MAX IV

Enabling next level industrial research

MVA-HALOS Symposium 31/1-2022

Workflows and resources around the large scale Research Infrastructures in the Hamburg-Öresund-Kattegatt-Skagerack region

Magnus Larsson, Head of Industrial Relations at MAX IV Laboratory in Lund

What is available?

X-rays, synchrotrons and neutrons

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MAX IV

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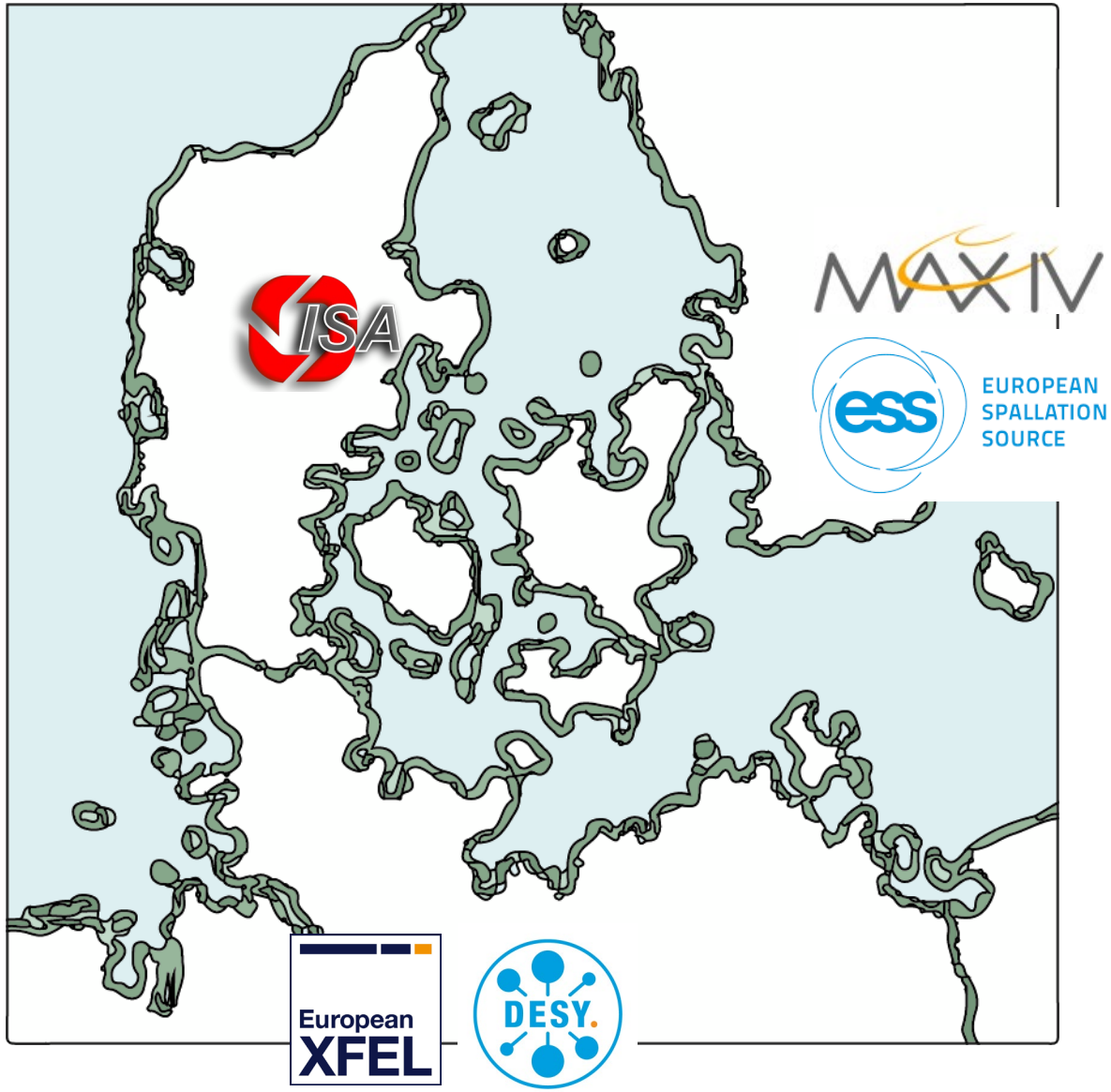
Large Scale Research Infrastructure in the HALOS region

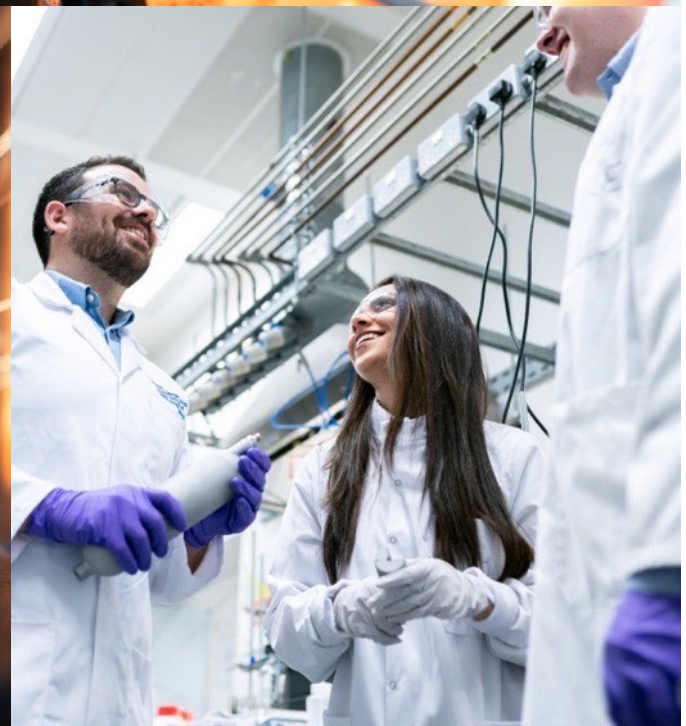


INDUSTRIAL RELATIONS OFFICE

MAX IV

Can I use it?

Is it useful for industry?



