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

PLENARY ECFA

114th meeting

Participation in person and by videoconference – 4 and 5 July 2024

Draft Minutes

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LIST OF PARTICIPANTS

Chair:	P. Sphicas	Greece
Secretary:	P. Conde Muíño	Portugal
Members:	R. Arnaldi	Italy
	P. Azzurri	Italy
	G. Bernardi	France
	N. Besson	France
	D. Bettoni	Italy
	D. Bortoletto	United Kingdom
	P. Campana	Italy
	S. Caron	Netherlands
	M. Ciuchini	Italy
	B. Clerbaux	Belgium
	M. Cobal	Italy
	D. Contardo	France
	M. Delmastro	France
	D. Dobur	Belgium
	D. Dougan	ECR Panel
	B. Erazmus	France
	S. Farrington	United Kingdom
	D. Ferencek	Croatia
	A. Ferrari	Sweden
	A. García Alonso	ECR Panel
	G. Gaudio	Italy
	M. Giovanetti	ECR Panel
	J. Goldstein	United Kingdom
	R. Hawkings	CERN
	Z. Hubacek	Czech Republic
	J. Łagoda	Poland
	A. Lucotte	France

	S. Malvezzi	Italy
	C. Martínez Rivero	Spain
	M. Mikuž	Slovenia
	F. Ould-Saada	Norway
	A. Robson	United Kingdom
	C. Salgado	Spain
	S. Sampsonidis	Greece
	P. Schmidt-Wellenburg	Switzerland
	Y. Sirois	France
	G. Stoicea	Romania
	N. Tuning	Netherlands
	L. Vacavant	France
	N. van Remortel	Belgium
	M. Vos	Spain
	M. Wing	United Kingdom
	J. Zalesak	Czech Republic
	L. Živković	Serbia
Ex officio:	F. Gianotti	CERN
	K. Jakobs	Former ECFA Chair
Invited:	F. Bossi	INFN-LNF
	J. Clarke	STFC Daresbury
	N. Colino Arriero	CIEMAT
	I. Gil-Botella	CIEMAT
	A. Ianni	INFN
	X. Lou	IHEP
	J. Mnich	CERN
	D. Newbold	LDG Chair
	C. Touramanis	University of Liverpool/CERN
	F. Zimmerman	CERN
Observers:	M. Lewitowicz	NuPECC Chair

Other attendees: P. Azzi, R. Bertelli, J. Cassar, A. Costantini, A. De Santos, P. Gianotti, C. Grojean, P. Janot, D. Lucchesi, B. Meirose, A. Nisati, N. Pastrone

The meeting, held primarily in person at the Laboratori Nazionali di Frascati (LNF) with a videoconference connection, was called to order at 11.30 a.m. on Thursday, 4 July 2024.

1. WELCOME FROM INFN–HEP IN ITALY
(Item 1 of the Agenda)

MALVEZZI (INFN Italy) presented[1] an overview of the INFN and the high-energy physics landscape in Italy, outlining the Institute's five main lines of research and its contributions to projects, including the Phase 2 upgrades of ALICE and CMS, LHCb Upgrade II, Belle II, DUNE and Hyper-K, and providing details of INFN initiatives within the context of the update of the European Strategy for Particle Physics (ESPP), as well as commitments to future accelerator projects and detector R&D.

In reply to BORTOLETTO (University of Oxford), MALVEZZI said that, while high-temperature superconducting (HTS) magnets were certainly the main technological challenge of the future, the INFN would also continue its work on Nb_3Sn high-field magnets (HFM). Ongoing activities, namely the Future Accelerator post-LHC Cos-theta Optimised Nb_3Sn Dipole (FalconD) programme, were already a key part of the CERN HFM programme and were supported by funds from the European Recovery and Resilience Facility.

GIANOTTI (CERN) added that ASG Superconductors, the INFN's industrial partner that was responsible for manufacturing the Nb_3Sn coils for the FalconD programme, had also manufactured the MgB_2 and REBCO cables for the High-Luminosity LHC (HL-LHC) HTS links.

In reply to the CHAIR, MALVEZZI said that the rise in the number of staff at the INFN could be explained by several factors, including the increase in funding to each of the five National Scientific Committees of the INFN and the reallocation of budgets from smaller experiments to larger ones.

The Committee took note of the presentation by Malvezzi and of the additional information provided.

[1] See Indico: https://indico.cern.ch/event/1361605/contributions/5966838/attachments/2890719/5067050/SM_pECFA_Jul2024.pdf

2. WELCOME FROM FRASCATI DIRECTOR
(Item 2 of the Agenda)

BOSSI (INFN-LNF) gave a presentation[2] on the Laboratori Nazionali di Frascati (LNF), covering the history of the laboratory and its current and future accelerator facilities (DAΦNE, SPARC_LAB and EuPRAXIA), listing a number of notable achievements that had been made by LNF personnel in the development and construction of detectors, both at LNF and at other laboratories, and providing an overview of several experiments and experiment proposals in the fields of fundamental physics and applied physics.

In reply to a question from NEWBOLD (LDG/STFC) concerning the intended user community of the future EuPRAXIA facility, BOSSI said that, as a free-electron laser (FEL) facility, it would primarily serve the life sciences and materials science communities; however, work was under way to gauge whether the machine, or part of it, might be used for fundamental physics studies.

