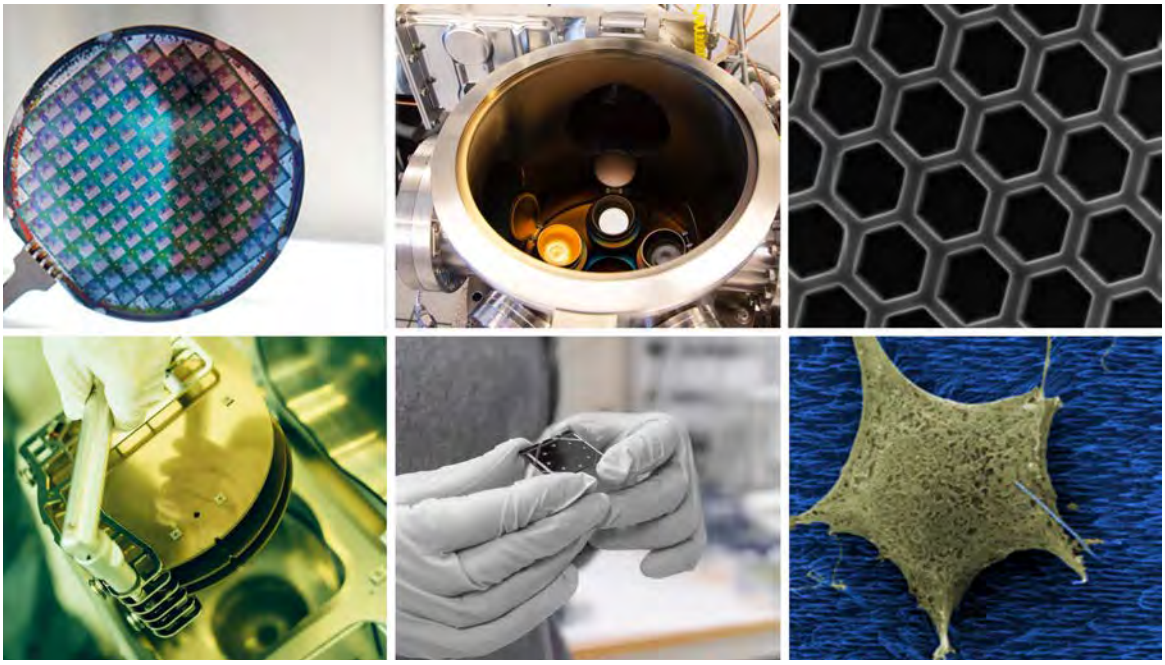

Myfab Report 2022

Myfab - The Swedish Research Infrastructure for Micro and Nano Fabrication

INTRODUCTION

Myfab is the national research infrastructure for nano- and microfabrication. This distributed cleanroom infrastructure is the best possible environment for the development and fabrication of materials, structures, and devices for advanced research in a wide field, including physics, materials science, nanoscience, chemistry, life science and nanoelectronics.

Myfab's mission is to provide Swedish researchers, entrepreneurs, and industry with leading-edge micro- and nanofabrication equipment in a nationally distributed infrastructure of operationally excellent cleanroom facilities, supported by expert and collaborative staff.

Myfab was founded in 2004 and became a national research infrastructure in 2010, with cleanroom laboratories at Chalmers University of Technology, KTH Royal Institute of Technology, and Uppsala University. Since 2016, Lund University has been a full member of the infrastructure, and further expansion is under consideration. The four large cleanroom laboratories form a powerful organisation, nurtured by synergies and collaboration, where users have access to and support from the whole infrastructure.

Together during almost two decades, we have developed an internationally recognized operational model, offering user-fee based open access with practically no waiting time, available to academy and industry year-round. The distributed character and interconnecting Myfab LIMS system make this an efficient infrastructure, combining local presence [1] and national coverage. Each node offers an entry point to the whole infrastructure, where dedicated staff provides education, training, process advice and support to the users. The expert staff interacts within Myfab, with the user community and in international networks to improve the operation and develop the infrastructure.

