ECFA/RC/534/Draft
Original: English
30 May 2024

**ORGANISATION EUROPÉENNE POUR LA RECHERCHE NUCLÉAIRE**
**CERN EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH**

---

PLENARY ECFA

113th meeting

Participation in person and by videoconference – 16 and 17 November 2023

# Draft Minutes

TABLE OF CONTENTS

Section Page

# LIST OF PARTICIPANTS

| | | |
|---|---|---|
| **Chair:** | K. Jakobs | Germany |
| **Secretary:** | P. Conde Muíño | Portugal |
| **Members:** | E. Adli | Norway |
| | J. Albrecht | Germany |
| | P. Bartos | Slovakia |
| | S. Bentvelsen | Netherlands |
| | G. Bernardi | France |
| | N. Besson | France |
| | D. Bettoni | Italy |
| | M. Bombara | Slovakia |
| | D. Bortoletto | United Kingdom |
| | L. Brenner | ECR Panel |
| | A. Çakır | Türkiye |
| | S. Caron | Netherlands |
| | M. Cobal | Italy |
| | A. de Cosa | Switzerland |
| | S. De Curtis | Italy |
| | M. Delmastro | France |
| | A. F. Dobrin | Romania |
| | D. Dobur | Belgium |
| | B. Erazmus | France |
| | S. Farrington | United Kingdom |
| | A. Ferrari | Sweden |
| | E. Gallo | Germany |
| | J. Gluza | Poland |
| | B. Golob | Slovenia |
| | R. Hadjiiska | Bulgaria |
| | Z. Hubacek | Czech Republic |
| | U. Husemann | Germany |
| | A. Ilg | ECR Panel |
| | M. Jeitler | Austria |
| | C. Joram | CERN |
| | A. Kaczmarska | Poland |
| | H. Kirschenmann | ECR Panel |

| | | |
|---|---|---|
| | H. Lacker | Germany |
| | J. Łagoda | Poland |
| | S. Lai | Germany |
| | T. Lappi | Finland |
| | K. Lassila-Perini | Finland |
| | A. Lucotte | France |
| | S. Malvezzi | Italy |
| | C. Martínez Rivero | Spain |
| | I. Melzer Pellmann | Germany |
| | C. Meroni | Italy |
| | M. Mikuž | Slovenia |
| | P. Milenović | Serbia |
| | A. Negret | Romania |
| | S. Plätzer | Austria |
| | A. Read | Norway |
| | A. Robson | United Kingdom |
| | C. Salgado | Spain |
| | P. Schmidt-Wellenburg | Switzerland |
| | F. Siklér | Hungary |
| | Y. Sirois | France |
| | P. Sphicas | Greece |
| | A. Stocchi | France |
| | G. Stoicea | Romania |
| | N. Tuning | Netherlands |
| | A. Karasu Uysal | Türkiye |
| | M. Vos | Spain |
| | M. Wing | United Kingdom |
| | W. Wiśliski | Poland |
| | L. Živković | Serbia |
| **Ex officio:** | H. Abramowicz | Former ECFA Chair |
| | J. D'Hondt | Former ECFA Chair |
| | F. Gianotti | CERN |
| | T. Nakada | Former ECFA Chair |
| **Invited:** | P. Allport | United Kingdom |
| | M. Benedikt | CERN |
| | T. Bergauer | Austria |

| | | |
|---|---|---|
| | F. Bossi | INFN-LNF |
| | B. Heinemann | DESY |
| | J. Mnich | CERN |
| | D. Newbold | LDG Chair |
| **Observers:** | A. Haungs | APPEC Chair |
| | M. Lewitowicz | NuPECC Chair |

**Other attendees:** D. Adamova, A. Andronic, M. Babeluk, W. Baldini, J. Barreiro Guimaraes Da Costa, Y. Benhammou, M. Biglietti, C. Biino, C. Bini, M. Bomben, W. Bonivento, C. Borca, V. Boudry, C. Bourdarios, M. Bragadireanu, F. Brizioli, A. Campredon, J.M. Carceller, J. Cassar, A. Ceccucci, S. Cetin, J. Christiansen, A. Chrysostomou, Y. Coadou, P. Colas, E. Cortina Gil, V. Cox, H. Danielsson, D. Dannheim, S. Das, I. Dawson, A. Desai, P. Deucher, A. Diciaccio, C. Di Giulio, A. Dierlamm, A. Dimitrievska, P. Dougan, D. Emschermann, J. Engelfried, M. Felcini, D. Ferenček, F. Filthaut, H. Fischer, P. Francavilla, L. Franco, M. Fraser, A. Freise, J. Frost, Y. Gao, A. Garcia Alonso, G. Gaudio, M.-H. Genest, S. Gennai, P. Gianotti, M. Giovannetti, V. Gkougkousis, J. Hahnfeld, J. Hegeman, K. Hidaka, A. Hirtl, A. Hollnagel, G. Iacobucci, G. Iakovidis, P. Iengo, R. Jacobsson, S. Jaelani, P. Janot, P. Jenni, P. Juillard, V. Keus, J. Kitowski, C. Kleinwort, P. Koppenburg, I. Kopsalis, O. Kouznetsov, W. Kozanecki, M. W. Krasny, T. Kress, P. Kuijer, S. Kulis, L. Lanfranchi, A. Lankford, A. Lapertosa, C. Lazzeroni, Q. Li, J. List, L. Lista, J. Liu, F. Lyons, L. Lyons, G. Majumder, F. Malek, S. Malyukov, M. Mangano, V. Manzari, G. Marchiori, K. Mazumdar, G. Mazzola, A. Mehta, B. Mele, M. Merschmeyer, G. Messineo, F. Moortgat, T. Mori, T. Muller, S. Molina, I. Mutuberria, M. Najafabadi, M. Needham, W. Ootani, D. Orestano, M. Ovchynnikov, S. Pape, R. Pasechnik, G. Passaleva, N. Pastrone, N. Patronis, J. Pekkanen, P. Pelissou, A. Perego, M. Perganti, P. Pignereau, A. Quercia, F. Ravotti, P. Rebello Teles, F. Rehbein, A. Ur Rehman, C. Renard, A. Romano, S. Roth, M. Rovere, S. Roy, N. Rusakovich, D. Sampsonidis, A. Santoro, A. Santra, A. Savoy Navarro, W. Scandale, C. Scharf, J. Schwandt, A. Sciandra, S. Senyukov, X. Shi, S. Sultansoy, L. Teodorescu, F. Tessarotto, A. Tinoco Mendes, L. Toffolin, H. Torres, C. Troncon, J. Troska, G. Unal, Y. Unno, K. Vellidis, T. Virdee, S. Visser, R. Wallny, C. Weiser, K. Whalen, M. Wiehe, S. Williams, H. Yang

The meeting, held in hybrid mode, was called to order at 2.00 p.m. on Thursday, 16 November 2023.

