## Document information

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<th>Deliverable no.</th>
<th>D6.3</th>
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<tr>
<td>Deliverable title</td>
<td>Foresight document following workshop in internationalization, access and user policy, governance of user facilities</td>
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<td>Deliverable responsible</td>
<td>CEA</td>
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<td>Related Work-Package/Task</td>
<td>WP6/Task. 6.3</td>
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<td>Type (e.g. Report; other)</td>
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<tr>
<td>Author(s)</td>
<td>C. Miron</td>
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<tr>
<td>Dissemination level</td>
<td>PU</td>
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<tr>
<td>Submission date</td>
<td>16-03-2018</td>
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<tr>
<th>Project full title</th>
<th>Connecting Russian and European Measures for Large-scale Research Infrastructures</th>
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<tbody>
<tr>
<td>Project acronym</td>
<td>CREMLIN</td>
</tr>
<tr>
<td>Grant agreement no.</td>
<td>654166</td>
</tr>
<tr>
<td>Instrument</td>
<td>Coordination and Support Action (CSA)</td>
</tr>
<tr>
<td>Duration</td>
<td>01/09/2015 – 30/08/2018</td>
</tr>
<tr>
<td>Website</td>
<td><a href="http://www.cremlin.eu">www.cremlin.eu</a></td>
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This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No. 654166.
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1. Introduction

This document reports on the conclusions of the Round Table on Internationalization of the XCELS project organized by the lead beneficiary Commissariat à l’Energie Atomique (CEA) on 7 and 8 December 2018 on the premises of the Extreme Light Infrastructure Nuclear Physics (ELI-NP) in Bucharest-Mâșturele, Romania.

The event gathered, in addition to the CEA and the Russian promoters of the XCELS project from the Institute of Applied Physics (IAP) Beneficiaries representatives, a representative of the European Commission, as well as representatives of the management of key European Research Infrastructures: European XFEL, ELI-DC, ESS, ESRF, ILL, and of the LaserLab Europe network.

During the 1st day of the event, the participants had the opportunity to visit the new ELI-NP facility, which hosted the event in Mâșturele, Romania.

![Visit of the ELI-NP facility on December 7th, 2017.](image)

The promoters of XCELS project presented its present status, the European ambition and the approximate schedule for XCELS' implementation, the representative of the European Commission described the strategy of DG Research in supporting research infrastructures development strategy in Europe, and in particular dedicated actions aiming at supporting cooperation in this area with the Russian Federation, whereas the leaders of the European
Research Infrastructures addressed, for their facilities, the key figures related to user access and international cooperation, formulating recommendations for the requirements and expectations concerning the fundamentals of internationalization, user access policy and governance.

A significant amount of time was left for vivid discussions among the participants.

The conclusions and recommendations resulting from the roundtable discussion are summarized in Section 2, whereas the Annexes are presenting the Agenda of the meeting, the list of participants, and the presentations delivered during the event.

2. Main conclusions and recommendations concerning the internationalization of XCELS project

2.1 Conclusions

- The XCELS project is a very challenging ultrahigh power laser-based research infrastructure, mainly dedicated to academic research, to be implemented under the responsibility of the Institute of Applied Physics of the Russian Academy of Sciences (IAP-RAS) in Nizhny Novgorod, Russian Federation;
- The funding of the XCELS project by the Russian government has not been committed so far, but funding has been secured in order to build, between 2019 and 2022, a 2-chanel prototype (15 PW each), as a demonstrator for the technologies behind XCELS;
- The time schedule of the project aims at completing it by 2025;

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<thead>
<tr>
<th></th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
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<td>Two prototype 15 PW lasers</td>
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<td>200 PW laser system</td>
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*Figure 2 - Implementation schedule of XCELS.*
The proposed governance by the promoters of XCELS is a Limited Liability Company under Russian Federation’s law, whose supreme body is a Council of Plenipotentiaries of the governments of all Member States. The proposed executive body is a Management Board (MB). The Council would appoint the members of the MB, as well as the members of the Scientific Advisory Committee (SAC) and Machine Advisory Committee (MAC);

- There is already a preliminary design of the buildings prepared.
- XCELS intends to become an active actor of the European Research Area (ERA) by offering access to the European users;
- The promoters of the XCELS project consider as a possible way of European integration of the XCELS project, applying to become a new pillar of the Extreme Light Infrastructure (ELI), currently in final implementation stage on three sites in the Czech Republic, Hungary and Romania.

