

Increasing capacity and skills of PhD students regarding industrially relevant neutron and synchrotron-based analytical methods – Spring 2020

A call for proposals within the program “**Research infrastructure - utilisation and collaboration**”- for increased competence and industrial utilisation of large-scale infrastructure such as MAX IV and ESS.

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Revision history

Date	Change
2019-11-19	Page2. The proposal must be submitted to Vinnova by: 4 March 2020, at 14.00

If there are any uncertainties, please refer to the Swedish text.

1 Summary

With this call for proposals, we want to give the opportunity for PhD students to build new networks and to gain more knowledge about neutron and synchrotron-based techniques and how these can be used in industry-relevant applications.

The project shall build on and complement an already ongoing and funded PhD-project. It shall also be based on an industry-relevant application.

The project description shall include the implementation of an experiment at the MAX IV-laboratory or at any international large-scale research infrastructure for neutron or synchrotron-based techniques.

One of the PhD student's supervisors shall be the project manager and also participate actively in the project activities.

The project shall be planned and implemented in close collaboration with expertise in the neutron or synchrotron technology addressed. This expertise should be necessary for the implementation thus we do **not** intend to support projects that further strengthen a PhD-student or supervisor who have already used these advanced analytical techniques in their research.

The industrial relevance of the project shall be verified by a Letter of Support from a Swedish company, which does not need to be a formal project participant.

To be able to perform experiments at a large-scale research infrastructure for neutron and synchrotron-based techniques, access to beam time (also called experimental time) must be granted by the facility itself. Beam time does not need to be formally approved when the proposal is submitted to Vinnova, but the proposal shall include a description of the proposed experiment, where it is planned to be implemented as well as how beam time intends to be obtained.

A PhD student can only participate in one project proposal in this call for proposals.

The maximum project period length is 12 months.
Each project proposal can apply for a maximum grant of SEK 400.000.

Up to SEK 10 million is available for the call for proposals.

Important dates:

The proposal must be submitted to Vinnova by: **4 March 2020, at 14.00**

Decision date: 28 April 2020

Earliest start date: 1 May 2020

Latest start date: 15 May 2020

Contact Details:

Questions on the contents:

Maria Öhman, responsible for the Call for proposals

08-473 3189

maria.ohman@vinnova.se

Rebecca Hollertz

08-473 3076

rebecca.hollertz@vinnova.se

Administrative questions:

Marie Wikström

08-473 3179

marie.wikstrom@vinnova.se

Contact regarding the eService portal (Intressentportalen)

08-473 32 99

helpdesk@vinnova.se

Link to the Call for proposals website:

<https://www.vinnova.se/en/calls-for-proposals/research-infrastructure-utilisation-and-collaboration/increasing-capacity-and-skills-of-phd-2019-04476/>

2 What we want to accomplish with the call

Through the funding program "Research infrastructure – utilisation and collaboration", Vinnova wants to strengthen the Swedish innovation system by contributing to building skills and increasing the understanding of how the use of advanced research infrastructures such as the MAX IV-laboratory and ESS can answer to industrial and societal needs.

The goal of this specific call for proposals is to increase the knowledge of neutron and synchrotron-based techniques and how these can be used in industrial research. Beyond obtaining an increased skills base, another expected outcome is that the formation of new networks within and between universities, institutes and companies.

Within this call for proposals we fund activities performed at the MAX IV-laboratory as well as at any international large-scale research infrastructure for neutron or synchrotron-based techniques. In all, the techniques allow for an extensive portfolio of advanced experiments based on e.g. diffraction, spectroscopy and various forms of imaging in 2D and 3D (see Appendix).

Additional calls of this kind are planned by Vinnova, but the content will be developed gradually based on experience and outcomes from previous call for proposals.

Vinnova is tasked with promoting sustainable growth by increasing the innovation capacity. Through our funding, we strengthen the capacity to reach the goals for sustainable development in Agenda 2030¹. Gender equality is a prerequisite for sustainable growth, why this permeates the work with all sustainability goals².

3 To whom is this call for proposals directed?

This call for proposals is directed toward PhD students who are employed either in academia, at a research institute, a company or another legal entity.

