CERN/2094
31 May 1995

ORGANISATION EUROPÉENNE POUR LA RECHERCHE NUCLÉAIRE
CERN EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH

HUNDRED-AND-SECOND SESSION OF COUNCIL
CENT DEUXIÈME SESSION DU CONSEIL

Geneva - 23 June 1995

PROGRESS REPORTS PRESENTED TO COUNCIL

RAPPORTS D'ACTIVITÉS PRÉSENTÉS AU CONSEIL

TABLE OF CONTENTS

Section Page

III ADMINISTRATION

I RESEARCH DIVISIONS

- Theoretical Physics Division (TH)
- Particle Physics Experiments Division (PPE)
- Electronics and Computing for Physics Division (ECP)
- Computing and Networks Division (CN)

THEORETICAL PHYSICS DIVISION (TH)

The May 1995 telephone list of CERN-TH Division had 135 names. In the period from 1st January to 8th May 1995, 111 preprints were registered.

As in previous years, the activities of the Theory Division (TH) covered virtually all fields of high-energy physics and related areas. We represent a rather large community of physicists, and it is natural to expect that the production of TH should give a faithful portrait of the topics of interest in the high-energy community world-wide. Below is a non-exhaustive description of the main topics dealt with in the above-mentioned preprints.

One of the most important topics of research has been the theoretical analysis of LEP precision data, and the prospects for direct and indirect discoveries of new physics at LEP2 and at the LHC. The LEP2 workshop has continued its vigorous activity and is expected to give its conclusions some time in the autumn. Meanwhile, the important question of the discovery limits for a light Higgs at an upgraded version of LEP2 is being thoroughly analysed. Other phenomenological subjects of research in TH include the small-x region of DIS, the BFKL Pomeron, the heavy-quark effective theory, polarised structure functions, as well as supersymmetric unification and flavour-changing processes.

On the more theoretical front, new results were obtained on non-Abelian and on S (or electro-magnetic) duality. Mechanisms for breaking local supersymmetry were studied. A new way of making finite-loop calculations of renormalized low-energy parameters in string theory was proposed. New predictions were obtained for various low-energy parameters by taking the string theory suggestion of promoting them to dynamical fields. Work has continued on theoretical aspects of black-hole physics and on ways to solve the information paradox.

Research on various aspects of lattice gauge theories is continuing, including attempts to extend the method to chiral and supersymmetric theories. Much research has also been carried out in astroparticle and cosmoparticle physics, in particular on the problems of dark matter, of microlensing, and of EW baryogenesis. Applications of string theory to cosmology and inflation were also vigorously pursued.

Finally, a successful and well-attended series of lectures was organized on recent developments in theoretical physics, in particular on the above-mentioned new dualities which appear in certain supersymmetric gauge and string theories.

PARTICLE PHYSICS EXPERIMENTS DIVISION (PPE)

LEP EXPERIMENTS

The past year has shown that the LEP experiments continue to be outstandingly lively and productive: overall the experiments have had more than 90 Ph.D. obtained and more than 60 published scientific papers.
The highlight of the last running period of 1994 was the successful test of the bunch train scheme for operating the machine. The decision of operating LEP in such a mode for the 1995 run has made the shutdown period between December 1994 and April 1995 somewhat more loaded than usual. All experiments underwent substantial upgrades of their front end electronics to cope with the new running mode of LEP. Nevertheless, all experiments have managed to complete in time their shutdown maintenance.

ALEPH

Aleph has been very stable during the 1994 run and, besides the modifications for bunch train running, the major activity during the shutdown has been the replacement of the On-line computer cluster, which is now fully AXP based.

DELPHI

The operation of the prototype inner radiation mask, installed before the 1994 run, was very successful. A new mask has been installed during the shutdown in order to improve the shielding of the central detectors in view of the LEP200 synchrotron radiation background. The major activity of the shutdown has been the installation of the new Inner Detector Jet chamber and the new ID trigger layer based on layers of cylindrical drift tubes ("straws"). The calorimetric coverage of the transition region between the Endcap and Barrel calorimeters has been completed during this shutdown. Finally, the minor modifications for running with bunch trains have been completed.

L3

L3 has completed the installation of the forward-backward muon spectrometer by fully equipping all solenoid doors with the new muon detection system. This is composed of three layers of drift chambers and two layers of Resistive Plate Chambers. The hermeticity of the detector has been improved by the installation of the active lead ring detector. The first and second level trigger electronics and

the BGO readout front end electronics have been upgraded to reduce the dead time and to prepare for the LEP200 running.

OPAL

The major activity during the shutdown has been the repair (and partial upgrade) of the Silicon Microvertex which had been damaged at the end of the 1994 run due to overheating caused by a faulty interlock. The other major modification, besides the upgrades needed by the bunch train scheme, has been the installation of the new experimental beam pipe, which includes the inner radiation masks similar to the ones installed in IP8.

FIXED TARGET EXPERIMENTS

CP Violation

The preparation of NA48 continues to progress well. The components for the liquid krypton calorimeter have been constructed and the full calorimeter will be assembled at CERN by the end of the year. The preparation of the electronics is well advanced, but remains a major challenge for the collaboration. Beam tests done in 1994 show that the performance of the prototype calorimeter electronics is as expected. Further tests will be performed this year. The first tests of the charged particle spectrometer are planned for 1995 and the calorimeter will be commissioned in 1996.

Neutrino and Muon Experiments

In 1994, the SPS was again run at high intensity throughout the year in order to supply the CHORUS and NOMAD experiments with neutrinos. A total of 7×10^{18} protons were delivered to the neutrino target during the year.

CHORUS, which includes an emulsion target, collected data for the whole period and all the detectors in the experiment worked well. A small fraction of the emulsion has been removed to be prepared for analysis. The rest of the emulsion will be used for further data collection in 1995.

The unanticipated technical problem with the drift chambers in NOMAD has been overcome and the modification and continued construction of the chambers is well under way. The other components of the detector operated well in 1994 and prospects for data taking with the complete detector during the 1995 beam period are good.

The Spin Muon Collaboration ran successfully throughout the 1994 beam period, adding to their considerable collection of proton data. In 1995, their last year of approved data taking, they propose to run with a polarised deuteron target. Discussions for a further year of running with polarised protons are under way.

Spectroscopy and Heavy Flavour Production

The Omega spectrometer will continue to run in 1995. WA89 took a substantial amount of data in 1994 with the 'Sigma-minus' beam, which is currently being analysed. WA91 had a successful run in combination with detectors from the NA12/2 collaboration. This forms the basis of the WA102 experiment, aimed at searching for non-standard mesons in the central region, which will take data this year.

Heavy Ion Experiments

The acceleration of lead ions was successfully accomplished in 1994. The lead ion accelerator components were set up progressively during the proton run and were ready to deliver high quality beams on schedule.

Seven major experiments were commissioned and collected first data with high energy Pb beams. NA49 commissioned the right-hand half of their time projection chamber and time of flight counter systems. NA44 ran with a new aerogel Cerenkov detector. NA52 were ready to take data when the beam started and ran successfully throughout. After a successful test done by NA45, the proposal P280 for a study of low-mass electron pairs was approved on the basis of the 1994 data. NA50 study muon pair production from ion interactions. WA97 are running in the OMEGA spectrometer during the ion period and collect data to study baryon and antibaryon spectra. WA98 performed a major detector upgrade including a 10'000 block lead glass calorimeter. An emulsion exposure run, involving 9 different experiments, was also completed successfully. First results from the experiments were presented at the Quark Matter conference in the USA in January.

ISOLDE

The second part of 1994 was very successful for the ISOLDE community: 34 experiments using 9 different targets were performed. At the end of the year, 41 out of the now 46 approved experiments have had beam time.

Of specially notice in the last running period is the successful upgrade of the ISOLTRAP (IS302), used for precise mass determinations of nuclei far from stability. A high sensitivity measurement (IS308), performed on a pure source of ^{38}Ca, revealed a significant discrepancy from expectations in the $0^+ \rightarrow 0^-$ beta process, inconsistent with present theoretical estimates.

On the Nuclear Solid State program, a new vacuum chamber for on-line manipulation of the irradiated crystals, ASPIC (IS318), was installed and successfully commissioned. Finally, tests with liquid targets have advanced and one hopes to be able to take full proton beam intensity also on these targets during 1995.

LEAR EXPERIMENTS

Meson Spectroscopy

The Crystal Barrel (PS 197), Obelix (PS 201) and Jetset (PS 202) experiments are studying antiproton-nucleon annihilation to search for new forms of matter (e.g. glueballs) which are predicted to have properties similar to ordinary S- and P-wave ($q\bar{q}$) mesons.

The special feature of the Crystal Barrel detector is a large solid angle and high resolution electromagnetic CsI calorimeter which - together with a Jet Drift Chamber for the momentum measurement of charged particles - enables it to fully reconstruct all annihilation events. The year 1994 was devoted to recording some additional 60 million events at rest and in flight to increase the statistics in some selected final states, as well as record annihilations with a gaseous hydrogen target for the first time.

Further analysis of the high statistics data taken in 1992 and 1993, with 3 pseudoscalar particles ($\bar{p}p \rightarrow \pi^o\pi^o\pi^o$, $\pi^o\eta\eta$, $\pi^o\pi^o\eta$ and $\pi^o\eta\eta'$) in the final state, has proven to be very successful. It has revealed new scalar resonances in the 1300-1600 MeV mass region, which shed new light on the scalar meson nonet. In a combined analysis of the $\pi^o\pi^o\pi^o$ and $\pi^o\eta\eta$ channel, two new isoscalar $J^{PC} = 0^{++}$ states, the $f_o(1365)$ and the $f_o(1500)$ have been observed. It will now be of prime importance to obtain high statistics data on the $\pi^oK_SK_S$ final state to measure the precise decay branching ratios, which will allow an interpretation of this new state; it may be the long awaited 0^{++} glueball mixed with neighbouring scalar mesons.

