ATLAS and CMS have been recommended for approval by the LHC experiments committee. They will be installed opposite each other in new underground areas at points P1 and P5. Two more experiments in the initial programme could be installed in the existing LEP experimental facilities at P2 and P8. ALICE will be a specialised experiment using heavy ions, while LHC-B will be optimised for studying the physics of the Beauty quark and CP violation. Only at these four points (P1, P2, P5 and P8) will the LHC beams cross over from the inner to the outer arc, or *vice versa*. At the other four points, machine utilities can be installed without bringing the beams into a common vacuum pipe, thus avoiding the need for expensive bending magnets.

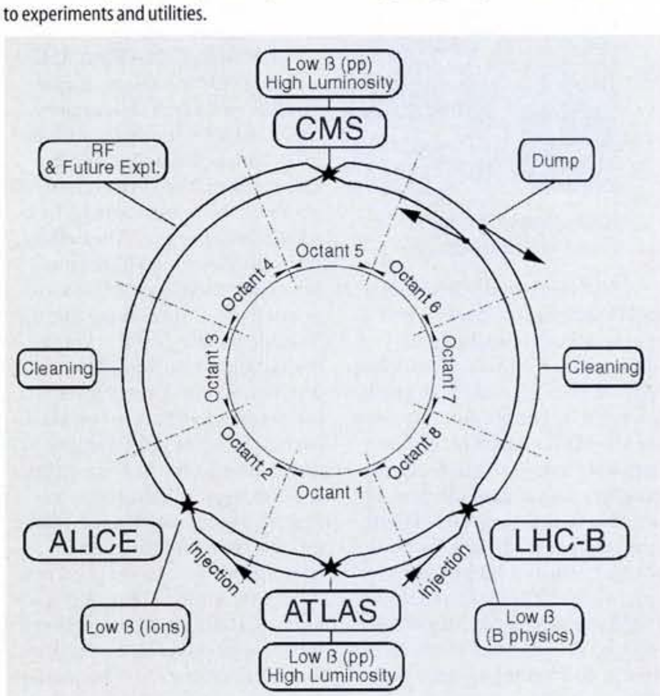
The straight sections around P3 and P7 will be used for the very important beam-cleaning sections, systems of collimators which will ensure that all particles which fall outside the dynamic aperture of the machine in any of the six dimensions of phase space, will be safely removed and absorbed into suitable shielding. If they were to be allowed to circulate until they struck the vacuum pipe near superconducting magnets, these particles would deposit their energy causing superconducting to normal transitions, or "quenches". The efficiency to be achieved in these cleaning sections is 99.9%, as the LHC halo is expected to be fed by 10^9 protons per second, while as few as 10^6 may cause a quench.

It has very recently been decided to install separated RF accelerating cavities on each beam, each side of P4. This requires an increased separation of the beams in order to have enough space for the superconducting 400 MHz cavities. Separated RF became necessary to reduce beam loading and power dissipation in the couplers to manageable values, but it will also give greater flexibility during filling and operating, and allow the LHC to collide particles or ions with different charge-to-mass ratios. An interest has already been expressed in colliding protons against lead ions. The cavity layout which has been adopted will allow the use of P4 for a future colliding beam experiment, if needed.

Injection of 450 GeV protons from the CERN SPS ring will be immediately upstream of P2 for the clockwise rotating beam, and of P8 for the opposing beam. The whole chain of injectors already exists and recent beam studies have shown that the performance required is within reach. Indeed it is expected that commissioning of the LHC will profit from the availability of much lower emittance beams at lower intensities. These smaller cross-section beams are expected to allow useful luminosities of around 10^{33} $cm^{-2}s^{-1}$ to be reached, even if beam intensities are initially limited operationally by magnet quenches or for any other reason.

The beams, which will have total energies of up to 334 MJ, must be safely extracted and absorbed in external beam dumps at the end of LHC colliding beam runs. The extraction system of fast kickers and septum magnets will be installed at P6 with the absorber blocks some 600 m away, in caverns 100 m underground, which will be accessed from the machine tunnel and require no new surface areas or access shafts. Details of the machine layout, with its new underground caverns, surface buildings and services are now being finalised in order to prepare an environmental impact report. The report will be presented to the relevant French and Swiss authorities in early 1996, leaving time for the necessary authorisations to be delivered and construction work to start in 1998, as required for a 2004 start-up date.

