

# **Industrial pilot projects for the utilisation of large scale infrastructures for neutron and photon-based techniques – Spring 2019**

Stimulating collaboration around skills development and industrial utilisation of advanced experimental environments as those being developed at MAX IV and ESS in Lund.

A call for proposals within the programme “**Research infrastructure - utilisation and collaboration**”

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## Revision history

| Date | Change |
|------|--------|
|      |        |

## 1 Summary

Through co-funding of industrial needs-driven pilot projects, Vinnova wants to strengthen Swedish skills regarding how industry can use and benefit from large-scale research infrastructures for advanced neutron and photon-based techniques<sup>1</sup>.

Each project proposal should be based on the needs of at least one Swedish company which is also a participant of the project. The work in the project shall verify whether neutron or photon-based technologies are suitable options to meet that need. Planning and implementation of experiments, as well as interpreting the results, should be carried out in active collaboration with appropriate expertise. The project consortium shall therefore also include at least one Swedish participant organisation that assists with such expertise.

Up to SEK 15 million is available for the call, which consists of three different sub-calls for project initiatives of different maturity (see section 4.1).

### **A) Preparatory projects for survey and planning**

Each project proposal can apply for a maximum grant of SEK 100.000.

The maximum project period length is 3 months.

The proposal should be based on a hypothesis regarding how photon or neutron-based technologies can meet the company's needs. The project activities should include identification of available technologies, methods and relevant experimental stations in specific research infrastructures, as well as method selection and planning of experiments.

### **B) Pilot experiments at large scale research infrastructures for neutron and photon-based techniques**

Each project proposal can apply for a maximum grant of SEK 500.000.

The maximum project period length is 18 months.

The call for proposals funds experiments at MAX IV as well as at international large-scale research infrastructures for neutron and photon-based techniques. All types of access for experimental/beam time are allowed and beam time is an eligible cost.

### **C) Development projects for improved industrially relevant post-experimental analysis and data management**

Each project proposal can apply for a maximum grant of SEK 300.000.

The maximum project period length is 8 months.

The proposal should be based on already obtained data/results from a previously performed experiment using photon or neutron-based techniques, where the

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<sup>1</sup> Photon-based experiments can be performed at both synchrotron radiation facilities and facilities for XFEL.

company has participated and confirmed the industrial relevance. The project activities shall include development work where, for example, data processing methods are further developed or adapted to the industrial application.

Please note that offers A-C do not apply to applications and needs where the methods are already an established tool for the company. A project goal should always be to be able to determine a yet unverified added value with neutron and / or photon-based techniques.

**Important dates:**

- Proposals should be submitted to Vinnova by: **24 April 2019 at 14:00**
- Decision date: 19 June 2019
- Project start date: 19 June 2019 (earliest) – 19 August 2019 (latest)

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**Link to call for proposals website:**

<https://www.vinnova.se/en/e/research-infrastructure-utilisation-and-collaboration/pilot-projects-neutron-photon-2019/>

## **2 What we want to accomplish with the call**

### **Background**

World-leading research increasingly requires access to advanced research infrastructures. In addition to contributing to excellent basic research, these infrastructures also enable cutting-edge applied research and innovative development work in industrial and public sectors.

Through the "Research infrastructure – utilisation and collaboration" programme, Vinnova wants to strengthen the Swedish innovation system by contributing to capacity building and increased understanding of how the use of advanced research infrastructures can respond to industrial and societal needs.

With this call for proposals we want to support industrial innovation work and encourage Swedish companies to better see the possibilities of advanced neutron or photon-based experiments within their respective areas of application. This can be anything from the development or improvement of new materials, drugs or processes to the need to investigate why a construction has failed.

MAX IV in Lund is Sweden's largest research infrastructure and one of the world's brightest source for synchrotron radiation. In close proximity, the European Spallation Source (ESS) is being built to become the world's strongest neutron source. This will give unique development opportunities within a wide range of research areas, such as life sciences and materials science - and all the important industrial and societal applications that rely on the characteristics and performance of different materials.