2.2 Recommendations

- As a pre-requisite for starting negotiations with possible international partners, the XCELS project team is recommended to prepare a business model and a detailed business plan covering both the construction and the operation\(^1\) phases.
- The internationalization of XCELS project necessitates the implementation of governance structures, as well as of scientific and technical advisory bodies according to the international standards and practices;
- User access to the research facilities should be granted based on the scientific excellence of the experimental proposals as evaluated by an international Peer Review Panel (PRP);
- Training of the mid- and top-management of XCELS should be considered within one of the frameworks provided or supported by the current European Commission H2020 programs (specialized training programs, staff exchange);
- XCELS project should contact and initiate discussions with the Laserlab Europe network to identify possible collaboration ways with this network;
- As XCELS project is interested in establishing a long-term collaboration with the Extreme Light Infrastructure, the RAS is encouraged to establish contacts with the ELI-DC in view of exploring the modalities of engagement and participation of the Russian Federation in the ELI-ERIC infrastructure currently under creation, possibly as a Strategic Partner.

\(^1\) For instance, aspects such as the proposed staff status (international vs. national), with consequences on the operation costs, should be detailed.
3. Conclusion

A roundtable was organized by the CEA and hosted by the ELI Nuclear Physics in Romania on 7-8 December 2017 on the topic of the internationalization of the XCELS project promoted by the IAP-RAS. The roundtable involved key representatives if the EC, of main EU research infrastructures in physical sciences. The discussion lead to a set of conclusions and recommendations, which are summarized in the present deliverable.
Annex I – Agenda of the event

CREMLIN WP6 Round Table on:
Internationalization of the XCELS project

7 December 15:00 EET - 8 December 2017 14:00 EET
ELI Nuclear Physics, Bucharest-Măgurele, Romania

Objective:

This CREMLIN Round Table is devoted to the discussion and preparation of the introduction of fundamentals of an international access, user, and governance policies for the Russian XCELS Exawatt laser project, hosted at the Institute of Applied Physics (IAP) of the Russian Academy of Sciences.

The round table is an event within CREMLIN WP6 Science cooperation with XCELS in the field of high power laser research, Task 6.3 Internationalization, access and user policy, governance of laser user facilities.

Lead beneficiary: CEA

Related CREMLIN Deliverable: D6.3 Foresight document describing fundamentals of international access, user, and governance policy for XCELS [Public]
# Agenda

**Thursday, 7 December 2017**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>15:00-16:00</td>
<td><em>Welcome coffee – ELI-NP Meeting Room (ground floor)</em></td>
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<tr>
<td>16:00-16:30</td>
<td><strong>ELI-NP – A unique RI in Nuclear Physics</strong></td>
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<td></td>
<td>Nicolae Victor Zamfir – ELI-NP – Director of ELI-NP project</td>
</tr>
<tr>
<td>16:30-18:00</td>
<td><em>Visit of the ELI Nuclear Physics facility</em></td>
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<tr>
<td>18:00-18:45</td>
<td><em>Transfer to Bucharest</em></td>
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<tr>
<td>19:30-22:30</td>
<td><strong>Networking dinner</strong></td>
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<td></td>
<td>Location: Restaurant “The Artist”, Calea Victoriei 147, București 010073</td>
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</tbody>
</table>

