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

EUROPEAN COMMITTEE FOR FUTURE ACCELERATORS

Second Plenary Meeting

Geneva - 23 May, 1966

DRAFT MINUTES

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The Committee consisted of the following:

<u>Chairman</u> :	E. Amaldi	Italy
<u>Secretary</u> :	A. Citron	Federal Republic of Germany
<u>Members</u> :	H. Koziol	Austria
	K. Hubner	
	J. Géhéniau	Belgium
	L. Rosenfeld	
	J.E. Hooper	Denmark
	H. Filthuth	Federal Republic of
	K. Gottstein	Germany
	W. Jentschke	
	U. Meyer-Berkhout	
	A. Schoch	
	H. Schopper	
	H.O. Münster	
	P. Falk-Vairant	France
	C. Ghesquière	
	J. Parain	
	L. Van Rossum	
	A. Rousset	
	J. Teillac	
	T. Filippas	Greece
	E. Sacharidis	
	Th. Ypsilantis	
	F. Amman	Italy
	G. Diambriini	
	R. Gatto	
	G. Salvini	
	A. Zichichi	
	D. Harting	Netherlands

<u>Members</u> :	E. Lillethun	Norway	
	(cont'd)	O. Skjeggestad	
	J. Catala	Spain	
	J.A. Ruiz		
	F. Verdaguer		
	H. Atterling	Sweden	
	G. Källén		
	S. Nilsson		
	J.P. Blaser	Switzerland	
	B. Hahn		
	R. Mermod		
	E.H.S. Burhop	United Kingdom	
	C.C. Butler		
	J.C. Gunn		
	L.C.W. Hobbis		
	P.G. Murphy		
	D.H. Perkins		
	T.G. Pickavance		
	G. Cocconi	CERN	
	G. Fidecaro		
	P. Germain		
	B.P. Gregory		
	H.G. Hereward		
	M.G.N. Hine		
	K. Johnsen		
	P. Lapostolle		
	R. Meunier		
	W. Paul		
	C. Peyrou		
	P. Preiswerk		
	C.A. Ramm		
	L. Van Hove		
	H.H. Blewett	Argonne	} observers
	Y. Ne'eman	Israel	
	Y. Yamaguchi	Japan	

1. ADOPTION OF THIS AGENDA (Item 1 of the Agenda)

The Agenda was adopted.

2. APPROVAL OF THE DRAFT MINUTES OF THE MEETING OF 7 MARCH, 1966

The CHAIRMAN said that in order to keep laboratories outside the Member States informed of the work of ECFA, as agreed at the last Meeting (CERN/ECFA 66/2, p. 5), he had asked the Secretary-General of IUPAP, Professor C.C. Butler, to write to IUPAP members of all European countries. Moreover, he had written to the Directors of the following Laboratories: Argonne, Berkeley, Brookhaven, Dubna, Serpukhov and Stanford, and, in a personal way, to de-Shalit (Israel) and Suwa (Japan), Menon (India) and Salam (Pakistan). All had been offered information about the proceedings of ECFA, and in case of special interest, the opportunity of sending an observer to ECFA meetings.

The Committee endorsed the action taken by the Chairman.

On the proposal of LILLETHUN it was agreed that in the subparagraph entitled "Exploitation Potentialities" (CERN/ECFA 66/2, p. 6) the words "backbone of European physics" should be replaced by "backbone of European high-energy physics".

After a discussion involving BURNOP, CITRON, GOTTSTEIN, HARTING, LILLETHUN, ZICHICHI, the CHAIRMAN and GREGORY, it was agreed that Dalitz should be asked whether he considered his statements about the quark mass remained valid in the light of more recent information (CERN/ECFA 66/2, p. 8).

The Minutes of the Meeting of March, as amended, were approved.

3. CONCLUSIONS REACHED AND PROBLEMS RAISED BY WORKING GROUP 2
(Item 4 of the Agenda)

ALLMAN presented the report of Working Group 2 (CERN/ECFA 66/WG2/3 Rev. 2, which is attached as Annex I).

