

Connecting Research Infrastructure to Industry:

The case of the European Synchrotron Radiation Facility

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Société Civile under French law
Budget 95MEuro
600 Staff – 500 with a technical background
7000 visiting users per year



ESRF Member States

France	27.5 %
Germany	25.5 %
Italy	15 %
United Kingdom	14 %
Spain	4 %
Switzerland	4 %
Benesync (Belgium, Netherlands)	6 %
Nordsync (Denmark, Finland, Norway, Sweden)	4 %

ESRF Associates

Portugal	1 %
Israel	1 %
Austria	1 %
Poland	0.6 %
CentralSync (CZ, H, SK)	1.05%



Exploiting the innovation potential of research infrastructures

- **R&D partnerships with industry** to develop Union capacities and industrial supply in high-tech areas such as scientific instrumentation or ICT;
- Stimulate the **use of research infrastructures by industry**, e.g. as experimental test facilities, innovation hubs, knowledge-based centres;
- Encourage the integration of research infrastructures into local, regional and global **innovation systems**;
- **Pre-Commercial Procurement and Public Procurement of Innovation** by research infrastructure actors to drive forward innovation.

ESRF www.esrf.eu

- Non-destructive synchrotron X-rays for **micro- and nano-structures of real objects under real manufacturing and end-use conditions, often in real time**
- **40** experimental stations and **450** scientists, technicians and engineers

- PHARMA • POLYMERS • TEXTILES • ENGINEERING • STRESS & FATIGUE • FOOD • ENVIRONMENT • CHEMISTRY • CATALYSIS • MATERIALS •
- NON-DESTRUCTIVE • CHEMICAL SENSITIVITY • BULK & SURFACE PROPERTIES • HIGH TIME RESOLUTION • VERY HIGH SPATIAL RESOLUTION •

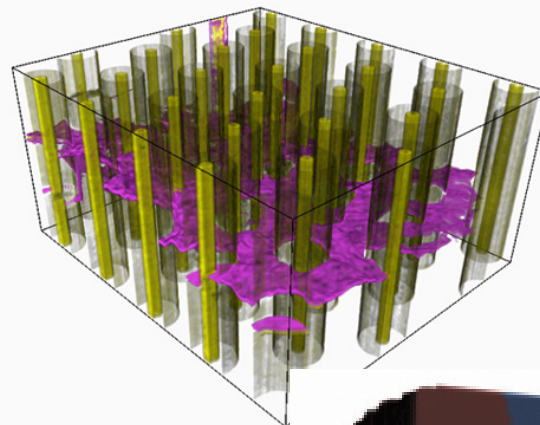
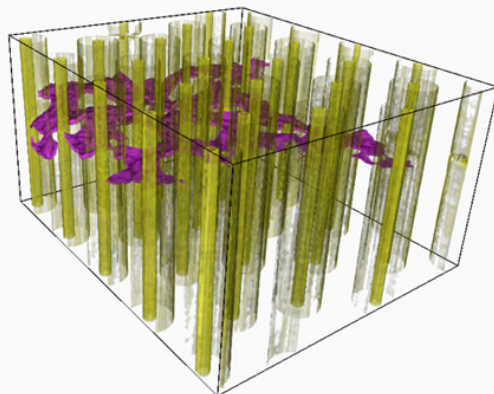
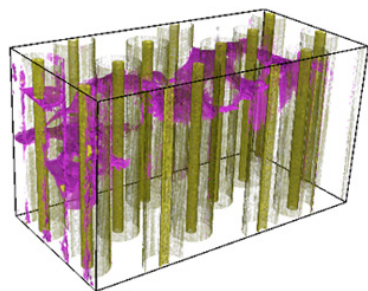


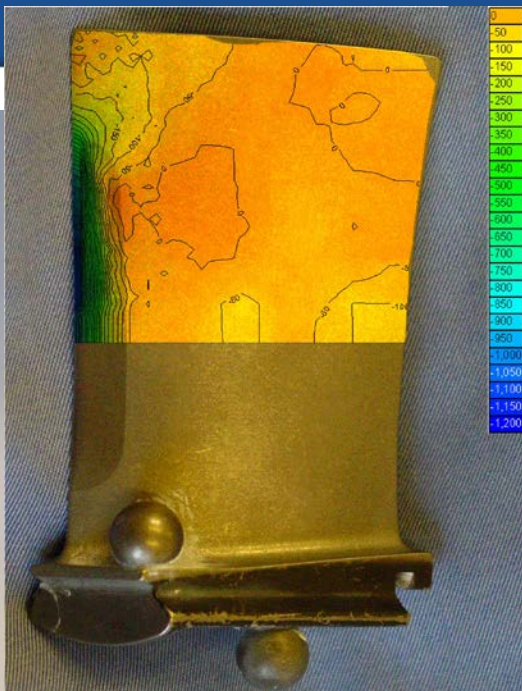
*A light for Science,
A vision for Industry*

A large, red, rectangular stamp with a thick border, tilted at an angle. Inside the stamp, the words "Top Secret" are written in a bold, red, sans-serif font. The stamp is set against a light gray background with a pattern of faint, light blue circles of varying sizes.