**Housing at the Sheraton Bucharest Hotel,** Calea Dorobanților 5-7, Bucharest, 010551, Romania

**Friday, 8 December 2017**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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</thead>
<tbody>
<tr>
<td>09:00-09:10</td>
<td><em>Welcome and introduction</em></td>
</tr>
<tr>
<td></td>
<td>Catalin Miron – CEA Paris-Saclay – CREMLIN WP6 Leader</td>
</tr>
<tr>
<td>09:10-09:40</td>
<td><strong>The international dimension of EU policy and activities on Research Infrastructures</strong></td>
</tr>
<tr>
<td></td>
<td>Philippe Froissard – European Commission – Deputy Head of Unit Research Infrastructures, DG RTD, B4</td>
</tr>
<tr>
<td>09:40-10:10</td>
<td><strong>The European ambition of XCELS project</strong></td>
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<td></td>
<td>Alexander Sergeev – IAP/RAS – President of the Russian Academy of Sciences</td>
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<tr>
<td>10:10-10:30</td>
<td><em>Coffee Break and group picture</em></td>
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**Session II**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>10:30-10:50</td>
<td><strong>The Extreme Light Infrastructure – a RI of pan-European dimension for laser research and applications</strong></td>
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<tr>
<td></td>
<td>Carlo Rizzuto – ELI-DC AISBL – Director General</td>
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<tr>
<td>10:50-11:10</td>
<td><strong>The European Synchrotron Radiation Facility – a pioneer</strong></td>
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<td></td>
<td>Harald Reichert – ESRF – Director of Research in Physical Sciences</td>
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<tr>
<td>11:10-11:30</td>
<td><strong>Institut Laue Langevin (ILL) – 50 years of the first international scientific user facility</strong></td>
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<td></td>
<td>Jiri Kulda – ILL – Senior Scientist</td>
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<tr>
<td>11:30-11:50</td>
<td><strong>Laserlab Europe – user access, networking and joint research across Europe</strong></td>
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<td></td>
<td>Philippe Martin – CEA Paris-Saclay – Director of LIDYL</td>
</tr>
<tr>
<td>11:50-12:10</td>
<td><strong>The European Spallation Source (ESS)</strong></td>
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<td></td>
<td>Allen Weeks² – on behalf of the European Spallation Source</td>
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<tr>
<td>12:10-12:30</td>
<td><strong>The European X-ray Free Electron Laser (European XFEL)</strong></td>
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<tr>
<td></td>
<td>Michael Meyer – European XFEL – Leading scientist</td>
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<tr>
<td>12:30-12:45</td>
<td><em>Discussions / Wrap-up</em></td>
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<td></td>
<td>Frank Lehner – DESY – International Cooperation and Strategic Partnerships</td>
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<tr>
<td>12:45-13:30</td>
<td><strong>Buffet lunch</strong></td>
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<tr>
<td>13:30</td>
<td><strong>Participants departure</strong></td>
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</table>

*Round table Organizer:* Catalin Miron, catalin.miron@cea.fr, CEA Paris-Saclay

*Event host:* ELI Nuclear Physics, 30 Reactorului Street, PO Box MG-6, Măgurele, 077125 Romania

*Contact:* Ms. Catalina Oprea, catalina.oprea@eli-np.ro, Mobile phone: +40 731 525 179

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² Now Associate Director for Members and Stakeholders Relations at ELI-DC AISBL.
Annex II – List of participants

<table>
<thead>
<tr>
<th>NO.</th>
<th>NAME</th>
<th>AFFILIATION</th>
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<tr>
<td>1</td>
<td>FROISSARD Philippe</td>
<td>EU Commission</td>
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<tr>
<td>2</td>
<td>KOSTYUKOV Igor</td>
<td>IAP-RAS</td>
</tr>
<tr>
<td>3</td>
<td>KUZMIN Aleksei</td>
<td>IAP-RAS</td>
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<td>4</td>
<td>MARTIN Philippe</td>
<td>CEA</td>
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<tr>
<td>5</td>
<td>MEYER Michael</td>
<td>European XFEL</td>
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<td>6</td>
<td>MIRON Catalin</td>
<td>CEA</td>
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<td>7</td>
<td>REICHERT Harald</td>
<td>ESRF</td>
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<td>8</td>
<td>RIZZUTO Carlo</td>
<td>ELI-DC AISBL</td>
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<td>9</td>
<td>LEHMER Frank</td>
<td>DESY</td>
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<tr>
<td>10</td>
<td>SERGEEV Alexandru</td>
<td>IAP-RAS/RAS</td>
</tr>
<tr>
<td>11</td>
<td>SHAIKIN Andrei</td>
<td>ELI-DC AISBL</td>
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<td>12</td>
<td>WEEKS Allen</td>
<td>IL</td>
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<td>13</td>
<td>KULDA Jiri</td>
<td>ELI-NP</td>
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<tr>
<td>14</td>
<td>ZAMFIR Nicolae Victor</td>
<td>ELI-NP</td>
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Annex III – Presentations delivered at the event
International dimension of EU policy and activities on Research Infrastructures

Philippe Froissard
Deputy Head of Unit
DG Research & Innovation
European Commission
Research Infrastructures