On the proposal of SALVINI it was decided to consider this report item by item.

1. ACCELERATOR DESIGN

i) Wilson philosophy

At the request of PAUL and COCCONI it was agreed that, although much in the Wilson philosophy remained to be defined, the technical points made by Wilson should be borne in mind by Working Group 2.

ii) Booster energy

After a discussion on the problems posed by a 50 GeV injector, in which AMMAN, CYRON, GREGORY, JOHNSEN, LAPOSTOLLE, MURPHY, PERRIN and SALVINI took part, the Chairman summed up in the following way:

A 50 GeV booster could produce the same intensity at 300 GeV as an 8 GeV booster, contrary to what was said in the report (CERN/ECFA 66/WG2/3 Annex p. 7). In such a case it would, however, cost at least a 100 million Sw. fr. more to build than the 8 GeV machine. In any event, the idea of a straightforward injection booster, such as the 50 GeV, was being superseded by newer schemes.

YPSILANTIS pointed out that, as explained on page 2 under Item (iv) "Flexibility on final proton energy", it was planned to operate the big machine over a very wide energy range, which made it less necessary to have a 50 GeV booster.

iii) Suggestions for final design of accelerator

AMMAN observed that further work was obviously necessary.

HINE remarked that the design would be much affected by the injection scheme chosen, since this would condition practically all the parameters.

SCHOPPER said that some points raised in the Wilson philosophy might alter machine cost estimates.

HINE explained that the latest estimates made by Wilson for a 300 GeV project were getting closer to the Berkeley estimates. Many points raised by Wilson would be taken into consideration by the Study Group in its further work.

AMMAN said that he did not feel that the points raised in the Wilson philosophy were likely to affect the machine costs by much more than 10%.

iv) Flexibility on final proton energy

COCCONI said it would be useful to have a statement concerning the monochromaticity of the beams.

HINE said that it was still too early to go beyond the minimum values indicated in the report on the design study (CERN/563). In particular the final values would depend on the details of the ejection scheme and on the intensity of the beams: the higher the intensity the greater the energy spread because of difficulties at transition.

JOHNSON pointed out that the energy spread was expected to be proportionally smaller in the big machine than in the CERN PS.

The CHAIRMAN concluded that the problem required further consideration.

v) Shielding

CITRON remarked that to implement the recommendations of Working Group 2, there should be closer collaboration between the MPS and the ISR Groups.

JOHNSON said that studies would in any case continue within the Study Group in order to obtain more accurate data.

2. EXPERIMENTAL UTILIZATION AND EXPLOITATION

i) Beam utilization

HINE, replying to the question by Salvini about the splitting of beams, said that the intention was to extract the beam initially into three areas. The beams thus extracted could be further split into several more beams. The fast extraction system could extract beams of different energies but there were difficulties in that connection with slow extraction.

GREGORY said that a summary of what had already been done with the CERN PS in this respect could be made available to ECFA and its Working Groups.

The CHAIRMAN observed that it would be desirable to accept Gregory's suggestion.

ii) Bubble chambers

GREGORY remarked that a big experimental apparatus project would take five to six years to bring to completion. Accordingly great care should be taken not to make definite statements about a project before the end of the first third of the accelerator construction period. It was important to make the necessary financial provisions for such a project without specifying what it would be.

KALLEN said that he agreed with Gregory.

LILIENTHUN and PEYROU said that it was essential to keep an open mind about future apparatus.

HINE said that it was desirable for ECFA to give its views about the degree of initial exploitation, as this would be essential for cost estimates.

BUTLER said that the point raised by Hine was very important and relevant to the studies of Working Group 1.

iii) Development of super-conducting technology

On the Chairman's proposal it was agreed that a very short paper should be produced on work being done on the development of super-conducting technology in Europe; Dr. Hine was so kind as to accept to take care of the preparation of such a document.

iv) Costs of experimental programmes during the initial operation

In a discussion on the total cost figure for the initial experimental programme (545 Msfr. at 1964 prices) the importance of shielding in the experimental areas was stressed by GREGORY, HOBBS and BLEWETT.

