NOTES OF THE ROUND TABLE

ON

LARGE SCALE SYNCHROTRON RADIATION FACILITIES

AT

LURE, ORSAY

10-11 OCTOBER 1996

NOTES OF THE ROUND TABLE ON LARGE SCALE SYNCHROTRON RADIATION FACILITIES AT LURE, ORSAY 10-11 OCTOBER 1996

INSTALLATIONS' REPRESENTATIVES ("PARTICIPANTS")

Prof. I H Munro, Director Synchrotron Radiation Department, CLRC Daresbury Laboratory (CO-ORDINATOR)
Prof. W Gudat, Director, BESSY, Berlin
Prof. G Materlik (for Prof. J Schneider), HASYLAB, Hamburg
Dr R Comes, Director, LURE, Paris and Dr H Dexpert, LURE, Paris
Prof. G Margaritondo, Sincrotrone Trieste
Dr K S Wilson, EMBL, Hamburg
Prof. M Van der Wiel, FELIX, Nieuwegein
Dr J. M. Ortega, CLIO, LURE, Paris

USERS' REPRESENTATIVES

Prof. M A Carrondo, CTQB, Lisbon
Dr I T McGovern, Director of Science of Materials, Dept. of Physics, Trinity College, Dublin
Dr A Xenakis, NHRF, Athens

EU REPRESENTATIVE

Dr M Malacarne, Directorate Unit XII-G-2: "Research Networks & Large-Scale Facilities"

INVITEES

This was a special two day meeting with day one devoted to Round Table business and day two devoted to a review of SR in Europe. For this reason a number of additional persons were invited to facilitate wider coverage of facilities and discussion. The OECD Megascience Forum was represented also. A full list of names and affiliations is given in the Appendix.

SECRETARY

Dr A Hopkirk, CLRC, Daresbury Laboratory.

10 October - Round Table Business

1 WELCOME AND INTRODUCTION TO THE MEETING

R Comes welcomed all present to Orsay and to this the final meeting of the Round Table. In particular, he welcomed the guest observers from the OECD Megascience Forum.

2 NOTES OF THE PREVIOUS MEETING

The notes were accepted as presented.

3 FACILITY ACTIVITY REPORTS

Each of the Round Table facility participants gave a short presentation reviewing EU supported access and other activities at their respective facilities.

The main points from the presentations and discussions are given below. Copies of overheads and any other materials tabled at the meeting are in the Appendix.

LURE / R COMES

- The advent of ESRF is having a negative effect on the demand in the X-ray programme, particularly in the areas of diffraction and materials science. However there is growth in demand for the softer photon energy ranges.
- HCM/TMR funding is regarded as an essential lubricant to facilitate non-French use of the Orsay facilities. There is little or no local funding to replace it if it were terminated

SRS / I MUNRO

- Structural changes in the UK Research Councils are leading to organisational and procedural changes at the SRS facility. Beamtime delivered is being ever more closely related to income generated.
- EU (non-UK) users have performed very well in the peer-review procedures, winning more beamtime than pro-rata by EU income. Financially driven cut-offs now need to be applied.
- Detector development is increasingly seen as a way to get performance and efficiency gains at relatively low cost.
- There is a focus on industrial use of the SRS, much of which is hidden in collaborative work not declared by university based users. There is pressure in the UK (and France) for rapid access and sample characterisation services to be provided.

BESSY / W GUDAT

- BESSY do not charge for beamtime they deliver in excess of their target of 60 hr/wk.
- EU funds have been used to establish an equipment pool (their statutes do not permit using their own funding for this). They would like this to be more explicitly supported in future Framework contracts.
- There is a new TMR contract (in collaboration with MAX-lab and ELETTRA) for the construction and use of a new insertion device (ID) at BESSY for circularly polarised 100-1000 eV radiation.

HASYLAB / G MATERLIK

- HASYLAB are satisfied to see the EU funded programme growing in size and quality as the non-German users gain experience. The more experienced are now becoming fully integrated into the HASYLAB community of researchers. This is seen as a positive benefit of EU support.

- The High Energy Photons Workshop (which was partially funded by the Round Table) has been held.

ELETTRA / G MARGARITONDO

- ELETTRA has an unusually high level of international usage, currently approaching 50% (includes EU (no Italian) usage, non-EU European usage and EU - Italian collaborations). The success of the non-Italian users is consuming the EU income rapidly.

- There is also growing demand from Eastern European users. ELETTRA is responding by building more beamlines (including two with Czech and Slovenian funding) but the question of how to maintain growth is pressing management hard.

EMBL/DESY & GRENOBLE / K WILSON

- The EU funds are not used to pay for access to the EMBL beamlines at DESY. They fund travel and subsistence for appropriate nationals only. At ESRF the funding is used to provide for access and enhancement of the equipment pool.

- Demand for beamtime outstrips supply at both the ESRF and DESY operations. EU support is now an essential lubricant in facilitating international usage.

CLIO / J ORTEGA

- The CLIO FEL programme more physics orientated (surface studies in particular) than medical /biological.

- Approximately one-third of the user programme is associated with EU based researchers. EU TMR funded support for access has only recently been established. Advertisements in European journals will be used to attract new users.

FELIX / M VAN DER WIEL

- Currently, 7 out of 16 user groups are not Dutch. The present policy is that access is permitted at no charge. This will change, to be replaced with support funding from the EU TMR access contract. The training element of TMR is seen as particularly important at the moment.

- As at CLIO, the programme is physics orientated (solid state, surfaces and atomic and molecular) rather than medical/biological.

- M Van der Wiel proposed closer collaboration between FEL facilities to make best use of available funding and user community interests. Some suggestions: joint meetings to promote and demonstrate the capabilities of IR FELs; a Joint Programme Advisory Committee; workshops to discuss operational and instrumentation issues.

SUPER-ACO FEL / M COUPRIE

- The Super-ACO FEL has a small user community, mainly because of its limited availability (the electron source is shared with non-FEL users). Recent successes include two-colour FEL (UV) + SR (VUV) pump-probe experiments and they are now planning to attempt FEL (UV) + SR (IR).

- An HCM Network on storage ring FELs finishes in May 1997 (Couprie/LURE is the co-ordinator).

HASYLAB FEL PROJECTS / G MATERLIK

- G Materlik reported upon recent HASYLAB FEL activities, in particular those activities working towards the proposed TESLA source. Ten working groups have been established (open to all - see the DESY pages on the World Wide Web) to look into the user applications of high energy FEL radiation. Components are being tested now for high energy e-beam injection (target 1000 MeV injection energy into a test undulator), aiming at 100 eV undulator radiation output. Current plans are to extend this work to the TESLA very long undulator and obtain X-ray radiation in the region of 10 keV photon energy.

- There was much discussion about the practicalities of the TESLA scheme. G Materlik emphasised the step by step nature of the development plan.

4 DETECTOR FACILITIES AT SR SOURCES

H Walenta brought the Round Table up to date with detector issues:

- The present position with respect to X-ray detectors was satisfactory in some areas but not good enough or could be better in many others.

- Two HCM detector networks already exist and a wide range of technical solutions are being proposed and/or made up into working devices. Examples include: solid state and gas proportional pixel detectors, gas microstrip detectors and silicon drift multidetectors. A single cell device of the latter type is now commercially available

- It there is added value to be had in co-ordinated efforts. A Walenta suggested that a Round Table style of approach could work here too.

- There were a number of questions concerning industrial exploitation of technical developments and technology transfer. M Malacarne commented that TMR RTD support could be useful in this area, particularly as a means of involving SMEs at an early stage.

5 TMR & FRAMEWORK DEVELOPMENTS

M Màlacarne brought the Round Table up to date with TMR and Framework developments. He reviewed the TMR-LSF activities, their objectives, principles, statistics and auditing. He also reviewed concerted actions, the evolution of EU funded activities in the SR area generally and looked forward to the next Framework and future Round Table(s) in SR related matters.

- There are two subactivities in TMR-LSF of interest:

  (1) researcher access contracts

  (2) Transnational RTD projects for improving the quality and quantity of access (co-ordinated by an LSF already funded under TMR-LSF).

- While the facilities programmes are demonstrably very successful at winning access contract funding, the Commission is reluctant to get inadvertently involved in funding on-going activities at the facilities that could be construed as a rolling programme of regular users and/or investment. The Commission is auditing its involvement in facilities generally, with a view to assessing the scope of what it funds as well as just investigating the spending of resources. Technical audit panel reports will be sent to the facilities for comments before passing on upwards and eventual publication. Further details of researcher access and RTD project conditions of contracts are given in the Appendix.

- The Commission wishes to extend the number and scope of the Round Tables and expects the facility Round Tables to apply for re-establishment or top-up extension funding. The next calls for proposals in Framework 4 will be by 16/12/96 for Concerted Actions (including Round Tables) and by 16/6/96 for Researcher Access and RTD Projects. Framework 5 calls may not appear until 1999. The Commission sees Concerted Actions as useful inputs into meeting the requirement to have constant updates upon areas of interest or concern.

- The TMR-LSF programme is in competition with the very popular Network and Fellowships programmes. It may even get squeezed out of Framework 5. It is necessary therefore for the facilities to demonstrate and publicise the benefits from earlier programmes.

6 ANY OTHER BUSINESS

6.1 FUTURE OF THE ROUND TABLE

As this was the last meeting under the present contract, the meeting considered the future of the Round Table. I Munro indicated that Daresbury Laboratory would not seek to continue as co-ordinator but was willing to participate if another would take on that role. G Margaritondo proposed that ELETTRA lead a new bid to the EU Commission. This was agreed.

END OF DAY ONE

11 October - Overview of European SR facilities and future projects

1 WELCOME AND INTRODUCTION

I Munro opened day two with a short review of the purposes of this second day. The day was devoted to survey reviews of SR provision in Europe, including invited presentations from facilities/countries who were not part of the Round Table to give more comprehensive coverage.

2 REVIEW PRESENTATIONS

2.1 UP-DATE OF THE ESRS COMPENDIUM OF WORLD SR SOURCES

A Hopkirk tabled the results of a paper survey of European SR sources (see Appendix). It is the intention of Daresbury Laboratory to extend the survey to sources outside Europe and to continue this process as far as a new edition of the European Synchrotron Radiation Society Compendium of World SR Sources. The new edition will also include FEL sources. The information collected will be made available on the World Wide Web.

2.2 FACILITY / COUNTRY PRESENTATIONS

Each of the facility participants / country representatives gave a short presentation. The focus was upon plans for the development of existing facilities and plans for new facilities.

The main points from the presentations and discussions are given below. Copies of overheads and any other materials tabled at the meeting are in the Appendix.

<u>DENMARK - ASTRID(I & II)/AARHUS/ E UGGERHOJ</u>

- The new name for the institute at Aarhus is the Institute for Synchrotron Facilities, reflecting a change in emphasis and orientation of the organisation.
- The present ring is the product of collaboration with a very wide range of institutions, including CERN, BESSY, MAX-Lab, DESY, DL 'SRS, ESRF and the University of Gottingen. Further collaborations were seen as important in continuing development.
- Planned developments of the ASTRID (I) ring included a small electrostatic ring (ELISA) and a Penning ion trap. Present activities are mainly in atomic / solid state / surface physics and materials science. There little biology orientated work. Most projects are long term projects.
- There are early plans for a new 1-2 GeV ring, ASTRID (II).
- The institute wants to become known as a 'centre of excellence' rather than a 'large scale facility'.

<u>FRANCE - CLIO/ORSAY/ J ORTEGA</u>

- The CLIO FEL covers 3-50 µm, diffraction limited at the 50 µm end. OPO development is extending the range to lower wavelengths.
- The science programme is largely based in FEL physics studies: extending the wavelength range, femtosecond pulses, two colour operation, SASE studies and comparison with theory.
- Future developments may include CLIO (II) for IR (50 µm - 1 mm) studies, perhaps as part of the SOLEIL package.

FRANCE - SOLEIL/ P THIRY & LURE/ R COMES

- SOLEIL is intended to be the new French national facility for the photon energy range 10 eV-20 keV with high brilliance and large numbers of IDs.

- Current expectations are that approval for the detailed design phase (3 years of work) will be given soon. With a 4 year building programme to follow the design stage, it is unlikely that first light will be before 2003. The expected total cost is 2 billion FF over 11 years.

- SOLEIL will have a big effect on LURE. There are a number of scenarios for a phased transfer of activity to SOLEIL. There is likely to be a dark period of 12-18 months. French use of other facilities can be expected to increase if this is so.

- The current programme at LURE now includes beamline developments expected to transfer to SOLEIL and a Spanish funded beamline on Super-ACO as a precursor to their own national source.

GERMANY

Because of their number, the German facilities were treated as a group and reviewed by G Materlik and W Gudat.

ELSA/BONN

- This facility is not open to general access users. Access can be achieved by collaboration with in-house workers only.

ANKA/KARLSRUHE

- This is a new facility and has been established primarily to service LIGA lithography interests.

- There is a strong focus on industrial participation. The target is 60% industrial usage of all X-ray stations. Some 25 local companies are already interested or actively involved.

- Centres for Microfabrication and Analysis will be established.

BESSY (I & II)/BERLIN

- There is also focus on LIGA lithography at BESSY. They will offer a 'service centre' approach in partnership with two other key technology providers.

- BESSY (I) is the European standard SR source.

- 40 nm resolution cryo X-ray microscopy is now routine.

- Construction of BESSY (II) is very well underway. First light is expected in December 1998. The first users in January 1999.

- BESSY (I) will close after the transfer of activities to BESSY (II)

DELTA/DORTMUND

- DELTA is a test/educational facility for storage ring science, engineering and technology.

- Approved in 1991 and based at a university, several generations of postgraduates and postdoctoral students have worked on it and it is now in routine operation with stored beam.

- The race-track layout allows the testing of trial FELs and MPWs. Three beamlines are planned for full operation next year (LIGA, general spectroscopy and one other).

HASYLAB

- Activities at HASYLAB were covered on day one. Particularly relevant to this discussion were the plans for FEL development.

INTERNATIONAL - ESRF/ Y PETROFF

- ESRF continues to exceed design goals as more is learned about accelerator operations. Beam lifetimes of 45 hrs have been achieved with 2/3 ring fills. There are 40 ID's installed. The brilliance target is up 3 orders to 10^{21} ph/s/0.1% bandpass/mrad^2/mm^2.

- ESRF are testing an in-vacuum undulator for SP-ring 8. They are also working on an ultra-fast, jitter free, streak camera.

- The prospect of budget cuts is causing management concern. They remain optimistic however that it will be possible to mitigate the worst effects of any sudden changes.

- Some 50 industrial companies have some involvement at ESRF. There are plans for a new station for trace element analysis in semiconductor materials (to include a clean room facility).

INTERNATIONAL - EMBL AT ESRF AND HASYLAB/ K WILSON

EMBL AT ESRF

- Demand for protein crystallography (PX) beamtime exceeds supply.

- The general focus is on difficult systems e.g. very small crystals, weak diffractors, time resolved studies, MAD work for phasing.

- Detector development is needed to improve the efficiency of station usage - target 10 x greater throughput.

EMBL AT HASYLAB

- In addition to considerable PX usage, bio-XAFS and NCD feature here.

- It is anticipated that the growth in PX at Hamburg will level off (at ~ 600 days pa) as ESRF reaches its full potential for development.

ITALY - ELETTRA/ G MARGARITONDO

- Initial findings confirm the benefits hoped for of third generation facilities: higher brilliance, better resolution in dispersive and imaging applications, better time resolution in experiments.

- The proportion of non-Italian proposals is currently more than 60% and only some 20% of proposals overall are accepted for the 6 operating beamlines. More beamlines are needed now.

NETHERLANDS - FELIX/ M VAN DER WIEL

- The issues for FELs are now less to do with reliability, easy tunability and establishing a broad user community. Of more concern are wider wavelength tuning ranges and matching FELs to experiments and other light sources. This is driven by user demand.

- Present FELIX developments include: adding more undulators and experiments stations, linac beam switching between FEL undulators for multi-user operations and femtosecond pulses e.g. 220 fs at 10 μm

- Access is on the basis of science peer review. They hope to expand in the biomedical and biophysical areas in particular.

RUSSIA - SIBERIA (I & II)/MOSCOW/ V STANKEVITCH

- Progress with SIBERIA (II) in Moscow is slow due to funding constraints. Both SIBERIA (I) (VUV/SXR studies mainly) and SIBERIA (II) (X-ray studies mainly) are operational at present.

- Targets for SIBERIA (II) include: 100 mA stored beam at 2.5 GeV in 1996, rising to 300 mA in 1997 and first X-ray experiments 1997.

- Collaborations are being established with Czech and German groups (IMM Mainz) in LIGA and other deep X-ray lithographies.

- V Stankevitch briefed the meeting on recent developments in Russian governmental support for SR. He canvassed letters of support for SR research in Russia from the facility directors present. He would forward these to the appropriate authorities.

SPAIN - LSB/ J BORDAS

- The Spanish believe that access to SR is a key target to help achieve scientific and technical competitiveness in a growing number of areas. The SR community now numbers more than 80 groups (~ 400 scientists) from all over Spain.

- The strategy is to work towards a national facility (LSB) via personnel and hardware involvement in other sources. User requirements are being refined, based on actual SR experience at other sources wherever possible. The design requirement is converging towards a 2.5-3 GeV storage ring with a variety of IDs.

- Current status of the project - 14 staff
  - 1995-1997 design study
  - establishing a laboratory for magnetic structure evaluation
  - establishing collaborative arrangements with local industry
  - the full proposal is to be complete in 1997

SWEDEN - MAX (I & II) / I LINDAU

- Approximately 60% of beamtime at MAX(I) is devoted to SR experimental applications and 40% to nuclear and accelerator physics.

- Most of the international groups are collaborating with local Swedes. Approximately 50% of the 200 users are Swedish. Atomic and molecular, surface and solid state physics in the IR-VUV/SXR spectral ranges dominate the programme.

- The first stored beam in MAX (II) was in 1995. The first user experiments are due in December 1996.

- The first tranche of 4 IDs and 2 bending magnets stations at MAX (II) are under construction now. The target is 70-80% development of the facility capacity by 2000.

SWITZERLAND - SLS/ G MARGARITONDO

- SLS is claimed to be the first fourth generation light source design and features the exploitation of brightness/brilliance for spectromicroscopy and time resolution in spectroscopy and the exploitation of coherent SR in the 10-100 eV photon energy range, perhaps to 1000 eV also.

- The current status of the project is that political level decision making is awaited.

- The first call for beamlines was made in 1996. The intention is to have these ready if approval is given for a ring and beamlines package as a whole.

UNITED KINGDOM - SRS & DIAMOND/ I MUNRO

- The balance of scientific activity is changing. Atomic and molecular and surface science are in relative decline, with biology, PX and industrial services growing. Currently, approximately half of the total activity uses X-rays. Direct sales to industry account for only a few percent of current total usage.

- Future plans for the SRS depend on the fate of the DIAMOND proposal for its replacement and what limited scope there is at the SRS itself. The UK scenario remains that of "the three sources": ESRF, a medium energy source (DIAMOND or similar) and a high brilliance VUV source.

- DIAMOND is currently in the outline design stage. Attempts are being made to find a way to fund this new national facility within the new structure of UK Research Councils.

- It is likely that private sector funding and direct involvement of industrial collaborators will be demanded of any new facility like DIAMOND. All avenues for funding are being explored.

3 GENERAL DISCUSSION

3.1 CO-OPERATIVE ACTIVITIES

I Munro drew the meeting's attention to the series of annual workshops on SR light sources. The fourth in the series was held earlier this year. These workshops were the product of a bottom up initiative which, by information and experience exchange at the earliest possible stage in new projects, had saved significant time and effort all around at little cost.

W Gudat proposed European co-operation on SR-related test facilities and theory development. He suggested this could extend to a test beamline on one of the present or next generation sources. He indicated that BESSY was willing to participate in this and called on any parties present who were interested in an RTD bid to contact him directly.

3.2 MEGASCIENCE FORUM COMMENTS

The Megascience Forum is currently particularly interested in the policy making and management practices of large facilities. For example, the Forum will be circulating a questionnaire to a sample of facilities concerning structural impediments to international co-operation and asking who (or what) determines their access policies?

P Zinsli and P Baruch reported their observations of the Round Table process to the meeting:

They explained that the Forum had developed an interest in establishing a European regional working group on SR sources and researcher access provision Over the past two days they had observed that this Round Table was indeed very close to what was envisaged. Their conclusions were:

(1) The Round Table should continue. Information gathered by it, and about it, should be more widely disseminated upwards and outwards both politically and scientifically.

(2) The involvement of the non-EU SR active countries should be encouraged to give further strength in depth to Round Table discussions.

(3) When appropriate, governmental and other officials should be invited to hear the Round Table's discussions.

(4) The Round Table could play a very useful role in providing a means of establishing and/or monitoring co-ordinated activities at these relatively large facilities where a very diverse range of small science is being done.

4 MEETING CLOSE

M Malacarne thanked I Munro and Daresbury Laboratory for co-ordination of this Round Table and thanked R Comes for hosting this meeting at LURE. He welcomed the positive comments by the Megascience Forum representatives and noted their suggestions for wider involvement in Round Table activities.

I Munro closed the meeting with thanks to all who participated and extended particular thanks to the local organisers R Comes, H Dexpert and M Lemonze.

APPENDIX CONTENTS

Section Number (sections are labelled by the page number at the foot of the section cover page)

List of attendees

(* = OECD Megascience Forum representative)

11/10/96

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R Comes (10 October)

Octobre 1996

CNRS-CEA-MESR

-:-:-:-:-:-:-:-:-

L U R E

en quelques chiffres

4 installations :	Accélérateur linéaire (2.2 GeV e^-)	
	Anneau DCI – Rayons X (2.5 à 50 KeV)	
	Anneau Super ACO – X Mous (5 KeV), UV, visible, IR (mm)	
	LEL-CLIO	IR du µm à 50 µm
	LEL sur Super ACO	(350 nm)

Postes d'expériences = 40 simultanés (50 en temps partagé).

Personnel = 400 personnes (230 ITA, 110 chercheurs, 70 thésards et post-docs)

30 laboratoires en collaboration permanente
20 partenaires industriels

Budget total 150 MF par an (dont hors personnel 50 MF)

Utilisateurs des installations :

- 1800 chercheurs (1/3 étranger, 1/3 province, 1/3 région parisienne), dont 200 thésards
- 900 propositions d'expérience : 2/3 DCI, 1/3 Super ACO
- 600 propositions acceptées

Publications : plus de 400 par an

Domaines scientifiques principaux :

• <u>Structures atomiques et électroniques</u> :
- Physique (41 %)
- Chimie (27 %)
- Biologie animale et végétale et environnement (15 %)

• <u>Sciences physiques pour l'ingénieur</u> :
- Lithographie, Microfabrications (7%)
- Espace : Astrophysique (5%)
- Utilisations Industrielles directes (5%)

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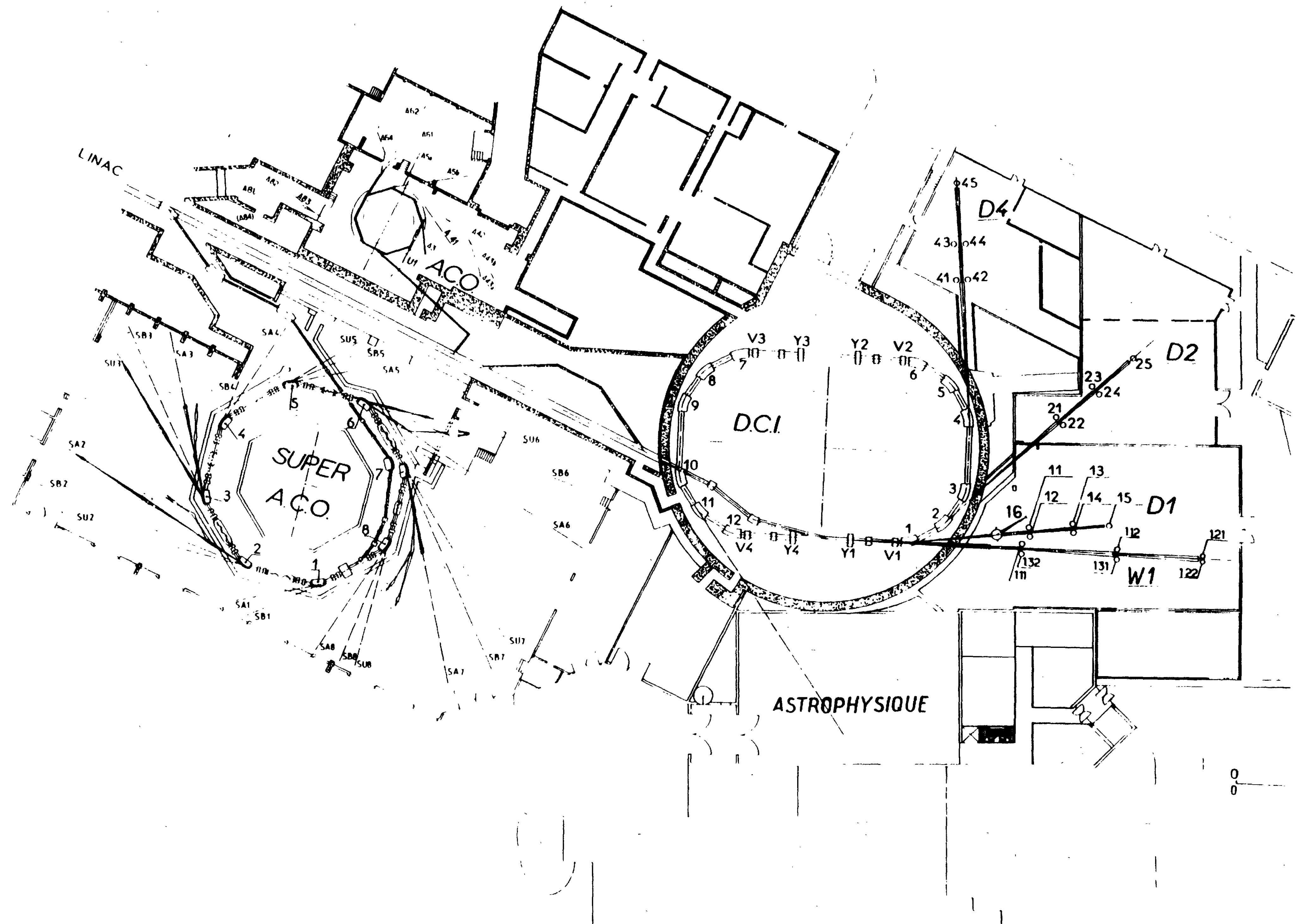
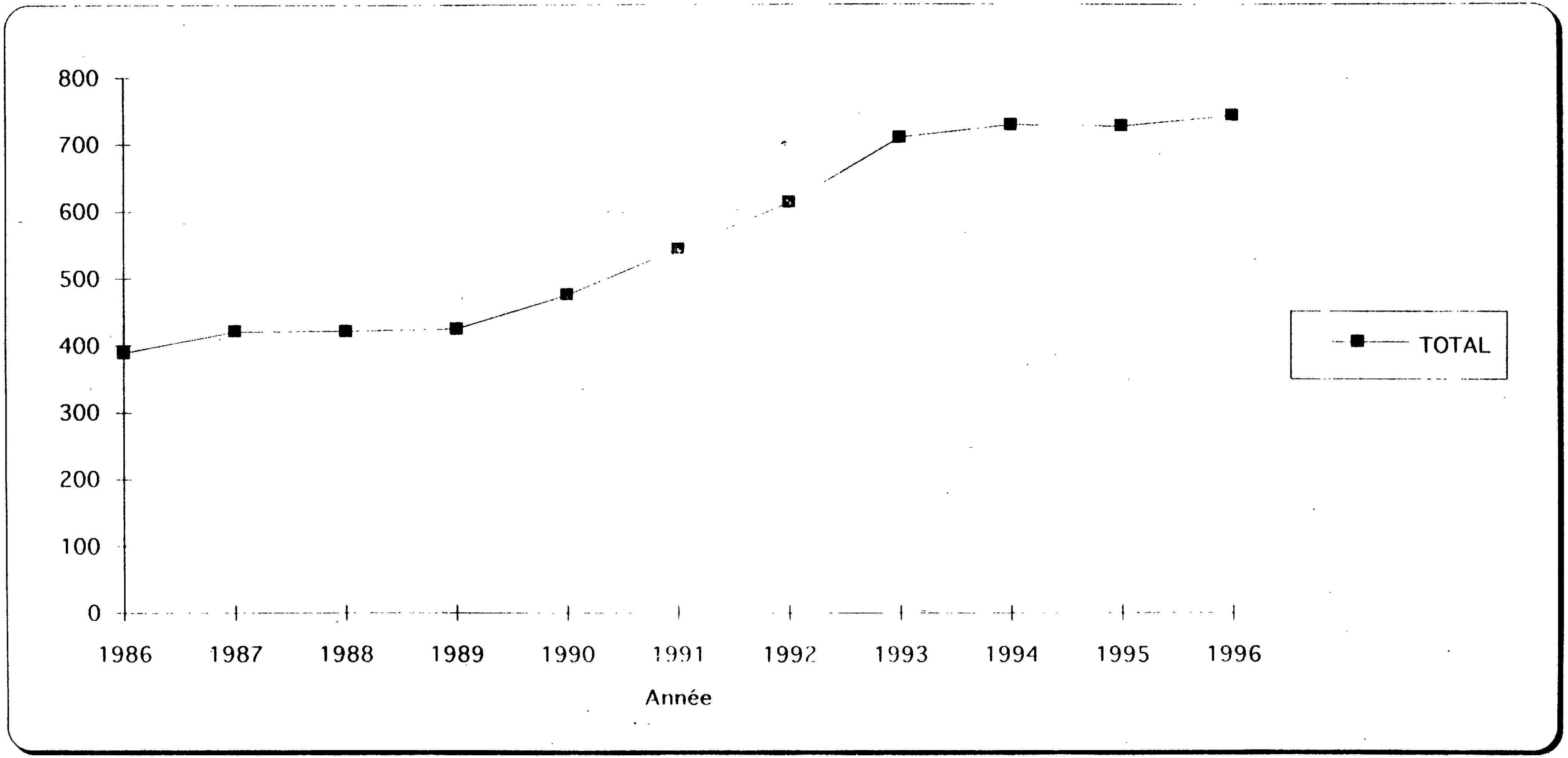


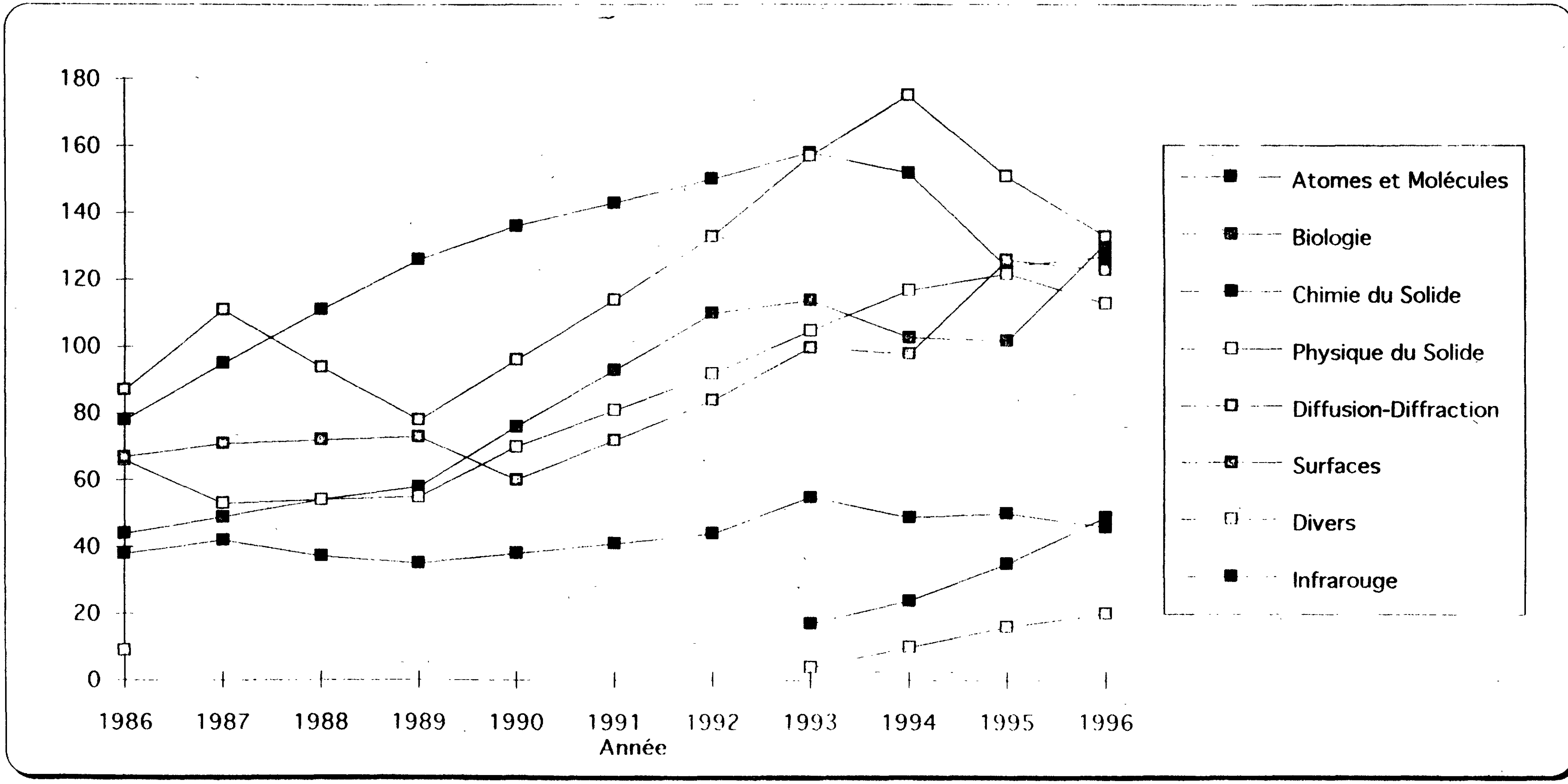
LINAC
ACO
SUPER A.C.O.
D.C.I.
D4
D2
D1
W1
ASTROPHYSIQUE

Nombre total de projets déposés

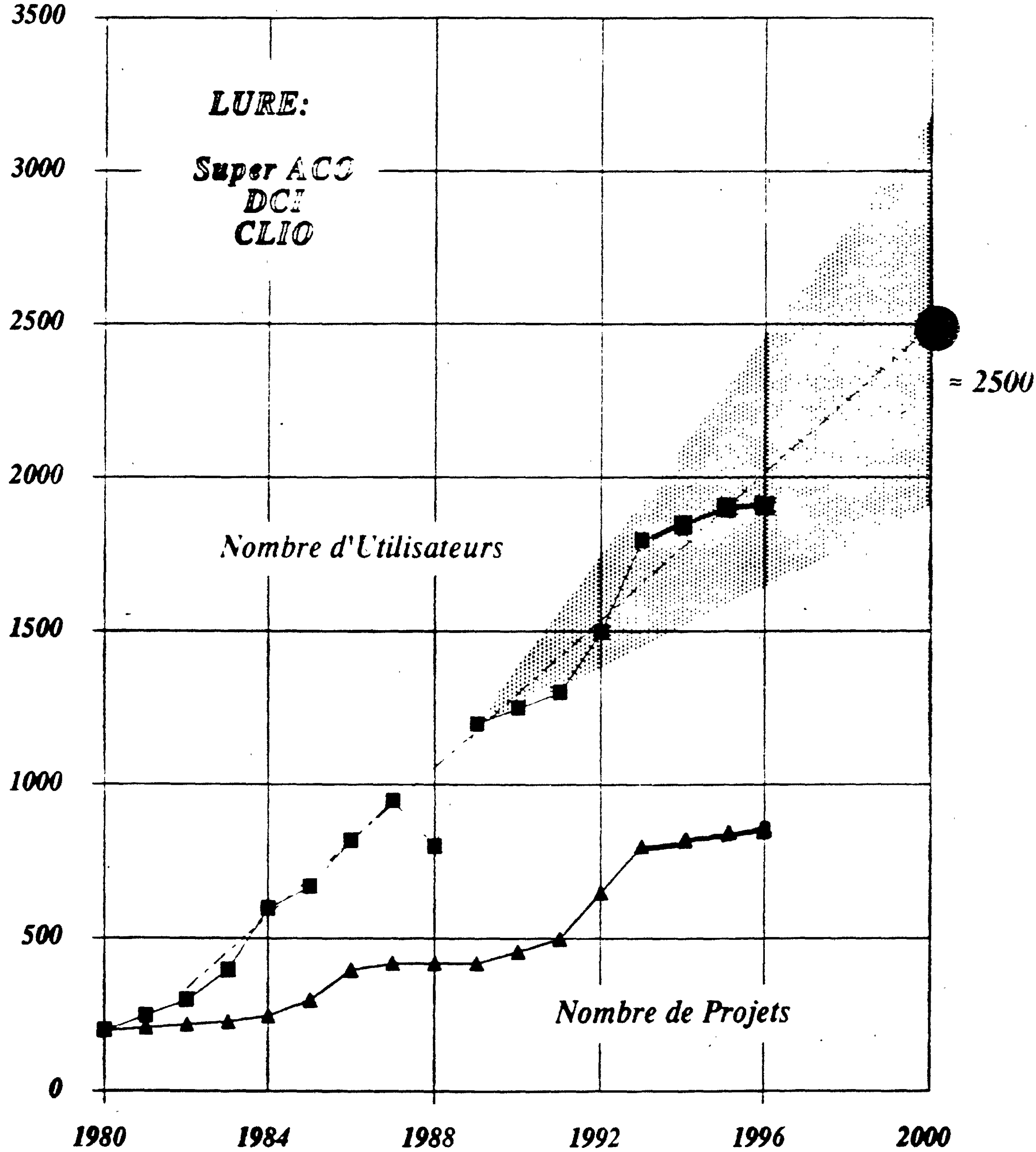


14/3

Nombre de projets déposés par section scientifique



14/4



LURE:
Super ACO
DCI
CLIO
Nombre d'Utilisateurs
Nombre de Projets
≈ 2500
3500
3000
2500
2000
1500
1000
500
0
1980
1984
1988
1992
1996
2000

14/5

LURE
Secrétariat Scientifique

12 Avril 1995

Number of accepted projects x Post. for 1995

PROJECT LEADERS*	Nber of accepted Projects x Post.		Percentage of alloted sessions
INTERNAL USERS	107	17 %	21 %
EXTERNAL USERS	533	83 %	79 %
TOTAL	**640**	**100 %**	**100 %**
FRENCH	489	76 %	77 %
FROM E.C.	110	17 %	17 %
OTHERS	41	7 %	6 %

* The projects are classified according to the origin of the responsible person independently of the origin of the other participants.

LURE
Secrétariat Scientifique

Le 13 Septembre 1996

Number of accepted projects for 1996

PROJECT LEADERS *	Nber of accepted Projects		Nber of alloted 24 h sessions	
INTERNAL USERS	92	15 %	932	23 %
EXTERNAL USERS	521	85 %	3185	77 %
TOTAL	**613**	**100 %**	**4117**	**100 %**
FRENCH	470	76 %	3270	79 %
FROM E.C.	103	17 %	621	15 %
OTHERS	40	7 %	226	6 %

* The projects are classified according to the origin of the responsible person independently of the origin of the other participants.

Total 1996 : 613 accepted projects for
742 proposals

LURE

Secrétariat Scientifique

25 Septembre 1996

1996

NUMBER OF ACCEPTED PROJECTS AND ALLOTED 24 H SESSIONS FOR E.C. USERS

COUNTRY	Nber of accepted projects*	E.C. Percentage	Nber of alloted 24 h sessions	E.C. Percentage
BELGIUM	14	13%	104	17%
GERMANY	25	24%	152	24%
GREECE	3	3%	20	3%
ITALY	31	30%	190	31%
PORTUGAL	3	3%	14	2%
SPAIN	22	22%	112	18%
SWEDEN	1	1%	4	1%
UK	4	4%	25	4%
TOTAL	**103**	100%	**621**	100%
OVERALL TOTAL	**613**	**17%**	**4117**	**15%**

* The projects are classified according to the origin of the responsible person independently of the origin of the other participants.

1996

LURE
Secrétariat Scientifique

25 Septembre 1996

NUMBER OF ACCEPTED PROJECTS AND ALLOTED 24 H SESSIONS FOR PECO USERS

COUNTRY	Nber of accepted projects*	PECO Percentage	Nber of alloted 24 h sessions	PECO Percentage
LETTONIE	1	5%	2	2%
POLOGNE	4	20%	20	20%
REPUBLIQUE TCHEQUE	2	10%	4	4%
RUSSIE	11	55%	67	66%
SLOVENIE	1	5%	2	2%
UKRAINE	1	5%	6	6%
TOTAL	**20**	100%	**101**	100%
OVERALL TOTAL	**613**	**3%**	**4117**	**2,5%**

* The projects are classified according to the origin of the responsible person independently of the origin of the other participants.

LURE
Secrétariat Scientifique

Orsay, le 17 Septembre 1996

1996
NUMBER OF ACCEPTED PROJECTS AND ALLOTED 24 H SESSIONS FOR E.C. USERS

Country	Nber of accepted projects*	E.C. Percentage		Nber of alloted 24 h sessions	E.C. Percentage
BELGIUM	28	19 %		186	19 %
FINLAND	1	0,7 %		8	0,8 %
GERMANY	38	25,5 %		234	24 %
ITALY	45	31 %		299	31 %
GREECE	2	1 %		10	1 %
NETHERLANDS	0	0 %		0	0 %
PORTUGAL	2	1 %		9	0,9 %
SPAIN	23	15,5 %		116	12 %
SWEDEN	1	0,5 %		4	0,4 %
UK	9	6 %		98	10 %
E.C. TOTAL	**149**	**100 %**		**964**	**100 %**
OVERALL TOTAL	**613**			**4117**	
Percentage	**24 %**			**23 %**	

* Projects with at least one E.C. user

NOMBRE DE SESSIONS ATTRIBUÉES PAR PAYS DE LA C.E.

(1990 À 1996)

	Nb de sessions allouées en **1990** 1/4/90 au 31/3/91	Nb de sessions allouées en **1991** 1/4/91 au 31/3/92	Nb de sessions allouées en **1992** 1/4/92 au 31/3/93	Nb de sessions allouées en **1993** 1/4/93 au 31/3/94	Nb de sessions allouées en **1994** 1/4/94 au 31/3/95	Nb de sessions allouées en **1995** 1/4/95 au 31/3/96	Nb de sessions allouées en **1996** 1/4/96 au 31/3/97
Allemagne	**54**	**129**	**180**	**152**	**181**	**213**	**234**
Angleterre	**24**	**138**	**119**	**118**	**66**	**54**	**98**
Belgique	**99**	**132**	**91**	**179**	**153**	**123**	**186**
Danemark	-	-	5	**1**	-	-	-
Espagne	**65**	**43**	**126**	**147**	**140**	**131**	**116**
Grèce	**6**	**6**	**29**	**6**	**5**	**12**	**10**
Irlande	-	-	**5**	-	-	-	-
Italie	**153**	**228**	**263**	**269**	**316**	**358**	**299**
Luxembourg	-	-	-	-	-	-	-
Pays Bas	**64**	**53**	**27**	**96**	**12**	**32**	**0**
Portugal	**11**	**20**	**7**	**51**	**38**	**7**	**9**
Total C.E.	**476**	**749**	**852**	**1 019**	**911**	**930**	**952**
Total Général	**2 851**	**2 750**	**2 988**	**3 426**	**3 778**	**3 836**	**4 117**
% sessions C.E.	**16,7%**	**27%**	**28%**	**29%**	**24%**	**24%**	**23%**

N.B. : Projects with at least one non French E.U. users.

LURE
Secrétariat Scientifique

Orsay, le 25 Septembre 1996

1996
NUMBER OF ACCEPTED PROJECTS AND ALLOTED 24 H SESSIONS FOR PECO USERS

Country	Nber of accepted projects*	PECO Percentage	Nber of alloted 24 h sessions	PECO Percentage
LATVIA	5	14 %	11	5 %
POLAND	4	11 %	20	10%
REPUBLIC CZECH	2	6 %	4	2 %
RUSSIA	22	60 %	163	76 %
SLOVENIA	1	3 %	2	1 %
UKRAIN	2	6 %	11	6 %
PECO TOTAL	**36**	**100 %**	**211**	**100 %**
OVERALL TOTAL	**613**		**4117**	
Percentage	**6 %**		**5 %**	

* Projects with at least one PECO user

PLAN D'EQUIPEMENT COMPLEMENTAIRE LURE EN VUE DE SOLEIL

Total MF

1. Haute Energie. Haute Résolution
   (100 → 1500 eV ≈ 10^4)
   onduleur SU5

2. Basse Energie. Haute Résolution
   (8 → 60 eV ≈ 10^5)
   aimant

3. Photoémission - Photodiffraction
   (15 → 900 eV ≈ 10^4)
   onduleur SU8

4. Cavité RF 500 MHz
   section droite 4

5. Ligne Diffraction - Absorption
   aimant H10

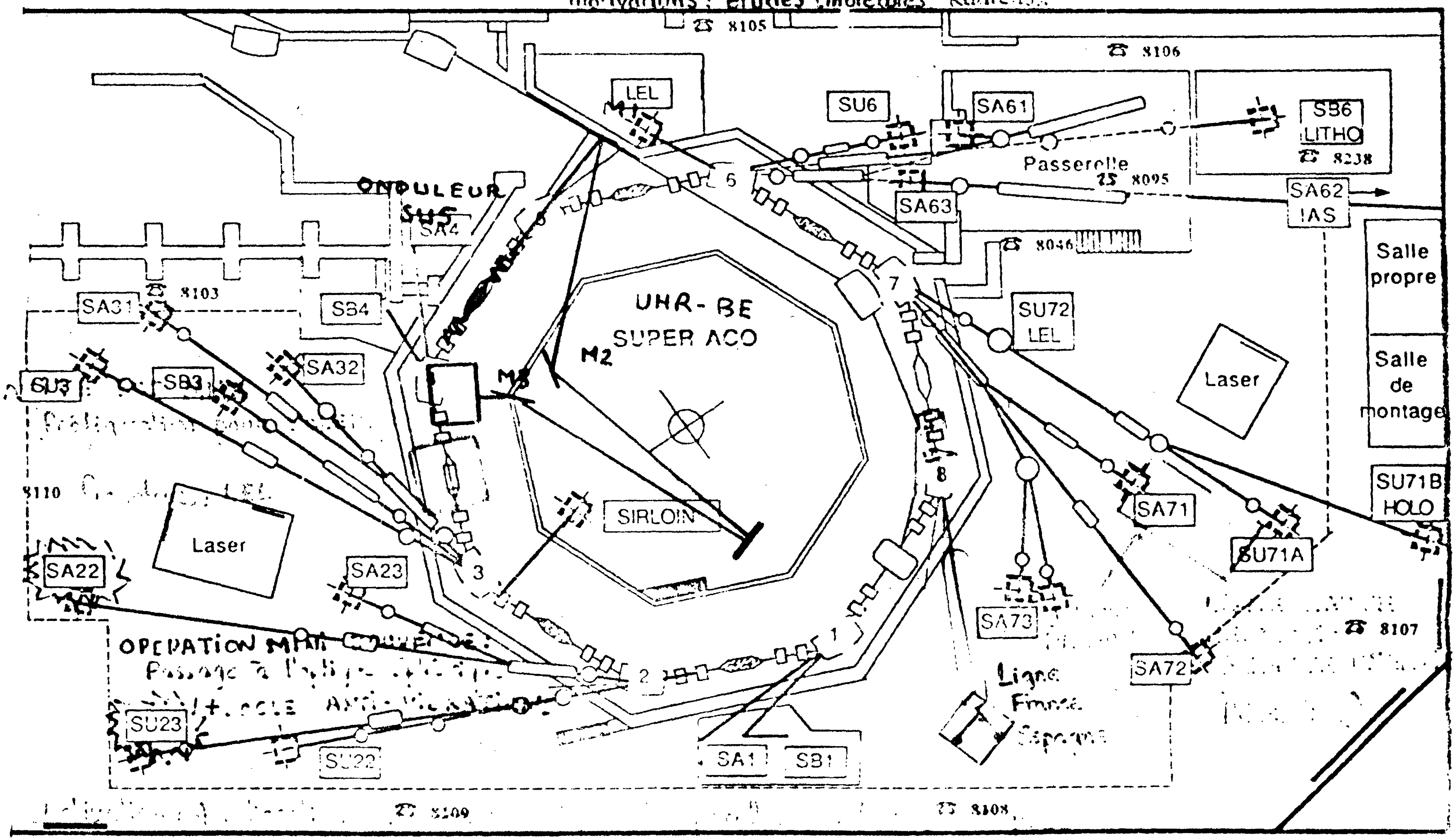
6. Détecteur bio (30 cm)
   D41

7. Jouvence EXAFS Dispersif
   D11

LURE Budget ordinaire
LURE Budget exceptionnel
Autres : Espagne (3)
Région Centre et Industrie

Total contributions

Promoteurs : Atomes et molécules / Resp : L. Nahon / Atomes, Agrégats, Motivations : études molécules Radicaux



Super-ACO

LOW ENERGY - HIGH RESOLUTION (SU5)

Project manager : L. Nahon

Scientific goals	8-60 eV high resolution ($\approx 10^5$) beam line -> spectroscopy in gas phase -> atomic and molecular physic
Technical design	6-m normal incidence "Eagle off plane" monochromator Electromagnetic ondulator on SD5 with phasing to change the polarization plane High-orders gas filter
Present situation	Optical design completed Design of the ondulator completed To be installed during the fall 97

R.F. CAVITY 500 MHz

Project manager : G. Flynn

Scientific goals	Increase from 2 to 6% of the FEL gain Extension to 230 nm of the energy range Shortening of the pulse length (factor 3)
Technical design	500 MHz of the "Elettra" type
Present situation	Installation during the winter 96-97 Tests during the spring 97

Super-ACO

HIGH ENERGY - HIGH RESOLUTION (SB7)

Project manager : F. Sirotti

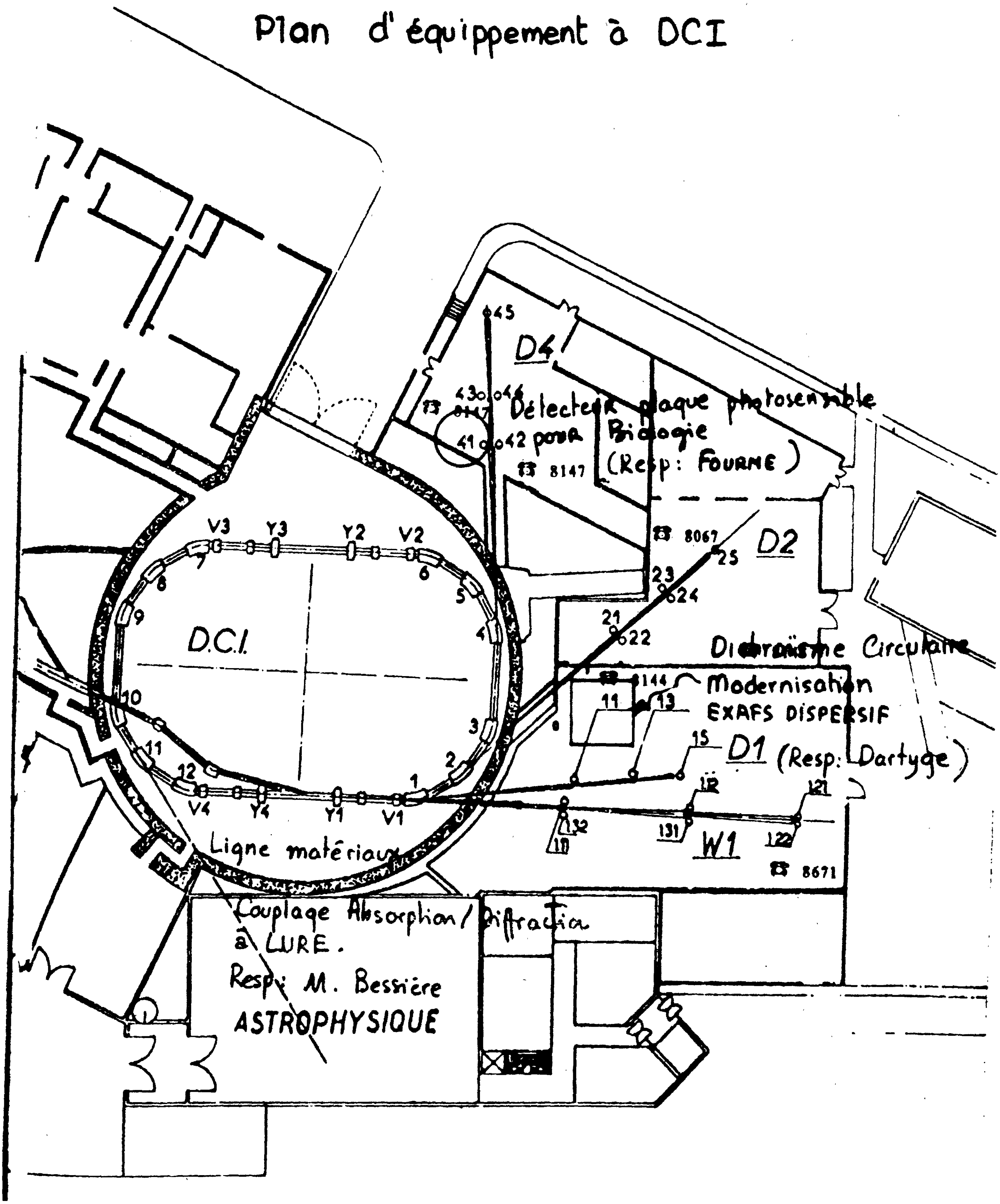
Scientific goals	100-1500 eV high resolution (10^4) beam line -> circular polarization -> absorption spectroscopy, photoemission
Technical design	SGM (double-head Dragon type) monochromator on a bending magnet
Present situation	Optical design completed Delivery and assembly of the beam line by May 97, commissionning by July 97

FRANCO-SPANISH BEAM LINE (SU8)

Project manager : M.C. Asencio

Scientific goals	15-900 eV high resolution (10^4) beam line ->photoemission, photodiffraction -> absorption spectroscopy
Technical design	PGM - SM monochromator hybrid ondulator installed on SD8
Present situation	Optical design completed Delivery and assembly of the ondulator by June 97, of the beam line by July 97

Plan d'équippement à DCI



DCI

DCI

DISPERSIVE EXAFS BEAM LINE (D10)

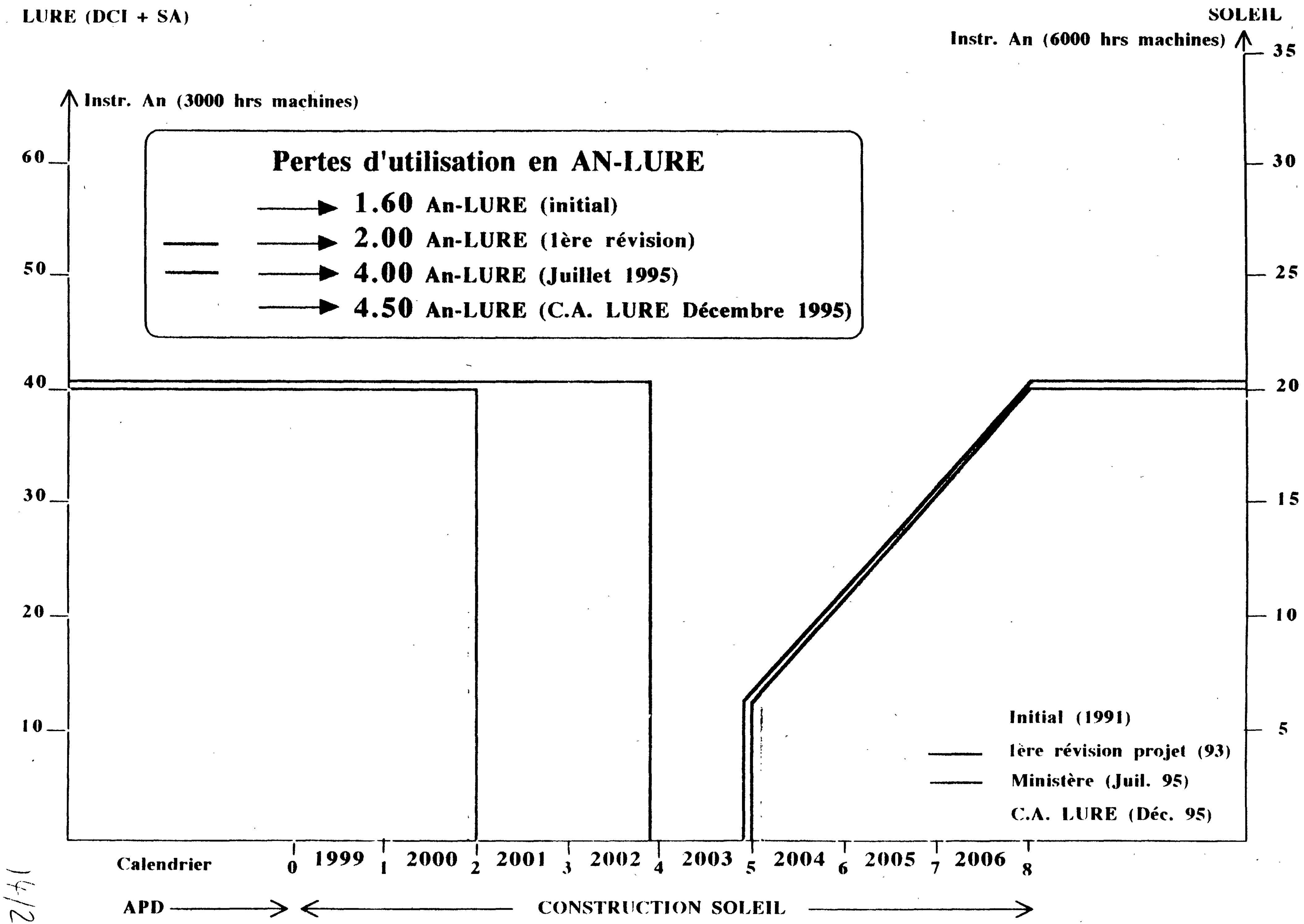
Project manager : E. Dartyge

Scientific goals	Renewal of the dispersive set-up for : -> X-ray circular dichroism -> High T / high P experiments
Technical design	Replacement of the monochromator, the optical bench and the detector
Present situation	Installation during the winter 96-97 Tests during the spring 97

2D DETECTOR FOR BIOCRYSTALLOGRAPHY EXPERIMENTS

Project manager : R. Fourme

Scientific goals	Improvement of the data collection for macromolecules crystallography
Technical design	30-cm image plate
Present situation	Installation during the fall 96



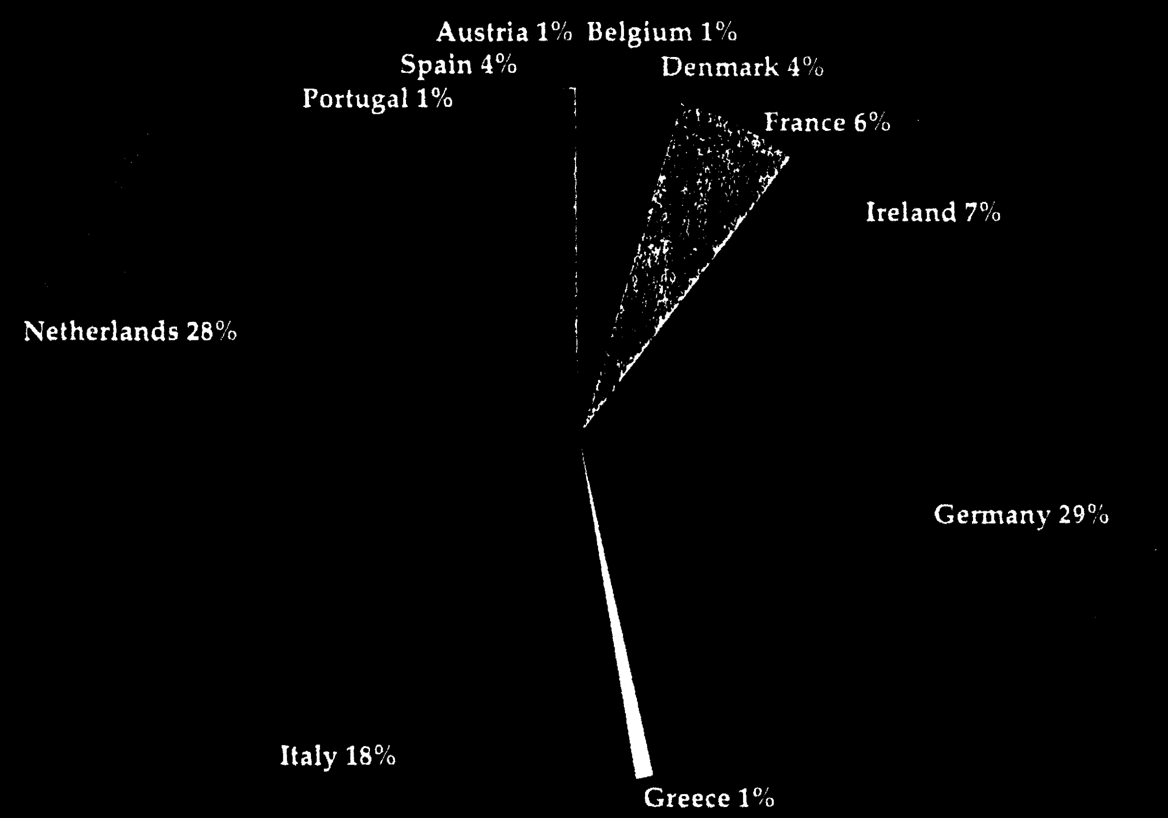
LURE (DCI + SA)
SOLEIL
Instr. An (6000 hrs machines)
Instr. An (3000 hrs machines)
Pertes d'utilisation en AN-LURE
1.60 An-LURE (initial)
2.00 An-LURE (1ère révision)
4.00 An-LURE (Juillet 1995)
4.50 An-LURE (C.A. LURE Décembre 1995)
60
50
40
30
20
10
35
30
25
20
15
10
5
Initial (1991)
1ère révision projet (93)
Ministère (Juil. 95)
C.A. LURE (Déc. 95)
Calendrier
0 1999 1 2000 2 2001 3 2002 4 2003 5 2004 6 2005 7 2006 8
APD
CONSTRUCTION SOLEIL

14/20

I Munro (10 October)

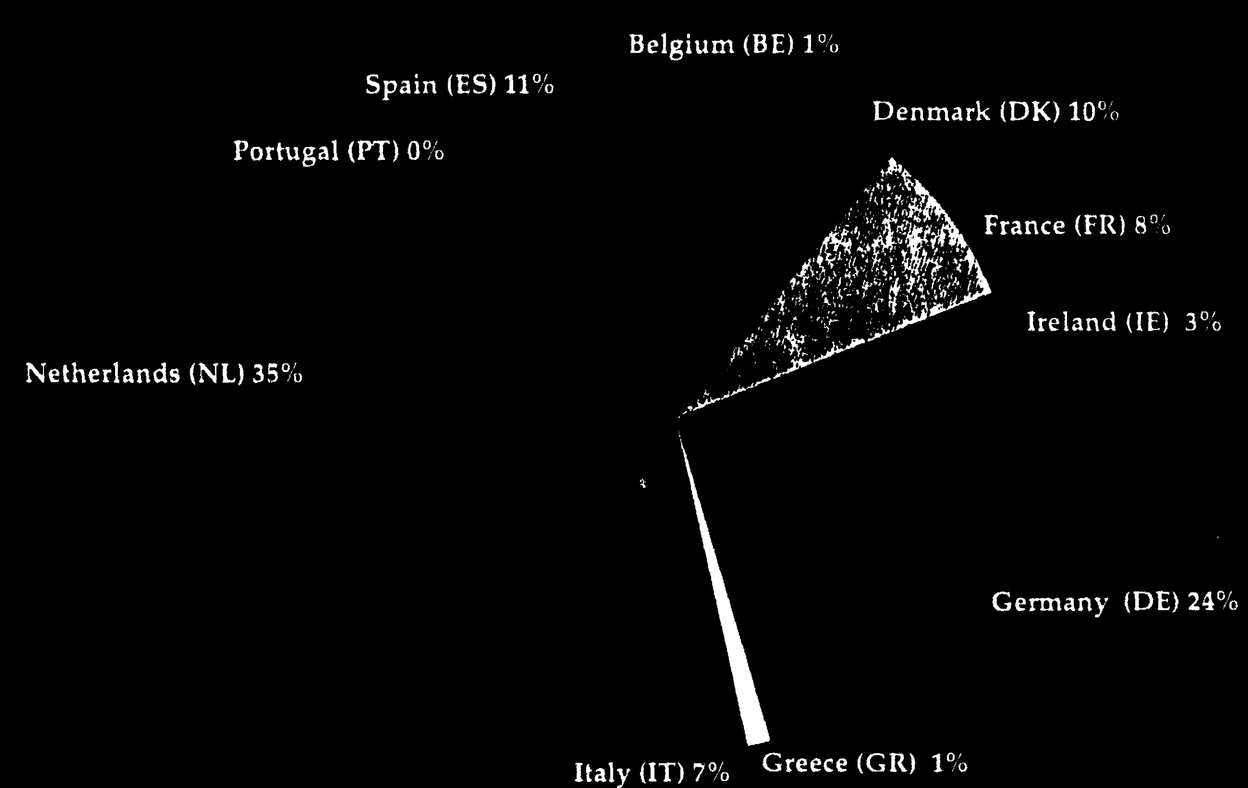
CLRC

EU usage of beamtime at the SRS in FY95/96 (total 497 Station days)



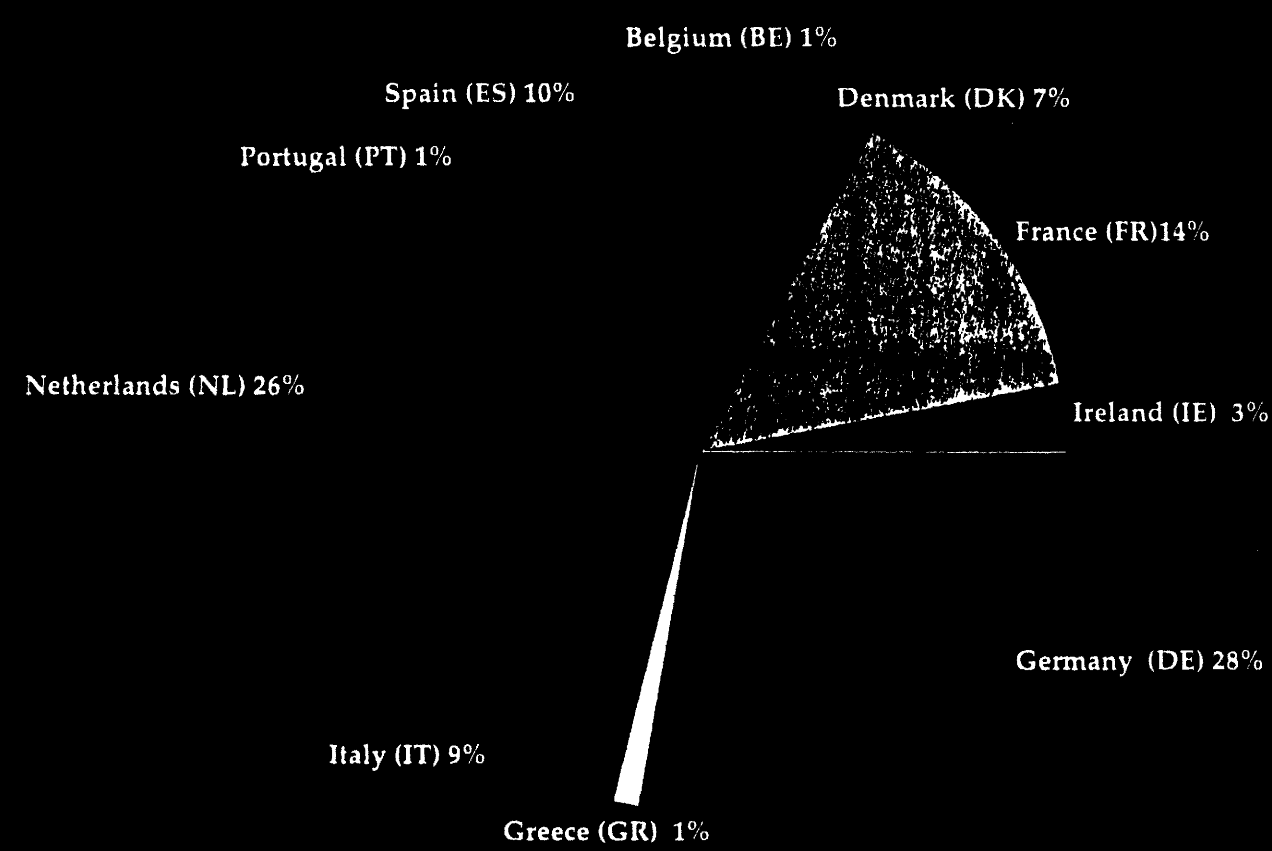
CLRC

Number of EU researchers in FY94/95 and FY95/96 (total 620)



15/2

EU projects in FY94/95 and FY95/96 (total)



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CLRC

THE FACILITY

Synchrotron Radiation Source (SRS) at Daresbury Laboratory (U.K.).

