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

PLENARY ECFA

91st meeting

PSI, Paul Scherrer Institut – 19 and 20 July 2012

Minutes

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LIST OF PARTICIPANTS

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| Secretary: | K. Long | U.K. |
| Members: | H. Abramowicz | Israel |
| | P. Adzic | Serbia |
| | S. Bertolucci | CERN |
| | Ph. Bloch | CERN |
| | C. Bloise | Italy |
| | K. Borras | Germany |
| | M. Bourquin | ApPEC |
| | J.-C. Brient | France |
| | A. Buzatu | Romania |
| | M. Cavalli-Sforza | Spain |
| | K. Clausen | Switzerland |
| | J. Chyla | Czech Republic |
| | A. De Roeck | CERN |
| | J. Dingfelder | Germany |
| | G. Dissertori | Switzerland |
| | P. Eerola | Finland |
| | R. Ferreira Marques | Portugal |
| | B. Foster | U.K. |
| | C. Fountas | Greece |
| | T. Garvey | Switzerland |
| | S. Gascon-Shotkin | France |
| | Th. Gehrman | Switzerland |
| | P. Hansen | Denmark |
| | R. Heuer | CERN |
| | J. Kalinowski | Poland |
| | Y. Karyotakis | France |
| | K. Kirch | Switzerland |
| | M. Klein | U.K. |

| | | |
|-----------------------|-------------------|-------------|
| | D. Lacour | France |
| | F. Linde | Netherlands |
| | M. Lindner | Germany |
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| | Th. Müller | Germany |
| | O. Napoly | France |
| | E. Nappi | Italy |
| | P. Osland | Norway |
| | R. Patterson | U.S. |
| | L. Rivkin | Switzerland |
| | A. Schöning | Germany |
| | M. Spira | Switzerland |
| | R. Tsenov | Bulgaria |
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| | A. Zoccoli | Italy |
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| | J. Dedhar | CERN |
| Apologies: | T. Akesson | Sweden |
| | Ph. Burrows | U.K. |
| | S. de Jong | Netherlands |
| | U. Dosselli | Italy |
| | A. Lucotte | France |
| | M. Merk | Netherlands |
| | G. Pasztor | Hungary |
| | Th. Peitzmann | Netherlands |
| | U. Uggerhoej | Denmark |
| | C. Vander Velde | Belgium |
| | B. Wosiek | Poland |
| | D. Zeppenfeld | Germany |

The meeting was called to order at 2.00 p.m. on Thursday, 19 July 2012.

Apologies were received from T. Nakada, Scientific Secretary of the CERN Council's European Strategy Sessions.

1. OPENING

(Item 1 of the Agenda)

The CHAIRMAN welcomed participants to the Plenary ECFA meeting at the Paul Scherrer Institut (PSI), drawing attention to the presentations by PSI personnel featured in the Agenda and to the guided tour of the Laboratory to which all participants were invited following the meeting.

The Committee took note of the information provided by the Chairman.

2. APPROVAL OF THE AGENDA

(Item 2 of the Agenda) (ECFA/12/274)

The Agenda (ECFA/12/274) was adopted.

3. APPROVAL OF THE DRAFT MINUTES OF THE NINETIETH PLENARY ECFA MEETING HELD AT CERN ON 24&25 NOVEMBER 2011

(Item 3 of the agenda) (ECFA/11/273)

The Minutes of the Ninetieth meeting of Plenary ECFA (ECFA/11/273) were approved.

4. WELCOME AND PSI GENERAL PRESENTATION

(Item 4 of the Agenda)

JERMANN welcomed the members of Plenary ECFA to the Paul Scherrer Institute (PSI) and gave a [general presentation](#) of the Institute and its activities¹.

In response to GEHRMANN (University of Zurich), who noted that a Swiss bank was included in the list of industrial users of the Swiss Light Source (SLS), JERMANN explained that the bank was one of the shareholders of the SLS Techno Trans AG company that had been established when the SLS project had begun.