We want to give the opportunity for PhD students to build new networks and gain more knowledge about using neutron and synchrotron-based techniques - and how these can be used for industry-relevant applications. This means that we do **not**

¹ Read more (in Swedish only): <https://www.vinnova.se/m/agenda-2030/>

² 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/>

intend to fund projects to further strengthen a PhD student or supervisor who already have used these advanced analytical techniques in their research.

The organisation(s) that employ the PhD student and the participating supervisor must be a project participant. There is no requirement for additional project participants, but collaboration and knowledge transfer between different organisations are encouraged.

The project must be planned and implemented in close collaboration with expertise in the addressed neutron or synchrotron-based technique. Expertise can be obtained from several types of organisations. If there is not already a well-established collaboration between the PhD student/supervisor and the supporting expertise, it is allowed that the expertise is employed at another faculty, workplace or research group within the same organisation as the PhD student/supervisor. However, collaboration between different organisations is encouraged.

The project should be based on an industry-relevant application, which must be verified by a Letter of Support from a Swedish company³.

Please observe that funding is only granted to Swedish organisations. Swedish organisations include foreign organisations that have a branch or establishment in Sweden. The costs in the project must however always be attributable to the activities of the Swedish branch or establishment. A non-Swedish organisation may be a project participant if it finances its own costs.

Also observe that this call for proposals allows eligible costs of expertise employed at an international organisation as consulting costs ("konsultkostnad") of a project participant (se chapter 4.2).

Project consortia who intend to carry out experiments in collaboration with additional resources who does not intend to report costs to Vinnova should attach an additional letter of support to prove this. This may for instance involve collaboration with a research infrastructure (friendly beam time, analysis support, etc.) or synergies with already ongoing projects.

³ In this context, the term "company" does not include research institutes or companies that do not own the development needs that the project intends to meet.

4 What do we fund?

4.1 What project activities do we fund?

The project shall complement an already ongoing PhD-project with the aim to build competence regarding how experimental environments such as the MAX IV-laboratory and ESS can be utilised in Swedish industry.

The intended project shall include the implementation of an experiment at a large-scale research infrastructure for neutron or synchrotron-based techniques, the analysis of the measurement data, and planning for how the results can be developed after the project.

Also the following types of activities constitute eligible costs:

- Planning and design of experiments, including adaptation of a relevant experimental/sample environment.
- Sample preparation and sample characterization directly linked to the neutron/synchrotron experiment to be performed.
- Comparisons with already existing results from more established analytical techniques or modelling.
- Knowledge transfer and dissemination of the results within and outside the project group organisations.

The project proposal should describe a relevant and realistic choice of technique, as well as how beam time/experimental time is believed to be obtainable (with the help of expertise) at a specific experimental station within the project time. Beamtime does not need to be formally approved or fixed in time when the proposal is submitted to Vinnova. However, the project consortia should describe where the experiment is expected to be performed, as well as how access will be ensured to the largest possible extent.

We believe that a realistic project plan contains a relatively extensive commitment of expert support.

There is no requirement for additional funding of the project (co-funding / in-kind). However, we believe that a realistic project plan also needs to include activities that are covered by the PhD student's existing funding.

The call for proposals is expected to contribute to a gender equal development of society. It is therefore important to analyze and comment on relevant aspects of gender equality with respect to the utilization of results and the application area addressed by the proposal.

Vinnova intends to organize a smaller program conference for granted projects during the duration of the project time. We therefore recommend that the project allocates time and a smaller travel budget within the framework of the grant granted to be able to participate.

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. The types of project activities approved in this call shall be covered by **Grundforskning** or **Industriell forskning** in the rules on state aid for research, development and innovation. Eligible costs are described in the "Vinnova's general terms and conditions for grants"⁴ and are also described in more detail in the "Vinnova Guide to Terms and conditions for eligible costs"⁵.

Eligible costs for expertise support in neutron or synchrotron-based techniques that are not employed by a project participant may be included as a consultancy cost (Swedish: Konsultkostnad). Please note that expertise may only be used as subcontractors **to the extent specified in the project description**.

Please observe that paid beam time/experimental time is **not** an eligible cost in this specific Call for proposals.