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

Knowledge-based resources

Major scientific equipments

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

<table>
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<th>CALL INFRADEV</th>
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<tr>
<td>Development and LTS of new Pan-European RIs</td>
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<td>Design Studies (2019)</td>
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<td>Preparatory phase of new ESFRI projects (2019, 2020)</td>
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<td>Individual support to ESFRI and other World Class RI (2018, 2019)</td>
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<td>Access to commercial services through the EOSC Hub (2018)</td>
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<td>Prototyping new services (2019)</td>
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<td>Integration of public EINFRA services into the EOSC catalogue of services (2020)</td>
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<td>Connecting ESFRI RI through cluster projects (2018)</td>
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<td>EOSC governance (2018)</td>
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<td>Enhancing the EOSC portal &amp; connecting thematic clouds (2019, 2020)</td>
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<td>Integrating activities for advanced communities (2018, 2019)</td>
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<td>Integrating activities for starting communities (2020)</td>
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<td>Pilot for a new model of IA (2020)</td>
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<th>CALL INFRAEDI</th>
<th>6 calls, 11 topics</th>
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<td>European Data Infrastructure</td>
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<td>Support to a Pan-European HPC infrastructure &amp; services – PRACE (2018)</td>
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<td>Supporting centres of excellence on HPC (2018)</td>
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<td>Supporting the governance of the EDI (2018)</td>
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<td>Support to public procurement of innovative HPC systems (2020)</td>
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<td>Role of RIs in the translation of OS into Open Innovation</td>
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<td>Stimulate the innovation potential of SMEs (2019)</td>
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<td>Network of RI industrial liaison and contact officers (2019)</td>
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<td>Co-Innovation platform for RI technologies (2020)</td>
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<td>Innovation pilots (2020)</td>
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<td>Support to policy and international cooperation</td>
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<tr>
<td>Policy &amp; international cooperation measures for research infrastructures (2018, 2019)</td>
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<tr>
<td>Strengthening the human capital of research infrastructures &amp; E-infrastructures (2020)</td>
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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
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)
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
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: challenges and new opportunities”

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

HORIZON 2020
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"

XCELS - Exawatt Center for Extreme Light Studies

www.xcels.iapras.ru
Megaproject XCELS

Laser source for XCELS

XCELS is based on the 200 Petawatt ($2 \times 10^{17}$ 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/cm² by combining 12 laser beams. The resulting energy density in the focal area attains $10^{16}$ J/cm³, several orders of magnitude higher than in the center of the Sun.
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

XCELS - Exawatt Center for Extreme Light Studies
Megaproject 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.
Megaprocess 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

• 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

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, IUCIL

XCELS - Exawatt Center for Extreme Light Studies
Megaproject XCELS

International Expertise

Report on XCELS by the International Advisory Committee

Gérard Mourou, Paul Bolton, Maria Drouka, Dino Jarzynski, Björn Manuel Hegelich, Thierry Massard, Wolfgang Sandner, Toshihiko 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 EU 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

“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

XCELS - Exawatt Center for Extreme Light Studies
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

XCELS - Exawatt Center for Extreme Light Studies
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)

**XCELS - Exawatt Center for Extreme Light Studies**
Megaproject XCELS

Progress in China

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

Ruxin Li, Director of SIOM

XCELS - Exawatt Center for Extreme Light Studies
## Megaproject XCELS

### XCELS - roadmap

<table>
<thead>
<tr>
<th>Project</th>
<th>2018</th>
<th>2019</th>
<th>2020</th>
<th>2021</th>
<th>2022</th>
<th>2023</th>
<th>2024</th>
<th>2025</th>
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<tr>
<td>Preparatory phase</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two prototype 15 PW lasers</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Buildings and utilities</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>200 PW laser system</td>
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<td></td>
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<tr>
<td>Main target chamber</td>
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<tr>
<td>Radiation safety</td>
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<tr>
<td>Research laboratories</td>
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<tr>
<td>A computer and communication center</td>
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</tr>
</tbody>
</table>

XCELS - Exawatt Center for Extreme Light Studies
Megaproject XCELS

XCELS - Project management

COUNCIL OF PLENIPOTENTIARIES

ADVISORY BOARDS  DIRECTORATE  FINANCE COMMITTEE

LASER AND TECHNOLOGY DEPARTMENT

RESEARCH AND COMPUTING DEPARTMENT

DEPARTMENT OF INTERNATIONAL RELATIONS

XCELS - Exawatt Center for Extreme Light Studies
Megaproject XCELS

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
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
The agreement

Competitiveness Council of November 20\textsuperscript{th} 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”.
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!
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.
ELI-Beamlines
Dolní Břežany, Czech Republic
December 2015
## Main Parameters of sources

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

Governments
(direct or through RE, or Strategic Partners)

Integrated functions/activities:
Statutory
Users
Scientific programmes
Technical & Technological
Human resources
Legal & institutional
Administrative & fiscal
Financial & Fund raising
Tech Transfer