## CLOSED SESSION

1. OPENING, ADOPTION OF THE AGENDA
(Item 1 of the Agenda)

The CHAIR presented[1] his opening remarks, welcoming the attendees and pointing out that PECFA's 113th meeting would be divided into two parts, with the present closed session covering internal matters, the endorsement of the new ECFA Chair and endorsements of EFCA, RECFA and ECR Panel members, a mid-term report from Poland, laboratory reports from Frascati and PSI, and reports from APPEC and NuPECC, while the open session the following day would be open to the full particle physics community.

The Agenda[2] was adopted.

2. DRAFT MINUTES OF THE 112TH MEETING
(Item 2 of the Agenda) (ECFA/RC/23/527/Draft and ECFA/RC/23/528/Draft)

The minutes of the 112th meeting of Plenary ECFA (ECFA/RC/23/527/Draft and ECFA/RC/23/528/Draft), which had taken place across two sessions, in July and August 2023, were approved.

3. REPORT FROM THE CHAIR
(Item 3 of the Agenda)

The CHAIR presented[3] his report, covering the implementation of the ECFA Detector R&D Roadmap, progress with the ECFA $e^+e^-$ Higgs/EW/Top factory studies, the forthcoming ICFA seminar at DESY in Hamburg, joint ECFA–NuPECC–APPEC (JENA) activities, and the schedule for ECFA meetings and Restricted ECFA (RECFA) country visits in 2024.

---

[1] See Indico: https://indico.cern.ch/event/1220533/contributions/5596297/attachments/2752416/4791500/Introduction_PECFA_2023.11.16.pdf

[2] See Indico: https://indico.cern.ch/event/1220533/

[3] See Indico: https://indico.cern.ch/event/1220533/contributions/5596299/attachments/2753687/4794169/Chair_Report_PECFA_2023.11.16.pdf

In reply to a question from ADLI (University of Oslo) concerning the ICFA seminar at DESY, the CHAIR confirmed that the talks would be recorded and subsequently made available on the event's public Indico page[4].

In reply to a question from NAKADA (EPFL), the CHAIR said that the remit of the ECFA–LDG Working Group, chaired by S. Bentvelsen (Nikhef) and M. Mikuž (Jožef Stefan Institute), was limited to addressing the pending General Strategic Recommendations set out in the Detector R&D Roadmap.

In reply to a further question from NAKADA, the CHAIR said that the ECFA Training Panel would take the broadest possible approach to fostering training programmes in instrumentation for particle physics, with a focus nevertheless on instrumentation for detector physics, in cooperation with NuPECC and APPEC. The Panel's goals were to enhance the synergies between existing training programmes and to stimulate the creation of complementary ones where relevant, particularly multidisciplinary schools or joint academia–industry training programmes providing hands-on experience. The creation of a European master's programme in HEP instrumentation across several universities in Europe would be a major undertaking. More information would be provided the following day in the presentation to the open session by the Panel's Chair, E. Garutti of Hamburg University.

In reply to a question from VOS (IFIC-Valencia) about the timeline for the pending proposal for Detector Research and Development collaboration (DRD) 8, covering integration, mechanics and cooling, BERGAUER (HEPHY-OEAW Vienna) said that 16 institutes had expressed their willingness to join DRD8 and would come together for a workshop at CERN on 6 December 2023 in order to discuss how to proceed.

The CHAIR added that the DRD8 proposal should be the result of a bottom-up, community-driven process. The proposal could then be reviewed by the DRD Committee and added to the full set of DRD proposals in due course. If a proposal failed to emerge, the important areas of integration, mechanics and cooling would have to be incorporated into other DRDs.

In reply to a comment from LAI (Georg August Universität Göttingen) about the importance of artificial intelligence for the future of fundamental physics, the CHAIR said that the Expression of Interest in the "European Coalition for AI in Fundamental Physics (EuCAIF)" had already been endorsed by RECFA and APPEC, with NuPECC's endorsement expected to

[4] See https://indico.desy.de/event/38293/timetable/#20231128

come later in November. The next step would be to organise a kick-off meeting that would be open to participants from all three fields.

LEWITOWICZ (NuPECC Chair) added that more information would be published online once the Expression of Interest had been formally accepted.

The Committee took note of the Chair's report and of the additional information provided during the discussion.

## 4. ENDORSEMENT OF THE NEW ECFA CHAIR
(Item 4 of the Agenda)

The CHAIR reported[5] that P. Sphicas (CERN/National and Kapodistrian University of Athens) had been elected as the new ECFA Chair at the RECFA meeting in September 2023. He would serve a three-year term of office starting on 1 January 2024.

The Committee unanimously endorsed P. Sphicas as the new ECFA Chair as of 1 January 2024.

## 5. ENDORSEMENT OF NEW ECFA, RECFA AND ECR PANEL MEMBERS
(Item 5 of the Agenda)

The CHAIR presented[6] the proposed PECFA, RECFA and ECR Panel appointments and reappointments as well as the proposed ECR Panel ex officio appointments to ECFA.

