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# Early-Career Discussion on Strategy CHIPP Strategy Update Workshop 2025

Introduction

University of Bern, 04.02.2025

The event organisers:

Robert Mihai Amarinei (Unige), Lorenzo Gianessi (Unige), [Armin Ilg \(UZH\)](#), Vedantha Srinivas Kasturi, Pantelis Kontaxakis (Unige, ECFA ECR), Giuseppe Lospalluto (ETHZ/PSI, ECFA ECR), Marko Pesut (UZH, ECFA ECR)

\* Early-career researcher:  
<8 years after PhD or non-permanent

# Glossary

CHIPP: Swiss institute for particle physics (more in Ben's talk)

- The Swiss Institute for Particle Physics (CHIPP) is an association according to Swiss law regrouping all the **particle, astroparticle, and nuclear physicists** holding a **Master in physics and working for a Swiss institution**, as well as the **Swiss PhD nationals working at CERN**.

ECFA: European Committee for Future Accelerators

- Founded in 1963 (!), not limited to "future accelerators"
- Connecting particle physicists among Europe

ECFA ECR panel: ECFA Early-Career Researcher Panel\* (more in backup)

- [...] to discuss all aspects that contribute in a broad sense to the future of the research field of particle physics [...]
- Three representatives per ECFA country and CERN
- Representing ECRs in ECFA

EPPSU: European Particle Physics Strategy Update

All working  
"Bottom-up"

# Last European Particle Physics Strategy Update (EPPSU) in 2020

Year-long process, [20 strategy statements](#)

3.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:

7.b: Particle physics, with its fundamental questions and technological innovations, attracts bright young minds. Their **education and training** are crucial for the needs of the field and of society at large. For **early-career researchers** to thrive, the particle physics community should place strong emphasis on their **supervision and training**. Additional measures should be taken in large collaborations to **increase the recognition of individuals developing and maintaining experiments, computing and software**. The particle physics community commits to placing the principles of **equality, diversity and inclusion** at the heart of all its activities.

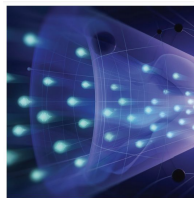
# European Particle Physics Strategy Update

<https://europeanstrategy.cern/>

- Cornerstone of Decision-Making: Guides Europe's long-term future in particle physics.
- Broad Community Input: Developed through extensive consultation with the global particle physics community.
- Previous Strategies: Building upon decisions from previous strategies.
- Status of the Field: Consideration of recent advances and the international landscape of the field.
- Promote Synergies: Coordination with similar processes in the US and Japan.

# Events in the last one and a half years

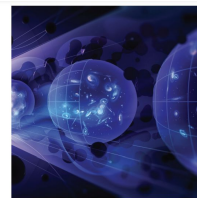
- Dec. 2023: US strategy culminating in [P5 report](#)
  - ... an off-shore Higgs factory ... The current designs of the FCC-ee and ILC meet our scientific requirements
  - ... vigorous R&D towards a cost-effective 10 TeV pCM collider ... long-term ambition of hosting a major international collider facility in the US ... **This is our Muon Shot**
- Dec. 2023: [CEPC accelerator TDR](#), strong support from Chinese HEP community
  - What does this mean for FCC-ee? → F. Gianotti in [Jan. 2024 meeting to CERN personnel](#): *Should we change our plans? **NO**. Should we accelerate our planning? **YES***
- Feb. 2024: FCC Feasibility Study [mid-term report](#) released (not public)
  - Positively received by CERN Council
  - To finish by end of 2024
- March 2024: ECFA ECR panel letter to March CERN Council meeting ([report](#) and backup)
  - ... strongly urge the Council to make every effort to ensure that the process of evaluating, selecting and implementing potential future projects ... proceed with as quick a pace as possible, accelerating its time frame to **start the European strategy process as early as possible** and conclude by early 2026.
- March 2024: **CERN Council launched the EPPSU process**: Start in Sep. 2024 and end by mid-2026
- April 2024: [Joint Statement of Intent between The USA and CERN](#)
  - ... continue to collaborate in the feasibility study of the Future Circular Collider Higgs Factory (FCC-ee) ...
  - ... should the CERN Member States determine the FCC-ee is likely to be CERN's next world-leading research facility following the HL-LHC, the US intends to collaborate on its construction and physics exploitation, subject to appropriate domestic approvals.