Neutrons and photons interact in different ways with a material. Therefore, both comparable and complementary analyses are made possible. For example, you can study how different materials and biological structures are constructed, map the chemical states of materials, or follow different types of processes in real time and in realistic experimental environments. The techniques allow for an extensive portfolio of analytical possibilities based on e.g. scattering, diffraction, crystallography, spectroscopy and various forms of imaging in 2D and 3D. Provided that an intended experimental environment is in place, the techniques can be used for experiments in relevant environments for different applications - for example at extreme temperatures and high pressures, in gases and liquids, or under mechanical load.

The possibility of in-situ analyses under manufacturing and operating conditions (in operando) opens for ground-breaking development opportunities for many industrial applications.

The performance of MAX IV already offers opportunities to design experiments in completely new ways – and the same will apply to ESS. In addition to industry relevant experiments, even more user applications could benefit from the technologies. Compared to other European synchrotron facilities, the potential of MAX IV is particularly competitive for experiments that depend on high brilliance and coherence, which opens for new opportunities regarding e.g. imaging of unstructured materials within materials research and life sciences.

The research infrastructures in Lund are still under construction, and even after full completion, MAX IV and ESS will not be able to offer all types of experiments. International facilities will thus be needed as an important complement also in the future. This call for proposals can therefore also fund experiments at international large-scale research infrastructures for neutron and photon-based techniques<sup>2</sup> outside Sweden.

Additional funding opportunities are planned by Vinnova, but the content will be developed gradually based on experience and outcomes from this call, as well as from other initiatives.

Vinnova is tasked with promoting sustainable growth by increasing the innovation capacity. Improved conditions for innovation will strengthen the capacity to reach the goals for sustainable development in Agenda 2030<sup>3</sup>. Collaboration and innovation will be crucial, and with this call we want to develop the innovation capacity through new collaborations and create new solutions that contribute to the goals within the framework of the priorities of the call. Gender equality is a prerequisite for sustainable growth and the call for proposal is expected to contribute to an equal development of society linked to two main perspectives. This means that both women and men take part of the grant in an equal opportunity and participate in - and have influence over - the project. Another important aspect is about analyzing and taking a position on whether there are gender aspects that are relevant in the problem area and utilization of the solution<sup>4</sup>.

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<sup>2</sup> ESS is a spallation source, but experiments with other types of neutron sources are also permitted. MAX IV mainly uses synchrotron light, but also experiments at XFEL facilities are permitted.

<sup>3</sup> Read more (in Swedish only): <https://www.vinnova.se/m/agenda-2030/>

<sup>4</sup> Read more about what our work for equality innovation means for you who apply for grants from us (in Swedish only): <https://www.vinnova.se/m/jamstalld-innovation/>

### **3 To whom is this call for proposals directed?**

This call for proposals is aimed at project consortia consisting of companies, research institutes, academia or other legal entities.

The project consortium shall consist of **at least two project participants**. Of these, at least one participant must be a Swedish-registered **company** (or a company with an establishment or branch in Sweden) who owns the problem that the project addresses. Additionally, at least one further Swedish organisation must be a formal project participant and assist with **relevant expertise** linked to the neutron or photon technology addressed. This expertise can come from all types of organisations, from research organisations as well as from companies with relevant expertise, or from the research infrastructure where the experiments will be performed.

In this call for proposals, non-Swedish organisations may only be project participants if they finance their own costs, and they cannot receive funding from Vinnova. This means that an international research infrastructure that does not finance its own costs, but is used as a subcontractor, cannot be counted for as a formal project participant.

### **4 What do we fund?**

#### **4.1 Activities which you can seek funding for**

Vinnova aims to fund industrial needs-driven projects that build expertise in how industrial research and development can benefit from advanced neutron and photon technologies. Therefore, the concept on which the project is based must be motivated by the development need of at least one Swedish registered company<sup>5</sup>, which is also a participant in the proposal. Please note that solely enhancing the skills within a company does not constitute a sufficient need in this context.

The project activities shall be carried out in collaboration, with an exchange of knowledge with at least one additional Swedish participant that contributes with relevant expertise. This shall include the necessary skills for the planning and implementation of the experiments, as well as handling the data collected and the interpretation of measured results. The expert is also expected to provide guidance on how the results can be developed after the project has been completed. This could, for example, be direct implementation - or assessment of the potential of conducting further work with the development of industrially relevant methods or

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<sup>5</sup> Or a company with an establishment or branch in Sweden.

experimental setups. Participation in order only to coordinate and administer project management is not allowed.

