International dimension of EU policy and activities on Research Infrastructures

Philippe Froissard

Deputy Head of Unit
DG Research & Innovation
European Commission

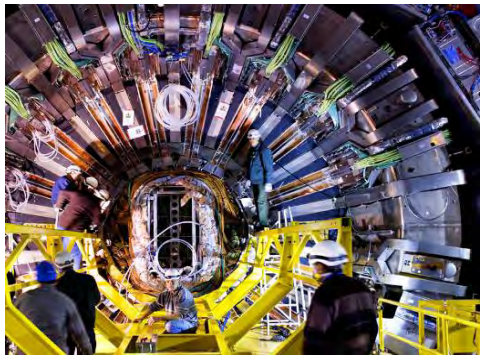
Research and Innovation

Research Infrastructures

- *Research infrastructures are facilities, resources and services that are used by the research communities to conduct research and foster innovation.*

Major scientific equipments

Knowledge-based resources



e-infrastructures

International Cooperation on RI

Rationale

- The **nature and complexity** of the societal challenges require a global approach for the design and operation of the RI;
- Global cooperation is the only option when **pooling of resources** is necessary due to the scale of the investment for construction and operation of the RI;
- International cooperation on RI can be considered **strategic** in areas where a) Europe has an international leadership and can influence standardisation at global level; b) Europe can take advantage of resources not available within Member States; c) Europe can develop internal capacities, benefiting from best practices in the global arena;
- Global cooperation on RI can be used as a tool to support or complement the EU external policy and contribute to **Science Diplomacy.**

Facilitating Strategic International Cooperation

- Fostering Cooperation between European RI and Other World Class RI;
- Strengthening the links between European RI with their counterparts in third-countries;
- Ensuring their interoperability and outreach;
- Pursuing international agreements on the reciprocal use, openness or co-financing of RI.

European RI policy context

- Development of the **2018 ESFRI roadmap;**
- Publishing of the **Charter for Access to Research Infrastructures** & SWD on **long term sustainability** of RI;
- **17 ERICs established so far** - Regulation on the European Research Infrastructure Consortiums (ERICs);
- Active Participation in international fora e.g. GSO on Global Research Infrastructures, OECD GSF;
- Implementation of a Work Programme (Horizon 2020) between DG RTD and DG CNECT with a strong international outreach component.

Research Infrastructures in Horizon 2020

Objectives

1. Developing the European RIs for 2020 and beyond
   - Developing new world-class RIs
   - Integrating and opening national and regional RIs of European interest
   - Development, deployment and operation of ICT based e-Infrastructures

2. Fostering the innovation potential of RIs and their human resources

3. Reinforcing European RI policy and international cooperation

In a snapshot:

RESEARCH INFRASTRUCTURE
Work Programme 2018-2020: 6 calls, 22 topics

CALL INFRADEV
DEVELOPMENT AND LTS OF NEW PAN-EUROPEAN RIS

- DESIGN STUDIES (2019)
- PREPARATORY PHASE OFNEW ESFRI PROJECTS (2019, 2020)
- INDIVIDUAL SUPPORT TO ESFRI AND OTHER WORLD CLASS RI (2018, 2019)

CALL INFRAEOSC
IMPLEMENTING THE EOSC

- ACCESS TO COMMERCIAL SERVICES THROUGH THE EOSC HUB (2018)
- PROTOTYPING NEW SERVICES (2019)
- INTEGRATION OF PUBLIC EINFRA SERVICES INTO THE EOSC CATALOGUE OF SERVICES (2020)
- CONNECTING ESFRI RI THROUGH CLUSTER PROJECTS (2018)
- EOSC GOVERNANCE (2018)
- ENHANCING THE EOSC PORTAL & CONNECTING THEMATIC CLOUDS (2019, 2020)

CALL INFRAIA
INTEGRATING AND OPENING RI OF EUROPEAN INTEREST

- INTEGRATING ACTIVITIES FOR ADVANCED COMMUNITIES (2018, 2019)
- INTEGRATING ACTIVITIES FOR STARTING COMMUNITIES (2020)
- PILOT FOR A NEW MODEL OF IA (2020)

CALL INFRAEDI
EUROPEAN DATA INFRASTRUCTURES

- SUPPORT TO A PAN-EUROPEAN HPC INFRASTRUCTURE & SERVICES – PRACE (2018)
- SUPPORTING CENTRES OF EXCELLENCE ON HPC (2018)
- SUPPORTING THE GOVERNANCE OF THE EDI (2018)
- SUPPORT TO PUBLIC PROCUREMENT OF INNOVATIVE HPC SYSTEMS (2020)

CALL INFRAINNOV
ROLE OF RIS IN THE TRANSLATION OF OS INTO OPEN INNOVATION

- STIMULATE THE INNOVATION POTENTIAL OF SMES (2019)
- NETWORK OF RI INDUSTRIAL LIAISON AND CONTACT OFFICERS (2019)
- CO-INNOVATION PLATFORM FOR RI TECHNOLOGIES (2020)
- INNOVATION PILOTS (2020)

CALL INFRASUPP
SUPPORT TO POLICY AND INTERNATIONAL COOPERATION

- POLICY & INTERNATIONAL COOPERATION MEASURES FOR RESEARCH INFRASTRUCTURES (2018, 2019)
- STRENGTHENING THE HUMAN CAPITAL OF RESEARCH INFRASTRUCTURES & E-INFRASTRUCTURES (2020)

Research Infrastructures in Horizon 2020

The International dimension

- Individual support to ESFRI and Other World Class RI to address international dimension
- Integrating Activities
    - Access of non-EU Users to RI (transnational access)
    - Participation in the Project Consortia
- Dedicated International Cooperation topics

Research Infrastructures in Horizon 2020

Awareness, Openness & Reciprocity

International outreach of the ESFRI and ERICs is a priority:

- **Individual support grants**
- **RISCAPE project – international landscape of RIs**
- **Current WP - CSA on Internationalization of ESFRI and ERICs (March 2018)**
- **International Conference on RIs – ICRI 2018 – September 12-14**

Work Programme Openness is clear through the Transnational Access Scheme in the Integrating Activities Grants

- **Preliminary Statistics on third country users are high (+/- 10%)**
- **… but there is a clear need for reciprocity**

Research Infrastructures in Horizon 2020

International cooperation flagships

SESAME: EU with observer status since 2016,
next Council meeting 22 Dec. 2017

Russia: RI Working Group of EU-Russia JSTCC

CELAC: Setting-up of RI Working Group, March 2018
(workshop with CELAC countries, Oct.2017)

Research and Innovation

EU Russia cooperation on RI

Policy Framework

- Bilateral EU-Russia cooperation agreement on S&T since 2000
- Focus on mega science projects since 2013
- Working group on RI established in 2010 and revived in June 2017

Objectives:

- Exchange best practices and information on RI development in Europe and in Russia;
- Share information on RI road-mapping processes in the EU and Russia;
- Prepare the follow-up of the CREMLIN initiative and ensure monitoring;
- Organise thematic workshops for exploring possible collaboration opportunities among Russian and European RI.

Next meeting – 18 December 2017

Research and Innovation

EU Russia cooperation on RI

Flagship initiative in WP 2018-2020 of H2020

Call INFRASUPP - 01 - 2018 – 2019 : Policy and international cooperation measures for research infrastructures

Topic 2019: Support the EU cooperation on RI (CREMLIN follow-up)

- Opening: 14 November 2018;
- Deadline: 20 March 2019;
- Funding scheme: RIA;
- Indicative budget: EUR 25 million

EU Russia cooperation on RI

Flagship initiative in WP 2018-2020 of H2020

Scope of the action:

1. Supporting the **joint development of components and equipment** for infrastructures that are close to being operational, e.g. NICA and PIK, as well as **joint conceptual development** for mega science projects that are at an early conceptual stage, e.g. SSRS-4 or XCELS;
2. Facilitating the **access of EU scientists to Russian RI**. The Russian RI to be targeted should include those identified in 2016 by the Ministry of Education and Science of the Russian Federation (update possible);
3. Developing a **staff exchange programme**, including the organisation of thematic courses and workshops for staff managing and operating research infrastructures

EU Russia cooperation on RI

Flagship initiative in WP 2018-2020 of H2020

Info day "Deepening EU-Russian strategic cooperation in the area of Research Infrastructures: chalenges and new opportunities"

- Organiser: CREMLIN project
- Location: MISIS University (RI NCP), Moscow
- Date: 19 December 09:00-13:30

Research and Innovation

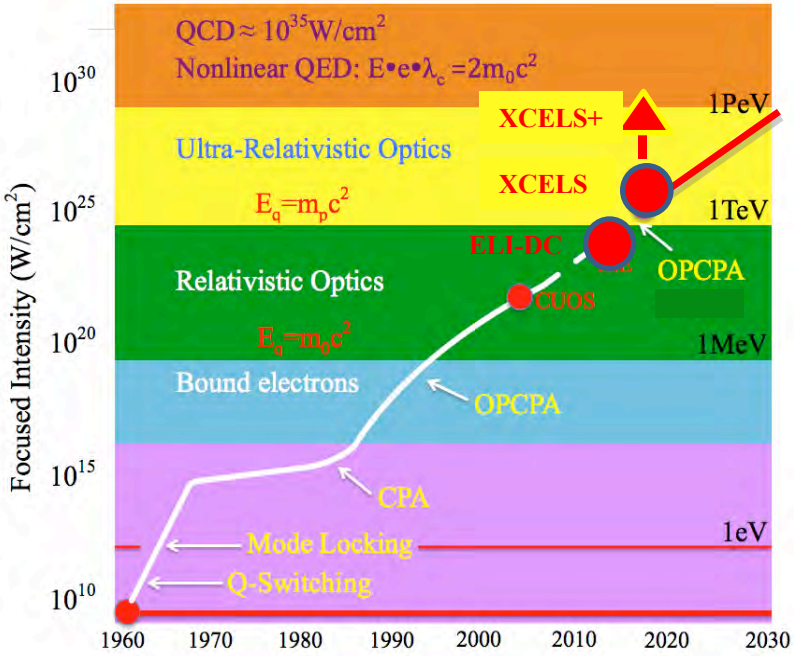
Thank you for your attention

Megaproject XCELS

XCELS - world most powerful laser infrastructure that will be built at

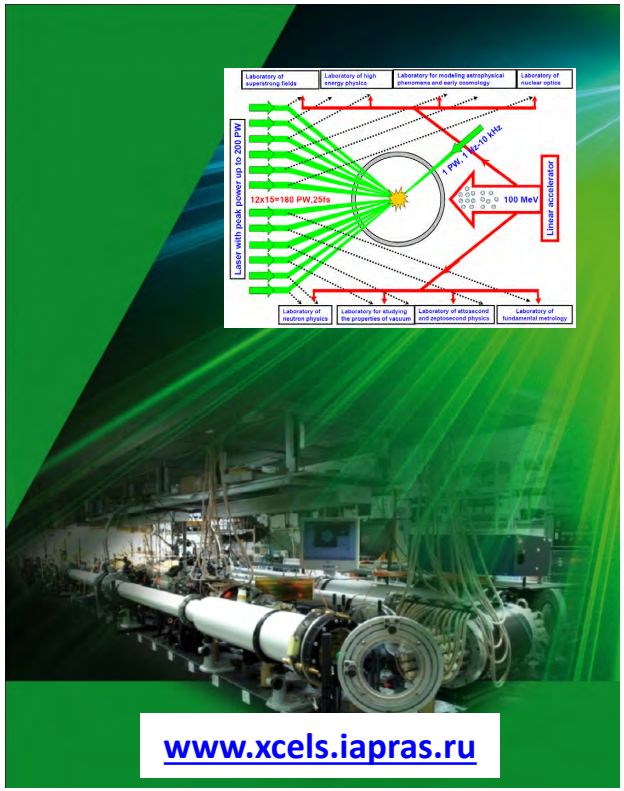
the Institute of Applied Physics in Nizhny Novgorod

to study the properties of matter and vacuum in the presence of extreme light



Ascent to the highest intensity of light,

"the Extreme Light"

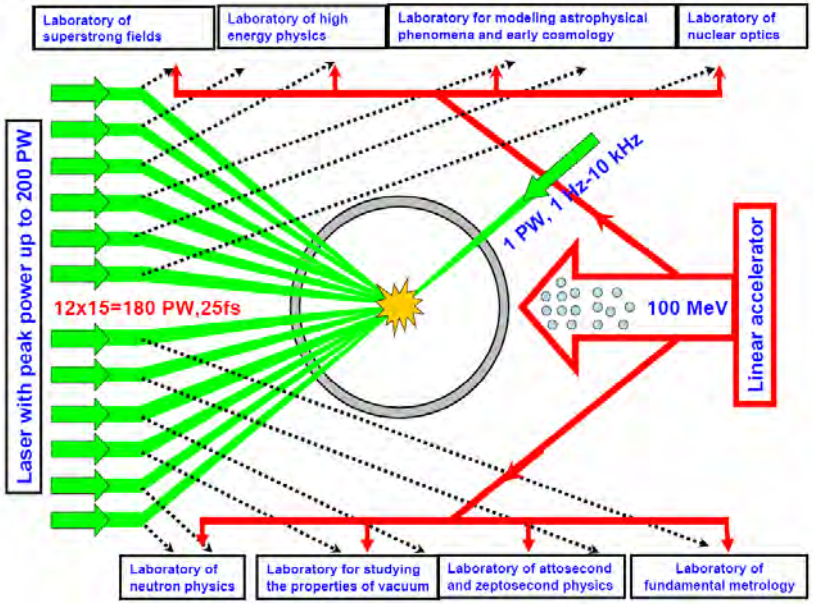


www.xcels.iapras.ru

XCELS - Exawatt Center for Extreme Light Studies

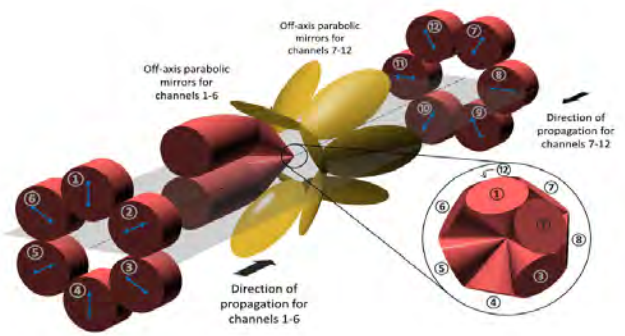
Megaproject XCELS

Laser source for XCELS



XCELS is based on the 200 Petawatt (2×10^{17} Watt) laser facility that exceeds the current record power level by 100 times. It comprises 12 amplification channels, each producing a laser pulse with 400 J energy and 25 femtosecond pulse duration.

A specially designed focusing system provides the ascent to the highest intensity level of 10^{25} - 10^{26} W/cm^2 by combining 12 laser beams. The resulting energy density in the focal area attains 10^{16} J/cm^3, several orders of magnitude higher than in the center of the Sun.



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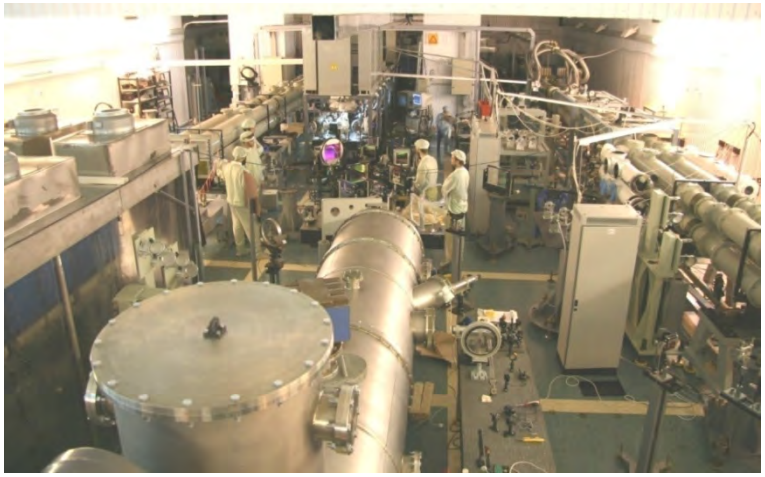
Megaproject XCELS

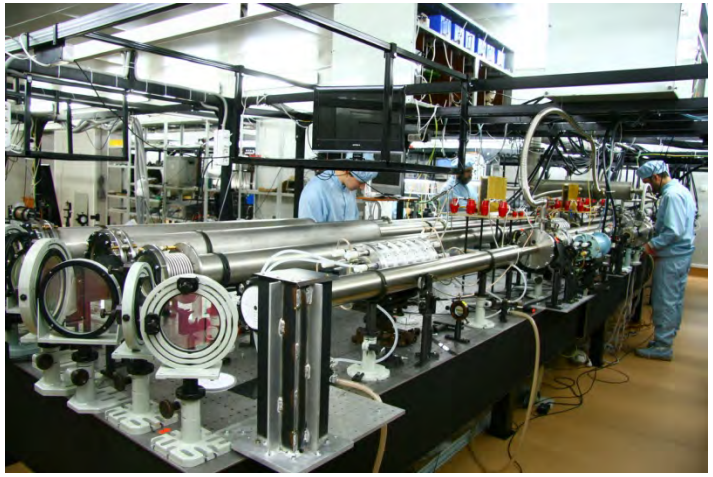
Key technologies behind XCELS laser facility

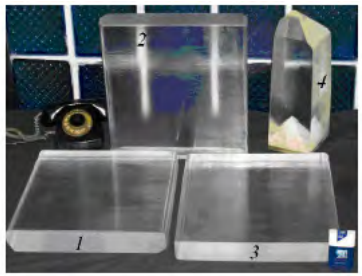
The XCELS laser facility is based on the technologies developed at the Institute of Applied Physics in Nizhny Novgorod and the Russian Federal Nuclear Center in Sarov and implemented in PEARL and FEMTA, the world's first petawatt parametric lasers

FEMTA

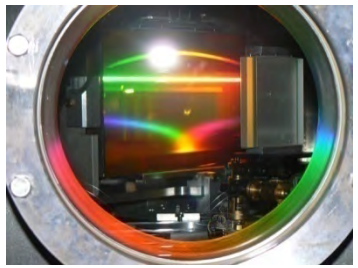


PEARL-10





Large aperture nonlinear crystals and optical gratings provide amplification and compression of laser pulses to multipetawatt level



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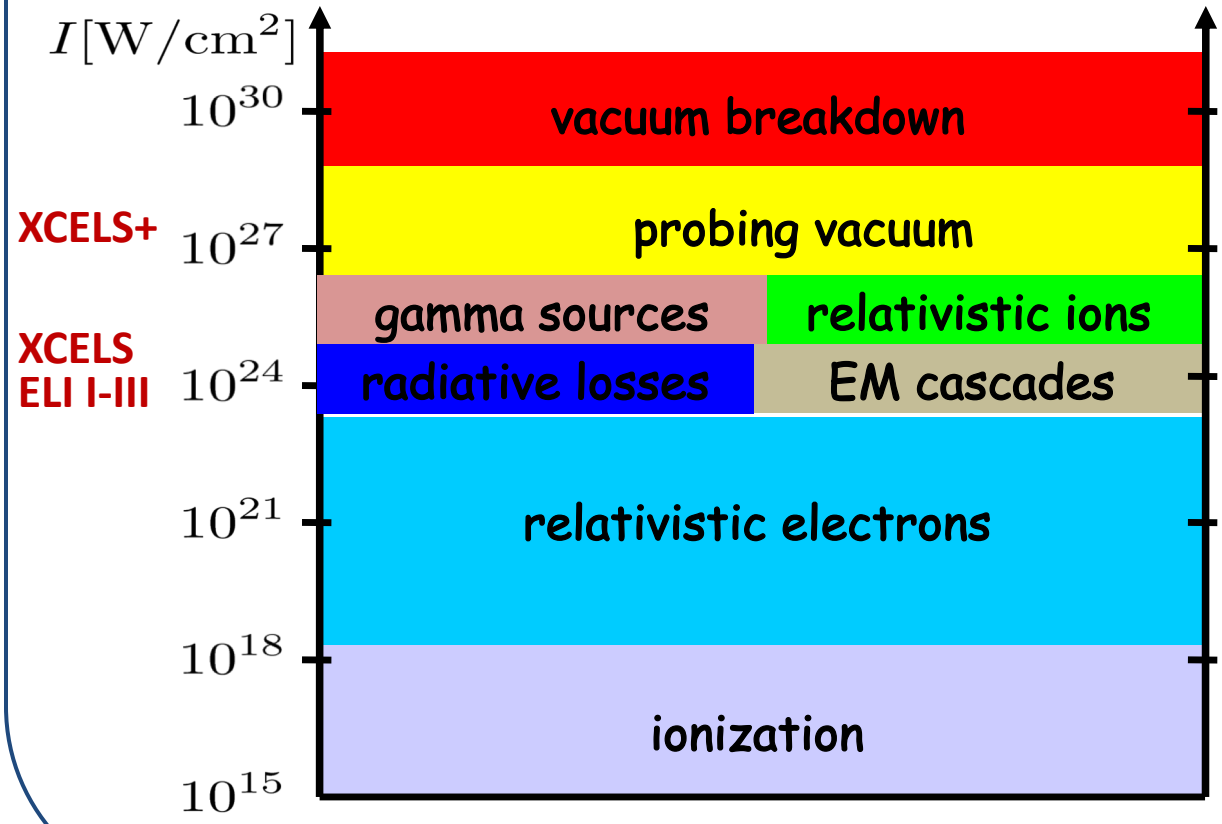
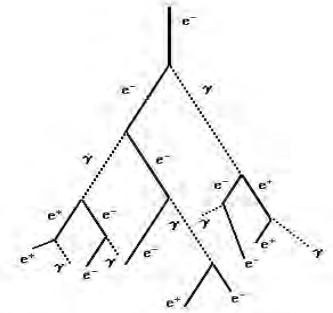
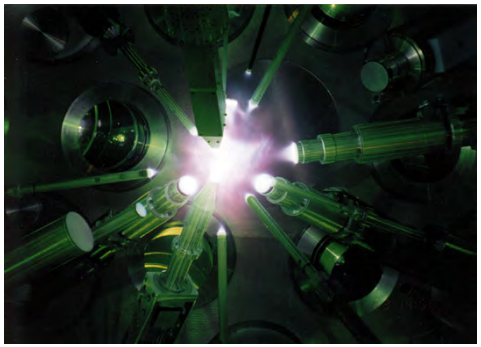
Megaproject XCELS

New science with XCELS

The main goal of XCELS is to study new science and applications at the emerging interface between high-field physics and high-energy physics







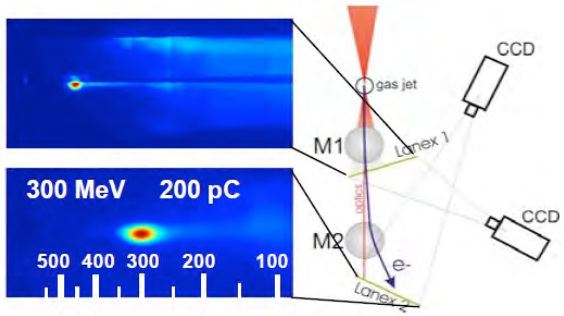
Electromagnetic cascades in vacuum can be produced by laser light

XCELS - Exawatt Center for Extreme Light Studies

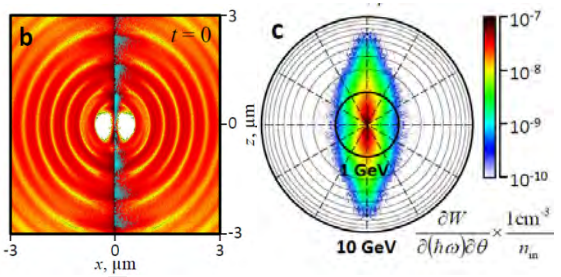
Megaproject XCELS

Prospects for fundamental research and applications

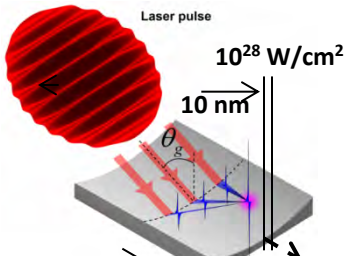
- Ultrarelativisitic laser-matter interaction
- Exotic states of matter with ultrahigh energy density, laboratory astrophysics
- Phenomena of nonlinear quantum electrodynamics in the presence of ultraintense laser fields; ultradense electron-positron plasma
- Study of space-time structure of vacuum
- Nuclear optics



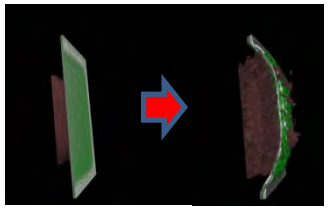
Electron acceleration with rate 1 GeV/cm



Directed Γ-ray source with 10 GeV quanta

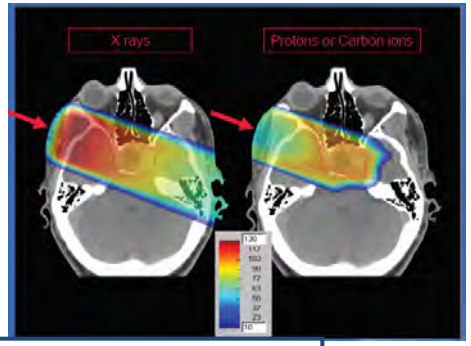


Generation of giant attosecond pulses for probing of quantum vacuum



300 MeV protons from thin foils for hadron therapy

- Ultracompact particle acceleration
- Directed brilliant gamma-ray sources
- Material diagnostics and metrology with picometer spatial and subfemtosecond temporal resolution
- Advanced particle and radiation sources for medicine, pharmacology, radiography, nuclear inspection and processing



XCELS - Exawatt Center for Extreme Light Studies

Megaproject XCELS

International Collaboration

The main contribution of foreign partners is supposed in the form of high-tech research equipment for the laser complex and research laboratories

Interest to collaborate from:

- The Ministry of Education and Science of France
- The Commissariat of Atomic Energy of France
- Thales (France)
- The Nuclear Energy Agency of Japan
- High Energy Accelerator Research Organization KEK (Japan)
- Center for Antiproton and Ion Research- FAIR (Germany)
- Extreme Light Infrastructure - ELI (Europe)
- Lawrence Livermore National Laboratory (USA)
- Los Alamos National Laboratory (USA)
- Fermi National Accelerator Laboratory (USA)
- Rutherford Appleton Laboratory (UK)
- The John Adams Institute for Accelerator Science (UK)

XCELS International Advisory Committee was founded in December 2011


T.Tajima, Chair of ICUIL


G.Mourou, Chair of XCELS IAC

Gérard Mourou – Chair, Ecole Polytechnique, France
Christian Barty – Lawrence Livermore National Laboratory ,USA
Paul Bolton – Kansai Photon Science Institute, Japan
Maria Douka – European Commission
Bjorn Manuel Hegelich – University of Texas at Austin, USA
Dino Jaroszynski – SCAPA ,University of Strathclyde, UK
Kazuoshi Koyama – KEK, Japan
Thomas Kuehl – GSI Helmholtzzentrum, Germany
Thierry Massard – Commissariat of Atomic Energy, France
Toshiki Tajima – International Committee for Ultraintense Lasers, ICUIL

Megaproject XCELS

International Expertise

Report on XCELS
by the
International Advisory Committee

Gérard Mourou, Paul Bolton, Maria Douka, Dino Jaroszynski, Bjorn Manuel Hegelich, Thierry Massard, Wolfgang Sandner, Toshiki Tajima, Thomas Kuehl, Kazuoshi Koyama

Conclusion

Based on the description of the conceptual design, the scientific committee is convinced of the quality and timeliness of the XCELS project. XCELS is ambitious and designed to introduce a new paradigm in High Energy Physics where high-energy particles are replaced by an ultrahigh laser field. XCELS could be the premiere laser-based High Energy Physics platform in the world occupying a prominent scientific position. The committee is of the opinion that the XCELS conceptual design phase has been completed and recommends advancement to the prototyping phase. The appropriate funding should be allocated. During this phase, which would last two to three years, we recommend that the current team works in concert with the international community as early as possible. This, includes, in particular the ELI Consortium.

During this phase the design will be finalized. It should include specification of the laser, the beamline configuration and experimental halls. An early integration with the international community will facilitate and encourage other countries to join and help to fund the project.

Gérard Mourou
Chair of the International Advisory Committee

EUROPEAN COMMISSION

DIRECTORATE-GENERAL FOR RESEARCH & INNOVATION

REPORT OF THE EXPERT GROUP ON THE ASSESSMENT OF EU COOPERATION WITH SIX RUSSIAN FEDERATION MEGASCIENCE PROJECTS

"The expert group encourages the Russian authorities to timely implement the first stages of the XCELS project, in order to demonstrate the feasibility of the project to the potential partners and to keep up with the dynamic international evolution of high-power lasers. "
Dec. 20, 2013

Megaproject XCELS

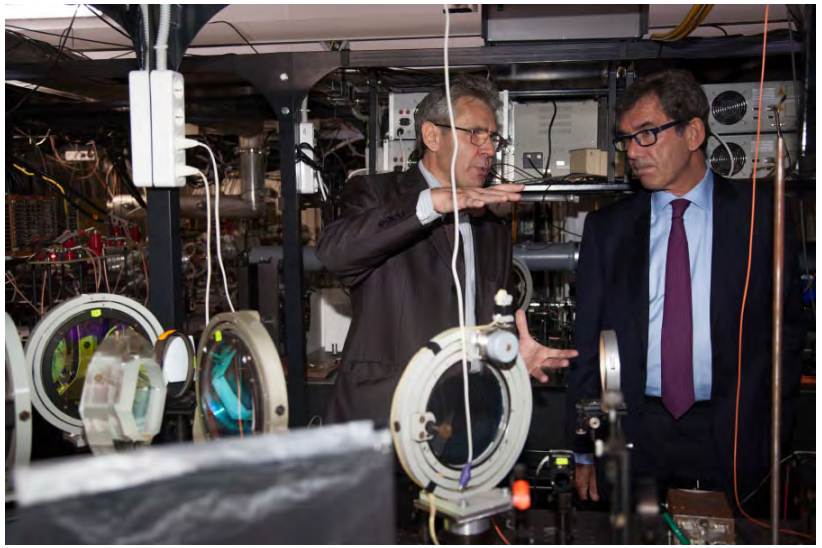
Collaboration - Recent MoUs

China (Shanghai Institute of Optics and Fine Mechanics (SIOM) of the Chinese Academy of Sciences): IAP RAS and SIOM signed a MoU on collaboration in the field of ultra-high intensity lasers in August 2017.
India (Tata Institute of Fundamental Research (TIFR) of the Department of Atomic Energy): IAP RAS and TIFR signed a MoU on collaboration within the framework of XCELS.
Greece (Ministry of Science, Education and Religious Affairs (MSERA) of the Republic of Greece): IAP RAS and MSERA signed a MoU on collaboration in the field of development and exploitation of Petawatt and Exawatt power laser facilities in 2016.
France (Thales Optronique): IAP RAS and Thales Optronique signed a MoU on collaboration within the framework of XCELS.

