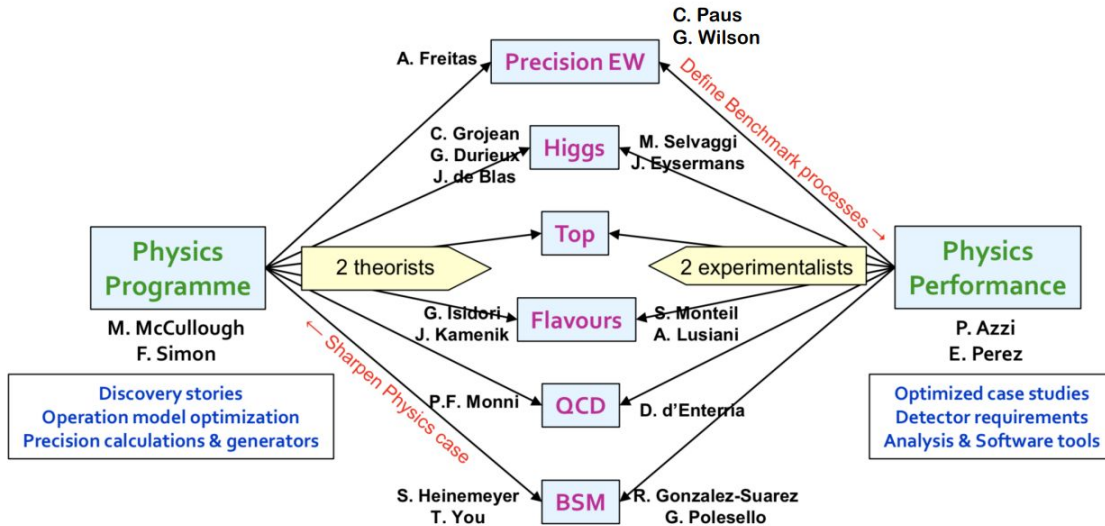
Higgs Performance meeting

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Michele Selvaggi (CERN), Jan Eysermans (MIT)

March 28 2022

FCC-ee Physics Groups overview



Physics Performance (exp.) **TODAY**

- Michele Selvaggi (CERN, CMS)
- Jan Eysermans (MIT, CMS)

Physics Programme (th.)

- Christophe Grojean (DESY)
- Gauthier Durieux (CERN)
- Jorge De Blas Mateo (Notre Dame)

Goal: establish the detector requirements that will match the systematic uncertainties with the statistical ones, through benchmark exercises and physics analyses

- As part of the FCC [Feasibility Study](#), to be completed by the end of 2025
- Mid-term review of feasibility study in 2024

Common tools and software



Central MC production ([see list for IDEA](#))

- Share samples for signals and backgrounds, using EDM4HEP format
- Different MC generators available (Pythia, Whizard, KKMC, Sherpa), coupled to Delphes for reconstruction
- Different systematics (e.g. BES, ISR, FSR, ...), detectors configurations (IDEA 3T, FullSilicon, ...), different COM

Analysis implementation and software

- FCCSW based on RDataFrame ([more info here](#)): baseline event selection + histograms for post-analysis/fitting part
- Common analysis tools for e.g. heavy flavor tagging: currently being integrated in FCCSW
- Discussion on baseline object/analysis selection (e.g. in ZH, $Z \rightarrow \text{leptons}$) that would be useful for potential combination of results (i.e. ensure orthogonality among analyses/categories)

Statistical part

- Advertise to use RooFit + HiggsCombine (CMS)
- Higgs mass and cross-section analysis fully implemented → will provide full documentation with scr
- Beneficial for potential combination of results (e.g. different analyses, or different COMs)

We, as conveners, are happy to help in generating MC, software and fitting part, ...

Today's meeting



Overview of existing efforts

- Quick introduction by several analysis groups
- Analysis strategies, results (so far), plans for the future, person power, rough timelines

Group covers already substantial amount of analyses (see Agenda), though some missing items

- Importantly Higgs width analyses
 - e.g. $H \rightarrow ZZ$ BR
- Rare decays ($\gamma\gamma, \mu\mu, \dots$)
- Other proposals welcome

The screenshot shows a Zoom meeting agenda for "Higgs Performance meeting" on Monday 28 Mar 2022, 14:30 to 17:05. The meeting is a videoconference titled "Higgs Kick-off meeting". The agenda includes the following items:

- 14:30 → 14:40 Introduction**
Speakers: Jan Eysermans (Massachusetts Inst. of Technology (US)), Michele Selvaggi (CERN)
- 14:40 → 14:50 ZH, Z→ee/mumu: Higgs mass, cross-section and H → hadrons**
Speakers: Ang Li (APC, CNRS/IN2P3 and Université de Paris), Giovanni Marchiori (APC, CNRS/IN2P3 and Université de Paris), Gregorio Bernardi (APC Paris CNRS/IN2P3), Jan Eysermans (Massachusetts Inst. of Technology (US))
- 14:50 → 15:00 ZH, Z→vv, Higgs →hadron**
Speakers: Laurent Forthomme (CERN), Loukas Gouskos (CERN), Michele Selvaggi (CERN)
- 15:00 → 15:10 H→ss and strange tagging**
Speakers: Christopher Damerell (Science and Technology Facilities Council STFC (GB)), Jerry Vavra (SLAC), Matthew Basso (University of Toronto (CA)), Valentina Cairo (CERN)
- 15:10 → 15:20 Higgs → invisible**
Speakers: Andrew Mehta (University of Liverpool (GB)), Nikolaos Rompotis (University of Liverpool (UK))
- 15:20 → 15:30 Higgs self coupling**
Speakers: Roberto Salerno (Centre National de la Recherche Scientifique (FR)), Roy Crawford Lemmon (STFC Daresbury Laboratory (GB))
- 15:30 → 15:40 ee→H**
Speaker: David d'Enterria (CERN)
- 15:40 → 15:50 H→tau tau and new scalars**
Speakers: Clement Helsens (CERN), Markus Klute (Karlsruhe Inst. of Technology (GER)), Xunwu Zuo (Rice University (US))
- 15:50 → 16:00 Anomalous couplings**
Speakers: Juan Alcaraz Maestre (Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas (CIEMAT, Madrid)), Maria Cepeda (CIEMAT)

A file named "CIEMAT_FCC-Higg..." is visible at the bottom of the agenda.

FCC Week

- <https://indico.cern.ch/event/1064327>
- 30 May 2022 to 3 June 2022, Paris (Sorbonne)
- Would be nice to have results presented

Next meeting(s)

- General meeting with theorists (Physics Programme)
- Status update meeting somewhere around 3th week of April
- Just before FCC week to discuss the content presented

Shall we open maybe a Mattermost channel for Higgs studies, for technical details, questions, ... ?