Top Secret







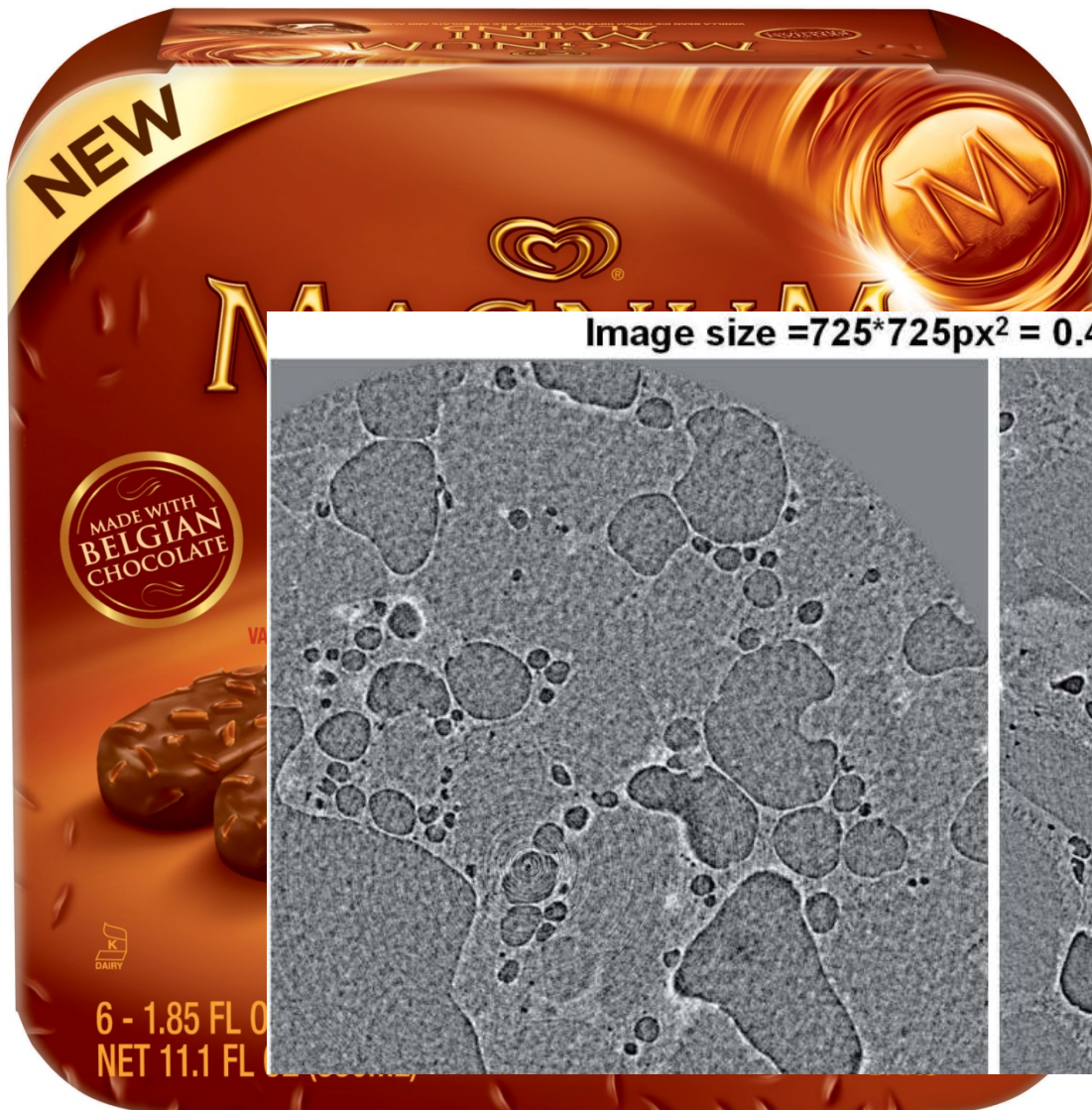
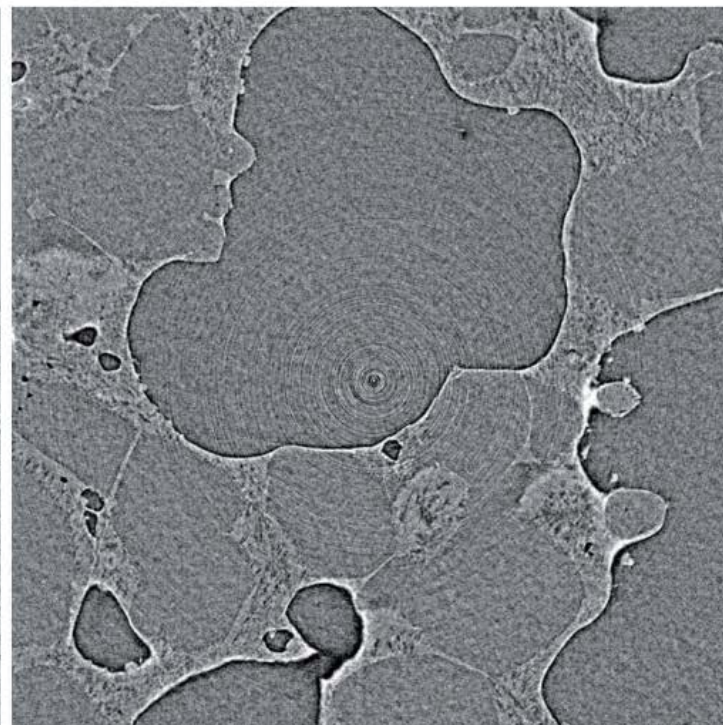
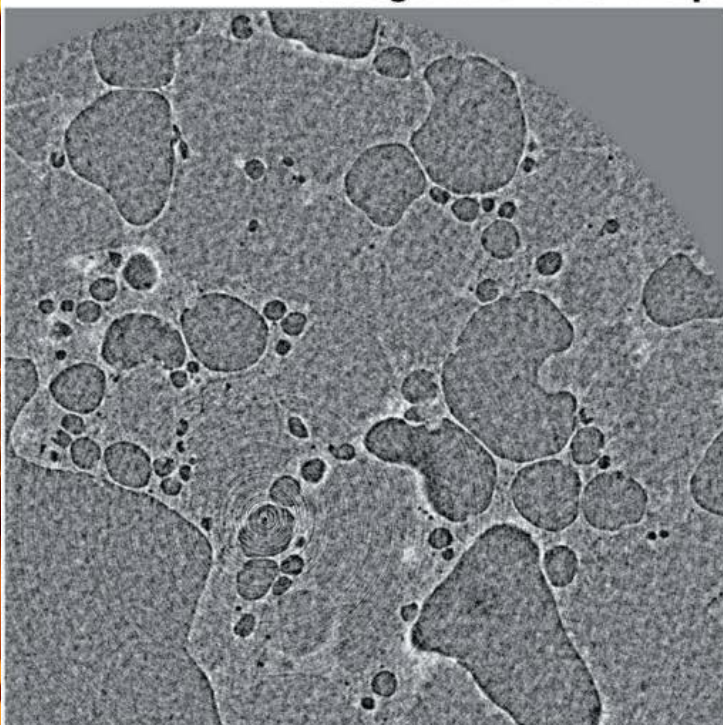
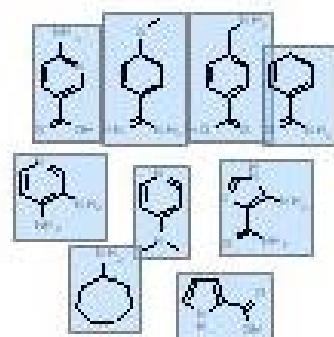


