

Recent view of the Omega spectrometer. The beam-line providing the high energy particles can be seen coming in top left. The large spectrometer magnet itself is now topped by an 'igloo' in which the Plumbicon cameras are operating. Above the igloo, helium transfer lines can just be seen heading for the helium refrigerator which cools the superconducting coils. The ten optical spark chamber modules (100 gaps in all) have been rolled out of the magnet aperture to the right. Notice that they are inclined to the vertical so that the cameras can see into the gaps without involving many mirrors.

and transferred to the PS. These protons from the Booster at 800 MeV were observed in the PS for three turns. At the second attempt, 3×10^{11} protons coasted in the PS until (after 7 ms) the rising magnetic field drove them into the vacuum chamber. The injection efficiency was about 97 %.

Omega testing

Since the beginning of June there have been five short runs (three days each) during which beams have been fed to the Omega spectrometer. Three experimental groups were setting up and testing their detectors and the performance of the spectrometer is looking healthy.

To recall briefly the major features of Omega: A superconducting magnet provides a 1.8 T field in a very large aperture (3 m diameter, 2 m between poles and 1.5 m between coils). The

aperture contains a detection system which is initially a series of optical spark chambers observed by Plumbicon cameras. A large 'dedicated' computer system, involving PDPs, an EMR 6130 and a CII 10070, receives the data on-line. The spectrometer is a 'universal' detector intended to serve many experiments with essentially the same components. Several experiments can be set up at the same time, the data collection being dictated by different trigger systems.

On 8 June the first run began with beam from the PS taken all the way to the Omega installation in the West Hall. Three of the spark chamber modules were powered and were watched by two Plumbicon cameras. The second run saw all ten spark chamber modules and six Plumbicons in action. The third run brought on the magnet also for part of the time providing a 1.1 T field in the aperture (only one superconducting coil is

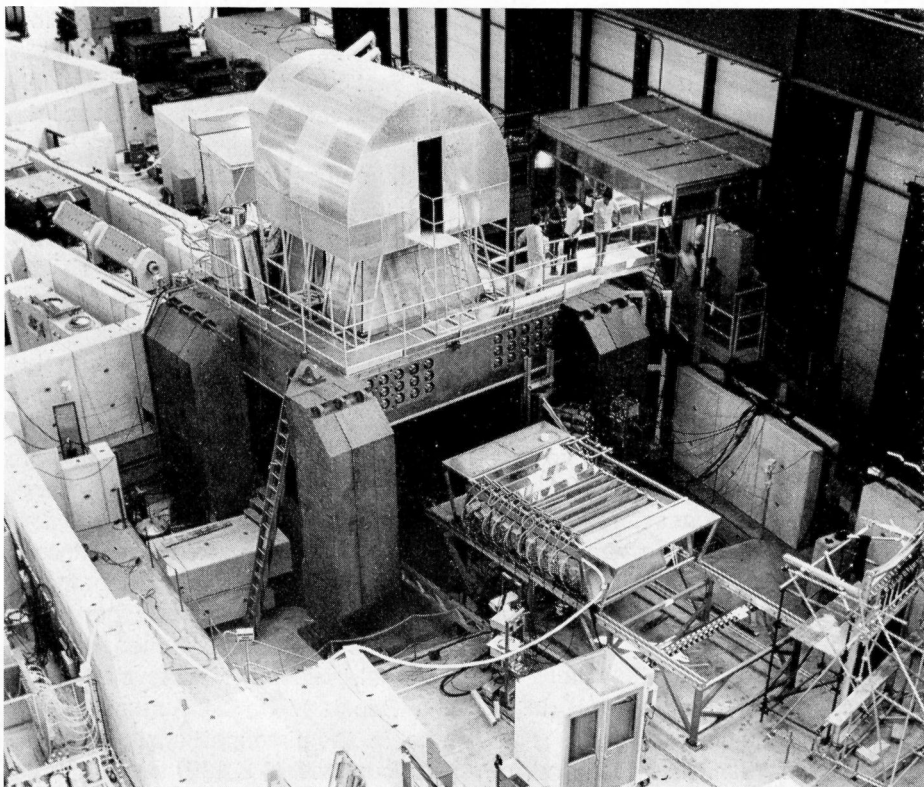
installed at present — the second coil will be put in place probably in November to achieve the design field). For the last two runs it was all systems go.

