



SOLEIL NEWSLETTER n°6

EDITORIAL

This newsletter is an opportunity to keep you regularly informed on the progress of the third generation synchrotron SOLEIL project. Feel free to pass the newsletter around and to visit our WEB site: www.SOLEIL.u-psud.fr for further information on the project.

A WORD FROM THE DIRECTOR

What's happened to SOLEIL in the past six months? A lot!

Validation of the SOLEIL characterization studies, which in SOLEIL jargon we call APD (*Avant Projet Détaillé*, or Detailed Preliminary Project) validation, is well underway as regards the accelerators, insertion elements and the civil engineering programs and should be completed by the end of the year. You will find quite a lot of information on the subject in this issue of Rayon de SOLEIL. The beginning of the construction phase is still scheduled for January 2002. The necessary structures are being set up, particularly at management level.

Concurrently, intensive collaborative reflection is going on covering all the fields of SOLEIL's scientific program. Several one-day seminars on a specific theme have been initiated by the concerned communities who have developed, or are developing, propositions for light beams and experiments installations. You will find in this issue of Rayon de Soleil a list of the workshops and seminars that were held in quick succession during the second half of the semester. The wealth and spontaneity of these initiatives are the best guarantee for SOLEIL's future scientific success. One must now give shape to these propositions and turn them into structured preliminary projects to be discussed by our Scientific Committee (first meeting on 24 September). You will find herewith its composition, as well as that of the Technical Committee in charge of advising SOLEIL's management team on the accelerator program and infrastructures.

I would like to recap briefly on some of the major points of this APD validation below:

- *The project group*

First, it is the most numerous, as a team of over 30 persons is now at work, covering all the departments and units as a whole planned for in the SOLEIL organization chart. The forecast is to reach the equivalent of fifty full-time employees by the end of the year. This will now enable the SOLEIL project group to move ahead rapidly.

The management team is now in place, except for the second scientific director, more specifically in charge of Life Sciences, who is currently being appointed. Last February Ms Brigitte Gagey was appointed head of the Computer Unit and Marie Paule Level deputy to the director of Sources, J-M. Filhol; Dominique Chandesris and Paul Morin were appointed scientific coordinators as deputies to the scientific director in charge of the physics of matter, Michèle Sauvage. The management team was completed in May by the appointments of Didier Bordet as director of management and Michel Bessière as deputy to the director responsible for the technical units. Until now Michel was in charge of the DIMERS department at LURE, and Didier was deputy director of Strategy at the CEA headquarters.

Most of the persons responsible for a group in the Sources Department - Administration, Computers and Techniques - have already been chosen. Group training is underway, mainly at the level of recruiting executives - a priority in this phase of doing studies and setting up infrastructures. Most of them come from LURE, as well as from various CEA managerial positions, and 20% were recruited outside.

An objective difficulty comes from the fact that many of the LURE employees whose skills are useful to the project group can only participate in SOLEIL part-time owing to their workload at LURE. I would like to emphasize here the excellent co-operation with the LURE management, which does its utmost to facilitate our work. Nevertheless this situation is difficult to handle, with respect both to the operation of LURE and the requirements of SOLEIL, which is a source of concern for both management teams.

- *Sources*

In the framework of APD validation, the Sources team has recently suggested a clever modification of the design of the ring, which will enable us to have 8 additional straight sections; these 3.6 meter-long sections entail a minor modification of 5% of the ring size, with no extension to the building (see the report enclosed in this Rayon de SOLEIL). We have cause to be optimistic about the future with this increase from 14 to 21 in the total amount of insertions available for experiments. I am sure that I can safely claim to be the spokesman of all future users in thanking

the parents of the new lattice, J.M. Filhol, M.P. Level, A. Nadji and all their collaborators. Let's remember, however, that current financing makes provision for only 14 insertions!

We have also decided to use one of these straight sections to install a second superconductor **wavelength cavity** in order to ensure the proper operation of the ring at 2.75 GeV and 500 milli-amperes, which should become the common operating mode. Finally, studies are underway to optimize the insertion elements depending on the requests of potential users.

- *Buildings*

As regards civil engineering, the contract with the main contractor concerning the program for the construction of the buildings was signed at the end of August. The engineering group chosen is the one that had carried out the study for this program during the APD phase. APD validation prior to submitting the planning permission request, including modifications linked to the site and evolutions in the device, started in early September. The objective is to submit the planning permission request for the ring building, the main office building, the technical buildings and the staff restaurant by the end of the year. Details on civil engineering are given in this issue of *Rayon de Soleil*.

Preliminary work undertaken prior to construction has begun on the site of L'Orme des Merisiers. Exploratory archaeological excavations were carried out in July. They revealed the presence of human traces dating back two thousand years, prior to the Gallo-Roman period. The Department of Cultural Affairs of the Ile de France region (*Direction des Affaires Culturelles d'Ile de France*) is currently assessing their potential significance. Geotechnical boreholes required to finalize the foundations of the ring building will be done in the fall. Work for bringing services to the site should start in summer 2002, as soon as planning permission is granted. Construction of the ring building should start by the end of 2002.

- *Budget*

One of the first tasks of the project group was to update the construction cost of the project to 1.8 billion francs net of VAT, at October 2000 value. This takes into account mechanical effects linked to the evolution of price and salary indexes: for the civil engineering program, prices have shot up by over 15% since early 1998 when the APD evaluations were originally done. In addition, the payroll had to be reviewed owing to the transition to the 35-hour work week. The reassessment was carried out according to constant geometry, with the financing of 14 insertion elements and 24 beam lines, including five transferred from LURE. However, it takes into account modifications brought to the ring and the extension of its tunnel necessary for the new lattice. It also makes provisions for a significant increase in the construction budget of the 19 new beam lines, which are included in the project, from 12 to 17 MF (ondulators and line heads not included). This should make it possible to build competitive high-quality beam lines and experimental installations that take good advantage of the source performance.

This construction budget was approved in May by the supervising organizations, CNRS and CEA, via the project's Steering Committee. The corresponding financing is covered in the amount of 1.2 billion francs by a contribution of the Ile de France Region and the General Council of the Essonne department and 0.6 billion francs by the State through the CNRS and CEA organizations.

Meetings held in summer helped to develop a draft with the Regional Communities and the Ministry of Research specifying that the installation will be open to businesses in Ile de France, as well as the modalities for the participation of the Communities in construction costs. This text should be signed by the end of October.

