EUROPEAN COMMITTEE FOR FUTURE ACCELERATORS

Third Plenary Meeting

Geneva - 10 October, 1966

DRAFT MINUTES
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The Committee consisted of the following:

Chairman: E. Amaldi
Italy

Secretary: A. Citron
Federal Republic of Germany

Members:
H. Koziol
Austria

J. Géhéniau
Belgium
M.P. Grard
L. Rosenfeld

J.K. Bøggild
Denmark

P. Falk-Vairant
France
C. Ghesquière
J. Parain
L. Van Rossum
J. Teillac

K. Gottstein
Federal Republic of Germany
W. Jentschke

U. Meyer-Berkhout
A. Schoch
H. Schopper
H.C. Wüster

T.A. Filippas
Greece

F. Ammar
Italy
G. Diambrini
G. Salvini
A. Zichichi

D. Harting
Netherlands
E. Lillethun
Norway
J. Catala
Spain
J.A. Ruiz
F. Verdaguer

H. Atterling
Sweden
G. Källen
S. Nilsson

66/1051/5
Members:
(cont'd)
B. Hahn
R. Mermod

E.H.S. Barhop
C.C. Butler
J.C. Gunn
L.C.W. Hobbs
D.H. Perkins

G. Cocconi
G. Fidecaro
B. French
B.P. Gregory
M.G.N. Hine
K. Johnsen
L. Kowarski
P. Lapostolle
R. Meunier
F. Mollet
D.R.O. Morrison
W. Paul
P. Preiswerk
C.A. Ramm
L. Van Hove
S. Van der Meer
J.C. Zilverschoon

M.H. Blewett
G. Yekutieli

Switzerland
United Kingdom
CERN
Argonne
Israel
observers
1. APPROVAL OF THE MINUTES OF THE SECOND PLENARY MEETING
   (CERN/ECFA 66/7) (Item 1 of the Agenda)

   a) It was agreed that under heading (ii) Booster Energy
      (CERN/ECFA 66/7 page 4) the name between Murphy and Salvini should
      be Parain instead of Perrin, and that the sub-paragraph on the 50 GeV
      booster should be redrafted as follows:

      A 50 GeV booster could be made to produce the same
      intensity at 300 GeV as an 8 GeV booster. But as was
      said in the report (CERN/ECFA 66/WG 2/3), already for a
      more conventional design giving only one quarter of that
      intensity, the cost would be at least 100 million Swiss
      francs more than for the 8 GeV machine as proposed in the
      original CERN design. In any event, the idea of a straight­
      forward injection booster, such as the 50 GeV, was being
      superseded by newer schemes.

   b) SALVINI, referring to his last statement on page 7, said
      that the figure 40 which he recommended applied only to experimental
      researchers, as opposed to theoreticians and staff engaged in tech­
      nical support.

      HINE, referring to his statement on page 7 said that only
      a few of the 120 staff members would hold indefinite contracts. Most
      of them would be on the staff for periods of 3 - 6 years.

   c) On AMMAN'S proposal and after a discussion involving Citron,
      Harting, Johnson and Kowarski, the third paragraph on page 11 was
      redrafted as follows:

      "The Committee agreed with the contents of Section 4
      'General Questions of Policy' of the Interim Report of
      Working Group 2 (CERN/ECFA/66/WG2/3/Rev.3) and accepted
      the views expressed by Salvini, Falk-Vairant and the
      Chairman in this connection".

      The Minutes of the Second Plenary Meeting (CERN/ECFA 66/7),
      as amended, were approved.

2. COMMUNICATIONS BY THE CHAIRMAN (Item 2 of the Agenda)

   The CHAIRMAN said that, following the various letters
   written to inform physicists in different countries of the work of
   ECFA, replies had been received from Goldhaber, Panofsky and also
   from Logunov and Bogolubov. Moreover, Agarbesomi of Rumania had
   expressed interest in receiving the ECFA papers.