Explore, discover, learn

- Study materials behaviour and properties at **unprecendented resolution**
- Enable radical **product optimisation**
- Improve manufacturing processes
- Obtain **input and data** for computational modelling, patents, marketing, etc
- Gain new insights – **transform and accelerate** your business

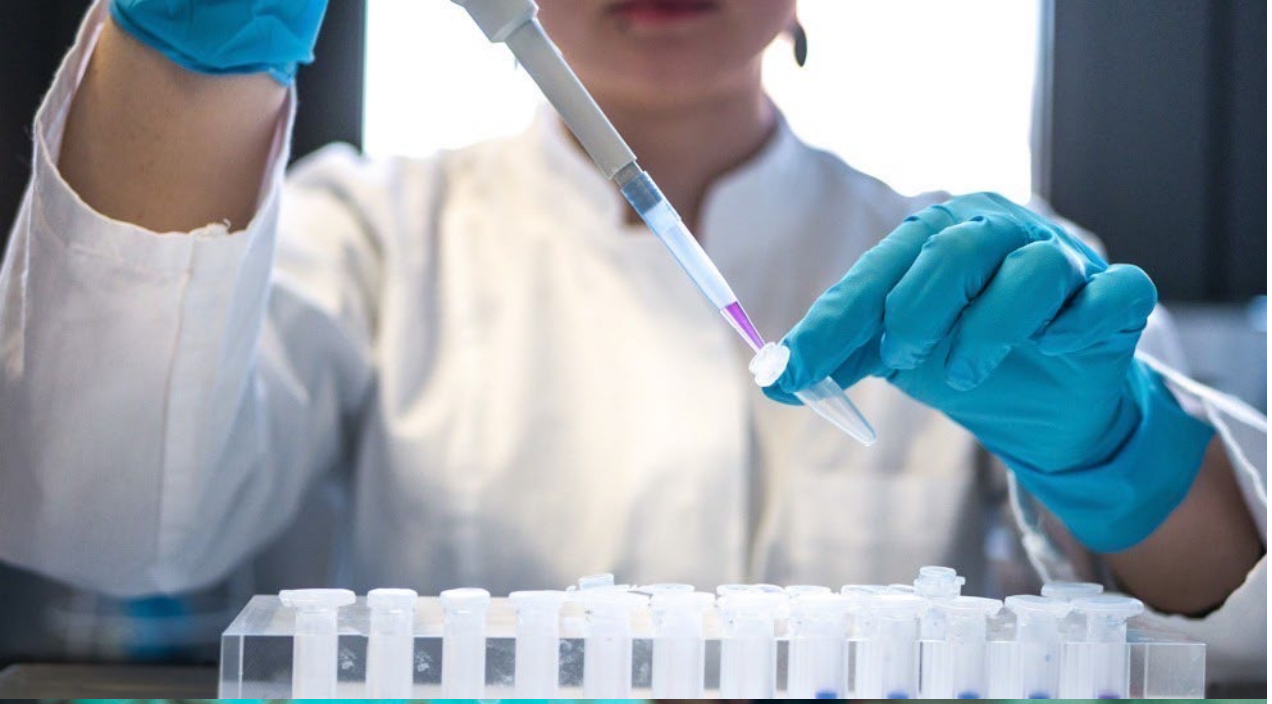
MAX IV

Drug discovery

- Optimisation and improvement of drugs and their effects
- Focus on proteins and their active sites, modes of binding drug candidates to target proteins
- New starting points for developing novel pharmaceutical substances

Uses MAX IV to study:

- Protein structure determination
- Small-molecular drugs, nanomaterials for medical application, and drug-delivery vehicles
- Rapid examination of microcrystals
- Protein dynamics in solution
- How reactions take place in proteins



Health and life sciences

- Exploring new active compounds and formulations of drug delivery systems
- Underlying biological processes for conditions that affect human health
- MS research, diabetes research on pancreatic islets, brain tissue affected by Alzheimer's, etc.
- MAX IV, ESS, and SciLifeLab has established the platform *InfraLife* to increase collaboration

Uses MAX IV to study:

- Biological and soft matter *in vivo* at high spatio-temporal resolution
- Trace substances and the relationship between chemical structure and reactivity in samples
- Local structure of metal centers in proteins

MAXESS INDUSTRY ARENA

Discover the true potential of your biomaterial with X-rays

BoneSupport AB and scientists from Lund University used X-ray tomography to observe how the bone substitute produced by the company behaves inside the bone. They confirmed the distinctive features of the product and observed how it protects the bone material during mechanical loading.

