

Japanese success

Aerial view of the Japanese KEK Laboratory showing the 3 kilometre TRISTAN ring with its four straight sections. At the top can be seen the building housing the injectors, including the 400 metre linac.

A few days before the fifth anniversary of its 19 November 1981 groundbreaking ceremony, the gleaming new TRISTAN colliding beam accelerator at the Japanese KEK Laboratory smashed together contrarotating 25 GeV beams of electrons and positrons, setting up a new world electron-positron collision energy record of 50 GeV, and with the promise of more energy to come.

Several days after the initial collisions in the ring on 14 November, the big VENUS detector surrounding the collision point in the 'Fuji' experimental hall saw its first electron-positron events. Maximum luminosity in the initial run was a modest $2.6 \times 10^{29} \text{ cm}^{-2} \text{ s}^{-1}$, but this will surely be coaxed much higher in the months to come.

TRISTAN's positrons (antielectrons), manufactured by a high current (around 10 A) 200 MeV electron beam from a linac hitting a tantalum target, are collected and accelerated to 250 MeV in a second linac. They are then fed into the appropriate point of the 400 m linac operational since 1982 as the injector for KEK's 'Photon Factory' for synchrotron radiation. This linac has been modified to provide short (less than 1 ns) pulses to enable electrons and positrons to be injected in a single radiofrequency accelerating 'bucket'.

Leaving the long linac at 2.5 GeV, the particles pass into a 377 m-circumference Accumulation Ring. When the current reaches a sufficient level (about 10 mA), they are accelerated to between 6.5 and 8 GeV ready for injection into the three kilometre Main Ring.

Acceleration in the Main Ring is currently handled by 64 units of nine-cell radiofrequency accelerating cavities of the Alternating Per-



iodic Structure type (508 MHz) driven by 16 1 MW (cw) klystrons. This equipment is installed in two of the machine's four straight sections.

TRISTAN's curved sections use 272 5.86 m bending magnets, 280

0.8 m quadrupoles and 240 sextupoles. Additional quadrupoles are installed in the straight sections.

Main Ring tests got underway on 16 October with injection of 6.5 GeV electrons from the Accu-

The VENUS detector in position in the TRISTAN Main Ring, showing the casing of the electromagnetic shower counter barrel.

(Photos KEK)



mulation Ring. On 22 October the control room reported a 1 ms spiralling beam, limited by synchrotron radiation losses, and just two days later efforts were rewarded as the obedient electrons went all the way to 25.5 GeV. This was soon followed by injection and acceleration of positrons.

The TRISTAN team is particularly proud of achieving acceleration of electrons and positrons to 25.5 GeV in the initial tests without deploying any steering correction magnets. A fully computerized control system and high speed optical fibre communications also contributed significantly to the fast commissioning.

Initial studies concentrate on improving Main Ring performance, with both VENUS (superconducting magnet, conventional tracking) and the smaller AMY detector profiting from beam tests. AMY is operated by a highly international team (US, Korea, China and Japan — see November 1985 issue, page 387). The big TOPAZ detector is com-

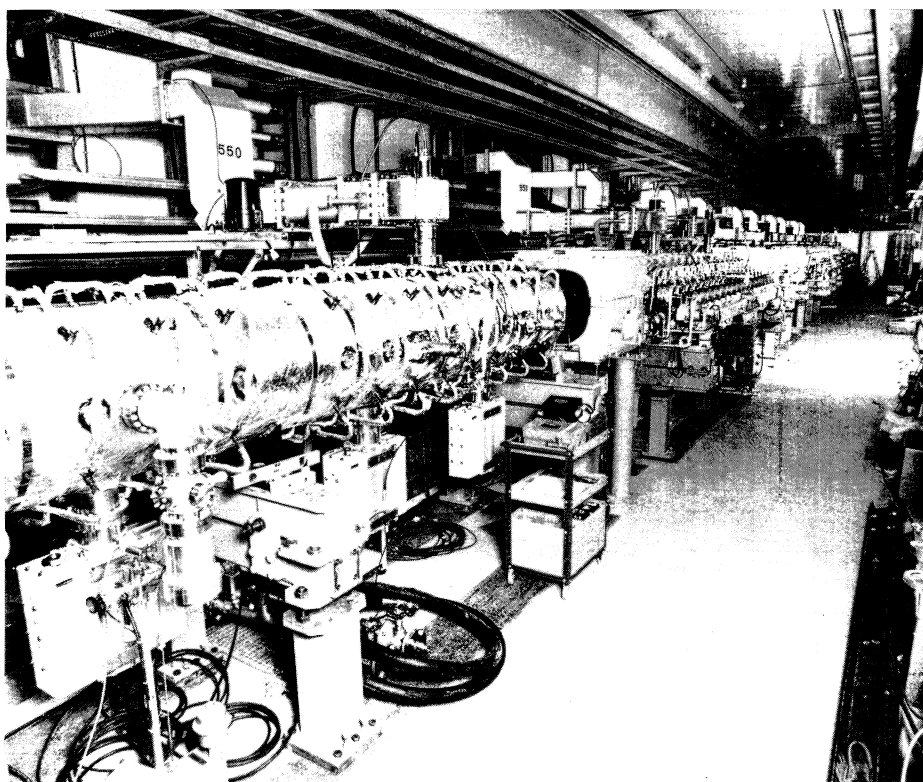
plete but is undergoing further trials before being rolled into the ring.

Next objective is to install 40 additional r.f. cavities of the same type into a third straight section, aiming for beam energies close to 30 GeV. With the TOPAZ detector scheduled to be in position by the spring, the full TRISTAN experimental programme should be underway early in May.

With TRISTAN, Japan joins Europe, the US and the Soviet Union in the centre stage of world particle physics.

Meanwhile at Stanford the new Linear Collider is being prepared to take electron-positron collisions to even higher energies.

▼ *One of the two strings of radiofrequency accelerating cavities. A third is being installed to take the beam energy towards 30 GeV.*



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