Analysis of $\bar{p}p \rightarrow 3\pi^o\eta$ at 1940 MeV/c reveals two new isoscalar 2^{-+} resonances decaying into $2\pi^o\eta$, the first of which is interpreted naturally as a $q\bar{q}$ meson in the $^1D_2$ nonet, while the decay modes of the second resonance indicate a non-$q\bar{q}$ internal structure.

The statistics for neutral final states accumulated with the gaseous hydrogen target are as large as those previously accumulated with a liquid hydrogen target. The change of target pressure ensures a different fraction of s- and p-wave annihilation in the two data samples, and will allow to eliminate remaining ambiguities in the description of the $\pi^o\pi^o\pi^o$, $\pi^o\eta\eta$ and $\pi^o\pi^o\eta$ final states.

The PS 197 collaboration has constructed and is presently installing a silicon microstrip detector to increase its possibility to trigger on $K_S \rightarrow \pi^+\pi^-$ decays, with the objective of accumulating a high statistics sample of the $\pi^oK_SK_S$ final state.

With an improved DAQ system, Obelix (PS201) has collected over 70 million events in 1994, with both $\bar{p}$ and $\bar{n}$ beams. The main experimental efforts have been devoted to the study of the E/j and Ax mass regions, explored in different initial ($\bar{p}$, $\bar{n}$, target density) and final state conditions. The results of the analysis performed so far suggest the presence, for the E/j, of (at least) a second pseudoscalar state, and, for the Ax, of a 0^{++} and 2^{++} state.

Profiting from their low pressure target, PS201 have also measured for the first time the $\bar{p}p$ annihilation cross-section at very low $\bar{p}$ momentum (about 50 MeV/c), and have studied the nuclear stopping power for antiprotons below 0.5 keV, as well as the Barkas effect in hydrogen and helium.

CP violation

The CP-LEAR (PS 195) experiment studies CP violating phenomena in the neutral kaon system by comparing the time-dependant decay rates of K^o and $\bar{K}^o$ for the three main decay modes ($\pi\pi$, $\pi\pi\pi$, and $\pi e\nu$). The K^o and $\bar{K}^o$ "beams" are tagged by the accompanying charged kaon in the reaction $\bar{p}p \rightarrow K^-K^o\pi^+$ and $\bar{p}p \rightarrow K^+\bar{K}^o\pi^-$, respectively. From the analysis of data taken until the middle of 1994, a precise determination of the CP-violation parameter h_{+-} is obtained. The limits for CP violation in the 3π decay mode are improved. T-violation is directly measured for the first time. Moreover, the analysis of semileptonic decays yields the best single measurement of the $K_S - K_L$ mass difference, together with improved limits on the occurrence of decays forbidden by the $\Delta S = \Delta Q$ rule.

Atomic Physics with Antiprotons

The PS205 collaboration studies the unusually long life of antiprotons trapped in high-n, high-l metastable levels of the antiprotonic helium atom $\bar{p}\ He^{++}\ e^-$. Dipole transitions from metastable levels into non-metastable atomic states are induced by a MW/cm^2 dye laser, and the fast subsequent atomic cascade of the antiproton leads to a sudden increase in the $\bar{p}$-He annihilation rate. After the first ever laser spectroscopy experiment on an antiprotonic atom in 1993, in which the collaboration observed an induced transition (n,l) = (39,35) $\rightarrow$ (38,34) with wavelength λ in the vicinity of 597 nm, a second transition (n,l) = (37,34) $\rightarrow$ (36,33), with wavelength λ = 470.724 nm was observed in 1994. By firing two lasers in rapid succession, the depopulation and repopulation of these metastable states could also be investigated. Finally, a fast extraction technique, in which a very large number of antiprotons are simultaneously stopped in the He target, leading to a large number of antiprotonic helium atoms, was successfully implemented.

A second atomic spectroscopy experiment, PS207, is concentrating on a high resolution measurement of line shapes and energy shifts of antiprotonic K_α and L_α transitions of hydrogen and helium isotopes. The apparatus was set up in 1994, and first data, showing that the expected resolution can be achieved, have been taken at the end of last year.

Fundamental symmetries

In the past year, PS196, the TRAP collaboration, has completed a 1 ppb comparison of the antiproton and proton charge-to-mass ratios. The measurement was performed by comparing the cyclotron frequencies of individual antiprotons and protons captured in a Penning trap. Extensive systematic studies of the magnetic field have also been performed. The group is currently developing techniques to improve the measurement by another order of magnitude, by comparing the cyclotron frequencies of one antiproton and one H^- ion held in the trap simultaneously.

R&D ACTIVITIES

The challenging experimental environment of high-energy hadron colliders such as LHC has triggered a large variety of new development activities. By now 59 proposals have been discussed in the DRDC and 45 have been approved by the Research Board. PPE Division is participating in many of them with some 50 of its staff, including a significant number of research physicists. These projects are being progressively transferred to the LHC collaborations for final prototyping and implementation in the design of their detectors.

TECHNICAL SUPPORT AND ADMINISTRATION

The Detector Unit of the Division has been providing support in the mechanical areas of detector development and in the construction of detectors for the approved experimental programme. This included mechanical support for the operation of the current large detectors, as well as participation in ongoing R&D projects. Despite some recruitment, the staffing level has seen a considerable reduction over the past three years. This has very serious consequences on the support which can be provided to the ongoing programme and in particular to the new generation of large experiments for LHC. More recruitment is urgently needed.

The Division continues to support an ever growing visitor programme both through the Users' Office and through the Administration and Secretariats group.

ELECTRONICS AND COMPUTING FOR PHYSICS DIVISION (ECP)

SPS and LEAR Programmes

Substantial support has been provided to the neutrino experiments CHORUS and NOMAD.

In CHORUS, the complex system of 58 intensified CCD cameras used for the readout of the scintillating fibre trackers has performed reliably through the whole period of data taking. Major contributions were made to the reconstruction software for the fibre tracker, including the calibration, alignment, track finding and predictions for the emulsion scan.

In NOMAD, the electronics for the calorimeter, preshower and TRD have been commissioned (4,000 channels in total) and used during the neutrino run. The calorimeter calibration system based on LEDs has been operated successfully. The reconstruction software has been completed and used for the first production of data taken. Various enhancements have been included in the CASCADE data acquisition software.

Upgrades to the neutrino beam control system have been implemented and tested in time for start-up of 1995 data taking.

Support has been provided to the CPLEAR experiment, particularly in the trigger distribution system and in the improvement of speed of the data acquisition hardware.

Substantial effort has been invested in the readout of the silicon microstrip and pixel detectors in the Omega experiments. In WA97, 4 planes of Si pixels (300,000 channels) have been successfully operated.

A major effort has started in the last quarter to support the NA48 experiment. The development of fast digitizers, data compaction/merger modules and fast digital optical links has made considerable progress. A prototype of part of the data merger and the front-end workstation farm with the relevant software components was successfully tested. A Joint Project with Digital for the PCI-TurboChannel interface has been started and is progressing well. Monte Carlo simulations were run on the Meiko CS-2 parallel computer with greatly improved feedback to physicists. The architecture for the slow controls system has been agreed with the experimenters and implementation has started. Controls for the cryogenic parts of the LKr calorimeter are well under way.

Simulation studies for extracted neutrino beam lines towards Gran Sasso and Nestor have been completed and published as a report.

LEP Programme

Support has been provided to ALEPH, DELPHI and OPAL for the upgrade of the readouts of the silicon-strip micro-vertex detectors. The OPAL general trigger unit has been commissioned. The upgrade of the DELPHI trigger and timing system has well advanced.

Various upgrades have been made to hardware and software of data-acquisition systems and processing environments to cope with the higher data rates expected for 1995 data taking.

A review has been made of the user requirements for a partial re-engineering of the GSS (General Safety and Surveillance system) supervisor software, the final document is now available.

LHC experiments and R&D for LHC

Direct participation in the LHC experiments has been building up and a series of discussions has been held with the collaborations to define domains of activities for enhanced participation.

The R&D activities in the field of trigger, data acquisition and software for LHC experiments have continued vigorously. Members of ECP were involved in the following LHC R&D projects: RD2, RD3, RD6, RD9, RD11, RD12, RD13, RD16, RD19, RD20, RD23, RD24, RD27, RD31, RD32, RD36, RD38 and RD41. Several projects have been reviewed recently by LCRB and LERB, the successors to the former DRDC.

Good results have been recently achieved in the development of integrated front-end electronics, hybrid silicon pixel detectors with dedicated readout chips, and in the investigation of rad-hard technologies.

RD31 (ATM switch technology for event building) and RD38 (generic control systems) results have been presented recently at the LCRB and a continuation of the investigations has been approved.

The study of fast dual port memory (DPM) structures has been continued within RD12 with a view to producing data readout DPMs and event filter DPMs

to be tried out in a data acquisition test bench together with an event builder switch. The current status has been presented at a recent workshop.

The Esprit projects have progressed well: for GPMIMD a 54-node transputer system has been installed in autumn and the project is now finished with final review in June, for project Harmony (PET scanner) a hybrid transputer/PowerPC system has been set up to be tested soon at Geneva hospital, project Macrame has started to build up a large testbed to study switching networks.

Other topics

The Research Sector VMEbus Steering Committee, now working under the auspices of ESONE and VIPA - the VMEbus International Physics Association, is heavily engaged in the formulation of a set of guidelines or "recommended practices" for the use of VMEbus in High Energy Physics.

WebMaker, a customizable (automatic) converter from FrameMaker technical documents to WWW html files, has been released and transferred to a commercial company for further development and marketing.

COMPUTING AND NETWORKS DIVISION (CN)

Introduction

The evolution of support for physics data processing using low cost microprocessors and inexpensive disk storage systems has entered the final phase. The last of the mainframe computers was replaced by a small system to provide a residual service until the middle of 1996, with essentially all of the physics batch work now running on workstation clusters and scalable parallel computers based on RISC processor technology.

The Division is providing a support infrastructure for distributed desktop computing at CERN, above all with the aim of removing the dependence of over 6000 CERN users on the CERNVM service during 1995/1996.

Normal operation and support of internal and external networks continued, with sustained growth in traffic and the number of connections.