The Committee unanimously endorsed the following PECFA and RECFA appointments and reappointments:

- T. Bergauer of Austria, replacing M. Jeitler (RECFA);
- A. Hirtl of Austria, replacing R. Schöfbeck;
- P. Luukka of Finland, replacing K. Lassila-Perini (RECFA);
- H. Kirschenmann of Finland, replacing M. Voutilainen;
- M. Delmastro of France;

[5] See Indico: https://indico.cern.ch/event/1220533/contributions/5619038/attachments/2752417/4794354/Endorsements_ECFA_Chair_2023.11.16.pdf

[6] See Indico: https://indico.cern.ch/event/1220533/contributions/5596300/attachments/2752418/4794352/Endorsements_PECFA_2023.11.16.pdf

- E. Gallo of Germany;
- F. Maas of Germany;
- J. Erdmann of Germany, replacing A. Schmidt;
- D. Sampsonidis of Greece, replacing P. Sphicas (RECFA);
- F. Siklér of Hungary;
- E. Gross of Israel (RECFA);
- D. Bettoni of Italy;
- P. Campana of Italy;
- P. Azzurri of Italy, replacing A. Cardini;
- M. Cobal of Italy;
- M. Ciuchini of Italy, replacing S. De Curtis;
- G. Gaudio of Italy, replacing L. Lista;
- R. Arnladi of Italy, replacing V. Manzari;
- S. Malvezzi of Italy, replacing C. Meroni (RECFA);
- W. Waalewijn of the Netherlands, replacing E. Laenen;
- E. A. Kurkela of Norway, replacing E. Adli;
- F. Ould-Saada of Norway, replacing A. Read (RECFA);
- P. Conde Muíño of Portugal (RECFA);
- B. Meirose of Sweden, replacing D. Milstead;
- R. Gonzalez Suarez of Sweden, replacing R. Pasechnik;
- R. Wallny of Switzerland, replacing M. Weber (RECFA);
- S. Farrington of the United Kingdom;
- J. Goldstein of the United Kingdom;
- S. Williams of the United Kingdom,
- M. Wing of the United Kingdom;
- H. Rafique of the United Kingdom;
- R. Hawkings from CERN, replacing C. Joram (RECFA).

The Committee unanimously endorsed the following ECR Panel ex officio appointments to ECFA:

- A. García Alonso of the Netherlands;

- P. Dougan of the United Kingdom;
- H. Pacey of the United Kingdom.

The Committee unanimously endorsed the following ECR Panel appointments and reappointments:

- L. Dufour from CERN;
- M. Babeluk of Austria, replacing G. Räuber;
- D. Krupova of the Czech Republic, replacing T. Herman;
- P. Vana of the Czech Republic, replacing K. Jarkovská;
- M: Myllymäki of Finland, replacing H. Kirschenmann;
- P. Major of Hungary;
- E. Kasimi of Greece,
- E. Tziaferi of Greece;
- I. Zisopoulos of Greece;
- Y. Afik of Greece;
- M. Giacalone of Italy, replacing V. Zaccolo;
- M. Giovannetti of Italy, replacing E. Diociaiuti;
- M. Olmi of Italy, replacing G. Benato;
- Z. Wolffs of the Netherlands, replacing J. Degens;
- M. Niemiec of Poland, replacing J. Malczewski;
- I. Duminica of Romania;
- P. Dougan of the United Kingdom, replacing P. Dunne.

The CHAIR thanked the outgoing members and representatives for their excellent work and commitment to ECFA's activities and welcomed the newcomers, whose terms of office would begin on 1 January 2024.

## 6. PRESENTATION BY THE INCOMING ECFA CHAIR
(Item 6 of the Agenda)

SPHICAS presented[7] his vision and ambitions for ECFA, recalling its mandate, summarising its activities to date and outlining its major goals for the following three years.

In reply to a comment from NAKADA about the need for ECFA to focus not only on CERN but also on other, smaller, accelerator facilities in Europe, SPHICAS agreed that the wide range of excellent physics being pursued in various facilities was and should continue to be part of the ECFA remit and must not be taken for granted. The ECFA Chair's participation in meetings of the LDG (Large Particle Physics Laboratory Directors Group) was one way to achieve that goal.

In reply to a follow-up question from NAKADA about the next update of the European Strategy for Particle Physics, SPHICAS underlined that, while the preparatory discussions would likely be dominated by the next major accelerator project, broad community involvement would help ensure that the field's diverse scientific, R&D, computing and other initiatives were given due consideration.

The Committee took note of the presentation by Sphicas and of the additional points made during the discussion.

## 7. REPORT FROM THE EARLY-CAREER RESEARCHERS PANEL
(Item 7 of the Agenda)

ILG (ECR Panel) presented[8] an update on the ECFA Early-Career Researchers (ECR) Panel, highlighting its mandate and composition and summarising the activities in 2023 of its three working groups (career prospects and diversity in the physics programme; future colliders; and software and machine learning for instrumentation).

The Committee took note of the presentation by Ilg.

---

[7] See Indico: https://indico.cern.ch/event/1220533/contributions/5664372/attachments/2753833/4794472/2023-11-16-CERN-PECFA-Introduction-PS.pdf

[8] See Indico: https://indico.cern.ch/event/1220533/contributions/5596301/attachments/2753701/4794216/ECFA%20ECR%20Panel%20-%20PECFA%20November%202023.pdf

## 8. MID-TERM REPORT FROM POLAND

(Item 8 of the Agenda)

ŁAGODA (NCBJ) presented[9] the mid-term report on the status of particle physics in Poland since the last RECFA visit in May 2019, covering funding for R&D, Poland's status at CERN, its contribution to CERN and non-CERN projects and the progress made with the recommendations issued by RECFA.

In reply to BORTOLETTO (University of Oxford), who, noting the lack of significant progress made with the recommendations issued by RECFA following its visit to Poland, but also the role that governments played in allocating funding, asked whether the visits were useful, ŁAGODA said that the RECFA visit had helped to highlight Poland's areas for improvement. The challenges of recent years, particularly the COVID-19 pandemic, had diverted attention and resources away from the RECFA recommendations, but it was hoped that more progress would be made soon.

In reply to a question from the CHAIR, ŁAGODA said that developing a national funding path for the DRD collaborations would depend on the activities and priorities of the newly configured Polish Ministry of Education and Science. It was hoped that the new Polish government would prioritise funding for science.

