proposal, where an independent assessment indicates costs considerably in excess of $500 million. Cost reductions of some 15 per cent in the basic detector design are being sought.

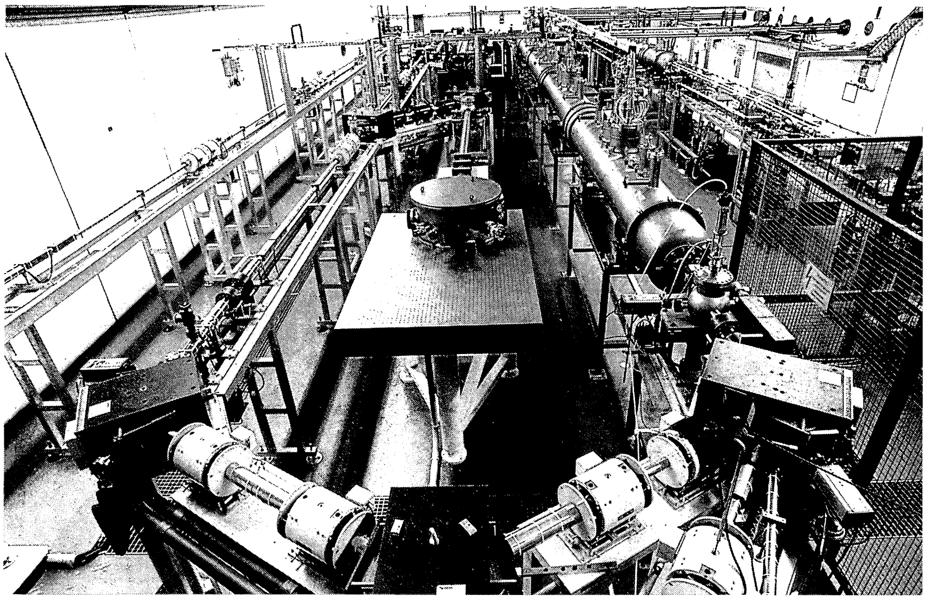
In addition, a revised L* management structure has been proposed, with an Executive Committee led by spokesman Sam Ting, and a new Management Board whose Chairman will also act as leader of the US groups in the collaboration. Barry Barish of Caltech has been elected to this new position.

Meanwhile the now traditional SSC Industrial Symposium, held this year in Atlanta, attracted strong interest. Department of Energy SSC Project Manager J. Cipriano and SSC Laboratory General Manager E. Siskin stressed that building the 87-kilometre ring and associated infrastructure to the proposed budget and schedule will be a major challenge, for which any delays would add about a million dollars per day.

'We're going to build what we said we would build and we're going to be relentless in doing it,' insisted Siskin. From the perspective of the IISSC meeting, the project resembles somewhat a major defence-style project than a traditional approach to physics facility construction.

The big meeting mirrored the enthusiasm and momentum now behind the SSC project in the wake of Gulf War successes. The initial physics community which launched the SSC idea is now only a part of what has become a major national undertaking, backed by impressive resources and widespread commitment from the US Administration, from Congress, from local authorities, from the educational sector, and especially from industry.

The S-DALINAC superconducting electron accelerator at Darmstadt. Right is the pre-acceleration and injection beamline into the 10 MeV injector. After an initial pass through the 40 MeV linac (centre right), the beam is recirculated twice using the two beamlines on the left. The electron beam can also be deflected from the first recirculation beamline into the undulator of a free electron laser (background). The tunable infrared laser beam's 15 m optical cavity is seen centre.



DARMSTADT
Superconducting electron accelerator in operation

In December, the S-DALINAC superconducting radiofrequency electron accelerator at the Nuclear Physics Institute of Darmstadt's Technische Hochschule was completed. This pioneer continuous-wave (c.w.) machine passed a major milestone several years ago when it accelerated its first low energy electron beam (September 1987, page 34).