- *Statutes*

At the institutional level, the statutes of the Non-trading Company "Synchrotron Soleil", which cover the construction and subsequently the operation of the installation, have been approved during the board meetings of the CEA and CNRS on 27 June and 4 July respectively. In accordance with the recommendations made by the Minister of Research when the construction of Soleil was announced, these statutes are close to those currently valid at the ESRF. The "Synchrotron Soleil" Company was created on Tuesday 16 October 2001. Its founding members are the CEA and CNRS, with shares fixed at 28 and 72 % respectively during the construction phase. It is now most likely that Spain will participate in the project as early as its construction phase. The first board meeting of the Company was held, and the board appointed its Chairman (Philippe Gillet, Director of the department of sciences of the universe at the CNRS) and its vice-chairman (Irène Nenner, Deputy-Director at the Department of the physics of matter at the CEA). As Director General, I, Denis Raoux, was also appointed manager of the Non-trading Company. The Company will be registered at the *Régistre du Commerce et des Sociétés* (RCS) of Evry (Essonne department - 91).

The Company statutes enable us to recruit our own personnel under open-ended contracts, as well as personnel detached by outside organizations. The business draft contract was approved by the joint CEA/CNRS Steering Committee. The status of the Company employees (whether detached or directly recruited) will be quite similar to that currently valid at the CEA and ESRF. Detachment concerns state-employee agents coming from the CNRS or Universities, as well as agents from research organizations such as the CEA. Detachment modalities (duration, conditions of possible return, etc.) are specified by each organization.

It is also provided for that CNRS and University employees can be made available to Soleil while receiving their salaries from their own organizations. In that case, they will be evaluated and overseen by those organizations. With this view, the CNRS will create a unit for overseeing the assignment of its personnel made available to Soleil, as well as their evaluation according to standard procedures. This unit will also oversee the scientific assessment of Soleil, carried out in

particular by the National Committee, which we are very keen on. In order to maintain coherent decision-making and operations, the director of Soleil will be by right responsible for this unit, and the employees assigned to this unit will have to comply with the in-house operating rules as a whole put in place in the framework of the Non-trading Company. The CNRS employees will be free to choose between two possibilities: detachment or availability through assignment to this unit. Through these measures, accepted by the SOLEIL project group and employees of LURE, we will at last be able to look ahead serenely by responding to the concerns of the employees who do not wish to be detached, while at the same time preserving the essential coherent operation of Soleil.

Finally, big news for the SOLEIL project group. At the end of July it will move into the 600m² prefabricated premises set up on the University Center of Orsay, opposite the reception building of LURE. This will enable us to take advantage of the campus infrastructures and the support of LURE, as well as bringing the team together until it enjoys the necessary autonomy to move onto the site of SOLEIL at L'Orme des Merisiers, probably at the end of the first semester of 2002.

You are all welcome to our 209H prefab!

D.Raoux, Director of the SOLEIL project

GENERAL ORGANIZATION

Budget and staff of the Soleil Project

The synchrotron Soleil project budget, as defined in the study of the preliminary detailed project, was 2,100.7 MF net of VAT, *according to the economic conditions of October 1998*. It covers an 8-year period divided into two phases:

Phase I – Years 1 to 4: Construction of the buildings and device, installation of 10 beam lines (5 of which transferred from Lure¹); progressive installation of additional lines.

Phase II – Years 5 to 8: Operation of the first 10 beam lines – Construction and progressive beginning of operation of 14 more beam lines.

This budget was reviewed by the Soleil project group to take into account the economic update of the costs from 1998 to 2000, the impact of the 35-hour work week (not included in the 1998 budgeting) and modifications of the technical design decided by the CEA-CNRS Steering Committee in early 2001.

According to the economic conditions of October 2000 (with reference to the 11 September 2000 announcement of the decision to launch the project), the yearly distribution of expenses as provided for by the Soleil project budget are as follows:

¹ Lure: Laboratory for the use of electromagnetic radiation

	2002	2003	2004	2005	2006	2007	2008	2009	TOTAL
Construction									
Investissement	178,8	324,5	317,5	150,0	100,4	81,5	66,4	56,3	1.275,42
Fonctionnement	9,5	11,2	20,6	25,3	1,8	1,8	1,8	1,8	73,79
<i>Salariés permanents</i>	33,6	58,4	81,1	106,0	46,0	40,9	26,1	21,9	414,09
<i>Salariés non permanents</i>	-	0,2	0,8	2,1	-	-	-	-	3,14
<i>Coûts associés</i>	1,1	1,8	2,6	3,4	1,5	1,3	0,8	0,7	13,11
Personnels	34,6	60,5	84,5	111,4	47,5	42,2	26,9	22,6	430,34
TOTAL	222,9 MF	396,2 MF	422,6 MF	286,7 MF	149,7 MF	125,5 MF	95,1 MF	80,7 MF	1.779,55 MF
Exploitation									
Investissement	-	-	-	-	1,7	1,7	1,4	0,9	5,73
Fonctionnement	-	-	-	-	42,7	45,9	48,8	51,1	188,48
<i>Salariés permanents</i>	-	-	-	-	80,0	97,1	119,5	129,4	425,89
<i>Salariés non permanents</i>	-	-	-	-	4,0	6,2	8,2	10,6	28,95
<i>Coûts associés</i>	-	-	-	-	2,5	3,1	3,8	4,1	13,49
Personnels	-	-	-	-	86,5	106,4	131,4	144,0	468,32
TOTAL	0,0 MF	0,0 MF	0,0 MF	0,0 MF	130,9 MF	154,0 MF	181,6 MF	196,0 MF	662,53 MF

	2002	2003	2004	2005	2006	2007	2008	2009	TOTAL
Construction et exploitation									
Investissement	178,8	324,5	317,5	150,0	102,1	83,2	67,8	57,2	1.281,15
Fonctionnement	9,5	11,2	20,6	25,3	44,5	47,7	50,6	52,9	262,27
<i>Salariés permanents</i>	33,6	58,4	81,1	106,0	126,0	138,0	145,6	151,3	839,98
<i>Salariés non permanents</i>	-	0,2	0,8	2,1	4,0	6,2	8,2	10,6	32,09
<i>Coûts associés</i>	1,1	1,8	2,6	3,4	4,0	4,4	4,6	4,8	26,60
Personnels	34,6	60,5	84,5	111,4	134,0	148,6	158,3	166,6	898,67
TOTAL	222,9 MF	396,2 MF	422,6 MF	286,7 MF	280,6 MF	279,5 MF	276,8 MF	276,7 MF	2.442,08 MF

Financing of the project, for phases I and II is covered, on the one hand, by the Regional Communities (Ile de France Region and Council General of the Essonne department), and on the other by the members of the Non-trading Company.