The performance of the various components can be summarized as follows: The long beam-line from the PS is performing well. Positive and negative beams of momentum 8 GeV/c were available at will throughout the runs. The magnet gave no trouble and it looks as if the new force-cooled type of superconducting coil will be a very successful feature of the spectrometer. At present the helium refrigerator is holding one coil down well enough and work is progressing to meet the technical specifications required for operation with two coils.

The optical spark chambers were operated during the runs both to optimize their performance and for data acquisition. The Plumbicons have operated well and the on-line computer system looks in reasonable shape already. Obviously there is a lot of work to be done to improve the computer programs and to get more accurate information on track positions (it is hoped to achieve 0.5 mm in space or better). But overall the quality of the data is looking reasonably good.

Three teams were testing their experimental set-ups during the runs and an example of event reconstruction by the computer for each of the three trigger systems is shown in the photographs.

One experiment, to be carried out by a Birmingham, Rutherford, Westfield College collaboration, will study neutral bosons having zero strangeness. The interaction is $\pi^- + p \rightarrow n + \text{boson}$ and the detection system is triggered when a neutron is detected. This experiment has almost all its components ready and may be the first to take data in the Autumn. Another experiment will be carried



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Computer displays of events recorded by the three experiments which are now setting up in the Omega spectrometer. The experiments have different triggers — the spark chambers are fired to record the events when different interactions occur. The Plumbicon cameras detect the sparks in the chambers, convert the light signals to electronic form and feed them to the on-line computer system. These events can be displayed on a TV screen.

1. Detection of a neutron caused this event to be recorded. Note fiducial marks on the edges of the spark chamber modules.

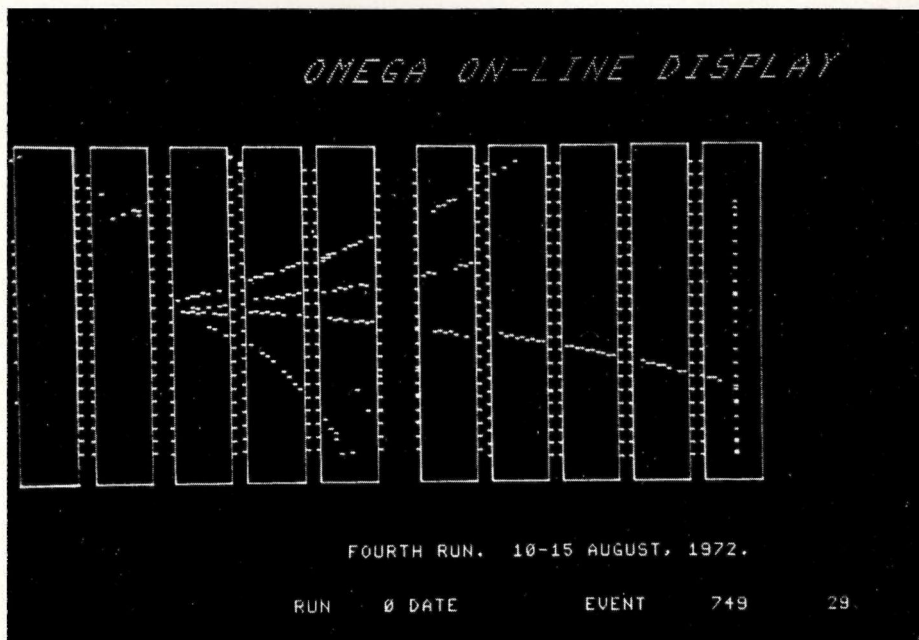
2. A slow proton is the trigger for this experiment. In the photograph a star indicates where it was detected outside the Omega magnet. Thin walled spark chambers help low momentum particles to escape on one side without scattering.

3. A fast forward proton coming from the decay of a lambda is the trigger. Its path outside the magnet is traced between two scintillator arrays.