Decipher the Quantum Realm  
Elucidate the Mysteries of Neutrinos  
Reveal the Secrets of the Higgs Boson



Explore New Paradigms in Physics  
Search for Direct Evidence of New Particles  
Pursue Quantum Imprints of New Phenomena



Illuminate the Hidden Universe  
Determine the Nature of Dark Matter  
Understand What Drives Cosmic Evolution



Future Circular Collider  
Midterm Report

February 2024

## 2025–2026 EPPSU: Remit

The Strategy update should include the preferred option for the next collider at CERN and prioritised alternative options to be pursued if the chosen preferred plan turns out not to be feasible or competitive. The Strategy update should also indicate areas of priority for exploration complementary to colliders and for other experiments to be considered at CERN and at other laboratories in Europe, as well as for participation in projects outside Europe.

The ESG should review and update the Strategy and add other items identified as relevant to the field, including accelerator, detector and computing R&D, the theory frontier, actions to minimise the environmental impact and to improve the sustainability of accelerator-based particle physics, the **strategy and initiatives to attract, train and retain the young generations**, public engagement and outreach.

# EPPSU timeline and structure

Check [slides from Karl Jakobs](#) (Strategy Secretary) for all details on the process



## 9 topical WGs in Physics Preparatory Group (PPG)

- EW/Higgs Physics
- Strong Interaction
- Flavor Physics
- BSM
- Neutrino Physics and Cosmic Messengers
- DM and Dark Sector
- Accelerator Science and Technology
- Instrumentation
- Computing

1 ECR scientific secretary for each WG

- Anyone can submit input to the strategy (31st of March)
  - Future colliders and beyond colliders communities
  - Collaborations, ..., **ECFA countries (=national input)** → tomorrow!

# National input – following ECFA guidelines

## Future collider choice

- Which is the **preferred next major/flagship collider project for CERN**?
- What are the **most important elements**?
  - i) Physics potential, ii) Long-term perspective, iii) Financial and human resources: requirements and effect on other projects
  - iv) Timing, v) Careers and training, vi) Sustainability
- Should CERN/Europe **proceed with the preferred option** or should **alternative options be considered**:
  - i) if Japan proceeds with the ILC in a timely way?
  - ii) if China proceeds with the **CEPC on the announced timescale**?
  - iii) if the **US** proceeds with a **muon collider**?
  - iv) if there are **major new (unexpected) results** from the HL-LHC or other HEP experiments?
- Beyond the preferred option, what other **accelerator R&D topics** (e.g. highfield magnets, RF technology, alternative accelerators/colliders) should be **pursued** in parallel?
- What is the **prioritised list of alternative options** if the preferred option is **not feasible** (due to cost, timing, international developments, **or for other reasons**)?
- What are the most important elements then?