Within a total cleanroom area of 5400 m^2, Myfab provides more than 750 processing and characterization tools maintained by a staff of 74 engineers and researchers (58 full-time equivalents), 35 of which hold a PhD degree. During 2022 this environment hosted 835

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[1] Within 60 minutes travel are an estimated 4.4 million people in the Gothenburg, Malmö, Stockholm, and Uppsala regions.

active users (79% academic). This is a very dynamic user base, as evidenced by the fact that about 1/3 is replaced every year, creating a significant output of well-trained researchers and engineers. Many young and successful PIs are attracted to the environment to establish new research groups. During 2016–2022, at Myfab Chalmers alone, 24 PIs started their activities and researchers received 28 prestigious grants from Knut and Alice Wallenberg's foundation (KAW), the Swedish Research Council (SRC) and the European Research Council (ERC). Our users produce truly impressive results in terms of scientific discoveries, innovative ideas, and original products.

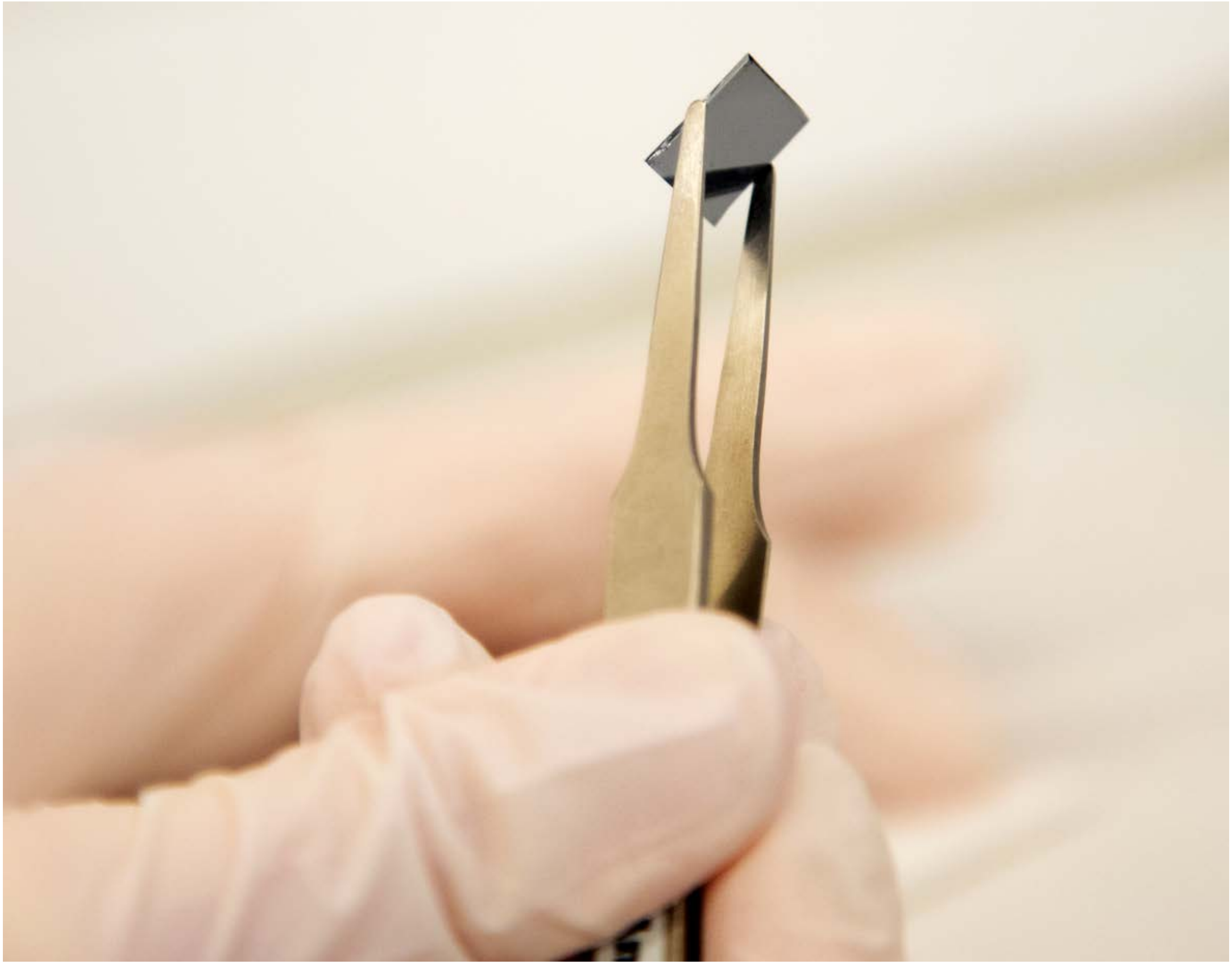
Myfab Infrastructure Overview			
5400 m^2 Cleanroom area	750 Bookable Tools	74 Expert Staff	835 Active Users
Myfab Research			
24 ERC Grants	30 KAW Grants	836 Publications 2022	47 Ph.Ds. 2022

