

52nd Session of CERN Council

*The Council met on 26, 27 June under the
Presidency of Professor W. Gentner*

difficulties of parton models to explain it, related to the SPEAR results on $e^+ e^- \rightarrow$ hadrons or are we seeing very substantial production of ϕ mesons which then decay to lepton pairs? This is undoubtedly the firmest of the three results to be discussed and in the next two years several experimental searches for lepton pair production at high transverse momentum will be made.

The second very interesting result was the observation at FNAL of two neutrino induced reactions with not only a μ^- in the final state but also a μ^+ . Both events occurred at the highest neutrino energies and we may be observing the onset of a new process.

Thirdly, another experiment at FNAL studying deep inelastic muon scattering from a nuclear target shows some weak indication of a deviation with the scaling which would have been expected from lower energy deep inelastic lepton scattering. The breakdown of scaling at high energies would indicate that some new process was taking place involving the existence of a fundamental length. However this is a very difficult experiment to perform needing a thorough understanding of the systematic errors.

Three hints then from the Conference which could lead to an even more interesting Rochester Conference in two years' time. How widespread was the sense of expectancy that the next two years will witness very important discoveries? Well, one rapporteur went on record as being prepared to bet any physicist a crate of wine that by the next Conference charmed particles with masses below 12 GeV will have been found.

So we can make one firm prediction for the next Rochester Conference. There will either be excitement among physicists at a discovery of great importance or a number of professionally despondent but inebriated physicists.

At the June Council Session the Directors General presented reports of progress at the two CERN Laboratories. W. K. Jentschke mentioned some recent physics results from the 28 GeV proton synchrotron and the intersecting storage rings. As covered in the report of the London Conference, there is further evidence for neutral currents from the neutrino experiments with the Gargamelle heavy liquid bubble chamber. Another example of neutrino-electron scattering has been seen and over two hundred events on nucleons are now confirmed. In addition, an experiment with a proton beam into the chamber has checked that the estimate of the background, which could result in other events being confused with neutral current events, is correct.

While the existence of neutral currents is supporting evidence for the attempt to unify the interpretation of weak and electromagnetic interactions,

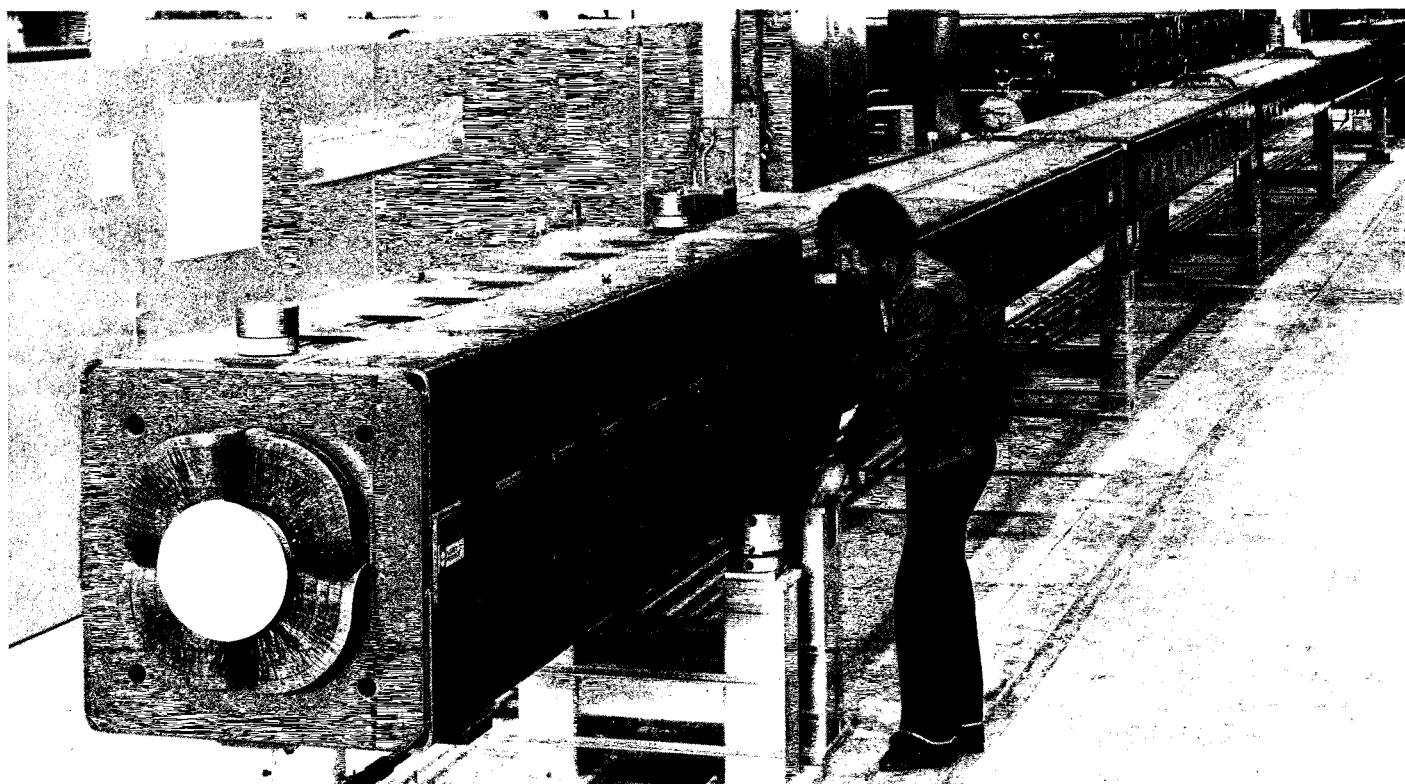
a subversive new type of interaction remains the only way to explain the behaviour of the neutral kaon. The so-called superweak force has been postulated to account for the disrespect of the neutral kaon for the symmetry of charge and parity in Nature. Since the combined symmetry of charge, parity and time is still believed to be good, the violation of charge-parity implies a violation of time symmetry to restore the balance. The superweak theory makes rather precise predictions as to how the symmetry of time will be broken.