General Assembly
Members (+ Observers + Strategic Partners)

Director General

Board of Directors

Integrated ERIC model

ISTAC
AFC
Peer Review Panels

Statutory
Users
Scientific P'
TT prog
HR
Leg&Inst
Adm + Fisc
Financ + FR
TTransfer

Statutory
Users
Scientific P'
TT prog
HR
Leg&Inst
Adm + Fisc
Financ + FR
TTransfer

Statutory
Users
Scientific P'
TT prog
HR
Leg&Inst
Adm + Fisc
Financ + FR
TTransfer

Directors
Spokeperson
Spokeperson
Spokeperson
Spokeperson
Spokeperson
Spokeperson
Spokeperson
# Investments, past and future

## Construction costs

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

## UPGRADES (Rough Estimate)

<table>
<thead>
<tr>
<th>Item</th>
<th>2018-2020</th>
<th>2021-2024</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lasers</td>
<td>33,1</td>
<td>53,0</td>
<td>86,1</td>
</tr>
<tr>
<td>Secondary Sources</td>
<td>28,0</td>
<td>46,1</td>
<td>74,0</td>
</tr>
<tr>
<td>Others</td>
<td>33,8</td>
<td>52,6</td>
<td>86,4</td>
</tr>
<tr>
<td>Upgrades TOTAL</td>
<td>94,8</td>
<td>151,7</td>
<td>246,5</td>
</tr>
</tbody>
</table>
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
THANK YOU!
The European Synchrotron
Radiation Facility:
A Pioneer

H. Reichert
Director of Research
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
22 PARTNER COUNTRIES

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

9 Scientific Associate countries:
- Israel: 1.5%
- Austria: 1.3%
- Centralsync: 1.05%
- (Czech Republic, Hungary, Slovakia): 1.5%
- 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

HEALTH & FOOD
CONSUMER PRODUCTS
METALLURGY
PETROCHEMICALS
CULTURAL HERITAGE
ADVANCED MATERIALS
ENERGY & ENVIRONMENT
MICROELECTRONICS
EXTREME CONDITIONS
Many industrial partners
Observing, characterising and understanding the structure of matter
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
THE ESRF AND ITS NEIGHBOURS

Large scale European laboratories

Academic partners

Grenoble INP

Université Joseph Fourier

EMBL

ILL Neutrons for Science

ibs

Research organisations

Cena

CNRS

Local Authorities

Rhône-Alpes

Isère
At the heart of a global innovation campus
Concentrating research, innovation and higher education in one location

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

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

<table>
<thead>
<tr>
<th>SOURCE POSITION</th>
<th>NUMBER OF INDEPENDENT END-STATIONS</th>
<th>BEAMLINE NAME</th>
<th>FIELD OF RESEARCH</th>
<th>STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>BM01</td>
<td>1</td>
<td>Swiss-Norwegian BL</td>
<td>X-ray absorption and diffraction</td>
<td>Operational since 01/95</td>
</tr>
<tr>
<td>BM02</td>
<td>1</td>
<td>D2AM (French)</td>
<td>Materials science</td>
<td>Operational since 09/94</td>
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<tr>
<td>BM08</td>
<td>1</td>
<td>LISA (Italian)</td>
<td>X-ray absorption and diffraction</td>
<td>Operational since 09/94</td>
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<tr>
<td>BM20</td>
<td>1</td>
<td>ROBL (German)</td>
<td>Radiochemistry</td>
<td>Operational since 09/98</td>
</tr>
<tr>
<td>BM25</td>
<td>2</td>
<td>SPLINE (Spanish)</td>
<td>X-ray absorption and diffraction</td>
<td>Operational since 04/05</td>
</tr>
<tr>
<td>BM26</td>
<td>2</td>
<td>DUBBLE (Dutch/Belgian)</td>
<td>Small-angle scattering</td>
<td>Operational since 12/98</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<td>EXAFS</td>
</tr>
<tr>
<td>BM28</td>
<td>1</td>
<td>XMAS (British)</td>
<td>Magnetic scattering</td>
<td>Operational since 04/98</td>
</tr>
<tr>
<td>BM30</td>
<td>2</td>
<td>FIP (French)</td>
<td>Protein crystallography</td>
<td>Operational since 02/99</td>
</tr>
<tr>
<td></td>
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<td>FAME (French)</td>
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<td>EXAFS</td>
</tr>
<tr>
<td>BM31</td>
<td>1</td>
<td>SNBL II (Swiss-Norwegian)</td>
<td>X-ray absorption and diffraction</td>
<td>Operational since 09/16</td>
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<tr>
<td>BM32</td>
<td>1</td>
<td>IF (French)</td>
<td>Interfaces</td>
<td>Operational since 09/94</td>
</tr>
</tbody>
</table>