¹ All the presentations are available at <http://indico.cern.ch/conferenceDisplay.py?confId=192258>

In reply to the CHAIRMAN, who was pleased to hear about the medical applications of PSI's technology but asked what the implications were of having both a research and a treatment facility within the same laboratory, JERMANN agreed that it was sometimes difficult to balance the demands of the physicists who developed the technology with those of the physicians who used it to treat patients and explained that a system was in place whereby the beam was used for medical purposes during the day and for development at night. It had recently been decided to reduce the beam-time allocated for treatment for a few months in order to allow more development, on the grounds that innovative medical techniques would thus be introduced more quickly.

In reply to a question from OSLAND (University of Bergen) concerning payment by patients from outside Switzerland, JERMANN answered that patients were charged for the whole treatment, which cost around 30 kCHF for a deep-seated tumour, and that the cost of treatment for European patients was covered by health insurance in their home countries, subject to approval based on a number of indicators.

In reply to a question from ADŽIĆ (University of Belgrade), who wished to know whether PSI would be branching into heavy-ion therapy using the 250 MeV compact cyclotron "COMET", JERMANN said that there were no such plans as proton therapy remained the main focus of the Institute's medical programme. PSI was something of a pioneer in the field, dating back to the 1980s and early 1990s when the "Piotron" pion therapy machine had been used to irradiate tumours in some 500 patients. That facility had been replaced in 1996 by the PSI Gantry 1. In addition, PSI had been cooperating closely with the Ophthalmology Hospital of the University of Lausanne since 1984 in the development and use of the OPTIS facility to treat eye melanomas using proton radiotherapy. By the end of 2011, more than 5,700 patients had been treated using OPTIS, in which a proton beam was directed onto the retinal tumour. In more than 98% of cases, the tumour was successfully eradicated or its growth halted and in more than 90% of cases, the eye was saved. COMET, the super-conducting proton cyclotron, had been constructed more recently and had been used for the treatment of deep-seated tumours since 2007.

In answer to BLOCH (CERN), who asked how the distribution of funds between the various fields represented at PSI was decided, JERMANN explained that the Directorate of the Institute allocated funds after consulting with external investors and considering the advice of its own strategic departments.

The Committee took note of Jermann's presentation.

5. PARTICLE PHYSICS ACTIVITIES

(Item 5 of the Agenda)

KIRCH presented an [overview](#) of the particle physics activities at PSI, including its active theory group, high-energy physics groups notably those participating in the CMS pixel detector at the LHC, operation of the world's most powerful proton beam to targets, namely the 590 MeV Proton Cyclotron, of the world's highest intensity pion and muon beams (MuLan/MuCap/MuSun), as well as a new ultracold neutron source which was scheduled to come on line by the end of 2012. PSI's flagship experiments included the search for $\mu \rightarrow e\gamma$ (MEG), the neutron electric dipole moment (nEDM), precision measurements and new physics searches.

Responding to a question from KALINOWSKI (University of Warsaw) about the prospects for a neutron-antineutron oscillation search, KIRCH underlined that, in order for such a search to be feasible, two parameters would need to be optimised, namely the neutron intensity and the free-flight time required for the neutron to accumulate phase and become an anti-neutron. Initial studies had investigated how the latter might be optimised with the intensity envisaged for ultracold neutrons and while the first results were encouraging they remained some orders of magnitude below the required intensity. A specific facility - the Deep Underground Science and Engineering Laboratory (DUSEL) - was being considered at the US Oakridge reactor but, given the high cost of such a venture (approximately USD 100 million), the debate continued as to whether such an investment could be justified for a single measurement.

In reply to CAVALLI-SFORZA (IFAE, Barcelona), who wished to know whether the specific models of the physics reach of mu-to-e-gamma and mu-to-three-e were better than the generic models, KIRCH observed that some models produced more mu-to-e-gamma, and others more mu-to-three-e. From the generic viewpoint, everything which produced mu-to-e-gamma did so by radiative processes and would also go mu-to-three-e at an alpha suppressed branching fraction. In certain specific models that trend would be turned around and lead to an over-production of mu-to-three-e without generating any mu-to-e-gamma. As an experimentalist, his basic approach would be to test the available models as far as possible, provided they were promising from the theoretical point of view.