In reply to CONDE MUÍÑO (LIP), who asked whether the DRD collaborations could be included in an existing funding path for other scientific collaborations, ŁAGODA said that detector R&D was in the remit neither of the National Science Centre, which was dedicated to fundamental or basic research, nor of the National Centre for Research and Development, which was dedicated to transferring technological innovations to domestic industry. In short, detector R&D fell through the cracks of the Polish scientific funding system and an effective solution was needed from the Polish Ministry of Education and Science.

In reply to a question from MARTÍNEZ RIVERO (Universidad de Cantabria/CSIC), WIŚLISKI (NCBJ) said that the Tier 1 data centre at the Polish National Centre for Nuclear Research (NCBJ) in Świerk would initially support the LHCb experiment and subsequently the CMS experiment.

[9] See Indico: https://indico.cern.ch/event/1220533/contributions/5596302/attachments/2753318/4793367/poland-midterm-report.pdf

In reply to READ (University of Oslo), who, noting Poland's relatively respectable industrial return rate of 0.74, asked whether concerns over that figure arose from a negative trend, ŁAGODA said that she could not compare the industrial return figure to previous years, as exact data for those years had not been received from the country's Industrial Liaison Officer. Although Poland's rate of return was not critical compared to some other countries, the lack of stability and the fact that Poland still featured on the list of "poorly balanced countries" meant that progress could be made on that front.

BORTOLETTO remarked that Poland had a very good return coefficient for both fellow selections (2.61) and staff selections (1.21), which placed it in a more favourable position than many other Member States.

The Committee took note of the report by Łagoda and of the additional points made during the discussion.

## 9. REPORT FROM THE LABORATORI NAZIONALI DI FRASCATI

(Item 9 of the Agenda)

BOSSI (INFN-LNF) presented[10] a report from the Laboratori Nazionali di Frascati (LNF), providing details of the facility's workforce, budget and infrastructure, outlining its contributions to machines and experiments in other laboratories, and highlighting its involvement in the EuPRAXIA multinational project for plasma-based accelerator facilities and in the FCC Feasibility Study.

In reply to a question from BORTOLETTO about the status of the Beam Test Facility (BTF), BOSSI said that it now had two extraction lines. One of the lines was currently occupied by the PADME experiment, which was due to end its data taking at the end of 2024. More than 200 days of beam had been provided to other BTF users in 2023, and in the coming weeks the first users from the EURO-LABS project would be granted access.

In reply to a further question from BORTOLETTO, BOSSI said that LNF's longstanding tradition of detector development, particularly in the areas of gaseous detectors and scintillating calorimeters, would certainly continue through the DRD collaborations.

[10] See Indico: https://indico.cern.ch/event/1220533/contributions/5624371/attachments/2753430/4794516/PECFA-LNF-Nov-23.pdf

The Committee took note of the presentation by Bossi and of the additional information provided during the discussion.

## 10. REPORT FROM PSI
(Item 10 of the Agenda)

SEIDEL (PSI) presented[11] a report from the Paul Scherrer institute (PSI), covering its range of research facilities, examples of its R&D collaboration with other institutes, the scope of three particle physics experiments hosted at PSI, its involvement in the FCC Feasibility Study and its long-term strategic plan.

In reply to a question from SPHICAS, SEIDEL said that around 10% of PSI's research budget was devoted to high-energy physics experiments. The ring light source and the free electron lasers attracted the highest numbers of users, followed by the high-intensity proton accelerator. Collaboration with the Swiss pharmaceutical industry was also a key activity.

In reply to a question from the CHAIR, SEIDEL said that PSI's magnet development work was embedded in the FCC project and involved collaboration with Italian and US colleagues on high-temperature superconductors.

In reply to a question from NAKADA about the budget being invested in energy and environmental research at PSI, SEIDEL said that the institute endeavoured to exploit synergies between nuclear and non-nuclear research in order to develop materials that could also address environmental issues.

The Committee took note of the presentation by Seidel and of the additional information provided during the discussion.

## 11. REPORT FROM APPEC
(Item 11 of the Agenda)

HAUNGS (APPEC Chair) gave a presentation[12] outlining the mandate and activities of the Astroparticle Physics European Consortium (APPEC) and its strategy and facilities in

[11] See Indico: https://indico.cern.ch/event/1220533/contributions/5637026/attachments/2753897/4794587/PSI_Seidel.pdf

[12] See Indico: https://indico.cern.ch/event/1220533/contributions/5624392/attachments/2753718/4794260/PECFA_Nov23_APPEC_Haungs.pdf

Europe and beyond and summarising the scope of astroparticle physics and its synergies with neighbouring fields.

In reply to a question from the CHAIR, HAUNGS said that the cost of the DARWIN and ARGO experiments was included in the plot on slide 28. They would be operated in existing underground laboratories, resulting in stable maintenance and operation costs, with the main outlay being the purchase of the xenon at an annual cost of approximately 5 MEUR. The cost of a potential argon experiment was not included in the plot as it was only at the recommendation stage.

In reply to FARRINGTON (University of Edinburgh), who noted the importance of complementarity across the international astroparticle physics landscape and the need to cover the phase space in a uniform way, avoiding duplication and gaps, HAUNGS said that the plot on slide 28 focused on large investments that were clearly identified as belonging to the astroparticle physics field and not covered by the neighbouring fields. The APPEC Roadmap[13] presented a more nuanced and detailed view of the full range of experiments and facilities that made up the landscape.

In reply to a question from ADLI about recruitment, HAUNGS said the astroparticle physics field could draw on a wealth of good human resources and that the various flagship projects did not overlap and were therefore not competing for the same talent. Nevertheless, it was not always easy to coordinate between national funding agencies in different European countries nor to reconcile the diverging priorities of national communities, which did result in a dynamic and constantly shifting landscape of initiatives.

The Committee took note of the presentation by Haungs and of the additional information provided during the discussion.