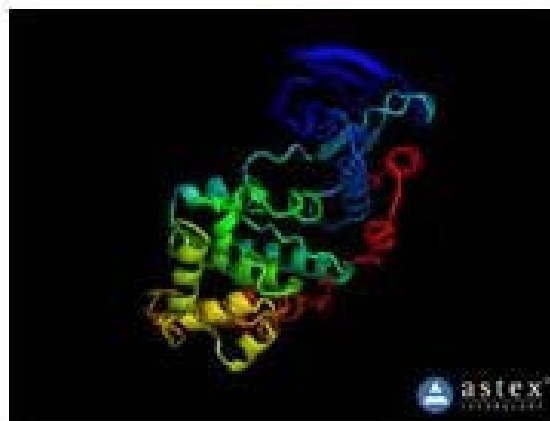
Image size = $725 \times 725 \text{ px}^2 = 0.41 \times 0.41 \text{ mm}^2$



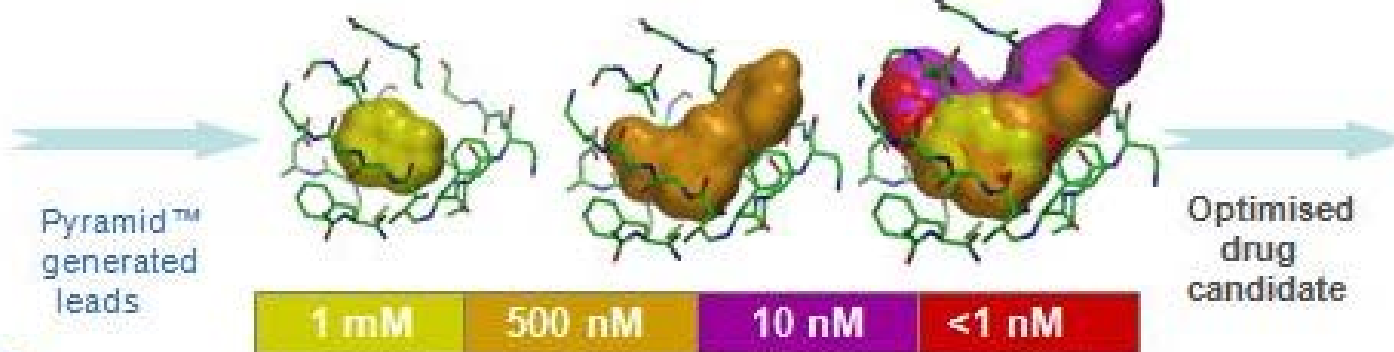
Fragment-Based Discovery Using Pyramid™



Proprietary fragment libraries



Less than 100 analogues



The ESRF Business Development Office: “to increase ESRF impact with industry”

Responsible for all industrial activities

- Industrial access to beamlines, facilities, and expertise
- Technology transfer through licensing, patents, spin-off
- Manufacturing
- European and national funding opportunities with industry

About 4 FTE + other resources as we can obtain

2 x Structural Biology Industry Scientists

2 x Imaging Industry Scientists

1 x Soft Matter Scientist

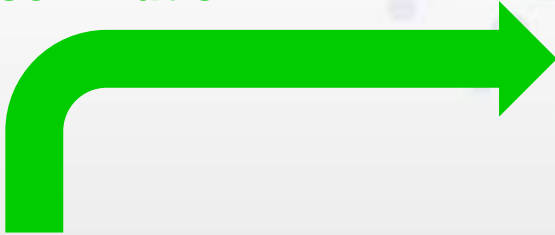
1 x Instrumentation Engineer

1 x Administrative Coordinator

1 x Head of Business Development

ESRF technology and expertise: driving impact

*Open dissemination
and use*

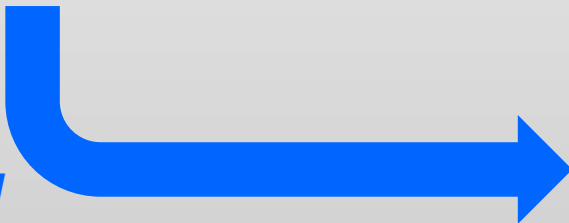


- Peer review beam time
- Open source software (e.g. TANGO)
- Hardware (e.g. ICEpap)
- Engineering designs for member states
- Training



**Creative partnerships with industry,
combining both open and protected aspects**

*Protected
dissemination and use*



- Proprietary beam time and services inc. remote access and mail-in
- Contract R&D
- Technology licences
- Co-innovation (more of a wish!)
- Patents
- Direct sales of know-how (consultancy) and equipment

...Synchrotron @ Home...



