

ECFA

European Committee for Future Accelerators

[ECFA Input]



P. Conde Muñío

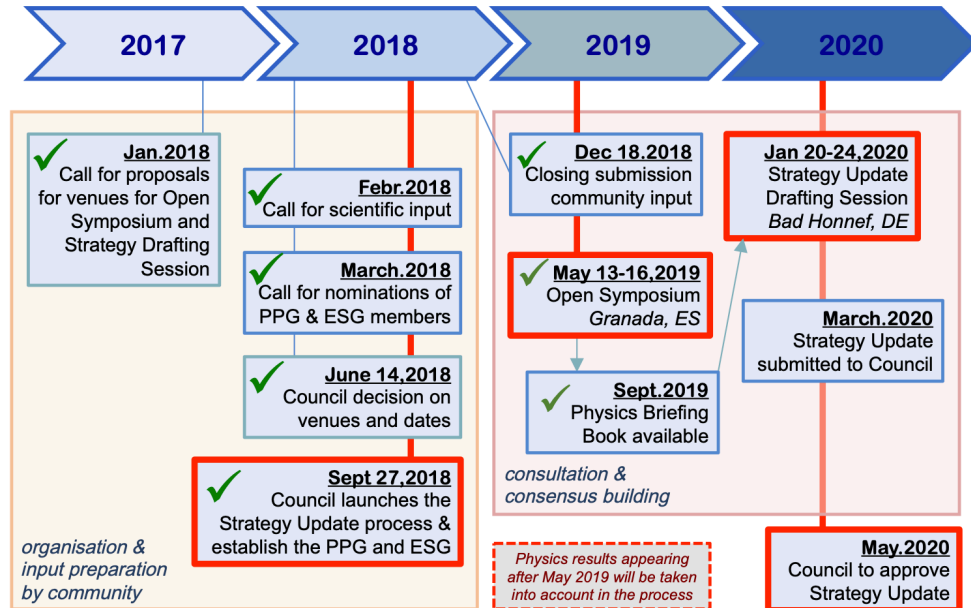
Outline

- The European Strategy Update
 - Description of the process
 - Priorities
- Actions:
 - FCC Feasibility Study study (not covered in this talk)
 - Accelerators R&D Roadmap
 - Detectors R&D Roadmap
 - Roadmap implementation
 - ECFA Workshops towards the future e+e- Higgs/EW/Top factory
- Summary and conclusions

Update of the European Strategy for Particle Physics

Provides a clear prioritisation of European ambitions in advancing the science of particle physics

- takes into account the worldwide particle physics landscape and developments in related fields



3 | High-priority future initiatives



A. An electron-positron Higgs factory is the highest-priority next collider. For the longer term, the European particle physics community has the ambition to operate a proton-proton collider at the highest achievable energy. Accomplishing these compelling goals will require innovation and cutting-edge technology:

- ***the particle physics community should ramp up its R&D effort focused on advanced accelerator technologies, in particular that for high-field superconducting magnets, including high-temperature superconductors;***

- ***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.***

Covered in FCC talk
(S. Williams)

The timely realisation of the electron-positron International Linear Collider (ILC) in Japan would be compatible with this strategy and, in that case, the European particle physics community would wish to collaborate.

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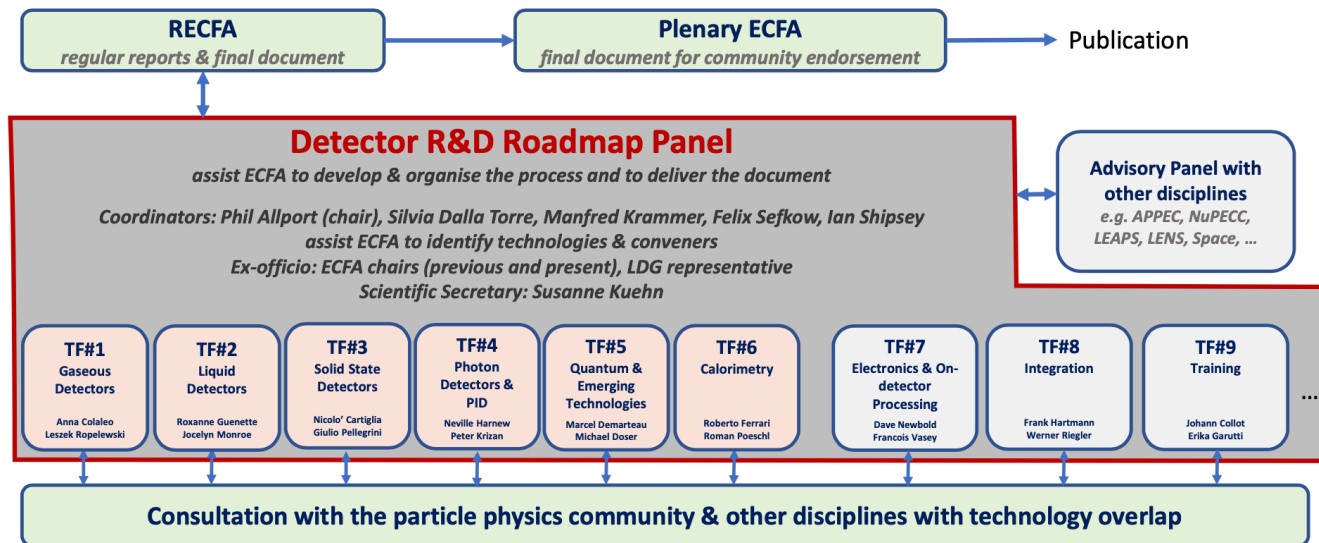