A schematic layout showing the assignment of the eight long straight sections of the LHC to experiments and utilities.



Final Guidelines

The original version of the International Union of Pure and Applied Physics (IUPAP) Guidelines for the Major Physics Users Facilities, which were proposed by the United States Liaison Committee (USLC) in 1994, have been widely circulated. The IUPAP President received many positive responses supporting the Guidelines, as well as a few critical comments made in the context of existing large facilities that recover operating costs from users. In the light of these comments a revised Guidelines, which explicitly mention a realistic special treatment for such existing facilities, have been formulated by the USLC. They were approved by the IUPAP Executive Council in September 1995 and will be presented to the IUPAP General Assembly in Uppsala in September 1996 for ratification.

The Guidelines are the result of an extensive consultation within IUPAP, liaison committees, the UNESCO Physics Action Council, and the physics community at large. Thus, the final version, given on the next page, incorporates a wide perspective on such major facilities from many different disciplines and enjoys general support within the physics community.

IUPAP anticipates that the Guidelines, which are intended to apply to the inter-regional or international use of major facilities, will be accepted widely within the international physics community and that all future facilities will be planned, from the beginning, in conformity with the Guidelines. Furthermore, IUPAP has brought the Guidelines to the attention of other member scientific Unions of the International Council of Scientific Unions (ICSU). It expects that they will prove to be of broad interest and will eventually be generalised to become ICSU Guidelines.

In commenting on the need for common guidelines, IUPAP stresses that effective inter-regional and international cooperation is vital because scientific institutions sometimes set up restrictive political and financial goals. Guidelines benefit science by promoting open access, given that guest imbalances will tend to even out among the richer nations, while less affluent regions can contribute to the vitality of user facilities with talented scientists and individual experiments.

The IUPAP Guidelines

1 The selection of experiments and the priority accorded to them are the responsibility of the host facility.

2 The criteria to be used in selecting experiments and determining their priority are: scientific merit; technical feasibility; capability of the experimental group; availability of the resources required.

3 The institutional, regional or national affiliations of the experimental teams should not influence the selection of an experiment nor the priority accorded to it.

4 In some instances, no additional capabilities are needed to successfully perform an approved experiment other than those capabilities routinely provided by the host facility. When this is not the case, the contributions of each team and of the host facility are to be agreed upon by the authorized leaders of the team and by the host facility prior to approval. Whenever appropriate, these agreements should be formally drawn, and be accompanied by discussions with the relevant authorities for the regions concerned.

5 Host facilities should not normally require experimental groups to contribute to the running costs of the facilities (including associated experimental areas and equipment normally maintained by the facilities). Exceptions to this Guideline may be made in special circumstances or in the case of proprietary research, which we define as research the results which are not intended for timely disclosure in the open scientific literature. Such circumstances will not be invoked as an excuse to restrict access artificially nor exclude participation. Should a user facility feel that special circumstances exist, the facility should make public their reasons for a deviation from the normal procedure and the conditions for access by scientific groups. In all cases, special consideration should be given to the needs of less-developed nations.

Major Facilities Defined

By a major user facility, IUPAP means a regional, national or international facility with unique experimental capabilities of sufficient power and utility to attract a large number of visiting users, usually of the order of hundred or even thousands. Most high-energy and nuclear particle accelerator centres are in this category, as are plasma confinement facilities. To these we add accelerator facilities designed to produce and use synchrotron radiation, spallation neutron sources and nuclear reactors designed to produce neutrons for research purposes. Other, but by no means exhaustive, examples may include centres for high-resolution electron microscopy and high pressure or high-magnetic field research. The pattern of use at some of these facilities involves large teams of users.