It was agreed that Group 2 would investigate this problem.

The CHAIRMAN and GREGORY said it would be politically very difficult at the present moment to aim at a higher figure. The money would probably be adequate for a start. It was true that it did not provide for any major project, such as a very large bubble chamber.

PEYROU said that in order to obtain good physics results, at least one major project should be aimed at at an early stage.

ZICHICHI and COCCONI warned against leaving too little for normal size experiments.

LILIENTHUN said that expenditure on experimental facilities could be adjusted to some extent according to the time-scale adopted for their completion. It was accordingly very important that the Working Group should study exactly the cost of items involved and draw up a priority list.

A discussion started about the "cost per experimentalist" notion.

PREISWERTH emphasized that the cost per experimentalist figures should be treated with great reserve as all the data had not been fully analysed. This sort of information was required mainly for administrative purposes and it was more relevant in many cases to talk of cost per experiment.

ZICHICHI said that a recent study had shown that the number of experiments performed per man was likely to be halved on the big machine, as compared to the CERN PS. Some mention ought to be made of this at some stage.

SALVINI said that it would be better policy and more realistic to show the cost of operations per physicist since a great many theoretical physicists would benefit by the work done on the big accelerator. This would also show that high-energy physics did not cost more per researcher than most other disciplines.

Next the staff figures in the table were discussed.

SALVINI said that, in his opinion, the number of experimentalists in the 6th year on the site, i.e. 450, was too high.

HINE explained that the footnote in document CERN/BCFA 66/WG2/3/Rev. 2, page 5, did not refer only to costs and that the figure of 450 included fellows and visitors. The expected figure for staff members was about 120.

SALVINI said that even this figure was too high and that he wished to be on record as having asked that this figure should be replaced by 40.

GREGORY said that the table on page 3 should be treated with great caution, as Preiswerk and Hine had already explained. At the moment the ratio of staff members to the total number of experimentalists was 10 to 15%. In his view, it seemed difficult to run a laboratory with such a small permanent staff as suggested by Salvini. It was important that a laboratory should be run in a spirit of association with universities, but it was not really sensible to set a definite figure at this stage.

The CHAIRMAN said that all the views put forward in the papers and during the discussion would be reported to the Scientific Policy Committee to enable it to appraise the various problems.

3. CHOICE OF MACHINE ENERGY AND FUTURE DEVELOPMENTS

The CHAIRMAN said that Perkins had apologized for being unable to attend and sent a letter in which he reiterated that there was no reason to change the original choice of 300 GeV as the final energy of the machine, particularly in view of the fact that it was likely to be completed a few years after the United States' machine.

BURHOP, referring to the minutes of the last plenary meeting (CERN/ECFA 66/2, p. 16), said that the Committee should avoid committing itself definitely to a specific machine energy for the time being, as information on the quark mass might be available before a final decision had to be taken on the machine energy.

PEYROU said that there would be much merit in building a 200 GeV machine to be completed before the American machine.

RAMM said that the arguments used in the report to eliminate the CERN-Meyrin site were not convincing. There would be plenty of room to build a 300 GeV machine underground and it should be remembered that there was now a great deal of experience in large scale tunnel building, e.g. St. Bernard and Mt. Blanc. In this connection, the cost of tunnelling under Mt. Blanc had only amounted to some 140,000,000 Swiss francs. In any event, if it should prove possible to build a 300 GeV machine near CERN, ECFA should say whether it was a good idea or not.

PAUL said that the financial argument put forward by Ramm was worth investigating.

YPSILANTIS remarked that if the CERN PS could not be used as an injector for the big machine, a strong argument in favour of the Meyrin site automatically disappeared.