- funded by the Council for the Central Laboratory of the Research Councils (CCLRC).
- operational since 1981.
- investment cost ca. 30MECU (although replacement cost at current prices ca. 100MECU).
- annual operating costs ca. 20MECU.
- 265 staff on operational support.
- 2 GeV storage ring supplies 43 operating stations (42 for users)
- 7000 hours of operations in 95/96

43 stations:

- two wavelength-shifting hard X-ray wigglers feeding 13 stations
- one soft X-ray undulator with 2 stations
- 28 experimental stations use radiation from bending magnets (27 for users)

All the stations are fully equipped with state-of-the-art detectors and data acquisition/ data reduction systems. Many of these are unique, such as X-ray area detectors for macromolecular crystallography, non-crystalline and powder diffraction and multi-element solid state detectors for X-ray spectroscopy.

1.14

CLRC

USER PROGRAMME

For the year of 1 April 1995 to 31 March 1996,

'national'	3926 station-days	86.9%
HCM	497 station-days	11.0%
other European	26 station-days	0.6%
non-European	67 station-days	1.5%
TOTAL	4516 station-days	100%

15/5

CLRC

ACCESS PROVIDED UNDER THE CONTRACT

- start date 01/04/94
- end date 31/03/97
- EC funding granted = 2,200 kECU
- access to be provided 1326 station-shifts of 8 hours, i.e. 442 station-days.
- access provided up to 1 April 1996 totalled 990 station-days.
- to 31/3/96 there were 324 HCM applications (183 accepted (56%)), leading to 3522 person-days at the facility
- the HCM contract thus allowed us to increase the total of station-days by 3.3%.

15/6

CLRC

Number of EU users at the SRS

The total number of researchers was 620*

Country	Year 1994/95	Year 1995/96	Total
Belgium (BE)	6	1	7
Denmark (DK)	33	28	61
France (FR)	25	22	47
Germany (DE)	57	89	146
Greece (GR)	0	8	8
Ireland (IE)	10	6	16
Italy (IT)	21	23	44
Netherlands (NL)	77	142	219
Portugal (PT)	0	2	2
Spain (ES)	45	25	70
TOTAL			**620**

*Note that the total given is the sum of two individual years: a researcher who had access in both years is counted twice.

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CLRC

Number of EU programmes at the SRS

The total number of projects was 155.

Country	Year 1994/95	Year 1995/96	Total
Belgium (BE)	1	1	2
Denmark (DK)	6	5	11
France (FR)	11	10	21
Germany (DE)	15	28	43
Greece (GR)		2	2
Ireland (IE)	2	2	4
Italy (IT)	5	9	14
Netherlands (NL)	10	31	41
Portugal (PT)		1	1
Spain (ES)	10	6	16
TOTAL			**155**

15/8

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EU science areas at the SRS

Days to EU users in FY95/96

Sum of days country	Total
AUSTRIA	4
BELGIUM	5
DENMARK	19
FRANCE	28
GERMANY	146
GREECE	4
IRELAND	35
ITALY	91
NETHERLANDS	140
PORTUGAL	7
SPAIN	18
Grand Total	**497**

Breakdown by science area

Area	Total days
Biology	86
Chemistry	133
Environment	4
Materials	172
Physics	102

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SCIENTIFIC OUTPUTS

- Annual Report (1994/95) listed 35 papers in peer-reviewed journals, and a total of 68 publications.
- Data for for 1995/96 is being compiled now.
- Our experience is that an average of about one publication per year per application is normal. Thus we would expect several hundred publications to ensue from the life of the HCM contract.

HIGHLIGHTS:

SR Department Annual Report highlight - Monez-Piaz, Sevilla University, Spain
'Natural clays used as barriers in the storage of nuclear wastes'
EXAFS and XANES studies of intercalated lanthanide group cations in silicate clays have revealed a new phase in which the lanthanide ions are trapped and held within the silicate matrix. This phase may prove an effective barrier to ion movement within such materials hence the prospect for trapping the chemically similar radioactive species common in nuclear wastes.

Electron-ion coincidence measurements following 1sC-photoabsorption of CO
W B Westerveld, J van der Weg, J van Eck, H G M Heidemann and J B West
Chemical Physics Letters 252 (1996) 107

Through the use of electron-ion coincidence spectroscopy, fragmentation of CO has been studied for resonant excitation and ionisation of the carbon 1s shell on the undulator beam-line at the SRS. The interplay between radiative decay and decay into singly charged and doubly charged fragments is highlighted by these measurements. In this work a reflectron mass spectrometer and a high efficiency cylindrical miror analyser are used, representing a significant advance on methods used elsewhere.

15/10

CLRC

Selected publications:

(results of the 1996 trawl exercise are not yet in the database)

Bouwstra, J.A., Gooris, G.S. (Leiden University, NL), Weerheim, A., Kempenaar, J., Ponec, M. (University Hospital, Leiden, NL) 'Characterization of stratum corneum structure in reconstructed epidermis by X-ray diffraction', Journal of Lipid Research 36 (1995) 496.

Quaeyhaegens, C., Knuyt, G., Dhaen, J. and Stals, M. (Limburg University, BE) 'Experimental study of the growth evolution from random towards a (111) orientation of PVD TiN coatings', Thin Solid Films 258 (1995) 170.

Lombardi, V., Piazzesi, G., (University of Firenze, IT), Ferenczi, M.A., Thirlwell, H., (National Institute for Medical Research, London), Dobbie, I. and Irving, M. (King's College, London). 'Elastic distortion of myosin heads and repriming of the working stroke in muscle', Nature 374 (1995) 553.

Munoz-Paez, A., (University of Sevilla, Spain) and Koningsberger, D.C. (Univ. Utrecht, NL) 'Decomposition of the precursor Pt(NH3)4(OH)2, genesis and structure of the metal-support interface of alumina supported metal particles: a structural study using TPR, MS and XAFS spectroscopy', Journal of Physical Chemistry 99 (1995) 4193.

Nitsche, R., Winterer, M. and Hahn, H. (Technical University, Darmstadt, DE) 'Structure of nanocrystalline zirconia and yttria', Nanostructured Materials 6 (1995) 679.

Technical University of Eindoven, Institute of Catalysis
"SAXS, WAXS and STXM investigations of silica gels and zeolite precursors"

Prof. Rutger van Santen, Dr Theo Beelen and coworkers in collaboration with
E.Pantos and K.Komanchek at DL and Graeme Morrison at Kings College London.

'5/11

CLRC

Most recent refs:

T.P.M.Beelen, W.D.Shi, G.R.Morrison, H. F. van Garderen, M.T.Browne, R.A. van Santenand E.Pantos,
Scanning transmission X-ray Microscopy: a new method for the investigation of aggregation in silica
J.Coll.Interf.Sci. 1996 (in press).

E.Pantos, H.F van Garderen, P.A.J.Hilbers, T.P.M.Beelen and R.A. van Santen
Simultion of Small Angle Scattering from large assemblies of multi-type scatterer particles,
Horizons in Small Angle Scattering, Stromboli, Italy, 27-30 Sept. 1995,
J.Mol.Struct.1996
(in press).

HF van Garderen, TPM Beelen, PAJ Hilbers, MAJ Michels and RA van Santen andE.Pantos
Aggregation and aging of zeolite precursors and silica gels Faraday Discussion No 101 organised by the Faraday Division of Royal Society of
Chemistry on "Structure and Dynamics of Gels", Paris, 6-8 September 1995, J.de Chim. Phys. 1996 (in press)

H.F van Garderen, W.H.Dokter, T.P.M.Beelen, R.A. van Santen, E.Pantos,M.A.J.Michels,and P.A.J.Hilbers
Volume fraction and reorganisation effects in off-lattice DLCCA,
J.Chem.Phys., 102, 480-495, 1995.

R.A. van Santen, T.P.M.Beelen, H.F van Garderen, W.H.Dokter and E.Pantos
Aggregation and aging in silica gel,
N.Instr.Meth. B 97 (1995) 231-237

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CLRC

INDUSTRIAL CONNECTIONS

examples of research:

- on skin structure (Bouwstra, NL),
- catalyst metal-support interaction (Koningsberger, NL),
- intercalation of clays (Munoz-Paez, ES),
- surface structure of electrodes (Demourgues, FR).

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THE TMR CONTRACT .v. HCM CONTRACT

The same facilities are offered, but the TMR contract gives support for a lower amount of access than the HCM contract. We shall have to reduce the amount of available beamtime and have a much lower acceptance rate than up to now. We shall give preference to new users, in line with the spirit of the TMR contract.

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ACADEMIC AND RESEARCH TRAINING

20 Ph.D. theses have been based, in whole or in part, on the HCM-supported use of the SRS

15/15

CLRC

PROBLEMS

The primary problem for us has been oversubscription, far exceeding the level of support from EU. For organisational reasons we will no longer be able to award beamtime access that exceeds what the contract pays for.

We have also experienced some difficulties in obtaining the necessary information from users, particularly on publications.

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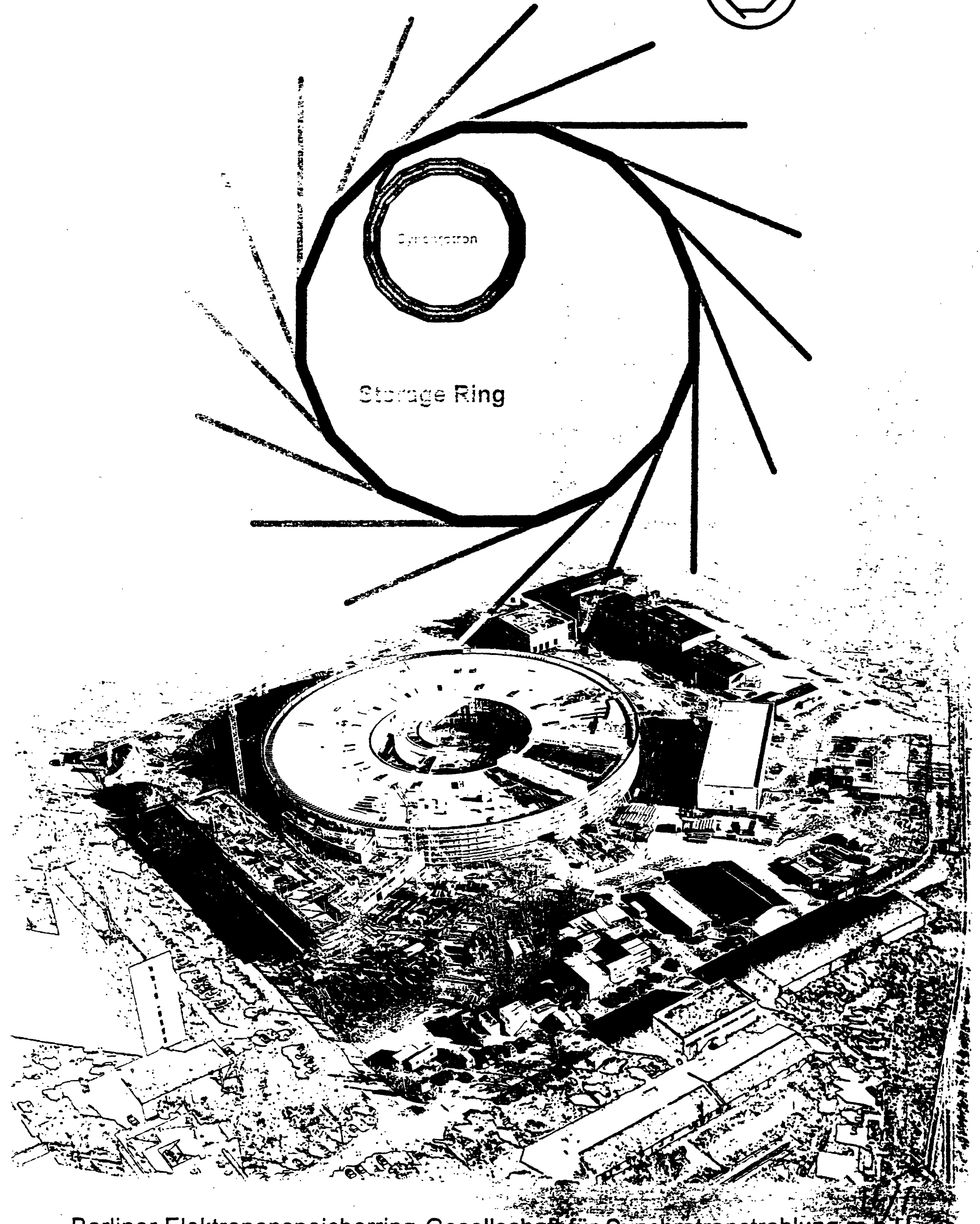
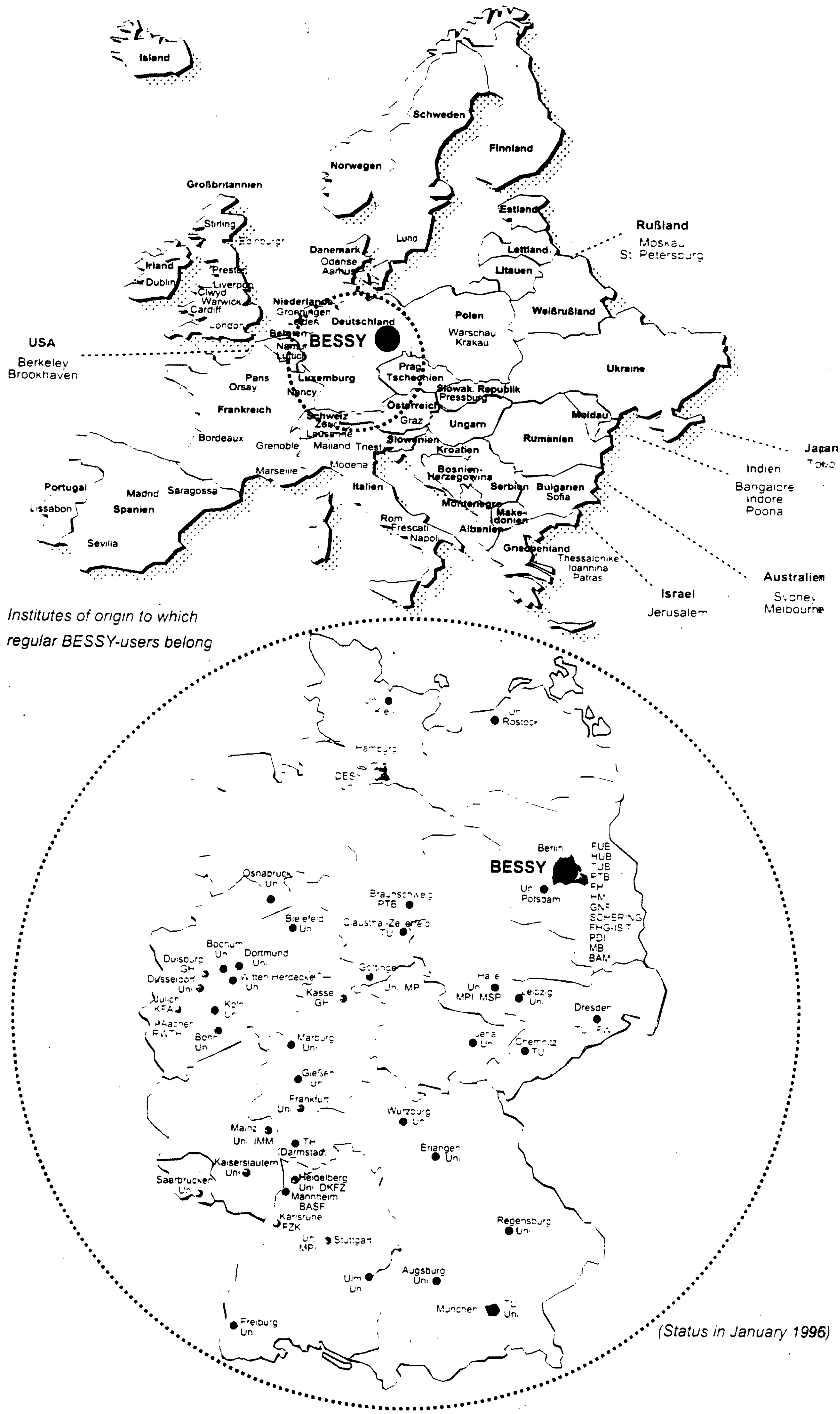
W Gudat (10 October)

(copies of the brochures may be obtained from BESSY)

BESSY



Berliner Elektronenspeicherring-Gesellschaft für Synchrotronstrahlung m.b.H.



Institutes of origin to which regular BESSY-users belong

(Status in January 1996)

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Contents:

16/3

Instead of a Foreword

This brochure is addressed to the interested public. We wish to introduce the BESSY operation as well as the scientific results achieved with BESSY-light. by giving a few examples selected by BESSY. The scientific work at BESSY is usually done by users. i.e. scientists who come to BESSY from their home institutes. bringing with them their ideas. apparatuses and test samples, to perform their experiments. This brochure can only give a very small glimpse into the wide range of applications for which the tool of „synchrotron radiation" may be used. The reports on scientific results published annually can give a more thorough insight.

We wish to thank everyone involved in the making of this brochure for their work and support.

Berlin. June 1996

The Directorate of BESSY GmbH

Impressum

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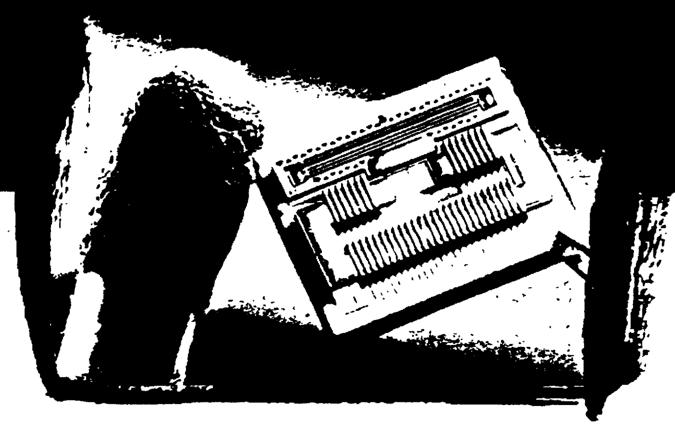
Fax: +49 (721) 97875 - 75

Printed by ENGELHARDT & BAUER Karlsruhe

16/4

DO YOU LOOK FOR
REALISATION OF YOUR
MICROSTRUCTURES ?



ALIGA

IS THE RIGHT ANSWER

Service center for Advanced LIGA
components and microstructures

FhG ISiT
Fraunhofer Institut
Siliziumtechnologie

Forschungszentrum Karlsruhe
Technik und Umwelt

BESSY
Berliner Elektronenspeicherring-Ges.
f. Synchrotronstrahlung m.b.H

16/5

WHAT ABOUT JOINING ALIGA ?

The association **ALIGA** is open for new partners. If you like to participate in the LIGA technique on a larger scale, you are welcome to become a member of our association.

DO YOU NEED FURTHER INFORMATION ? PLEASE CONTACT

ALIGA service center:
Dr. M. Borner, Forschungszentrum Karlsruhe,
c/o FHG-ISiT, Dillenburger Str. 53, D-14199 Berlin,
Phone: ++49 30-82998-219, Fax: ++49 30-82998-199,
e-mail: aliga@bessy.de

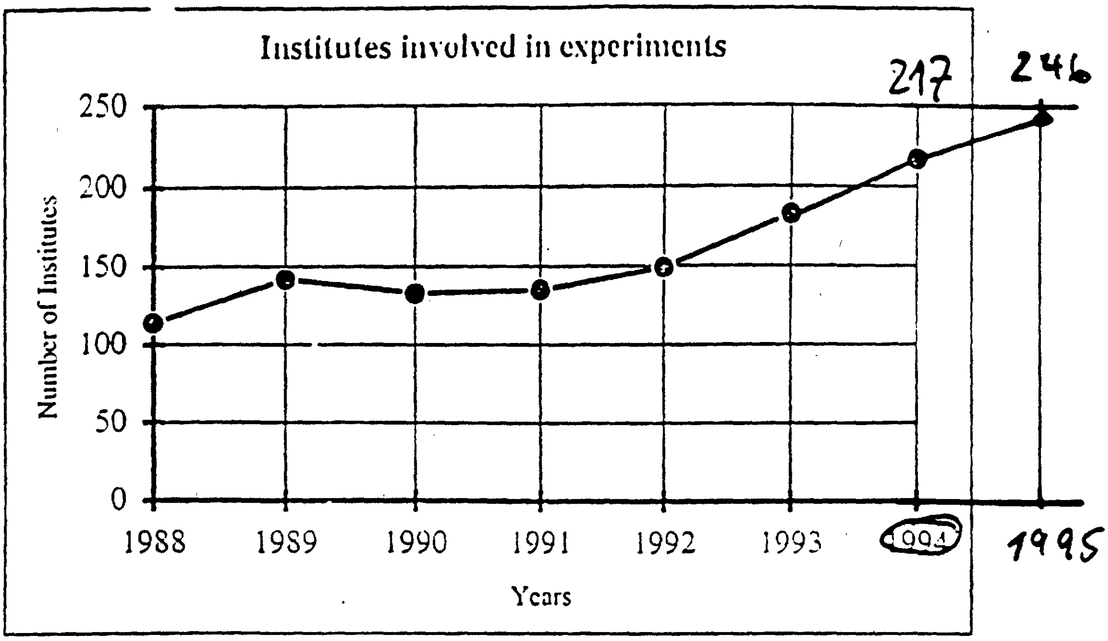
ALIGA : Service Center for Advanced LIGA Components and Microsystems

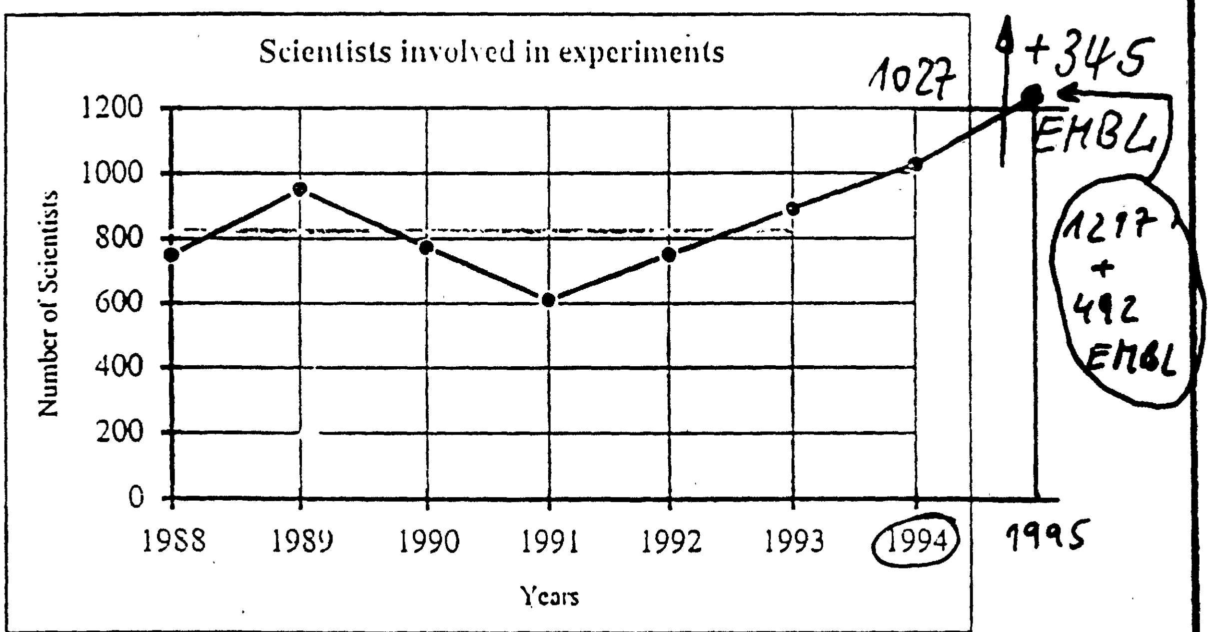
I am interested in

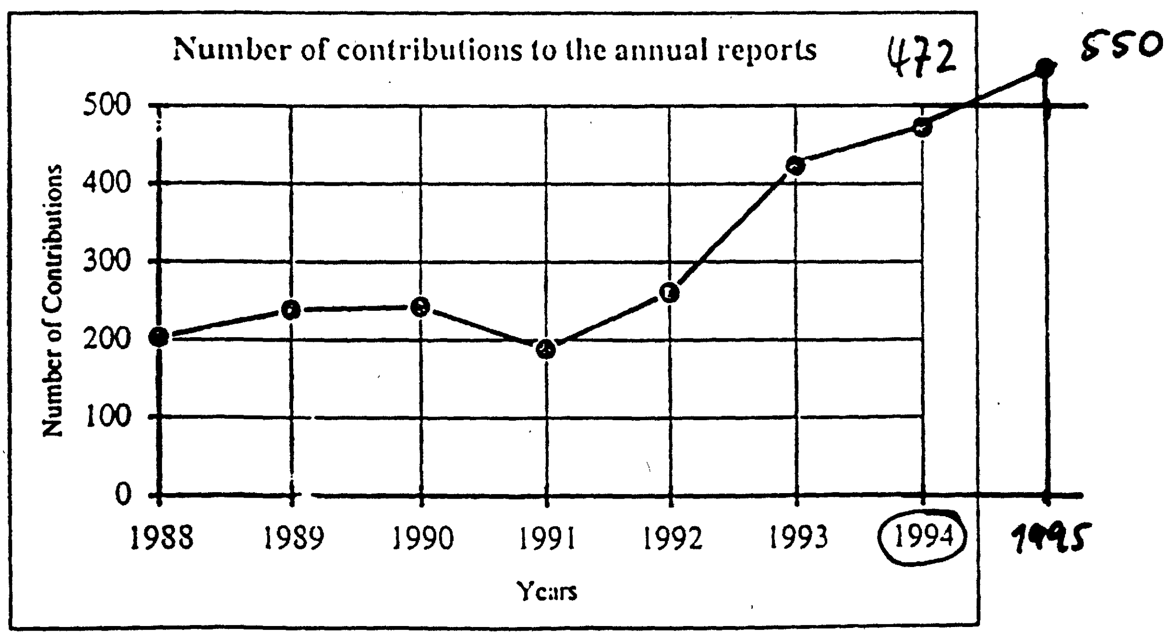
- ☐ **LIGA technique and microstructuring,**
- ☐ **ALIGA services,**
- ☐ **prototyping of microdevices,**
- ☐ **semi-finshed products e.g. masks, inserts,**
- ☐ **Joint R & D projects.**

G Materlik (10 October)

HASYLAB Statistics for 1988 - 1996

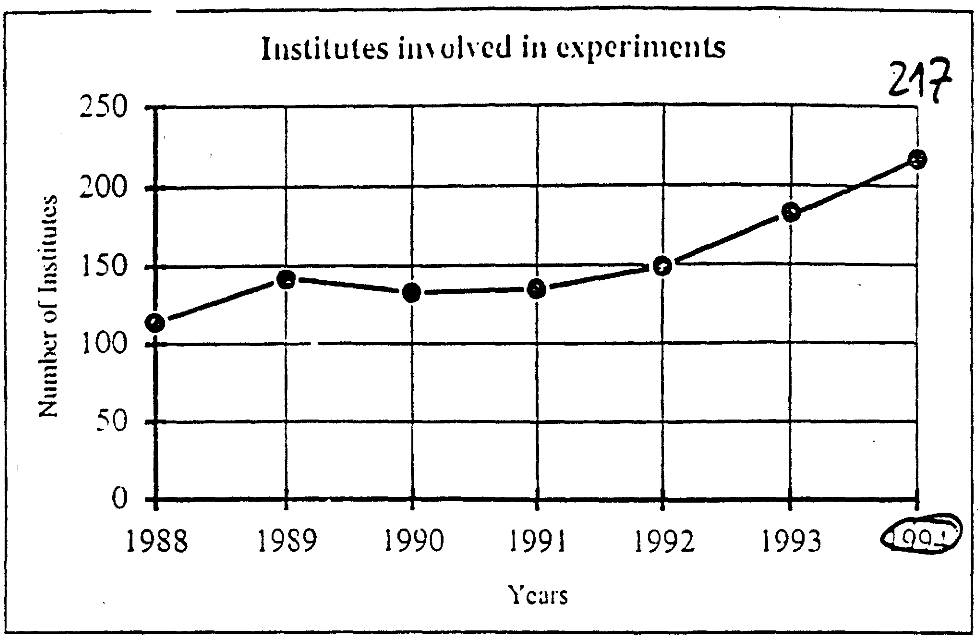


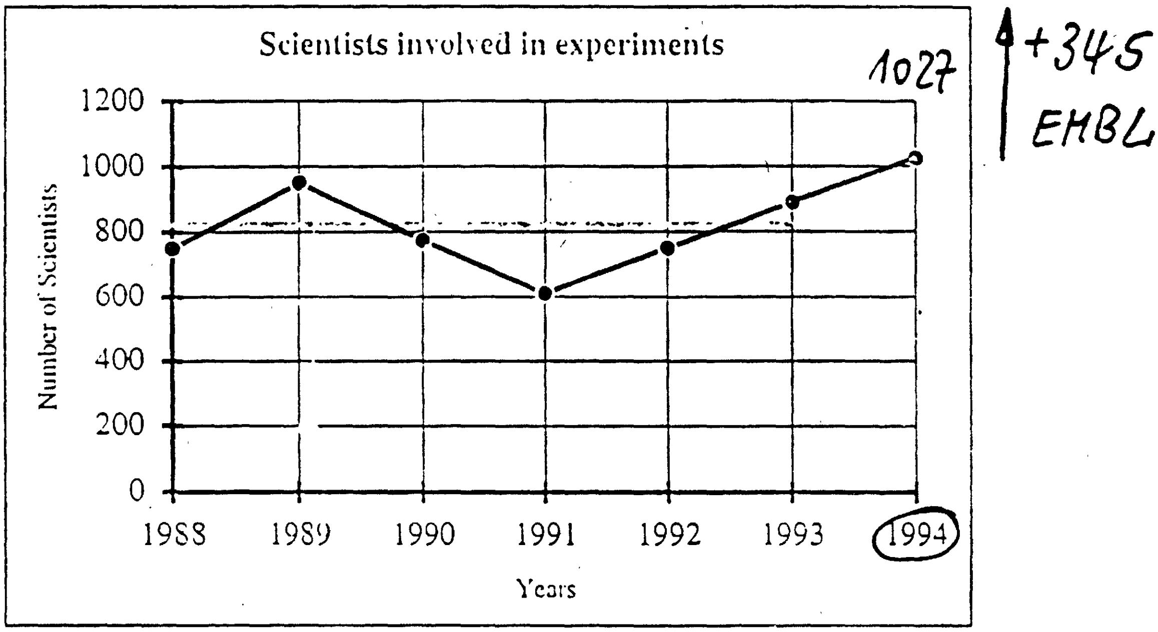


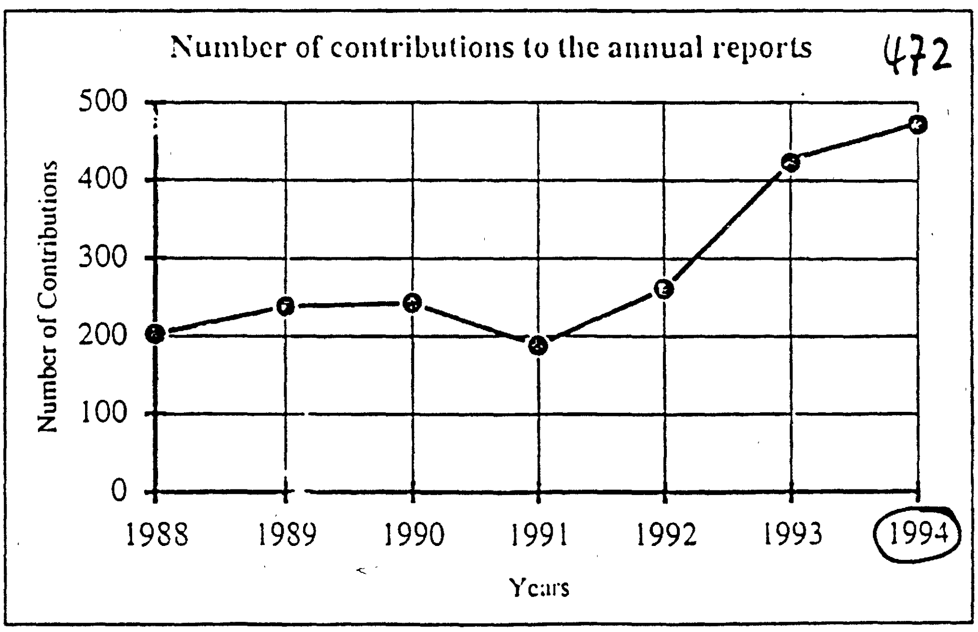


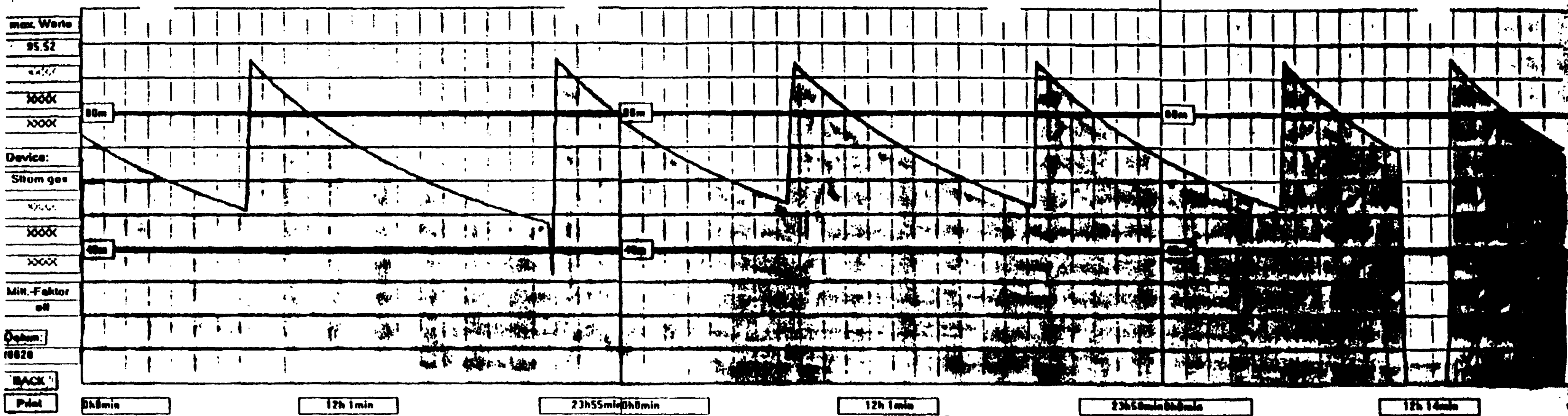
17/i

HASYLAB Statistics for 1988 - 1994

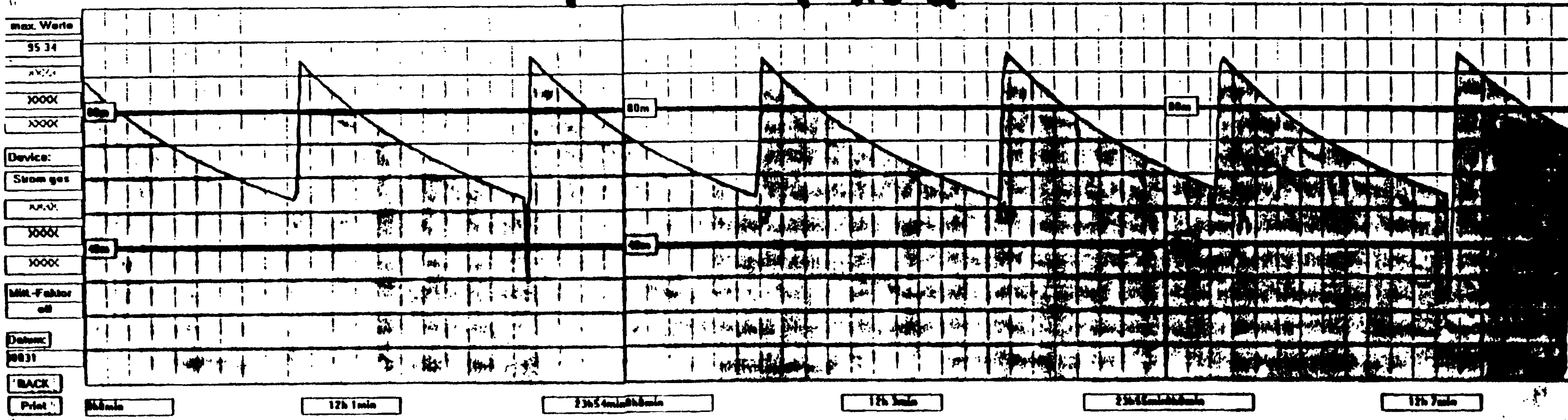




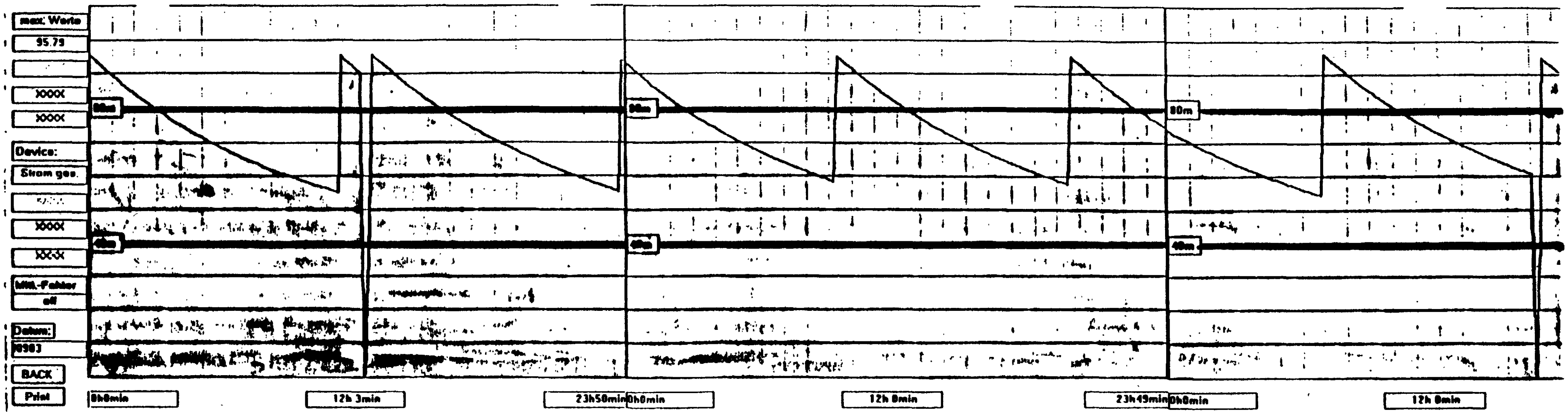


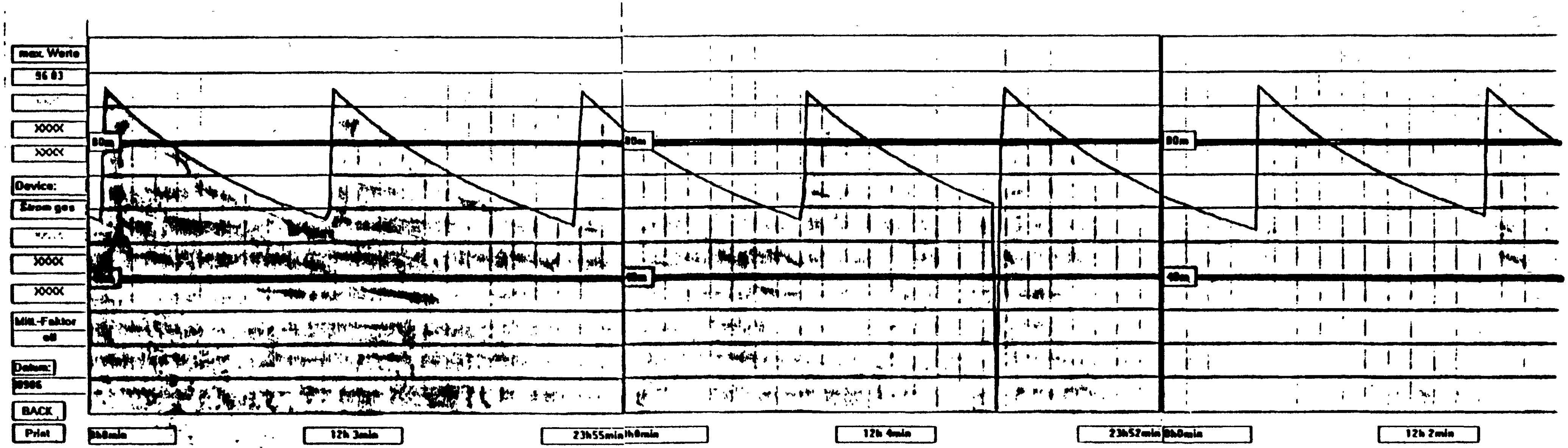


10 h



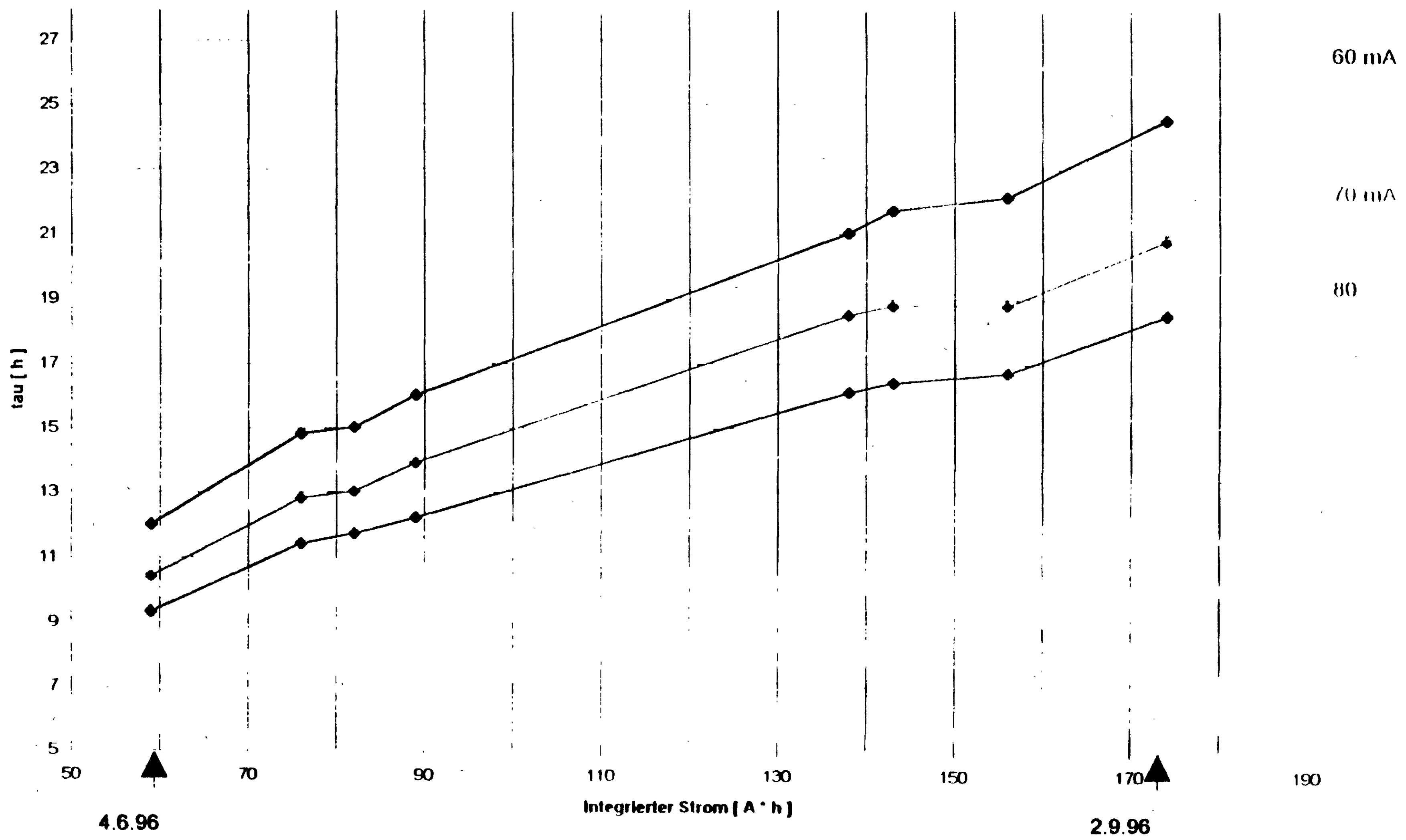
DORIS II: 28.8. – 2.9.1996

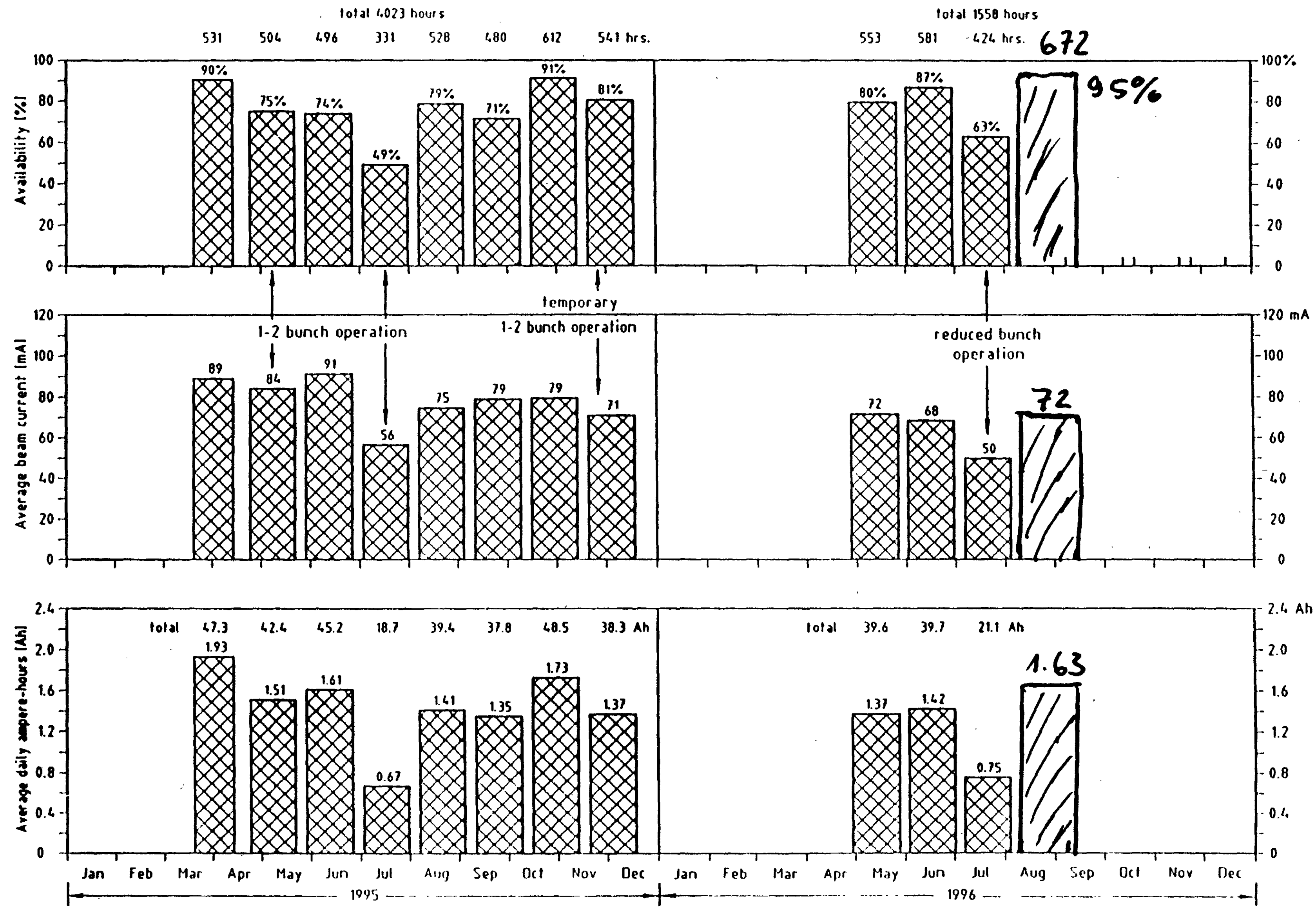




DORIS III : 3.9 - 8.9. 1996

DORIS 5 Bunch Lebensdauern nach TSP | 4.6. - 2.9.96





Availability = Useable beamtime for HASYLAB (in %)

Criterion: Beam current ≥ 40 mA ; Run duration ≥ 1 hour

(In the years 1989 to 92 partly other criterions were used.)

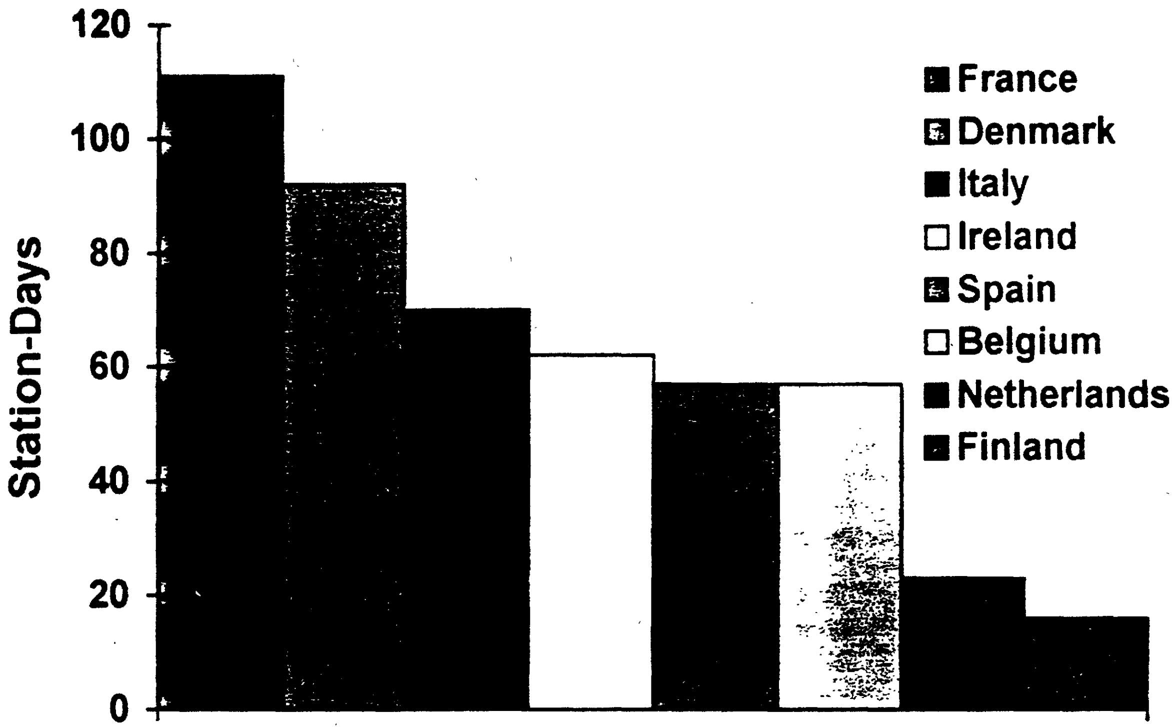
Total integrated ampere-hours (Ah)							
1989	1990	1991	1992	1993	1994	1995	1996
(208)	(82)	(42)	(61)	68	215	318	100

as of 05. august 1996

Beamtime statistic DORIS III

17/6

EC users at HASYLAB (Oct. 95 - Oct. 96)



Total number of station-days alotted to EC users:
488 (5.6%)

Additional station-days at the EMBL beamlines:
459

Total: 947 (10.1%)

54 EC-projects presently running

72 contributions to HASYLAB Annual Rep 1995

17/7

G Margaritondo (10 October)

10/10/96 1

Laboratory:

ELETTRA
Sincrotrone Trieste SCpA
Strada Statale 14, km 163,5
34012 Basovizza (Trieste), Italy

Type of Facility:

Ultrabright synchrotron-radiation source of soft-X-rays

Most relevant characteristics:

- Ultrahigh brightness
- Very Low Emittance
- High Coherence
- Primary sources: wigglers and undulators

Designed, built and operated by the Sincrotrone Trieste SCpA, a private company with public sharehoders

Opened to external users:

- unofficially, november 1993
- Officially, summer 1995

Investment costs: 170 MECU
Annual operation budget: 17 MECU

EC-related activities:

- **Use of ELETTRA's beamlines by EC-based scientists and groups, selected through the general peer review process**

- **Development of general and specialized instrumentation for the same use**

- **Design and development of unique, very advanced facilities in cooperation with other EC institutions.**

- **Training of EC fellows in the general field of synchrotron radiation**

ELETTRA use -- 14-month summary (hours of beamtime):

• Internal groups:	1104
• Italian partner groups:	992
• Other Italian groups:	3048
• Groups supported by EC contract:	3992
• Other European groups:	768
• Non-European groups:	416
TOTAL:	10320

Examples of EC-sponsored Research domains:

- Raman Auger effecf in water based systems
- Protein and DNA structural analysis
- Substrate binding to methylmalonyl-CoA mutase
- Photoemission microscopy of polycrystalline metal surfaces
- Crystal structure determination of firefly luciferase
- Chemistry of transition metals
- Spectromicroscopy of steel for tools
- Anomalous dispersion measurements of cyclic DNA octamers
- Photoemission and photoelectron diffraction of molecular adsorption systems
- Photoemission of fullerenes
- Oscillatory reactions of nitric oxide
- Photoelectron diffraction of semiconductor on metal interfaces
- Resonant photoemission of rare earth compounds
- Oxygen on alkali metals
- Sppectromicroscopy of bimetallic plasters
- Surface chemistry of sulphur dioxide on transition metals
- Photoemission of quantum well states
- Anomalous dispersion studies on d(ACGTAACG5BR-U)2 complex
- Crystallography of novel viral surface glycoproteins

A few research highlights:

- C. J. Cardin, A. Adams, A. Todd & H. R. Powell, U. of Reading, Dublin and Cambridge)
  The structure of the complex of the drug daca (the acridine 4-carboxamide antitumor) was successfully investigated with the MAD technique based on four wavelenghts. The Br atom was located with the anomalous difference direct method using 2 of these wavelengths.
- G. Cecchi, M. A. Bagni, C. C. Ashley, P. J. Griffith, S. Bernstoff & H. Amenitsch (Austrian Ac. of Sciences Beamline)
  A record time resoution of 50 microseconds was reached in analyzing the lattice spacing changes for actin and myosin during frog muscle movement. This resolution is important to determine the mechanical transient and changes in protein crossbridge orientation
- A. Potts & G. Morrison, King's College
  The small-spot ESCA Microscopy beamline was used to reveal oxidation rate differences of differently oriented microcrystallites of Sn and Pb, and to study the effects of grain boundaries
- J. Haase et al., Fritz-Haber
  SuperESCA revealed the dynamics of sulphur dioxide adsorption and dissociation on Cu. Several hypotheses for intermediate species were definitely ruled out.

Main difficulties:

- Extreme shortage of beamtime
- Scarcity of support personnel
- Support for Eastern-Europeans colleagues

Training and mobility aspects:

- ELETTRA makes it possible for scientists from European countries to perform experiments using one of the most advanced instrumentation systems in the world. This also implies the opportunity for young scientists to obtain hands-on experience in the use of such facility, with the chance to implement their own ideas.

- In addition, ELETTRA hosts many scientists under EC fellowships for training and mobility. The cross fertilization produced by this program has opened up many new avenues of research.

- The environment is particularly suitable for young women scientists, since many of our staff members, including the senior and group-leader level, are women. We are committed to giving everyone equal opportunities for professional growth.

9/81

8

ELETTRA use -- 14-month EC-sponsored use, individual researchers:

• Belgium:	3
• Germany:	12
• Ireland:	3
• Italy:	1
• Portugal:	1
• Spain:	5
• Sweden:	4
• The Netherlands:	2
• UK:	23
TOTAL:	54

ELETTRA use -- 14-month EC-sponsored use, projects:

• Belgium:	1
• Germany:	5
• Ireland:	1
• Italy:	1
• Portugal:	1
• Spain:	3
• The Netherlands:	2
• UK:	5
TOTAL:	26

1/81

Status of ELETTRA beamlines -- Summary:

- In operation: 6
- Open to external users: 4
- Under development: 7
- Future: Further development programs sponsored by the INFM, CNR and other organizations

1?/1?

Publications (partial list):

- M. Polcik et al.: "The Adsorption and Temperature-Dependent Decomposition of SO_2 on Cu(100) and Cu(111)", Phys. Rev. B53, 13270 (1996).
- C. Uebing et al.: "Structure of 3-dimensional CrN Surface Precipitates on Fe-15%Cr-N(100), Proc. 15th ECOSS Conf.
- P. Cobden et al.: "NO Disociating on a Stepped Rh Surface: Time-resolved XPS on Rh(533), ibid.
- K. M. Schindler et al.: "High-resolution XPS Studies of Ni(111)-2-butyne, ibid.
- C. Keller et al.: "Dynamics of Charge Relaxation Processes in Adsorbates", ibid.
- C. Rojas et al.: "Structure Determination of the Si/Cu(110) Interface by Photoelectron Diffraction, Proc. 5th Intern. Conf. on the Structure of Surfaces, Aix-en-Provence.
- L. Casalis et al.: "First Results of the ESCA Microscopy Beamline", J. Vac. Sci. Technol. (in press).
- Rojas et al.: "Structural Determination of the Si/Cu(110) Interface by Photoelectron Diffraction", Surf. Rev. Lett. (in press).
- C. J. Hirschmugl et al.: "Ni(111)-acetylene and Ni(111)-2-butyne: Vibrational Fine Structure on C1s Core Level Photoemission", Phys. Rev. B (in press).
- A. Baraldi et al.: "The Structure of the MoN Surface Compound on Fe-3,5%Mo-N(110) Studied by X-ray Photoelectron Diffraction: First Results from ELETTRA", Vacuum (in press).
-

EC-related facility upgrades:

- Overall, the Sincrotrone Trieste SCpA spent approximately 340 MLit in durable equipment to improve beamlines used for EC-sponsored activities.

- Of these, approximately 102 MLit were charged to the EC contract

Summary statement:

- **ELETTRA is now a fully operating facility, reliably delivering approximately 5'000 hours of beamtime per year.**
- **Its reliability factor in excess of 93% is satisfactory for the routine implementation of advanced experiments.**
- **ELETTRA has already produced many important results in spectroscopy, spectromicroscopy and crystallography, a large fraction of them related to EC-sponsored research.**
- **ELETTRA, although funded by Italian source, has become de facto an international laboratory. More than 50% of its users are from outside Italy, and this fraction increasing. Two out of three directors are from countries other than Italy. The access to the facility is strictly through merit review by an independent international committee.**
- **The two main factors in this internationalization were: (1) the fact that ELETTRA is a top facility, highly desirable for advanced experiments; (2) the EC contracts which greatly helped the European users' activities.**

J Ortega (10 October)

CLIO,
an infrared
free electron laser facility

LURE, bat. 209 D, Orsay, 91405 - France

CLIO is a linac based (20 - 50 MeV) free electron laser (3 - 50 μm), working independently of the other machines of LURE

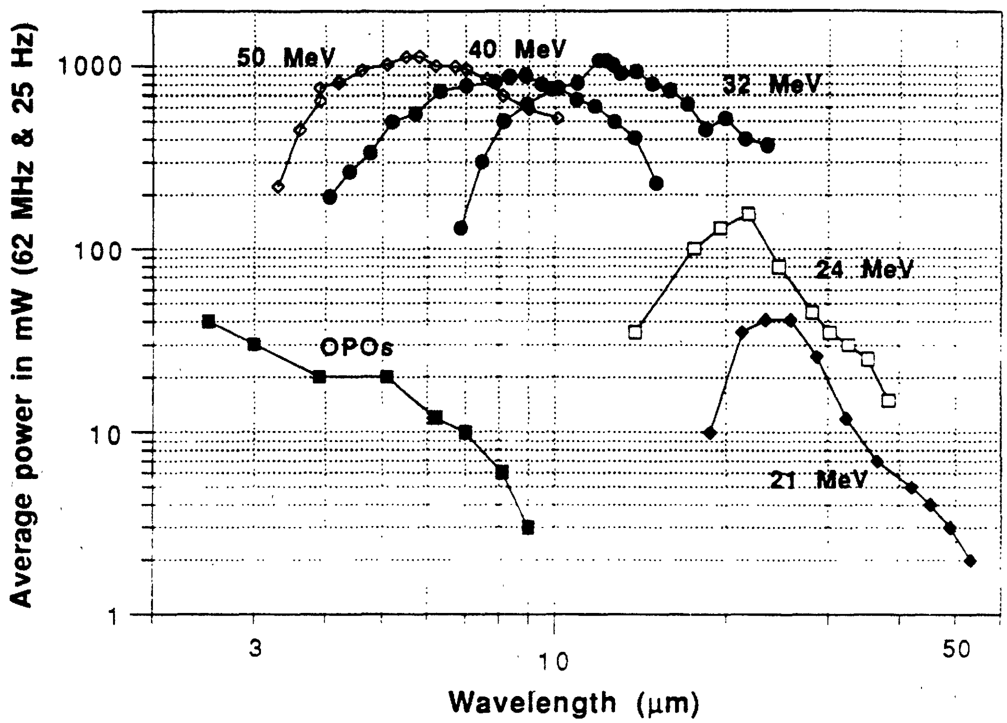
- Properties of the source

- CLIO as a user facility

- European activities

Spectral range of CLIO + OPOs

(CLIO peak power : 100 MW, pulse length : 0.5 à 5 ps - OPO : 10 ps)



Special features :

- Development of parametric oscillators (OPOs) in mid-IR ---> Increase of user's beam time

- Two-colors FEL : Lasing simultaneously at 2 different wavelengths, independently adjustable and separated by as much as 60 % in $\Delta\lambda/\lambda$

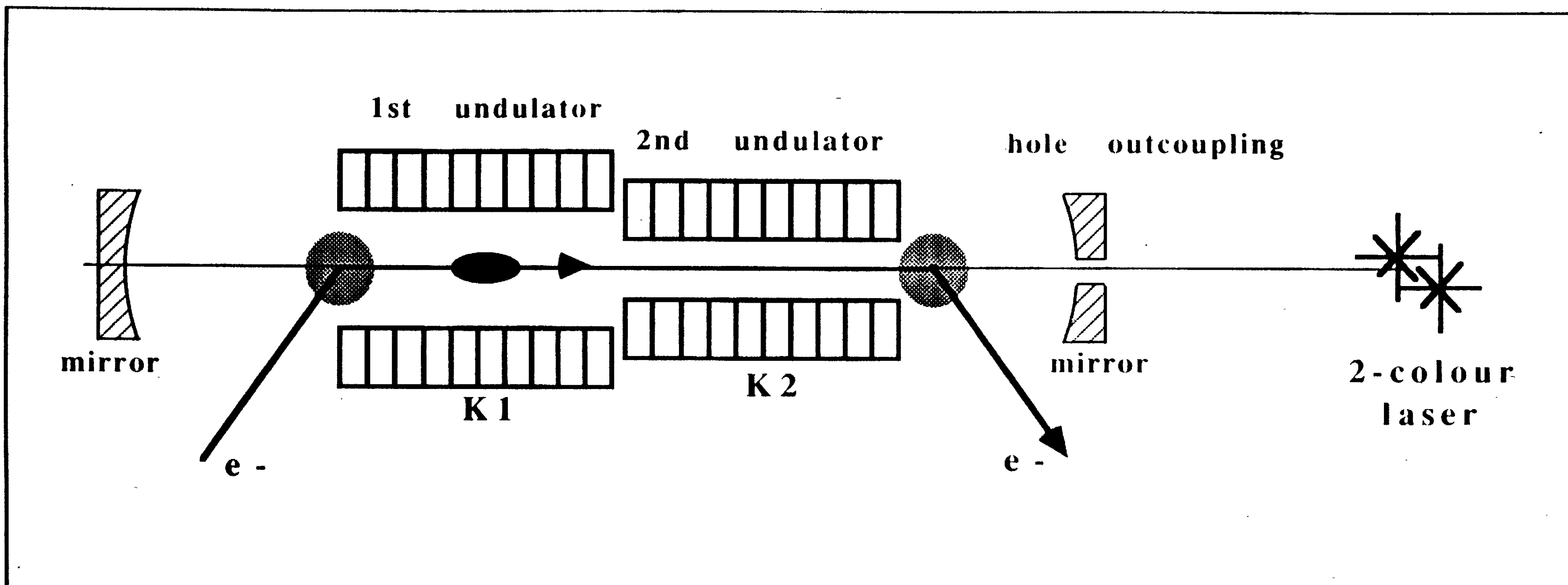
---> Pump - Probe experiments

- Surface SFG ("Sum Frequency Generation") Set-up permanently available for users

- Pulse length adjustable from 5 ps to o.3 ps

- Fast and automated wavelength scans

19/3



SCHEME OF THE 2 - COLOUR FREE ELECTRON LASER

Time resolved study of intersubband relaxation in GaAs quantum wells using a two-color free electron laser

F.-H. Julien, P. Boucaud
Institut d'Electronique Fondamentale, Université Paris XI, Bat 220, 91405 Orsay FRANCE

R. Prazeres, J.-M. Ortega
CLIO/LURE Université Paris XI, Bat 209 D, 91405 Orsay FRANCE

The knowledge of intersubband relaxation times in GaAs quantum wells is a key parameter to develop a unipolar intersubband laser operating in the mid-infrared. We have studied the intersubband relaxation in asymmetric GaAs/AlGaAs coupled quantum wells using a two-color free electron laser. The sample was designed to exhibit spontaneous emission between subbands under intersubband optical pumping. Three subbands are bound in the conduction band and exhibit two intersubband transitions in the mid-infrared E_{13} and E_{23} at 10 and 14.5 μm respectively. In order to measure the intersubband relaxation time in the E_3 subband, we have performed time-resolved pump and probe experiment in a multipass waveguide geometry with the two-color free electron laser facility CLIO in Orsay. At room temperature, the first color is set at 10 μm and pumps the E_{13} intersubband transition while the second color (14.5 μm) probes the E_{23} intersubband transition. A relaxation time ≈ 1 ps on the third subband is measured. This value is in good agreement with theoretical relaxation calculations which take into account interface and slab phonon modes.

