

Late news: On 13 October Fermilab (US) achieved its first collisions of proton and antiproton beams, at a record-high total energy of 1.6 TeV (1600 GeV, 800 GeV per beam) and first events were recorded – a fine achievement by both the machine and experimental physicists.

The Texas Accelerator Center concentrated on another approach aiming for simplicity in construction and hence lower fabrication costs. Their design is a low field superferric magnet in which the field configuration is partly determined by the shape of the iron pole pieces. With the enthusiasm and motivation of a new Laboratory, they made quite remarkable progress in developing this concept. Evolving through several pole face and conductor configurations, they built and tested a series of magnets. They also pushed collaboration with industry further than the other Laboratories and had magnets built by General Dynamics.

Since the design field of the superferric magnets is 3 T, the corresponding storage ring is much larger (about 160 km) than for the high field type. The TAC therefore paid a lot of attention to ways of reducing tunnelling costs. In collaboration with the Texas Engineering Experiment Station of A. and M. University, they have started investigating a new tunnelling technique (known as CUTS – Continuous Unitized Tunnelling System) which is a horizontal version of the familiar technique used for the continuous forming of concrete liners such as is used in the building of silos. This development could obviously have important applications outside the field of accelerator building.

There have been several important steps over the past year en route to the final decision. A Technical Magnet Review Panel reported last December guiding the participating Laboratories as to the information that they would need to have in place prior to the decision. They also presented a final

report conveying their opinions on technical aspects. An Aperture Task Force studied the particle dynamics of the proposed machine and fed back to the magnet experts the implications for the magnet aperture. Two other task forces were set up by the SSC Central Design Group – a Cost Comparison Task Force, whose role was obvious, and an Operations and Commissioning Task Force whose role was to examine the operational implications of each of the proposed magnets.

Finally a Magnet Selection Advisory Panel was set up under the Chairmanship of Frank Sciulli with Eberhard Kiel, Neal Lane, Michael McAshan, John Rees, E. Parke Rohrer, Alvin Tollestrup, and Bjorn Wiik. There were also three industrial consultants. They met at Berkeley at the end of August and their unanimous decision for the high field magnet was accepted by Maury Tigner, Director of the SSC Central Design Group, who announced the decision on 19 September. This magnet was preferred because of its well understood behaviour and for several relative cost implications of its corresponding ring size.

Much work remains to be done to refine the design and optimize the magnet cost. It is hoped that all the Laboratories will participate in this further work. Meanwhile other preparatory steps towards project authorization have been taken. A 'Siting Parameters Document' was issued in June giving general guidance on the various criteria (both technical and social) which should influence the selection of the site for the Collider. These criteria are helping States keen to be host to the SSC to prepare their proposals.

CERN U(A)pgrading

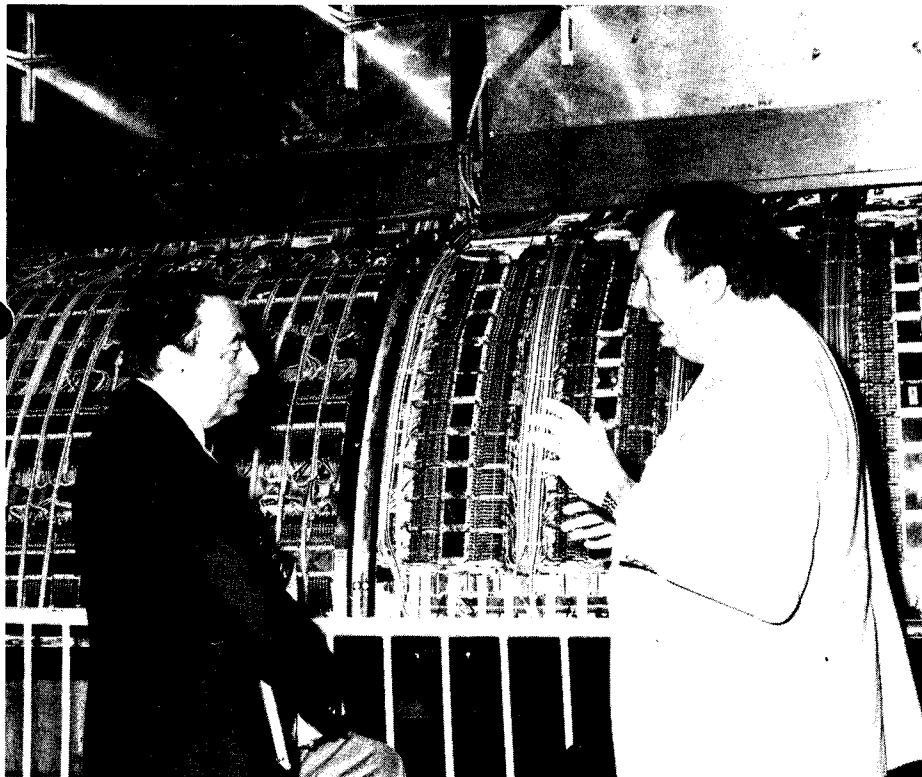
With a sizeable clutch of physics discoveries already to their credit, the big UA1 and UA2 experiments at CERN's proton-antiproton Collider are one of the big success stories of modern physics. Not content with resting on these laurels, both experiments have embarked on major refits to take advantage of the improved collision rates which will be available when the new ACOL Antiproton Collector Ring comes into operation in 1987.