In reply to BORRAS (DESY), who wished to know whether PSI was collaborating with the Canadian national laboratory TRIUMF on ultracold neutrons, KIRCH stated that healthy competition existed between the two laboratories, which cooperated well whenever necessary. For instance, PSI had recently played an active role in a target review of the scheme being considered by TRIUMF for building a spallation source as the neutron producer for its ultracold neutron source. The success of such projects hinged ultimately on the available

primary neutron flux, which was typically around a factor of ten lower at spallation sources compared with nuclear reactors. That was why PSI had a dedicated system for ultracold neutron production in order to compensate for the higher flux from the reactor. PSI was using solid deuterium at 5 K as the converter path for the neutrons whereas TRIUMF would be using superfluid helium at 0.5 K. If the significant technical challenges associated with operating a large volume of superfluid helium at 0.5 K close to a spallation target could be overcome then TRIUMF's prospects for achieving higher rates were excellent.

The Committee took note of the presentation by Kirch.

6. CHAIRMAN'S REPORT (Item 6 of the Agenda)

The CHAIRMAN said that following the ratification by the Serbian government of the Agreement providing for Serbia's accession to CERN as Associate Member State in the Pre-stage to Membership, it was now proposed that Serbia should become a member of ECFA.

The Committee unanimously agreed to admit Serbia as a member of ECFA.

The CHAIRMAN then presented the list of proposed new representatives to RECFA and members of Plenary ECFA.

The Committee unanimously elected Professor P. Adžić (University of Belgrade, Serbia) as the Serbian representative to RECFA and the following new members of Plenary ECFA:

Professor D. Šijački (University of Belgrade, Serbia);
Professor B. Wosiek (IFJ, Poland);
Professor K. Borras (DESY, Germany);
Professor J. Dingfelder (University of Bonn, Germany);
Professor M. Schumacher (University of Freiburg, Germany);
Professor A. Schöning (University of Heidelberg, Germany);
Professor A. Stahl (RWTH Aachen University, Germany).

The CHAIRMAN then presented his regular report, covering the European Detector R&D panel and the LHeC panel; the country visits to the Netherlands and Poland in February and May 2012 respectively; the meetings in February and July of the ILCSC and ICFA, which had agreed on a new organisational structure for the linear collider planning process to come into effect in 2013 with Lyn Evans as Director; the report from Japan on future projects and in particular its recommendations for a linear collider project to be based in Japan; the

possibility of a new ICFA panel on accelerator neutrino facilities; the activities of the EPS HEP Board, and finally the provisional schedule for RECFA country visits in 2013.

He also introduced a survey on detector R&D, asking members to forward it to the relevant groups in their countries to complete before the deadline of 15 August, and reminded members about the joint EPS/ECFA session that would take place in Stockholm from 18 to 24 July 2013.

Finally he wished to initiate a discussion on the role of Plenary ECFA and the format of its meetings and, to that end, invited all members to offer feedback and suggestions either to him directly or via the country representatives as to how the meetings could be improved.

In response to KLEIN (University of Liverpool), who asked whether the plans to build an e^+e^- linear collider in Japan were consistent with the newly-proposed linear collider organisational structure, the CHAIRMAN agreed that the Japanese linear collider project looked increasingly likely after the discovery of a Higgs-like particle with a mass of around 125 - 126 GeV but noted that if it did go ahead, it would not begin for several years. The new organisational structure would provide a forum for discussion on linear collider development in the meantime.

The Committee took note of the Chairman's report.

The meeting was adjourned at 3.50 p.m. and resumed at 4.20 p.m.

7. CERN REPORT

(Item 7 of the Agenda)

HEUER presented his [status report](#) on CERN's activities, covering in particular the latest developments in the search for the Higgs boson, the envisaged long-term programme for the LHC machine, studies into future high-energy physics projects and developments in neutrino research.

CERN had been proud to announce the discovery of a Higgs-like particle on 4 July 2012 and the next challenge was to measure the properties of that new particle with high precision in order to establish whether it was consistent with the Standard Model Higgs boson. If the new particle was found to be the first known fundamental scalar, it would open the doors to research into dark matter and energy. With that in mind and to allow time to study the particle, CERN had decided to postpone the long shutdown (LS1) by seven weeks, meaning that the present run of the LHC would continue until February 2013.