Users and research partners

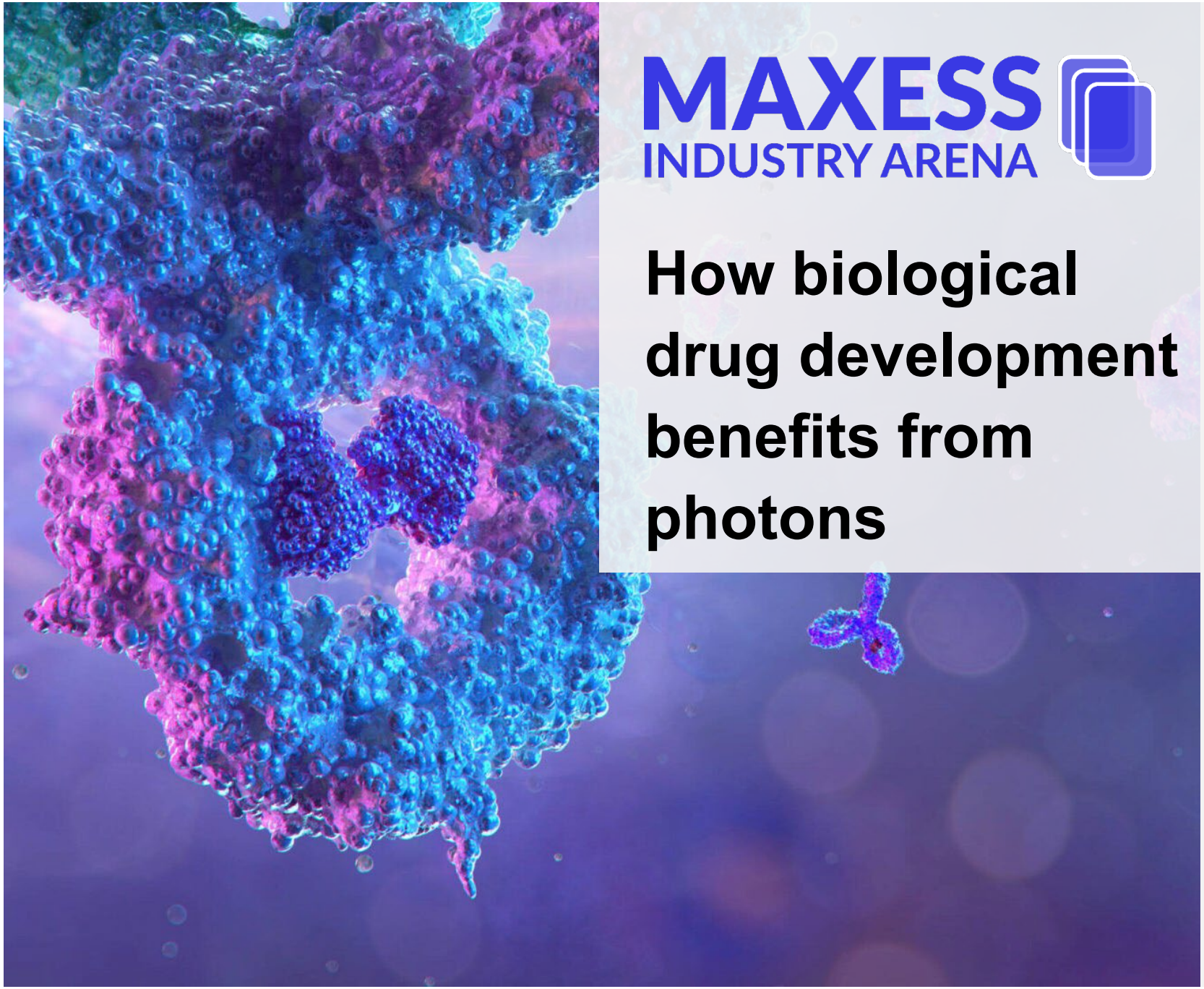
BoneSupport AB, Lund Biomechanics at Lund U.

Techniques used

X-ray imaging at the Swiss Light Source (PSI)

Link to more info

maxess.se/case/discover-the-true-potential-of-your-biomaterial-with-x-rays/



MAXESS INDUSTRY ARENA

How biological drug development benefits from photons

Alligator Bioscience in collaboration with SARomics Biostructures used X-ray crystallography to unveil the unique characteristics of one of their antibody-drug candidates, proving how valuable synchrotron X-rays can be for drug development.

Users and research partners

Alligator Bioscience AB, SARomics Biostructures

Techniques used

Serial X-ray Crystallography, BioMAX

Link to more info

maxess.se/case/biological-drug-development-maxiv/

MAXESS INDUSTRY ARENA

Identifying leaking syringes with neutrons

The biopharmaceutical company Sobi together with neutron experts from RISE used neutron radiography for the detection of leakages in prefilled syringes. The results show the potential of this technique in detecting leaks, with significant advantages for design and quality assurance in syringe production.

Users and research partners
Swedish Orphan Biovitrum AB (SOBI), RISE LSRI group.

Techniques used
Neutron radiography at Laboratorie Leon Brillouin (LLB).

Link to more info
maxess.se/case/identifying-leaking-syringes-with-neutrons/

How can I use it?

Access modes and Connections

Two ways to get beamtime

- ✓ Free
- ✓ Apply for beamtime (2 open calls/year)
- ✓ Collaborate with an academic research partner
- ✓ Proposals ranked on scientific merit
- ✓ Publish your results

- ✓ Paid
- ✓ Faster, industry-tailored access
- ✓ Full confidentiality and IP rights
- ✓ One time project or long-term framework agreement
- ✓ You own your results

Different routes into MAX IV

novo nordisk
GRÄNGES
HALDOR TOPSØE
AstraZeneca

Proprietary access for advanced users

Peer-reviewed access for advanced users

Mediated proprietary access

SARomics
RI.SE
MOLO
LINX
Linking Industry to Neutrons and X-rays
SWERIM

TREESEARCH

ForMAX

Investor access

Peer-reviewed access through academic groups

Proprietary industry solutions at MAX IV

MAX IV

Different Paths to New Insights with PETRA III.

Joining forces with DESY

Direct Commercial Access

- No academic partner required
- **Free-of-charge feasibility study** possible
- Discounts:
  - Case study or publication
  - Longer-term / frame agreements
  - Quantity discount

Cooperation with DESY

- **Working together** on new methods, technologies, …
- Joint third-party funding proposals with
  - DESY as a project partner or
  - DESY as a subcontractor
- **Funding a PhD** student for largest added value
- Support with proposals and search for funding

Through Universities/Institutes

- Standard academic proposal by university/institute
  - Review on scientific excellence
  - Half-year scheduling
  - Publication required
- Fast commercial access through university or company

Through Commercial Service Providers

- **Highly specialized experts** in many fields
- Offer additional services, such as
  - Consulting
  - Preparation
  - Postprocessing

Interested to learn how DESY can help you innovate?
Get in touch with us: innovation@desy.de
Or directly contact our innovation services manager for PETRA III: oliver.wendt@desy.de

What kind of help can I get?