The initial phase of UA1's improvement programme involved installing new muon shielding and detection systems, a new microvertex detector immediately surrounding the beam pipe, and a faster and more powerful data acquisition and triggering system (see June 1984 issue, page 189). These new elements are being run in during the present Collider run, so that further improvements can be carried out during the long Collider shutdown, beginning next year, when the new ACOL ring will be installed.

When the initial UA1 design was drawn up, convincing evidence for confined sprays ('jets') of hadrons had yet to be seen. At Collider energies, jet physics has become a key feature. To improve the performance of the detector both for this work and for W and Z physics, the UA1 team is planning a further upgrade with a new fine-grain uranium calorimeter for both hadronic and electromagnetic energy measurement. The detecting medium will probably be a liquid operating at room temperature if a

Carlo Rubbia (right) explains the tracking chamber of the UA1 experiment at CERN to Erich Bloch, Director of the US National Science Foundation. The UA1 detector is undergoing a series of upgrades to exploit improved proton-antiproton collision rates.

(Photo CERN 97.6.85)



safe liquid can be made to work satisfactorily. Successful results have already been obtained with tetra-methyl silane (TMS), but this boils too easily (26.5°C).

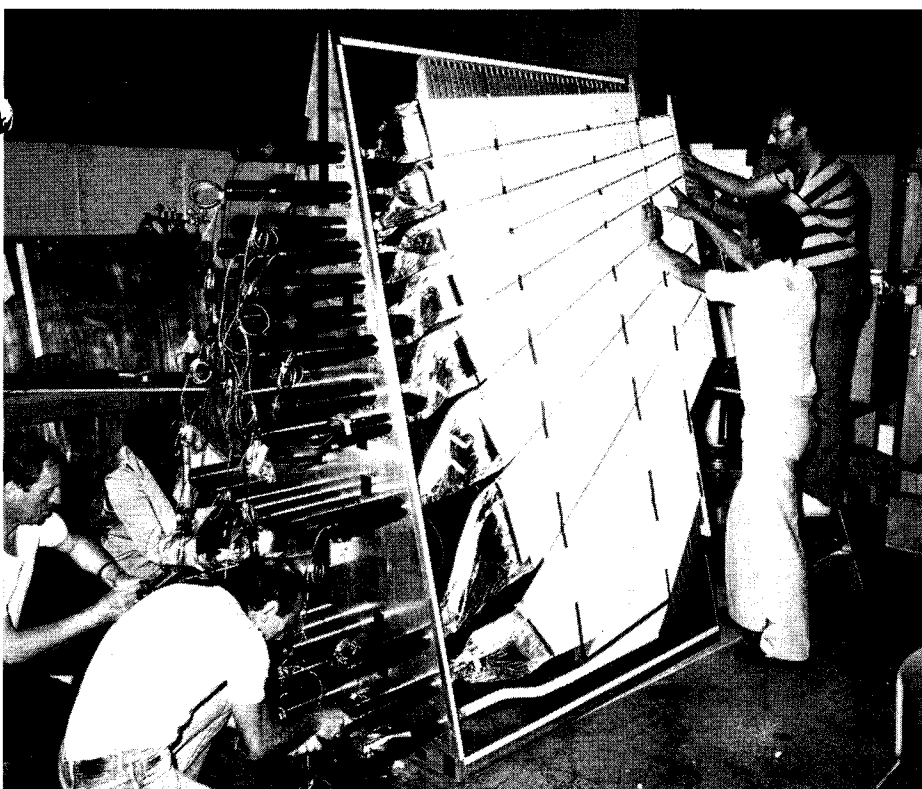
The UA2 detector is likewise undergoing a thorough facelift. A modified collaboration (Bern/Cambridge/CERN/Milan/Orsay/Pavia/Pisa/Saclay) is rebuilding the apparatus to provide better solid angle coverage, especially in the forward zones, and to improve the electron signal. The new UA2 lineup includes members of the Cambridge (UK) team from the UA5 streamer chamber experiment which used to alternate with UA2 for Collider data-taking.

