

5th FCC France workshop, Paris, 26-28 November 2025

Some Conclusions

European Strategy : Status of the projects according to WG2a

Scope

	CLIC	FCC-ee	FCC-hh	FCC-hh SA	LCF	LEP3	LHeC	MC
Is the project scope well defined? Does the scope definition allow a translation into an engineering design at this stage? (N=red; Y=green, for the majority of the important subsystems=yellow)								
Does a WBS, at least high level, with sufficient granularity (down to at least 100 MCHF or better) exist? And has it an associated scope definition? (Y=green; N=red; partially = yellow)								
Summary								

Table A.1: Traffic-light summary table for the “Scope” criterion (i.e. scope level-of-definition).

FCC-ee

Project	Scope	TRL	R&D	Test facilities	Performance	Site preparation	Schedule	Cost	Risk
FCC-ee 91-365 GeV		4 - 7 / 6.0							

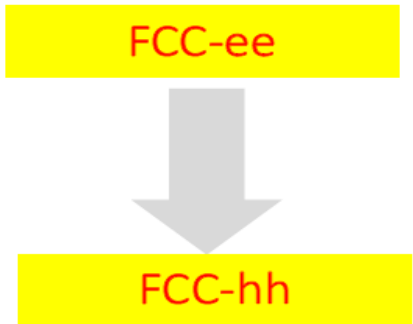
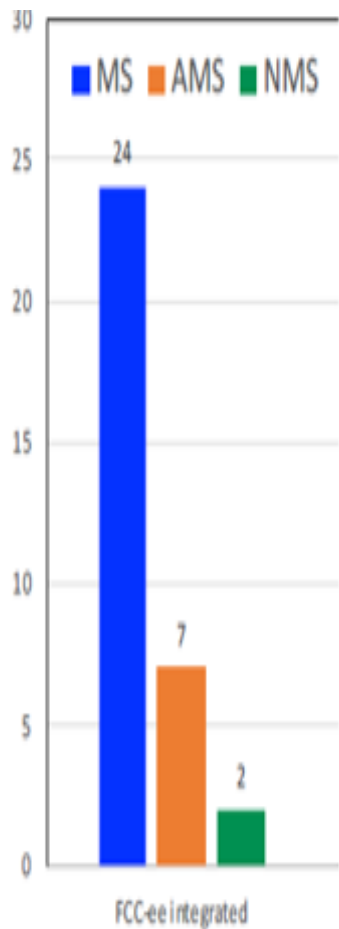
CLIC

Project	Scope	TRL	R&D	Test facilities	Performance	Site preparation	Schedule	Cost	Risk
CLIC 380GeV 1.5TeV		4 - 6 / 5.2							

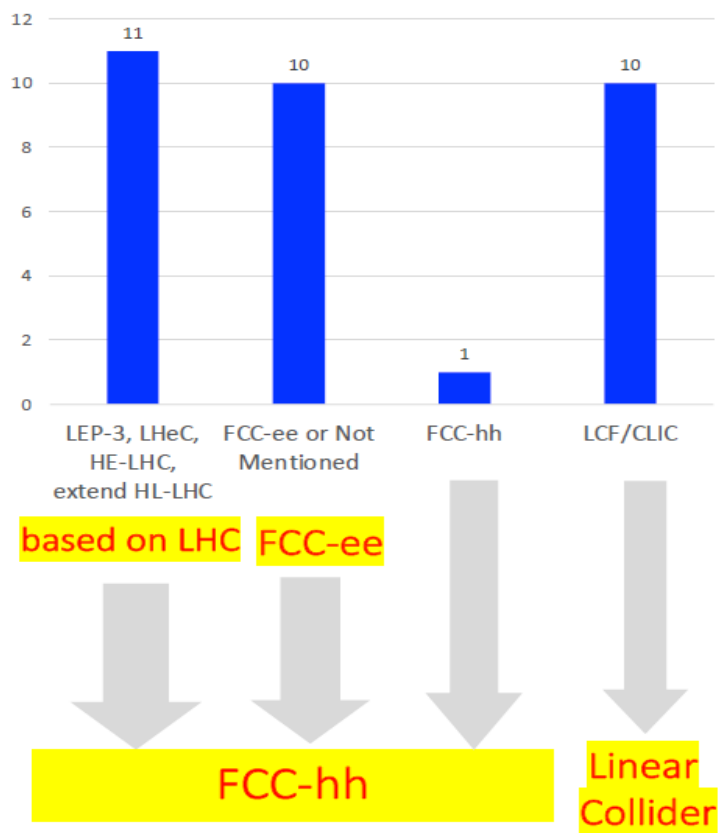
LCF

Project	Scope	TRL	R&D	Test facilities	Performance	Site preparation	Schedule	Cost	Risk
LCF 250-550GeV		5 - 7 / 5.5							

