

Confidence at SLAC

Preparations for the new linear collider at SLAC. Here a precision alignment team check a raft of magnets in the new Damping Ring. Beam has now been carried round the ring.

(Photo Joe Faust)

SLAC Director 'Pief' Panofsky had reason to be enthusiastic when he gave his traditional 'State of SLAC' speech earlier this year. Although at the time the US President's budget, even for fiscal year 1983 (which began on 1 October 1982), had not yet been passed by Congress, the news is far from bad. At a time when US public sector spending is being cut, high energy physics could have come off a lot worse. In particular, the SLAC Linear Collider (SLC) project has been recommended by the President for authorization in fiscal year 1984. SLC would provide 100 GeV energies by making electron and positron beams from a linac collide head-on, rather than using the conventional storage ring solution. (See January/February 1982 issue, page 8.)

'The most exciting part of the President's budget is that it recommends authorization to commence construction of the SLAC Linear Collider in fiscal year 1984. It specifically recommends that \$40 million be appropriated for this first year of construction. This is very close to the amount which we had requested. Therefore, should the Congress follow the President's recommendations, we can say that the speed with which we can get SLC construction work under way will be limited mainly by our ability to perform, rather than by any external financial limitations.

Happily we should be able to move ahead with the SLC construction quite rapidly once the next fiscal year begins in October 1983, provided, of course, that the Congress has indeed acted favourably. In contrast to the situation which some of you remember in respect to the PEP ring, we will be able to complete this fiscal year, that is before October 1983, the detailed design of the various 'civil



works' which are needed to house the SLC. Thanks to the work of our engineers, steady progress has been made in preparing final design drawings for the SLC tunnel and the junction of these tunnels into the SLAC beam switchyard. Thus, if things go as planned, we will issue competitive bids to the construction industry even before the end of this fiscal year to be able to get a running start on the work by this fall.

We also have been in good communication with our neighbours. We have in fact made several major modifications of the SLC layout in response to concerns expressed in various meetings with community organizations dealing with the possible impact of the SLC installation on the surrounding community. I am happy to report that the current design appears acceptable to almost everyone. We have submitted an Environmental Impact Assessment,

and after the changes mentioned, have received a 'Finding of No Significant Impact' by the Department of Energy. All this means that we are not anticipating that environmental concerns will impede the construction in any way. I can assure our neighbours that we can build the SLC without causing them any problems. Let me note that SLC is a job roughly one-half the magnitude of PEP.

The SLC is technically an extremely difficult but also important and exciting undertaking. It pioneers a new direction to obtain very high energy electron-positron collisions and at the same time gives physicists from many institutions a new tool to reach what is currently believed to be the most critical energy region in which new phenomena are expected.

Just because the technology to reach both a new realm of energy at moderate cost and to do physics research with the SLC is so challeng-

ing, our ability to meet the schedule of completing all construction activities by the end of 1986 depends critically on pushing as hard as possible our current research and development programme designed to solve the technical problems. Thus we are faced with the dual task of advancing this effort rapidly while at the same time operating our facilities which support both our physics programme and that of many other institutions in the United States and abroad.

We hope to schedule the break-in into the SLAC structure and joining the SLC ring to that structure during our regular summer shutdown, similar to the procedure which we executed with PEP. Once this break-in and junction has been successfully accomplished, the technical interaction between the SLC and the ongoing SLAC activities will consist mainly of carrying out tests in the linear accelerator and making major revisions to its installations and control system. These improvements are necessary to have the SLC live up to its expectations, but will at the same time improve the performance of the 2-mile linac in its own right.

However, this is not all. In addition

to giving the green light on the SLC, the President's budget also provides funding for two other important new projects: a very substantial growth in synchrotron radiation facilities and an off-axis injector that will make it possible to generate low energy beams in linac End Station A for nuclear-structure physicists and others needing beams of energy no greater than 3 GeV. At the same time the off-axis injector will make it possible to inject into the SPEAR electron-positron ring without having to power the entire accelerator. As a result of this new scheme it might well be possible in the future to operate SPEAR (and therefore synchrotron radiation experiments) together with the low energy programme in End Station A during the summer months, when we are highly restricted in the use of electric power. This should greatly increase our scheduling flexibility, in particular once SLC becomes operational.

Stanford Synchrotron Radiation Laboratory is planning to expand its operations substantially over the next few years. SSRL and SLAC are each independent laboratories reporting to the Stanford University administration, with each determin-

ing its own programme under the general policies of the University of California, although an independent laboratory, depends on a reimbursable basis on SLAC for technical support in many areas. As SSRL expands questions are raised whether this type of relationship will continue to serve the needs. Accordingly, the Provost has just appointed a committee under the chairmanship of Sidney Drell, Deputy Director of SLAC, to make recommendations on the long-range future relationship between SSRL and SLAC.

All this means that SLAC staff will be involved in three major construction activities — the SLC, the off-axis injector, and whatever help we can give SSRL in connection with the SPEAR upgrading programme and support of synchrotron radiation work. Nonetheless, the ongoing particle physics programme will continue with highest priority. This commitment generates a major load on SLAC's technical and administrative staffs, and I hope that the confidence which the government has shown us in giving us the green light on all these ventures will be vindicated.

Fast work

One of the most impressive aspects of the initial evidence for W particles (see March issue, page 43) was how fast the evidence emerged from the mass of collected data. This was underlined by Leon Lederman in his conclusion at the recent Rome collider physics workshop.

The 1982 period of proton-antiproton collisions in the CERN SPS ring finished on 6 December. In the

two month run, the big UA1 and UA2 experiments had each been exposed to some 10^9 collisions. By the time of the Rome collider workshop (12 January), the experimenters had been able to enjoy Christmas and to comb their recorded data for the handful of examples of lone high transverse momentum electrons 'balanced' by missing energy. These events are explained as the decays of charged

weak bosons into an electron and a neutrino.

These high energy proton-antiproton collisions are extremely complex, producing sprays of secondaries. However only a small fraction are of immediate physics interest, and judicious triggering greatly assists the subsequent data handling and timely extraction of physics results.