## 12. REPORT FROM NUPECC

(Item 12 of the Agenda)

LEWITOWICZ (NuPECC Chair) presented[14] a report outlining the mandate and activities of the Nuclear Physics European Collaboration Committee (NuPECC), describing the major nuclear physics infrastructures in Europe, and summarising the process for elaborating

[13] See https://www.appec.org/roadmap

[14] See Indico: https://indico.cern.ch/event/1220533/contributions/5636973/attachments/2752981/4795165/NuPECC%20ECFA%20Meeting%2015%20Nov%202023%20Marek%20Lewitowicz.pdf

the NuPECC 2024 Long-Range Plan for Nuclear Physics in Europe and the preliminary recommendations and strategy pillars that had emerged to date.

In reply to a question from SPHICAS about the application process for becoming a member of NuPECC, LEWITOWICZ said that a country was required to have a range of well-developed nuclear physics activities and to pay an annual fee of 5 kEUR. NuPECC was working hard to bring on board eligible European countries that were not yet members.

In reply to a further question from SPHICAS, LEWITOWICZ said that CERN and FAIR were the only nuclear physics facilities in Europe that had more than one member state. However, many countries had nuclear physics facilities to which other countries contributed.

In reply to a question from the CHAIR, LEWITOWICZ confirmed that European participation in the detector for the Electron–Ion Collider (EIC) in the United States was likely to be recommended under the NuPECC 2024 Long-Range Plan for Nuclear Physics in Europe. It was important to note that the Long-Range Plan did not address financial scenarios.

In reply to a further comment from the CHAIR regarding the potential competition for nuclear physics resources, in particular personnel, caused by the overlapping time frame of a possible ALICE-3 upgrade and the construction of the EIC, ERAZMUS (CNRS), seconded by BETTONI (INFN-Ferrara), said that the situation varied from one country to another but in most cases the relevant people would be able to participate in both projects and the R&D synergies between the two could be exploited.

The Committee took note of the presentation by Lewitowicz and of the additional information provided during the discussion.

13. OTHER BUSINESS
(Item 13 of the Agenda)

There being no other business, the meeting was suspended at 5.35 p.m.

The meeting resumed in open session on Friday, 17 November 2023 at 9.00 a.m.

## OPEN SESSION

1. ECFA DETECTOR R&D ROADMAP
(Item 1 of the Agenda)

a) Introduction

The CHAIR presented[15] an overview of the elaboration and implementation of the ECFA Detector R&D Roadmap, describing the tasks completed by the Detector R&D Roadmap Panel and the transition to the ECFA Detector Panel, and outlining the pending work on the General Strategic Recommendations set out in the Roadmap document[16], which would be overseen by the ECFA-LDG Working Group.

The Committee took note of the presentation by the Chair.

b) Report from the DRD Committee

BERGAUER presented[17] a report from the newly established DRD Committee, recalling the ECFA Detector R&D Roadmap process that had resulted in the planned DRD collaborations, describing the mandate, role and composition of the DRD Committee, and providing an overview of the status of the planned DRD collaborations.

In reply to VOS, who asked whether the memorandum of understanding (MoU) that would be signed by all institutes within a DRD collaboration would require a firm financial commitment on the part of the funding agencies to a common fund, BERGAUER said that individual DRD collaborations could decide whether or not to include such a fund in their MoU. The existing RD50 and RD51 collaborations, for example, were financed in part by a common fund that was defined in the MoUs signed by all the participating funding agencies, but such a structure might not be appropriate for all DRD collaborations.

In reply to a question from HUSEMANN (KIT) about which strategic R&D projects should be prioritised within a DRD collaboration, BERGAUER said that the funds available

[15] See Indico: https://indico.cern.ch/event/1220533/contributions/5636996/subcontributions/447790/attachments/2754264/4795273/Introduction_ECFA-activities_2023.11.17.pdf

[16] See https://cds.cern.ch/record/2784893

[17] See Indico: https://indico.cern.ch/event/1220533/contributions/5636996/subcontributions/447791/attachments/2754218/4795178/2023-11-17_DRD_Bergauer.pdf

could not cover every proposed project and that a coordinated effort should be made to decide which projects to support, based on the long-term needs of the community.

In reply to SPHICAS, BERGAUER said that the figures shown in the slides for "existing" and "requested" funds were based on data compiled by community surveys. "Existing" funds were those that an institute had indicated were already available for DRD collaborations and which they believed could be sustained. "Requested" funds were those the institutes had answered that they needed and believed were realistically attainable. As questions concerning "requested" funding had been asked and interpreted differently in the surveys, those figures included a large level of uncertainty.

In reply to a question from BORTOLETTO, BERGAUER said that funding agencies in the larger countries, such as Italy, France, Germany and the United Kingdom, had recently started looking in more detail at the figures from the community surveys to check whether funds were evolving to meet institutes' needs and to organise their funding at national level.

In reply to a question from SPHICAS, who asked how many US groups involved in the DRD collaborations had also joined the recently created US R&D collaborations (RDCs), BERGAUER noted that the US process was somewhat behind the European process, so it was too early to say with any great certainty. The DRDs did, however, benefit from a significant US contribution, so a degree of overlap was likely. For example, many of the groups involved in DRD2 for liquid detectors were from US institutes, although other DRDs saw a smaller US contribution.

The Committee took note of the presentation by Bergauer and of the additional information provided during the discussion.

c) Report from the ECFA–LDG Detector R&D Infrastructure Panel

MIKUŽ presented[18] a report from the ECFA–LDG Detector R&D Infrastructure Panel, covering the Panel's composition, the results of two surveys[19] conducted to determine the requirements of the DRD collaborations and the available laboratory resources, the potential to tap into European funding through EURO-LABS, and the planned measures to match the DRD requirements to resources and to liaise with institutes and funding agencies to secure additional resources where needed.

In reply to SCHMIDT-WELLENBERG (PSI), who noted that the PSI's shutdown from 2027 to 2028 would also coincide with the CERN, DESY and Fermilab shutdowns, MIKUŽ commented that it was an unfortunate coincidence that shutdowns by multiple test-beam facilities had been planned for the same period. It was hoped that CERN might be able to keep its test beamlines running, at least partially, during some of LS3.

