THE CERN OMEGA PROJECT

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This short report summarizes the present status of the Omega spectrometer which first took beam in June, 1972. The Omega magnet has a useful field volume of 3 m × 1.5 m × 1.5 m and is located in the West Hall at CERN. It has superconducting coils which were tested at the design current of 4800 amps before the beam was first transported to the hall. The special feature of the coils is that liquid helium is flowed through the hollow windings, and this has proved to be very successful. Currently only one coil is mounted giving a field of 1.1 T instead of the 1.8 T full field.

Up to the time of the Conference there have been five three-day test runs with beam during which the plumbicon television camera readout system for the 100 optical spark-chamber gaps has been tested as well as the several triggering devices around the magnet. The plumbicon system was developed at the Rutherford Laboratory by a Birmingham, RHEL, Westfield collaboration with the help of the Rutherford Laboratory electronics and apparatus groups. The cameras have achieved the expected spatial accuracy of 0.5 mm and are adequately efficient for two- and four-prong events though some improvement is desirable for higher multiplicities. This may come from further work on the spark chambers.

The three pairs of cameras as well as the beam-proportional chambers, hodoscopes, and Cerenkov counters are read into an EMR 6130 on-line computer while each of the triggering systems uses a PDP-11 for checking purposes. When a particular user is triggering the system, trigger data from his PDP-11 are transferred to the EMR and written on to magnetic tape along with the spark chamber and beam information for each event. Also available either on-line or off-line is a CII 10070 computer where most of the program development on the track-finding and geometrical reconstruction programs has been carried out and where users can perform more sophisticated checks on their data using a complete chain of analysis programs. The bulk of the analysis is however expected to take place outside CERN at the user's home laboratories.

Figure 1 shows a schematic plan view of the apparatus. Two experiments, one by the Birmingham, RHEL, Westfield group and the other by a Bari, Bonn, CERN, Daresbury, Liverpool, Milan collaboration are studying meson resonances with slow neutron and slow proton-recoil triggers respectively. In the latter case the protons pass through the specially designed thin walls at one side of the spark-chamber frames. Two other groups are making use of the atmospheric pressure threshold Cerenkov counter built at Saclay and its associated hodoscopes to identify fast protons or antiprotons coming from the decay of forward lambda or antilambda particles. The lambda trigger of the CERN, ETH, Freiburg, Karlsruhe group is designed to study baryon exchange and uses a small veto counter immediately after the 30-cm hydrogen target. The Glasgow-Saclay collaboration's anti-lambda trigger is to study mesons decaying into baryon-antibaryon pairs. Initial tests have shown the Cerenkov counter to have an efficiency for pions above 99% and