Physics Data Processing

The CS-2 scalable parallel computer, manufactured by the British company Meiko, has been put into production for a number of applications for the NA48, LEP and LHC experiments. The CS-2 was funded as part of a European Community research project, GPMIMD2, in which CERN collaborates with Meiko and other European computer firms and scientific institutes to demonstrate applications running on this computer. The IBM SP-2 scalable computer, installed at the end of 1994, has also entered production, as CERNSP, providing a general purpose batch and interactive service to replace the CERNVM mainframe service. The other more conventional workstation clusters have all been upgraded in line with LEP and LHC requirements for 1995.

First steps have been taken in the migration of the magnetic tape services towards high capacity tapes, with the introduction of a service based on DEC digital linear tapes. These provide a 12-50 fold increase in capacity over the current tape systems. For the first time at CERN, four experiments will record data centrally during this year's run.

Desktop Computing Infrastructure

Over the year the CERN UNIX workstation and X-terminal population continued to grow to nearly 2000 units, spread among five major vendors. File services are now based on a distributed model known as AFS, the Andrew File System, with over 750 users now registered. A major effort has been to address the necessary packaging of the UNIX desktop environment for users migrating off CERNVM. The basic toolkit has been defined, developments have taken place to ease the migration path from VM products into the UNIX world, and the packaging has started.

There has been continual expansion for Work Group Servers and Public Login Unix Servers (PLUS) in the Computer Centre and, by the end of 1994, 15 machines of three architectures (IBM, HP and SUN) were supporting services for eight different groups with over 800 accounts registered.

On VMS the focus has been on making the services as cost effective as possible and the VXCERN service was right-sized, replacing the VAX 9000 mainframe with a cluster of workstations in January. A review of VMS services was made and it was agreed to maintain them at the current level until at least the end of 1996 when the situation would be again reviewed.

The number of simultaneous users of NICE has now grown to more than 900 and nearly 3000 Novell accounts have been registered including more than 1200 registered Microsoft Mail users. A number of recent architectural improvements, in particular the introduction of Netware 4 on the servers, has facilitated the rightsizing of the Novell environment with a number of existing servers being coalesced onto a smaller number of Netware 4 servers.

Computer Operations Infrastructure

There has been a shift in emphasis of the tasks of certain of the operations staff such that they are now more directly involved or even responsible for other areas of Divisional activities, such as those related to the new Unix services where they are doing systems configuration, installation and monitoring. To this

end the shift system has been modified, and a trial run using contract staff for console monitoring and first-level intervention during the day has been started.

Applications Support and Databases

Release 95A of the CERN Program Library went very smoothly. In the context of RD45 a significant amount of training in Object Oriented Databases and OO technology was undertaken together with investigations into industrial component solutions for object persistency for HEP.

The GEANT4 project (RD44) has made good progress in identifying sub-domains of the project and subsequent working groups. A requirements document has been produced, tools and existing class libraries have been evaluated and a first phase of analysis has been made.

Based on the results of a user survey on PAW requirements, a medium-term plan for PAW has been made, emphasizing improved reliability, better documentation, user interface consistency and robustness. The plan is now being implemented.

Applications development within the ESPRIT-funded GPMIMD2 parallel computing project has progressed well, notably an event-level version of GEANT, the parallel data analysis facility, PIAF, a second-level trigger simulation, and Monte Carlo programs for NA48.

Oracle tools have been installed on the CERNSP. The general purpose database server based on a SUN SparcCentre has been upgraded to an 8-CPU machine. The LEP Logging and LHC String test databases have been installed on a SparcCentre 1000.

Networking

A 65-node network was installed for the CERN World-Wide Web days in March. Several major CERN meetings including LHCC and LEPC were broadcast in video and audio over the Internet, with several hundred outside viewers.

A contract was signed with Olivetti for the major project to install structured network cabling throughout CERN, and the first buildings were cabled. At the same time a cable management software package was bought from industry. Server computers were installed for a new industrial network management package.

An electronic trouble-ticket system implemented at CERN was licensed to industry for further development.

A new small Asynchronous Transfer Mode (ATM) switch was delivered for further investigations of this important technology. CERN became a participant in the Geneva International Organisations Metropolitan Area Network project, also based on ATM.

Computing for Engineering

The 9404 release of the Cadence CAE/CAD package for high end digital electronic design was installed, configured and tested. New versions of the Altera, Xilinx and Actel design kits were installed and tested. The synthesis packages Exemplar and Abel-FPGA were also received and tested. For the ORCA FPGA family a new routing tool NeoCad was acquired and installed. A new LabView version 3.1 was introduced. The preparation for moving to Solaris 2 in the SUN CAE cluster continues.

Support for SABER and PSpice was continued. As a new activity, the applicability of Signal Integrity CAE tools to the design and optimisation of high-speed HEP electronics is being evaluated. Tests with a first package, 'Maxwell SI' from Ansoft Inc., are well advanced. SABER/MAST modelling work for the simulation of LHC magnet supplies is being carried out in collaboration with the SL Power Conversion group.

Functionality and performance tests of the mechanical CAE package EUCLID on four types of UNIX stations permitted the selection of the type of UNIX station to be chosen as the standard EUCLID platform at CERN. The first 20 of these stations will be delivered before the end of June. Important progress has been made by the Computer Aided Detector Design initiative in the area of world-wide access to the

mechanical design data base of the LHC experiments via WWW, including links to a virtual reality presentation of detectors inside the LHC experimental areas.

Installation of a new Novell 4.1 server, dedicated to CAE applications, with ample disk and FDDI network access was prepared. This server will allow CAE software licence monitoring and access control to be introduced on a nominative basis, allowing to match more accurately software licence resources to actual user demands. Tests have been carried out on a new Juke Box system for handling CDs over the Novell network. An evaluation of new European PC hardware has been carried out in collaboration with AS Division. New standard graphics and sound cards have been introduced for all new high end PCs at CERN.

Microware's X-based development environment for OS9, FasTrak, has been put into service and permitted major progress in porting the CERN libraries to OS9. A new generation of VMEbus single-board computers (PowerPC based) is becoming available and work on LynxOS support for it is under way. A workshop on "VMEbus Extensions for Physics" was jointly organized with ECP and ESONE, and participation on the recommended-practices document continues. Code generators (C, VHDL) for Nu Thena's tool for modelling and simulating time-dependent systems (Foresight) are being tested. A new joint project with Nu Thena on bridging the gap between modelling/simulating and implementing real-time systems is making good progress.

II TECHNICAL DIVISIONS

- Accelerator Technologies Division (AT)
- Mechanical Technologies Division (MT)
- Proton Synchrotron Division (PS)
- SPS and LEP Division (SL)
- Technical Support Division (ST)
- Technical Inspection and Safety Commission (TIS)

ACCELERATOR TECHNOLOGIES DIVISION (AT)

AT activities have continued on the three main fronts of machine exploitation, including the completion of the shutdown work, and advancement of the LEP2 and LHC projects.

1. CRYOGENICS

As usual, a general overhaul of all the 21 cryoplants in operation at CERN took place during the annual accelerator shutdown period. At LEP point 6 the low-beta quadrupoles have been connected to the new 12 kW cryoplant and the old 400 W liquefier has been recuperated for the ATLAS H8 experiment in the North Area. A freeze-out helium purifier of 18 g/s capacity has been added to the 6 kW cryoplant of the SM 18 test area and a contract was placed with industry to double its liquefaction capacity (optimizing for liquefier rather than for refrigerator duty).

For LEP2, five new superconducting cavity modules have been installed in the ring, bringing the total at point 2 to two and at point 6 to six. Pre-installation tests of cavities and cavity modules have continued.

For LHC, tests continued in the areas of the individual 10 m-long model magnets, the magnet string (two 10 m-dipoles and one quadrupole) , smaller model magnets and model installations. In the test string the main effort was devoted to the installation of a low pressure helium recuperation line and to the upgrading of the instrumentation and data acquisition system.

The contract authorized by the Finance Committee in March 1995 for the operation and maintenance of cryoplants is now being negotiated with an industrial consortium.

2. MAGNETS

Existing accelerators

At the PS, in addition to the general overhaul of several magnetic elements, three dipole magnets for beam transport and two solenoids were constructed. The

repair of radiation-damaged pole-face windings is in progress. A set of magnets for bunch compression has been assembled and installed at the CLIC Test Facility.

At the SPS, the programme of refurbishing the SPS magnet coils is well under way. New spares are being constructed in industry and several magnets have been reconditioned. Investigations on mechanical movements of excitation coils have been started. A specification is being prepared for recycling the beam transfer quadrupole magnets .

To further improve the definition of the LEP energy two NMR probes have been installed in the main ring dipoles. The system for the modulation of the field in the LEP lattice quadrupoles has been extended into the two half arcs around point 8. For the bunch-train programme the skew quadrupoles have been repositioned, and 4 of the eight "pretzel" sextupoles have been modified into skew sextupoles and relocated to provide the possibility of controlling the tune split. LEP2-related work has included the moving of quadrupoles and the installation of new superconducting quadrupoles at point 6.

LHC

Magnetic measurements have been completed on the fourth 10 m long twin 50 mm aperture dipole magnet. All the necessary components for the two 10 m twin 56 mm aperture magnets have been ordered. Work has been started on the 15 m long dipole which is being made in the framework of a collaboration with INFN. The dipole model programme continues strongly; coils are being wound from the 15 mm wide cable, and the first sets of collars have been procured. The magnet string tests have continued, providing valuable information on the quench behaviour of long magnets connected in series. On its first test, a 1 m model of a 70 mm single aperture low-beta quadrupole achieved a gradient of 190 T/m at 4.5 K after one training quench.

3. VACUUM

The shutdown work for the different machines of the PS complex included the maintenance and upgrading of the vacuum systems which, in many important instances, was related to the lead ion program. For an urgent replacement of several leaking vacuum bellows on one of the large and radioactive tanks of the PSB an outside firm providing customer-specific machining services was engaged

with full success. Vacuum interventions at the SPS have been related to routine maintenance together with modifications required for LEP and LHC.