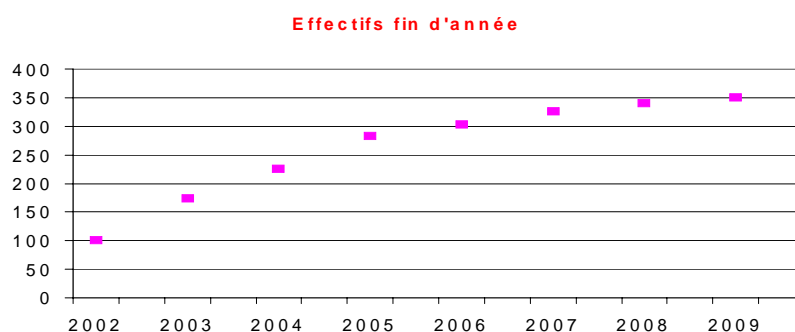
The "Synchrotron Soleil" Non-trading Company which is in the process of being created and will be called on to oversee the project, consists to this day of two members, the CEA and the CNRS, whose shares are fixed to 28% and 72% respectively. This Company will be created in October 2001. The CEA and CNRS boards had approved the participation of their organizations in the future company during the end-of-the-year meetings held at the end of June (CEA) and end of July (CNRS).

The financing contributed by the regional communities is allocated to the construction cost, excluding labor, and consists of:

- Ile de France region: 975 MF
- General Council of the Essonne department: 225 MF

or a total of 1200 MF, the ceiling fixed for this financial contribution defined in Francs **at the current rate**.

The staff of Soleil will number 350 persons by the end of phase II at the end of 2009. The chart below shows the increase in staff over the 8 years covering phases I and II:



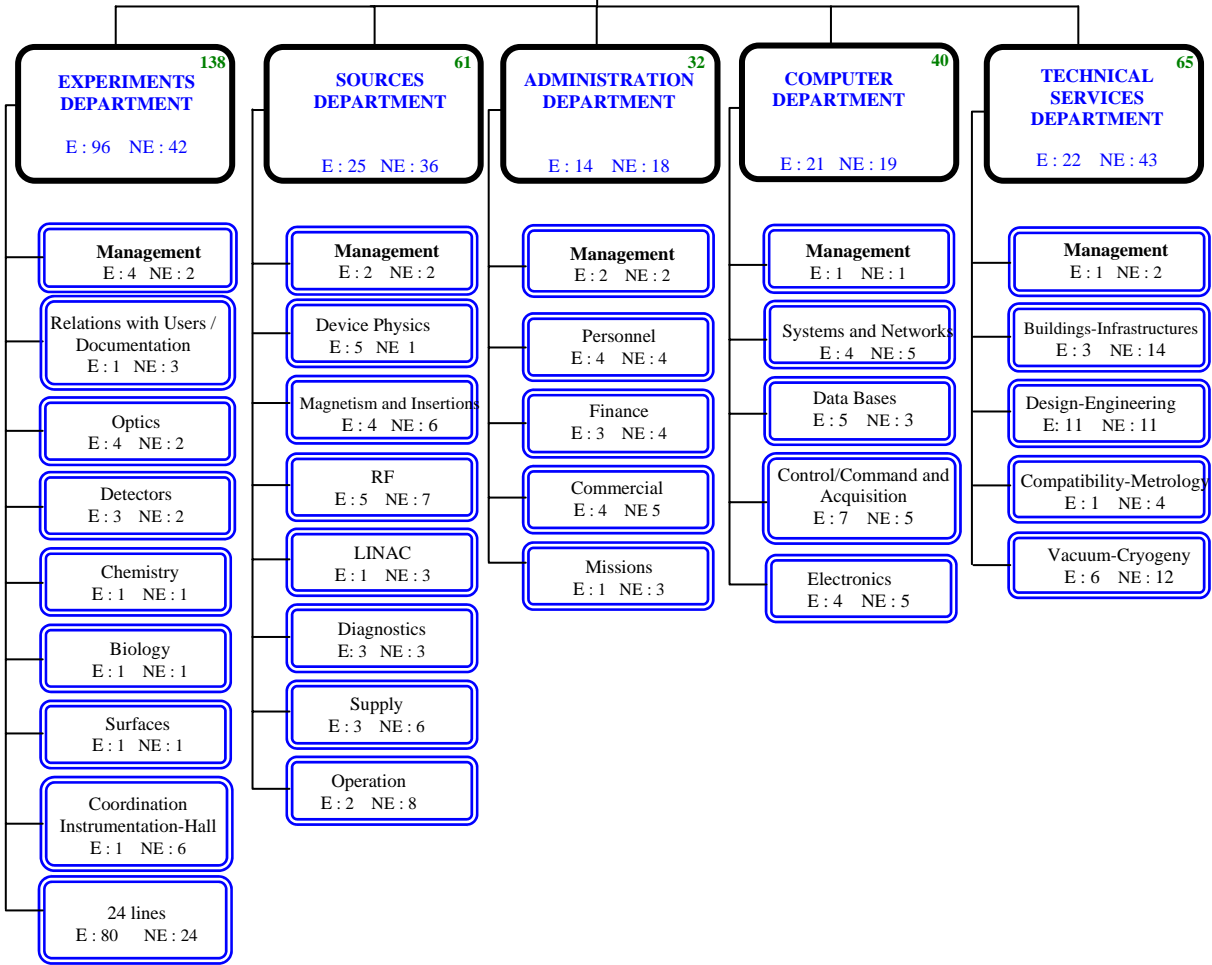
SOLEIL ORGANIZATION CHART

Staff 350
183 executives
167 non-executives

MANAGEMENT 17

Incl. communication, safety, audit,
industrial relations

C : 10 NC : 7



Latest update : 11/05/2001

DEVICE PROGRAM

A new lattice for Soleil

The structure for the storage ring, defined and optimized during the APD phase, was designed to offer the possibility of installing 14 lines on insertion elements and up to 30 lines on bending magnets, since the latter offer a continuous spectrum of much broader radiation (from UV to hard x-rays), though of lesser brilliancy compared to insertion elements.

Experience derived from third-generation devices recently built (ESRF, Elettra, Bessy II) or in the planing stages (Diamond) shows that there is a growing demand by the scientists who designed beam lines for insertion-element type sources to obtain greater brilliancies whatever the field of energy, but more specifically in the field of hard x-rays

For instance, the bio-crystallography lines must imperatively use radiation produced by undulators to achieve the required performance (brilliancy of 10^{19} to 10^{20} keV).

Therefore, the Soleil team examined the possibility of increasing the number of straight sections on the storage ring in order to offer a greater number of insertion elements as radiation sources for supplying the beam lines.