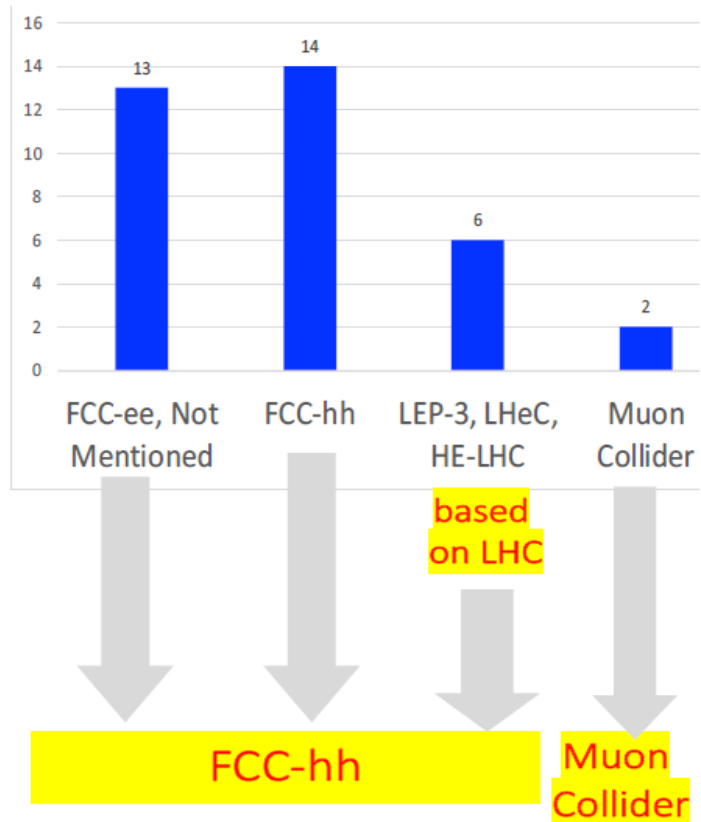
Q1: What is the preferred large-scale post-LHC accelerator at CERN?



Q2: What is the preferred alternative, if the preferred option is not feasible?



Q3: What is the preferred alternative, if the preferred option would not be competitive?



Status of the FCC project

5th FCC / DRD France Workshop
Paris Nov.26-28/2025
Michael Benedikt
on behalf of the FCC collaboration

- Civil engineering and subsurface investigations
- Excavation material management
- Preparations for the public participation processes in FR and CH
- Next steps for FCC and considerations on in-kind contributions



Swiss Accelerator
Research and
Technology

<http://cern.ch/fcc>



ent 654305; EASITrain, grant
act no. 645479; EAJADE,



European
Commission

Horizon 2020
European Union funding
for Research & Innovation

photo: J. Wenninger

Future Circular Collider Physics-Experiment-Detectors in the pre-TDR period (2025-2028)

Christophe Grojean, Patrick Janot, Guy Wilkinson
(on behalf of the PED coordination group)

Fifth FCC/DRD France Workshop – 26 November 2025

PED priority items for the pre-approval phase

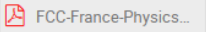
1. Lay the foundations for the conceptual design studies of four (or more) **detectors**
2. Consolidate **IR** layout, detector integration, and related background mitigation
3. Collaborate with **IT** to develop a computing architecture model for experiments
4. Complete the **software & analysis toolkit** to ease detector performance comparison
5. Confirm, with full analyses, the current uncertainty estimates on **EWPOs** (Z and W)
6. Gather the worldwide **theory community** to address the theoretical challenges
7. Streamline and optimise the procedure for **centre-of-mass energy calibration**
8. Develop an efficient PED **Education/Communication/OutReach/InReach** strategy
9. Ascertain the **detector cost estimate**
10. Articulate the physics case, feasibility, and schedule implications of **other vs stages**
11. Anticipate FCC-PED **structure and management** in the project phase (2027-2033)

Physics Studies

Présidents de session: Bogdan MALAESCU (LPNHE, Paris, FRANCE), Jean-Baptiste De Vivie De Regie

16:45 New developments for the FCC-ee Physics program

Orateur: Michele Selvaggi (CERN)