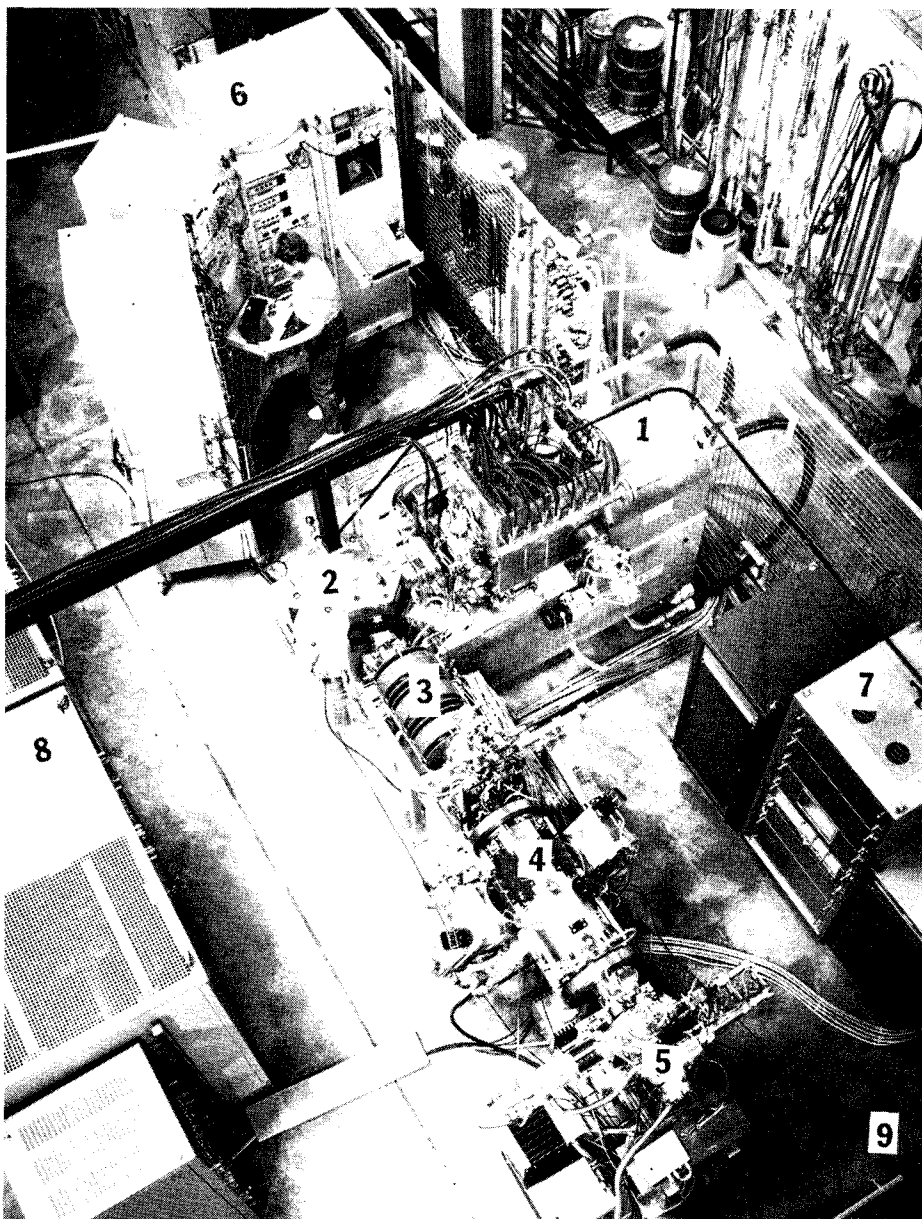
Prototype equipment for the endcaps to close the detector (calorimetry, preshower counters and triggering) have been successfully tested. The main central calorimeter will benefit from new jet vertex detection (the flash analog/digital conversion readout system is already installed), silicon hodoscopes and transition radiation detectors. The use of scintillating fibres is planned to provide a compact good resolution tracking device to make room for the new transition radiation units.

To further increase the power of the detector, the UA2 team is introducing a new data acquisition and triggering system based on the FASTBUS standard and using the new generation of microprocessor-based emulators. The overhaul is scheduled to be complete when the Collider, boosted by the new ACOL ring, switches on again in 1987.

Assembling equipment (calorimetry, to measure energy deposition) for the new endcaps of the UA2 experiment at the CERN SPS proton-antiproton Collider.

(Photo CERN 991.7.85)





Whiff of oxygen

The oxygen ion injector, which will be installed on linac 1 at the CERN proton synchrotron, is seen here undergoing tests at GSI Darmstadt. The indicated components are – 1) ion source from CEN Grenoble, 2) analysing magnet and 3) beam transport from Darmstadt, 4) radiofrequency quadrupole from Berkeley (see below), 5) beam monitor, 6) control unit, 7) ion source generator, 8) ion source power supplies, 9) RFQ generator from CERN.

The tests at Darmstadt went very well. More than 95 per cent of the 80 microamp current of oxygen ions could be transmitted through the injector. The injector is being transferred to CERN and first tests on Linac 1 are scheduled for February of next year. Several experiments to use the ion beams are being prepared and will be covered in a forthcoming article.

(Photo Darmstadt)

A radiofrequency quadrupole has been completed at Berkeley as part of the Berkeley/CERN/Darmstadt collaboration's goal of doing experiments with oxygen 16 ions in the CERN machines. Seen here is the Berkeley RFQ team, left to right, Bob McGill mechanical technician, r.f. engineer Don Howard, design physicist John Staples and project leader Rick Gough.

(Photo Berkeley)