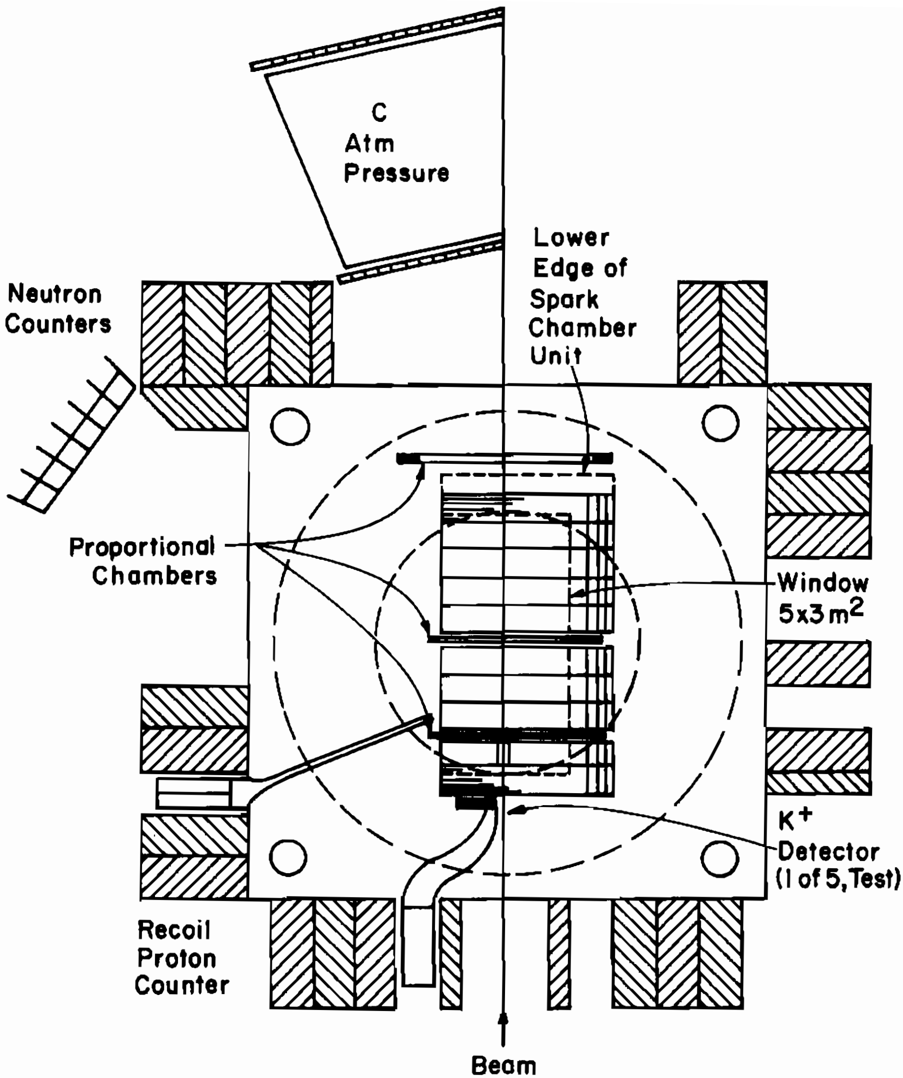

Fig. 1. Plan view of the apparatus.

good uniformity. Also shown in Fig. 1 is a test K^+ detector from Imperial College, London, intended for a Ξ^* experiment not yet approved, and several proportional chambers which are not yet installed.

Figure 2 is a general view of the apparatus with the spark chambers withdrawn, and Fig. 3 shows them in place inside the magnet. Two examples of events from 8 GeV/c π^- mesons seen on the EMR 6130 on-line display and taken with the neutron and fast lambda triggers are shown in Fig. 4. In one of these the fiducial marks on either side of each 10-gap module are seen. These are used to correct the nonlinearities of the plumbicon scan. In the other photograph the path of the proton from the lambda decay is shown between the two hodoscopes. The lambda mass has been reconstructed on-line.

Time is available in October for preliminary data taking when several hundred thousand triggers should be recorded for test purposes. Systematic evaluation of the device will then be possible. The main data taking will start in February, 1973, by which time the second coil and other missing items will be in place.

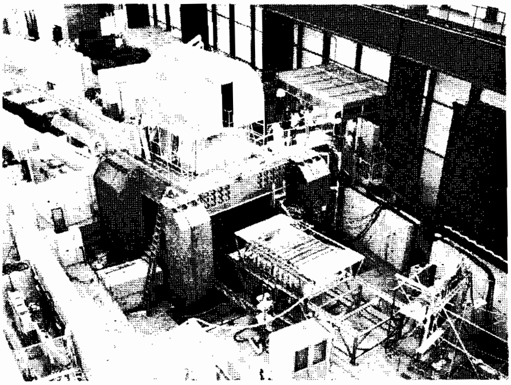

Fig. 2. View of Omega magnet with spark chambers withdrawn from interior.