The lattice defined **in the APD phase**, consists of 4 super-periods each composed of:

- **One long 14-meter straight section, with one quadripole triplet at either end,**
- two bending magnets separated by two **quadripole doublets,**
- **one 7 meter straight section, with one quadripole triplet at either end,**
- two bending magnets separated by two **quadripole doublets,**
- **one 7 meter straight section, with one quadripole triplet at either end,**
- two bending magnets separated by two **quadripole doublets,**
- **one 7 meter straight section, with one quadripole triplet at either end,**
- two bending magnets separated by two **quadripole doublets,**

Out of the 16 straight sections, 14 were available for installing insertion elements (three long sections and eleven 7-meter sections).

Modification of the lattice

The original approach consisted in studying a new lattice obtained by separating the two **quadripole doublets** located between two bending magnets to create a straight section of about 3 meters. In order to limit the increase in the overall ring circumference, only two of the four doublets present in a super period were modified (the two central ones in order to maintain symmetry). Moreover, to limit the overall length, the four large 14-meter sections were reduced to 12 meters.

The lattice of the modified device consists of 4 super-periods, each composed of:

- **one long, straight 12 meter section, with one quadripole triplet at either end,**
- two bending magnets separated by two quadripole doublets,
- **one 7-meter straight section, with one quadripole triplet at either end,**
- *one bending magnet followed by a quadripole doublet,*
- **one 3.6-m straight section,**
- *one bending magnet followed by a quadripole doublet,*
- **one 7-meter straight section, with one quadripole triplet at either end,**
- *one bending magnet followed by a quadripole doublet,*
- **one 3.6-m straight section,**
- *one bending magnet followed by a quadripole doublet,*
- **one 7-meter straight section, with one quadripole triplet at either end,**
- two bending magnets separated by two quadripole doublets.

The ring circumference will increase from 337 meters to 354 meters (17 meters), or by 5 % more than the initial circumference.

Both linear and non-linear optic systems (dynamic acceptance) have been enhanced, and very good results have been achieved that are comparable or even better than those obtained with the APD device:

- A horizontal emittance of $\epsilon_x = 3.08 \text{ nm}\cdot\text{rad}$ is achieved, at 2.5 GeV.
- The dynamic acceptance for the nominal energy and the acceptance in energy are almost the same as those of the standard optic system which results in an equivalent Touschek life time (43 h instead of 40h).
- Moreover, the β functions have been adapted in the short sections for **high velocity** undulators: $\beta_z = 2 \text{ m}$ which allows having **low gap** undulators $\beta_x = 17 \text{ m}$ resulting in a low horizontal divergence. The contrary would penalize the use of high harmonics.

Out of the 24 straight sections, 21 will be available for the installation of insertion elements (three long 12-meter sections, ten 7-meter sections, and eight short 3.6 -meter sections).

Comparison between the modified device and the APD device:

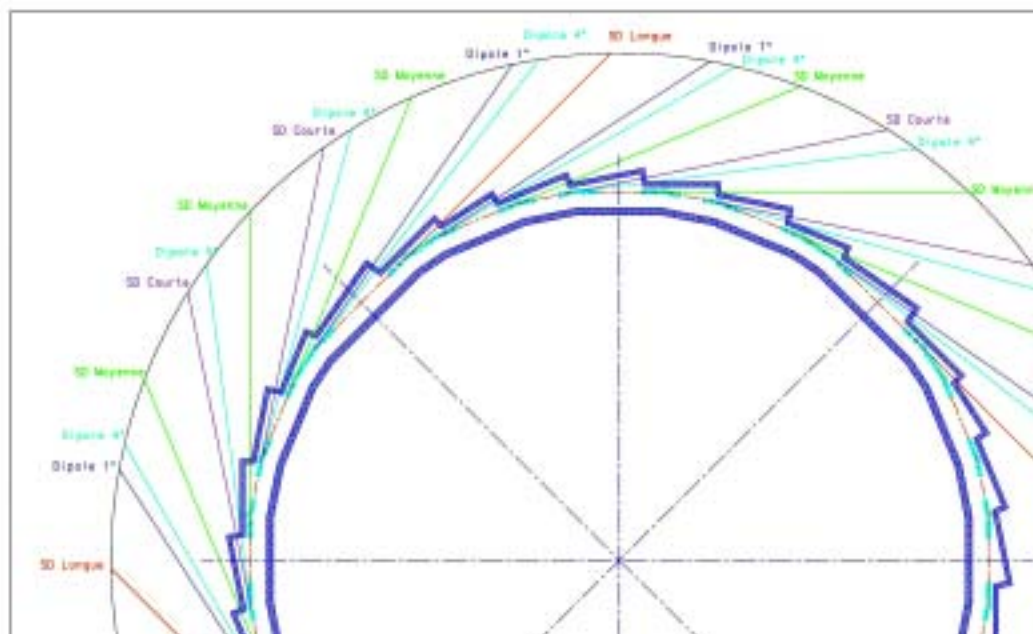
	APD device (2.5 GeV)		Modified device (2.75 GeV)*	
Number of insertion lines	14	3 x 14 m	21	3 x 12 m
		11 x 7 m		10 x 7 m
				8 x 3.5 m
Number of magnet lines	30		22	
Total lines	44		43	

In the current proposition we eliminated a 7 meter line, which actually corresponds to another concern linked mostly to the operation at 2.75 GeV. Indeed, in the APD, only one 2-cavity RF cryo-module (installed on a 7-meter straight section) had been provided for. However, the power couplers are planned for only 2 x 200 kW (sufficient power at at 2.5 GeV) while 2 x 300 kW will have to be supplied for operation up to 500 mA at 2.75 GeV. In addition, having two cryo-modules is an important asset to ensure the reliability of the RF system. Therefore, we are considering using two straight 7-meter sections to install two cryo-modules.

The total length actually available for installing insertions elements is 104 m, which represents 29% of the device circumference. By comparison, the corresponding values are 140 m and 17% at the ESRF.

With the APD device, the plan was to have two lines exit on every other bending magnet except one, which resulted in 30 possible lines on bending magnets.

In the modified device, 8 of these lines will be replaced by undulator lines (3.6m sections), therefore, there will remain 22 possibilities of lines on bending magnets. The figure below shows the distribution of the lines with the new lattice.



Le ray

The modified device will make it possible to install up to 21 beam lines on insertion elements, which corresponds precisely to the requirement of users of a third generation source.