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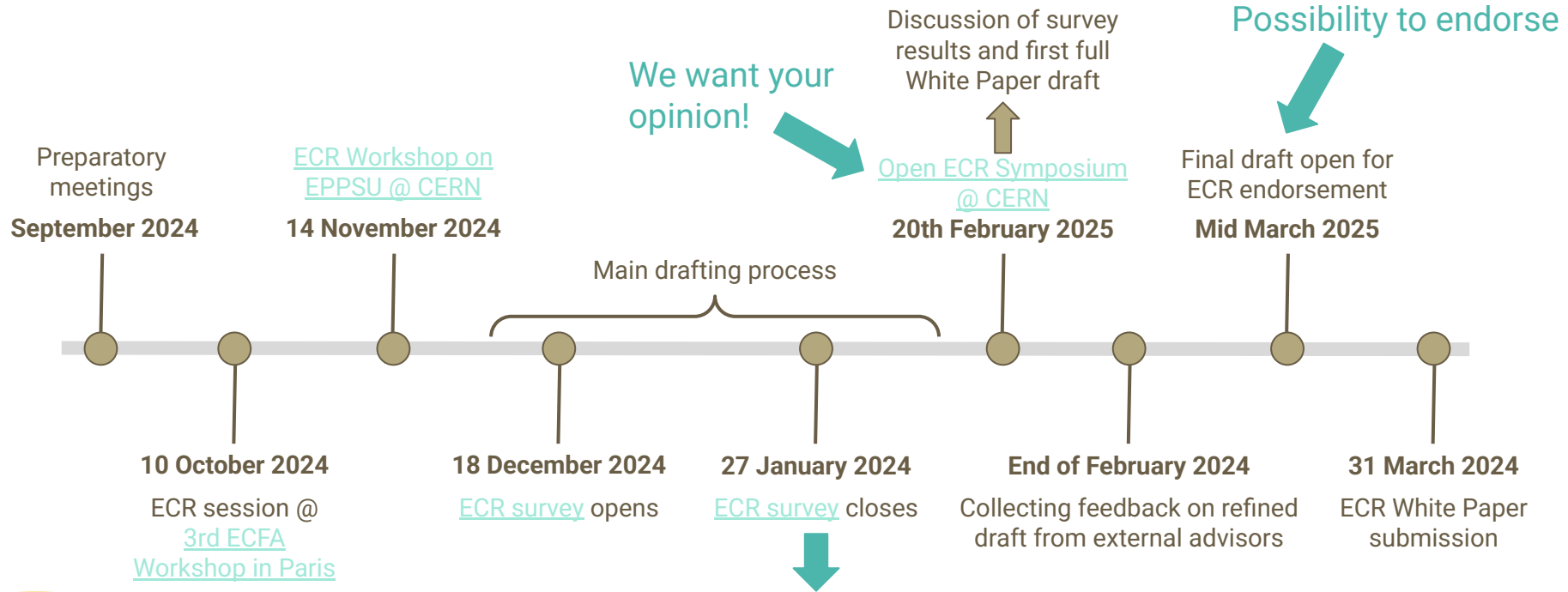
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  - And ECR community → ECR White Paper
    - Focus on topics relevant to ECRs, not covered in topical WGs

# Process towards ECR White Paper Input to EPPSU



We want your opinion!

Open ECR Symposium @ CERN

Possibility to endorse

Main drafting process

10 October 2024

ECR session @  
3rd ECFA  
Workshop in Paris

14 November 2024

ECR Workshop on  
EPPSU @ CERN

18 December 2024

ECR survey opens

27 January 2024

ECR survey closes

20th February 2025

Discussion of survey results and first full White Paper draft



Collecting feedback on refined draft from external advisors

Final draft open for ECR endorsement

Mid March 2025



31 March 2024

ECR White Paper submission

Got 900 full responses!

Every voice matters!

Topics covered:

- Future colliders, Future experiments beyond colliders
- Communicating the importance of particle physics
- Career prospects & ECR leadership and diversity, inclusion and mental health

	<b>Welcome to Early-Career Discussion on the Swiss Input</b>	Armin Ilg
	Tuesday Raum B7 / Wednesday Raum A6, ExWi	09:45 - 09:46
	<b>Introduction to the European Particle Physics Strategy Update</b>	Armin Ilg
	Tuesday Raum B7 / Wednesday Raum A6, ExWi	09:46 - 09:55
10:00	<b>CHIPP and overview of the current swiss collider physics landscape</b>	Ben Kilminster
	Tuesday Raum B7 / Wednesday Raum A6, ExWi	09:55 - 10:20
	<b>Overview of Swiss neutrino/astroparticle physics landscape</b>	Mr Robert Mihal Amarinej
	Tuesday Raum B7 / Wednesday Raum A6, ExWi	10:20 - 10:40
	<b>View from the Swiss Government</b>	Francesca Stocker
	Tuesday Raum B7 / Wednesday Raum A6, ExWi	10:40 - 11:00
11:00	<b>Coffee Break</b>	
	Tuesday Raum B7 / Wednesday Raum A6, ExWi	11:00 - 11:30
	<b>Where is the future taking us?</b>	Marko Pesut
	Tuesday Raum B7 / Wednesday Raum A6, ExWi	11:30 - 12:00
12:00	<b>Future collider options and accelerator challenges</b>	Pantelis Kontaxakis
	Tuesday Raum B7 / Wednesday Raum A6, ExWi	12:00 - 12:20
	<b>Theoretical challenges around future colliders</b>	Jason Aebischer
	Tuesday Raum B7 / Wednesday Raum A6, ExWi	12:20 - 12:40