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
- 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)
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
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.
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 University of Technology of Russia
MOSCOW Moscow Institute of Physics and Technology
MOSCOW National Research Nuclear University MEPhI
MOSCOW Institute of Experimental Mineralogy
NOVOSIBIRSK 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
RUSSIA AS A PARTNER

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

Year

% of Delivered Beamtime

0.0% 1.0% 2.0% 3.0% 4.0% 5.0% 6.0% 7.0%


Russian Federation Ideal Share

Russian Use of ESRF 2011-2017

User Visits Scientists Laboratories

<table>
<thead>
<tr>
<th>Year</th>
<th>User Visits</th>
<th>Scientists</th>
<th>Laboratories</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>10</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>2012</td>
<td>78</td>
<td>59</td>
<td>34</td>
</tr>
<tr>
<td>2013</td>
<td>79</td>
<td>69</td>
<td>36</td>
</tr>
<tr>
<td>2014</td>
<td>121</td>
<td>81</td>
<td>44</td>
</tr>
<tr>
<td>2015</td>
<td>286</td>
<td>168</td>
<td>73</td>
</tr>
<tr>
<td>2016</td>
<td>377</td>
<td>228</td>
<td>95</td>
</tr>
<tr>
<td>2017</td>
<td>378</td>
<td>236</td>
<td>92</td>
</tr>
</tbody>
</table>
SCIENTIFIC USE BY RUSSIAN FEDERATION – PUBLIC BEAMTIME

The diagram shows the percentage of beam time requested, allocated, used, and the ideal share for each scheduling period from 2012/II to 2018/II. The bars indicate the percentage of beam time, with different colors representing the different categories.
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!
Institute Laue-Langevin

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

\[ T_c = 120 \text{ K} \]

\[ T = 8 \text{ K} \]

\[ T = 2 \text{ K} \]

\[ T = 93 \text{ K} \]
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"
Neutron source luminosity

Nuclear fission:
2.5 neutrons per event
(1 neutron sustaining reaction, 0.5 absorbed)

Cooling limits neutron flux!
Nonproliferation act!

ILL reactor:
peak flux density $3 \times 10^{15} \text{ cm}^{-2}\text{s}^{-1}$ into $4\pi$ sterad
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%
850 experiments/year
2000 users
38 countries
28 instruments + 8 CRG
650 publications/year
Peer reviewed proposal system

ILL RESEARCH PROPOSAL

Experiment Title: Anisotropic 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 PHYSICS LAB, BRISTOL ROYAL FORT TYNDALL AVENUE BSI ITL BRISTOL ROYAMIE-UNI +44 117 928 8715 +44 117 9255624 s.hayden@bris.ac.uk New neutron user? No New ILL user? No Phd student? No

