Japanese physics

Accelerator swings into action

Tokyo

JAPAN's High Energy Physics Laboratory, KEK, has achieved a world's first by boosting the electron beam in the 3-km main storage ring of TRISTAN to 25.5 GeV during a test run of the accelerator. If tests of the positron beam go according to plan, the first collision experiments will begin before the end of the year and TRISTAN can enjoy a spell as the world's number one electron–positron collider. But plans for electron–proton collisions have been dropped in the face of competition from West Germany's HERA electron–proton collider.

TRISTAN, which has taken five years and Y87,000 million (£388 million) to build, consists of a 2.5-GeV linear accelerator that feeds electrons and positrons into an accumulator ring where they are boosted to 6.5–8 GeV before injection into the main ring. Radio-frequency cavities in four long, straight sections of the main ring accelerate the counter-rotating bunches of electrons and positrons which can be squeezed by superconducting magnets and smashed together in the middle of each straight. But as the electrons/positrons traverse the bends of the main ring near the speed of light, energy is released as synchrotron radiation, a loss which limits the power of the accelerator.

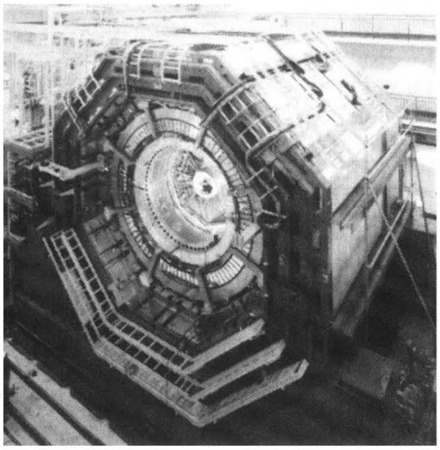
The record just set by TRISTAN exceeds the maximum of 23.5 GeV achieved by the PETRA ring in Hamburg, although TRISTAN's electron-beam current was only 0.4 mA. The KEK scientists are racing to raise this to 2–3 mA, the minimum required for collision experiments. VENUS, the first of TRISTAN's four detectors, is "about 70 per cent complete" and the first electron–positron collisions may be performed on schedule at the end of this month, according to KEK director Tetsuji Nishikawa.

Commissioning of TRISTAN ahead of US and European rivals will be a major triumph for Japan's high-energy physicists who have been struggling to put Japan back on the map since the end of the Second World War when the country's four largest cyclotrons were dumped at sea by US marines because someone in Washington feared they could be used to make atomic bombs.

But TRISTAN's dominance may be short-lived. The Stanford Linear Collider (SLC) has already taken electrons up to 37.5 GeV towards its target of 52 GeV with the prospect of electron–positron collisions in February or March 1987.

Nishikawa, however, is confident that with its higher luminosity and wider, stable beams TRISTAN will have advantages over SLC — the beams of SLC are only about a micrometre across and there will be difficulty in making them collide.

Among the particles TRISTAN may find are the top quark, Higgs particle, supersymmetric particles and fourth generation leptons and quarks, if they exist. But KEK scientists will also be looking for "totally unexpected and new phenomena in the new energy frontier".



TRISTAN will continue to consume large amounts of money, mainly in the form of electricity bills. In this fiscal year (until April 1987), Y6,000 million (£27 million) has been allotted by the Ministry of Education, Science and Culture for operation costs, enough for 1,000 hours. KEK is hoping for 1,800 hours at a cost of Y10,000 million in fiscal year 1987.

Next March, 40 radio-frequency cavities will be added to the main ring, bringing the beam energy up to about 28 GeV, and the addition of superconducting cavities in 1988 is expected to boost this to 33 GeV, a matter of months before the LEP electron–positron collider ring at CERN is due to come on line at 50 GeV.

KEK also plans to use the main ring as a 10-GeV synchrotron radiation source, which could be another first for Japan, but the most ambitious plan of all for TRISTAN has been abandoned.

Since TRISTAN was first proposed in 1973, it had been intended to include a proton storage ring alongside the electron–positron ring to allow electrons at 30 GeV to collide with protons of 300 GeV. Space for the proton ring was made in the 3-km tunnel of the main ring and a 12-GeV proton synchrotron built at KEK in 1976 would have provided the protons. But West Germany's decision to build the larger HERA electron–positron collider at Hamburg by 1990 has apparently caused Japan to change its plans. The main reason, says Nishikawa, is that HERA, which will smash 30-GeV electrons against protons of at least 820 GeV (with even higher energies in prospect), will be much more likely to reveal quark structure.

David Swinbanks

One-way crossing

THE British electrical utility, the Central Electricity Generating Board, began last Thursday to draw some 1,500 MW of cut-price electricity from France along four pairs of high-power cables recently laid across the English Channel. The French generating system is now more than 70 per cent nuclear and has over-capacity. Under the 1–2-year deal between CEGB and its opposite number, Electricité de France, the British board will take at least 1,000 MW continuously at a cost 25 per cent below 'average' generating costs in Britain, and 'part' (typically 500 MW according to CEGB) of the remaining 1,000 MW capacity of the link at the same cost. The link is two-way, so British electrical exports to France are possible, but none is planned. The power thus to be drawn by Britain from France exceeds the capacity of a single pressurized water reactor, such as that CEGB wishes to build at Sizewell in Suffolk, and on which the planning enquiry report is now imminent.

Robert Walgate

What anniversary?

THE BBC (British Broadcasting Corporation) is this week celebrating the fiftieth anniversary of its first television broadcast with a series of past performances almost calculated to meet the Conservative (and government) party's charge than the BBC's news reporting is biased; past politicians are mocked with an even hand. But readers should judge for themselves, from this extract from *Nature* (**78**, 151; 1908), whether the BBC is celebrating the right anniversary. □

Distant Electric Vision.

REFERRING to Mr. Shelford Bidwell's illuminating communication on this subject published in NATURE of June 4, may I point out that though, as stated by Mr. Bidwell, it is wildly impracticable to effect even 160,000 synchronised operations per second by ordinary mechanical means, this part of the problem of obtaining distant electric vision can probably be solved by the employment of two beams of kathode ray (one at the transmitting and one at the receiving station) synchronously deflected by the varying fields of two electromagnets placed at right angles to one another and energised by two alternating electric currents of widely different frequencies, so that the moving extremities of the two beams are caused to sweep synchronously over the whole of the required surfaces within the one-tenth of a second necessary to take advantage of visual persistence.

Indeed, so far as the receiving apparatus is concerned, the moving kathode beam has only to be arranged to impinge on a sufficiently sensitive fluorescent screen, and given suitable variations in its intensity, to obtain the desired result.

The real difficulties lie in devising an efficient transmitter which, under the influence of light and shade, shall sufficiently vary the transmitted electric current so as to produce the necessary alterations in the intensity of the kathode beam of the receiver, and further in making this transmitter sufficiently rapid in its action to respond to the 160,000 variations per second that are necessary as a minimum.

Possibly no photoelectric phenomenon at present known will provide what is required in this respect, but should something suitable be discovered, distant electric vision will, I think, come within the region of possibility.

A. A. CAMPBELL SWINTON.

66 Victoria Street, London, S.W., June 12.