From the Myfab environment 836 publications and 47 doctorial theses were produced during 2022, and during the seven-year period 2016 – 2022, 5277 peer-reviewed publications and 380 PhD students have emerged, which correspond to more than one doctoral thesis per week and more than two peer-reviewed publication per day during seven years! This demonstrates Myfab's capability for the development and fabrication of materials and device structures for advanced research in Sweden.

Business creation and job opportunities are other important outputs from the environment; during the period 2016–2022, 123 innovative companies, mostly small and medium-sized enterprises (SME) and start-ups, have used Myfab. Myfab has often been the launching point for a number of spin-off companies emanating from the research environments using the infrastructure. During a 5-year period, typically 20–30 start-ups emerge from the environment. These spin-offs create an immense societal impact, and we estimate that their total turnover is well beyond one billion SEK per year.

Further, Myfab is part of the Nordic Nanolab Network, where management, experts and users collaborate extensively in improving operations, process development, tool maintenance, user services, problem solving and by arranging common user meetings.

Myfab has set the standard in Europe for efficient user access, follow-up and planning through our operations practices supported by the tailor-made Myfab LIMS system. Myfab LIMS itself, is continuously developed through a community formed by Myfab and six other national RIs in Finland, Norway, Ireland, France, Portugal and Latvia, and a cleanroom laboratory in Spain. The system is used by 18 cleanrooms in total, and we have a dozen other lab infrastructures at Swedish Universities that run the system.



New and potentially returning users, with no previous experience from Myfab, are invited to apply for funding for their first project through Myfab Access.

Research at Myfab is often cross disciplinary and covers a wide scientific field. With increasing challenges calling for solutions based on science and innovation, the role of Myfab should be even greater in the years to come. Important initiatives, such as the European Chips Act and the European Green Deal, will require advanced and powerful research infrastructures to reach their goals.

Topics addressed by the Chips Act were the initial reason to establish our cleanroom facilities and we are now ready to ramp up our activities in this field. We have updated our investment plan to accommodate for new requirements set by the Chips Act, and we will contribute all the way from education to innovation at high TRL levels. Myfab is absolutely crucial for the position Sweden has in micro- and nanofabrication, and if Sweden is to take a clear role in the European Chip Act.

For the national KAW initiatives WACQT (quantum technology) and the newly *started* WISE (sustainable materials), Myfab is established or identified as an essential infrastructure. We also support users in new and expanding areas targeting UN's Sustainable Development Goals and provide various types of material for Max IV and ESS users.

SRC-FUNDED PROCUREMENTS DURING 2022

Myfab Chalmers – Automated SEM (3 272 484 SEK from Myfab plus additional funding from Chalmers)

We have procured a chipscanner 150 from Raith that was commissioned during spring 2022. In connection to the purchase, we have also signed a three-year long collaboration project with the vendor to develop both software and hardware to better work for our purposes. A chipscanner is originally built for reverse chip engineering. We will use it for process development and as a feedback loop for our electron-beam lithography operations.

The system can be programmed to automatically take and collect many SEM images over a substrate. Typically, we collect several thousand pictures and systematically/automatically analyse the features. This has for example revealed that some fundamental parameters set by our e-beam lithography vendor (also RAITH) can be further optimized. We also combine these automatically gathered images with data from an automatic probe station and optical profiler to better understand the effect that variations in the fabrication have on the device performance of for example qubits used for quantum computers. This combined analysis revealed that the also some fundamental geometries in other processing tools also have effects. In a very short time this new capability has proven to be very useful.

Myfab KTH - UHV evaporation with e-gun etc./AJA deposition system 2.714.088 SEK (this cost represents 50% payment at tool delivery)

This is a new tool at Albanova Nanolab, expanding the functionality and efficiency, via an integrating upgrade of three heavily used tools.