The plan for the future of the LHC until 2030 included continuous performance-improving consolidation over ten years, with the possibility of installing high-luminosity upgrades at a later date if CERN decided to proceed with the High-Luminosity LHC. R&D was under way for other possible projects, including linear colliders, a High-Energy LHC, a Large Hadron electron Collider and the Large Electron-Positron 3. The possibility of installing a test beam for neutrinos in the Super Proton Synchrotron area was also being investigated and if approved, the test beam would be used for the testing of neutrino detectors and modules and for a short baseline experiment into sterile neutrinos. However, no decisions would be made as to which projects to prioritise until after the completion of the European Strategy update and input from the physics community on an international level.

CERN was also planning the further development of its non-LHC experiments, some of which were unique to the Laboratory. The HIE-ISOLDE (high intensity and energy) project had been approved, as had a second experimental area (EAR2) for the neutron Time-of-Flight facility. With regard to the Antiproton Decelerator, both the ELENA upgrade and an additional storage ring had been approved and a Gravitational Behaviour of Antihydrogen at Rest project, which would measure the effects of gravitational forces on antimatter, had been proposed. The DIRAC experiment, on the other hand, was set to conclude at the end of the year and the CERN Neutrinos to Gran Sasso beam was unlikely to continue beyond 2012.

Finally on neutrinos, the OPERA experiment had recently announced the observation of a second candidate for ν_τ appearance, putting progress in line with expectations considering that much of the 2011-12 data was still to be analysed

In reply to LONG (Imperial College London), who asked what the forum was for discussion with the international community, HEUER said that plans for projects in the different regions were discussed at ICFA seminars and during the European Strategy sessions, at which members from regions outside Europe were present. The goal of the European Strategy update was not to decide on locations for future projects but to give the European opinion on scientific priorities with input from non-European representatives. The strategy for future international projects could also be discussed by ICFA but because many of its members were directors of laboratories, their priorities differed from those of the community as a whole and it was not therefore considered the most appropriate forum.

Responding to MÜLLER (KIT) who asked whether the plans for a LEP3 e^+e^- ring had been conceived with the intention of presenting them at the European Strategy update Open Symposium in Krakow in September, HEUER remarked that the idea had come from the scientific community rather than the CERN Management and was being discussed as one of

many possibilities. In any case the project was unlikely to materialise before 2030 because the new machine could not be installed in the tunnel while the LHC was still in use.

Answering a request for clarification from SPIRA (PSI) about the energy that the LHC would reach in its first run after LS1, HEUER explained that the LHC magnets would have to be retrained after the shutdown and that it had therefore been decided to begin with 13 TeV before progressing to 14 TeV. 13 TeV could be achieved relatively quickly whereas it would take six months of training for the magnets to be capable of 14 TeV, so starting at a lower energy meant that data collection could begin sooner.

In reply to a question from NAPOLY (CEA/Saclay) concerning the R&D envisaged for the International Linear Collider, HEUER commented that the detectors still required R&D and that, while good progress had already been made, the yield from the high-gradient cavities could be further improved.

The Committee took note of Heuer 's report.

8. DESY REPORT

(Item 8 of the Agenda)

MNICH presented his [status report](#) on DESY's activities, covering the latest progress on the construction of the European XFEL Accelerator Complex, in particular the start of mass production of the accelerating cavities and the various ongoing studies for the future industrialised production of cryomodules and high-gradient cavities for the ILC. Other ongoing projects at DESY included ILC detector development, the OLYMPUS experiment at the DORIS accelerator and various accelerator R&D projects funded in the framework of the Helmholtz Association. The long-term strategy for the Laboratory was based on strong participation in the LHC and vigorous activities in preparation for a future linear collider on the accelerator, detector and computing fronts. In addition, the Directorate was constantly exploring the potential of DESY's infrastructure to create new and innovative particle physics projects. Finally, on behalf of the whole DESY Management and staff, he wished to convey warm congratulations to R. Heuer and everyone at CERN for the ground-breaking discovery of a new boson, announced at the seminar on 4 July.

In reply to a question from SPIRA who asked whether the OLYMPUS experiment would be able to shed any light on the proton charge radius, MNICH said that that would not be the case as the OLYMPUS experiment had specifically been designed to give a final answer on the effect of two-photon exchange in elastic lepton-proton scattering by precisely measuring the ratio of positron-proton to electron-proton elastic unpolarised cross sections. The two-photon exchange was a very difficult parameter to calculate but it might play an

important role in explaining the unexpected and dramatic discrepancy with the elastic form factor ratio obtained using the Rosenbluth separation technique in unpolarised cross section measurements.