New services



Brand enhancement

- Joint research students
- Training
- Better key account management

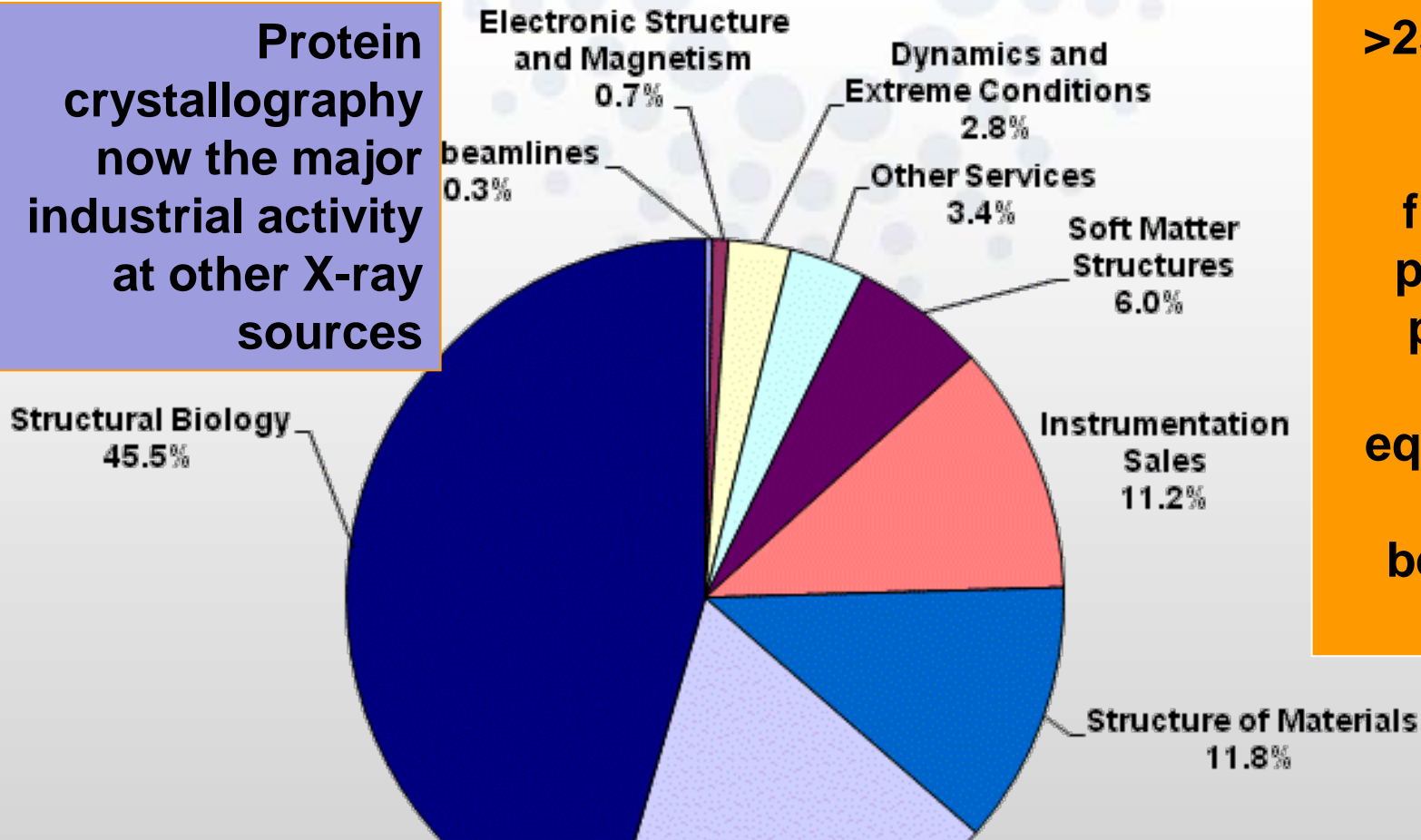
Alliances



EMBL



Protein crystallography now the major industrial activity at other X-ray sources



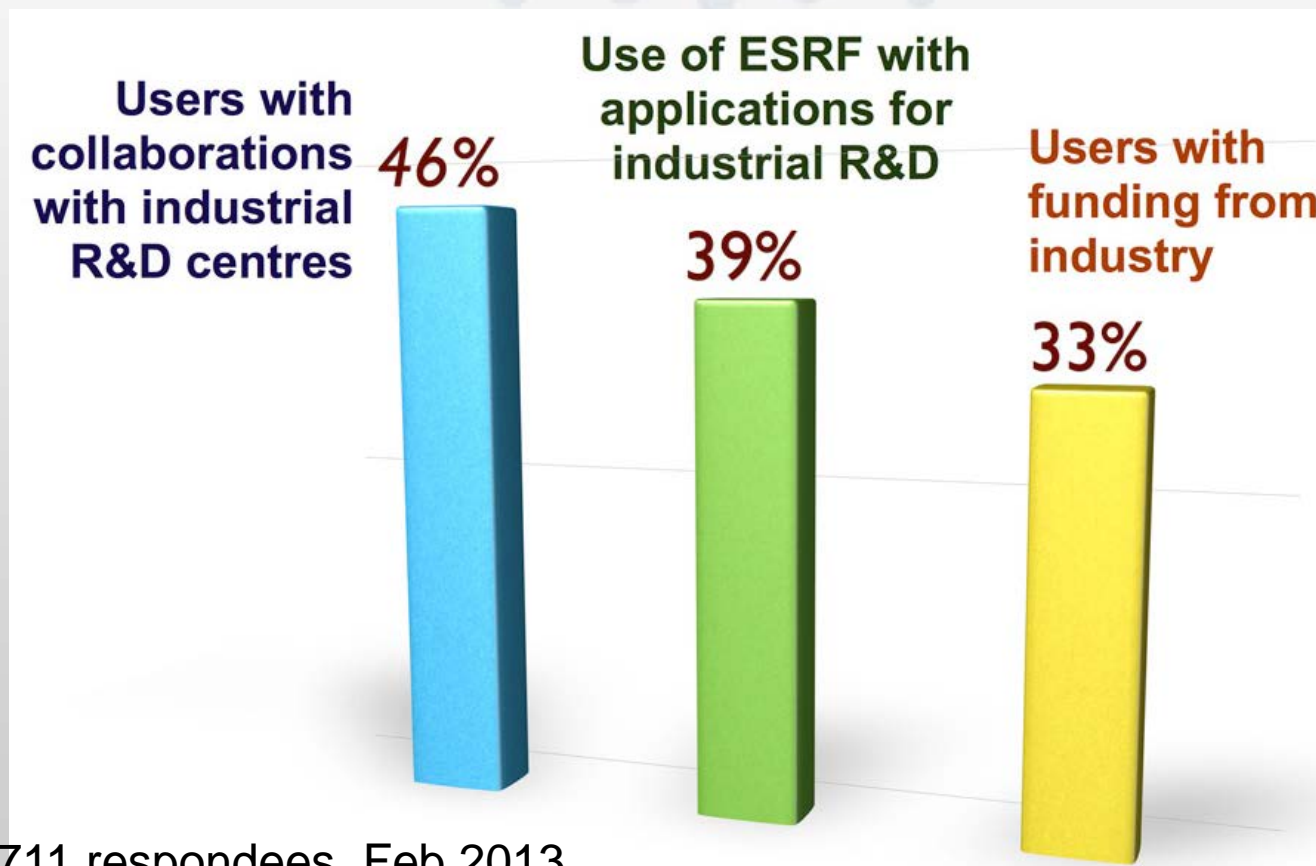
Generated >25MEuros

Used to fund staff positions, purchase new equipment, fund beamlines

- 2011: 2.2MEuros income generated
- Beam access by industry represents about 2% of beam time capacity; but about 10% of allocatable income

Industry via the Peer Review Programme

All Peer Review experiment IP belongs to the users.



Data from 711 respondees, Feb 2013

Creating new business areas with industry



Key bottlenecks: Industry as a user and as a partner for co-innovation

- Industry ↔ Facility: Understanding and expectations
 - Answers that industry want
 - In-house capacity to provide answers and not simply data
- Facility motivation:
 - Top-down/bottom-up
 - Return to earning beamlines
 - Visibility and perceived value of industry work (publications, CV, bonuses, promotions...)
 - Staff already stretched with conventional user programme

CHAPTER XVII

X-RAYS IN INDUSTRY

MANY and varied are the uses to which X-rays have already been applied. From golf balls to aeroplanes, from chocolates to big guns, from the fitting of shoes to the detection of "faked" oil paintings have their applications ranged in the comparatively few years during which industrial uses have been a practical possibility. No great power of imagination is required to realise the immense importance to many industrial processes of the ability to see into the interior of either the raw material or the finished article in order to make sure that all is as it should be. In these days of expensive labour a hidden defect in raw material, which may only be revealed after a great deal of work has been done on it, may prove disastrously costly. Such hidden flaws occur, especially when the raw material is of a nature that is not easily examined than the finished article.

X - RAYS *Past and Present*

by V. E. PULLIN
Director of Radiological Research
Research Department, Woolwich