The tool allows optimization where e-gun, thermal evaporation, and in-situ ion milling could be combined in one, substantially more capable system with a much smaller footprint and maintenance. Such versatile e-gun/thermal/ion-milling UHV system from AJA Inc.is a significant improvement for most of the process lines, cover current material deposition needs and allow us to expand into new material systems and patterning processes.

The tool supports projects in nano electronics and photonics, quantum optics, quantum computing, nanomaterials. In the longer term, tool will undoubtedly attract new research groups, projects, and funding to the nanofabrication environment within Myfab.

Myfab KTH - CD overlay defect inspection 1.733.916 SEK

This is a generic tool to acquire critical dimension (CD) and overlay information in a process line. This is a new metrology capability at Myfab KTH. The fabrication of complex components and circuits demands automatic metrology of CD, overlay and defect densities for fast and reproducible feedback on the processing results enabling the Si and SiC based circuits and 3D integration for interfacing electronics with devices and structures. It is also strongly motivated by the ISO9001 quality system.

It will support the development of very complex device structures for wide areas of applications e.g., for increasing device packaging densities through 3D monolithic integration, interfacing electronics with biology, enabling electronics operating elevated temperatures, enabling integrated sensors, and photonic – electronic co-integration. This research is partly based on a fully depleted Si CMOS technology and a SiC integrated circuit technology, which have been established at KTH.

Myfab KTH - HPVE Reactor Upgrade 2.737.866 SEK

This upgrade prolongs the lifetime of an existing hydride vapor phase epitaxy (HVPE) reactor for growth of III-V materials, which is a process unique for Myfab, and even in Europe. HVPE is used for boosting the performance of advanced photonic devices, where structures have been fabricated by more conventional epitaxial techniques, such as MOVPE or MBE, and could also be used to create completely novel device concepts.

Applications are found in several research areas, e.g., for developing III-V/Si heterojunction solar cells, High Speed QCLs for free space communication, orientation patterned GaP for quasi phase matched non-linear optical frequency generation of entangled photons. There is also a project on THz laser generation.

GOVERNANCE DURING THE CURRENT PERIOD OF OPERATION 2020 - 2024

Myfab's fifth period of operation started on 1 January 2020 and is promoted by a new model for governing national research infrastructures. Common for all national research infrastructures in Sweden since 2020 is that they have a governing board, the General Assembly (GA or Stämman in Swedish), which oversees general conditions including the consortium agreements and commitments of the participating universities. Myfab's GA thus consists of four members, one each from Chalmers (host), KTH, Lund University and Uppsala University respectively. The GA meets at least once per year.

The Steering group, with members recommended by the General Assembly and appointed by Chalmers University of Technology (Chalmers), consists of seven members. Four of them are representatives proposed by the participating universities, one is an industrial representative, one international representative and finally one from another Swedish university. The steering group oversees Myfab's activities during the current period of operation, which ends on 31 December 2024. The steering group decides on the use of the SRC funding.

The steering group normally has four meetings each year, where the director also participates. During the pandemic, electronic meeting replaces physical meeting, but after the restrictions were lifted during sprint 2022, the steering group and Myfab's Advisory Board met during a two-day physical at a meeting in September at Chalmers.

Myfab's activities. Through this process we make sure that operations and strategic development are aligned and support the need of our users in the best possible way.

The director oversees operations and to implement the decisions by the steering group. The operational management consists of the director and the four laboratory managers and oversees day-to-day operation and collaboration with the steering group and the owner group. The over-all structure of Myfab's management gives a balance between the bodies involved.

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MYFAB LIMS

During 2022 we have continued to develop several modules and features of Myfab LIMS. We have launched a module for facility tools where we can control the connection of all processing tools. This helps put with information across several tools when we service or repair facility infrastructure. We have refactored and updated some of the old parts of the code such as tool info/edit. We have started the development of a new electronic logbooks for the tools. This will also include a electronic shop for consumables and accessories. The logbook update is also needed for the completion of the run sheet documentation part of the process manager module. During 2022 we have also optimized the whole server setup and introduced more advanced follow up and control of the server operation.

INTERNATIONAL NETWORKING

Nordic Nanolab Network (NNN)

The Nordic Nanolab Network (NNN) is an established collective of research infrastructures across the Nordic Countries[2]. There are established tasks aimed at simplifying the exchange of users between the Nordic countries; enabling the exchange of wafers and materials between the laboratories; dissemination of expert knowledge relating to fabrication equipment and processes and establishing common e-learning systems for all users.