Reasonable and appropriate costs for travel and accommodation in connection with the experiment are eligible for the PhD student, the supervisor and the expert, respectively.

Also observe that no project activities may be initiated prior to the start of the project.

5 What size grant do we fund?

Each project proposal can apply for a maximum grant of SEK 400.000 for a project period of maximum twelve (12) months.

There is no overall requirement for additional funding of the project (co-funding/in-kind) from any project participant.

Grants to organisations carrying out economic activities are, however, subject to

⁴ 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/> (note that there are different documents depending on the number of project partners).

⁵ See Sections 4.1 – 4.5 of the <https://www.vinnova.se/globalassets/dokument/guide-till-vinnovas-villkor-om-stodberattigande-kostnader.pdf> (in Swedish only).

state aid rules. The amount that a company applies for in grants can only represent a certain share of its total eligible cost.

For this call, companies can apply for the following share from Vinnova, depending on the size of the company⁶:

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

The remaining costs must be financed by the company itself.

6 Conditions for us to assess the proposal

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

- All project participants (Swedish: Projektpart) are legal entities.
- The participants applying for grants are either registered in Sweden or have a branch or establishment in Sweden⁷.
- Organisation(s) that employs the PhD student and the supervisor are project participant(s).
- The Project manager (Swedish: Projektledare) is a supervisor of the PhD student in the ongoing PhD project.
- The PhD student does not participate in more than one project proposal in this call from Vinnova.
- The proposal follows the instructions in section 9 and contains all the mandatory attachments requested there.
- A Letter of Support is enclosed from at least one Swedish company.

7 Assessment of submitted proposals

7.1 What do we assess?

Only the written content of the submitted proposal will be assessed. 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.

⁶ For the current definition of small and medium sized companies see:
<http://ec.europa.eu/DocsRoom/documents/15582/attachments/1/translations>

⁷ The costs in the project must be attributable to the activities of the Swedish branch or establishment.

Potential

- All project activities are in line with the purpose of the call for proposals, according to sections 3 and 4.
- The background description of the proposal and the letter of support motivates the choice of experiment as well as its industrial relevance.
- The application addressed have potential to contribute to economic, environmental and socially sustainable societal development. The proposal also relates to relevant aspects of the project with regards to gender equality.

Feasibility

- The proposal motivates in a credible way that the experiments are technically feasible and possible to carry out at an intended experimental station with respect to the project time. Relevant risks associated with the project implementation are managed in an appropriate and credible manner.
- The project activities and time schedule are reasonable with respect to the project goals as well as the available resources described in the proposal.

Participants

- It is clear that the project is implemented in collaboration between the PhD-student, supervisor and expertise within neutron or synchrotron-based techniques at a large-scale infrastructure.
- The competence and resources allocated correspond to the project plan and goals, with sufficient commitment from both supervisor and expertise and clear collaboration and knowledge transfer between the key persons.

7.2 How do we assess the proposals?

The proposals that meet the formal requirements (see section 6) will be assessed according to the criteria (see section 7.1) by specially chosen experts appointed by Vinnova. This results in a recommendation for funding to Vinnova. Programme managers at Vinnova may also participate in the assessment process.

Vinnova decides which projects are to be funded, taking into account the expert's recommendation. In a competitive situation, account will be taken to the breadth of the project portfolio with respect to scope/area of application. Already granted/confirmed beam time/experimental time will also be seen as a strength in the case of a competitive situation.

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 project participant 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. 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 grants⁸. These conditions include rules on prerequisites for payment, follow up, reporting and utilisation of results. Note that no project activities may be started before the decision date.

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

1. In connection with the 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. A template for this is distributed by Vinnova.
2. The following condition replace § 1.4 of Vinnovas general terms and conditions: Project agreement is not required within this project.

Note, however, that a project agreement should be established if the project participants consider that need to be dealt with in an agreement.

Vinnova intends to organize a smaller program conference for granted projects during the duration of the project time. We therefore recommend that the project allocates time and a smaller travel budget within the framework of the grant granted to be able to participate.

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.