19/4

User facility

- Beam time : 1/3 FEL optimisation and physics
  2/3 users ≈ 1600 hours/year

User beam time capability is 2500 hours but nigth shifts are not fully utilised by user teams.

- Users have full control of laser wavelength and linewidth :

  - linewidth : 0.2 to several %
  - pulse length : 5 to 0.2 ps
  - Wavelength scans computerized

- Ancillary equipment :

  - Optical parametric oscillators from 2 to 8 μm

  - SFG set-up

  - UHV chambers
  - Fourier transform spectrometer
  - Cryostat
  - Detectors, optical elements....

- Beam time is attributed once a year by a scientific programm committee (applications in November) including OPOs.

?/5

APPLICATIONS

- In 1996, 32 projects have been examined by the programm committee :

<u>asked</u> : 372 runs (227 CLIO + 145 OPO)
<u>offered</u> : 182 " (112 CLIO + 70 OPO)

1 run = ---> 24 hours of beam

On the 32 projects, 29 were accepted, some with a reduced time

<u>Distribution in 1994-95</u> :

- 31 %	Electrochemistry studied by SFG	
- 13 %	Surfaces " "	
- 8 %	Near-field microscopy	
- 6 %	Surface photo-emission	
	i.e. ≈ 60 % of surfaces	
- 26 %	Molecules in matrices	
- 14 %	Semicond. & Quantum wells	
- 2 %	Medical	

Compared to other FELs :

- Less Medical & Biology
- More study on Surfaces

<u>EEC activities</u>

In 1996, on 32 projects examined by the programm committee, 12 were issued from the EEC :

- 5 from Belgium
- 7 Germany

They had 62 runs allocated (on a total of 182) :

- 38 on the FEL
- 24 on the OPO

<u>Results</u> :

It is too early to draw conclusions on a programm that started only a few months ago

Developments

- Improvement of transmission at long wavelengths (25 - 50 μm)

Optical beam line under vacuum

- Surface SFG at long wavelength (> 11 μm)

Diamond window / UHV and electrochemical cell
High rejection monochromator

- Laser at wavelength > 50 μm

RF modifications to run the accelerator at lower energy (present range 20 - 50 MeV)

Changing the beam line optics

- Study of a far-infrared FEL : 50 μm - 1mm

Long term development

M Van der Wiel (10 October)

TMR Contract nr. ERBFMGECT950056

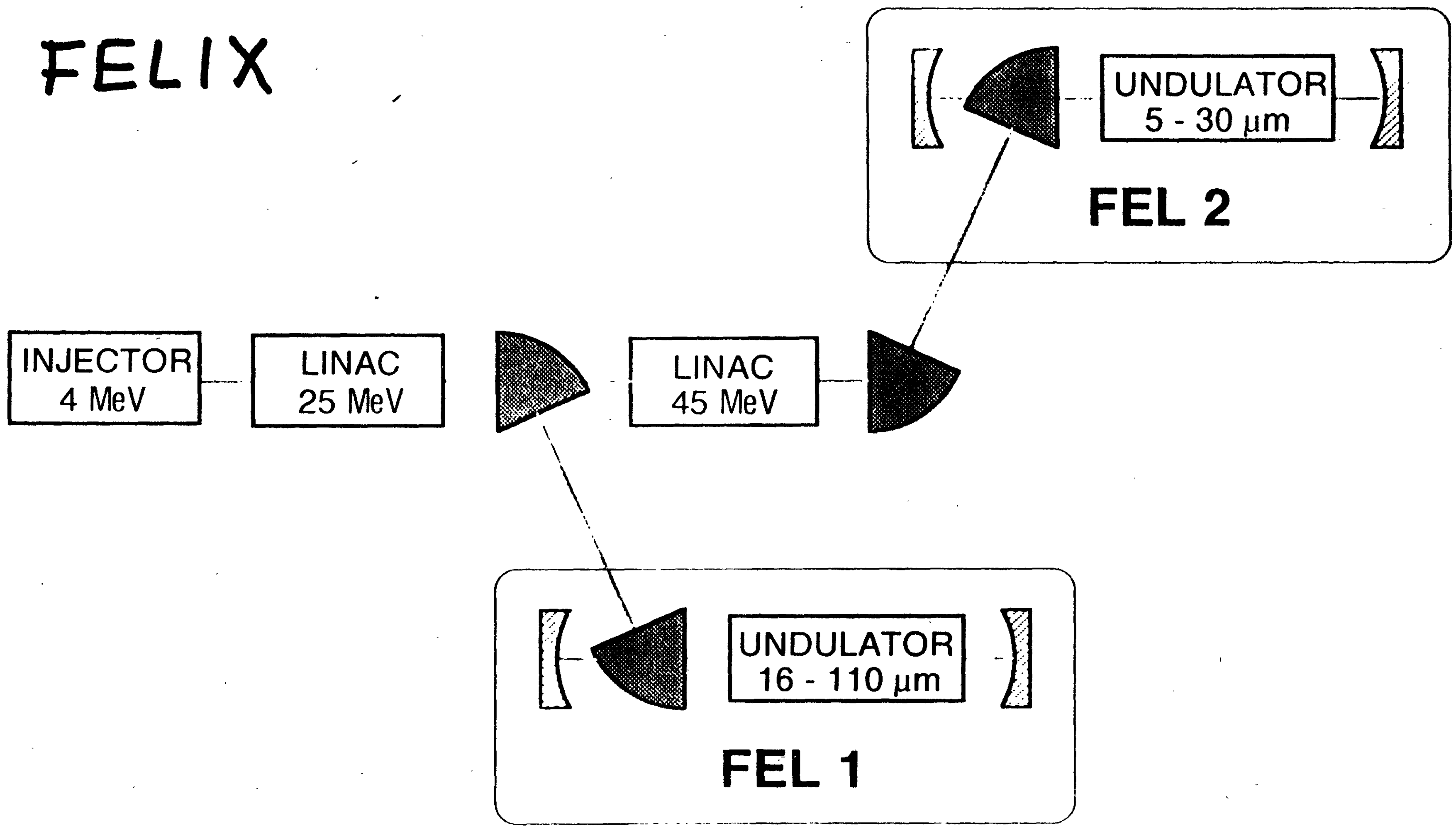
Operation of IR-FEL facility

FELIX

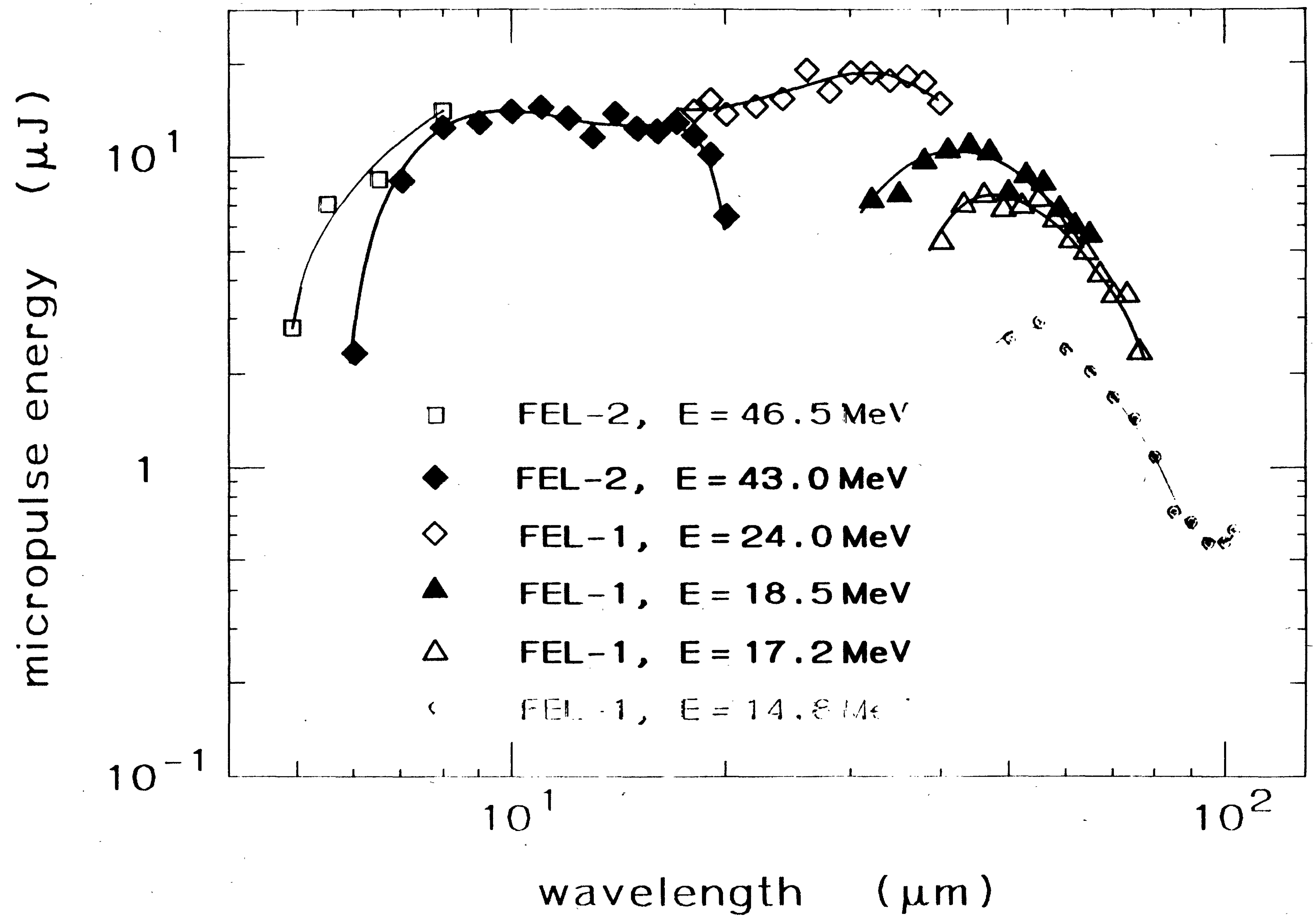
at Nieuwegein, The Netherlands

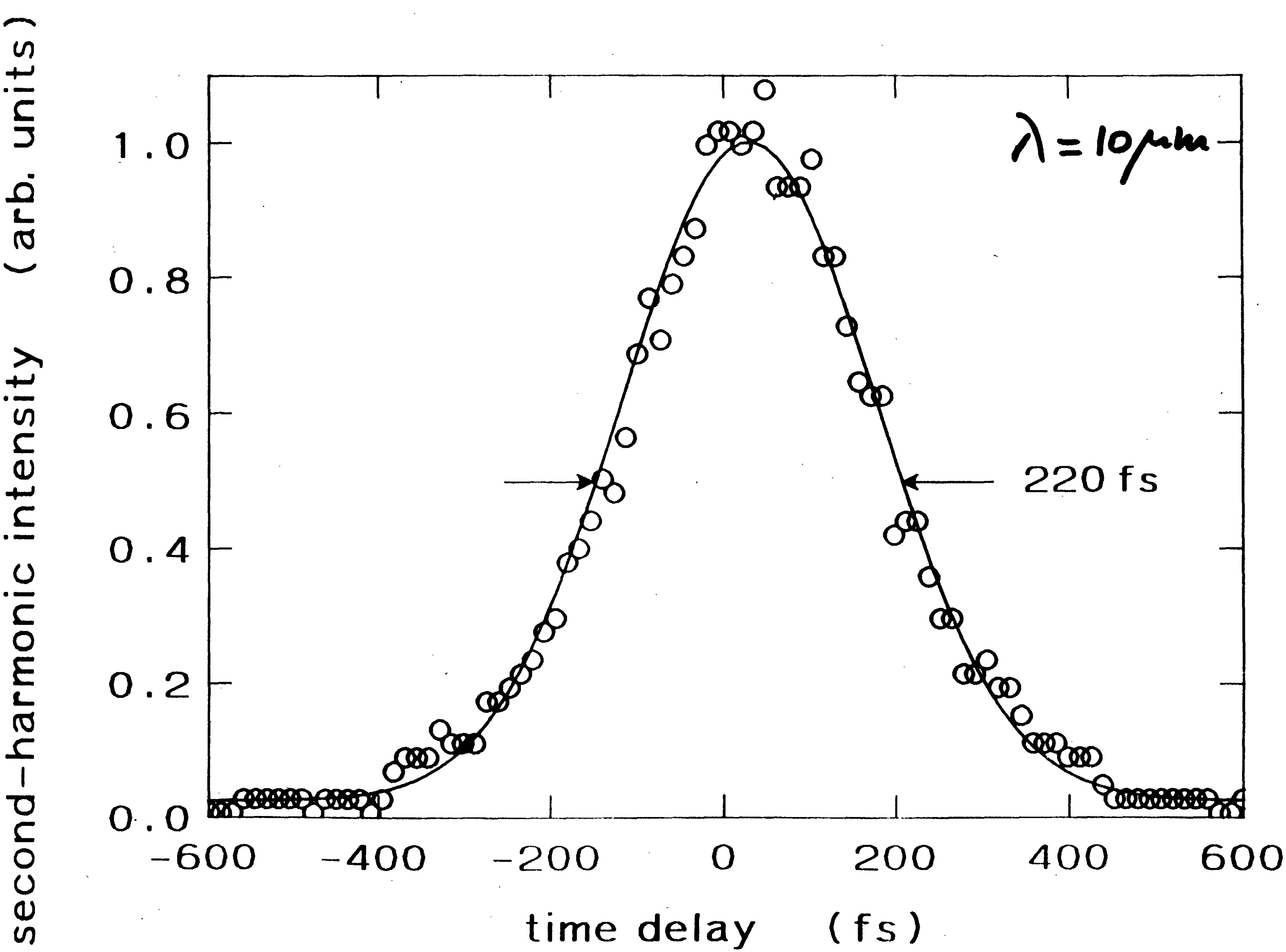
Presented by M. van der Wiel

FELIX


INJECTOR
4 MeV
LINAC
25 MeV
LINAC
45 MeV
UNDULATOR
5 - 30 μm
FEL 2
UNDULATOR
16 - 110 μm
FEL 1

2c

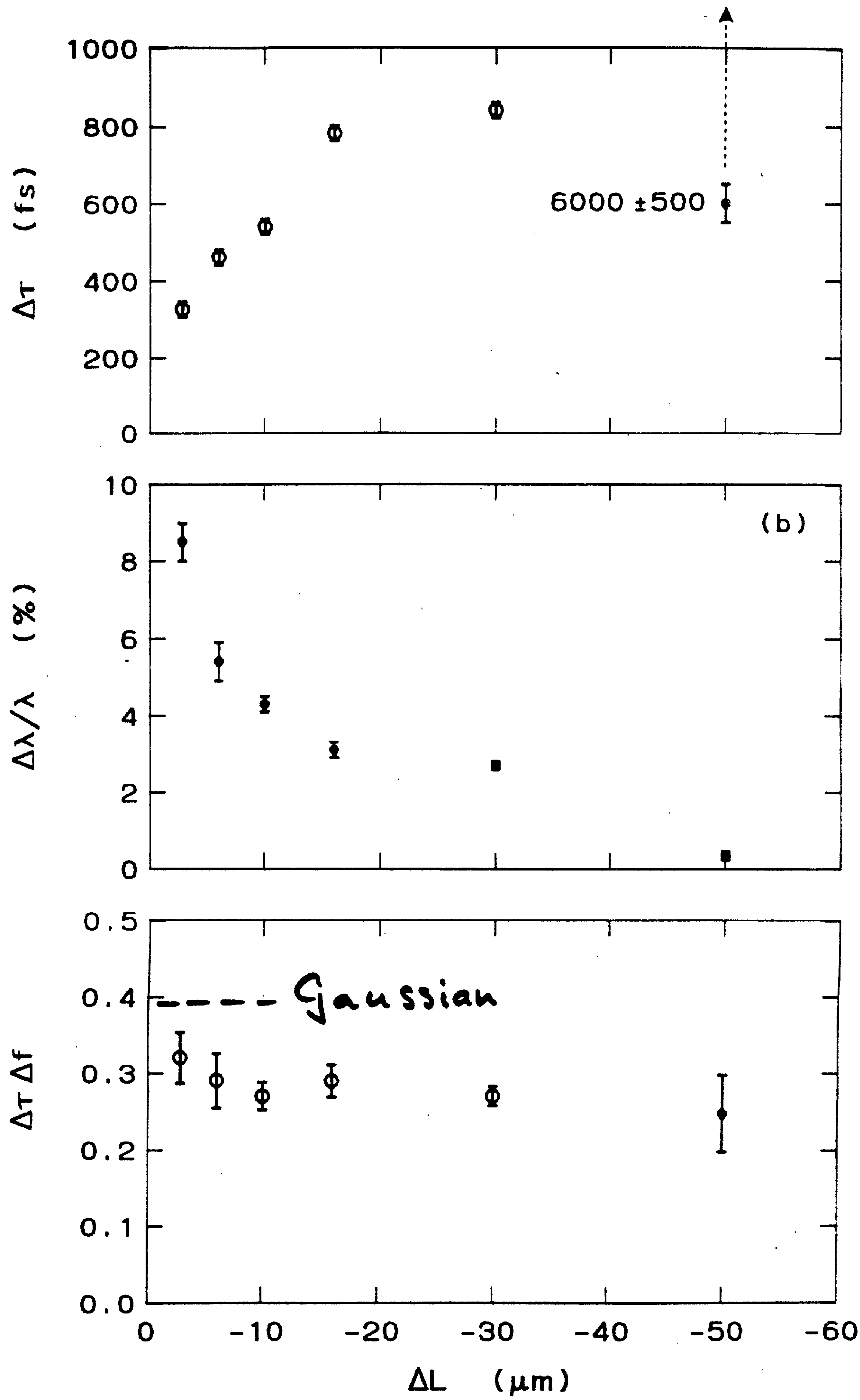

micropulse energy (μJ)
10^1
1
10^{-1}
10^1
10^2
wavelength (μm)
FEL-2, E = 46.5 MeV
FEL-2, E = 43.0 MeV
FEL-1, E = 24.0 MeV
FEL-1, E = 18.5 MeV
FEL-1, E = 17.2 MeV



λ = 10 μm
220 fs
1.0
0.8
0.6
0.4
0.2
0.0
-600
-400
-200
0
200
400
600
time delay (fs)
second-harmonic intensity (arb. units)

102

$\lambda = 18\mu m$



2015

Present Status of the Facility

- **Improved performance:**

max. μ-pulse energy	> 50 μJ
max. μ-pulse power	> 100 MW
min. pulse length	< 6 cycles
max. efficiency	> 3 %

- **Routine operation of 25 MHz mode** ~~x~~ 1 GHz

- **LABVIEW-based remote control for users**

- **Very little unscheduled down time: < 3 % !!**

- Beam time delivered in past year:

  3200 hrs

- 16 user groups; 7 non-Dutch

- 7 user stations

ANCILLARY USER EQUIPMENT

- Evacuable pump / probe setups

- LHe cryostat with 16-T superconducting magnet

- Flow cryostat with temperature control (4 - 300 K)

- 60-T pulsed magnet with flow cryostat (Fall '96)

- Sum-Frequency setup with synchronized (1ps) Nd:Ylf

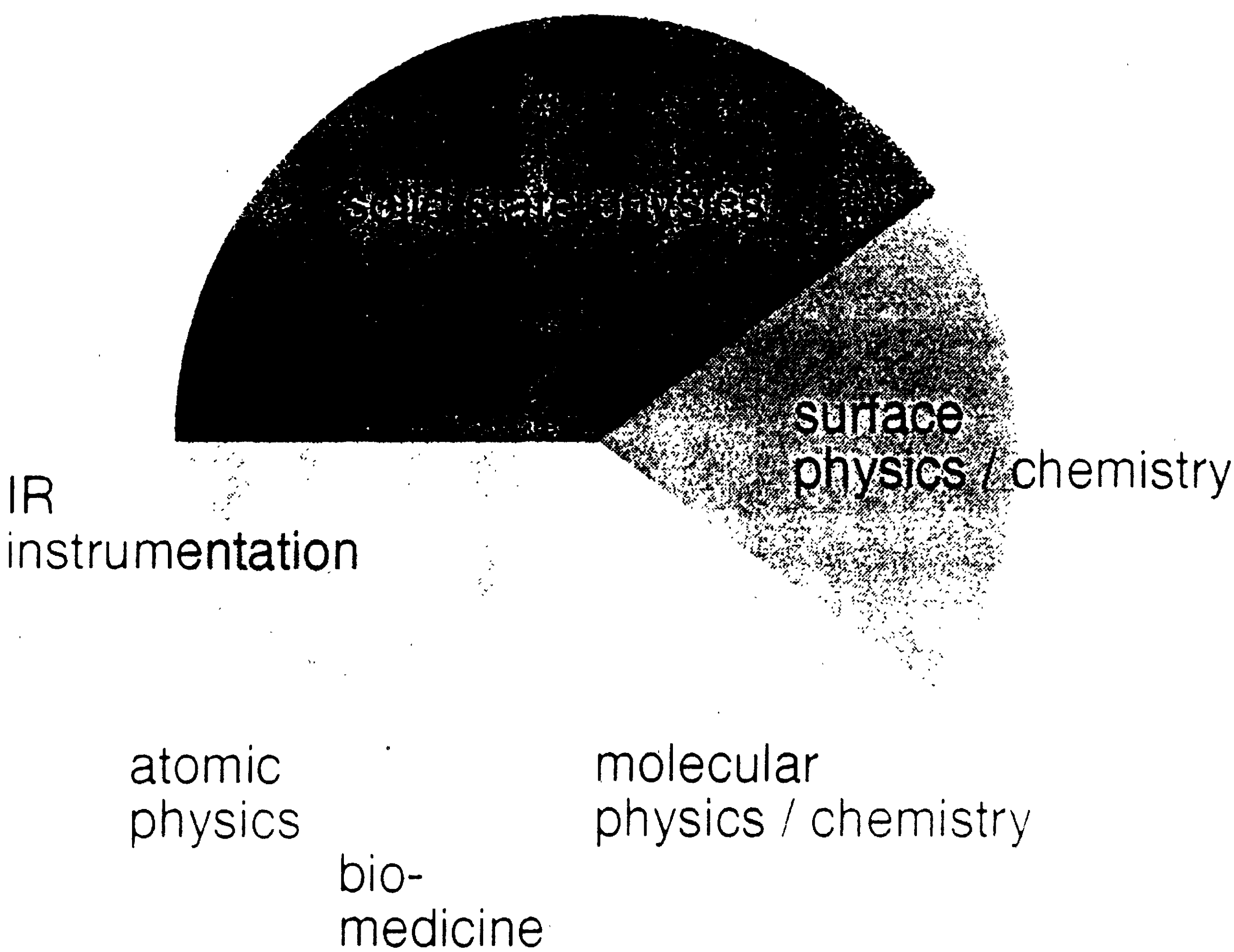
- LABVIEW-based control and data acquisition system

- optical pulse slicer for selection of 1 or more μ-pulses

Plans for the near future

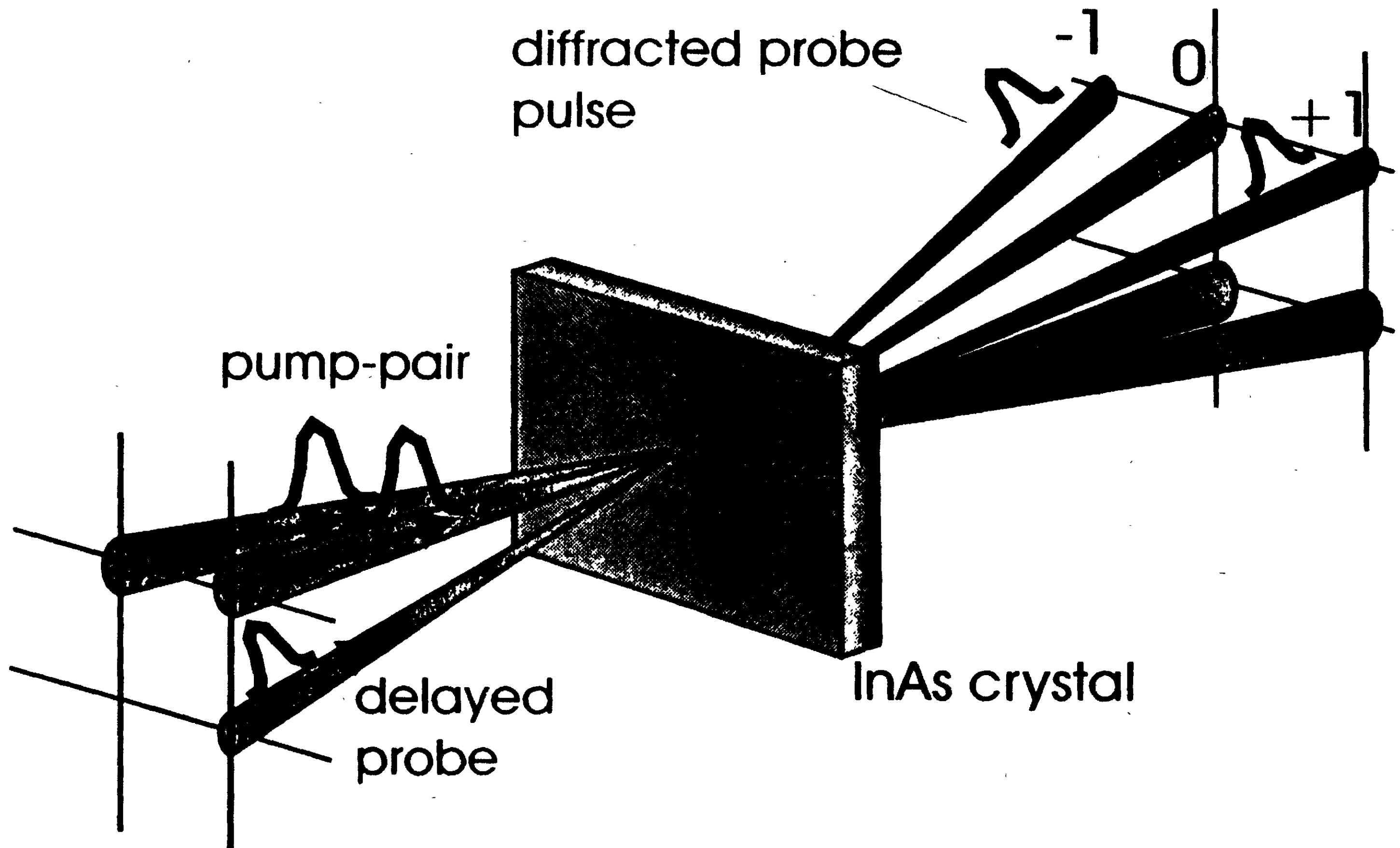
- 60T pulsed-magnet facility
- Upgrade of the optical transport system
- Improve wavelength and pointing stability
- Upgrade of remote control system for users
- Extension of wavelength range to 300 μm

FELIX APPLICATIONS



20/9

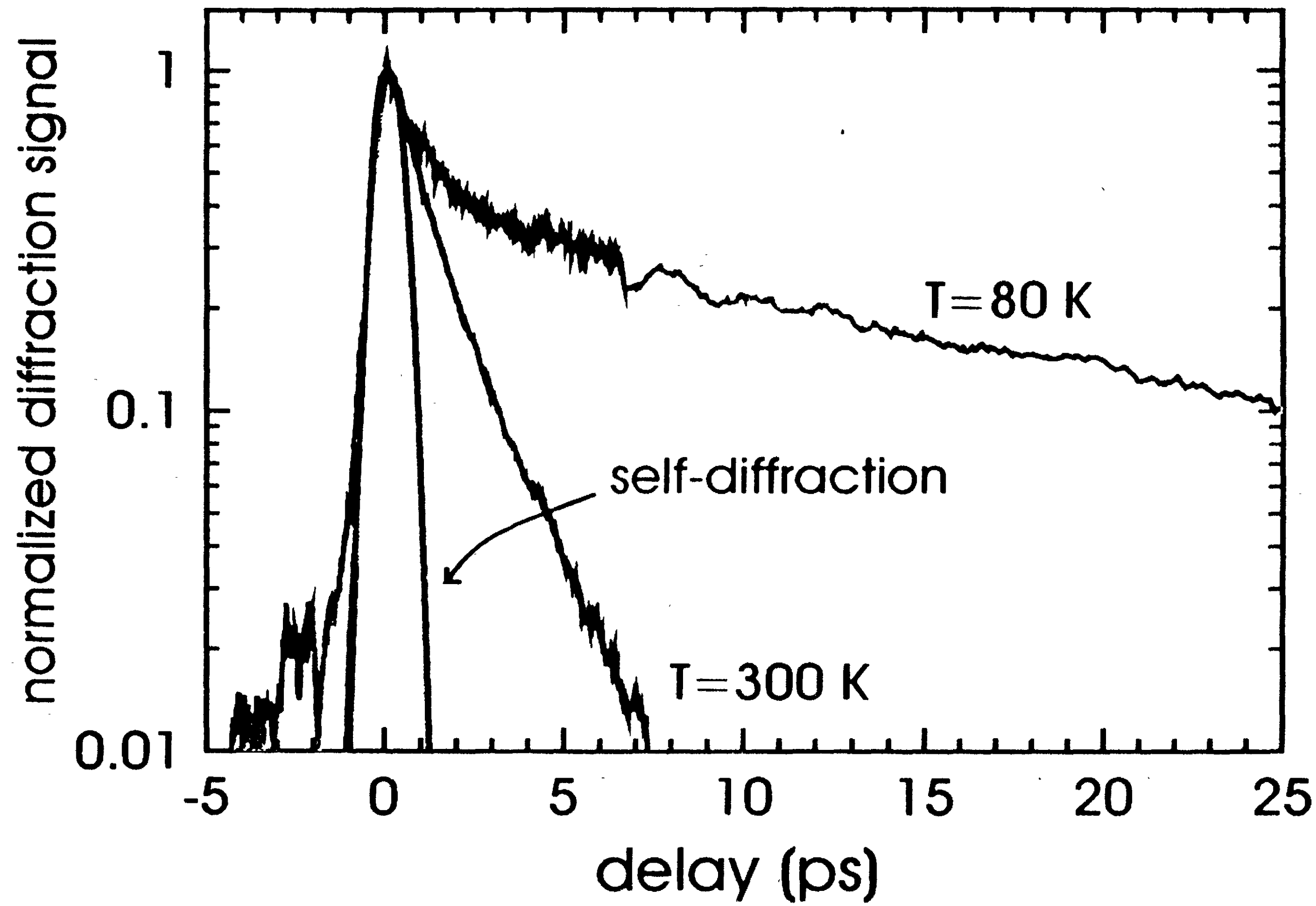
Three-pulse diffraction setup



-Pump-pair writes temporary <u>grating</u>.
-Measure probe diffraction efficiency versus pump-probe delay

probe diffraction in InAs as a function of temperature

$n = 5 \times 10^{16}\ cm^{-3}$



Observe rapid decay, followed by slower decay

Slow part of decay at 80 K lasts ~10 times longer than slow part of decay at 300 K

20/11

Name of Large-Scale Facility: FELIX **ANNEX II**

Project Manager: M.J. van der Wiel **Contract no: ERBFMGECT950056**

Draft Short-List of User Groups Recommended by the Selection Panel for the period 1 January - 30 June 1996

Date: 9-2-1996

Heriot-Watt University, Edinburgh, UK Imperial College, London, UK Oxford University, Oxford, UK Nottingham University, Nottingham, UK Bath University, Bath, UK Glasgow University, Glasgow, UK FOM Rijnhuizen, Nieuwegein			
UK beam time proposal			
288 hours			
C.R. Pidgeon	British	Heriot-Watt Univ., Edinburgh	
C.J.G.M. Langerak	Dutch	FOM Rijnhuizen, Nieuwegein	26 weeks
R.A. Stradling	British	Imperial College, London	1 week
C.C. Phillips	British	Imperial College, London	
R.J. Nicholas	British	Oxford Univ.	1 week
J. Singleton	British	Oxford Univ.	2 weeks
J.M. Chamberlain	British	Nottingham Univ.	
S. Andrews	British	Bath Univ.	1 week
C.M. Sotomayor-Torres	German	Glasgow Univ.	1 week
B.N. Murdin	British	FOM Rijnhuizen, Nieuwegein	26 weeks

University of Tübingen, Eye Hospital Vanderbilt University, Nashville, TN, USA			
Photoablation with the free-electron laser FELIX			
72 hours			
B. Jean	German	Univ. of Tübingen, Eye Hospital	
R. Walker	German	Univ. of Tübingen, Eye Hospital	2 weeks
M. Ostertag	German	Vanderbilt Univ., Nashville, TN	2 weeks
T. Bende	German	Univ. of Tübingen, Eye Hospital	

20/1

Oxford University, Oxford, UK Cambridge University, Cambridge, UK			
Sum-frequency generation from organic monolayers on surfaces			
64 hours			
C.D. Bain	British	Oxford Univ.	1 week
R. Braun	German	Oxford Univ.	2 weeks
P.B. Davies	British	Cambridge Univ.	2 weeks

LURE, Orsay, France CEA, Bruyeres-le-Châtel, France Univ. of Milan, Italy			
Superradiance in the short pulse FEL			
56 hours			
D.A. Jaroszynski	British	LURE, Orsay, France	2 weeks
R. Prazeres	French	CEA, Bruyeres-le-Châtel, France	
N. Piovella	Italian	Univ. of Milan, Italy	

Paul Scherrer Inst. Zürich, Delft University of Technology, NL Laboratory for Electromagnetic Fields and Microwave Electronics, ETH-Zürich, Switzerland Fraunhofer Institut, Freiburg,			
Intersubband photon drag detector			
48 hours			
H.C. Sigg	Swiss	Paul Scherrer Institut Zürich, Switzerland	1,5 weeks
P.C. van Son	Dutch	Delft University of Technology, NL	1,5 weeks
H. Schneider	German	Fraunhofer Institut, Freiburg, Germany	1,5 weeks

Name of Large-Scale Facility: FELIX

Project Manager: M.J. van der Wiel **Contract no: ERBFMGECT950056**

Short-List of User Groups Recommended for Access under the TRM Scheme by the Selection Panel for the period 1 September 1996 - 28 February 1997

Date: 19-7-1996

Heriot-Watt University, Edinburgh, UK Imperial College, London, UK Oxford University, Oxford, UK Nottingham University, Nottingham, UK Bath University, Bath, UK Univ. of East Anglia, UK University, of Strathclyde, Glasgow, UK Surrey Univ., Guildford, UK			
UK beam time proposal			
232 hours			
C.R. Pidgeon	British	Heriot-Watt Univ., Edinburgh	
R.A. Stradling	British	Imperial College, London	1 week
C.C. Phillips	British	Imperial College, London	1 week
R.J. Nicholas	British	Oxford Univ.	1 week
J. Singleton	British	Oxford Univ.	2 weeks
J.M. Chamberlain	British	Nottingham Univ.	1 week
S. Andrews	British	Bath Univ.	1 week
S. Meech	British	Univ. of East Anglia	1 week
B.N. Murdin	British	Surrey Univ., Guildford	2 weeks

University Eye Hospital Tübingen, Div. Experimental Ophthalmic Surgery, Germany University Medical Clinic Tübingen, Orthopedic Surgery, Germany			
Photoablation with the free-electron laser FELIX			
60 hours			
B. Jean	German	University Eye Hospital Tübingen	
T. Bende	German	University Eye Hospital Tübingen	1 week
W. Küsswetter	German	Univ. Medical Clinic Tübingen	1 week

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University of Heidelberg, Germany			
Ablation of brain tissue with picsosecond laser pulses of a tunable free-electron laser of high repetition rate			
30 hours			
M.H. Götz	German	University of Heidelberg	1 week
J.F. Bille	German	University of Heidelberg	1 week

University, of Strathclyde, Glasgow, UK Univ. of Milan, Italy Univ. ov Abertay, Dundee, UK			
Nonlinear studies of the saturated short pulse FEL			
60 hours			
D.A. Jaroszynski	British	Univ.of Strathclyde, Glasgow	2 weeks
B.W.J. McNeil	British	Univ.of Strathclyde, Glasgow	1 week
N. Piovella	Italian	Univ. of Milan	1 week
W.A. Gillespie	British	Univ. ov Abertay, Dundee	2 weeks
A.A.M. MacCleod	British	Univ. ov Abertay, Dundee	2 weeks

Univ. of Amsterdam, Van der Waals-Zeeman Instituut, Amsterdam, NL			
The energy back-transfer mechanism for erbium-in-silicon system			
60 hours			
T. Gregorkiewicz	Dutch	Univ. of Amsterdam	2 weeks
C.A.J. Ammerlaan	Dutch	Univ. of Amsterdam.	1 week

20/15

Difficulties in Execution of TMR Contr

- TMR funds 20% of beam time;
  use of FELIX by non-Dutch is ~ 50%
  → how to choose 'TMR-funded' use
  → why separate report on these user

- FELIX and CLIO are nucleus
  of cluster of complementary facilitie
  → how to merge Progr. Adv. Committee

- TMR favors User Workshops
  → how to make users discuss
  operational & instrumentation issue
  rather than details of their
  particular science field?

Contribution to Training & Mobility

- **Training:**

→ for most (young) users, work at FELIX is first experience at 'large' facility and exposure to other disciplines

- **Mobility:**

→ use of beam time involves intra-EU travel for all users

20/5

H Walenta (10 October)

Detector Facilities at Synchrotron Light Source

A.H. Walenta, Univ. of Siegen

New Synchrotron Radiation Sources and Improved Beam Lines

- higher brilliance
- higher energy

higher photon rates n_d

accumulated rate N_d in a time Δt

$$N_d = n_d \cdot \Delta t$$

relative precision due to the inherent photon statistics:

$$\frac{\Delta N_d}{N_d} = \frac{1}{\sqrt{N_d}} = \frac{1}{\sqrt{n_d \cdot \Delta t}} .$$

The higher rate n_d can be used for improved precision $\Delta N_d/N_d$ or for reaching shorter exposure times Δt at the same precision.

1) Therefore new detectors not only have to be able to cope with higher rates but also to pass on either higher precision or shorter exposure times or both to the experimenters.

Spectroscopic application is noise limited:

$$(ENC)_{rms} \sim \frac{C_{in}}{\sqrt{T_m}}$$

C_{in} input capacitance and T_m the integration time

2) For higher x-ray intensity an improved signal to noise ratio and an improved energy resolution is needed at the same time.

Requirements for new detectors

- precision of intensity measurement
- time resolution
- position resolution
- efficiency
- energy resolution

Solutions

- smaller detector cells
- reduced read–out capacitance
- larger number of parallel read–out channels
- use of integrated electronics
- implementation of modern signal processing
- new high Z material

Direction of Programme

common effort of a number of institutes

experienced in detector and electronic development

experienced in synchrotron radiation application

It should be noted that institutes with a the high level of experience in different fields are not found in one European country alone but are found only in different European countries such that a true international collaboration with exchange of expertise follows automatically by the nature of the project. Furthermore the interconnections are such that continuous interaction and mobility of the researchers is necessary.

21/2

X-Ray Detector Development for Synchrotron Radiation Sources

HCM-Program :

- 2D Gaseous Micro Strip Detector
  - Coimbra
  - Dublin
  - Grenoble (ILL)
  - Hamburg (HASYLAB)
  - Orsay (LURE)
  - Siegen

- Si Drift Detector Array with Integrated Transistor
  - Athens (NCSR)
  - Grenoble (ESRF)
  - Magdeburg
  - Milano
  - Garching (MPE)
  - Siegen

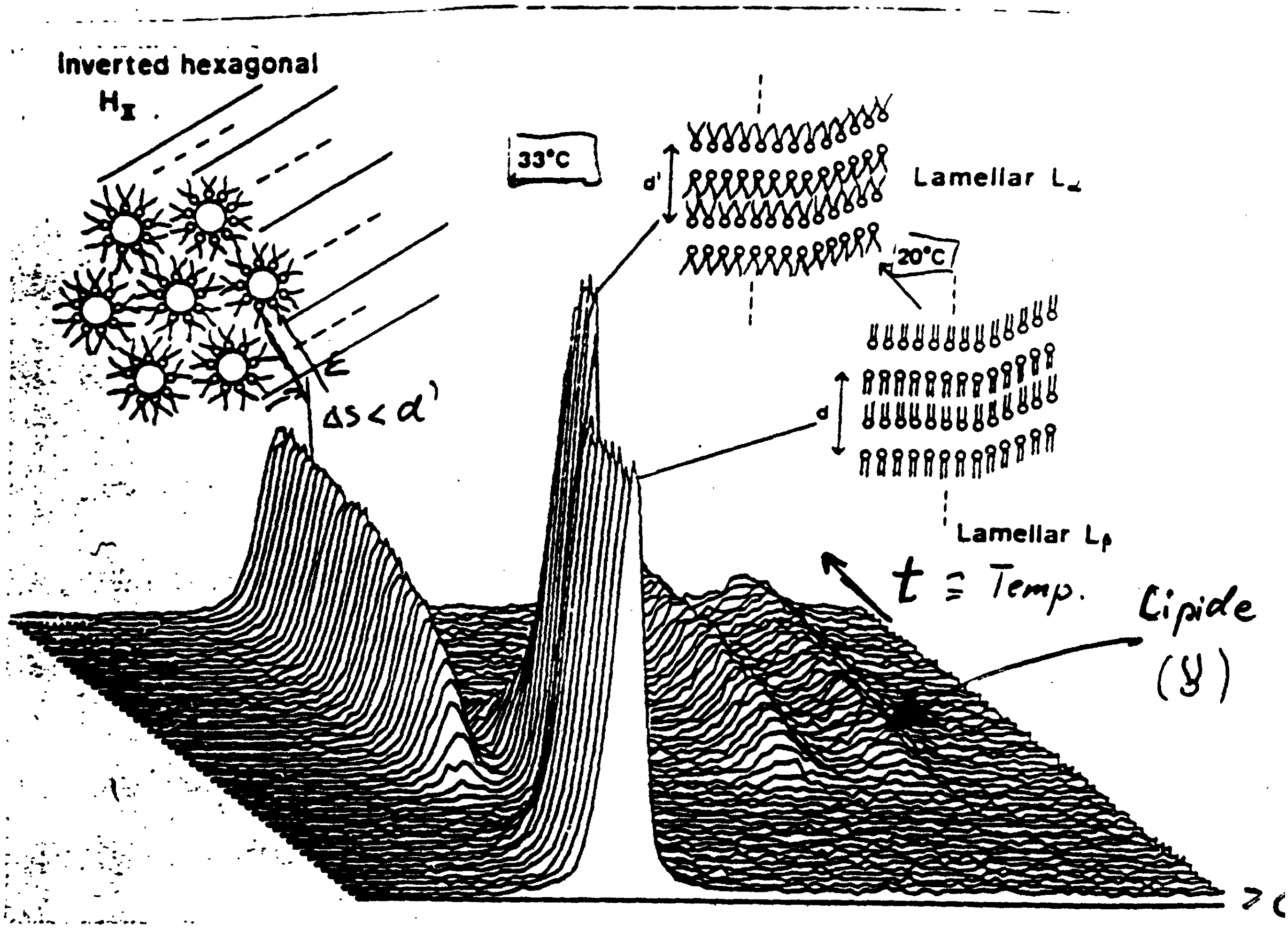
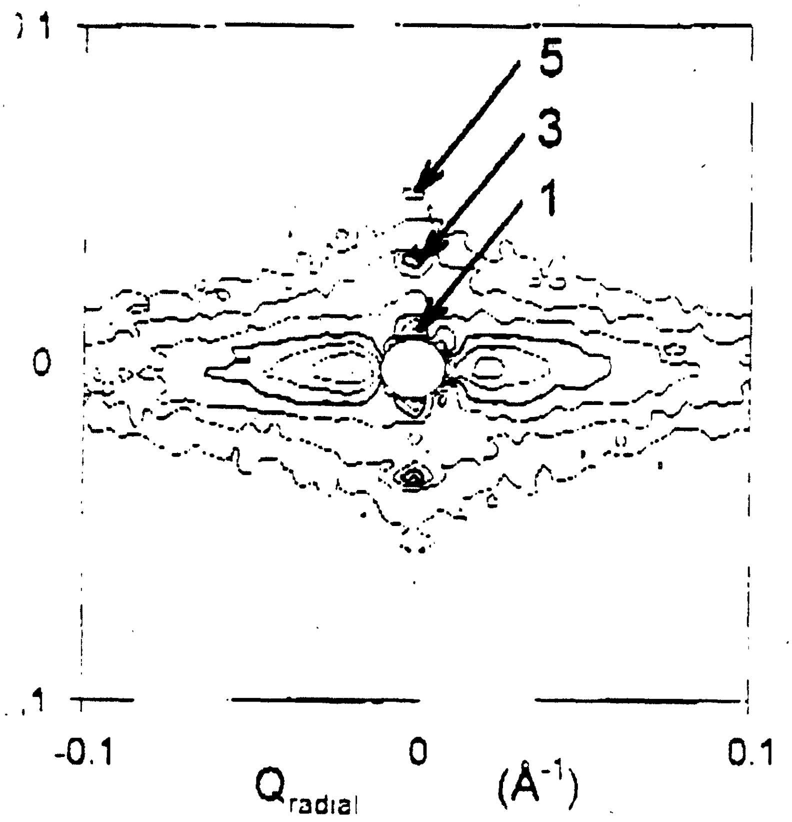


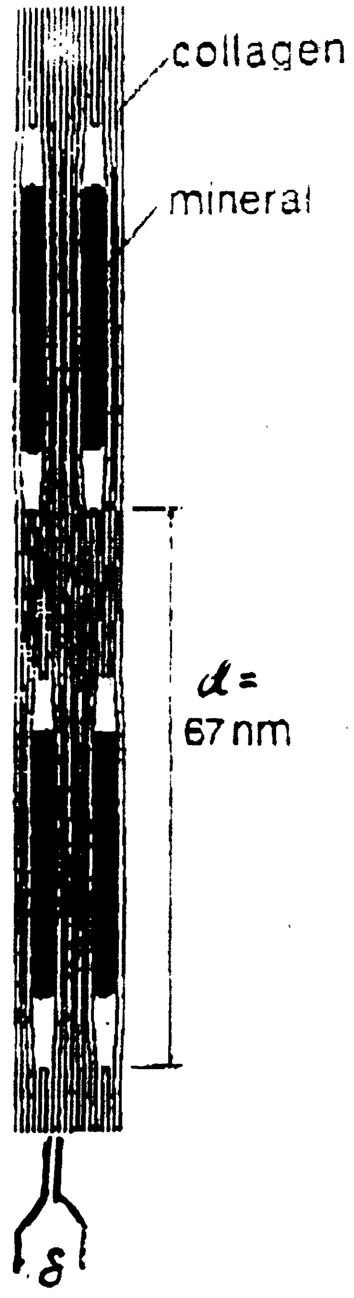
Abb. 2: Zeitaufgelöstes Röntgenkleinwinkelexperiment an einem lamellar → hexagonal Phasenübergang eines Ethanloaminphospholipides. Die einzelnen Streubilder wurden in Abständen von 250 Millisekunden aufgenommen.

1. Diffraction

⇝ time resolved

BONE





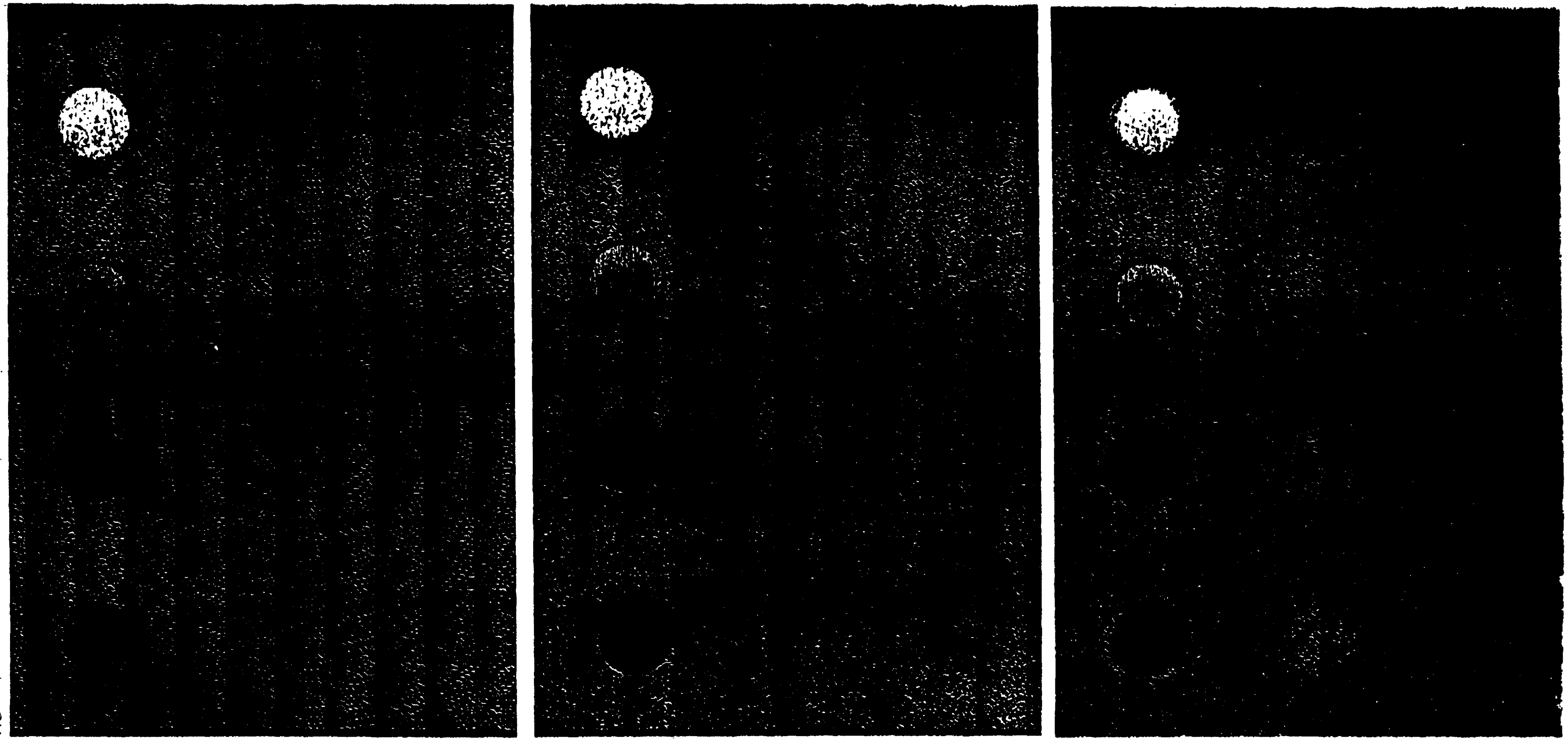
reflexes 1, 3, 5 from 67 nm pitch (axial), voids with Ca-phosphids

In radial direction: mostly diffuse from δ (not regular) and some from mineral.

2 D Detector

Graded Absorber Comparison

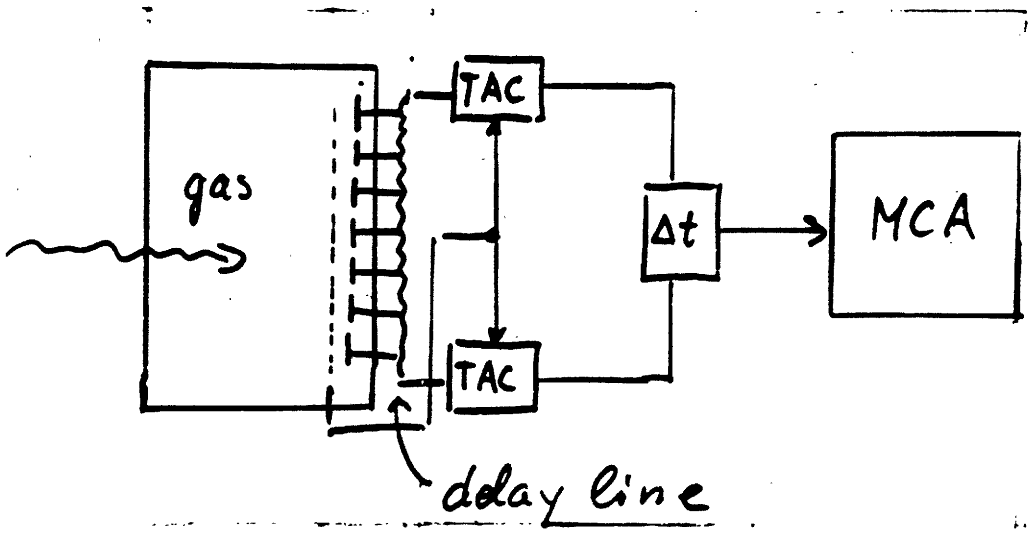
Mar Image Plate | ESRF-Thompson IIT / CCD | Daresbury MWPC

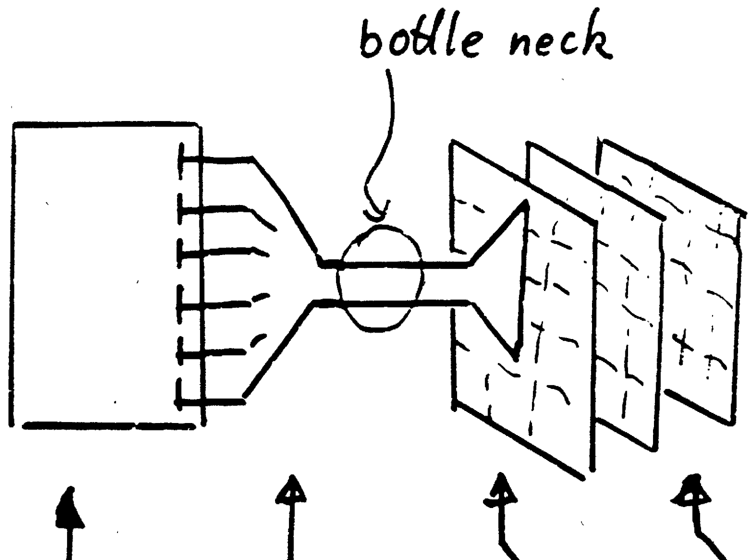


Rob Lewis *DRAL*

~ photon counting

Typical Detector

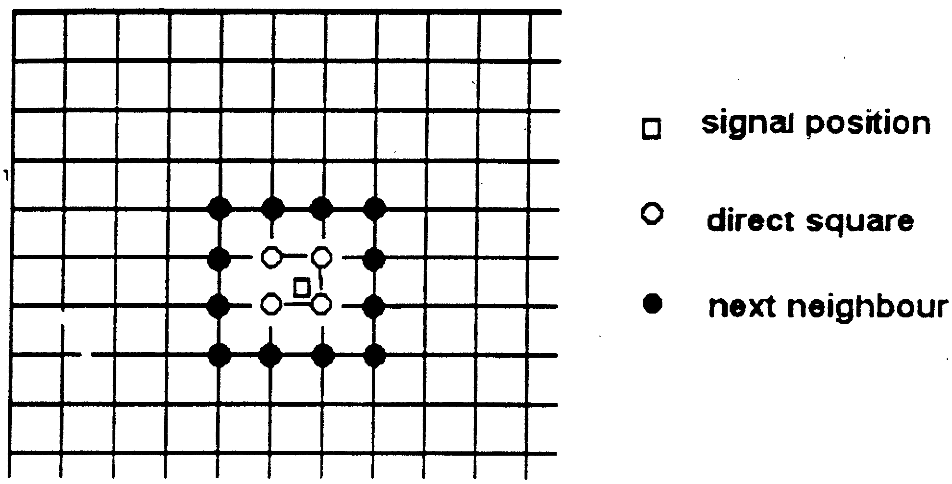


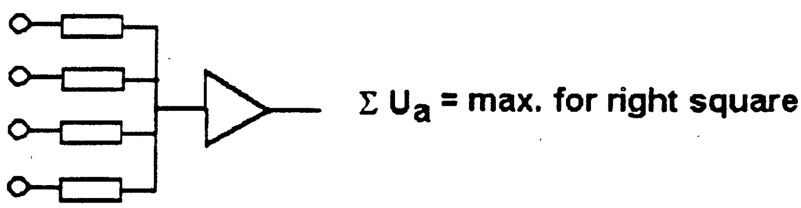


Absorber Encoder DAQ Memory (frames)

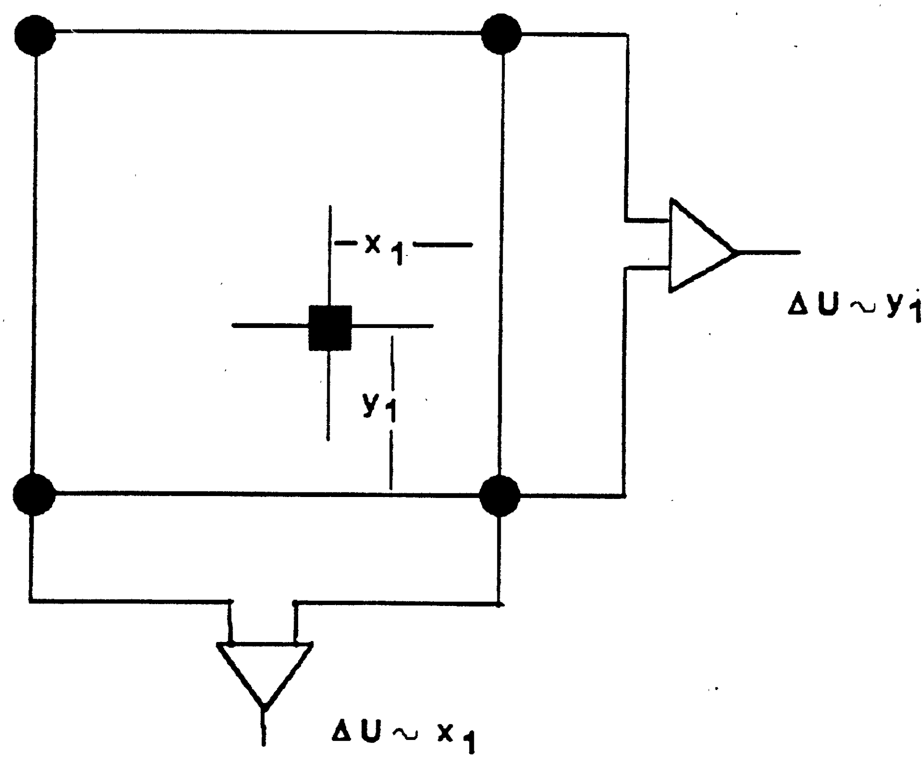
⇝ parallel transfer to memory
(as in HEP up to 10^6 channels)

