

from ideas to reality

*6 W04
10/10/00*

Particle Physics by beginning of 1982

b - quark 1977 FNAL: CFS
 1978 DESY-DORIS: DASP2, PLUTO

gluon 1979 DESY-PETRA: TASSO

$\sin^2 \Theta_W =$ $0.224 +/- 0.019$ $\rho = 0.992 +/- 0.020$
 $0.229 +/- 0.010$ $\rho = 1.0$

No W, Z theory: $M_W = 77.9 +/- 1.7 \text{ GeV}$
 $M_Z = 88.8 +/- 1.4 \text{ GeV}$

No top $M_{t\bar{t}} > 36 \text{ GeV}$ PETRA

No Higgs

CERN Sp \bar{p} S : UA1, UA2 data taking started in 1981

Issues for LEPC

- are the proposed detectors adequate for the physics at LEPI and II
- how many experiments: up to 6 interaction points technically feasible
- will the detectors be ready in time

LEP operation beginning of 1988

envisaged construction time
for large solenoidal detector magnets: 4 years

also: SLC start up planned for end 1986

---> decision on detectors by end 1982

- cost of detectors and available resources

expect	from member states	150 Msfr
	from CERN	50
	from nonmember states	50
sum		250

LEPC 1
26.03.1982

LEP EXPERIMENTS COMMITTEE

Minutes of the First Meeting

On Wednesday and Thursday, 24 and 25 March 1982, the LEP Experiments Committee had its first Meeting.

The LEPC Members are:

Ordinary Members:

T. Ekelöf ←	Astbury, A.	Rutherford Appleton Lab.
	Bøggild, H.	Niels Bohr Inst., Copenhagen
	Davier, M. <u>i</u>	LAL, Orsay
	Della Negra, M.	LAPP, Annecy-le-Vieux
	Ellis, J.	CERN
	Flügge, G. <u>i</u>	KfK, Karlsruhe
	Goggi, V.G.	Univ. di Pavia
	Murphy, P.G. <u>i</u>	Manchester
	Peccei, R.	MPI, Munchen
	Sens, J. <u>i</u>	NIKHEF H, Amsterdam
	Strolin, P. <u>i</u>	Univ. degli Studi, Napoli
	Taylor, R.	SLAC, Stanford
	Willis, W.	CERN
	Wolf, G. (Chairman)	DESY, Hamburg

Ex Officio Members:

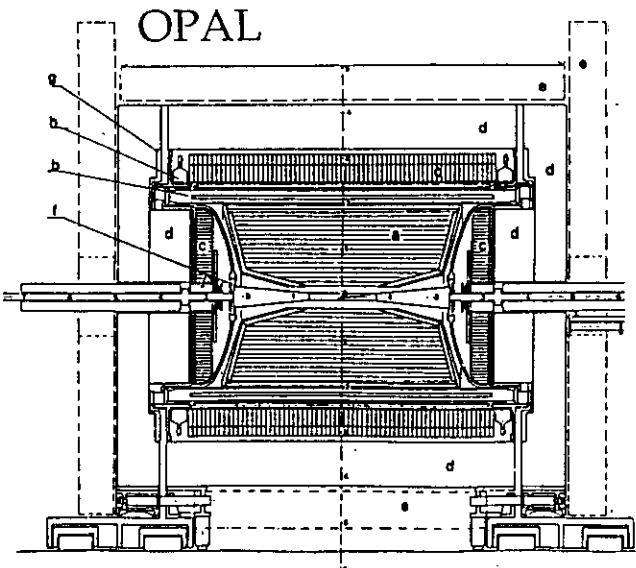
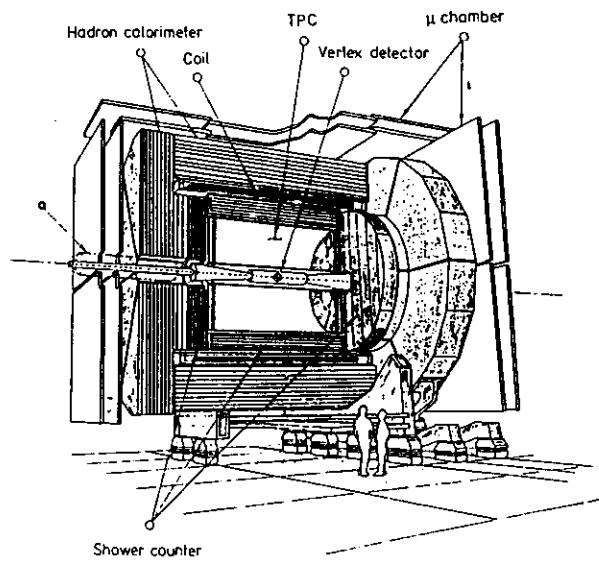
Bonaudi, F.	CERN
Gabathuler, E.	CERN
Hoffmann, H. (Secretary)	CERN
Minten, A.	CERN
Picasso, E.	CERN
Schopper, H.	CERN
Wetherell, A.M.	CERN

