News - Physics Performance, Oct 19, 2020

✦ Note the new Indico category "Physics Performance" under "Lepton Collider Physics and Experiments" (thanks to Alain and Patrick !)

  ✦ We plan to meeting monthly. Time slot = Monday 3 – 5pm

    ✦ 3rd Monday of each month

✦ Current understanding of the Mondays schedule :

  ✦ Last Monday of each month: FCC General Meeting

  ✦ 3rd Monday of each month: FCC-ee Physics Performance Meeting

  ✦ 2nd Monday of each month: FCC-ee MDI Meeting

  ✦ 1st Monday of each month: FCC-ee Detector Concept Meeting

    ✦ of course workshops/holidays etc might slightly change this

Other organisational news

- Preparation for the November workshop (https://indico.cern.ch/event/932973/):

    - Tuesday morning, general reports about PPC

    - Wednesday morning, before the detectors sessions

    - Friday morning, second session: reports on ongoing activities

    - Invitations to speakers are being sent

- The "Long Lived Particles" effort is getting organised

    - A first informal meeting with interested parties from theory/PBC/colliders (Snowmass LOI):

        - Minutes can be found here https://indico.cern.ch/event/962804/

        - more meetings to organize and split the work

        - « Case studies » will be a subset of all the work that will done by the group. First step is to define « benchmark » processes to be used for the case studies

Documentation & Repository for the Physics Performance effort

✦ Github repository that contains two main items:

✦ **Case studies pages:** they are (will be) collected in the "Case studies" page, each study being listed along with the requirement(s) that it addresses.

   ✦ When you click on one CS, you are directed to another page, which will be an "analysis twiki" : the case study contact will be given access rights and will populate this page as (s)he sees fit - bibliography, links to relevant talks, links to private repositories, etc.

      ✦ In addition, there is one subdirectory per CS in the repository, which may be used to host steering cards, pieces of code, ultimately the whole chain that allows to produce the analysis. Again, this is the "property" of the CS contact.

✦ **"General information » page** (while waiting for some better name.)

   ✦ The idea here is to collect recipes, analysis tips, etc - information that is not specific to one CS but of interest for many, while not being general enough or high-level enough to be hosted in the software documentation.

      ✦ So far, it is a rather short and random collection of information that has been circulated in emails and that is of general interest.

✦ This repository will be soon moved to a proper « home » and we will advertise the full github path.

✦ This repository will be linked from the web site http://fcc-ee.web.cern.ch/ and there will be proper links also connecting Physics Groups and CS as well

Physics case studies

Table of Contents

Electroweak physics at the Z peak

General references

Precision Electroweak Measurements on the Z Resonance: The Phys Report from the LEP & SLD Electroweak WG, 2006

Case studies

- The ratio Rl: geometrical acceptance for lepton pairs
- The total Z width: track momentum (and angular) resolution, scale (magnetic field) stability
- Luminosity from diphoton events (for sigma^0_had): electron-photon separation, photon acceptance
- The muon pair forward-backward asymmetry A^mumu_FB: QED corections
- The forward-backward asymmetry of b quarks at the Z pole: flavour tagging, QCD corrections
- The coupling of the Z to electron neutrinos: photon energy scale
- Lepton Flavor violation in Z and tau decays: lepton momentum scale

Tau Physics

General references

- Precision Tau Physics: review by A. Pich
- Tau-lepton Physics at the FCC-ee circular e+e− Collider: Mogens Dam, proceedings TAU'2018

Case studies

- The measurement of the tau lifetime: accuracy of the construction and the alignment of the vertex detector

General information

Rather random for the while...

Table of Contents

CLD paper

The CLD performance paper on arXiv

Common event samples

Some samples (ZH, ZZ and WW, at sqrts = 240 GeV) have been produced (Sep 2020) for the Snowmass Software tutorial. The events were simulated with Delphes, with the "IDEA_TrkCov" card. They are on EOS at CERN, details can be found here.