   The Committee took note of the Chairman's communication.
3. ADOPTION OF THE AGENDA (Item 3 of the Agenda)

The Agenda was adopted.

4. REPORT ON THE POSSIBILITY OF CONSTRUCTING A LARGE ACCELERATOR AT MEYRIN (Item 4 of the Agenda)

CITRON said that he had received a letter from Ramm, dated 3 October, informing him that he did not wish to become involved in any discussions concerning the site of the 300 GeV machine.

RAMM explained his position by stating that he had further investigated the question with aerial photographs and on the basis of ground data available, and that he could not change his opinion. He had, however, spoken to as many people as he could find about preferring the Meyrin site to another one for the 300 GeV machine. He had found no one in favour of that site. Moreover, he was in no position to offer a site and so he did not wish to slow down the work of ECFA.

The Committee took note of Ramm's statement.

5. REPORT ON THE STUDIES OF CRYOGENIC TECHNIQUES IN EUROPE (Item 5 of the Agenda)

HINE said that, in addition to the work mentioned in his notes on the state of superconducting technology in Europe as applicable to high-energy physics (CERN/ECFA/66/WGII/MGNH-1*), he would be grateful for any further information on this subject. He had hoped that Hereward would be able to make a report on extraction problems. However, he was away at the moment and there was in fact little to report so far. Experimental tests were still continuing about the possibility of sharing the slow extraction system.

It was agreed that further progress reports would be made on cryogenics and extraction.

6. STATUS OF THE WORK OF WORKING GROUP II (Item 6 of the Agenda)

PERKINS reported that Working Group II had met seven times altogether. Since presenting its Interim Report at the last Plenary Meeting of ECFA, the Working Group had concentrated on the design

*Attached as Annex I.
study for the 300 GeV machine and it had found itself in general agreement with the conclusions of the CERN Study Group. During the discussions it had appeared clearly that, all other factors being constant between very good and technically just acceptable sites, the cost of civil engineering might well affect total machine costs by ± 4% and this difference would be equivalent to the cost of, say, two typical beam lines or half the cost of the large bubble chamber.

The shielding experiment which had been treated as a priority in the Interim Report (CERN/ECFA 66/WG2/3/Rev.3) was now in progress and CERN was co-operating with Berkeley and the Rutherford Laboratory in this connection.

The following sub-groups comprising 66 physicists altogether had been set up:

- Sub-Group I - Beams and components; Moderator: K. Gottstein
- Sub-Group II - Representative experiments; Moderator: J.J. Thresher
- Sub-Group III - Bubble chambers; Moderator: E. Fiorini
- Sub-Group IV - High-energy detectors; Moderator: B. Thevenet
- Sub-Group V - General aspects; Moderator: M.G.N. Hine

All reports from these Sub-Groups should be completed by the end of October and sent to Blewett (CERN ISR Division) so that a first attempt might be made to co-ordinate the utilization reports at a meeting of Working Group II to be held on 14 November, with the five moderators. A Winter Study was then due to be held from 9 - 21 January to reassess the studies of the individual groups and to discuss physics programmes on the basis of different layouts proposed, common problems and final points.

It was then proposed to hold a meeting of Working Group II with the five moderators in order to make a draft proposal to ECFA on utilization cost estimates and to collect shortly afterwards the final reports of the utilization study groups.

The CHAIRMAN said that, even after its final report had been submitted, Working Group II must continue to meet as there would obviously be a number of points to consider. He wondered if he ought to report to the Committee of Council the fact that the slight increase in civil engineering costs might easily leave no money for beam lines and halls, and that the quality of the ground in the experimental areas was therefore of special importance.

ALMAN said that ground stability was obviously very important for external beams and experimental halls, in some ways more important even than for the machine itself.
ZICHICHI and LILLETHUN said that they agreed.

GOTTSTEIN observed that one solution would consist in keeping the machine construction budget separate from the construction budget for experimental facilities.