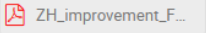
17:10 QCD studies with jets for FCC-ee

Orateur: Line Delagrange (LPNHE, Paris, France)



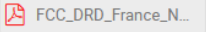
17:28 Improvements in ZH cross section measurements

Orateur: M. Tom FOURNIER (APC Paris CNRS/IN2P3)



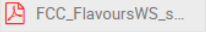
17:46 Precision measurements of Higgs branching ratios

Orateur: Alexis Maloizel (APC, Paris)



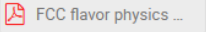
18:04 Heavy Flavour recent results

Orateur: Stephane Monteil (Laboratoire de Physique de Clermont - UCA/IN2P3)



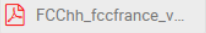
18:22 Ultra granular calorimeter and flavour physics

Orateur: Jean-Claude Brient (LLR)



18:40 Physics prospects for FCC-hh

Orateur: Michele Selvaggi (CERN)

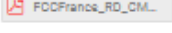


5 DRD Tracking

Présidents de session: Didier Contardo, Gaëlle Boudoul ((IP2)/AICP (CNRS/IN2P3))

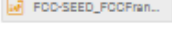
09:00 R&D CMOS (zoom)

Orateur: auguste besson (Institut Pluridisciplinaire Hubert Curien)



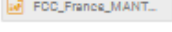
09:20 FCC-Seed concept (zoom)

Orateur: jeremy andrea (IPHC)



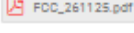
09:40 Manta Project in DRD3

Orateurs: Didier Contardo (IN2P3/CNRS), Didier Contardo



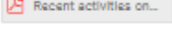
10:00 CMOS & timing

Orateur: Philippe Schwemling (Université Paris Cité and CEA/Irfu/DPHP)



10:20 TPC & Ion Back Flow

Orateurs: Paul Colas (CEA/DAPNIA Saclay), Serguei Ganjour (CEA/Saclay/IRFU/SPP)



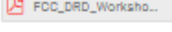
0 coffee break

5 DRD Calorimetry

Présidents de session: Fares DJAMA (CPPM), Vincent Boudry (Laboratoire Lagrange-Ringue, CNRS/IN2P3)

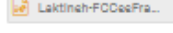
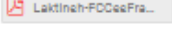
11:00 R&D High Granularity ECal

Orateur: JEROME NANNI (LLR-CNRS/IN2P3)



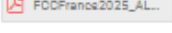
11:20 TSDHCAL (Zoom)

Orateurs: Imad Laktineh ((UNIV CLAUDE BERNARD)UMR5822), imad laktineh (In2p3-ucbf)



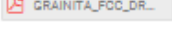
11:40 ALLEGRO

Orateur: Zhibo Wu



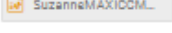
12:05 GrainIta

Orateurs: Mille Yingrui Hou, Yingrui Hou (LPC Clermont)



12:30 MODOP - MaxiCC

Orateur: Suzanne GASCON-SHOTKIN ((IP2) Lyon/Université Claude Bernard Lyon 1)

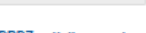


5:15 Other DRD's

Président de session: Suzanne GASCON-SHOTKIN ((IP2) Lyon/Université Claude Bernard Lyon 1)

14:15 The CALOROC family

Orateur: Christophe de LA TAILLE (OMEGA)



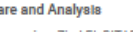
14:35 DRD7 activity overview (zoom)

Orateur: Marlon BARBERO (CPPM)



14:55 Summary 1st FCC-ee TDAQ Workshop

Orateur: Vincent Boudry (Laboratoire Lagrange-Ringue, CNRS/IN2P3, École polytech

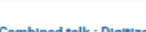


5:30 FCC Software and Analysis

Président de session: Ziad EL BITAR (IPHC)

15:15 Progress on particle flow

Orateur: Giovanni Marchiori (APC Paris)



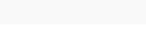
15:40 Combined talk : Digitization for tracker/vertexing full simulation . Background

Orateurs: Gaëlle Boudoul ((IP2)/AICP (CNRS/IN2P3)), Jessy DANIEL (IP2), groupe



16:15 APRIL Particle Flow Algorithm (Zoom)

Orateur: Tanguy PASQUIER (IP2, Univ Lyon 1)



7:00 Coffee break

5:45 Participations Françaises aux futurs detector concepts

Présidents de session: Didier Contardo (IN2P3/CNRS), Gregorio Bernardi (APC Paris CNRS)