In reply to BORTOLETTO, MIKUŽ said that DRD2 had very specific background radiation requirements, as it explored neutrinos and dark matter detection. The anonymous ECFA–LDG survey, produced with the aim of showing general trends in the requirements of the various DRDs, had asked respondents whether their collaboration would need a background-radiation-free laboratory. Some had replied that they did and others not.

In reply to a request for clarification from STEWART (CERN), MIKUŽ said that one DRD's request for "high performance computing for simulation" under software support (slide 8) was probably intended to mean that access to more computing power, such as through the WLCG, would be helpful.

In reply to BOSSI, MIKUŽ said that, in the survey, the DRDs had listed only their resource requirements beyond what was already available in the collaborations, while the laboratory resources survey gave a complete picture of the available infrastructures. The 47 research infrastructures covered by EURO-LABS were organised into different work packages (WPs), with the bulk of detector development executed in WP4 infrastructures, but the possibility for cross-fertilisation between the WPs should not be overlooked.

[18] See Indico: https://indico.cern.ch/event/1220533/contributions/5636996/subcontributions/447794/attachments/2754134/4795014/Infra-survey_PECFA_Nov23.pdf

[19] See https://indico.cern.ch/event/1220533/contributions/5636996/subcontributions/447794/attachments/2754134/4795018/survey-report-drd-ldg-ecfa-survey.pdf

The Committee took note of the presentation by Mikuž and of the additional points made during the discussion.

d) Report from the ECFA Training Panel

GARUTTI presented[20] a report from the ECFA Training Panel, covering its composition and the list of tasks to be completed based on recommendations from the ECFA Detector R&D Roadmap, namely supporting the career paths of R&D experts, redesigning the ECFA training web page, collecting information on and coordinating schools in instrumentation, and creating an EU master's programme in instrumentation, and appealed for volunteers to support and coordinate the work on each task.

CONDE MUÍÑO noted that, in some countries, the only clear-cut career path in academia was the "postdoc pathway" to professorship, so finding and implementing alternative career paths for instrumentation experts would be a difficult albeit necessary task. It was hoped that successful experiences in different countries could be drawn upon and shared.

GARUTTI added that, in most countries, the qualifications required of a scientist applying for permanent roles in experimental physics instrumentation and laboratory services were not well defined. That lack of clarity was one of the issues that the ECFA Training Panel aimed to address.

The Committee took note of the presentation by Garutti and of the additional points made during the discussion.

2. FCC FEASIBILITY STUDY
(Item 2 of the Agenda)

BENEDIKT (CERN) gave a presentation[21] on the status of the FCC Feasibility Study, covering the progress with implementation activities, site investigations and environmental studies, planned civil engineering, cooling water supply concepts and excavation material management, and gave an update on the Study's mid-term review.

[20] See Indico: https://indico.cern.ch/event/1220533/contributions/5636996/subcontributions/447795/attachments/2754204/4795156/PECFA-171123-TrainingPanel.pdf

[21] See Indico: https://indico.cern.ch/event/1220533/contributions/5624394/attachments/2754194/4795146/231117_FCC-FS-Status-ap.pdf

In reply to a question from BORTOLETTO, BENEDIKT said that reserving the sites for the FCC involved two considerations: protecting the underground areas from activities such as geothermal borehole drilling or other investigative work that could conflict with the tunnel's construction, and protecting the surface areas, as the tunnel's positioning had been optimised and agreed with the Host States and could not be easily altered. On the French side, a procedure was in place to notify CERN if anyone tried to buy or change the usage of either the underground or surface areas planned for FCC usage. Following any such notification, CERN would have a limited time to react. By the end of the year, however, CERN would send a request to the French authorities to formally reserve the required plots of land. On the Swiss side, as all the planned FCC surface sites were owned by the Canton of Geneva, appropriate measures were already in place to reserve those areas for CERN. For example, local farmers could only work on those surface areas for a fixed duration, so as not to interfere with plans for the FCC. Regulations differed between France and Switzerland but various working groups were aiming to develop harmonised solutions for aspects such as the use of excavation material and other environment-related issues.

In reply to a question from VOS concerning the environmental impact of the excavation and construction of the FCC tunnel, BENEDIKT said that, by the mid 2030s, the date planned for the first groundbreaking, tunnelling methods would very likely be more carbon neutral. In particular, the industry for carbon-negative concretes had seen rapid expansion in recent years. Although it was difficult to say exactly which methods would be available in ten years' time, it was reasonable to assume, given recent progress in new, carbon-neutral technologies, that the tunnel would have a low environmental impact. The use of renewable energy and more environmentally friendly materials would be addressed in final Feasibility Study report scheduled for 2025.

The Committee took note of the presentation by Benedikt and of the additional information provided during the discussion.

## 3. REPORT FROM THE LDG

(Item 3 of the Agenda)

NEWBOLD, Chair of the Large Particle Physics Laboratory Directors Group (LDG) presented[22] an update from the LDG, covering progress with the five main areas of the

[22] See Indico: https://indico.cern.ch/event/1220533/contributions/5624404/attachments/2754418/4795573/LDG_Update_231117.pdf

Accelerator R&D Roadmap (high-field magnets, radiofrequency structures, energy-recovery linacs, muon colliders and plasma wakefield acceleration), a planned sustainability assessment of accelerators, and recent and forthcoming community meetings, and looking ahead to the major challenges and opportunities in particle physics in the coming years.

In reply to a question from BORTOLETTO, NEWBOLD said that the scale of the European accelerator R&D projects set out in the Roadmap was between 10 and 20 MEUR, not including the expected US contributions, with some 250–400 FTEs per project. Those resources were primarily channelled through the laboratories' existing budgets. The LDG would be conducting its annual review the following week, where the figures would be scrutinised in more detail.

In reply to a question from the CHAIR about the resources devoted to magnets, NEWBOLD said that magnet development was a slow-moving field characterised by a high level of sustained investment in complex magnet facilities and skills. Any change of direction, such as a decision to move away from niobium–tin magnets towards high-temperature superconducting magnets, would be significant and irrevocable. Once the outcomes of the FCC Feasibility Study were known, a major discussion would have to take place in the HFM collaboration and, ultimately, a decision taken about which magnet path to pursue.