NIST Center for Neutron Research
Proposal for Neutron Beam Experiment

Submission ID: 21684 Proposal Number: H34-02

Experiment Title
Title: Quantum critical scaling of spin excitations in \( \text{BaFe}^{2+} \text{Cr}^{3+} \text{Fe}^{3+} \text{As}_3 \text{P}\text{O}_8 \)
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>
<thead>
<tr>
<th>Country</th>
<th>Request</th>
<th>%</th>
<th>Allocation</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>AT</td>
<td>81.22</td>
<td>2.09</td>
<td>74.15</td>
<td>3.52</td>
</tr>
<tr>
<td>BE</td>
<td>14.53</td>
<td>0.37</td>
<td>9.84</td>
<td>0.47</td>
</tr>
<tr>
<td>CH</td>
<td>232.20</td>
<td>5.98</td>
<td>130.83</td>
<td>6.20</td>
</tr>
<tr>
<td>CZ</td>
<td>52.36</td>
<td>1.35</td>
<td>40.64</td>
<td>1.93</td>
</tr>
<tr>
<td>DE</td>
<td>900.84</td>
<td>23.19</td>
<td>427.43</td>
<td>20.27</td>
</tr>
<tr>
<td>DK</td>
<td>43.28</td>
<td>1.11</td>
<td>28.52</td>
<td>1.35</td>
</tr>
<tr>
<td>ES</td>
<td>177.22</td>
<td>4.56</td>
<td>84.29</td>
<td>4.00</td>
</tr>
<tr>
<td>FR</td>
<td>1019.26</td>
<td>26.24</td>
<td>552.14</td>
<td>26.18</td>
</tr>
<tr>
<td>GB</td>
<td>815.33</td>
<td>20.99</td>
<td>443.70</td>
<td>21.04</td>
</tr>
<tr>
<td>IT</td>
<td>236.89</td>
<td>6.10</td>
<td>137.97</td>
<td>6.54</td>
</tr>
<tr>
<td>PL</td>
<td>101.30</td>
<td>2.61</td>
<td>81.87</td>
<td>3.88</td>
</tr>
<tr>
<td>SE</td>
<td>198.81</td>
<td>5.12</td>
<td>90.57</td>
<td>4.30</td>
</tr>
<tr>
<td>SK</td>
<td>11.58</td>
<td>0.30</td>
<td>6.70</td>
<td>0.32</td>
</tr>
<tr>
<td>Total</td>
<td>3884.81</td>
<td>100.00</td>
<td>2108.66</td>
<td>100.00</td>
</tr>
</tbody>
</table>
Publication output

537 ILL publications in 2017

High impact publications - extended list
PRL, PRB, PRC, PRE, Science
2000 – 2015
The resulting average neutron detection rate is improved by a factor of $\approx 25$
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

CREMLIN WP6, 7 /8 December 2017, Bucharest-Mägurele
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)

- 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)

- 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

CREMLIN WP6, 7 /8 December 2017, Bucharest-Măgurele
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

C.G. Wahlstrom (LLC)
LASERLAB-EUROPE

1. What is LASERLAB-EUROPE

2. Access management

3. The role of users
1 – An active Access Board

Supervision of the access activities (operation & quality)
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

Referees
Evaluation of the proposal

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

Selection Panel
- Final decision
- Ranking

Selection Panel
- Choice of 2 referees
- Eligibility check

Host Institution
- Information of the applicant
- Management of the visit
LASERLAB-EUROPE

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

Information Posters

Outreach

Discover the power of light!

Visit us on facebook.com/laserlabeurope
User Training

- Training schools for young researchers

9-12 April 2014, Laserlab Training School, Riga, Latvia

Laser Applications in Spectroscopy, Industry and Medicine

Developments in Optics and Communications / Laserlab III Training School

The 11th International Young Scientists’ Conference in conjunction with the Laserlab III Training School. The event will take place in Ljubljana, Slovenia.

Mission

The conference “Developments in Optics and Communications” is aimed at fostering collaboration and exchange of knowledge between young scientists and researchers.

The mission of the Laserlab III Training School is to provide training and networking opportunities for young scientists and students in the field of optics and communications.

Laserlab Europe User Community Training

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

Laserlab-Europe

Emerging Pan-European ESFRI Infrastructures

National scale
National interest

Flexible instrument beyond the national scale

Mission-oriented single entities to meet global challenges
LASERLAB-EUROPE ambition

The European Laser Community

Laserlab-Europe

Emerging Pan-European ESFRI Infrastructures

National scale
National interest

Flexible instrument beyond the national scale

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
Decision to Site ESS in Lund 2009

European Design of ESS Completed 2003

Construction Starts on Green Field Site 2014

ESS Design Update Phase Complete 2012

Start of Initial Operations Phase 2019

ESS Starts User Program 2023

ESS Construction Phase Complete 2025
What’s the ‘Unique Selling Point’?

![Diagram showing brightness and time comparison between different sources.](image)

**Brightness (n/cm²/s/sr/Å)**

- **ESS 5 MW**
  - 2015 design
  - λ = 5 Å

- **ESS 2 MW**
  - 2015 design

- **ESS 5 MW**
  - 2013 design (TDR)

- **ISIS TS1**
  - 128 kW

- **ISIS TS2**
  - 32 kW

- **SNS**
  - 1-2 MW

- **JPARC**
  - 0.3-1 MW

- **ILL 57 MW**

**Possibilities of pulse shaping**
Organisation and People

- 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
“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.

Political Level

Top–level conditions & non-project issues

Situation Assessment

Country Negotiation Objectives

Identify Key Contacts

Engagement Plan

Join

Yes

Objectives Agreed?

No

ESS Management + Steering Committee Members bring the levels together.