The LEP Committee appointed for each proposed experiment two referees:

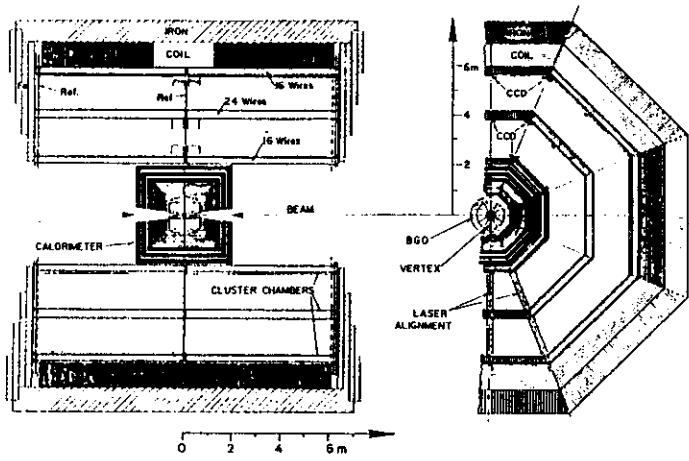
- LEPC/I 1 (ALEPH) H. Bøggild/W. Willis
- LEPC/I 2 (OPAL) V.G. Goggi/W. Willis
- LEPC/I 3 A. Astbury/V.G. Goggi
- LEPC/I 5 (ELECTRA) A. Astbury/M. Della Negra
- LEPC/I 6 (DELPHI) A. Astbury/W. Willis
- LEPC/I 7 (LOGIC) H. Bøggild/M. Della Negra