LAPOSTOLLE explained that it was very difficult to estimate the cost of tunnelling in ground as bad as was found in the vicinity of Meyrin. This could vary by as much as a factor of 20, as it would be necessary to go down 100 to 200 metres. Even if the ring tunnel cost 80-100,000,000 Swiss francs, the service tunnel would cost as much again. In addition, an underground experimental hall 350 metres long was likely to cost about 100,000,000 Swiss francs. Moreover, the Committee should bear in mind safety problems, particularly hydrogen safety underground, and the political difficulties which might result from operating under a number of villages. Finally, most tunnelling schemes had so far been completed well behind schedule.

On Burhop's proposal, supported by the Chairman, it was agreed that Lapostolle and Ramm should get together to prepare a short report on the possibility of accommodating a larger machine near CERN.

4. GENERAL QUESTIONS OF POLICY

On Diambrini's proposal, it was agreed to discuss this point in connection with the report of Working Group 1.

The CHAIRMAN thanked Amman and Perkins for their report.

The meeting adjourned at 1.45 p.m. and resumed at 2.35 p.m.

4. CONCLUSIONS REACHED AND PROBLEMS RAISED BY WORKING GROUP 1
and COMMENTS BY THE RESTRICTED ECFA (Items 3 and 4 of the Agenda)

The CHAIRMAN said that Working Group 1 had a particularly difficult task to perform and accordingly the restricted ECFA at its last meeting had thought it desirable to make a number of comments (CERN/ECFA/66/RC/2 Rev) on the interim report of Working Group 1 (CERN/ECFA/66/WG1/2 Rev).

BULLER presented the interim report of Working Group 1 (CERN/ECFA/66/WG1/2 Rev), which is attached as Annex II.

CITRON presented the comments of the restricted ECFA (CERN/ECFA/66/RC/2 Rev) of which a revised version is attached (CERN/ECFA/66/RC/2 Rev. 2) as Annex III.

DIAMBRINI said it was of the utmost importance to prepare in the universities for the experimental work to be done on the big machine. There should be discussions between European physicists from the universities to consider proposals concerning experimental work with the big accelerator.

AMALDI said that the point raised by Diambrini was important. He wondered if Gregory could give an idea of the methods which could be used to secure the best results.

GREGORY said that the Emulsion Committee and the Track Chambers Committee which had now been in operation for 5 years, had been quite successful in fostering good relations between universities and CERN in those two fields. Now the Emulsion Committee would be merged into a new Emulsion/Nuclear Structure Committee and the Electronic Experiments Committee would be reorganized. He felt that two or three years before the ISR were due to come into operation, Users Committees should start considering possible experiments. A similar procedure could be used with respect to the big machine, although it was obviously rather early at this stage to make provision for it.

The CHAIRMAN said that the scheme outlined by Gregory should prove quite satisfactory and meet the points raised by Diambrini.

FALK-VAIRANI said that an effort should be made on the definition and provision of standard equipment for electronic experiments. Thus pools of standard components could be established for the use of the various groups which might require them.

ZICHICHI said that he was not happy about the formulation of Section 3 of the Working Group report dealing with CERN and the small Member States (CERN/ECFA/66/WG1/2 Rev).

BUTLER remarked that Working Group 1 had felt that the problems should be mostly dealt with by the Track Chambers Committee.

HARTING and SALVINI said that there would be representatives of every country at the next meeting of Working Group 1 when this paragraph could be suitably redrafted.

SALVINI said that it was not clear whether the existing plans for Europe were adequate or whether provision should be made for a fast cycling bubble chamber.

PEYROU said that he was not fundamentally opposed to a fast cycling bubble chamber, provided it was proved that the bubble chamber policy was to collect the same events at a faster rate. However, it must be borne in mind that the policy should in any case be to produce first class data and not a vast amount of second rate pictures.

It was agreed that Working Group 1 would be invited to re-draft this section.

GUNN said that some idea should be given in Tables I and II (CERN/ECFA/66/WG1/2 Rev) of the likely position in 1976.

BUTLER said that he agreed, although it would not be an easy task.

HARTING said that it would indeed be difficult to give good figures for the period after 1974. However, Working Group 1 could certainly try to give an opinion about these figures and make recommendations concerning the growth rate and the allocation of money to enable physicists to do valuable work.