The main vacuum related activities for LEP have been the layout modifications imposed by the change of operation from the Pretzel scheme to that of bunch trains. The program of improvements to the experimental vacuum chambers has been continued with the modification of the OPAL vacuum chamber: this is now equipped with background masks and with two enlarged cruciform section beam pipes extending from about 30 to 60 m on each arm of point 6. As part of this program a set of fixed aperture and moveable aperture collimators has been installed. The vacuum work related to the installation of superconducting cavity modules has continued at points 2 and 6. A superconducting niobium sheet module, rinsed with the high pressure water jet, has exceeded the nominal performance during the high power RF tests and has been installed at point 2.

For the LHC, the vacuum group has gained first operating experience with the vacuum system of the magnet test string. The detailed design of the beam vacuum in the cold arcs has been updated to be in line with the most recent layout changes. A preliminary study of the warm sections of the vacuum system in the beam transfer lines and in the cleaning insertions has been undertaken.

4. COOLING AND VENTILATION

Changes have been made to the low conductivity water cooling circuits in two LEP sectors to cope with the increased LEP 2 energy. Controls of air handling units are being progressively adapted to the future LEP 2 operation. The local supervision systems have been extended to all 8 pits of LEP; all main processes are now monitored.

Studies of refrigerating fluids which meet the new environmental regulations have progressed and that of the first chiller should soon be changed. Tenders for dehumidification equipment in the Jura sector have been received; the order will soon be placed.

Participation in the work on LHC experiments continues.

5. SURVEY

A complete new levelling of LEP has been made which involved 70 corrective refinements. The main effort is now being put on the radial realignment: six octants have been measured, and the first smoothing scheme has led to the movement of 120 quadrupoles. In addition, new components for LEP 2 and the bunch train operation were aligned, and hydrostatic levels were installed in point 2. A complete survey of the PS machine showed significant deviations around the ring, which were corrected by a global smoothing. Movements were also observed along ISOLDE beam lines, due to a settling of the building. Last but not least, several secondary beam lines and many experiments required measurements and realignments.

6. INDUSTRIAL CONTROLS

All the main hardware for the LEP 2 Project has now been received and the last items are now being integrated into the existing cryogenics control network. The second generation software with the so-called "light objects" (simplified data modules) has been delivered and tested on-site in the hardware configurations of Sulzer/Linde and Air Liquide.

The LHC String Test Project, after the success of December 94, is now running smoothly. The fast data acquisition system has been commissioned and is providing data for the analysis of the equipment behaviour.

7. DATA BASE SUPPORT AND SOFTWARE ENGINEERING

The Database Support team has completed the migration of the engineering database service to more cost effective computers. A new project planning tool has been acquired for the LHC project. The upgrade of some widely used equipment maintenance software is being studied.

The European Space Agency's standards (ESA-PSS-05) are now applied to most of the significant software projects at CERN. The project SECIS (Software Engineering CASE Integrating System) aims at demonstrating the feasibility to integrate different CASE tools into a single workbench. A prototype which is capable of mapping ORACLE and NIAM (Natural Information Analysis Method) entity models is now available.

8. ENERGY TECHNOLOGIES

During the first half of 1995, the ET group has moved ahead in computer simulation work to design a conceptual, realistic and efficient Energy Amplifier. The work, which is still in progress, shows that the use of lead as a weakly moderating and diffusing medium for the spallation neutrons (i.e. a fast neutron regime) can produce a higher energy gain and a much better fuel burn-up than the use of water as a moderator (thermal neutron regime). A special geometry involving a reflection effect allows a good homogeneity of the neutron flux.

To test these principles, and also the novel concept of incineration of waste by Adiabatic Crossing of Resonances, the ET group, associated with a Collaboration of French, Greek, Italian and Spanish Institutes has submitted a proposal to the relevant body of the European Union for the funding of an experimental test at the CERN PS. A proposal for beam time has been presented to the SPSLC Committee to be discussed at its Cogne session. If accepted the experiment could begin in November 1995.

MECHANICAL TECHNOLOGIES DIVISION (MT)

The three groups providing mechanical engineering support for the Accelerator Sector have supplied to their clients more than 30'000 man-hours in the first half of 1995, carrying out design studies and preparing manufacturing drawings.

1.1 Machine consolidation group (ESM)

The ESM group continued its work for the LHC project in particular for the tooling of the LHC Dipole Magnet Assembly Facility in Building 181, tooling for coil winding of model magnets, accessories for the measuring bench of the dipoles, cryostat thermal model, transfer lines from SPS to LHC and investigation of new materials for the LHC magnet support posts.

During the first quarter of the 1995 shut-down, a consolidation program was set up for SPS and PS, namely on the remote control system for separators and a study of replacement of radiation damaged power cables for septum magnets. In collaboration with specialists in MT Division, the ESM group is creating a complete library for the vacuum elements of the SPS machine, stored in an AutoCAD database, and available to all the designers in the division.

In addition, the ESM group, being in charge of subcontracting design work in the division, has prepared and issued in May a market survey for a contract involving 20 to 30 man-years during the forthcoming 5 years to help the design office facing the workload coming from LHC.

1.2 LEP2 and infrastructure group (ESI)

Four main fields of design activities are considered :

- Design of layouts and components

  The production of LEP machine layouts included all documentation for the 94/95 LEP machine shut-down. The design activity also covers new experimental chambers for L3 and ALEPH. A new generation of collimators is now being studied for installation during the 95/96 shut-down. Design optimization and contract management work was carried out for ancillary RF devices (HOMs and main couplers).

- Infrastructure design

  The infrastructure design activities included support for installation studies of ATLAS cryogenic equipment in Bldg. 180, and improvement of facilities in Building SM18.

  Work continued on the LHC experimental areas layouts and on the underground machine service galleries in conjunction with the LHC "CHEAP" Committee (set up to minimise the size and fix the design of new underground areas) and the "Four Feed Points" Working Group.

- Developments

  The rinsing machine for the SCRF cavities is now operational.

  Support to MT-SM group was provided for the design of laboratory equipment to be used for surface studies and for LEP2 component sputtering.

  The Russian helium transfer lines at LEP Point 4 have been commissioned.

- Lifting and robotics

  These activities have been combined now into one section. Heavy lifting studies and market surveys for LHC experimental areas are progressing, including the investigation of possible reductions of shafts and caverns by use of different handling methods, in the frame of the CHEAP Committee.

  A remote intervention was carried out using a purpose-built manipulator to retrieve a piece of equipment lost inside a physics detector.

1.3 LHC Magnet design support group (ESH)

In collaboration with the AT-MA group, the design of the new LHC dipole models with 15 mm cables was completed, the necessary tooling built and most components ordered. A new coil winding machine was installed and commissioned as well as a new for measuring coil modulus. The main market surveys and associated calls for tenders for 10 m long dipole models were launched and several important orders placed. Studies of coils under tensile pre-stress and with end cages were undertaken and some models tested. In addition, several 1 m long LHC dipole models were measured and analyzed:

New model beam screens for the LHC vacuum system were built for impedance and quench behaviour measurements, which allowed to validate the design. A collaboration and a preliminary design of the equipment for a LHC vacuum experiment at cryogenic temperature in EPA were drawn up.

Conceptual studies related to 'LHC with Four Feed Points' and a possible separate cryogenic transfer line as well as symmetric short straight sections are in progress.

Synchrotron radiation masks were displaced and realigned in DELPHI, masks were installed in OPAL and the design of masks for L3 and ALEPH is in preparation. Conceptual studies of vacuum chambers for ATLAS, CMS, ALICE and B-physics were started.

2. MANUFACTURING FACILITIES GROUP (MF)

Most of the group activities are linked to the modifications being made to the LEP RF system, in particular for the collimators and the RF antennae (double wall extension tube) as detailed below.

- The fabrication of the first series of 30 double wall extension tube has started mid-November 1994 and was completed by mid-February 1995 in full accordance with both the technical specification and the planning requests. The fabrication of the 220 remaining double wall extension tube which started in January 1995 is under way at a rate of 20 units per month since April 1995.

The MF group is also fully in charge of the modification of the 70 existing and fabrication of 150 new couplers which is progressing satisfactorily at the rate of 20 couplers per month as from April 1995. The fabrication of a few accessory elements (door knob, antennae cooler, ceramic insulator, wave guides) must be also undertaken by the MF group. These activities represent a considerable workload exceeding 10'000 hours not only for the workshop itself but also for the subcontracting section and the SM group. It is both a technical and organizational challenge to meet the stringent requirements of the LEP2 project planning.

Amongst the other tasks undertaken by the MF group, special mention should be made of the RF short-circuit mechanism for the CPS 40 MHz cavity and the modifications of about 50 LEP experimental vacuum chambers.

Another activity concerns the development work for the LHC beam screen, which includes the fabrication of the prototypes for RF tests, and the necessary welding tests on capillary cooling tubes performed with a new YAG laser.

3. SURFACES AND MATERIALS GROUP (SM)

The overall workload of the group for the LEP2 programme continued to increase during the first half of 1995. The group has always been very active in the programme for developing niobium coated superconducting cavities and associated diagnostics. The effort for LEP2 still includes a large volume of work, with major contributions in the fields of materials expertise and selection, chemical cleaning, vacuum heat treatments, vacuum brazing and sputter coating for the production of the first series of the couplers and RF extension tubes. It is foreseen that this work will continue at least until the Autumn in order to equip all the 200 SCRF cavities.

In a more general context, in collaboration with AT Division, a feasibility study was started on applying laser annealing to improve the RF performance of thin superconducting films used in cavities. The device under study, called ELSA (Excimer Laser Surface Annealing), is at present limited to 1.6 GHz monocell cavities in order to facilitate the problem of ultimate RF testing.

Since the approval of LHC an increasing number of requests were received for advice and assistance on materials and processes. Already in 1994 the group was contributing to the selection of appropriate metallic materials and the assessment of welding processes, but today this also covers the selection and testing of epoxy resins and adhesives suitable for low temperatures and resistant to high radiation doses.