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

3. OPENING, ADOPTION OF THE AGENDA
(Item 3 of the Agenda)

The CHAIR welcomed the members to the meeting.

The Agenda[3] was adopted.

4. DRAFT MINUTES OF THE 113RD MEETING
(Item 4 of the Agenda) (ECFA/RC/534/Draft)

The minutes of the 113rd meeting of Plenary ECFA (ECFA/RC/534/Draft) were approved.

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[2] See Indico: https://indico.cern.ch/event/1361605/contributions/5966841/attachments/2881068/5066249/PECFA-LNF-July-24.pdf

[3] See Indico: https://indico.cern.ch/event/1361605/timetable/?view=standard

5. ENDORSEMENT OF NEW MEMBERS (RECFA, PECFA, ECRS)
(Item 5 of the Agenda)

The CHAIR presented the list of new RECFA[4], PECFA[5] and Early-Career Researchers (ECR) Panel[6] members, noting that the PECFA members who would need to be reappointed or for whom a replacement would need to be nominated in the upcoming November meeting had been highlighted in blue.

The Committee unanimously endorsed the following RECFA appointments:

- D. Ferencek of Croatia, replacing M. Planinic;
- I. Kyryllin of Ukraine, replacing M. Shul'ga.

The Committee unanimously endorsed the following PECFA appointments and reappointments:

- V. Brigljevic of Croatia (reappointment);
- D. Lelas of Croatia, replacing I. Puljiak;
- D. Ferencek of Croatia, replacing M. Planinic;
- I. Kyryllin of Ukraine, replacing M. Shul'ga.

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

- N. Zardoshti of CERN (reappointment);
- L. Dulibić of Croatia;
- A. Šćulac of Croatia;
- A. Utrobičić of Croatia;
- K. Urquía Calderón of Denmark;
- L. Portales of France, replacing A. Kotsokechagia;

[4] See Indico: https://indico.cern.ch/event/1361605/contributions/5966893/attachments/2884881/5067779/RECFA_Composition_2024.07_ForEndorsement-v1.pdf

[5] See Indico: https://indico.cern.ch/event/1361605/contributions/5966893/attachments/2884881/5066454/PECFA_Composition_2024.07_ForEndorsement-v1.pdf

[6] See Indico: https://indico.cern.ch/event/1361605/contributions/5966893/attachments/2884881/5066453/ECR_members_2024.07_forEndorsement-v1.pdf

- L. Reichenbach of Germany, replacing L. Moreno Valero;
- A. Usachov of the Netherlands, replacing S. Klaver;
- R. Guevara of Norway;
- T. Solberg Hillersøy of Norway, replacing N. Fomin;
- D. Kalvik of Norway;
- S. Jovicevic of Serbia (reappointed until the end of 2024);
- J. Mitic of Serbia, replacing V. Milosevic;
- S. Blanco Fernández of Spain, replacing L. Urda Gomez;
- M. Vande Voorde of Sweden, replacing L. Gellersen.

6. REPORT FROM THE CHAIR
(Item 6 of the Agenda)

The CHAIR presented[7] his report, covering the endorsement of the new ECFA Scientific Secretary, L. Zivkovic, and endorsements of RECFA and EFCA Detector Panel members; progress with the ECFA e^+e^- Higgs/electroweak/top factory studies; preparations ahead of the ESPP update, including ECFA nominees to the Physics Preparatory Group and the role of ECFA in the Strategy update process, which would be presented in more detail the following day (see Item 18 below); joint ECFA–NuPECC–APPEC activities (JENAA); the selection of Rutherford Appleton Laboratory (UK) as the venue for the next joint ECFA–NuPECC–APPEC Seminar (JENAS) in April 2025; the schedule for ECFA meetings and RECFA country visits in 2024 and 2025; and the development of a proposal to set up a small RECFA fund to support PhD students and award prizes. The CHAIR also thanked, on behalf of ECFA, the outgoing ECFA Scientific Secretary, P. Conde-Muino, for her extended service to the Committee; the outgoing co-Chair of the ECFA Detector Panel (EDP), P. Allport, for his all-important contributions to the Panel and to the ECFA Detector R&D Roadmap; and D. Eckstein, the outgoing Scientific Secretary of the EDP, for over a decade of service.

JAKOBS (former ECFA Chair, University of Freiburg) said that he welcomed the idea of having a small RECFA budget, which might also be used to update the ECFA website, and hoped that the Member States would be willing to contribute to it.

[7] See Indico: https://indico.cern.ch/event/1361605/contributions/5966892/attachments/2890423/5067573/2024-07-04-PECFA-Report-from-Chair-v1.pdf

The Committee took note of the Chair's report.

7. REPORT FROM THE LABORATORY DIRECTORS GROUP (LDG)
(Item 7 of the Agenda)

NEWBOLD (LDG Chair) presented[8] a report on the Laboratory Directors Group (LDG), covering the open forum held at Brookhaven National Laboratory on 6 and 7 June 2024; the role and remit of the LDG; an overview of progress in each of the five technical areas covered by the Accelerator R&D Roadmap, namely high-field magnets, laser/plasma acceleration, RF structures, muon colliders and energy-recovery linac (ERL) technology; an update on the LDG working group on objective sustainability assessment of future accelerators; an explanation of how the LDG intended to contribute to the ESPP update; and some changes in the composition of the LDG, including the election of M. Seidel as the new LDG Chair for 2025–2026.

