

CERN Courier Archive: 1970

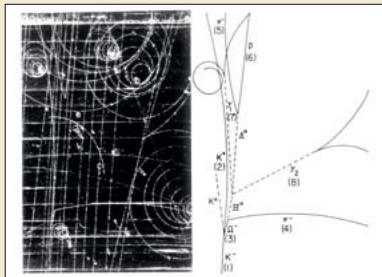
A LOOK BACK TO CERN COURIER VOL. 8, JULY/AUGUST 1970, COMPILED BY PEGGIE RIMMER

NEWS FROM ABROAD

Brookhaven AGS 10th anniversary

The Brookhaven Alternating Gradient Synchrotron AGS really started in 1952. The Cosmotron had accelerated protons beyond 2 BeV (not yet called GeV) and although the machine was still too rickety to do real research, it was clear that the proton synchrotron could be extended to any size. CERN was being established to build on the next larger scale (we did not yet know that the Russians were embarking on the Synchrophasotron) and it seemed straightforward to extrapolate the technique, until one looked critically at the technical and financial problems. Then Courant, Livingston and Snyder hit on alternating-gradient focusing and realized that they had really struck something.

On 29 July 1960, the AGS accelerated proton beams to peak energy [30 GeV] for



the first time. Its operation was just pipped by the CERN PS [on 24 November 1959] but, with the experience of the 3 GeV Cosmotron and 6 GeV Bevatron behind them, [the Americans] were the first to get going with an excellent research programme.

High-energy physics began in December

One of the most famous photographs in the history of high-energy physics, taken in the 80-inch bubble chamber at Brookhaven in 1964, in which an Ω^- particle, whose existence was a crucial prediction of unitary symmetry theory, was first found. Negative kaons enter from below and the sequence of interactions from which the Ω^- was identified is shown. (Image credit: BNL.)

1960 and many of the plums in the newly available energy range – including such sensational discoveries as the existence of two types of neutrino, the identification of the omega minus and the first observation of CP violation – fell to the AGS.

● Compiled from texts on pp210–21, 222–223.

Oxford's fast PEPR System

A PEPR [precision encoding and pattern recognition] device, constructed at Oxford University in 1966–67, has measured film of 13,000 events of 740 MeV/c negative pion–proton interactions at rates of 150 to 430 events per hour. The upper rate is obtained when measuring two prong events (on average one per 4 frames) for which frame number, topology and vertex guidance have been pre-defined at a conventional scanning table.

PEPR is a CRT line digitizer of the type first constructed by L Pless at MIT. It uses a PDP6 computer and the programs occupy 30 K words of storage, with the general strategy of the successful POLLY system at Argonne, which enables tracks associated with a vertex to be rapidly distinguished.

The main difference from POLLY is that detection and measurement of tracks is done using a 1-mm line image. A fast, track-following program, the only part not written in Fortran IV, maintains the line tangential to the track while predicting along its length. A typical beam track from the 80 cm [Saclay] hydrogen bubble chamber [at CERN] can be measured in about 60 ms. The program outputs “master points” on all tracks associated with a vertex in a given view, and an off-line program MATCHes the images from all three views, discarding redundant tracks. Remaining tracks are input to the geometrical reconstruction program.



PEPR programs include HELP facilities that show, on a monitor, a scan of any area of film in which some ambiguity has arisen. The operator can then indicate exact vertex position, etc. using a light pen. However, this attempt to rescue doubtful events reduces the

The Oxford PEPR system for the automatic measurement of bubble chamber film. (Image credit: Oxford University)

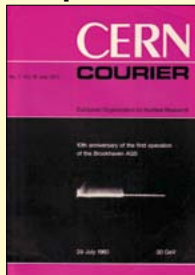
measuring rate to 150 events/hour.

In future, a compromise may be adopted in which events whose beam track is not clearly distinguishable in at least two views in the pre-scan are not presented to PEPR. This will reduce operator intervention to around 5% of events and maintain a measuring rate of 200–300 events per hour.

Development work [is planned] to dispense with pre-scan information where film quality is good, and a three-view PEPR is being constructed to allow immediate access to other views of a given track, avoiding the present disadvantages of “post mortem” matching.

● Compiled from texts on pp258–259.

Compiler's Note



The discovery of two neutrino types at Brookhaven's AGS in 1962 and of CP violation in 1963 led to Nobel prizes in physics in 1968 and 1980, respectively. The simultaneous discovery at the AGS and at SLAC of the J/ψ particle in 1974, and therefore the first evidence for the charmed quark, was rewarded with yet another Nobel prize in 1976. Like the Proton Synchrotron at CERN, the AGS continues in service to this day.

With the electronic era of particle-physics detectors fast approaching, pattern recognition of events on bubble-chamber film was reaching its zenith in the late 1960s. Some of those marvellous measuring machines – part mechanical, part electrical and part whatever else was needed (one incorporated a fishing net) – were worthy of Heath Robinson.

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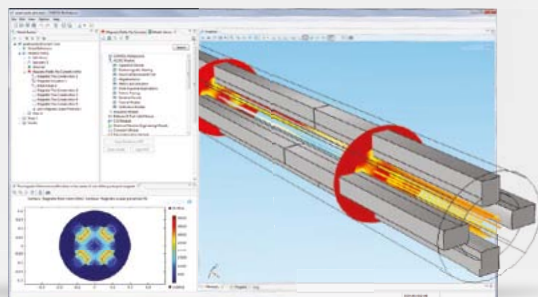


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