check cost of detectors H.F. Hoffmann/R. Taylor

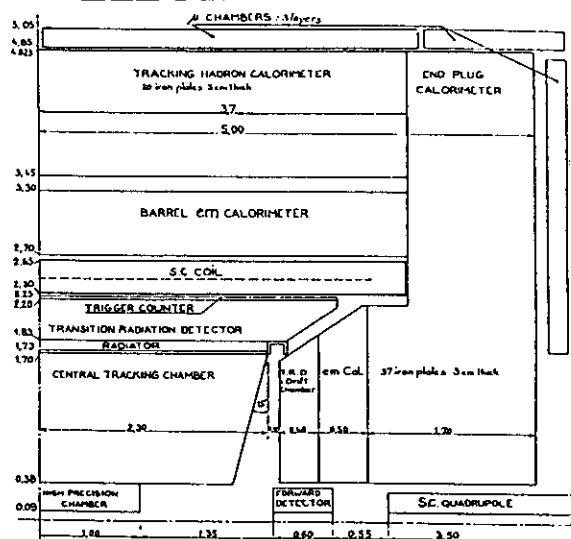
ALEPH



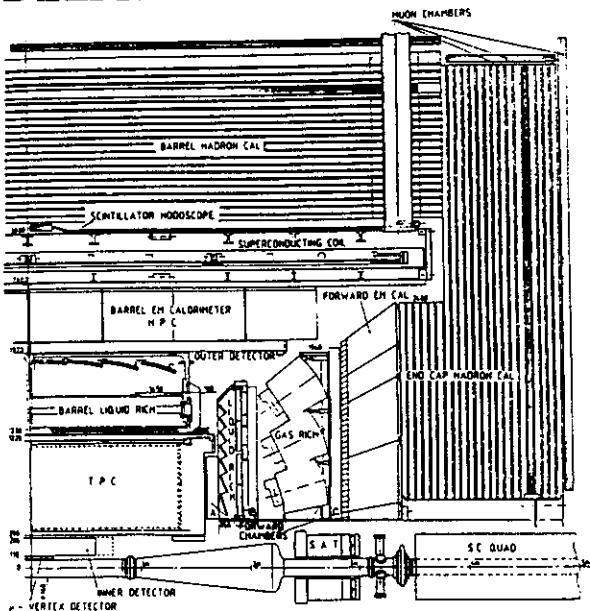
L3



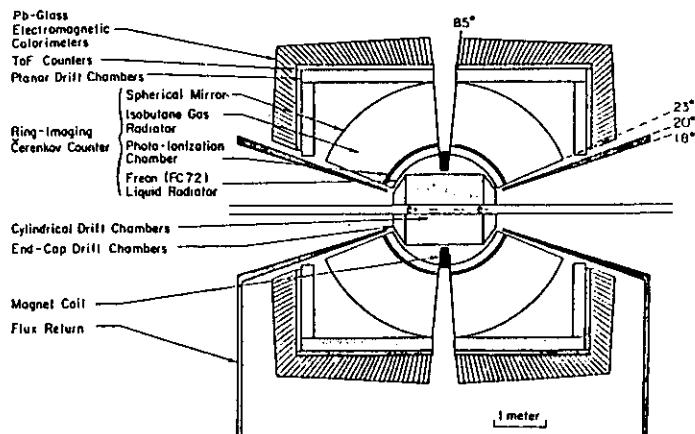
ELECTRA



DELPHI



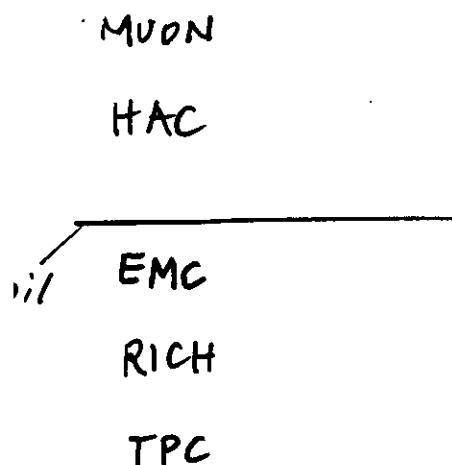
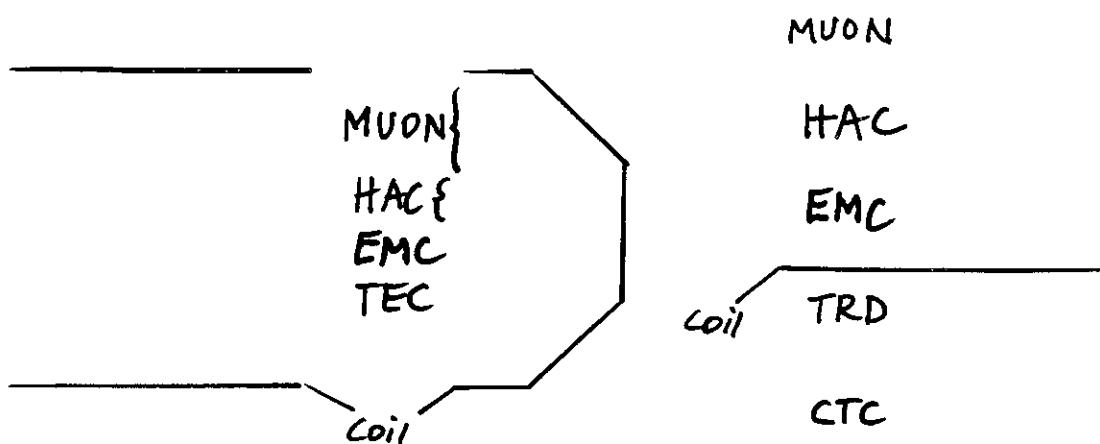
LOGIC



MUON
HAC
EMC
TPC

MUON
HAC
EMC

CTC



EMC
DC
RICH
CTC
Coil

L4: BCF develop e, μ detection + $\beta + p$ measm.