Megaproject XCELS

Visits to XCELS prototype at IAP

Andrei Fursenko, Assistant to the President of the Russian Federation
Mikhail Kotyukov, Head of FASO



Jean-Maurice Ripert,
Ambassador Extraordinary and Plenipotentiary of France in the Russian Federation

Megaproject XCELS

ELI

ELI will comprise 4 branches:

- **Attosecond Laser Science**, which will capitalize on new regimes of time resolution (*ELI-ALPS*, Szeged, HU)

- **High-Energy Beam Facility**, responsible for development and use of ultra-short pulses of high-energy particles and radiation stemming from the ultra-relativistic interaction (*ELI-Beamlines*, Prague, CZ)

- **Nuclear Physics Facility** with ultra-intense laser and brilliant gamma beams (up to 19 MeV) enabling also brilliant neutron beam generation with a largely controlled variety of energies (*ELI-NP*, Magurele, RO)

- **Ultra-High-Field Science** centred on direct physics of the unprecedented laser field strength (*ELI 4*, to be decided)

W. Sandner, ELI 2013-01

Megaproject XCELS

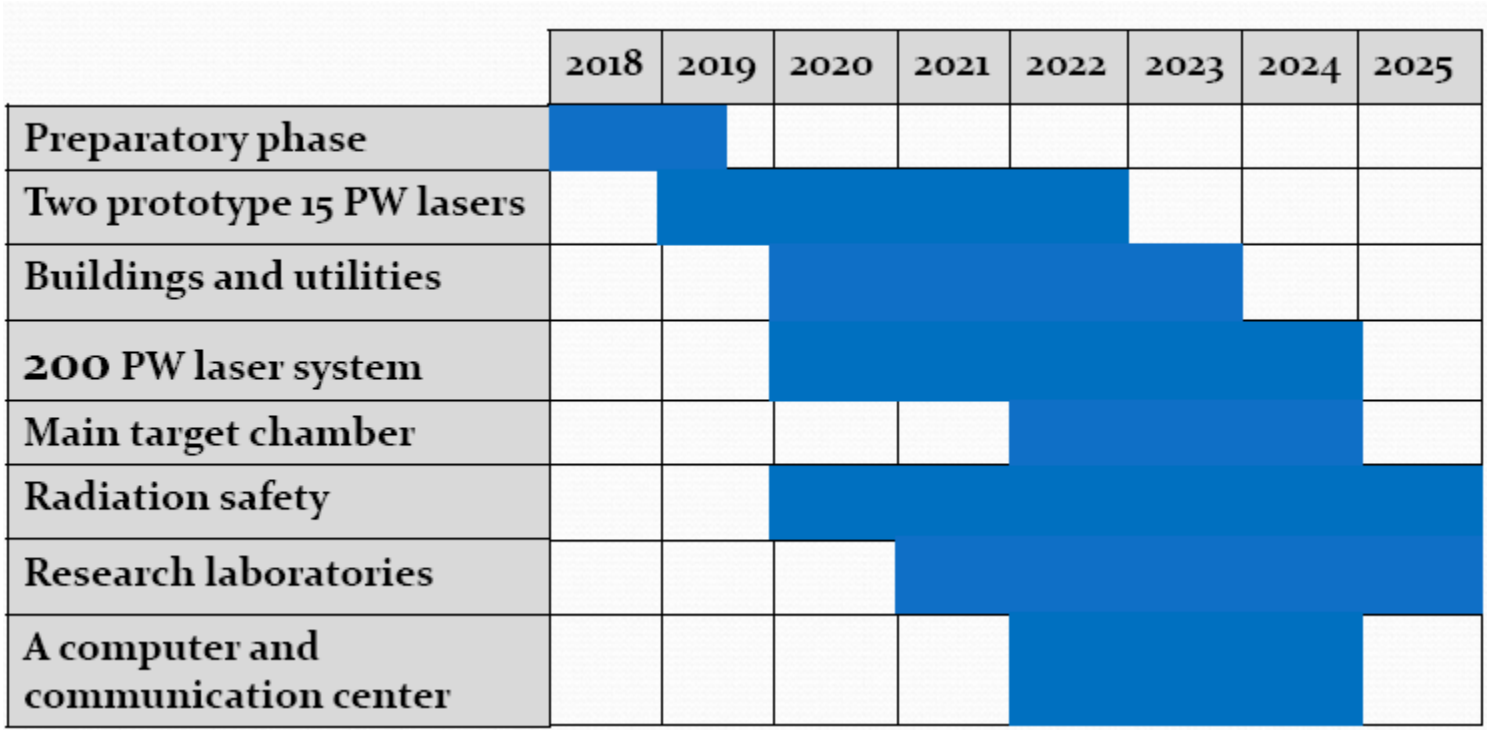
Progress in China

Ruxin Li, Director of SIOM

Shanghai Institute of Optics and Fine Mechanics (SIOM)
Qiangguang 10 PW laser under construction.
In 2015, the world highest peak power 5 PW (150 J in 30 fs) performance was demonstrated

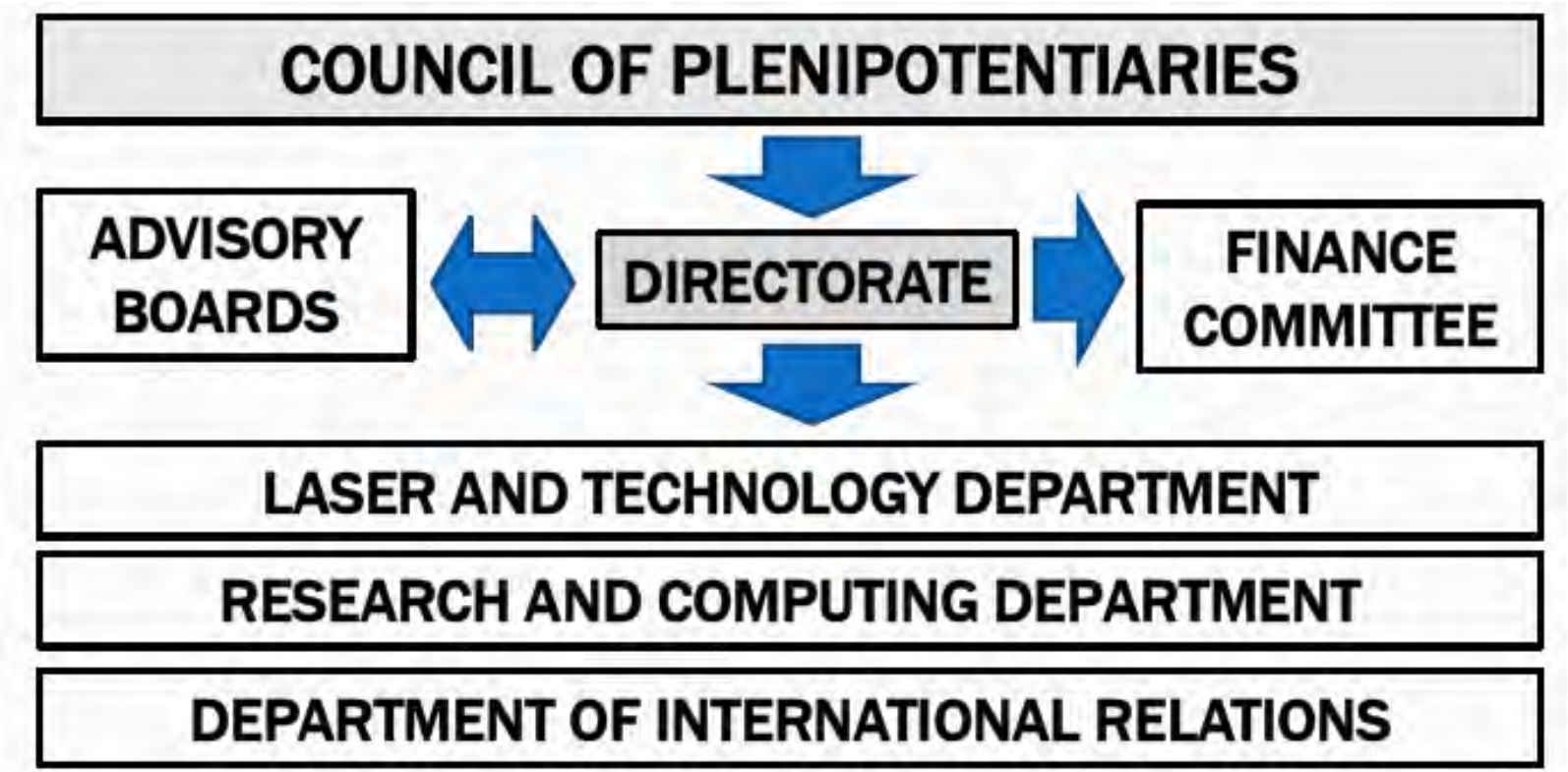
Megaproject XCELS

XCELS - roadmap



Megaproject XCELS

XCELS - Project management



Megaproject XCELS

XCELS - Project management

The construction and operation of the XCELS shall be entrusted to a Limited Liability Company, which shall be subject to the Russian Federation law. The Supreme governing body of XCELS could be the Council of Plenipotentiaries of the governments of all Member States. The organs of the Company shall be the Council of Plenipotentiaries, and the Management Board. The Company exclusively and directly pursues nonprofit objectives in the field of science and research. The Management Board of the Company is composed of Managing Directors Scientific/Technical Directors. The division of responsibilities of the Directors shall be established by the Council. The Directors shall be appointed for a period not exceeding five years. Appointment, employment and termination of the appointment of the Directors as well as any amendment or enlargement of their contracts of employment shall be subject to the approval by the Council. The Council shall appoint the members of the Scientific Advisory Committee and Machine Advisory Committee by qualified majority.

Megaproject XCELS

XCELS – building design

XCELS - Exawatt Center for Extreme Light Studies

The ELI-ERIC

Carlo Rizzuto

(CREMLIN 2017, Bucarest)

What and why a Research Infrastructure?

- A Research Infrastructure is a unique/rare **set of facilities and instruments, built and managed for service to international researchers** to allow the development of unique scientific projects.
- The users are attracted by its quality and **selected solely on the quality of the proposed projects** and bring the best ideas and strongest technical challenges.
- The instruments, staff and management of the Infrastructure are, then, **fully exposed to international competition** in science, technology, education and organization.
- This translates into **technological and educational advances,** connected to the local economical and social environment.
- For this reason the EU (Countries and Commission) have developed a **European strategic** approach through ESFRI

EUROPEAN UNION
EUROPEAN REGIONAL DEVELOPMENT FUND
INVESTING IN YOUR FUTURE

ELI at a glance

- ELI will be the world's **first international laser research infrastructure**, pursuing unique science and research applications
- ELI is **a multi-site research infrastructure** based on 3 specialised and complementary facilities located in the Czech Republic, Hungary and Romania
- First ESFRI project **fully implemented in the newer EU Member States**
- ELI is **pioneering a funding model combining the use of structural funds** with national and Framework programme **contributions**
- First **ERIC European Entity** in the Central-East Europe

EUROPEAN UNION
EUROPEAN REGIONAL DEVELOPMENT FUND
INVESTING IN YOUR FUTURE

The agreement

Competitiveness Council of November 20th 2009:

"The Czech Republic, Hungary and Romania highlight the fact that this integrated proposal is the application of the principle of pooling national resources with structural funds, as well as the fact that this proposal reflects the ESFRI Roadmap into national and regional policy implementation. The integrated proposal on the implementation of ELI corresponds to the need to provide access to research infrastructures throughout Europe as well as to the need to develop Europe's regions. The three Member States invite all Member States to participate in this endeavor, and to make the ELI project a truly European achievement".

ESFRI

Landmark

eli delivery consortium

Selected by **ESFRI in 2006**

Funded between **ESIF, National and Framework** funds, after international site selection, and **EU approval**

First **multi-site research infrastructure** built completely in **Central Europe.**

…**In time and within budget!**

The Science Case For a European Initiative

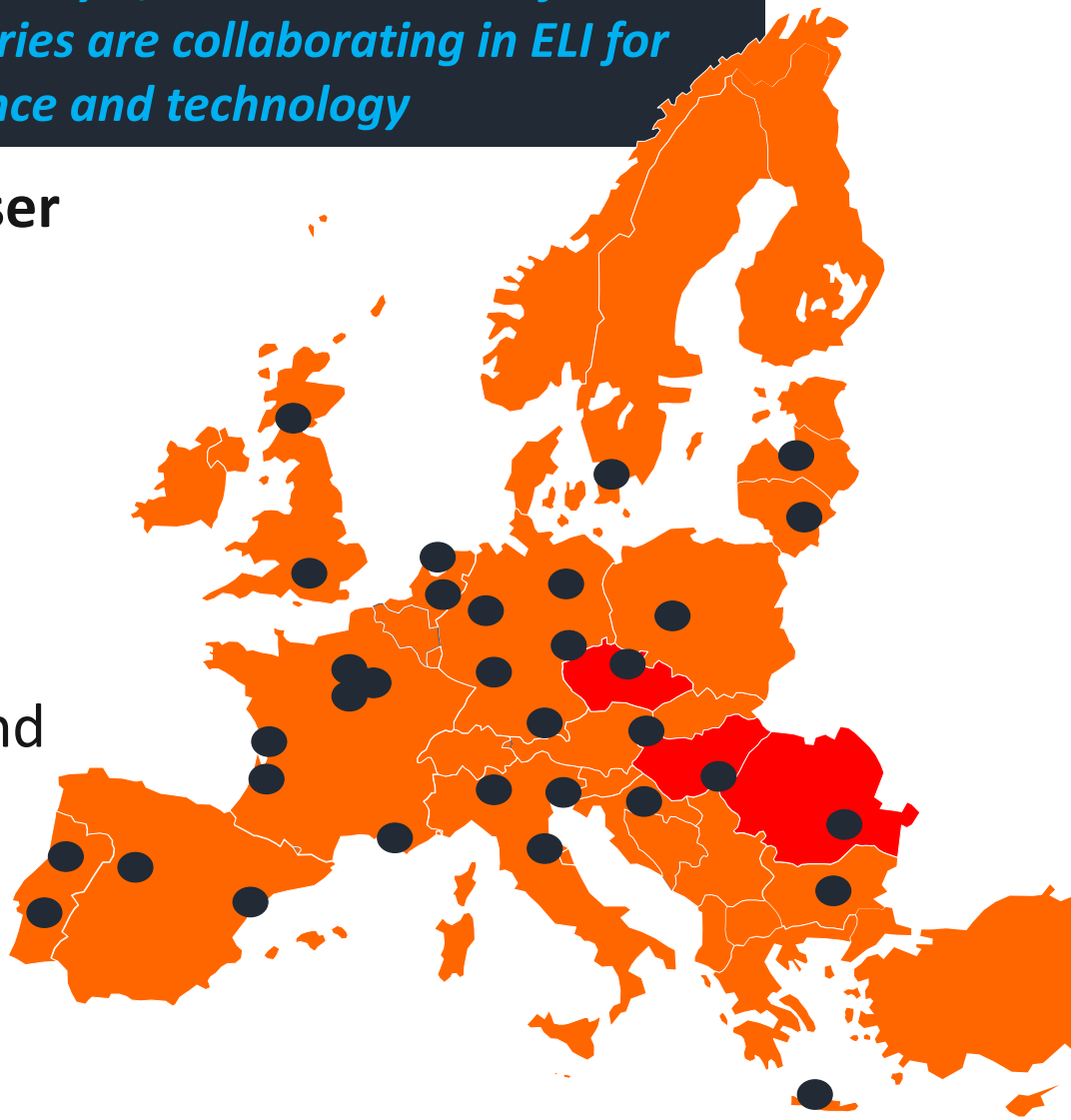
Already today 1,500+ researchers from 25 EU Countries are collaborating in ELI for new science and technology

A globally leading **European Laser Community**

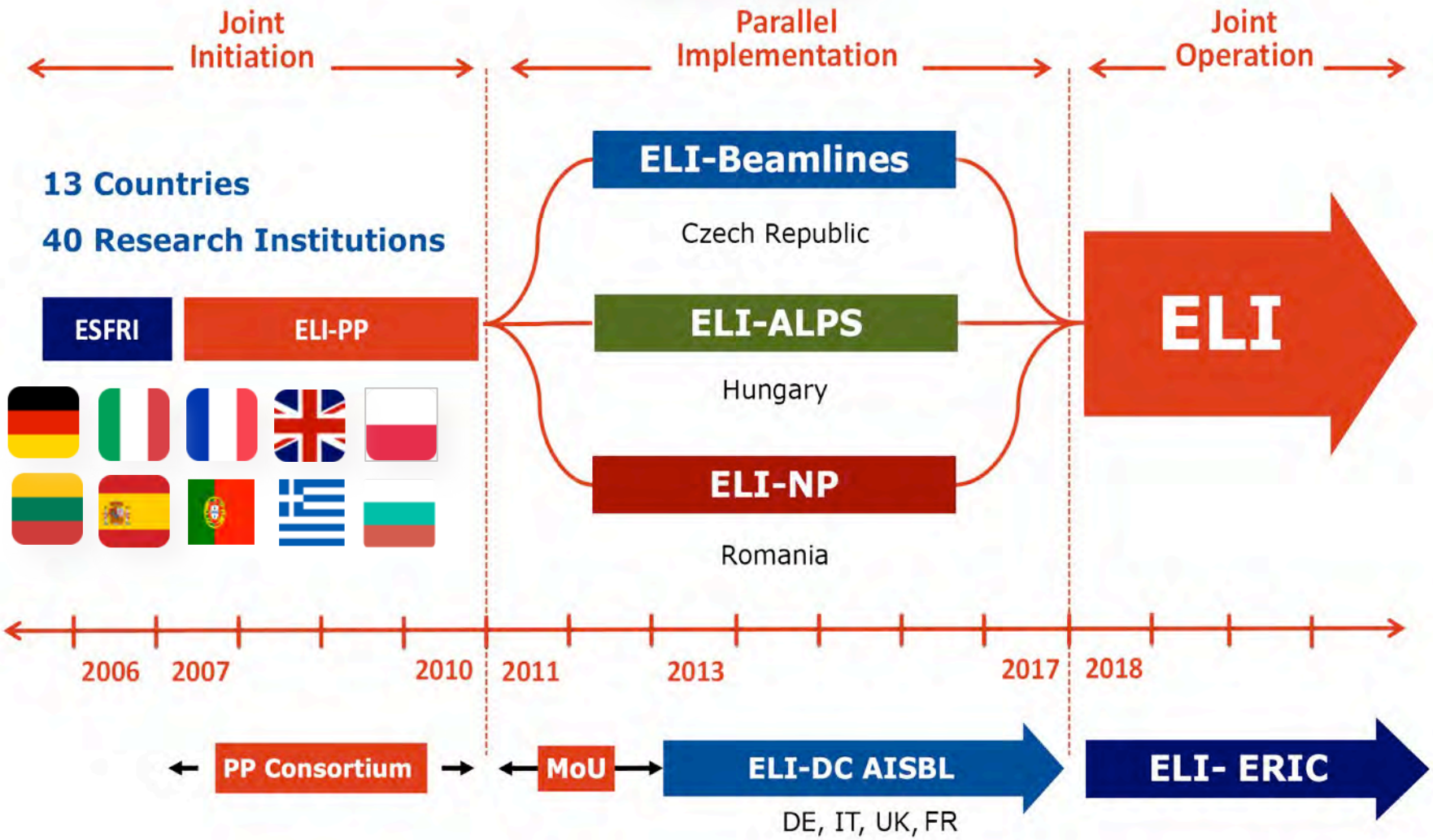
ELI builds on a well-structured research landscape and the success of **Laserlab-Europe**

A new instrument for science and innovation on a global scale

First users access second half of 2018.



Timeline


Joint Initiation
Parallel Implementation
Joint Operation
13 Countries
40 Research Institutions
ESFRI
ELI-PP
ELI-Beamlines
Czech Republic
ELI-ALPS
Hungary
ELI-NP
Romania
ELI
2006
2007
2010
2011
2013
2017
2018
PP Consortium
MoU
ELI-DC AISBL
DE, IT, UK, FR
ELI- ERIC


ELI-NP
Măgurele, Romania
September 2016


ELI-Beamlines
Dolní Břežany, Czech Republic
December 2015


ELI-ALPS
Szeged, Hungary
May 2017

Main Parameters of sources

		Peak power	Energy in pulse	Pulse duration	Repetition rate
ELI-Beamlines	L1	>5 TW	100 mJ	< 20 fs	kHz
	L2	1 PW	20 J	≤ 20 fs	10 - 20 Hz
	L3	≥ PW	≥ 30 J	≤ 30 fs	10 Hz
	L4	10 PW	≥ 1.5 kJ	≤ 150 fs	1 shot per min
ELI-ALPS	HR	> 1 TW	5 mJ	5 fs	100 kHz
	SILOS	> 20 TW	100 mJ	< 5 fs	1 kHz
	HF	> 2 PW	34 J	17 fs	10 Hz
	MIR	> 25 GW	0.16 mJ	< 4 cycles	100 kHz
ELI-NP	HPLS output 1 (2x)	0.1 PW	1.5 – 2.5 J	15 - 25 fs	10 Hz
	HPLS output 3 (2x)	1 PW	15 – 25 J	15 - 25 fs	1 Hz
	HPLS output 3 (2x)	10 PW	150 - 250 J	15 - 25 fs	1 shot per min

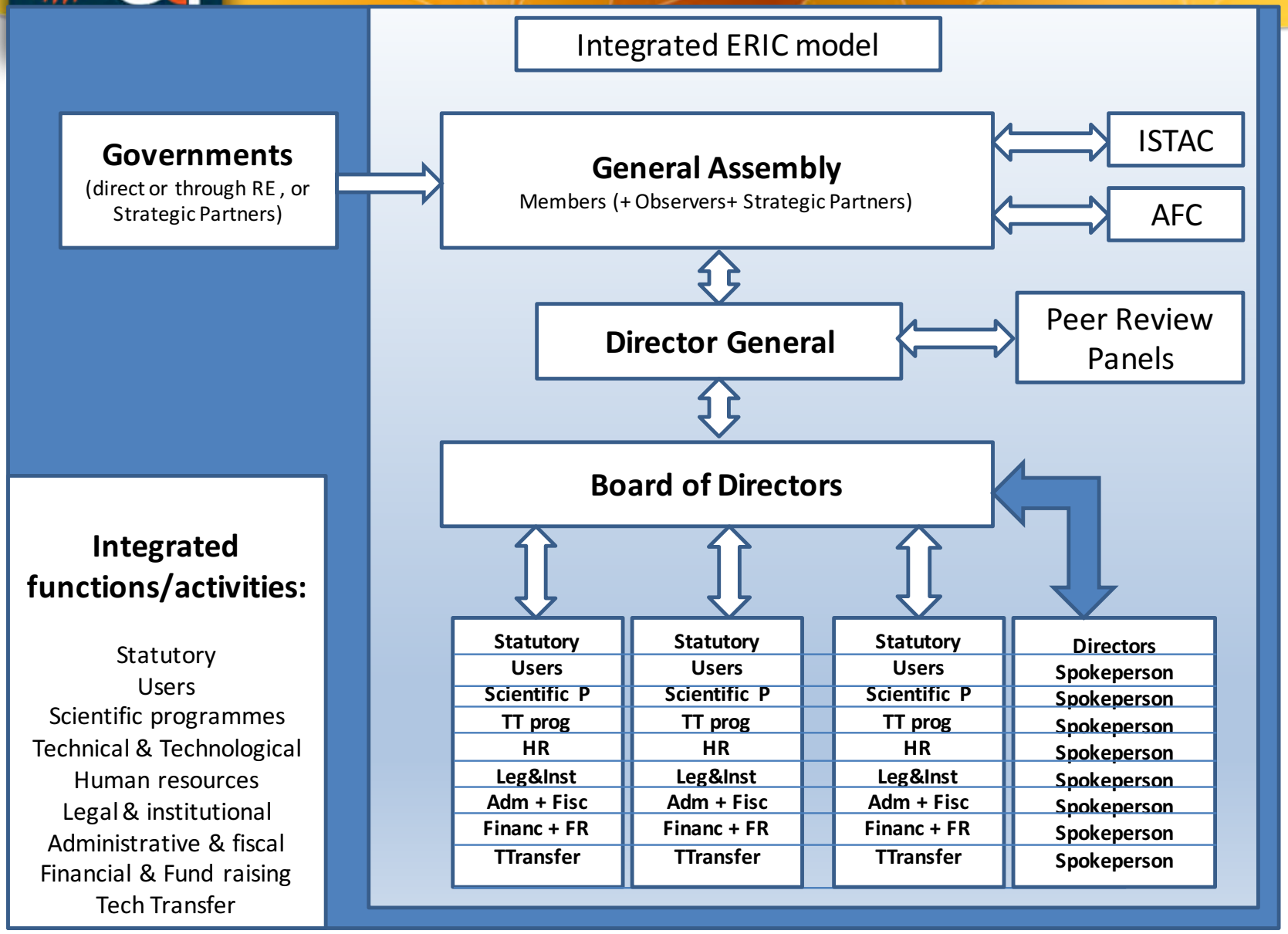
What is an ERIC

The Members are Governments (or International Organizations)

Has tax exemptions
Procurement rules are independent from EU rules
Staff rules are national
and still the whole potential + limits have to be explored

The procedure of setting-up an ERIC with the EU is simple
(three proposing EU Members, 6 months delay, if evaluation ok),

Organisation Overview



Investments, past and future

Construction costs	ELI BL	ELI ALPS	ELI NP	ELI
Building + Land	84 913 000	88 705 128	79 710 986	253 329 114
Technology	161 876 341	105 435 077	188 627 929	455 939 347
Services	7 601 481	9 788 212	10 748 919	28 138 612
Personnel Costs	23 518 519	27 483 498	31 858 856	82 860 873
TOTAL	277 909 341	231 411 915	310 946 690	820 267 946

UPGRADES (Rough Estimate)			
Item	2018-2020	2021-2024	TOTAL
Lasers	33,1	53,0	86,1
Secondary Sources	28,0	46,1	74,0
Others	33,8	52.6	86,4
Upgrades TOTAL	94,8	151,7	246.5

Access policy

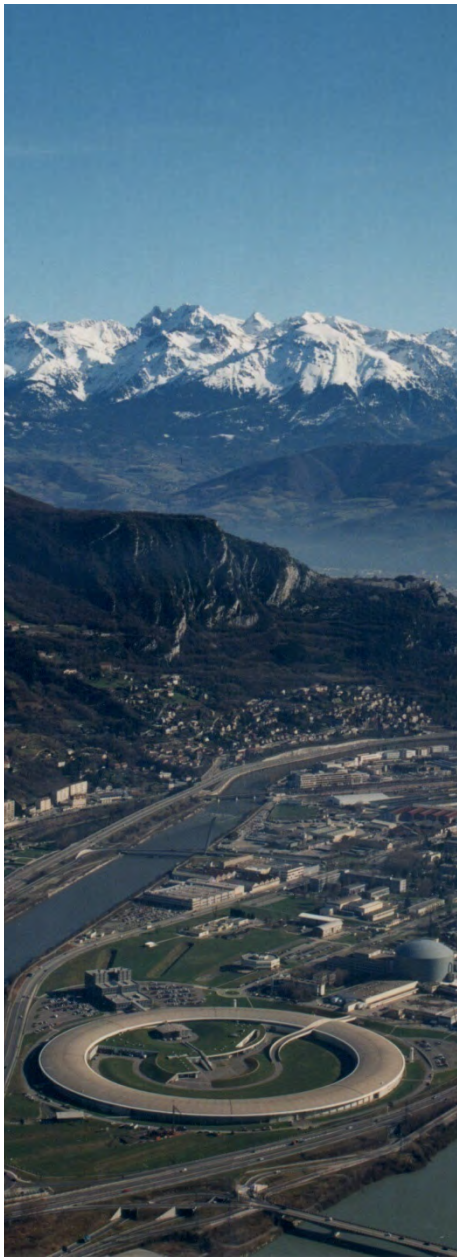
The access policy must ensure the attraction of the best scientific users and the best results in the facilities (scientific management fully empowered):

- The reference quality (of non-proprietary access) shall be set by proposals accepted solely through independent peer review (also from non Members)
- The quantity of solely peer-reviewed proposals should be large enough to be a reference for all users.
- The proprietary (non excellence-based selection) access shall be limited.
- Access for training and testing should be considered for the Members.
- Access coordinated with Partner Facilities

eli delivery consortium

THANK YOU!


