

## Organizational meeting on FS Energy calibration polarization and monochromatization working group

Alain Blondel  
Angeles Faus-Golfe,  
Eliana Gianfelice,  
Ivan Koop,  
Katsunobu Oide,  
Tatiana Pieloni,  
Jorg Wenninger  
Frank Zimmermann

Proposed agenda:

1. discussion of goals of the FDS study for Energy calibration and polarization  
(see text)
2. discussion of goals of the FDS study for monochromatization  
(see text)
3. organizational issues

Let me start by a few slides from Fabiola's presentation last Tuesday concerning the FCC study proposal.

These decisions were endorsed by council unanimously on the 17-18 June session.

FCC Feasibility Study (FS) will address recommendation of 2020 update of the European Strategy for Particle Physics (ESPP):

*“Europe, together with its international partners, should investigate the technical and financial feasibility of a future hadron collider at CERN with a centre-of-mass energy of at least 100 TeV and with an electron-positron Higgs and electroweak factory as a possible first stage. Such a feasibility study of the colliders and related infrastructure should be established as a global endeavour and be completed on the timescale of the next Strategy update.”*

High-level objectives of the Feasibility Study:

- ❑ optimisation of placement and layout of the ring and related infrastructure, and demonstration of the geological, technical, environmental and administrative feasibility of the tunnel and surface areas;
- ❑ pursuit, together with the Host States, of the preparatory administrative processes required for a potential project approval, with a focus on identifying and surmounting possible showstoppers;
- ❑ optimisation of the design of the colliders and their injector chains, supported by targeted R&D to develop the needed key technologies;
- ❑ development and documentation of the main components of the technical infrastructure;
- ❑ elaboration of a sustainable operational model for the colliders and experiments in terms of human and financial resource needs, environmental aspects and energy efficiency;
- ❑ development of a consolidated cost estimate, as well as the funding and organisational models needed to enable the project's technical design completion, implementation and operation;
- ❑ identification of substantial resources from outside CERN's budget for the implementation of the first stage of a possible future project;
- ❑ consolidation of the physics case and detector concepts for both colliders.

→ results will be summarised in a Feasibility Study Report by the end of 2025.



# Main deliverables and milestones

main deliverables and timelines of the FCC Feasibility Study	2021				2022				2023				2024				2025			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
technical design work and R&D in all relevant areas																				
progress review on key technology R&D programs																				
development and documentation of implementation scenario																				
design update for preferred implementation variant																				
communications plan development and implementation																				
development of funding models and concepts																			update	
development of project organisation and operation models																			update	
CDR cost update with external review																				
general coherence review (mid-term)																				
detailed design for Feasibility Study Report																				
environmental evaluation process and impact study with host states							preparation													
high-risk areas site investigations							preparation													
project cost update with external review																				
Feasibility Study Report																				

Decision on placement of the ring (geology, surface areas, etc.): mid-2022

High-risk area site investigations for selected placement: mid-2023 to mid-2025

Design update for preferred placement scenario: mid-2023

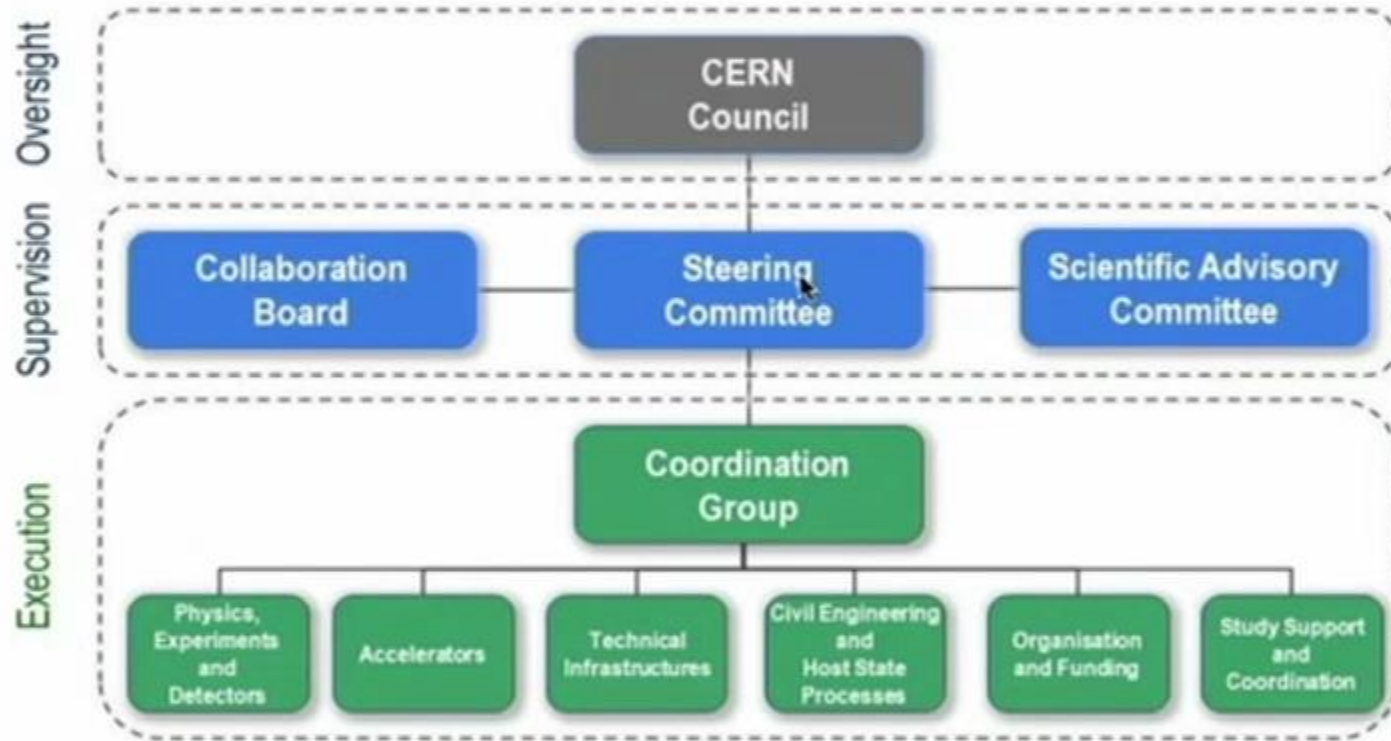
General coherence review across all work packages: mid-2023 (Feasibility Study mid-term review)