In reply to JAKOBS, NEWBOLD said that the working group on objective sustainability assessment of future accelerators was intended to bring together accelerator experts and experts in sustainability assessments of large-scale technical infrastructures in order to develop a new process for measuring the carbon impact of future accelerators, based on a full life-cycle assessment (LCA). Such analyses often identified unexpected ways to reduce the carbon footprint of a project – for example, by simply changing the size and shape of the buildings – thus reducing the number of physics trade-offs initially thought to be required.

In reply to a question from the CHAIR on the involvement of industry in efforts to improve the sustainability of future accelerators, NEWBOLD said that ARUP, the European market leader in carbon assessment of technical infrastructure, was providing free consultancy services to the working group. The working group would seek to liaise more closely with suppliers as specific questions arose, for example, to understand the carbon impact of producing HTS magnets.

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

[8] See Indico: https://indico.cern.ch/event/1361605/contributions/5967276/attachments/2890636/5066896/LDG_Update_240704.pdf

8. REPORT FROM CERN
(Item 8 of the Agenda)

MNICH (CERN) presented[9] a status report from CERN, covering the strong start of the 2024 LHC run and the excellent prospects for the rest of the year; progress with the HL-LHC and the Phase 2 upgrades of ATLAS and CMS; the decision to proceed with the SHiP (Search for Hidden Particles) experiment at the upgraded ECN3 facility; the smooth running of the WLCG (Worldwide LHC Computing Grid) and the inauguration of the Prévessin Data Centre; activities at the Neutrino Platform; Science Gateway visitor statistics; the admission of Brazil as an Associate Member State in March 2024 and the Council decision to admit Estonia as a Member State, subject to its completion of the accession process; and the termination of the International Collaboration Agreements (ICAs) with the Russian Federation and Belarus.

In reply to NEWBOLD, MNICH said that the upcoming HL-LHC Cost and Schedule Review would focus on the schedule of Long Shutdown 3 (LS3). It was his belief that it would be more damaging to the experiments to extend the duration of LS3 – as opposed to postponing it – since that would result in a reduced period of data taking.

In reply to the CHAIR, MNICH said that CERN's involvement in the DarkSide experiment at Gran Sasso was limited to the construction of the cryostat, which enabled CERN to gain experience in the construction of such infrastructure, setting it in good stead for larger projects such as DUNE.

GIANOTTI (CERN) added that, while CERN was able to collaborate on the technological aspects of projects such as DarkSide and the Einstein Telescope, its involvement in the related research was limited by the CERN Convention to accelerator-based projects in the domain of particle physics.

In reply to a question from FERRARI (Uppsala University) as to why Estonia was not a member of ECFA despite having been admitted as a CERN Member State, MNICH said that Estonia's admission as a CERN Member State was subject to its completion of the accession process.

The CHAIR, conceding that it was something of an anomaly that Slovenia was a member of ECFA but Estonia, Latvia and Lithuania were not, said that the matter would be given due consideration in the coming months.

[9] See Indico: https://indico.cern.ch/event/1361605/contributions/5966911/attachments/2890782/5067177/JM%20PECFA%20Jul%202024-final.pdf

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

9. REPORT FROM IRFU/SACLAY
(Item 9 of the Agenda)

BESSON (IRFU) presented[10] a report from IRFU/Saclay, covering the Institute's mission and main areas of research, some highlights from LHC Run 3, TK2, KATRIN, SPIRAL 1 and 2, EUCLID and SVOM and some examples of projects currently in operation and under development, providing an overview of IRFU's involvement in the Detector Research & Development (DRD) collaborations, and reaffirming the Institute's full commitment to the ESPP update process.

The Committee took note of the report by Besson.

10. REPORT FROM CIEMAT
(Item 10 of the Agenda)

COLINO (CIEMAT) presented[11] a report from CIEMAT, providing details of the structure of the research institute, the size of its staff and the range of facilities available there, the main lines of research and contributions to various particle physics activities and experiments, such as the FCC HFM programme, the HL-LHC upgrades, LBNF/DUNE, the RICH detector, DESI and n_TOF.

NEWBOLD noted that CIEMAT might consider linking its research activities in the field of renewable energy to the running of its facilities, for example, by harnessing solar energy, which was readily available in Spain, to run its computing infrastructure.

The Committee took note of the report by Colino.

11. REPORT FROM STFC DARESBURY
(Item 11 of the Agenda)

CLARKE (STFC) presented[12] a report on activities at Daresbury Laboratory, covering the status of in-kind contributions to the European Spallation Source, LBNF/DUNE and the

[10] See Indico: https://indico.cern.ch/event/1361605/contributions/5967275/attachments/2891395/5068400/IRFU@ECFA%20July%202024%20N%20BESSON.pdf

[11] See Indico: https://indico.cern.ch/event/1361605/contributions/5966916/attachments/2891063/5067724/Frasscati_2024_07_04_CIEMAT.pdf

[12] See Indico: https://indico.cern.ch/event/1361605/contributions/5966913/attachments/2890335/5066299/DL%20Report%20to%20ECFA%20July%2024.pdf

HL-LHC, as well as the approved contributions to the Electron–Ion Collider; an overview of the CLARA accelerator test facility, which was currently being upgraded and would resume operation in 2025; the status of the recently approved RUEDI facility; the plans for a UK-based next-generation X-ray Free Electron Laser (UK-XFEL); and the plans to establish a new Centre of Excellence in Sustainable Accelerators (CESA) at Daresbury Laboratory.