The most important asset is the formation of Nordic Nanolab User Network (NNUN), expert (NNEN) and management network (NNN) communities with active interactions, physical meetings, and common electronic tools.

The NNEN has expert groups for dry etching, thin films, lithography, characterization (in cleanrooms) and facility management. Each group meets once per year with lunch-to-lunch meetings. In-between meetings, the online web-forum Basecamp is used for interactions. The NNEN activities strongly contributes to high-quality technical- and user support and are central to Module 2 and 3 by promoting staff competence development.

The Nordic Nanolab User Meeting (NNUM) is held every second year. During the pandemic, webinars on Maskless Aligner Systems were presented by the NNEN expert group attracted more than 200 participants. In May 2022, the Nordic Nanolab User Meeting (NNUM) was hosted at Chalmers. It attracted over 300 participants from the Nordic countries[3]. The next NNUM meeting will be hosted in 2024 by NorFab, Norway. Events like these are especially important to young scientists who in addition to learning about the

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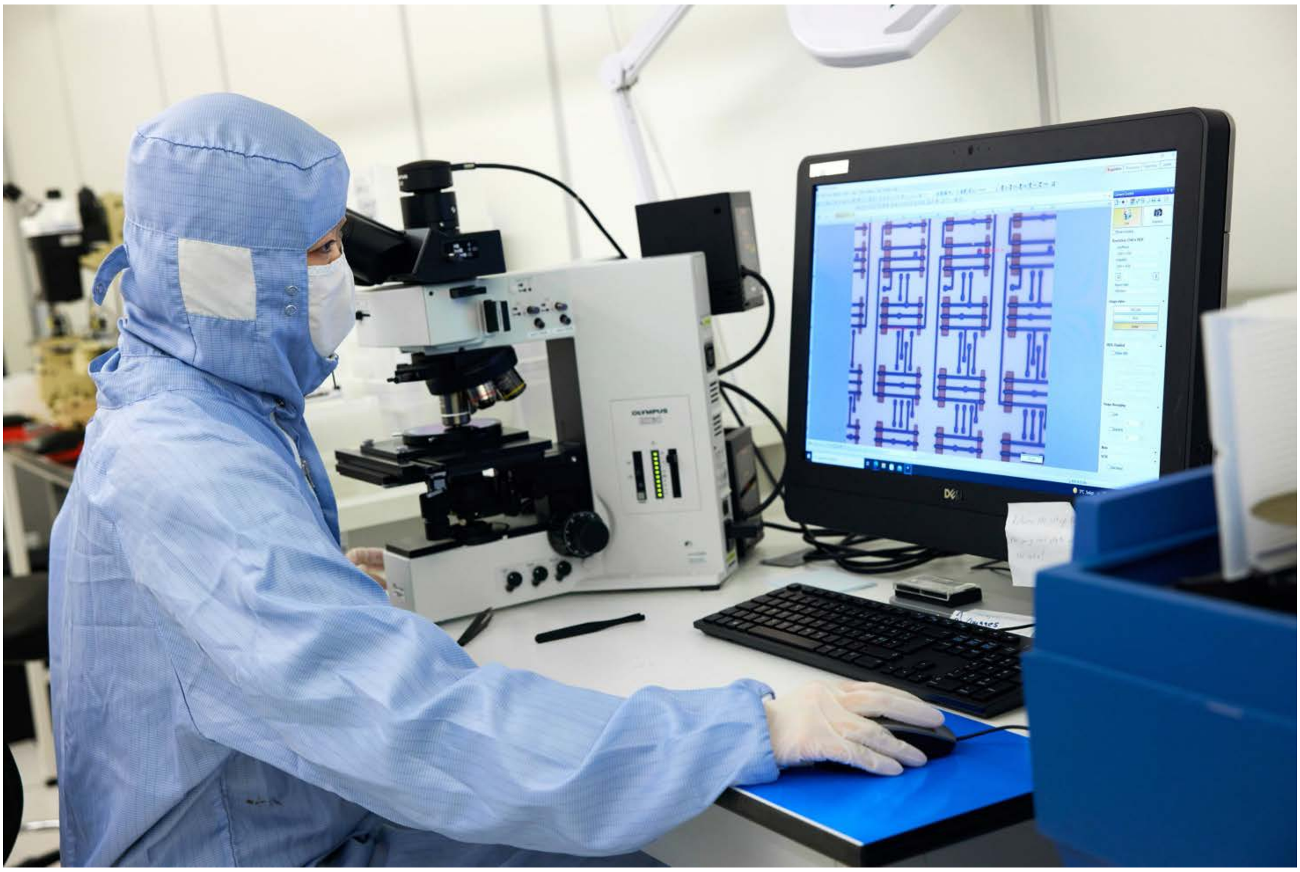
[2] NorFab Norway, DTU Denmark, OtaNano /Aalto University and VTT Finland, and the University of Iceland.