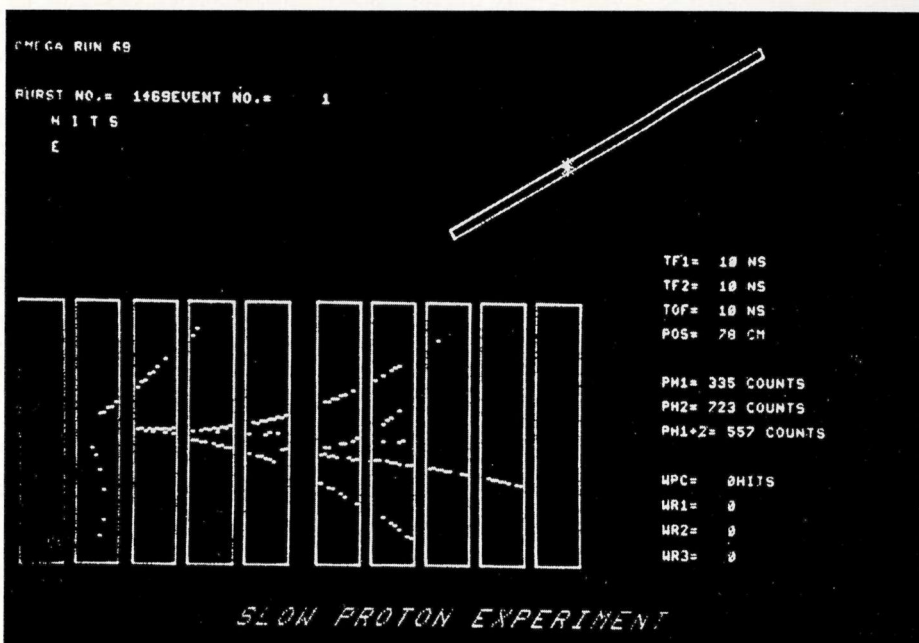
out by a Bari, Bonn, CERN, Daresbury, Liverpool, Milan collaboration. It will study charged bosons from the interaction $\pi^- + p \rightarrow p + X^-$. A slow proton is the trigger for the detection system. All components are not yet in place. A third experiment, to be carried out by a CERN, ETH, Freiburg, Karlsruhe collaboration, will study baryon exchange involving the production of a lambda. The interactions are then of the form $\pi^- + p \rightarrow \Lambda^0 + (K^0 \text{ or } K^+ \pi^- \text{, etc.})$. The trigger for the detection system is a fast proton in the forward direction coming from the decay of the lambda. A large Cherenkov counter has just been mounted for this experiment and almost all components are now in place. By early next year the Omega spectrometer is likely to be pouring out data.

Superconducting quadrupole looking good

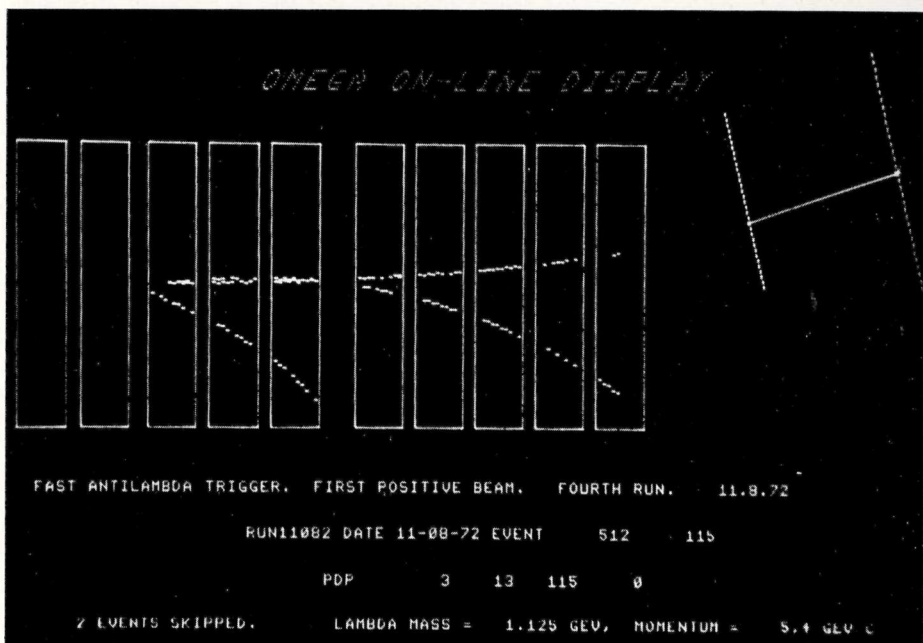
Another item in the list of preparations for the day when beams of hundreds of GeV energy become available at CERN was given its first trial run in August. A superconducting quadrupole was constructed in the Synchrotron Injector Division and on 21 August, only a few days after it was first cooled down, it climbed to 90 % of its critical current. This is a very high figure compared with what has been usually achieved in sizable superconducting beam-handling magnets in other Laboratories. The total losses of the



1.



2.



3.