

CERN/LEPC 96-7

LEPC 43

7 November 1996

LEP EXPERIMENTS COMMITTEE

Minutes of the 43rd meeting,
8 October 1996

OPEN SESSION

(Joint Particle Physics Seminar, 2-5 p.m.)

1. Status of LEP2

D. Brandt reported on the status of LEP2. At the start of the cycle in June, a total of 144 superconducting (sc) rf cavities (36 modules) were installed in the LEP ring. Together with the existing 120 warm rf cavities, this provided a maximum accelerating voltage of 1.73 GV and allowed LEP to be operated for the first time above W^+W^- threshold, at $\sqrt{s} = 161$ GeV. After some startup difficulties, which necessitated a return to 90/60 optics from an unsuccessful 108/60 optics (poor dynamic aperture), LEP has operated 4x2 bunches per beam with reasonably good performance: a peak luminosity of $3.0 \times 10^{31} \text{ cm}^{-2}\text{s}^{-1}$ and a maximum integrated luminosity of 1 pb^{-1} per day. However there is room for further improvement: the betatron coupling parameter (emittance ratio), κ^2 , is typically 0.007-0.010 (to be compared with 0.005 achieved previously), and the beam-beam limit is not being reached. So far this year, the total luminosity delivered per experiment is 12 pb^{-1} at 161 GeV and 0.5 pb^{-1} at the Z^0 for detector calibration.

Extra sc rf cavities are being installed during the current technical stop, bringing the total to 176 (44 modules) and allowing the machine to operate up to 172 GeV for the remainder of the 1996 cycle. This marks the completion of LEP2 - Phase II. This last period will include a 3-day technical stop to re-cable the sextupoles and allow testing of the 108/90 optics before the end of the cycle. Testing of this optics is important for future LEP2 operation, in several areas: the luminosity at high energy, the performance for beam polarization (energy calibration), and the performance for detector calibration data at the Z^0 .

2. Reports from the LEP experiments on LEP161 results

DELPHI	W. de Boer
ALEPH	R. Miquel
L3	M. Pohl
OPAL	N. Watson

Preliminary results were presented from the four LEP experiments on the recorded data samples of 11 pb^{-1} at 161 GeV. After excluding radiative returns to the Z^0 , each experiment has identified about 450 hadronic events and about 20 W^+W^- events, including both $q\bar{q}$ and lv decay channels. The combined W measurements from the four LEP detectors at $\sqrt{s} = 161.3 \pm 0.2$ GeV are $\sigma(WW) = 3.57 \pm 0.46 \text{ pb}$ and $m(W) = 80.4 \pm 0.2 \pm 0.1(\text{LEP}) \text{ GeV}$. No sign of the SM Higgs is seen, however the mass limits so far are weaker than those obtained at LEP1. Similarly analysis of the data has revealed no sign of supersymmetric particles; upper limits on the cross sections are about 0.5 pb . ALEPH reported additional 4-jet events in the total-mass region of 105 GeV, similar to those observed previously by ALEPH at $\sqrt{s} = 130$ GeV, but the other three detectors did not confirm a signal.

CLOSED SESSION
(10-12 a.m.)

Present: S. Bethke, M. Calvetti, J. Dainton, J. Drees, L. Foà, G. Goggi, P. Hansen, R. Heuer, K. Hübner, G. Kantardjian, J. Kirkby (Secretary), M. Klein, T. Lohse, M. Mangano, S. Myers, J. Panman, L. Pape, S. Pokorski, L. Rolandi, D. Stickland, D. Treille, I. Videau, P. Wells and P. Zerwas (Chairman).

Apologies: K.-H. Kissler, B. Mansoulié, R. Marshall and R. Mount.

1. Approval of the minutes of the 42nd meeting

The minutes of the 42nd meeting (LEPC 96-3/LEPC 42) were approved without modification.