The S-DALINAC consists of an injector and a main linear accelerator where the electron beam is accelerated three times (an initial acceleration pass and two subsequent recirculations). It has been operated so far with beam energies of 6, 29, 52 and 75 MeV, and after initial acceleration tests will be slowly tuned up to its rated energy of 130 MeV.

With the CEBAF electron machine (to provide continuous electron beams at 4 GeV) now under construction at Newport News, Virginia, and with European nuclear physicists pushing for high energy electron machines (January/Februa ry, page 22), initial S-DALINAC performance will be followed with much interest.

The Darmstadt accelerator, designed mainly for nuclear physics and free electron laser (FEL) research, was originally planned by a collaboration between Wuppertal's Gesamthochschule and Darmstadt's Technische Hochschule.

Built at the latter institution by a enthusiastic team comprising a small scientific staff, a lot of students and only a few technicians, its successful completion shows how an advanced and sizable technical project can still happen at a University laboratory.

(Another recent example, also Germany, is the MAMI continuous electron source at Mainz, using conventional accelerating technol gy – April, page 12).

The Darmstadt accelerating ca ties – one 0.25 m 5-cell cavity a capture section in the injector and ten 1 m 20-cell cavities behind it – are made of niobium metal and are of a now standard design.

However in contrast to the cavities now being used or introduced in high energy electron machines throughout the world, the S-DALINAC cavities are operated at a higher frequency (2997 MHz) and a lower temperature (2K, using supercooled liquid helium). The high frequency and thus small cavities result in a very economic cryostat and a slim accelerator.

The S-DALINAC delivers a continuous (c.w.) beam current and, with the continuous variation of input power in the injector and the recirculating linac, a wide range of beam energies (2-130 MeV), while beam currents and their time structure can be varied to suit different needs.

For nuclear physics experiments beam currents of 20 microamps with a bunch spacing of 334 ps are available, while average beam currents of 60 microamps are used to drive the infrared FEL (tunable between wavelengths of 2.5 and 5 microns). In the latter case the electron bunches are 100 ns apart, corresponding to a 10 MHz repetition rate. Peak current in the bunch is then as high as 2.7 A.

Increased reliability and stability have resulted from recent developments including the use of new high purity 20-cell niobium cavities manufactured at Dornier, Friedrichshafen, and tuned for high field flatness at Darmstadt. These cavities are operated with accelerating fields well in excess of 5 MV/m.

Furthermore, a microprocessor-controlled radiofrequency system to operate these cavities has been constructed. Tuners with magnetostrictive elements integrated into the r.f control have been developed and are now used routinely with all cavities .

The accelerator has so far been operated for 2600 hours with low energy beams for nuclear physics and channeling radiation experiments. These studies are continuing with higher energies, while the FEL facility, whose undulator is now in place, is also being put through its paces.

The main accelerator development programme will concentrate on bringing the machine up to higher energies, in gaining long-term operational experience and in testing new superconducting cavity types for very high energy superconducting accelerators in the context of the TESLA (TeV Energy Superconducting Linear Accelerator) collaboration (April, page 16).

A 9-cell 5 GHz cavity fabricated at Cornell and finished at Wuppertal will soon be installed and tested with electron beams. Since the Darmstadt accelerator can provide true c.w. beams with narrow and large bunch spacing both with and without a superimposed macrostructure, a 'collider-like time structure' of the beam is possible.

CEBAF
First experimental equipment

The Continuous Electron Beam Accelerator Facility (CEBAF) under construction in Newport News, Virginia, has ordered its first major piece of experimental equipment: the superconducting toroidal magnet for the CEBAF Large-Acceptance Spectrometer, CLAS.

This large instrument will detect multiparticle final states in nuclear physics experiments in one of CEBAF's three experimental halls. Six

First experimental equipment to be ordered for the CEBAF electron accelerator under construction at Newport News, Virginia, is the Large-Acceptance Spectrometer.