ESRF
The European Synchrotron



The European Synchrotron Radiation Facility: A Pioneer

H. Reichert
Director of Research

ESRF : MORE THAN 20 YEARS OF SUCCESS AND EXCELLENCE

- **1988** 12 member states sign the creation of the ESRF
- **1992** 1st electron beam in the storage ring
- **1994** Inauguration : 15 beamlines
  In time and within budget
- **1998** 40 beamlines
  In time and within budget
- **2009-2015** Upgrade Programme Phase I
  In time and within budget
- **2012** New design for the storage ring
- **2015** *Launch of the ESRF-EBS project*

INTERNATIONAL COLLABORATION VIA INTERGOVERNMENTAL CONVENTION

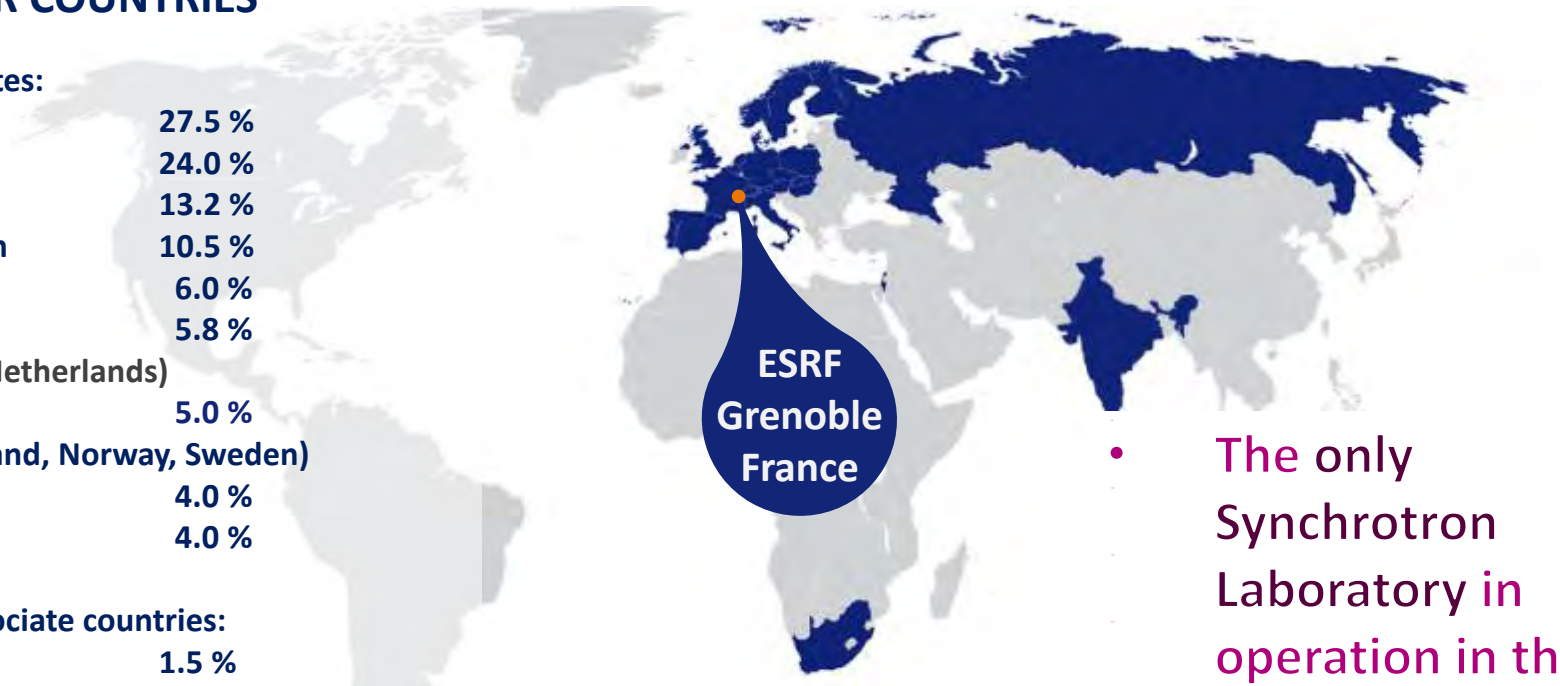
22 PARTNER COUNTRIES

13 Member states:

France	27.5 %
Germany	24.0 %
Italy	13.2 %
United Kingdom	10.5 %
Russia	6.0 %
Benesync (Belgium, The Netherlands)	5.8 %
Nordsync (Denmark, Finland, Norway, Sweden)	5.0 %
Spain	4.0 %
Switzerland	4.0 %

9 Scientific Associate countries:

Israel	1.5 %
Austria	1.3 %
Centralsync (Czech Republic, Hungary, Slovakia)	1.05%
Poland	1.0 %
Portugal	1.0 %
India	0.66 %
South Africa	0.3 %



Annual Members contribution to the ESRF Budget:

- 80 M€ for Operation
- 10 M€ for Upgrade

- The only Synchrotron Laboratory in operation in the world with an International Governance

THE ESRF IN A NUTSHELL

- Partnership between 22 countries
- World's most productive synchrotron laboratory
- Research in all areas involving condensed matter, materials, and living matter
- ~30 public beamlines (instruments); 14 CRG beamlines (national teams)
- 600 Staff: 500 with a technical background, 60 post-docs, 40 PhD students
- > 9000 user visits for ~2000 projects
- ~1800 refereed publications / year
- Annual budget: ~100 M€ including the Upgrade Programme

ESRF MILESTONES

THE ESRF USERS CONTRIBUTION TO MODERN SYNCHROTRON SCIENCE AND APPLICATIONS

TO CITE SOME EXAMPLES:

- **ESRF: the first 3rd generation synchrotron entirely based on ID based X-ray sources**
- **Development of X-ray key techniques pre-natal or at their infancy at second generation sources: IXS, RIXS, XMCD, XES, XPCS with many microscopy and imaging derivations and developments**
- **X-ray Protein Crystallography with IDs: first time at the ESRF (ID13 and ID14) =>> 2009 Nobel Prize in Chemistry (RIBOSOME)**
- **X-ray Protein Crystallography with IDs and micro-focus: first time at the ESRF (ID13) =>> 2012 Nobel Prize in Chemistry (GPCRs)**
- **X-ray Phase contrast 3D-imaging and microscopy: first time at the ESRF (ID19)**
- **Far-reaching and comprehensive Industrial Programme using synchrotron light (MX beamlines): first time at the ESRF**
- **X-ray science at Extreme Conditions Programme (P at Mbars and T at 5 000 K) (ID30): first time at the ESRF**
- **Hard X-ray techniques for material science and Paleontology (diffraction, imaging and time-resolved): first time at the ESRF**

X-RAY SCIENCE: DISCOVERING WHERE ATOMS ARE AND HOW THEY MOVE

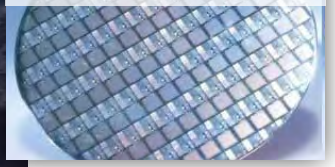
Fundamental and applied studies on materials and living matter

ADVANCED MATERIALS

ENERGY & ENVIRONMENT

HEALTH & FOOD

MICROELECTRONICS



CONSUMER PRODUCTS

EXTREME CONDITIONS

METALLURGY

PETROCHEMICALS

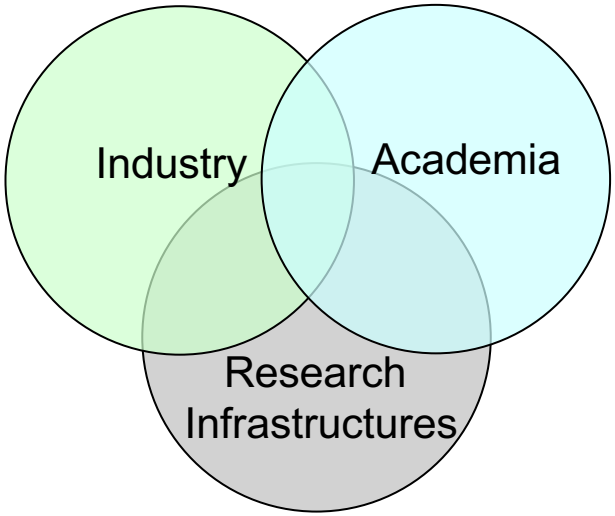
CULTURAL HERITAGE

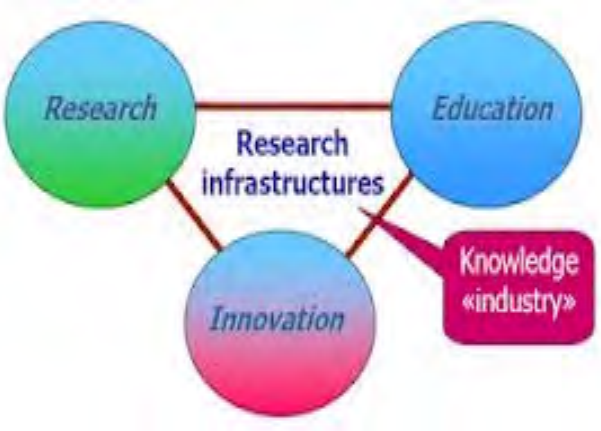
ESRF TODAY : INNOVATION AND INDUSTRIAL APPLICATIONS

Many industrial partners

Observing, characterising and understanding the structure of matter

RESEARCH INFRASTRUCTURES & INDUSTRY

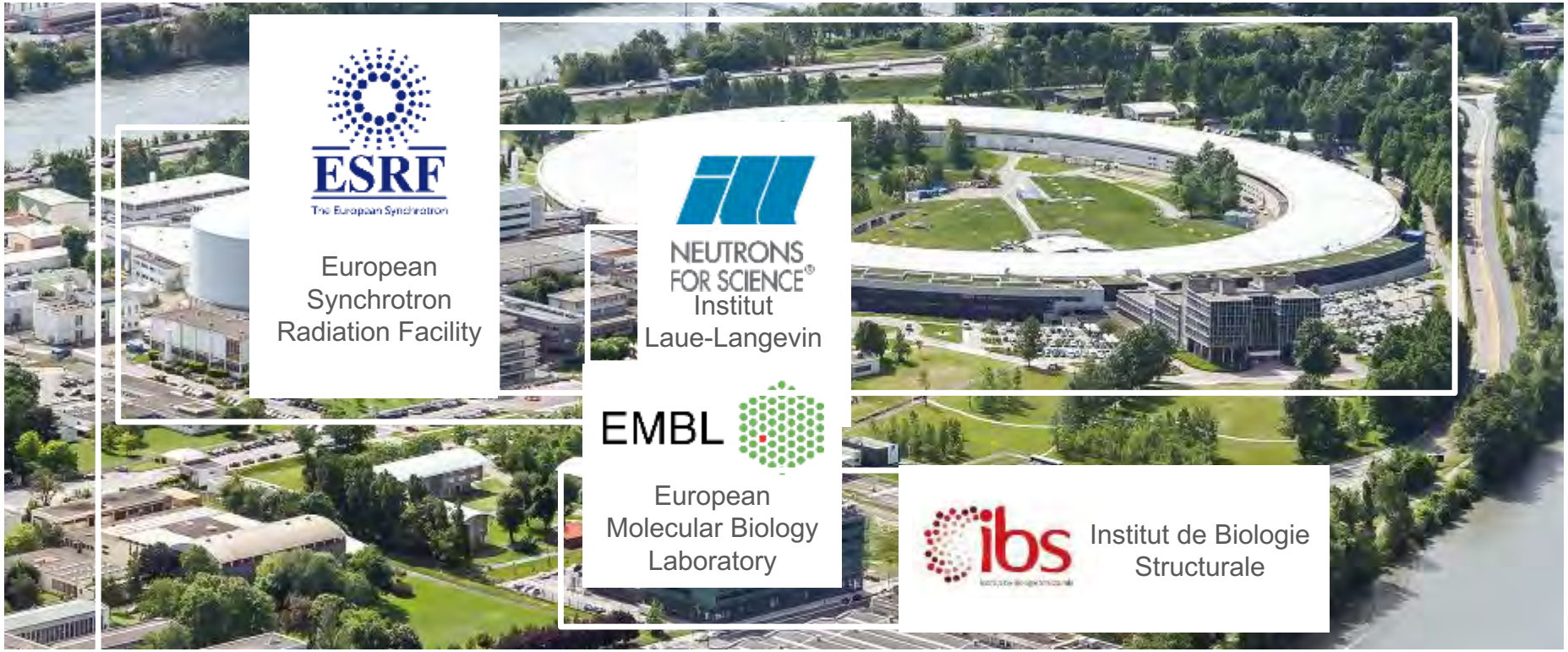




Industry as supplier
Industry as beneficiary: technology transfer
Industry as user: pay for access and service at RI
Industry as partner: **Co-Innovation**

- with experts at the RIs
- with Academia
- with RIs **and** Academia

A UNIQUE SITE FOR RESEARCH AND INNOVATION



ESRF
The European Synchrotron

European Synchrotron Radiation Facility

NEUTRONS FOR SCIENCE®
Institut Laue-Langevin

EMBL
European Molecular Biology Laboratory

ibs
Institut de Biologie Structurale

european photon & neutron science campus

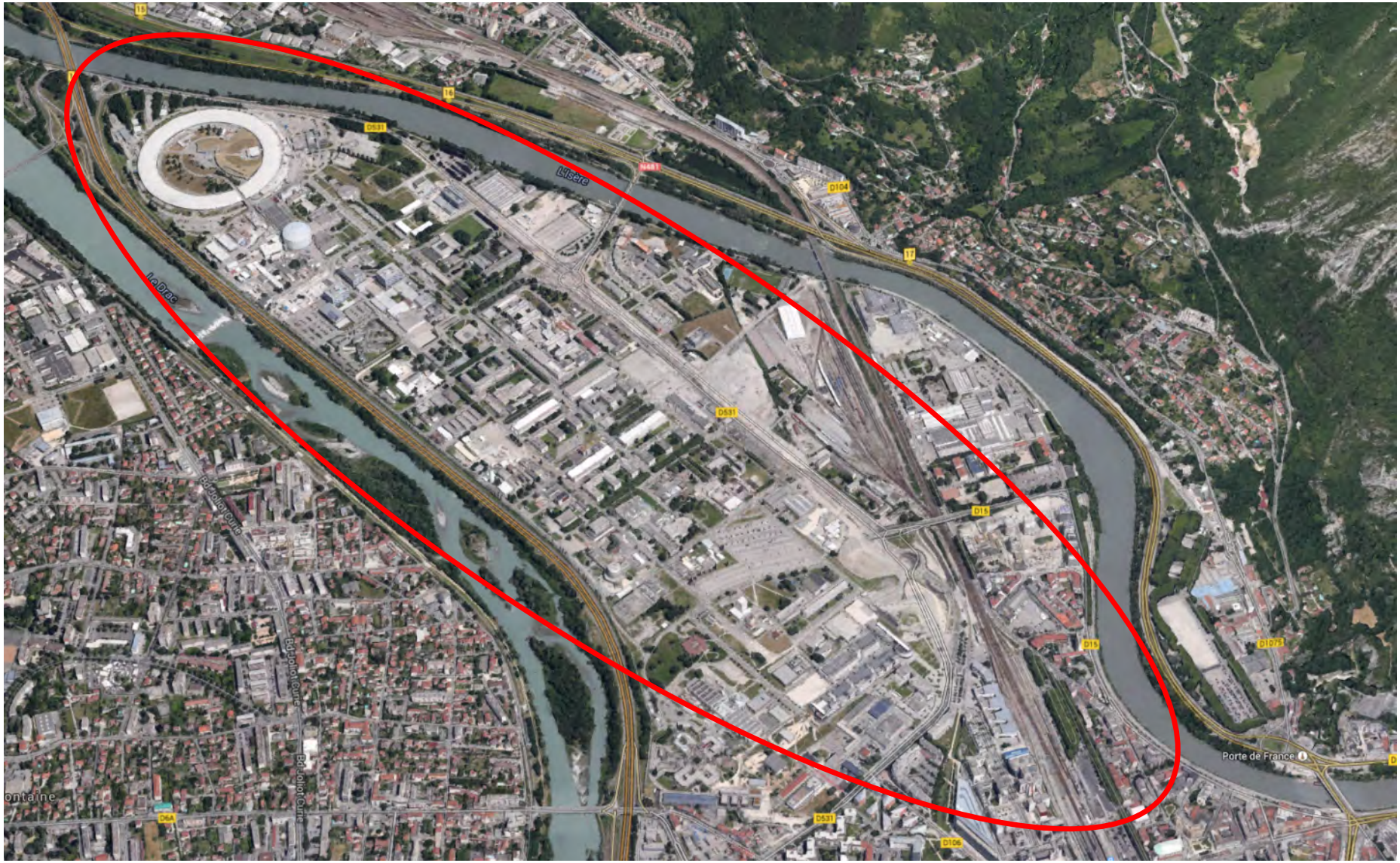
ESRF
The European Synchrotron

NEUTRONS FOR SCIENCE®

EMBL

ibs

AROUND ESRF - THE “PRESQU'ÎLE SCIENTIFIQUE”



THE ESRF AND ITS NEIGHBOURS

Large scale European laboratories

Academic partners

Research organisations

Local Authorities

At the heart of a global innovation campus

Concentrating research, innovation and higher education in one location

Communauté UNIVERSITÉ Grenoble Alpes

- F. Sette, member of the CA of the COMUE
- Scientific and pedagogical partnerships

AROUND ESRF: THE GIANT ALLIANCE

GIANT Alliance

EMBL

ESRF

NEUTRONS FOR SCIENCE

cea

CNRS

UNIVERSITE JOSEPH FOURIER
SCIENCES. TECHNOLOGIE. SANTÉ

Grenoble INP

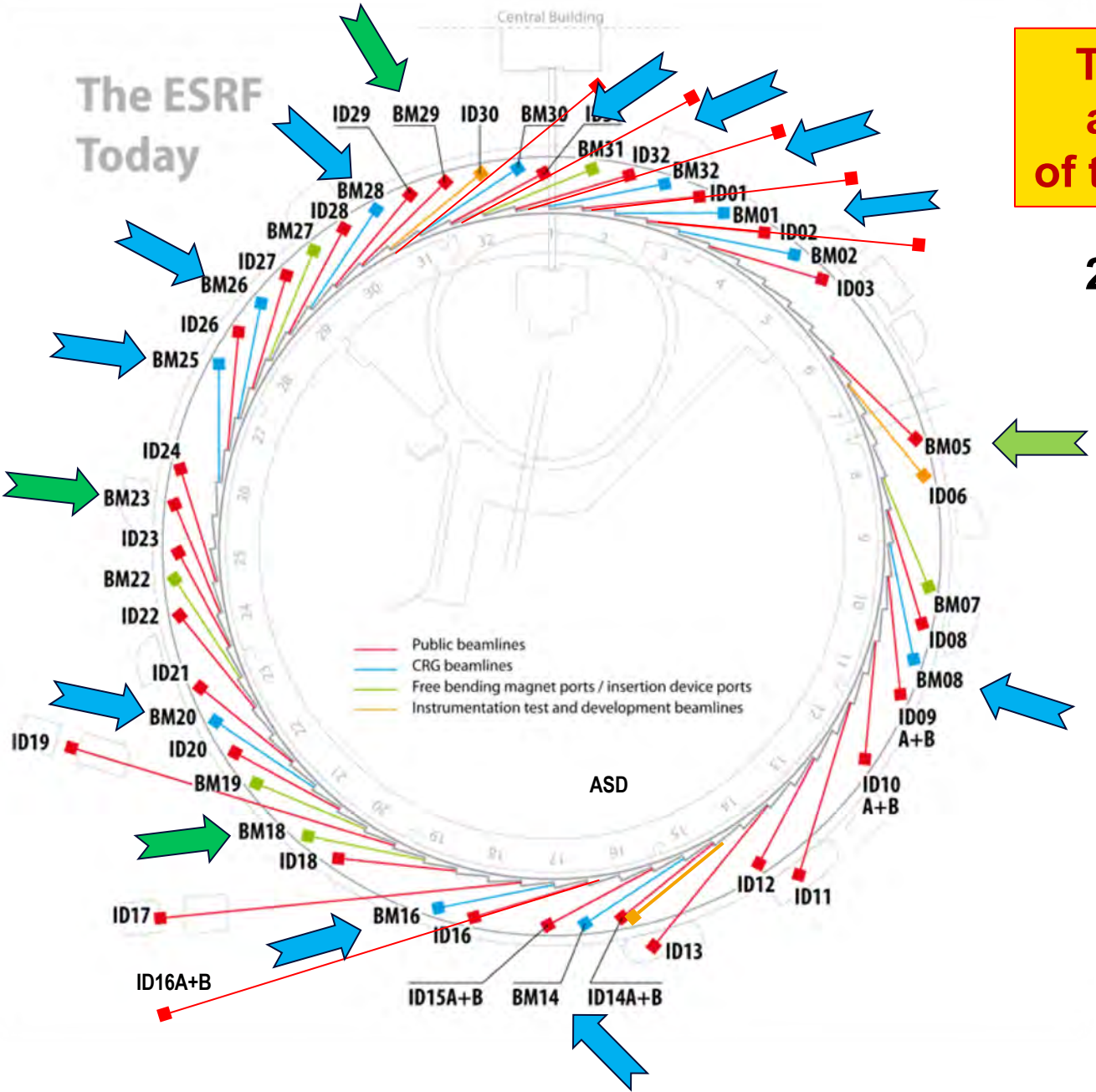
GRENOBLE ECOLE DE MANAGEMENT

- Responding to societal challenges: health, information and energy
- Transcending barriers to create excellence
- Enhancing international visibility and attractiveness
- Fostering higher education, research and interest to industry
- Boosting technological innovation
- Harmonizing urban and scientific development

TRAINING AND EDUCATION

- Hercules courses since more than 20 years
- PhD programme with ESRF funding for 30 positions (many of them co-funded)
- Trainee programme (up to 6 month in science and technology, funded by ESRF)
- Sandwich courses (2-year courses alternating at the ESRF and in school)
- ESRF-ILL International summer student summer programme (1 month, 20 places)
- Synchrotron @ School (a day of immersion in science for school kids, ~ 850 participants in 2016)

ESRF BEAMLINE PORTFOLIO



The CRG beamlines are an integral part of the ESRF BL portfolio

29.5 ESRF Beamlines
14 CRG Beamlines

Diffraction
Scattering
Spectroscopy

cm – mm – μm beam size

CRG BEAMLINES

CRG beamlines are in operation since 1994
CRG beamlines are located at bending magnet (BM) sources

SOURCE POSITION	NUMBER OF INDEPENDENT END-STATIONS	BEAMLINE NAME	FIELD OF RESEARCH	STATUS
BM01	1	Swiss-Norwegian BL	X-ray absorption and diffraction	Operational since 01/95
BM02	1	D2AM (French)	Materials science	Operational since 09/94
BM08	1	LISA (Italian)	X-ray absorption and diffraction	Operational since 09/94
BM20	1	ROBL (German)	Radiochemistry	Operational since 09/98
BM25	2	SPLINE (Spanish)	X-ray absorption and diffraction	Operational since 04/05
BM26	2	DUBBLE (Dutch/Belgian)	Small-angle scattering	Operational since 12/98
			EXAFS	Operational since 06/01
BM28	1	XMAS (British)	Magnetic scattering	Operational since 04/98
BM30	2	FIP (French)	Protein crystallography	Operational since 02/99
		FAME (French)	EXAFS	Operational since 08/02
BM31	1	SNBL II (Swiss-Norwegian)	X-ray absorption and diffraction	Operational since 09/16
BM32	1	IF (French)	Interfaces	Operational since 09/94
Operational in 2017:				
BM14	1	Assigned to DUBBLE (Dutch/Belgian)	EXAFS	Operational from 09/17
BM16	1	FAME-UHD (French)	XES from ultra high diluted samples	Operational from 02/17

Scientific capabilities on CRG beamlines complement ESRF portfolio
CRG beamlines often serve as an entry point for new users

LEGAL FRAMEWORK

- Operation of a CRG beamline is a membership privilege

- CRG contracts are established for 5 years and can be prolonged in 5 year intervals following scientific review (SAC) and approval by Council

- All CRG operation contracts are the same, no individual agreements with individual CRGs on certain aspects or legal boundary conditions

- ESRF provides a beam port including front end + "green field" space on the experimental floor. All installations (hutches, beamline optics and experimental equipment) are financed by the CRG

- If a CRG contract terminates, all installations outside the ring tunnel are to be removed at the CRG's expense unless a successor is found (requires endorsement from SAC and approval by Council)

OPERATIONAL SUPPORT

- **CRGs are entitled to use ESRF service groups if they follow ESRF technical standards:**
  - **IT standards**
  - **Beamline control (motion control, data acquisition)**

- **Services offered by ESRF to CRGs:**
  - **TID: buildings and infrastructure, computing, vacuum, alignment**
  - **ISDD: detector group, optics group, hard and software**
  - **ADMIN: purchasing, accounting, medical service**

OBLIGATIONS

- CRGs must follow ESRF Safety regulations and the directives of the ESRF Safety group

- CRGs must not incur costs to ESRF due to their existence or operation

- In case CRGs generate costs for the ESRF or use ESRF service groups, they reimburse ESRF on a non-profit basis

- ESRF delivers photons free of charge. In return, CRGs provide 1/3 of the available beamtime from a fully staffed and operational beamline for the ESRF public user programme. 2/3 of the beamtime is available for the CRG's private user programme (following peer review by CRG-organised committees to maintain a high level of scientific standards

- CRGs are encouraged to follow ESRF technical standards

Russia as a Partner

RUSSIA AS A PARTNER

ESRF: rich and long lasting story of strong collaboration with many Russian scientists

- Accelerator and Undulator Magnet Array developments
- X-ray Crystallography
- X-ray Spectroscopy
- X-ray Standing Waves
- Liquid and grazing incidence X-ray scattering and spectroscopy
- Macromolecular X-ray Crystallography
- High Pressure Science
- Surface Science
- Time-resolved X-ray science
- Nuclear Resonant Scattering
- X-ray Optics
- Etc.

RUSSIA AS A PARTNER

ESRF: rich and long lasting story of strong collaboration with many Russian scientists

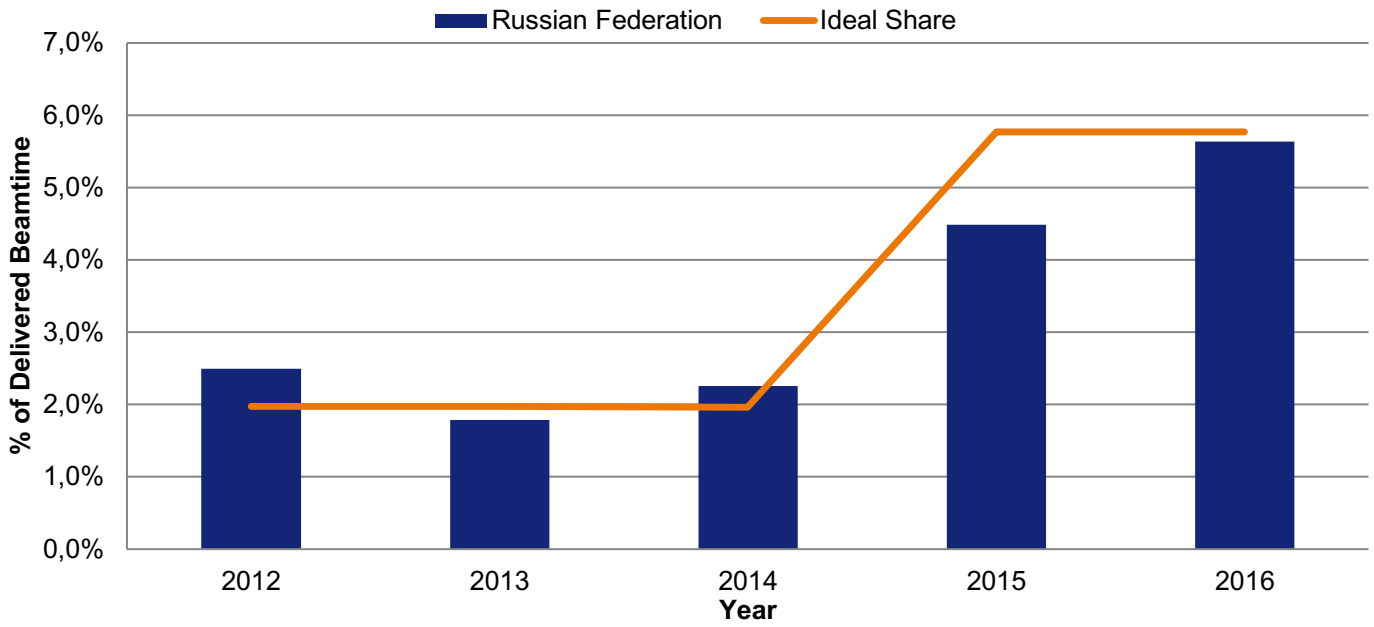
CHERNOGOLOVKA	Institute of Microelectronics Technology, RAS
GATCHINA	Petersburg Nuclear Physics Institute
KALININGRAD	Baltic Federal University
MOSCOW	National Research Centre “Kurchatov Institute”
MOSCOW	Institute of Crystallography of the RAS
MOSCOW	Moscow State University
MOSCOW	Lebedev Physical Institute
MOSCOW	Institute of Microelectronics Technology of Russia
MOSCOW	Moscow Institute of Physics and Technology
MOSCOW	National Research Nuclear University MEPhI
MOSCOW	Institute of Experimental Mineralogy
[illegible]	Kuzbass State Pedagogical Academy
NOVOSIBIRSK	Novosibirsk University
NOVOSIBIRSK	Nikolaev Institute of Inorganic Chemistry
NOVOSIBIRSK	Boreskov Institute of Catalysis
NOVOSIBIRSK	Institute of Geology and mineralogy Siberian, RAS
ROSTOV	Rostov Federal State University
ST PETERSBURG	Ioffe Physical - Technical Institute (IOFFE)
ST PETERSBURG	St Petersburg University
ST PETERSBURG	St Petersburg State Polytechnic University
TROITSK	Institute for High Pressure Physics, RAS
…. and many others	

