# ESPPU Drafting Day

# Report of Contributions

https://indico.stfc.ac.uk/e/1183

Contribution ID: **1** Type: **not specified**

# Introduction: agreeing/discussing the physics priorities for the future

*Thursday, 9 January 2025 10:30 (15 minutes)*

This discussion aims to agree/discuss a set of (non-prioritised) physics goals for the future, with the view that these goals can be used to frame subsequent discussions on the future roadmap, including (but not limited to):

- Full characterisation of the properties of the Higgs
- Complementary coverage of possible dark matter candidates
- Push energy frontier exploration to highest achievable value
- Address unanswered questions in quark flavour physics
- Understand origin and nature of neutrino masses
- Precision in muon/kaon/EDM physics as a tool for indirect discoveries
- Others (to be proposed/discussed within the community)

**Session Classification:** Session 1

Contribution ID: **2** Type: **not specified**

# Introduction- additional priorities for the future

*Thursday, 9 January 2025 10:45 (15 minutes)*

Opportunity to make specific statements on the list of non-physics considerations for the future. These will not be prioritised (we hope we can agree they are all important) but there are specific statements we may want to make on each of these areas:
- Long-term perspective
- Financial and human resources: requirements and effect on other projects
- Timing
- Careers and training
- Sustainability

**Session Classification:** Session 1

Contribution ID: **3** Type: **not specified**

# Metrics and timescales for answering q3a "Which is the preferred next major/flagship collider project for CERN?"

*Thursday, 9 January 2025 11:00 (45 minutes)*

We would like community input on what the metrics should be for converging on an answer to q3a, and what timescale we should be aiming to provide an answer (i.e. before March 31st or after all community inputs have been submitted).
[15'] Framing discussion- summary of the additional information we expect to be available after 31st March i.e. updated HL-LHC projections, updated LEP3 proposal, linear collider visions update, ECFA e+e- study report, FCC feasibility study report (feel free to add others).
[30'] Preliminary discussion on FCC as CERN's preferred project- we would like to have an open discussion about the community's thoughts about:
-The risks of not committing to building the FCC tunnel now.
-The risks of committing to building the FCC tunnel now

**Session Classification:** Session 1

Contribution ID: **4** Type: **not specified**

# Scenario planning for the future: possible "plan A" options for CERN and scenarios for risk mitigation.

*Thursday, 9 January 2025 11:45 (45 minutes)*

It was agreed in November that we should aim to discuss the future roadmap in terms of optimisation/risk mitigation for different scenarios. For the January drafting day, we have prepared two lists of scenarios for the community to provide input on (both before the meeting and during the meeting). The first considers alternative "plan A"roadmaps for CERN, and the second focuses on risk-mitigation assuming (as a starting point) CERN's default plan of HL-LHC through to 2041 followed by FCC-ee in ~ 2047. The first set of scenarios will be discussed before lunch and the second afterwards; however, it is anticipated that some of the considerations may be linked.

Framing discussion (<15') on the key (collider-related) recommendations from the last ESPPU, i.e. that
-The successful completion of the high-luminosity upgrade of the machine and detectors should remain the focal point of European particle physics, together with continued innovation in experimental techniques. The full physics potential of the LHC and the HL-LHC, including the study of flavour physics and the quark-gluon plasma, should be exploited.
- 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.

Scenarios for discussion:
Discussion of possible "plan As"- what are the risks and opportunities? (Note that 1b, 3,4 and 5 are in tension with the recommendations of the last ESPPU so this discussion should also be steered by the input above).
1) FCC tunnel- part of discussion above but also additional options:
a) FCC-ee followed by FCC-hh (baseline integrated programme)
b) Intermediate energy FCC-hh as the first step (aggressive energy frontier programme)
c) FCC-ee, FCC-hh, FCC-eh (extended integrated programme)
2) Linear e+e- Higgs factory @ CERN
3) Expand LHC infrastructure (LHeC, FPF and other auxiliary experiments)
4) Delay next big collider experiment and focus on R&D
5) Muon collider @ CERN
6) LEP3 in LHC tunnel
Example risk mitigation exercise: assume CERN's default plan is HL-LHC to 2041 followed by FCC(ee) in ~ 2047.
1) HL-LHC delayed/technical problems requiring >~5 years additional data-taking to reach 3000 /fb.
2) Updated HL-LHC projections place Higgs coupling sensitivities closer to e+e- projections.
3) Another Higgs factory begins construction prior to approval of FCC.
4) A significant (5sigma) deviation from the SM observed within the field (either at the 5) HL-LHC/LHC or at another experiment).
6) Technology (i.e. RF) required to deliver e+e- programme delayed by >~5 years.
7) FCC integrated programme deemed technologically, environmentally or financially unfeasible

**Session Classification:** Session 1

Contribution ID: **5** Type: **not specified**

# Scenario planning

*Thursday, 9 January 2025 13:15 (30 minutes)*

Aim to continue and conclude discussion of possible future collider scenarios.

**Session Classification:** Session 2

Contribution ID: **6** Type: **not specified**

# Accelerator R+D topics for the future

*Thursday, 9 January 2025 13:45 (30 minutes)*

- Blue skies R+D topics- do we want to prioritise any (subset) of technologies?
- Do we want to make a statement on the importance of ringfencing funding for disruptive technologies?

**Session Classification:** Session 2

Contribution ID: **7** Type: **not specified**

# Additional considerations for the future collider roadmap

*Thursday, 9 January 2025 14:15 (30 minutes)*

- Industrial input/return
- Communication/public engagement
- Training and retention of talent (including theory, software, instrumentation, accelerator science).

**Session Classification:** Session 2

Contribution ID: **8** Type: **not specified**

# Framing discussion for non-collider topics

*Thursday, 9 January 2025 15:15 (15 minutes)*

- Aim to present information on which non-collider projects/ experiments exceed the resource threshold (in terms of costs) for possible direct consideration/mention in our ESPPU input.
- Will also attempt to summarise points raised in November and submitted through the community inputs.

**Session Classification:** Session 3

Contribution ID: **9** Type: **not specified**

# Summary of comments/considerations for non-collider questions

*Thursday, 9 January 2025 15:30 (30 minutes)*

- Future of neutrino physics- statements on neutrino platform? Beyond accelerators?
- Dark matter and complementarity a) Do we want a statement on Boulby ambitions? b) Similar for FPF/Ship
- Importance of smaller (complementary) experiments
- Quantum technologies
- Others (based on community inputs)

**Session Classification:** Session 3

Contribution ID: **10** Type: **not specified**

# Discussion of input related to astroparticle/ nuclear physics

*Thursday, 9 January 2025 16:00 (30 minutes)*

**Session Classification:** Session 3

Contribution ID: **11** Type: **not specified**

# Wrap-up + next steps

*Thursday, 9 January 2025 16:30 (30 minutes)*

**Session Classification:** Session 3