The Committee took note of the presentation by Newbold and of the additional information provided during the discussion.

## 4. REPORT ON THE ECFA $E^+E^-$ WORKSHOP IN PAESTUM

(Item 4 of the Agenda)

KOPPENBURG (Nikhef) presented[23] a report from the ECFA $e^+e^-$ workshop in October 2023 in Paestum, recalling the triple working group structure of the $e^+e^-$ Higgs/Top/EW factory study, summarising the workshop attendance and topics addressed, and outlining some highlights from the plenary sessions and the next steps to be taken with a view to the next update of the European Strategy for Particle Physics.

In reply to NEWBOLD, who noted the magnitude of the challenge of securing political support for a future collider and the need to appeal to national interests in a politically astute manner, KOPPENBURG said that the workshop session on the science case had focused on

[23] See Indico: https://indico.cern.ch/event/1220533/contributions/5624405/attachments/2754438/4795910/Koppenburg-20231117-ECFA.pdf

developing arguments to counter the cost and environmental criticisms already being levelled at a future collider project in the public domain, such as on social media.

In reply to a comment from SALGADO, who noted that the focus on an $e^+e^-$ collider excluded a large part of the LHC community whose involvement would also be needed to convince the national funding agencies to support a future collider, the CHAIR said that the decision by ECFA to establish an $e^+e^-$ Higgs/Top/EW factory study and workshop series stemmed from the last European Strategy update and the consensus that an $e^+e^-$ collider should be the next priority machine. Indeed, the outcomes of the study would provide input for the next Strategy update. Nevertheless, ECFA should certainly not forget about the wider community on a longer time scale.

The Committee took note of the presentation by Koppenburg and of the additional points made during the discussion.

## 5. JOINT ECFA–NUPECC–APPEC COMPUTING WORKSHOP

(Item 5 of the Agenda)

STEWART presented[24] a report from the Joint ECFA–APPEC–NuPECC Computing Workshop in Bologna in June 2023, covering the origins and purpose of the workshop, the topics addressed, the common computing challenges and potential solutions identified, the working groups to be set up in five critical areas and the white paper planned for the JENA Symposium in 2025.

In reply to a comment from READ about the high cost of moving high-energy physics (HEP) to high-performance computing (HPC) infrastructure, STEWART said that national funding agencies were keen for the HEP community to make use of the HPC machines in which they had invested. While moving HEP computing wholescale to HPC would be inefficient, activities such as event generation were a good way to take advantage of HPC infrastructure. In parallel, it was important to maintain traditional computing resources, such as those of the Worldwide LHC Computing Grid (WLCG).

The CHAIR added that the participants at the workshop in Bologna had recognised the growing pressure from funding agencies to make use of HPCs, and that was why a working

[24] See Indico: https://indico.cern.ch/event/1220533/contributions/5624411/attachments/2754208/4795901/JENA-Computing-Report.pdf

group would be set up to examine where and how they could be most useful and to endeavour to help shape how HPC centres would be set up in the future.

In reply to a question from BORTOLETTO, STEWART said that the only country to have announced that it would no longer fund regional Tier 2 centres as traditional high-throughput facilities and that LHC computing must move to its new HPC centres was Germany, but other countries were likely to follow suit and start applying pressure. The HEP community should therefore be aware of and prepared for that trend.

In reply to a question from CONDE MUÍÑO about progress with common computing solutions, STEWART said that achievements to date included the convergence within HEP on tools such as Rucio and CVMFS, including for small experiments. Federated authentication and authorisation, which had been driven by European Union initiatives, had also resulted in improvements. Successful common software solutions included ROOT, Geant4 and event generators.

In reply to a question from NAKADA about field-programmable gate arrays (FPGAs), STEWART said that their usefulness in the HEP field depended on the development of high-level synthesis languages. It was too early to say whether or not widespread applications would be feasible.

The Committee took note of the presentation by Stewart and of the additional information provided during the discussion.

## 6. REPORT FROM CERN
(Item 6 of the Agenda)

MNICH (CERN) presented[25] a status report from CERN, covering the LHC's performance in 2023, progress with the HL-LHC and the ATLAS and CMS Phase 2 upgrades, the NextGen Trigger project, the nearly completed CERN Data Centre in Prévessin, activities at the Neutrino Platform, the Open Quantum Institute, and the opening of the Science Gateway and the newly renovated library.

In reply to a question from KRASNY (Saclay), MNICH said that the LHC would need to cease operation in 2041 in order to free up financial and human resources to be invested in the

[25] See Indico: https://indico.cern.ch/event/1220533/contributions/5624410/attachments/2754465/4795681/JM%20PECFA%20Nov%202023-final.pdf

next major project. It was not planned to diversify the planned LHC runs beyond proton–proton and ion–ion collisions.

In reply to a question from HIDAKA (Tokyo Gakugei University), MNICH and LAMONT said that by the end of Run 3 it was hoped that the LHC would deliver between 250 and 300 inverse femtobarns of data.

The Committee took note of the presentation by Mnich and of the additional information provided during the discussion.

## 7. THE EINSTEIN TELESCOPE: STATUS AND CHALLENGES
(Item 7 of the Agenda)

FREISE (Nikhef) presented[26] a report on the status and challenges of the Einstein Telescope project, covering the science case, the technological and engineering aspects, the organisational structures being established, potential funding sources and international collaboration.

In reply to a question from NAKADA, FREISE said that the plots on slide 10 compared the satellite measurements of the first photons from a neutron star collision arriving just 1.7 seconds after the gravitational wave, enabling the scientists to make the best ever measurement of the difference between the speed of light and the speed of gravity.

In reply to a question from SALGADO, FREISE said that, while building the Einstein Telescope on the surface would avoid the need for tunnels and thus halve the cost, that possibility had been ruled out not only because of the lack of a suitable surface site in Europe but also because the instruments could be kept smaller when installed underground and because shifting the "seismic wall" to low frequencies was only possible underground. Having an underground environment would also provide room for longer-term developments of the Einstein Telescope.