In reply to GIANOTTI (INFN Frascati), CLARKE said that the 150 companies on site at the Sci-Tech Daresbury campus ranged from small and medium-sized enterprises to large, well-established companies like IBM, all of which paid to access the laboratory facilities, to use the high-performance computing systems and to rent office space.

In reply to the CHAIR, CLARKE said that Sci-Tech Daresbury was not an industrial park; the companies based there worked directly with the laboratory on computing or accelerators or with one of the other companies on site.

In reply to VOS (IFIC Valencia), CLARKE said that, while certainly promising, the thin-film superconducting radiofrequency (TF-SRF) cavities being developed at Daresbury Laboratory had a low technological readiness level at present. Further R&D work would be carried out at CESA, once the facility became operational, in order to ensure that the TF-SRF cavities could achieve the same gradient performance as the cavities of EU XFEL and to begin to move from the development of single-cell to multi-cell cavities. CESA would work closely with industry to ensure a smooth transition when the time came to enter the industrialisation phase. The TF-SRF programme had a duration of eight to ten years, meaning that it aligned with the ambitious timeframe of the UK XFEL project, which was expected to begin operating around 2032. The technology developed would, nevertheless, benefit many other accelerators.

In reply to a question from the CHAIR on the meaning of the term “open access facility”, CLARKE said that any scientist could apply for beamtime at CLARA; proposals were judged on their merits and the best ones were granted beamtime, which was free at the point of access.

In reply to a further question from the CHAIR, CLARKE said that the plans to achieve net zero emissions by 2040 referred to the STFC facilities as a whole and not to one specific accelerator.

NEWBOLD added that there could be no such thing as a “net zero accelerator”. Facilities could only mitigate their carbon impact by reusing waste energy, which was feasible for STFC given that its laboratories were located in urban areas, and by carbon offsetting, which was controversial.

The Committee took note of the report by Clarke and of the additional information provided during the discussion.

The meeting was suspended at 4.25 p.m. and resumed at 5.00 p.m.

12. NUPECC REPORT AND LONG-RANGE PLAN 2024
(Item 12 of the Agenda)

LEWITOWICZ (NuPECC Chair) presented[13] 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 main findings and recommendations that had emerged from the NuPECC 2024 Long-Range Plan for Nuclear Physics in Europe, which was to be published by the end of September and officially presented on 19 November at the University Foundation in Brussels.

In reply to BORTOLETTO, LEWITOWICZ said that, in its recommendations with regard to strongly interacting matter at extreme conditions, NuPECC had focused on LHCb Upgrade 2 and NA60+ and had not made reference to ATLAS and CMS – despite the existence of heavy-ion programmes at those detectors – because the latter were more concerned with particle physics than with nuclear physics.

ARNALDI (INFN Turin) added that the NA60+ project, which proposed to investigate plasma formation in a high-μ_B region, had not yet been fully approved by CERN so it was very important for the project to be able to count on the support of the NuPECC community.

LEWITOWICZ said that he wished to clarify that the Long-Range Plan had not taken into account budget or resources availability. The next step would be to discuss with the funding agencies what had been achieved in the seven years since the publication of the previous Long-Range Plan, in order to gauge the extent to which the 2024 plan could realistically be implemented.

In reply to a question from NEWBOLD concerning the document “Nuclear Physics in Everyday Life”, which had been issued by NuPECC in 2021, LEWITOWICZ said that it was intended to provide laypersons with an overview of nuclear physics and its applications and had been written in simple language by experts from various subfields of nuclear physics.

In reply to JAKOBS, who expressed concern at the significant overlap between the proposed ALICE 3 detector upgrade and the future Electron–Ion Collider (EIC) at Brookhaven National Laboratory in the United States, LEWITOWICZ said that the matter

[13] See Indico: https://indico.cern.ch/event/1361605/contributions/5968731/attachments/2890537/5066696/NuPECC%20LRP2024%20ECFA%20Frascati%20Marek%20Lewitowicz_04072024.pdf

had not been discussed in detail by NuPECC but that any potential overlap between the two projects, which he did not believe to be substantial, would depend largely on how they were developed.

In a follow-up comment, JAKOBS remarked that the overlap between ALICE 3 and the EIC was, indeed, significant and needed to be discussed sooner rather than later.

BETTONI (INFN Ferrara) added that the overlap between the two projects had, in fact, proved very beneficial thus far, as it had enabled the two communities to collaborate on R&D work. Moreover, while it was true that some researchers would be obliged to make a difficult choice between ALICE 3 and the EIC, owing to the similar timescales of the projects, most of those interested in the EIC were currently working on experiments at JLAB and therefore did not represent a potential loss for the ALICE collaboration.

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

13. APPEC REPORT AND NEW ROADMAP
(Item 13 of the Agenda)

IANNI (INFN Gran Sasso) presented[14] a report from the Astroparticle Physics European Consortium (APPEC), outlining the mandate and organisation of the Consortium, highlights since the publication of the European Astroparticle Physics Strategy for 2017–2026 and activities in preparation for the 2027–2036 Strategy.