17:00 Introduction

Orateurs: Gregorio BERNARDI (APC Paris, CNRS/IN2P3), Gregorio Bernardi (APC Paris, CNRS/IN2P3)

17:20 ALLEGRO

Orateur: Fares DJAMA (CPPM)



17:30 CLD

Orateur: jeremy andrea (IPHC)



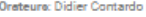
17:40 IDEA

Orateur: Suzanne GASCON-SHOTKIN ((IP2) Lyon/Université Claude Bernard Lyon 1)



17:50 ILD

Orateur: Vincent Boudry (Laboratoire Lagrange-Ringue, CNRS/IN2P3, École polytech




18:00 Discussion

Orateurs: Didier Contardo (IN2P3/CNRS), Didier Contardo

Planning scenario towards 4 experiments at FCC-ee

french interests associated with an R&D program in red

- 2023 DRD formation, French contribution w/ ongoing R&D related to FCC-ee systems:
 - DRD1 TPC, DRD3 VD-Tracking/PID layers; DRD6 HG-E(H)Calo, LNG-ECalo, CrystalShashlik-ECal (GRAiNITA)
- 2025 French EoI [contributions to ESPP 2025](#)
 - subsystems :Si/W-ALLEGRO-GRAiNITA-DRCrystal E-Calo, TSDHCAL; VD/Seed, Tracking/PID layers
 - Detector Concepts : ALLEGRO, CLD, IDEA, ILD 
- 2028-2029 after FCC approval \gtrsim 4 collaborations forming...:
- 2031-2032 CDR - selection of 4 detector concepts (FCC-Committee)
 - cost considerations, merging of collaborations, possibly systems/technology variants remaining...
- 2035-2036 TDR - final selection of subsystems and technologies

Current institute interests

By subsystems (based on ongoing R&D)

- Tracking (DRD1, DRD3)
 - TPC : IRFU
 - VD - Tracking/PiD : APC, CPPM, IPHC, IP2I, IRFU, IJCLab, LPNHE
- Calorimetry (DRD6)
 - HG-E(H)Calo : IJCLab, LLR, LPNHE, (IP2I)
 - LNG-ECalo : APC, CPPM, IJCLab, LAPP, LPSC
 - CS-ECalo: IJCLab, LPCA

By detector concepts (based on ongoing R&D)

Calorimetry driven

- CLD/ILD : IJCLab, LLR, LPNHE, IP2I (if RPCs)
- ALLEGRO : APC, CPPM, IJCLab, LAPP, LPSC
- CSDC : IJCLab, LPCA
- IDEA : ?

VD, Tracking/PID driven

IPHC, IP2I, 1 of any concept
IRFU, 1 of any concept (CLD/ILD if TPC)

By Physics areas

- Higgs : APC, CPPM, IJCLab, IP2I, IRFU, LAPP, LLR, LPSC, L2IT
- ElectroWeak : IJCLab, IRFU, LAPP, LPNHE, LPCA LPSC
- Top : IPHC, IP2I, LPCA
- BSM : CPPM IJCLab, IPHC, IP2I, IRFU, LLR
- HFL : IJCLab, IRFU, LLR, LPCA
- QCD : LPNHE

Considerations for preparation of detector concept choices (2026-2027)

- Contributions to at least 3 detector concepts appear plausible
 - process/leadership for collaboration formation not yet defined
 - need to think how we will contribute to this process in France
- 2026-2027 French community should prepare decisions
 - teams should increase/reach critical mass, contribution wishes of HL-LHC teams should be identified now, even if they can only join around CDR time $\gtrsim 2030$
 - institutes can formulate their current preferences for calorimetry & tracking association
 - to assess in common global detector concepts performance (PED framework see C. Grojean)
 - institutes can prioritise contributions to subsystem(s) at an early stage (if involved in several)
- IRFU/IN2P3 management can provide guidance on process and calendar to approve contributions
- Plenty of work in front of us !

Many thanks to:

APC and LPNHE labs that hosted us during these three days

the APC secretaries (E. Guet, E. Halm) and LPNHE support (M. Roynel) that helped with the practical details

the local organising team (Bogdan, Giovanni and GB) for taking care of the smooth running of the workshop

the FCC team/IN2P3 and the APC Particles group for co-funding the event

the national FCC contacts for setting up a very interesting program

our funding agencies representatives for attending the workshop opening and closing and sharing their views with us

all the speakers and participants for the carefully prepared presentations and lively discussions,
in particular the FCC responsables who came from CERN and Germany

THANKS ALL, and HAVE A SAFE TRIP HOME