The project can consist of complementary activities to work that is already carried out within the company. It is thus possible to apply for a pilot project to supplement the activities in an already ongoing development project, or to build on the results of a previously performed work<sup>6</sup>. However, **a project goal should always be to be able to determine a previously unverified value added with neutron and / or photon-based techniques and - when applicable - in comparison with other more established analysis techniques.**

It is important that the pilot projects granted funding can be displayed and inspire others. In connection with final reporting to Vinnova, a description of the purpose, participating actors and overall project results must therefore be enclosed for free publication and dissemination (se 8.2.).

The call for proposals consists of three different sub-calls for project initiatives at different stages.

- A) Preparatory projects for survey and planning
- B) Pilot experiments at large scale research infrastructures for neutron and photon-based techniques
- C) Development projects for improved industrially relevant post-experimental analysis and data management

In addition to the above, the following applies to the respective sub-offer A-C:

#### **A) Preparatory projects for survey and planning**

- Each project proposal can apply for a maximum grant of SEK 100.000 for a project period of maximum three (3) months.
- The projects should be based on an already identified challenge for the company and, when applicable, also contain a description of the limitations of more established analytical techniques.
- The following types of project activities constitutes eligible costs:
  - o Identification and mapping of available photon or neutron-based techniques and methods, as well as relevant experimental stations in specific research infrastructures.

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<sup>6</sup> If the project activities are complementary to an existing innovation project, the corresponding activities cannot already have been granted other funding. An existing project can thus not be supplemented in order to reallocate already existing projects resources.

- o Method selection, planning of experiments, or specification / planning for adaptation of relevant experimental environments
- o Dialogue with additional expertise (e.g. staff at identified experimental stations)
- o Planning for how the results can be developed after the project

**B) Pilot experiments at large scale research infrastructures for neutron and photon-based techniques**

- Each project proposal can apply for a maximum grant of SEK 500.000 for a project period of maximum 18 months.
- To justify the added value using neutron or photon experiments, the proposal must clearly describe relevant preparatory work and identified restrictions when using more established analytical techniques.
- In addition to the experiment's implementation at the research infrastructure, the following types of project activities constitutes eligible costs:
  - o Design of experiments, including necessary method development or adaptation of relevant experimental environment
  - o Sample preparation directly linked to the neutron / photon experiment to be performed
  - o Travel and living in connection with the experiment's implementation
  - o Analysis, treatment and interpretation of measurement results / data, including comparisons with already existing results from more established analytical techniques or modeling
  - o Planning for how the results can be developed after the project

Please note that any complementary experiments with more established analytical equipment, or modelling, are only approved project activities if they can be justified as necessary for sample preparation, sample characterisation, interpretation of results or experimental design. In this context, development of experiments and sample preparation refers only to adaptation to the current experiment. Work packages that include advanced material development or manufacturing per se are not allowed.

The call for proposals funds experiments at MAX IV as well as at international large-scale research infrastructures for neutron and photon-based techniques.

An organisation that wishes to perform neutron or photon experiments in a large-scale research infrastructure needs to be actively approved access by the infrastructure itself. The largest proportion of access (also called experimental time or beam time) is granted based on scientific excellence through a peer review process. However, many large-scale research facilities also provide access for experiments that the stakeholders themselves pay for, so-called proprietary access (or non-peer reviewed access)<sup>7</sup>. In this call for proposals, all types of availability (access models) are allowed. All eligible costs arising at an international research infrastructure – including paid beam time - is admitted as costs of consultants (“konsultkostnad”) of any of the participants.

To meet the purpose of active and mutual knowledge transfer, we encourage representatives from several project participants to take part in the implementation of project activities, including the experiments at the large-scale research infrastructure.