JOHNSON said that the problem of ground stability for external beams should certainly not be minimized. However, great care should be taken not to stress any point more than others. For instance, the cost of electricity supplies or of the cooling water might have as much of an effect as additional engineering costs.

ZILVERSCHOON pointed out that stress had already been laid on the question of ground stability in document CERN/644 concerning site proposals, page 3:

"Very high stability is also required for the beam lines leading to the experimental equipment in order to ensure the accurate alignment of limiting apertures necessary for precision measurements.

Artificial foundations for this precision and on this scale have never been constructed. They would certainly be very expensive and difficult to construct and could introduce other risks. Therefore we want to rely on the stability of the ground itself."

GREGORY said that he felt the passage quoted by Zilverschoon placed sufficient emphasis on this point.

KÄLLEN remarked that it would be premature to attach too much importance to estimates which were bound not to be completely accurate. It was necessary simply to stress the need to save money on construction whenever possible, in order to have as much as possible for experimental facilities.

PERKINS said that he agreed with Kallen.

The CHAIRMAN said that he proposed simply to mention to the Committee of Council that differences in the cost of machine construction would affect the provisions available for building experimental facilities.

The meeting was adjourned at 11.20 a.m. and resumed at 11.45 a.m.
7. REPORT BY WORKING GROUP I (Item 7 of the Agenda)

BUTLER reported that Working Group I had met in May, July and October and that many questions were under consideration, although, like Working Group II, it was not yet ready to present a full report. The relation between expenditure at home and on the international programme had been examined and more thought was being given to the tentative 1/1 ratio.

Members had been asked to prepare reports on the cost of a typical counter group from a Member State collaborating with a group at CERN (Falk-Vairant). Likewise in the bubble chamber field, papers had been prepared on the cost of a small group doing heavy liquid bubble chamber research and on the cost of HEP analysis and computing of hydrogen bubble chamber pictures. These would enable the Working Group to build up an imaginary national programme consisting of several research groups.

Working Group I considered that the 1/1 ratio for small countries was worth achieving fairly soon, but that it would tend to fall once the 300 GeV accelerator came into operation. It was felt that the 1/1 ratio should then be a minimum for a big country. The group was also attempting to obtain factual information about the actual cost of high-energy physics in the various countries, including research on nuclear structure, and on the manpower situation.

CITRON observed that Working Group I should attempt to make recommendations to Member States about the effort needed to support the 300 GeV project.

BUTLER explained that the Group was open to directions from ECFA although it was not very keen at the moment to work out detailed figures for each country. However, it was considering a number of points in this respect, particularly the problem raised in connection with bubble chambers, namely that analysis facilities might outstrip production in the fairly near future.

SCHOPFER remarked that there were two tendencies in Working Group I: some members felt that the Group should draw up a list of national accelerators to be built, while the majority felt this should be left to the countries concerned.

The CHAIRMAN said that Working Group I had two really difficult problems to deal with, i.e. the question of national accelerators to be built and the ratio of national expenditure to the expenditure on international programmes. He had been told that the solution adopted in 1963 whereby a difference was made between strong recommendations and simply desirable facilities was now likely to create some difficulties.

SALVINI remarked that it would nonetheless be desirable to have a positive list of recommendations from Working Group I as this would help a number of countries to plan national facilities.