⁸ Current terms and conditions can be found on our website, along with help to understand and meet the terms: <https://www.vinnova.se/globalassets/dokument/guide-till-vinnovas-villkor-om-stodberattigande-kostnader.pdf> (note that there are different documents depending on the number of project partners).

9 How to apply

To apply for a grant, you fill in the special web-based form in Vinnova's eServices portal (Intressentportalen). There you will also upload the following required documents, according to templates downloaded from the Web page of the Call for proposals⁹. The documents must be written with twelve (12) point normal black text. **Please note that the proposal can 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:** May consist of maximum five (5) A4 pages.
- **CV:** Shall include relevant information regarding the PhD-student, supervisor (project manager), expert(s) and possible additional key persons.
- **Letter of Support:** Shall be attached from at least one company and describe how the expected skills increase can be of benefit in the field of application. It should also be stated whether/how knowledge transfer is planned. The Letter of Support shall be signed by a person qualified to sign contracts for research- and innovation projects on behalf of the organisation concerned.

If the project consortia intend to use additional resources whose costs are not intended to be reported to Vinnova, a letter of confirmation regarding this resource allocation should be attached as additional attachment (**Övrig bilaga**). **No** additional material may be attached to the proposal.

Proposals should be submitted to Vinnova by: **4 March 2020 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.

⁹ You find templates for the required documents to attach on: <https://www.vinnova.se/en/calls-for-proposals/research-infrastructure-utilisation-and-collaboration/increasing-capacity-and-skills-of-phd-2019-04476/>

Appendix. Short guide to research infrastructures for neutron and synchrotron based techniques

Use of neutron and synchrotron-based techniques

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.

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.

Short guide regarding MAX IV and international research infrastructures

The Swedish synchrotron MAX IV in Lund is Sweden's largest and most ambitious investments in research infrastructure and is also one of the world's brightest source for synchrotron radiation. The MAX IV-laboratory offers opportunities to design experiments in completely new ways – and the same will apply to the European Spallation Source (ESS) which is being built to become the world's strongest neutron source. In addition to industry relevant experiments,

even more user applications could benefit from these 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 material research and life science.

MAX IV has opened up for experimental possibilities at several beamlines and open call already exists for 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 the open port of the beamline Veritas. See the following link for specifications from MAX IV regarding performance and capacity, as well as how to proceed to apply for access (beam time) in the open calls for proposals: <https://www.maxiv.lu.se/users/proposal-calls/>

Through the Swedish Research Council, Sweden also finances the experimental station P21/"Swedish materials science beamline" (SMS) at the German synchrotron Petra III¹⁰ in Hamburg. The SMS P21 works at a photon energy that complements what is possible at the MAX IV-laboratory, allows diffraction and imaging (P21.2) and broadband diffraction (P21.1) and is administered by KTH, Linköping University and DESY through the centrum CeXS¹¹ funded by the Swedish Research Council. This user agreement with DESY also includes some priority access to Swedish users at all beam lines of the Petra III synchrotron which are administered by DESY.

Sweden also co-finances the reflectometer "Super ADAM" at the neutron source ILL¹² in France. SuperADAM is administered by Uppsala University¹³. The Swedish Research Council also finances Swedish membership in the ILL neutron source and in the synchrotron ESRF¹⁴ in France. They also contribute to operating costs of the neutron source ISIS¹⁵ in England.

Detailed information on the capacity and availability of the individual international facilities can be provided through their respective websites. Information regarding facilities for synchrotron light and XFELs is presented at the webpage of the initiative Lightsources.org (<https://lightsources.org/lightsources-of-the-world/>). For neutron sources, for instance the initiative Neutronsources.org gathers information (<https://neutronsources.org/neutron-centres.html>).

¹⁰ Petra III at Deutsches Elektronen-Synchrotron (DESY) Hamburg, Germany

¹¹ Läs mer på <https://www.cexs.kth.se/sv>

¹² Institute Laue-Langevin (ILL), Grenoble, France

¹³ See <https://www.physics.uu.se/research/materials-physics+/super-adam/>

¹⁴ European Synchrotron Radiation Facility (ESRF), Grenoble, France

¹⁵ ISIS Neutron and Muon Source (ISIS) Oxford, England.