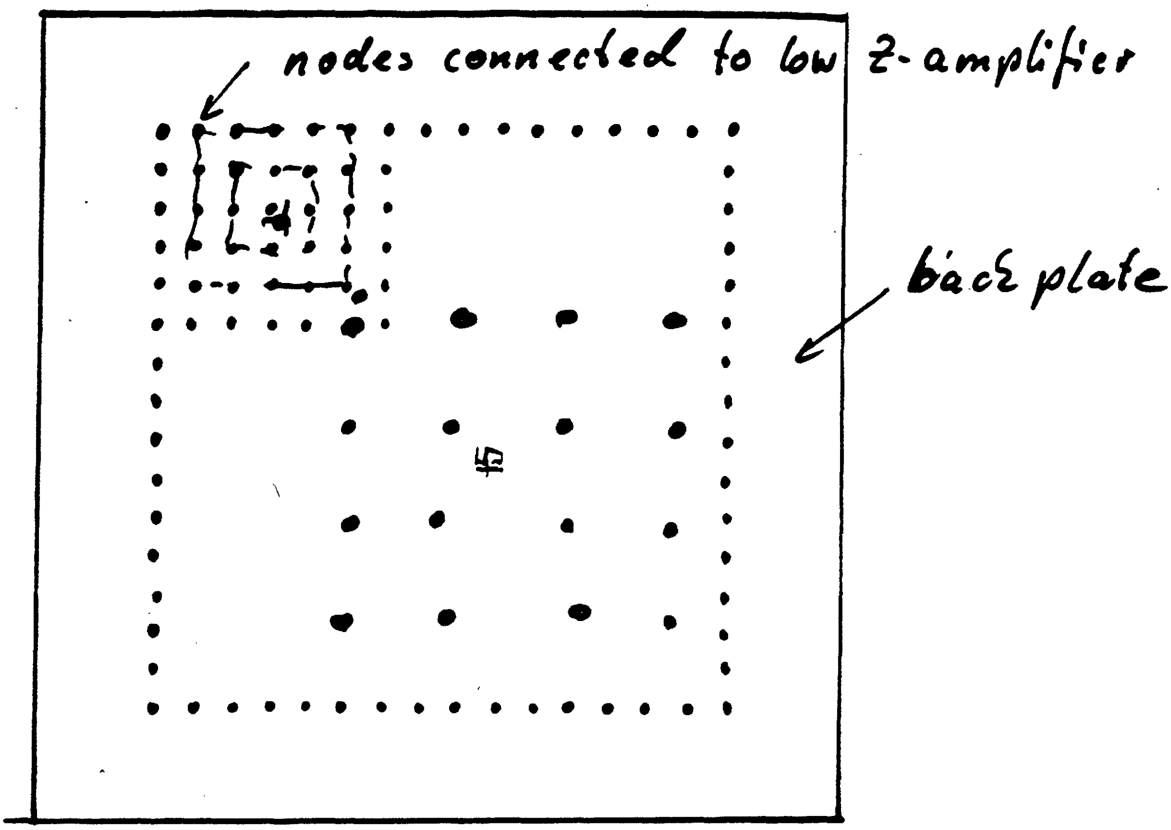
Local asynchronous trigger

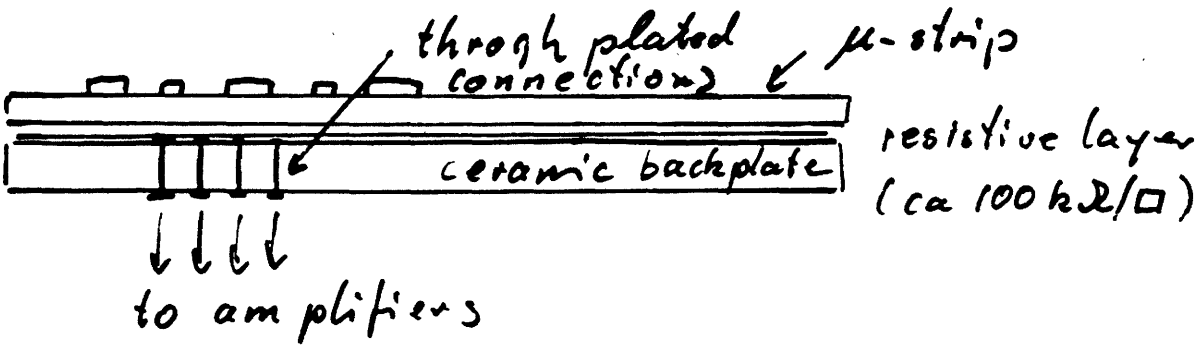




Interpolation in square







CTS, Dublin

LURE, Orsay

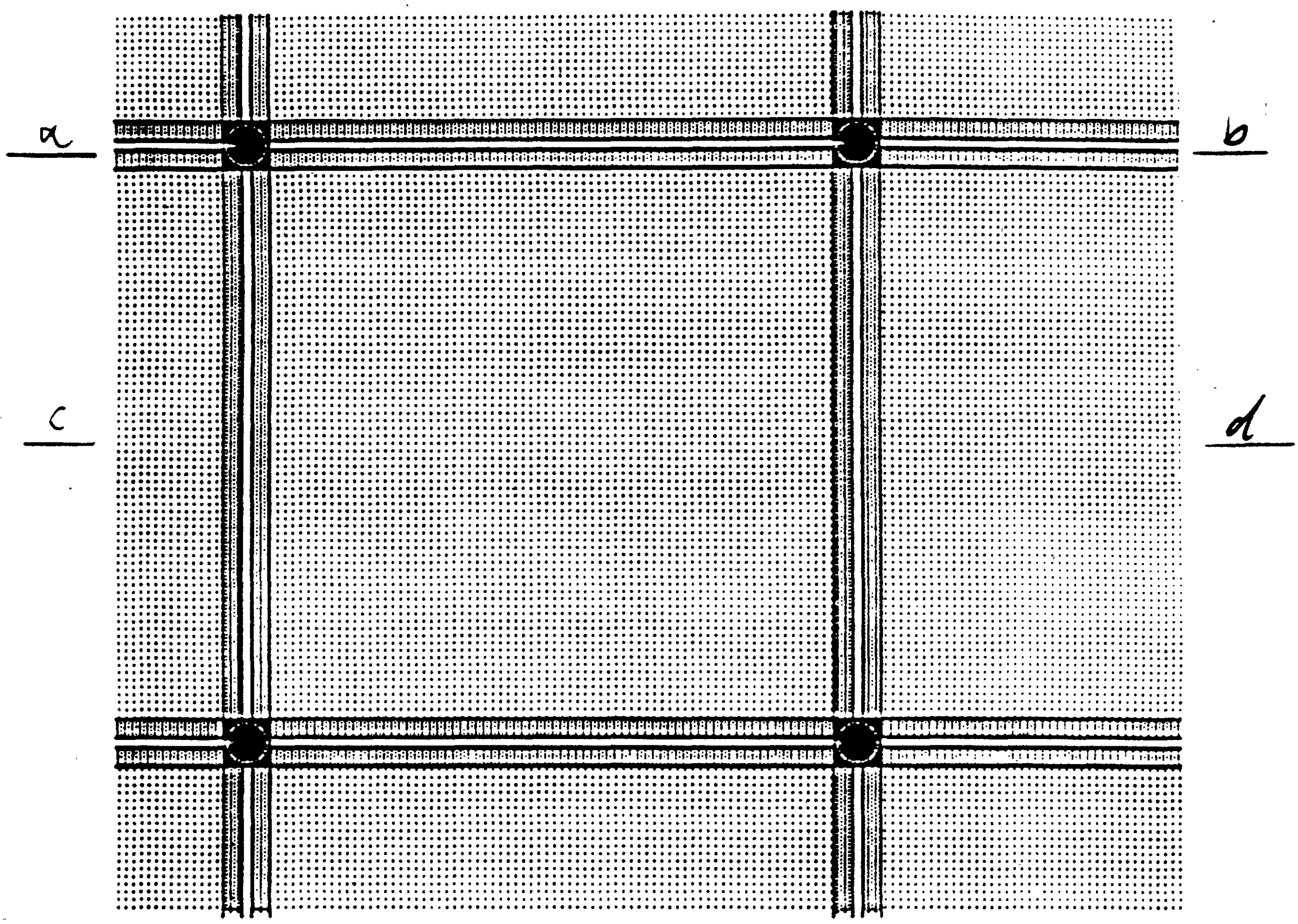
ILL, Grenoble

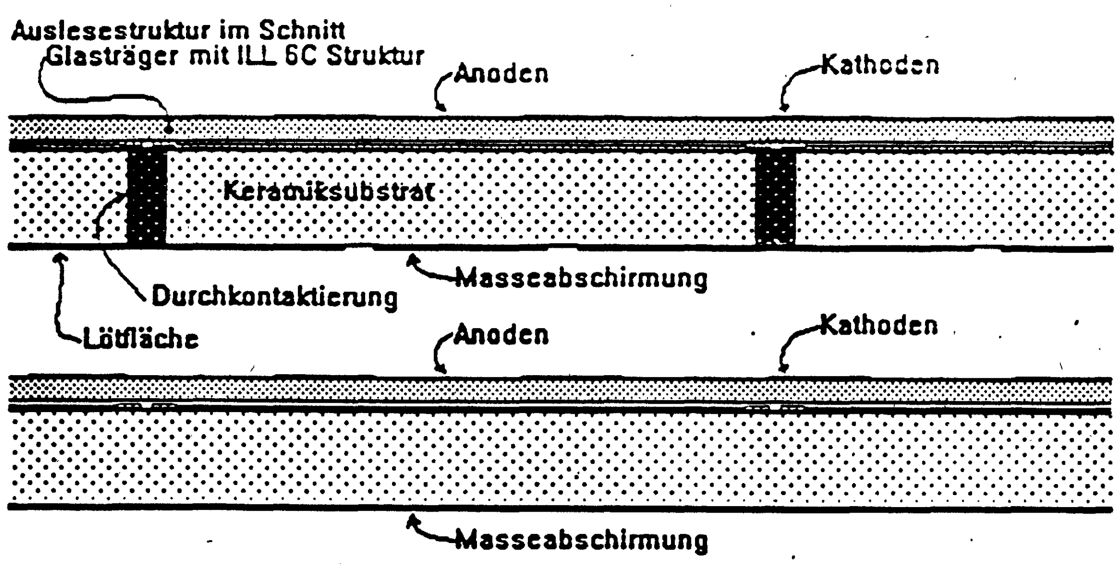
LIP, Coimbra

ZESS, Siegen

Ergebnis der Entwicklung:

backplane topview



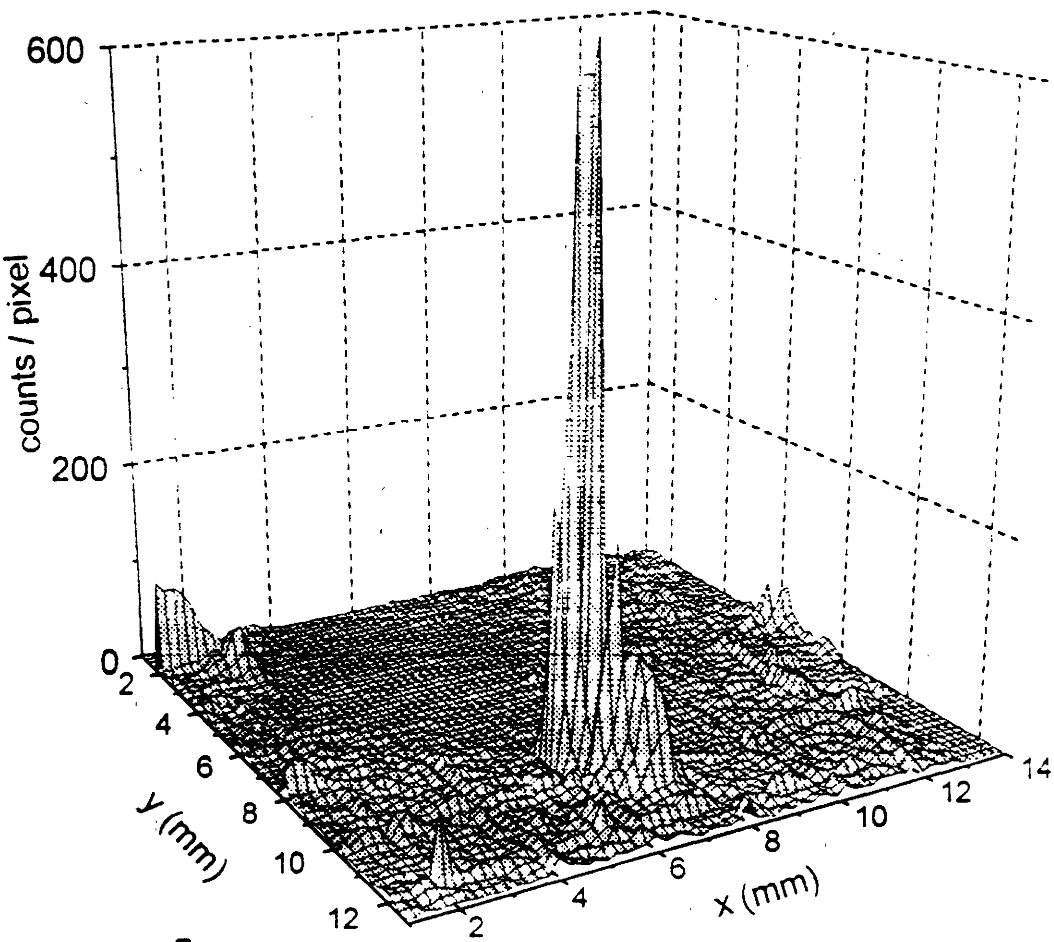


gesinterte Schichten: —— Silber-Palladium ——100kΩ$_\square$ —— 1MΩ$_\square$

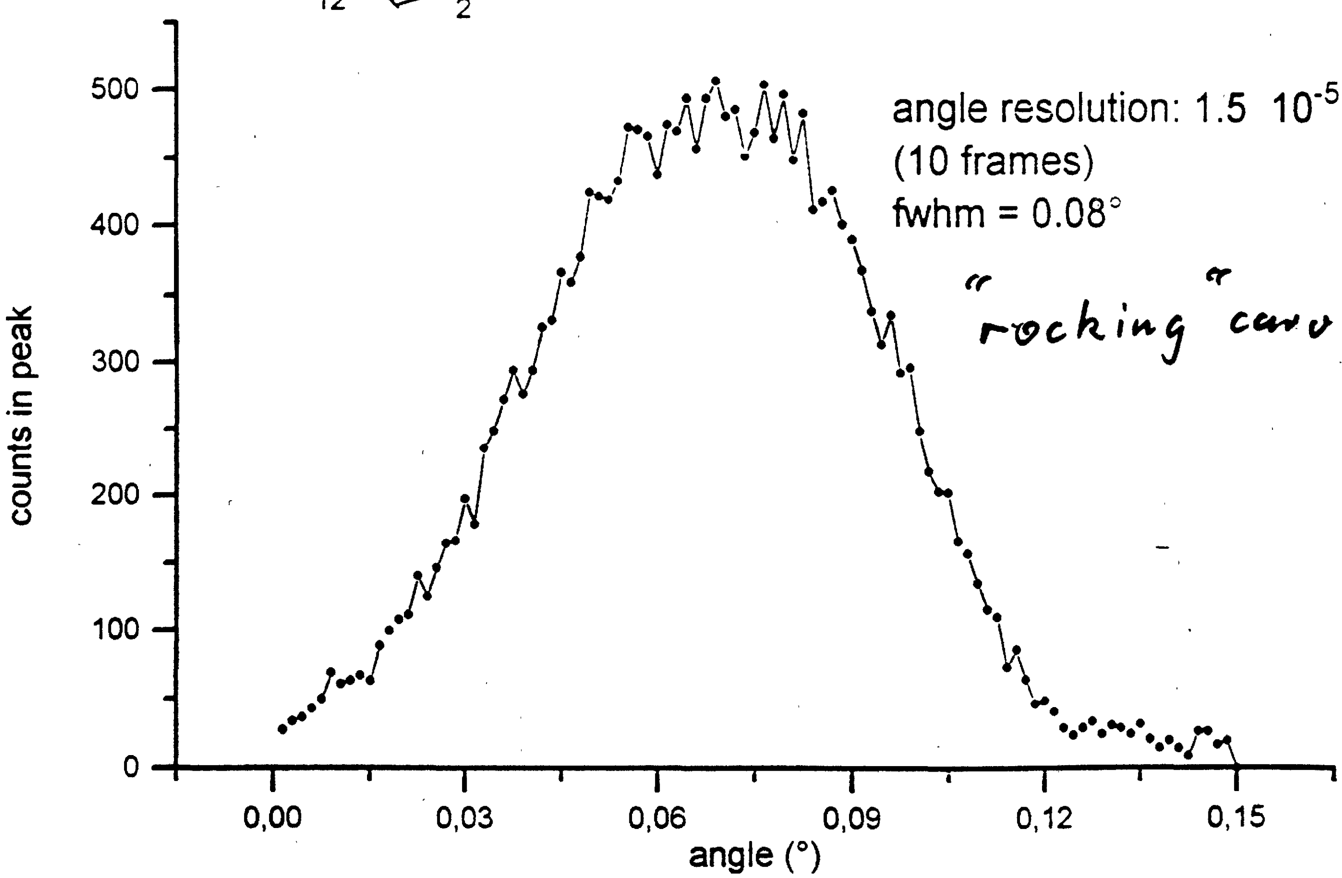
24.06.96

BRAGG PROFILE / LURE 1996

Diffraction spot from Collagenase



run65,run66,run67
3 x 1000 frames
120 500 events
sample time: 2.7 sec
read-out time: 30 min
ArCO2 (90/10) 4.0 bar
gain 1500



angle resolution: 1.5 $10^{-5\circ}$
(10 frames)
fwhm = 0.08°

"rocking" curve

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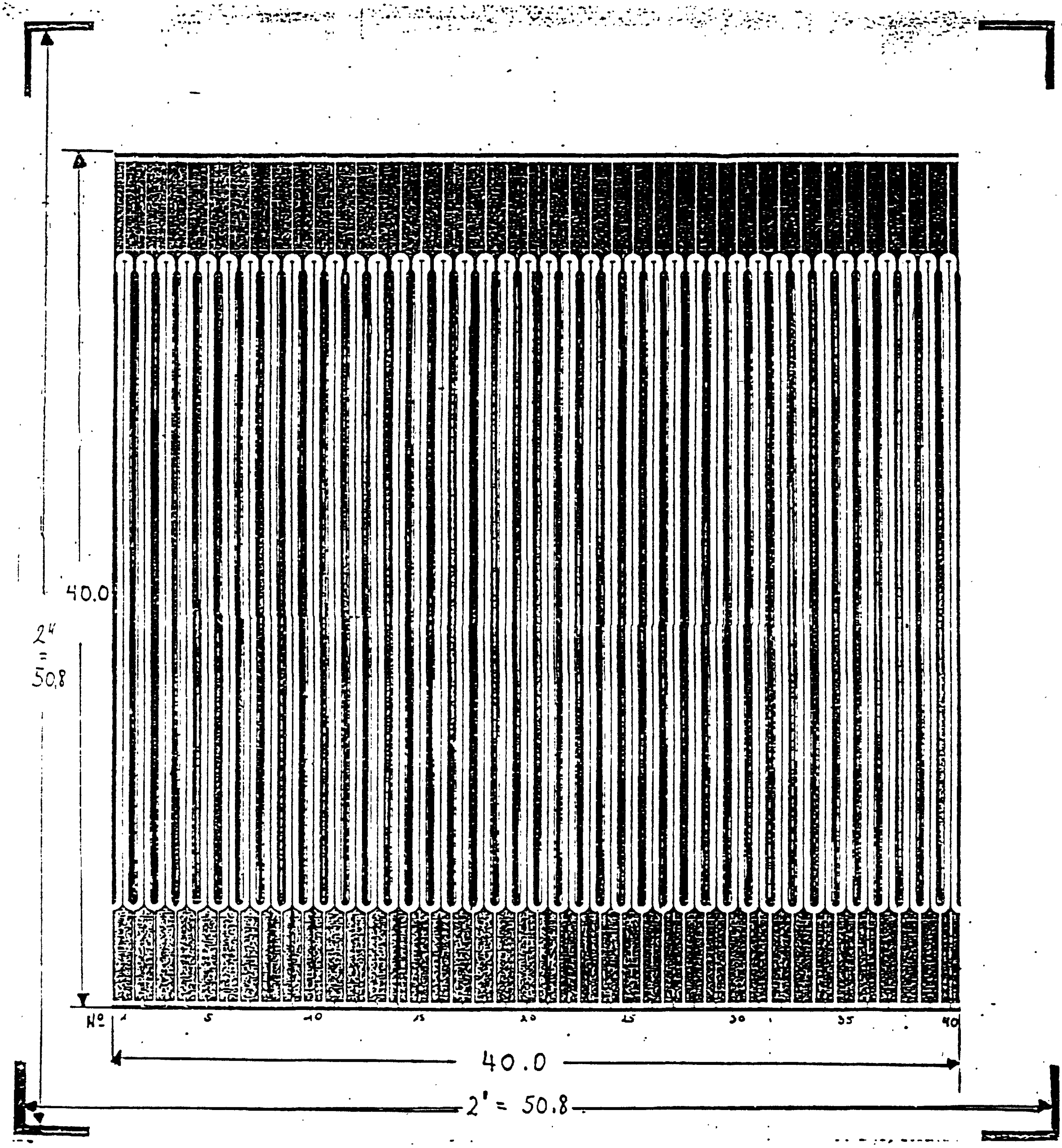
MSGC (A. Oed, ILL)



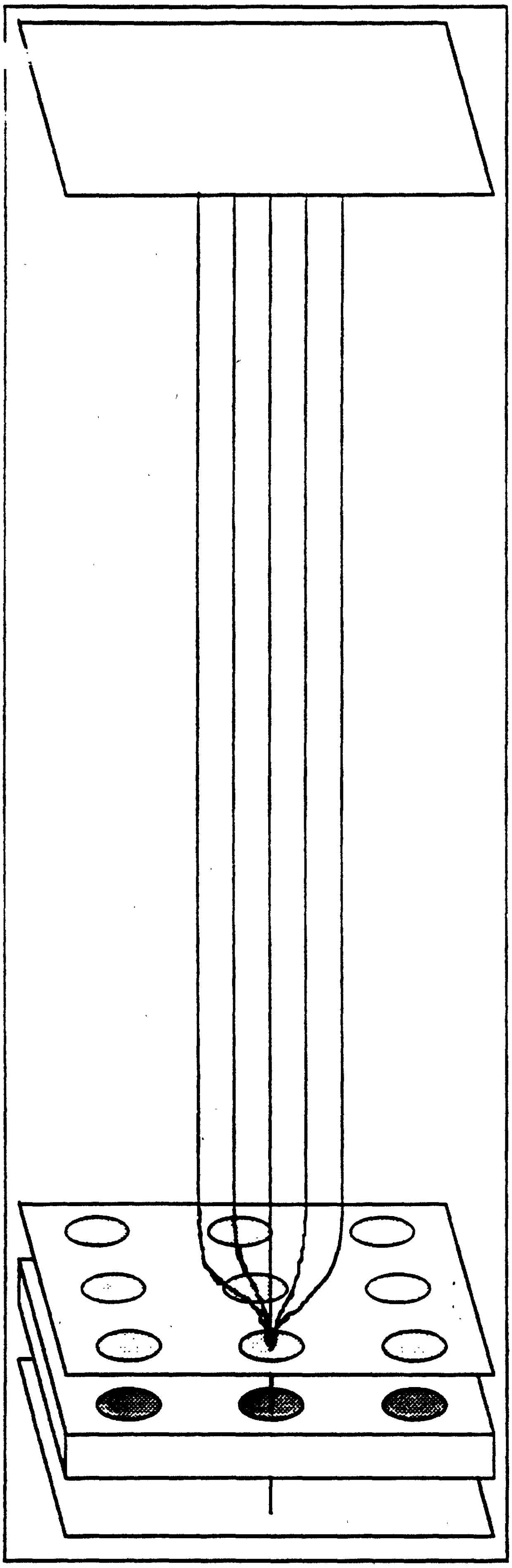
Now: 300 mm × 300 mm, 300 μm
200 plates produced
HERA-B

Masque: ILL 6 C
Leti No Serie 12 013

surface coating solved

The C.A.T. - the robust, high rate capable hybrid of MSGC and PPAC

SCHEMATIC SETUP



M.Lemonnier et al. THE C.A.T. PIXEL PROPORTIONAL GAS COUNTER DETECTOR J.Phys. III France 6 (1996) 337 - 347.
***european patent** FR 25.11.94 FR941458*

***driftcathode** - entrance window*

FUNCTION PRINCIPLE:

- **primary electrons are collected and focussed to the holes axis**
- **amplification:**

outside hole	**like MSGC**
inside hole	**like PPAC**

- **path separation of incomming electrons and outcomming +ions**
- **+ions drift directly to C.A.T.-cathode**

  => short drift time

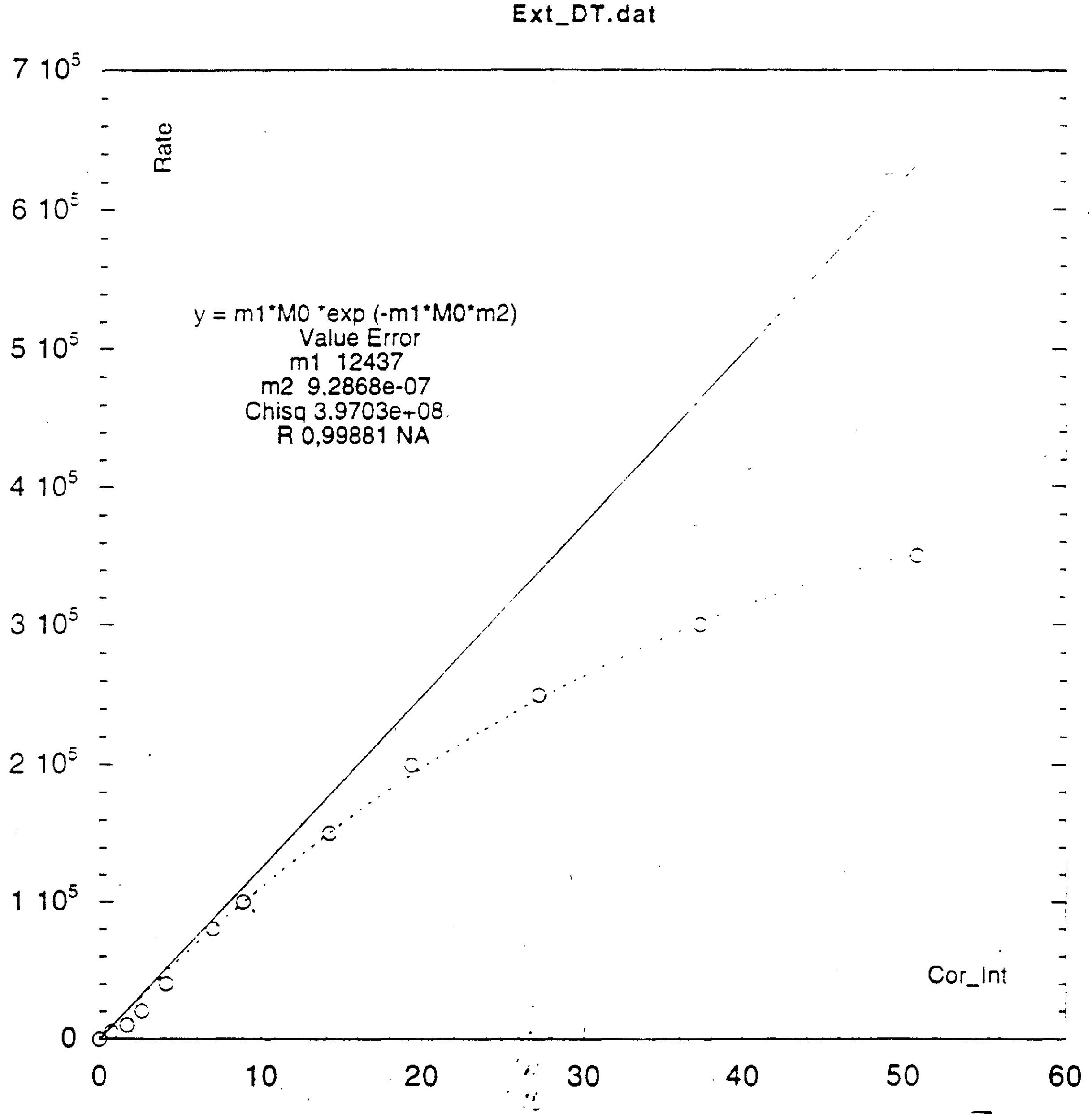
C.A.T.-cathode
(slits possible instead of holes)

isolating spacer (optional)

solid anode
(position encoding structure possible)

21/1

rate capability C.A.T.



Summary

- energy range: 5... 25 keV
- local rate: 10^6 counts/sec $(5 \cdot 10^5 s^{-1})$
- position resolution: 200 μm x 200 μm
- detector size: 400 mm x 400 mm
- No. of pixel: 4×10^6
- No. read out nodes: 26,000
- global rate (max.): $\approx 3 \times 10^9$ counts/sec

→ high precision (≤ 1%)
in ms-time scale

2. Si-drift detector

A high resolution, 6 channels, Silicon Drift Detector Array with integrated JFET's designed for EXAFS : first X-ray fluorescence excitation spectra recorded at the ESRF. *

Ch. Gauthier, J. Goulon, E. Moguiline, A. Rogalev.

European Synchrotron Radiation Facility, B.P. 220, Avenue des Matyrs, F-38034 Grenoble Cedex.

P. Lechner, L. Strüder

MPI für Extraterrestrische Physik, Halbleiterlabor, Paul-Gerhardt-Allee 42, D-81245 München, Germany.

C. Fiorini, A. Longoni, M. Sampietro

Politecnico di Milano, Dipartimento di Elettronica e Informazione, Piazza L. da Vinci 32, 20133 Milano, Italy.

A. Walenta, H. Besch, H. Schenk, R. Pfitzner, U. Tafelmeier.

Universität Gesamthochschule Siegen. FB 7, Physik, Adolf-Reichwein-Str. 2, D-57068 Siegen, Germany.

K. Misiakos, S. Kavadias, D. Loukas

NCSR Demokritos, Microelectronics Institute, Athens 153 10. Greece.

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* Work supported by the Commission of the European Communities, Human Capital and Mobility, Contract No. ERBCHRXCT 930348

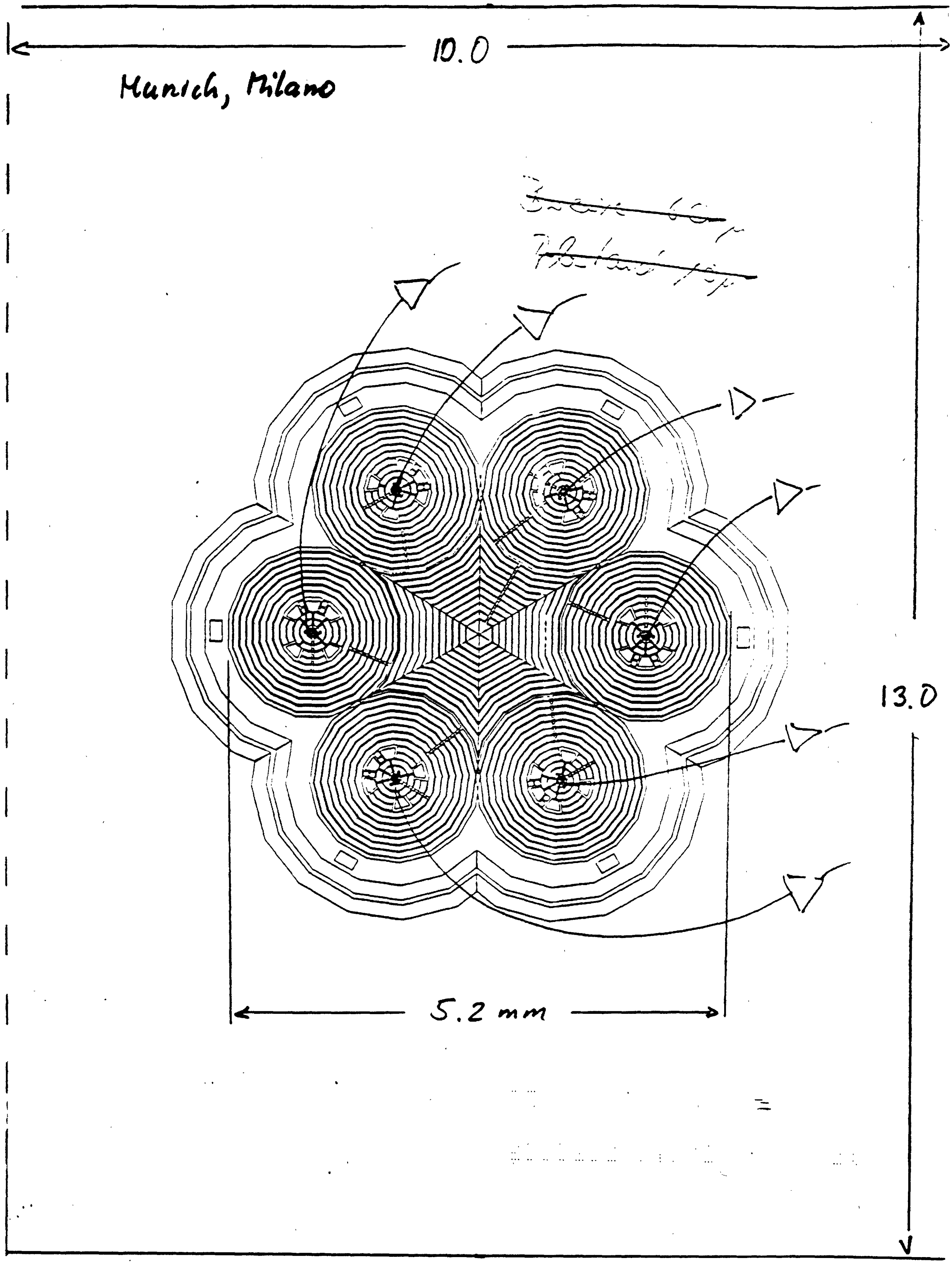
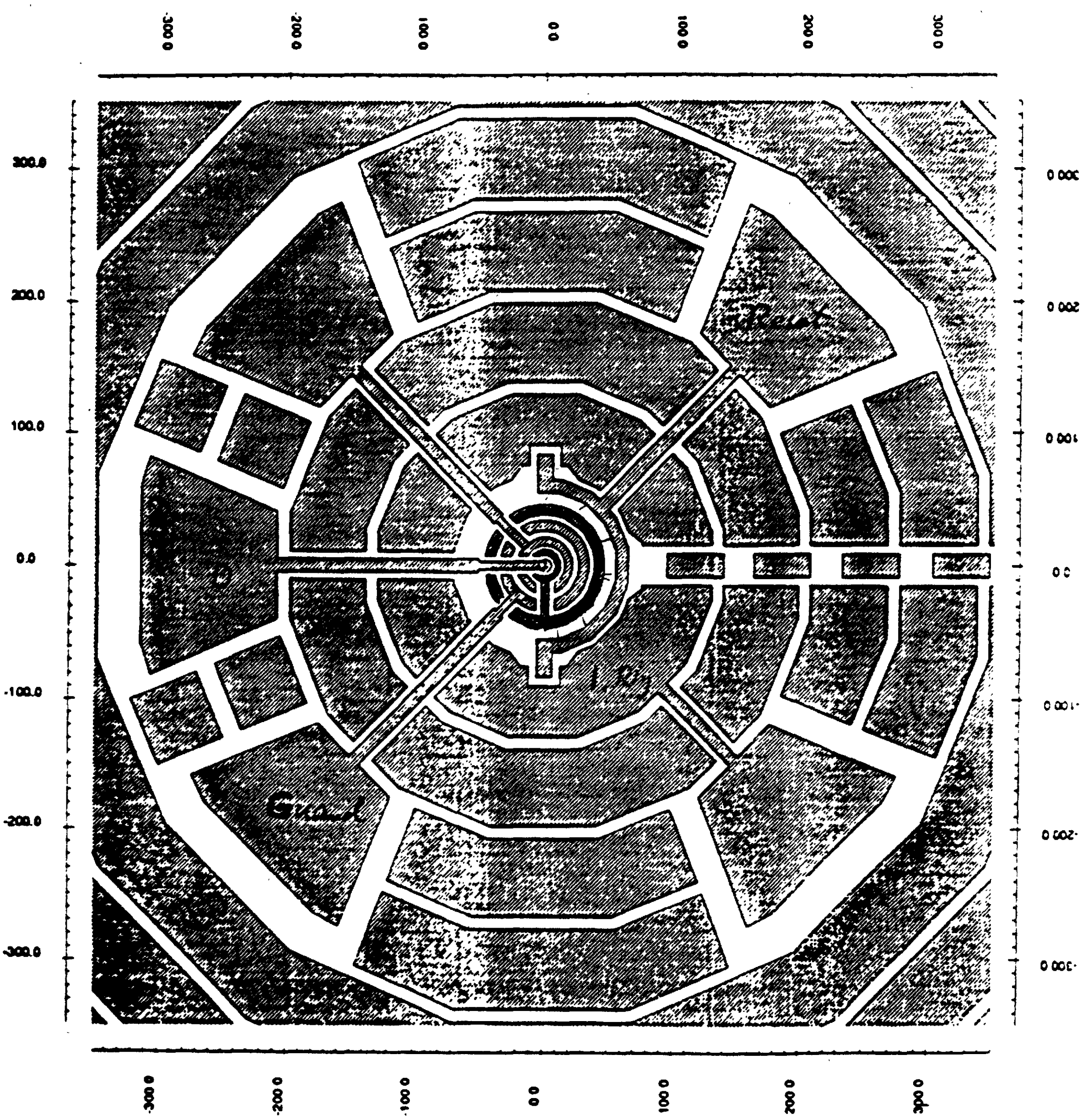


Fig. 3

Integrated FET on drift detector

$C_{in} \approx 0.2\,pF$

$A = G$



Cell: SDC_FF4 Mirror: OFF Rotation: 0

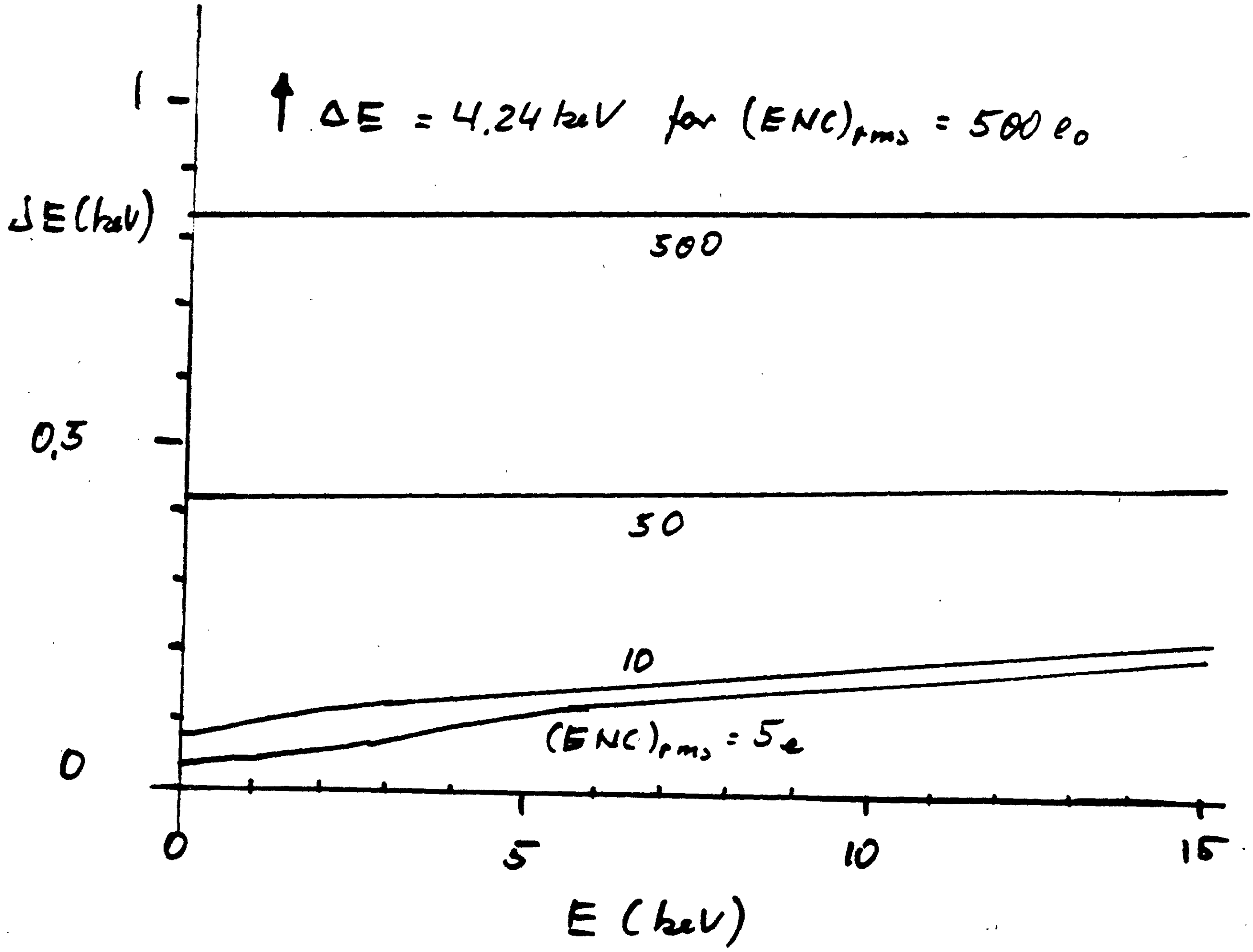
Scale: (200.00 requested) 199.92

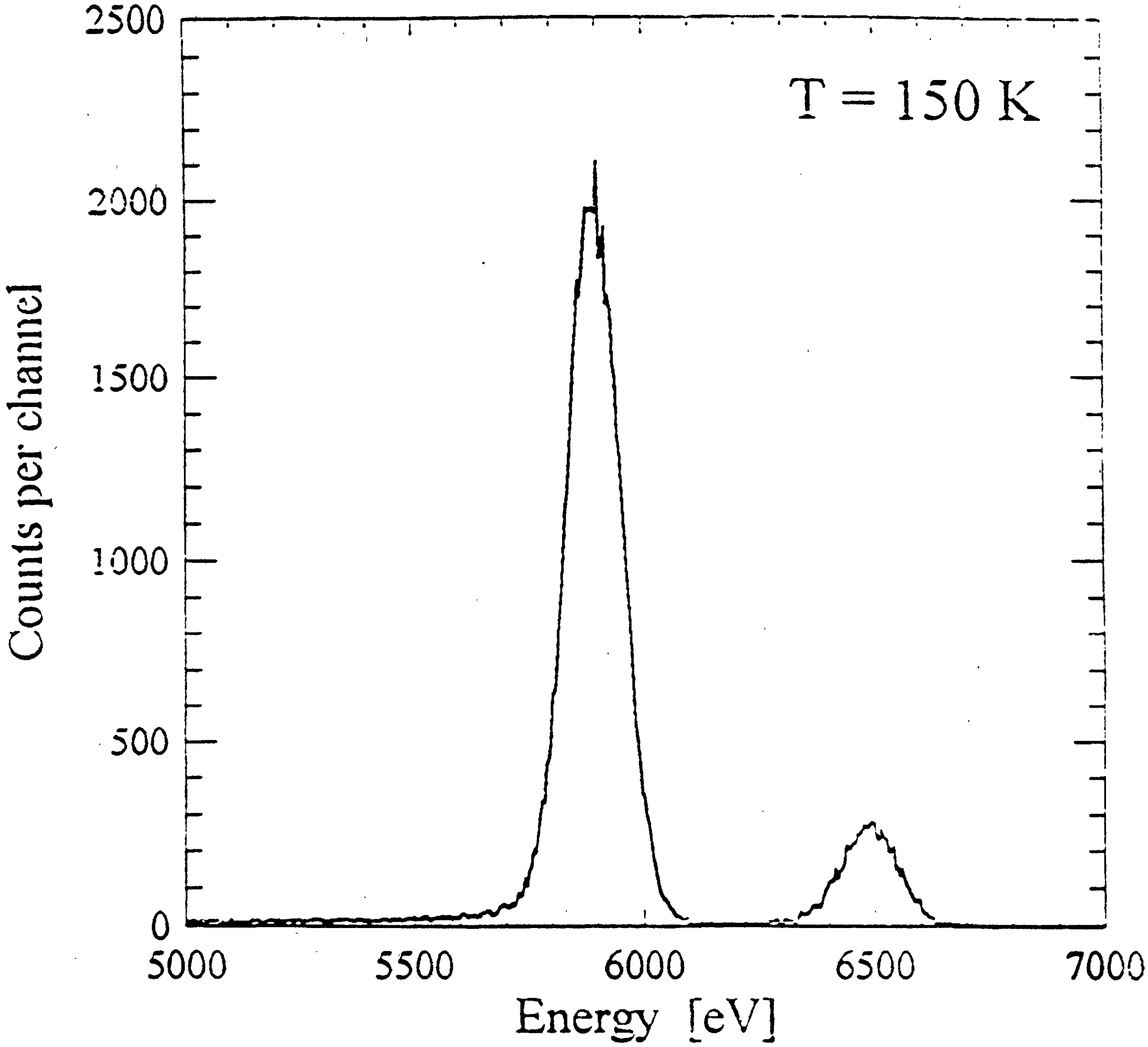
Wed Jan 26 14:58:58 1994

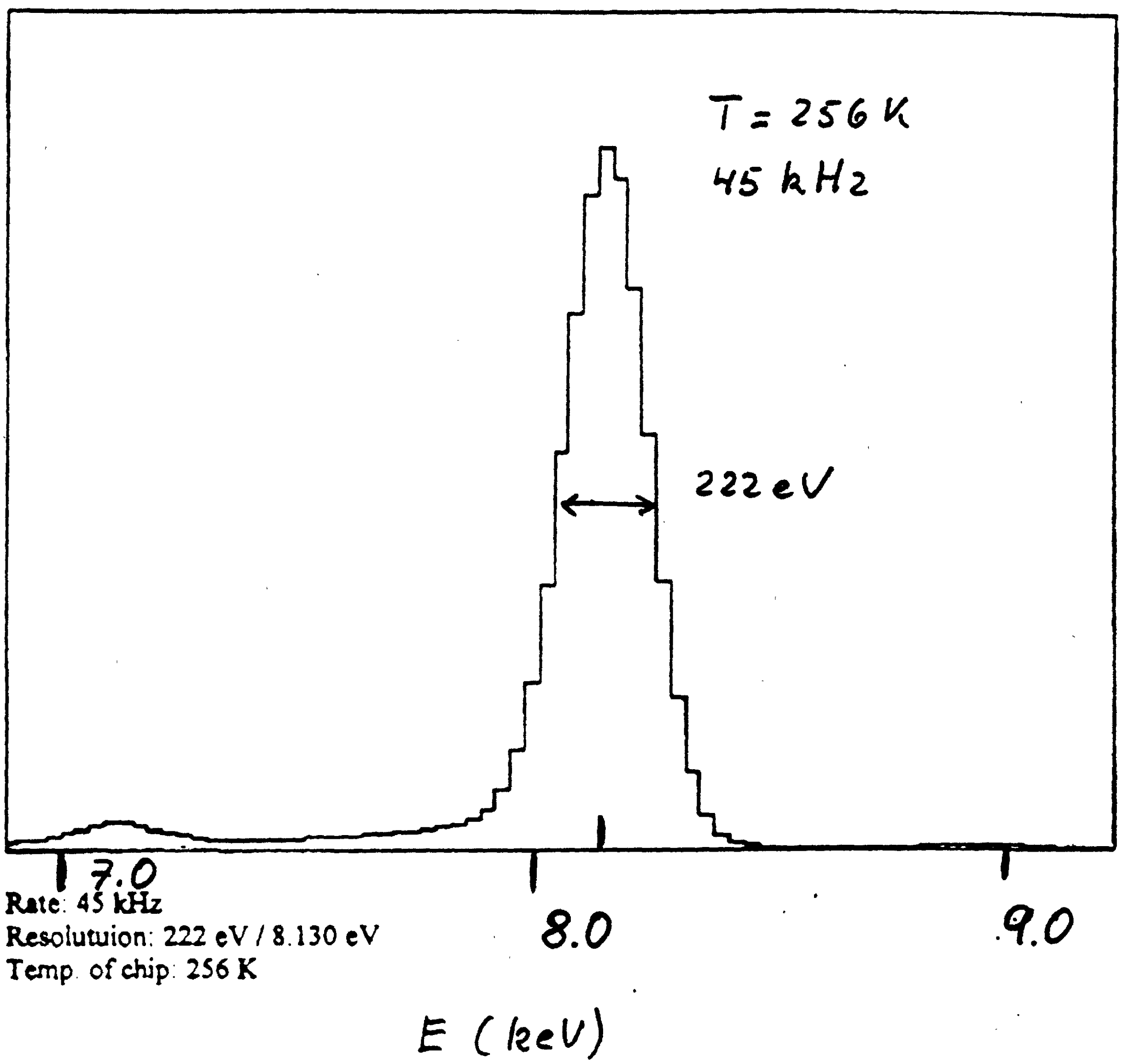
Valid Layout Plot version 04.0-p02sun4

alun

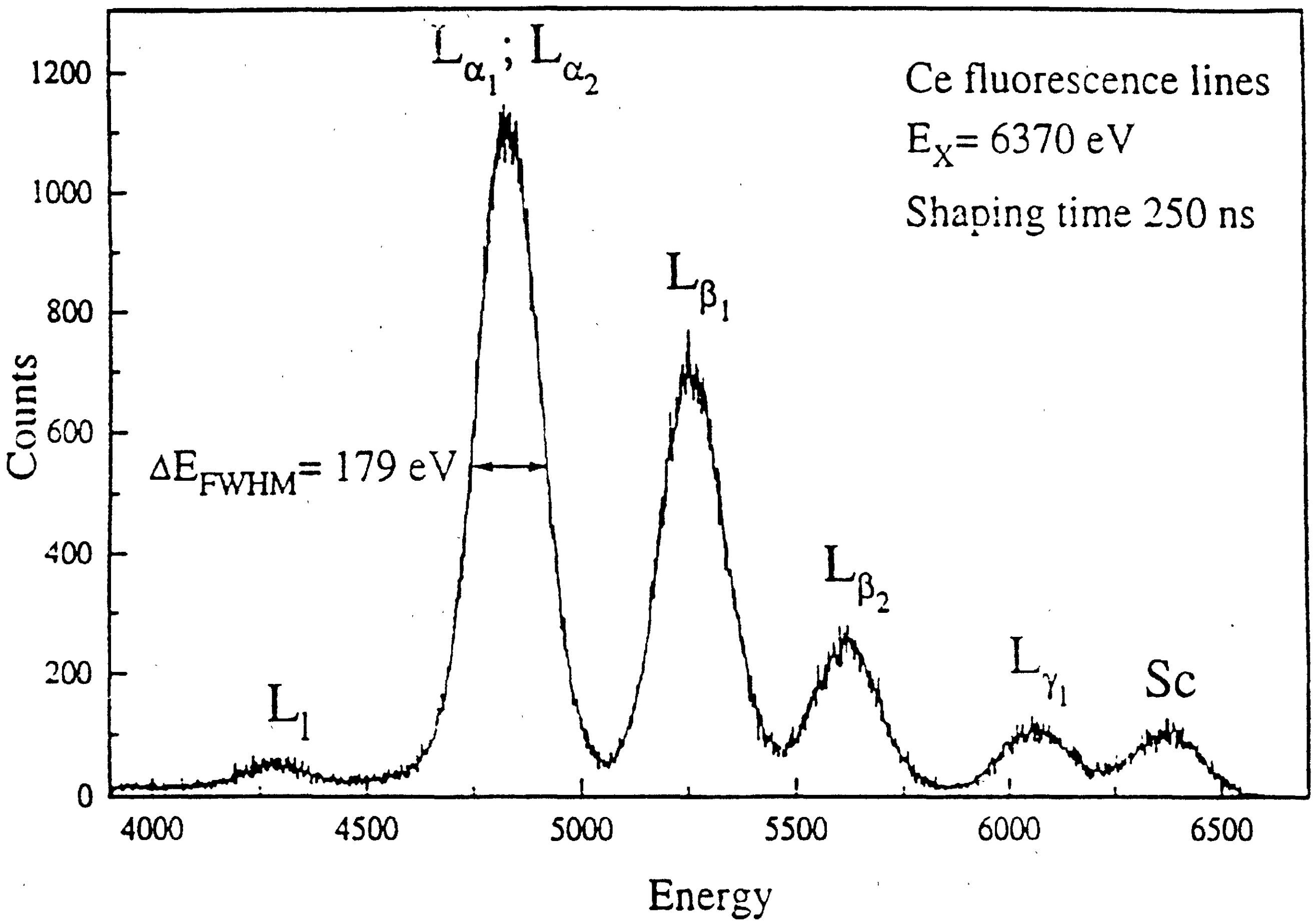
Energy resolution in Si




T = 150 K
Counts per channel
2500
2000
1500
1000
500
0
5000
5500
6000
6500
7000
Energy [eV]



Si-drift diode with integrated FET



ESRF - measurement

X-ray Holography with Atomic Resolution: Trying to Make It Work

T. GOG[(1)], R.-H. MENK[(2)], F. ARFELLI[(2),(3)], P.M. LEN[(4)], C.S. FADLEY[(4),(5)] AND G. MATERLIK [(6)]

[(1)]*Oak Ridge National Laboratory at the National Synchrotron Light Source, Brookhaven National Laboratory, Upton, NY 11973, USA;*
[(2)]*Brookhaven National Laboratory, Upton, NY 11973, USA;*
[(3)]*Sincrotrone Trieste, 34012 Trieste, Italy;*
[(4)]*Department of Physics, University of California at Davis, Davis, CA 95616, USA;*
[(5)]*Materials Science Division, Lawrence Berkeley National Laboratory, Berkeley, CA 94720, USA;*
[(6)]*Hamburger Synchrotronstrahlungslabor HASYLAB am Deutschen Elektronen-Synchrotron DESY, 22603 Hamburg, Germany*

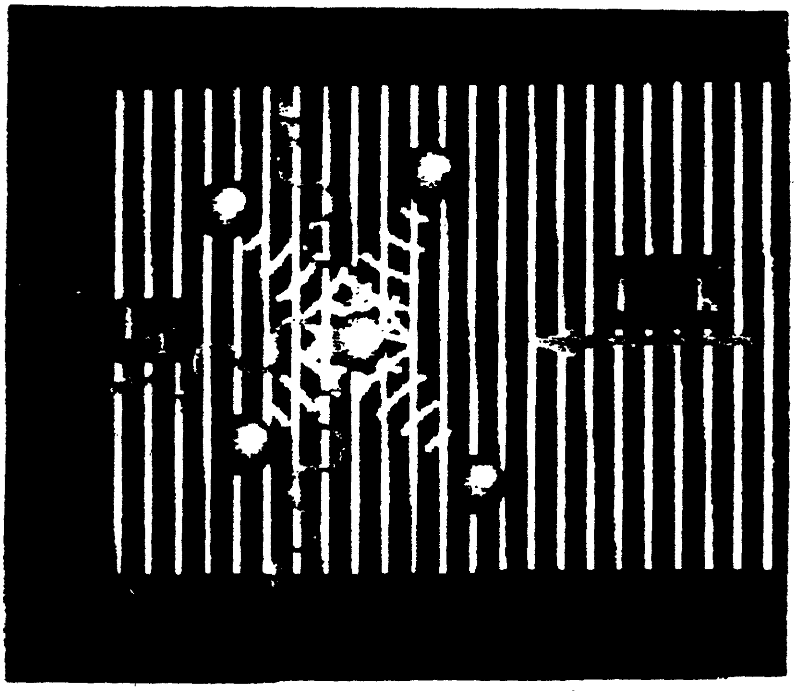
Introduction

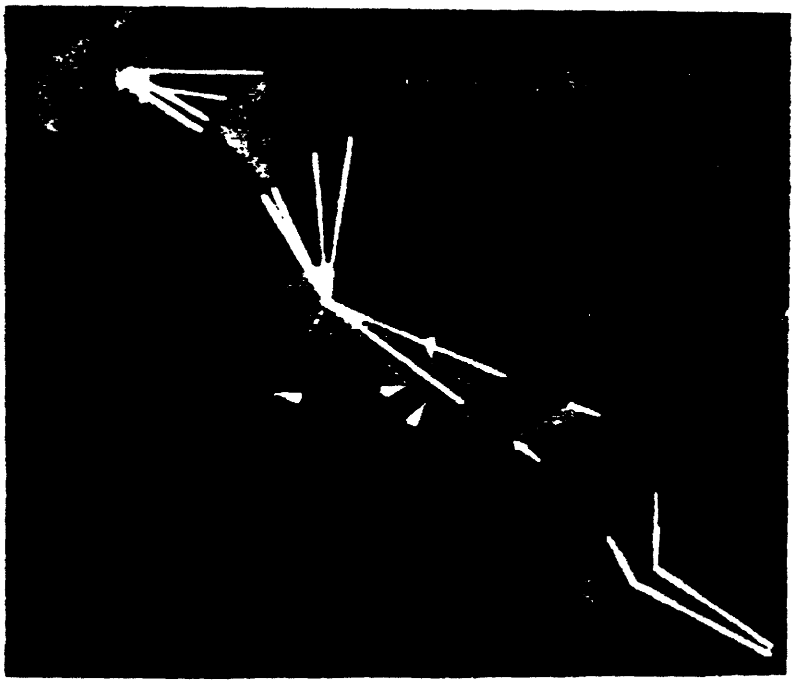
Since its invention by Dennis Gabor in 1948 [1], holography has attracted both scientists and the general public alike for its ability to record and display objects in a three-dimensional "life-like" fashion. And while human vision is stimulated by the simple hologram of Marilyn Monroe from the corner novelty store, a scientific desire exists to extend this exciting method to the realm of objects inaccessible to even the microscope-aided eye, where structures of atomic and sub-atomic dimensions lie waiting to be resolved and imaged in a straightforward way.

Originally designed for that purpose, atomic resolution in holography was not achieved in Gabor's time. During the last few years however, promising developments were reported from various fronts. Electron emission holography (EEH) techniques succeeded in imaging selected surfaces of solids [2-7], although the strongly interacting nature of electrons greatly complicates the data analysis and reconstruction of real-space holographic images. Concepts were also put forth to use X-ray fluorescence for holographic imaging [8], and an X-ray fluorescence hologram (XFH) of $SrTiO_3$ was presented [9].

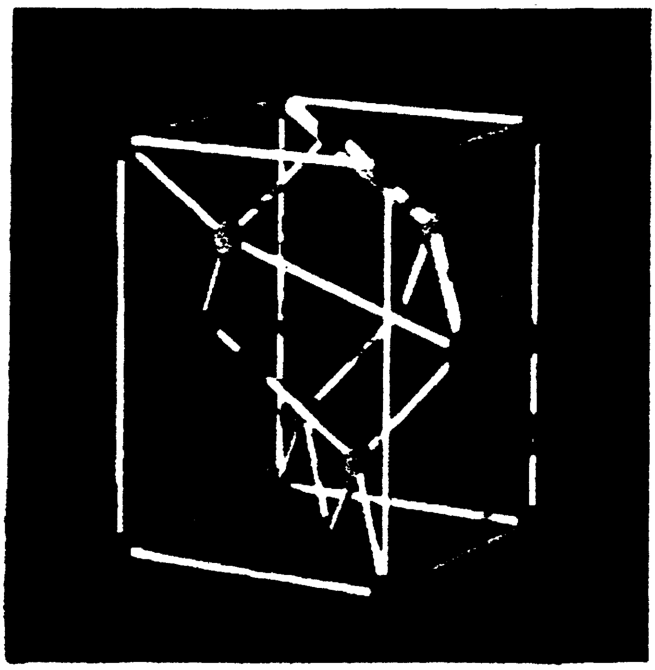
At the same time, a different approach was attempted to image the immediate vicinity of specific atoms in bulk crystals, using a novel X-ray technique: multiple-energy X-ray holography (MEXH). One sample studied was a natural hematite crystal, for which a holographic image of an iron layer contained within a (100)-plane could be generated [10]. In a second experiment, a perfect crystal of Ge was used, yielding images for atomic layers of various orientations and positions within the crystal's unit cell.

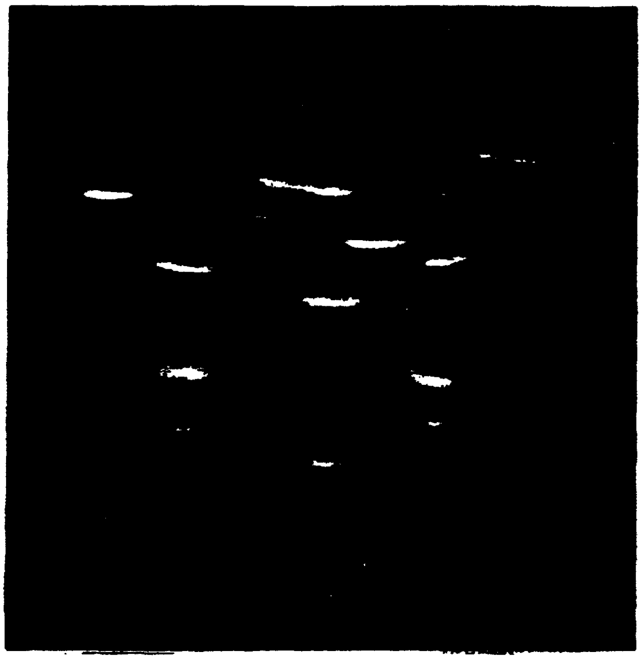
21/23





Ge





21/2

European Detector Facility
at Synchrotron Radiation Sources

1) 2D Detector for Diffraction

Essential characteristics:

- **single photon counting**
- **enrgy range 5...25 keV**
- **very high rate 10 GHz (total)**
- **large size 400mm x 400mm**
- **number of pixels, ca. 4 10^6**

Essential technical development:

- **new gain structure: MSGC, C.A.T.** -> industrial
- **2D asynchronous read out**
- **VLSI electronics** -> workshops
- **parallel data acquisition**

Possible Partners:

institute	task
HASYLAB, DESY, (D)	small angle scattering
Elettra, Triest (I)	small angle scattering
ÖAdW, Graz (Aus)	small angle scattering
ESRF (F)	small angle scattering
LURE (FR)	crystallography, C.A.T.
Elettra, Triest (I)	crystallography
Daresbury (UK)	detector system
ILL (FR)	MSGC
LIP (P)	gas gain
University of Siegen,(D)	rate, pressure, 2D read out
NCSR Demokritos (Gr)	VLSI preamplifier development
RAL, Didcot (UK)	VLSI electronics
CTS, (IE)	data aquisition

+ others

Total cost: 4.2 Mio ECU, 50% of total cost: 2.1 Mio ECU
Time: 4 years

2) Silicon drift detector array for high precision spectroscopy

Essential characteristics:

- good energy resolution < 200 eV
- short shaping time < 250 ns
- energy range 0.5...12 keV
- large number of channels, 1000
- very high rate 300 MHz (total)
- large solid angle, up to 2π

Essential technical development:

- drift diode with integrated FET → available
- VLSI preamplifier, shaper
- multi channel FADC
- parallel data acquisition (spectra)

} → workshops

Possible Partners:

institute	task
ESRF (Fr)	EXAFS, beam
Daresbury (UK)	diffraction (time res.)
Hasylab (D)	fluorescence holography
Elettra (I)	fluorescence holography
Politecnico (I)	integrated FET, simulation
University of Siegen (D)	system mounting, VLSI preamplifier, FADC
Univ. Heidelberg,(D), subcontr.	data acquisition
MPI, Garching (D), subcontr.	Si-drift detector

Total cost: 4.5 Mio ECU, 50% of total cost. 2.25 Mio ECU
Time: 3 years

- EAV
- Mobility
- Training
- industrial competitivity
- science
- feasible

M Malacarne (10 October)

TMR - LSF CONTRACTS:

- OBJECTIVES and PRINCIPLES / CONDITIONS
- STATISTICS (1st CALL)
- TECHNICAL AUDIT (HCM)

CONCERTED ACTIONS FOR ROUND-TABLES

- OBJECTIVES AND PRINCIPLES

THE EVOLUTION OF THE LSF ACTIVITY (AND OF THE F.P.)

TMR - Access to Large-Scale Facilities

The rationale of the Access to Large-Scale Activity is to open-up large nationally-owned research facilities to European users.

The proposals are divided between two sub-activities:

Researchers access:

monopartner proposals from large-scale facilities offering European-wide access to their installations

RTD projects:

transnational proposals for the purpose of improving the quality and quantity of access (ex: new instrumentation, peripheral equipment, key technologies, etc.) coordinated by a large-scale facility already supported for access

22/

TMR Access to Large-Scale Facilities

1995 Selection Round

First Call for Proposals

Publication: 17 January 1995 (closing date: 18 April)

Number of proposals received

Researchers access: 170

RTD projects: 23

Budget available

Researchers access: 63 Mio ECU

RTD projects: 9 Mio ECU

Peer review arrangements

Dedicated panel of 31 independent experts

2 meetings: 8 May and 12 June

22P

Researchers access

75 proposals selected

Funding amount to 63 Mio ECU (requested:144 Mio ECU) for an average of 840,000 ECU per facility

Continuity with HCM and LIP programmes

52 facilities already supported under HCM and LIP

23 facilities selected for the first time

12 facilities financed by the earlier programmes had their proposals rejected

RTD projects

9 proposals selected, involving 21 large-scale facilities supported under TMR/HCM/LIP plus a further 25 partners

Funding amount to 9 Mio ECU (requested: 10 Mio ECU) for an average of 1 Mio ECU per project

TMR - Access to Large-Scale Facilities

Researchers access

Conditions of contract:

- Actual Cost Basis / Unit Cost Basis (User Fees)

- Users must be both nationals of and conducting research in a Member State or Associated State (no more than 15% from countries where the owner(s)/operators(s) of the facility are located)

- Potential users throughout Member States and Associated States must be informed ⇒ publication of call for proposals in scientific journals (and Internet)

- Independent peer review of all applications ⇒ Users Selection Panel involving external experts (EC to be informed of shortlist)

- Users must publish their results in the open literature

- Participation to Round Table meetings (once a year) bringing together facilities of similar nature with representatives of their users, to discuss annual reports and other matters of common interest

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TMR - Access to Large-Scale Facilities

RTD projects

Conditions of contract

- up to 50% of the full costs of the project (lower if project is near the market place) or up to 100% of additional costs (for Universities, etc.)

- not intended to support procurement of fixed capital equipment; other durable equipment to be supported proportionally to the use of the equipment within the project

- minimum total manpower: 10 man years

TMR - Access to Large-Scale Facilities

Concerted Actions

Rationale

to build upon and strengthen the Round-Tables and to complement the other actions of the LSF activity

Objectives

a) to manage the Round-Table;
b) to maintain a watching brief on the scientific needs for access to facilities in the field;
c) to promote joint scientific and technological activities among members of the Round-Table;
d) to undertake other studies that could strengthen the Round-Table goal.

Proposals

- must involve at least 4 HCM/TMR supported facilities in 3 countries (coordinator must be a TMR supported facility);
- should involve representatives of users and of other major European facilities (also from European Third Countries);
- max funding: 10,000 ECU per year per participant (average) and 150,000 ECU per year (duration : 2-3 years).