Consequence of the modification of the lattice

This new lattice entails the following modifications (with respect to the APD):

- The geometry of the tunnel is changed.
- The layout of the beam lines in the hall is different.
- The length available in the hall for the lines is slightly reduced (but nevertheless goes up to 35-38m).
- There are 8 more hexapoles (120 instead of 112).
- Two additional power supplies are needed for the hexapoles.
- There are 8 more support frames.
- The **empty chamber** is modified, there are 8 more isolation valves...
- ...

Additional costs linked to these modifications have been assessed at about 25 MF (including 15 MF for the device, and 10 MF for the building). The cost for the additional insertion elements is not included in the 15 MF. These figures will be more accurate in the phase of APD validation.

THE SOLEIL TECHNICAL COMMITTEE

Composition

Dr. BOCCHETTA	Carlo	ELETTRA
Dr. BOUTEILLE	J. François	ESRF
Dr. ELLEAUME	Pascal	ESRF
Dr. HUTTEL	Erhard	ANKA
Dr. KUSKE	Peter	BESSY
Dr. LACLARE	J. Louis	CEA
Dr. MUNOZ	Marc	SLS
Dr. POOLE	Michael	DARESBURY
Dr. RINOLFI	Louis	CERN
Dr. RIVKIN	Leonid	SLS
Dr. ROBIN	David	ALS/Accelerator Physics Group
Dr. SVANDRLIK	Michele	ELETTRA

INFRASTRUCTURES AND BUILDINGS PROGRAM

Reminder on the validation of the main contractor's contract

Although the SOLEIL project group is both owner and main contractor of the process (device program and experiments program), an engineering group has been assigned as main contractor for the buildings and infrastructures program.

During the APD study, the CEA, acting as owner, had entered into a contract with a main contractor for the detailed definition of the project's building program. The **signatory/holder?**, a group of four companies (*Ingérop, Atelier d'Architecture Chaix, Morel et Associés, Atelier d'architecte DeSoos et Associés* and *Artec*) of which Ingérop was the representative, had been short listed following a tender in compliance with CEA market rules, and also following approval by the CEA's Consultative Commission of Markets (*Commission Consultative des Marchés*, or CCM).

The terms of the contract consisted of a firm share (a study and detailed definition of the buildings program, as well as a provisional assessment of the cost of the works), and conditional shares for the preparation of planning permissions, assistance in drafting the contracts for the works, for supervising and managing the implementation of markets and for assistance **aux opérations de réception/in checking their completion?**, as well as a certain number of optional, complementary assignments (including one APD validation on the chosen site).

The firm share has been fully carried out and paid for. However, the conditional shares could only be launched once the construction of Soleil had been decided and a site had been identified. The contract made provision for the fact that the decision could take time and the contractor agreed to keep his team operational for a period of one year following the implementation of the firm share.

At the end of 1998, once the first part of the contract had been completed, the main contractor handed in a "general presentation report" giving an exhaustive and detailed description of the buildings program as resulting from the studies carried out jointly by the Soleil project team and the main contractor. This document was accompanied by an appendix presenting a detailed provisional assessment of the costs for carrying out this program.

Validation of the contract: In order to take advantage of the work carried out during the APD phase, and with the aim of reducing delays (and therefore costs) in construction, the project team decided – in accord with the commercial divisions of the Saclay center – to renew the contract with the same main contractor.

Ingérop was therefore contacted and gave a favorable answer to our request. They expressed the wish to resume the contract, but indicated that the provisional cost of the works would have to be significantly increased with respect to the figures given at the end of the APD, owing to a sharp rise in activity in the construction sector and public works.

Ingérop's updating of the cost of the works (corresponding to the perimeter defined at the end of the APD phase) was corroborated in an assessment made by an independent economist commissioned by the project team. The results show that, although from October 1997 to October 2000 indexes show a 7.2 % rise, one should forecast an evolution of the economic trend of about 15.7 % of the actual cost of the works during the same period.

The new contract was signed by the CEA Managing Director and Ingérop at the end of August, and the validation of the APD buildings program started in early September.

The main stages of this APD validation phase are the submission of the request for the Planning Permission (*Permis de Construire*, or PC) and proposal for an Installation Classified for the Protection of the Environment (Installation Classée pour la Protection de l'Environnement, or ICPE) on the site of L'Orme des Merisiers in December of this year, and submission of the final report on the completion of the APD validation in February 2002 with decision-making on the follow-up of the infrastructures/buildings program.

Recap on the works for the characterization of the site

1. Why archaeological excavations?

The plots located on the Saclay plateau as a whole are liable to contain archaeological remains. Therefore, before submitting the PC proposal, it is both necessary and mandatory to carry out an archaeological survey to ensure that there are no remains on the site earmarked for the construction of Soleil.

Agreement with the Ministry of Culture. To this effect, an agreement was entered into between the CEA, provisional main contractor, and the Regional Department for Cultural Affairs of Ile-de-France (*Direction Régionale des Affaires Culturelles* (DRAC) *d'Ile-de-France*), referring to the Ministry of Culture and Communication, to carry out an archaeological survey mission regarding the future establishment of the Synchrotron Soleil.

This agreement stipulates that the archaeological constraint will be immediately lifted in the event that nothing is found during the digging.

The site consists of two plots, *L'Orme des Merisiers* and *La Mare du Vivier* (see the previous issue of Rayon de SOLEIL), of which only the former is immediately available, and on which the synchrotron building, its auxiliary buildings and the main building will be constructed. An agreement was entered into regarding only this plot.

Assessment work

The DRAC entrusted the Association for National Excavations (*Association pour les Fouilles Nationales*, or AFAN) with the task of carrying out this operation. Thus, the CEA placed an order with the AFAN for carrying out an archaeological survey on the land of *L'Orme des Merisiers*, for the amount of 42 685.72 € (280 kF) net of VAT.

This survey was carried out during the month of July. It consisted in digging trenches 2m by 1m deep every 20m.

In parallel, the SPS of Saclay performed analyses on earth samples which confirmed the absence of any radioactivity.

The results of this survey are as follows: traces of human occupation dating back about 2000 years (around year 0 of our era) were detected on the entire area surveyed (in 99 % of the trenches). The anthropogenic structures detected consist of troughs, enclosures, pits, settlements (presence of holes for steadying wooden posts). The site is therefore of archaeological interest due to the size of the area concerned and to the successive periods which the remains date back to.

The final synthesis document was submitted by the DRAC in mid-October and will be integrated in the study submitted to the Inter-regional Commission for Archaeological Research (*Commission Inter-régionale de la Recherche Archéologique*, or CIRA), which will decide at the end of October whether or not it is necessary to carry out further excavations.

If such preventive archaeological excavations were decided upon, their cost would be covered by the land developer, which means Soleil. A new agreement would then have to be entered into between the DRAC and Soleil regarding responsibility for the cost of the excavations decided by the CIRA.