[3] http://nordicnanolab.se/Home.aspx

extensive possibilities within NNN will also be able to expand their personal networks and possibly start cooperation with researchers at other Nordic universities and/or in different research areas.

Thorough the NNN collaboration we have insight in and collaboration involving development of user education. The knowledge users receive after they have completed a cleanroom introductory course at any of NNN's nanofabrication laboratories guarantees that the user has the fundamental skills and safety knowledge required to perform work in any other NNN laboratory. Additional requirements such as tool-specific education ("driver's license") approved process plan, project funding etc. apply and vary between laboratories.



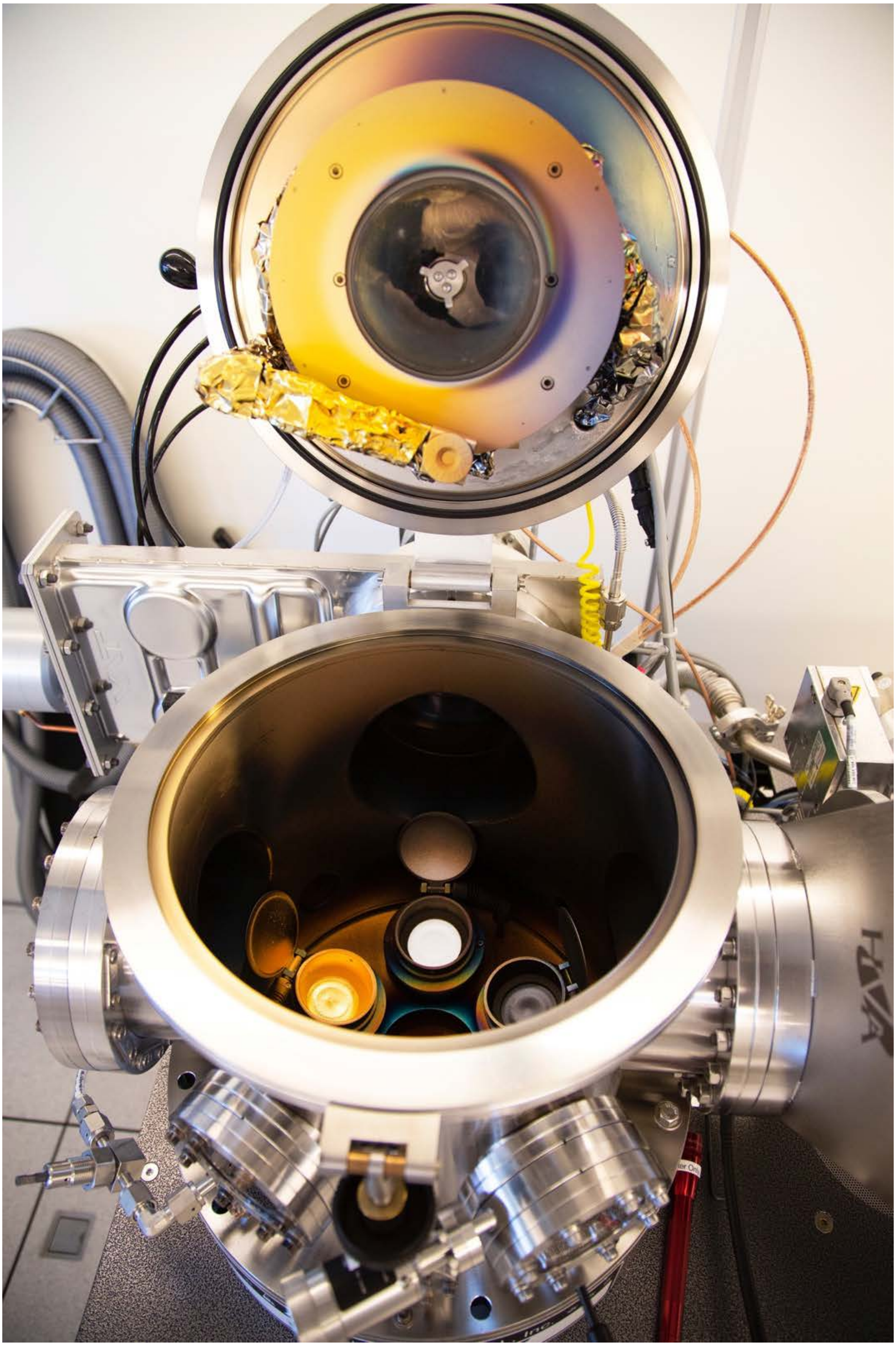
The success of the NNN collaboration has been recognized internationally and was central for the motivation to create and develop EuroNanoLab in a similar way.