2. Chairman's report

The chairman welcomed the new members of the LEPC: J. Dainton, J. Drees, M. Mangano and S. Pokorski. He congratulated the LEP machine team on successfully operating LEP above W^+W^- threshold for the first time and on completing the installation of the sc rf cavities for LEP2 - Phase II on schedule.

3. Report from the LEP Coordinator on planning for the 1996/97 LEP schedule

The LEP Coordinator presented the LEP schedule for the final (October-November) period in 1996, and the draft schedule for 1997. Estimated luminosities of 0.5 pb^{-1} at the Z^0 and 8 pb^{-1} at 172 GeV and should be delivered before the 3-day technical stop at the beginning of November. After the stop there could be an additional 5 pb^{-1} before the end of the cycle, implying a potential total of more than 10 pb^{-1} at 172 GeV if LEP is operated at this energy for both periods.

Concerning LEP operation in 1997, the period for physics will be 108 days, to be compared with typically 125-130 days per year in earlier physics periods at the Z^0 . At present the time required to collect the necessary Z^0 calibration data for the detectors (dominated by the 4 pb^{-1} requirement for L3) is uncertain, but for 4 pb^{-1} it would be about 12 days. This would leave only 96 days for high energy running, yielding an estimated 105 pb^{-1} .

Regarding beam energy calibration, the uncertainty at the time of the summer conferences was rather large, $\sigma(E_b) = 100 \text{ MeV}$ (to be compared with the desired eventual precision of $<15 \text{ MeV}$), reflecting the precision and consistency of the flux loop and NMR measurements. Although a third method—resonant depolarization—agrees well at 45 GeV, the one measurement made at higher energy (50 GeV) has shown a 30 MeV discrepancy with the other two methods. Further studies will be carried out in the upcoming period and a detailed report will be discussed at the next LEPC meeting.

4. Discussion on the LEP schedule for 1996/97

The chairman had invited the spokesmen of the four LEP detectors to be present at the closed session to present their requests for LEP operating energies for the remainder of 1996. Three experiments (DELPHI, L3 and OPAL) requested the maximum energy of 172 GeV, whereas ALEPH expressed a preference to continue at 161 GeV, although a readiness to run at 172 GeV. ALEPH's preference for 161 GeV is based on strengthening the statistics for the $m(W)$ measurement at threshold and for the 4-jet anomalous events, which will suffer larger W backgrounds at higher energy.

The committee agreed with the main arguments of the spokesmen for running at the highest energy, namely to extend the mass window on SUSY particles, especially charginos, and to check

the reconstruction methods for $m(W)$ at high energies. In the absence of large colour recombination effects, the $m(W)$ sensitivity per unit of luminosity is equal at the two energies in question, although there is a factor of about three more W^+W^- events produced at the higher energy. For the SM Higgs, neither energy would yield enough luminosity in the short period remaining this year to extend the mass sensitivity beyond the present LEP1 range (before combining the data). The committee therefore **recommended operation of LEP at $\sqrt{s} = 172$ GeV for the remainder of the 1996 cycle**, after an additional 0.5 pb^{-1} of Z^0 calibration data has been delivered.

Concerning the ALEPH 4-jet events, and following the suggestion of the spokesmen, the committee supported the establishment of a special working group involving the four experiments to evaluate the experimental data and the optimum energy for their investigation. Concerning the Z^0 calibration data, the committee strongly encouraged L3 to optimize its calibration requirements in the light of the shortened physics periods expected for LEP in future.

5. A.O.B.

The committee expressed its high regard for the Electroweak Working Group in deriving LEP results from the combined four detectors. It encouraged the establishment of similar groups for LEP2 physics which, in addition to the ongoing Electroweak Working Group, may include a Higgs Group and a SUSY Group. A QCD group may also be established similar to the b physics groups.

6. Next LEPC meeting

The dates of the next meeting of the LEPC are **Tuesday-Wednesday, 19-20 November 1996**. The tentative dates for the LEPC in 1997 are

29-30	May
9-10	September
11-12	November.

J. Kirkby