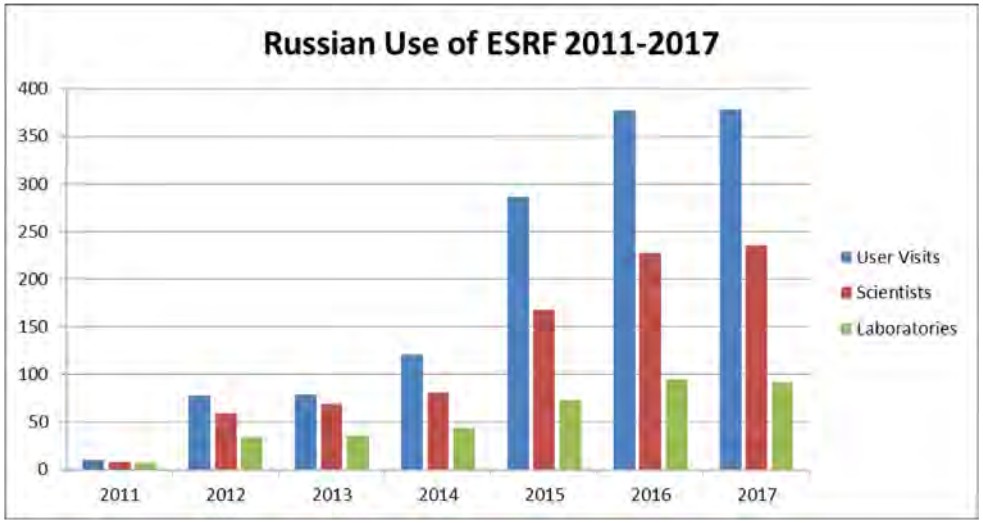
More than 20 prestigious Russian Research Centres and Universities

RUSSIA AS A PARTNER

23 June (Grenoble) and 15 July (Paris) 2014
ACCESSION OF THE RUSSIAN FEDERATION TO THE ESRF

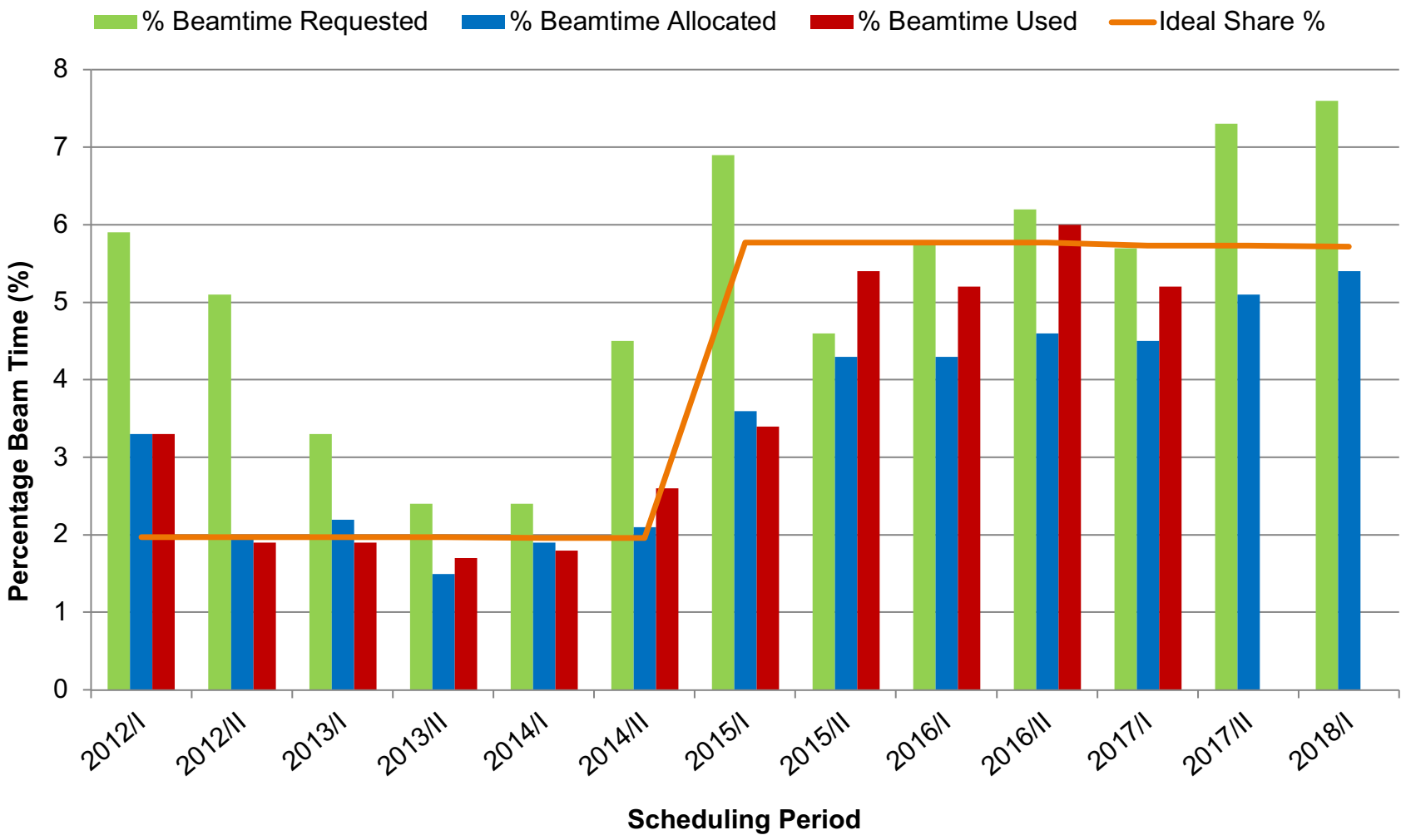
SCIENTIFIC USE BY RUSSIA





	User Visits	Scientists	Laboratories
2011	10	8	7
2012	78	59	34
2013	79	69	36
2014	121	81	44
2015	286	168	73
2016	377	228	95
2017	378	236	92

SCIENTIFIC USE BY RUSSIAN FEDERATION – PUBLIC BEAMTIME



WHAT MAKES THE ESRF SO SUCCESSFUL?

At the heart of the ESRF's success are

- a clearly structured public access programme
- scientific excellence as the only criterion
- rigorous external quality control
- the ability to attract the best scientists (users and staff)
- an ambitious technology programme
- the ability to attract new partners

THANK YOU FOR YOUR ATTENTION!

NEUTRONS FOR SOCIETY

Institute Laue-Langevin

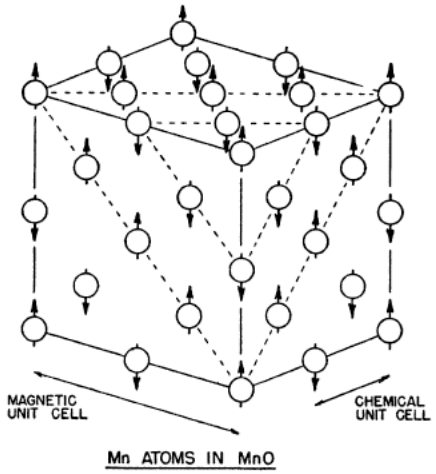
Endurance
Setting the pace

50 years of the first international scientific user facility

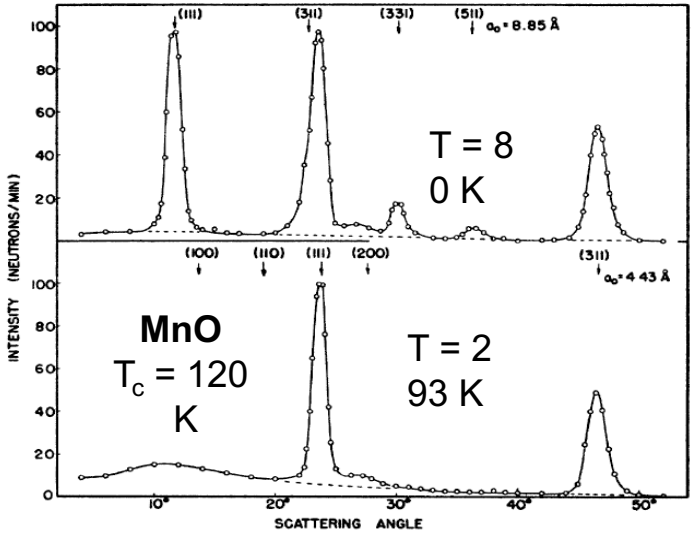
Jiří Kulda ILL Grenoble, France

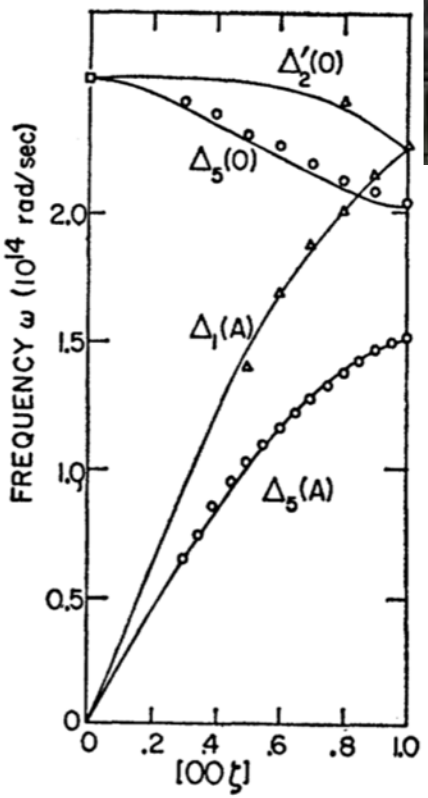
ILL: 50th anniversary!

Neutron Nobel prizes 1994



Clive Shull, ORNL 1951



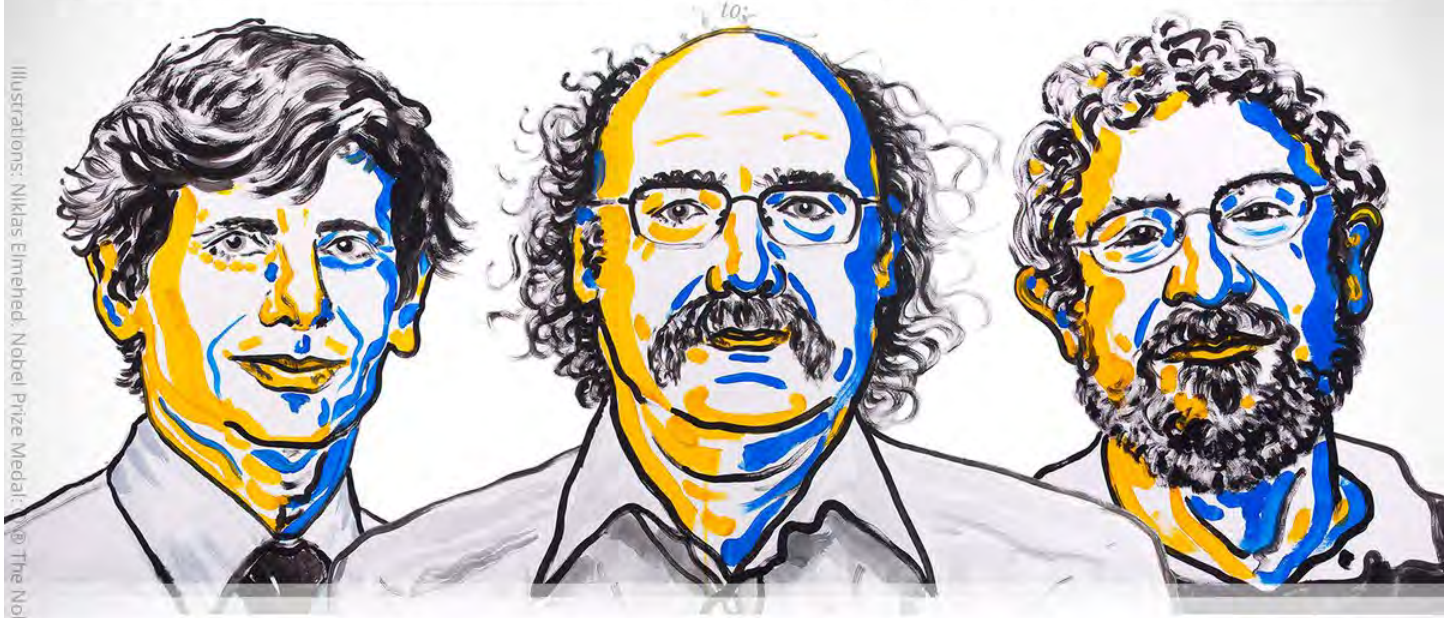


Bertram Brockhouse
Chalk River, 1957

"For the greatest benefit to mankind"
Alfred Nobel

The Royal Swedish Academy of Sciences has decided to award the

2016 NOBEL PRIZE IN PHYSICS

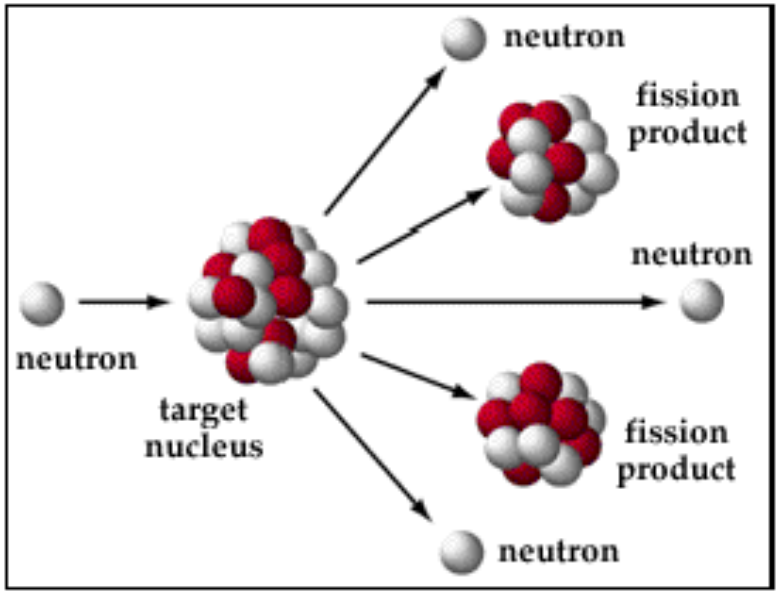


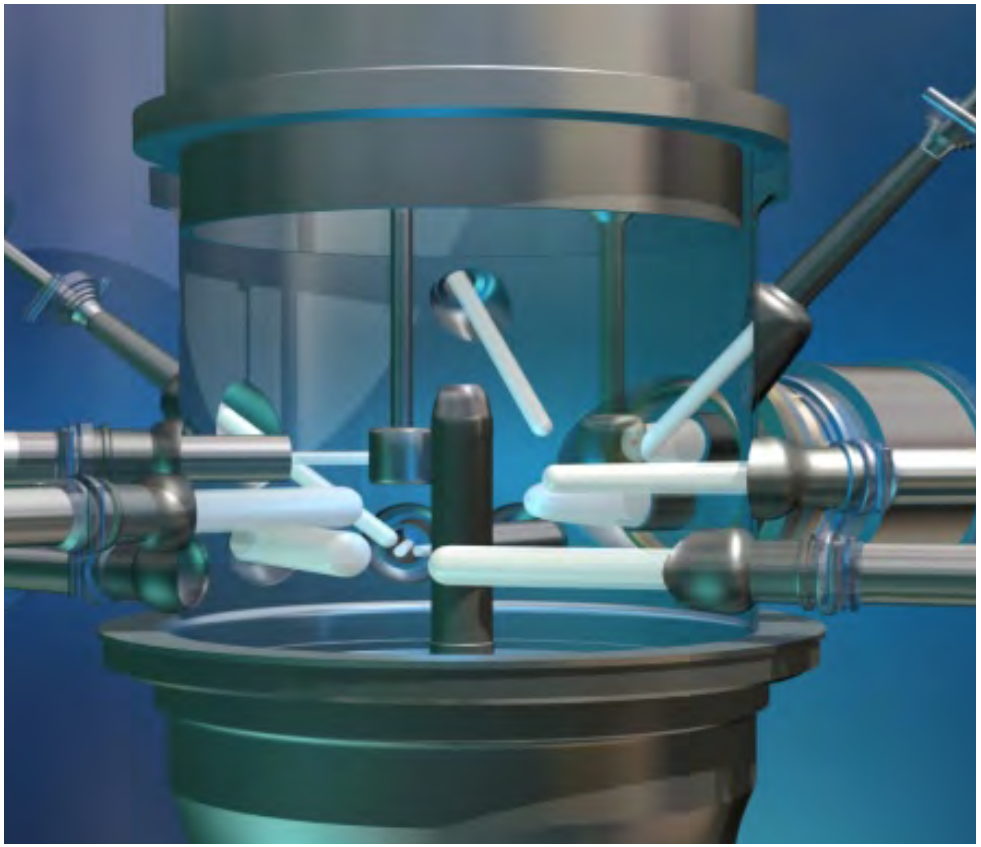
David J. Thouless
F. Duncan M. Haldane
J. Michael Kosterlitz

"for theoretical discoveries of topological phase transitions and topological phases of matter"

Nobelprize.org

Neutron source luminosity





Nuclear fission:

2.5 neutrons per event

(1 neutron sustaining reaction,0.5 absorbe)d

Cooling limits neutron flux!

Nonproliferation act!

ILL reactor:

peak flux density 3×10^{15} $cm^{-2}s^{-1}$ into 4π sterad

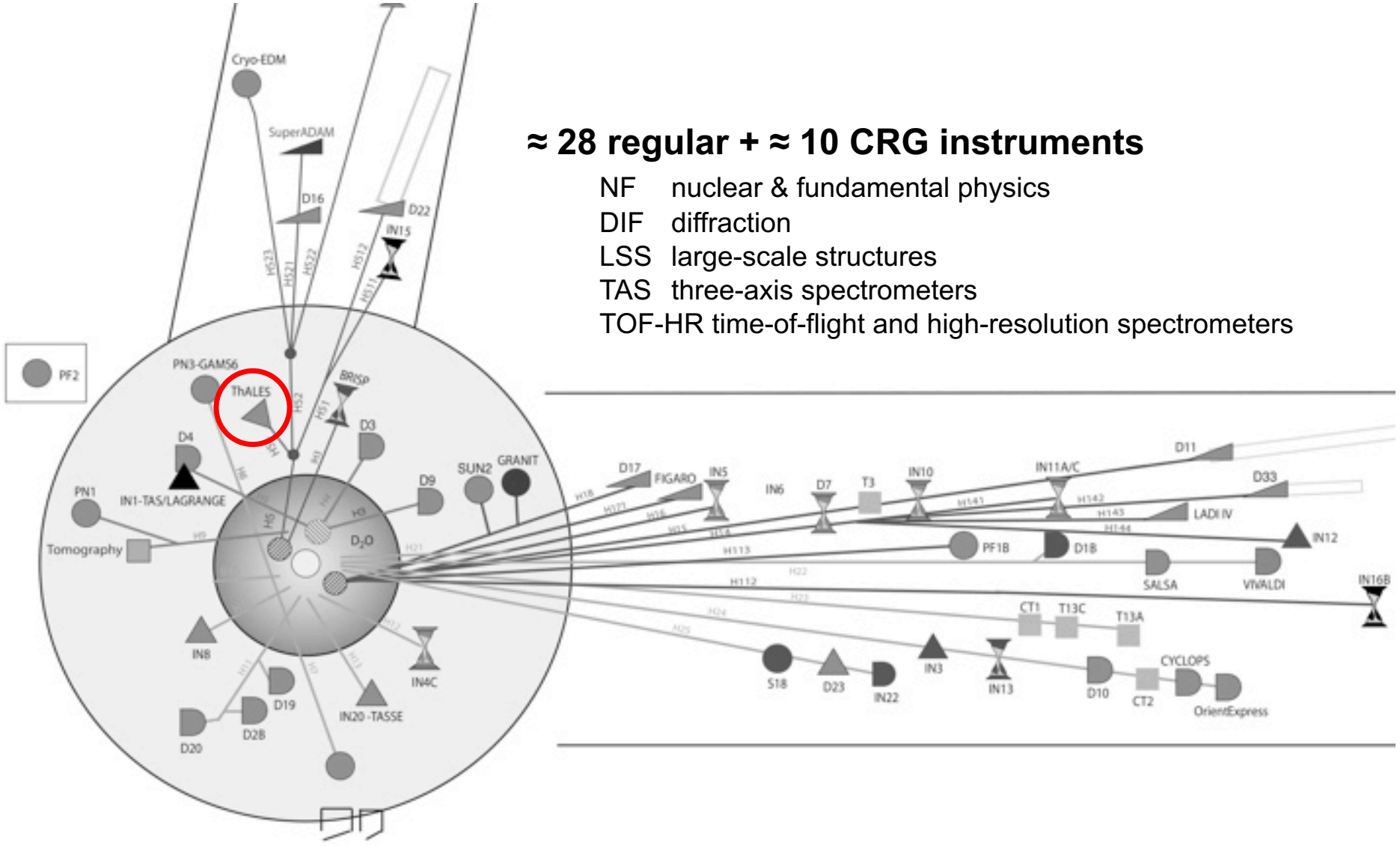
NEUTRONS FOR SOCIETY

Neutrons worldwide

Endurance
Setting the pace

The ILL is the most intense neutron source in the world.

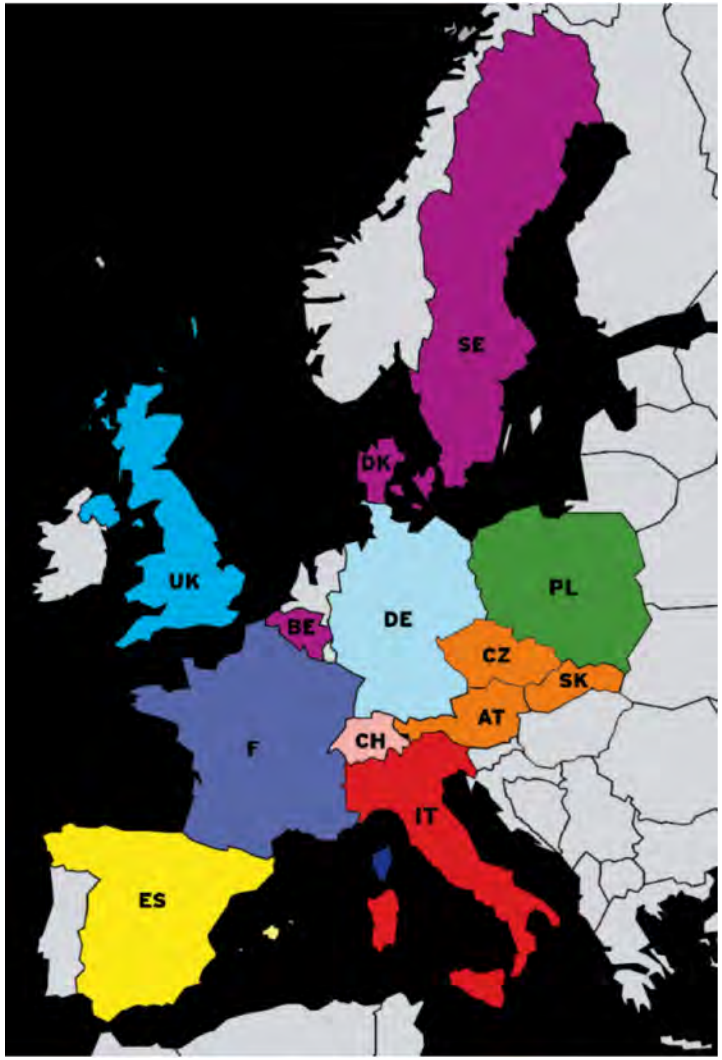
ILL instruments



≈ 28 regular + ≈ 10 CRG instruments

- NF nuclear & fundamental physics
- DIF diffraction
- LSS large-scale structures
- TAS three-axis spectrometers
- TOF-HR time-of-flight and high-resolution spectrometers

ILL member countries

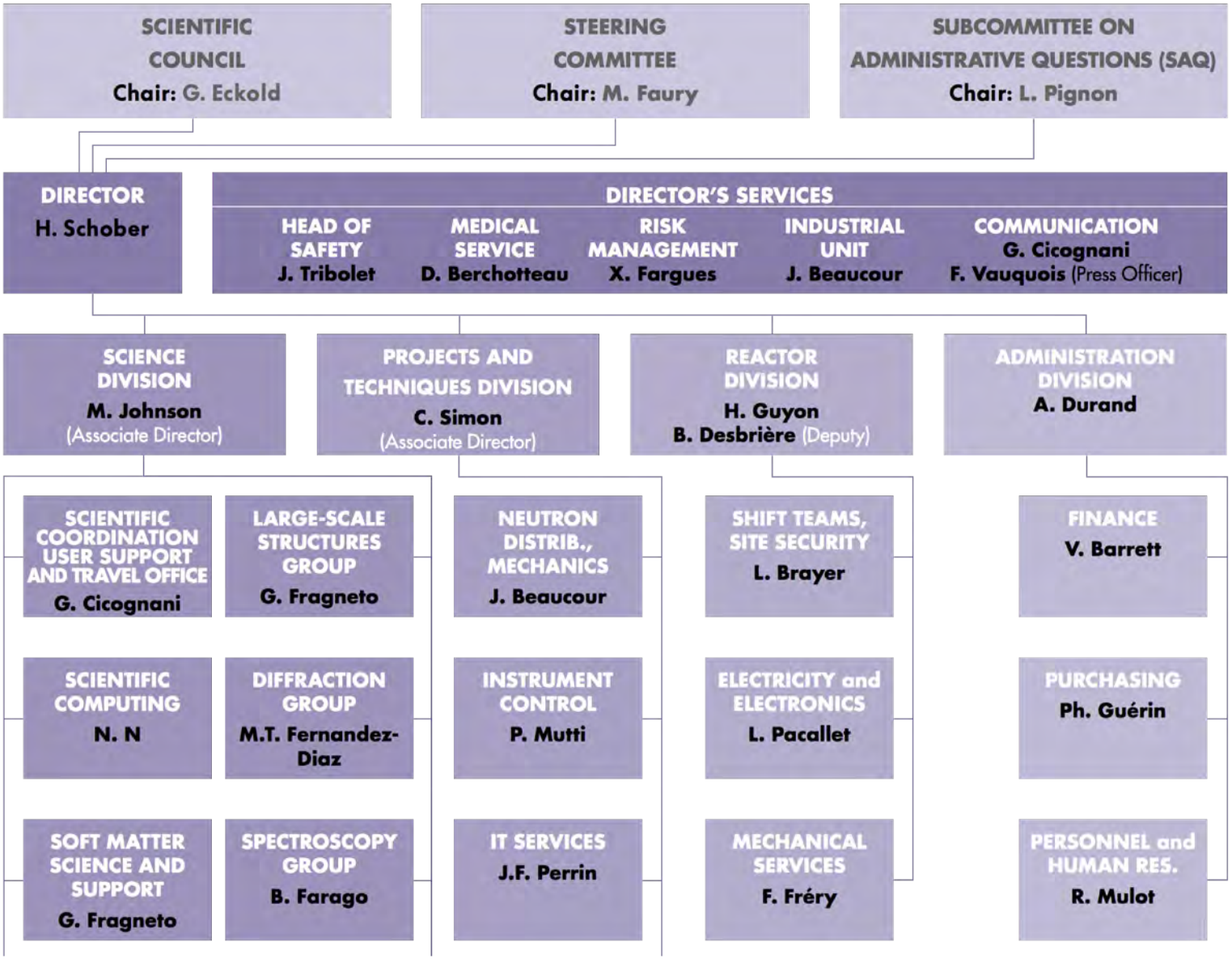


Germany : 25 %
UK : 25 %
France : 25 %

Spain
Italy
Switzerland
CENI (Central European Neutron Initiative, Austria, Czech Republic, Hungary, Slovakia)
Denmark
BELPOLSWENI (Belgian-Polish-Swedish Neutron Initiative)
India

scientific members: ≈ 25%

ILL organization



ILL scientific output

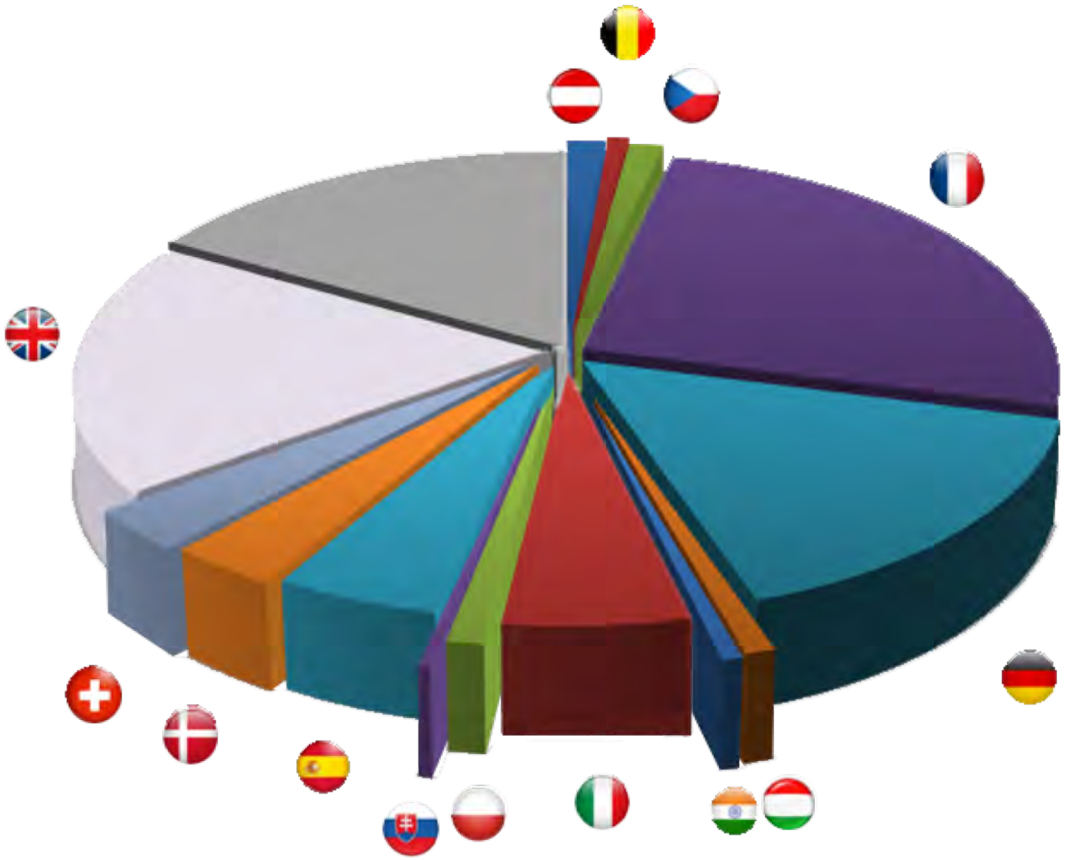
850 experiments/year

2000 users

38 countries

28 instruments + 8 CRG

650 publications/year



Peer reviewed proposal system

ILL RESEARCH PROPOSAL Printed : 24/02/2011

Experiment Title : **Anisotopic Spin Fluctuations in Opt imally Doped YBa2Cu3O6.9**	Proposal Number **4-01-1080**

Proposer (to whom correspondence will be addressed)

Name and first name	Address	Phone / Fax / Email
HAYDEN Stephen M.	**H H WILLS PHYICS LAB, BRISTOL** ROYAL FORT TYNDALL AVENUE BS8 1TL BRISTOL ROYAUME-UNI	+44 117 928 8715 +44 117 9255624 s.hayden@bris.ac.uk New neutron user? **No** Phd student? **No** New ILL user? **No**

Neutron Sciences User Office

Proposal IPTS-13695.1

Title: Study on magnetic orders and excitations in a roo-temperature multiferroic BaSrCo2Fe11AlO22
PI: Kazuhisa Kakurai
PI Employer: Japan Atomic Energy Agency (JAEA)

Abstract: We propose a WAND diffraction and HB-1 polarized neutron inelastic scattering investigation on the Y-type hexaferrite BaSrCo2Fe11AlO22 exhibiting a spin-driven ferroelectricity at room temperature. Because the magnetoelectric effects in this material are thought to originate from conical magnetic ordering, the detailed investigation on static and dynamical spin correlations in zero and applied magnetic field in the wide temperature range of 2-400K are required.