The Committee took note of Mnich's report.

9. FRASCATI REPORT
(Item 9 of the Agenda)

Due to the unforeseen absence of the speaker, M. Dosselli, the item was cancelled.

10. MIDTERM REPORT FROM THE CZECH REPUBLIC
(Item 10 of the Agenda)

CHYLA presented presented his mid-term report on the status of high-energy physics in the Czech Republic since the last visit of Restricted ECFA in March 2007.

Responding to a question from KLEIN about the peer review system in the Czech Republic, CHYLA said that peer reviews were conducted by special commissions within the Research Ministry.

In reply to CAVALLI-SFORZA, who wished to know whether the Czech Republic had been hit by the economic crisis in the same way as other CERN Member States, CHYLA said that while the Czech Republic was obviously not insulated from the financial situation in other European countries, its economy had not been too badly hit for the time being. As far as R&D and funding for research were concerned, the overall budget had remained constant for the past four years and positive signals had been received from the government that the annual R&D budget for all sciences would be maintained at around € 1 billion. However, it could not be ruled that internal efforts to reform the funding system might have a detrimental effect on the Academy of Sciences.

The Committee took note of Chyla's mid-term report.

The meeting was adjourned at 5.50 p.m. on Thursday 19 July and resumed at 9.00 a.m. on Friday 20 July.

11. HIGHLIGHTS FROM MELBOURNE

(Item 11 of the Agenda)

DE ROECK presented a [selection of highlights](#) from the ICHEP 2012 Conference in Melbourne, including the observation of a Higgs-like particle, QCD and heavy ions, new EWK/Top measurements, searches for new physics, heavy flavour measurements, neutrinos and dark matter/dark energy. In conclusion, he said that ICHEP 2012 had been a dynamic and well organised conference at which many outreach and media events had been successfully realised. The main news had naturally been the 5-sigma discovery of a Higgs-like particle by both the ATLAS and the CMS collaborations, which opened up exciting prospects for new studies, clearly a very timely event in the run-up to the update of the European Strategy for Particle Physics in 2013. No convincing sign of new physics had so far been unearthed from the initial analyses, but the phase space continued to be systematically scanned and more complex processes were now being analysed. More news on that and other topics such as dark matter and rare decays would emerge over the coming months and years.

In reply to a question from KLEIN about the weights used for the $H \rightarrow \gamma\gamma$ peak, DE ROECK explained that they were simply a signal of a background weight because was what the MVA analysis used. In other words, the weights served to visualise the way the MVA looked at the peak. Without them, more background fluctuation would be obtained and the peak would be less visible to the eye.

Responding to comments by LINDNER (University of Heidelberg), who expressed scepticism about the announced dark matter signals, which appeared to be mutually inconsistent, and further observed that strong limits were now cutting deeply into the SUSY parameter space with very profound consequences for SUSY search strategies at the LHC, DE ROECK agreed that the new results from the XENON100 experiment were cutting severely into the constrained SUSY predictions. That was not necessarily the case for more global types of parameter space, such as the pMSSM, but the constrained predictions were certainly now getting squeezed from all sides and at some point it would be necessary to take a decision as to whether or not such searches should be continued.

Answering a question from DISSERTORI (ETH Zurich) about the significance of the gamma ray lines in the Fermilab data on indirect dark matter searches, DE ROECK said that there had been some discussion of that topic in a parallel session and while the two lines detected were not precisely understood it was not generally believed that they constituted signals of dark matter.

The Council took note of De Roeck's report.

12. REPORT ON THE EUROPEAN STRATEGY UPDATE STATUS

(Item 12 of the Agenda)

In the absence of T. Nakada, the CHAIRMAN gave the [status report](#) on the update of the European Strategy for Particle Physics. The Preparatory Group was in the process of collecting input from the particle physics community and from policy-makers and it had defined the schedule for the Open Symposium that would take place from 10 to 12 September 2012 in Krakow. The same group would then summarise both the written input and the Open Symposium sessions in a Briefing Book that, along with the conclusions of the working groups on non-scientific matters, would serve as a reference document for those drafting the update. The European Strategy Group (ESG) would meet in Erice, Italy from 21 to 26 January 2013 to draft the two-page strategy statement and a strategy deliberation document, which would then be submitted to the CERN Council for discussion and finalisation in its March session. The updated strategy documents would be formally adopted at a special Council session in Brussels in the week of 20-24 May 2013.