After the major renovation undertaken in 1994, work is back to normal in Bldg. 102 where both the chemical and electrochemical surface treatment plants and facilities for developing photomechanical technologies are installed. As a result, the working conditions as well as the quality of the work, have greatly improved to the general satisfaction of both the staff and the users. In addition, new technologies based on recently developed photosensitive polyimide products were tested for multilayer hybrid components with 10 micron resolution, and a good start was made in developing the technology to electroform 3D pure copper components by pulsed current plating.

4. COORDINATION FOR LHC

Two interdivisional projects are coordinated within the MT Division.

4.1 LHC Test Cell in SM18

After the successful commissioning at the end of last year, the LHC Test String in SM18 was recooled at the end of February. A comprehensive experimental programme has been drawn and is being carried out, with the primary aims of optimizing the LHC working parameters for the cryogenic system and for the quench protection system. The first results show that the whole string can be cooled from 300K to 1.8K in less than five days and that the magnets can be ramped at 10 A/s, which is the nominal value for LHC. The nominal field of 8.4 T has been reached again on the first attempt. Quenches above this level have also been induced and showed that the magnet internal pressures remain reasonably low: this should allow to reduce drastically the number of safety relief valves in the final LHC half cell. Also the time for the string to recover from a quench has been minimized and is now around 6-8 hours. These studies will continue till the summer: at that time another dipole will be added to the string.

4.2 Magnet Assembly Facility

The infrastructure of Bldg 181 was prepared for the Dipole Magnet Assembly Facility. The hall has been completely emptied and the electrical installation remade to conform to the new safety rules. A concrete support beam is being built to receive the 18 m long heavy duty press, which is the main tool for assembling the magnets and which is scheduled for delivery by the middle of the year. Several measuring benches, tools etc. were also ordered and should arrive before the summer, in such a way that the whole facility will be commissioned in the second half of the year. It is already planned to repair one dipole magnet in September and to assemble two other dipoles towards the end of the year.

PROTON SYNCHROTRON DIVISION (PS)

As in past years, the PS complex continued to operate after the end of the physics programme in mid-December 1994, and right up to the last possible moment before the laboratory closed for Christmas. This time the machine development work was devoted to the study of Pb-ions in LEAR in order to measure how fast the electron cooling system could cool a beam of Pb 53+ ions rather than antiprotons, and to measure the lifetime of the ion beam in the presence of the electron cooling beam. These measurements and others are necessary because LEAR will be used in the future as an ion accumulator ring, prior to injecting ions into LHC. The first studies were quite encouraging, yielding preliminary values of 50 msec and 300 msec for the momentum and transverse cooling times respectively; however, the ion beam lifetime will need more work to reach an acceptable value. There will be further machine development sessions in 1995. The other extremely important topic just before Christmas was the series of tests and reference measurements made on the control system under operating conditions prior to the installation of the next slice of the renovated controls during the shutdown; without these tests the implementation would be a risky business, but no major problems were encountered.

The annual shutdown was scheduled to last until the beginning of March. It included as usual a long list of repair and preventive maintenance jobs which can only be done when the machines are off for a long period. At the Booster, special attention was paid to the repair of leaks in the vacuum system and to further improvements to it, since the Pb-ion programme relies so heavily on having an excellent vacuum in the Booster. On the PS machine, the main activities centred on a survey of the magnet positions resulting in some slight corrections, and a similar verification of the positions of elements in the transfer line to the SPS, where some doubts had been cast on the alignment. At the proton Linac a long-awaited beam stopper was installed after the RFQ, but this involved realignment of the RFQ so it was not a trivial affair; whereas on the heavy ion Linac, the definitive RF amplifier for tank 1 from GSI was installed, thus liberating the temporary amplifier which had been used for the 1994 runs. For the lepton machines, the main activities concerned the installation of acoustic shielding in the klystron gallery, an improvement in the switching

between the LEA test zone and EPA which will allow parastic irradiations during LEP production runs, and the conversion of the water cooling system into a closed-circuit system (thus avoiding the waste of water by jettisoning it into the drains),. A different type of "cooling", was worked on for the antiproton machines, namely the stochastic beam cooling system, where a systematic search was carried out to identify possible noise sources; in addition, at LEAR, several delicate bellows at the ends of the bending magnets were replaced by more robust models following the discovery of vacuum leaks last year, and clearing electrodes were added to the ring in various places to help eliminate sites where ions might collect and perturb the circulating antiproton beam.

Important as these jobs were, the main task for the 1995 shutdown was the installation of the latest slice of the new controls system which is gradually being implemented throughout the PS complex in each shutdown. This year the last unconverted machine was tackled, the PS itself. Since this is too big an undertaking for a single shutdown, the job was split into two parts, and this year injection and acceleration in the PS were implemented (power supplies, radiofrequency, beam diagnostics and pulse-to-pulse modulation); next year, it will be the turn of extraction and beam transfer to the SPS. Of particular importance this year were the introduction of a new synchronisation system (using the newly-developed "TG8" modules) and the implementation of good archiving. The huge amount of cabling work, installation of the control chassis and the workstations, sorting out the specific PS software, etc. was all accomplished in the time allocated. Then, in an intensive starting up period of about 3 weeks in March, the control system demonstrated that it performed exactly as it should do, with the same high level of reliability as the rest of the new control system. However, this success was only achieved by the enormous effort of a large number of people.

Although the accelerators were back in operation by April, there had been much cause for anxiety. This was because the work of the shutdown had been rudely interrupted one weekend in February by an unprecedented act of sabotage, when about 1300 electronic modules were removed from their chassis, involving the disconnection of some 5000 cables and the cutting of about 200. A systematic search of all PS areas was immediately carried out, followed by searches in certain ISR zones, and the equipment was found over a period of several days, hidden in eight different places. Over 100 people were mobilised to make the searches. All

the missing elements were recovered and appeared to have suffered no damage, but the real test could only be made once the modules were plugged into their slots again, and thoroughly checked. It proved a long job to replace all the modules, re-cable them, replace damaged cables, and test them. In many cases the off-line, static test does not necessarily show a fault, which only becomes apparent when the module is tested on-line with beam, so there was still some anxiety until all the beams had finally started up at the end of the shutdown. The sabotage cost a great deal of additional effort in the shutdown (estimated at a total of 2 man-years of work), to the detriment of the planned work, and it resulted in a delay of the startup of the different machines of the PS complex by 1 to 2 weeks. But, by rearranging the schedule, by reducing the scope of the startup tests, and above all by the dedication of the staff putting in extra hours of work, it was in the end only at LEAR that physics suffered from the sabotage, by the loss of almost one week of physics time compared to what was originally planned for 1995. However, the PS was, and still is, unable to deliver the highest proton intensity because there was insufficient time to remount and test the complete PS longitudinal beam control system before the startup; the consequence is that for the moment the antiproton production rate is about 30% lower than normal, which means that in order to deliver the required beam to the LEAR experiments, the production process has to continue for longer than it should, resulting in a higher electricity consumption. This situation probably cannot be rectified until the summer, because of the pressure of other scheduled dates. As a result of the sabotage incident, security procedures are being reviewed around the PS, but unfortunately little can be done to protect our installations from damage by someone with insider knowledge.

During the setting-up phase of the antiproton beam, the collection rate for antiprotons has to be optimised, and one of the main elements is the lithium lens which focuses the antiprotons into the aperture of the AA machine. It is pulsed with a current of 450 KA and after 3 years of reliable operation, it broke down. However we have no replacement lens, since it was decided long ago that in the event of a breakdown, we would switch over to the use of a magnetic horn. These horns have been used before and the new model is more robust than earlier ones, so should have a long lifetime, although it is known that its yield is not quite as high as that of a lithium lens. The installation work was successfully accomplished using the usual remote handling gear foreseen for the highly radioactive target zone, in a delicate operation lasting about 3 hours.

There then followed a continuation of the search for the infamous "phantom" in LEAR during a dedicated machine development period with antiprotons. This "phantom" manifests itself as a sudden and uncontrollable loss of the stacked beam in LEAR, but only at a momentum of 200 MeV/c. The phenomenon comes in an apparently random way and has so far resisted all attempts to pin down its origin. The latest measurements show that although the "phantom" still appears, it does so less frequently than before, which may well be correlated with the fact that the vacuum in LEAR is better by a factor of 2 or 3 compared to last year. A major improvement, however, has been the installation of a feedback system from the signal of the beam delivered to the physicists. This gives a constant beam intensity to the users by automatically correcting the noise signal used to determine the spill of the beam from LEAR, resulting in a much-improved duty cycle. In addition, if there is a "phantom", the users do not lose their beam, but see only a somewhat shorter beam spill, and this should allow a much improved data taking rate for those users who were badly affected last year.

A very important series of machine measurements started in early May on the PS and will continue whenever development time can be made available throughout the year. The subject is the study of non-linearities at high energy in the PS, prompted by the request of SPS for future LHC beams with a much larger momentum spread than currently accelerated. The larger beam sizes implied might well mean that the beam passes in regions where it will be subject to non-linear effects, and the consequences of these have to be studied as soon as possible. Another important topic is the blow-up of the PS beam in the transfer to SPS, observed with the Pb-ion beam in the November 1994 run, but also seen with protons. Both these topics are given high priority for 1995. Studies are also under way of the properties of the extracted beam in the T7 line in the East Hall, where a request has been received for a clean beam with extremely small halo, which requires very precise measurements of the beam profile there.

Finally, progress has also been made with the two research topics in the Division not directly related to the functioning of our 9 accelerators. On the first of these, the CLIC test facility CTF, work during the shutdown aimed at installing two new pieces of equipment: a magnetic pulse compressor to shorten the bunch length of the accelerated electron beam by a factor 5 from 1.1 mm to 0.22 mm, and a high gradient (60 MV/m) accelerating section borrowed from LAL whose object

is to reduce the effect of beam loading on the electron beam. This new equipment was ready by the end of the shutdown and will be used in the first CTF run of the year in May. The other topic of study, the development of a laser ion source for the benefit of the CERN Heavy Ion Programme, has concentrated on emittance measurements, especially of Ta beams of charge state 18+, and on improving the energy spread of the beam extracted from the source, making use of new equipment provided by the collaborating institute in Prague. Detailed design work has been made on the components of the future laser ion source system, including the target chamber, extraction and low energy beam transport and RFQ, as well as the high intensity laser itself (which is being designed by collaborators in ITEP and TRINITI in Russia).