Other essential scientific activities for particle physics

C. The success of particle physics experiments relies on innovative instrumentation and state-of-the-art infrastructures. To prepare and realise future experimental research programmes, the community must maintain a strong focus on instrumentation. ***Detector R&D programmes and associated infrastructures should be supported at CERN, national institutes, laboratories and universities. Synergies between the needs of different scientific fields and industry should be identified and exploited to boost efficiency in the development process and increase opportunities for more technology transfer benefiting society at large. Collaborative platforms and consortia must be adequately supported to provide coherence in these R&D activities. The community should define a global detector R&D roadmap that should be used to support proposals at the European and national levels.***

Detectors R&D Roadmap

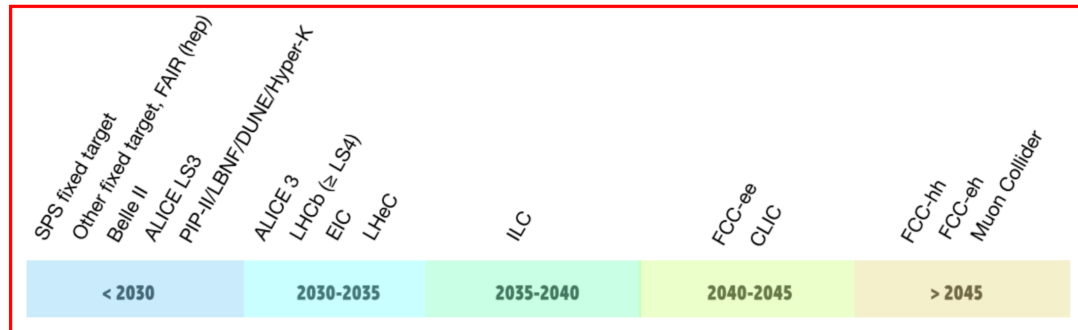
- Intensive process during 2021
 - Community consultation
 - Interim reports at EPS-HEP Conference in July 2021



- Interactions with national communities (via ECFA delegates)
- SPC (CERN Scientific Policy Committee)
- Roadmap presented to CERN Council in Dec. 2021, after endorsement by Plenary ECFA in Nov. 2021