In reply to a question from FOSTER (DESY/University of Hamburg), who was concerned that the closing discussion of the Open Symposium may be unfocused and that the attendees would leave without a clear idea of the key points raised during the sessions, the CHAIRMAN answered that each individual session would be followed by a discussion in which its key points would be summarised. The aim of the Open Symposium was to collate information and ideas without attempting to draw any conclusions about the scientific priorities and the Preparatory Group had produced a programme that it believed would facilitate that. On HEUER's suggestion, the CHAIRMAN agreed to propose to the Preparatory Group that one speaker from each session summarise its key messages during the closing discussion to ensure a clear focus on the structure, topics and outcomes of the sessions.

In reply to a comment from DISSERTORI (ETH) who suggested that it would be preferable to delay the strategy update if possible until the full results of the 2012 LHC run were available, the CHAIRMAN said that the schedule for the update had been decided over a year earlier and it was too late to change as the process was already under way. The most crucial information needed from the first long run of the LHC in order to decide on future priorities had been the existence or exclusion of the Higgs boson, so given the announcement of the particle's discovery well before the Open Symposium, discussions and decisions regarding the strategy update would be well-informed.

The Committee took note of the status report on the European Strategy update.

13. LHEC PANEL REPORT

(Item 13 of the Agenda)

MÜLLER presented [a draft intermediate report from the panel](#) set up at the November 2011 meeting of Plenary ECFA together with a proposal for a set of statements by ECFA for the attention of the community working on the LHeC project.

The CHAIRMAN reported that, at its meeting the previous day, Restricted ECFA had discussed the draft intermediate report and wished to propose that the panel be invited to submit its final report to RECFA in October and subsequently to Plenary ECFA in November for endorsement, after which it could be sent to the LHeC Steering Committee and made publicly available.

The Committee took note of Müller's report.

The meeting was adjourned at 10.30 a.m. and resumed at 11.00 a.m.

14. DETECTOR R&D PANEL REPORT

(Item 14 of the Agenda)

KARYOTAKIS presented his [report](#) on the initial work of the ECFA detector R&D panel, whose the remit, composition and host laboratory (DESY) had been endorsed by Plenary ECFA at its meeting at CERN in November 2011. At its first meeting, at DESY on 2-3 May, the Panel had made a general overview of linear collider R&D activities, and at its second meeting, scheduled for November, it would consider a request for evaluation by the CALICE (Calorimeter for ILC) collaboration. In conclusion, he wished to call on all members of Plenary ECFA to spread the word about the Panel's existence and to encourage fledgling detector R&D collaborations seeking formal recognition by an official European body to get in contact with himself or the Scientific Secretary, D. Eckstein (doris.eckstein@desy.de), or visit the Panel's [website](#).

In reply to a question from SCHÖNING (Heidelberg, Germany), who wished to know what kind of R&D group could most benefit from a review by the Panel, KARYOTAKIS underlined that the Panel's aim was not to take the place of national committees reviewing their country's own small-scale projects without an international dimension. The R&D projects which had the most to gain from a seal of approval from the ECFA Panel were those with relatively large budgets involving collaboration between several laboratories across Europe. Nonetheless, any group of any size was naturally welcome to request an evaluation by the Panel.

Responding to a remark by DOLEZAL (Charles University, Czech Republic), KARYOTAKIS stressed that since the Panel was not a funding agency and thus would not be sending out calls for proposals. The best way, in his opinion, for the Panel's existence to become widely known would be by word of mouth, and the members of Plenary ECFA, as representatives of their national communities, obviously had a key role to play in that regard.

The Committee took note of Karyotakis's report.

15. PROTON THERAPY AND PSI EXPERIENCE

(Item 15 of the Agenda)

GOITEIN gave a [presentation](#) of PSI's extensive experience of cancer treatment using protons and answered questions from the floor.

The Committee took note of Goitein's report.

The meeting rose at 12.10 p.m.