Access (experimental time) does not need to be formally approved or fixed in time when the proposal is submitted to Vinnova. However, **the project consortium should describe/motivate in the proposal that the experiment is expected to be technically feasible and possible to carry at the experimental station<sup>8</sup> with respect to the project time.** This means that:

- Project consortia intending to pay for experimental access (proprietary access) should be able to refer to a dialogue with a named research infrastructure.
- Project consortia intending to seek experimental access through open calls (not yet granted) should be able to refer to a dialogue with a named research infrastructure. The proposal should also describe what measures can be taken to enable the project to be implemented if no free access is granted.
- If free experimental access has been granted before the proposal is submitted, that confirmation can be attached to the proposal. Note, however, that no project activities may be started before the project's start date.
- Project consortia who intend to carry out experiments in direct collaboration with staff at the research infrastructure should enclose a letter of support confirming this.

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<sup>7</sup> Please note that Vinnova's funding conditions that certain information be made available for free publication after the end of the project, regardless of whether the "access model" used allows confidentiality by the research infrastructure itself (as, for example, with paid beam time / proprietary access).

<sup>8</sup> Also referred to as beamline or instrument.

Regardless mode of access chosen, and financing of individual project activities, the proposal should state how sufficient human- and financial resources exist to implement the whole project plan.

For a research infrastructure to take on a task and approve access, they may first require that a technical feasibility study of a desired experiment has been performed<sup>1</sup>. They may also want to ensure that sample handling will be safe. Before completing the application, we therefore recommend an **early dialogue** with the user office of the identified facility.

The Appendix of this document provides a number of suggestions on where more information can be obtained concerning the capacity and availability of various international facilities.

### **C) Development projects for improved industrially relevant post-experimental analysis and data management**

- Each project proposal can apply for a maximum grant of SEK 300.000 for a project period of maximum eight (8) months.
- The projects should be based on already obtained measurement data from a previously performed experiment at a research infrastructure for photon or neutron-based techniques, where the company has been involved in execution but where the possibilities to fully utilize and realizing the value of the experimental data was limited. Note that the project should include development activities, where, for example, data processing methods are established, modified, adapted or validated to suit the industrial application in order to provide a more qualified response - for example, ensuring statistical reliability and repeatability.
- In addition to the above, the following types of project activities constitutes eligible costs:
  - o Analysis, treatment and synthesis of measurement results / data from previously performed experiments, including comparisons with already existing results from more established analysis techniques or from modeling.
  - o Planning for how the results can be utilized in the company after the project - by direct implementation or by further development or validation of industry-relevant analysis tools.

This offer can follow on a Vinnova-funded pilot experiment (as sub-call B) provided that the results from this project already has been reported to Vinnova.

## 4.2 Eligible costs

Vinnova's funding is through grants and is subject to certain regulations. These regulations control, among other things, the types of costs of the project partners that may be covered by grants. Eligible costs are shown in the "Vinnova's general terms and conditions for grants"<sup>9</sup> and are described in more detail in the "Vinnova Guide to Terms and conditions for eligible costs"<sup>10</sup>.

The types of project activities approved in this call shall be covered by **Industrial research** (sub-calls B and C) or **Feasibility study** (sub-call A) in the rules on state aid for research, development and innovation. A description can be found in the "Vinnova's Table of aid levels for state aid"<sup>11</sup>.

Please note that international research infrastructures may solely be used as subcontractors **to the extent specified in the project description**, and that the eligible costs shall be accounted for as consultancy costs for any of the project partners. Travel expenses shall be reasonable and appropriate.

## 5 What size grant do we fund?

Up to SEK 15 million is available for the call.

Grants to organisations carrying out economic activities (hereinafter "companies") are subject to state aid rules. Therefore, the amount that a company seeks in grants can only represent a certain proportion of its total eligible cost.

For this call, companies can apply for the following share in support from Vinnova, depending on the size of the company<sup>12</sup>:

Large: 50 percent  
Medium: 60 percent  
Small: 70 percent

This call also permits, by means of eligible certificate, aid to undertakings under the De Minimis regulation (also known as 'negligible aid')<sup>13</sup>.