2/7

TMR - Access to Large-Scale Facilities

Next Calls for Proposals

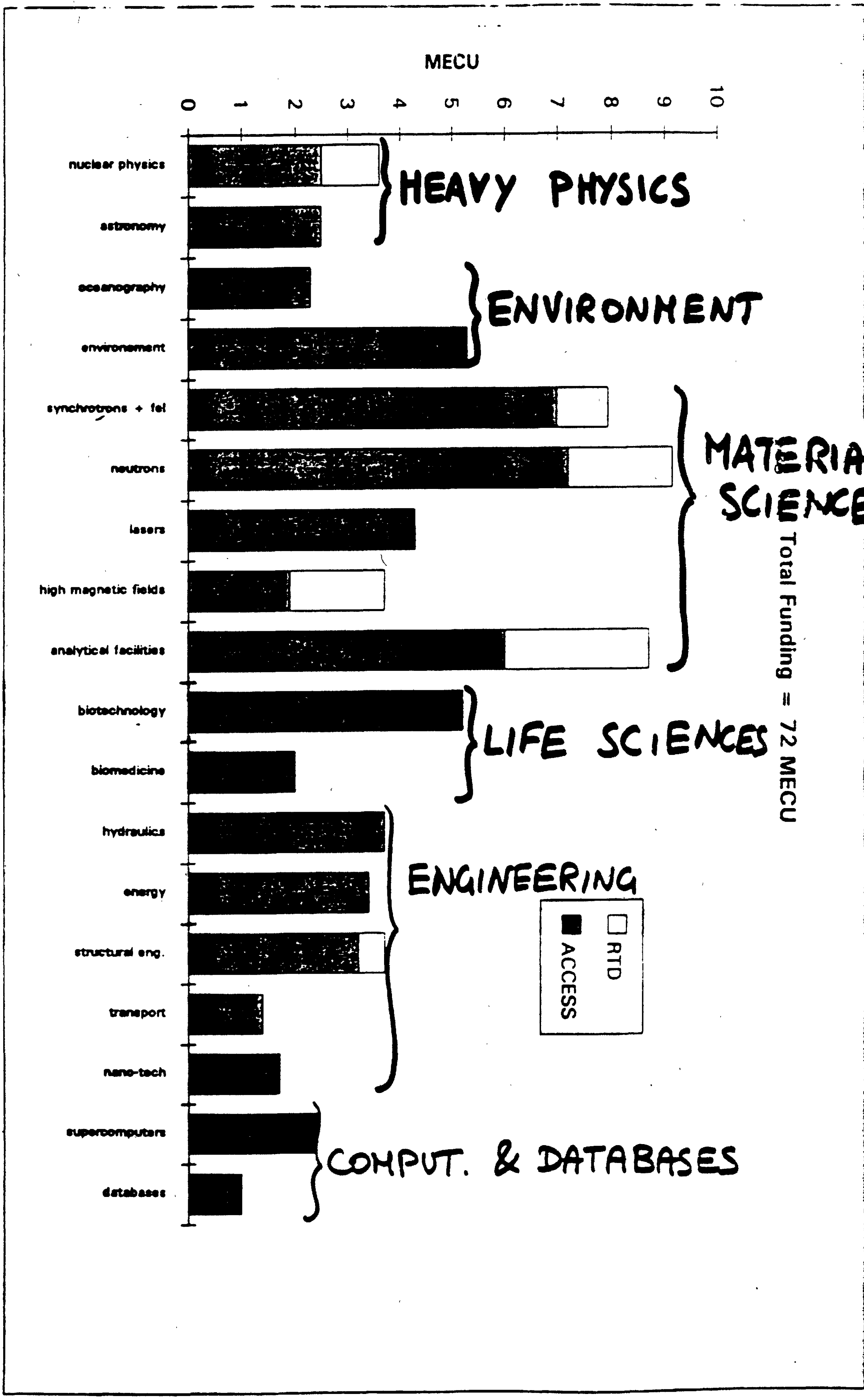
- 17 September 1996 (closing date: 16 December 1996): "Concerted Actions" (up to 2 Mio ECU)

- 15 March 1997 (closing date 16 June 1997): "Researchers access" and "RTD projects" (remaining budget: ca. 40 Mio ECU)

(wpfiles\tmr\talk_lsf.nt; 4 June 1996)

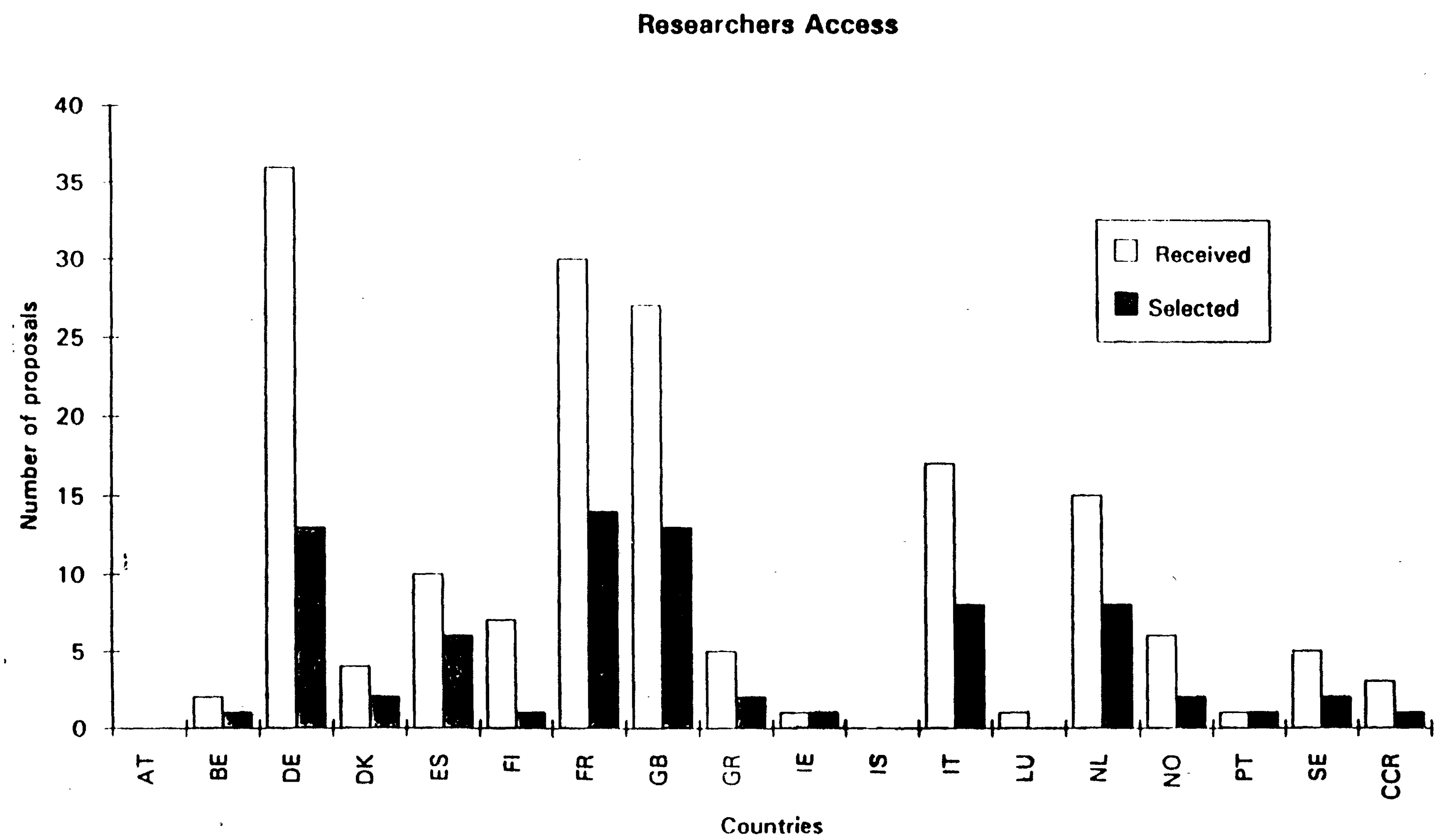
2 4/8

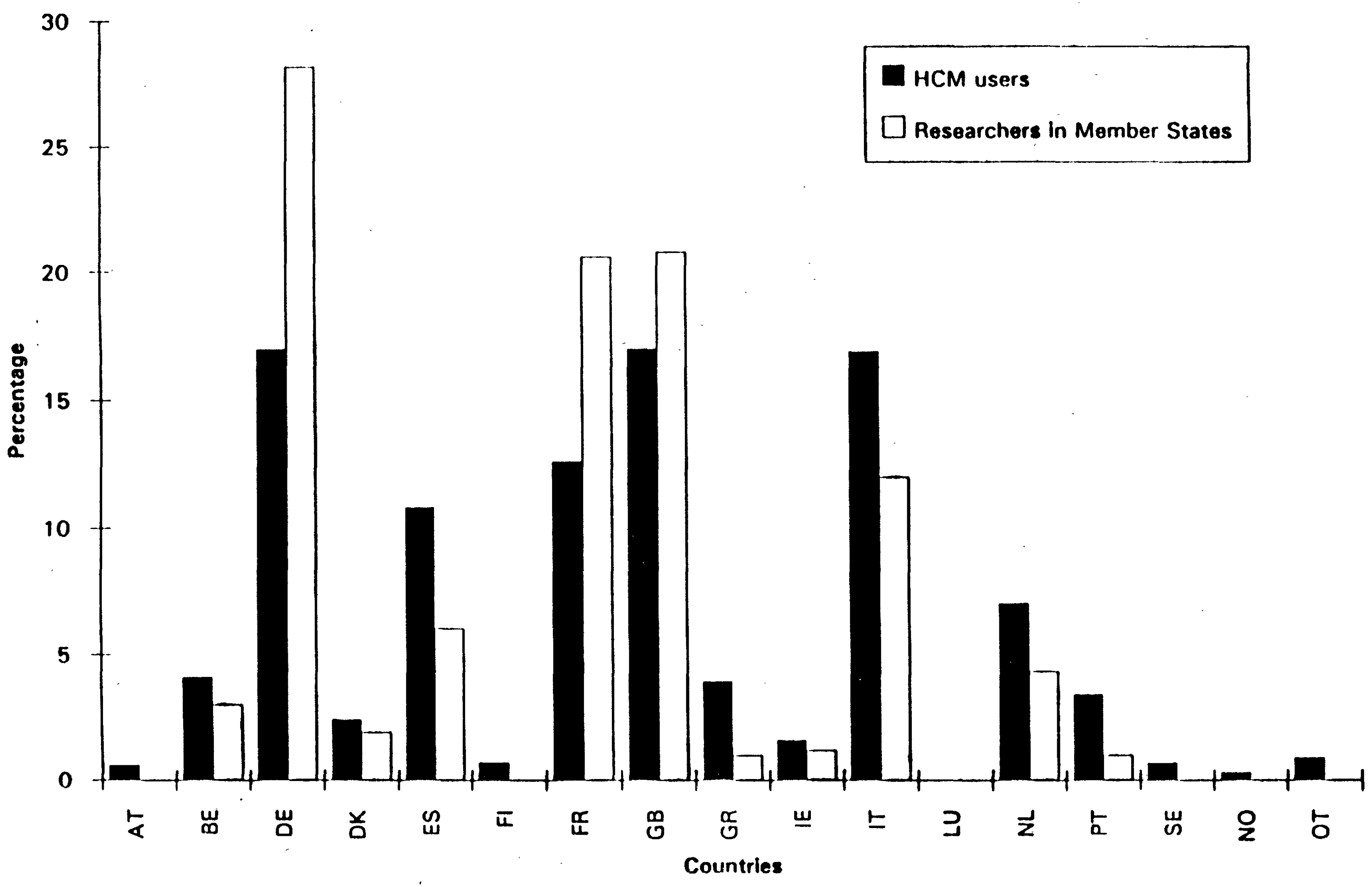
TMR - ACCESS TO LARGE-SCALE FACILITIES



TMR - ACCESS TO LARGE-SCALE FACILITIES

Countries	AT	BE	DE	DK	ES	FI	FR	GB	GR	IE	IS	IT	LU	NL	NO	PT	SE	CCR	Total
Received	0	2	36	4	10	7	30	27	5	1	0	17	1	15	6	1	5	3	170
Selected	0	1	13	2	6	1	14	13	2	1	0	8	0	8	2	1	2	1	75




30
25
20
15
10
5
0
Percentage
HCM users
Researchers in Member States
AT
BE
DE
DK
ES
FI
FR
GB
GR
IE
IT
LU
NL
PT
SE
NO
OT
Countries

22/i

SCIENCE
RESEARCH
DEVELOPMENT

EUROPEAN
COMMISSION

ACCESS TO LARGE-SCALE FACILITIES

CONCERTED ACTIONS

TRAINING AND MOBILITY
OF RESEARCHERS (TMR)
1994 - 1998

INFORMATION PACKAGE

Edition 1996

Section 22

TABLE OF CONTENTS

TIMETABLE

DATE	ACTIVITY
17 September 1996	Call for Proposals for Concerted Actions
16 December 1996	Deadline for receipt of proposals
May 1997	Results of evaluation
June 1997	First contract negotiations
August 1997	Probable earliest start of contracts

INTRODUCTION

The Concerted Actions described in this Information Package form part of the Access to Large-Scale Facilities (LSF) Activity of the Training and Mobility of Researchers (TMR) Programme (1994-98). For general information concerning the TMR Programme, please refer to the TMR Work Programme.

The LSF activity of the TMR Programme is a development of a similar activity under the previous Human Capital and Mobility (HCM) Programme (1990-94) and has also drawn on the experience acquired through the earlier Large Installations Plan (LIP) (1989-92). For more information on the LSF activity of the TMR Programme, please refer to the corresponding Information Package.

ACCESS TO LARGE-SCALE FACILITIES: DESCRIPTION OF THE ACTIVITY

The essential objective of the LSF activity is to provide research teams throughout the Member States of the Community and the Associated States[1] with access to large-scale facilities in Europe that are important for high quality research. This activity is intended to be of particular significance to researchers working in regions of the Community where such facilities do not exist.

The term "large-scale facility" refers to an installation, which is unique or rare in Europe, whose investment and operating costs are relatively high in relation to those costs in its particular field of research, and whose importance for research justifies a substantial effort at the Community level in order to widen or improve the access of researchers to the facility. Furthermore, a well-established scientific, technical and logistical infrastructure should exist to host and support external researchers.

Following the first Call for Proposals for the LSF activity, published in January 1995, the Commission selected for support seventy-five large-scale facilities, the list of which is given in Annex I. Together with contracts established under HCM, the two Programmes support access to ninety-seven different facilities.

In managing the LSF activity, the Commission has been organizing meetings that bring together large-scale facilities of the same type and representatives of their users, including users from industry where relevant. These so-called Round-Tables take place at least once a year to discuss annual activity reports and other subjects of common interest. Round-Tables have already had a significant impact on the coordination of activities in the various facilities concerned. Several Round-Tables have also attracted the participation of major international facilities not supported by the Programme.

The TMR Work Programme states that, in implementing the LSF activity, *the Commission will initiate, in conjunction with contractors under the TMR Programme (or under the earlier HCM Programme and Large Installation Plan), a number of supporting actions, which could take the form of concerted actions, to encourage the exchange of information between large-scale facilities and European researchers on subjects of common interest (for example, through studies, including conceptual studies for new large-scale facilities, seminars and workshops), complementing national and international efforts. Such measures will include the support for the Round-Tables mentioned earlier, as well as the support of Study Panels to explore the possible role of the LSF activity in relation to specific research areas*[2].

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1 For the definition of an Associated State, see chapter 2.

2 So far there have been twelve Study Panels: "Neutron Beam Sources", "Large Magnetic Fields", "Hydraulics", "Combustion Technologies", "Earthquake Engineering", "Oceanography", "High Power Lasers", "Ground Astronomy and Astrophysics", "Free-Electron Lasers", "Environmental Sciences", "Analytical Facilities", "Social Sciences".

Under the previous HCM Programme, Round-Table meetings were organized and managed directly by the Commission Services responsible for the Programme. Recently, on a limited pilot basis in preparation for the Fourth Framework Programme, some Round-Tables were supported through Concerted Action contracts in order to experiment with a more decentralized management and a more flexible support for the activities of the Round-Tables involved. The present Call for Proposals for Concerted Actions is meant to draw on the success of this pilot scheme.

1. CONCERTED ACTIONS FOR ACCESS TO LARGE-SCALE FACILITIES

RATIONALE AND OBJECTIVES

The rationale of the present Call for Proposals for Concerted Actions is to build upon and strengthen the activities of the existing Round-Tables and, in so doing, to complement the results of the other actions supported by the LSF activity. The objectives of each Concerted Action will be:

(as a minimum)

(a) **to manage the Round-Table in a particular field** for the purpose of monitoring the implementation of access contracts and to act as a forum for the regular exchange of information between facilities covered by the Round-Table and representatives of their users. Beyond this simple exchange of information, members of the Round-Table should be free to discuss any subject of mutual interest related to access, e.g. improving access through the common development of key technologies, peripheral equipment or instrumentation, organization of training courses, the joint exploitation of specialized technologies, joint publications. Each Round-Table is encouraged to be open to new members, when suitable occasions arise.

(as additional options)

(b) **to maintain a watching brief on the scientific needs for access to facilities in the field** covered by the Round-Table. The Round-Table should be in a position to assess, on a continuous basis, the main scientific developments that concern access in the areas of research to which it is related, and to provide the Commission periodically with a comparison between the scientific needs for access of European researchers to such facilities over the coming say ten years against their present and planned availability. One purpose of this action would be to follow up and keep up-to-date the reports of earlier Study Panels, where such exist. (Where perspective studies are organized by other bodies, e.g. the OECD Megascience Forum, work should not be duplicated but made use of by the Round-Table).

(c) **to promote joint scientific and technological activities among the members of the Round-Table** that could lead to an increase in the quality or quantity of access offered by the facilities covered by the Round-Table. The Concerted Action may be used to coordinate the research activities of the Round-Table members and to promote the diffusion and joint exploitation of technologies coming from such activities, in particular from RTD Projects supported under the LSF activity of the TMR Programme. These actions could also assist in the transition from laboratory to large-scale realization or in the standardization at the European level.

(d) **to undertake other studies that could strengthen the Round-Table goal** of increasing the quality or quantity of access to facilities in the field. The Concerted Action could be used, for instance, to support conceptual studies of new peripheral equipment or new instrumentation. Potential proposals for future RTD Projects could be "tested" through workshops or small feasibility studies organized, on an ad-hoc basis, by the Concerted Action itself, acting as an "incubator".

Successful proposals will always be required to implement point (a) above. The Commission reserves the right to supplement point (a) with any or all of the further actions corresponding to points (b), (c) and (d).

Presently, there are thirteen Round-Tables covering the facilities supported under the TMR and HCM Programmes. The list of these Round-Tables and of the facilities they include is given in Annex II. This list is indicative of the Round-Tables that might be considered for support in the context of this call for Concerted Actions. Applicants may however find it appropriate to propose revising the scope of an existing Round-Table or creating new ones.

CALL FOR PROPOSALS

The selection round for Concerted Actions will be initiated by a Call for Proposals, published in the Official Journal of the European Communities on 17 September 1996. The deadline for the receipt of proposals is 16 December 1996. The selection of those proposals to be financed will be conducted according to the procedures set out in Chapter 6 and following the timetable shown at the beginning of this Information Package.

BUDGET

Up to ECU 2 million will be committed as a result of the Call for Proposals described in this Information Package.

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2. *WHO CAN PARTICIPATE?*

In general, each Concerted Action selected will cover in full the work of one Round-Table. As well as large-scale facilities already supported for access under TMR and earlier programmes, participants in the Concerted Action should include organizations representing users of the facilities. Other major European facilities active in the field may also take part, as well as relevant European societies.

WHO CAN ACT AS COORDINATOR?

The coordinator of a Concerted Action must be a contractor for a large-scale facility already supported for access under the TMR Programme (see list in Annex I).

WHO CAN BE A PARTICIPANT?

From Member States of the Community

Participation in the Concerted Actions is open to any legal entity established in the Community that is engaged in research activities in the exact, natural, economic and management sciences, as well as in those social and human sciences that contribute to the objectives of the Fourth Framework Programme.

From Associated States

If a non-Member State has signed an agreement with the Community for association to the implementation and financing of the TMR Programme (referred to as a "State associated to the Programme" or "Associated State"), legal entities from that country can participate in the Concerted Actions under similar conditions as organizations from Community Member States.

Note: At the time of preparing this Information Package, the following States were associated with the

Programme: Iceland, Liechtenstein and Norway. Furthermore, an association agreement with Israel has been signed, but has still to be ratified by both parties; entities from Israel are allowed to participate in proposals under this call on the understanding that the agreement will have entered into force by the date of the decision of the Commission of the financial support of any proposal concerned.

From European Third Countries

Participation is also open to any legal entity established in a European Third Country on a project-by-project basis, though without financial support from the TMR Programme. Participation must be in the interest of Community policies.

At present, these European Third Countries are: Albania, Armenia, Azerbaijan, Belarus, Bulgaria, Czech Republic, Cyprus, Estonia, Georgia, Hungary, Latvia, Lithuania, Malta, Moldova, Poland, Romania, Russia, Slovakia, Slovenia, Switzerland, Turkey and Ukraine.

From International Research Organizations

Any international research organization may participate without financial support from the TMR Programme. However, certain European intergovernmental research organizations[3] are eligible to receive financial support from the TMR Programme.

Unsuccessful Applicants

It should be noted that Round-Tables will continue to be organized and managed by the TMR Programme management for those facilities with TMR and HCM access contracts that are not involved in the Concerted Actions that result from this Call for Proposals.

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3. *WHAT ARE THE CRITERIA FOR PROPOSALS ?*

ELIGIBILITY CRITERIA

Only proposals coordinated by the contractor for a large-scale facility supported for access under the TMR Programme will be eligible. The proposal must contain, as participants, at least three other non-affiliated large-scale facilities currently supported for access under the TMR or HCM Programmes. These facilities participating in the proposal must be located in at least three different Member States or Associated States, with at least one of the facilities being located inside the Community.

Note: Two organisations are affiliated if either one directly or indirectly controls the other or if both are directly or indirectly controlled by the same parent organisation. Organisation A is considered as controlling B if:

- *A holds more than 50% of the share capital of B.*

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[3] European intergovernmental research organizations, eligible to be supported as participants in this activity, are the European Molecular Biology Organzation (EMBL), the European Organization for Nuclear Research (CERN), the European Southern Observatory (ESO), the European Space Agency (ESA), the European Synchrotron Radiation Facility (ESRF), the Institut Max Von Laue - Paul Langevin (ILL) and the International Centre for Advanced Mediterranean Agronomic Studies (MAI).

- *A holds more than 50% of the shareholders' voting rights of B.*
- *A holds the decision making powers of B.*

FINANCIAL GUIDELINES

The following guidelines are provided to assist applicants in formulating their proposals for financial support.

Each Concerted Action should have a duration of 2 to 3 years. In general, the Community contribution will not exceed an average of ECU 10,000 per-year per participant nor a total of ECU 150,000 per year per action.

EVALUATION CRITERIA

Proposals will be selected on the following basis:

- the ability of the applicants to provide an effective management of the Round-Table and coordination of its activities;
- the potential benefits in terms of the expected increase in the quality or quantity of access for researchers to the large-scale facilities involved in the Round-Table.

It is not necessary for all the prospective members of the Round-Table to be involved as participants in the proposal itself. However, proposals involving, as participants, a high number of the facilities and user representatives that will be members of the Round-Table will be preferred over proposals with a more limited participation

The Commission Services may negotiate with coordinators of successful proposals the final list of participants to the Concerted Action as well as of participants to the corresponding Round-Table.

4. *HOW TO PREPARE AND WRITE A PROPOSAL*

THE PROPOSAL FORM

This Information Package contains a Proposal Form in Annex III. The Form is divided into four parts: general proposal information, individual partner information, proposal abstract and proposal description.

(1) General Proposal Description

This first part of the Proposal Form contains the general information that will be entered into the TMR Programme's data base, notably: the proposal title, a short title or acronym that will be used to identify the proposal, details of the coordinator including name and postal and telecommunication addresses, a list of all the participants involved and their respective roles in the Round Tables, proposed duration, and the financing requested.

(2) Individual Partner Information

The Individual Partner Information Sheets must be completed separately for each participant in the proposal, including the coordinator. The principal information requested is the legal name and address of the participant and the name of the technical contact. To ensure that proposals have the full support of all participating organizations, each Individual Partner Information Sheet must be certified and signed by an authorised signatory. Only forms with original signatures will be accepted. The

Commission will, however, accept photocopies or faxed copies of the original forms containing the appropriate signatures provided that they are countersigned with an original signature of the proposal coordinator.

(3) **Proposal Summary**

The third part of the completed Form provides a brief summary of the proposed action describing its main aspects as indicated under points (a), (b), (c) and (d) of section (4) below. The summary should be a maximum of 300 words of plain typed text, preferably in English.

The summary should not take the form of an abstract of the proposal, but rather of a self-contained description of the concerted action that would result if the proposal were to be funded. It should be informative to people working in related fields and, insofar as possible, understandable to a scientifically literate lay reader.

(4) **Proposal Description**

The Proposal Description is that part of the Proposal Form on which the scientific/technical evaluation will be based. It is structured to correspond to the objectives of the Concerted Actions discussed in Chapter 1 of this Information Package and to take into account the evaluation criteria discussed in Chapter 3.

Applicants should ensure that their Proposal Description addresses all the points raised by this part of the Proposal Form, since proposals that do not demonstrably fulfil the necessary criteria will be rejected. Close attention should be given to the following points:

(a) **To manage the Round-Table.** The proposal must indicate who will be the members of the Round-Table, how it will be managed and what resources will be devoted to the exchange of information between facilities and the users community. Please note that active user representation is considered to be an essential feature of a good Round-Table. The proposal should also outline a typical agenda for a Round-Table. Applicants should bear in mind the following:
- general meetings must occur at least once a year and should normally be hosted by the facilities taking part on a rotating basis;
- the members of the Round-Table and of the TMR Programme management are to be informed of the date and venue of each meeting at least four months in advance;
- the TMR Programme management will normally be represented at each general meeting;
- the agenda and working papers for each meeting should be circulated to the members at least two weeks in advance of the meetings;
- a summary record of the meetings will be taken under the responsibility of the coordinator and distributed to all Round-Table members and to the TMR Programme management within one month.

(b) **To maintain a watching brief concerning access in the field.** The proposal should indicate what measures are envisaged in order to assess the main scientific developments for access in the areas of research to which the Round-Table is related. Reports of previous Study Panels, of the OECD Mega-Science Forum and of similar bodies should be mentioned, where relevant.

(c) **To promote joint scientific and technological activities.** The proposal should describe the objectives and workplan for such joint activities which may involve some or all of the participants in the Round Table.

(d) **Other relevant studies.** The proposal should outline the objectives and structure of any additional joint study that could lead to an improvement of the access to facilities in the field.

5. *HOW TO SUBMIT A PROPOSAL*

SUBMISSION BY THE COORDINATOR

The coordinator is responsible for the internal management and administration of the proposal and liaison with the Commission.

Proposals may be submitted in any official language of the Community. However, it is advisable to supply at least the summary in English. This will facilitate the assessment of proposals.

DELIVERY

For applications sent by post, the original of the proposal, together with three complete photocopies of the proposal, should be delivered in a single package to:

European Commission
Directorate-General XII: Science, Research and Development
TMR Programme - Unit XII-G-2
Office: MO75 5/30
Rue de la Loi, 200
B-1049 BRUSSELS
Belgium

Alternatively, the package may be delivered by courier or by hand to the following address:

European Commission
Directorate-General XII: Science, Research and Development
TMR Programme - Unit XII-G-2
Office: MO75 5/30
Square de Meeûs, 8
B-1050 BRUSSELS
Belgium

In exceptional circumstances, the package may also be delivered before the deadline to an Information Office of the Commission located in one of the Members States of the Community or in an Associated State.

All parcels should be clearly marked **"TMR - LSF Concerted Action Proposal"**.

The Commission will not accept individual pages or additional documents sent separately from the main proposal package. Applications sent by fax will not be accepted. Copies should be complete and of good quality, as they will be used for scientific evaluation.

DEADLINE

Proposals must reach the Commission **by 12h00 local time on 16 December 1996**. Proposals arriving up to 72 hours after this deadline will, however, be accepted if proof can be provided that they were posted or handed to a courier service before the deadline. No other exceptions to this rule can be allowed.

Note: Coordinators are advised always to obtain proof of dispatch and, where possible, proof of delivery, so that the Commission can rectify problems caused by the late delivery of proposals sent in good time

ACKNOWLEDGEMENT OF RECEIPT

The official acknowledgement-of-receipt form, which is part of the proposal form, has to be filled in by the coordinator and included in the parcel in which the proposal is delivered. This will ensure that the acknowledgement is returned correctly addressed. Before it is returned, normally within three weeks after proposal delivery, the Commission staff will record the date of receipt and issue a reference number for use in all subsequent correspondence relating to the proposal.

6. *EVALUATION AND SELECTION OF PROPOSALS*

The Commission will ensure a confidential, fair and equitable evaluation of proposals. This evaluation will have due regard to the criteria set out in Chapter 3. It will be carried out under the responsibility and coordination of the Commission, assisted by external independent experts chosen by the Commission.

EVALUATION OF PROPOSALS

The evaluation of proposals for LSF Concerted Actions will proceed as follows:

- Verification of the eligibility of proposals by the TMR Programme management;

- Evaluation of the proposals through a peer review system carried out by a dedicated LSF Concerted Actions Panel consisting of independent external experts.

- Before the Panel meets, each proposal will be sent by post for assessment against scientific/technical criteria by at least two Panel Members acting as primary assessors, who may consult other independent experts as they wish;

- At its meeting in Brussels, the Panel will examine each proposal on the basis of the primary assessments. The Panel will also take account of the experience gained in the implementation of the TMR and earlier Programmes. The Panel will then establish a shortlist of the proposals, or parts of proposals, that it recommends for selection, with an indication of their funding level. Where the recommended amount of funding is less than the original request, or where it is felt that two or more shortlisted proposals could be usefully merged together, the Panel may be asked to give guidelines to assist the subsequent contract negotiation.

SELECTION OF PROPOSALS

Following the completion of the evaluation process, the selection of proposals proceeds as follows:

- Preparation by the Programme management of the Draft Shortlist of proposals to be funded;

- Opinion of the Programme Committee for the Training and Mobility of Researchers for proposals on the Draft Shortlist of ECU 100,000 or more. This Committee is composed of Member State nominees (and nominees from Associated States). Its role is to assist the Commission in the implementation of the Programme;

- Decision by the Commission after completion of internal procedures;

- Communication of acceptance and rejection notices to applicants.

7. CONTRACTS: PROCEDURES AND PRINCIPLES

NEGOTIATION OF CONTRACTS

Coordinators of successful proposals may be required to travel to Brussels to negotiate the details of the contract. They will also be asked to provide:

- more detailed financial information, in particular on the justification of costs;
- an appropriate project programme for inclusion in the contract.

The Commission may require changes to a proposed action on the basis of the evaluation. In order to facilitate the negotiation process, the coordinator should:

- be familiar with the allowable costs that can be supported under these contracts;
- provide rapidly all the detailed information requested.

This will help to get the action started as quickly as possible, and contribute to the effectiveness of its management.

NOTE: The negotiation process will be terminated if:
- *the negotiation process cannot be completed within the specified time;*
- *the applicant seeks to modify substantially the proposal*

CONCERTED ACTION CONTRACTS: MAIN PRINCIPLES

A model contract for concerted actions, setting out detailed terms and conditions, is available on request.

The Role of the Coordinator

The coordinator will be the contractor with whom the Commission signs the contract.

The coordinator is responsible for the management of the action and should therefore have the appropriate management, as well as the technical, expertise to direct the action. The coordinator's responsibilities also include administrative responsibilities, such as general liaison with the Commission, submission of progress reports and the distribution of the financial support paid by the Commission.

Associated Contractors

The other participants in the concerted action will be associated contractors. They will each sign an associated contract with the contractor. The contractor and the associated contractors will assume joint and several responsibility for completing the action envisaged.

European Economic Interest Groupings

Participants may wish to establish a European Economic Interest Grouping (EEIG) as a separate legal entity to enter into the contract with the Commission and perform the work. In some cases, an EEIG can be a useful mechanism for participating in EC RTD programmes and exploiting the results.

A guide to the role of EEIGs in RTD can be obtained from the Directorate-General XII and more detailed documentation is also available from Directorate-General XV (Financial Institutions and Company Law)

Procedures

Two copies of the contract will be sent to the contractor for signature; the Commission will sign these documents on their return.

The operative commencement date of the action will normally be the first day of the month following the signature of the contract by the Commission.

Payments

All payments will be made in ECU. An advance payment will be made after the signature of the contract by the Commission.

Periodic payments, normally at 12 monthly intervals, will depend on the submission and approval of progress reports, and appropriate cost claims. For small contracts, the Commission may decide to use, with the agreement of the contractors, a fixed contribution contract.

A retention (normally 10% of the EC contribution) is withheld until all the final documents (technical and financial) have been received and approved by the Commission.

Costs

The Commission will not contribute to any costs incurred before the formal commencement date specified in the contract.

Community funding will cover up to 100% of the allowable costs of the action. Allowable costs for Concerted Actions may include:

(A) *Personnel costs:* actual employment costs (salaries, grants, social charges, pension costs) of professional and post-graduate staff directly involved in the management and coordination of the action, but excluding the personnel costs of such staff while they are engaged in research activities.

(B) *Exchange and Mobility costs:* costs of holding meetings for some or all participants; travel and subsistence relating to visits to, and meetings with, other participants and relating to short-term exchanges of personnel between the participants not exceeding three months. *(Please note that the participation to Round-Table meetings of representatives of TMR supported facilities is to be charged to their access contract and not to the concerted action.)*

(C) *Support Services:* consumables, materials, computing, external assistance (if agreed by the Commission), publications, to the extent that they relate to the action.

(D) *Overhead Costs:* a maximum of 20% of the other allowable costs (A + B + C) as a contribution to indirect general costs including administrative, non-professional and secretarial staff, telephone, etc.

Concerted action contracts are not intended to support the procurement of durable equipment.

Project Programme

Each contract will contain a technical annex specifying the project programme to be implemented by the contractors in return for the EC funding.

The project programme will include a description of the objectives and work plan of the Concerted Action, of the role of the participants and of the relevant deliverables and milestones of the action.

Reports

The coordinator will be expected to provide annual progress reports giving an overview of the action, in order to assist the Commission in monitoring work and results. At the end of the action, final technical and financial reports must be provided covering all the action, objectives achieved and conclusions.

Auditing

The Commission or the Court of Auditors may order the auditing of any contract while it is running, and up to two years after its completion.

Contractors are not required to send supporting documentation with the cost statements. They are, however, required to keep appropriate documentation for possible inspection for two years after the last report has been submitted under the contract.

ANNEX I

LIST OF LARGE-SCALE FACILITIES SUPPORTED FOR ACCESS UNDER THE TMR PROGRAMME

NUCLEAR PHYSICS

CENTRE DE RECHERCHES DU CYCLOTRON
Université Catholique de Louvain
BELGIUM

GRAND ACCELERATEUR NATIONAL D'IONS LOURDS (GANIL)
FRANCE

ACCELERATOR LABORATORY
University of Jyväskylä
FINLAND

GESELLSCHAFT FUER SCHWERIONENFORSCHUNG (GSI)
Gesellschaft für Schwerionenforschung mbH
GERMANY

GROUND ASTRONOMY

EUROPEAN VLBI NETWORK
Joint Institute for Very Long Baseline Interferometry (JIVE) in Europe
NETHERLANDS

EUROPEAN NORTHERN OBSERVATORY - CANARY ISLANDS
Instituto de Astrofisica de Canarias
SPAIN

OCEANOGRAPHY

RESEARCH VESSEL SONNE
Forschungszentrum Julich GmbH (KFA)
GERMANY

GLORIA & TOBI.
Natural Environment Research Council - Southampton Oceanography Centre (SOC)
UNITED KINGDOM

MANNED SUBMERSIBLES CYANA AND NAUTILE
IFREMER - Institut Francais de Recherche pour l'Exploitation de la Mer
FRANCE

ENVIRONMENTAL SCIENCES

NY-ALESUND INTERNATIONAL ARCTIC ENVIRONMENTAL RESEARCH STATION
Norwegian Polar Institute of the Ministry of Environment
NORWAY

GRANDE PLATEFORME TOURNANTE DE GRENOBLE "CORIOLIS"
Universite Joseph Fourier
FRANCE

METEOROLOGICAL RESEARCH FLIGHT (MRF)
Secretary of State for Defence - Ministry of Defence - Meteorological Office
UNITED KINGDOM

AVION DE RECHERCHE ATMOSPHERIQUE ET DE TELEDETECTION FOKKER 27 (ARAT)
Centre National de la Recherche Scientifique - Institut National des Sciences de l'Univers
FRANCE

DLR RESEARCH AIRCRAFT FALCON 20
German Aerospace Research Establishment
GERMANY

DIGITAL AIRBORNE IMAGING SPECTROMETER (DAIS)
Deutsche Forschungsanstalt für Luft- und Raumfahrt e.V. (DLR)- Institute of Optoelectronic DLR
GERMANY

ICE AND ENVIRONMENTAL TECHNOLOGY LABORATORIES OF THE HAMBURGISCHE SCHIFFBAU-VERSUCHSANSTALT GmbH (ARCTELAB)
GERMANY

SYNCHROTRONS

ELETTRA
Sincrotrone Trieste SCpA
ITALY

BERLINER ELEKTRONENSPEICHERRING-GESELLSCHAFT FUR SYNCHROTRONSTRAHLUNG (BESSY)
GERMANY

SRS - DARESBURY LABORATORY
The Council for the Central Laboratory of the Research Councils
UNITED KINGDOM

HAMBURGER SYNCHROTRONSTRAHLUNGSLABOR HASYLAB
Stiftung Deutsches Elektronen-Synchrotron (DESY)
GERMANY

LABORATOIRE POUR L'UTILISATION DU RAYONNEMENT ELECTROMAGNETIQUE (LURE)
Centre National de la Recherche Scientifique
FRANCE

FREE ELECTRON LASERS

FREE ELECTRON LASER FOR INFRARED EXPERIMENTS (FELIX)
Stichting voor Fundamenteel Onderzoek der Materie - Instituut voor Plasmafysica Rijnhuizen
NETHERLANDS

THE INFRARED FREE ELECTRON LASER FACILITY: CLIO, LURE
Centre National de la Recherche Scientifique, Laboratoire pour l'Utilisation du Rayonnement Electromagnetique
FRANCE

NEUTRON BEAM SOURCES

THE ISIS PULSED NEUTRON FACILITY
Council for the Central Laboratory of the Research Councils - Rutherford Appleton Laboratory
UNITED KINGDOM

ISIS PULSED MUON SOURCE
Council for the Central Laboratory of the Research Councils - Rutherford Appleton Laboratory
UNITED KINGDOM

COLD NEUTRON FACILITY AT DR3
Risø National Laboratory
DENMARK

STUDSVIK NEUTRON RESEARCH LABORATORY (NFL)
Uppsala University
SWEDEN

ORPHEE - LABORATOIRE LEON BRILLOUIN
Commissariat à l'Energie Atomique, Direction des Sciences de la Matière
FRANCE

BERLIN NEUTRON SCATTERING CENTER (BENSC)
Hahn-Meitner-Institut Berlin GmbH
GERMANY

HIGH POWER LASERS

PHEBUS - CEA/L-V. LASER FACILITY
Commissariat à l'Energie Atomique, Limeil-Valenton
FRANCE

CENTRAL LASER FACILITY (CLF)
Council for the Central Laboratory of the Research Councils - Rutherford Appleton Laboratory
UNITED KINGDOM

LABORATOIRE POUR L'UTILISATION DES LASERS INTENSES - (LULI)
Centre National de la Recherche Scientifique
FRANCE

HIGH MAGNETIC FIELDS

GRENOBLE HIGH MAGNETIC FIELD LABORATORY (HMFL)
Centre National de la Recherche Scientifique
FRANCE

HIGH FIELD MAGNET LABORATORY (HFML)
Katholieke Universiteit Nijmegen
NETHERLANDS

ANALYTICAL FACILITIES

LABORATORIO EUROPEO DI SPETTROSCOPIE NON-LINEARI (LENS)
Laboratorio Europeo di Spettroscopie Non-Lineari
ITALY

MAX BORN INSTITUTE (MBI) FOR NONLINEAR OPTICS AND SHORT PULSE SPECTROSCOPY
Forschungsverbund Berlin E.V. - Gemeinsame Verwaltung
GERMANY

LIF: ENSTA-ECOLE POLYTECHNIQUE - CNRS
Association pour la Recherche et le Developpement de Methodes et Processus Industriels - ARMINES
FRANCE

LUND LASER CENTRE (LLC)
Lund Universitet
SWEDEN

ULTRAVIOLET LASER FACILTY (ULF)
Foundation for Research and Technology-Hellas, Institute of Electronic Structure and Laser
GREECE

HIGH AND VERY HIGH TEMPERATURE NUCLEAR MAGNETIC RESONANCE (NMR) SPECTROMETERS

Centre National de la Recherche Scientifique - Centre de Recherche sur la Physique des Hautes Températures
FRANCE

ULTRALOW TEMPERATURE FACILITY
University of Bayreuth
GERMANY

<u>BIOTECHNOLOGY</u>

MARINE PELAGIC FOOD CHAIN RESEARCH
University of Bergen
NORWAY

SON NMR FOR BIOMOLECULAR RESEARCH AND STRUCTURAL ANALYSIS OF FUNCTIONAL BIOMACROMOLECULE (SON-NMR)
Stichting Scheikundig Onderzoek in Nederland
NETHERLANDS

LARGE SCALE FACILITY FOR RELAXOMETRY & MAGNETIC RESONANCE ON PARAMAGNETIC BIOMOLECULES (NMR-PARABIO)
Consorzio Interuniversitario Risonanze Magnetiche di Metalloproteine Paramagnetiche
ITALY

FRANKFURT UNIVERSITY CENTRE FOR BIOMOLECULAR NMR (BIO-NMR)
Johann-Wolfgang-Goethe Universitat Frankfurt
GERMANY

CNR - SERVIZIO DI SPETTROMETRIA DI MASSA (SESMA)
Consiglio Nazionale delle Ricerche
ITALY

WAGENINGEN AGRICULTURAL NMR CENTER
Landbouwuniversiteit Wageningen
NETHERLANDS

<u>BIOMEDICINE</u>

TWO - BIOMEDICAL PRIMATE RESEARCH CENTRE (BPRC)
NETHERLANDS

MRC - HUMAN MOVEMENT AND BALANCE UNIT (HMBU)
Medical Research Council
UNITED KINGDOM

PATERSON INSTITUTE FOR CANCER RESEARCH FREE RADICAL RESEARCH FACILITY
Christie Hospital (NHS) Trust - Paterson Institute for Cancer Research
UNITED KINGDOM

<u>HYDRAULICS</u>

DELFT HYDRAULICS
Stichting Waterloopkundig Laboratorium - Delft Hydraulics
NETHERLANDS

DHI OFFSHORE WAVE BASIN AND 3D WAVE GENERATING SYSTEM
Danish Hydraulic Institute

DENMARK

CANAL DE INVESTIGACION Y EXPERIMENTACION MARITIMA (CIEM)
Universidad Politecnica de Catalunya, Laboratorio de Ingenieria Maritima
SPAIN

LABORATORIO DE DINAMICA DEL BUQUE (LDB)
Canal de Experiencias Hidrodinamicas del Pardo, Laboratorio de Dinàmica del Buque
SPAIN

TANQUE DE OLEAJE MULTIDIRECCIONAL DEL CENTRO DE ESTUDIOS DE PUERTOS Y COSTAS DEL CEDEX (TOM)
Centro de Estudios y Experimentacion de Obras Publicas, Centro de Estudios de Puertos y Costas
SPAIN

HR WALLINGFORD LTD
UNITED KINGDOM

ENERGY

PLATAFORMA SOLAR DE ALMERIA (PSA)
Centro de Investigaciones Energeticas, Medioambientales y Tecnologicas (CIEMAT)
SPAIN

INTERNATIONAL FLAME RESEARCH FOUNDATION (IFRF)
NETHERLANDS

ENEL S.p.a. - CENTRO RICERCA TERMICA
ITALY

CARDIFF LARGE SCALE COMBUSTION FACILITIES
University of Wales - College of Cardiff
UNITED KINGDOM

FACILITIES FOR AEROTHERMODYNAMIC AND PROPULSION STUDIES (FAPS) Centre National de la Recherche Scientifique Laboratoire d'Aérothermique
FRANCE

STRUCTURAL ENGINEERING

EUROPEAN LABORATORY FOR STRUCTURAL ASSESSMENT (ELSA)
Joint Research Centre, Ispra
ITALY

TAMARIS LABO D'ETUDE DE MECANIQUE SISMIQUE
Commissariat a l'Energie Atomique
FRANCE

EARTHQUAKE ENGINEERING RESEARCH CENTRE
University of Bristol
UNITED KINGDOM

NATIONAL TECHNICAL UNIVERSITY LABORATORY FOR EARTHQUAKE ENGINEERING
National Technical University of Athens
GREECE

ISMES
Structural Dynamics Testing Laboratory
ITALY

LABORATORIO NACIONAL DE ENGENHARIA CIVIL (LNEC)
PORTUGAL

TRANSPORT, MANUFACTURING AND MICROTECHNOLOGIES

CRIS - CENTRO RICERCHE TRASPORTI E SUPERCONDUTTIVITA
ANSALDO - Consorzio Ricerche Innovative per il Sud
ITALY

COPES - CLAUSTHAL CENTRE OF PROCESS ENGINEERING DESIGN AND RESEARCH
Technical University of Clausthal
GERMANY

NATIONAL MICROELECTRONICS RESEARCH CENTRE (NMRC)
University College Cork
IRELAND

SUPERCOMPUTERS

EDINBURGH PARALLEL COMPUTING CENTRE UNIVERSITY OF EDINBURGH (EPCC)
University of Edinburgh
UNITED KINGDOM

CONSORZIO INTERUNIVERSITARIO PER LA GESTIONE DEL CENTRO DI CALCOLO ELETTRONICO DELL'ITALIA NORD ORIENTALE (CINECA)
ITALY

CESCA - CENTRE DE SUPERCOMPUTACIO DE CATALUNYA, CENTRE EUROPEU DE PARALLELISME DE BARCELONA
Universidad Politecnica de Catalunya
SPAIN

DATABASES FOR SOCIAL SCIENCES

INSTITUTE FOR THE SOCIAL SCIENCES (ISS)
University of Essex
UNITED KINGDOM

CENTRAL ARCHIVE FOR EMPIRICAL SOCIAL RESEARCH (ZA)
University of Köln
GERMANY

LIST OF ROUND-TABLES

Name of Round-Table	HCM/TMR supported Facilities
Synchrotron Radiation and Free-Electron Laser Facilities	BESSY, Berlin (DE) LURE, Orsay (FR) SRS, Daresbury (GB) HASYLAB, Hamburg (DE) ELETTRA, Trieste (IT) EMBL, Grenoble (FR) FELIX, Utrecht (NL) CLIO/LURE, Orsay (FR)
Neutron Sources	ORPHEE, Saclay (FR) ISIS(Neutrons)/RAL, Didcot (GB) ISIS(Muons)/RAL, Didcot (GB) BER2(Bensc), Berlin (DE) BER2(Neact), Berlin (DE) DR3, Riso (DK) NFL, Studsvik (SE) SILOE, Grenoble (FR)
High Performance Computing	CINECA, Bologna (IT) CESCA, Barcelona (ES) EPCC, Edimburgh (GB) CNRM, Toulouse (FR) HCCPR, Braknell (GB) KRZ, Hamburg (DE) EMBL, Heidelberg (DE)
Oceanography and Hydraulics	IFREMER, Issy-les-Moulineaux (FR) SOC/NERC, Southampton (GB) KFA, Rostock (DE) GEOMAR, Kiel (DE) Delft Hydraul., Delft (NL) HR, Wallingford (GB) DHI, Hørsholm (DK) GWK, Uni. Hanover (DE) CIEM, Barcelona (ES) LDB, Madrid (ES) TOM, Madrid (ES)
Structural Engineering	Univ. Bristol (GB) Tech. Univ. Athens (GR) LNEC, Lisbon (PT) ISMES, Bergamo (IT) TAMARIS, Saclay (FR) ELSA, Ispra (JRC)
Life Sciences	SON-NMR, Utrecht (NL) NMR-PARABIO, Florence (IT) BIO-NMR, Frankfurt (DE) Agro NMR, Wageningen (NL) SESMA, Naples (IT) Marine Res., Bergen (NO) MRC-HMBU, London (GB) BIRCH, Helsinki (FI) Paterson Inst., Manchester (GB) TWO-BPRC, Rijswijk (NL)

Name of Round-Table	HCM/TMR supported Facilities
Laser Facilities	ULF, Creete (GR) LENS, Florence (IT) LIF, Palaiseau (FR) LLC, Lund (SE) MBI, Berlin (DE) CLF/RAL, Didcot (GB) PHEBUS, Limeil (FR) LULI, Palaiseau (FR) ASTERIX, Garching (DE) Fraunhofer-Inst., Aachen (DE)
Nuclear Physics and Astrophysics	GSI, Darmstadt (DE) GANIL, Caen (FR) SATURNE, Saclay (FR) Univ. Louvain (BE) Univ. Jyväskylä (FI) IAC, Canarias (ES) VLBI (JIVE), Dwingeloo (NL)
High Magnetic Fields, NMR, Low Temperatures and High Pressures	HMFL, Grenoble (FR) HFML, Nijmegen (NL) High Temp. NMR, Orleans (FR) Low Temp., Helsinki (FI) Low Temp., Bayreuth (DE) High Press., Bayreuth (DE)
Environmental Sciences	CORIOLIS, Grenoble (FR) MRF C-130 Aircraft (GB) ARAT Aircraft (FR) FALCON 20 Aircraft (DE) DAIS/DLR Aircraft (DE) Ny-Alesund Arctic Station (NO) ARCTELAB, Hamburg (DE) NIVA, Oslo (NO) Ecosystem, Gottingen (DE) Lichenol., Helsinki (FI) Natur. Reserve, Doñana (ES)
Databases for Social Sciences	ISS, Essex Univ (GB) ZA, Köln (DE)
Energy	IFRF, Ijmuden (NL) Univ. of Wales (GB) ENEL, Pisa (IT) PSA, Almeria (ES) CNRS, Orleans (FR)
Transport Systems, Manufacturing and Microtechnologies	CRIS, Naples (IT) CIM Lab, Chemnitz (DE) COPES, Clausthal (DE) NMRC, Cork (IE) IMEC, Leuven (BE) IMM, Mainz (DE)

PROPOSAL FORM

Each of the four parts of the Proposal Form must be completed and returned.
Incomplete proposals will be rejected.

NOTES

(1) Before filling in the forms, please read thoroughly the relevant parts of the Information Package

(2) These forms have been designed to be photocopied and then used with a word-processor and its printer.

The forms have been set in Times 9 point

EUROPEAN COMMISSION

DG XII Science, Research and Development

Proposal for a Concerted Action in the Access to Large-Scale Facilities of the Training and Mobility of Researchers Programme

1. GENERAL PROPOSAL INFORMATION (1)

Proposal Title (2) → **Proposal Short Title (3)** →	
Classes of Large-Scale Facility Covered by the Round-Table (4) →	

Name and Postal Address of the Proposal Coordinator (5)	
Title, Family Name →	
First Name →	
Name of Organization →	
Name of Department →	
Street Name and N° →	
Town/City →	
Post Code/cedex →	
Country Code (6) →	
Telephone N° (7) →	
Fax N° (7) →	
E-mail →	

Reserved for Commission Use - Proposal Number	**Reserved for Commission Use - Commission Stamp**

1. (continued) GENERAL PROPOSAL INFORMATION

Proposal Short Title (3) →	

Partnership Summary (8)

Participant Number *(Coordinating partner as number 1)* (9)	Abbreviated Name of Organization (10)	Type/Size of Organization (11)	Country Code (6)	Role in the Round-Table (12)
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

Project Duration (13) →	Months
EC Funding Requested (14) →	kECU

I, the proposal coordinator, certify that the information contained herein Part 1 of the Proposal Form corresponds to the information contained in the Individual Participant Information Sheets

Signature →	
Date →	

2. PROPOSAL SUMMARY (1)

Proposal Short Title (3) →	
Give below a brief summary of the objectives and content of the proposed concerted action. The whole summary must be a maximum of 300 words of plain typed text, avoiding formulae and any special characters, *preferably in English.*	

3. INDIVIDUAL PARTICIPANT INFORMATION (16)

Participant Number (9) →	
Proposal Short Title (3) →	
Participating Organization (legal entity)	
Full Legal Name and Status (17) →	
Abbreviated Name (10) →	
Type/Size (11) →	
Registered Address (18): →	
Country Code (6) →	
Department/Institute/Laboratory Taking Part in the Round Table	
Full Name →	
Postal Address (18) →	
Country Code (6) →	
Scientific Official in Charge of the Work:	
Title, Family Name →	
First Name →	
Telephone N° (7) →	
Fax N° (7) →	
E-mail →	

3. (continued) INDIVIDUAL PARTICIPANT INFORMATION

Partner Number (9) → **Proposal Short Title (3)** →	
EC Funding Requested (19) →	kECU (to be completed on the form of the coordinating partner only)
Role of the participant in the Round Table (12) →	
Is the organization affiliated to any other participant in this proposal? (20) → *(State "YES" or "NO")* **If yes, indicate the participant name(s) and number(s)** →	

I certify that the information in this proposal about my organization is accurate and that my organization has agreed to participate (21)

Authorised Signatory → *(Full name in capitals)* **Position in Organization** → **Signature (22)** → **Date** →	

4. PROPOSAL DESCRIPTION (23)

All applicants must complete section 1 of this Proposal Description. Sections 2, 3 and 4 are optional.

1. MANAGING THE ROUND TABLE **(maximum two A4 pages, excluding tables, charts and the typical agenda)**

1.1 Scope and Membership

Specify the classes of large-scale facility that are to be covered by the proposed Round-Table. *(Note: If the applicants intend to revise the scope of an existing Round-Table, the reasons for this should be explained.)*

State who will be the members of the Round-Table, distinguishing between:

- large-scale facilities financed by the TMR/HCM/LIP Programmes:
- large-scale facilities outside these Programmes (for such facilities, indicate briefly their principal features and their relevance to the work of the Round-Table);
- organizations representing users of the facilities (indicating why you consider that each of these organizations is suitable to act as a representative of users in general);
- European scientific societies (indicating their possible contribution to the work of the Round-Table);
- others (explaining their role in the Round-Table).

Indicate the level of the persons likely to attend the Round-Table meetings as representatives of its members.

1.2 Organization

Indicate how the Round-Table meetings will be organised and managed (see Chapter 4 of this Information Package for minimum conditions) and provide a typical agenda for a Round-Table meeting.

The person likely to be in charge of the secretariat of the Round-Table should be named and his relevant experience explained.

1.3 Financing

Summarize how the overall financing requested for managing the Round-Table is distributed between the four main titles of expenditure, i.e. personnel costs, exchange and mobility costs, support services, overheads (see Chapter 7 of this Information Package for definitions of allowable costs).

2. MAPPING STUDIES **(maximum two A4 pages, excluding tables and charts)**

2.1 Scope

Specify the classes of large-scale facility for which you intend to maintain a watching brief on the scientific needs for access. *(Note: It is possible that applicants may wish to conduct these mapping studies on only a sub-set of the classes of facilities taking part in the Round-Table).*

Explain, if relevant, how the reports of earlier Study Panels and perspective studies organised by other bodies will be integrated into this work.

2.2 Work Plan

Provide a work plan, with relevant milestones and deliverables, explaining how these mapping studies will be organised and how the members of the Round-Table will be involved. In particular, indicate how you intend to assess both the scientific needs for access to such facilities over the coming ten years and the likely availability of facilities in that period.

2.3 Financing

Summarize how the overall financing requested for these mapping studies is distributed between the four main titles of expenditure, i.e. personnel costs, exchange and mobility costs, support services, (see Chapter 7 of this Information Package for definitions of allowable costs).

(continued) PROPOSAL DESCRIPTION

3. JOINT SCIENTIFIC AND TECHNOLOGICAL ACTIVITIES (maximum three A4 pages, excluding tables and charts)

Note: If you are proposing to concert on more than one scientific/technological activity, you should complete a separate section 3 of this Proposal Description for each.

3.1 Objectives and State-of-the-Art

Review the current international state-of-the-art and the main lines of investigation currently being carried out in Europe in the areas of research where you intend to concert.

Describe the objectives of the joint scientific/technological activity being proposed. Explain the relevance of the activity to the facilities taking part in the Round Table, particularly in terms of any increase that might result in the quality or quantity of access offered by them.

3.2 Work Plan

Provide a work plan, containing a schedule and relevant milestones and deliverables.

Describe the role of each of the research teams participating in the activity, explaining their expertise and competence. Indicate, in tabular form, the size of the professional effort (in man-months) that each of the teams will contribute to the joint activity.

If any teams external to the Round Table will collaborate in the activity, or if any task is to be subcontracted, this should be mentioned.

3.3 Organization

Describe the organization of the proposed activity and explain how the research teams participating will collaborate and interact.

3.4 Financing

Summarize how the overall financing requested for this activity is distributed between the four main titles of expenditure, i.e. personnel costs, exchange and mobility costs, support services, overheads (see Chapter 7 of this Information Package for definitions of allowable costs).

4. OTHER STUDIES (maximum two A4 pages, excluding tables and charts)

Note: If you are proposing to concert on more than one study, you should complete a separate section 4 of this Proposal Description for each.

4.1 Objectives

Describe the objectives of the study and its relevance to the facilities taking part in the Round Table, particularly in terms of any increase that might result in the quality or quantity of access offered by them.

4.2 Work Plan and Organization

Provide a work plan, with relevant milestones and deliverables, explaining how the members of the Round Table will be involved.

If any teams external to the Round Table will collaborate in the study, or if any task is to be subcontracted, this should be mentioned.

4.3 Financing

Summarize how the overall financing requested for this study is distributed between the four main titles of expenditure, i.e. personnel costs, exchange and mobility costs, support services, overheads (see Chapter 7 of this Information Package for definitions of allowable costs).

NOTES FOR COMPLETING FORMS

1 To be completed by the proposal coordinator.

2 Use a clear, self explanatory title of not more than 20 words, providing guidance as to the contents of the concerted action.

3 Provide an acronym or short title of not more than 30 characters, to be used to identify the concerted action. The same acronym should appear on each page of the proposal in order to prevent errors during its handling.

4 Enter the classes of large-scale facility covered by the proposed Round-Table, using, as far as possible, the classification of facilities given in Annex I of this Information Package.

5 All correspondence concerning this proposal will be between the Commission and the coordinator responsible for this proposal. The name and postal address of the proposal coordinator should be entered here.

6 Use the following ISO Country Codes:

Austria	AT	Belgium	BE	Denmark	DK	Finland	FI
France	FR	Germany	DE	Greece	GR	Ireland	IE
Italy	IT	Luxembourg	LU	Netherlands	NL	Portugal	PT
Spain	ES	Sweden	SE	United Kingdom	GB		
Iceland	IS	Israel	IL	Liechtenstein	LI	Norway	NO
Switzerland	CH						
Albania	AL	Bulgaria	BG	Czech Republic	CS	Estonia	EE
Hungary	HU	Latvia	LV	Lithuania	LT	Poland	PL
Romania	RO	Slovakia	SK	Slovenia	SI		
Armenia	AM	Azerbaijan	AZ	Belarus	BY	Georgia	GE
Moldova	MD	Russia	RU	Ukraine	UA		
Cyprus	CY	Malta	MT	Turkey	TR		

For other countries enter OT.

7 When filling in the phone and fax numbers, give the direct line, if there is one, and type them in the following way:
+Country Code - Town Code - Local Number
For example +44-71-123 4567 for a number in central London, +34-1-123 4567 for a number in Madrid.

8 This table should summarise the information from the Individual Participant Information Sheets.

9 The coordinating partner should appear as participant N° 1. Where a proposal has more than 15 participants, please add a second copy of this page, but remember to continue numbering 16, 17, etc. and write "CONTINUED" in the TOTALS row. Use the same participant numbering on the Individual Participant Information Sheets.

10 Where the organization's full title is commonly abbreviated or a logo is used, this should be entered here. For organizations which do not commonly use an abbreviated name, enter an appropriate abbreviation e.g. U. Santander (for Universidad de Santander); MPI/Züchtung (for Max-Planck-Institut für Züchtungsforschung) etc. Use the same abbreviated name throughout the application.

11 Fill in one of the following to describe the participating organization:

- EDU University, Higher Education
- ROR Research Organization (including hospitals)
- IND Industrial or Commercial Enterprise
- INT European Intergovernmental Research Organization (one of the seven listed in Chapter 2 of the Information Package as being eligible to receive financial support)
- OTH Other

(continued) NOTES FOR COMPLETING FORMS

If you enter "OTH", please explain briefly on the Individual Participant Information Sheet the status of your organization.

In addition, add one of the following size codes, if you are an industrial or commercial enterprise:

1	Less than 50 employees	5	501-1000
2	51-100	6	1001-5000
3	101-250	7	Over 5000 employees

For example, for an industrial company with 2000 employees, enter IND 6.

12 Describe the role of each participant in the Round Table using one of the following codes:

LSF - TMR	a large-scale facility financed for access under the TMR Programme
LSF - HCM	a large-scale facility financed under the HCM Programme, but not under the TMR Programme
LSF - LIP	a large-scale facility financed under the LIP Programme, but not under the TMR or HCM Programmes
LSF - OTH	a large-scale facility outside the TMR, HCM and LIP Programmes
USER	an organization representative of users of the facilities covered by the Round Table
SOC	a European scientific society
OTH	other types of participant

13 The duration should not exceed 36 months.

14 Round off the amount requested to the nearest 1 kECU. 1 kECU = 1000 ECU (e.g. 140 kECU = 140 000 ECU)

15 The summary should be a self-contained description of the concerted action that would result if the proposal were to be funded.

16 One set of Individual Participant Information Sheets is to be filled for each participant. They should be identified by the same participant numbers used in the Partnership Summary. See note 10.

17 Indicate the legal status of the organization, such as SA, Ltd., GmbH, NV, etc.

18 Include street, city, country code, postal code and (if applicable) a cedex number. An official stamp may be used if it gives all this information and does not obscure other information on this page.

19 See Chapter 7 of this Information Package for definitions of the funding basis. Round off the amount requested to the nearest 1 kECU. Further detail on the funding requested is required in Section 4 of the Proposal Description.

20 An organization A is "affiliated" to an organization B if:

- A controls B, directly or indirectly, or
- A and B are controlled by the same (parent) organization, or
- A is controlled directly or indirectly by B.

Company A is considered as controlling company B if:

- A holds directly or indirectly more than 50% of the share capital of B, or
- A holds directly or indirectly more than 50% of the voting rights of the shareholders or of the associates of B, or
- A holds directly or indirectly the decision-making powers within company B.

(continued) NOTES FOR COMPLETING FORMS

21 **By signing this form, the signatory certifies that his organization is prepared to participate in the proposed concerted action. Note that only forms with original signatures will be accepted. The Commission will, however, accept photocopies or faxed copies of the original forms containing the signatures provided that they are countersigned with an original signature of the proposal coordinator.**

22 The signature should be accompanied by the official stamp of the organization, where such exists.

23 The Proposal Description should be submitted on single-sided A4 pages. Please print the proposal short title as a header to each page. All pages should be numbered in a single series to prevent errors during handling.

If the Proposal coordinator wishes to receive acknowledgement of receipt, he should complete (A) and (B) and return this form to the Commission with the proposal.

ACKNOWLEDGEMENT OF RECEIPT

EUROPEAN COMMISSION
TMR Programme (LSF Activity)
DGXII - G-2
Science, Research & Development
rue de la Loi 200
B-1049 BRUSSELS

(A) Write your name and address in the box below:

Dear Sir or Madam,

We are pleased to acknowledge receipt of your proposal with the following short title (B):

This proposal has been given the following reference number (C):

You are requested to quote this reference number in all future correspondence relating to this proposal. Please ensure that all other participants in your proposal are also made aware of this reference number.

After a check for eligibility, your proposal will be evaluated. It is expected that the final result of the evaluation will be communicated to you in May 1997.

On behalf of the Commission, we would like to thank you for your proposal and your interest in the TMR Programme.

Yours faithfully,

Proposal registered on (D) ______________________ by ______________________

(A) Name and postal address of the proposal coordinator - to be completed by the applicant
(B) Short title of the proposal - to be completed by the applicant
(C) Reference number of the proposal - to be completed by the Commission
(D) Date of registration of the proposal - to be completed by the Commission

COMMISSION OF THE EUROPEAN COMMUNITIES

Preliminary guidelines for the Fifth Framework Programme of Research and Technological Development Activities

Satw. 22

"INVENTING TOMORROW"
Europe's research at the service of its people

"... apart from generating new knowledge, we would like science to contribute to general well-being and social balance. We want to see scientific progress and innovation making a major contribution to Europe's future ..."

European Research Ministers, 1996

The purpose of this document is to open a debate with the participation of Parliament, Council and all those concerned by or interested in European research. The aim is to decide together the guidelines which will serve as the basis for a detailed proposal for the Fifth Framework Programme of research and technological development, which will determine Union action in this area as we move into the next millennium.

SUMMARY

INTRODUCTION

The world is changing ever more rapidly. Never before has there been such a mix of trends, ideas and aspirations, feeding on each other and contradicting each other at the same time. This is borne out by three statistics, all of which were difficult to imagine only four years ago when the fourth framework programme was being prepared. In 1996 there are now 18 million unemployed in Europe, 1.3 million declared cases of AIDS throughout the world and 50 million Internet users.

Everything seems possible. We now have a global economy. Ideas, like capital, travel around the earth as fast as fibre optics and satellites permit. Every day, shares for an equivalent of US$2 000 billion are traded throughout the world. Increasingly, the value of products lies in their intangible characteristics. Unemployment on the other hand is a very tangible problem.

Meanwhile, work continues on the institutional framework for Europe with the opening of the Intergovernmental Conference which will determine the future of the continent for many years to come. Research will have to play its part as a force for integration and for shaping the future.

On a day-to-day basis, in a European society which is torn between moving ahead and marking time, each individual is at the same time a citizen, a consumer of products and services and a source of ideas and patterns of behaviour. Locked into a society which depends ever more directly on the acquisition of knowledge, individuals sometimes wonder about the impact of scientific progress on their lifestyle and values.

There is no denying that the world has become increasingly complex and that in order to understand it better and to feel more at home in it, individuals require more knowledge. However, the answers to many of the major problems now facing society - growth and unemployment, and also health, the environment and mobility - have to be sought in science and technology.

This is the purpose behind European research. It is not an end in itself but a means of meeting common objectives. It is now time to change direction slightly in order to put it in its new context. Hitherto research has been based largely on technical achievement. The aim now is to make research more efficiency and increasingly directed towards meeting basic social and economic needs by bringing about the changes which each individual desires.

I. WHAT DO WE NEED FROM EUROPEAN RESEARCH AT THE BEGINNING OF THE 21ST CENTURY?

Europe needs research and research needs Europe.

With the globalization of economies and trade, the only way to solve many of our problems will be by bringing to bear the critical mass of Europe's own resources and knowhow. It is within a European framework that national or local research projects are envisaged and Europe is the level at which meetings of minds and cross-fertilization of ideas takes place.

Article 130f of the Union Treaty establishes an original instrument, the **framework programme** and sets out some general objectives for research in Europe:

(i) **to strengthen the scientific and technological bases of Community industry;**
(ii) **to encourage it to become more internationally competitive;**
(iii) **to support other Community policies.**

Four types of activity are envisaged:

(i) research, technological development and demonstration programmes;
(ii) international scientific cooperation;
(iii) dissemination and optimization of results;
(iv) training and mobility of researchers.

These four activities are the basis around which the fourth framework programme was organized. They correspond to areas where action at European level has proved fully justified.

Now that it has established its identity, European research has a value of its own. The sum is greater than the parts. Joint projects, which are the principal way in which it operates, are an investment with a strong multiplying effect in both economic and social terms.

It is worth noting that in a recent opinion poll on "Europeans, science and technology", the citizens of the Member States supported research at European level "... for reasons of efficiency ..." (64% of those polled thought that "... it is as efficient as or more efficient than national research ..."), and considered that "... it will increase in importance ..." (79% "... to the same extent or greater than at present ...") and that "... it corresponds with national interests ..." (69%).

I.1 General parameters

Before defining the objectives of the new framework programme, it is essential to consider three parameters which are all connected in different ways with **added value**, which is the guiding principle of Community action.

- The **time-scale** set for achievement of results makes it necessary to re-consider the time it takes for research to find its way onto the market and into daily life. It is worth noting that 78% of the revenue of the data-processing industry comes from products which have been on the market for two years or less. The R&D activities undertaken by companies in the year 2000 will be aimed at the markets in the years 2003 to 2007 or thereabouts. Community research must at the same time prepare for the distant future and take account of shorter marketing lead times.

- Research should be undertaken at **European level** only if it is better done at that level than in the Member States or their regions. The framework programme accounts for only a fraction of the research carried out in Europe and is not designed to replace national research programmes. On the contrary. Research at European level has to rely on sound national and regional structures, which make it easier for effective cooperation to take place.

  The idea is to **coordinate research in Europe** more effectively by ensuring the compatibility, complementarity and general coherence of the activities undertaken by the Union, the Member States and in other European or international cooperation frameworks.

- As with all public policies, the Union's research must comply with the principle of **budgetary efficiency**, since this will be a permanent feature of the planned move towards economic and monetary union. There will therefore have to be a precise estimate of the critical masses of resources which will have to be deployed and the results expected in each area of activity, where as a logical consequence topics will have to be chosen more selectively. More than ever before, European research will have to make a point of being as **cost-effective** as possible.

The total budgetary allocation will have to be decided by negotiation between government ministers and members of Parliament. As a guide, European research investment in 1995 amounted to 1.9% of GDP, compared with 2.45% in the USA and 2.95% in Japan, where research spending has been increasing by 3% a year over the last seven years. Comparison with the major competitors of the Union indicates that private investment in research in Europe needs to rise.

The level of research is a sure guide to the confidence of a country or region in its own future. **Europe must "invent tomorrow".**

I.2 Challenges and opportunities (cf. annex)

Various studies and forecasts have been prepared (the Commission's "*Scientific Indicators*", the UK's "*Technology Foresight*", France's "*Key Technologies*", OECD studies, etc.) which identify the challenges and opportunities which Europe will encounter as we move into the next millennium, and also the key scientific and technical areas. As examples can be cited:

- ***The problems facing society in the Union and the challenge of sustainable development***: e.g. the problems connected with the need for mobility (the negative costs of traffic jams, accidents, environmental damage and human health are estimated at ECU 250 billion a year), the ageing population and the increasing cost of health care (the percentage of the population over 75 is expected to increase by about 40% between now and the year 2010).

  The concept of "eco-efficiency" - producing more and better with less, whilst respecting the environment - points the way towards reducing the burdens of waste and pollution, while at the same time providing the opportunity for businesses to make considerable savings;

- ***Market opportunities and job creation in Europe***. Many areas of technology are expected to show rapid growth: examples are the goods and services connected with environmental protection technologies, an area where certain European countries are a long way ahead (the European water market will grow to ECU 30 billion in the year 2000); the biotechnologies market, which in 1993 is estimated to be worth less than ECU 10 billion but is expected to grow to ECU 80 billion by the year 2000.

At world level, there is a disturbing correlation between the loss of market shares in advanced technology areas by European industry, the rise in unemployment and the declining competitiveness of Europe's Member States.

These trends are not irreversible. Various studies show that, for example, the rapid and widespread introduction of advanced communications throughout the Union will add 3.5% to GDP growth between now and 2010, leading directly and indirectly to the creation of six million new jobs. More generally, conditions need to be created which at the same time encourage the development of high value-added activities, and support employment-intensive growth.

- ***The challenge of the globalization of knowledge and Europe's place in the world.*** Two thirds of world advances in science and technology take place outside the Union. Europe currently has 4.7 scientists and engineers per 1000 inhabitants compared with 7.4 in the USA and 8 in Japan. A new development is that together the total number of scientists and researchers in China, India and Indonesia is now the same as in the Union.

Three needs arise from these considerations:

(i) on issues of global importance (like climatic change and the emergence of new infectious diseases), knowledge, investment costs and risk should be shared;

(ii) in areas where Europe does not have expertise, it should be able to draw on skills available elsewhere or have access to different environments;

(iii) Europe should bring its influence to bear as widely as possible (e.g. by defining world standards) in order ultimately to capture markets.