Publications:

Facility: High Flux Isotope Reactor
Requested HB-2C, HB-1

Run Cycle: HFIR 2015-B
Days Requested: 9

NIST Center for Neutron Research
Proposal for Neutron Beam Experiment

Submission ID:21664 Proposal Number: H34-02

Experiment Title
Title: Quantum critical scaling of spin excitations in Ba(Fe*.97Cr*.*3)2(As1-xPx)2
Proposal Type: New Proposal
Time Received: 30-JAN-16 09:46

Scheduling
Desired Dates: 05/15/2016 to 06/15/2016
Impossible Dates: 04/01/2016 to 04/30/2016
Estimated Duration: 7 days

ORNL, NIST, LLB Saclay, MLZ Munich, PSI, ... , Budapest, Rez near Prague ....
ESRF, DESY, Diamond ..... synchrotron centers .....
other facilities ....

April 2017 SC round

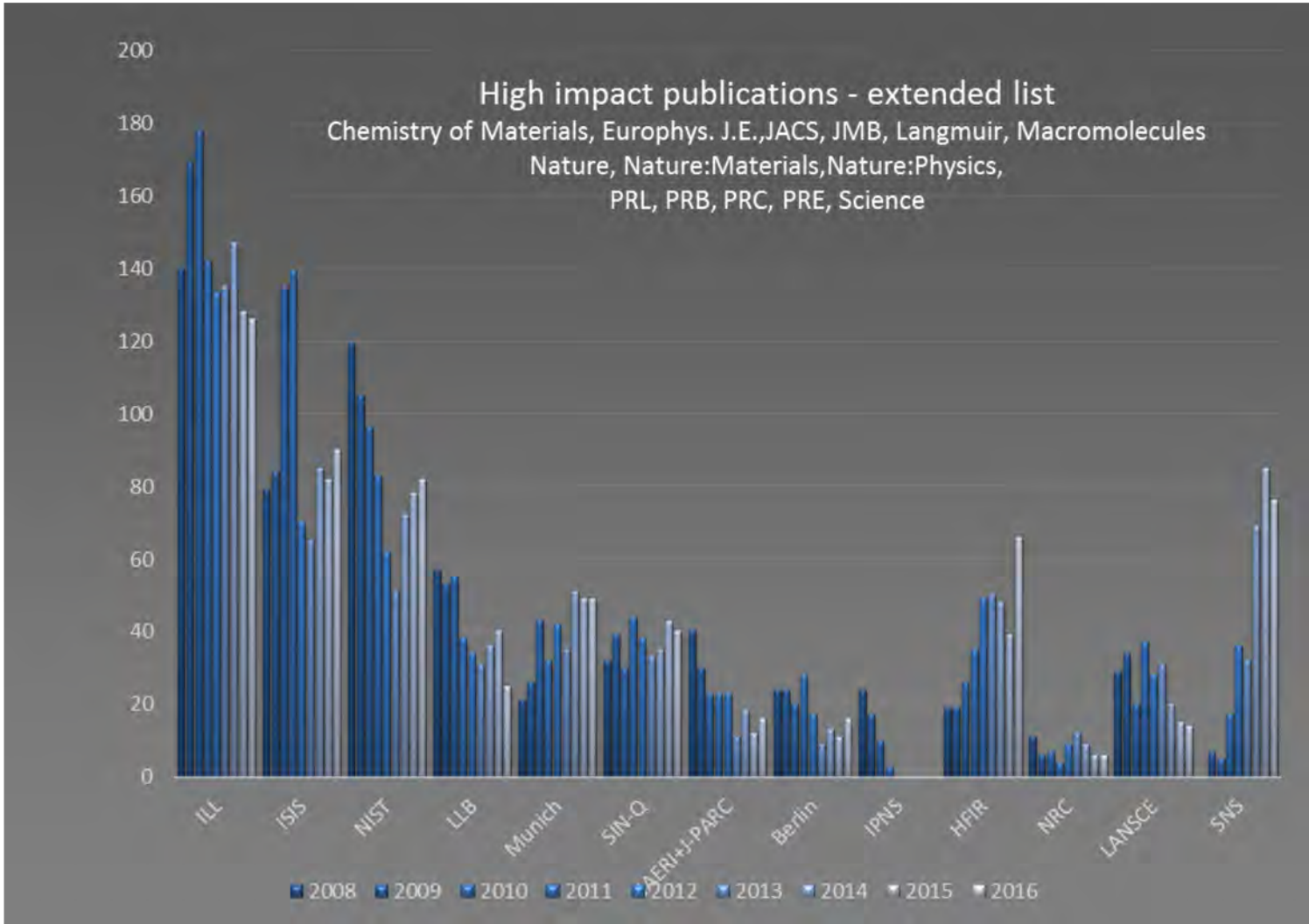
2017: 3 cycles planned; 2 proposal rounds

- 592 proposals received for first proposal round corresponding to 1.5 cycles
- Distribution over colleges is constant with respect to previous year.
- Healthy demand from Scientific Member countries posing the difficulty of national balance

TABLE 3 *Without purely non member countries (null) and ILL/ESRF*	Request days	Request %	Allocation days	Allocation %
AT	81.22	2.09	74.15	3.52
BE	14.53	0.37	9.84	0.47
CH	232.20	5.98	130.83	6.20
CZ	**52.36**	**1.35**	**40.64**	**1.93**
DE	900.84	23.19	427.43	20.27
DK	43.28	1.11	28.52	1.35
ES	177.22	4.56	84.29	4.00
FR	1019.26	26.24	552.14	26.18
GB	815.33	20.99	443.70	21.04
IT	236.89	6.10	137.97	6.54
PL	101.30	2.61	81.87	3.88
SE	198.81	5.12	90.57	4.30
SK	11.58	0.30	6.70	0.32
		0.00		0.00
Total	***3884.81***	***100.00***	***2108.66***	***100.00***

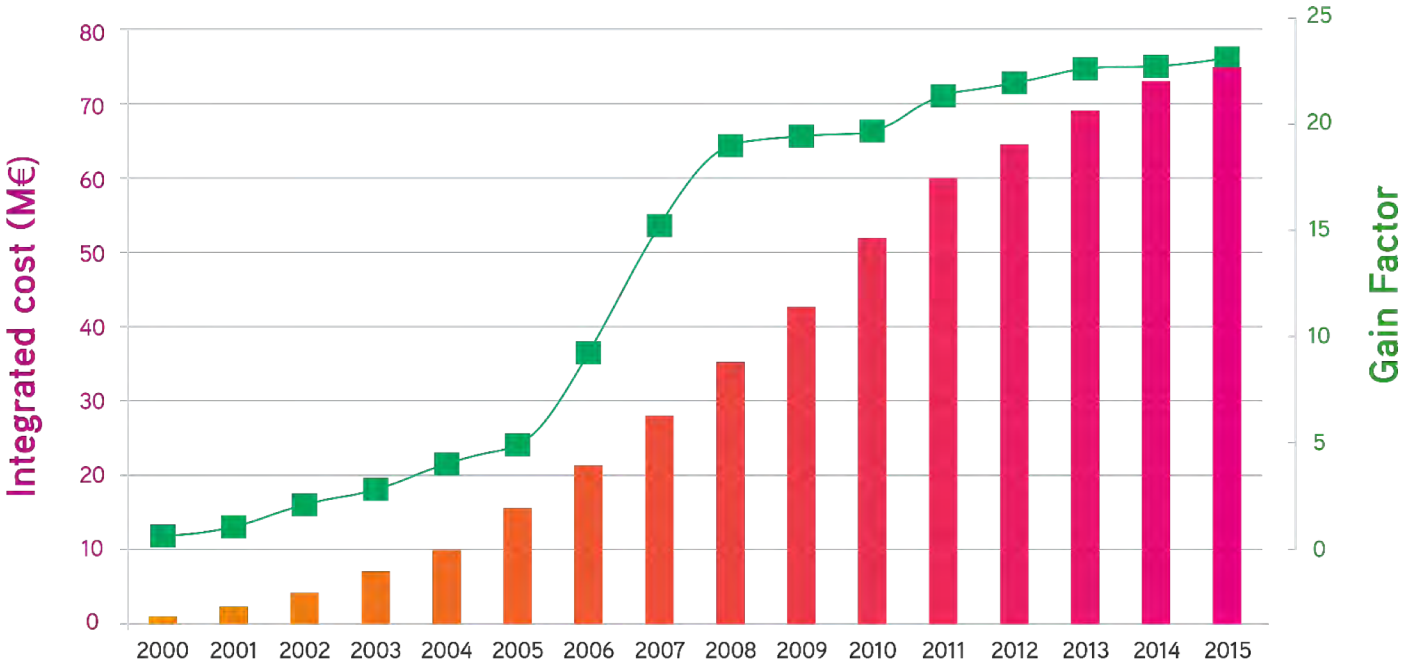
Publication output

537 ***ILL*** publications in 2017



Instrument upgrades

2000 – 2015
The resulting average neutron detection rate is improved by a factor of ≈ 25



Concluding remarks

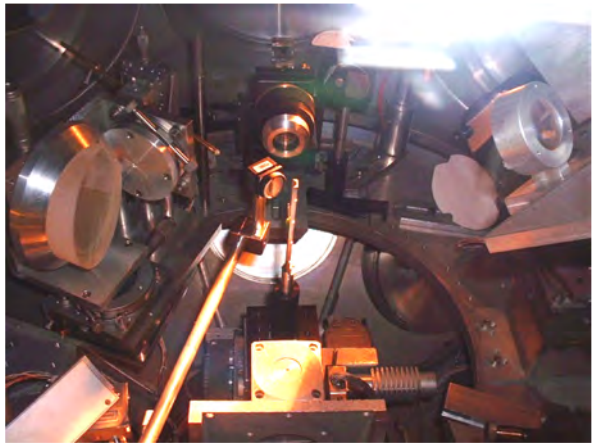
- ***open access*** and ***peer review*** have become a general rule at user-oriented facilities
- polarity between ***national*** and ***international*** appears obsolete from the user's point of view
- **community** inspired/driven/reviewed development scenarios have become current

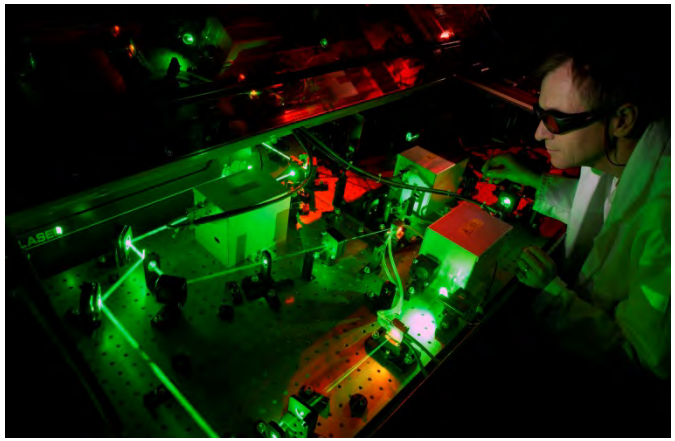
ILL: 50th anniversary!

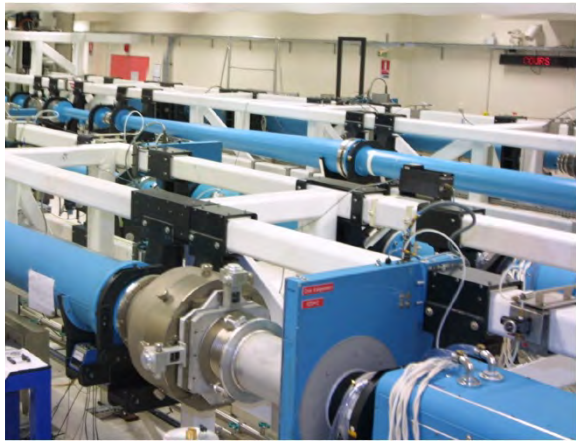
LASERLAB-EUROPE

Philippe Martin, LIDYL Director, CEA-CNRS/Saclay

1. **What is LASERLAB-EUROPE**
2. Access management
3. The role of users







LASERLAB-EUROPE : The Integrated Initiative of European Laser Laboratories

EU network of state-of-the-art laser facilities for research

→ Boost the impact of Europe in laser science and technology

21 European Countries

33 laser infrastructures

The strategic evolutions of LASERLAB-EUROPE (2003-2019)

LASERLAB-EUROPE I (2003-2008): founded by Wolfgang Sandner

- *First vision of a unified "European Distributed Laser Infrastructure"*

LASERLAB-EUROPE II (2009-2012) coordinated by Wolfgang Sandner

- *"Extending the European dimension": growing from 17 to 27 laser infrastructures.*

LASERLAB-EUROPE III (2012 – 2015) coordinated by Claes-Göran Wahlström

- *Supporting the Extreme Light Infrastructures (ELI)*

LASERLAB-EUROPE IV (2015 – 2019) coordinated by Claes-Göran Wahlström

- *Extending the access offer towards Free Electron Lasers (FEL) growing from 27 to 33 laser infrastructures.*
- *Promoting life science and industrial applications*

LASERLAB-EUROPE V (2019 – 2023)

- *Thinking over it*
- *Renewal of activities ?*
- *Novel management/governance: AISBL, ERIC, Coordination*

LASERLAB-EUROPE : our 3 pillars

Transnational Access

providing access to top-quality laser research facilities for scientists all over Europe and beyond

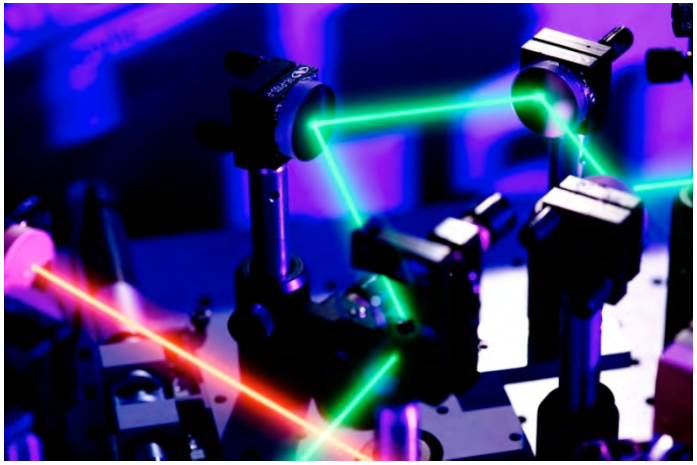
→ Apply through www.laserlab-europe.eu/transnational-access

Joint Research Activities

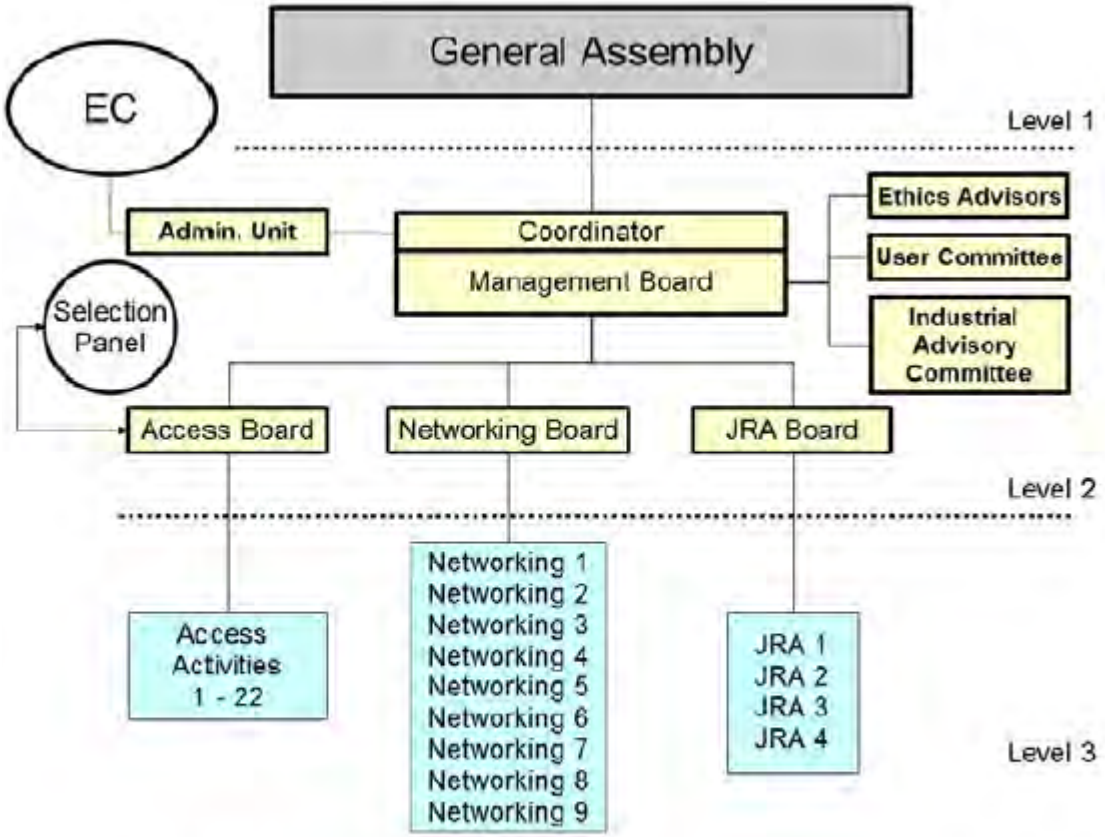
- Biomedical Optics for Life Science Applications - **BIOAPP**
- Photonic Techniques for Material Analysis, Nanoscience and Sensing - **PHOTMAT**
- Innovative Laser Technologies - **ILAT**
- Laser-driven High Energy Photon and Particle Sources towards Industrial and Societal Application - **LEPP**

Networking Activities

- fostering collaboration, best practices and exchanges
- planning the future of the field
- user training
- training and education for young researchers
- public outreach
- collaboration with industry and medical centres



Management of LASERLAB-EUROPE (2003-2019)



C.G. Wahlstrom (LLC)

LASERLAB-EUROPE

1. What is LASERLAB-EUROPE
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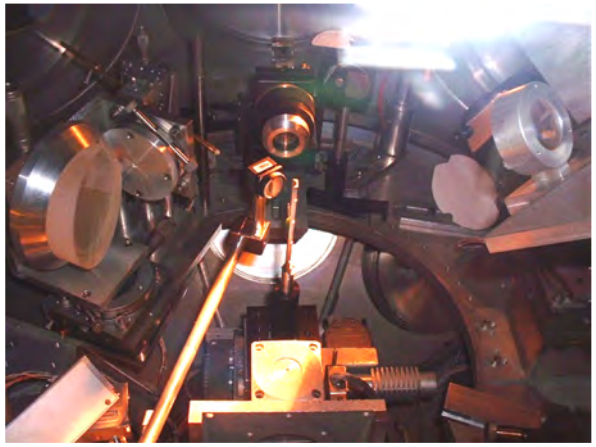
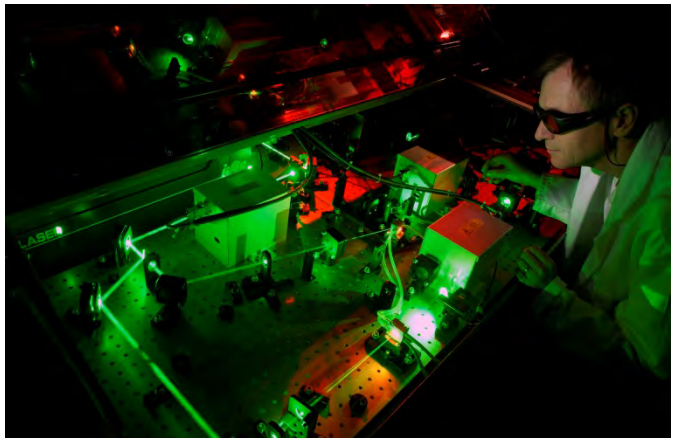
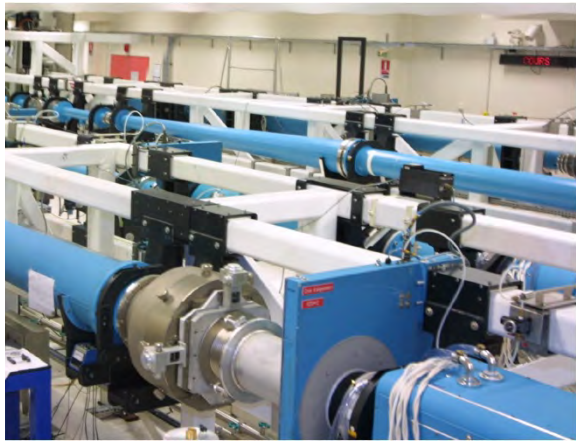






1 – An active Access Board

Supervision of the access activities (operation & quality)

Didier Normand (SLIC, FR) chair
Sylvie Jacquemot (LULI, FR)

Sandor Szatmari
(DP-USZ, HU)

Valdas Sirutkainis
(VULRC, LT)

Gerhard Paulus
(GSI & FSU-IOQ, DE)

Britta Redlich
(FELIX, NL)

Dimitris Charalambidis
(FORTH, GR)

Jouko Korppi-Tommola (FI)

Marco Borghesi (UK)

Istvan Földes (HU)

LASERLAB access program

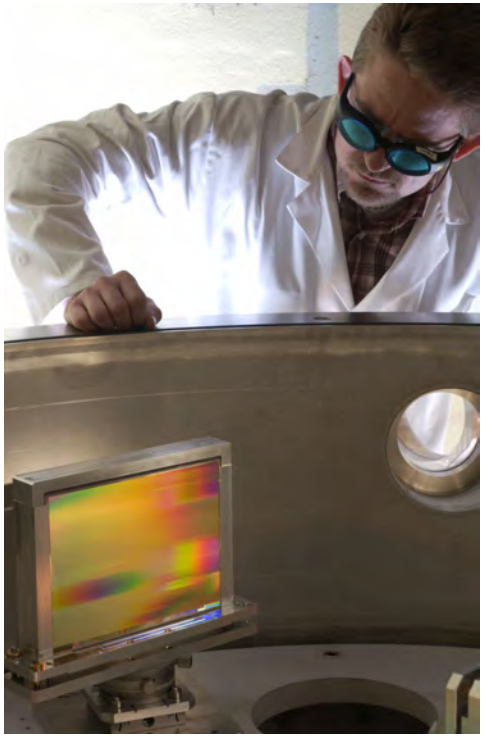
Users

- access to world-class laser facilities
- carry out research free of charge, including travel and accommodation.

Based on Excellence !

Win-win strategy

- For the users : unique opportunity to access state of the art facilities for free
- For the hosts i) get a budget from Laserlab proportional to the number of access days and ii) take advantage from new expertise, new ideas, new equipments or diagnostics …



Laserlab-Europe-IV ACCESS programme (2016-2019)

- Strong commitments : 3000 access days, 300 projects, 700 users
- Budget : 4 M€ for 22 access providers including 1 M€ for Users Travel & Subsistence

Role of the MB/ Access B : make sure

- **to fulfil the commitments**
- **to give the best service to the community**
- **to do the best science**

Fair and efficient proposal selection

- permanent call for proposals => proposals accepted at any time
- Fully electronic proposal processing => typical return time: 6-7 weeks
- Selection by an independent external Selection Panel
  - Large pool of referees (> 100) jointly selected by all infrastructures
  - Each proposal evaluated by 2 experts

Selection of proposals

Applicant
Proposal submission

Targeted Infrastructure
- *Technical feasibility check*
- *Resources check*
- *Proposition of 2-4 referees*

Selection Panel
- *Choice of 2 referees*
- *Eligibility check*

Referees
Evaluation of the proposal

Selection Panel
- *Final decision*
- *Ranking*

Host Institution
- *Information of the applicant*
- *Management of the visit*

LASERLAB-EUROPE

1. What is LASERLAB-EUROPE
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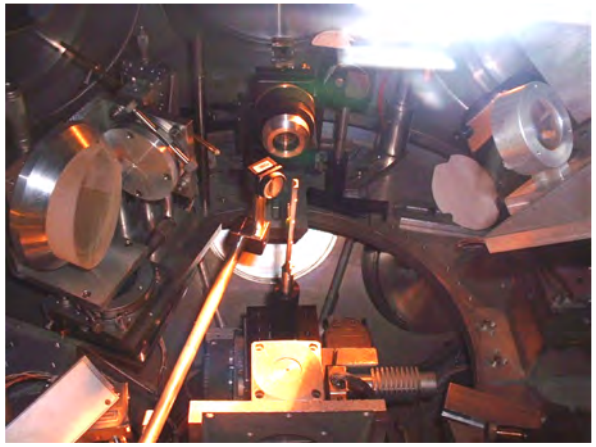
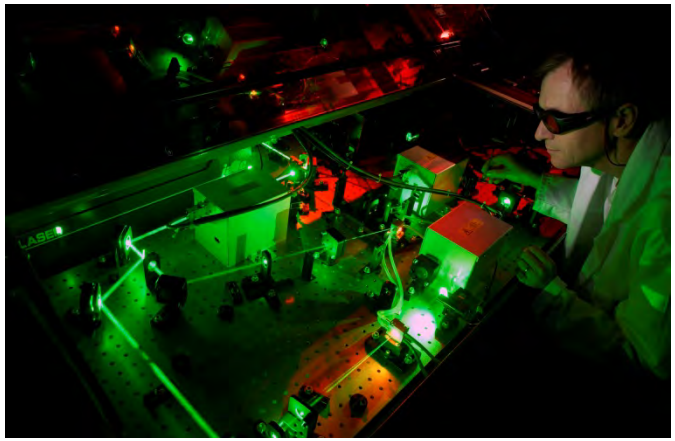
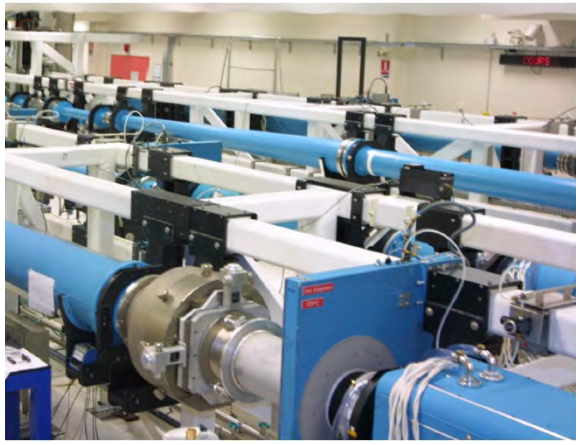
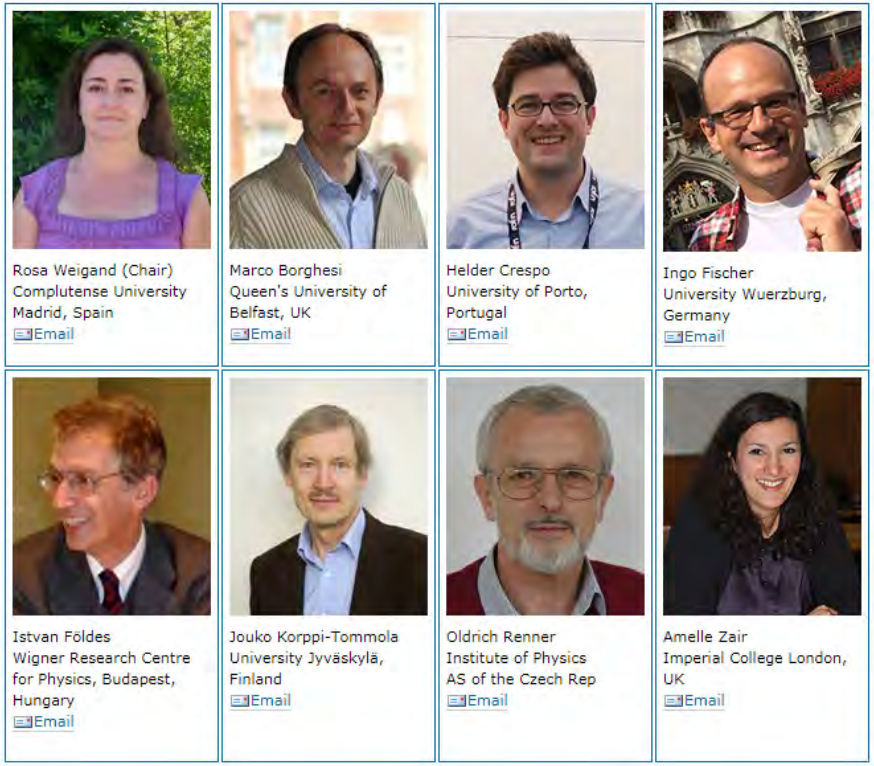