2. Vibration measurements

New vibration measurements were carried out on the site of *L'Orme des Merisiers*. The aim was to characterize the main sources of vibration linked to the traffic around the site on national highway RN 306, on the one hand, and departmental road RD 128 on the other.

Since the task of both the DDE and the General Council is to provide the support necessary to implement the SOLEIL project, they submitted a request to be associated with these complementary measurements and asked the LROP to carry out measurements along national highway N 306, which revealed a poor surface level.

Previous measurement studies had revealed 2.5 Hz micro-seismic waves mostly linked to the traffic of public work trucks on both roads adjacent to the site (N 306 and D 128).

The persons in charge of SOLEIL thought it useful to place an order with the AVLS company for a new measurement study to assess experimentally the vibratory impact of this type of vehicle by setting up night traffic (a quiet period with respect to vibrations) and measuring the vibratory levels induced on the site.

The measurements were carried out in the evening and night of 10 to 11 May 2001 and integrated measurements aiming more specifically at localizing flaws in the road system as requested by the DDE.

The main conclusions are:

- Without traffic, vibrations are so low as to be barely detectable.
- The level of vibration depends on the type of truck. A truck with 3 double axles induces vibrations with maximum amplitude at the frequency of 2.5 Hz.
- In this case, the vibration levels observed on the future location at the center of the ring are 0.7 to 0.8 microns, rising to 2 to 3 microns on the periphery of the ring.
- These vibrations are generated when the heavy-trucks run on certain detectable defects of the pavement, identified during the measurement of the profile.
- These vibrations are felt even with unevenness in the pavement that is relatively distant from the site, for instance, when going downhill to Gif on RN 306.

These tests have clearly shown that the main sources of vibrations recorded on the site are linked to poor pavement condition on roads RN 306 and RD 128, around the site.

3. Geotechnical boreholes

During the APD, the land survey had been deliberately limited since the site of Saint Aubin could not be considered as final. Cored boreholes and 3 pressio-metric measurements had been carried out.

As the site has now been confirmed, it is essential to carry out an extensive borehole campaign with a high grid resolution making it possible to determine the stratigraphy and characteristics of the ground on the location of each building. The objective is to find out about the difference in thickness of the ground layers in a sufficient number of spots, as well as the variations in their levels and characteristics, in order to valorize their homogeneity and grades and to produce a sharper definition of the foundations.

This measurement campaign has been going on under the responsibility of the construction manager since 26 November in order to finalize the foundations studies with validated data. To this effect, the construction manager subcontracted to the Mecasol company the follow-up of the works carried out by the Sobesol company for the amount of 174 252 € (about 1,143 MF) net of VAT.

These measurements must be carried out during the APD validation by the main contractor in order to be able to start the studies with accurate data, which means as soon as the archaeological excavations are over.

EXPERIMENTS PROGRAM

Scientific program update

In response to the publication of the planning for the selection of the beam lines in Rayon de Soleil n°5, numerous propositions for meetings and workshops were made to the project group. The objectives were either to highlight the interactions as a whole between a broad theme, or even a whole discipline, and synchrotron radiation in order to end up in a second stage with proposals for lines and/or new experiments, or to refine the scientific program and

characteristics of lines the outline of which had already been approved in the APD phase. These meetings were organized in the framework of collaborations between SOLEIL, laboratories of the relevant scientific community, LURE and for some of them with the collaboration of the CNRS scientific departments and the Management of Strategy and Programs. The programs of these meetings can be consulted on SOLEIL's web site. Compilations of abstracts and in some cases synthesis reports are available on request. A brief analysis of the meetings already held is presented in chronological order, as well as the planning for future meetings.

Work groups, formed following these meetings, prepared the synopsis of preliminary projects for lines (*Avant Projet Sommaire*, or APS), with element of information already specified in Rayon de Soleil n° 5.

Lectures and thematic one-day seminars

1) Micro-manufacturing. *Organized by LURE (S. Megtert), the General Council of the Essonne department (Conseil Général de l'Essonne), in collaboration with SOLEIL (28 March 2001, Orsay)*

The SOLEIL project and results of the work carried out by the Micro-manufacturing team of LURE and of semi-industrial experiments carried out abroad in this field (CAMD, Louisiana-USA) were presented to Ile-de-France industrialists during this half-day of lectures and debates attended by about 40 participants, among whom representatives of the regional industries (Thales, Alcatel, Jobin-Yvon, Framatome etc..) and persons involved in the public development of the region and department (General Council, DDE). The objective was to identify paths for promoting a wider use of these techniques not only among big industrial groups, but also medium and small scale businesses (PME) as well as medium and small scale industries (PMI). The need for a specific cooperation structure to initiate access by PMI was highlighted.

2) Applications and perspectives for the use of synchrotron radiation in the fields of biology, medicine and the environment. *Organized by SOLEIL (M. Sauvage), under the aegis of the CNRS and CEA (9-10 May 2001, Michel-Ange Campus, Paris)*

With the participation of R. Fourme and A. Bentley (LURE), J.C. Thierry (CNRS Department of Life Sciences) and the support of the CNRS Direction of Strategy and Programs.

24 lecturers invited, among whom 7 foreigners, presented a complete range of the various experimental approaches using synchrotron radiation for objectives related to Life Sciences in the broadest sense of the term: structures of increasingly complex objects and assemblages such as virus, ribosome or **membrane** proteins, changes in conformations, imagery at the scale of human cell, cycle of pollutants etc. The techniques implemented cover practically the entire range of energy of synchrotron radiation from infrared to hard x-rays.

French laboratories were represented as a whole as well as the centers of synchrotron radiation which will be the major scientific partners of SOLEIL (SLS, DIAMOND and ESRF) in this field. The presence of scientists from the most diverse fields and backgrounds: public laboratories, private laboratories from the drugs and cosmetics industries, public hospitals (*Centres Hospitaliers Universitaires*, or CHU), demonstrated the wide ranging impact of this research. A session was dedicated to presenting and discussing beam line projects under development for use in biocrystallography, small angle scattering, as well as to a rapid overview of the various techniques.

The opening and closing speeches were made by Mrs Jacqueline Godet, director of the CNRS Life Sciences Department and Geneviève Berger, General Director of the CNRS, respectively. Both insisted on the significance of the scientific program dedicated to Life Sciences, of that of SOLEIL and the conditions for its success.

3) Photoemission in spin resolution. *Organized by the University of Cergy-Pontoise (K. Hricovoni) and LURE (F. Bertran) with the support of SOLEIL for its inclusion in the Magnetism program (18 May 2001, Orsay)*

Ten lecturers invited, among which 7 foreigners, presented the most recent results obtained on spin distribution measurement, and their theoretical analysis, as well as the beam lines already in operation or under development in foreign centers.