and W. J. WILTSHIRE
Research Department, Woolwich

Nuturing an industry-friendly culture...

- Managing staff expectations during recruitment
- Staff training on working with industry, use of IP tools, confidentiality...
 - Create a Code of Conduct
 - Automatic reflex to “think IP” before publishing
- Bring industry into the institute meritocracy
 - Rewarding staff in the same way and level as done for traditional scientific work
 - Make industry a review point in annual appraisals



Gaps to bridge

1. Communication and understanding
2. Resources to work with industry
 - Specific expertise
 - Very high levels of service
3. Training/education
 - Non-expert access and use
4. Statutes and working practices set-up for academics
 - Slow access
 - Confidentiality issues
 - Motivation of our scientists
5. Standards/certification
 - QC, GLP, ISO
6. Lack of industrial sample conditions and equipment

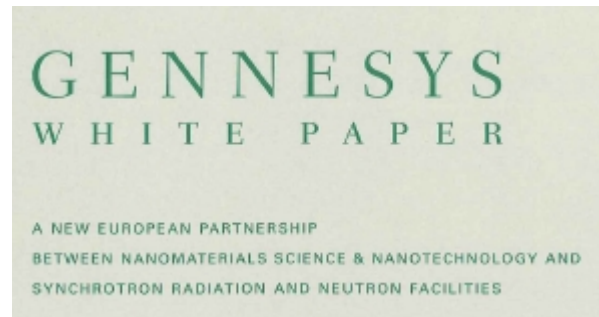


European Light Sources for Industrial Innovation “ELSII”

Networking activity of CALIPSO

Building on existing work

- o ERID-watch (2008)
- o GENNESYS (2009)
- o EIRRISS (2012)



European large-scale facilities try to open up to applied activities

- The large-scale facilities offer unequalled possibilities for material analysis, in particular the synchrotrons and neutrons facilities. These platforms were initially designed as tools for research fundamental with, as unique evaluation criterion, the quality of the scientific publications of their users
- Conscious to have now reached a stage of performances and reliability compatible with a use by the industrialists, and gain notoriety, the large-scale facilities now wish to invest towards the applied activities.
- Industry needs a fast and cheap access to the techniques; most of the time, long delays are requested and the expertise is not available in the company, requiring scientific- and technical assistance from the large test facilities;
- However, their culture and their operating process do not facilitate this opening which remains still too limited today in regard to the importance of the challenge for European industry.