An active board of user representatives

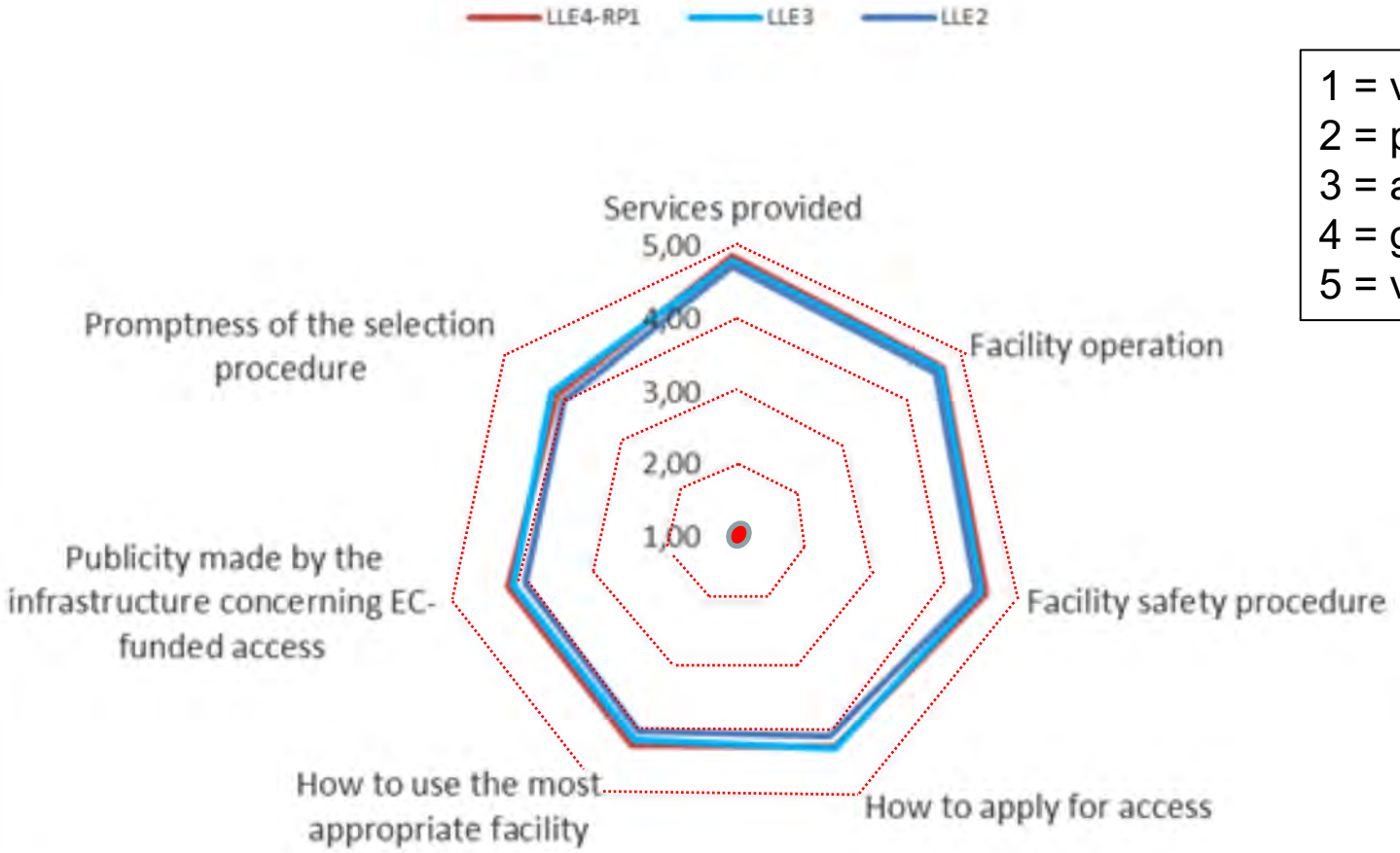
Play an essential role of interface between users and LASERLAB, providing advice to both sides



- ❑ they are members of the Management, Access & Networking Boards, and of the General Assembly, with full voting rights
- ❑ in charge of organizing the user meetings

Ask for users satisfaction

- Based on 510 user questionnaires (60% of projects)



1 = very poor
2 = poor
3 = acceptable
4 = good
5 = very good

Organizing regular user meetings

Laserlab Europe User Meeting Vilnius,27-29 August, 2017

- High Intensity interactions and plasma physics,
- Life sciences & biotechnology and molecular and cellular biology,
- Cultural heritage investigations with lasers,

Access management is based on:

1. Strong Access Board including users representatives
2. Clear procedure for applying for access
3. Fair selection procedure based on external selection panel & pool of referees
4. Regular tracking of the partners access performances
5. Check for future projects
6. User feedback and advice (user questionnaires and user meetings)

Publicity and Dissemination

Laserlab newsletter

Outreach

Visit us on facebook.com/laserlabeurope

Information Posters

www.laserlab-europe.eu

User Training

- Training schools for young researchers

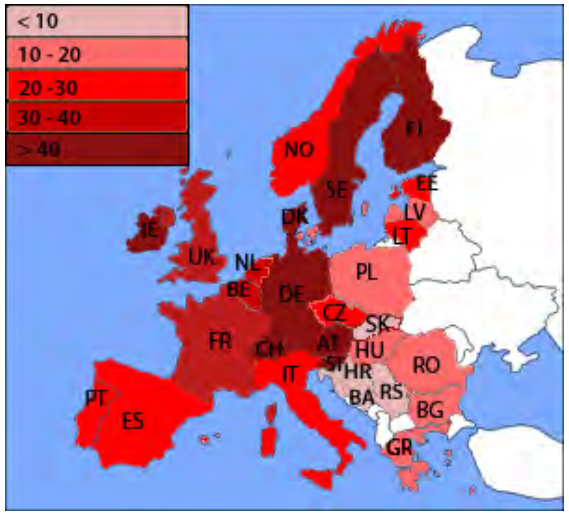
2-4 September 2015, User Training Workshop on Light-Based Technologies, Trnava, Slovakia

- Staff exchange for technical staff and scientists

LASERLAB-EUROPE

in the center of a structured laser research landscape

The European Laser Community



National scale
National interest

Laserlab-Europe

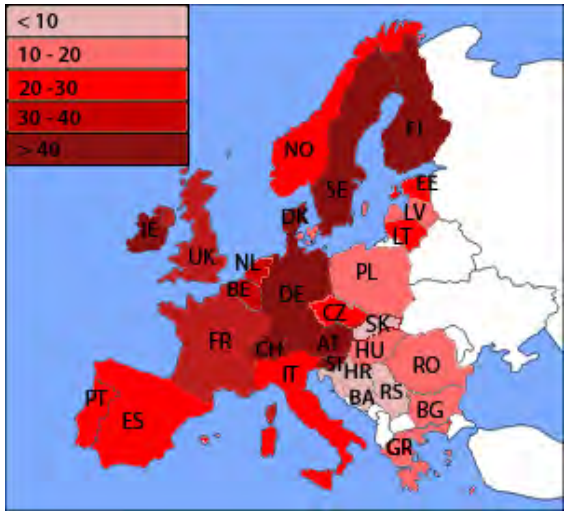
Flexible instrument beyond the national scale

Emerging Pan-European ESFRI Infrastructures

Mission-oriented single entities to meet global challenges

LASERLAB-EUROPE ambition

The European Laser Community



National scale
National interest

Laserlab-Europe

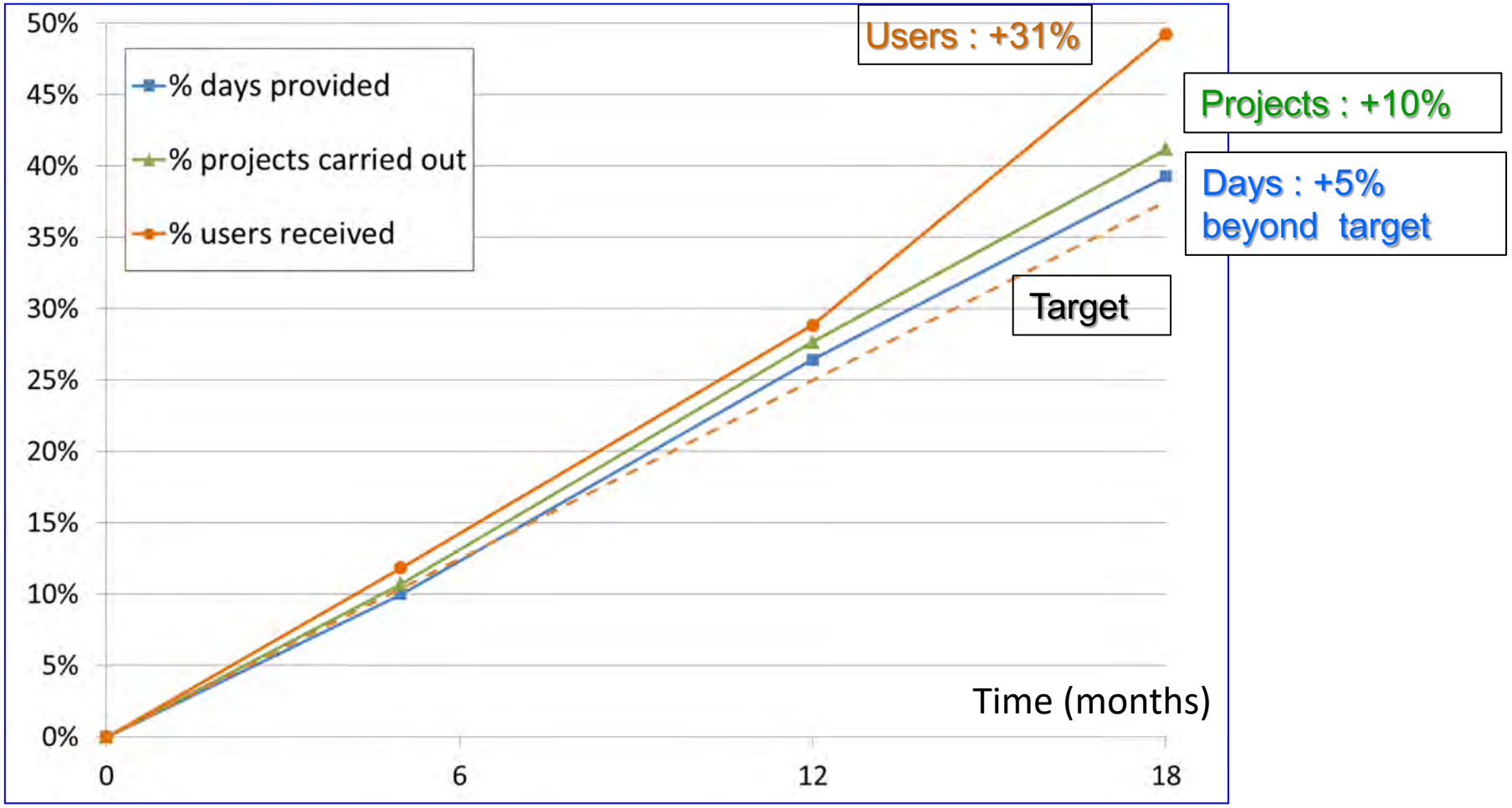
Flexible instrument beyond the national scale

Emerging Pan-European ESFRI Infrastructures

Mission-oriented single entities to meet global challenges

4 – Keep tracking the partners' access performances

Reallocate beam time between partners (dynamic access)



Internationalization of the XCELS Project

CREMLIN WP 6

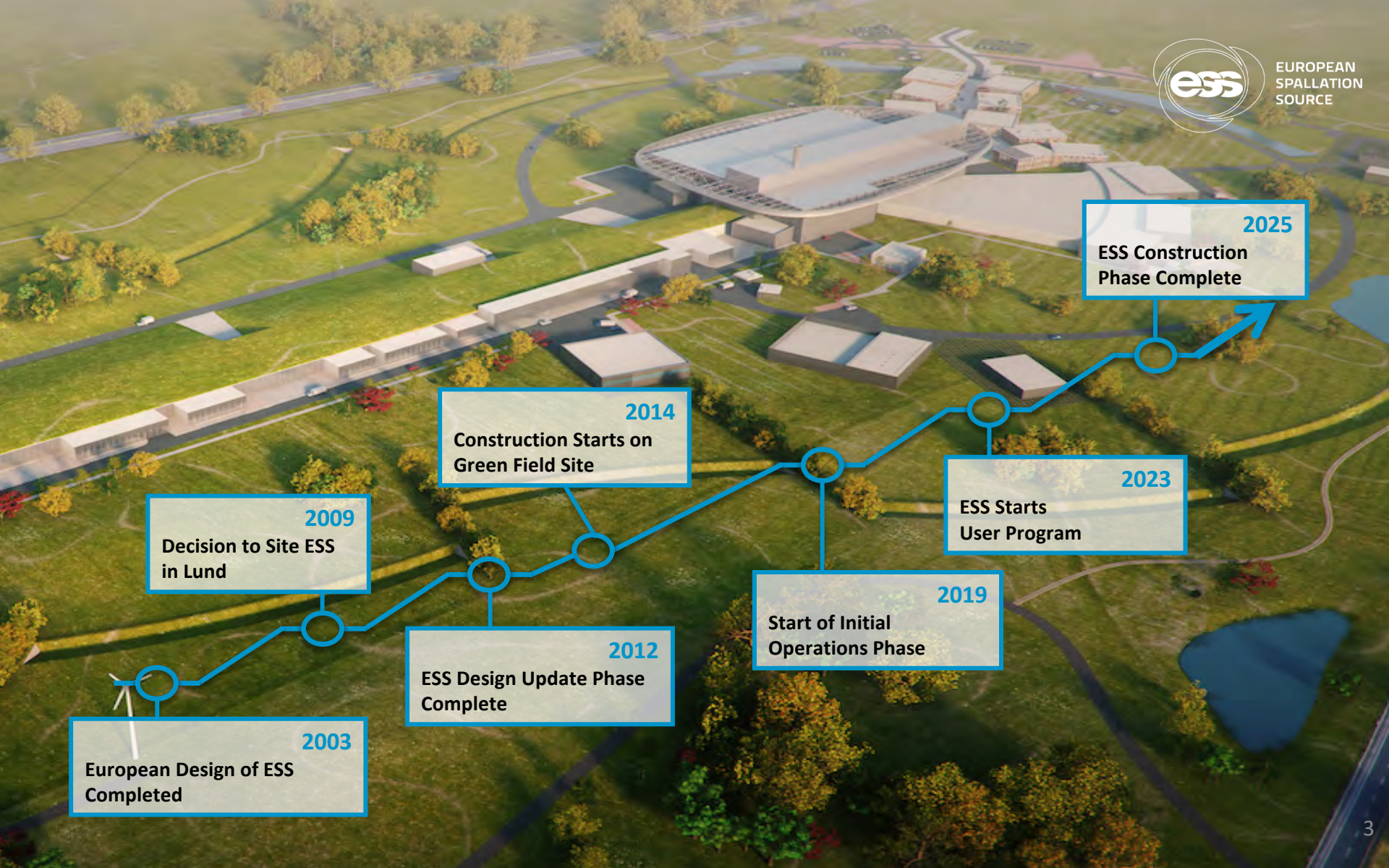
Măgurele, Romania, 8 December 2017

Allen Weeks

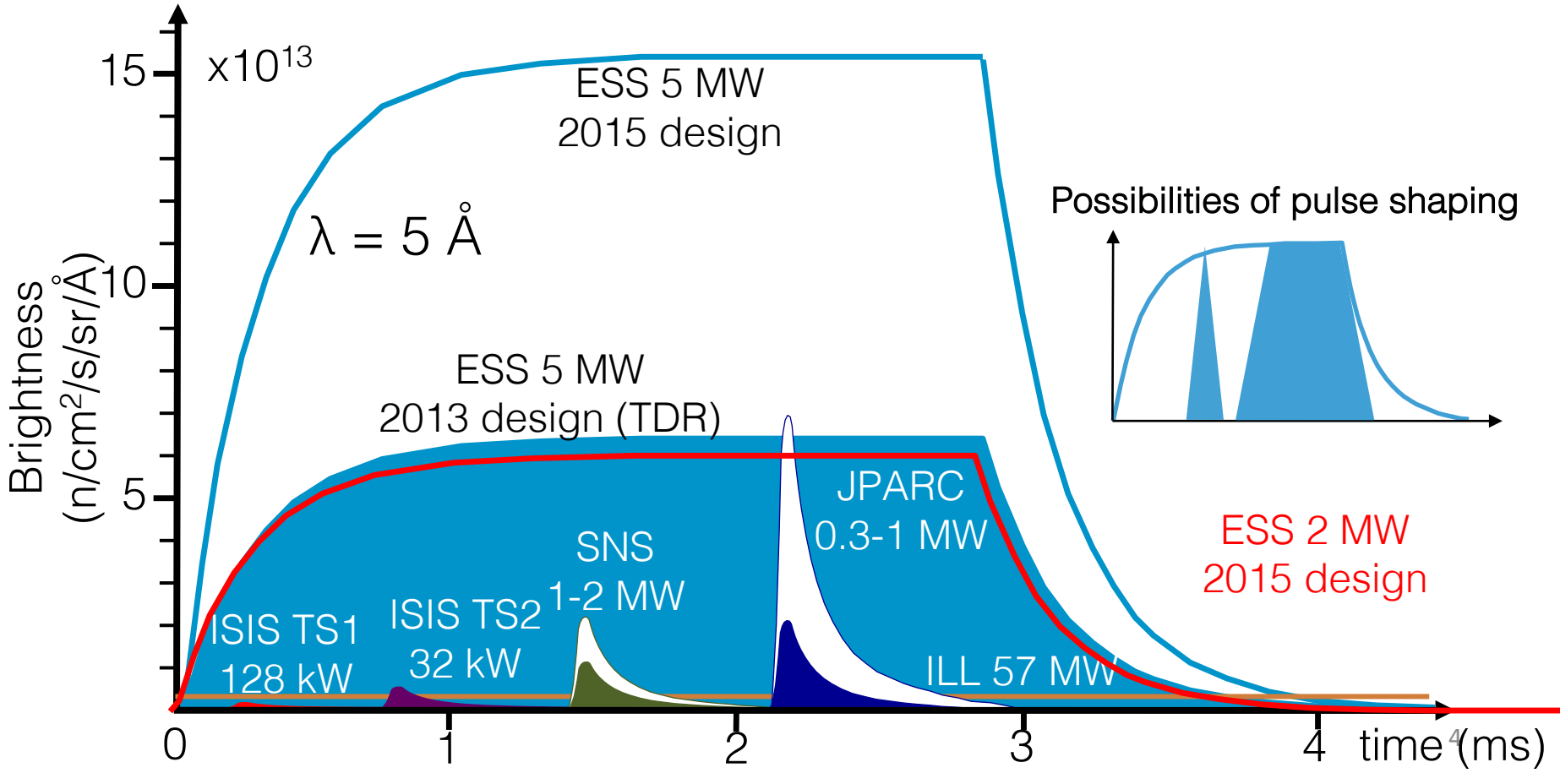
www.esss.se

Involved in WP1, and (marginally) in WP4

Press visit connected to GSO meeting in Moscow, 2017


EUROPEAN
SPALLATION
SOURCE
2025
ESS Construction
Phase Complete
2014
Construction Starts on
Green Field Site
2023
ESS Starts
User Program
2009
Decision to Site ESS
in Lund
2019
Start of Initial
Operations Phase
2012
ESS Design Update Phase
Complete
2003
European Design of ESS
Completed

What's the 'Unique Selling Point' ?



Organisation and People

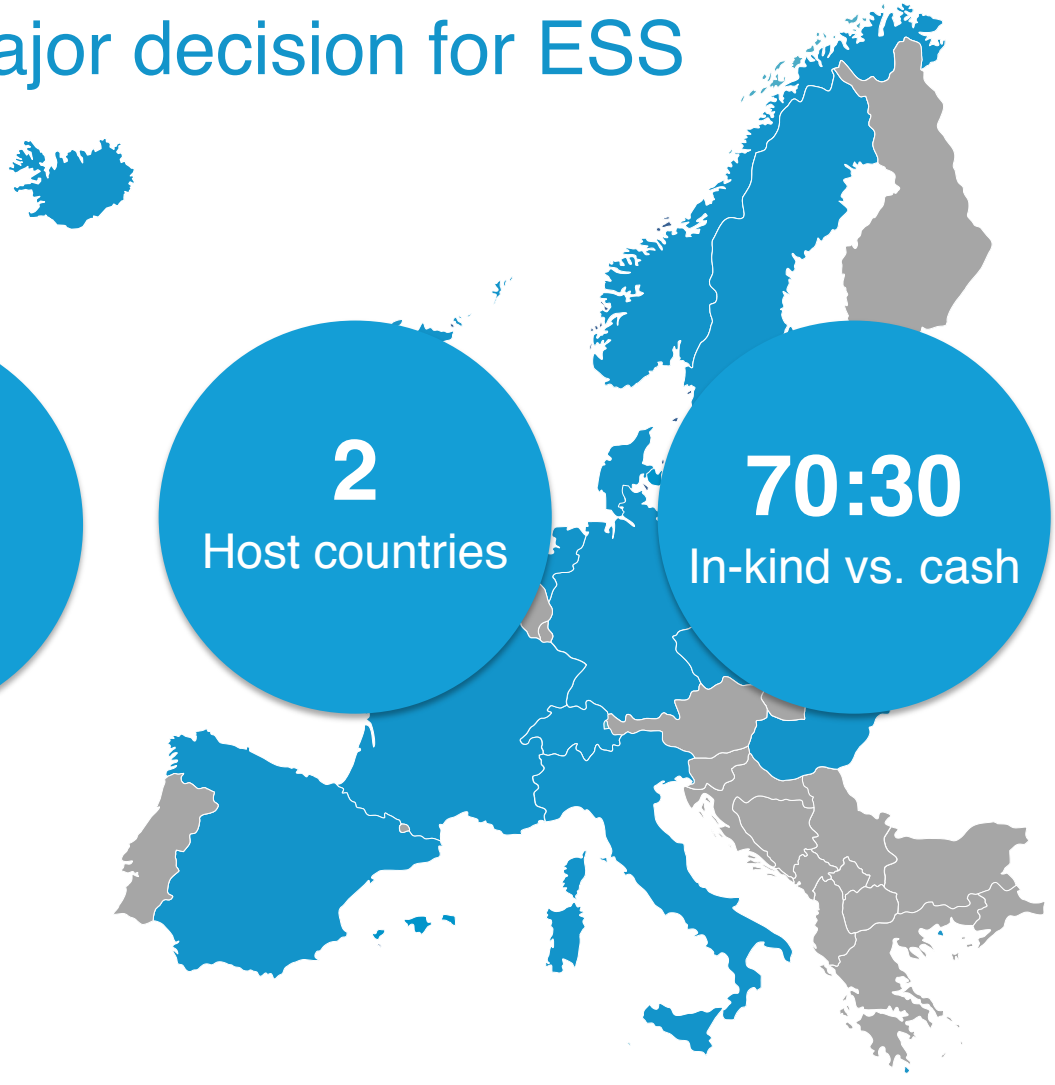
EUROPEAN SPALLATION SOURCE

426
Employees

50
Nationalities

~ 100
Collaborating Institutions

2014 Major decision for ESS



17
Countries

2
Host countries

70:30
In-kind vs. cash

€1.84B
Construction Cost

Strategic European Research Infrastructure

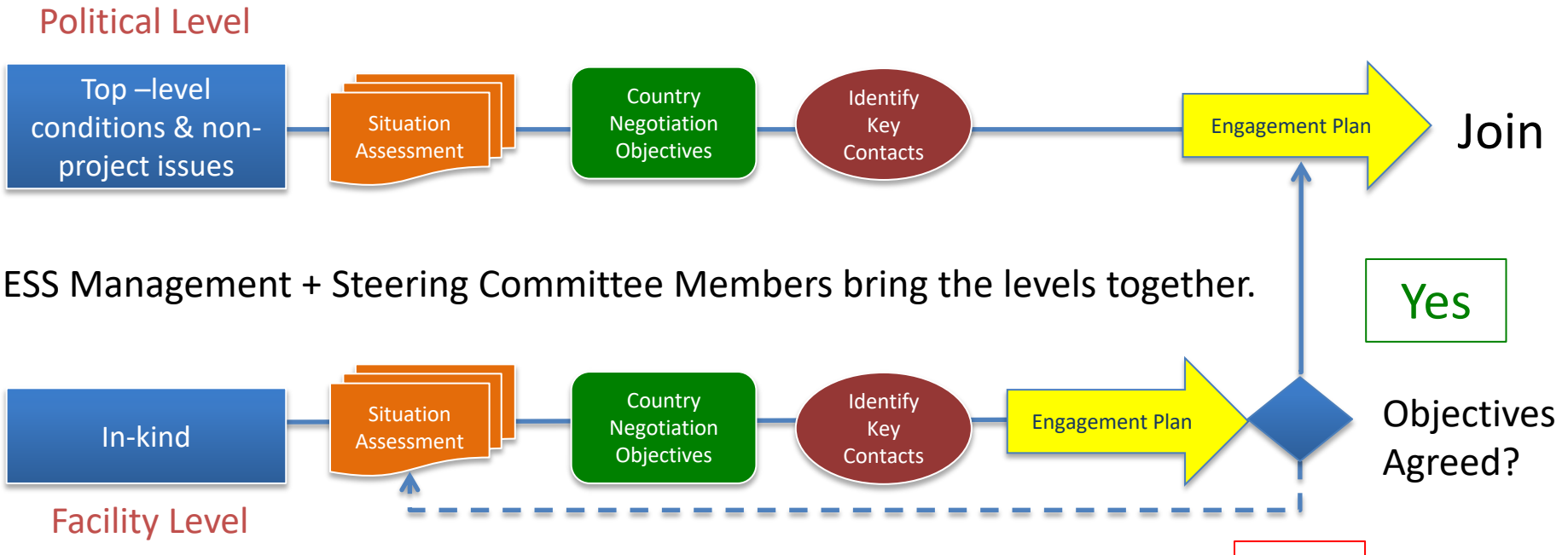
EUROPEAN SPALLATION SOURCE

"The Council adopted conclusions in support of the implementation of the roadmap for the European Strategy Forum on Research Infrastructures (ESFRI) … three projects are ***strategically relevant for Europe*** *and ready for development: the European Plate Observing System (EPOS), the European Life-Science Infrastructure for Biological Information (ELIXIR), and* ***the European Spallation Source****."*

- Competitiveness Council, 27.05.2014

Governance and Facility Work Together

Host Country Negotiators + Ministries in Member Countries negotiate high-level amounts as a percentage of the project and mix of in-kind and cash.