Support labs, mediators and collaborations

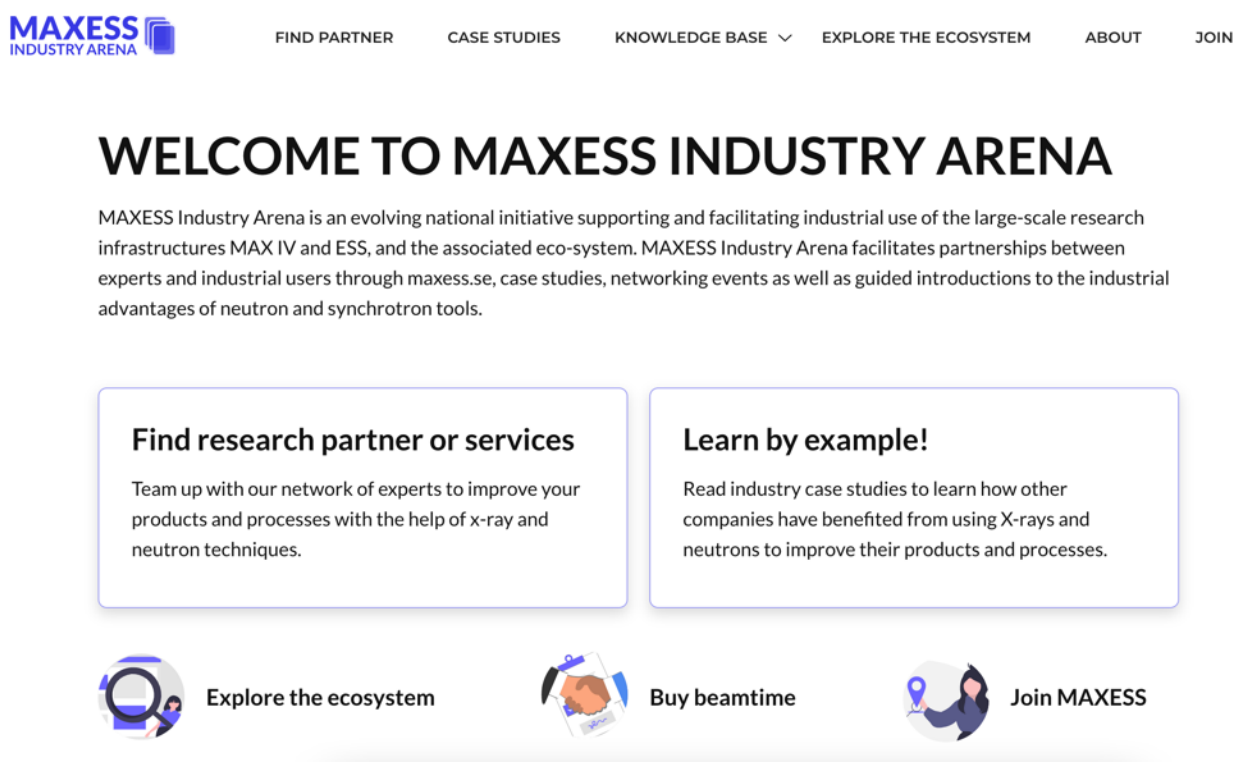
Academia

MAXESS
INDUSTRY ARENA

One **central gateway** to MAX IV and ESS for companies

- **Access industry services** at MAX IV, ESS, and the associated ecosystem
- **Find research partners** for experiments and research proposals
- **See how other companies** have used the facilities (cases, knowledge base)

→ www.maxess.se



RI. SE MAX IV smile ess EUROPEAN SPALLATION SOURCE SCIENCE VILLAGE
EUROPEISKA UNIONEN Europeiska regionala utvecklingsfonden REGION SKANE

LOG IN

MAXESS INDUSTRY ARENA

FIND PARTNER | CASE STUDIES | KNOWLEDGE BASE | EXPLORE THE ECOSYSTEM | ABOUT | JOIN

Sectors: All Selected | Capacity: All Selected | Position in Eco System: All Selected | Instruments: All Selected

Clear All

64 MATCHES

Feedback

LABORATORY & LAB INSTRUMENTS

3D Imaging – X-ray tomograph service

RISE
Stockholm

Offer / Action
Non-destructive 3D structural characterization of materials using la based X-ray microtomography. We c offer help with visualization, in-situ mechanical testing and quantitative analysis. Please feel free to contact u free consultation on how we can ana your material.

Description

CENTER

Biofilms Research Center for Biointerfaces

Malmö University Malmö → Biofilms Research Center for Biointerfaces website

Share card

Description

Biofilms Research Center for Biointerfaces is a multidisciplinary research centre within materials and life sciences. The centre's activities focus on phenomena associated with biofilms and biobarriers. The practical applications of the research include diagnostics, treatment methods, drug formulation and the use and development of medical implants and sensors. The centre hosts Open Lab Skåne where you can rent lab space, office space and instrumentation. In addition, you can get support from a qualified research engineer. The centre has just acquired new SAXS/WAXS lab equipment that is open for external users.

Tags

Bio-based materials and polymers, Chemistry and Catalysis, Medtech - Biomedical engineering, Nanotechnology and Nanomaterials, Pharma and Biotechnology

Offer / Action

Contact us for research projects and collaborations as well as for getting access to our lab SAXS equipment.

We also have other equipments and lab space for rent.

Feel free to join our breakfast seminars.

Contact

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Director
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therese.nordstrom@mau.se

LARGE-SCALE INFRASTRUCTURE

Balder

MAX IV Laboratory
Lund

Offer / Action
Buy beamtime at Balder by contacti IV industry office. Apply for open access beamtime through the Digital User Office. Join a research or development project with the Balder team – contact: Konstantin Klementiev or Kajsa Sigfridsson [...]

Contact us for research projects and collaborations as well as for getting access to our lab SAXS equipment. We also have other equipments and lab space for rent. Feel free to join our breakfast [...]

MAX IV industry office. Apply for open access beamtime through the Digital User Office. Use the fragment screening platform FragMAX. Join a research or development project with the BioMAX team – contact Ana [...]

IV industry office. Apply for open access beamtime through the Digital User Office. Join a research or development project with the Bloch team – contact Johan [...]

X-rays can help stop wasting waste

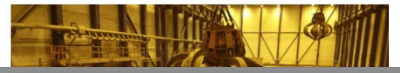
Waste incineration companies working together with RISE investigated the use of synchrotron X-rays to identify nontoxic bottom ash from waste incineration that can be used as ground construction material.