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<sup>9</sup> Current terms and conditions can be found on our website, along with help to understand and meet the terms: <https://www.vinnova.se/en/apply-for-funding/rules-for-our-funding/terms-and-conditions-for-our-funding/>

<sup>10</sup> See Sections 4.1 – 4.5 of the <https://www.vinnova.se/globalassets/dokument/guide-till-vinnovas-villkor-om-stodberattigande-kostnader-2017-04-21-master.pdf> (in Swedish only)

<sup>11</sup> See s.8 in <https://www.vinnova.se/globalassets/huvudsajt/sok-finansiering/dokument/stodnivaer-statligt-stod.pdf> (in Swedish only)

<sup>12</sup> For the current definition of small and medium sized companies see: <http://ec.europa.eu/DocsRoom/documents/15582/attachments/1/translations>

<sup>13</sup> For more information on De Minimis aid, as well as the download of the mandatory certificate, see: <https://www.vinnova.se/sok-finansiering/regler-for-finansiering/statligt-stod/>

Each project participant is responsible for ensuring that the grant received does not exceed the level of aid permitted under state aid rules.

## 6 Conditions for us to assess the proposal

Vinnova will only assess proposals that meet the following formal requirements:

- ✓ All project participants are legal entities.
- ✓ The participants seeking grants are either registered in Sweden or have a branch or establishment in Sweden.
- ✓ The project consortium consists of at least two participants, of which at least one is a company<sup>14</sup> which is registered in Sweden or has an establishment or branch in Sweden, and at least one is a different Swedish organisation.
- ✓ The Project manager (Projektleddare) is employed by a company<sup>15</sup> that is a project participant.  
Note that the Coordinator of the project may be a different organisation from the one the Project manager is employed at.
- ✓ The proposal follows the instructions in section 9 and contains all the mandatory attachments requested there.
- ✓ The project start date is set to earliest 19 June 2019 and latest 19 August 2019.

## 7 Assessment of proposals received

### 7.1 What do we assess?

Only the written content of the submitted proposal will be assessed, and what is assessed is the degree to which the project proposals meet the three main evaluation criteria of Potential, Feasibility and Participants.

The bulleted list below indicates what contributes positively to the assessment. In the event of a competitive situation, account is taken to the present project portfolio's breadth of scope and needs-owned companies, and to an even distribution of projects for each sub-call (A-C).

#### Potential

- It is clear how the project activities are in line with the purpose of the call for proposals – according to paragraph 4.1.

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<sup>14</sup> In this context, the term "company" is not understood to mean incorporated research institutes or companies that do not own the development needs that the project intends to meet. However, these can fulfill the role of expertise.

<sup>15</sup> See note 14.

- The project consortium's previous work in this area is described and it is clear what the added value of neutron or photon-experiments in a large-scale research infrastructure is expected to be able to bring beyond what can be achieved with more established analytical techniques.
- It is clear that the project will be implemented in active collaboration, with dissemination of newly acquired knowledge between the participants.
- The project results have the potential to contribute to economic, environmental and socially sustainable societal development.

### **Feasibility**

- The project activities and time schedule are reasonable with respect to what is to be done and the available resources. Relevant risks associated with the project implementation are managed in an appropriate and credible manner.
- For sub-call B only:  
The project consortium describes the dialog that has been conducted with the intended research infrastructure and motivates in a credible way that the desired experiments are technically feasible and possible to carry out at an intended experimental station with respect to the project time.

### **Participants**

- The project consortium is appropriately composed with regard to project goals and implementation, e.g. skills and time commitment of project management and key personnel.
- The project proposal clarifies collaboration and knowledge / technology transfer within the project consortium, and how relevant IPR issues are handled.
- The gender distribution in the implementation is well balanced, including commitment and influence. A possible imbalance is explained in a credible and specific way for the project proposal.

## **7.2 How do we assess the proposals?**

The proposals that meet the formal requirements will be assessed according to the assessment criteria by specially chosen experts appointed by Vinnova. This results in a recommendation for funding to Vinnova. Experts at Vinnova also participate in the assessment process.

Vinnova decides which projects are to be funded, taking into account the evaluators recommendation as well as using a portfolio perspective. Proposals that do not meet formal requirements will be rejected without further justification.

## 8 Decisions and conditions

### 8.1 About our decisions

The granted amount to each participant in the project is stated in the grant decision. Vinnova's grants is awarded with support from the rules on state aid for research, development and innovation, stated in SFS 2015:208, or with support from the De Minimis regulation, EU no 1407/201 (also known as negligible aid). The aid foundation is set out in the grant decision and also governs the eligibility of costs.

Vinnova's decision to grant or refuse a proposal cannot be appealed.