In reply to BORTOLETTO, IANNI said that the main goal of the Astrophysics Centre for Multi-messenger studies in Europe (ACME) was to enhance collaboration and virtual interactions between research infrastructures in the domain of multi-messenger astrophysics. In the event of a supernova, for example, ACME would enable multi-messenger observations across the electromagnetic spectrum, in gravitational waves and in neutrinos, functioning in much the same way as the SuperNova Early Warning System (SNEWS) but on a European scale, not globally. Over 30 research infrastructures were involved in ACME, including Virgo, KM3NeT, the Cherenkov Telescope Array (CTA) and MAGIC.

In reply to VOS, IANNI said that the graph on the projected annual capital investment in astroparticle physics, included on slide 11, did not show the maximum estimated figure for gravitational-wave expenses since the cost of the proposed Einstein Telescope (ET), which had been taken into account in the calculations, was not yet known. The ET project had

[14] See Indico: https://indico.cern.ch/event/1361605/contributions/5968736/attachments/2890753/5067541/APPEC-EFCA-2024.pdf

advanced significantly in the two years since the graph had been produced, so it was likely that the figures had evolved too. The maximum figure for gravitational-wave expenses over the coming years was estimated to be 1 BCHF.

In reply to a question from the CHAIR, IANNI said that, in response to the decision by the US National Science Foundation to put the CMB-S4 project on hold, APPEC encouraged European funding agencies to contribute to the Japanese LiteBIRD mission and to closely monitor future developments.

The Committee took note of the report by Ianni and of the additional information provided during the discussion.

14. EARLY-CAREER RESEARCHERS PANEL
(Item 14 of the Agenda)

GARCÍA ALONSO (ECR Panel, Nikhef) and DOUGAN (ECR Panel, University of Manchester) presented[15] 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).

In reply to ŽIVKOVIĆ (IPB Belgrade), GARCÍA ALONSO said that the Working Group on Software and Machine Learning for Instrumentation was conducting a survey to gain a clearer picture of ECRs' perspectives on the current state of schools for instrumentation and on potential barriers to access, such as the cost, the number of places available and the relevance of the subjects taught.

In reply to a question from SCHMIDT-WELLENBERG (PSI) concerning the 2021 survey on training in instrumentation, DOUGAN said that a breakdown of the questions with respect to diversity was included in the survey report[16].

In reply to a question from VOS concerning the future collider proposals currently under consideration, DOUGAN said that he did not have any data on ECRs' views compared to those of more senior researchers. Among ECRs, opinions tended to vary by country: Americans were more in favour of a muon collider, whereas Europeans tended to back the FCC. Regardless of which collider was ultimately selected, for ECRs, it was vital that the project was backed by adequate amounts of research funding and, given the long timescales

[15] See Indico: https://indico.cern.ch/event/1361605/contributions/5968737/attachments/2890697/5067028/ECFA%20ECR%20Panel%20-%20PECFA%20July%202024.pdf

[16] See https://arxiv.org/pdf/2107.05739

involved, complemented by other, smaller projects that they might be able to work on in the meantime. Such considerations were generally more important to members of the ECR community than any preferences they might have in favour of one project or another.

GARCÍA ALONSO added that it was important for ECRs to be able to plan their futures now.

GIOVANNETTI (ECR Panel, LNF-INFN) remarked that, while ECRs tended to favour the future collider they were currently studying in their PhD or postdoctoral studies, their primary concern was to have certainty that they would be working on a solid project in the near future.

In reply to a further question from VOS, DOUGAN said that the future collider events organised by the ECR Panel sought to engage the ECR community in future collider activities. Nevertheless, it was incumbent on senior colleagues to build on that engagement by actively involving ECRs in the conversation on future colliders. In that connection, ECFA members should invite their country's ECR Panel representatives to participate in the preparation of the national input to the Physics Briefing Book for the ESPP update, and the opportunity for ECRs to contribute to that effort should be broadly advertised.

In reply to the CHAIR, DOUGAN said that the three principal concerns for ECRs were work–life balance, money and a lack of long-term planning and stability; indeed, the ECR Panel's survey on career prospects and diversity[17] had revealed that those were the main factors leading respondents to consider leaving the field.

The Committee took note of the report by García Alonso and Dougan and of the additional information provided during the discussion.

The meeting was suspended on Thursday, 4 July at 6.30 p.m. and resumed on Friday, 5 July at 11.30 a.m.

15. FCC FEASIBILITY STUDY: UPDATE
(Item 15 of the Agenda)

ZIMMERMAN (CERN) presented[18] a status update on the FCC Feasibility Study, covering the timeline of the FCC integrated programme, the successful outcome of the Study's mid-term review, the planned completion of the Study by March 2025 as input for the European Strategy process, work with the national and local authorities concerned by the

[17] See https://arxiv.org/pdf/2404.02074

[18] See Indico: https://indico.cern.ch/event/1361605/contributions/6016779/attachments/2891214/5068692/FCC-ECFA-5July2024.pdf

FCC tunnel and sites, geological investigations, public engagement and outreach activities, progress with the technical design and parameters of the FCC-ee and with the magnet and optic designs for the FCC-hh, and international collaboration.

