

Last month at CERN

2-metre bubble chamber tested

The most exciting news at CERN during the last month of 1964 was of the successful testing of the 2-m liquid-hydrogen bubble chamber. At two minutes past midnight on the morning of Sunday 13 December, some five years of effort devoted to its design and construction were rewarded with the first track photograph, the final proof that all was well.

Various modifications and adjustments remain to be carried out and final tests still have to be made with the magnet energized, but within the next few months CERN expects to be able to conduct its first experiment with one of the two largest hydrogen bubble chambers in the world.

As most readers will know, a bubble chamber is a complex device, requiring the application of advanced engineering techniques, for detecting nuclear particles by means of the tracks of minute bubbles they leave in a 'super-heated' liquid. The heart of the new CERN chamber is a stainless-steel vessel, weighing 22 tons and containing 1650 litres (275 gallons) of liquid hydrogen, at a temperature of -247°C and under a pressure of about 6 atmospheres. The front and back walls of this vessel are optically clear glass windows, 200 cm wide, 60 cm high and 17 cm thick, enabling the hydrogen to be illuminated, by a flash tube and lens system, through one and photographed, by an array of four cameras, through the other. The whole massive equipment is enclosed in an electromagnet of overall dimensions 3.6 m $\times$ 6.5 m $\times$ 4.16 m high, weighing over 400 tons. The major part of

the design was carried out at CERN but industrial firms in many of the Organization's Member States contributed to its construction.

A photograph of the completed equipment will be published in the February issue of *CERN COURIER*. A limited number of copies are also available of the engineering drawings showing the three main cross-sections of the chamber and magnet. However, the 'artist's impression' produced by Bernard Chamdru, of the Track Chambers Division, and distributed as a supplement to this issue, is thought by many people to give a rather more interesting picture of some of the details!

28th Session of CERN Council

On 15 and 16 December, delegates from CERN's 13 Member States met in Geneva for the 28th Session of the Council, under its President, Mr. J. H. Bannier.

In presenting the Progress Reports of the Divisions for the previous six months, Prof. V. F. Weisskopf was able to announce, among other things, the successful tests of the 2-m bubble chamber and also of the radiofrequency particle separator, which had been shown capable of separating kaons, from other particles in a beam, up to a momentum nearly twice as high as that previously obtainable.*

A total budget for 1965 of 128.76 million Swiss francs was approved, and eleven of the thirteen Member States also agreed to provide a further 5.7

million Swiss francs for the supplementary programme on new projects.

The chairman of the Scientific Policy Committee transmitted the Committee's recommendations for full support of a coherent programme for the development of high-energy physics in Europe, which includes various improvements to the present CERN proton synchrotron, as well as the construction of intersecting storage rings for this machine, and the creation of a new laboratory centred around a 300-GeV accelerator of the same basic type.

A fuller report of the Council Session will be included in our February issue.

Senior staff changes

The following appointments were made by the Council at its December session:

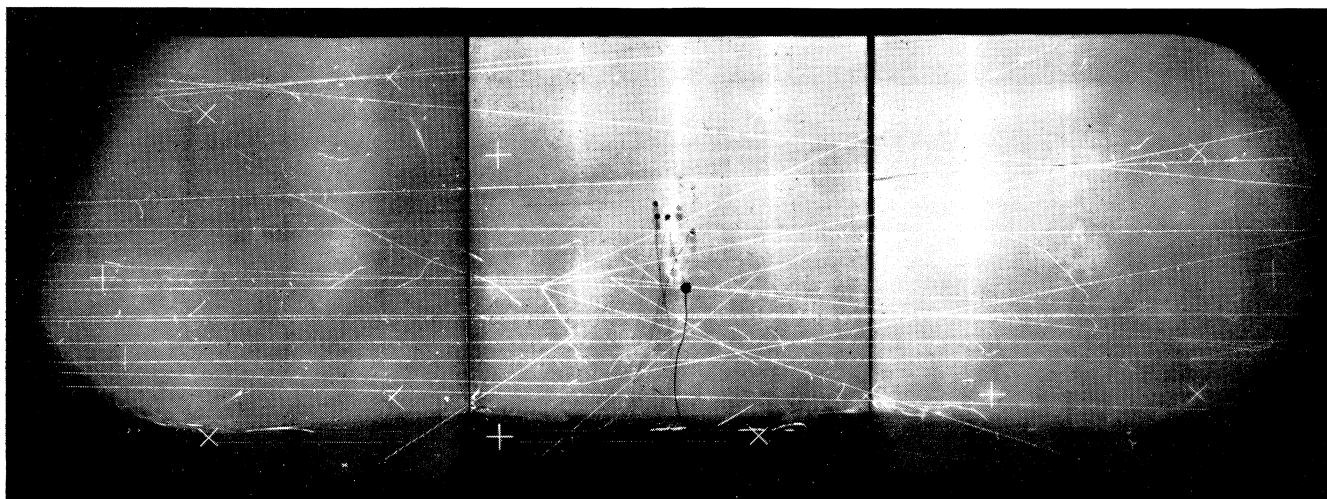
Dr. Pierre Germain as full-time Member of the Directorate, with responsibility for Technical Management, a position he has held part-time for the last two years while also Leader of the Proton Synchrotron Machine (MPS) Division;

Dr. Peter H. Standley as Leader of the MPS Division, in succession to Dr. Germain;

Prof. Wolfgang Paul as joint Leader of the Nuclear Physics Division, together with Prof. P. Preiswerk.

Proton synchrotron

Because of the troubles of the preceding two weeks, the PS schedule was changed during the first part of December and from 9-14 December the previous



A 'life-size' (2-metres long) copy of this photograph was on display outside the Council room on the first day of the December meeting. It is one of the first to be taken with the 2-metre bubble chamber and shows particles travelling from right to left. One of these incident particles clearly interacts with a proton near the centre of the chamber.

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counter experiments were continued, instead of the bubble-chamber runs originally planned. The latter then took place in the week before the Christmas shut-down.

Among the counter/spark-chamber experiments, the one investigating the parity of the negative xi (using the polarized-proton target described in last month's issue) took some 27 000 photographs. Its m_{45} beam line gave excellent results; providing 10 000 to 12 000 kaons in each pulse, using 60-70% of the internal proton beam (at 8×10^{11} protons per pulse) on target no. 1. Secondary particles for three other beams were also taken from this target. In the North Hall, the CERN/Ivry group took 400 000 photographs in their investigation of pion and kaon scattering from a hydrogen target, at momenta of 2.8, 3.25 and 3.5 GeV/c. These photographs are being analysed by means of the automatic system employing the flying-spot digitizer 'Luciole' (CERN COURIER, vol. 4, p. 75, June 1964).

During this week, also, the 152-cm British bubble chamber continued to take pictures on a 'parasitic' basis, using some 10% of the beam directed on to target no 60 (by the rapid beam deflector) during the acceleration phase of the machine cycle. The 57 000 photographs obtained, of 10-GeV/c proton interactions in hydrogen, were shared among groups in Cambridge, Hamburg and Stockholm.

In the following week, most of the operating time of the o_2 beam line that feeds this chamber was devoted to tests of the radiofrequency separator system. These separators demand a very short (2-microsecond) burst on the internal target, which is produced by giving a 'kick' to the beam, by means of the kicker magnet normally used for the fast ejection. This kick causes the beam to oscillate slightly about its normal path, in such a way that it strikes the target after a further $1\frac{2}{3}$ circuits of the machine, that is, after travelling a distance of about 1000 metres. As may be imagined, the adjustment of such a system, and the co-ordination between its various components, is rather critical and in the time available it was not possible to get particles along the beam line and into the bubble chamber.* However, between tests the chamber