To prepare you for



<	Tue 04/0	<b>Wed 05/02</b>	days	>
				Print PDF Full screen Detailed view Filter
09:00		<b>Coffee Break: COFFEE BREAK and WELCOME</b>		
		Tuesday Raum B7 / Wednesday Raum A6, ExWi	09:30 - 10:00	
10:00		<b>CHIPP Strategy Update Workshop</b>		
		Tuesday Raum B7 / Wednesday Raum A6, ExWi	10:00 - 12:00	
11:00				
12:00		<b>Lunch Break: LUNCH</b>		
		Tuesday Raum B7 / Wednesday Raum A6, ExWi	12:00 - 13:00	
13:00		<b>CHIPP Strategy Update Workshop</b>		
		Tuesday Raum B7 / Wednesday Raum A6, ExWi	13:00 - 13:30	
		<b>Beyond flagship at CERN</b>		Paolo Crivelli
14:00				
15:00				
		<b>Coffee Break</b>		
		Tuesday Raum B7 / Wednesday Raum A6, ExWi	15:30 - 16:00	
16:00		<b>CHIPP Strategy Update Workshop</b>		
		Tuesday Raum B7 / Wednesday Raum A6, ExWi	16:00 - 17:00	
17:00		<b>Next steps</b>		Ben Kilminster
		Tuesday Raum B7 / Wednesday Raum A6, ExWi	17:00 - 18:00	



14:00	<b>Experimental challenges around future colliders</b>	Armin Ilg
	Tuesday Raum B7 / Wednesday Raum A6, ExWi	14:00 - 14:20
	<b>Current involvement and future interest in future collider R&amp;D in Switzerland</b>	Radoslav Marchevski
	Tuesday Raum B7 / Wednesday Raum A6, ExWi	14:20 - 14:45
	<b>Impact of particle physics on society and sustainability</b>	Dr Barbara Bruant Gulejova
15:00	Tuesday Raum B7 / Wednesday Raum A6, ExWi	14:45 - 15:10
	<b>Transmutex - where experimental physics meets human needs</b>	Jean-Christophe de Mestral
	Tuesday Raum B7 / Wednesday Raum A6, ExWi	15:10 - 15:30
	<b>Coffee Break</b>	
	Tuesday Raum B7 / Wednesday Raum A6, ExWi	15:30 - 16:00
16:00	<b>Panel Discussion</b>	Lorenzo Giannessi et al.
	Tuesday Raum B7 / Wednesday Raum A6, ExWi	16:00 - 17:00

<https://qrfy.io/a-vTgxZKA2>

# Backup

# ECFA ECR Panel

[...] to discuss **all aspects** that contribute in a broad sense to the **future of the research field of particle physics** [...] ..

Aiming to represent the European early-career particle physics community

- From PhD students to young assistant professors
- Theoreticians, phenomenologists, experimentalists, ...
- 3 members per country (+1 if LDG lab in country)
- Organization Committee (Marko Pesut, Jan-Hendrik Arling, Arnau Morancho Tarda)
- 5 delegates in Plenary ECFA, 1 delegate in Restricted ECFA
  - Andrea Garcia Alonso, Patrick Dougan, Bruno Alves (RECFA), Kevin Urquía, Magdalena Vande Voorde

Our panel actually was created as a follow-up to the [ECFA Early-Career Researchers response to the 2020 Update of the European Strategy for Particle Physics](#) (rather ad-hoc, not a panel)

- The ECFA ECR panel is tightly linked with the Update of the European Strategy
- Make sure that this time ECRs are in the loop from the beginning!

# ECFA ECR panel

## Keep in touch with us

- [Our webpage](#) to find your country ECR representative
- [ecfa-ecr-organisers@cern.ch](mailto:ecfa-ecr-organisers@cern.ch)
- [Subscribe](#) to ecfa-ecr-announcements e-group to get notified about our activities!

# ECFA Early-Career Researchers response to the 2020 Update of the European Strategy for Particle Physics ([report](#))

## General

- [...] must therefore include **sociological and sustainability aspects** [...]
- [...] funding for non-permanent positions is converted to funding for **permanent positions** [...]
- [...] **different states of maturity** of the projects were not taken into account sufficiently.
- [...] impact of collider projects outside Europe [...] has not been laid out sufficiently.

## Future of the Field

- While being **open** for future international projects, the ECRs emphasise the **importance of a European collider project soon after HL-LHC**. **Postponing** the choice of the next collider project at CERN to the 2030s has the potential to **negatively impact** the future of the field.