The Committee took note of Butler's report.
8. PRELIMINARY DISCUSSION OF THE TENTATIVE TABLE OF CONTENTS FOR THE FINAL REPORT OF ECFA
   (Item 8 of the Agenda) (CERN/ECFA/66/8 and covering letter)

The CHAIRMAN, drawing attention to his letter dated 11 July (CERN/ECFA/66/8) and the tentative table of contents attached to this letter, said that it had been discussed with the Chairman of the two Working Groups, and Citron and Hine. As a result of this discussion it was proposed that ECFA should write a report for the Council and a second one containing a list of suggestions and comments for the Director-General. It was also proposed that Section 3 should become an appendix and that Section 4 should become Section 3·

In addition, comments had been received from Stafford and Hobbis which emphasised the need to concentrate more on the future establishment than on the present situation. In this connection they insisted on the difficulty of truck experiments on a 300 GeV accelerator and envisaged, therefore, that high-energy physicists might spend a year in every five at the European establishment. They also felt that there was some risk of confusion in the definitions of the various types of physicists and engineers. Kowarski had also stressed this point in a very useful paper which he had written on collaboration between universities and the large laboratories in the USA.

The proposed time-table was the following. If a list of the items approved by ECFA could be drawn up by the end of the year, a first draft of the ECFA conclusions could be prepared during the course of January for submission to a plenary meeting between 15 and 25 February. As a result of this meeting, a second draft could be prepared for a plenary meeting to be hold between 25 and 30 March, so that a final paper might be submitted to ECFA by mid-April. The report could then be distributed at the beginning of May.

The Committee was now invited to examine the proposed conclusions section by section.

Section 1:

1.1 - 1.4: No comments.

1.4· To be added: "consideration of other important points for site selection".

1.5: In this connection a discussion started on the classification of scientific staff, especially research physicists, applied physicists and engineers.

*Attached as Annex III.
The CHAIRMAN said that this question could in any case be taken into account in the conclusions, whatever the classification.

1.6: No comments.

1.7: The CHAIRMAN said that Section 4 "General Questions of Policy" of Working Group II's Interim Report (CERN/ECFA/66/WG2/3/Rev.3) should be dealt with under this item.

1.8: The CHAIRMAN pointed out that Burhop had insisted in 1963 on saying that conclusions should be revised if the 300 GeV project had not been adopted by 1966.

Section 2 - The Base of the Pyramid Programme:

2.4: In a discussion in which Burhop, Harting, Gregory and the CHAIRMAN took part, it was agreed that items 2.3, 2.4 and 2.5 should be included in the appendix.

Teillac observed that it was difficult to discuss the detailed list of accelerators at the base of the pyramid. The Committee could say that certain machines would be useful for collaboration but each Government finally remained master of its own decisions.

Salvini remarked that it would nevertheless be very useful for the countries concerned to have a discussion on the accelerators desirable for Europe.

Falk-Vairant said that the duty of ECFA was to stress the absolute need for satellite centres. Although ECFA had to be careful about voicing opinions which might be used unwisely by politicians, it would be desirable for it to express views on national projects.

Gottstein said that he agreed with Falk-Vairant. ECFA could even be used as a consultant on these matters.

Zichichi said that he agreed with Gottstein.

Gregory observed that it would be very difficult for ECFA to recommend the building of a particular national machine. However, the Base of the Pyramid Programme was intended to show that the countries' efforts should not be limited to the 300 GeV project. The pool of existing machines in Europe could obviously not be allowed to die out without replacements and it might therefore be worth getting a feeling for the volume of replacements which could be expected.

The CHAIRMAN proposed that the question of national accelerators be resumed at the next meeting.

It was so agreed.
Section 3 (formerly 4) - Possible Recommendations for the Future:

3.1 and 3.2: No comments.

3.3: KALLEN and BØGGILD pointed out that in some countries one committee looked after all forms of nuclear physics and that this arrangement worked quite well.

After a discussion involving Harting, KAllen, Citron, Schopper and Van Rossum, the CHAIRMAN proposed the following wording for sub-section 3.3:

"Recommendation that in each country there should be either a national committee specifically for high-energy physics or, if there is a committee competent for both low and high-energy physics, that adequate attention should be paid to the needs of high-energy physics."

It was so agreed.

3.11: Ratio of national expenditure to contribution to international laboratories.

