SLAC calls time out on Stanford linear collider

- Particle collisions disappoint
- Earlier mode of operation planned

Berkeley

THE attempt by the Stanford Linear Accelerator Center (SLAC) to build an innovative electron-positron linear collider (SLC) has stalled. After a series of technical problems, the new machine has been temporarily shut down, and the facility will revert to its earlier mode of operation, with separate electron and positron storage rings. The goal now is to make changes that will allow the accelerator complex to switch between the two modes.

SLC is a technically daring addition to the linear accelerator, from which it takes beams of electrons and positrons alternately to send them around separate curving arms to a collision point. It was begun in 1983 as a competitor to LEP, a more conventional circular electron-positron collider at CERN, the European Laboratory for Particle Physics near Geneva, Switzerland, and is the brainchild of Burton Richter, who succeeded Wolfgang Panofsky as director of SLAC in 1984.

The new machine was finished on schedule last year, but by then CERN had already won the race to find the W and Z⁰ particles of electroweak unification. Still, US high energy physicists hoped that SLC would be the first machine to produce the Ws and Z⁰s in large quantities, allowing their properties to be studied in detail.

But SLC has not worked as planned. The beams have proved difficult to focus and control, and the collision rate has been low. Meanwhile, LEP is scheduled for completion next summer, and SLAC's 2-GeV and 14-GeV storage rings, which depend on SLAC's linear accelerator for the generation of particle beams, have been lying idle for two years, longer than was originally expected, while all energies were devoted exclusively to the development of the SLC.

The decision to shift some emphasis back to use of the storage rings was driven by the need of those projects for new data, said SLAC spokesman Michael Riordan, coupled with the fact that the SLC would need to be shut down for further modifications.

Last month, after several weeks during which the operation of SLC had been plagued by breakdowns, Richter removed Rae Steining, head of the accelerator division, from his post and stepped in himself with a taskforce to tackle the collider's problems (see *Nature* 334, 554; 1988).

Following the recommendations of the

taskforce, SLAC will make several modifications to SLC this autumn, including the addition of 400 tons of magnets to help deflect background radiation generated by the spreading of the particle beams as they travel through the collider's opposing arcs.

Later in the year, SLAC physicists hope to bring SLC back on line, in conjunction with the storage rings. In theory, the accelerator can be used to operate the SLC for periods of 2–3 hours, interrupted by half-hour pauses needed to fill the storage rings. But the transition between modes promises to be difficult and time-consuming at first.

While this shift in priorities may seem destined further to impede the progress of the SLC, Riordan insists that SLAC is not "giving up"; he hopes to be running the SLC and the storage rings in tandem by next February, and to characterize the Z⁰ particle by the end of next summer. Such an accomplishment would help win the favour of Congress for future colliders based on the SLC prototype.

With hindsight, SLAC officials say the SLC design cut too many corners. But despite the handicaps of ageing equipment and cost cutting, they believe that they have proved the principle of using linear accelerators as a source of particles for colliding machines. "We have made small micron-size beams and brought them into collision", said Riordan. "But it would certainly help our case to make a few thousand Z⁰s before LEP comes on line."

Marcia Barinaga

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IMAGE
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REASONS

Down the tube: a view into the damping ring vault from the tunnel linking the ring to the linear accelerator. This photograph was taken during construction, before the tunnel components had been installed.

US embarks on radon testing

Washington

THE US government last week declared radon gas a national health hazard and recommended that every home should be tested for the presence of the radioactive material. The announcement triggered a sell-out of domestic radon test-kits, a stock-market boom for companies that make them and a flood of telephone calls to the Environmental Protection Agency (EPA).

The latest surge of interest in the hazards associated with radon came after a survey commissioned by EPA of 11,000 homes in seven states which has shown that high radon concentrations are much more common than expected. Radon gas forms radioactive decay products that, when inhaled, can damage lung tissue. EPA and the Surgeon-General's Office now estimate that radon is the largest cause of lung cancer after cigarette smoking, and may cause 20,000 lung cancer deaths a year in the United States.

The dangers of radon have long been recognized in other than domestic settings, in uranium mines for example. Interest in the domestic hazards of radon was heightened by an influential reassessment of radon as a contributor to the natural radiation dose published earlier this decade (see *Nature* 290, 99; 1981) and, more recently, by the recognition of high radon concentrations in houses built on uranium-bearing rocks in the Appalachian region. These data suggest that modern buildings minimizing draughts are prone to high concentrations of the gas.

Risks of lung cancer from radon have been calculated from the incidence in people working in uranium mines, where radon levels can be very high. A detailed analysis was released in 1984 by the United Nations Scientific Committee on the Effects of Atomic Radiation. The US government did not begin to worry about radon in homes until 1986, however, when EPA published booklets explaining the problem and began national monitoring.

As the results came in from the EPA survey it was soon apparent that the problem is even more serious than had been thought. Levels of radon vary enormously — even between two houses in the same street. And high levels of radon are not necessarily confined to areas with particular kinds of rocks beneath them.

Given the scale of the problem, the joint conclusion of EPA and Surgeon General's Office is that people should test their own homes. Radon monitors are available at low cost. And high radon levels can usually be reduced quite simply and cheaply by increasing ventilation and sealing off the ground beneath a house.

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