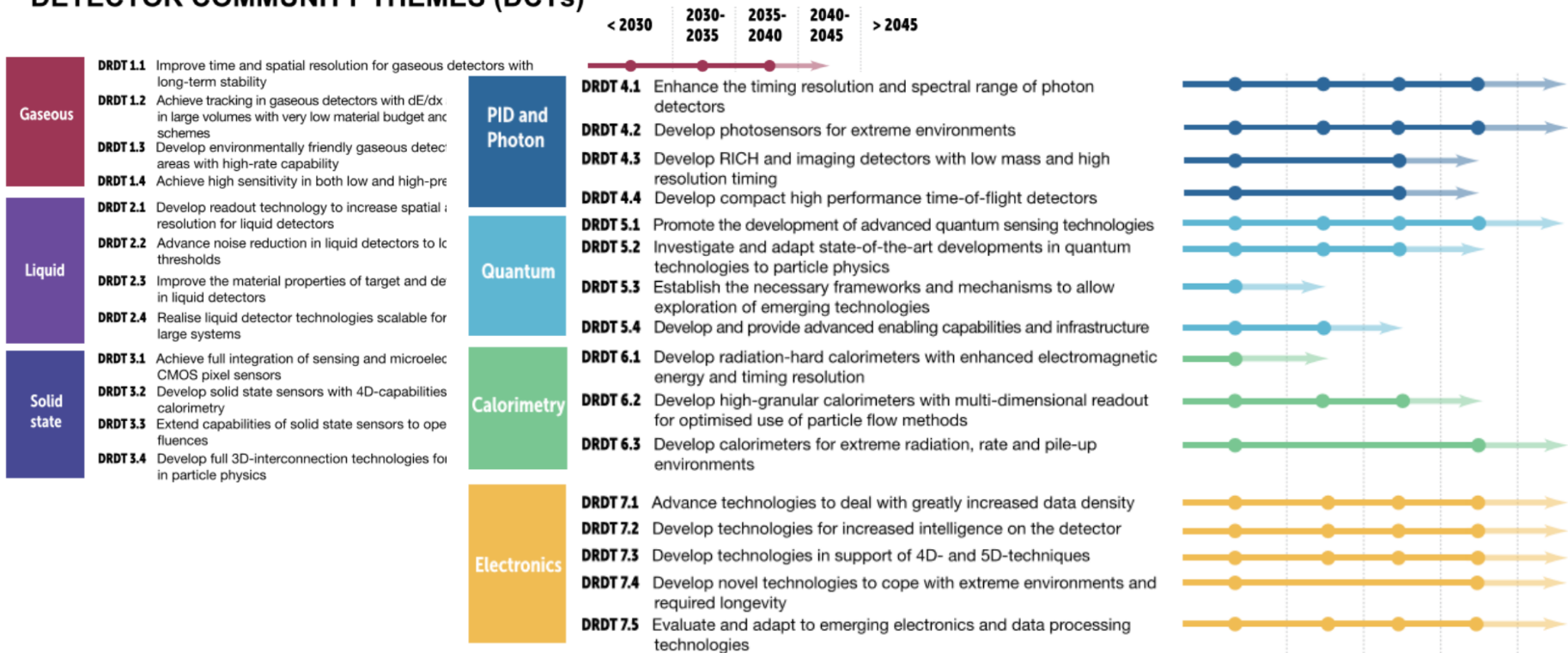
Detectors R&D Roadmap Document

- Identified R&D objectives to ensure that detectors R&D is not the limiting factor at the earliest feasible start dates of a proposed facility
- Defined Detector Research and Development Themes (DRDTs) and objectives



Detectors R&D Roadmap

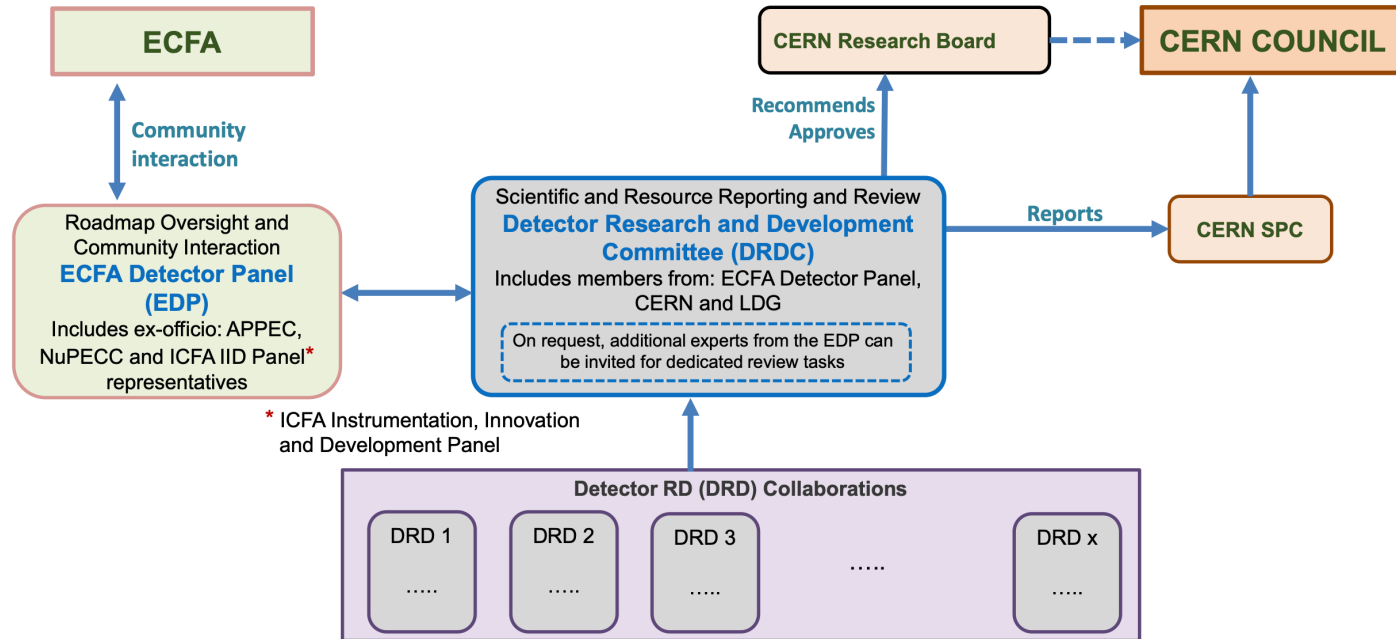
DETECTOR RESEARCH AND DEVELOPMENT THEMES (DRDTs) & DETECTOR COMMUNITY THEMES (DCTs)



