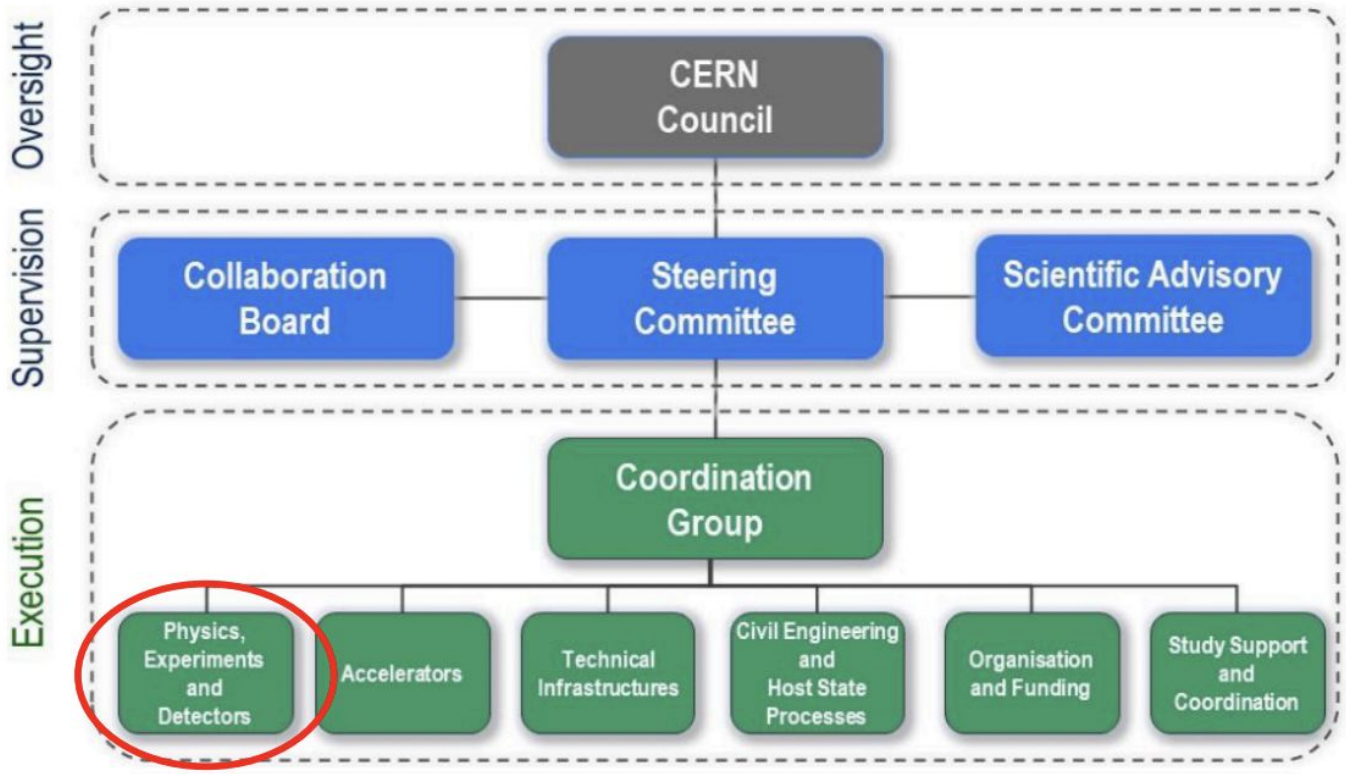
News - Physics Performance, Sep 21, 2021

P. Azzi (INFN - PD), E. Perez (CERN)

FCC Feasibility Study (2021-2025)



FUTURE CIRCULAR COLLIDER FEASIBILITY STUDY:

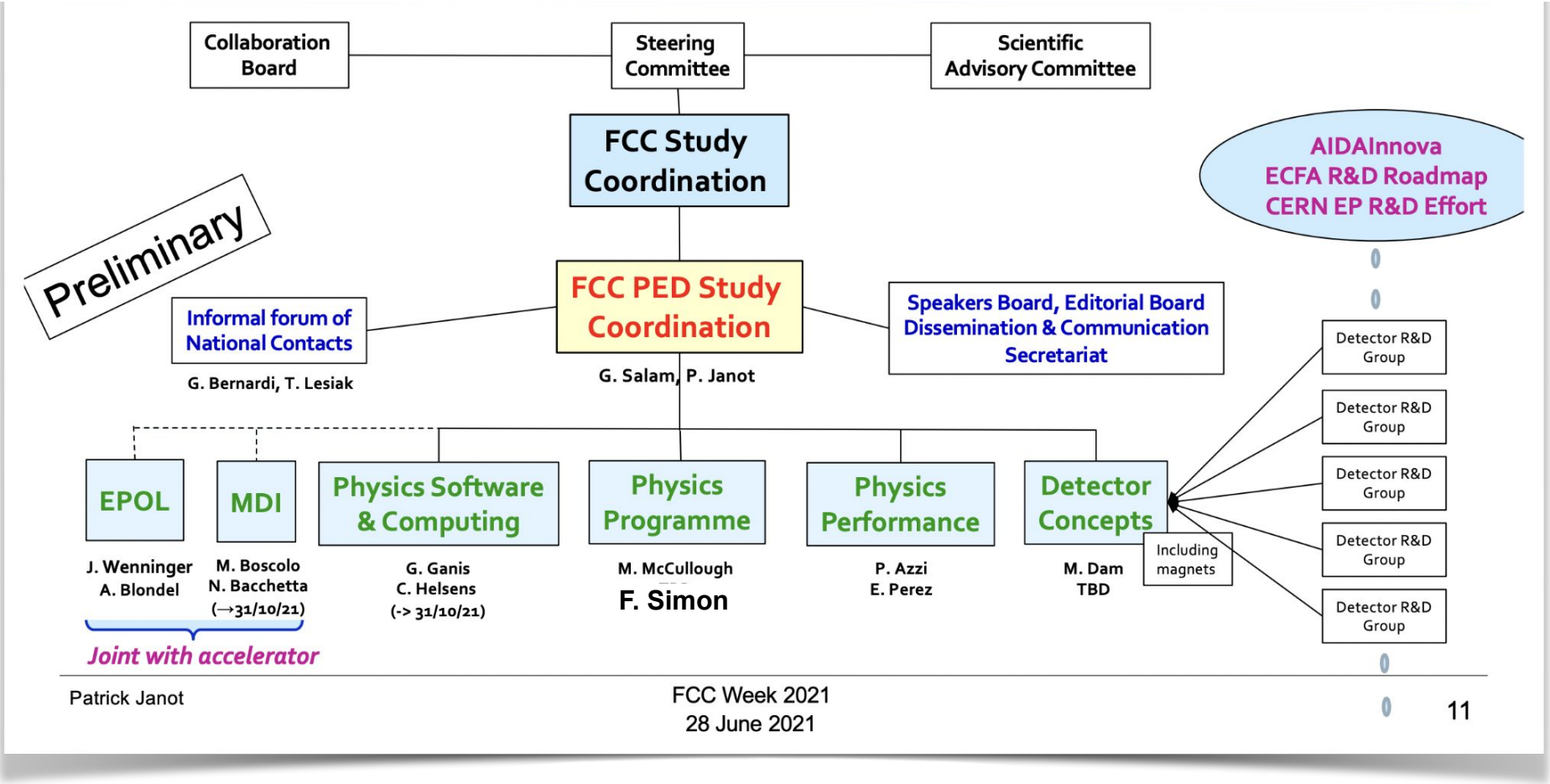
MAIN DELIVERABLES AND MILESTONES

CERN/SPC/1161
CERN/3588
Original: English
21 June 2021

RESTRICTED COUNCIL
203rd Session
17 June 2021

- a committee including external experts will be established to review the cost of the first-stage project (the tunnel and the FCC-ee collider) by mid-2023; a second cost review will take place at the end of the Feasibility Study in 2025;

PED Pillar Structure



Physics Programme WP

- **Six working groups (with at least one experimentalist and one theorist conveners, tbd)**
  - **Focus on the phenomenological aspects of the integrated FCC programme**
    1. **Precision Electroweak Physics**
       - ➔ **Z peak and WW threshold (ee)**
       - ➔ **High-energy diboson and difermion (hh)**
    2. **Higgs physics**
    3. **Flavour (c, b, τ) physics**
    4. **BSM Physics**
       - ➔ **Indirect sensitivity from precision measurements (ee and hh)**
       - ➔ **Direct BSM searches at the smallest couplings (ee and hh) and highest masses (hh)**
    5. **QCD**
    6. **Top physics**
  - **To be considered in addition**
    - **Physics at FCC-hh with dedicated experiments**

