

CERN Courier Archive: 1968

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CERN

At the Proton Synchrotron

The majority of the experiments at the 28 GeV proton synchrotron PS are concerned with accumulating information on the properties of the newly discovered particle resonances or of the more familiar elementary particles. This methodical work has been called the new spectroscopy, analogous to the atomic spectroscopy earlier this century. Other experiments are attacking fundamental problems such as the questions of symmetry or the limits of application of quantum electrodynamics.

Experiment S 50 is being done by a CERN-Heidelberg team in the m4b beam (the branch of the separated m beam that can give pions, kaons or protons up to a momentum of about 2 GeV/c). A negative kaon beam of momentum 1.65 GeV/c is directed onto a polyethylene target to produce the negative Xi hyperons. The aim is to measure the branching ratio of the Xi decay into an electron plus a lambda, compared with the decay into a pion plus a lambda.

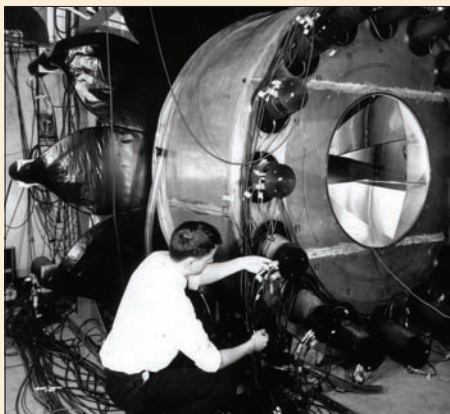
● Compiled from pp70–71 and 73.

HPD Mark 2

About 5 million pictures were taken in 1967 by the three bubble chambers operating at the PS: 2 100 000 for the 2 m hydrogen chamber in the East Hall (including 523 000 in deuterium), 1 700 000 for the 81 cm hydrogen chamber in the North Hall, which has recently taken its ten-millionth picture, and over 1 125 000 in the heavy liquid chamber operating in the East Hall during the neutrino experiments.

The frightening job of examining and measuring this vast number of pictures has to be confronted. The majority are dispersed for analysis to universities and research centres throughout Europe. CERN has one of the latest attacks on this problem.

The HPD (Hough Powell Device, named after its inventors P Hough and B W Powell) involves an almost fully automatic method of measuring bubble-chamber (and optical spark-chamber) photographs. A small spot of light is made to travel backwards and forwards across each photograph, scanning for particle tracks. The tracks modulate the light signal passing through the film to photomultipliers making information on track positions available in electronic form to be passed to a computer.

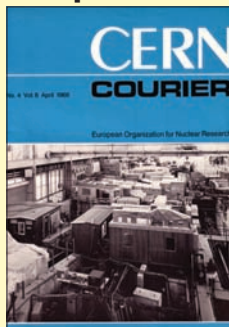


The gas Cherenkov counter used in S 50 to distinguish between electrons and pions from the Xi decay. Behind is a great wheel of scintillation counters to detect the decay products of the Xi. (See story left.)



In the East Hall looking towards the PS. Wooden huts house the small computers being used on-line in electronics experiments clustered around the slow ejected beam. From the April cover (below).

Compiler's Note



way into other track-tracing applications such as the digitization of maps, hence pioneering spin-off.

Film-measuring machines were a mix of mechanics, electronics and computers that allowed teams of “old school” inventors and “new school” programmers to give full rein to their ingenuity. One of these devices, worthy of Heath Robinson, reputedly had a fishing net strung below the scanning table to catch the little magnets that occasionally fell off the underside instead of gliding along beneath magnetic partners being moved around on top by the “scanning girls”. Apocryphal? Maybe. These machines spearheaded the use of small computers for physics data handling but, as Otto Frisch said of SWEEPNIK, “small” meant the size of a wardrobe and costing more than £10 000. They gave rise to early joint ventures between the academic and business worlds and some found their

The HPD was first proposed in 1960 and, following a collaborative effort by Berkeley, Brookhaven, Rutherford Laboratory and CERN, a prototype HPD Mark 1 came into operation at CERN in mid-1961, initially connected to an IBM 709 computer.

The Rutherford Laboratory considered having the mechanical parts designed and constructed commercially to help standardize the machines and make them more readily available for other laboratories and universities. CERN joined in this effort, which resulted in an HPD Mark 2 being delivered to CERN in September 1964.

By now, Mark 2, connected to the CDC 6600 computer, is in “production” measuring film from the 2 m bubble

chamber. With a smaller spot size and greater light intensity, the duration of one scan line has been reduced from 6 ms to 2.5 ms, enabling Mark 2 to carry out measurements faster and more accurately than its predecessor.

Some preliminary examination is still necessary; each picture is examined (on “Milady” scanning tables) and information is passed to the computer on the number of the frame recording an interesting event, the type of event and the rough position of each relevant track. A system known as “minimum guidance”, which would involve telling the computer only the position of the event vertex, is being developed.

● Compiled from pp75, 79–80.