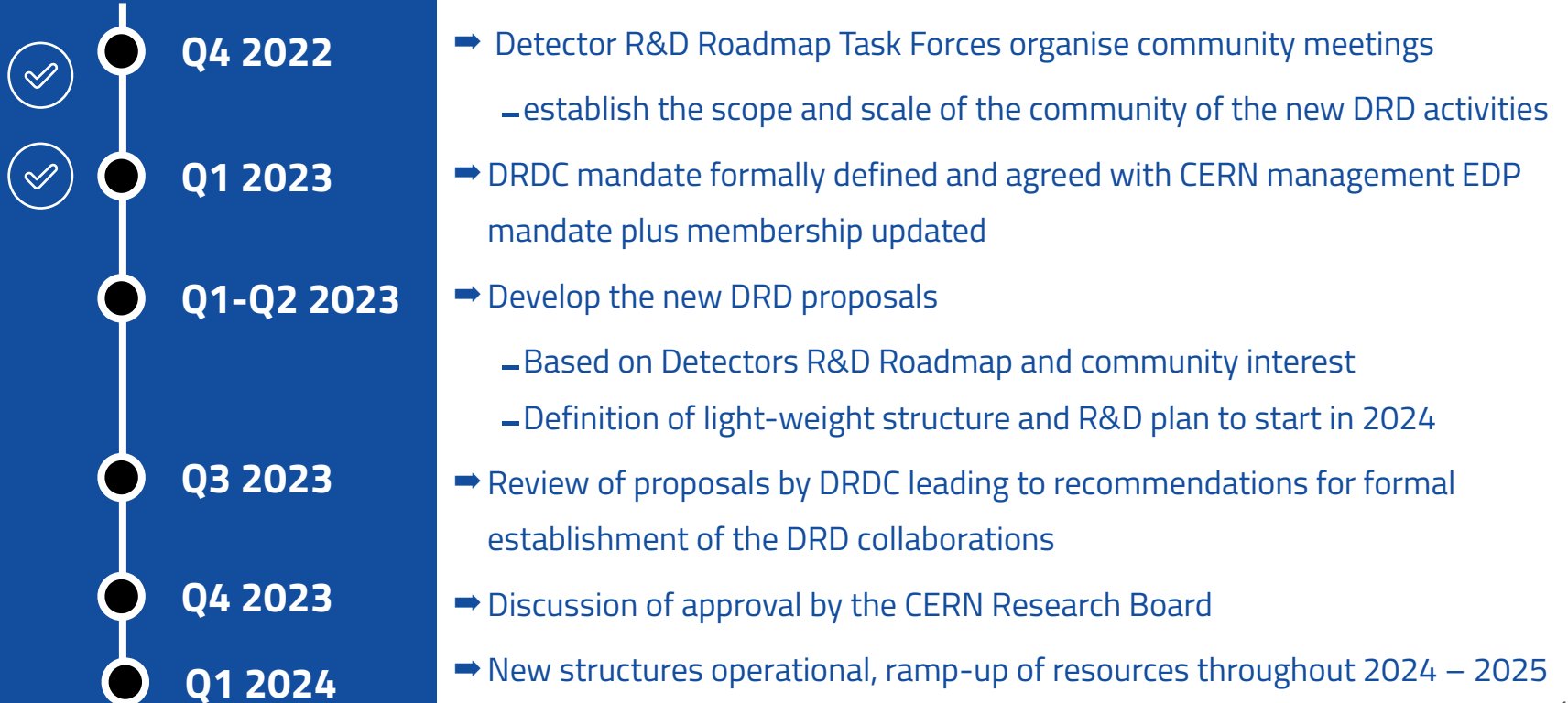
Detectors R&D Roadmap implementation

- Proposed implementation elaborated by the ECFA Roadmap Coordination Group
 - Discussed/iterated with RECFA, national contacts for detector R&D, CERN management, SPC and Council, and Funding Agencies
 - “sign-off” by SPC and Council, end of 2022
- Organise long-term R&D efforts into newly established Detector R&D (DRD) Collaborations
 - Anchored at CERN (CERN recognition, DRD label)
 - Taking full account of existing, well-managed and successful ongoing R&D collaborations and other existing activities
- The formation of new DRD collaborations should adopt a community-driven approach
 - Supported by existing ECFA Detector R&D Roadmap Task Forces
 - With involvement of managements of existing R&D collaborations

Detectors R&D Roadmap Implementation



Implementation Timeline



DRD collaborations in preparation



- Different approaches to form the collaboration, different stages
 - Kick-off workshops at the beginning of 2023
 - Proposals in preparation

DRD1: gaseous detector technologies,

Coordinators:

- Anna Colaleo (INFN Bari (IT))
- Leszek Ropelewski (CERN)

- Transition from RD51
- Scientific organisation well defined:
 - Eight Technology/Activity Working Groups
 - Work-packages of sub-groups of institutes towards common deliverables, workplans and sharing of resources.

DRD2: Liquid detectors

Coordinators:

- Jocelyn Monroe (RHUL (GB)),
- Roxanne Guenette (Manchester (GB))

- Four main work-packages defined with sub-projects.
- Technical Areas (TAs) established
 - Deliverables tables for each TA being finalized.
 - Most FTE/resources/facility (available/needed) collected

DRD collaborations in preparation

DRD3: Solid state detectors

Coordinators:

- Giulio Pellegrini (IMB-CNM-CSIC) (ES))
- Nicolo Cartiglia (INFN Torino (IT))

- Transition from RD50
- Detector R&D Themes (DRDTs) define the work-packages
 - Seven Working Groups to organise the proposal deliverables
 - WG milestones defined

DRD4: Photon Detectors & Particle Identification

Coordinators:

- Christian Joram (CERN)
- Peter Krizan (JSI (SI))
- Community meeting discussed draft collaboration structure.
- Work on the proposal and MoU underway

DRD5: Quantum and Emerging Technologies

Coordinators:

- Marcel Demarteau (ORNL)
- Michael Doser (CERN)
- Very different & diverse community, many interfaces to other programmes and science areas.
- "White paper" prepared with LoI targeted for July 2023 & full proposal ~end 2023, given specific issues of overlaps etc with funded initiatives outside PP.