* On 25 January the full system was operated for the first time when the o_2 beam line, equipped with two radiofrequency separator cavities, provided a beam of negative kaons at a momentum of 10 GeV/c for the 152-cm hydrogen bubble chamber. The photographs obtained showed an average of seven kaons per picture with a contamination of other strongly interacting particles of only about 5-10%.

obtained some 8000 photographs of 5 GeV/c positive pions, to add to earlier ones shared between groups in Bonn, Durham, Paris (Ecole Polytechnique), Nijmegen and Turin. The 81-cm Saclay/Ecole Polytechnique chamber, at the same time, provided 90 000 photographs of negative kaons in hydrogen, with momenta between 800 and 1200 MeV/c, for CERN, Heidelberg and Saclay.

Nuclear Chemistry at the PS

Contained within the Nuclear Physics Division is a small group doing Nuclear Chemistry, that is, applying the techniques of chemistry to the solution of nuclear problems (see, for example, CERN COURIER, vol. 3, pp. 31-34, March 1963). Each week they have about $1\frac{1}{2}$ hours of synchrotron machine time to themselves, when they irradiate their special targets for later analysis. As an example of the way in which this comparatively short time can be used, it is worth citing the exposures carried out in the first week of synchrotron running mentioned above.

Firstly, there was the exposure of three mica foils, each receiving just one pulse of the internal proton beam, as part of an investigation of the possible use of such foils for the study of fission cross-sections at high proton energies. For this purpose they are much less sensitive than nuclear emulsions to the background of protons.** These foils were sent to Naples for examination. Then an iron target was irradiated for 10 minutes. The lithium isotopes produced by the high-energy protons will be studied using a mass spectrometer at Orsay. A silver foil was irradiated for 30 minutes, for an investigation at CERN of the indium isotopes produced; and finally a uranium foil was given a 20 minute irradiation, the resulting radioactive bromine isotopes being isolated and separated in the CERN isotope separator, as part of a study of high-energy fission and fragmentation.

The following week, two exposures were made during the 'Nuclear Chemistry' period. A further mica target was irradiated for examination at CERN, and a 40-minute uranium irradiation was carried out, this time for the study of the iodine isotopes produced.

News in brief

Experiments at the synchro-cyclotron continued as usual during the month. Most of the time only the neutron room was in use, for experiments on positive pion decay and problems of nuclear structure, as well as the testing of

various items of equipment for other investigations. At the beginning of the month a few shifts were taken up by the establishment of a shielding funnel for the external proton beam, so that measurements of the scattered radiation intensity could be made by the Health Physics group.

Among the 'social' activities at CERN in December were the traditional Christmas parties for children of the staff and from local schools, held on the afternoons of 6 and 13 December, and a Christmas Ball arranged by the Staff Association, from 9.30 p.m. until 2.30 a.m. on 11/12 December. Following the Photo Club's annual exhibition in the last week of November, December produced an exhibition of paintings and handicrafts by the children of CERN staff; winning entries in the accompanying competition later joined those from other International Organizations in Geneva in an exhibition and sale, arranged in collaboration with the 'Intérêts de Genève', in aid of a local children's organization. On the evening of 10 December, Richard Morris, the Irish actor, gave his characterization 'Shakespeare and his time', illustrated with excerpts from the comedies and tragedies, and the following week the Music Club's second concert of the season brought the violinist Szymon Goldberg, accompanied by Gerard Hengeveld, to CERN ●

VISITS AND LECTURES ORGANIZED BY CERN

The European Organization for Nuclear Research, at Meyrin, Geneva, announces that in 1965, as in previous years, visits for groups will be organized on Saturdays. It is, however, stipulated that visits take place only by prior arrangement.

In addition, CERN puts at the disposal of schools, universities and societies the services of lecturers well qualified to explain its work or to present its recent achievements in the field of high-energy physics. Lectures can be given in English, French, German or Italian, and may be adapted to correspond to many different levels.

Further information is available from:

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** See CERN COURIER, vol. 4, p. 134, October 1964; a report of the first CERN tests has been issued as CERN 64-49.