Cost reviews by committee of external experts: 2023 and 2025

In parallel, **financial feasibility** assessment:

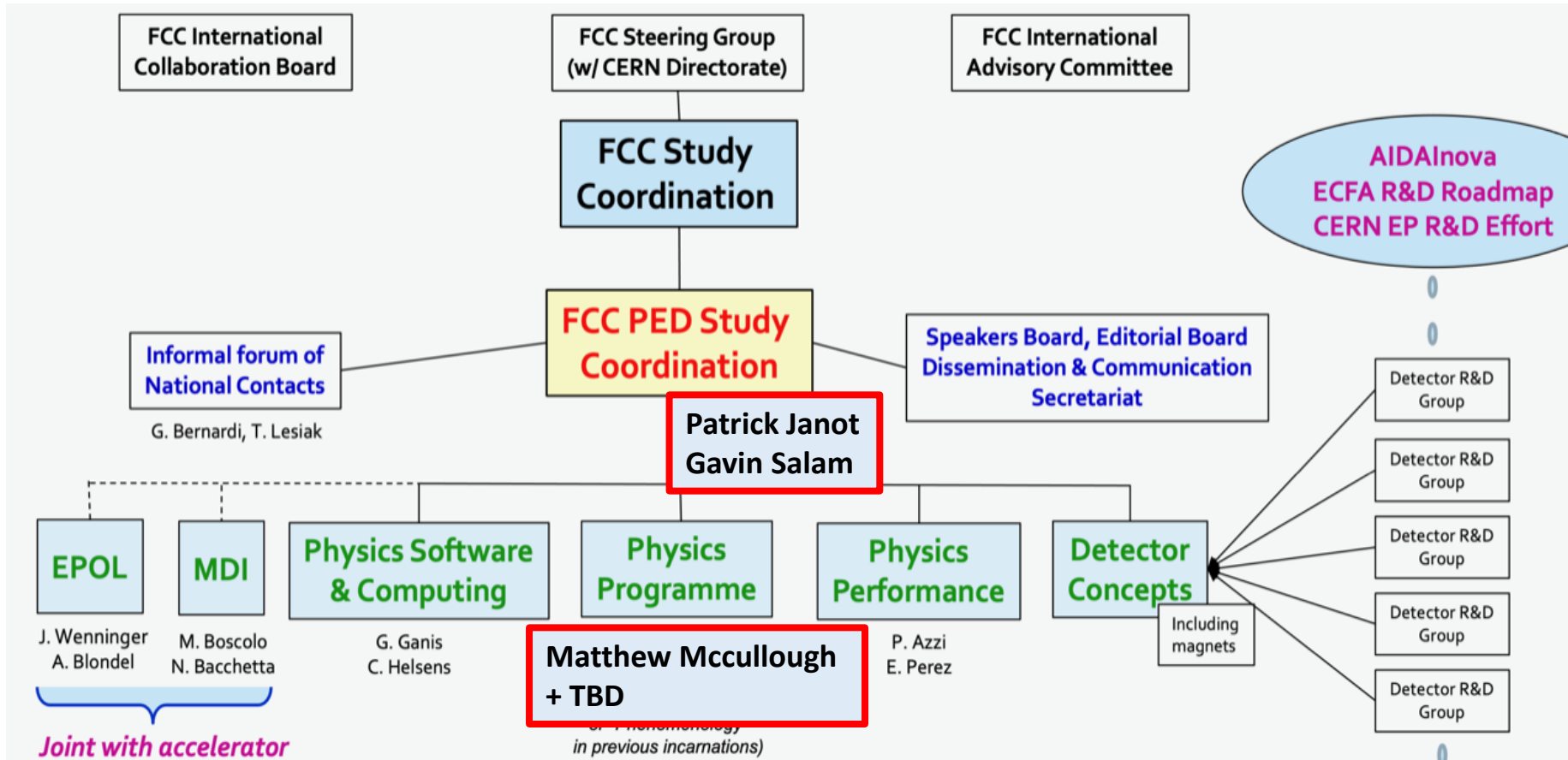
- development of profile of expenses vs time, and corresponding funding needs: end-2021;
- preliminary discussions with main partners: end-2023;
- identification of potential contributions and development of affordable funding model for first-stage (tunnel and FCC-ee): end-2025.