Vertexing and flavour tagging

- Description of the LCFIPlus algorithm used for the CLD studies
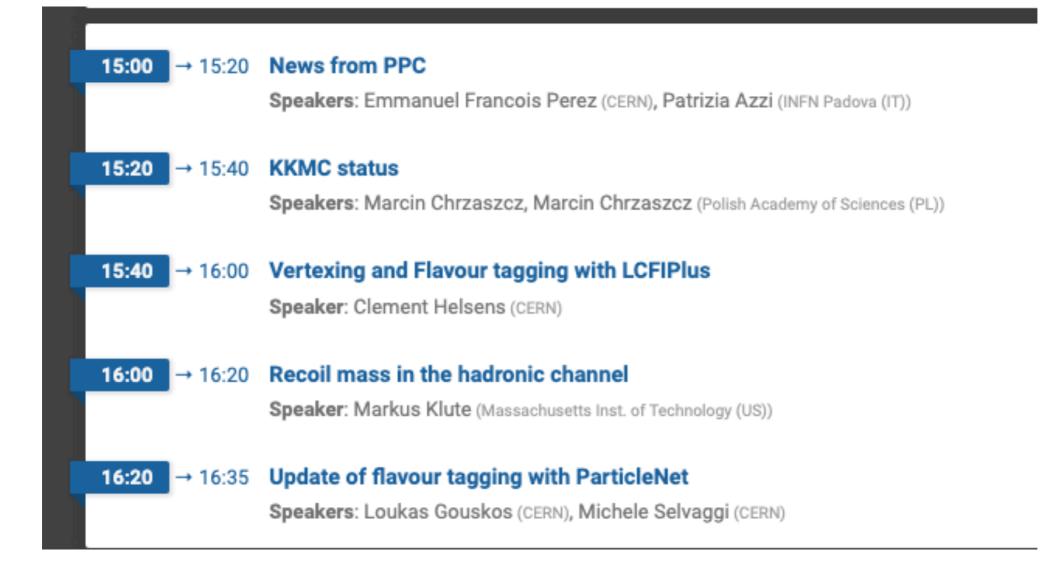- see also the work done in the context of the Hcc case study

Producing five-parameter tracks with the Delphes interface

- Recent versions of Delphes offer a rather detailed modelling of the tracks via the TrackCovariance Delphes module, developed from a code by Franco Bedeschi. The module, in the input card, must contain a description of the tracker, see for example the delphes_card_IDEAtrkCov.tcl. (Try to give more detail here about the geometry description). This produces five-parameter tracks - i.e., including the transverse and longitudinal impact parameters - with their covariance matrix.

- In FCCSW: in order to save the 5-parameter tracks and their covariance matrix, the DelphesSaveChargedParticles module should be configured with the flag **saveTrkCov** set to True. Example:

```
chhadSaveTool = DelphesSaveChargedParticles("efcharged")
```

15:00 → 15:20 News from PPC

Speakers: Emmanuel Francois Perez (CERN), Patrizia Azzi (INFN Padova (IT))

15:20 → 15:40 KKMC status

Speakers: Marcin Chrzaszcz, Marcin Chrzaszcz (Polish Academy of Sciences (PL))

15:40 → 16:00 Vertexing and Flavour tagging with LCFIPlus

Speaker: Clement Helsens (CERN)

16:00 → 16:20 Recoil mass in the hadronic channel

Speaker: Markus Klute (Massachusetts Inst. of Technology (US))

16:20 → 16:35 Update of flavour tagging with ParticleNet

Speakers: Loukas Gouskos (CERN), Michele Selvaggi (CERN)

- ✦ more and more case studies are being started. Please contact us right away, don't wait to have a « mature study »!

- ✦ This is a working group where we develop together a lot of the needed tools so that individuals can go faster.

- ✦ We are also available to help you out if you want to contribute but don't know how! :-)