DRD6: Calorimetry

Coordinators:

- Roberto Ferrari (INFN Pavia (IT))
- Roman Poeschl (Université Paris-Saclay (FR))

- Four separate tracks defined
- Required resources identified including significant test-beam availability after 2025.

Transversal task forces



DRD7: Electronics and on-detector processing

Coordinators:

- Dave Newbold (STFC (GB))
- Francois Vasey (CERN)

- Seven Working Groups (scope depending on the content of other DRD proposals)
 - Projects to implement its objectives to be aggregated into a coherent proposal to be submitted to DRDC.
- Organisation and planning detailed in a [draft document](#)

Transversal task forces



TF8 Integration

Coordinators:

- Frank Hartmann (KIT (DE))
- Werner Riegler (CERN)

- Survey launched in March to gauge community interest for DRD in the areas. Results are returned and have been analysed.
- Forum on Tracking Detector Mechanics seen as opportunity to discuss possible interest in forming a DRD for their specific area.
- Other TF8 topics seen as equally important to the future of the field and funding mechanisms for these are needed, but will not lead do DRD

TF9: Training

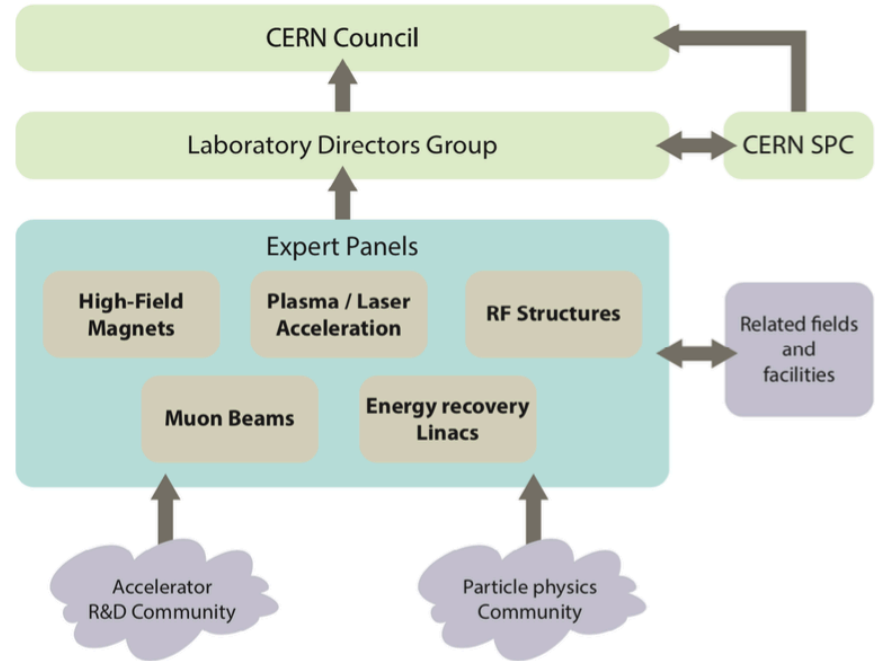
Coordinators:

- Erika Garutti (Hamburg University (DE))
- Johann Collot (university Grenoble Alpes (FR))

- Lead to the new [ECFA Training Panel](#)
- [Web pages](#) under construction

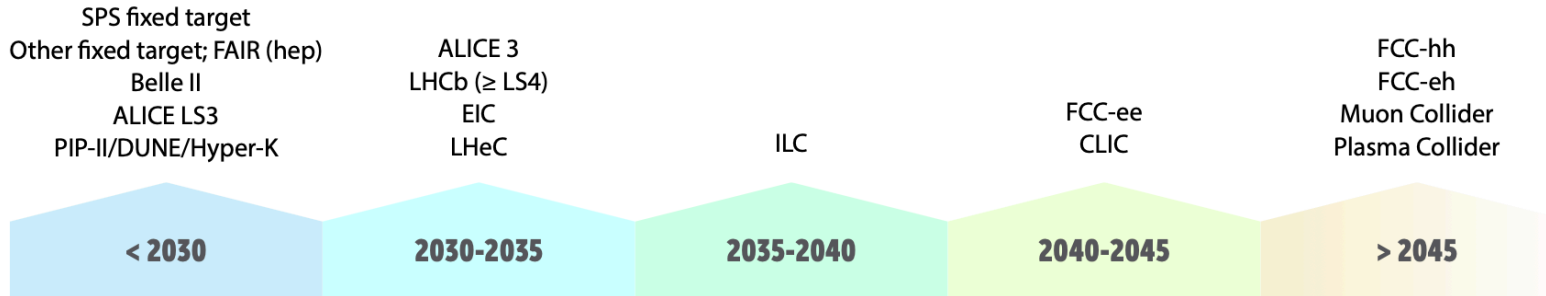
Accelerators R&D Roadmap development

- Intensive process during 2021
 - Expert panels convened in January 2021
 - Intensive community consultation
 - Interim reports at EPS-HEP Conference in July 2021
 - Interactions with national communities (via ECFA delegates)
 - Reviews by SPC (CERN Scientific Policy Committee)
 - Closed process for prioritisation, planning and costing



