

in the AGS from tandems and the addition of a booster to achieve ions across the periodic table. Four dipole prototypes for RHIC have been tested with results above the 3.45 T design field.

Kaon factories (high intensity proton synchrotrons of several tens of GeV for copious production of kaons and other particles) were reviewed by Mike Craddock. Four such machines are at present on the table in Canada, Europe, Japan and USA but none has yet received construction authorization (see April issue, page 23).

Graham Rees reported on the operation of the ISIS intense neutron source at the UK Rutherford Appleton Laboratory. The high

intensity proton synchrotron has been in action for just over a year and is now feeding six neutron beam instruments (four more are under development). Muon spin rotation work and a neutrino experiment should start soon. The machine intensity has reached 50 microamps and the operating energy is 550 MeV. This will be increased to 100 microamps and 750 MeV in the near future. (An interesting implication of dealing with such high intensities in the neutron source is that ISIS is one of the few machines in the world where the operators are keen to increase the beam emittance!) European co-operation (France, Germany, Italy and Sweden) is in-

involved in longer term development options which include an additional target station and the rebuilding of the linac — the least reliable element of the machine at present.

Forthcoming attractions

This first report from the Washington Conference concentrates on news from particle/nuclear physics machines. In our next issue we will cover some of the accelerator news at the meeting from other fields.

By Brian Southworth

Around the Laboratories

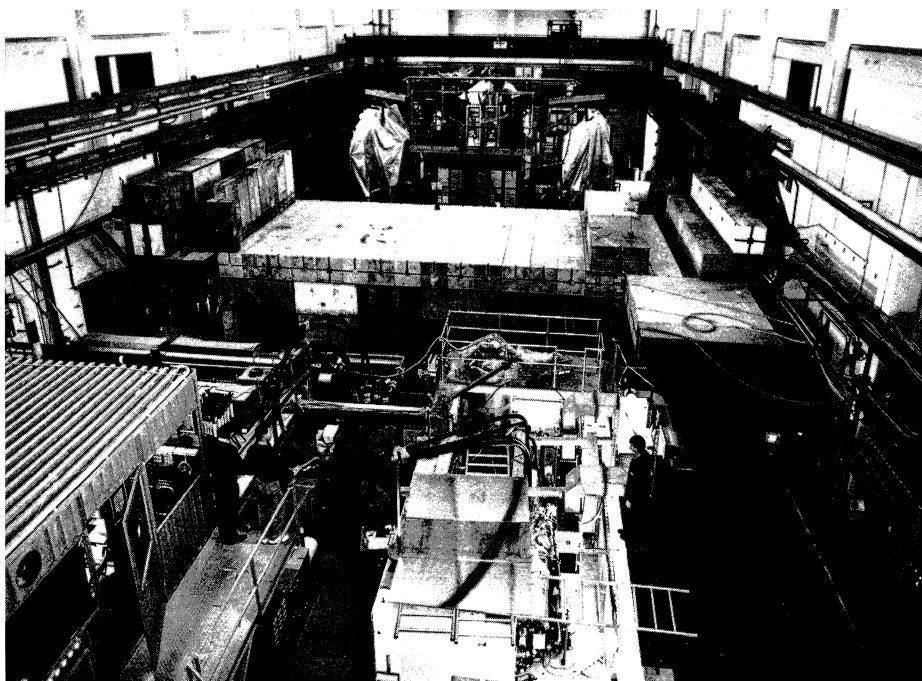
DESY PETRA II

After the successful start for the new DESY II electron synchrotron at the German DESY Laboratory in Hamburg (see April issue, page 14), the PETRA ring restarted operations on 8 March as PETRA II. Both these second generation rings will be used to handle particles destined for the HERA electron-proton collider now under construction.

PETRA II is a substantial modification of the ring used from 1978 to 3 November last year (see January/February issue, page 23) for electron-positron collision physics.

With the CELLO experiment retired in the background, the beam pipe of the substantially modified PETRA ring is now encased in concrete blocks. In the foreground is a superconducting cavity test installation.

(Photo DESY)



Blazing a trail for protons

On April 1 at the DESY Laboratory in Hamburg, a 7 GeV positron beam produced by the new 'DESY chain' of machines (Linac II, PIA, DESY II and PETRA II) was fired into a beam dump in the still incomplete tunnel being excavated for the HERA electron-proton collider, blazing the injection trail for the HERA protons. In the meantime DESY's new proton source is being put through its paces, pending construction of the new DESY III synchrotron to handle the proton beams prior to injection.

After the shutdown, the four big experiments (CELLO, JADE, Mark-J and TASSO) were removed from the ring, together with the big focusing quadrupoles, the mini-beta high luminosity quadrupoles and the electrostatic beam separators. Of the four experiments, only the CELLO set-up was retained, out of the beam, as a standby for eventual future use. Concrete shielding was placed around the ring in the former experimental halls and 500 metres of new vacuum pipe added, together with ancillary vacuum equipment.

As well as taking care of electrons (and positrons), the new PETRA ring will also be called upon to handle protons. All radiofrequency accelerating cavities were removed from the PETRA North Hall and most of the remainder switched off. These will later find

their way to the main HERA ring. To run PETRA with 14 GeV electrons, only 16 cavities are necessary. These will be positioned in the South Hall, but must be bypassed in future by the proton beam, taken to 40 GeV prior to injection into HERA.

The modified ring structure and the new beam optics required a different arrangement of focusing elements. In addition, septum and kicker magnets for particle ejection were installed in the North straight section. All this transformation work took only four months.

FERMILAB Short-lived study continues

According to the almost exact theoretical principle of combined charge conjugation/parity (CP) invariance — under which particles and antiparticles are interchanged and left and right are switched round — the neutral kaon comes in two forms, a short-lived variety, preferring to decay into two pions, and a long-lived one, disintegrating mainly into three pions.

In 1964, the classic experiment of J. W. Cronin and V. L. Fitch at Brookhaven revealed that CP invariance was not exact. About one long-lived neutral kaon in five hundred was seen decaying into two pions. Subsequent CP-violation studies found other unusual decays of the long-lived neutral kaon. Now experiment E621 at Fermilab (a Michigan/Minnesota/Rutgers collaboration) has looked for CP violation through unusual (three pion) decays of the short-lived neutral kaon.

W goes West

On March 26, the first candidate W particle — the electrically charged carrier of the weak nuclear force — was seen in proton-antiproton annihilations at the Fermilab Tevatron by the big CDF detector. The Tevatron's luminosity figure was about $7 \times 10^{28} \text{ cm}^{-2} \text{ s}^{-1}$, about the same as CERN's collider when the first-ever W events were recorded towards the end of 1982. However the Tevatron is operating at 1800 GeV collision energy, compared with 540 GeV at CERN in 1982. The Fermilab 'new world' W gives a clean 36 GeV electron coming out almost perpendicular to the colliding beams.

To make a beam of long-lived neutral kaons and study their CP-violating decays is relatively easy — just sit a long way from the kaon production target so that all the short-lived neutral kaons have gone. For the short-lived variety, this trick doesn't work, so CP violation has to be sought close to the production target in the delicate interference effects between the two kinds of kaons.

A 800 GeV proton beam from the Tevatron was split into two and led to two kaon production targets, one 25 metres upstream of the other, and the characteristics (acceptance) of the detector measured using the almost pure long-lived kaon decay sample from the upstream target.

E621 was the first experiment in the Proton Center beamline at Fermilab to run using 800 GeV