Roundup

Neutron Demand Increasing

A panel discussion led by H. Curien that followed summaries by 10 working groups at the workshop *Scientific Prospects for Neutron Scattering with Present and Future Sources* (Autrans; 11-13 January 1993 – organized by the European Science Foundation in collaboration with the European Neutron Scattering Association) voiced two main concerns. First, that demand for beam time at the already oversubscribed large sources will continue to build up as many smaller reactor neutron sources built in the 1960s are closing down. Second, that a major new source such as the proposed European Spallation Source will be expensive, take a long time to design and build, and need meticulous justification. Demand is also being accentuated by the fact that most areas see a strong trend from "simple samples" towards complex systems. Moreover, scientists are tending to carry out systematic, time-consuming studies. There was general agreement that the techniques offered at the rapidly evolving third-generation synchrotron x-ray sources are truly complementary. Nonetheless, a shortage of neutron beam time seems likely, and there remain pressing scientific and technological problems which call for the unique characteristics of neutrons combined with higher fluxes and more sophisticated instruments.

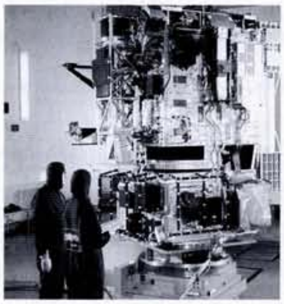
ELFE at DESY

NuPECC, the European Nuclear Physics European Coordination Committee, has established an Initiative Group for ELFE at DESY, Hamburg, to explore the common interface between ELFE (Electron Accelerator for Europe) and DESY's proposed TESLA linear collider and its project to build a high-power free-electron laser [see *EN* **26** (1995) 127]. NuPECC has proposed ELFE as Europe's "natural and necessary machine for the long-term future of hadronic physics", but there remains the need to assemble a large enough community with the necessary resources.

GSI to Examine Upgrade

The Gesellschaft für Schwerionenforschung (GSI), Darmstadt, has formed working groups to analyse in detail within one year a next-generation upgrade of its facilities. GSI produced its first beams with the UNILAC linear accelerator in 1975 and an upgrade that ended in 1990 involved installing the SIS heavy-ion synchrotron and the ESR storage ring. The topics selected are:
• deep-inelastic electron-nucleon scattering and electron-nucleus scattering at intermediate energies, taking account of projects such as the lower energy ELFE and DESY's higher energy HERA;
• x-ray spectroscopy and radiation physics, notably high-brilliance x-rays as a by-product of high-quality electron beams;
• nuclear collisions at maximum baryon density (a high-energy synchrotron or a high-energy heavy-ion collider);
• physics with secondary beams from a high-energy synchrotron;
• nuclear structure at an advanced radioactive-beam facility;
• plasma physics with heavy-ions to extend today's density and temperature limits.

SOHO Launched



SOHO's complex instrumentation was evident during assembly.

ESA's 1.6 tonne SOHO (Solar and Heliospheric Observatory) spacecraft was launched and deployed by NASA on 2 December 1995. Aboard are eight instruments provided by Europe and three by the US. SOHO is part of the international Solar-Terrestrial Science Programme, the next member of which is Cluster, a flotilla of four spacecraft to study how the Sun affects Earth and surrounding space that will be launched aboard ESA's new Ariane 5 in May. SOHO will take four months to reach its final position, the Lagrange point some 1.5 million km from Earth where the gravitational pull of the Earth and Sun are equal. With an unobstructed view, SOHO will then allow scientists for the first time to study 24 hours a day, 365 days a year, the internal structure of the Sun, its outer atmosphere and the origin of the solar wind. The first experimenter command was uplinked on 4 December and on 5 December, the VIRGO instrument made the first measurement when a cover was briefly opened to prove that it was properly released. Subsystems and instruments will be checked out during the four-month transfer phase.

Particle Hits Affect ISO

ESA's 2.4-tonne/0.6-m aperture Infrared Space Observatory (ISO), the last telescope of its type to be launched this century, was successfully placed in an eccentric, 24-hour orbit about Earth by ESA on 16 November 1995. The helium cryostat's cover was ejected on 27 November thereby enabling astronomical use. Data indicate that the absolute pointing error is better than specification. But all four instruments are affected by high rates (typically 1 hit/s) of cosmic-particle hits. The hits primarily increase noise, but have sometimes led to changes in instrument settings and observing strategy. Since ISO has an 18-month expected operational lifetime, the good news concerns tests indicating that a 40-minute extension of observation time may be possible, for the present orbit, during the 16 hours/day spent outside the van Allen belts.