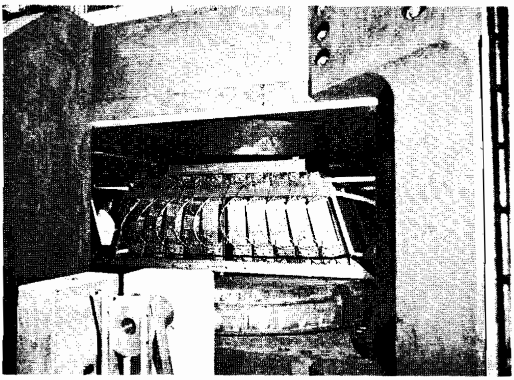

Fig. 3. Spark chambers installed in magnet gap.

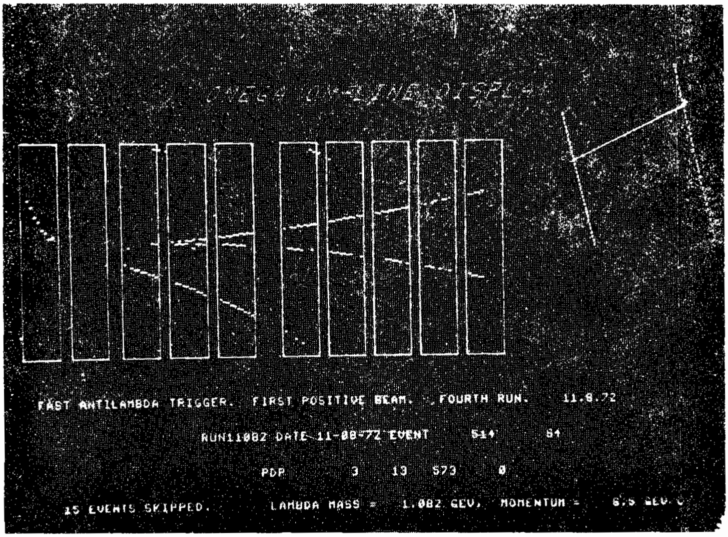

Fig. 4(a). Omega on-line display of antilambda event.

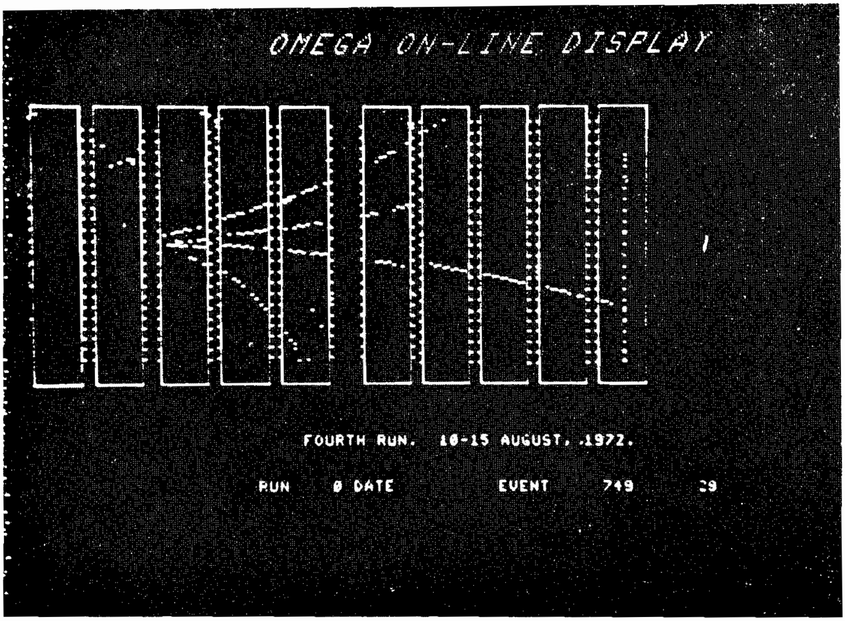

Fig. 4(b). Associated production event with kaon and lambda decays.