About fifty participants attended this program the conclusions of which were reported on during the general lecture on Magnetism.

4) Magnetism and Synchrotron Radiation. *Organized by SOLEIL (D. Chandesris) and the IPCMS (J.P. Kappler); (21-22 May 2001, Strasbourg)*

This meeting was in two parts: a first half-day session dedicated to nine guest lectures with, on the one hand, presentations of reviews covering important themes dealing with magnetism, and on the other presentations of results illustrating more specifically one of the investigation techniques of magnetism. The second day consisted in 4 workshops carried out concurrently dedicated to the major experimental approaches to the magnetic properties of materials: absorption, dichroism, photoemission, imagery, diffraction and resonant or non-resonant reflectivity. The aim of these workshops was to identify the needs of the magnetism community in terms of beam lines and devices relevant to these various fields. The conclusions of the workshops were the subject of a discussion held during a plenary session. Some of the propositions for beam lines support other communities' projects under study, in particular in the field of soft x-rays, while others constitute specific propositions. Emphasis was laid on the significance of having within SOLEIL itself areas equipped with the most efficient means for the preparation and characterization of samples. The idea of a dedicated laboratory located in the immediate vicinity of SOLEIL was broached.

About one hundred persons attended this workshop, showing thereby the vitality of the magnetism community which masters at the same time the most theoretical aspects of this discipline, its technological potential and the most sophisticated aspects of instrumental development.

5) Materials under extreme conditions; requirements for SOLEIL. *Organized by the High Pressure network (réseau Haute-Pression), and the Laboratoire des Milieux Condensés - Jussieu (J.P. Itié and A. Polian) with the support of SOLEIL (28-29 May 2001, Jussieu Campus - Paris)*

As for the Magnetism seminar this meeting was in two parts. Twelve guest lectures covering both the relevant scientific and technical domains as a whole and dealing with the coupling of high pressures with synchrotron radiation were held concurrently with a morning of workshops followed by a session of discussions and conclusions.

The diversity of disciplines involved was highlighted: earth sciences and planetology, physics and chemistry of solids and fluids, biology etc. as well as the high number of techniques implemented (diffraction, absorption and dichroism, inelastic scattering, infra-red microscopy, small angle scattering ...).

Both scales of extreme energies are in demand: medium and distant infra-red for micro-spectroscopy and high energy for diffraction (some ten keV). Absorption experiments, and more specifically those dealing with magnetic dichroism under pressure, require the intermediary x-ray scale (3.5-18 keV) comprising the threshold of the most important elements: metals of the first transition series, rare earths, actinides. The scattering mode EXAFS beam scheduled to be transferred to SOLEIL meets most of the demands made.

The significance of an efficient infrastructure for assembling, standardization of pressures and temperatures, and ex-situ characterization of samples was highlighted as well as the advantage of in-situ coupling of synchrotron radiation with another analysis technique such as Raman spectroscopy or infra-red (convergence of two lines on the sample).

This seminar attended by sixty to eighty participants, among whom the persons in charge of the ESRF beams entirely or partly dedicated to high pressure measurements, helped identify axes in which SOLEIL could make it possible to compete with research that could be carried out at the ESRF but whose beams are overloaded (factor 3 between demand and availability). The installation on SOLEIL of undulators producing up to 30keV high brilliancy radiation and powerful field superconductor wigglers is in great demand among this community.

6) Metrology. *Organized by LURE (M. Idir, F. Polack), The Metrological National Bureau (Le Bureau National de Métrologie), with the support of SOLEIL (30 May 2001, Orsay)*

During this meeting, attended by about fifty participants, the metrological programs carried out at the ALS (Berkeley-USA), at Bessy (Berlin - Germany) and at LURE were presented. The program developed at LURE, which should carry on with SOLEIL, regards mainly the standardization of optics and detectors for the Laser Megajoule project, radiometry and space astrophysics. The internal needs of a laboratory like SOLEIL for qualifying optics as well as beam line R & D programs were also presented. The cost of the specific equipments needed and the request for priority access by certain potential users suggest the choice of a particular status to be discussed with the institutions involved.

7) Absorption spectroscopy in the science of materials. *Organized by LURE (A. Traverse, V. Briois and A.M. Flank) with the support of SOLEIL (15 June 2001, Orsay)*

The objective of this workshop attended by 85 participants involved in various disciplines was to highlight the importance of the community using absorption spectroscopy dedicated to various scientific themes whose common denominator is the science of materials. This in order to promote the project of a 4 - 40 keV dedicated beam line complementary to projects already under discussion for other ranges of energy. Following the presentations dedicated to ESRF beam lines in operation (BM29) or in the starting phase (French CRG FAME), as well as beam lines transferable to SOLEIL, a series of presentations on subjects representative of the various disciplines: physics of material, chemistry

of solids, coordination chemistry, heterogeneous catalysis (as a complement to the one-day thematic workshops organized at Orsay on 06/14/01), environment and geoscience underlined the contribution of absorption spectroscopy and each community's specific needs. The advantage of coupling with small angle scattering or diffraction in total reflection mode (GISAXS) was also emphasized.

Preliminary reflection was engaged on the desirable characteristics of a spectroscopy beam line in the field of hard x-rays in terms of source, an optical system integrating stability and high-velocity energy sweep requirements; the option of microfocalization was discussed as well as the environments of samples specific to each theme.

8) Chemistry and Synchrotron Radiation. *Organized by SOLEIL (M. Sauvage), The Institute of Materials of Nantes (L'Institut des Matériaux de Nantes) (G. Ouvrard) and LURE (P. Roy) with the collaboration of the CNRS Department of Chemical Sciences (18-19 June 2001, CNRS Michel-Ange Campus, Paris)*

With 135 participants, this seminar attracted the widest audience among all those organized up to then. Both days presented a very broad overview of the themes relevant to chemical sciences using synchrotron radiation. Each session consisted in most cases of a guest presentation and a review of the sub-discipline introduced by a moderator.

J.C. Bernier, director of the CNRS Department of Chemical Sciences presented the strategy of the department in terms of objectives, tools and interdisciplinary actions as well as answers to public demands (environment, pharmacology...). Observing on the use of synchrotron radiation by the community of chemical engineers he indicated a few priority paths for future research leaving it to the community to formulate them more precisely. During the debate which followed this presentation, the significance of the department's explicit support, on the one hand, and the strong commitment of user laboratories on the other for the construction of a set of beam lines, efficient experiments and sample environments meeting the community's expectations was underlined. Possible regional participation in the setting up of experimental support was broached.