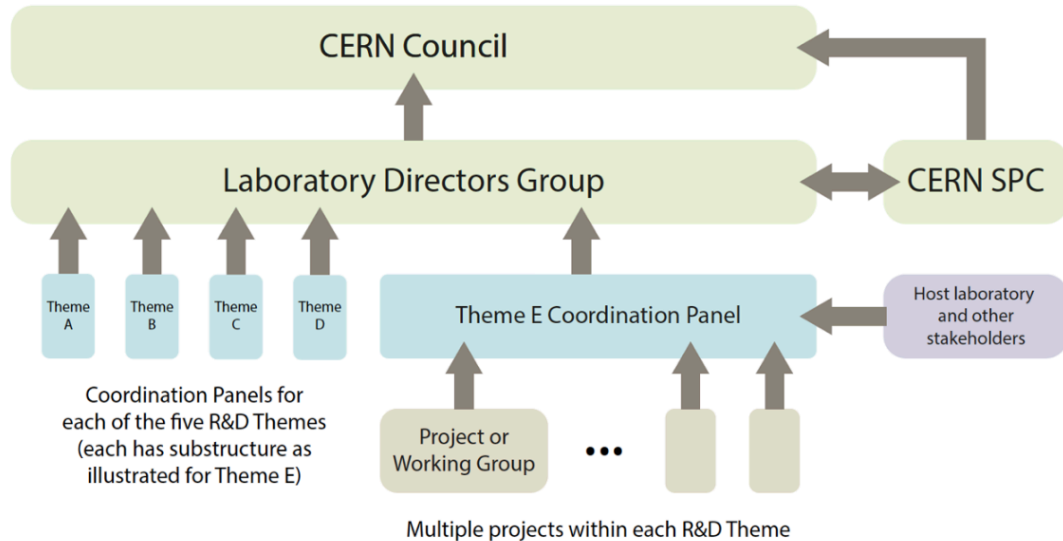
Accelerators R&D Roadmap

- Roadmap presented to CERN Council in Dec. 2021
 - Broad and deep survey of each technology area
 - Identification of key R&D objectives for short term and long term
 - Definition of delivery plans for the next five to ten years
 - Outline estimates of resources needs and the necessary facilities
 - Overarching recommendations on the future R&D programme



Accelerators R&D Roadmap implementation

- LDG was mandated by Council in December 2021 to work out an implementation plan
- Coordination Structure proposed
 - Lightweight, causing minimal disruption / delay to existing projects



- Panel tasks: make contacts (projects, laboratories, institutes, and funding agencies), organise the long term structure for the work, define and negotiate technical and financial contributions, develop the detailed R&D programme, monitor the progress, report to LDG

1st Workshop on the European Accelerators R&D Roadmap

1st Workshop on the European Accelerator R&D Roadmap

12–13 Jul 2023
Frascati
Europe/Zurich timezone

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Overview

Timetable

Contribution List

Timetable

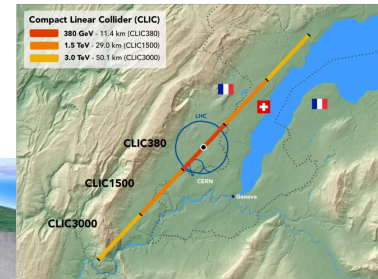
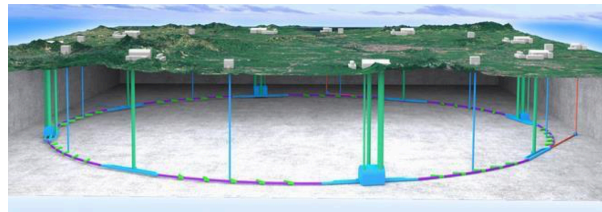
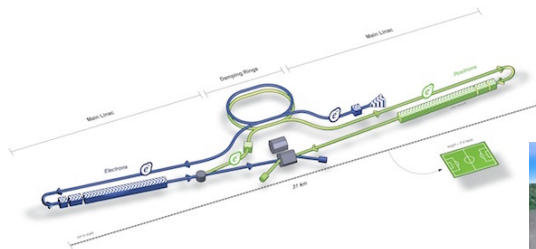
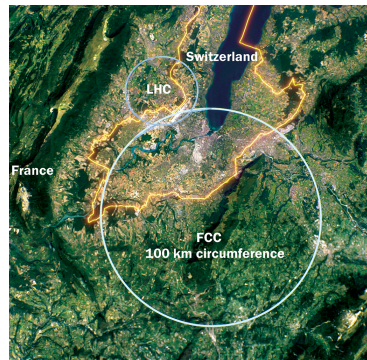
< Wed 12/07 Thu 13/07 All days >