- ***The European innovation "paradox".*** The Green Paper on innovation highlights a mismatch between Europe's scientific and technological potential and its record on innovation. For example, the total number of patents registered by Japan under the European patents system is higher than the number applied for by any single European country. In addition, it costs US$ 120 000 to file and maintain a patent in 8 Member States compared with US$ 13 000 in the USA.

SMEs are a very important source of innovation. In addition to a small number of high-tech SMEs (e.g. in the areas of software and biotechnology) there is a much larger number of conventional SMEs which should be allowed access to research work and results.

1.3 Main objectives

Scientific and technical progress should pave the way for the opening up of new areas, whether they relate to knowledge, ideas, products, processes or services, in order to improve the quality of life for individuals and to help bring about the harmonious development of employment, the economy and social cohesion in Europe. It should also contribute to sustainable development and growth.

If this new political will is to be incorporated into the framework programmes of the future, within the guidelines laid down by the Treaty, while supporting the aims of Community policies, various requirements will have to be met.

- It is essential to **satisfy the expectations of our citizens** for improved quality of life, work and environment, by making systems, products and services easy and safe to use within a perspective of sustainable growth.

  If science and technology are to be accepted and adopted by our citizens, research must be more comprehensible, more visible, and more accessible even though modern science is becoming increasingly complex.

- Research must have a **positive impact on employment and competitiveness**, by being based on "... *non-material investment in human capital and R&D, innovation* ...", as was emphasized at the Florence European Summit in June 1996.

  Some economists consider that technological change and educational standards account for 80% of growth. The generation of new ideas, which is a virtually unlimited resource, is an increasingly important factor here and makes it possible to transcend physical limitations. Recent studies[1] have shown that in the G7 countries an increase in research spending of US $100 will increase GDP by an average of US $123. The way to encourage the emergence of an innovatory tertiary sector, which will create

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[1] *International R&D spillovers*. European Economic Review, vol. 39, No 5, May 1995.

jobs, is to have high performance industries and services based on highly intensive research.

- **The frontiers of knowledge must be pushed back** in a number of key areas. This will require more than ever respecting the **principle of excellence**. Working together the best research teams in Europe have recently succeeded, by networking and by pooling their equipment, in sequencing the yeast genome, which is a world first and prepares the way for many medical and industrial applications. Europe must be a reference and focal point for world science.

- A more determined effort must be made to create a **favourable climate for research and innovation in Europe.** The framework programme must help the Member States to adapt their research and innovation systems and make them more coherent.

  Efforts must continue at **strengthening partnership** links throughout Europe between scientists, industry, universities and consumers so as to share out the risks, investment costs and benefits of research and to help create a real European scientific area and single market. In this respect it is encouraging to note that in some industrial programme two thirds of the partnerships established for a given project carry on after it has been completed.

List of criteria

On the basis of these objectives it is possible to draw up **a list of criteria**. Now that a measure of maturity has been achieved, the fifth framework programme should provide the opportunity for choosing topics more **selectively**, by concentrating on those areas where Community research can play a decisive role. Each topic should be selected according to an optimal combination of criteria under the following three headings.

(i) **"Basic principles"**, in particular:

- the **value added** at European level, with reference to the principle of subsidiarity and the resources available;

- the concepts of **public and social acceptability**, which ensure that research is meaningful to European citizens

(ii) **"Major concerns"**, like those repeatedly proposed at European summit meetings, in particular:

- tackling **unemployment**, through the possibilities of creating new jobs, or through the high level of employment in the areas selected for research;

- **competitiveness**, by concentrating on Europe's real assets (for example its knowhow, and its production and exploitation capacity), on the basis of the priorities identified by industry and market development prospects;

- helping to establish the **information society**;

- promoting a model for **sustainable development** by improving living conditions and reducing environmental damage;

- **preparing for the accession** of new Member States from **Central and Eastern Europe and the Mediterranean**.

(iii) Support for **Community policies**, in particular through:

- helping to develop policies for **agriculture** and **fisheries**;

- defining the tools and systems needed for transport;

- knock-on effects on the European regions (**cohesion** policy);

- expanding knowledge and developing new techniques for **health** protection;
- developing and refining new **energy** technologies;

- involving **SMEs** more in research and innovation.

II. MOVING FROM THE FOURTH TO THE FIFTH FRAMEWORK PROGRAMME

The vast input already received for the next framework programme makes it clear that merely continuing the fourth framework programme would not be appropriate.

The priority would seem to be to consolidate our research efforts. Secondly, although it is worth persevering with certain projects and tried and tested principles and procedures,[2] it is essential to incorporate new topics and change the way in which research is organized. Attempts to shift the balance must be viewed in the light of the initial findings arising from analysis of the fourth framework programme.

II.1 Progress with the fourth framework programme

The fourth framework programme has been running for 18 months and is proving extremely attractive. In 1995 20 000 proposals were received resulting in 3 000 projects involving more than 10 000 participants.

The changes observed are that the size of projects is tending to increase, including on average more participants from a larger number of Member States, the rate of renewal of participants is increasing (37% on average of which 40% are SMEs). One area of concern is the continual increase in the number of proposals not accepted, since on average only 1 in 6 has received funding.

These preliminary figures clearly indicate a need for better targeting of calls for proposals and for more concentrated efforts as a way of reducing the dispersal of resources and the administrative burden. A detailed evaluation of projects will accompany the formal proposal for a fifth framework programme.

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2 Most contributions emphasize the positive aspects of the framework programmes, particularly in the fields of industrial research, establishing networks of researchers and encouraging researcher mobility.

Over time, apart from various "success stories" (eg sequencing of the yeast genome, parallel computers, telecoms standards, first demonstrations of nuclear fusion) it can be said that 100.000 partnership links have been established across Europe, which often lead to commercial relationships.

II.2 *Shifting the balance to improve the impact on society and the economy*

The new general policy guidelines to put research at the service of the people can best be achieved by improving the bases of European competitiveness within a perspective of sustainable development. This can be done by at the same time providing better support for the production of new ideas, taking more account of the realities of demand and reinforcing links with organizations which can help to exploit the results.

Supporting basic research

Reducing the period of time which elapses between the discovery in the laboratory and the marketing stage and providing a wider range of the inputs required for the development of complex systems will help to eliminate the old distinction between basic research and industrial and applied research.

It is now difficult to catalogue the discovery an a new computer algorithm or a breakthrough in the sequencing of genomes, since the time between the discovery of new knowledge and its application may be extremely short.

Consequently it is essential to maintain a research context which is open to new ideas, for work on basic questions which may possibly generate new fields of activity.

Bringing research more into line with the real market

Discussions of the framework programme have always touched on the distance between research and the market and the difference between "academic" and "industrial" research. This is how the idea of "precompetitive" research came about, although its boundaries have become rather vague and in practice it is largely ignored by the major competitors in Europe.

Competition, whether intellectual, industrial or economic, is one of the basic driving forces behind research. However, three observations should be taken into account when preparing the framework programme:

(i) research should now be viewed within its world context;

(ii) the spiralling costs of research and development are now beyond the means of individual operators or even individual states, which means that risks and investment costs have to be systematically shared out;

(iii) it is important to consider how results can be exploited.

Experience shows that we should be moving from research aimed purely at technological achievement to research aimed at satisfying consumers by providing high quality goods and services which are produced in an acceptable manner at low cost and which are at the same time highly diversified and personalized and rapidly available.

The need to involve users much more in project design, which is beneficial in terms of meeting real needs, presupposes that much greater attention should be given to demonstration and prestandardization activities. This will require changing the level of support given, while complying with international rules on research aid.

Doing more to exploit results

In previous framework programmes, not enough has always been done to exploit results. Additional efforts are required in order to extend the relationships between partners and networks so that results are better exploited and to ensure that risks are funded by calling on financial and risk capital organizations.

The rules on intellectual property are closely linked with the question of partnership and exploitation. They will have to be changed to take account of technological progress, to provide more incentive for the exploitation of results and to ensure that European interests are pursued at world level.

III. PRELIMINARY PROPOSAL FOR THE STRUCTURE OF THE FIFTH FRAMEWORK PROGRAMME[3]

Given the framework and list of criteria set out above, an initial outline can be drawn of the structure and content of the future framework programme and of ways of implementing it.

III.1 Content

Without prejudice to the final structure, the number of subjects has been deliberately limited and the following three priorities can be identified along with three horizontal activities.

III.1.1 Priority topics (research at the service of the people)

The focus is on the targeting of activities and the impact the research will have on people's lives.

- **Unlocking the resources of the living world and the ecosystem:** The life sciences and the environment are literally vital to people's lives and have an especially critical impact on health. Europe must realize the full potential of its scientific and technical assets in these areas, which are also promising in terms of the growth of markets and the creation of jobs.

  This topic will in particular cover the acquisition and utilization of knowledge about fundamental mechanisms affecting human life, especially in the fields of health and food. Emphasis will be placed in particular on the acquisition of fundamental knowledge, the prevention of disease, (research on the brain and newly developing infectious diseases) and the quality, safeness and renewable nature of bioproduction, while complying with ethical rules.

  For the environment, the development of environmental regulations, tax incentives and wider adherence to the principle of responsible behaviour call for a greater understanding of the interplay between environmental factors and the introduction of advanced forms of technology in order to safeguard natural resources, reduce the use made of them and tackle the problems of pollution and waste.

[3] By extension, this discussion also covers the EURATOM framework programme.

This highly interdisciplinary research will in particular include an in-depth study of matters relating to global environmental change, the basic cycles, natural hazards and European ecosystems.

- **Creating a user-friendly information society:** Europe has made a name for itself by developing the concept of an "information society", linking together technical, economic and industrial considerations and the social dimension. The very numerous applications to which it lends itself in virtually all areas of activity underline its enormous potential for increasing the competitiveness of industry and satisfying the demands of the individual.

  The anticipated technological and industrial convergence between computers, telecommunications and the media is now rapidly coming about through the use of digital systems and the multimedia. The non-material aspects of this development, in particular the "contents" of software, are especially important. The aim now is to identify the research needed for an information society.

  This research should aim at the development of technology, infrastructure, services and applications that are interoperable at world level. It will provide the foundations for very many jobs in tomorrow's world and will contribute toward the decentralization and personalization of activities in a more competitive and innovative framework.

  The identification of and experimentation with these new concepts and tools will give people easier access to information and education throughout their lives, help people to share the cultural heritage and preserve linguistic diversity.

- **Promoting competitive and sustainable growth:** This topic covers a range of priorities which are the result in particular of various Community policies. They have a major impact on the competitiveness of the Union in view of the considerable number of jobs involved and their common feature is the need for a reorganization of production systems aimed at achieving sustainable growth.

  Not only conventional forms of industrial manufacturing but also the design and production of new products and materials will, for example, have to be reconsidered in terms of the "life cycle" of a product, lower costs, the drafting of standards, the way in which regulations are likely to change and, more generally, the "external factors" concerning the product, all of which have too often been disregarded in the past. Furthermore, services and non-material activities, techniques for the design, production and management of complex systems and ergonomic considerations, all of which are becoming increasingly important in the economy, will have to be developed.

In the energy domain, priority will have to be given to the development and demonstration of safe, acceptable energy systems which comply with standards and environmental constraints and are competitive in terms of production costs and the global economy. Research might also cover the rational management of energy in everyday life,(e.g. the "town and home of the future"), as well as the various options as regards the production and storage of energy with a view to the medium-term and long-term.

As regards the mobility of passengers and freight, research will be directed in particular at optimizing efficiency, safety, environmental impact and competitiveness as these are all necessary to promote the quality of products and services, to ensure their integration at the European level and to capture world markets. Particular attention will be paid to the question of intermodality, combining different transport modes.

In the agricultural sector, it is necessary to flesh out the concept of an "integrated rural development policy". All activities in rural areas, including forests, need to be subject to an integrated approach, based on the need for competitiveness and sustainability and ensuring optimum land use in these areas. New instruments and systems to optimize and diversify production need to be developed, focusing on complete cycles and sequences, multifunctional management (production and ecological and social aspects) and links between activities, incorporating quality, health, environmental and socio-economic considerations at all levels.

Lastly, in the fisheries sector, a multidisclipinary approach will be needed to shape the future of this industry and help to restore fish stocks to their normal levels.

III.1.2 Horizontal activities

These activities will include two components: one general component designed to meet common needs and provide general coordination, and the other component related to the list of priority topics above.

- **Improving human potential:** Greater effort is needed to improve the training and mobility of scientists, including those in industry, and to encourage them to seek scientific research posts in Europe. This would require the provision of compatible training courses and equitable treatment of visiting scientists throughout Europe, extending the communication and exchange networks between laboratories and companies and granting access to major facilities, the duplication of which should be avoided, while ensuring that new projects are better coordinated.

The promotion of a European identity by introducing a European science prize (as recently suggested by the European Parliament) and the qualification of "European scientist" will be pursued. Better links should also be sought with education and training policy mechanisms.

In a socio-economic context, action will be needed to identify social needs more clearly and to improve understanding of the social impact of research work, the changes taking place in European society and the diverse nature of its component parts and foundations by increasing capacity for the planning and study of various scenarios resulting from the introduction of technology at work and in the economy, education and culture. New organisational and developmental models which may help to achieve a breakthrough in the creation of new jobs might be analyzed together with the most promising experiments carried out in this area.

- **Innovation and participation of SMEs**: More "conventional" SMEs and mid-sized firms will be able to have easier access to all research and research results following the introduction of a single, simplified framework and the development of technology transfer mechanisms.

  Following the guidelines laid down in the innovation action plan, more attention may also be given to the ways in which results are analyzed and used to the best possible effect and to the establishment of links with risk capital and financial engineering mechanisms, as seen in the success of the NASDAQ. Ways of promoting research will also be analyzed.

- **Confirming the international role of European research**: The following guidelines will be implemented in line with the Union's political objectives (particularly its foreign policy objectives) and the principle of mutual interest and on the basis of bilateral or regional agreements, and decisions to start programmes and specific projects:

  - *the direct, improved involvement of certain outside participants in research programme projects*. Particular attention should be given to the Central and East European countries in order to help with their rapid accession the Union. They should be encouraged to become fully involved in research, together with the industrialized countries, the emerging economies and possibly the countries of the Mediterranean for the mutual benefit of all concerned;

  - *the introduction of schemes to improve cooperation at European level* and to make the European research area more attractive to scientists from countries with which the Union has beneficial links:

- *the definition of specific international scientific cooperation projects*, along with the appropriate resources, either on specific topics or relating to specific countries or regions such as the Mediterranean, the CIS and the developing countries to support external policy objectives, involving industry and European centres of excellence.

III.2 Implementation

With each framework programme, the question arises of the "dispersion" of projects and resources. There is also the problem of incorporating novel ideas that arise while a project is in progress and the difficulty of winding up activities, since each by their very nature meets the interests of a particular group of people.

The time has come to be more **selective** about topics and to ensure a greater **concentration** of resources. For it to succeed, this approach must be accompanied by greater **effectiveness** of project implementation while complying strictly with the **principle of transparency**, especially in the selection process. The Commission will also work to ensure the **avoidance of fragmentation** in Community research.

Increasing flexibility in research work and the decision-making process

The procedures set up over the years for the framework programme need to be slimmed down, while retaining the defining principles of equality of treatment and access and of transparency.

There is much room for improvement in the institutional support arrangements. At the Intergovernmental Conference, the Commission will, for example, advocate a **simplified decision-making procedure** for implementation of research policy and specific programmes and for their adoption by a qualified majority. Matters could also be simplified by **reducing** considerably **the number of programmes** and the **number of committees**.

It needs to be possible to supplement and adjust work programmes at regular intervals in line with scientific and technical changes. In the event of an emergency, as recently with the problem of "mad cow disease", there needs to be an arrangement for the rapid regrouping of several projects around a single target, for bringing together the resources needed and, where appropriate, for redirecting the work.

Ensuring more efficient management

A slight improvement would seem to be possible where management techniques are concerned. The Commission has called for ideas about possible ways of **simplifying** internal management procedures and the procedures governing external contractual relations. A stated aim is to **shorten the deadlines** and reduce administrative costs, e.g. when selecting proposals and concluding contracts, and when making payments, a matter of particular importance for small firms and researchers in receipt of grants.

The **calls for proposals** must be published on a regular basis, be compatible with the working patterns of industry, research centres and universities, and meet the requirements of sound management. Where the procedures governing the **selection** of proposals are concerned, it would seem to be necessary to explain the selection criteria more clearly.

Lastly, the need is being felt for some kind of **monitoring** tool with which to measure, in real time and on the basis of a set of indicators, the state of progress and performance of the framework programme, **and a forum** (e.g. on the Internet) **for ongoing dialogue** with participants in the Fifth Framework Programme and other interested parties.

Extending the range of instruments and means of coordination

The approach so far, which has very largely consisted of juxtaposing a large number of projects (50/50 partnership for a project generally of a modest size), should be replaced by a wider range of modalities and financial instruments more appropriate to the various objectives, whereby it is possible to establish closer links between Community activities and national activities or between national activities on certain topics.

In order to be able to respond rapidly to the considerable pressure to allow spontaneous proposals, to include emerging interdisciplinary research topics (e.g. neurosciences) and to allow for the unexpected, there needs to be some leeway, albeit strictly controlled in terms of decision-making;

The following instruments in particular are envisaged:

- a small number of **horizontal programmes** with a strong focus on generic technologies applicable to many areas, capable of giving rise to and sustaining more targeted research topics not necessarily always specified initially.

- ***"task forces"***. This approach is that of targeted research, open to all comers, on unifying topics. Task force activities are a new concept introduced by the Commission on an experimental basis with the fourth framework programme.

  This type of research is based on the idea of placing advances in knowledge and technologies at the service of primary societal and industrial objectives, thus meeting the three objectives of transparency, selectiveness and concentration. In practice, the task forces are primarily coordination instruments for formulating and monitoring the implementation of a limited number of new short-term activities, for which priorities must be identified in close consultation with industry, consumers and governments;

- **Instruments for encouraging cooperation between Member States**. To be truly significant, European research must not confine itself to work carried out together solely within the specific programmes. Depending on the genuine desires of the Member States, the Commission is willing to promote this approach on specific topics, making use of the possibilities afforded by Articles 130k (supplementary programmes), 130l (participation in projects undertaken by certain Member States) or 130n (participation in joint undertakings) of the Treaty.

Where these first three instruments are concerned, COST could be used, as it was to begin with, as a breeding ground for ideas, while links with EUREKA could be improved in order to direct the results of Community research towards the market. This would necessitate closer interaction between the framework programme and these two forums for cooperation whose strategy is currently under review.

In addition, there is a need for more exchange of information and better **coordination** between Community and national research policies and investments.[4] Greater consistency would entail a competitive advantage and a financial saving, enabling the Union and the Member States to focus more effectively on their respective objectives.

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[4] See Article 130h of the Union Treaty: "The Community and the Member States shall coordinate their research and technological development activities so as to ensure that national policies and Community policy are mutually consistent."

- to ensure that the framework programme is better equipped to provide effective support for other Community policies, there is a need for a significant improvement **in the mechanisms for liaising and interfacing with the instruments of the other policies** so as to make these instruments interoperable[5] with research and to make the Community activities more effective.

International cooperation[6] and the Structural Funds and the Cohesion Fund are chiefly concerned. In the latter case, the aim is to encourage the Member States to devote a larger proportion of structural resources to research in order to foster the rapid development of their potential for scientific excellence and confirm the catching-up process that has begun[7].

- **the Joint Research Centre**: the role and tasks of public laboratories are being carefully examined in all the major industrialized countries The laboratories that go to make up the JRC should, similarly, be used for clear and ambitious tasks, striving for excellence and focusing on a few aspects in line with new needs emanating from industry and the market. It is necessary in particular:

  - to make available independent and impartial expertise to meet the needs of Community policies and contribute towards the scientific basis for Union policy decisions,

  - to ensure closer links between the institutes and the national and international laboratories.

The JRC needs to be given the organizational flexibility it requires to be in a better position to cooperate with industry and users within a properly adapted legal framework. The emphasis will be on utilizing the know-how and expertise of the institutes' researchers and facilities, which in many areas are unique in Europe, transfers of technologies, and industrial joint ventures.

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5 Experience with the task force approach has shown how difficult it is to involve different programmes (e.g. research and education programmes) in a joint call for proposals exercise.

6 Where international scientific cooperation is concerned, improvements are already in sight with programmes such as TACIS, PHARE and MEDA being opened up more widely in order to allow the participation in Community research projects of entities from the countries concerned.

7 A communication on the relationships between research and the structural funds is currently being prepared by the Commission.

CONCLUSIONS

The preparations for the fifth framework programme are taking place in a period of rapid and far-reaching change. The vital problem of employment; the increasing globalization of the economy, and the movements in progress in the building of Europe (Intergovernmental Conference, economic and monetary union, enlargement) all have to be taken into account in this exercise.

We therefore need to examine under a new light the rationale for European research. If it is to continue to exist, its tasks must be more transparent and visible, it must be carried out more simply, and its results must be more effective.

A first set of guidelines are emerging. While maintaining the continuity of certain recognized achievements, new balances must be established and the content of research topics renewed in the light of the challenges and opportunities of the horizon 2000+.

Basically, it is a question of moving on from research focusing solely on technological performance towards research focusing on the citizen and the response to economic and social needs.

In order to succeed, a strong political will based on consensus is needed. The Commission invites discussions and reactions to these first guidelines. Subsequently, it will be submitting detailed proposals to the Parliament and Council.

Faits, chiffres, tendances

1. L'Europe dans la recherche mondiale

2. Le paradoxe européen

3. La recherche européenne sur la scène technologique internationale

4. Les efforts de recherche américain et japonais

5. PMEs, recherche et emploi

6. Visions prospectives et priorités

7. Besoins sociétaux et perspectives de marchés: exemples

   Développement durable et environnement

   Biotechnologies

   Santé

   Société de l'information

1. L'Europe dans la recherche mondiale

Dans l'Union Européenne, la part du PIB consacrée à la recherche, les dépenses de recherche de l'industrie, les dépenses de recherche par habitant, le nombre total de chercheurs et de chercheurs dans les entreprises par rapport à la population active, sont inférieurs à ce qu'ils sont aux Etats-Unis et au Japon.

	UE 15	USA	JAPON
Dépenses totales de R&D (MECUS) 1994	121 882	142 047	104 069
Dépenses totales de R&D en % du PIB 1995	1.91	2.45	2.95
Dépenses totales de R&D par habitant (ECUS) 1994	329	545	833
% des dépenses totales de R&D financées par l'état 1993	39.6	39.2	19.7
% des dépenses totales de R&D financées par l'industrie 1993	53.5	58.7	73.4
Nombre de chercheurs 1993	774 071	962 700	526 501
Nombre de chercheurs par millier d'actifs 1993	4.7	7.4	8.0
Nombre de chercheurs dans les entreprises 1993	376 000	765 000	367 000
Nombre de chercheurs dans les entreprises par millier d'actifs 1993	2	6	6

Source: Commission Européenne, DG XII à partir de données de l'OCDE

L'observation des grands indicateurs (dépenses de recherche, nombre de chercheurs) pour d'autres régions du monde, montre que les pays de la Triade ne sont plus seuls sur la scène scientifique et technologique internationale. De nouvelles puissances apparaissent, qui se hissent progressivement au niveau des pays les plus avancés.

Main Indicators for Some Areas of the World

	Gross Domestic Expenditure on R&D ($ billions)	GERD/Gross Domestic Product %	R&D scientists & engineers (000s)	R&D scientists per thousand population
Central & Eastern European Countries	2.89	1.5	285.5	2.2
Israël	1.24	1.9	20.1	3.8
Latin America	3.93	0.4	158.5	0.3
NICs	10.73	1.3	136.7	1.5
China	22.24	0.7	391.1	0.3
India	7.1	0.8	106.0	0.1

Source: European Commission DG XII (1994) European Report on S&T Indicators; UNESCO, OST estimates and treatment, 1995 *UNESCO, World Science Report*

2. Le paradoxe européen

Part mondiale dans les publications en %

	1981	1993
UE 15	29	32
ETATS-UNIS	37	36
JAPON	7	8
AUTRES PAYS	27	24
LE MONDE - Total	100	100

L'Europe demeure une grande puissance scientifique: l'Union européenne est à l'origine d'environ 1/3 des publications scientifiques mondiales; sa part dans le total a même augmenté au cours des dernières années. Cependant, l'analyse des brevets déposés aux Etats-Unis et en Europe montre que la performance technologique européenne est globalement plus faible que celle de ses concurrents: c'est le "paradoxe européen".

Part mondiale en % dans les brevets déposés

	aux Etats-Unis		en Europe	
	1990	1993	1990	1993
UE 15	23	18	46	46
ETATS-UNIS	45	50	26	29
JAPON	25	24	21	18
AUTRES PAYS	7	8	7	7
LE MONDE - Total	100	100	100	100

Source: European Commission DG XII, OCDE, EUROSTAT

La décomposition par domaines des parts mondiales des brevets européens et américains, met en évidence la forte position du Japon dans les technologies avancées, le poids des secteurs traditionnels en Europe et la présence importante des industries américaines dans l'ensemble des secteurs.

The positions of the Triad by technological area, measured in patents, 1993

	European patents world share (%)			US patents world share (%)		
EUROPE	European Union	USA	Japon	European Union	USA	Japon
Electroncis/ electricity	34.2	30.0	31.8	11.5	46.7	35.4
Instruments/optics	37.8	32.4	23.4	14.9	50.8	28.0
Chemistry/pharmaceuticals	40.3	33 7	20.0	28.2	51.0	19.7
Industrial processes	50.1	25 6	16.6	22.3	50.5	19.3
Mechanical engineering/transport	58.5	19 2	15.5	23.6	45.4	22.5
Consumer goods	64.0	16.9	8.0	19.1	50.1	12.5
All fields	45.4	27.3	20.9	18.8	48.7	25.0

Source USPTO data; OST and CHI-Research treatments 1995. *UNESCO World Science Report*

3. La recherche européenne sur la scène technologique internationale

La dégradation du solde des échanges de l'Union avec le reste du monde pour les biens à haute intensité en R&D est un indicateur de l'érosion de la compétitivité technologique européenne: en une dizaine d'années, le déficit s'est multiplié par 10.

Solde des échanges en milliards de dollars

Secteurs industriels dont:	1982 Union européenne	1982 Etats-Unis	1982 Japon	1991 Union européenne	1991 Etats-Unis	1991 Japon
Haute intensité en R&D	-2 21	13 48	15 98	-23 64	12 48	52 36
Moyenne intensité en R&D	69 93	6 23	54 92	87 79	-23 44	133 34
Faible intensité en R&D	35 75	-18 01	24 07	5'54	-43 05	-5 21

Source: Chelem CEPII; traitement OST OST, Science et Technologie Indicateurs 1996

US Technology Position Relative to Japan & Europe

	Lag Substantial	Lag Slight	Parity		Lead Slight		Lead Substantial	
Energy								
Energy efficiency				—	○			
Storage, conditioning, distribution & transmission				●	○			
Improved generation				●	○			
Environmental quality								
Monitoring & assessment					•	←		
Pollution control			○	●				
Remediation & restoration				←	•			
Information & communication								
Components			→			●		
Communications						●	•	
Computing systems						●	•	
Information management							→	
Intelligent complex adaptive systems			○			←		
Sensors			→	—				
Software and toolkits						●	→	
Living systems								
Biotechnology					○	—		
Medical technologies					→	●		
Agriculture and food technologies					•	—		
Human systems						—	→	
Manufacturing								
Discrete product manufacturing					○	●		
Continuous materials processing			○	●				
Micro/nanofabrication and machining			→			●		
Materials								
Materials					•	●		
Structures						●	•	
Transportation								
Aerodynamics						●	→	
Avionics & controls						←	•	
Propulsion & power					•	●		
Systems integration						●	○	
Human interface							→	—

La comparaison des positions américaine, européenne et japonaise dans une série de "technologies critiques" met en évidence à quel point les Etats-Unis, malgré l'érosion de leur position dans certains secteurs, continuent à dominer la scène technologique internationale.

US Technology Position Relative to	Improved	Declined	Maintained
Japan	→	•	○
Europe	—	←	●
1990-94 Trend			

Source National Critical Technologies Review Groups *Science Engineering Indicators 1996*

4. Les efforts de recherche américain et japonais

Etats-Unis

De 1990 à 1996, bien qu'augmentant en termes nominaux, le budget fédéral américain de recherche a légèrement décru en termes réels. Cette baisse provient de la réduction des crédits de R&D militaires

Les dépenses de recherche civile ont, elles, augmenté en termes réels de 3.4 milliards de dollars au cours de ces cinq années. Les parts relatives, dans le budget fédéral, des secteurs de la santé, de l'espace, de l'énergie et de la recherche fondamentale ont augmenté. Pour 1997, malgré les restrictions budgétaires, le Gouvernement Clinton-Gore a proposé un budget en augmentation de 1,6 %.

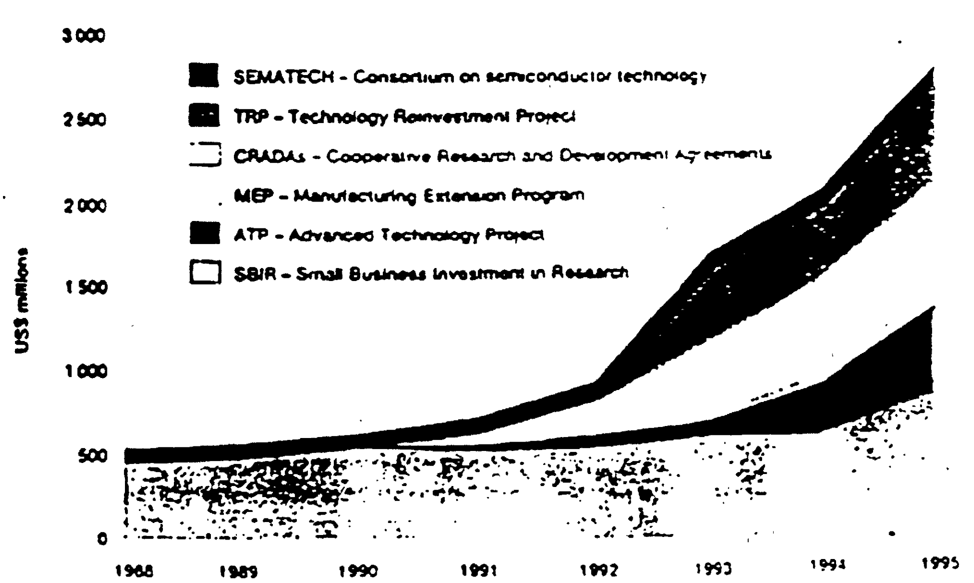
Evolution des priorités du financement fédéral américain en matière de R&D (crédits budgétaires de R&D par objectif socio-économique)

	1990	1995	1996
Total en valeur (millions de dollars)	*63 781*	*70 309*	*70 503*
Défense	62.6	54.8	53.3
Santé	13.0	16.2	16.7
Recherche spatiale & technologie	9.0	11.2	11.2
Sciences	3.8	[illegible]	4.3
Energie	4.3	[illegible]	4.4
Ressources naturelles & Environnement	2.2	2.9	3.1
Transports	1.6	[illegible]	2.8
Agriculture	1.5	[illegible]	[illegible]
Autres	2.0	[illegible]	[illegible]
Total en pourcentage	100.0	100.0	[illegible]

Source: National Science Foundation

De 1991 à 1995, les budgets des programmes de recherche américains basés sur le partenariat avec le secteur privé se sont considérablement accrus.

Selected Federal Paternship with Industry



Source: Department of Commerce data 1995

Japon

Bien placé au niveau des applications technologiques, mais en retard en recherche de base sur les Etats-Unis et l'Europe, le Japon investit désormais massivement dans la science et les ressources humaines en matière de recherche. Dans le même temps, son effort de recherche industrielle demeure élevé.

Augmentations dans le budget de recherche publique japonais 1996:

Budget public total de recherche : + 6,9 %

Organismes :

- [illegible] de la Science (MONBUSHO) : + 7,2 %
- [illegible] de l'Industrie (MI[illegible]
- [illegible] la Science et de la Technologie (STA) : + 7,[illegible] %
- Agence de la Recherche industrielle et de la Technologie : + [illegible] %

Programmes :

- [illegible] postdoctorales : + [illegible] %
- Programme pour les centres d'excellence : + [illegible] %
- Bourses d'aide à la recherche : + 10,2 %
- Programme "Sciences et technologie industrielles" : + [illegible]63 %

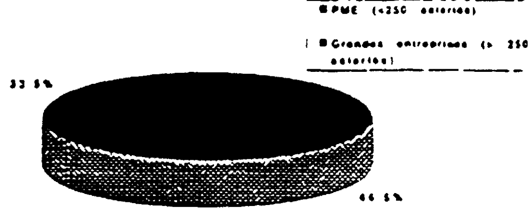
Domaines (exemples) :

- [illegible] : + [illegible] %
- [illegible] : + [illegible] %
- Energie nucléaire : + 7,2 %

5. PMEs, recherche et emploi

Les PMEs représentent la plus grande source d'emploi dans l'Union européenne. Par ailleurs, les petites et très petites :ntreprises sont celles qui produisent le plus d'innovations. L'analyse montre que les secteurs où l'investissement en echerche croît le plus sont aussi ceux où la création d'emplois est la plus forte.

Part des PMEs dans l'emploi total de l'UE



Source · Commission Européenne Eurostat, base de données du Projet PME. 1995

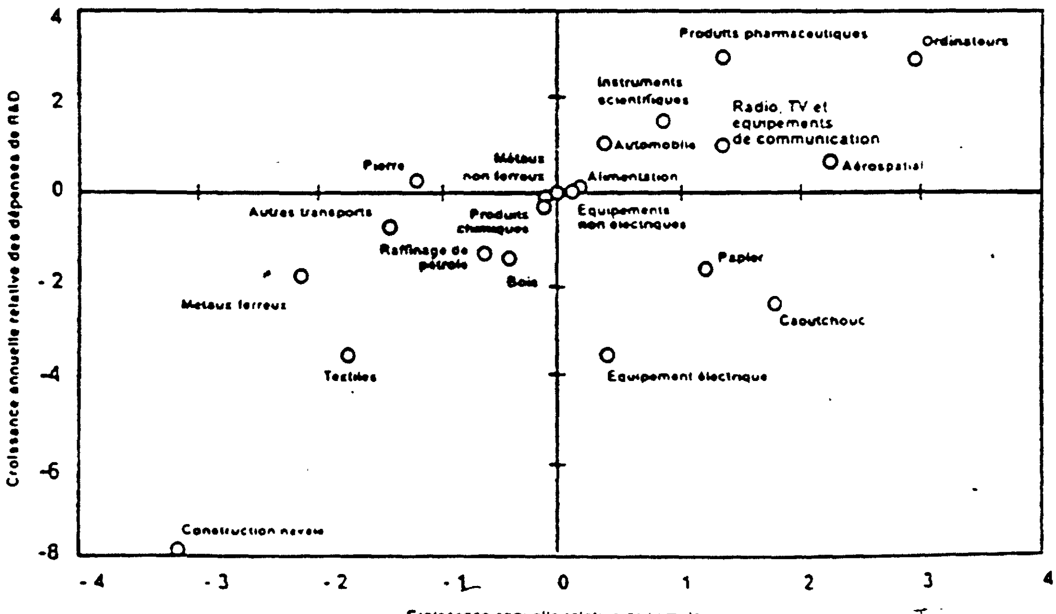
Répartition en pourcentage des innovations en fonction des catégories d'effectifs salariés (Irlande, Italie, Pays-Bas, Royaume-Uni)

Catégorie de taille	Irlande	Italie	Pays-Bas	Royaume-Uni
1-19	61.0	14.4	35.0	22.4
20-49	21.0	21.3	18.4	14.7
50-99	9.0	27.2	10.9	26.7
100-499	8.0	14.1	21.1	15.6
500-999	1.0	5.5	14.6	7.6
1000 et plus		17.5		13.0
Total	**100.0**	**100.0**	**100.0**	**100.0**

Source · Observatoire européen des PME. 1995

Dépenses de R&D et croissance de l'emploi, 1973-1990

Taux de croissance moyens en pourcentage par industrie par rapport à la croissance industrielle totale pour 13 pays de l'OCDE



Source OCDE base de données STAN

6. Visions prospectives et priorités

Des "Foresight exercises" (études de prospective scientifique et technologique) sont menés régulièrement au Japon et aux Etats-Unis depuis trente ans. Des opérations de ce type ont été récemment lancées en Europe (notamment en Grande-Bretagne, en France, en Allemagne, au Danemark, aux Pays-Bas et en Espagne).

La comparaison de leurs conclusions montre une grande convergence des listes de priorités retenues aux niveaux élevé et moyen d'agrégation des thèmes *(opto-électronique et intelligence artificielle; nanotechnologies et matériaux nouveaux et intelligents; biotechnologies, biologie moléculaire et neurosciences; technologies environnementales et technologies de production propre d'énergie, etc).*

En termes d'objectifs économiques et sociaux, deux thèmes majeurs émergent :

- **la société de l'information;**
- **le développement durable.**

Ces conclusions sont également convergentes avec celles du "Projet 2025" entrepris à la demande de 18 grandes organisations et sociétés américaines, britanniques et allemandes. Basé sur l'analyse critique de 1500 exercices de prévision entrepris depuis 1970, ce projet a débouché sur l'établissement d'une liste de 83 hypothèses "à forte probabilité" pour l'année 2025. Parmi les grands thèmes : *la gestion intégrée de l'environnement et des ressources naturelles; la gestion intégrée de la santé humaine; l'avènement du "Village global électronique"; la production intelligente.*

Source : OECD Science Technology Industry Review, N° 17, Special issue on Government Technology Foresight Exercises; *The competitive position of European science, technology and industry* - an ESTA opinion in relation with the 5th Framework Programme. *L'avenir hautement probable. 83 hypothèses sur l'année 2025*, Joseph Coates, Futuribles, avril 1996.

7. Besoins sociétaux et perspectives de marchés: exemples

Développement durable et environnement

ı ne peut y avoir de développement durable sans effort de recherche. Parmi d'autres, deux grands problèmes à résoudre ont ceux des ressources en eau et l'impact des transports sur l'environnement. Au niveau européen comme au niveau ondial, l'environnement représente un important marché potentiel.

Une ressource rare : l'eau

En Europe et dans le monde, l'eau devient une ressource rare. 65% de l'eau prélevée des rivières, des lacs et des aquifères dans le monde est utilisée par l'agriculture. 1000 tonnes d'eau sont nécessaires pour produire une tonne de blé. Pour nourrir les 90 millions de personnes s'ajoutant à la population mondiale chaque année, 27 millions de m^3 d'eau supplémentaires sont nécessaires.

En Europe, 20% des eaux de surface sont menacées. 60% des surfaces agricoles présentent une concentration d'engrais et de pesticides dangereuse pour la qualité de l'eau dans le voisinage. De 15 à 30% de l'eau collectée en Europe est perdue dans les circuits de distribution.

urce: Document de travail des services de la Commission sur les Task Forces Recherche-Industrie (sec (96) 568)/ L'état de la planète 1996.

Les coûts du transport

En 50 ans, la population mondiale a doublé; le nombre de voitures particulières, lui, a décuplé : **il est aujourd'hui** d'environ 500 millions. Vers 2025 ou 2030, il devrait y avoir 1 milliard de voitures dans le monde. **En Europe, le** parc automobile devrait croître de 25% entre 1992 et 2005.

Les transports consomment 30% de la demande finale d'énergie et sont responsables de 25% de la totalité des émissions de CO_2. Le transport routier à lui seul représente 80% du CO_2 produit par les transports. Le total des coûts externes des problèmes de santé attribués aux émissions dues aux transports est estimé entre 0,3 et 0,4% du PNB.

urce: Document de travail de la Commission sur les Task Forces Recherche-Industrie (sec (96) 568) / The Economist, 22 June 1996 "Living th the car" : a survey

Le marché mondial de l'environnement
Estimations en milliards de $

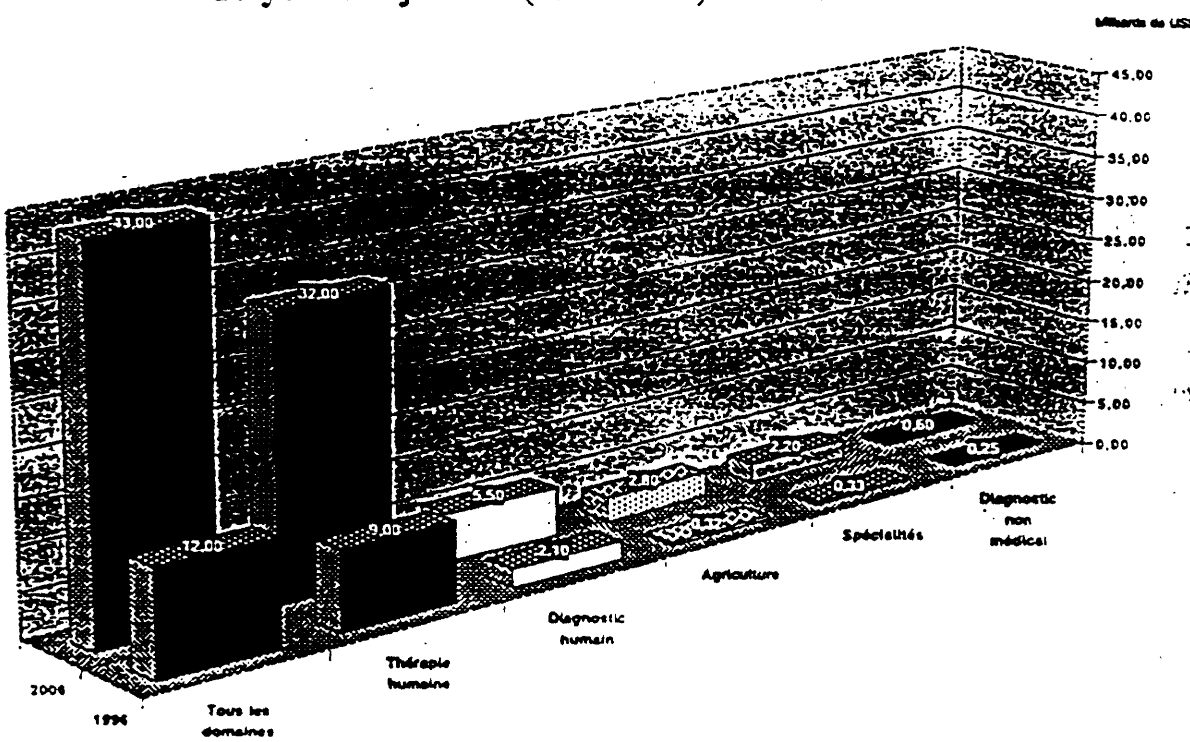
	OCDE	ECOTEC	ETDC	Environmental Business International
Année	2000	2000	2000	1998
Amérique du Nord	125	147	217	199
Amérique latine	-	5	-	10
Europe occidentale	78	89	188	132
Europe de l'Est/NIS	21	9	25	27
Asie Pacifique	42	63	138	49
Total mondial	300	320	580	426

Source: OCDE (1992), ECOTEC (1994), ETDC (1994), OTA (1994)

■ Biotechnologies

Le marché des produits basés sur les biotechnologies est un de ceux qui croissent le plus rapidement à l'échelle mondiale. En termes de nombre de sociétés, d'emploi, de chiffres d'affaires ou de dépenses de recherche, l'effort américain est aujourd'hui très supérieur à l'effort européen.

Global Sales for Biotechnology-Based products 10 year Projection (1996-2006) - in 1996 $ Billions



Source: Consulting Resources Corp.

EU vs US BIOTECH SECTORS (Ecu Millions)

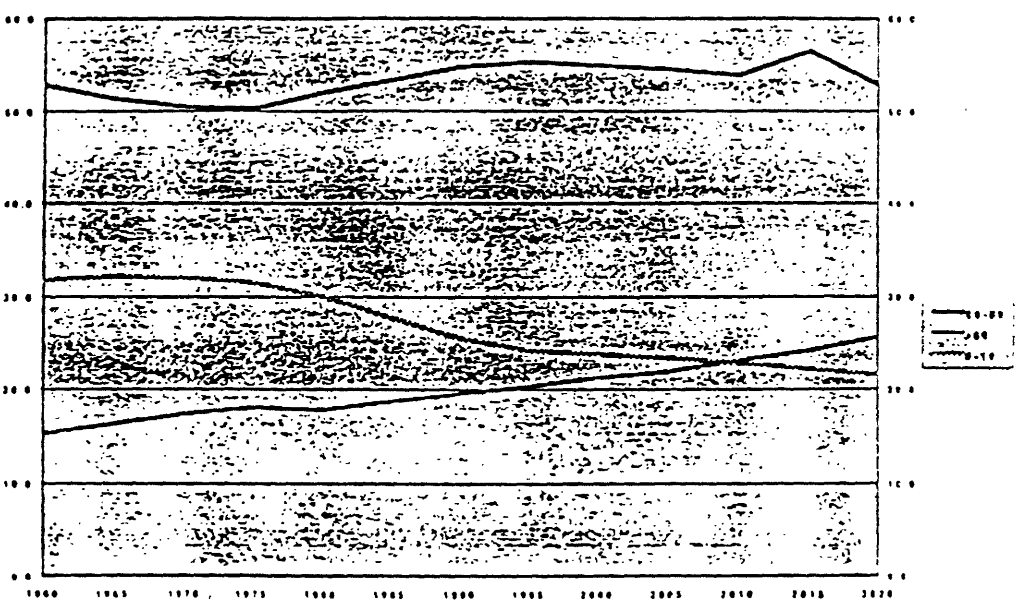
	Europe	US
Financial		
Turnover	1 158	9.663
R&D Expenditure	605	5.859
Industry		
Number of Companies	584	1.308
Number of employees	17 200	108.000

Source: Ernest & Young BioBusiness

Santé

La population européenne vieillit. En 2020, les plus de 60 ans représenteront plus d'un quart des personnes, et les moins de 20 ans, un peu plus d'un cinquième seulement. Les conséquences de cette tendance en termes médicaux et de santé publique, sont importantes.

Population de l'UE par groupe d'âge (%)



Source: Eurostat, L'Europe en chiffres

Dans le monde, les maladies infectieuses frappent des centaines de millions de personnes: elles en tuent des dizaines de millions.

Populations Affected by Various Infectious Diseases, 1993

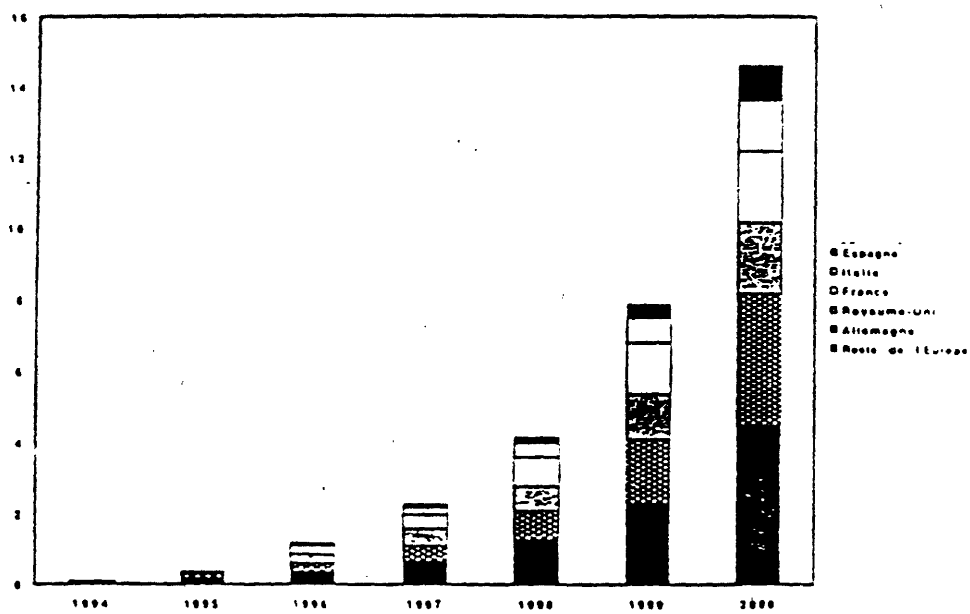
Disease	Deaths	Incidence
Acute Respiratory Infections	4.1 million	248 million
Diarrheal Diseases	3.0 million	1.8 billion
Tuberculosis	2.7 million	8.8 million
Malaria	2.0 million	300-500 million (prevalence)
Measles	1.2 million	45 million
Hepatitis B	1.0 million	2.2 million
HIV/AIDS	700000	2-3 million
Cholera	6800	380000
Polio	5500	110000

Source: WHO, 1995 — *State of the World 1996*

■ Société de l'information

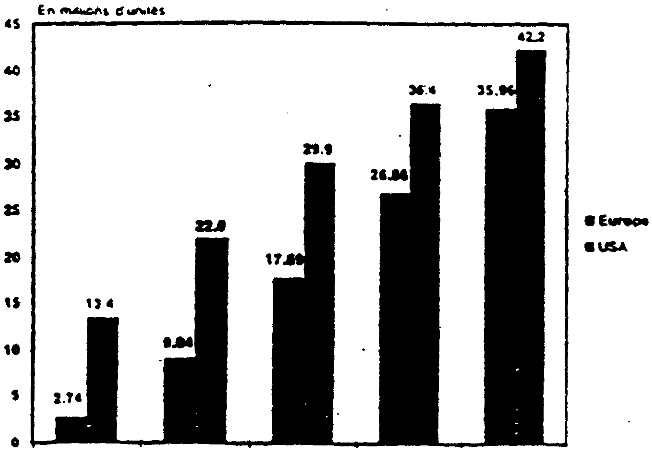
L'Europe est entrée dans la société de l'information. Le nombre de connections des particuliers et des entreprises au réseau Internet et le marché des lecteurs de CD-Rom croissent à un rythme soutenu. Les sociétés américaines produisent aujourd'hui l'essentiel des titres de CD-Rom.

The Internet Market in Europe, 1994-2000
Number of Households with Internet Access (Millions)



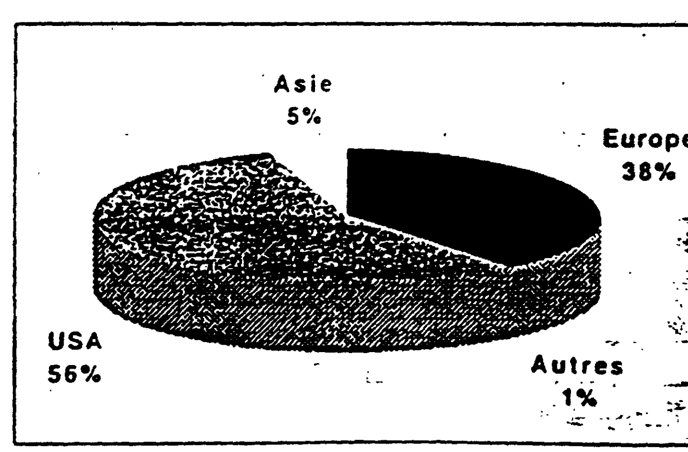
Source: European Information Technology Observatory EITO 1996

Equipement des foyers en lecteurs CD-Rom



Source Inteco 1994

Production mondiale de titres CD-ROM en 1995



Source TPFL Publishing Facts & Figures 95

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A Hopkirk (11 October)

Survey of European SR facilities

A Hopkirk
CLRC Daresbury Laboratory, UK
October 1996

In order that there be an informed debate about the current and future levels of support for SR facilities and the opportunities for an international dimension to this activity, it is necessary to have up to date information about the current and presently planned levels of activity. To this end we have surveyed the European SR facilities known to us, sending each a copy of a simple questionnaire.

The list of facilities surveyed and the questionnaire are given in Appendix 1.

The questionnaire was sent to 20 facilities in western Europe and 12 replies have been received as of 7 October. Eight Russian facilities were also surveyed but none have replied. Copies of the replies can be found in Appendix 2.

The set of returns is not complete at the time of this Round Table meeting so only a very preliminary digest can be given. However the significant magnitude of the activity is already apparent and some useful points of information can be made at this early stage.

Appendix 3 contains summary tables of selected data taken from the information in the questionnaire replies.

For example, from the twelve facility returns made to date:

- The typical facility operates for 250 days per annum.
- The typical facility provides 200 days per annum for user experiments.

In 1996:

- These facilities will provide some 37000 station days of access to users.
- Just over half of these will work on x-ray experiments.
- The rest will be split 60:40 between soft x-rays and the lower photon energy ranges.

- The total number of user groups reported (assuming no duplication between facilities and measuring over the lifetime of the facilities) is over 2500, representing more that 19000 individual scientists.

- The user community at the typical facility is >95% academic in origin, however this figure may be biased by old data as in recent years most facilities have made positive efforts to increase their non-academic activities. In two cases the % commercial users is said to be >10%.

- The cost of a facility varies widely because large multinational institutions cost considerably more than the small national facilities. For example, an ESRF comes in at the order of £200 million while MAX2 and BESSY2 come in at £20-30 million.

Detailed analysis and World Wide Web presentation of the information awaits completion of the set of replies.

Appendix 1

List of facilities surveyed and status of reply

Survey Questionnaire

LIST OF FACILITIES SURVEYED AND REPLY STATUS

FACILITY	REPLY RECEIVED (as of 7 October)
ANKA	YES
BESSY1	YES
BESSY2	YES
DORIS3 & PETRA2	YES
ELETTRA	YES
ELSA	YES
ESRF	YES
MAX1	YES
MAX2	YES
SLS	YES
SRS	YES
SUPER-ACO & DCI	YES
ADONE	no
AmPSMEA	no
ASTRID	no
BONN2	no
DELTA	no
EUTERPE	no
SOLEIL	no
<u>Russian sources</u>	
SIBERIA1	no
SIBERIA2	no
SIBERIA-AS	no
SIBERIA-SM	no
TNK	no
VEPP2M	no
VEPP3	no
VEEP4	no

European Facility Questionnaire

Full Facility Name ______________________

Address & Country ______________________

WWW Site Address ______________________

Email & Fax address ______________________

What is the present status of the facility?

- Proposed ❍
- Under construction ❍
- Approved ❍
- Operational for users ❍

RESOURCES

- Ownership
  - 100% publicly owned ❍
  - 100% private/commercially owned ❍
  - mixed ownership ❍

- Main source(s) of funding or organisation type
  - central government ❍
  - academic institution or consortium ❍
  - private or public company ❍

- Financial information

Annual total budget	
Total cost/value of facility (at 1996 prices)	

- Facility history

Year when facility was (or will be) first available for user experiments? ____________

A "key dates" history of the facility.

STORAGE RING DETAILS

What is the storage ring energy?	
What is the number of 24 hr days (or day equivalents) for storage ring operated last year?	
What is the number of 24 hr days (or day equivalents) available for experiments?	

What generation would you describe your facility as belonging to?

first	(parasitic)	O
second	(dedicated & mainly bending magnet sources)	O
third	(dedicated & mainly insertion device sources)	O
fourth	(please define below if selected)	O

USER EXPERIMENTAL FACILITY DETAILS

Total number of simultaneously available experiment stations available for users in January 1996	
Total number expected in January 2000	
Total number expected in January 2005	
Total number expected in January 2010	

Spectral ranges exploited now	**Number user experiment stations**
IR/visible/VUV up to 150 eV	
general soft X-ray 150 - 2500 eV	
soft X-ray lithography dedicated	
x-ray (photon energy above Be window limit)	
test	
other	
	Total number of stations =

COMPOSITION OF THE USER COMMUNITY

Total number (integrated) of user groups who have used the facility up to January 1996.	
Total number of individual users who have used the facility up to January 1996.	
% Academic users	
% Commercial/industrial users	
% International users (i.e. not from the country of the facility)	

MECHANISMS FOR ACCESS

academic peer review of proposals	O
purchase of time	O
granted solely by facility management	O

If you sell beamtime, what is the normal charge per day for access to an operational SR beamline & stations?	

Thank you for completing this questionnaire. Please return it to the address on the covering letter.

Appendix 2

Copies of questionnaire replies to date

European Facility Questionnaire

Full Facility Name	ANKA
Address & Country	Dr H O Moser, Forschungzentrum Karsruhe, Projekt ANKA / Bau 687, Postfach 36 40, D-76021 Karlsuhe, Germany
WWW Site Address	http://hbksun17.fzk.de:8080/ANKA/
Email & Fax address	moser@anka.fzk.de (+49) 7247 82 6172

What is the present status of the facility?

Proposed	
Under construction	
Approved	√
Operational for users	

RESOURCES

- Ownership

100% publicly owned	√
100% private/commercially owned	
mixed ownership	

- Main source(s) of funding or organisation type

central government	√
academic institution or consortium	
private or public company	√

- Financial information

Annual total budget	estimated 10 Mio DM
Total cost/value of facility (at 1996 prices)	70 Mio DM

- Facility history

Year when facility was (or will be) first available for user experiments? 2000

A "key dates" history of the facility.

Early 80s	Work on KIGA technology starting in FZK
1985	Design Report KSSQ: Superconducting compact synchrotron radiation source ofr LIGA and Analysis (Report Kfk3976 (1985))
1990	General purpose compact synchrotron radiation sources (NIMB61 (1991) 565)
1994	German ministry of Education, Science, Research and Technology asks for industrial use of source
1995	ANKA proposal
12.03.1996	Official announcement of approval by federal and state government

STORAGE RING DETAILS

What is the storage ring energy?	2.5 GeV
What is the number of 24 hr days (or day equivalents) for storage ring operated last year?	
What is the number of 24 hr days (or day equivalents) available for experiments?	

What generation would you describe your facility as belonging to?

first	(parasitic)	
second	(dedicated & mainly bending magnet sources)	√
third	(dedicated & mainly insertion device sources)	√
fourth	(please define below if selected)	

USER EXPERIMENTAL FACILITY DETAILS

Total number of simultaneously available experiment stations available for users in January 1996	
Total number expected in January 2000	13
Total number expected in January 2005	no planning yet
Total number expected in January 2010	no planning yet

Spectral ranges exploited now	**Number user experiment stations**
IR/visible/VUV up to 150 eV	1
general soft X-ray 150 - 2500 eV	/
soft X-ray lithography dedicated	/
x-ray (photon energy above Be window limit)	12
test PETRA II (Hard X-ray)	/
other	/
	Total number of stations = 13

COMPOSITION OF THE USER COMMUNITY

Total number (integrated) of user groups who have used the facility up to January 1996.	/
Total number of individual users who have used the facility up to January 1996.	/
% Academic users	/
% Commercial/industrial users	/
% International users (i.e. not from the country of the facility)	/

MECHANISMS FOR ACCESS

see footnote 1
academic peer review of proposals
purchase of time
granted solely by facility management

If you sell beamtime, what is the normal charge per day for access to an operational SR beamline & stations?	see footnote 2

Thank you for completing this questionnaire. Please return it to the address on the covering letter.

1. Priority on customer buying full service or various forms of partial service. Remaining part to research user upon special agreement or peer review
2. Estimated average 550 DM per hour of full service.

European Facility Questionnaire

Full Facility Name	BESSY I, Berlin-Wilmersdorf
Address & Country	Lentzeallee 100, D-14195 Berlin
WWW Site Address	—
Email & Fax address	buero@exp.bessy.de 82004-103

What is the present status of the facility?

- Proposed
- Under construction
- Approved
- Operational for users √

RESOURCES

- Ownership
  - 100% publicly owned
  - 100% private/commercially owned
  - mixed ownership √

- Main source(s) of funding or organisation type
  - central government
  - academic institution or consortium
  - private or public company √

- Financial information

Annual total budget	8 MECU
Total cost/value of facility (at 1996 prices)	63 MECU

- Facility history

Year when facility was (or will be) first available for user experiments? 1982

A "key dates" history of the facility.

1979 Official foundation of the BESSY company
1981 December, first stored beam
1982 February, first user experiments
start operation of X-ray lithography laboratory
1983 First beamline for circularly VUV radiation
1984 Two shift operation
1985 Routine operation of small emittance
European radiometry standard
1986 First undulator operation
1990 Spectral resolution in excess of 10 000 in the XUV
1991 Operation of crossed undulator for circularly polarized light
1994 Operation of wave length shifter for LIGA technology

STORAGE RING DETAILS

What is the storage ring energy?	800 MeV
What is the number of 24 hr days (or day equivalents) for storage ring operated last year?	205
What is the number of 24 hr days (or day equivalents) available for experiments?	205

What generation would you describe your facility as belonging to?

first	(parasitic)	
second	(dedicated & mainly bending magnet sources)	√
third	(dedicated & mainly insertion device sources)	
fourth	(please define below if selected)	

USER EXPERIMENTAL FACILITY DETAILS

Total number of simultaneously available experiment stations available for users in January 1996	35
Total number expected in January 2000	35
Total number expected in January 2005	-
Total number expected in January 2010	-

Spectral ranges exploited now	Number user experiment stations
IR/visible/VUV up to 150 eV	15
general soft X-ray 150 - 2500 eV	11
soft X-ray lithography dedicated	4
x-ray (photon energy above Be window limit)	1
test	1
other	3
	Total number of stations = 35

COMPOSITION OF THE USER COMMUNITY

Total number (integrated) of user groups who have used the facility up to January 1996.	1300
Total number of individual users who have used the facility up to January 1996.	3900
% Academic users	69
% Commercial/industrial users	22
% International users (i.e. not from the country of the facility)	9

MECHANISMS FOR ACCESS

academic peer review of proposals	√
purchase of time	√
granted solely by facility management	

If you sell beamtime, what is the normal charge per day for access to an operational SR beamline & stations?	1300 ECU

Thank you for completing this questionnaire. Please return it to the address on the covering letter.

* Two main users, the Physikalisch Technische Bundesanstalt (PTB) and the X-ray Lithography consortium have their own laboratory. They host their own guest groups.

European Facility Questionnaire

Full Facility Name	BESSY II, Berlin-Aldershof
Address & Country	Rudower Chaussee 5, D-12489 Berlin
WWW Site Address	–
Email & Fax address	mallwitz@port.exp.bessy.de +49+30 6392-4632

What is the present status of the facility?

Proposed
Under construction √
Approved
Operational for users

RESOURCES

- Ownership
  100% publicly owned
  100% private/commercially owned
  mixed ownership √

- Main source(s) of funding or organisation type

  central government
  academic institution or consortium
  private or public company √

- Financial information

Annual total budget	–
Total cost/value of facility (at 1996 prices)	100 MECU

- Facility history

Year when facility was (or will be) first available for user experiments? 1999

A "key dates" history of the facility.

Mid 1984	Feasibility studies for the construction of the high brilliance synchrotron light source BESSY II
December 1986	Preparation of the scientifc case study
March 1991	Decision for the site at Aldershof
7 July 1992	Project approval
4 July 1994	Ground breaking ceremony
8 February 1995	Laying of the foundation stone
13 December 1995	Topping-out ceremony
August 1996	Synchrotron installed

STORAGE RING DETAILS

What is the storage ring energy?	1.7 GeV
What is the number of 24 hr days (or day equivalents) for storage ring operated last year?	-
What is the number of 24 hr days (or day equivalents) available for experiments?	-

What generation would you describe your facility as belonging to?

first	(parasitic)	
second	(dedicated & mainly bending magnet sources)	
third	(dedicated & mainly insertion device sources)	√
fourth	(please define below if selected)	

USER EXPERIMENTAL FACILITY DETAILS

Total number of simultaneously available experiment stations available for users in January 1996	
Total number expected in January 2000	17
Total number expected in January 2005	32
Total number expected in January 2010	47

Spectral ranges exploited now	**Number user experiment stations**
IR/visible/VUV up to 150 eV	
general soft X-ray 150 - 2500 eV	
soft X-ray lithography dedicated	
x-ray (photon energy above Be window limit)	
test	
other	
	Total number of stations =

COMPOSITION OF THE USER COMMUNITY

Total number (integrated) of user groups who have used the facility up to January 1996.	
Total number of individual users who have used the facility up to January 1996.	
% Academic users	
% Commercial/industrial users	
% International users (i.e. not from the country of the facility)	

MECHANISMS FOR ACCESS

academic peer review of proposals	√
purchase of time	√
granted solely by facility management	

If you sell beamtime, what is the normal charge per day for access to an operational SR beamline & stations?	

Thank you for completing this questionnaire. Please return it to the address on the covering letter.

European Facility Questionnaire

Full Facility Name	Hamburger Synchrotronstrahlungslabor HASYLAB
Address & Country	Notkestr. 85, D-22603 Hamburg, Germany
WWW Site Address	http://WWW.DESY.de
Email &	HASYLAB@DESY.de
Fax address	+49 40 8998 4475

What is the present status of the facility?

Proposed
Under construction
Approved
Operational for users √

RESOURCES

- Ownership
  100% publicly owned √
  100% private/commercially owned
  mixed ownership

- Main source(s) of funding or organisation type

  central government √
  academic institution or consortium
  private or public company

- Financial information

Annual total budget	Part of DESY budget (29 Mill. DM)
Total cost/value of facility (at 1996 prices)	–

- Facility history

Year when facility was (or will be) first available for user experiments? 1974

A "key dates" history of the facility.

1969-1974	Construction of double storage ring DORIS at DESY
1972	Establishment of the Hamburg Outstation of the European Laboratory for Molecular Biology (EMBL)
1978-1980	Building of of HASYLAB at the DORIS storage ring
1981-1982	DORIS is adapted a single storage ring, DORIS II
1987	Establishment of three permanent MPG working groups at HASYLAB
1990-1991	DORIS II is improved with the addition of 7 wigglers/undulators for synchrotron radiation experiments into DORIS III
1993	DORIS III starts operation as a dedicated radiation source for HASYLAB
1995	March, commissioning of the undulator test beam for synchrotron radiation PETRA II

STORAGE RING DETAILS

What is the storage ring energy?	4.5 GeV
What is the number of 24 hr days (or day equivalents) for storage ring operated last year?	253 days*
What is the number of 24 hr days (or day equivalents) available for experiments?	214 days**

* 49 days for machine studies and maintenance ** in 1995

What generation would you describe your facility as belonging to?

first (parasitic)
second (dedicated & mainly bending magnet sources) 10 Wigglers/Undulators √
third (dedicated & mainly insertion device sources)
fourth (please define below if selected)

USER EXPERIMENTAL FACILITY DETAILS

Total number of simultaneously available experiment stations available for users in January 1996	42
Total number expected in January 2000	42
Total number expected in January 2005	
Total number expected in January 2010	

Spectral ranges exploited now	Number user experiment stations
IR/visible/VUV up to 150 eV	5
general soft X-ray 150 - 2500 eV	5
soft X-ray lithography dedicated	–
x-ray (photon energy above Be window limit)	32
test PETRA II (Hard X-ray)	(1)
other	
	Total number of stations = 42

COMPOSITION OF THE USER COMMUNITY

Total number (integrated) of user groups who have used the facility up to January 1996.	–
Total number of individual users who have used the facility up to January 1996.	18051*
% Academic users	98%
% Commercial/industrial users	approx 2%
% International users (i.e. not from the country of the facility)	30%

MECHANISMS FOR ACCESS

academic peer review of proposals √
purchase of time √
granted solely by facility management √

If you sell beamtime, what is the normal charge per day for access to an operational SR beamline & stations?	100-750DM for industrial users per hr

Thank you for completing this questionnaire. Please return it to the address on the covering letter.