Bottom ash from waste incineration

In Sweden, household and commercial waste that cannot be reused or recycled is incinerated, resulting in energy recovery and the generation of streams of fly ash and bottom ash as by-products. While fly ash is often put to landfills, bottom ash possesses excellent properties as ground construction material such as for building roads. However, in order to give it a new purpose, bottom ash must be classified as non-ecotoxic and not posing any environmental threat. Synchrotron light can help to develop a reliable method for identifying nontoxic ash and create a value for this by-product in a circular economy approach.

Good for our planet

Ash from incineration has an exceptionally complex composition matrix, which makes it challenging to identify potential toxic chemical forms. Currently, when a batch of bottom ash cannot be declared safe, it is considered toxic and put to landfills. The development of reliable, efficient, and standardised methods for characterising ash ecotoxicity would increase the use of bottom ash as secondary raw material and reduce human impact on our planet.



ENVIRONMENTAL ENGINEERING AND RECYCLING

Case Details
Nov 2018 - Apr 2020

Industrial user: Fortum Waste Solutions AB, E.ON , NOAH AS, Sysav Utveckling AB, and STENA Recycling AB

Research partner
Builder
LSRI-initiative at RISE

Source Files
X-ray absorption spectroscopy for speciation of hazardous metals in ash from waste incineration.pdf

Discover the true potential of your biomaterial with X-rays

BoneSupport AB and scientists from Lund University used X-ray tomography to observe how the bone substitute produced by the company behaves inside the bone. They confirmed the distinctive features of the product and observed how it protects the bone material during mechanical loading.

A biomaterial to reinforce bones

BoneSupport AB develops biomaterials to be injected in bones and used as bone substitutes in patients. The company seeks to better understand how the biomaterial behaves and interacts with the bone during mechanical loading, and how the bone response is altered when combined with the biomaterial. Taking advantage of synchrotron X-ray's high resolution, BoneSupport conducted experiments that showed an increased plasticity in samples where the bone is reinforced with their proprietary biomaterial. This evidence helps the company understand the features of the bone substitute once inside the bone and is valuable for future product development.

Filling the gaps

How does the biomaterial behave once injected in the bone? How does it interact with the native bone material? Does it improve the bone response to mechanical stress? Answering these questions involves understanding how the bone and the biomaterial interact during mechanical loading (which is the application of physical pressure to the point where the material fails). To tackle this challenging task, BoneSupport is collaborating with researchers at Lund University. The team turned to synchrotron-based X-ray tomography, which allowed them to carefully observe increasing stresses and their consequences in the biological structure. These experiments showed that the biomaterial produced by BoneSupport absorbs the loading in place of the native bone structure, thus helping

MEDTECH - BIOMEDICAL ENGINEERING

Case Details
Aug 2018 - Mar 2020

Industrial user: BoneSupport AB

Research partner
Lund Biomechanics

Source Files
In situ X-ray imaging of bone-biomaterial

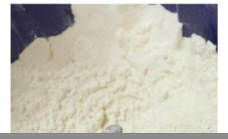
Bread at the nanoscale

Lantmännen and RISE want to establish new knowledge about the interaction of polysaccharides with water, and the gelatinisation of starch granules that shapes the baking process. The results of the X-ray scattering experiments help Lantmännen optimise the different qualities of their flours.

The aim for better flours

Lantmännen is an agricultural cooperative and Northern Europe's leader in agriculture, machinery, bioenergy and food products with operation in over 20 countries. One of the cooperative's key activity areas is in the production of polysaccharides, especially starch and flour, for the baking industry. In an effort to further optimise their products, Lantmännen seeks new and more advanced knowledge on the interaction of polysaccharides with water, and the subsequent gelatinisation of starch granules. This effort has kickstarted a series of research projects, which will help Lantmännen tailor their flours to the many needs of their customers.

The key role of polysaccharides



Polysaccharides are an important component in food production as thickeners, stabilisers, and texturisers. During heating, starch granules take up water and swell, resulting in the gelatinisation of granules. A more advanced knowledge of how the structure of polysaccharides rearranges during food preparation can help Lantmännen understand

FOOD AND AGRICULTURE

Case Details
Nov 2018 - Feb 2020

Industrial user: Lantmännen

Research partner
LSRI-initiative at RISE
RISE Agriculture and Food are using X-ray and neutron techniques at LSRI

Source Files
Determination of starch gelatinization and polysaccharide gelation using SAXS and WAXS for optimized product quality.pdf

A push towards flux-free aluminium brazing

Gränges Sweden AB together with Uppsala Synchrotronix, AB and Linköping University use X-ray spectroscopy to understand how to develop a flux-free aluminium brazing treatment for aluminium plates, which would help Gränges to further improve their aluminium products.

Leading in aluminium engineering

The Sweden-based company Gränges is specialised in aluminium engineering and is a leading global supplier of aluminium products for, among others, heat exchanger applications and the automotive industry. In collaboration with Linköping University and Uppsala Synchrotronix AB, the company used MAX IV's X-rays to investigate how to remove the surface oxide layer from aluminium sheets without using flux. The development of a flux-free brazing approach would contribute to improving the properties of Gränges's aluminium products, while also providing a safer and more environmentally friendly solution.

INDUSTRIAL PRODUCTION AND MANUFACTURING

Case Details
Nov 2018 - Feb 2020

Industrial user: Gränges Sweden AB

Research partner
SPECIES
MIPRIE
Uppsala Synchrotronix
Lars-Åke Nässtrand, R&D Analysis & Design

Source Files
In situ XPS of Al2O3 break-up at flux-free brazing conditions.pdf

An X-ray look on an innovative steel

The company Ovako has developed the innovative Hybrid Steel and wants to gain a more thorough understanding of its composition at the nanometre level. Together with researchers from Chalmers University of Technology they performed X-ray experiments that can help refining the production process of their new proprietary material.