## Human and Sociological Factors

- [...] holistically **include social and human factors** when planning the future of the field.
- [...] **equal recognition and career paths for the various domains** of our field have to be established to maintain expertise in the field.
- The possibility for a **healthy work-life balance** and the reconciliation of family and a scientific career is a must.

## Environment and Sustainability

- A strong statement from CERN putting the **environment and sustainability** at the forefront of decision-making, aiming at becoming a carbon-neutral laboratory in the short term future, would have a **significant impact**.
- [...] higher **renewable energy** fraction.
- **Travel and conference schedules** [...] to reduce the amount of travel and the associated CO2 footprint.



## Computing and Software

- [...] recognised not only as means to do physics analyses, but **as research that requires a high level of skill**.
- [...] **minimise the time to produce physics results** allowing more person-power to be allocated to areas where innovation and development is truly needed.
- [to reduce CO2 footprint] our community can drive the development of new software for **remote meetings**
- [...] **open data** and [...] the need for **sharing knowledge and resources** with other computing communities.

## EW and Strong Interaction Physics

- Priority should be put on **precision measurements and global fits rather than model-driven searches**.
- Tighter **collaboration between theory and experiment** would enhance the precision of measurements.

## Beyond Standard Model, Dark Matter and Dark Sector Physics

- [...] **diversification of experiments**, building on projects such as Physics Beyond Colliders, [...] vital for the future of the field [...]

## Flavour, Neutrino and Cosmic Messenger Physics

- [...] **specialised smaller experiments** in the light sector are needed [...]
- Real-time observations between connected observatories [...] will be crucial in the future

# Future Colliders for ECRs, Sep. 2023 @ CERN ([indico](#), [report](#))



- There **are guaranteed discoveries** out there (e.g. Higgs self coupling and many more)
- Learn how to communicate importance of precision
- Future colliders are **worth it**
  - For science and society
- See **sustainability not as a concern but as a challenge**
  - To develop **technologies relevant for society** (e.g. high-temperature superconductors)
- Future collider R&D highly transferable between collider proposals (and beyond)
  - **Good ideas will survive a collider proposal or two...**
- It's a long time until any future collider is operational
  - Take **future collider decision as early as possible**, give ECRs a goal and timeline, ease grant application
  - **Long-term R&D** projects and support for **careers in instrumentation/engineering/accelerator physics/...**
  - Mind the **gap!**
- Huge **enthusiasm** for future colliders! (>100 participants in person and >100 on Zoom)
- Many aspects relevant for ECRs are country-dependent!
  - Created [national ECR event blueprint](#) and organised/organising national follow-up events
  - [Nordic countries](#), [Austria](#), [Czech Republic](#), [Czech Republic+Slovakia](#), [France \(Tuesday\)](#), [Germany](#), [Italy](#), [Belgium+Netherlands](#), [United Kingdom](#), and more planned!

# ECFA ECR letter to March 2024 CERN Council (see [report](#))

Dear CERN Council,

In the 70 years since its founding, CERN has not only established itself as the global centre of particle physics research but as a powerful symbol of international collaboration and scientific excellence. This would never have been possible without the unfaltering support offered by the CERN member states.

As a community, we feel immense pride and gratitude that we are part of this journey of scientific exploration and opportunity which CERN has pioneered. While the High-Luminosity LHC constitutes a much-anticipated and necessary advance in the LHC program, a clear path beyond it for our future in the field must be cemented with as little delay as possible. For the field to sustain the population, expertise, and enthusiasm required to overcome the challenges of what CERN's next major project/accelerator will present, the ECR community needs certainty without delay that High Energy Physics has an immediate future beyond HL-LHC, and that funding and positions required to realise our future will grow rapidly.

We, the ECFA Early-Career Researchers Panel, on behalf of the ECR community, would like to strongly urge the Council to make every effort to ensure that the process of evaluating, selecting and implementing potential future projects, which will define this century of High Energy Physics for Europe and the World, proceed with as quick a pace as possible, accelerating its time frame to start the European strategy process as early as possible and conclude by early 2026. This will go some way in helping further secure CERN's unique position in science, technology and international cooperation for the next 70 years and beyond.

Kind regards,

The ECFA Early-Career Researchers panel

**EPPSU started earlier than originally anticipated! ECR input has impact**

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.***

***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.***