SPS AND LEP DIVISION (SL)

The SPS Machine

The year started with the customary winter shutdown. As usual, most of the activities during the shutdown were related to routine maintenance of machine components and general services, including electrical power distribution, cooling and ventilation.

In the area of the internal beam dump and the injection system in the long straight section LSS1, all control cables and the HV cables for the injection kickers had been damaged by radiation and were replaced. In order to save money and to replace the damaged part of each cable only, patch panels for the control cables were installed in less irradiated areas of the tunnel under the main magnets, while for the HV cables such a patch panel was installed on a platform in the cable gallery at the junction to the machine tunnel. HV connectors had then to be moulded in situ.

The SPS is an ageing machine and many components continue to show serious signs of fatigue. Six main dipoles and six quadrupoles had to be replaced during the shutdown, a number which is considerably higher than in previous years and gives rise to concern.

Ground motion in the injection transfer line TT10 from the PS to the SPS had led to a significant misalignment of the magnetic elements of the line, with vertical deviations from the nominal position of up to 11 mm. This phenomenon may explain part of the difficulties which were experienced last year, in particular during the lead ion run, and has now been corrected.

The operation of the bunch train scheme in LEP requires to run its injector, the SPS, at a different harmonic number if eight bunches from the SPS are to be injected into four buckets in LEP within one cycle. As a consequence, a retuning of the 100 MHz cavities in the SPS became necessary. These cavities were dismounted, mechanically deformed such as to resonate at the appropriate frequency and then reinstalled.

Inspite of the fact that an entirely new access system for the SPS has been installed during the shutdown and inspite of the incident at the CPS, proton operation started up very successfully on 6 April, only three days behind the original schedule. No major problems were encountered. The beam received from the PS proved to have a substantially better quality than during last year's start-up.

Following initial measurements of the natural closed orbit in the SPS, six machine quadrupoles, three in the horizontal plane and three in the vertical plane, were realigned, a procedure which is usual during start-up and which this time has led to a reduction of the orbit excursions by a factor of two. Since then the machine is running very regularly, with an excellent transmission efficiency of more than 90%.

Soon after Easter, an intensity of $2.5*10^{13}$ protons per cycle could be accelerated to 450 GeV and one week later the machine was running regularly at $3.5*10^{13}$ ppp, an intensity which was reached last year in autumn only, towards the end of proton operation and after numerous difficulties.

All secondary beams in the two SPS Experimental Areas were brought into operation very smoothly during the Easter weekend. Fears that the new control system which has been installed during the shutdown might show some teething problems were unfounded. On the contrary, the new system, based on a modern network standard and on state-of-the-art microcomputers (PCs, UNIX workstations and X-terminals) turned out to be more userfriendly and more reliable from the beginning than the old system which was based on minicomputers and a proprietary network.

With the two neutrino extractions also well adjusted, the SPS proton programme is now in full swing.

SPS operation with leptons started up very smoothly in the week after Easter. At present, two positron cycles and two electron cycles are used per 14.4 second supercycle, with four bunches accelerated on each of the lepton cycles. Operation with eight bunches per SPS cycle will be implemented once the LEP start-up has been completed.

The LEP Machine

LEP stopped running for physics on 30 November but continued until 5 December with machine studies. The tunnel was then opened in order to carry out the heavy workload for the winter shutdown. The majority of this work was associated with the LEP2 energy upgrade project and the modifications necessary for the Bunch Train Project.

For the energy upgrade, seven operational superconducting modules (28 cavities) are now installed. These modules will be tested with beam during operation in 1995. In addition the newly designed LEP2 synchrotron radiation masks were installed around OPAL which was also equipped with an enlarged vacuum chamber at QS3. The new masks require ultra high precision alignment with respect to the beam pipe. New collimators were installed at QS10 near the L3 and OPAL experiments. The present LEP configuration (after the shutdown) is, with a small number of exceptions, that required for operation of LEP2.

In preparation for operation with bunch trains in 1995 the electrostatic separators in all LEP straight sections were modified and to a large extent relocated. Half of the sextupoles previously used for the "Pretzel" scheme were relocated so as to be useful for making tune differences between the electron and positron beams with the bunch train scheme. Finally the skew quadrupoles which compensate the betatron coupling were moved to more effective locations for operation with the new bunch train optics.

Following the excellent results of the complete vertical re-alignment from previous years, a similar exercise was repeated this year. The accuracy of the re-alignment was improved to an rms deviation from a smooth curve of less than .15 mm which required the movement of only 70 quadrupoles as compared with 140 and 450 in the 93/94 and 92/93 shutdowns respectively.

The shutdown officially ended for the main tunnel on 13 April in order to perform the INB safety inspection the next day. Following this successful INB test a "cold check-out" was performed (in parallel with access to some of the detectors) during the following week. This cold check-out was once again shown

to be invaluable for debugging all the LEP equipment before the arrival of the beams.

The LEP tunnel was closed for injection of beam on Saturday 22 April around noon and a beam was circulated only a few hours later. The next two weeks were foreseen for the LEP start-up with beam. In reality the first Z^0s were recorded on 3 May. The carefully planned sequence of tests and measurements aimed at progressively covering all phases of operation from single beam injection at 20 GeV to operation with bunch trains with initially 8 bunches per beam colliding at 46 GeV with a tightly squeezed β, is being carried out at the time of writing.

LEP2 Radio-Frequency System

Five new superconducting RF modules were installed in LEP during the winter shutdown. They will be operational after a modification at the junction between the rectangular 350 MHz waveguide and the coaxial power coupler. This modification can be made in situ and will improve the HV insulation of the central conductor of the coupler, the antenna. The insulation permits to apply a DC bias of some 2.5 KV to the antenna and thus suppress multipacting in the coaxial line. It will then be possible to transmit a maximum power of the order of 180 KW through the coupler, well above the required 125 KW for LEP2.

Undesirable higher-order modes which are excited in the cavities by the electron and positron bunches are removed via two HOM couplers per cavity. These couplers will now be equipped with a rigid connection for the removal of the HOM power, replacing the cables which were previously used and which had a limited power capability. The HOM couplers will then no longer determine the maximum currents at which LEP2 can be operated.

TECHNICAL SUPPORT DIVISION (ST)

After a year of intense work a wide-ranging investigation to determine the best solution to stop the inflow of water in the LEP Tunnel between points 3 and 4 has come to a successful conclusion. A contract could be placed for a detailed technical study of the proposed steel lining of the portion of the tunnel concerned. This order is accompanied by an addendum to cover the direction and work-inspection of an emergency intervention possibly occurring during the period between now and the end of LEP operation. There is strong hope that the tunnel can be kept in the present state until then. Nevertheless some investment will be necessary now to dry the air in the tunnel so as to avoid corrosion problems that would be created by a combination of humidity in the air and synchrotron radiation during operation of LEP at the expected higher energy.

The construction of the new Hostel is approaching completion after not more than 18 months since ground-breaking. It is very gratifying to note that also the financial frame is fully respected and the Hostel should become operational at the beginning of June.

The progress of the Physicists' Building is according to schedule both in time and money.

The technical infrastructure improvement programme is moving ahead as a function of the financial means set aside within very tight budget conditions. The end-of-the-year report will be the right time to give a more detailed inventory of the ongoing action.

TECHNICAL INSPECTION AND SAFETY COMMISSION (TIS)

Radiation Protection Group

In addition to the surveillance of the usual repair and maintenance work in radioactive areas during the annual shut down of the CERN accelerators, a major upgrading of the radiation monitor system around the machines was undertaken in this period. The pulse length of the output signals of all monitors was shortened to cope with the new faster ARCON software allowing for an instantaneous response in the case of a radiation alarm condition. The installation of the gate monitors at the entrance to the CERN sites was pursued and a specification for a warning panel which lights up when an alarm occurs was sent out. This specification is based on a prototype built at CERN.

The project of checking the presence of individual dosemeters for people entering in high radiation areas was finalized as far as the printing of the bar codes and the marking of the film badges are concerned. Work on the changes in the software which are needed for accessing the ORACLE data base after the run-down of the VM system continued. Following the development of a successful prototype, an order for five water samplers for the environmental programme was placed. These new samplers will replace the more than 15-year old equipment for which spare parts are no longer available.

After the new Swiss Ordinance on radiation protection, which is based on ICRP 60 and had come into force on 1 October 1994, CERN's internal regulations laid down in the Radiation Protection Manual had to be adapted. The text of the new edition of the Manual was adopted by the CERN Safety Policy Committee in March and the final version was submitted to the Host-State authorities for formal approval just before Easter. The new Manual will have the status of a CERN Safety Code.

Work for the LHC continued. Computer programs were used extensively to determine shielding thickness, levels of induced radioactivity and radiation doses as the machine parameters and the plans in particular for the experiments became better defined. Work on the radiological impact report was taken up again.

General Safety Group

The safety inspections concentrated on areas which are only accessible during the annual shutdown of the accelerators. Alarm systems and other safety installations have been thoroughly tested. The installation of cryogenic equipment for LEP200 and the construction of prototype dipole magnets for LHC required continuous interventions. The experiment NA48 and particularly the construction of its liquid Krypton calorimeter have also been followed closely. Special attention was given to civil engineering work of major new buildings (new hostel and the physicists' building) and to the transformation of the former SC complex. A programme for reducing noise levels around the LEP sites has been defined.

Chemistry, Fire and Materials Group

The apparatus to measure the explosion limits of flammable gas mixtures for LHC experiments is now calibrated and operational. The Flammable Gas Safety Manual is under revision. Contacts with DESY and GRAN SASSO are maintained in order to apply the same procedures and rules within the high-energy physics laboratories.