In reply to JAKOBS, GIANOTTI (CERN) said that the environmental impact study would be carried out in stages, beginning with the initial-state analysis and an assessment of the construction-related carbon emissions, which would be completed by the end of the Feasibility Study. During the pre-TDR phase, an in-depth assessment would be made of the FCC's environmental impact beyond the construction phase, and mitigation measures would be explored.

In reply to a further question from JAKOBS, GIANOTTI, supported by ZIMMERMAN, said that, while the precise design of the HTS magnets for the FCC-hh would not be known by the end of the Feasibility Study, the working assumption was that they would fit into a tunnel measuring 5.5 metres in diameter.

In reply to VOS, GIANOTTI said that the mid-term review had included two confidential documents that had been presented to the Council concerning the FCC cost assessment and potential funding models, but they were not available to the wider community. The inclusion of non-Member States in the FCC cost-sharing model would have an impact on the governance of the project and future machine, so the Council would continue to discuss those aspects over the coming months. Clear statements about the funding model would be made in time for the European Strategy deliberations and, by the time of the decision on the FCC in 2027/2028, the third round of the cost assessment would be completed, with still less uncertainty, so that governments and funding agencies would know what they were committing to.

The Committee took note of the presentation by Zimmerman and of the additional information provided.

16. US PROGRAMME SUMMARY AND UPDATE
(Item 16 of the Agenda)

TOURAMANIS (University of Liverpool/CERN) presented[19] an update on the US programme in the post-P5 era, with a particular focus on the Higgs Factory, covering the P5 process and recommendations, the responses of the US Department of Energy (DOE) and the National Science Foundation (NSF) and other developments since the publication of the P5 report in December 2023, and the current state of affairs.

[19] See Indico: https://indico.cern.ch/event/1361605/contributions/6016782/attachments/2891656/5068948/2_CT-ECFA114-USprogram.pdf

ROBSON (University of Glasgow) added that the request for US support for the International Linear Collider (ILC) through the International Technology Network (ITN) had been made before the publication of the P5 report, which was why the DOE had not yet been in a position to make commitments and remained as INT observers.

In reply to BORTOLETTO, TOURAMANIS said that theory departments and R&D efforts in US universities had been subject to budget cuts, hence the P5 recommendation that the DOE make some 20–30 million USD available per year in an effort to remedy that situation and avert long-term damage to the universities' research capabilities.

In reply to IANNI, TOURAMANIS said that the P5 had recommended that a Generation 3 (G3) dark matter direct detection experiment be sited in the US, namely at the Sanford Underground Research Facility (SURF), but the DOE had scaled back that ambition and stated a preference for the US community to participate in an experiment hosted outside the US, such as at SNOLAB in Canada.

In reply to the CHAIR, TOURAMANIS said that, of the three subpanels that would be set up by the DOE in collaboration with NSF and national laboratories to review (1) offshore Higgs Factory participation, (2) accelerator R&D and demonstration facilities, and (3) the evolution of the Fermilab accelerator complex, the former would be the first to get underway. The P5 report had clarified that a potential muon collider was not a competitor for the Higgs Factory on the same timescale, but rather an option for the second half of the century.

GIANOTTI (CERN) added that the DOE was aware that the FCC Feasibility Study included the machine's financial feasibility and so required some indication of the contributions that could be expected from non-Member States. The subpanel on Higgs Factory participation would therefore be convened on a timescale that would allow it to determine with greater certainty the potential US contribution to the FCC and provide that input for the FCC decision-making process.

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

17. STATUS OF THE CEPC/SPPC
(Item 17 of the Agenda)

LOU (IHEP) gave a presentation[20] on the status of the Circular Electron–Positron Collider (CEPC) planned in China, covering the publication of the TDR, accelerator and

[20] See Indico: https://indico.cern.ch/event/1361605/contributions/6016783/attachments/2891204/5068012/CEPC-XCLOU-July2024-ECFA.pdf

detector R&D progress, the project development, plans for its possible successor – the Super proton–proton Collider (SppC), the 2024–2027 EDR phase, the ideal schedule and plans for international collaboration.

In reply to GIANOTTI (CERN), LOU said that the construction and installation of the accelerator was planned to take 7–8 years and would be carried out by a workforce of around 500 scientists working with engineering and construction firms. As far as possible, production lines would be set up on site so as to minimise transport and other potential sources of delay. If approved, the project would go from being a laboratory-based project to a national project and, that being the case, the authorities would ensure that the necessary resources were available to make it a success.

In reply to the CHAIR, LOU said that the entire IHEP experimental physics division and various university groups – the equivalent of some 100 FTEs – had been mobilised to work full-time on the CEPC detector TDR, the EDR and the project proposal.

In reply to JAKOBS, LOU said that, although the 15th five-year plan would begin in 2026, it was expected that, if the project was approved, construction would not begin until 2027 to allow time for a period of national reviews and other preparations.

In reply to a further question from GIANOTTI, LOU said that the total project cost of 36.4 B RMB (~ 5 BEUR) indicated in the TDR was the baseline cost. Once approved, some contingency would be added to cover, for instance, the establishment of a new laboratory at the chosen project location.

In reply to a further question from the CHAIR, LOU said that, if the project was not approved in the context of the next five-year plan, work would probably continue with the aim of seeking permission to proceed with it as a special, large-scale project outside the five-yearly cycle, as had been done for the Beijing Electron–Positron Collider (BEPC).