Sep 2014: Ground Break

Important Symbolic Act Signals
"start" to stakeholders and partners

Sweden	35.0 %
Denmark	12.5 %
Germany	11.0 %
UK	10.0 %
France	8.0 %
Italy	6.0 %
Spain	5.0 %
Switzerland	3.5 %
Norway	2.5 %
Poland	2.0 %
Hungary	1.5 %
Czech Rep.	2.0 %
Estonia	0.25 %
Total	97.25 %

ESS AB transitioned into European Research Infrastructure Consortium (ERIC)

EUROPEAN SPALLATION SOURCE

ESS AB

- Swedish limited liability corporation
- Owned by the Swedish and Danish governments

transfer of assets, obligations and personnel by Oct 1, 2015

ESS ERIC

- European Research Infrastructure Consortium
- Sole governing body: the European Spallation Source ERIC Council, comprised of representatives from the Member and Observer Countries

Financing Includes Cash And Deliverables

EUROPEAN SPALLATION SOURCE

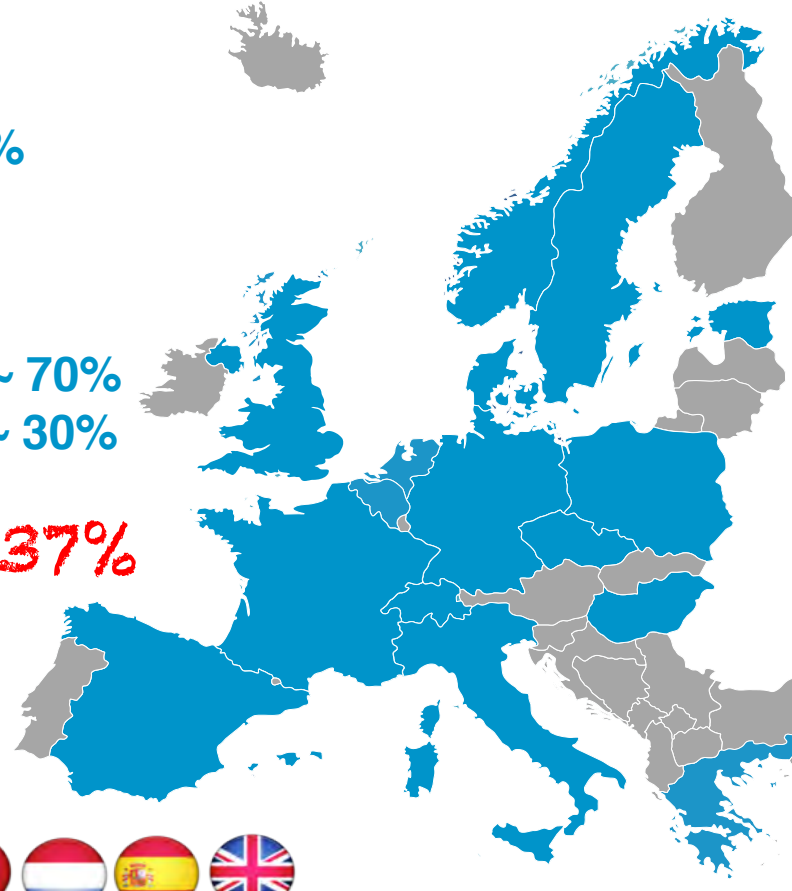
Host Countries of Sweden and Denmark

Construction	47.5%	**Cash**	**100%**
Operations	15%		

Non Host Member Countries

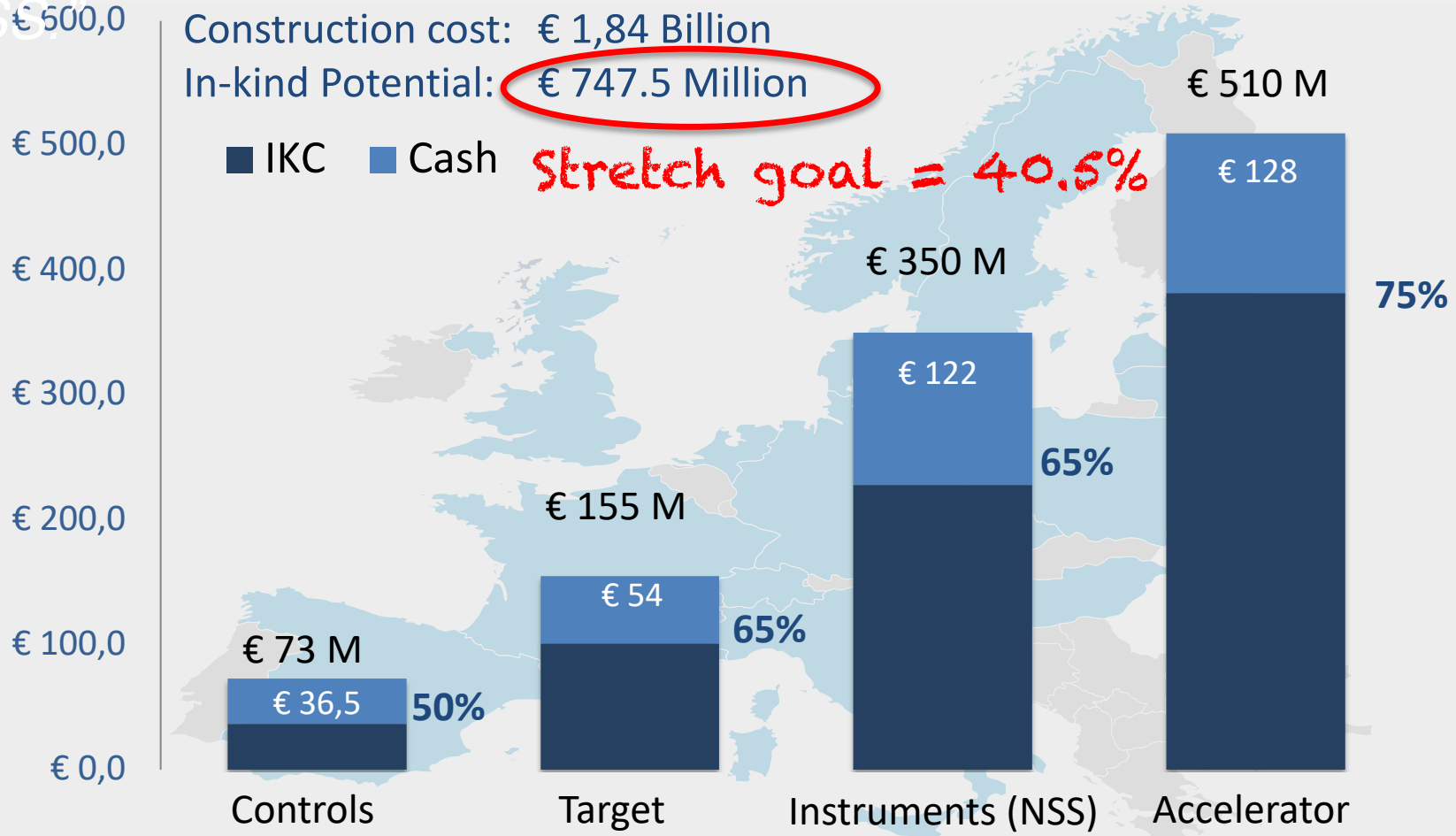
		In-kind Deliverables	**~ 70%**
Construction	52.5%	**Cash**	**~ 30%**
Operations	85%		

Members' In-Kind Goals = 37%
€685 million

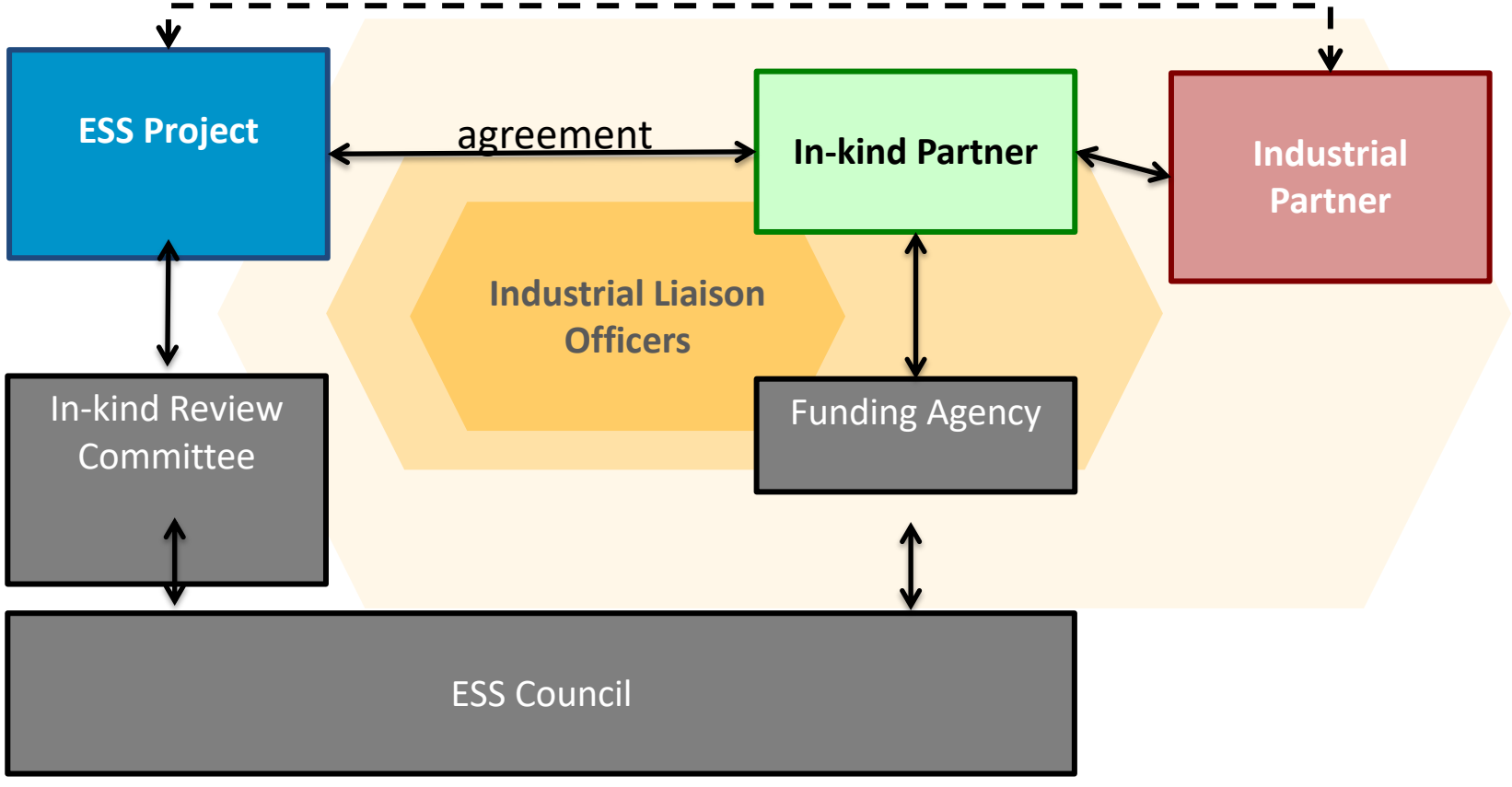


ESS In-kind Goals (based on 2013 Cost Book)

"*A non-cash contribution in labor or material to ESS.*"



The ESS Collaboration Landscape



Partner and Industry Days Campaign

GET IN VOLVED

Do You want to be a part of building the European Spallation Source?

Express your Interest in the In-Kind Contribution now.

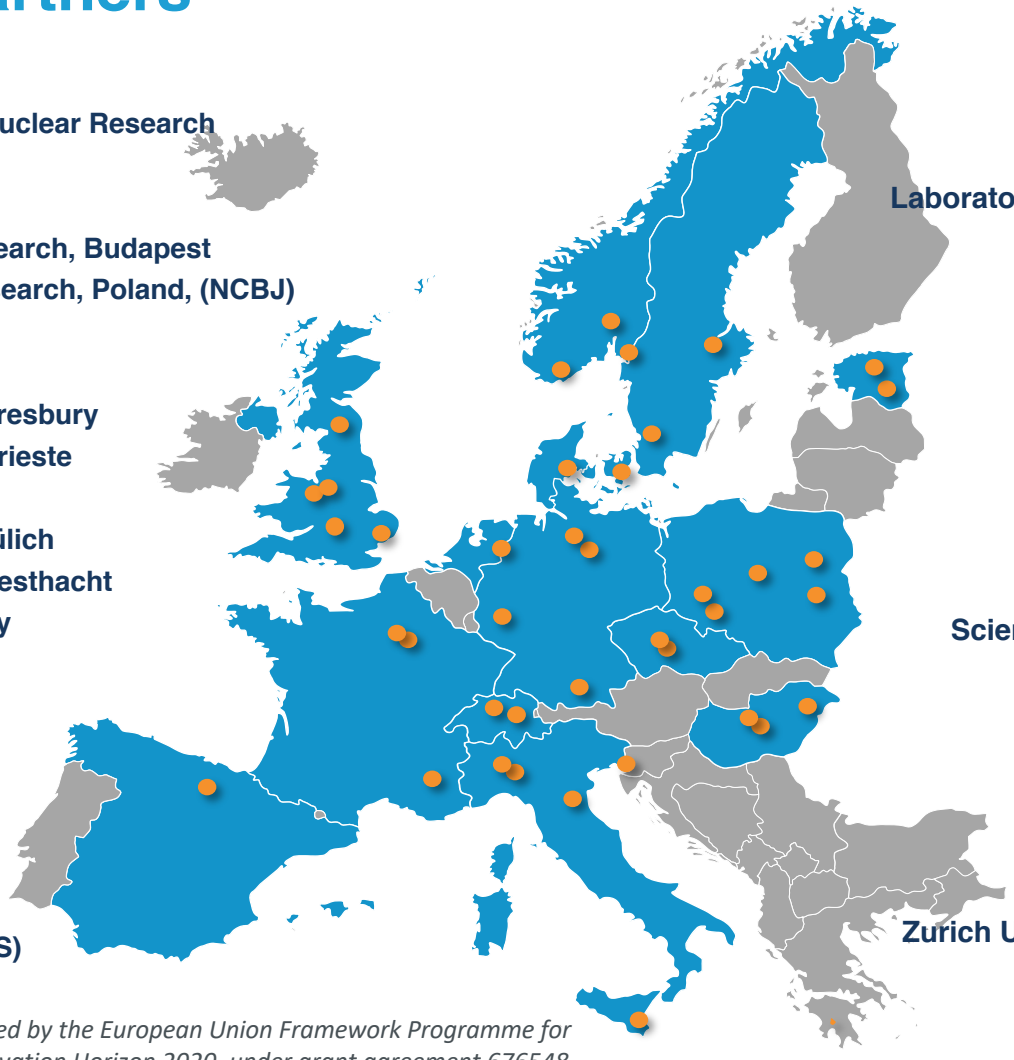
More information on europeanspallationsource.se/eoi.

ess EUROPEAN SPALLATION SOURCE


Results:
40
Events
2500
Participants
17
Countries
VOLVED

In-Kind Partners

Aarhus University
Atomki - Institute for Nuclear Research
Bergen University
CEA Saclay, Paris
Centre for Energy Research, Budapest
Centre for Nuclear Research, Poland, (NCBJ)
CNR, Rome
CNRS Orsay, Paris
Cockcroft Institute, Daresbury
Elettra – Sincrotrone Trieste
ESS Bilbao
Forschungszentrum Jülich
Helmholtz-Zentrum Geesthacht
Huddersfield University
IFJ PAN, Krakow
INFN, Catania
INFN, Legnaro
INFN, Milan
Institute for Energy Research (IFE)
Rutherford-Appleton Laboratory, Oxford(ISIS)

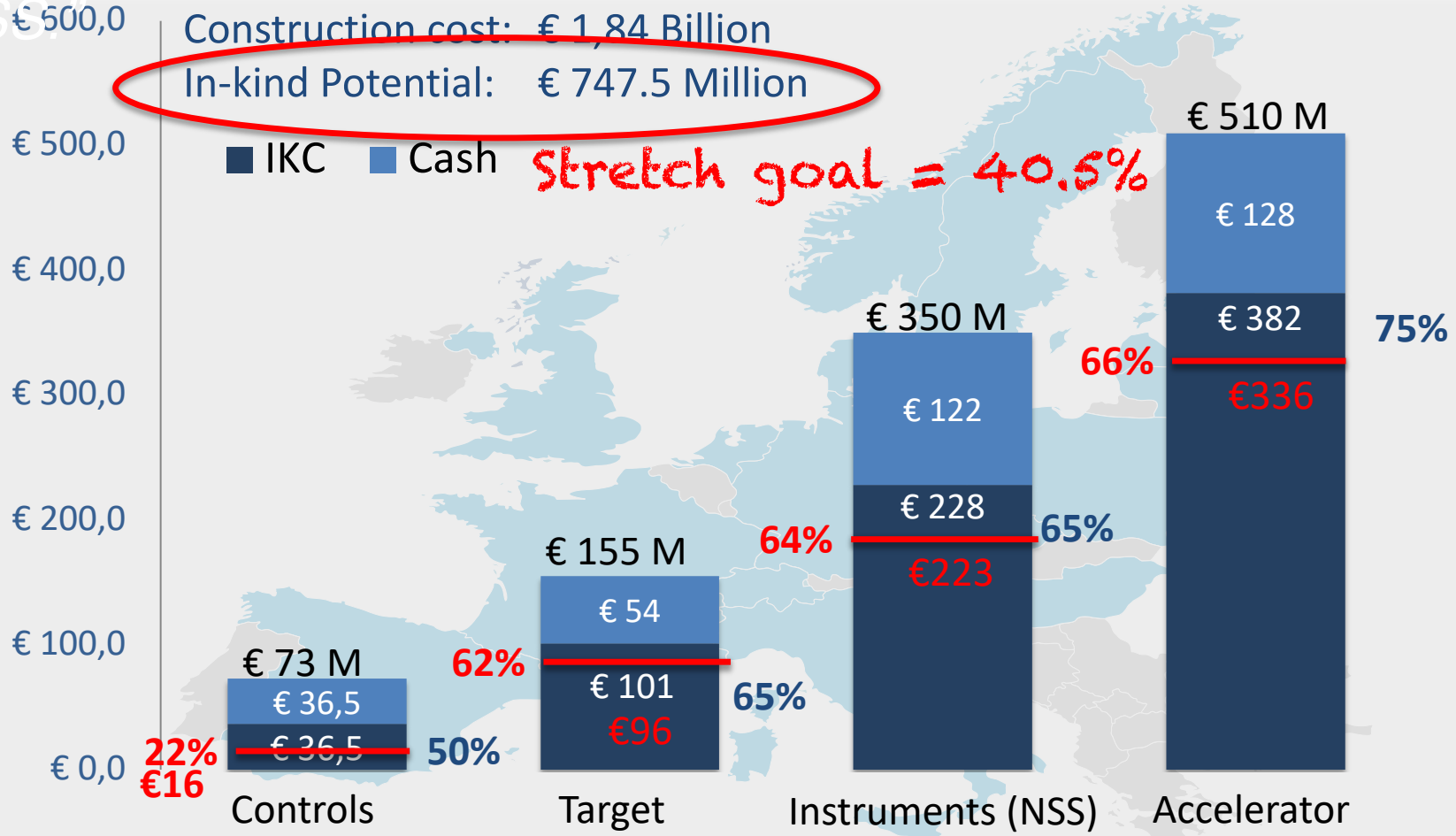


Kopenhagen University
Laboratoire Léon Brilouin (CEA – CNRS – LLB)
Lund University
Nuclear Physics Institute of the ASCR
Oslo University
Paul Scherrer Institute (PSI)
Polska Grupa Energetyczna - PGE
Roskilde University
Tallinn Technical University
Technical University of Denmark
Technical University Munich
Science and Technology Facilities Council
UKAEA Culham
University of Tartu
Uppsala University
WIGNER Research Centre for Physics
Wroclaw University of Technology
Warsaw University of Technology
Zurich University of Applied Sciences (ZHAW)

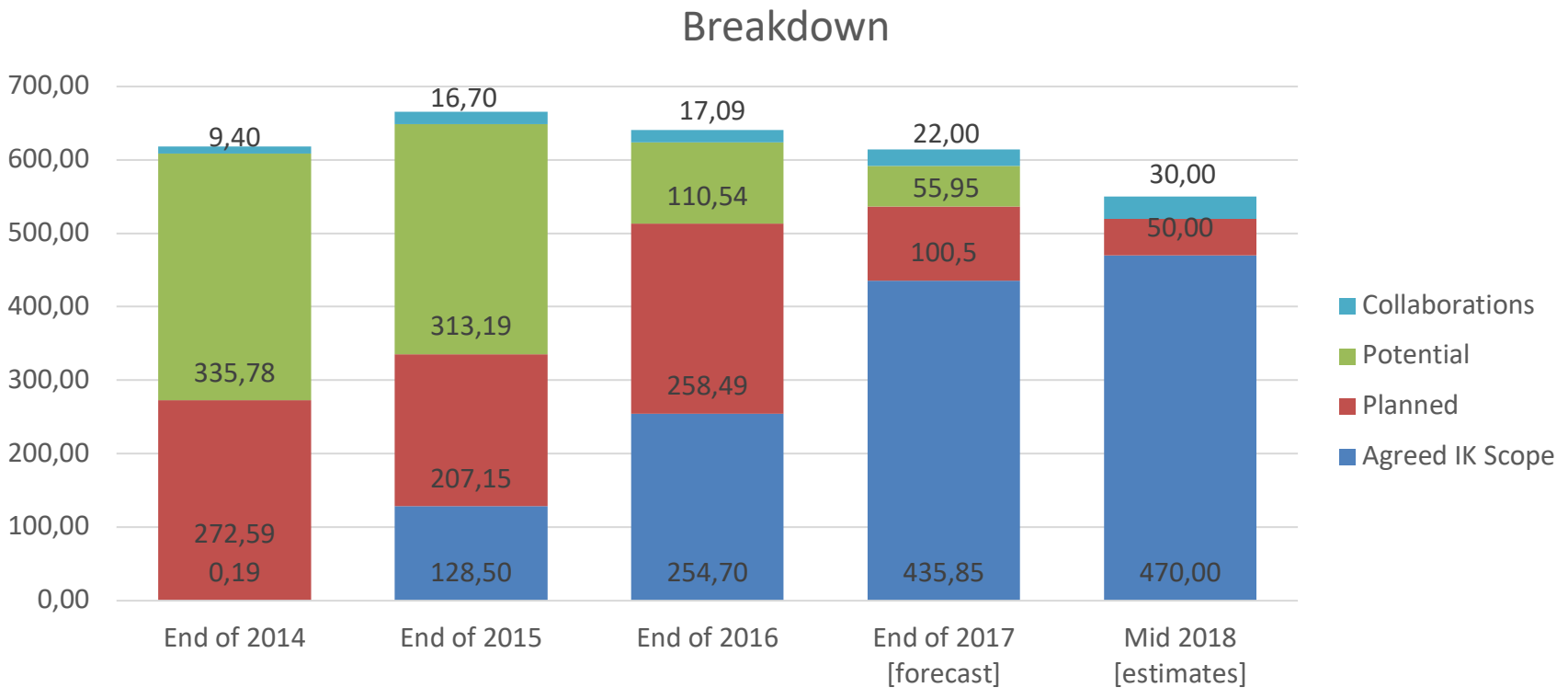
BrightnESS is funded by the European Union Framework Programme for Research and Innovation Horizon 2020, under grant agreement 676548

ESS In-kind Goals (based on 2013 Cost Book)

"*A non-cash contribution in labor or material to ESS.*"



Year by Year In-Kind planning



Phases of Enlargement

Phase 1: First Contact

Establish contact on political and scientific level

Phase 2: Collection of Information

Assessment of candidates background information

Phase 3: Awareness Raising

Organisation of joint activities to explore contribution and collaboration possibilities

Phase 4: Accession

Participation in Council Meeting, transition to Observer status

Phase 5: Establishing In-Kind Agreements

Identify partners for IKC and definition of financial commitment

Phase 6: Join the European Spallation Source

Finalisation of commitment and approval of Council for collaboration to continue

✓ Phase 1
✓ Phase 2
✓ Phase 3

✓ Phase 4
✓ Phase 5
✓ Phase 6

BrightnESS is funded by the European Union Framework Programme for Research and Innovation Horizon 2020, under grant agreement 676548

Consolidate Current Membership

Turn Observers into Members

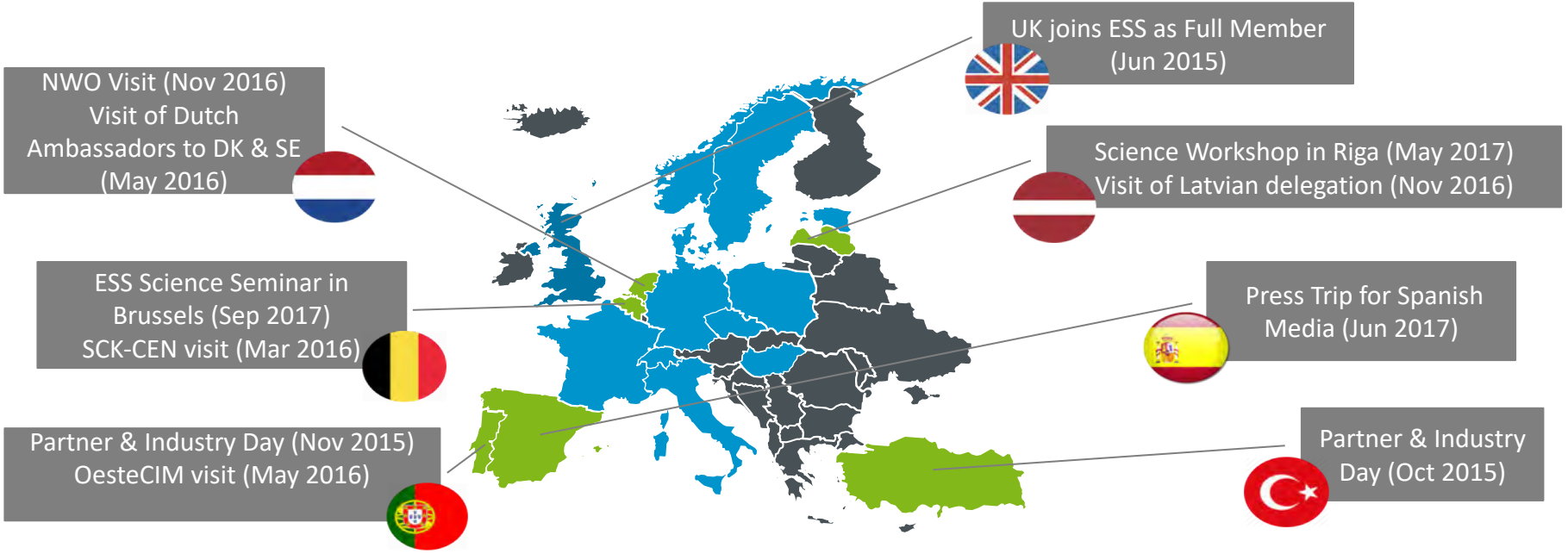

✓


✓…?


?


?

Enlargement Activities in Observer and ERA Countries



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Enlargement Activities
Cooperation Beyond Europe

EUROPEAN SPALLATION SOURCE

South Africa

- ESS will host a scientific delegation from South Africa in late 2017 or early 2018 to discuss collaboration opportunities
- ESS Director for Science participated in the Annual Conference of the South African Institute of Physics (SAIP) in Jul 2017

Brazil

- Presentation about ESS at Brazilian universities by ESS Partner, Julich
- José Roque da Silva, Director of the Brazilian Synchrotron Light Laboratory (LNLS), visited ESS, Jun 2016
- ESS and high-level delegation from SE participated in the "Brazil-Sweden Excellence Seminar" in Brasilia, May 2016

China

- ESS hosted professors from the Chinese Academy of Sciences in Dec 2015
- ESS signed MoUs with two institutes at the Chinese Academy of Sciences, i.e. the Institute of High Energy Physics (IHEP), and the Institute of Modern Physics (IMP)
- ESS hosted representative of the China Spallation Neutron Source (CSNS)

India

- ESS Director for Science participated in the 6th Conference on Neutron Scattering (CNS2016) at the Bhabha Atomic Research Centre (BARC) in Mumbai in November 2016

Japan

- ESS will host a joint workshop with J-PARC in Lund in Jan 2018
- MIRAI workshop will take place in Lund in Oct 2017
- ESS and J-PARC signed a new Memorandum of Collaboration in Jul 2017
- Director of J-PARC, Prof. Saito visited ESS in Jan 2017 to plan a joint MIRAI workshop together with Lund University and ESS

BrightnESS is funded by the European Union Framework Programme for Research and Innovation Horizon 2020, under grant agreement 676548

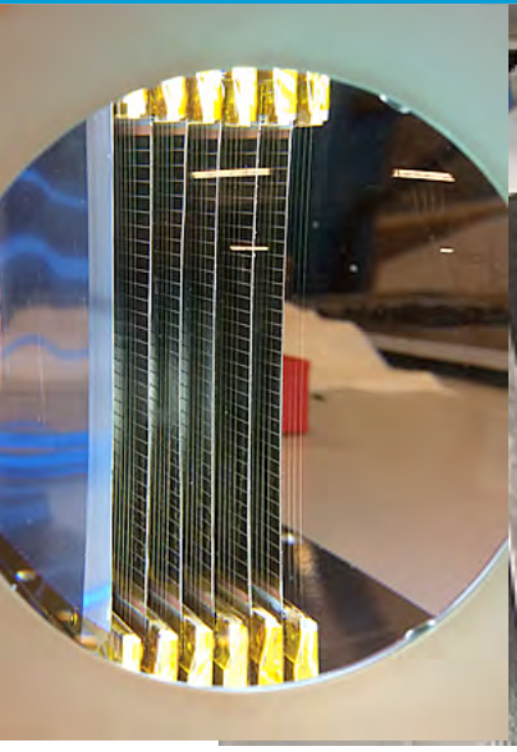
brightness

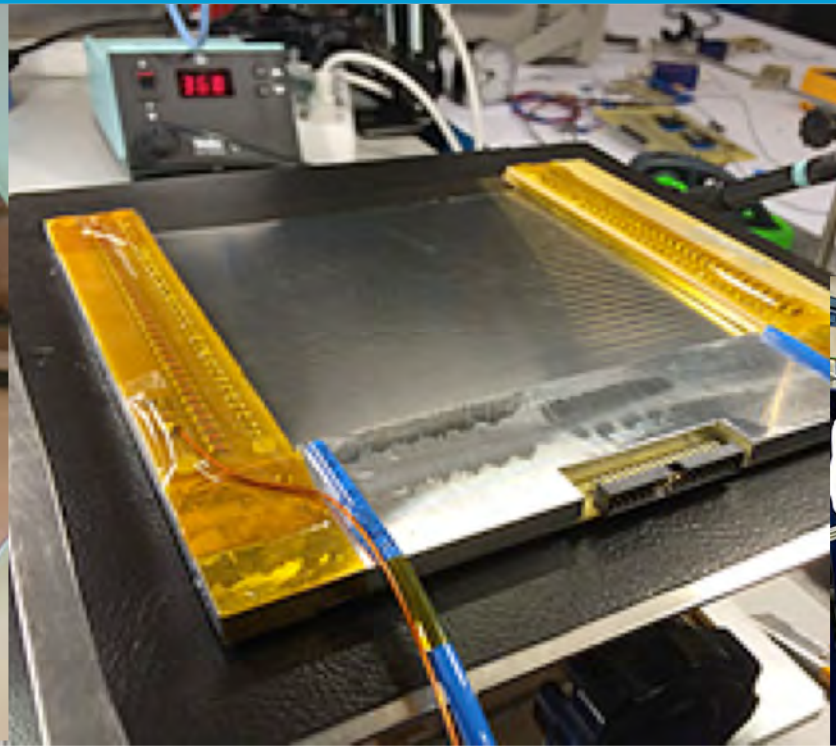
Canada moving toward membership

- ESS Visited Canadian Neutron Users in November 2016
- Canadian Governor General, Science Minister Feb. 2017
- Canadian Delegation of leading neutron scientists

BrightnESS is funded by the European Union Framework Programme for Research and Innovation Horizon 2020, under grant agreement 676548

Boron-10 Detectors





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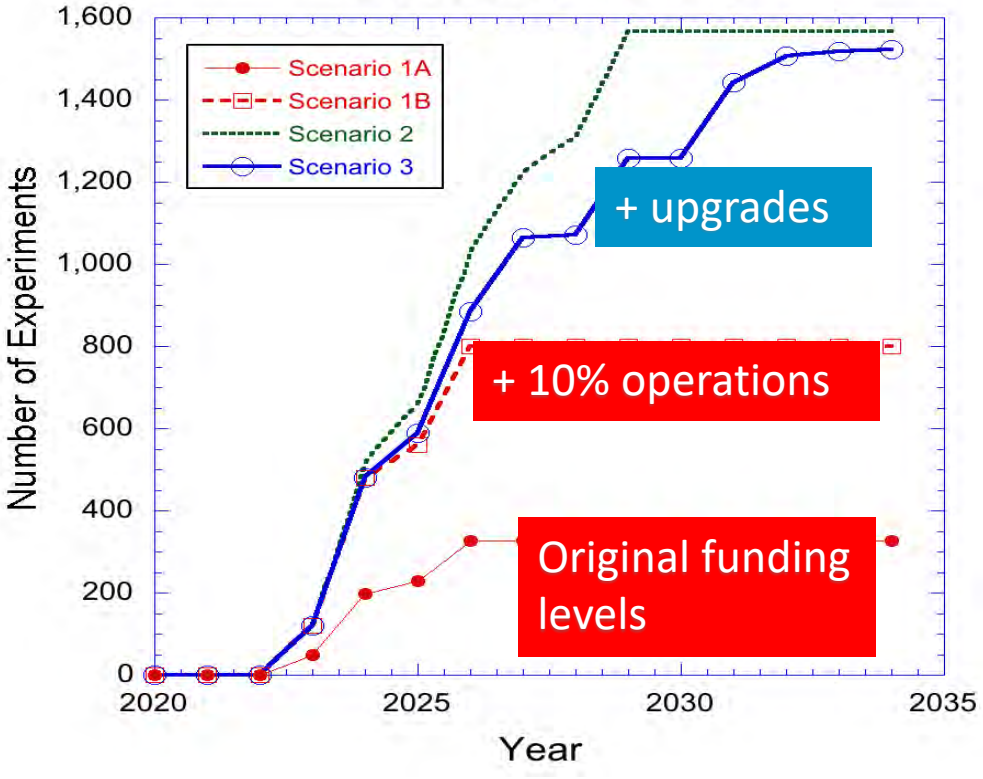
Construction Making Progress

- ESS is 40% complete as of mid June 2017
- Rapidly approaching the peak of construction
- First six buildings handed over from Skanska to ESS
- Staff moving to site in June 2018

Operations Planning



1. Ensure that the full baseline funding level (1843 M€$_{2013}$ plus host state contributions) is available. **Ensures completion of the facility for initial science.**
2. Sufficient spares and capital investment in initial operations. **Ensures reliable operation of the facility for initial science.**
3. Rolling programme of additional instruments and instrument upgrades. **Ensures the ongoing scientific excellence of the facility**.