Thanks to our international networks, especially NNN and NNEN and the network of Myfab LIMS users, we can assist and propose users with special needs to visit other (national) research infrastructures who also provide open user-access in the Nordic countries.

EuroNanoLab (ENL)

Myfab has actively contributed to the formation of EuroNanoLab (ENL)[4] through the collaboration with its member research infrastructures. ENL is, very much like NNN, inspired by the modus operandi and the user-fee based open access that Myfab has developed. In addition, ENL is planned to provide charge-free access to users based on scientific excellence. Another important aspect of ENL is that we plan to develop new fabrication processes necessary for research in emerging areas.

[4] Current members, in addition to Myfab are: RENATECH France, NorFab Norway, NanoLab NL the Netherlands, CEITEC the Czech Republic, NCNR Italy, and INL Portugal and Spain, all members with their corresponding research councils (Research Ministries) supporting the action.



NODE ACTIVITIES

Myfab Chalmers

During 2022 we have continued with our five-year re-investment bundle of in total 34 tools at a cost around 180 MSEK:

- a XeF2 dry etch release system from memstar.
- an electron beam evaporator dedicated for Al used in quantum components, from Plassys.
- a developer spinner from Osiris.
- a high temperature vacuum oven for polyamide from Yield engineering.
- an optical profiler from Sensofar.

During the year we have been a bit short on staff due to parental and sick leaves. This has led us to be behind in the procurement schedule. For 2023 we have a plan to catch up on six procurements.

During the year we have continued our work on saving energy and gas. We will replace all ULPA filters in the cleanroom to a new Teflon coated product with a much lower air flow resistance. We will also increase the number of filters with 20%. In total this will save around 200 MWh per year. Our LED lighting has now been verified to save around 80 MWh per year. These two savings correspond to around 10% of our total electrical power consumption. We have also started the substantial task to refurbish all wet benches. This will enable in situ control and optimization of the exhaust flows. Here we asses further power savings in the order of 300 MWh per year if we can reduce the exhaust volumes with around 30%.

Our roll out of hardware interlocks has been delayed for a long time since there have been no Raspberry PI computers available at all. We have now finally got our hands on a few dozen and some relays so this work can continue.

The activity for 2022 was on the same level as in 2021 (taken into account that we have decommissioned our PPMS system that typically had around 6000-7000 hours of usage per year). The project volumes and thus the income was on the same level as last year with a 55% user fee contribution to the running cost.

Myfab KTH

Myfab KTH consists of two cleanroom facilities. The Electrum Lab in Kista is operated in collaboration with the industrial research institute RISE, and the Albanova Nano Lab in collaboration with Stockholm University. Both laboratories are recognized as "KTH Infrastructures".

Gunnar Landgren, who has been deeply involved in the Electrum Laboratory already from planning of the lab in mid-1980’s and since 1999 chairman of the board of directors, has retired. Professor Carl-Mikael Zetterling serves as chairman of the board from January 2022.

Alex Radojcic has taken the role as deputy director at Electrum Lab, after the retirement of Per Wehlin. Alex is also responsible for the ISO9001 certified quality management system.

As suggested in the new strategic plan for the Electrum Lab, a Semiconductor Research Center has been established at KTH, with Per-Erik Hellström as director.