Resources for FS (~ 100 MCHF) included in 2020 MTP



- ❑ **Collaboration Board:** 1 representative per Institute that signed or will sign FCC MoU (~ 170 currently). It reviews work needs and resources requirements and their sharing among participating institutes.
  - ❑ **Steering Committee:** provides technical and organisational supervision of the study; includes CERN's Directorate, study leader, CB Chair, Council President ex-officio, and up to 5 members from Institutes involved in the FS
  - ❑ **Scientific Advisory Committee:** international experts covering all relevant scientific and technical areas
  - ❑ **Partners envisaging to contribute meaningful level of resources towards future project** (e.g. non-Member States, etc.) **will be invited by Council's President to attend agenda items devoted to FS.**
  - ❑ **Coordination group:** chaired by study leader, brings together conveners of the 6 activities
- Approved unanimously by the Council

# Organization of PED (not in Fabiola's slides)



Joint with accelerator

## NEWS:

1. **Gavin Salam** has agreed to be one of the PED study coordinators, **Patrick Janot confirmed**
2. **Matthew Mccullough** has agreed to be one of the **Physics programme coordinators** a second person is considering.
3. Having defined the mandate of the 'detector concepts' we are now collecting **nominations**
4. Possibility of 3d person in some boxes is OK.
5. Bacchetta and Helsen will need to be replaced before end 2021.



The goals of the working group on Center-of-mass Energy, Polarization and Monochromatization (EPOL), in the context of the FDS, are as follows (they are developed further in [3] and [4]).

**The following list is for discussion and correction.**

## Goals for centre-of-mass energy calibration:

- Confirm the technical feasibility and the performance of the scheme proposed in [2], by sufficient level of simulations; in particular complete the study of the depolarization method and its precision at the W energy.
- The existing simulation codes for luminosity and polarization must be unified, while calculating both the spin tune and the IR centre-of-mass energy. The relationship between these two quantities and its sensitivity to tuning knobs, centre-of-mass energy and various imperfections should be investigated and if possible mitigated.
- In particular, the mitigation of collision effects such as opposite sign dispersion should be developed.
- The design and implementation of the instrumentation must be completed and costed; this includes  $e^+$  and  $e^-$  polarimeter/spectrometer, wigglers, depolarization kicker and possibly additional IR instrumentation such as beamstrahlung monitors.
- The simultaneous and coordinated operation of the accelerator, of the continuous polarization and depolarization measurements, and of the beam monitoring devices, should be analysed in order to ensure a precise extrapolation from beam energies to the knowledge of centre-of-mass energy and energy spread.
- The contributions of the particle physics experiments to the determination of the centre-of-mass energy and its spread should be quantified and integrated in analysis and operation.

## Goals For monochromatization:

- The schemes of combination of schemes able to provide monochromatization should be investigated quantitatively to establish the feasibility of useful monochromatization.
- At the same time the experimental working group should explore further the optimization of purity and efficiency for the selection of Higgs s-channel production, possibly taking into account the specific beam set-ups.
- Realistic implementation scenarios should be proposed and analyzed with the tools developed above.
- The monitoring developed at the Z and W energies for ECM determination should be adapted for the Higgs s-channel production and possible additional actions to be foreseen should be identified and studied.
  - might need to run beams with different energies to reach exactly  $ECM = m_{\text{Higgs}}$
  - need to measure energy spread in each point of the luminous region (with e.g. large angle dimuon events)



# Organizational matters

- participants
  - collect mailing list (CERN e-group) How?
  
- regular zoom meetings
  - desirable?
  - frequency?
  - who chairs, organizes?
  
- full meeting or individual tasks meetings
  
- EPOL council meetings
  - suggest this group (with possible adjustments) meets briefly regularly
  - for instance at the end of each zoom meeting for 15 minutes to decide next meeting etc
  
- workshop? (in 2017 was very useful!)
  - format (2 weeks in person?)
  - dates (e.g. 15-27 November or similar)
  - location CERN, (or Fermilab, Novosibirsk etc...)
  - organizers local + program