

CERN Courier Archive: 1970

A LOOK BACK TO CERN COURIER VOL. 8, MAY 1970, COMPILED BY PEGGIE RIMMER

CERN

The 300 GeV project

New proposals for the 300 GeV project were announced on 18 April. Here, we recap key headlines in its history.

1963 The European Committee for Future Accelerators (ECFA) urges the construction in Europe of a new proton accelerator with an energy of about 300 GeV and high beam intensity.

1964 A design study is carried out at CERN, with the major parameters: a peak energy of 300 GeV, a beam intensity of 10^{13} protons per second, a main-ring diameter of 2.4 km, "combined-function" magnets with a peak field of 12 kG, several ejected beams, design and construction time of 10 years, cost 1902 million Swiss francs (MSF) [1969 prices].

1965 At the end of the year the CERN Council approves other ECFA recommendations in connection with the installations at CERN-Meyrin. These consist of an extensive improvement programme for the PS and its facilities, and the construction of intersecting storage rings for protons.

1967 Approval is received in the US for an accelerator in the hundreds of GeV region. Design studies begin under the direction of RR Wilson for a 200 GeV machine with a potential for 500 GeV.

1968 In June the UK government announces that it will not join the 300 GeV project. The project is revised to bring the cost down to 1431 MSF. Six countries declare their willingness to participate – Austria, Belgium, Federal Republic of Germany, France, Italy and Switzerland – thereby assuring sufficient funding.

1969 The CERN Council accepts the development of the 300 GeV Laboratory in stages, beginning with an energy not less than 200 GeV and a construction period of eight years.

JB Adams, Director of the 300 GeV project, initiates a rethink that leads to a "missing magnet" design and a programme beginning with a 250 GeV machine, within the same budget, with conventional magnets taking up half of the circumference of a 3 km diameter ring. Filling up the circumference later would give 500 GeV. If superconducting magnets are mastered, there is the alternative of inserting them in the free half of the circumference to give 650 GeV, and eventually filling the ring with superconducting magnets to give 1300 GeV.



The Director of the 300 GeV project, JB Adams, visited several US Laboratories in April. Here he is seen boarding a helicopter for an aerial view of the progress of construction of the 200–500 GeV accelerator at Batavia. With him, on the right, is FT Cole, Assistant Director for Technical Affairs. (Photo NAL.)

This proposal, Project A, could be built on any of the five sites offered by States ready to participate (Doberdo-Italy, Drensteinfurt-Federal Republic of Germany, Focant-Belgium, Gopfritz-Austria, Le Luc-France). The problem of site selection, however, brought the project to a standstill at the end of the year, and in this situation, during the first months of 1970, Project B was born.

Project B attempted to come more into line with the finance which might reasonably be anticipated in the future, where past growth

rates of expenditure on high-energy physics are unlikely to be sustained. It features a main ring about 2 km in diameter and a missing magnet design giving 300 GeV energy, with all magnets in place at a peak field of 18 kG. The cost of a 150 GeV stage, with half of the magnets, would be 1100 MSF with a construction time of eight years.

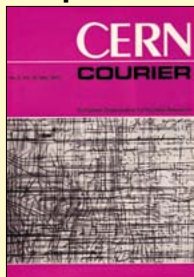
A significant aspect is that such a machine could be built not only on any of the five sites offered but also adjoining the existing Laboratory at CERN-Meyrin with further savings in cost and manpower. With the new accelerator next door, the existing CERN PS could, at least initially, serve as injector, eliminating the Booster from the construction programme, and the first experimental area for physics could be the existing PS West Hall. By the time of first high-energy beams this Hall will be exceptionally well equipped, including the 3.7 m European hydrogen bubble chamber and the "Omega project" for counter physics.

The exciting thing about this modification of Project B is that it opens up the possibility of physics at higher energies by the beginning of 1976 (if the project can go ahead in 1971) rather than several years later.

The discussion is continuing but already much has crystallized out. It is recognized that it is of supreme importance to move quickly if particle physics in Europe is to retain in the coming decades the excellent standing it has now.

● Compiled from texts on pp146–147.

Compiler's Note



The machines being designed in 1970 to deliver external beams were later transformed into colliders, to exploit the huge gain in centre-of-mass energy when particle beams crash head-on.

CERN's 300 GeV project, the Super Proton Synchrotron (SPS), did indeed start operation in 1976 and at 400 GeV. But by 1981 it had become a collider, providing proton–antiproton collisions at 540 GeV and by 1983 the W and Z vector bosons of the weak force had been discovered (p27).

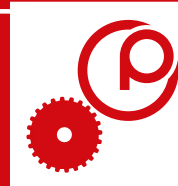
The Main Ring in what became Fermilab, Batavia, had already delivered 400 GeV protons by the end of 1972 and the bottom quark was discovered there in 1977. Revamped into the Tevatron, proton–antiproton collisions were produced at 1.6 TeV in 1985 and 1.8 TeV in 1986, and the discovery of the most massive quark, the top, was announced in 1995.

At CERN, the PS and the SPS are now in the injector chain of the Large Hadron Collider, where physics runs began in 2010 with two 3.5 TeV proton beams. Already a Higgs particle is in sight (p21). With spin 0, this scalar boson will be something different, neither matter nor force ...

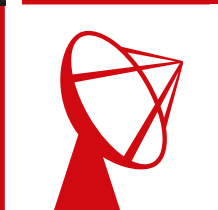
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Alan Jackson, former Technical Director of the Project (ASP)



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