In-kind

Situation Assessment

Country Negotiation Objectives

Identify Key Contacts

Engagement Plan

ESS Project + Collaboration Partners negotiate In-kind packages.
Important Symbolic Act Signals “start” to stakeholders and partners
ESS AB transitioned into European Research Infrastructure Consortium (ERIC)

**ESS AB**
- Swedish limited liability corporation
- Owned by the Swedish and Danish governments

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

Transfer of assets, obligations and personnel by Oct 1, 2015
Financing Includes Cash And Deliverables

<table>
<thead>
<tr>
<th></th>
<th>Host Countries of Sweden and Denmark</th>
<th>Non Host Member Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>47.5%</td>
<td>52.5%</td>
</tr>
<tr>
<td>Operations</td>
<td>15%</td>
<td>85%</td>
</tr>
<tr>
<td>Cash</td>
<td>100%</td>
<td>In-kind Deliverables ~ 70%</td>
</tr>
<tr>
<td>Cash</td>
<td>~ 30%</td>
<td></td>
</tr>
</tbody>
</table>

**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.”

Construction cost: € 1,84 Billion
In-kind Potential: € 747.5 Million

Stretch goal = 40.5%
Partner and Industry Days Campaign

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.eu/esi.
Results:

40 Events

2500 Participants

17 Countries
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 Brillouin (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

Construction cost: € 1.84 Billion
In-kind Potential: € 747.5 Million

Stretch goal = 40.5%
Year by Year In-Kind planning

Breakdown

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Collaborations</td>
<td>272.59</td>
<td>207.15</td>
<td>254.70</td>
<td>435.85</td>
</tr>
<tr>
<td>Potential</td>
<td>335.78</td>
<td>313.19</td>
<td>110.54</td>
<td>55.95</td>
</tr>
<tr>
<td>Planned</td>
<td>0.19</td>
<td>128.50</td>
<td>258.49</td>
<td>100.5</td>
</tr>
<tr>
<td>Agreed IK Scope</td>
<td>16.70</td>
<td>17.09</td>
<td>17.09</td>
<td>30.00</td>
</tr>
</tbody>
</table>
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

- UK joins ESS as Full Member (Jun 2015)
- Science Workshop in Riga (May 2017) Visit of Latvian delegation (Nov 2016)
- Press Trip for Spanish Media (Jun 2017)
- Partner & Industry Day (Oct 2015)
- NWO Visit (Nov 2016) Visit of Dutch Ambassadors to DK & SE (May 2016)
- ESS Science Seminar in Brussels (Sep 2017) SCK-CEN visit (Mar 2016)
- Partner & Industry Day (Nov 2015) OesteCIM visit (May 2016)

BrightNESS is funded by the European Union Framework Programme for Research and Innovation Horizon 2020, under grant agreement 676548
Enlargement Activities
Cooperation Beyond Europe

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. Sato visited ESS in Jan 2017 to plan a joint MIRAI workshop together with Lund University and ESS
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
Boron-10 Detectors
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
1. Ensure that the full baseline funding level (1843 M€\textsubscript{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.*
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**
The European X-Ray Free Electron Laser (European XFEL)

Michael Meyer, European XFEL GmbH
General layout of the European XFEL

- **Experiment Hall in Schenefeld**
- **Undulator/Photon Tunnels**
- **Linear Accelerator**
  - 1.9 km
  - 17.5 GeV
- **Injector at DESY campus**
Parameters European XFEL

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electron Energy</td>
<td>8.5 – 17.5 GeV</td>
</tr>
<tr>
<td>Photon energy</td>
<td>0.26 - &gt;20 keV</td>
</tr>
<tr>
<td>Pulse duration</td>
<td>1 – 100 fs</td>
</tr>
<tr>
<td>Seeding</td>
<td>In preparation</td>
</tr>
<tr>
<td># of pulses</td>
<td>27000 /s</td>
</tr>
<tr>
<td># of FELs</td>
<td>3</td>
</tr>
<tr>
<td># of instruments</td>
<td>6</td>
</tr>
<tr>
<td>Start of operation</td>
<td>2017</td>
</tr>
</tbody>
</table>

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$^2$

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**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

- electron tunnel
- photon tunnel
- undulator
- electron switch
- electron bend
- electron damp
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 (25 M€)) 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

  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

![XFEL Yearly Schedule]

- Scheduled Maintenance & Shutdown
- Accelerator Development
- X-Ray Development
- User Program

- FXE
- SPB/SFX
- all instruments
Thank you for your attention