

CERN Courier Archive: 1968

A LOOK BACK TO CERN COURIER VOL. 8, JUNE 1968, COMPILED BY PEGGIE RIMMER

HOME AND AWAY

CERN/Serpukhov collaboration

Collaboration with the Institute of High Energy Physics IHEP at the Serpukhov Laboratory, USSR, is fulfilling the highest hopes. At a meeting of the Joint Committee (which has six representatives from each Laboratory) at CERN at the beginning of June, details of the fast ejection system to be provided by CERN were agreed, and a CERN team is preparing to join Soviet colleagues for the first collaborative experiment at the newly commissioned 70 GeV proton synchrotron – the highest-energy machine in the world.

Performance of the accelerator itself is very promising. Protons have been accelerated to 76 GeV and energies even above this may prove possible. The linear injector has produced the remarkably high current of 100 mA at 100 MeV, an outstanding achievement for a linac of such high energy, and the present machine intensity is 3×10^{11} particles per pulse.

The first experiment in the CERN/Serpukhov collaboration is of a type often known as a “yield experiment”, usually among the first to be done on a new machine. It gives information on the number of the different types of secondary particles yielded by targets bombarded by the accelerated proton beam. It does not make heavy demands on the machine performance and yet knowledge of the different yields is very important for optimizing the layout of secondary-particle beams in the experimental hall. Following the yield study



The Serpukhov linear accelerator/injector with the vacuum lids removed. (Image credit: Serpukhov.)

will be a programme of measurements of total cross-sections, another “first thing to do” when a new energy range becomes available.

CERN scientists will probably go to Serpukhov in groups of about six at a time for periods of three to six months and, whenever possible, their families will go with them. They will be drawn from the team that did the equivalent experiment at CERN – J Allaby, A Diddens, A Klovning, E Sacharidis, K Schlüpmann, A Wetherell, F Binon, P Duteil, R Meunier, JP Peigneux, JP Spighel and JP Stroot.

● Compiled from text on pp123, 128 and 134.

TRIUMF

In April the Canadian government announced initial grants amounting to \$1.3 m for a cyclotron to be built at the University of British Columbia. The project, known as TRIUMF, an acronym for TRI-University Meson Facility, was initially proposed by three Universities – Victoria, Simon Fraser and British Columbia. The University of Alberta joined in 1967.

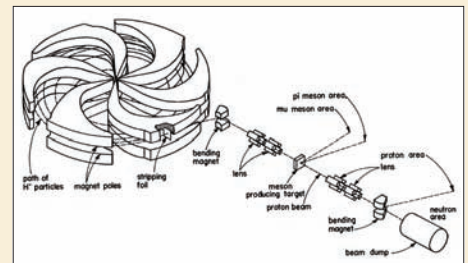
TRIUMF is intended to provide an advanced instrument for intermediate-energy physics to serve particularly the scientists on the west coast of Canada and is expected to be in operation by 1974.

By incorporating two comparatively recent advances in cyclotron technology, it will be able to produce protons in the energy range 200–500 MeV with a beam intensity a thousand times higher than at existing equivalent machines. Research will be possible using the proton beam itself, intense beams of pions and muons and a high flux of thermal neutrons, with the great advantage that all these beams can be produced and used simultaneously (see drawing).

One of the two advances which yields the higher performance for the machine is the use of sector-focusing. This involves replacing the conventional cyclotron magnet by specially shaped magnet sectors which introduce strong (or alternating-gradient) focusing and maintain a constant revolution frequency for the particles so that the r.f. accelerating frequency can also be held constant (rather than adjusting to the revolution frequency as in the synchro-cyclotron).

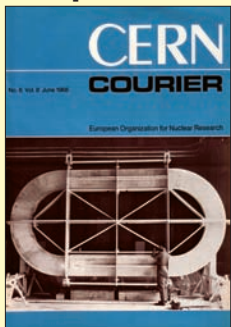
The second development involves accelerating a beam of negative hydrogen ions H^- rather than protons, by adding an electron to the hydrogen atom in the ion source. When the desired energy has been reached, the ion is passed through a very thin foil to strip off the electrons and release the proton. Since the protons are of opposite charge to the accelerated ions, the magnetic field of the cyclotron bends the protons out of the machine, circumventing one of the major problems of cyclotrons, namely extracting accelerated protons. Extraction efficiencies on proton cyclotrons rarely exceed 50%, while TRIUMF will achieve 99%. The idea of H^- cyclotrons has been developed principally at University of California, Los Angeles, where it was first shown to work in 1961.

● Compiled from texts on pp136 and 137.



The layout of extracted beams will allow simultaneous use of mesons, protons and neutrons.

Compiler's Note



Competition in space science between the Soviet Union and the US intensified when cosmonaut Yuri Gagarin circled the Earth in just 108 minutes 50 years ago. By contrast, contemporaneous Soviet plans to build the world's highest-energy accelerator at Serpukhov triggered a collaborative agreement between CERN and IHEP that would involve not only scientists and engineers but, of necessity, industrialists and politicians.

Co-operation has remained a cornerstone of CERN policy since its foundation, despite fluctuating international tensions and conflicts, especially during the difficult years of the Cold War. By now, non-member-state users make up some 37% of the 10 000 researchers at CERN, representing 52% of the 600 participating universities and

institutes. Notably, around 22% of non-member-state users are from the Russian Federation and 45% from the US. Might a Nobel Peace Prize be in order one day?