GREGORY said that the idea of ratios of expenditure, in his opinion, only had a real meaning when it applied to operating laboratories. However, comparisons became difficult when laboratories were not in the same phase, i.e. when some were under construction while others were in operation. This is made clearer by the graph in Fig. 1, page 11.

During the construction phase, the money involved was fairly well defined. During the operation phase some money was needed to operate the machine, some to run the experiments and some to enable outside groups to benefit by the machine.

If all the accelerators compared were at the same phase of operation, it was relatively easy to apply the ideas already put forward about the number of physicists working at the international laboratories as compared with the number working outside. Accordingly, given the fixed amounts needed to operate the installations whatever the physics done, a proportion could be worked out between the amount of money needed and the number of people involved.

The problem was to see what the proportions might be whilst the 300 GeV project was under construction, when most of the money involved would be in the form of capital investment for the first few years. Only during, say, the last two years would expenditure be made on beams for experiments, at the international laboratory, and on preparation of beam to enable national groups to do the physics experiments on the big machine.
Fig. 1.

1) Running expenditure for international laboratories.
2) Large capital plus running expenditure for international laboratories.
3) National expenditure in connection with exploitation of international laboratories.
4) Total national expenditure including expenditure for national laboratories.

Curve 3) follows curve 1) with some advance in phase because of the early starting of preparations of experiments. For curve 4) only a desirable average trend can be given since curves for individual countries will show deviations according to the national programme of accelerator construction. The dashed curve 4') shows a wrong trend which would mean that all national activities die out in favour of the international one.
Total expenditure would obviously bear some relation to the number of physicists involved. However, given the amount spent between 1964 and 1966 on groups doing experiments at national accelerators, it was not easy to extrapolate the curve, and he felt that ECFA could give some views about the total number of groups which might be involved in this kind of work. It was obviously wrong to contemplate the closing down of national laboratories and, if they were not to close down, they would need new facilities. The slope of curve 4) would obviously depend on what was felt to be a healthy development, but, if resources were reasonably pooled, Europe should have a very healthy accelerator programme within the boundary of expenditure fixed by that curve. In his view, it would be useful for ECFA to endeavour to draw the shapes of curves 3) and 4).

FALK-WAIRANT remarked that Gregory's example illustrated the difficulty of talking of ratios when there were no common criteria. If proper definitions were given, the ratio was likely to change with time as shown in Gregory's curve. If a country's effort was less than say 1/10th of its share of the average national expenditure, it was hardly worth its while being a member of CERN. In any event, the ECFA report should stress the need for a minimum amount to enable national laboratories to benefit by the 300 GeV accelerator.

CITRON commented on Gregory's curves, saying that one could argue whether curve 4) should follow curve 1) or curve 2), but that from an unbiased inspection of the curves, the first conclusion was that curve 4) had an average slope comparable with that of curves 1) and 2). This implied that an approximate factor of proportionality could be found between curve 4) and some suitable average of curves 1) and 2). The scaling factor would then be the ratio of national and international expenditure which had already been discussed so much. The idea of just quoting a minimum level of participation in the high-energy programme did not take into account at all the feature that was most obvious from the graphs, namely the rising expenditure from year to year.

SALVINI said that it was most desirable to stress the need for activity in all the Member States.

AMMAN and HASTING observed that one of the most relevant points would be the ratio of the time spent by physicists at home/time spent by physicists at international laboratories.

The CHAIRMAN proposed that Citron, Harting and Hine should endeavour to do several exercises and draw up several curves inspired from Gregory's curve.

It was so agreed.
Appendices A and B - Definition of Staff:

After a discussion involving Amman, Burhop, Gregory, Harting, Hine, Salvini and Van Rossum, it was agreed that Harting and Hine would endeavour to work out a common definition to avoid misunderstandings in the future.

The Committee agreed that the table of contents of the conclusions (CERN/ECFA/66/8) should be redrafted on the basis of the discussion and attached to the Minutes of the meeting (Annex II).

The meeting rose at 5.20 p.m.