In reply to VOS, LOU said that the national funding available in the context of the 15th five-year plan was intended to support a wide range of science projects, with high-energy physics being just one of the eight categories. As a result, given the financial scale of the project, the CEPC team would recommend that the local government of the chosen location match, double or even triple the funding secured from the national government.

The Committee took note of the presentation by Lou and of the additional information provided.

18. TOWARDS THE UPDATE OF THE EUROPEAN STRATEGY FOR PARTICLE PHYSICS
(Item 18 of the Agenda)

JAKOBS, in his capacity as Strategy Secretary and on behalf of the Strategy Secretariat, presented[21] an overview of the forthcoming update of the European Strategy for Particle Physics, covering the purpose of the update, the remit of the European Strategy Group (ESG), the role and composition of the Strategy Secretariat, the ESG and the Physics Preparatory Group, the timeline, the opportunities for community involvement and the next steps.

In reply to NISATI (INFN-Rome), JAKOBS said that the Strategy Secretariat felt it was important that, once the final FCC Feasibility Study report and reports on other accelerator and detector R&D were available, the Open Symposium in June 2025 would provide the community with its principal opportunity to discuss together and provide further input to the Strategy process.

GIANOTTI (CERN) said that the question of energy consumption should be added to the required input on high-field magnets (HFM) for a lower-energy hadron collider (slide 13), as it could be a potential showstopper for the acceptability of future machines.

GIANOTTI, supported by JAKOBS, added that, if potential alternative projects such as a muon or linear collider were planned to be hosted at CERN, their updated cost assessments should be subjected to the same scrutiny process by an independent panel of experts as had been done for the FCC in order to ensure that potential future machines were being compared on an equal footing.

NEWBOLD added that a common, uniform set of information of comparable quality, including their sustainability, should be produced for existing and new machine concepts in time for the Open Symposium.

TOURAMANIS said that the ESG may wish to provide some guidelines and set basic assumptions for the presentation of projects to be hosted at CERN in order to facilitate their subsequent review.

CONTARDO (CNRS/IN2P3) said that the community discussions should also address the need for technological progress to produce detectors that would be able to withstand the radiation produced by the HFM of a future hadron collider.

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

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[21] See Indico: https://indico.cern.ch/event/1361605/contributions/5967287/attachments/2891401/5068409/ECFA_Meeting_2024.07.05.pdf

The meeting was suspended at 1.55 p.m. and resumed at 2.50 p.m.

19. REPORT FROM THE DRDC: THE DRD LANDSCAPE
(Item 19 of the Agenda)

GIL BOTELLA (CIEMAT) presented[22] a report from the Detector Research and Development Committee (DRDC) – a new scientific committee established in autumn 2023 following the ECFA Detector Roadmap process – covering the status of the eight DRD collaborations, the proposed template for the memorandum of understanding (MoU) between all the institutes of each DRD collaboration and CERN, the role of the DRDC in ongoing reviews of the DRD collaborations, and potential synergies with DRD collaborations in the US following the Snowmass process.

JAKOBS said that the annexes to the MoU set out important financial and other arrangements and it was therefore surprising that their approval was subject only to the agreement of the Resources Review Boards (RRB) rather than being signed by the funding agencies.

GIL BOTELLA agreed that every collaborating institute and its corresponding funding agency should agree with the details of both the MoU and the annexes, noting that the RRB provided a forum to discuss and review the content of the latter.

MNICH added that certain information and arrangements concerning the DRD collaborations were likely to change regularly and so, for practical reasons, would be set out in the annexes.

The Committee took note of the presentation by Gil Botella and of the additional information provided.

20. REPORT FROM THE ECFA–LDG WORKING GROUP ON INFRASTRUCTURE FOR DETECTOR R&D
(Item 20 of the Agenda)

MIKUŽ (University of Ljubljana/Jožef Stefan Institute) presented[23] a report from the LDG–ECFA Detector R&D Infrastructure Panel, briefly recalling the Panel's task of conducting two surveys – to identify the needs of the DRD communities and to map out the availability of relevant resources in Europe – and the results of the first survey that had been

[22] See Indico: https://indico.cern.ch/event/1361605/contributions/5967273/attachments/2891468/5068933/ECFA_DRDC_inesgil_july24.pdf

[23] See Indico: https://indico.cern.ch/event/1361605/contributions/5967285/attachments/2891424/5068440/Infra-survey_PECFA_Jul23.pdf

presented to ECFA in November 2023, and focusing on what the results of the second survey revealed about the European laboratory landscape and the resources available for detector R&D.

CONTARDO said that the new DRD Collaborations Managers Forum[24] would be a good place to discuss and follow up on the results of the surveys.

In reply to ŽIVKOVIĆ, MIKUŽ said that the second survey could be extended to non-ECFA member countries or rerun in the future, but for the time being the existing data from 73 countries was sufficient to act upon.

In reply to NEWBOLD, MIKUŽ said that the original aim of the surveys, namely to match the DRD requirements to resources and to liaise with institutes and funding agencies to secure additional resources where needed, may have been overly ambitious. Nevertheless, in the coming months the managers of the DRD collaborations would indicate whether or not they were missing resources.

NEWBOLD added that, to that end, the LDG was the appropriate forum in which to keep the channels of communication between the laboratories and the DRD collaborations open.