18 Nov 82 conditional approval by RB

LOI
60
55
53-79
66

LEP Experiments Committee: The first 400 days

- 24/25 March 1982 Presentation of Letters of Intent
ALEPH, OPAL, L3, L4, ELECTRA, DELPHI, LOGIC
Give proponents physics questions for evaluation of detector performance
- 18/19 May 1982 First discussion on how many detectors
- 15/16 June 1982 Discuss answers to physics questions and evaluate relative merits
Consensus: no more than four experiments
- 13/14 July 1982 (ALEPH, ELECTRA, OPAL) (DELPHI, LOGIC,L3)
First indication: ALEPH, OPAL, DELPHI, L3
Narrow decision against ELECTRA
- 7/8 Sept 1982 Reaffirm previous conclusion
Ask for modifications/ reductions in size/ cost of detectors
- 19/20 Oct 1982 Identify technically difficult components
- 16/17 Nov 1982 Final recommendations
Guidelines for Technical Proposals staging scenarios
- 1/2/3 June 1983 Evaluate Technical Proposals + define milestones
Recommend for approval
- | | | milestones |
|--------|------------------------|-------------------------------|
| ALEPH | 73 Msfr 261 physicists | <u>TPC90,EMCmin,EMCful,MC</u> |
| DELPHI | 69 Msfr 269 physicists | <u>TPC,RICH3,RICHq,HPC,MC</u> |
| L3 | 99 Msfr 263 physicists | <u>TEC,BGO100,BGO+HAC,MC</u> |
| OPAL | 73 Msfr 142 physicists | <u>CTCful L, ZCH, MC</u> |
- estim. avail. budget: 140 (MS) +50 (CERN) + 130 (NMS) = 320 Msfr
- 16 June 1983 Research Board approves the four experiments

Physics Questions

1. Consider Z^0 decays. What fraction of $Z^0 \rightarrow b\bar{b}$ events can the detector identify by the electron or muon decay mode. With what accuracy can one determine the forward/backward asymmetry for b quarks. Assume $B(b \rightarrow e\nu \text{ hadrons}) = 0.1$ and $10^6 Z^0$ decays.
2. Consider Z^0 decays into B mesons.
What limit can one put on the B lifetime from a measurement of the decay vertex.
3. What is the expected accuracy for neutrino counting from a measurement of
 - a) the Z^0 width
 - b) the process $e^+e^- \rightarrow Z^0 + \gamma$
$$e^+e^- \rightarrow \gamma + \nu\bar{\nu}$$
4. If toponium exists with a mass of 70 (120) GeV can one detect the P wave states X_t via transition from the vector state
 - a) $\zeta' + \gamma + {}^3P(t\bar{t}) \rightarrow \zeta + \gamma_1 + \gamma_2$
 - b) $\zeta' \rightarrow \gamma + {}^3P(t\bar{t}) \rightarrow \text{hadrons}$
5. Search for Higgs in the reaction
$$e^+e^- \rightarrow Z^0 + H^0$$
where the mass of H^0 is 50 GeV.
6. If charged Higgs exist with a mass between 30 and 90 GeV can one detect
$$e^+e^- \rightarrow H^+H^-$$
7. Will the detector see minimum ionizing free quarks of charge $Q = 1/3$ and $2/3$. In case the quark is superstrongly interacting, it is interesting to know how much material there is between beam and tracking chamber.
The background from normal one-photon annihilation into hadrons should be taken into account, in each case. Assume 6 quarks, with 30 GeV for the mass of the t quark.

PHYSICS AT LEP

Edited by
John Ellis and Roberto Peccei

It's all your fault!



The image shows two handwritten signatures. The signature on the left is "Ellis" and the one on the right is "Peccei". Both signatures are written in black ink on a white background.

Volume 1

Introduction

J. Ellis and R. Peccei

Precision tests of the electroweak theory at the Z^0
G. Altarelli et al.

Toponium physics at LEP

W. Buchmüller et al.

New particles

H. Baer et al.

Volume 2

Physics at LEP at high energies

G. Barbiellini et al.

QCD, $\gamma\gamma$, and heavy quark physics

A. Ali et al.