The European Spallation Source ERIC Statutes

Art. 17, "Scientific Evaluation And Access Policy"

1. [ESS] shall provide effective access for European ***and international*** researchers as well as other relevant users. ***Access to the ESS shall be based on peer-review evaluation with scientific excellence and feasibility as criteria*** …
2. ***The ESS shall be open for access to others than members. Such access shall be open to European as well as international users***

EN Official Journal of the European Union

COMMISSION IMPLEMENTING DECISION (EU) 2015/1478

of 19 August 2015

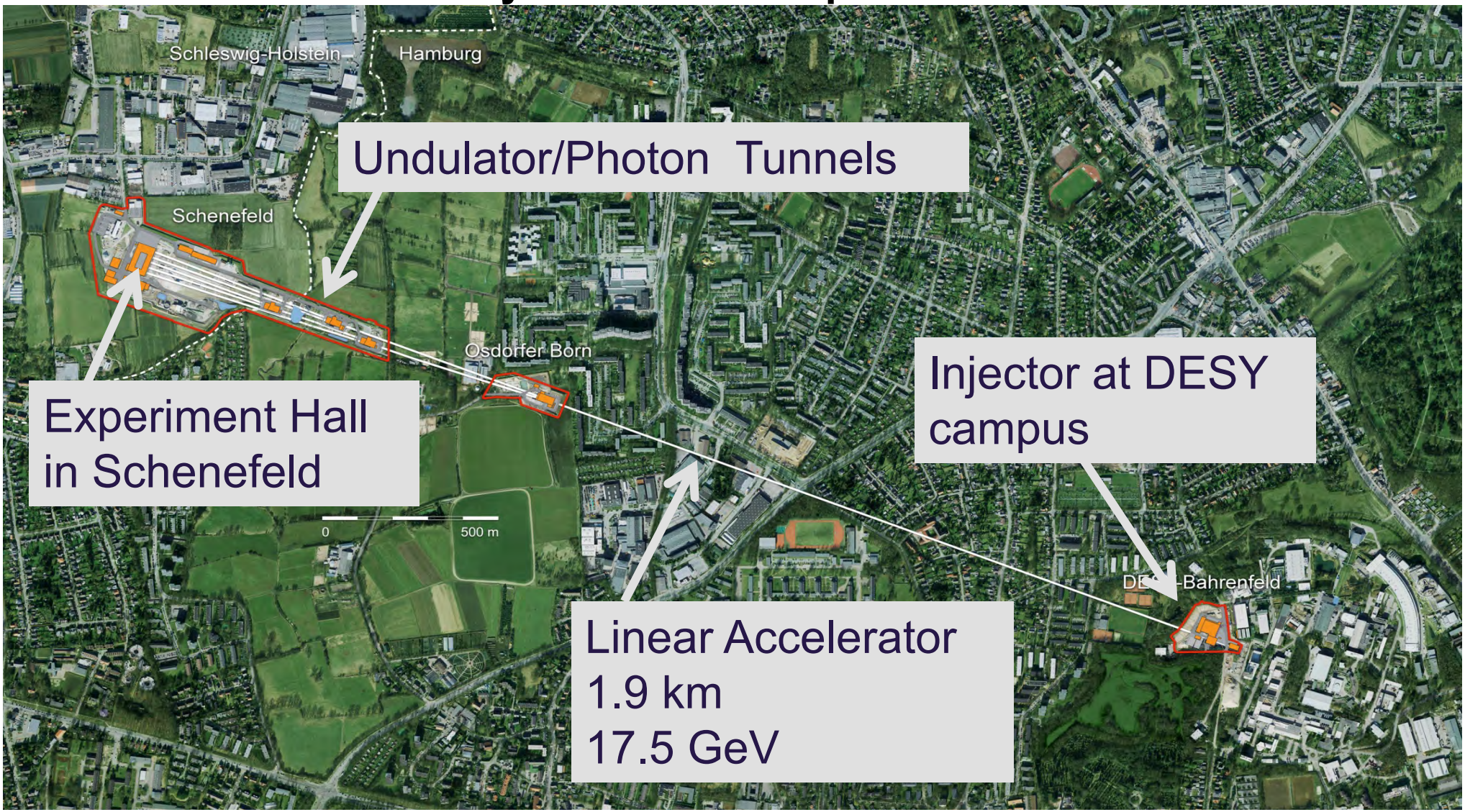
on setting up the European Spallation Source as a European Research Infrastructure Cor
(European Spallation Source ERIC)


EUROPEAN
SPALLATION
SOURCE

The European X-Ray Free Electron Laser (European XFEL)

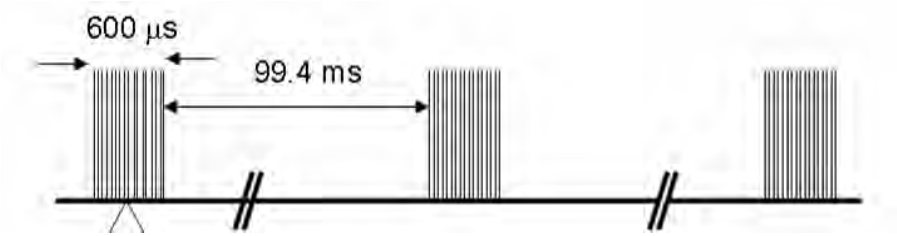
Michael Meyer, European XFEL GmbH

General layout of the European XFEL



Parameters European XFEL

Parameter	Value
Electron Energy	8.5 – 17.5 GeV
Photon energy	0.26 - >20 keV
Pulse duration	1 – 100 fs
Seeding	In preparation
# of pulses	27000 /s
# of FELs	3
# of instruments	6
Start of operation	2017



Electron & x-ray beam delivery pattern

- Follows from pulsed RF system
- Trains of e-/x-ray pulses
- Max. = 2.700 per train / 27.000 per sec

- High average brilliance
- Feedback & time and space stabilization
- Dedicated pulse delivery

Key x-ray FEL properties & their application

Ultrashort pulses

1 – 100 fs

Coherence

Fully transverse

Partially temporal

Intensity/power

up to few mJ

up to 10^{20} W/cm^2

Structural dynamics

Measurement of atomic and electron dynamics with high spatial [0.1 nm] and temporal [10 fs] res.

► physics, materials sciences, chemistry, life science

Imaging at the nanoscale

Imaging experiments on confined and extended objects with atomic to mesoscale resolution [0.1 – 1000 nm].

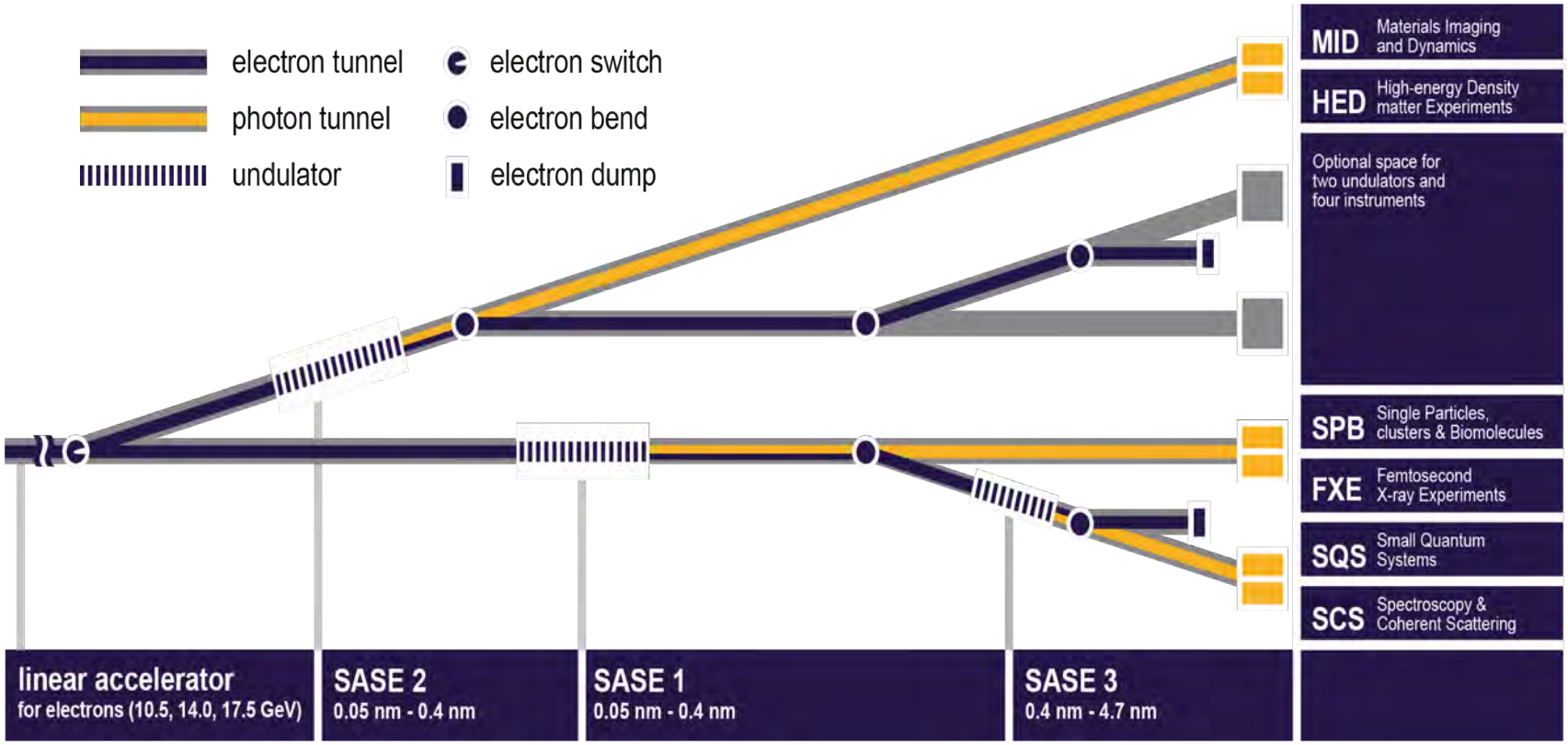
► physics, materials sciences, chemistry, life science

Non-linear x-ray science

Start using non-linear techniques to obtain otherwise hidden information (off-diagonal elements in reaction matrices)

► physics, chemistry

Beamline layout & experiment stations



Photon beamlines

Hard x-rays

SPB : Ultrafast Coherent Diffraction Imaging of Single Particles, Clusters, and Biomolecules

- Structure determination of single particles: atomic clusters, bio-molecules, virus particles, cells.

MID : Materials Imaging & Dynamics

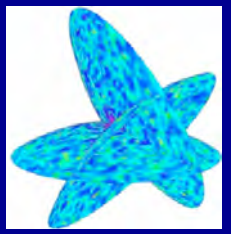
- Structure determination of nano- devices and dynamics at the nanoscale.

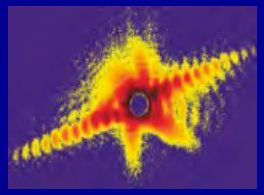
FXE : Femtosecond X-ray Experiments

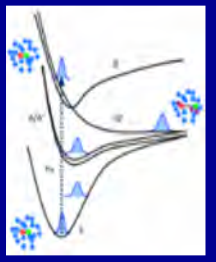
- Time-resolved investigations of the dynamics of solids, liquids, gases

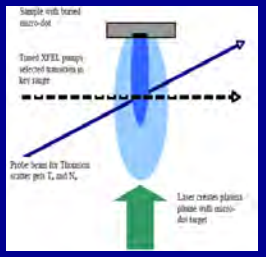
HED : High Energy Density Matter

- Investigation of matter under extreme conditions using hard x-ray FEL radiation, e.g. probing dense plasmas









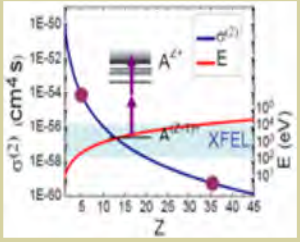
Soft x-rays

SQS : Small Quantum Systems

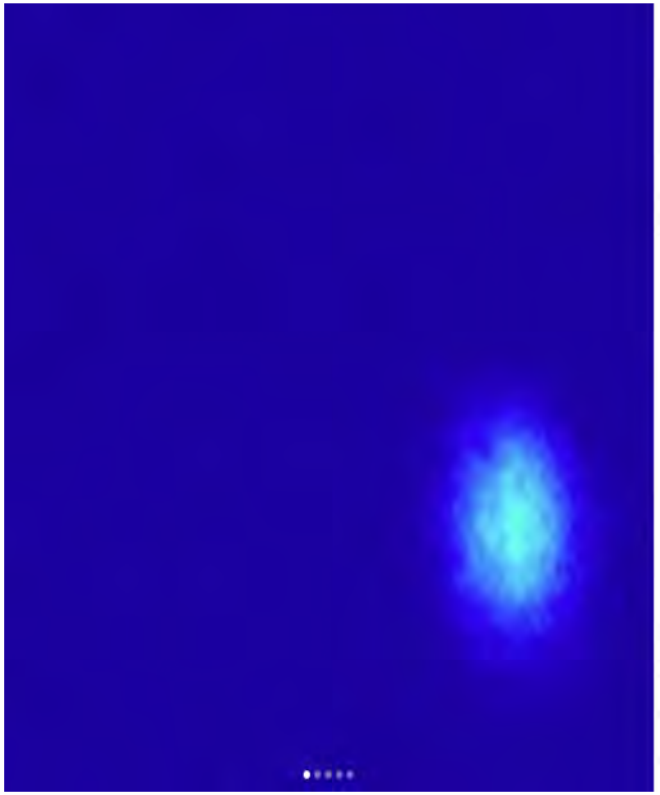
- Investigation of atoms, ions, molecules and clusters in intense fields and non-linear phenomena

SCS : Soft x-ray Coherent Scattering/Spectroscopy

- Structure and dynamics of nano-systems and of non-reproducible biological objects



First lasing SASE1 May 2, 2017 @ 9Å



Inauguration September 1 2017

About the European XFEL

- Start 2009
- Task : Construction and running of the X-ray Laser Facility
- Germany (Bund, Hamburg (65 M€) und Schleswig-Holstein (25M€)) 58%, Russia 27 %, Denmark, France, Hungary, Italy, Poland, Slovakia, Spain, Sweden, Switzerland 1–3%
- DESY operates the accelerator
- Staff XFEL about 350, Staff @ DESY about 250
- Start of operation 1. July 2017
  - 1,22 Mrd. € (2005 prices)
  - 600 Mio € in cash, 600 Mio € in-kind
  - Yearly running costs 117,6 Mio € (2018)

User Consortia

- Integrated Biology Infrastructure Life-Science Facility at the European XFEL (XBI)

Members: Arizona State University, EMBL, Uppsala University, University of Oulu, University of Hamburg, University Hospital Eppendorf, and Slovak Academy of Sciences.

- Serial Femtosecond Crystallography (SFX)

Led by DESY, and includes strong Swedish, UK, and Slovak contributions

- Helmholtz International Beamline for Extreme Fields at the European XFEL (HIBEF)

Led by HZDR and includes DESY (both research centres of the Helmholtz Association), plus many partners outside of Germany.

- COMO

Led by DESY, includes University of Aarhus, European XFEL

- Heisenberg Resonant Inelastic X-ray Scattering (h-RIXS)

Current members: University of Potsdam, DESY, and University of Milan.

User Access Policy

- "*Beam time will be allocated based on scientific excellence of the proposals. Priorities will be decided by peer review committees composed of highly qualified scientists, mainly from the community of Contracting Party countries and associated partners.*" [Policy for the allocation of beam time at the European XFEL]
  - Main allocation criteria is scientific excellence
  - Peer-review by expert committees
  - 2 allocation cycles per year (incl. possibility of short-term & long- duration)
  - Non-proprietary research → publication
  - Specific rules for proprietary research (to be written)

- No specific provisions are made for the distribution of user time amongst contracting partner countries, and even with respect to non-contracting partner countries. The reason is the vision to enable performance of the scientifically best proposals.

Distribution of beam time

- Various modes of beam time (hours/year)
  - Allocation time for peer-reviewed exps. ~4000 hrs
  - Instrument development time ~800 hrs (20%)
    - ► Actually original thought was that 20% of total time for instruments is not to be subjected to peer-review.
    - ► Includes “Maintenance, upgrading and development of the photon beam systems and the instruments, and in-house research” (15%)
    - ► Includes Mgmt contingency “to allow rapid access to beamlines for high priority work & beam time for projects involving industry-based proposers and providing potential for industrial application.” (5%)
  - Accelerator development time ~800 hrs (20%)

- Priority access for User Consortia
  - Should not exceed a volume of 30% of total time at a given instrument in any allocation period
  - In principle limited to 3 yrs after commissioning of UC contribution, but this was softened for large contributions (e.g. HIBEF)

Support access to European XFEL

- European XFEL will cover access costs (travel, accommodation, meals) of up to six scientists per scientific proposal in the regular peer review process. These scientists need to have affiliations from contracting party countries. Scientists from non-contracting countries will not be eligible. Nor will Priority Access proposals by User Consortia.

Accounting of use

- Measuring scientific usage
  - No distinction between regular and contributed (e.g. UC) instruments
  - Time assigned to UCs as ‘priority access’ time shall not be accounted
  - Define usage
    - ► Use allocated user time (No. of 12 hr shifts)
    - ► Divide number of allocated shifts by accountable institutes. Attribute to each country the sum of ‘shifts’ considering the institutes in that country.
    - ► Relate to total number of shifts provided in user-mode
  - Definition of accountable institutes (countries)
    - ► Institutes according to list of proposers on submitted proposal
    - ► Internationally funded institutes will be done according to respective shares
    - ► Institutes from non-contracting party countries will not be considered

- Application with 3-yrs rolling for averaging
  - Evaluate yrs n-3 to n-1 (e.g. evaluate in 2021: ‘18, ‘19, ‘20)
  - Apply yr n+2 (then: apply to budget 2023)

Proposal submission and review

- At deadline 63 proposals (37 FXE; 26 SPB/SFX incl. 3 community proposals) received
- These were scrutinized for safety aspects and technical feasibility
- In parallel, they were sent to the members of two Proposal Review Panels (PRP) for an initial assessment.
- The PRPs met on May 11+12, 2017 in Schenefeld for in-person meetings to establish a final ranking
- PRP rankings were made available by May 22, 2017
- Subsequent the PRP lists were used to make a final allocation of experiment proposals
  - Technical feasibility
  - Modified availability of all subsystems
  - Maximize number of user groups provided experiment time
  - Definition of shifts
- Allocation of 14 experiment proposals (out of 63) corresponds to ~20%

Some user statistics

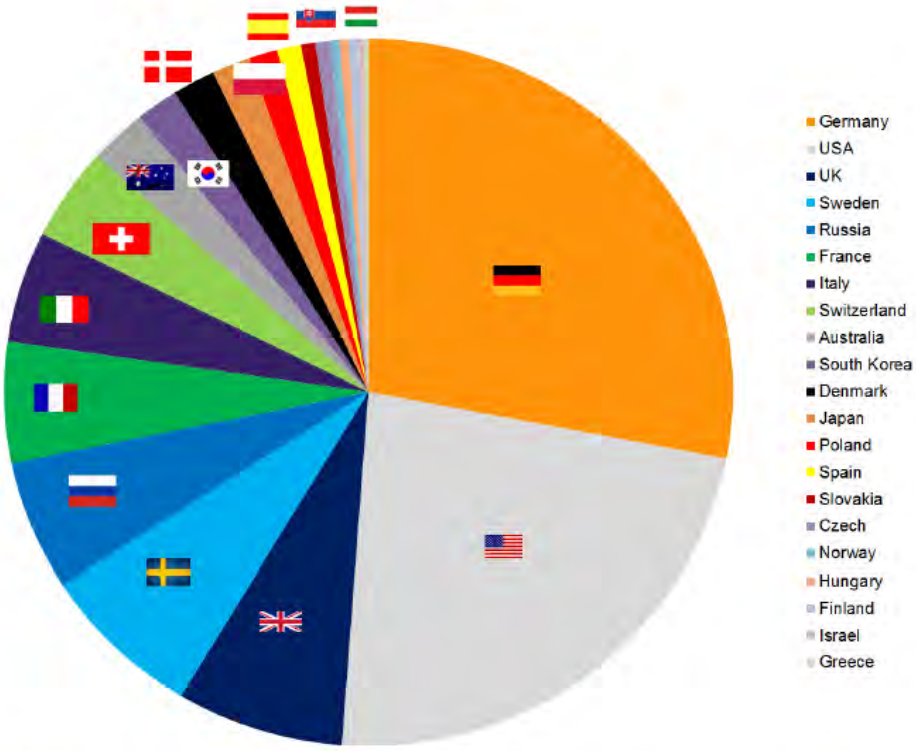


Figure 11: Number of co-proposers per country (except European XFEL)

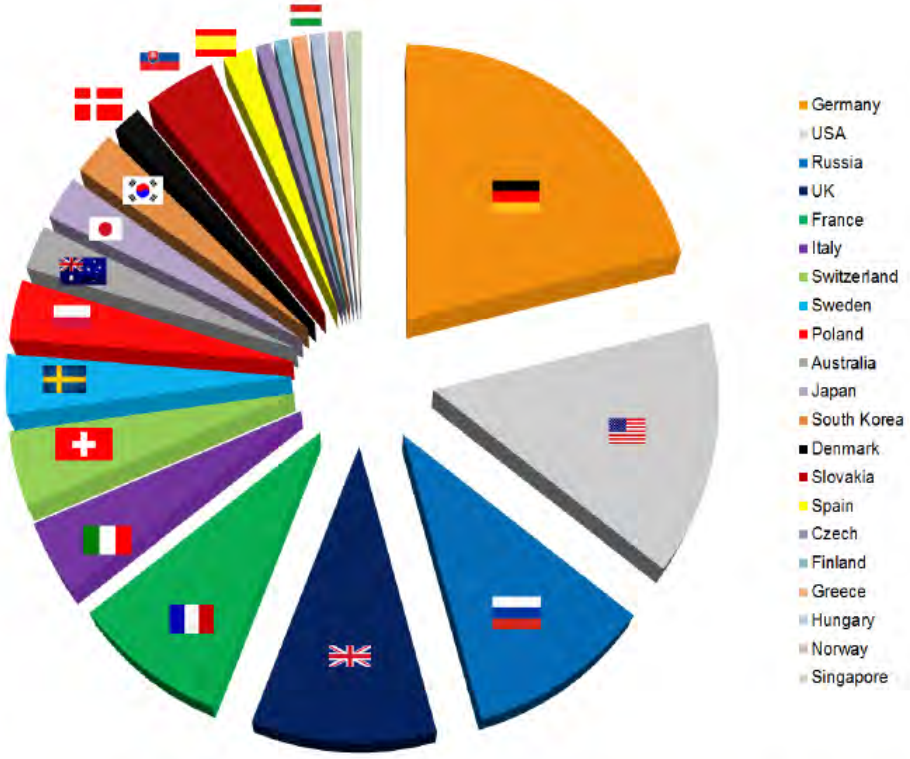


Figure 12: Institutions on proposals per country (excluding international institutions)

2018 Calls for Proposals

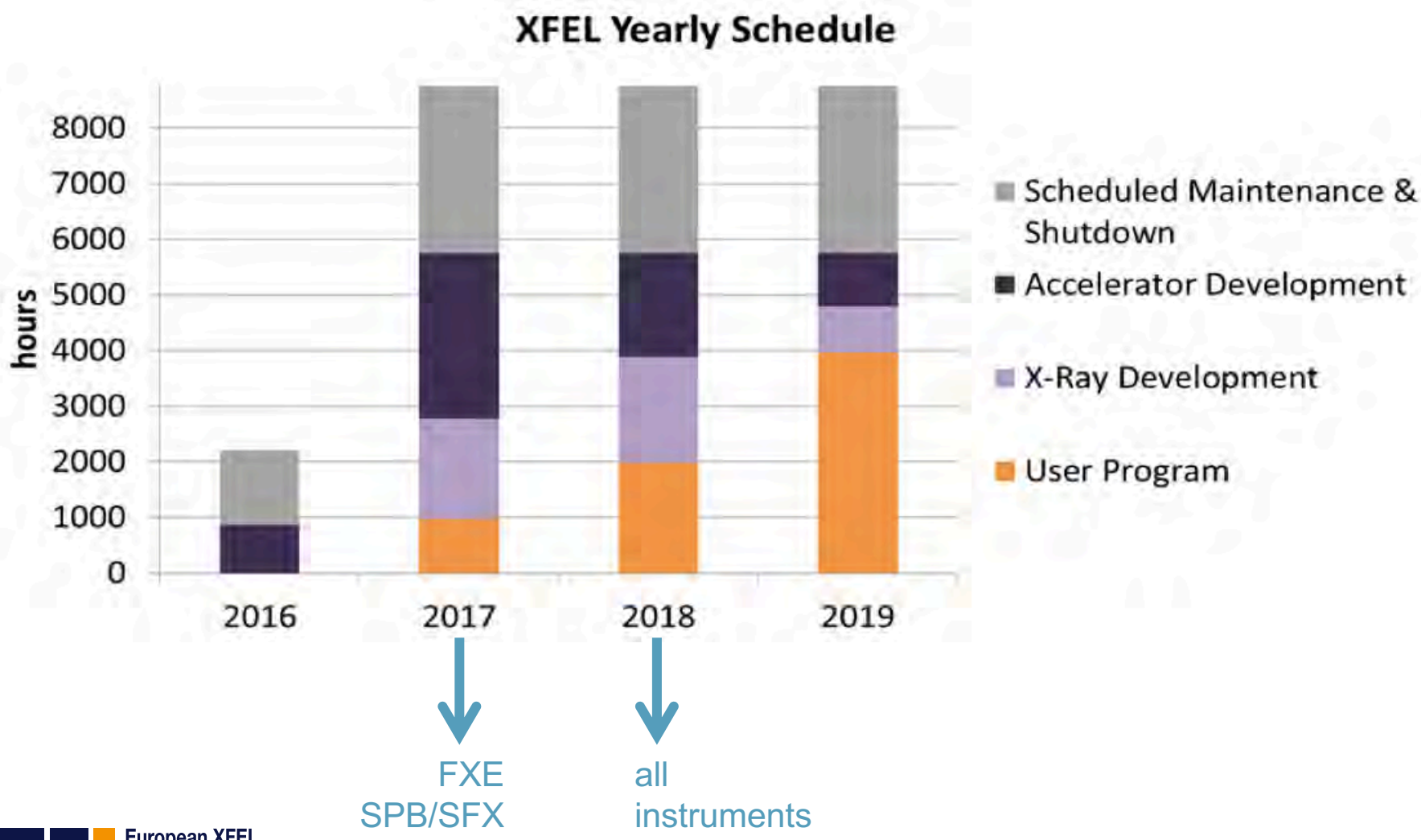
2nd CfP

- Opened: Oct 2017; Deadline: 16 Nov 2017; PRP: Jan 2018; Info: Mar 2018; Allocation: May/Jun 2018 → **Allocation period in Q2-2018**
  - ~800 hrs
  - Only FXE & SPB/SFX will be able to receive users then
  - New/enhanced functionality and performance at both instruments

3rd CfP

- Open: Jan 2018; Deadline: Mar 2018; PRP: May 2018; Info: Jul 2018; Allocation starting Sep 2018 → **Allocation period in Q3+Q4-2018**
  - ~1200 hrs
  - All instruments (HED possibly for a reduced period)

Ramping up user operation



Thank you for your attention