A stronger and more efficient steel

Ovako is a leading European manufacturer of engineering steel serving many industry sectors such as bearing, transportation, and manufacturing. Ovako developed and patented the Hybrid Steel, a type of steel that obtains its peculiar high strength by combining precipitation of intermetallic NiAl precipitates and carbides. Due to its unique composition, the precipitation process of Hybrid Steel is rather complex and still partially undescribed. By performing X-ray scattering, Ovako aims at gaining advanced in-depth understanding of the heat treatment used in the precipitation process. This additional

METALLURGY AND MINING

Case Details
Nov 2018 - Mar 2020

Industrial user: Ovako

Research partner
Microstructure Physics

Source Files
Understanding heat-treatment of Hybrid Steel using in-situ and ex-situ synchrotron X-ray diffraction

Better boxes for more sustainable packaging

BillerudKorsnäs together with RISE performed X-ray scattering experiments to understand the cause behind the deformation of corrugated boxes used in goods delivery. The collected data is contributing to the development of sturdier and more sustainable boxes.

The way goods travel the world

The use of corrugated boxes is the most common and wide-spread solution for the delivery of goods around the world, but it is far from being perfect. Corrugated boxes are subject to deformation called material creeps, which often result from the weight of the content and stockpile. Such deformations can lead to accelerated failures when atmospheric conditions like humidity cycle between high and low levels. Failures in corrugated boxes during transport and storage is one of the main causes of the loss of packaged goods. Material specialist at the Swedish company BillerudKorsnäs together with researchers from RISE used synchrotron light to start tackling this challenging issue and lay the ground for the development of more sustainable and efficient packaging.

Benefits on a global scale

Improving the resistance of corrugated boxes against weather conditions and load stress can bring significant benefits to the delivery industry on a global scale. Better boxes would also have an impact on the environment, as fewer goods would be damaged and compromised due to the packaging solution. The deformation mechanism causing material creeps is not fully understood yet. Previous works suggest that variations in humidity levels play an important role in this phenomenon, as the moisture interacts with the paper fibres. For researchers wanting to understand this mechanism, it is crucial to reproduce the right atmospheric conditions in a controlled environment. But that's not all. Since material creep is a dynamic process, it is also essential to observe the event

BIO-BASED MATERIALS AND POLYMERS

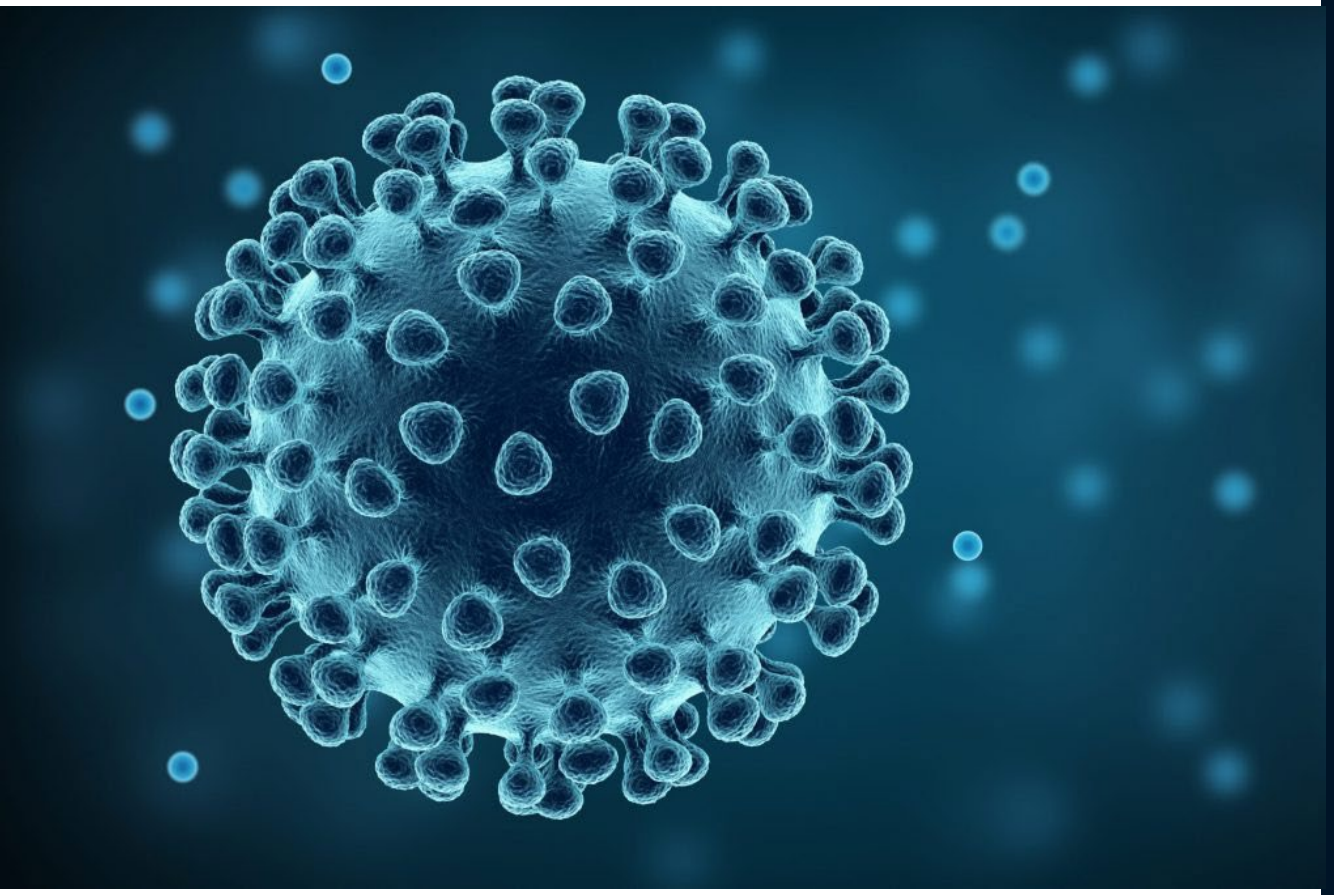
Case Details
Nov 2018 - Nov 2019

Industrial user: BillerudKorsnäs AB

Research partner
LSRI-initiative at RISE

Source Files
Vinnova case study: Understanding failure of paper-based packaging due to moisture induced creep

InfraLife.



Reaching and advocating for the **life science sector**

The **InfraLife** initiative aims to make Sweden's large scale research facilities more accessible to life science researchers, and make sure the facilities are developed to meet the sector's needs.

InfraLife is a collaboration between SciLifeLab, MAX IV, and ESS.