Print PDF Full screen Detailed view Filter

10:00	Introduction <i>Frascati</i> 10:00 - 10:30
11:00	ERL <i>Frascati</i> 10:30 - 12:15
12:00	Lunch <i>Frascati</i> 12:15 - 13:30

ECFA studies towards e^+e^- top/EW/Higgs Factory

- ECFA statement (endorsed by Plenary ECFA, July 2020):
 - ECFA recognises the need for the experimental and theoretical communities involved in physics studies, experiment designs and detector technologies at future Higgs factories to gather
 - Supports a series of workshops with the aim to share challenges and expertise, to explore synergies in their efforts and to respond coherently to this priority in the European Strategy for Particle Physics (ESPP).
- Goal: bring the entire e^+e^- Higgs factory effort together, foster cooperation across various projects, collaborative research programmes are to emerge



ECFA studies towards e^+e^- top/EW/Higgs Factory

■ Structure of the study:

- ▶ Activities organised via three Working Groups
- ▶ Community gathers for two major workshops, 2022 and 2023
- ▶ Will provide a report as input to next European Strategy Update
 - Chief editors A. Robson, C. Leonidopoulos

■ Focus on e^+e^- potential (Higgs, top, electroweak)

- ▶ No discussion of pros/cons of various machines/alternatives
- ▶ Understand the interplay between HL-LHC and an e^+e^- Higgs/EW/Top factory
- ▶ Development of common analysis methods & tools
 - software, simulation, fast simulation, ...
- ▶ Exploit synergies, discuss challenges, do not restrict to common items
- ▶ Need for theoretical accuracy and MC generator improvements

INTERNATIONAL ADVISORY COMMITTEE

- Jean-Claude Brient (Paris LLR)
- Patricia Conde Muino (IST/LIP)
- Didier Contardo (IN2P3),
- Mogens Dam (Copenhagen NBI)
- Juan Fuster (Valencia)
- Jorgen D'Hondt (VU Brussel)
- Christophe Grojean (DESY)
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- Aleandro Nisati (Rome I)
- Aidan Robson (Glasgow)
- Frank Simon (Munich MPP)
- Steinar Stapnes (CERN)
- Roberto Tenchini (Pisa)
- Guy Wilkinson (Oxford)
- Andrea Wulzer (Lausanne)

Working groups

Conveners: J. De Blas (Granada), P. Koppenburg (Nikhef), J. List (DESY), F. Maltoni (UC Louvain / Bologna)

- **WG 1: Physics Potential**
 - Collect, compare and harmonise the work of the different project-specific efforts
 - Interplay between (HL)-LHC and a future Higgs factory
 - e.g. include LHC potential on high- p_T measurements and EFT interpretations
 - Identify specific topics where concrete work should be organised
 - Requirements on accuracy in theoretical calculations and parametric uncertainties, ...
 - **5 physics teams:**
 - WG1-GLOB: global interpretations
 - WG1-PREC: theoretical and experimental precision
 - WG1-HTE: specific Higgs/Top/EW studies (+ connection with LHC)
 - WG1-HF: Heavy Flavour
 - WG1-SRCH: Direct searches (weakly-interacting, directly accessible particles)

Working groups

Conveners: P. Azzi (INFN-Padova / CERN), F. Piccinini (INFN Pavia) and D. Zerwas (IJCLab/DMLab)

■ WG 2: Physics analysis methods

- Monte Carlo generators for e+e- precision EW/top Higgs factory
- Software framework
- Fast simulation (and its limitations)
- Particle flow
- Luminosity measurement
- Workshops already held on topics of generators, simulation, reconstruction

Several topical workshops organised

1st Topical Meeting on Generators
9-10 November 2021 (hybrid)

Focus Meeting: Beamstrahlung
12 January 2022

1st Topical Meeting on Simulation
1-2 February 2022

1st Topical Meeting on Reconstruction
4-5 May 2022

2nd Topical Meeting on Generators
21-22 June 2023

2nd Topical Meeting on Reconstruction
11-12 July 2023

Working groups

Conveners: M. C. Fouz (CIEMAT), G. Marchiori (APC Paris), F. Sefkow (DESY Hamburg)

- WG3: Detector technologies
 - Started later (once the Detectors R&D Roadmap was finished)
 - Bridge between detector technology activities and detector concepts
- Two topical workshops already organised

Topical workshop on Calorimeters, Photodetectors and Particle ID for Future Higgs Factories

3-5 May 2023

Topical workshop on Tracking and Vertexing

30-31 May 2023

ECFA Workshops towards e^+e^- top/EW/Higgs Factory

First ECFA WORKSHOP. on e^+e^- Higgs / Electroweak / Top Factories 5-7 October 2022, DESY / Hamburg

Topics:

- Physics potential of future Higgs and electroweak/top factories
- Required precision (experimental and theoretical)
- EFT (global) interpretation of Higgs factory measurements
- Reconstruction and simulation
- Software
- Detector R&D

The European Committee for Future Accelerators (ECFA) organises a series of workshops on physics studies, experiment design and detector technologies towards a future electron-positron Higgs/Electroweak/Top factory.