WP3- Overview

- Overall aim is to catalyse and enhance industrial interaction with CALIPSO light sources
 - Industry as a user
 - Industry as a partner for instrumentation
- Budget 100kEuros
 - Original scale was of 200kEuros
- 30 month duration from month 6
- Link created with NMI3 for activities for enhanced actions and economy of scale

WP3- The tasks

o Task 3.1: Industrial Advisory Board

- Creation with 3 to 4 members
- Use as a focus group
- Only two meetings during ELSII life time due to budget cut

o Task 3.2: Promoting Light Sources for Industrial R&D

- Workshops, largely cut back from the original plans
- Each light source can hold a miniworkshop to capture its geographical region
- Larger-scale meeting for Autumn 2014, combining outreach and awareness, training, networking

WP3- The tasks

o Task 3.3: Enhancing Industry-Light Source Interactions for X-ray Detector Development

- Funding for one workshop between light source detector technologists and industry engineers
- Linked with the HIZPAD(2) Joint Research Activity

Expectations

1. Practical feedback from IAB with recommendations to Council
2. Increased contact between business offices of the CALIPSO light sources and bridging to those of NMI3 neutron sources
3. Heightened awareness of light sources in industry

IAB Terms of Reference

1. Advise the CALIPSO partners on **opportunities for industry to be engaged** in research at European light sources, and the best means for promoting such opportunities;
2. Advise the CALIPSO partners on how to **best engage with European industry** for proprietary and pre-competitive R&D at light sources;
3. **Identify industrial research priorities** that will help shape the operational strategy of the European light sources including the best way to exploit the current suite of beamlines in a complementary way, and to develop the case for joint programmes in the future;
4. **Prepare a concise report** to the CALIPSO Council and European research funders as to how best engage European light sources and industry to the end of enhancing innovation and competitiveness of European industry;
5. Carry out other tasks as agreed with the CALIPSO Council.



SCIENCE LINK



Baltic Sea Region
Programme 2007-2013

Part-financed by the European Union
(European Regional Development Fund)

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The GIANT initiative brings centres of excellence together to create a world-class Innovation Centre

EPN science campus
Large research infrastructures

Management of
Technology

MINATEC
Information & Communication

GreEn
Energy

NanoBio
Biology & Health

Fundamental research





Institut de Recherche
Technologique sur la micro
et nanoélectronique

IRT NanoElec

A French PPP of c. 450MEuros

**Core task:
Characterisation Programme**



“ILL and ESRF offer unequalled performance to characterise advanced nano- and micro-electronics”

To catalyse this use by industry, the IRT NanoElec is establishing a pathfinder programme to develop an improved interface between the ESRF and ILL and industrial nano/micro-electronics R&D.

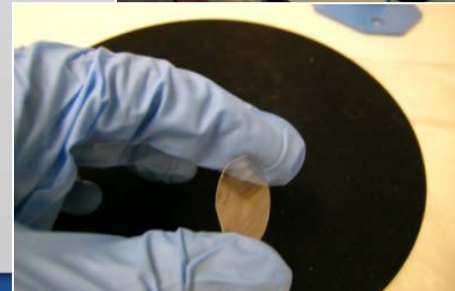
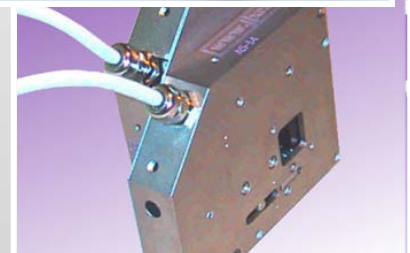
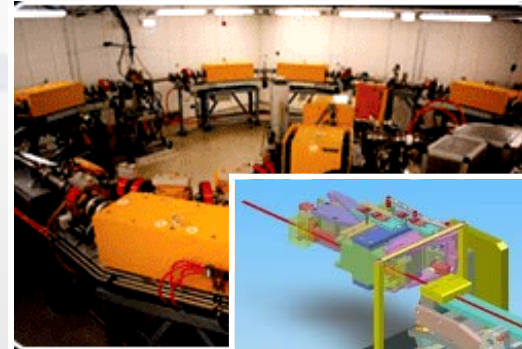
Four core components:

- 1. Define preparation and characterisation** responding to the needs of industrial R&D
- 2. Put in place technical and human support/resources** for that answer these need
- 3. Perform test cases** put forward by NanoElec partners, and further afield
- 4. Training, dissemination and communication**

Exploiting and innovating with ESRF IP

- **Licensing** instrument designs
- **Manufacturing** unique equipment for other RI
- **Helping** for engineering design
- **Patents** are not our favourite tool
- **Our software** is open source

