News - Physics Performance, Dec 14, 2020

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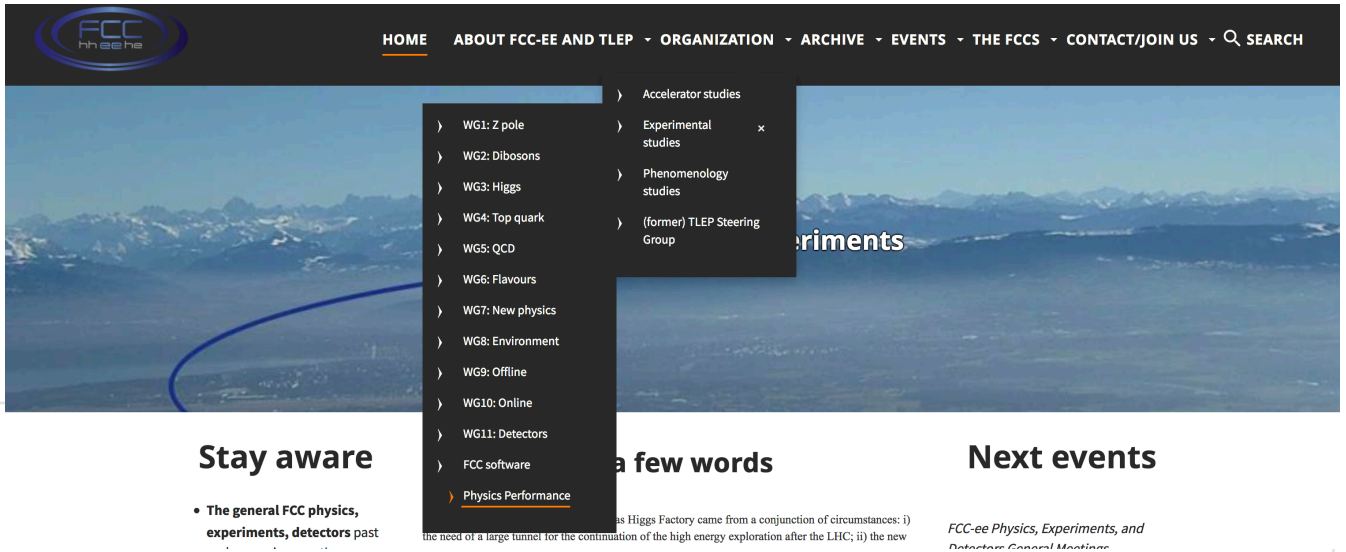
FCCeePhysicsPerformance repository and documentation REFURBISHED!

https://github.com/HEP-FCC/FCCeePhysicsPerformance

Also linked from the main FCC-ee site, https://fcc-ee.web.cern.ch



README.md

Welcome to the FCC-ee Physics Performance Documentation

Table of Contents

Case studies (evolving list)

1. Electroweak physics at the Z peak
2. Tau Physics
3. Flavour physics
4. WW threshold
5. QCD measurements
6. Higgs physics
7. Top physics
8. Direct searches for new physics

The team working on the Long-Lived particle
case study has started already to organize itself, with working meetings, and to populate the corresponding page (Rebeca Gonzalez Suarez)

Two new write-ups on Flavour (Stephane and Guy), one on CP violation, the other on rare decays.
INFN Phd student picking up a flavor analysis M. Scodeggio

Flavour tagging using DNN (Loukas Gouskos, Michele Selvaggi): looks very promising, see results presented at the workshop

The ZH recoil case study has also started, with a first concrete analysis in the lepton channel (Clement Helsens) and other people joining.

Studies also starting for Top Analysis (J. Andrea and Jorgen/Julie)

General information for FCC-ee analyses

1. Common event samples
2. Example analyses
3. To produce your own Delphes samples
    i. Change the Jet algorithms
4. The five-parameter tracks produced by the Delphes interface
5. Vertexing and flavour tagging
6. Making particle combinations with awkward arrays
7. Generating events under realistic FCC-ee environment conditions
    i. Beam energy spread
    ii. Vertex distribution
    iii. Transverse boost to account for the crossing angle
8. Monte-Carlo programs
9. Bibliography

Common event samples (Pythia)

Delphes samples in EDM4HEP, Nov 2020

A large set of DELPHES samples (Pythia) have been produced (C. Helsens) in EDM4HEP, using the "IDEA_TrkCov" card, and are stored in EOS. See here for the EOS path, number of events, cross-section, etc. The Pythia cards can be found in EOS in /eos/experiment/fcc/ee/utils/pythiacards, and the DELPHES card used for this production is in /eos/experiment/fcc/ee/utils/delphescards/fcc_tmp.

Caveats: beam-energy spread is not included ; and these samples are known to have an issue with the associations for electrons.

Generated Samples

- Samples at √s = 91 GeV
  - Inclusive samples :
    - Z → tau tau; Z → light jets; Z → cc ; Z → bb
  - Exclusive samples :
    - many Z → bb samples with exclusive decays performed b
    - Z → tau tau with tau → μ gamma
- Samples at √s = 125 GeV:
  - ee → H with H → gg ; H → bb ; H → cc ; H → tau tau
  - diboson production: ee → WW, ee → ZZ, ee → H
  - Drell-Yan : tautau, qq, bb, cc
- Samples at √s = 240 GeV:
  - ee → ZH
  - diboson production: ee → WW, ee → ZZ
- Samples at √s = 365 GeV:
  - ttbar, ZZ, WW, ZH production
  - ttbar, ZZ and WW in the full hadronic channel

Example analyses

Example analyses

Example analyses can be found in the FCCAnalyses repository. Checkout the master branch if you want to analyze EDM4HEP samples (the fccedm branch contains examples for the FCCSW-FCCEDM samples). And follow the instructions in the README of FCCAnalyses repository.

- Simple example used in the README: examples/FCCee/higgs/mH-recoil/mumu/
- The example in examples/FCCee/flavour/generic-analysis shows how the associations work (how to retrieve the Monte-Carlo particle associated to a reconstructed particle; how to retrieve the track of a reconstructed particle)
- The same example also shows how to use the code of FCCAnalyses to compute event variables (thrust, sphericity, etc)

- Full examples : from flat ntuple production to plotting macros
- List of functionalities / tools included is expanding
- People are strongly encouraged to code their analysis using this framework, making use of and contributing to the common analysis code.

NB: still “dynamic. Presentation also in today’s meeting.
Real experience will help optimize the overall documentation strategy

Action points & Agenda today

- Using for now this mailing list: fcc-experiments-lepton@cern.ch
- Maybe open a Mattermost channel for communication on case studies? (sub-channels possible for working discussion)
- **Next meeting: JANUARY 18 2021**

16:00 → 16:10 **News / welcome**
Speakers: Emmanuel Francois Perez (CERN) , Patrizia Azzi (INFN Padova (IT))

16:10 → 16:40 **Introduction to FCCAnalyses**
Speaker: Clement Helsens (CERN)

16:40 → 16:55 **Bc to tau +nu**
Speaker: Donal Hill (University of Oxford (GB))

16:55 → 17:15 **Point-to-point uncertainty on √s with dimuons, and momentum scale stability**
Speaker: Emilia Leogrande (University of Glasgow (GB))

17:15 → 17:35 **ee -> gamma gamma: SM rate measurement and deviations from New Physics**
Speaker: Juan Alcaraz Maestre (Centro de Investigaciones Energéticas, Medioambientales y Tecnológicas (CIEMAT, Madrid))