The aim is to bring together the efforts of various e^+e^- projects, to share challenges and expertise, to explore synergies, and to respond coherently to this high-priority item of the European Strategy for Particle Physics

INTERNATIONAL ADVISORY COMMITTEE

B. Braaten (Geneva)
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P. Conde Muiño (EST-UP)

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S. Onen (Munich)
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E. Tsesmelis (CERN)
R. Wilson (Duke)

PROGRAMME COMMITTEE

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SECOND • ECFA • WORKSHOP on e^+e^- Higgs / Electroweak / Top Factories

11-13 October 2023
Paestum / Salerno / Italy

Topics:

- Physics potential of future Higgs and electroweak/top factories
- Required precision (experimental and theoretical)
- EFT (global) interpretation of Higgs factory measurements
- Reconstruction and simulation
- Software
- Detector R&D

The European Committee for Future Accelerators (ECFA) organises a series of workshops on physics studies, experiment design and detector technologies towards a future electron-positron Higgs/Electroweak/Top factory.

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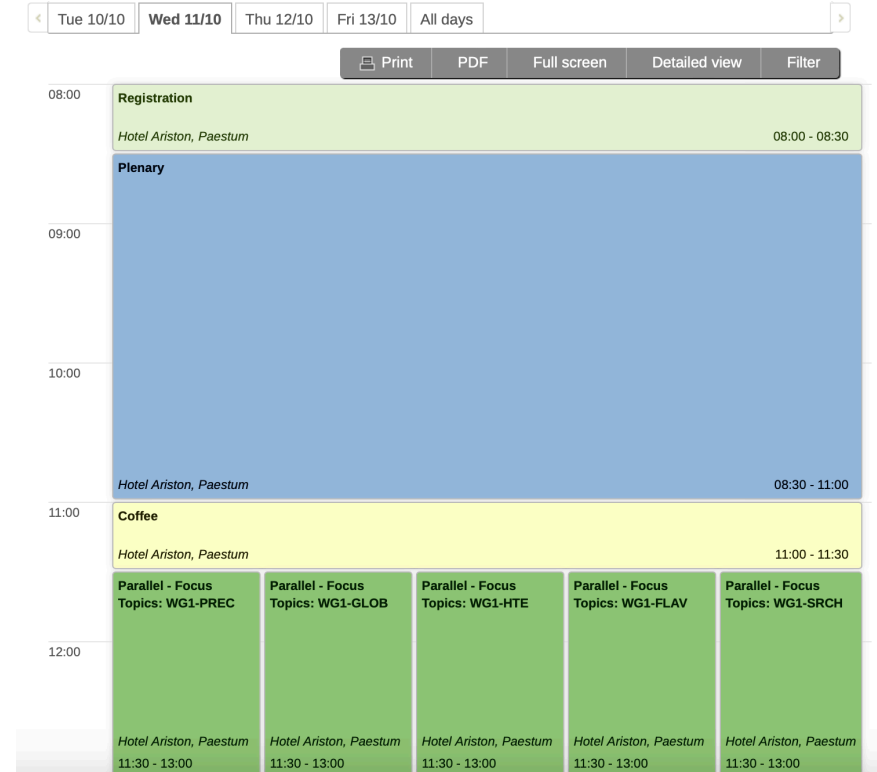


ECFA Workshops towards e^+e^- top/EW/Higgs Factory

- Plenary and parallel sessions

- Discussions related to working group activities
- Parallel sessions: mix of invited and submitted contributions
- Poster session
- Early Career Researchers session

- Registration Open!! [@Link](#)



Conclusions

- Update of the European Strategy for Particle Physics
 - Highest priority future collider: e^+e^- Higgs factory
 - Ambitious plan for the next years in order to achieve that
 - Accelerators R&D Roadmap
 - Detectors R&D Roadmap
 - FCC Feasibility Study
 - ECFA studies/workshops towards top/EW/Higgs Factory



Thanks!

Acknowledgments



REPÚBLICA
PORTUGUESA

FCT

Fundação
para a Ciência
e a Tecnologia

Backup

Panels

- Panel tasks: make contacts (projects, laboratories, institutes, and funding agencies), organise the long term structure for the work, define and negotiate technical and financial contributions, develop the detailed R&D programme, monitor the progress, report to LDG
- Coordinators:
 - HFM
 - Mike Lamont (CERN)
 - Pierre Vedrine (IRFU)
 - RF
 - Giovanni Bisoffi (INFN Padova)
 - Peter McIntosh (DL)
 - Muons
 - Steinar Stapnes (CERN)
 - Daniel Schulte (CERN)
 - Energy Recovery LINACS
 - Jorgen D'Hondt (VUB)
 - Max Klein (U. Liverpool)
 - Plasma/Laser acceleration
 - Wim Leemans (DESY)
 - Rajeev Pattahill (RAL)