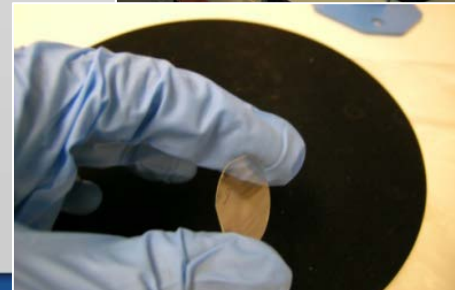
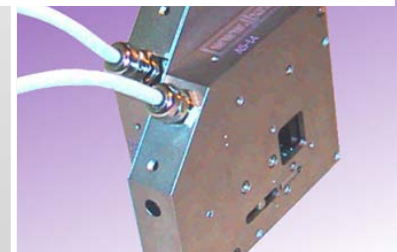
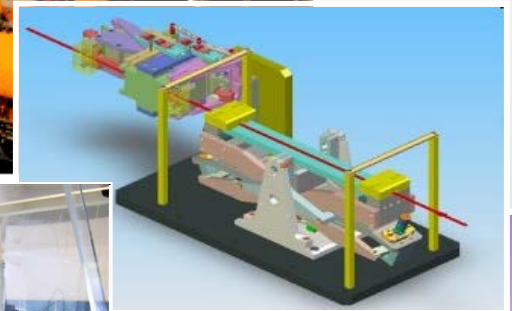
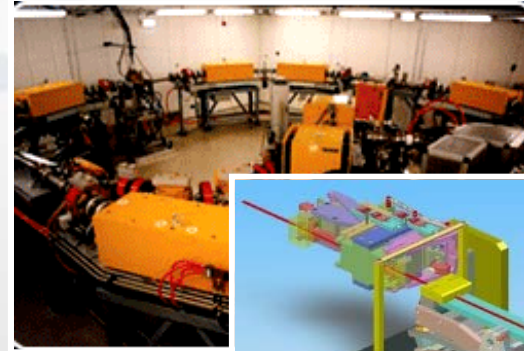
Key part to play in our role as nursery for developing and transferring synchrotron technologies



Exploiting and innovating with ESRF IP

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Key part to play in our role as nursery for developing and transferring synchrotron technologies



Satellite workshop @ ICNS

“Instrumentation – A challenge for European markets: R&D / IPR / Risks”

Draft Agenda for Tuesday July 9th, 2013 in Edinburgh

Free registration for ICNS for this satellite workshop:

<http://nmi3.eu/news-and-media/calendar/nmi3-industry-events.html>

Facilitators / Discussion leaders:

Jean-Pierre Caminade (French Ministry of Large Scale Infrastructures) &

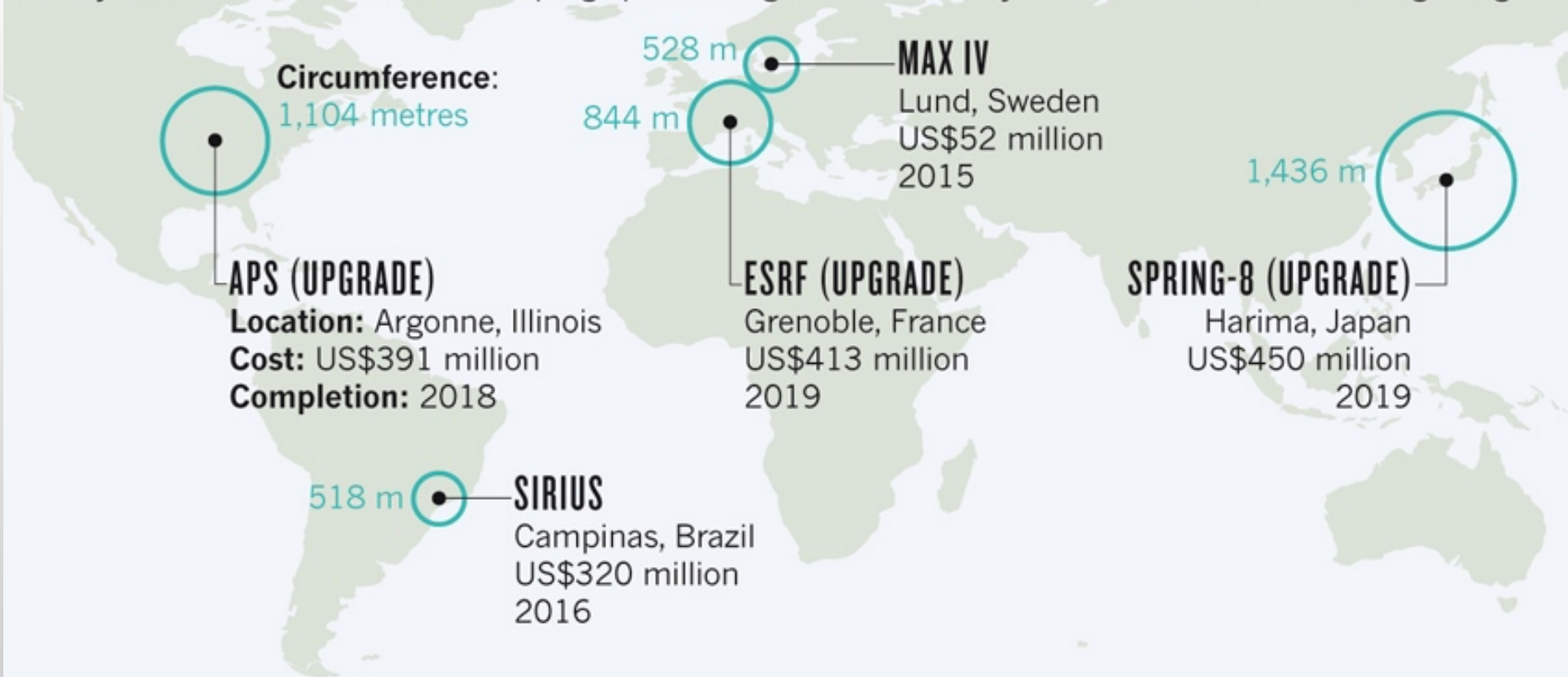
Ed Mitchell (Business development officer at ESRF)