European Facility Questionnaire

Full Facility Name	SINCROTRONE TRIESTE S.C.p.A.
Address & Country	Padriciano 99, 34012 Trieste, Italy
WWW Site Address	http://www.elettra.trieste.it
Email & Fax address	useroffice(at)elettra.trieste.it +39 40 3758565

What is the present status of the facility?

- Proposed
- Under construction
- Approved
- Operational for users √

RESOURCES

- Ownership
  - 100% publicly owned
  - 100% private/commercially owned
  - mixed ownership √

- Main source(s) of funding or organisation type
  - central government
  - academic institution or consortium
  - private or public company √

- Financial information

Annual total budget	30 billion It. Liras
Total cost/value of facility (at 1996 prices)	160 billion It. Liras

- Facility history

Year when facility was (or will be) first available for user experiments? 1995

A "key dates" history of the facility.

1986:	The Sincrotrone Trieste company starts operating. First funding is made available.
1991:	Groundbreaking.
4 Oct 1993:	First beam injected and stored
Nov 1993:	First experiment
July 1995:	The facility is officially opened to users.

STORAGE RING DETAILS

What is the storage ring energy?	1.5 or 2 GeV
What is the number of 24 hr days (or day equivalents) for storage ring operated last year?	6.100
What is the number of 24 hr days (or day equivalents) available for experiments?	177

What generation would you describe your facility as belonging to?

first (parasitic)
second (dedicated & mainly bending magnet sources) √
third (dedicated & mainly insertion device sources)
fourth (please define below if selected)

USER EXPERIMENTAL FACILITY DETAILS

Total number of simultaneously available experiment stations available for users in January 1996	4
Total number expected in January 2000	7
Total number expected in January 2005	approx 25
Total number expected in January 2010	approx 30

Spectral ranges exploited now	**Number user experiment stations**
IR/visible/VUV up to 150 eV	
general soft X-ray 150 - 2500 eV	3
soft X-ray lithography dedicated	
x-ray (photon energy above Be window limit)	1
test	
other	
	Total number of stations = 4

COMPOSITION OF THE USER COMMUNITY

Total number (integrated) of user groups who have used the facility up to January 1996.	78
Total number of individual users who have used the facility up to January 1996.	242
% Academic users	88.5%
% Commercial/industrial users	11.5%
% International users (i.e. not from the country of the facility)	45%

MECHANISMS FOR ACCESS

academic peer review of proposals √
purchase of time
granted solely by facility management

If you sell beamtime, what is the normal charge per day for access to an operational SR beamline & stations?	5500-9120 ECU

Thank you for completing this questionnaire. Please return it to the address on the covering letter.

European Facility Questionnaire

Full Facility Name	Electron Stretcher & Accelerator (ELSA), Bonn University
Address & Country	Physikalisches Institut, Nussallee 12, D-53115 Bonn, Germany
WWW Site Address	http://elsarl.physik.uni-bonn.de/
Email &	husmann physik.uni-bonn.de
Fax address	+228.73.3620

What is the present status of the facility?

Proposed
Under construction
Approved
Operational for users √

RESOURCES

- Ownership
  - 100% publicly owned √
  - 100% private/commercially owned
  - mixed ownership

- Main source(s) of funding or organisation type
  - central government
  - academic institution or consortium √
  - private or public company

- Financial information

Annual total budget	3.8 MDM
Total cost/value of facility (at 1996 prices)	~~unknown~~ facilities built from 1964-1967 and 1982-1986

- Facility history

Year when facility was (or will be) first available for user experiments? 1967
1987 MEP
1988 SR

A "key dates" history of the facility.

1964 - 1967: Construction of 2.5 GeV electron synchrotron
1967: Start of experimental research work at SY
1983 - 1986: Construction of 3.5 GeV storage ring (Stretcher)
: Stretcher uses SY as the booster
1988 - 1988: Construction of SR - Lab
1988: Start of SR experiments at Stretcher

ELSA is mainly used for particle physics (MEP): 75%
ELSA is partly used as a dedicated source for experiments with synchrotron radiation (SR): 20%

STORAGE RING DETAILS

What is the storage ring energy?	3.5 GeV
What is the number of 24 hr days (or day equivalents) for storage ring operated last year?	210 d *)
What is the number of 24 hr days (or day equivalents) available for experiments?	199 d *)

What generation would you describe your facility as belonging to?

first	(parasitic)	
second	(dedicated & mainly bending magnet sources)	√
third	(dedicated & mainly insertion device sources)	
fourth	(please define below if selected)	

USER EXPERIMENTAL FACILITY DETAILS

Total number of simultaneously available experiment stations available for users in January 1996	9
Total number expected in January 2000	13
Total number expected in January 2005	?
Total number expected in January 2010	?

Spectral ranges exploited now	Number user experiment stations
IR/visible/VUV up to 150 eV	3
general soft X-ray 150 - 2500 eV	2
soft X-ray lithography dedicated	3
x-ray (photon energy above Be window limit)	6
test	1
other	
	Total number of stations = 15

COMPOSITION OF THE USER COMMUNITY

Total number (integrated) of user groups who have used the facility up to January 1996.	23
Total number of individual users who have used the facility up to January 1996.	70
% Academic users	81
% Commercial/industrial users	7
% International users (i.e. not from the country of the facility)	11

MECHANISMS FOR ACCESS

academic peer review of proposals	
purchase of time	
granted solely by facility management	√

If you sell beamtime, what is the normal charge per day for access to an operational SR beamline & stations?	Users are always collaborators

Thank you for completing this questionnaire. Please return it to the address on the covering letter.

European Facility Questionnaire

Full Facility Name	European Synchrotron Radiation Facility
Address & Country	BP 220, F38043 Grenoble Cedex, France
WWW Site Address	http://www.esrf.fr
Email & Fax address	surname@esrf.fr (+33) 76882020 (from 18.10.96) (+33)(0) 4 7688 2020

What is the present status of the facility?

- Proposed
- Under construction
- Approved
- Operational for users √

RESOURCES

- Ownership
  - 100% publicly owned √
  - 100% private/commercially owned
  - mixed ownership

- Main source(s) of funding or organisation type
  - central government
  - academic institution or consortium
  - private or public company √

- Financial information

Annual total budget	1966: 416.6 MFF
Total cost/value of facility (at 1996 prices)	1980 MFF

- Facility history

Year when facility was (or will be) first available for user experiments? 1994

A "key dates" history of the facility.

1975-1985	Conception
1986-1987	Foundation phase based on Memorandum of Understanding (F, D, I, UK, E)
Jan 1988	Start of construction based on Protocol (F, D, I, UK, E, CH, DK/N/S/SF)
Dec 1988	Convention statutes signed (F, D, I, UK, E, CH, B, DK7N/S/SF)
Dec 1991	Accession of the Netherlands (in Consortium with B)
1991	Commissioning of injector
1992	Commissioning of storage ring
1993-1994	Construction and commissioning of first beamlines
Sept 1994	Start of regular user service with 9 beamlines Inauguration of the ESRF
June 1996	19 beamlines (out of 30) in user operation, Brilliance of source increased by factor with respect to target specification

STORAGE RING DETAILS

What is the storage ring energy?	6 GeV
What is the number of 24 hr days (or day equivalents) for storage ring operated last year?	258
What is the number of 24 hr days (or day equivalents) available for experiments?	198

What generation would you describe your facility as belonging to?

first	(parasitic)	
second	(dedicated & mainly bending magnet sources)	
third	(dedicated & mainly insertion device sources)	√
fourth	(please define below if selected)	

USER EXPERIMENTAL FACILITY DETAILS

Total number of simultaneously available experiment stations available for users in January 1996	16+4 CRG†
Total number expected in January 2000	37*+9 CRG†
Total number expected in January 2005	?*
Total number expected in January 2010	?*

†CRG = Collaborating Research Group   * subject to availability of appropriate budget

Spectral ranges exploited now	Number user experiment stations
IR/visible/VUV up to 150 eV	–
general soft X-ray 150 - 2500 eV	1
soft X-ray lithography dedicated	–
x-ray (photon energy above Be window limit)	19 + 4 CRG
test	
other	
	Total number of stations = 20 + 4

COMPOSITION OF THE USER COMMUNITY

Total number (integrated) of user groups who have used the facility up to January 1996.	427
Total number of individual users who have used the facility up to January 1996.	1398
% Academic users	98%
% Commercial/industrial users	2%
% International users (i.e. not from the country of the facility)	not appropriate for European lab

MECHANISMS FOR ACCESS

academic peer review of proposals	√
purchase of time	√
granted solely by facility management	

If you sell beamtime, what is the normal charge per day for access to an operational SR beamline & stations?	84000 FF (28000 FF per 8 hour shift)

Thank you for completing this questionnaire. Please return it to the address on the covering letter.

European Facility Questionnaire

Full Facility Name	The Swedish National Electron Accelerator Laboratory for Nuclear Physics and Synchrotron Radiation Research, MAX I
Address & Country	MAX-Lab, Lund University, Box 118, S-221 00 Sweden
WWW Site Address	http://www.maxlab.lu.se
Email & Fax address	firstname.lastname@maxlab.lu.se 46-46 2224710

What is the present status of the facility?

- Proposed
- Under construction
- Approved
- Operational for users √

RESOURCES

- Ownership
  - 100% publicly owned √
  - 100% private/commercially owned
  - mixed ownership
- Main source(s) of funding or organisation type
  - central government √
  - academic institution or consortium
  - private or public company
- Financial information

Annual total budget	30 MSEK*
Total cost/value of facility (at 1996 prices)	80 MSEK

- Facility history

Year when facility was (or will be) first available for user experiments? 1986

A "key dates" history of the facility.

1979:	Decision to build MAX I
1986:	MSX I in operation with two beamlines
1987:	First undulator installed
1996:	Nine beamlines (max capabilities) in operation
	Serving 260 users (60% from abroad)
	More than 120 referred papers published in 1993
	15 Ph.b. Thesis based on work at MAX I in 1995

* incl operation of MAX II

STORAGE RING DETAILS

What is the storage ring energy?	500 MeV
What is the number of 24 hr days (or day equivalents) for storage ring operated last year?	280
What is the number of 24 hr days (or day equivalents) available for experiments?	240

What generation would you describe your facility as belonging to?

first	(parasitic)	
second	(dedicated & mainly bending magnet sources)	√
third	(dedicated & mainly insertion device sources)	
fourth	(please define below if selected)	

USER EXPERIMENTAL FACILITY DETAILS

Total number of simultaneously available experiment stations available for users in January 1996	9
Total number expected in January 2000	9
Total number expected in January 2005	9
Total number expected in January 2010	9

Spectral ranges exploited now	Number user experiment stations
IR/visible/VUV up to 150 eV	5
general soft X-ray 150 - 2500 eV	4
soft X-ray lithography dedicated	0
x-ray (photon energy above Be window limit)	0
test	0
other	0
	Total number of stations = 9

COMPOSITION OF THE USER COMMUNITY

Total number (integrated) of user groups who have used the facility up to January 1996.	65
Total number of individual users who have used the facility up to January 1996.	300
% Academic users	95
% Commercial/industrial users	5
% International users (i.e. not from the country of the facility)	60

MECHANISMS FOR ACCESS

academic peer review of proposals	√
purchase of time	√
granted solely by facility management	

If you sell beamtime, what is the normal charge per day for access to an operational SR beamline & stations?	18000 SEK

Thank you for completing this questionnaire. Please return it to the address on the covering letter.

European Facility Questionnaire

Full Facility Name	The Swedish National Electron Accelerator Laboratory for Nuclear Physics and Synchrotron Radiation Research, MAX II
Address & Country	MAX-Lab, Lund University, Box 118, S-221 00 Sweden
WWW Site Address	http://www.maxlab.lu.se
Email & Fax address	firstname.lastname@maxlab.lu.se

What is the present status of the facility?

- Proposed
- Under construction
- Approved
- Operational for users √

RESOURCES

- Ownership
  - 100% publicly owned √
  - 100% private/commercially owned
  - mixed ownership

- Main source(s) of funding or organisation type
  - central government √
  - academic institution or consortium
  - private or public company

- Financial information

Annual total budget	30 MSEK*
Total cost/value of facility (at 1996 prices)	200 MSEK

- Facility history

Year when facility was (or will be) first available for user experiments? 1996

A "key dates" history of the facility.

1990:	MAX II was approved
1994:	MAX II is fully assembled
1995:	April, first beam stored in MAX II
1996:	Fall, MAX II reached or superseded design goals
1996:	Four beamlines under construction
1996:	Fall, first user operation

* incl operation of MAX I

STORAGE RING DETAILS

What is the storage ring energy?	1.5 MeV
What is the number of 24 hr days (or day equivalents) for storage ring operated last year?	280
What is the number of 24 hr days (or day equivalents) available for experiments?	240

What generation would you describe your facility as belonging to?

first	(parasitic)	
second	(dedicated & mainly bending magnet sources)	
third	(dedicated & mainly insertion device sources)	√
fourth	(please define below if selected)	

USER EXPERIMENTAL FACILITY DETAILS

Total number of simultaneously available experiment stations available for users in January 1996	1
Total number expected in January 2000	10
Total number expected in January 2005	13
Total number expected in January 2010	15

Spectral ranges exploited now	**Number user experiment stations**
IR/visible/VUV up to 150 eV	1
general soft X-ray 150 - 2500 eV	8
soft X-ray lithography dedicated	1
x-ray (photon energy above Be window limit)	3
test	1
other	1
	Total number of stations = 15

COMPOSITION OF THE USER COMMUNITY

Total number (integrated) of user groups who have used the facility up to January 1996.	2
Total number of individual users who have used the facility up to January 1996.	10
% Academic users	95
% Commercial/industrial users	5
% International users (i.e. not from the country of the facility)	50

MECHANISMS FOR ACCESS

academic peer review of proposals	√
purchase of time	√
granted solely by facility management	

If you sell beamtime, what is the normal charge per day for access to an operational SR beamline & stations?	18000 SEK

Thank you for completing this questionnaire. Please return it to the address on the covering letter.

European Facility Questionnaire

Full Facility Name	Swiss Light Source SLS
Address & Country	PSI, CH5232 Villgen, Switzerland
WWW Site Address	http://www1/PSI.CH/www SLS hb/SCS
Email &	Geissberger@psi.ch
Fax address	++41/56-31031 51

What is the present status of the facility?

Proposed	√
Under construction	
Approved	
Operational for users	

RESOURCES

- Ownership

100% publicly owned	√
100% private/commercially owned	
mixed ownership	

- Main source(s) of funding or organisation type

central government	√
academic institution or consortium	√
private or public company	

- Financial information

Annual total budget	
Total cost/value of facility (at 1996 prices)	165 Mio CHF

- Facility history

Year when facility was (or will be) first available for user experiments? ____________

A "key dates" history of the facility.

Proposal 1993

Decision expected mid 1997

STORAGE RING DETAILS

What is the storage ring energy?	2.1 GeV
What is the number of 24 hr days (or day equivalents) for storage ring operated last year?	
What is the number of 24 hr days (or day equivalents) available for experiments?	

What generation would you describe your facility as belonging to?

first	(parasitic)	
second	(dedicated & mainly bending magnet sources)	
third	(dedicated & mainly insertion device sources)	√
fourth	(please define below if selected)	

USER EXPERIMENTAL FACILITY DETAILS

Total number of simultaneously available experiment stations available for users in January 1996	
Total number expected in January 2000	
Total number expected in January 2005	
Total number expected in January 2010	

Spectral ranges exploited now	Number user experiment stations
IR/visible/VUV up to 150 eV	
general soft X-ray 150 - 2500 eV	
soft X-rav lithographv dedicated	
x-rav (photon energy above Be window limit)	
test	
other	
	Total number of stations =

COMPOSITION OF THE USER COMMUNITY

Total number (integrated) of user groups who have used the facility up to January 1996.	
Total number of individual users who have used the facility up to January 1996.	
% Academic users	
% Commercial/industrial users	
% International users (i.e. not from the country of the facility)	

MECHANISMS FOR ACCESS

academic peer review of proposals
purchase of time
granted solely by facility management

If you sell beamtime, what is the normal charge per day for access to an operational SR beamline & stations?	

Thank you for completing this questionnaire. Please return it to the address on the covering letter.

European Facility Questionnaire

Full Facility Name	SRS
Address & Country	CLRC, Daresbury Laboratory, Warrington, WA4 4AD, UK.
WWW Site Address	http://www.dl.ac.uk/SRS/
Email &	i.h.munro@dl.ac.uk
Fax address	(+44) 1925 603174

What is the present status of the facility?

- Proposed
- Under construction
- Approved
- Operational for users Å

- Ownership
  - 100% publicly owned Å
  - 100% private/commercially owned
  - mixed ownership

- Main source(s) of funding or organisation type
  - central government Å
  - academic institution or consortium
  - private or public company

- Financial information

Annual total budget	£20 million
Total cost/value of facility (at 1996 prices)	£200 million

- Facility history

Year when facility was (or will be) first available for user experiments? 1980

A "key dates" history of the facility.

1975	SRS approved by SERC
1980	world first x-ray user facility is operational
1983	first superconducting wiggler installed
1987	high brightness lattice up-grade
1995	second superconducting wiggler installed
1997	two new multipole wigglers planned for installation

STORAGE RING DETAILS

What is the storage ring energy?	2.0 GeV
What is the number of 24 hr days (or day equivalents) for storage ring operated last year?	250
What is the number of 24 hr days (or day equivalents) available for experiments?	180

What generation would you describe your facility as belonging to?

first	(parasitic)	
second	(dedicated & mainly bending magnet sources)	Ā
third	(dedicated & mainly insertion device sources)	
fourth	(please define below if selected)	

USER EXPERIMENTAL FACILITY DETAILS

Total number of simultaneously available experiment stations available for users in January 1996	39
Total number expected in January 2000	44
Total number expected in January 2005	no planning yet
Total number expected in January 2010	no planning yet

Spectral ranges exploited now	**Number user experiment stations**
IR/visible/VUV up to 150 eV	9
general soft X-ray 150 - 2500 eV	5
soft X-ray lithography dedicated	0
x-ray (photon energy above Be window limit)	24
test	1
other	2
	Total number of stations = 39

COMPOSITION OF THE USER COMMUNITY

Total number (integrated) of user groups who have used the facility up to January 1996.	450
Total number of individual users who have used the facility up to January 1996.	3500
% Academic users	98
% Commercial/industrial users	2
% International users (i.e. not from the country of the facility)	10

MECHANISMS FOR ACCESS

academic peer review of proposals	Ā
purchase of time	Ā
granted solely by facility management	

If you sell beamtime, what is the normal charge per day for access to an operational SR beamline & stations?	£5400

Thank you for completing this questionnaire. Please return it to the address on the covering letter.

European Facility Questionnaire

Full Facility Name	LURE
Address & Country	Centre Universitaire, Bat 209D, 91405 Orsay, France
WWW Site Address	www.lure.u_psud.fr.
Email & Fax address	LUREMAIL@LURE.U-PSUD.FR 64.64.41.48

What is the present status of the facility?

- Proposed
- Under construction
- Approved
- Operational for users √

RESOURCES

- Ownership
  - 100% publicly owned
  - 100% private/commercially owned
  - mixed ownership \

- Main source(s) of funding or organisation type
  - central government
  - academic institution or consortium √
  - private or public company

- Financial information

Annual total budget	150 MFF
Total cost/value of facility (at 1996 prices)	Unknown, most parts too old 1956

- Facility history

Year when facility was (or will be) first available for user experiments? 1972 in part time

A "key dates" history of the facility.

1972 First use of ACO for SR, part time with high energy
1975 Building of DCi
1980 Use of DCi for SR, part time with high energy
1985 DCi fully used for Dci
1982 Start building of S.ACo
1987 Operation start of S.ACo
1992 Operation of FEL IR CLIO

STORAGE RING DETAILS

What is the storage ring energy?	800 meV 1850 meV
What is the number of 24 hr days (or day equivalents) for storage ring operated last year?	150 on each ring
What is the number of 24 hr days (or day equivalents) available for experiments?	120 on each ring

What generation would you describe your facility as belonging to?

first	(parasitic)	
second	(dedicated & mainly bending magnet sources)	√
third	(dedicated & mainly insertion device sources)	√
fourth	(please define below if selected)	

USER EXPERIMENTAL FACILITY DETAILS

Total number of simultaneously available experiment stations available for users in January 1996	43
Total number expected in January 2000	Some or zero if SOLEIL
Total number expected in January 2005	
Total number expected in January 2010	

Spectral ranges exploited now	Number user experiment stations
IR/visible/VUV up to 150 eV	)
general soft X-ray 150 - 2500 eV	) 20
soft X-ray lithography dedicated	1
x-ray (photon energy above Be window limit)	21
test	1
other	
	Total number of stations =

COMPOSITION OF THE USER COMMUNITY

Total number (integrated) of user groups who have used the facility up to January 1996.	several hundred
Total number of individual users who have used the facility up to January 1996.	1600/year
% Academic users	70%
% Commercial/industrial users	5%
% International users (i.e. not from the country of the facility)	25%

MECHANISMS FOR ACCESS

academic peer review of proposals	√
purchase of time	√
granted solely by facility management	

If you sell beamtime, what is the normal charge per day for access to an operational SR beamline & stations?	20 to 40.000 FFS

Thank you for completing this questionnaire. Please return it to the address on the covering letter.

Appendix 3

Summary tables of data extracted from the replies to date

facility	annual budget	currency	in £M	total cost	currency	in £M	first available	operations days p.a.	days exp. p.a.	station days capacity p.a. 1996
MAX1	30 MILLION	SEK	3	80 MILLION	SEK	8	1986	280	240	2160
MAX2	30 MILLION	SEK	3	200 MILLION	SEK	19.5	1996	280	240	240
SRS	20 MILLION	GBP	20	200 MILLION	GBP	200	1983	250	180	7020
ELETTRA	30 BILLION	LIRE	13	160 BILLION	LIRE	67	1995	254	177	708
SUPER-ACO/DCI	150 MILLION	FF	19				1972	150	120	5160
ELSA	3.8 MILLION	DM	1.5				1988	210	199	1791
BESSY1	8 MILLION	ECU	6.5	63 MILLION	ECU	51	1982	205	205	7175
ERSF	416 MILLION	FF	52	1980 MILLION	FF	247.5	1994	258	198	3960
DORIS3 AND PETRA	29 MILLION	DM	12.5				1993	253	214	8988
						82				
BESSY2				100 MILLION	ECU	30.5	1999			0
ANKA	10 MILLION	DM	4.5	70 MILLION	DM	84.5	2000			0
SLS				165 MILLION	SWISS F					0
								TYPICAL = 250	TYPICAL = 200	37202

facility	no. stations for users 1996	2000	2005	2010	spectral ranges IR/visible/VUV up to 150 eV	general soft X-ray 150 - 2500 eV	soft X-ray lithography dedicated	x-ray (photon energy above Be window limit)	test	other	TOTAL
MAX1	9	9	9	9	5	4	0	0	0	0	9
MAX2	1	10	13	15	1	8	1	3	1	1	15
SRS	39	44			9	5	0	24	1	2	39
ELETTRA	4	7	25	30	0	3	0	1	0	0	4
SUPER-ACO/DCI	43				0	20	1	21	1	0	43
ELSA	9	13			3	2	3	6	1		15
BESSY1	35	35			15	11	4	1	1	3	35
ERSF	20	46				1		23			24
DORIS3 AND PETRA	42	42			5	5		32	1		43
BESSY2		17	32	47							
ANKA		13			1			12			13
SLS											
	202	236	79	101	39	59	9	123	6	6	240

G Margaritondo (Italy, ELETTRA) (11 October)

11/10/96
14

ELETTRA- KEY PARAMETERS:

- Energy: 1.5 or 2.0 GeV
- Maximum current: 530 mA
- Lifetime (relaxed optics):
  - at 250 mA: 30 hrs
  - at 100 mA: >40 hrs
- Emittance:
- Maximum brightness: $\approx 8 \times 10^{19}$ (conventional units)
- Reliability Factor: 92-94%
- Beamlines:
  - Operating:
    - SuperESCA*
    - ESCA Microscopy*
    - X-ray Diffraction*
    - VUV Photoemission*
    - Small-angle X-ray Scattering
    - Mammography (SYRMEP)
  - Under development:
    - Spectromicroscopy
    - Surface Diffraction (ALOISA)
    - Gas-phase Photoemission
    - LIGA
    - Materials Science
    - Circular Polarization
    - BOSS

  * open to external users

20/1

15

ELETTRA use -- 14-month summary (hours of beamtime):

• Internal groups:	1104
• Italian partner groups:	992
• Other Italian groups:	3048
• Groups supported by EC contract:	3992
• Other European groups:	768
• Non-European groups:	416
TOTAL:	10320

ELETTRA- MECHANISM OF BEAMTIME ALLOCATION:

- Every semester, a call for proposals is issued
- Proposals are first screened for technical feasibility
- Then, they are analyzed and rated by an independent international committee (present Chair: Professor D. W. Lynch of Iowa State)
- Beamtime is allocated based on this merit rating
- Confidential research can bypass this selection procedure but must pay the full cost of the beamtime

ELETTRA- OPERATION SCHEDULE:

- A minimum of 5000 hours of beamtime per year for users
- Operating on a 24-hour cycle
- The schedule is developed 3-8 months in advance
- The partition of beamtime between cooperative research group and the general users is still being negotiated. Informal solutions have been adopted

ELETTRA- FINANCIAL RESOURCES:

- **Total investments funds for construction: ≈170.5 MECU (from Italian sources)**
- **Annual operating cost: ≈17.4 MECU (≈13.1 MECU guaranteed by the Italian government)**
- **Additional construction funds for beamline (from Italian sources): ≈2.5 MECU/year predicted**

ELETTRA- INTERNATIONALIZATION:

- **Fraction of non-Italian user proposals**

1st call for proposal:	**49%**
2nd call for proposal:	**46%**
3rd call for proposal:	**62%**

ELETTRA- BEAMTIME SHORTAGE:

The shortage of beamtime on ELETTRA is dramatic and growing; overall:

	Open lines	Accepted proposals
1st call for proposal:	4	30%
2nd call for proposal:	4	16%
3rd call for proposal:	6	21%

ELETTRA- SUMMARY:

- ELETTRA is an excellent example of the concept of internationally open national facilities.
- A network of such facilities is the best response to many of the needs of European science in the domain of large installations.
- Beamtime shortage for the brightest synchrotron sources is a critical problem -- more beamlines are urgently needed.
- The concept of European network of large-scale national facilities should be extended to Eastern Europe.
- Our experience with short-term EC contract is excellent, but what about long-term employment?

M Van der Wiel (11 October)

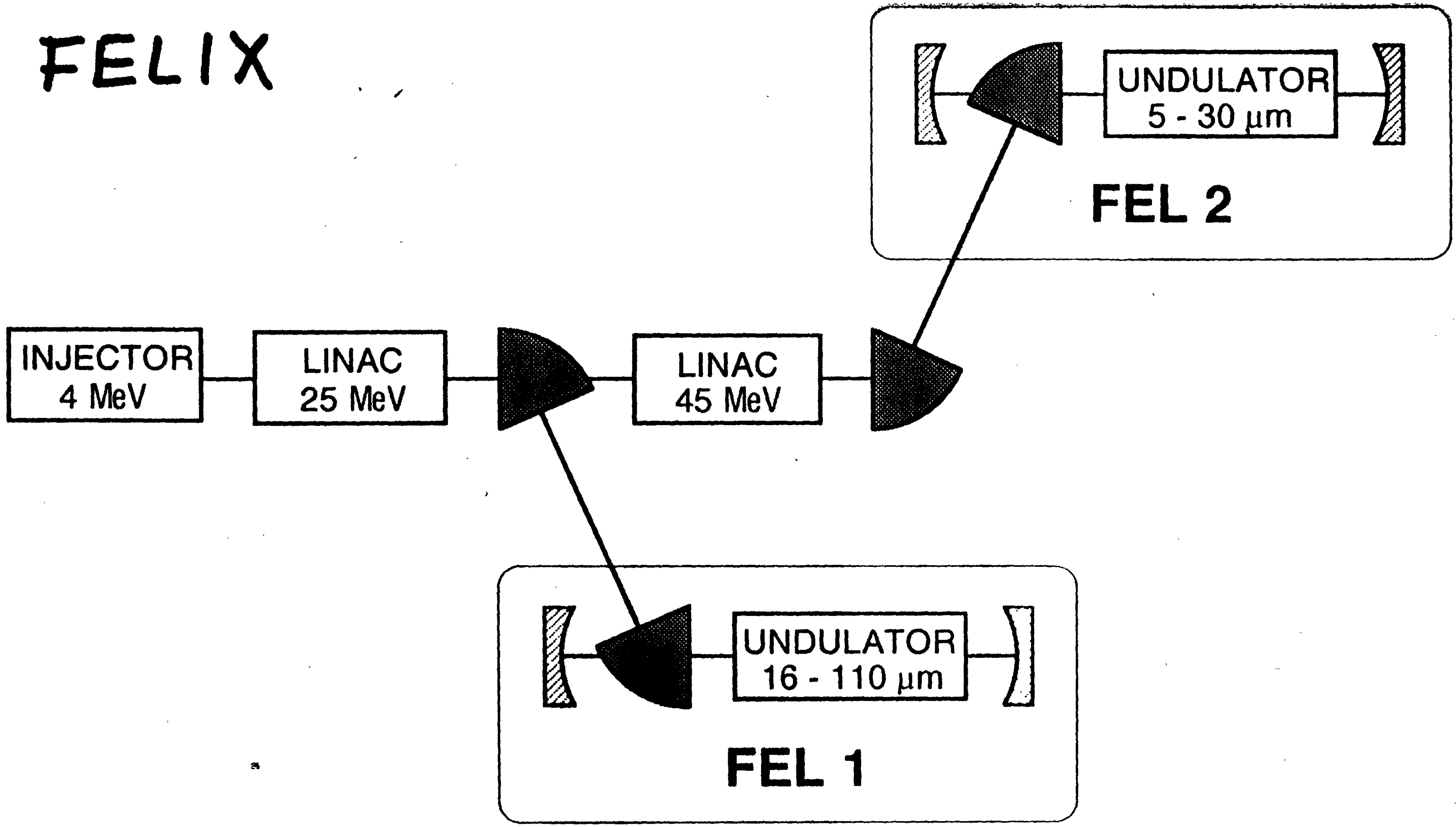
IR - FELs

- **issues 1986:**
  - demonstrate reliable operation
  - demonstrate easy tunability
  - serve a broad user community

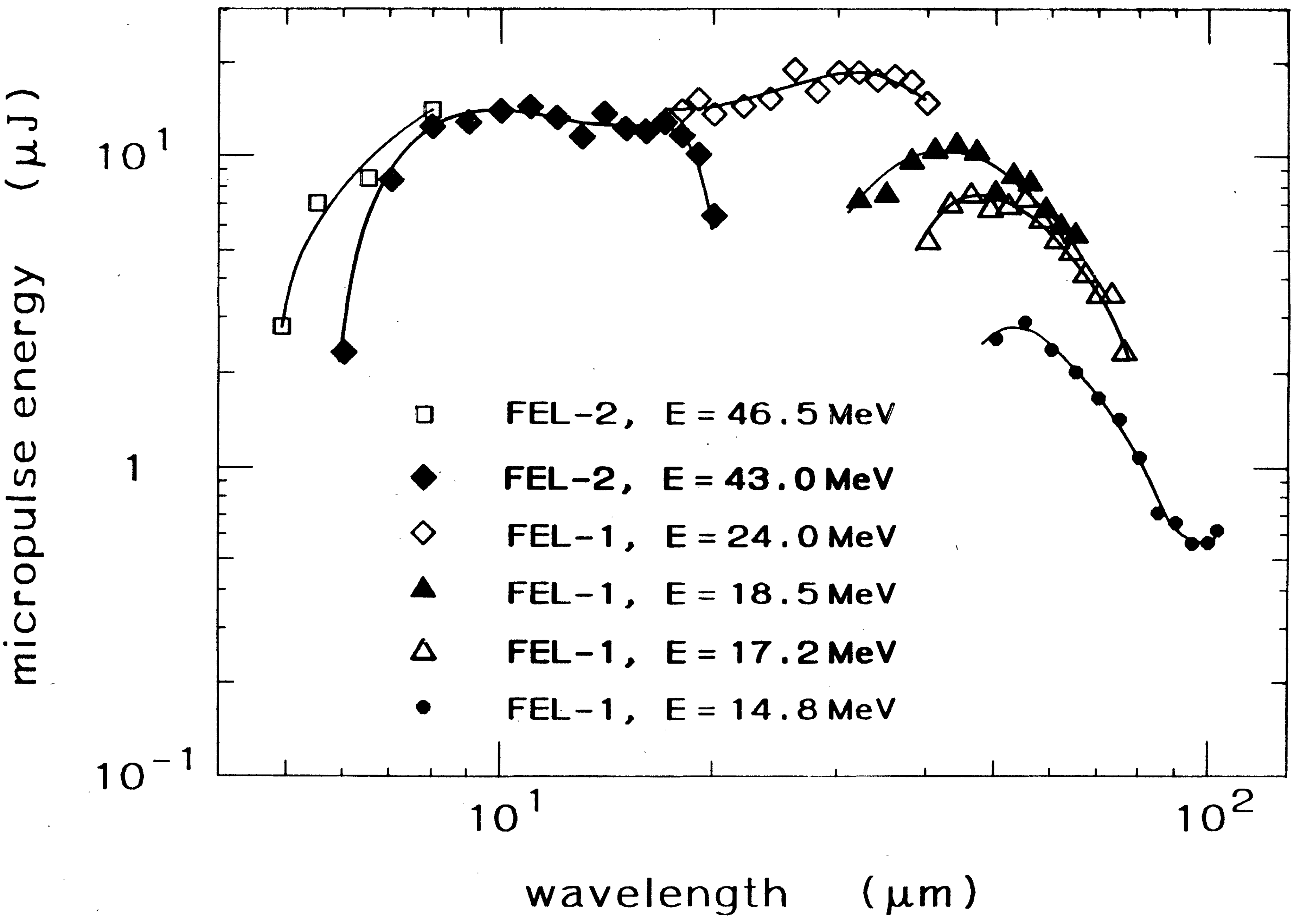
- **issues 1996:**
  - cover wavelength range μm - 1mm
  - form cluster of facilities
    - × develop complementary specialities
  - develop multi-user operation

    (or compact FELs)

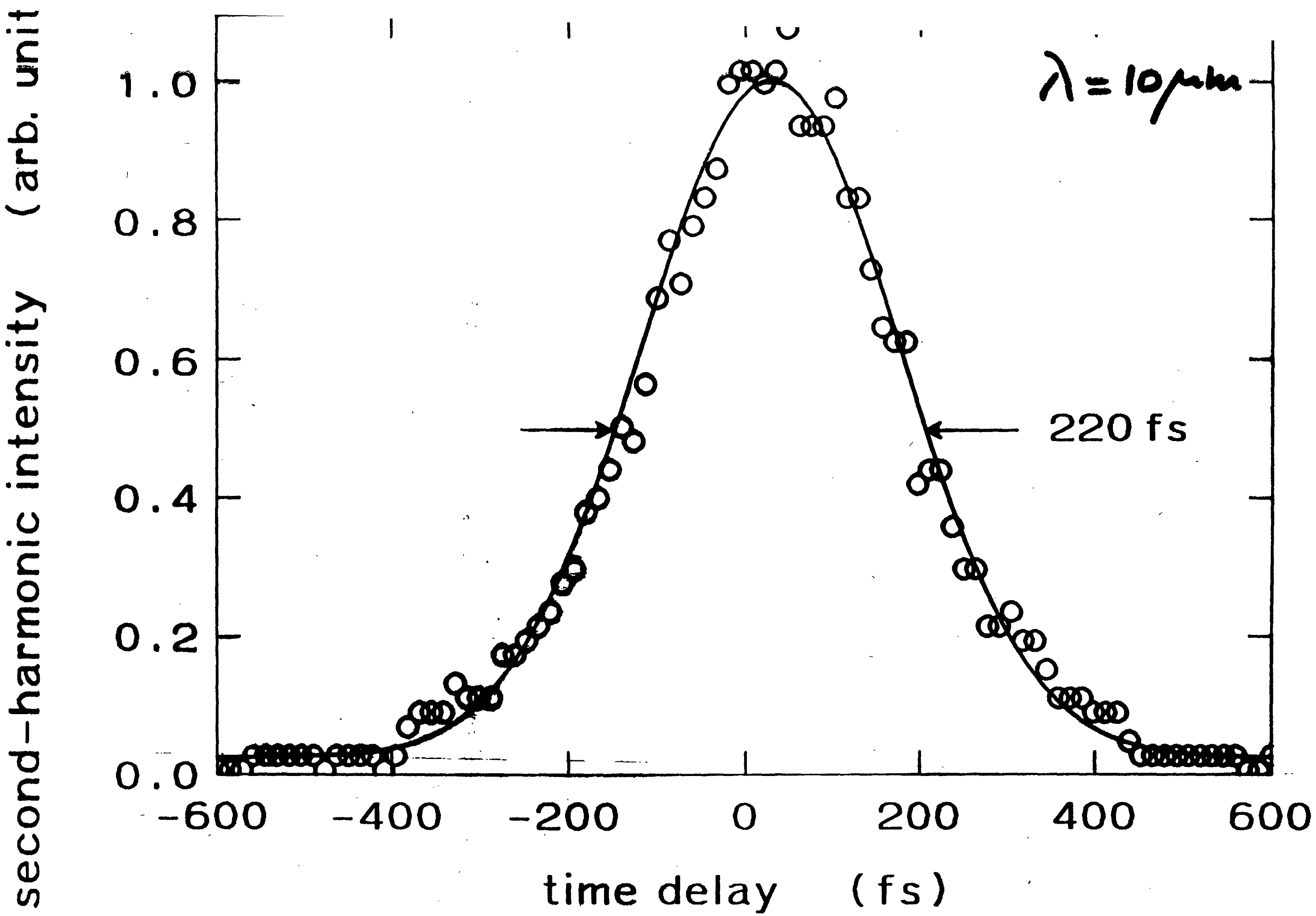
FELIX


INJECTOR
4 MeV
LINAC
25 MeV
LINAC
45 MeV
UNDULATOR
5 - 30 μm
FEL 2
UNDULATOR
16 - 110 μm
FEL 1

29/3



micropulse energy (μJ)
10^1
1
10^-1
wavelength (μm)
10^1
10^2
FEL-2, E = 46.5 MeV
FEL-2, E = 43.0 MeV
FEL-1, E = 24.0 MeV
FEL-1, E = 18.5 MeV
FEL-1, E = 17.2 MeV
FEL-1, E = 14.8 MeV



second-harmonic intensity (arb. unit
1.0
0.8
0.6
0.4
0.2
0.0
-600
-400
-200
0
200
400
600
time delay (fs)
220 fs
λ = 10 μm

Present Status of the Facility

- Improved performance:

max. μ-pulse energy	> 50 μJ
max. μ-pulse power	> 100 MW
min. pulse length	< 6 cycles
max. efficiency	> 3 %

- Routine operation of 25 MHz mode + 1 GHz

- LABVIEW-based remote control for users

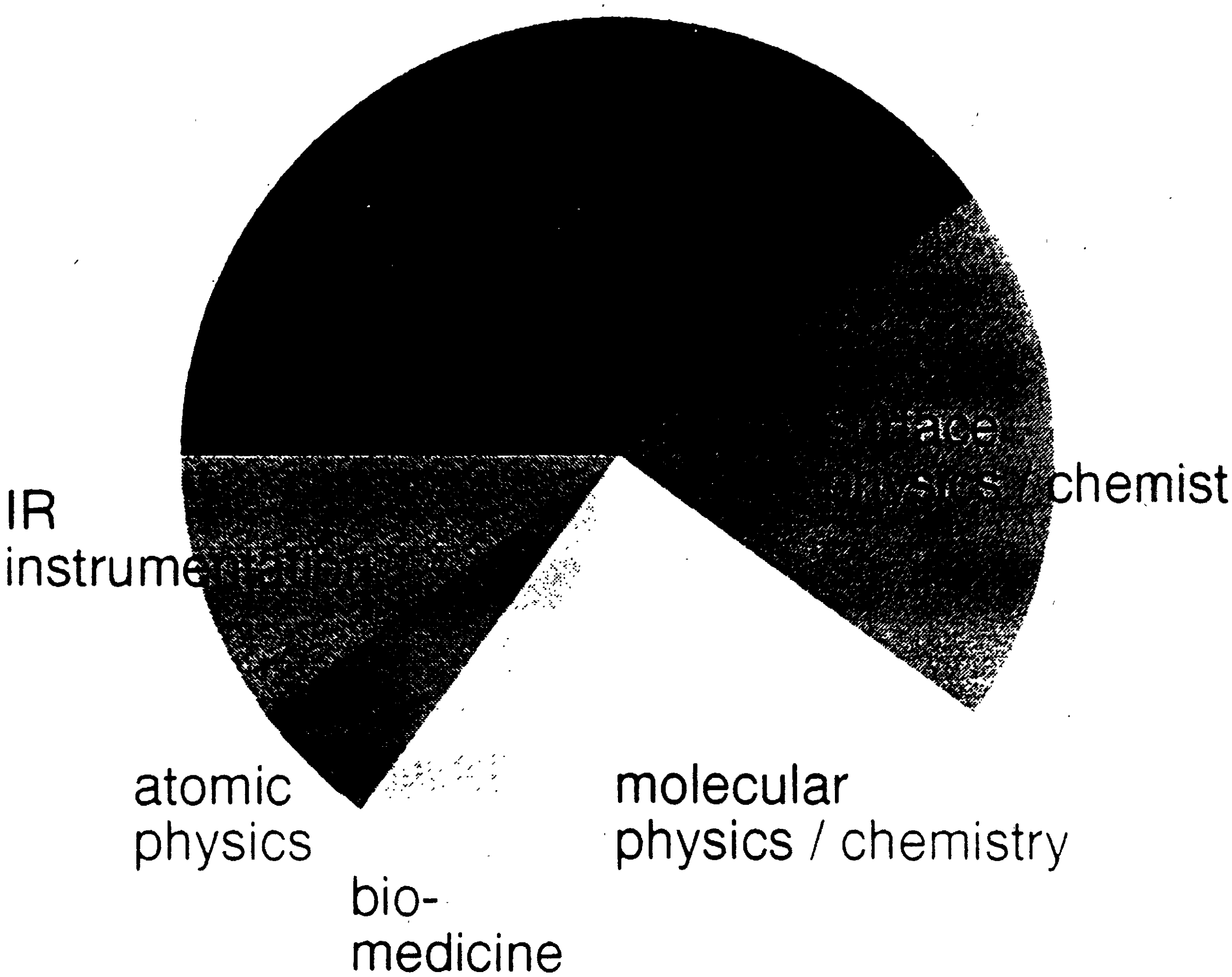
- Very little unscheduled down time: < 3 % !!

- Beam time delivered in past year:
  3200 hrs

- 16 user groups; 7 non-Dutch

- 7 user stations

FELIX APPLICATIONS



V Stankevitch (11 October)

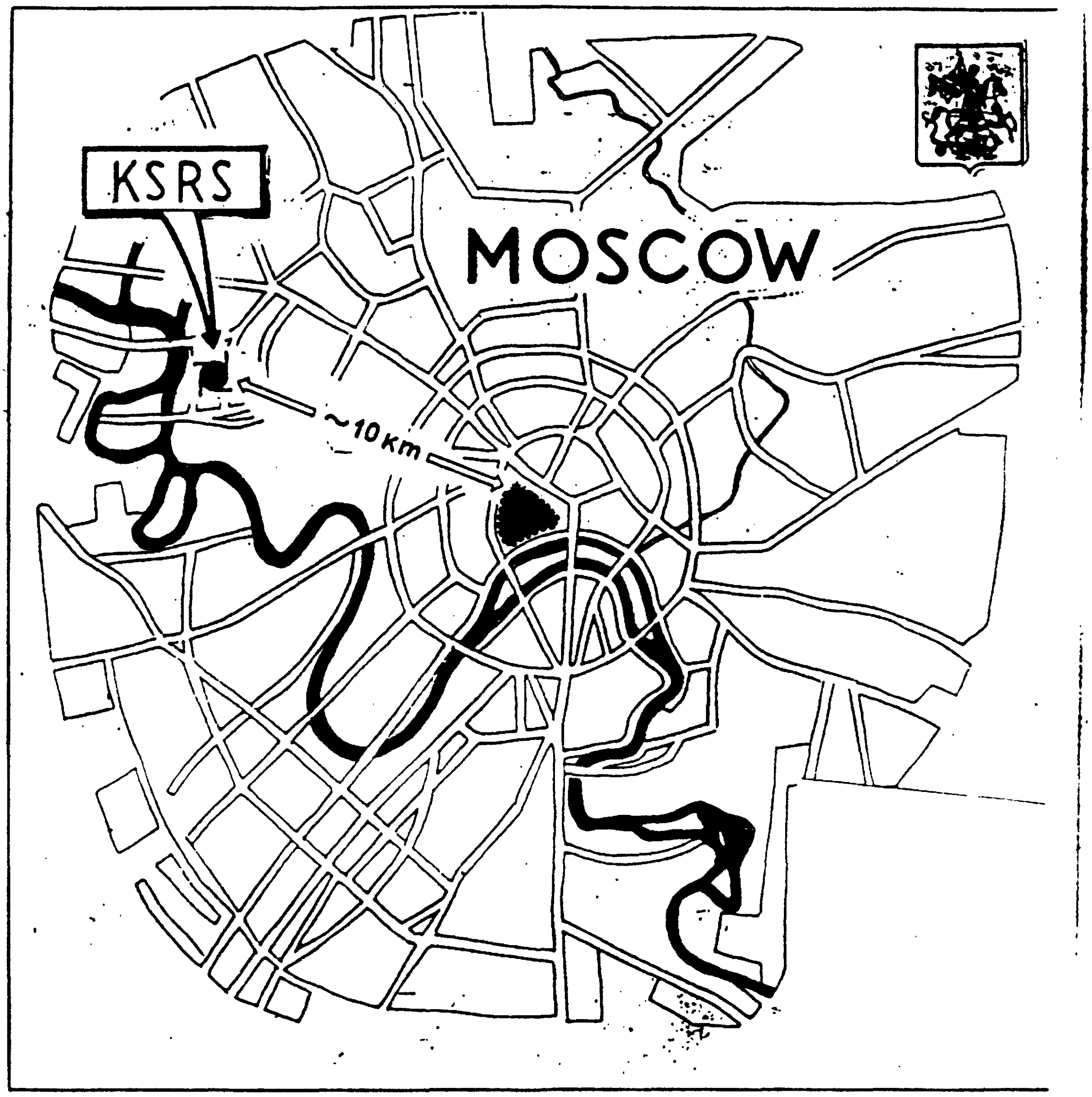
Kurchatov
Synchrotron
Radiation
Source
Status and activities

Russian Research Centre
"Kurchatov Institute"
Moscow, Russia

Dr. Vladimir Stankevitch

33/11


KSRS
MOSKOW
~ 4000 km
RUSSIA
NOVOSIBIRSK



30/

Main parameters of
Kurchatov Synchrotron Radiation Source

Parameter	Big ring	Little ring
Energy, GeV	2.5	0.45
Current, mA		
- single bunch mode	100	100
- multibunch mode	300	
Orbit circumference, m	124.13	8.7
Number of dipoles	24	4
SR critical energy, keV	1.75 7.1	0.21
Horizontal emittance, nm*rad	76	880
Number of beamlines from bending magnets	24	8
Lifetime, h	10	4
Bunch length, cm	4.4	60
Number of possible undulators	5	-
Number of possible wiglers	4	-

Major Milestones of Kurchatov SR Source

1979 - first official paper on SIBERIA 1 - (little ring)

1983 - first Synchrotron radiation from SIBERIA 1

1984 - 1991 - Investigation in VUV region at SIBERIA 1

1985 - 1990 - construction of new building (6000 sq. m)

1990 - commissioning of the new linac

1991 - translation of SIBERIA 1 into new building

1992 - first SR from SIBERIA 1 with new linac

1992 - SIBERIA 1 : E = 550 MeV, I = 150 mA,

1990 - 1994 - construction of SIBERIA 2 (big ring)

1994 - 1995 - commissioning of SIBERIA 2

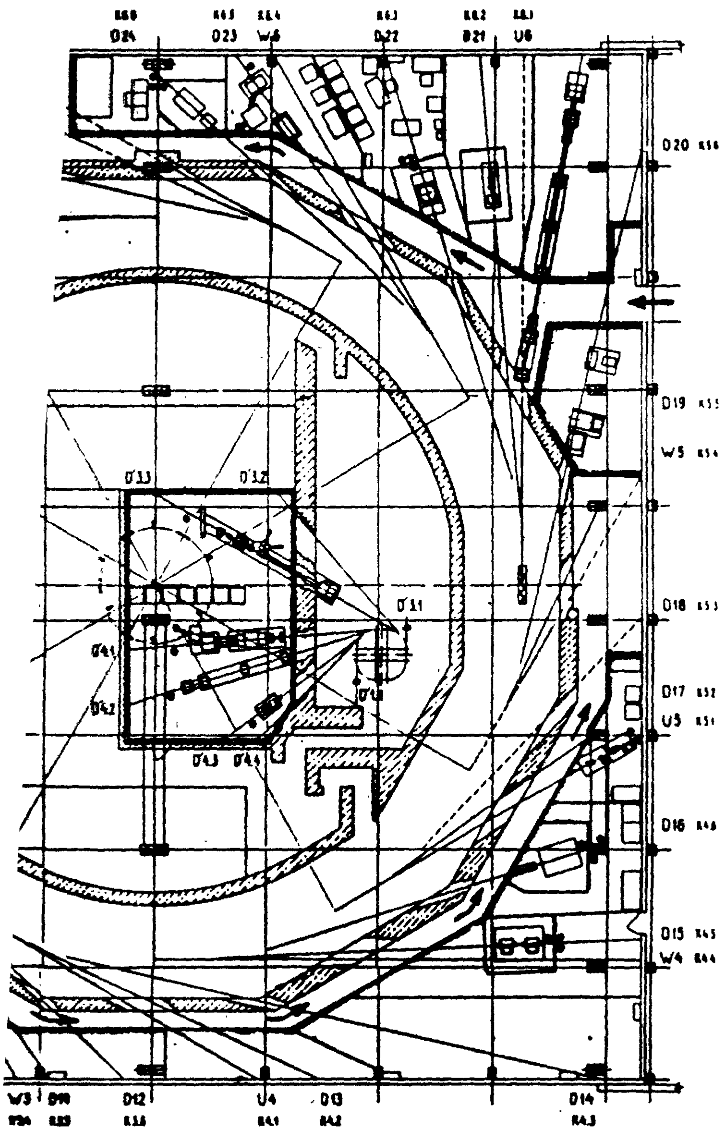
1995 - first Synchrotron Radiation from SIBERIA 2

May 95 - SIBERIA 2: E = 550 MeV, I = 0.5 mA

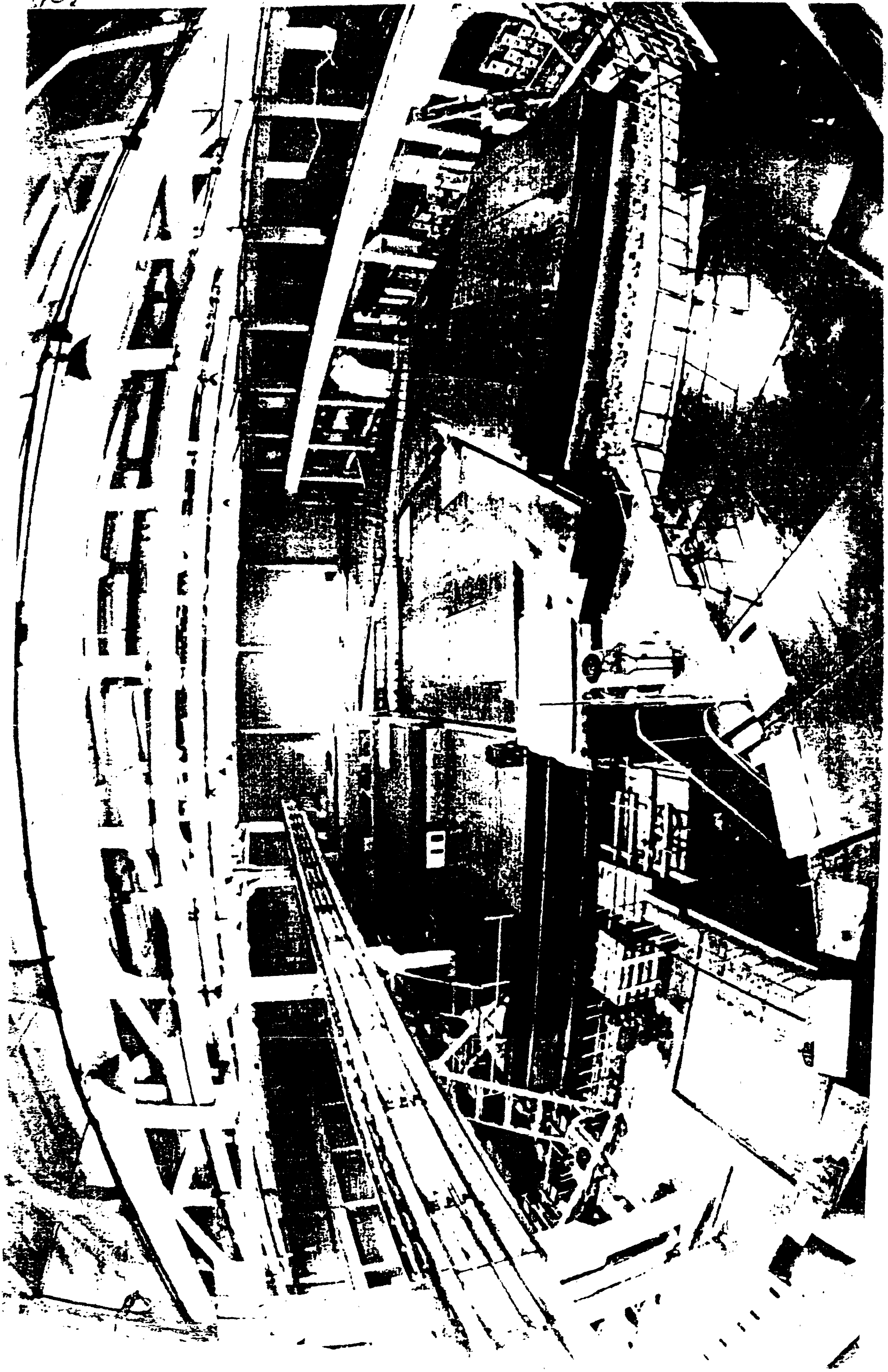
Finishing of VUV experimental hall for SIBERIA 1,

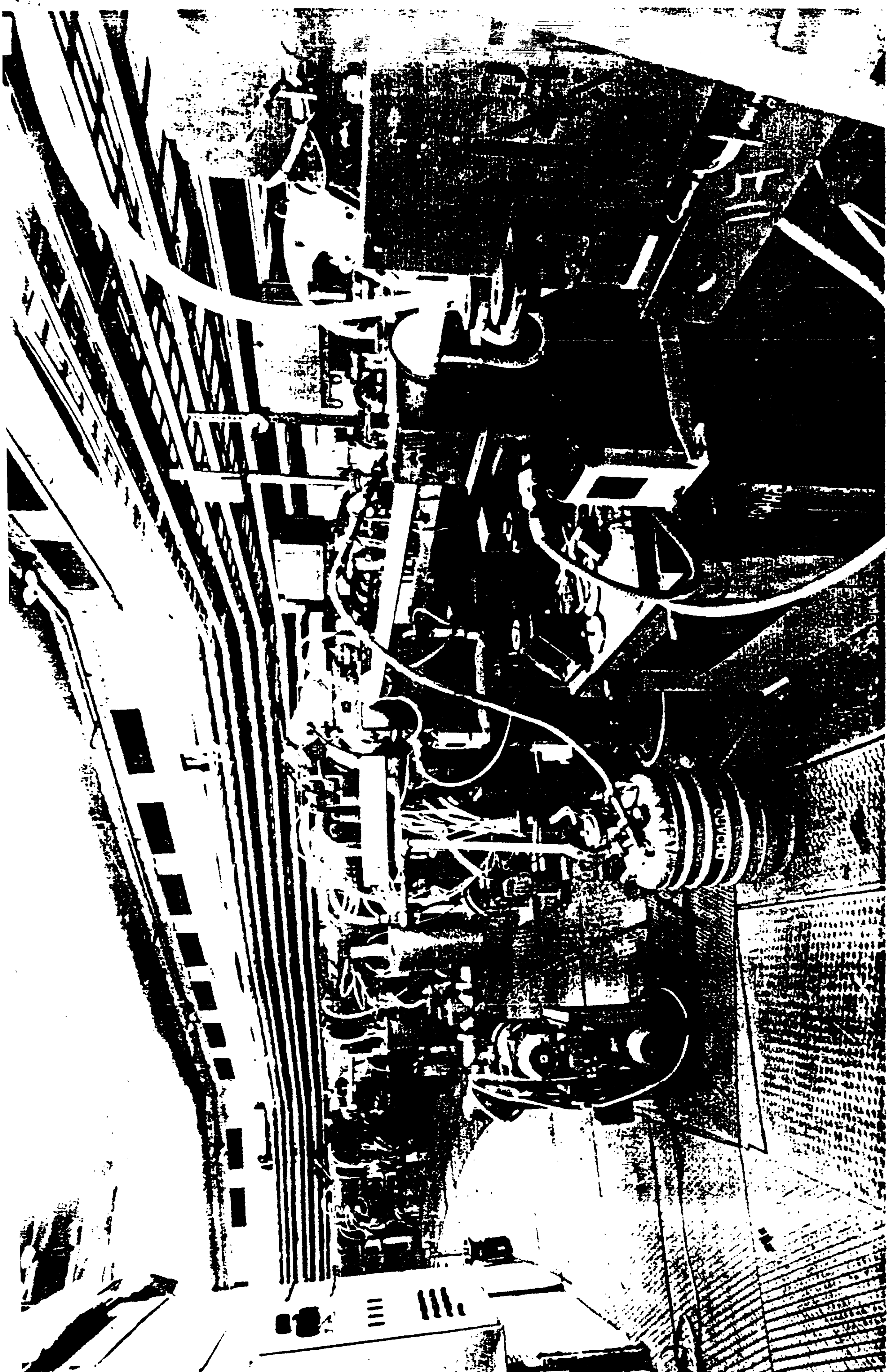
Oct. 95 - 3 VUV beamlines are installed

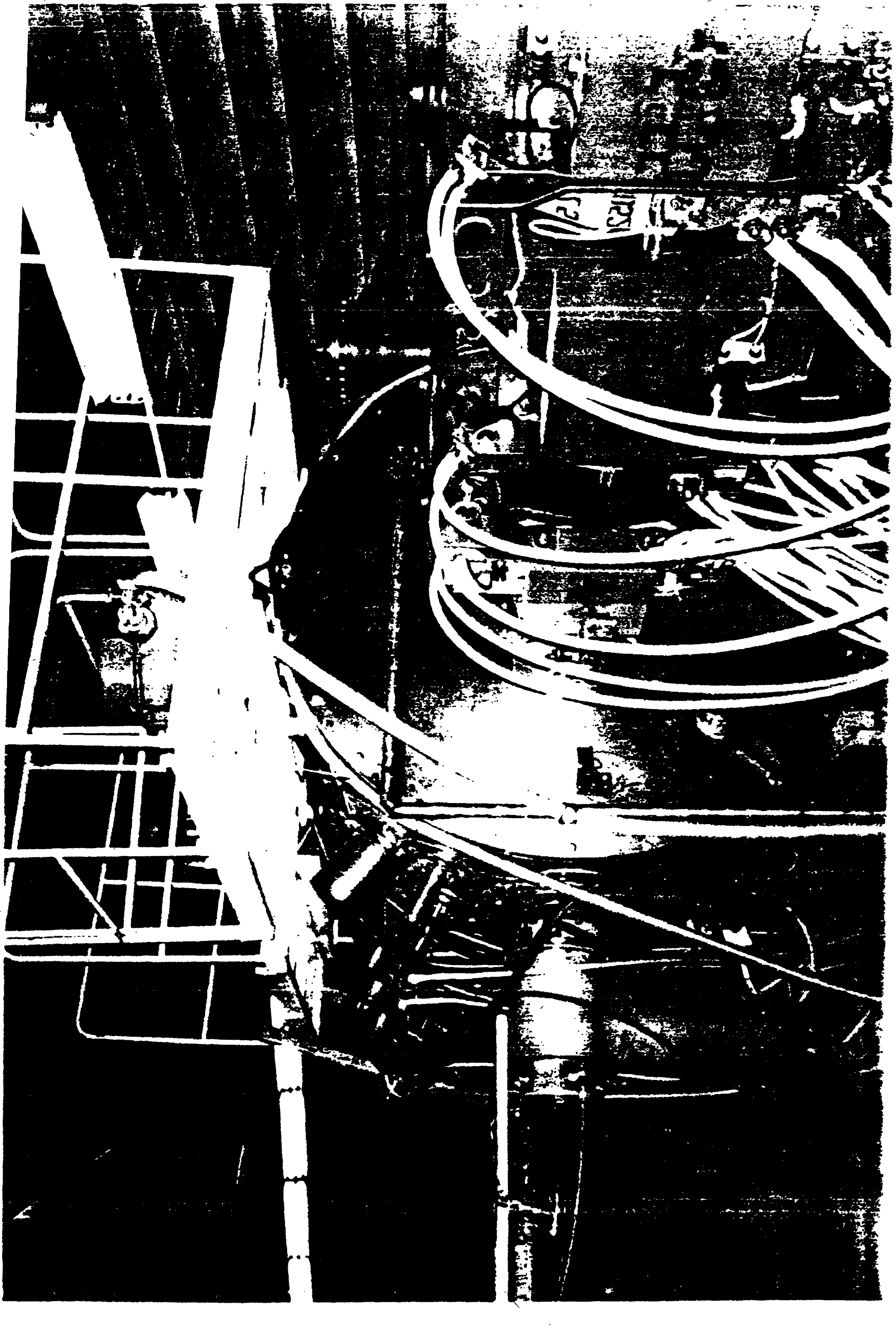
Jul 96 SIBERIA 2 E=2,5 GeV I=10 mA.