Coordinators:

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Stockholm

Elin Jonsson
Lund

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https://www.infralife.se/

SciLifeLab ess MAX IV

EMBL Hamburg https://www.embl.org/sites/hamburg/

EMBL Hamburg is specialized in structural biology research and services

CSSB https://www.cssb-hamburg.de/

Ten research partners from Northern Germany, including three universities and six research institutes that devotes itself to infection biology research

CAROTS https://www.carots.eu/

The objective of CAROTS is to establish a new type of SME – Commercial Analytical Research Organisations (CAROs) – providing services in various fields

NextBioForm https://www.ri.se/en/nextbioform

Centre, with 18 partners, providing cutting edge research on industrially relevant issues for formulation and characterisation of biologically based drug products

HALOS https://www.halos.lu.se/

Hanseatic League of Science - interconnecting infrastructures for life science research and innovation

MVA https://mva.org/

MEDICON VALLEY ALLIANCE

A Danish-Swedish networking organization for the entire life science community in Greater Copenhagen

How can I get the most out of it?

Fredrik Melander

Head of R&D Relations

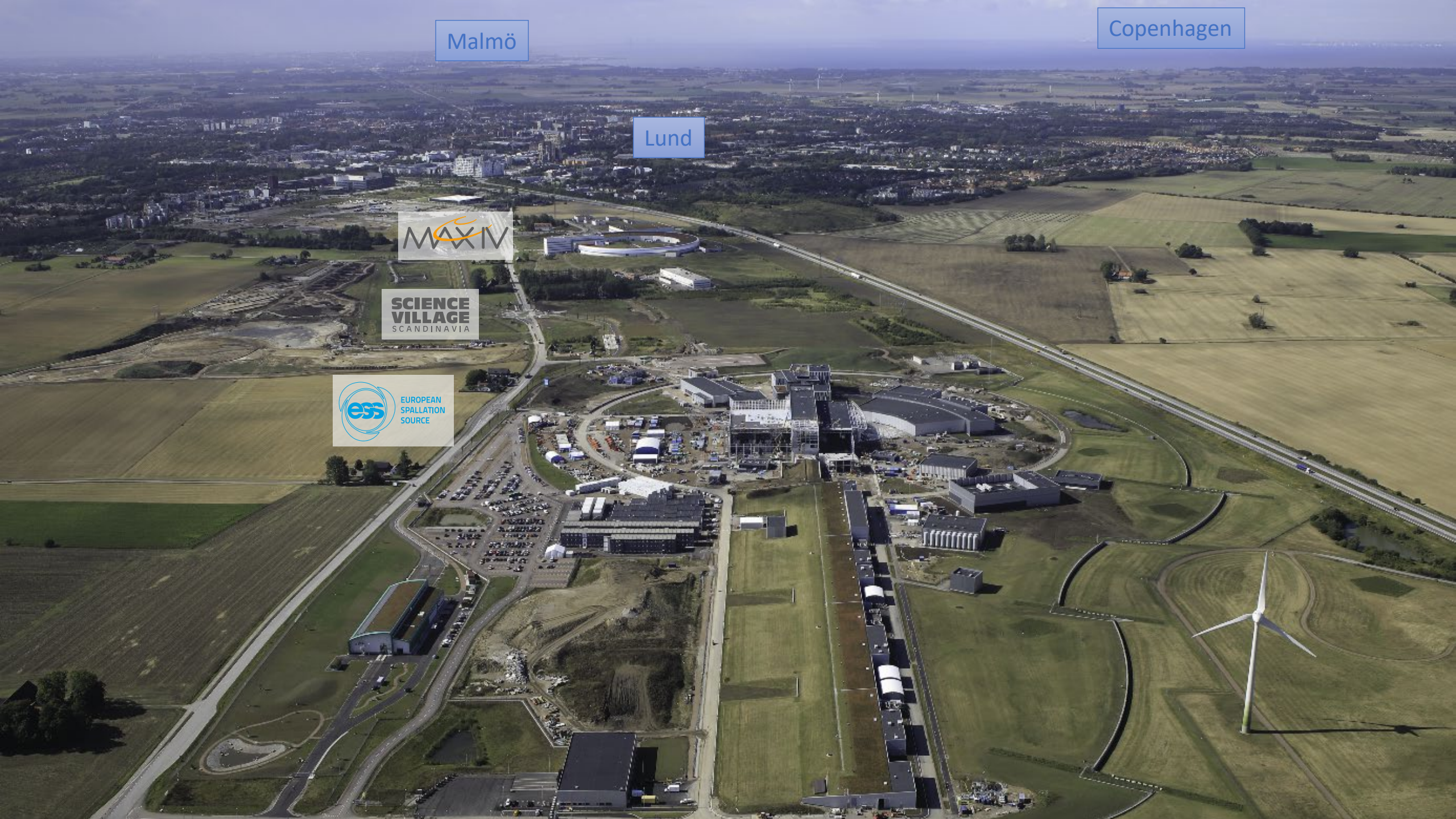
fredrik.melander@sciencevillage.com

Located in **Science Village Scandinavia**

City district with two of the world's most advanced science facilities

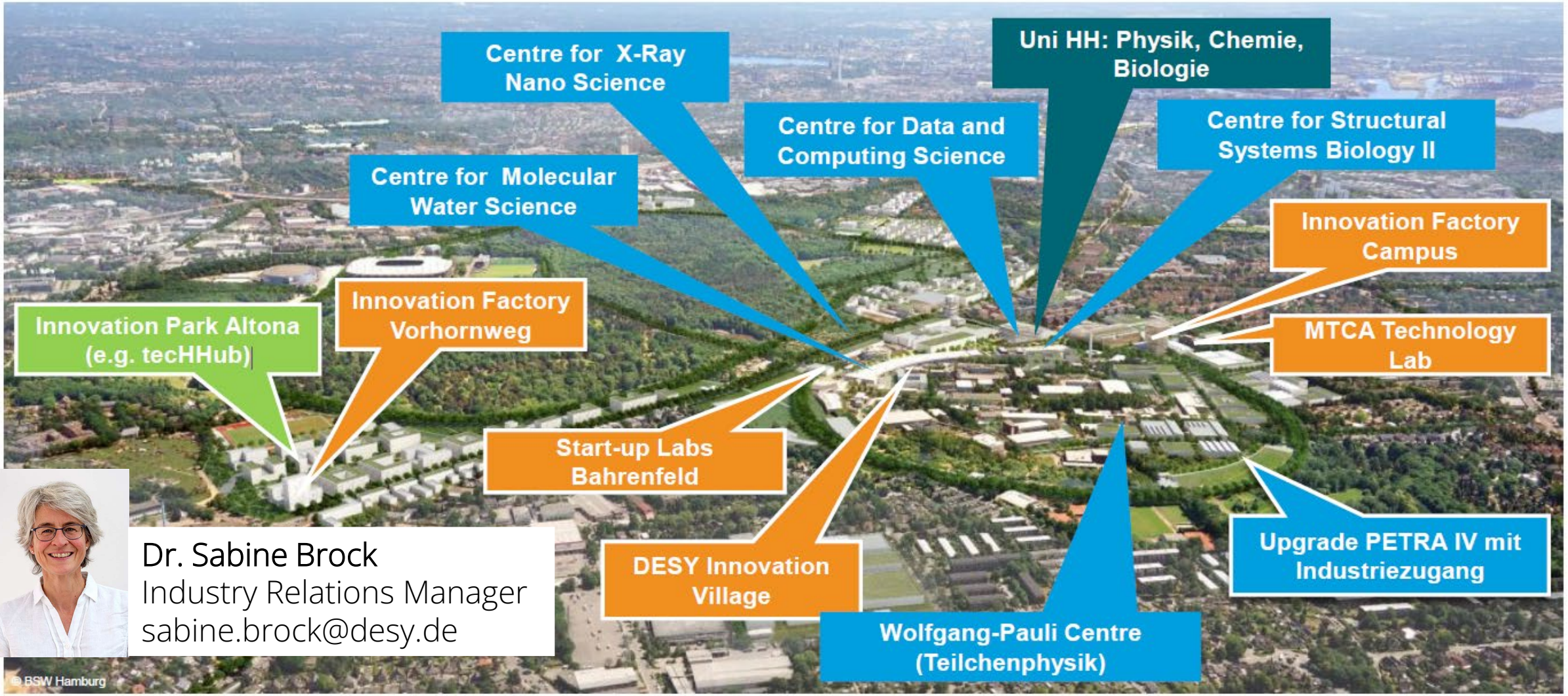
Photo: COBE

MAX IV


Malmö
Copenhagen
Lund
MAX IV
SCIENCE VILLAGE SCANDINAVIA
ess EUROPEAN SPALLATION SOURCE

Innovation @Science City Bahrenfeld

Interdisciplinary hub, where excellent science, academia and industry interact



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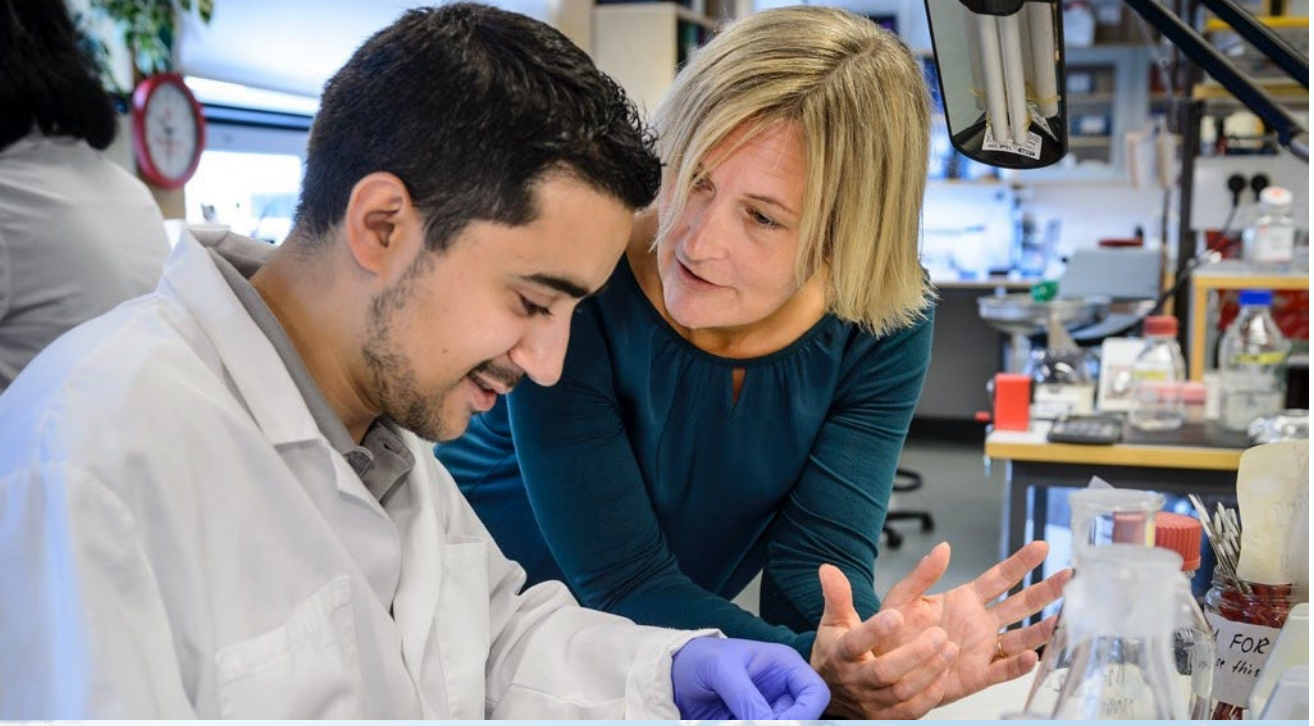

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Stockholms Universitet
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Lund University
KTH Vetenskap och Konst
Linköpings Universitet
Chalmers
Luleå Tekniska Universitet
Vetenskapsrådet
Vinnova
Treesearch
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Questions?
Ideas?