The CHAIRMAN asked if there were any comments on Section 4 - General Questions of Policy - of the interim report of Working Group 2 (CERN/ECFA/66/WG2/3 Rev).

SALVINI emphasized again that the resident staff of the new laboratory should be kept as low as possible. Moreover, arrangements

should be made to prepare well in advance for electronic experiments by outside groups on the big machine. The size of the programme would be such that European industry could be interested in taking part in this work.

The CHAIRMAN said that he agreed with Salvini. ECFA could take the initiative in stimulating European industry in that direction. This linked up with the point raised by Falk-Vairant earlier on.

The Committee endorsed the views expressed by Salvini, Falk-Vairant and the Chairman in this connection.

The last paragraph of the Restricted ECFA comments (CERN/ECFA/RC/2 Rev) was discussed at some length.

SALVINI, PAUL and PREISNERK felt that more emphasis should be put on electronics experiments.

PAUL was also concerned about suggesting an escalation policy.

CITRON finally proposed the wording which can be found in paragraphs 6 and 7 of CERN/ECFA/RC/2/Rev. 2, which is attached as Annex III.

The Comments in this form were endorsed by the Committee.

PAUL thought that the following wording would be more balanced:

" The participation of physicists from European universities in the exploitation of CERN should be encouraged as well with bubble chamber picture analyses as with counter techniques. Therefore, the development of advanced means of picture evaluation should be encouraged. But the supply of bubble chamber pictures should match this development.

On the other side all the facilities should be provided for sending well-equipped counter teams from the outside to CERN. Technical questions which at present complicate such exchange of counter teams from one place to another should be solved. Here again the ultimate problem of how to increase the over-all machine time available in Europe has to find a solution."

It was decided to include this version in the minutes.

5. DISCUSSION OF POINTS 3 AND 4 (Item 5 of the Agenda) and PRELIMINARY CONCLUSIONS (Item 6 of the Agenda)

After a discussion of the draft resolution by ECFA to the June 1966 Council (CERN/ECFA/66/4 Rev. 2), it was agreed that an amended version of this resolution be submitted by the Chairman to the Scientific Policy Committee and the Council.*

6. CONTINUATION OF THE WORK OF ECFA (Item 7 of the Agenda)

CITRON remarked that there should be closer cooperation between the CERN Study Group and Working Group 2, when considering the next series of problems.

AMMAN said that there should be monthly meetings organized either by the CERN Study Group or by Working Group 2 where subjects should be examined one by one. In this connection it would be desirable for Working Group 2 to hear the people responsible for the various chapters of the report on the design study (CERN/563).

HINE said that on the whole he agreed with Amman. The series of problems should be discussed piecemeal during the next twelve months. However, it should be borne in mind that certain problems such as aperture for instance would be the responsibility of the final design groups and project leader when appointed, since they would finally be responsible for the design.

VAN ROSSUM remarked that there was a disproportion in Working Group 2 between users and machine builders. It would be desirable to put this matter right.

COCCONI said that this had become particularly obvious as discussions had so far been mainly on machine design.

The CHAIRMAN said that Working Group 1 had done some very good work in listing the problems to be dealt with. He recommended now that they should try to find a practical solution to enable universities to take an effective part in work with the big accelerator. In particular they should consider what proposals could be put to Governments in this respect.

The Committee endorsed the recommendations made by the Chairman.

* Document CERN/ECFA/66/4 Rev. 3, attached as Annex IV.

7. CALENDAR OF MEETINGS (Item 9 of the Agenda)

The CHAIRMAN proposed that Working Group 2 should go on meeting at fairly regular intervals as suggested; that Working Group 1 which was due to meet shortly should meet again in August and September and finally that a plenary meeting of ECFA should be held at 9.30 a.m. on 10 October. He did not think it would be necessary to call a restricted meeting before the plenary meeting. Citron and he would prepare the Agenda.

It was so agreed.

The meeting rose at 6 p.m.