Physics Programme mandate

- **Within the domain of expertise of each working group**
  - **Bring together theorists and experimentalists**
  - **Report on recent results in the literature and develop new ideas**
    - **New models to probe; new experimental tests to implement; new observables to test**
    - **Examine different operation models (L vs √s: values and time ordering)**
    - **Propose ancillary (in situ) measurements of key accelerator/detector parameters**
  - **Propose physics benchmark measurements**
    - **Which may lead to new detector performance requirements or theory precision requirements**
  - **Plan for precision theory calculation development, to match experimental uncertainties**
    - **A strategic priority for FCC-ee – Such developments have focussed on LHC in the past 20 years.**
  - **Review existing MC generators**
    - **And plan for upgrade to include most recent theoretical progress**
  - **Deliver and test global fitting code and formulae**
    - **For standard model, specific BSM models, and generic Effective-Field-Theory (EFT) approach**
  - **Organize public documentation for the results of the working group**

Physics Performance Reorganization (in progress)

- Physics Performance effort was put in place O(1 year) ago. In the first months, with just a few analyses under study, having one single forum was good enough.

- We have now acquired a critical mass in several activities
  - Example: Higgs measurements
  - Starting from March, we have actually had:
    - ✔ Regular "working meetings" on the mH and σ(ZH) case study, in addition to the monthly Physics Performance meetings
      - Agendas under the Physics Performance category, although the meetings were not broadly announced
    - ✔ an ad-hoc mailing list
      - First with the few early proponents of this case study
      - who have been joined by others
      - It has now grown to include other people working on other Higgs analyses (e.g. contributors to our last Phys. Perf. meeting in July)
  - We think it is now time to make this subgroup more formal.

- Similarly: activities in Flavour Physics would benefit from a subgroup. And hopefully, other areas will also reach a critical mass soon.

Ideas for subgroups and activities

- Have working groups that “mirror” the WGs of Physics Programme
  - Higgs / Flavours / Precision EW / Top / BSM / QCD
  - The first two could be effective starting from now.

- Expect “working meetings” of these WGs where the details of the analyses are discussed.

- The monthly Physics Performance meetings would consist of :
  - regular status reports from these WGs
  - Detailed presentations of ”case studies” when they are (close to) final or when there has been significant progress.
  - Reports on “transverse” activities – for example algorithms for b / c / g / s tagging, or packages for kinematic fits.

- Considering 1 junior + 1 more senior person as “conveners”.

- Lenght of term still being discussed.

suggestions are welcome!

Considerations

- Clear written mandates are needed for Physics Performance and for Physics Programme
  - Such that there is no ambiguity of what should be done where
  - Some aspects were touched upon in Physics Performance so far, as there was no better forum, but should actually be part of Physics Programme now
    - ✔ Discussions about the Monte-Carlo generators
    - ✔ The current activities of the LLP informal group

  This is being discussed within the PED coordination team.

- A Task Force (lead by David Lange) has been formed to prepare an updated proposal for the Software and Computing WP.
  - Will use the SW & computing Task Force to also clearly define the boundaries between the SW group and Physics Performance.

- pp (and ep) should probably be included too – at least not excluded from the mandate of our group.

Future events of interest - Mark your calendar

- CEPC international Workshop, 8-12/11 China
  - https://indico.ihep.ac.cn/event/14938/
- ECFA "topical workshop" on Generators for "Future H/Ewk/top factories" - date to be defined, but 1st or 2nd week of November
- ECFA Plenary Meeting: 18-19 November
- **3rd FCC France Day,** Annecy, 30/11-2/12
- **5th FCC Physics Workshop,** Liverpool, 7-11 Feb 2022
  - https://indico.cern.ch/event/1066234/
- **FCC Week 2022**, Paris, 30/5-3/6 2022 -

Today's agenda and next meeting

15:00 → 15:05 **News / welcome** 5m

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

15:05 → 15:25 **B to K* tau tau at FCCee** 20m

Speakers: Stephane Monteil (Université Clermont Auvergne (FR)) , Tristan Miralles (LPC Clermont)

15:25 → 15:55 **Top anomalous couplings** 30m

Speakers: Jorgen Beck Hansen (University of Copenhagen (DK)) , Julie Munch Torndal (CERN) , Julie Munch Torndal (University of Copenhagen (DK))

15:55 → 16:15 **Angular analysis of e+e- –> W+ W- final states at sqrt(s)=240 GeV** 20m

Speakers: Jean-Loup Elysee Raymond (Centre National de la Recherche Scientifique (FR)) , Lucia Di Ciaccio (Centre National de la Recherche Scientifique (FR)) , Lucia Di Ciaccio (Centre National de la Recherche Scientifique (FR))

Next meeting: Monday, October 18