In reply to a question from the CHAIR about the geometry of the observatory, FREISE said that a paper[27] comparing different designs was available. The triangular design made it possible to minimise the number of expensive underground caverns, while the two-L design optimised the distance between the detectors. The Einstein Telescope was exploring both

[26] See Indico: https://indico.cern.ch/event/1220533/contributions/5624408/attachments/2754203/4795152/Freise_ETO_231117.pdf

[27] See https://arxiv.org/abs/2303.15923

configurations to ensure that, when the political decision was taken to select one of the candidate sites, or indeed to pursue a two-site solution, the project was ready to proceed.

The Committee took note of the presentation by Freise and of the additional information provided during the discussion.

## 8. PROPOSED FUTURE ACTIVITIES IN THE ECN3 BEAMLINE
(Item 8 of the Agenda)

### a) High-Intensity Upgrade of the North Area's ECN3

FRASER (CERN) presented[28] an overview of the technical studies into the feasibility of a high-intensity upgrade of the North Area's ECN3 beamline for physics exploitation in Run 4, covering the mandate and conclusions of the Physics Beyond Colliders ECN3 Beam Delivery Task Force, a summary of the relevant technical details, the current status of the plans and decision-making process, an implementation schedule and the next steps.

In reply to a question from BORTOLETTO, FRASER said that the duration of LS3 was being discussed as the groups' already heavy workload might make it difficult to perform the necessary detector R&D for the new experiment in time for commissioning in 2029.

The Committee took note of the presentation by Fraser and of the additional information provided during the discussion.

### b) HIKE

LAZZERONI (University of Birmingham) presented[29] the proposed phase 1 and phase 2 of HIKE (High-Intensity Kaon Experiments at CERN), outlining the aim of the experiments, highlighting their uniqueness, summarising the physics case for their installation at the North Area's high-intensity ECN3 beamline, providing details of the schedule and cost of the HIKE detector upgrades, and explaining how the various detector requirements mapped onto the Detector Research and Development collaborations (DRDs) of the European Detector R&D Roadmap.

---

[28] See Indico: https://indico.cern.ch/event/1220533/contributions/5638522/subcontributions/447546/attachments/2754562/4795881/MFraser_EFCA_HI_ECN3.pdf

[29] See Indico: https://indico.cern.ch/event/1220533/contributions/5638522/subcontributions/447547/attachments/2754561/4796177/ECFA_Lazzeroni_Nov2023_final.pdf

In reply to a question from NAKADA, LAZZERONI said that HIKE would collect a sufficient number of decays – in the order of 100 events – to measure $\pi^0 l^+ l^-$ as a function of $q^2$ and would explore the possibility of performing a time-dependent analysis of $\pi^0 l^+ l^-$. The scope of the proposal submitted to the review committee did not mention $\pi^0 \nu\overline{\nu}$ because it was limited to two phases over the 10–15-year time scale; nevertheless, pursuing $\pi^0 \nu\overline{\nu}$ remained a possibility for the experiments' third phase.

In reply to a question from VOS, LAZZERONI said that, by 2025, the data collected by NA62 would be sufficient to provide the shape information for the background yields that would also be expected for HIKE.

In reply to a question from SPHICAS, LAZZERONI said that the assumption of 5 x $10^{19}$ protons on target (POT) in beam-dump mode had been carried over from the beam conditions in kaon mode, although in practice a higher-intensity beam would be possible in beam-dump mode, thereby reducing the time required in that mode to achieve the same POT. The proposal had budgeted for four years of kaon mode interspersed with four years in beam-dump mode, plus an additional year of contingency. The assumptions made in the proposal would likely be revisited once the ultimate limitation for the beam intensity was known.

The Committee took note of the presentation by Lazzeroni and of the additional information provided during the discussion.

c) SHADOWS

LANFRANCHI (INFN-LNF) presented[30] the SHADOWS (Search for Hidden and Dark Objects with the SPS) proposal, covering the evolution of the proposal and its compatibility with HIKE in order to explore new light and feebly interacting particles and, simultaneously, very high-scale masses through precision measurements in the kaon sector, as well as the detector requirements and the project cost, schedule and organisational structure.

In reply to a comment by FRASER, LANFRANCHI said that 6 x $10^{20}$ POT was not the baseline in the current SHADOWS proposal; it was being floated as a future possibility and would require an upgrade of the dump to withstand such an intensity.

The Committee took note of the presentation by Lanfranchi and of the additional points made.

[30] See Indico: https://indico.cern.ch/event/1220533/contributions/5638522/subcontributions/447548/attachments/2754560/4795876/shadows_ECFA_Nov2023_Lanfranchi_v1.pdf

d) SHIP

JACOBSSON (CERN) presented[31] an overview of the BDF (Beam Dump Facility) / SHiP (Search for Hidden Particles) proposal, covering its physics potential, its complementarity with other experiments at the HL-LHC and its suitability for the TCC8/ECN3 location, and outlining the detector requirements, the status of the subsystems' prototyping and beam tests and a preliminary schedule.

In reply to a question from GIANOTTI (CERN) about the future composition of the SHiP collaboration, some of whose members would be excluded as a result of the termination of the international collaboration agreement with the Russian Federation, JACOBSSON said that many of the Russian scientists had now changed institute in order to be able to continue collaborating with CERN, so those affected were a small minority. The collaboration was in a healthy position, as evidenced by the 38 institutes and 15 countries listed on the slides. Its future would be secured by a good proportion of younger scientists from institutes with which CERN could continue to collaborate.

The Committee took note of the presentation by Jacobsson and of the additional information provided during the discussion.

GIANOTTI said that, on the occasion of K. Jakobs' last meeting as Chair of the Committee, she wished, on behalf of the CERN Management, to thank him for his commitment, hard work, dedication and efficacy throughout his three-year term of office, which would finish at the end of the year.

Applause.

The meeting rose at 4.15 p.m.

[31] See Indico: https://indico.cern.ch/event/1220533/contributions/5638522/subcontributions/447549/attachments/2754567/4795886/2023_11_17_ECFAplenary_BDF_SHiP_Jacobsson.pdf