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

21. TOWARDS AN EDP CONTRIBUTION TO THE ESPP PROCESS
(Item 21 of the Agenda)

CONTARDO, co-Chair of the ECFA Detector Panel (EDP), gave a presentation[25] summarising the role of the EDP, outlining the five potential areas where it could provide input to the European Strategy process and the plans for gathering and preparing that input, and looking ahead to the EDP's role beyond the Strategy update.

In reply to GIL BOTELLA, CONTARDO said that the EDP would gather input on how projects had evolved since the 2020 Strategy update and review the conclusions of the forthcoming Strategy update in order to determine whether the priorities set out in the ECFA Detector R&D Roadmap needed adjusting and warranted a Roadmap update.

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[24] See https://ecfa-dp.desy.de/sites/sites_desygroups/sites_extern/site_ecfa-dp/content/e279752/e272466/Draft_DRD_Collaboration_Managers_Forum_080324_nomembers.pdf

[25] See Indico: https://indico.cern.ch/event/1361605/contributions/5967283/attachments/2891412/5068430/EDP_ESPPinput_DC_pECFA_05072024.pdf

The Committee took note of the presentation by Contardo and of the additional information provided.

22. STREAMLINING THE NATIONAL INPUTS TO THE ESPP
(Item 22 of the Agenda)

The CHAIR presented[26] a proposal, which had already been approved by Restricted ECFA, on ECFA's potential role in streamlining the process and form of the national input to the European Strategy process, which included recommending the organisation of national and/or regional meetings and making the input more uniform and coherent by means of guiding questions based on the ESG remit.

In the ensuing discussion, the following points were made:

- Following a linguistic review, ECFA's recommendations and suggested guiding questions should be ready to send to the countries' RECFA delegates and ESG representatives in the coming weeks (CHAIR, in reply to FERRARI).

- National discussions can already begin, as much of the likely future particle physics landscape is already known. However, countries may wish to wait until the end of March 2025 to review the proposals submitted by the various collider communities before sending their input on prioritised alternative options for the next collider (CHAIR, in reply to CARON, Nikhef).

- It would be helpful to establish some structure to harmonise the national inputs. The proposed guiding questions are rather collider-heavy and could be expanded to encompass accelerator-based, non-collider physics more generally, which is still in line with the CERN Convention. It may also be helpful to provide the community with clarifications about the exact scope of the European Strategy when it comes to nuclear and astroparticle physics and other areas of science (FARRINGTON, STFC).

- The ESG should remind the particle physics community, particularly the younger generation, of the difference between the CERN Council operating as the supreme governing body of CERN, the Laboratory, and the CERN Council acting as the supreme driving force of European particle physics (NEWBOLD).

- It is indeed important for the ESG to bear in mind and communicate that the Strategy encompasses physics that is not necessarily done at CERN, the

[26] See Indico: https://indico.cern.ch/event/1361605/contributions/6016815/attachments/2891140/5068705/2024-07-04-PECFA-NationInputs.pdf

Laboratory, such as the dark matter physics being performed at Gran Sasso, even though it is the CERN Council that drives the Strategy process. Nevertheless, the focus of the guiding questions is shaped by the ESG remit, which states that the Strategy update should explicitly set out the preferred option for the next flagship collider at CERN (CHAIR, supported by JAKOBS).

- The financial scale of dark matter searches and other low-background non-accelerator physics is second only to that of the next major collider and thus warrants a dedicated discussion in the context of the Strategy update (NEWBOLD).

- While the P5 has recommended that a muon collider should be the next major project after the Higgs factory, the DOE has not yet decided whether or not to proceed. The inclusion of the muon collider in the list of possible scenarios is intended to give a complete picture of the potential developments in the landscape as context for national discussions (CHAIR, in reply to VOS).

- The purpose of question (c) is not to ask what the European particle physics community should do if any of the scenarios are realised before December 2025, as that will not be the case. Rather, the question is forward-looking and sets the decision matrix for the leadership of the field once the Strategy has been published (NEWBOLD).

It was agreed that the guiding questions would be expanded to address non-collider physics and prioritisation that would be needed in those areas in order to maintain Europe's overall leading role in the particle physics field.

The Committee took note of the presentation by the Chair and of the additional points made during the discussion and endorsed the proposal for ECFA's role in streamlining national input to the European Strategy process.

23. HIGGS/TOP/ELECTROWEAK FACTORY STUDY: STATUS AND PLANS
(Item 23 of the Agenda)

ROBSON presented[27] a report on the ongoing ECFA studies towards an e^+e^- Higgs/electroweak/top factory, summarising the activities being carried out by the three working groups and centred around 14 focus topics, outlining the planning and timeline for the final report that would be submitted as part of the Strategy process, and providing details of the

[27] See Indico: https://indico.cern.ch/event/1361605/contributions/5968742/attachments/2891495/5068641/ecfaHiggs_PECFA_July24.pdf

third ECFA Workshop on Higgs/top/electroweak factories, which was due to take place from 9 to 11 October 2024 in Paris.

The Committee took note of the presentation by Robson.

24. CLOSING, NEXT STEPS, OUTLOOK
(Item 24 of the Agenda)

The CHAIR thanked LNF for hosting the 114th Plenary ECFA meeting and said that the 115th meeting would take place at CERN on 14 and 15 November 2024.

The meeting rose at 4.55 p.m.