The network of survey reference points on the Laboratory II site is being extended to meet the geodetic needs of the accelerator and of its North Experimental Area. The work has been greatly eased by the use of a geodolite, on loan from the Fermi Laboratory, which is a distance measuring instrument using a modulated laser beam. It is capable of accuracies of one part in a million over distances longer than could previously be measured in one stage at CERN.



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To test assembly and alignment procedures for the imminent installation of components in the SPS tunnel, a 30 m stretch of machine comprising four bending magnets flanked by two quadrupoles has been linked up in the Laboratory II large assembly hall.



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A CERN/Orsay team in 1970 showed that time symmetry violation does occur and this has now been confirmed in a more precise experiment by a CERN/Heidelberg team. In essence what it does is to watch the neutral kaons and, after a fixed time, measure how many convert to anti-neutral kaons. Taking anti-neutral kaons it watches, after the same fixed time, how many convert to neutral kaons. If time is symmetric these should be equal but, in fact, the second figure is about 1 % greater than the first. This measurement is in good agreement with the prediction of superweak theory which remains an uncomfortable phenomenon on the sidelines of our present interpretation of Nature.

Another experiment which is just beginning to take data is the new version of the g-2 measurement aiming to push the accuracy of this key figure, which emerges from the roots of quantum electrodynamics,

still further. After about a week of tests with the pion beam, injecting into a storage ring where muons are produced in pion decay, a first attempt to observe what the muons are doing was made on 15 June. With only a seven hour run, excellent clean results were obtained which already give g-2 to the accuracy of the 1966-67 results. This promises well for being able to improve the accuracy considerably and thus to penetrate deeper into the nature of the electromagnetic force and of the muon.

L. Van Hove carried the physics story much further at the Council Session when he reviewed the outcome of the last few years of research to mark the end of his three year term as Director of the Theoretical Physics Department. Since we did a rather similar review in our May issue, we will leave this topic but may return to it in a subsequent issue since it illuminated in different ways our present

interpretation of particle interactions.

The steady progress in the building of the 400 GeV proton synchrotron the SPS, in Laboratory II was reported by J.B. Adams. He emphasized particularly the work on the machine tunnel (including the showing of a film, directed by G. Pessis, on tunnel construction). At the time of the Council Session, 'the mole' had bored its way around 90 % of the 7 km circumference of the machine, maintaining an accuracy of better than 5 cm compared to its scheduled position.

Meanwhile the lining of the raw tunnel has begun in the half of the ring no longer used by the mole and its spoil-removing/preliminary-lining entourage. This involves filling in the joints of the preliminary lining, mounting steel sheets for water proofing, casting a second concrete lining, injecting cement between the linings and laying the tunnel floor. Over a sixth of the ring is completed and the

Major services to the Laboratory II site are nearing completion:

- 1. Installation of the 380 kV electrical power lines is well advanced over the 40 km linking the Laboratory to the European grid at Génissiat. The hand is guaranteed to release the cable before the lines are powered.*
- 2. Two 5000 m³ reservoirs are to hold the site water supply brought from Lac Léman. One of them has already been filled and is distributing water, via the pumping station, to part of the site.*