Introductory speech (context)	Helmut Schober Science Director ILL	Discussion round	
Detectors: View of Research infrastructures	Bruno Guerard ILL	BREAK	
Detectors: success story of co-innovation	Robert McKeag Centronic	Procurement officers view (RIs) “identification of strategic suppliers”	Xavier Philippe, procurement officer at ILL, France
Sample Environment: ISI co-innovation with Oxford Instruments and Hiden Isochema	Oleg Kirichek ISIS	Innovative Procurement at ESS	Juan Tomás Hernani, General Secretary for Innovation and Industry, ESS
Sample Environment: possibilities of co- innovation - Cryostat	Oxford instruments Contact: Sophie Walker	Research infrastructures in Horizon 2020 – Industry and Innovation	Bernhard Fabianek, EC, DG Research & Innovation tbc
Neutron delivery systems: View of RIs	Peter Link Head of Optics group at FRM II	IPR issues: a case study (tbd)	Sabine Albrecht (IPR helpdesk) tbc
Neutron delivery systems: Company	Christian Schanzer Swissneutronics	Closing session/ round table discussion	
Discussion round		END	
BREAK			

Opportunity for Europe to lead the world in “Ultimate Storage Ring” technologies

FOCUSED BEAMS

Five synchrotron facilities are developing special magnets so that they can become ultimate storage rings.



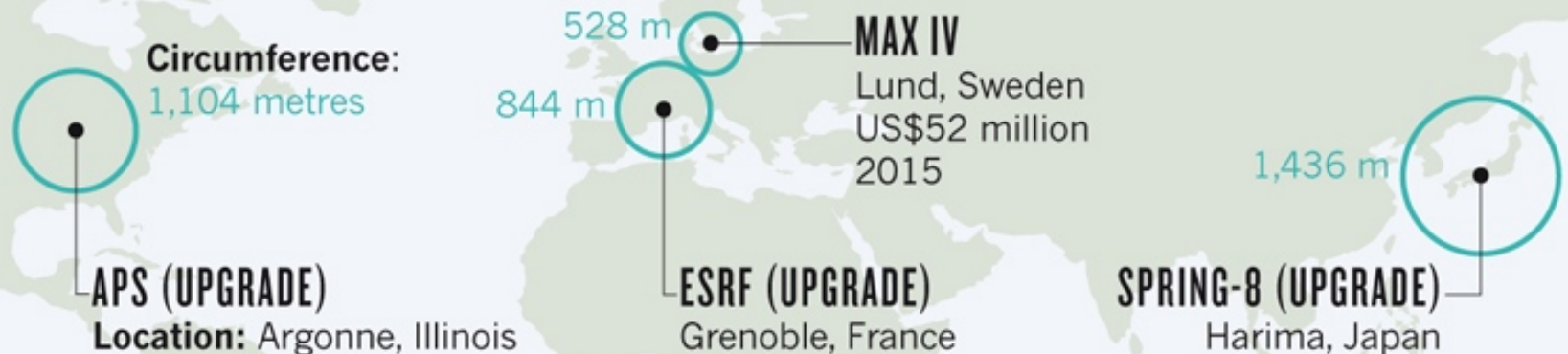
APS, Advanced Photon Source; ESRF, European Synchrotron Radiation Facility.

Nature, September 2013

Opportunity for Europe to lead the world in “Ultimate Storage Ring” technologies

FOCUSED BEAMS

Five synchrotron facilities are developing special magnets so that they can become ultimate storage rings.



Instrumentation developments, hand-in-hand with industry for these challenging new light sources, will open new markets for European companies (often smart technology SMEs) across the world. Technologies needed include:

- Magnets
- Fast, high-efficiency detectors
- High-performance and high-precision mechanics
- Advanced X-ray optics systems
- Control systems (TANGO...)

TANGO control software: a commercial product?

- Collaborative development amongst light sources
 - ESRF core driver
- Open source
- Already multi-million Euro market in supporting TANGO at RIs and supply of TANGO-ready hardware

Exploring routes for deeper industrial exploitation with local incubator support (cash and expertise)



TANGO Open Source Business Model

- **GOAL** : make TANGO the OPEN SOURCE solution for industrial control systems
- **HOW** : create a COMMUNITY of INDUSTRIAL PARTNERS
- **MARKET** : RESEARCH INFRASTRUCTURES 400 M€/yr, INDUSTRIAL CONTROL 12 B€/yr
- **BENEFITS** : create JOBS in INDUSTRY, give EU INDUSTRY a competitive ADVANTAGE, INVENT new solutions for control e.g. SECURE protocol

Conclusions

1. Synchrotron radiation is already an **essential tool** for the pharmaceutical and biotechnology industry worldwide
2. Synchrotrons provide techniques **going far beyond** that of lab sources
3. Synchrotrons **work increasingly closely with industry**
 - Mail-in services and providing expertise of synchrotron scientists
 - Trend for larger scale R&D and outsourcing, and collaborations
 - Growing taste for co-innovation and technology procurement
4. Light sources **need state-of-the-art instrumentation and processes**, creating (co)-innovation opportunities with European industry to lead instrumentation supply

Conclusions

5. Challenges:

- **Build two-way understanding**
- **Add capacity to work with industry**
- **Step beyond simple relationships and interactions for both industry using RI and co-innovating with RI**
- **Build an industry access and support network**

Grow to be more professional and mature in how we work with industry.

An aerial photograph of the ESRF facility in Grenoble, France. The image shows a large, modern industrial and research complex situated along the banks of the Isère River. The facility includes several large buildings, parking lots, and a prominent circular structure. The surrounding area is a mix of urban development and green spaces.

Enthusiastic to be partner in H2020 and national projects!

Thank you for your attention.

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