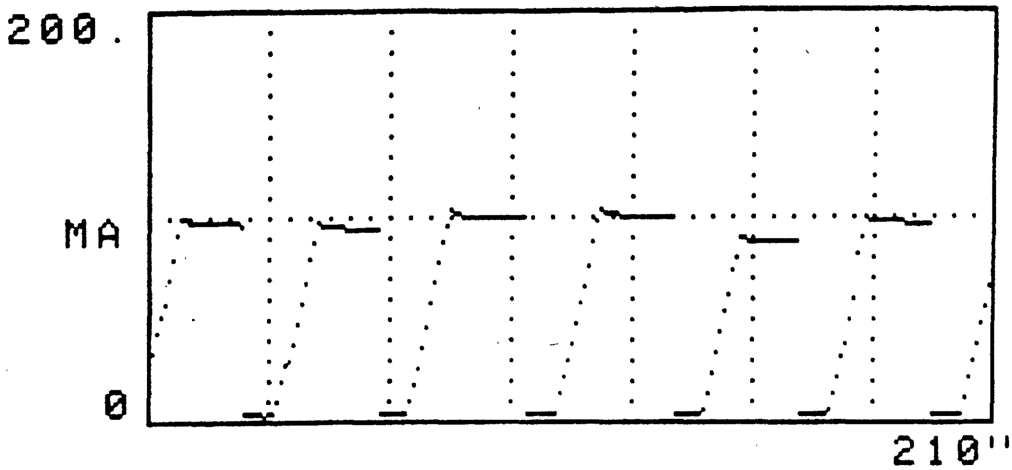

D24
D23
W6
D22
B21
U6
D20
D19
W5
D18
D17
U5
D16
D15
W4
D14
D13
U4
D12
W3
D'3.3
D'3.2
D'3.1
D'4.1
D'4.2
D'4.3
D'4.4

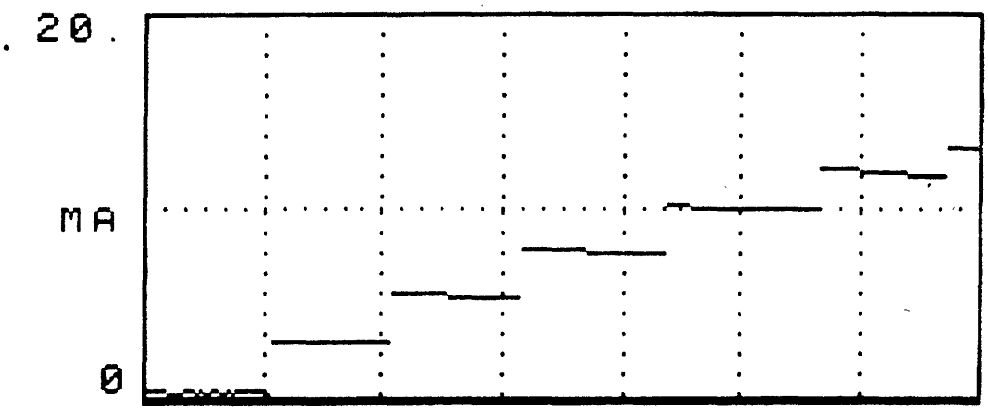
9/05

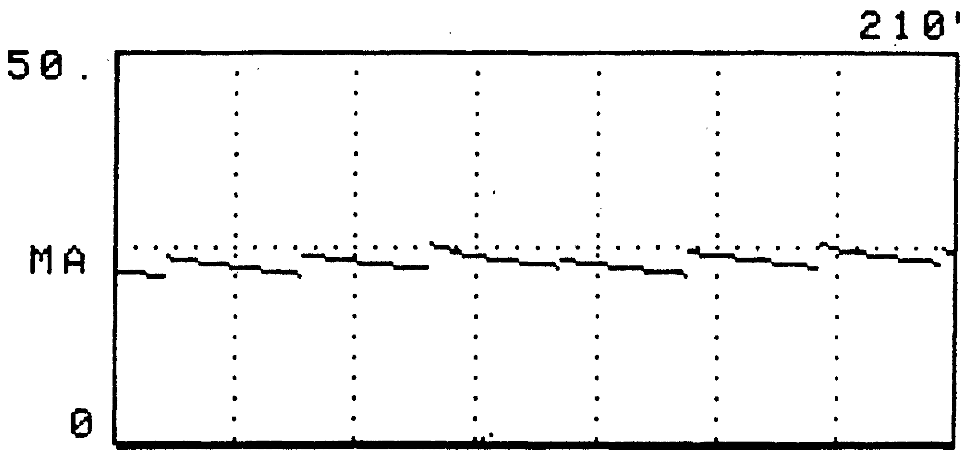




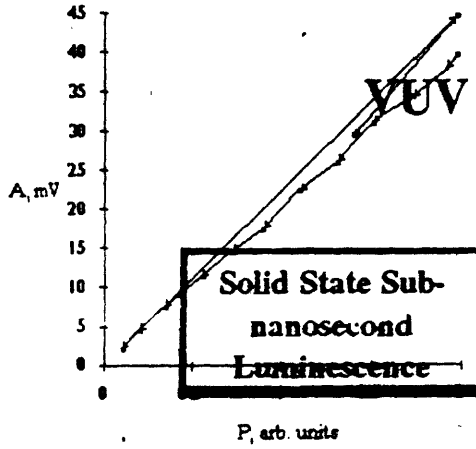








30/11



KSRS
VUV Investigation Directions

Solid State Sub-nanosecond Luminescence

Photoelectron Spectroscopy

Development of High Efficiency Crystal Phosphors

High Resolution VUV Spectroscopy with Undulator Radiation

HTSC Electron Structure (VUV Spectroscopy)

Electronic Excitations in Wide Band Dielectrics

IR Spectroscopy

Miscellaneous

Development of Insertion Devices

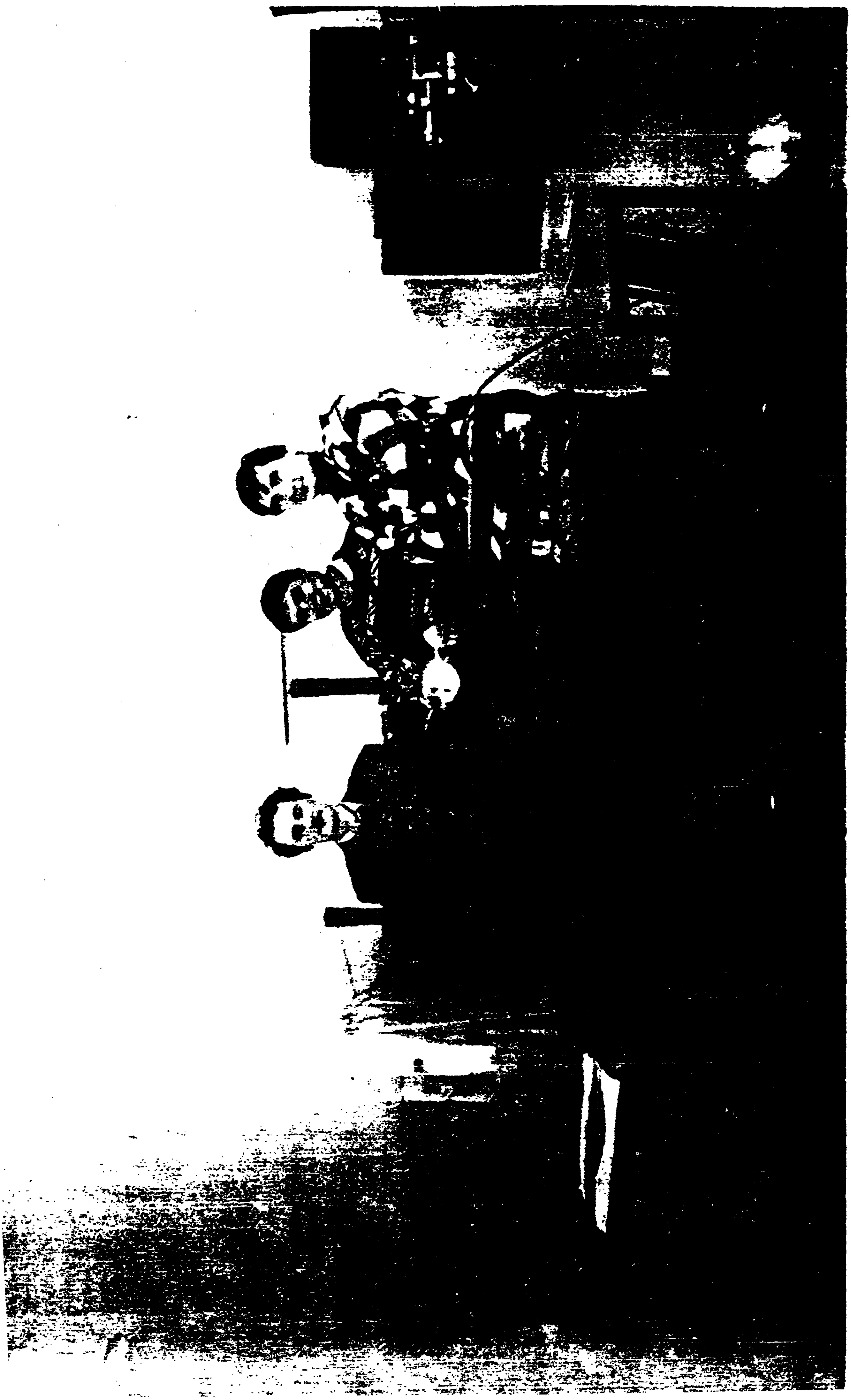
Electron Beam Diagnostics with Visible Range Edge Radiation

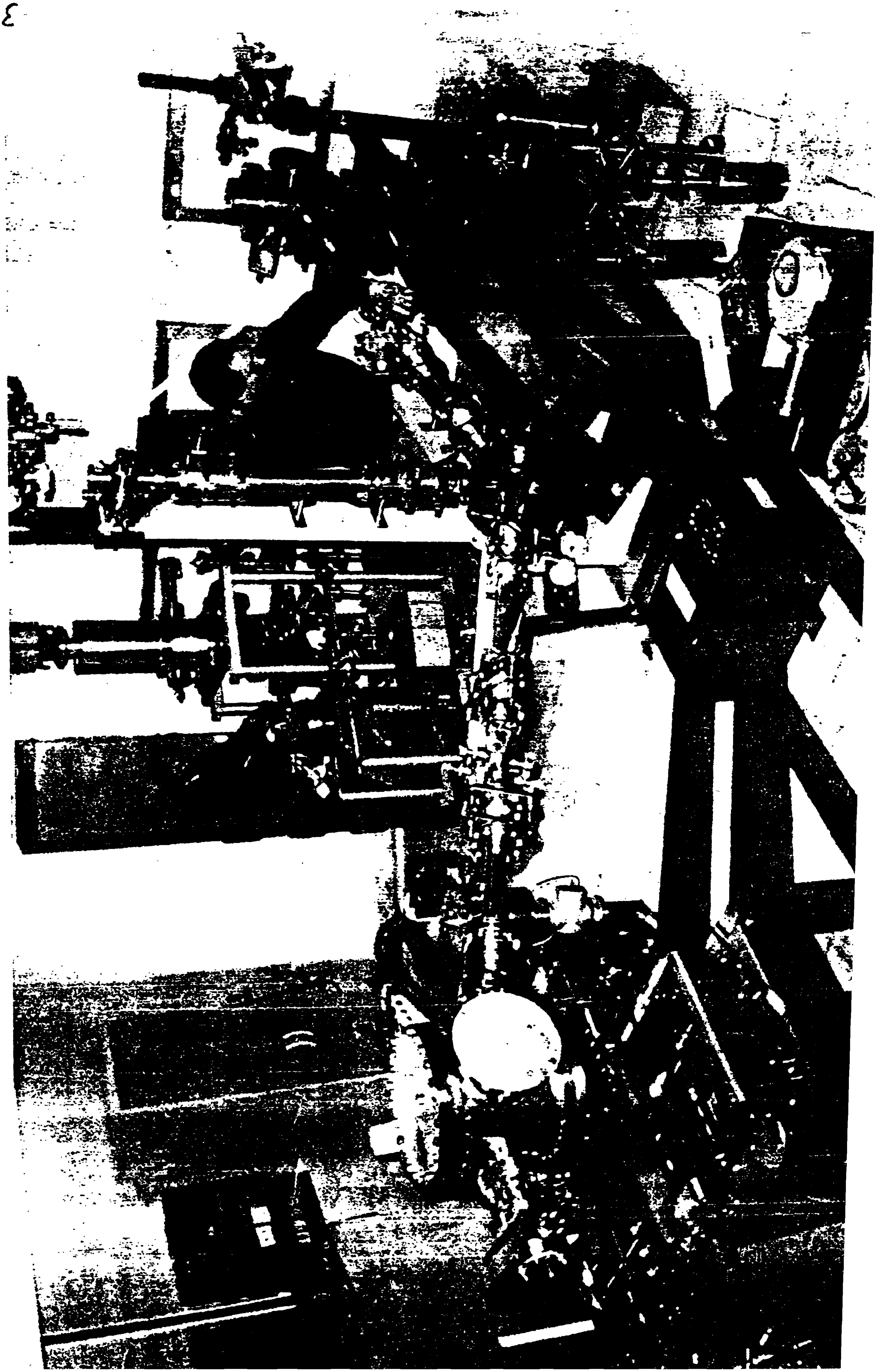
Photonuclear Reactions at Intermediate Energies

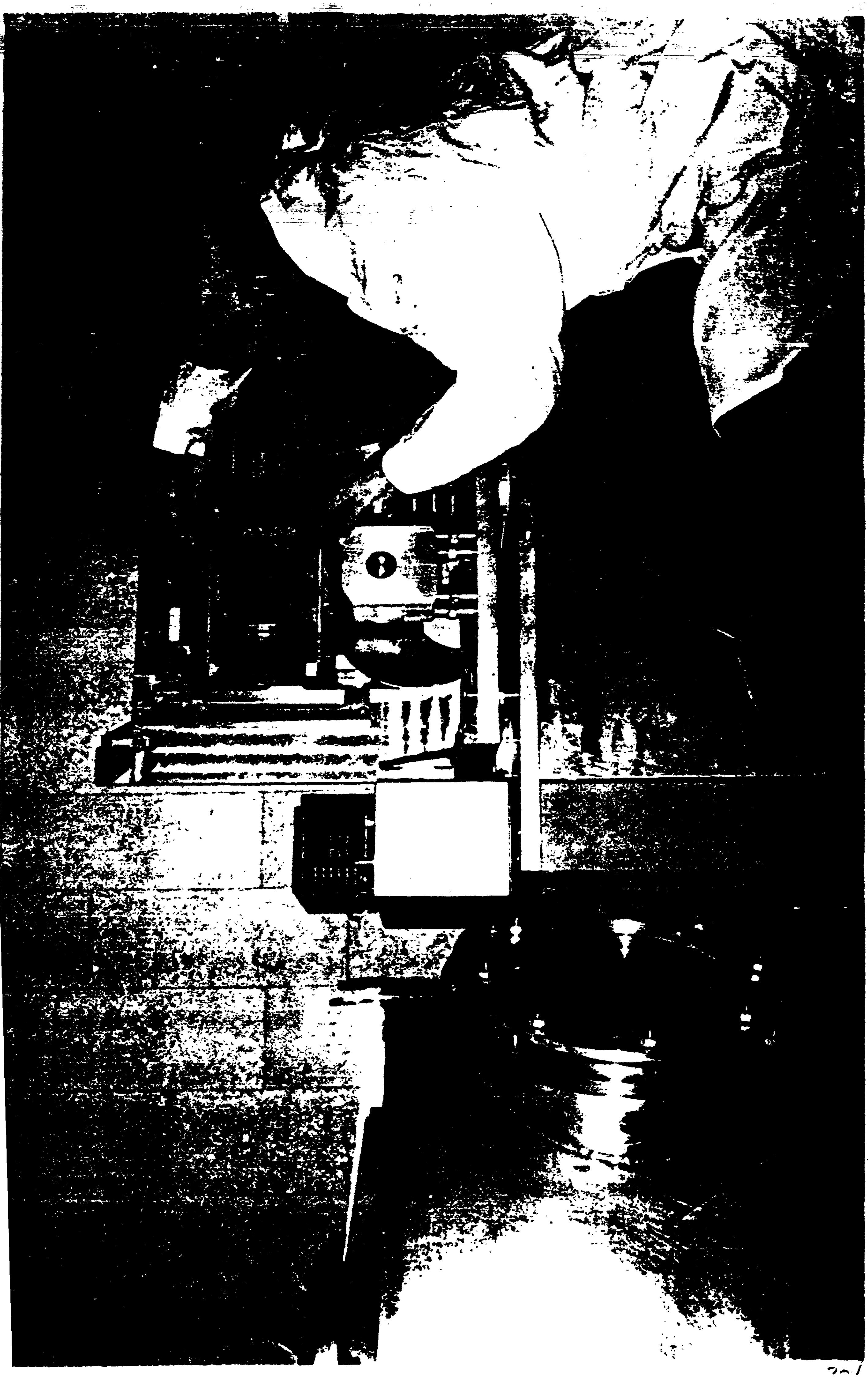
KSRS
X-ray Investigation Directions

Moessbauer Fluorescence	**EXAFS**	**X-ray Photoelectron Diffraction Spectrometer (X-ray standing waves)**
Asymptotic Bragg Diffraction	**X-ray Emission Line Chemical Shifts**	**Biopolymer Structure Transition High Speed (Small-Angle Diffractometry)**
Phase Transition at High Pressure		**Double-Bragg Reflection Diffractometry in Single and Polycrystals**
Nonlinear Resonance SR Scattering Phenomena (Magneto acoustic)	**High-Precision Measurements of Electron and Spin Densities in Crystals**	**X-ray Refraction Tomograph (high angular resolution: < 0.1")**

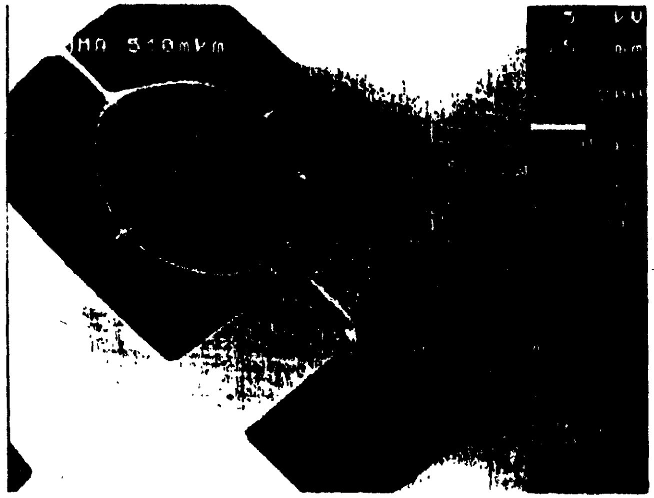
N	Acronym	User	site
1	KSRS RRC KI	Kurchatov Synchrotron Radiation Source Russian Research Centre "Kurchatov Institute" (RRC KI)	Moscow
2	ISSSP RRC KI	Institute of Superconductivity and Solid State Physics RRC KI	Moscow
3	IGNP RRC KI	Institute of General and Nuclear Physics RRC KI	Moscow
4	IIT	Institute of Information Technologies RRC KI	Moscow
5	ICB RAS	Institute of Cell Biology Russian Academy of Science (RAS)	Pushchino
6	ITEB RAS	Institute of Theoretical and Experimental Biology RAS	Pushchino
7	IC RAS	Institute for Crystallography RAS	Moscow
8	INR RAS	Institute of Nuclear Research RAS	Moscow
9	VIHP RAS	Vereshchagin Institute of High Pressure RAS	Moscow
10	MEPU	Moscow Engineering Physics University	Moscow
11	LMSU	Lomonosov Moscow State University	Moscow
12	IMM	Institute of Microtechnology at Mainz	Mainz, Germany
13	IP CzAS	Institute of Physics Czech Academy of Sciences	Prague, Czech Republic
14	ISSPS	Institute of Solid State Physics and Semiconductors	Minsk, Belarus

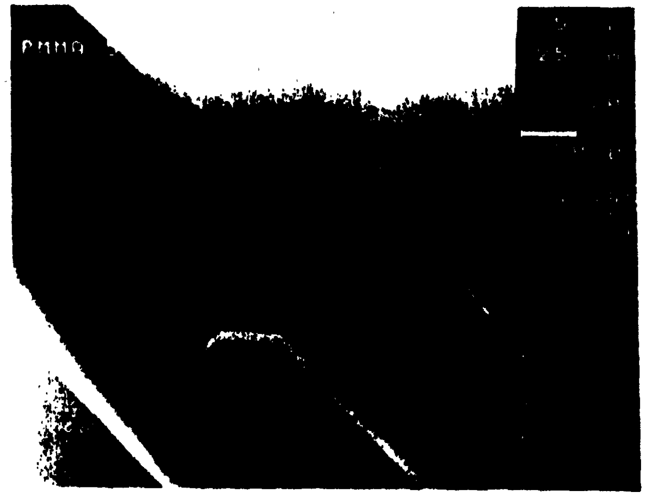


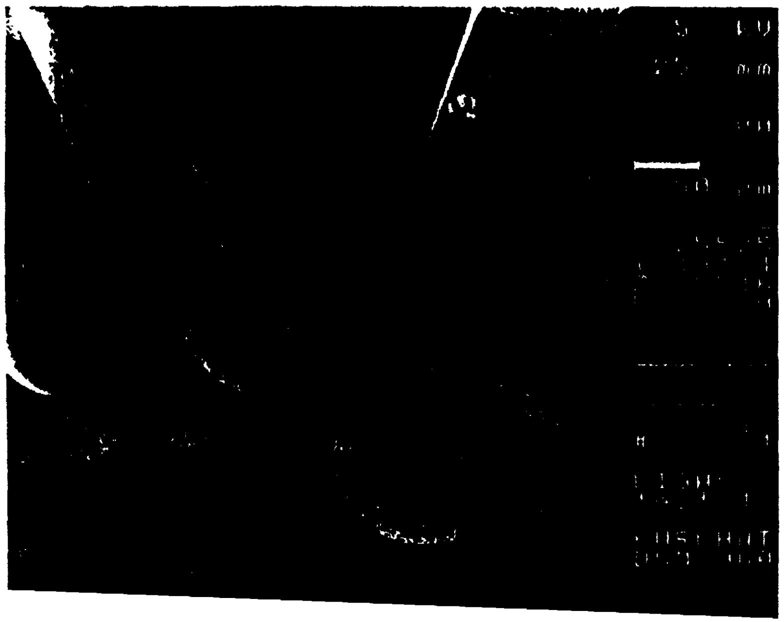


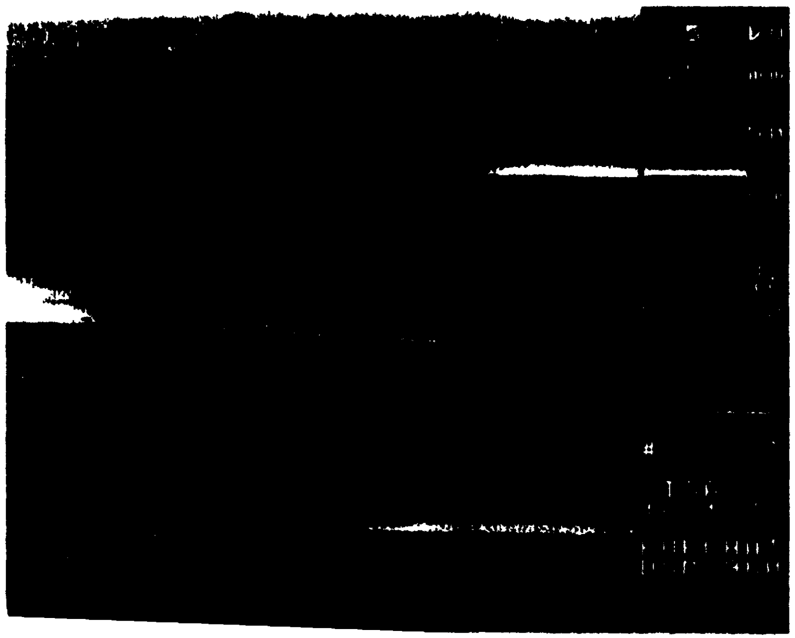


FIRST RESULTS FROM KURCHATOV

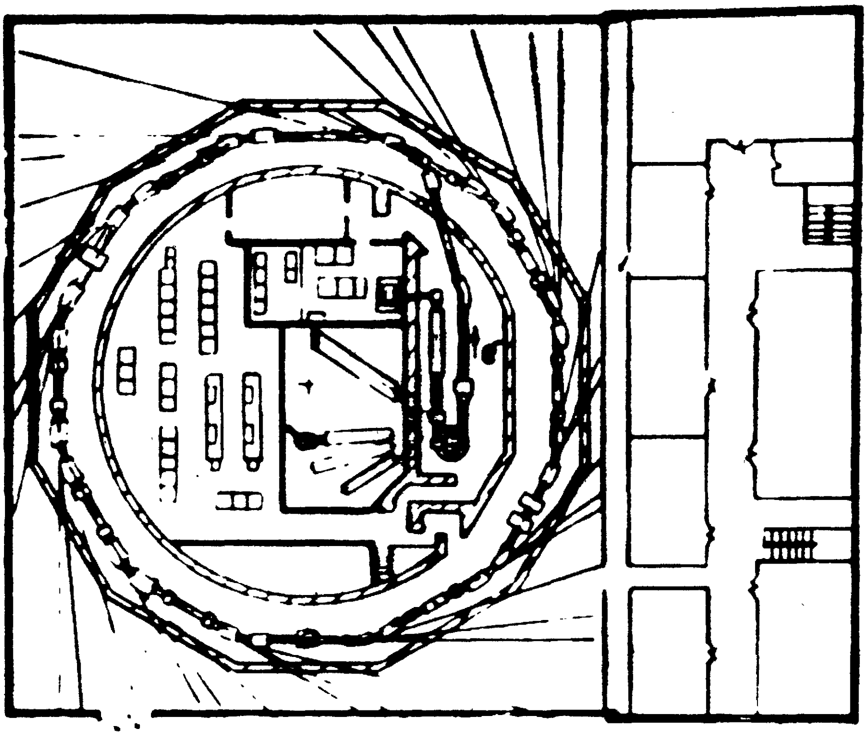






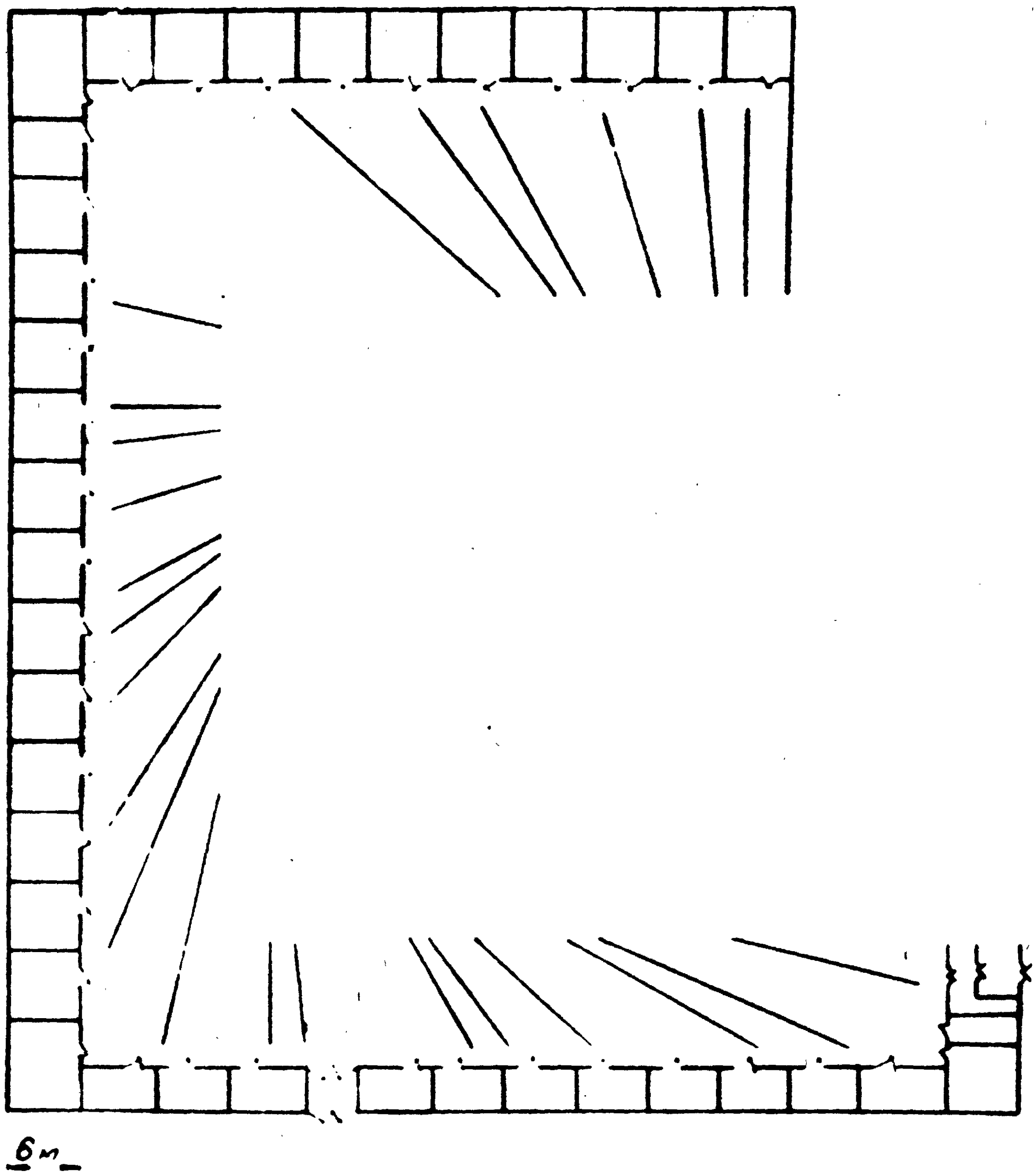


HL 63785



Kurchatov Synchrotron Radiation Source
Moscow, Russia
Present status

ɔ-/.



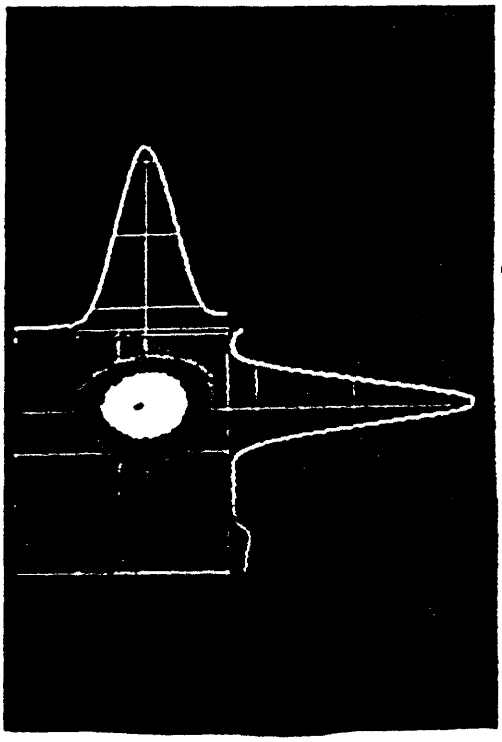
Future development

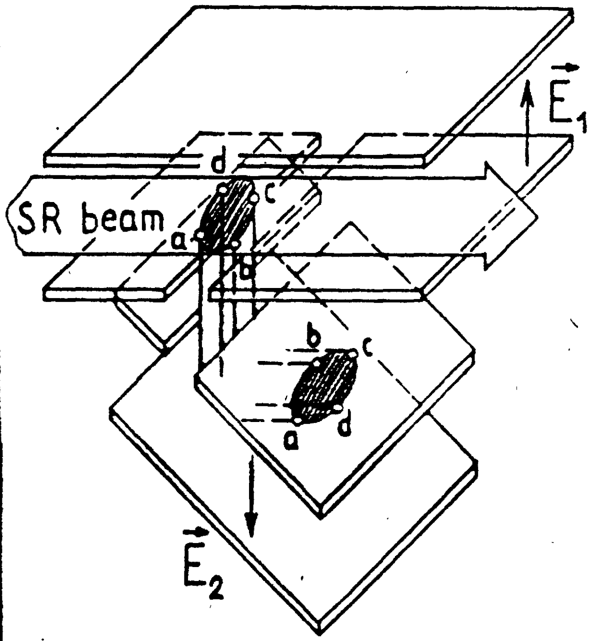
Beam line D'1.1 , Beam line D14

Non-destructive ionization SR beam monitor

-- (Institute of General and Nuclear Physics RRC KI)

- primarily developed for registration of accelerated beam two dimensional cross section
- full transparency to the beam to be controlled
- real beam cross section density distribution
- high vacuum VUV beam line
- X-ray beam line with Be window





He^3 , 0.1 μA , E = 40 MeV , P = 10^{-5} *Torr*

Call for proposals for RTD projects under the specific programme fo... and technological development, including demonstration, in the ... cooperation with third countries and international organizations (199...

COOPERATION WITH THE COUNTRIES OF CENTRAL EUROPE (CCE) AND THE NEW INDEPENDENT STATES OF THE FORMER SOVIET UNION (NIS)

1. In accordance with the European Parliament and Council Decision adopting the fourth framework programme[1] and the Council Decision adopting a specific programme in the field of cooperation with third countries and international organizations,[2] the Commission of the European Communities hereby invites interested parties to submit proposals for RTD projects.

   In accordance with Article 5(1) of the Council Decision adopting the specific programme, the Commission has drawn up a work programme setting out in detail the scientific and technological objectives, the types of RTD activities to be carried out, and the proposed financial arrangements.

2. Th... ectives and the research, technological development and demonstration activities covered by this call for proposals relate to the following area described in the work programme:

   Area A: Scientific and technological cooperation in Europe and with international organizations

   A2: Cooperation with the Countries of Central Europe (CCE)[3] and the New Independent States of the former Soviet Union (NIS)[4]

   The legal entities referred to in Articles 1, 2 and 3 of the Council Decision on the rules for participation in the specific programmes, and the JRC,[5] are invited to submit proposals for RTD projects in the following areas (the information ...ge specifies more clearly the sectors for which proposals are admissible):

Environmental protection and health

1. **Endangered ecosystems:** Coastal zones, regional seas and rivers, including global climate change
2. **Threats to the environment:** and impact on public health resulting in particular from major accidents and earthquakes, including radioactive pollution
3. **Health:** Research on occupational health
   Public health problems caused by pollution and industrial activities
4. **Energy:** Rational use of energy, renewable energy sources, fossil fuels

RTD ...ted on industry

5. **Advanced communication and telematics:** Transfrontier information and teleworking networks for small businesses and research centres, telematics applications for health care and education, language engineering
6. **Information technologies:** Software technologies, technologies for components and subsystems, multimedia systems, open microprocessor systems initiative, high performance computing and networking, technologies for business processes

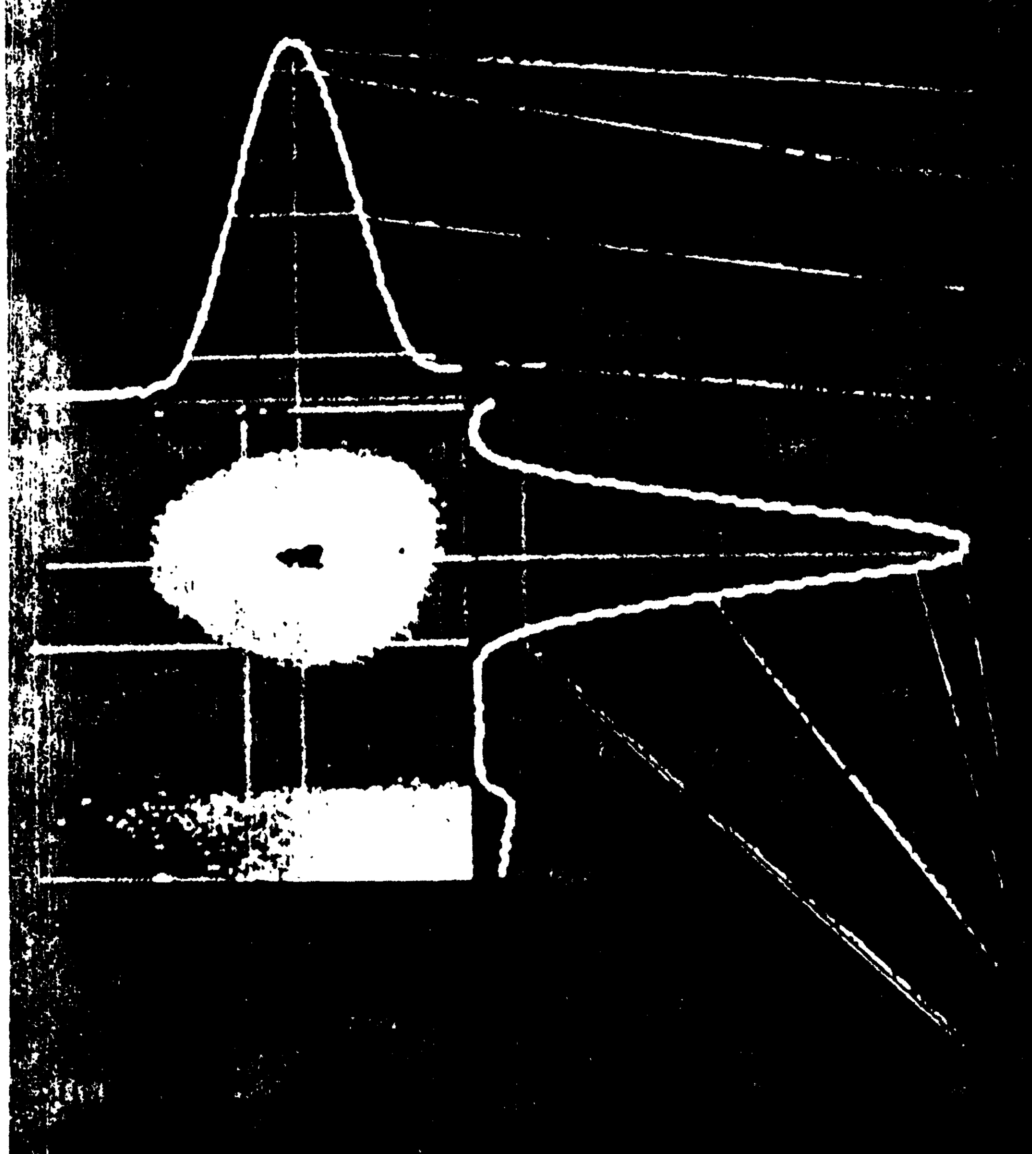
[1] Decision No 1110/94/EC of the European Parliament and the Council of 26 April 1994 concerning the fourth framework programme of the European Community activities in the field of research and technological development and demonstration (1994-98) (OJ No L 126, 18.5.1994, p. 1).

[2] Council Decision 94/807/EC of 23 November 1994 adopting a specific programme of research and technological development, including demonstration, in the field of cooperation with third countries and international organizations (1994-98) (OJ No L 334, 22.12.1994, p. 109).

[3] Albania, Bulgaria, Estonia, Hungary, Lithuania, Latvia, Poland, Czech Republic, Romania, Slovakia, Slovenia.

[4] Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgystan, Moldova, Russian Federation, Tajikistan, Turkmenistan, Ukraine, Uzbekistan.

[5] Council Decision of 21 November 1994 concerning the rules for the participation of undertakings, research centres and universities in research, technological development and demonstration activities of the European Communities (OJ No L 306, 30.11.1994, p. 8).



ПАРАМЕТРЫ

УРОВЕНЬ	РАЗМЕР, ММ	СМЕЩЕНИЕ, ММ
MAX	--	1.60
0,9	1.40	1.50
0,5	3.90	1.50
0,1	6.80	1.60
MAX	--	2.20
0,9	1.10	2.50
0,5	2.60	2.50
0,1	4.40	2.50

ITALY

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Fax : + 39 6 323 62 39

Mr G. MALDERA
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SWEDEN

Mr DAN ANDREE
Swedish Ec Rand D Council
Box 7091
10387 Stockholm
Sverige

Tel. : + 46 84 54 64 50
Fax : + 46 84 54 64 51

PLANS 96

1. $E = 2.5$ GeV $I = 100$ mA.

2. First experiments at 3 VUV beam-lines.

1997

1. Regular X-ray experiments.

2. $I = 300$ mA.

J Bordas (11 October)

Spain has a substantial and growing scientific community who requires access to SR sources.

87 highly active groups from 11 Autonomous Communities have manifested a desire to have regular access to SR. They represent ca. 400 scientists.

These groups are very active:
they manage an average of 1.7 projects/year over a broad range of scientific disciplines.

Spain is a member state of the ESRF with a 4% share. This provides acess equivalent to ca. 1.4 beam lines/year.

a) Volume of access is not sufficient for current needs

b) Users requiring Visible, VUV and Soft X-ray radiation are not served

c) It is difficult to obtain the necessary know-how with which to lead future developments.

Actions taken:

Short term:

a) Construction of a beam line at Super Aco for VUV and soft X-ray work.

b) Construction of a CRG beam line at the ESRF for X-ray work.

Long term:

Construction of a national SR source.

A top-down initiative led to a detailed feasibility study. This is jointly funded by an agreement between CIRIT and CICYT.

User requirements. In priority order:

Useful radiation and volume of access up to intermediate energy X-rays, i.e. ca. 20 keV

Source stability and long life times

High intensities

Small source size

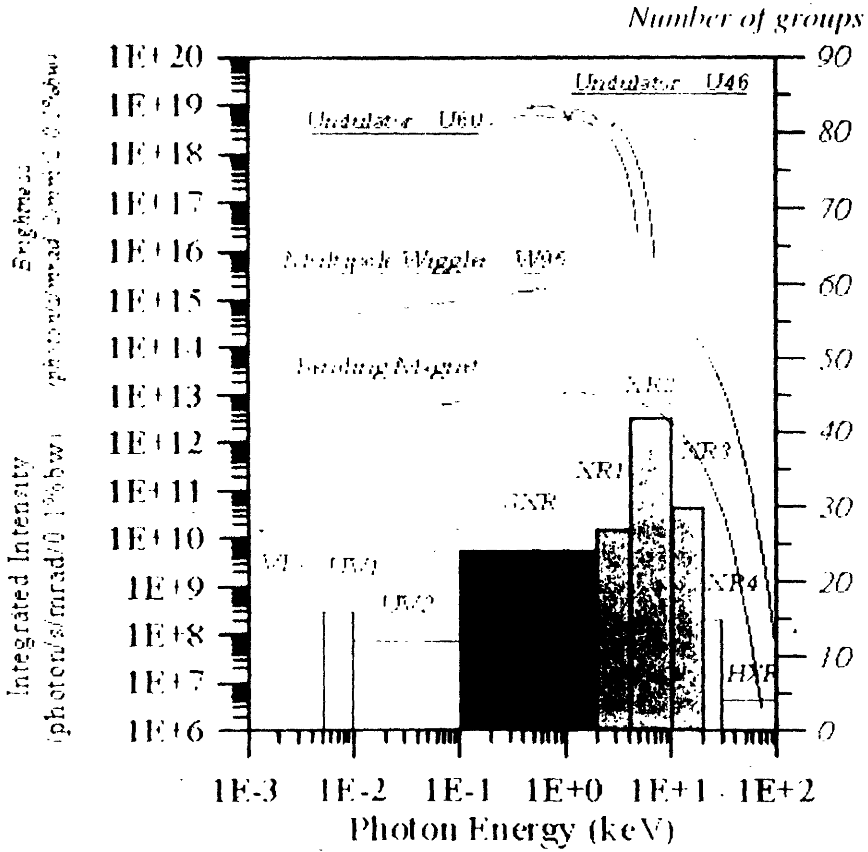
Good source collimation in the vertical plane

Good source collimation in the horizontal plane

Good time structure

LSB

Users Requirements



- Strong interest in X-Rays.
  - Critical Energy at leas 4 keV
- Small Beam sizes
  - Small Emittance
- Long Lifetime
- 'Safe' Design
- Possibilities of expansion
- Large number of possible beamlines, either form ID or bending.

3/12

LSB

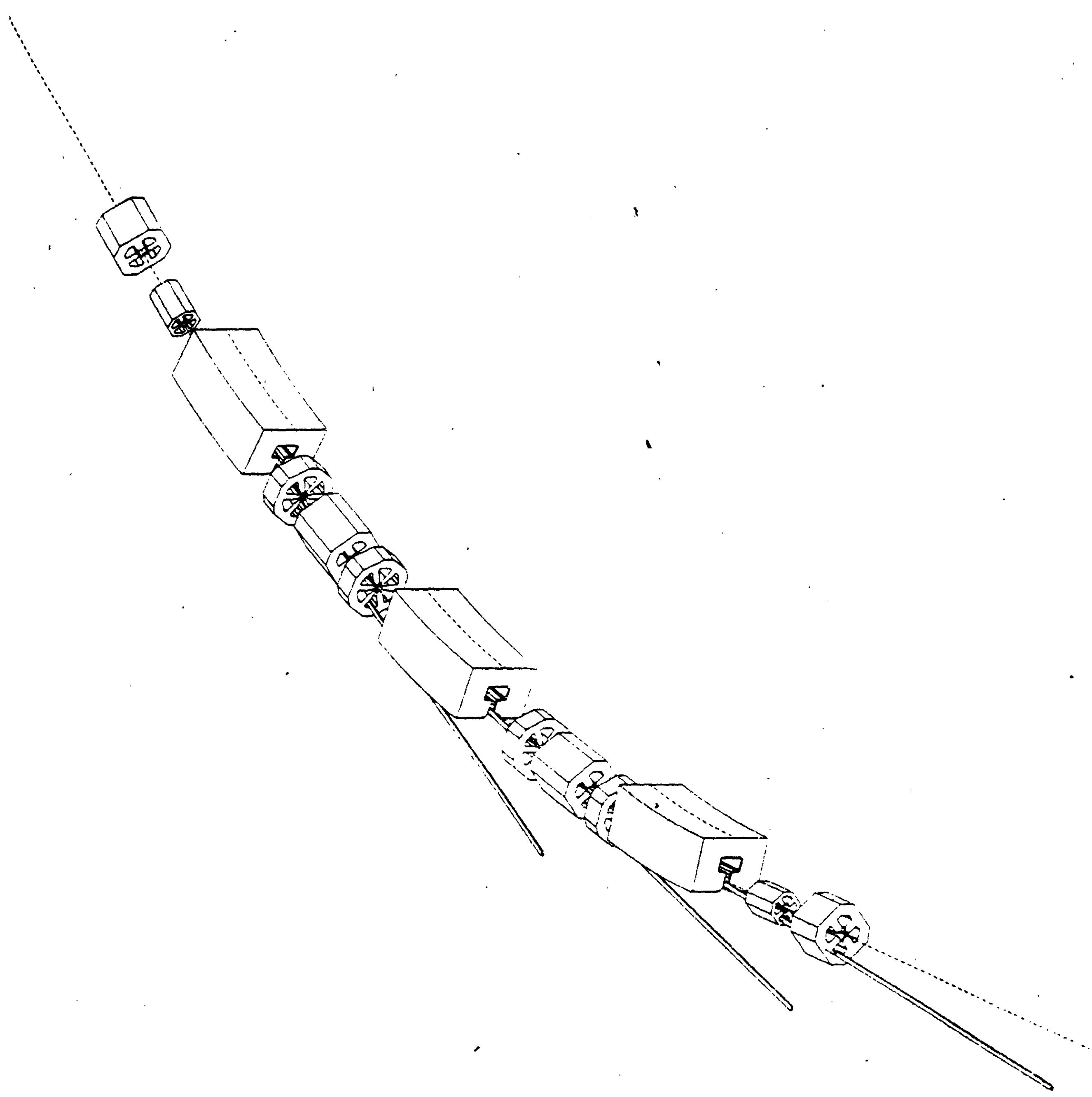
LABORATORI DEL SINCROTRO DE BARCELONA

The LSB Lattice

With the previous requirements (and the proposed site constraints) the lattice chosen is a TBA with a quadrupolar component in the bending magnets, at a running energy of 2.5 GeV, composed of 12 identical cells with a total circumference around 250 meters.

This lattice provides a low emittance and offers good potential for future upgrades (use of superconducting dipoles, higher energy).

Others alternatives (DBA, TBA-ng) have been studied and dismissed either due to high emittance or more circumference needed.



LSB

Machine Parameters

Energy	2.5	GeV
Number of Cells	12	
Cell Length	20.987	m
Circumference	251.844	m
Beam Current	250	mA
Energy Loss per turn	418	keV
Q_x	14.20	
Q_y	8.30	
Equilibrium Emittance	8.35	nm·rad
Coupling	5%	
Horizontal Emittance	7.85	nm·rad
Vertical Emittance	0.5	nm·rad
Relative Energy Spread	$8.61*10^{-4}$	
J_x	1.50	
J_y	1.00	
J_e	1.50	
α_p	$1.9*10^{-3}$	
Critical Photon Energy	4.2	keV
Harmonic number	420	
RF Frequency	500	MHz
Length for IDs	8	m

Bending magnet		
σ_x	c.a. 160	μm
σ_y	c.a. 80	μm
σ_x'	c.a. 130	μrad
Undulator		
σ_x	c.a. [illegible]	μm
σ_y	c.a. 16	μm
σ_x'	c.a. [illegible]	μrad
σ_y'	c.a. 20	μrad
MPW		
σ_x	c.a. 370	μm
σ_y	c.a. 10	μm
σ_x'	c.a. 160	μrad

Source sizes

A total volume of ca. 40 experimental stations from bending magnets and ca. 15 from IDs could be accomodated. 10 initial beam lines are planned in the design study.

Possible future expansions include:

a) higher energy if ever needed can be achieved by ramping.
b) Nominal energy injection allows to contemplate future use of, if not micro-undulators, at least milli-undulators.
c) Replacement of pairs of central magnets in TBA lattice by superconducting magnets.
d) Further reduction of source dimensions. For example, by inclusion of 6 pairs of additional quadrupoles in 6 symmetrically disposed straight sections.

Current Status:

14 staff are appointed to carry out detailed design study. Current budget 100 Mpts/year over three years (1995-1997)

Completion of building in which to house staff and Laboratory for evaluation of magnetic structures is due by end November 1996.

Collaboration with a number of national industries for R&D activities is either on the way or established. Additional support from R&D grants available for this purpose. Other grants are expected. Each case is handled on its own merit.

Synchrotron Radiation will remain indispensable for cutting edge research in

Physics,

Chemistry,

Biology,

Materials Science,

Applied research,

etc...

New and emerging scientific and technical challenges require unimpeded and regular access to SR sources.

e.g.:

Self-assembled clusters,

quantum dots,

impurities in semiconductors,

magnetism and magnetic materials,

polymer processing engineering,

biological macromolecules.

G Margaritondo (Swiss light source) (11 October)

SWISS LIGHT SOURCE SLS

THE FIRST PROPOSAL FOR A 4-TH GENERATION SOURCE

ORGANIZATION:

PAUL-SCHERRER INSTITUTE
(PSI)
VILLIGEN

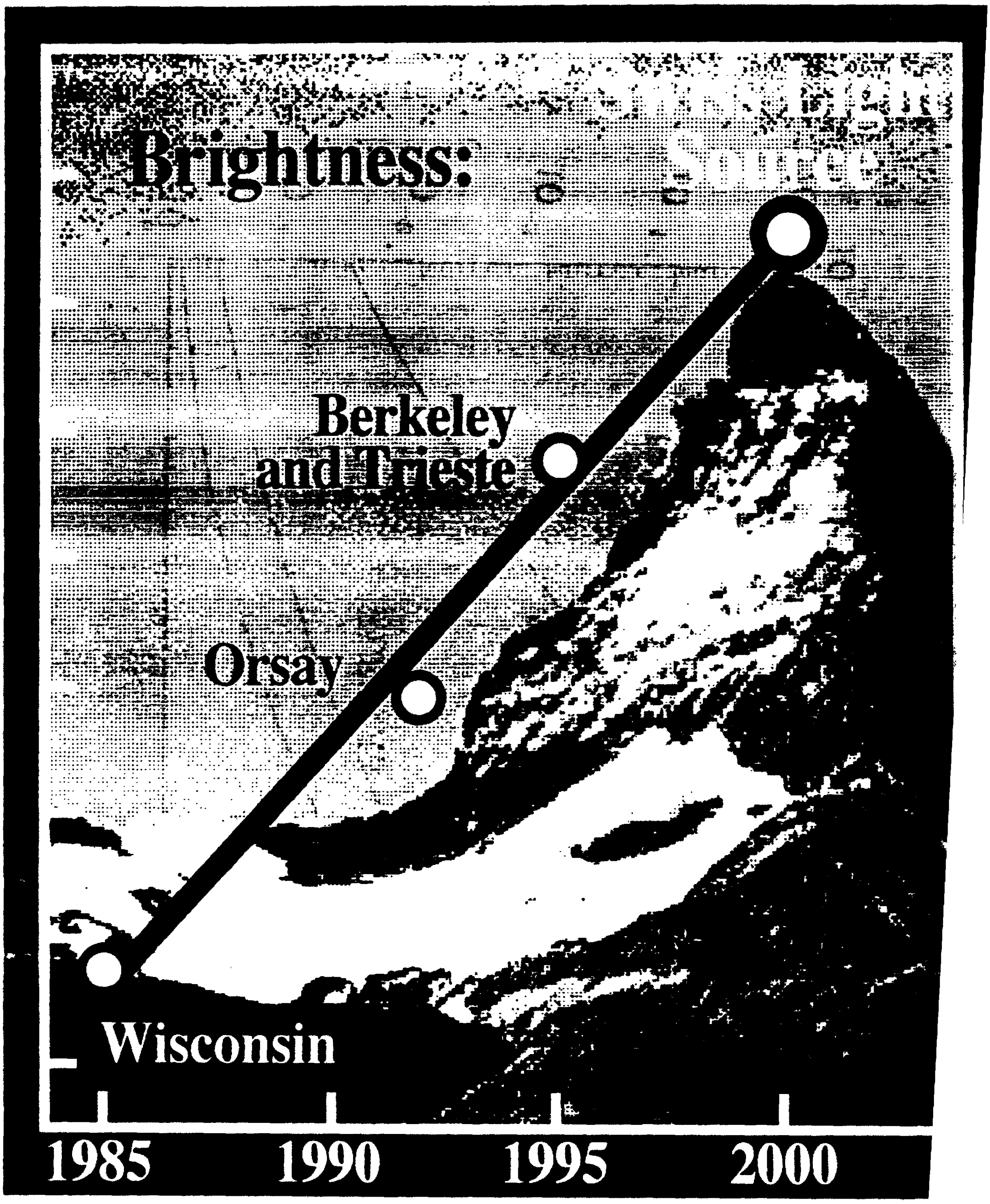
(A BRANCH OF THE FEDERAL POLYTECHNIC SYSTEM)

SCIENCE DIRECTOR:

B. REIHL

ACCELERATOR DIRECTOR:

MULHAUPT


Brightness:
Berkeley
and Trieste
Orsay
Wisconsin
1985
1990
1995
2000

SLS PROJECT

ENERGY: 2.1 GeV

HORIZ. EMITTANCE: 2 nm

NO. OF STRAIGHT SECTIONS: 6 → ???

BENDING MAGNET SOURCES: 6 → ???

MINIMUM TOP BRIGHTNESS: $> 10^{20}$ (Conv. units)

MONEY: 165 MSFr

MILESTONES OF SLS :

1991 - PROJECT DEVELOPMENT

1996 - FINAL ETH-RAT DECISION

- GOVERNMENT DECISION

< JUNE 97 - PARLIAMENT DECISION

1997 - START CONSTRUCTION

2001 - COMMISSIONING ENDS

1986 - FIRST CALL FOR BEAMLINE PROPOSALS -

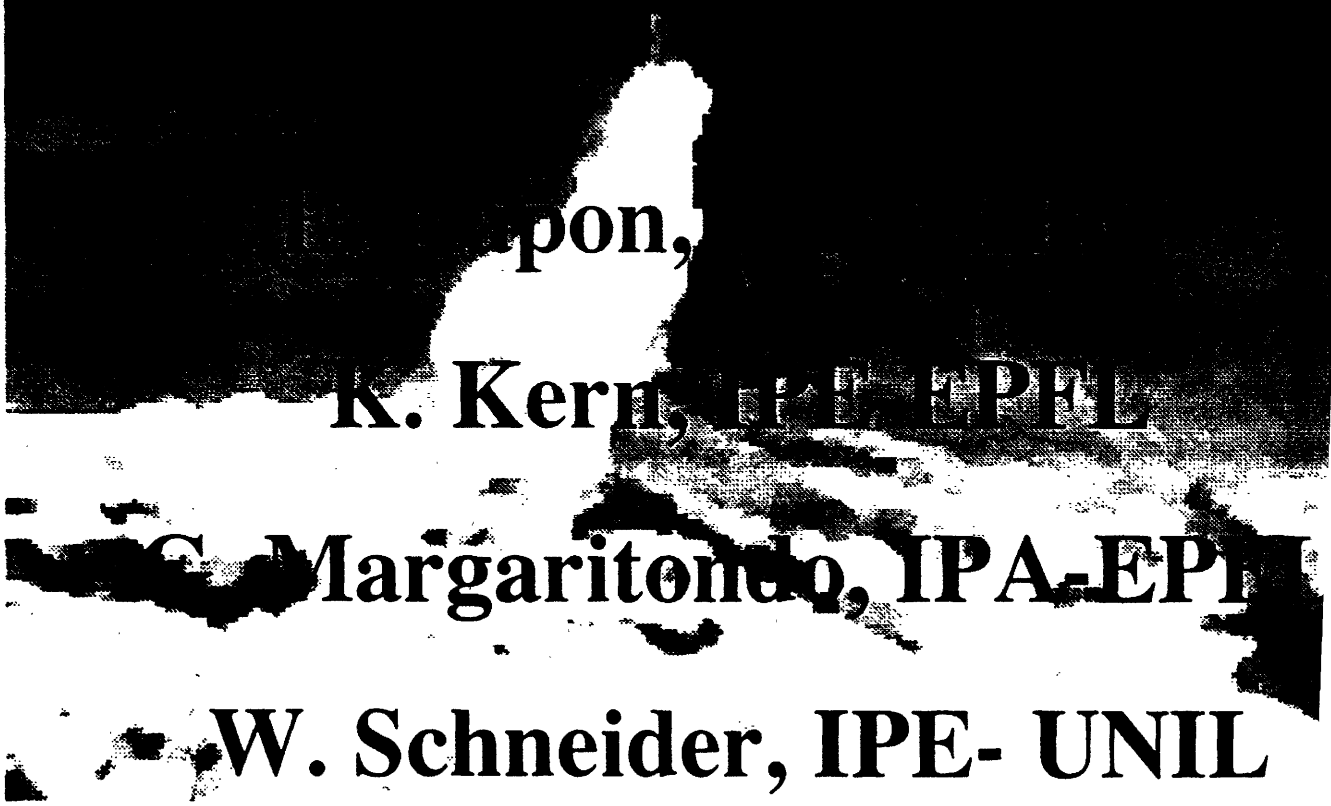
RESPONSE :

COLLABORATIONS	8
INDIVIDUAL	29
TOTAL	37

A Proposal for a Facility on the Swiss Light Source:

CERVIN Projec

(Collaboration for an Extrabright Radiation Venture in Nanoscience

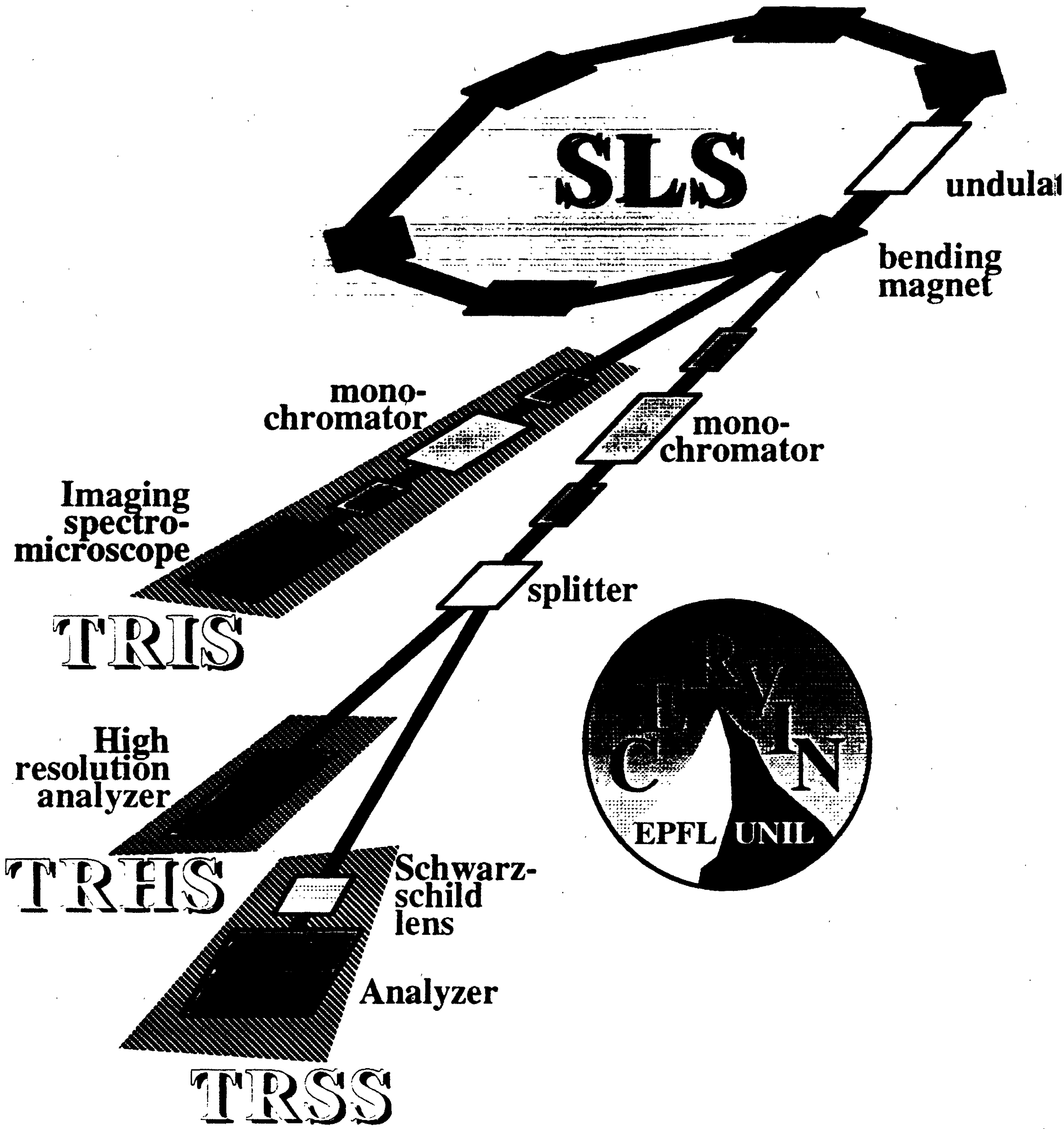


pon,

K. Kern, IPE-EPFL

G. Margaritondo, IPA-EPFL

W. Schneider, IPE- UNIL



Schematic view of the CERVIN Facility (Collaboration for an Extrabright Radiation Venture in Nanoscience) of the EPFL and UNIL at the SLS (Swiss Light Source), with its three branches: TRIS (time resolved imaging spectromicroscopy), TRHS (time resolved high resolution spectroscopy) and TRSS (time resolved scanning spectromicroscopy).

$$\text{Brightness} = \text{constant} \times \frac{\boxed{F}}{\boxed{S}\ \boxed{\Omega}}$$

Combination of horizontal ($\delta x\ \delta\theta_{Lx}$) and vertical ($\delta z\ \delta\theta_{Lz}$) source sizes and angular spreads.

Factors for bending mag

HORIZONTAL: caused by the action of the accelerator's magnet lattice, and chacterized by the accelerator's horizontal "emittance", ε_h

VERTICAL: caused by the imperfect alignement of the accelerator's magnets ("coupling"), and chacterized by the accelerator's vertical "emittance", ε_v

- **diffraction phenomena**
- **angular spread of synchro radiation emission (≈ 1**
- **accelerator's electron bea deviation from "avera trajectory**
- **accelerator's electron bea angular deviation fro "average" trajectory**

low emitta required f high bright

For undulators: $\delta\theta_L \approx ((1 + K^2/2)/N_u)^{1/2}($

high collimation means high brightne

Coherence = "the ability of a wave to form interference patterns when wavefronts are separated and recombined"

Longitudinal (time) coherence: characterized by the coherence length:

$$L_c = \lambda\,(\lambda/\Delta\lambda)$$

$\Delta\lambda$ = wavelength bandwidth; for an undulator $\Delta\lambda/\lambda = 1/N_u$, and $L_c \approx N_u\lambda_L/2\gamma^2$)

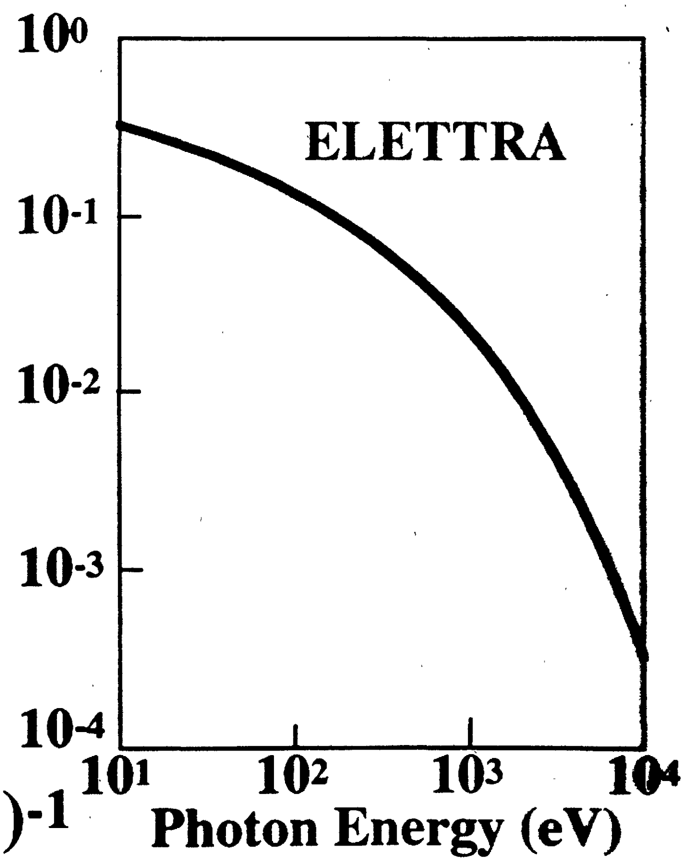
[ransverse (space) coherence: characterized by the product ource size $\times$ (solid) angular spread:

$$(\delta x\ \delta\theta_{Lx})(\delta z\ \delta\theta_{Lz})$$

nd therefore related to the (photon) emittances, $\varepsilon_h\ \varepsilon_v$

'ull (diffraction limited) space coherence:

$$\delta x\ \delta\theta_{Lx} \approx \lambda$$



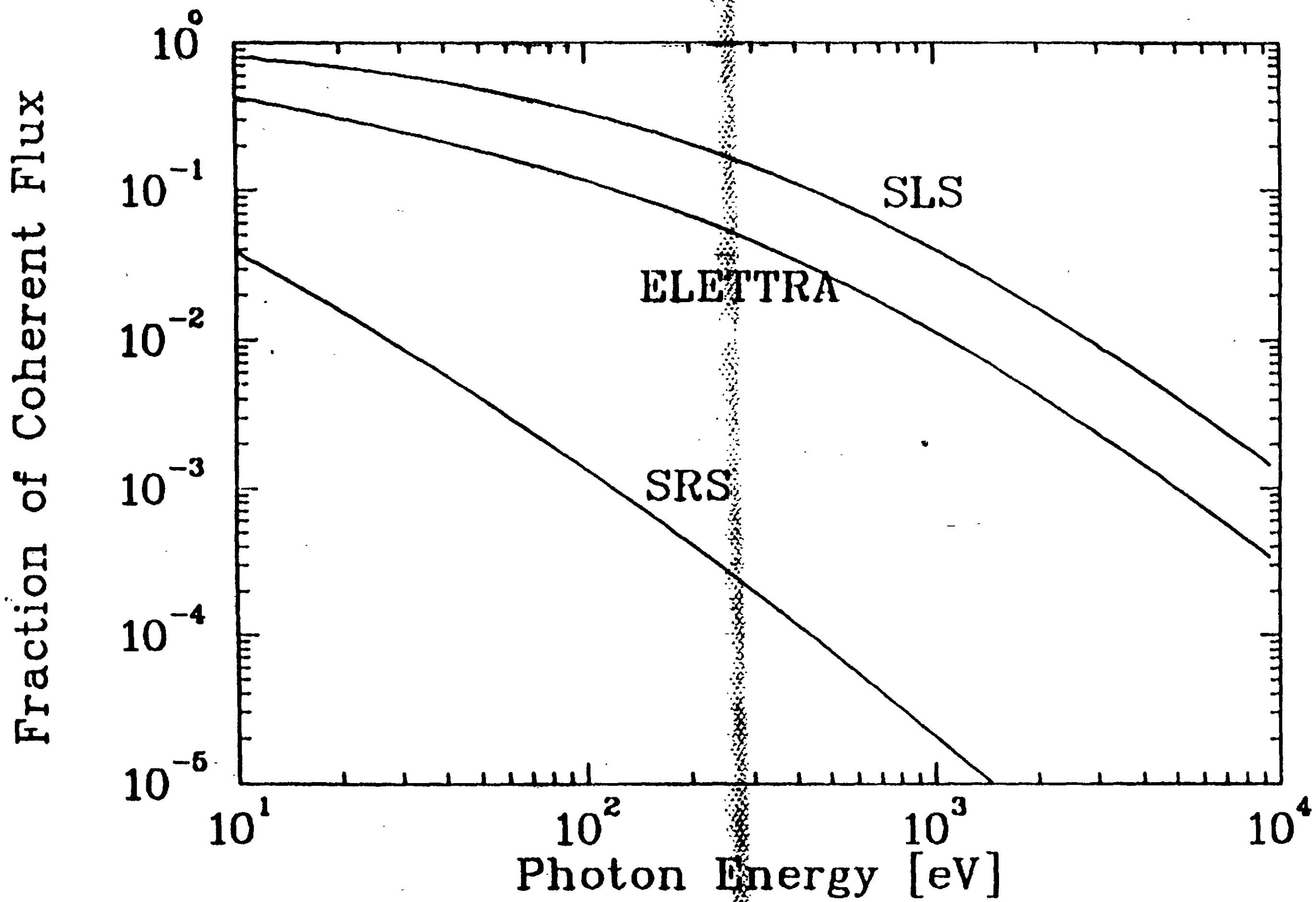
ORMALLY:

$$(\Sigma_{x,z})^2 = (\sigma_{x,z})^2 + (\sigma_R)^2$$

$$(\Sigma_{x,z}')^2 = (\sigma_{x,z}')^2 + (\sigma_R')^2$$

herent fraction
iry half-disk criterion):

$$1.22\ \lambda)^2(4\pi^2\ \Sigma_x\Sigma_x'\Sigma_y\Sigma_y')^{-1}$$



Fraction of Coherent Flux
10^0
10^{-1}
10^{-2}
10^{-3}
10^{-4}
10^{-5}
SLS
ELETTRA
SRS
10^1
10^2
10^3
10^4
Photon Energy [eV]