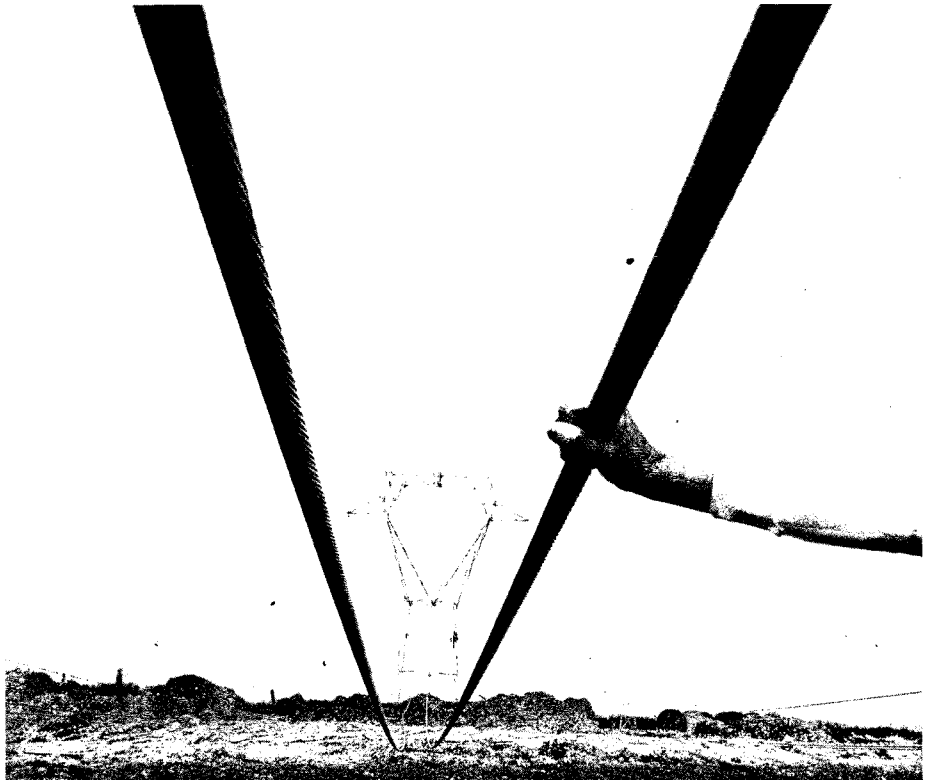
installation of services (power lines, etc.) has started. The first magnet is scheduled to be wheeled into the tunnel in October.

Assembly and testing of magnets is under way on a large scale. Over 100 bending magnets have been built, satisfactorily tested and stacked, awaiting their descent into the ring. About fifty quadrupoles have been delivered and some of the various types of correction magnets are beginning to arrive. A trial assembly of a half period (the sequence of magnets which is normally repeated around the ring) of the machine has been satisfactorily carried out in the large Assembly hall.

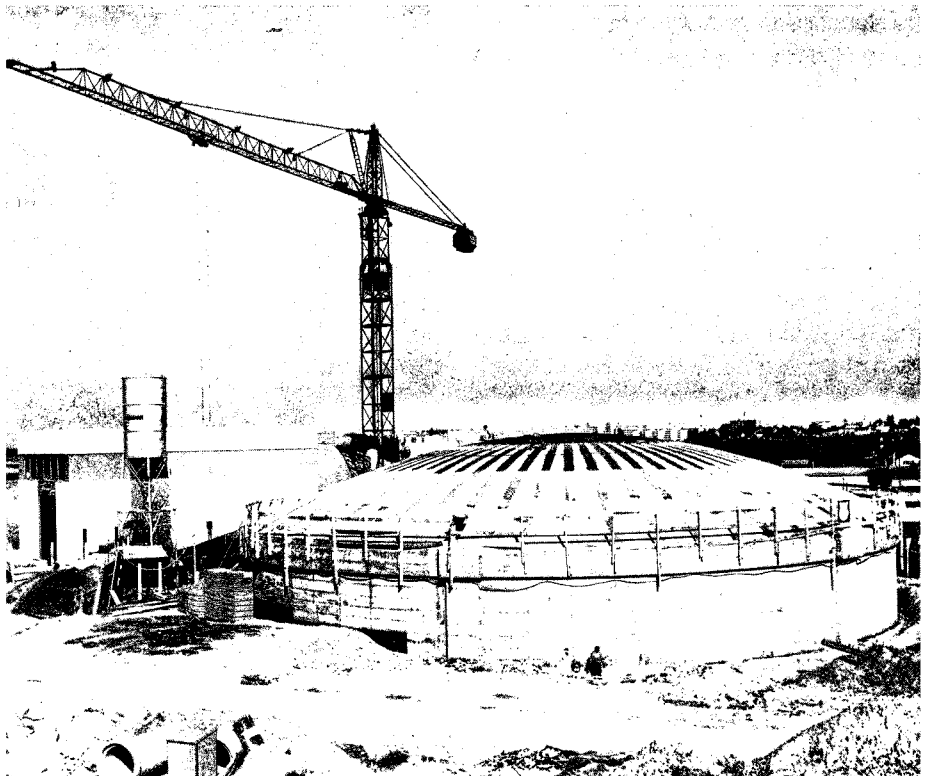
The high power components of the accelerating system are now being built and the first section of an r.f. tank is expected to be delivered soon. There have been problems with the 125 kW power amplifiers and the ceramic discs in the power transmission lines but they have been cleared and both amplifiers and discs are being produced which meet all the requirements.