One half-day was dedicated to reporting on more specifically targeted thematic workshops and work groups in order to introduce their conclusions in the synthesis of these days.

9) Soft matter, small angle scattering and surface-interface reflectivity for soft matter and materials of biological interest. *Organized by LURE, the SPEC-DRECAM-CEA and the GRPB (Univ. R. Descartes-Paris) with the support of SOLEIL (28-29 June and 2 July 2001 at Orsay)*

Initially conceived as a single workshop focused on the study of complex matter, these three days attended by sixty participants in all each had a specific flavor. The first day was exclusively dedicated to guest presentations on research themes illustrating some state-of-the-art methodological developments recently extended to the "soft matter" community's objects of study: soft x-ray microscopy, interferometry, infra-red spectroscopy, resonant diffraction and the use of micro-beams. Besides, two synthesis presentations were dedicated to scientific breakthroughs made possible on third generation sources by means of the two x-ray research methods most widely used by this community: Scattering at small angles and surface- interface scattering-diffraction.

Subsequently, each of these two methods was the object of a one-day specific workshop for the former and half-day workshop for the latter, divided into scientific presentations and more technical discussions about beam line projects. Examples of study regarded both materials of scientific interest and complex systems such as liquid crystal, colloids, and the mixture of polymers. Applications specific to composite materials relevant to the field of metallurgy were also presented.

An elaborated presentation on the performance of wigglers in the field of hard x-rays was made and at the end of these seminars work groups were formed to finalize the Synopsis of Preliminary Projects (*Avant Projet Sommaire* or, APS) for the lines.

10) On ring LEL-UV and applications. *Organized by SOLEIL, LURE and the SPAM-DRECAM-CEA (25-26 September 2001, ESPCI-Paris)*

This two-day meeting made it possible to present applications of the LEL on SOLEIL in various scientific fields: dynamics of excited states in surface physics, photochemistry, photobiology, spectroscopy in gaseous phase, molecular dynamics, use of coherence and non-linear physics.

The LEL characteristics were recapped, in particular the generation of superior harmonics in VUV up to 30 eV.

Compatibility (or incompatibility) of the LEL mode at 1.5 GeV with the functioning of the other beam lines was discussed in the framework of debates. Extended abstracts of the presentations and a synthesis of these seminars will be available.

To come

Compatibility effects and use of circular polarization (VUV- soft x-rays), in diluted phase. *Organized by SOLEIL, LURE and the SPAM-DRECAM-CEA (23 October 2001, Orsay)*

This one day gathering will highlight the new opportunity available in the field of interactions between diluted matter and soft x-rays by the use of polarized light. This will be the opportunity to update the proposition for a new beam line dedicated to the high-resolution spectroscopy of atoms, molecules or adsorbates or aggregates. Emphasis was laid on the coupling of the use of light polarized in a circular or linear mode, with coincidence techniques in order to obtain an exhaustive characterization of wavelength functions in continuum and carry out experiments **RÉSOLUES EN SYMÉTRIE ?**.

New opportunities for organic chemistry and biology in VUV: reactional processes, chirality and thermo-chemistry. *Organized by SOLEIL, LURE, SPAM-DRECAM-CEA (24 October 2001, Orsay)*

In order to update the case of scientific use of synchrotron radiation in VUV, the decision was made to organize a one-day scientific seminar dealing with new themes, essentially related to chemistry, either recently developed, either emerging within our community.

After briefly reviewing the main breakthroughs in each of these fields, the speakers will highlight new expected developments, the complementary nature of synchrotron radiation with other techniques as well as the required characteristics of the photons generated by the SOLEIL VUV line (s).

The conclusions of this seminar should make it possible to establish new fields of utilisation of synchrotron radiation in VUV, to define the required performance for the transferred line (SU5 LURE line), and to express, if necessary, the possible need for a second low-energy beam line on SOLEIL.

Workshops for updating beam line projects and experiments

- *Biocristallography work-group- 01/22, 03/19, 06/27 Orsay*
- *Soft x-ray, high resolution and high flow lines, physics and chemistry of surfaces, dichroism, microscopy - 05/17, Orsay*
- *High resolution soft x-ray line for atomic and molecular physics and chemistry - 03/09, 05/16, Orsay*
- *Hot line: absorption and diffraction on radioactive samples - 03/08, 04/25, Saclay*
- *Work group: SU5 transfer - 06/12, Orsay*
- *Scientific and technical work group: surface and interface diffraction - 06/22, Orsay*
- *Diffraction line for chemistry and physics of solids, molecular chemistry and mineralogy. Work group: 00/12, 01/04, Paris; Presentation 04/07, Orsay*

Scientific committee of SOLEIL

Composition

M. Altarelli	<i>Trieste, Italie</i>	<i>Physics of Condensed Matter- Magnetic and Electronic Properties</i>
J. Bartolome	<i>Zaragoza, Espagne</i>	<i>Physics of Materials</i>
B. Carré	<i>Saclay, France</i>	<i>Physics and Chemistry of Atoms and Molecules</i>
S. Ferrer	<i>Grenoble, France</i>	<i>Surface Diffraction and Nanostructures</i>
J. Jerphagnon	<i>Marcoussis, France</i>	<i>Nanotechnologies</i>
G. Jezequel	<i>Rennes, France</i>	<i>Physics of Surfaces, Nanostructures</i>
D. Moras	<i>Strasbourg, France</i>	<i>Biocrystallography</i>
C. Norris	<i>Leicester, UK</i>	<i>Surfaces, Interfaces</i>
A. Percheron	<i>Thiais, France</i>	<i>Chemistry of Solid matter</i>
J.C. Petit	<i>Saclay, France</i>	<i>Geoscience, Environment</i>
J. Schneider	<i>Hambourg, Allemagne</i>	<i>High velocity Energy Diffraction, Electronic Densities, Phase Transitions</i>
J. Stöhr	<i>Stanford, USA</i>	<i>Electronic Spectroscopies, Imagery</i>
D. Stuart	<i>Oxford, UK</i>	<i>Biocrystallography</i>
M. Verdagner	<i>Paris, France</i>	<i>Coordination Chemistry</i>
C. Williams	<i>Paris, France</i>	<i>Soft Matter, Interface : Physics/Chemistry</i>
F. Winkler	<i>Villigen, Suisse</i>	<i>Biocrystallography</i>

Meetings schedule

1st Scientific Committee: 24 September 2001

2nd Scientific Committee: 19-20 November 2001

3rd Scientific Committee: 21-22 January 2002

4th Scientific Committee: 16-17 May 2002

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