A new Safety Instruction IS 41 was issued entitled "The use of plastic and non-metallic materials at CERN with respect to fire safety and radiation resistance". This is of great importance to implement the use of halogen-free plastic materials for new buildings and for the LHC machine and experiments, as has been done for cables at CERN and DESY since more than 10 years. The appointment of a "cable controller" continues to be very useful and allows to keep control over cable orders at CERN and to identify future needs where solutions for halogen-free cables and materials still need to be found, in particular for LHC experiments.

The safety issues arising from the Technical Proposals of ATLAS and CMS are being analysed and a safety hearing is in preparation. Studies on fire prevention and fire fighting in the LHC underground experimental halls and counting rooms have started.

On 1st January 1995, the Fire and Rescue Group became a Section of the CFM Group. The Service is tackling the challenge of maintaining a credible level of service in the face of reductions in staffing. Training for the ambulanciers to the Swiss standards is continuing at the usual level, whereas other training in firemanship has been stepped up to improve efficiency and safety working in small teams, and with new breathing apparatus and ancillary equipment.

Service Médical

Le Service Médical continue les visites telles qu'elles sont pratiquées depuis octobre 1993, à raison d'une visite médicale pour chaque membre du personnel tous les deux ans, en regroupant autour de cette visite clinique les examens paracliniques utiles, compte tenu de la situation médicale ou de la nature des risques professionnels rencontrés à l'occasion des activités professionnelles.

Par contre, les personnes ayant été significativement exposées aux radiations ionisantes (> 100 mSv) ou travaillant régulièrement et habituellement en équipes alternantes sont invitées à cette visite médicale chaque année.

En ce qui concerne l'activité du laboratoire d'analyses médicales, l'acquisition d'un nouvel automate permet de proposer, dans le cadre des visites médicales, un plus grand choix et surtout une fréquence accrue des contrôles biologiques justifiée par l'augmentation de l'âge moyen du personnel.

Depuis le début de l'année 1995 une campagne de revaccination antitétanique et antipoliomyélite a été lancée pour tout le personnel, tandis que s'achève la campagne de vaccination contre l'hépatite B pour le personnel exposé (pompiers, secouristes auxiliaires) par un contrôle des anticorps protecteurs, qui permet de s'assurer de la réalité de la protection proposée.

III ADMINISTRATION

- Director-General Unit (DG)
- Directorate Services Unit (DSU)
- Administrative Support Division (AS)
- Finance Division (FI)
- Personnel Division (PE)

DIRECTOR-GENERAL UNIT (DG)

This unit consists of the Director-General and the Directors. The immediate administrative, secretarial and other support services of the Director-General and the Directors are grouped for administrative purposes in the Directorate Services Unit (DSU).

Directorate

The Directorate meets weekly and is chaired by the Director-General. Its deliberations are confidential, but summaries of decisions are distributed to Division Leaders and the President of the Staff Association. The Head of the Directorate Services Unit acts as Secretary.

DIRECTORATE SERVICES UNIT (DSU)

Administrative, secretarial and other support services of the Director-General and the Directors are grouped in this Unit. The Head of the DSU is responsible for all administrative and logistic matters pertaining to the groups within the Unit, although for the carrying out of their duties, the group leaders and individual staff members report to the Director-General or one of the Directors as appropriate.

OFFICE OF THE DIRECTOR-GENERAL

The office contains the administrative and secretarial support to the Director-General and the Head of the DSU, Relations with Member States and the Council Secretariat, as well as Relations with Non-Member States.

Relations with Member States

Information has been collected and assessed concerning particle physics in the Member States. Visits were made to a number of Member States, usually associated with giving a seminar or participating in a meeting. Special attention was given with CERN's relation with UNESCO and the EU, as well as to questions concerning our Host States. The document "Particle Physics in the Member States" has been updated.

Relations with Non-Member States

This activity increased following the approval of the LHC project. J.V. Allaby was appointed as the link person for these relations from 1st January 1995.

Delegations, led by the Director-General, went to Japan and the United States for discussions on CERN's relations with these countries. During the visits to Tokyo and Washington, the Science Counsellors from the CERN Member States were given a briefing by the Director-General. In addition, CERN staff have been to Romania and Slovenia, to visit research institutes, industrial firms, and had discussions with the relevant ministries. Further visits are planned to Russia, Armenia and Pakistan.

Council Secretariat

The Council Secretariat continued its work for the CERN Council and its subordinate bodies (Scientific Policy Committee, Finance Committee, Committee of Council, TREF). This involved close collaboration with the President, the Chairmen and the various national delegates. Likewise the Office continued to provide secretariat support for ECFA.

DIRECTORS' OFFICES

Provide administrative, secretarial and other support to the Directors. In addition, the Director of Administration's office includes the Industrial Services Unit, Host-State Relations, the Divisional Planning Service. Although not formally part of the DSU, the Industry and Technology Liaison Office is included hers as it operates under the general guidance of the Research/Technical Director.

Industrial Services Unit

Participated in the review of all standard documents annexed to calls for tenders for Industrial Services. Active support was given to the divisions for the drawing up of specifications for calls for tender, and the unit worked in liaison with the Monitoring Board to define practical solutions to cases arising from the implementation of the new Purchasing Policy and Procedures. It also carried out an in-depth review of the contractual conditions to apply to calls for tenders.

Host State Relations

Represents CERN at meetings and contacts with the French and Swiss Authorities, particularly concerning: residence and work permits for wives and children of CERN staff, use of the inter-site tunnel, arrangements with Customs Authorities and Police, protection of property, transport and circulation, status of industrial supply contractors and their personnel, etc.

Industry and Technology Liaison Office

Activities have included: participation in following up the implementation of the recommendations of the FC Working Group on Purchasing Policy and Procedures, assistance to Industry Liaison Officers, relations with industrialists from Member States, assessing possible contribution of Non-Member State

industry to the CERN programme, assessment of technology transfer actions, measures to protect the intellectual property rights of the Organization, assistance with the preparation of the Administrative Arrangement with the EU, participation in information and training activities relative to the technological spin-off from particle physics, the applications of particle accelerators to medicine and industry.

Divisional Planning

Activities for the whole of the Administrative Sector (AS, DSU, FI, PE) have included: book closing the 1994 accounts, preparation of the 1995 budget allocations, definition of the 1996 budget, preparation of the medium-term plan for 1996-99, management of the EDH data handling system, and definition of recruitment needs. For the DG unit and the DSU, the service is co-ordinating the annual advancement (MOAS) exercise. In addition, the service provides CERN-wide co-ordination of the administration of the Organization's telecommunications.

LEGAL SERVICE

Activities in which the Service has participated have included: preparation for the decisions concerning the LHC Project, discussions concerning contributions of certain Member States, preparation of agreements with Non-Member States and the EU, the work of the Pension Fund (notably concerning pension guarantees in the event of the dissolution of CERN), legal aspects of property protection, procedural agreements with the Host-States. In addition, it has participated in a number of internal committees, e.g. concerning safety, training, pensions, revision of the Staff Rules and Regulations, revision of contract documents.

The Service has defended the interests of the Organization before the Administrative Tribunal of the ILO, as well as on insurance questions, and in commercial litigation and arbitration.

INTERNAL AUDIT

During the first months of 1995, efforts have concentrated on the auditing of the 1994 Accounts of CERN and also those of the Pension Fund. Verification and checks have been carried out in agreement with the External Auditors to avoid

duplication of work. In addition, the Service has continued to ensure that rules and procedures are respected, and it has contributed to the establishment of new, improved or modified procedures by regular participation in working groups.

STRATEGIC PLANNING UNIT

The Unit's activities included: helping the Management in resources planning (especially preparing the medium-term plan for 1996-99), development of human and materials resources scenarios, miscellaneous analysis requested by the Management (particularly LHC resources and CERN users related expenditures at CERN), support to the Technology and Industry Liaison Office, updating information and providing statistics on technology collaborations between external partners and CERN. There was continued collaboration with external Business Management Institutes and participation in joint studies in the domain of strategic management and technology transfer.

COMMUNICATION AND PUBLIC EDUCATION GROUP

The Media Service's activities included dealing with the incident at the PS, where the control system of the accelerator was dismantled. The story was covered extensively in the world press. The Service organized an international conference on the World-Wide Web, which was opened by Mr David Hunt, Minister of Science for Great Britain, and which was attended by over 200 journalists and communication specialists. In addition, by the end of April, another 100 journalists had visited CERN. A special project has started for improved archiving and preservation of CERN films and videos.

In January, the Visits Service took over responsibility for the Reception desk from AS Division. The increase in CERN's popularity among the general public in Europe and elsewhere has continued, and there have been about 2000 visitors coming to CERN each month. A special project to improve the Visits Service is underway. This will include display areas for visitors to the PS and SPS, better training of guides and improvements to itineraries.

The 1995 exhibitions programme started with an exhibition in Brussels in April. Preparations are under way for a stand at the technological forum SITEF in Toulouse in September, and an exhibition in Cracow in October. It is planned to evaluate the content of the Microcosm and travelling exhibitions.

CERN PENSION FUND

The Annual Report of the CERN Pension Fund is submitted to Council separately (CERN/2088 - CERN/FC/3778).

ADMINISTRATIVE SUPPORT DIVISION (AS)

Data-Base Applications

Human Resources Management: the existing package was successfully replaced by a commercial package fully integrated with the other systems we run. A major effort is currently invested in its consolidation.

Payroll Management: a package totally integrated with the former, was successfully introduced after careful testing. Major simplifications and rationalisations of the charging of personnel costs prepare CERN for introduction of P+M, and better reporting on personnel related costing information.

Materials Management and Logistics, a commercial fully integrated package Triton was introduced on May 1, replacing the old system dating from the sixties. Major enhancements include streamlined procedures using bar-codes, state of the art replenishment increasing service level and/or reducing stock value, electronic catalogue and ordering, better integration with other packages. In the Import-Export area, a commercial package totally integrated with the Purchasing System was implemented. A new application for Advance and Claims has been developed, and introduced in-house, in view of CERN particularities.

Desktop Computing

The Desktop Computing group continued to consolidate its service role for all Macintosh and PC Users and in particular DG/DSU services. A survey and evaluation of Pentium-based PCs was undertaken based on the best price/performance and technical service from European suppliers.