Magnets (quadrupoles and bending magnets) for the injection beam-line from the PS are on site and the septum magnets for the injection system are being manufactured. The design of the kicker magnets is complete and components, such as ferrite blocks, vacuum tanks and ceramic feed-throughs, have been ordered. These magnets will be powered by current pulses as high as 10 kA with very short rise and fall times and pulse durations of some microseconds. Special pulse forming networks with a deuterium thyratron and ignitrons have been developed to provide these pulses and are being subjected to lifetests aiming for their survival over as many as 10^7 pulses.

A full-scale prototype of the electrostatic septum for the ejection system, one of the trickiest of the machine



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1. L. Leprince-Ringuet
2. K. Johnsen
3. L. Van Hove



1. CERN 3497

components, has been built. It is 3 m long with the septum made of a plane of stretched 0.15 mm diameter tungsten wires spaced 1.5 mm apart. To eject 400 GeV protons, it is required to hold a field gradient of 100 kV/cm between the wires and the titanium cathode. The prototype achieved 120 kV/cm with a gap of 17.5 mm and a pressure of 10^{-6} torr. However, lower pressures are desirable so as to reduce the number of ions liberated by the beam which can initiate electrical breakdown and at 10^{-9} torr performance of the prototype was reduced by about a factor of two. Studies to optimise operating conditions are continuing.

For the control system, three quarters of the 24 computers are delivered and performing well. The first part of the 'message transfer system' has been installed; prototypes of the CAMAC and multiplexor modules are in action. A total of 1500 km of cable for carrying control signals and light currents have been ordered. Some is already being installed in the Auxiliary Building by access shaft No 2.

The layout of beams in the West Hall and for the North Area has been approved by the Committees which oversee the experimental programmes. Detailed design of the beams is now under way. To the West, of particular interest will be the neutrino facility where both wide-band and narrow-band (energy spread) neutrino beams



2. CERN 291.2.71

will be sent to feed an array of detectors including the 3.7 m European bubble chamber, the Gargamelle heavy liquid bubble chamber and electronic detectors. To the North, of particular interest will be the muon beam where very high intensities at peak energies will be available.

Everything remains on schedule for commissioning the accelerator in the second half of 1976.

Collaboration with ESO

The Agreement for scientific and technical collaboration between CERN and the European Southern Observatory has been extended for a further three years. The Agreement covers particularly the help given by CERN in the construction of a 3.6 m optical telescope destined for the Observatory at La Silla in Chile.

Budgets in coming years

At the end of each year the Council considers CERN budgets for the following four years thus making it possible, both in the Member States and in CERN itself, to do long-term planning with a good understanding of the likely financial situation. In addition, for the building of the SPS a total budget and a budget profile over the years of construction have been agreed.

These forecast figures are adjusted



3. CERN 2734

to take account of the movements of raw material prices, salaries, etc. in accordance with a 'cost variation index'. A preliminary estimate of the index is usually presented at the June Council Session and this year it is coming out in the uncomfortably high region of 10 %. This reflects the rate of inflation prevailing in Europe and, compounded by currency exchange problems, will not make life easy during the financial discussions later this year.

Appointments

The Council approved the election of two new members of the Scientific Policy Committee — R.H. Dalitz and A. Lagarrigue. They succeed two members of long standing who have contributed considerably to the development of CERN — L. Leprince-Ringuet, a member of the SPC from its very first meeting twenty years ago, and S.A. Wouthuysen, a member of the SPC for the past ten years.

Within CERN itself, S. Fubini takes over from L. Van Hove, who has completed three years as Director of the Theoretical Physics Department, and W. Schnell takes over as Director of the Intersecting Storage Rings Department from K. Johnsen, who is to devote himself to further studies on storage rings. F. Ferger becomes Head of the ISR Division for three years beginning July 1974.