### 8.2 Terms and conditions for awarded grants

Vinnova's general conditions for grants apply to the awarded grants<sup>16</sup>. These conditions include rules on project agreements, prerequisites for payment, follow-up, reporting and utilisation of results. Note that a project agreement must be prepared before the first status report is submitted to Vinnova.

Also, the following terms apply to the grants awarded in this special call:

1. In connection with final reporting to Vinnova, an easily accessible description of the purpose, participating actors and overall project results must be enclosed for open publication and dissemination. This includes mentioning of the research infrastructure, experimental stations and method choices that the project has either addressed (A), used (B) or taken off from (C). A template in power point format is distributed by Vinnova.

Additional terms may be decided for individual projects.

If you do not comply with Vinnova's terms, you may be liable to repay the grant. This is also true if you have been granted an incorrect or excessive amount of funds.

## 9 How to apply

To apply for a grant, you fill in a special Web-based form in Vinnova's eServices portal (Intresseportalen). You will also upload the following required documents, according to templates downloaded from the Web page of the call for proposals<sup>17</sup>. The documents must be written with twelve (12) point normal black text.

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<sup>16</sup> Current terms and conditions can be found on our website, along with help to understand and meet the terms: <https://www.vinnova.se/contentassets/e8744691aa1e46e89c4cc67c7c00a50d/multi-participants.pdf>

<sup>17</sup> You find templates for the required documents to attach on: <https://www.vinnova.se/en/e/research-infrastructure-utilisation-and-collaboration/pilot-projects-neutron-photon-2019/>

**Please note that the proposal will be assessed by both Swedish and international evaluators. Therefore, we recommend that the proposal is written in English.** If the proposal is written in Swedish it will be translated without your co-operation.

Mandatory attachments:

- **Project description**  
The description may consist of maximum:  
**For sub-call B:** Five (5) A4 pages.  
**For sub-calls A and C:** Three (3) A4 pages.
- **CV - Appendix**  
Shall include relevant information for project managers and all key personnel in the consortium, including participants in consultant roles.
- **Letter of Intent**  
Shall be attached from at least one company amongst the project partners and shall be able to justify an interest and need in accordance with the purpose of the call. It shall be signed by a person qualified to sign contracts for research- and innovation projects on behalf of the organisations concerned. Signed declarations of intent are scanned and uploaded.

If an organisation seeks support according to the “de Minimis regulation”, the mandatory certificate for this shall be attached as **”Other attachments”**.

As **”Other attachments”** the following is admitted when applicable:

- Project consortia who have already received/been granted experimental time at a research infrastructure shall attach documentation that supports this
- Project consortia that intend to implement certain project also using resources whose costs are not intended to be reported to Vinnova shall enclose a confirmation signed by someone with mandate to approve such allocation of resources. This may involve collaboration with a research infrastructure (friendly beam time, analysis support, etc.), or synergies with already ongoing projects.

No additional material may be attached to the proposal.

Proposals should be submitted to Vinnova by: **24 April 2019 at 14:00**  
When the proposal period has expired, any addition to the proposal can only be made at the request of Vinnova.

## **10 Who can read the proposal?**

The proposal can be read by Vinnova's staff and by Vinnova's external evaluators appointed for the call. They all work under the obligation of professional secrecy.

Proposals submitted to Vinnova become public documents, but Vinnova does not disclose information about the individual's business or operational conditions, inventions and research results if it can be assumed that any individual suffers damage if the information is divulged.

## **Appendix. Short guide to research infrastructures for neutron and photon-based techniques**

### **Analysis options with neutron or photon-based techniques**

A comprehensive portfolio of advanced experiments with neutrons and photons is permitted at international large-scale research infrastructures.

Neutrons and photons interact in different ways with a material. Therefore, both comparable and complementary analyses are made possible. For example, you can study how different materials and biological structures are constructed, map the chemical states of materials, or follow different types of processes in real time and in realistic experimental environments. The techniques allow for an extensive portfolio of analytical possibilities based on e.g. scattering, diffraction, crystallography, spectroscopy and various forms of imaging in 2D and 3D.