Document Handling

A new high speed Océ 2600 copier was installed. The two Desktop Publishing centres also increased their production of documents in electronic and camera-ready form. A new section, Document Conversion and Presentation Services, was formed providing services for scanning paper documents to electronic form, conversion of various file formats and giving advice to users on the presentation of information at talks and conferences. The CERN Preprint Server has shown spectacular success, with an average of 3000 accesses per day rising to peaks of 6000. Improved search capabilities are among the new features added and the server hardware has been upgraded to match the increased load. The ALICE User

Guide has been made available on the World-Wide Web and preparations are well under way for installing a new version of ALICE and for migrating the service from VMS to UNIX. A prototype Document Management system with a WWW interface was developed and presented to users. This can provide full-text search capabilities to complement the navigation facilities offered by WWW.

General Services

Measures have been taken to implement the budget cuts for 1995. Further recommendations have been formulated which will involve changes in structure, reductions or suppression of certain activities. The transfer of informatics support for Space Management and Mail Office databases to AS-DB has been completed. The new on-site hostel has been completed according to the planned schedule and will open to guests at the beginning of June 1995. Preliminary studies are well under way for replacing the ageing barrack-dormitories.

Logistics

Materials Management and Logistics: Following the software package analysis carried out in 1993, the TRITON package from Baan (NL) was selected. Testing and customizing continued throughout the latter part of 1994 and implementation was planned for Spring 1995. The implementation of the TRITON package on May 1 will have a major impact on Stores operations. The inventory in all stores will be managed individually, currently they are managed globally, and bar coding and electronic point of sale techniques will also be introduced. Users will have access to an electronic catalogue and ordering procedure on the CERN Electronic Document Handling system EDH. A new inventory management forecasting and simulation tool has been developed for the optimization of stock management. Another new concept, the Virtual Store, was also introduced, in which inventory is held by the supplier and ordered by CERN, electronically, on a daily basis. Shipping: the SIRIAC Purchasing and Logistics applications in the AIS project were completed when the SIRIAC Import-Export module went into production in September 1994.

Organisation & Procedures

Members of the Organisation and Procedures unit preside and organise the work of the 'Groupe de Travail sur les Procédures Administratives' (GTPA). The Handbook of Administrative Procedures continues to be completed and updated

and has been made generally available via the World Wide Web. The Service collaborates actively with the team charged with the implementation of the new Human Resources Management and Payroll system. Their role in this context centres on user support and includes documentation of procedures and working methods. Procedures have been revised for the handling of OSVC's and related documents in view of their implementation in the Electronic Document Handling (EDH) system.

Scientific Information

The Preprint Weekly list is now available on paper and as hypertext on CERN Preprint Server. The number of preprints entered weekly has increased from 180/week over 300/week due to the savings introduced by the semi-automatic cataloguing of bulletin boards items. The forthcoming Conference list, previously available on CERN VM only, is now moved to the Preprint Server. The first inventory control for the central library reading room is finished, after 43 weeks of FTE. The tasks consisted of the basic work (retrospective cataloguing, loan files updates, corrections, bar-coding, etc.) and the inventory as such (bar-code reading, updates, etc.). Space extension: the library, together with ST worked out a plan of space extension, on a basis of the Brawne's report of 1990. It consists essentially of a ground floor reading room. In order to make the growing CD-ROM literature available to every CERN user, different platforms, such as MAC, PC and X-terminals have to be offered. A study of enlarging this access is underway together with DH group.

Systems and Interfaces Unit

Two new machines have been installed, one to run the Histo, Foundation, Gesloc, Gescle and Gesbaraq applications, and the other, a development machine for the financial and purchasing systems (ORIAC and SIRIAC). We are standardising on Solaris and most machines are now running either Oracle version 7.0 or 7.1. The Quickmail service has been expanded and one new server has been installed. All servers are now located in the server room in building 5 comprising around 1400 users on 7 machines. In addition we have 2 machines acting as gateways and we have one machine holding the CERN electronic mail directory (EMDIR). EDH 2.0 is now fully in production, and contains the electronic Leave Sheet, Stores Catalogue and Material Request. Many enhancements have been made to the DAI and TID documents to improve their look, and ease completion. A complete new Administration tool has been added

to enable divisions to maintain the data on which the routing logic of EDH is based. This includes the possibility to define, modify or delete Signature Rights, Profiles and Roles by certain authorised people. Workshops have been run at regular intervals allowing users to use EDH in the presence of the developers, which has proved to be of great mutual benefit. The interface of the application has been greatly enhanced, and many new functions will be available. A new simplified dimension has also been added for those users who repeatedly use the same few functions. An interface with Triton, the new stores application, has been put in place to enable stores information to be available in BHT as before.

Translation and Minutes

The Translation and Minutes Service carried out its normal tasks of translation work and minute-writing. On the translation side, work consisted mainly in translation into English and French of official documents for the Council and its Committees, specifications, articles for the CERN Courier, safety documents, press releases and other CERN documents as well as linguistic editing and checking in the framework of the revision of the Staff Rules and Regulations. A large proportion of the activity of the Service was devoted to minute-writing for the Scientific Policy Committee, Finance Committee, Committee of Council, TREF, Standing Concertation Committee and the Governing Board of the Pension Fund. In addition, the Service prepared the summaries of the monthly meetings of the Management Board for the Weekly Bulletin.

FINANCE DIVISION (FI)

1. INTRODUCTION

The revised purchasing policy, approved by the Council in December 1993 (CERN/FC/3662 - CERN/2006), was in full operation for the first time in 1994. The results, stemming from a combined effort of all Divisions, the Liaison Officers of the Member States and in particular the Purchasing Service in Finance Division, were very encouraging as the report on purchasing during 1994 (CERN/FC/3764) shows. It is worthwhile recalling that the new rules entail a major change in the purchasing practice at CERN and imply a non-negligible additional work-load for the CERN personnel involved in this activity, particularly for those in Finance Division.

As always in the early weeks of the year, the final adjustments were made to the Budget and the finalized 1995 Budget document was presented to the Finance Committee for approval on behalf of the Council in March. The preparation of the 1996 Budget is now also underway.

The preparation of a number of additional documents for the Committees regarding various alternative methods of calculating the contributions of the Member States was also included in the work programme of the first six months of the year.

A further important item during this period is the work associated with the audit of the 1994 Annual Accounts by the Norwegian Auditors and with the corresponding reports to the Finance Committee and Council in preparation for the June meetings.

Preparation of draft guidelines for general financial matters and purchasing rules and procedures for the LHC experiments in connection with common funds and external participation have also been initiated during the first half of the year.

2. ACCOUNTING SERVICES

The preparation and presentation of the Annual Accounts of the Organization represented the major activity of the Financial and Accounting Services group during the early months of 1995. The installation of the new stock management system, scheduled for early May 1995, will see the group cooperating with colleagues in AS Division to ensure smooth transition and the accuracy of the accounting records for stores.

The introduction of VAT in Switzerland was assimilated into our accounting systems.

The new electronic payment system has been introduced and has been in production for PTT payments since January 1995. An electronic payment system via the banks is scheduled to be introduced in the coming months.

New payroll and advances and claims systems started up in March 1995. This represents an additional work-load and will entail some difficulties during the next few months.

3. PURCHASING SERVICE

During the first few months of the year 27 contracts were awarded, 11 market surveys and 8 calls for tenders sent out and a total of about 6 900 orders placed. There were two cases of realignment.

A total of 6 one-day exhibitions (one comprising 42 firms) have so far taken place and to date a further 7 are planned for the near future. One Member State organized industrial presentations (comprising 46 firms and 19 lectures) and 3 more are planned for 1995.

A series of presentations are being prepared for all technical/scientific Divisions as a follow-up of last year's presentations concerning the introduction of the new purchasing procedures.

4. BUDGET AND FINANCIAL PLANNING SERVICE

This Service prepares the Organization's Budget documents as well as the official documents on the contributions of the Member States and on the cost-variation index for Personnel and Materials. It is also involved in the financial part of long-term manpower planning including the financial part of sectorial complements.

The development of a modified version of the simulation model for the Personnel Budget, covering 15 years instead of 10, is nearly completed. The new model should replace the old one in the course of the year.

As far as the Member States' contributions are concerned, studies are being made on how to calculate the contributions of the Czech Republic, Hungary, Poland and the Slovak Republic in the event that NNI values for 1992, 1993 and 1994 are not available for them at the OECD in December 1995 for the final calculation of the 1996 contributions.

PERSONNEL DIVISION (PE)

The periodic review of the Staff Rules and Regulations progressed with discussions of major issues between the Management and the Staff Association in the Standing Concertation Committee and discussions with Member State Delegations in the Tripartite Employment Conditions Forum (TREF), in preparation for submitting amended texts to the Finance Committee and Council at the end of the year.

The Remuneration Review initiated by Council for the year 1995 has entailed visits to 15 international organizations and national laboratories to compare CERN benchmark jobs. Contact has been maintained with a management consultancy firm on a survey which it is conducting on CERN's behalf on remuneration in high technology industry in France, Germany, Switzerland and the UK. Several foundation documents on results and presentation have been discussed in TREF.

Personnel Division has participated actively in the preparation of the report on the 5-yearly report on the Fellows, Associates and Students Programmes which is to be presented to the Scientific Policy Committee and the Finance Committee in June 1995.

In 1994 the Joint Training Board prepared a Five Year Forward Look at Training with recommendations to translate these principles into action in 1995 and subsequent years. After appropriate discussions, these papers were approved in March, and the JTB in collaboration with the Divisions started preparatory work on the implementation of the recommendations. A new draft text was prepared to simplify and update the section on training of the Staff Rules and Regulations, which had not been modified since its introduction in 1980. All of the training programmes with individual enrolment (Language, Management & Communication, and Technical Training) showed further increases in demand, as did the requests for team building actions.

The introduction of new informatics systems for human resources administration, payroll calculation, the processing of advances and claims and recruitment activities generated substantial extra work for staff in the

Administrative Services as well as the Recruitment Service. This involved data correction after the full transfer and the solving of various implementation problems required in adapting the new systems.

* * *