Neutrons stand out by being able to distinguish light elements, such as hydrogen and lithium, which are of great relevance for, among other things, battery and energy storage applications. Since neutrons are susceptible to isotopes, deuterium can be used as a marker for the study of e.g. biological materials. You can also study issues related to magnetic properties and superconductivity. Because neutrons penetrate deep into the materials, the technology is also suitable for non-destructive analysis to find hidden defects and internal stresses, even inside large, compact materials or components.

Photons have a shallower penetration depth and are therefore well suited for surface analyses and for experiments using thinner samples. The strong light from a synchrotron facility allows measurements with high spatial and/or time resolution which may, for example, be used to follow rapid chemical and biological processes in real time. Considering certain variations between different synchrotron facilities, experiments can be conducted using a broad wavelength spectrum, for instance hard and soft X-ray radiation, ultraviolet light and infrared light.

Detailed information on the capacity and availability of individual international facilities can be provided through their respective websites. Most also have user offices that offer special support for industry and can answer if any of their experimental stations and instruments is suitable for what is desired.

### **Short guide for using MAX IV and international research infrastructures**

The Swedish synchrotron facility MAX IV has opened up for experimental possibilities at several beamlines. Until **March 19th**, beamtime for autumn 2019 can be applied for through an open call for different experiments at the following

beamlines: BioMAX (macromolecular crystallography), HIPPIE (ambient pressure x-ray photoemission spectroscopy), NanoMAX (hard x-ray nano-diffraction and imaging), FinEstBeAMS (photoemission in gas-phase and photoluminescence spectroscopy), Balder (hard x-ray absorption), BLOCH (angle-resolved photoemission spectroscopy), MAXPEEM (photoelectron microscopy) and Veritas (side branch/open port).

See <https://www.maxiv.lu.se/users/open-calls> for specifications. Contact: MAX IV's Industrial User Office <https://www.maxiv.lu.se/industry/>

Through the Swedish Research Council, Sweden also finances the experimental station P21/"Swedish materials science beamline" (SMS) at the German synchrotron Petra III<sup>18</sup> in Hamburg. It allows diffraction and imaging (P21.2) and broadband diffraction (P21.1) and is administered by Linköping University and KTH. Petra III complements MAX IV particularly well when needed for higher energy levels. Sweden also co-finances the reflectometer "Super ADAM" at the neutron source ILL<sup>19</sup> in Grenoble (administered by Uppsala University). Additionally, the Swedish Research Council finances Swedish membership in the ILL neutron source, as well as in the synchrotron ESRF<sup>20</sup> in France and the free-electron laser XFEL<sup>21</sup> in Germany, and they also contribute to operating costs of the neutron source ISIS<sup>22</sup> in England.

There are a number of collaborative initiatives between European research infrastructures, whose websites convey both basic knowledge and links to useful individual sites. See for example the collaborative platform "The European Analytical Research Infrastructures Village" ([www.eariv.eu](http://www.eariv.eu)).

Regarding **neutron sources**, the website for EU projects SINE2020 gives additional information on the possibilities, performance and availability for industry of several European facilities, see <https://sine2020.eu/>.

Regarding **photon-based sources**, additional information is provided on both European synchrotron facilities and free electron laser (FEL) facilities via the websites of the EU Project CALIPSOplus (<http://www.calipsoplus.eu>), as well as the collaboration platform LEAPS (<https://www.leaps-initiative.eu/consortium/>). The initiative LightSources.org also collects several overseas facilities (<https://lightsources.org/lightsources-of-the-world/>).

The above links are only examples and guidance, and that the offer of the call is not limited to the research infrastructures involved in these collaboration initiatives. Several overseas research infrastructures also offer relevant and unique opportunities for industrial proposals, for example in Japan, USA, Canada, Australia and Brazil.

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<sup>18</sup> Petra III at Deutsches Elektronen-Synchrotron (DESY) Hamburg, Tyskland

<sup>19</sup> Institut Laue-Langevin (ILL), Grenoble, Frankrike

<sup>20</sup> European Synchrotron Radiation Facility (ESRF), Grenoble, Frankrike.

<sup>21</sup> European X-Ray Free-Electron Laser (XFEL), Hamburg och Schenefeld, Tyskland

<sup>22</sup> ISIS Neutron and Muon Source (ISIS) Oxford, England.