A relocation of tools and major reconstruction of the Electrum cleanroom is on-going, with the goal to clear space for commercial users to rent.

Webinars, promoting the infrastructures at KTH, RISE and University of Latvia, within the CAMART2 project, were held during spring. Electrum Lab was presented in the first webinar: https://www.camart2.eu/en/rix-sto-webinars/. Electrum Lab was also part of the 30 years celebration of SiC research and development in Kista, in November, with presentations and lab tours.

The procurement of tools funded by the Myfab grant proceeds according to plan. During 2022 the Four-point-probe and the HVPE control system were available for usage. The ICP Si deep etcher, the CD, overlay, defect inspection, and the thin film strain measurement tools were ordered. Also, a Diamond-Like-Carbon sputter was installed, funded by KTH and EU grants.

Albanova Nanolab has partially received the Myfab funded AJA UHV evaporator (the ion milling chamber has arrived Oct’2022); due to logistical issues with suppliers, AJA has shifted the remaining delivery and installation to April 2023.

The characterization system QD-PPMS (DynaCool; sponsored by KTH) has been installed and is in operation since July 2022. SU has also placed its QD-PPMS (EverCool, formerly at SU-Chemistry) in the ANL, which is in operation since November 2022. These strengthen ANL's interface with the Quantum Technology Center (QTC@KTH-SU) running multiple projects within QT, including the WACQT node in Stockholm. The newly established QT-Center at KTH-Albanova has heavy fabrication & characterization presence at ANL.

A new FIB-SEM (Helios 5 UC, FEI-Thermo Fisher Scientific) has been procured and contracted with the delivery in Oct'2023, sponsored by KTH at 8 mkr. The system has a mono-chromated column, a piezo-stage sample manipulator, and a number of other advanced features, to replace our ageing FEI-NOVA instrument (key ANL tool, in operation since 2007).

In terms of Lab-floor development, the Albanova Process-lab and Yellow-room have been re-designed for improved functionality, efficiency, and user access, with a view for future expansion.

Myfab Lund

Myfab Lund is a key resource for nanoscience and nanotechnology, serving the micro- and nanofabrication needs of multiple research groups in strategically important fields at NanoLund. The infrastructure is continuously updated and is supported by a dedicated team of highly educated lab personnel.

At Myfab Lund had 112 active academic users from 32 different research groups representing multiple faculties at Lund University, 3 institute users and 20 commercial users from 6 companies. There were 44 new users receiving introductory training to LNL. The number of hours booked by academic groups and companies is lower than pre-pandemic levels, which can be somewhat attributed to delays in getting spare parts and repairing some key equipment that regulate wider lab use. European and national programmes like the EU Chips Act, EU Quantum Flagship, WACQT and WISE will all lead to expansion of strong areas of research using the infrastructure.

In advance of the move to Brunnshög, concerted effort continues to secure equipment funding. In 2022, LNL gratefully received funding from the Crafoord Foundation to co-fund a Plasma Enhanced Chemical Vapour Deposition (PECVD) for high quality silicon nitride thin film deposition (the other 50% came from an LU grant) and 100% funding for a versatile X-Ray Diffraction (XRD) to measure, for example, the structure of MOVPE grown layers. In the same year, we have also been granted funding from the Engkvist foundation for a new scanning electron microscope (SEM) with energy dispersive X-ray spectroscopy (EDS) to measure composition of nanoparticles, an impedance analyser and an advanced epitaxy machine gallium oxide growth. In 2022, the LNL team installed a Beneq atomic layer deposition (ALD) tool and completed the procurements of a pulsed laser deposition (PLD) tool and an automatic resist processing tool. Procurements for a pulsed laser deposition (PLD) tool and a metal organic physical vapour epitaxy (MOVPE) tool are underway.

Myfab Uppsala

Located at the Ångström Laboratory, Myfab Uppsala has a legacy in materials science, with cutting edge activities in thin film and surface science, sustainable energy solutions, emerging electronics and biotechnology. This node also operates Customized Microfluidics, a SciLifeLab pilot facility that provides research solutions for the life science community.

User activities seem to recover after the pandemic, with 103 new users introduced during 2022 and a 27 % increase in booked hours compared to the year before. Yet, the full user potential could not be reached due to substantial technical issues, particularly in the etch area. Some staff reduction has not yet been compensated, but this situation will rather be used to strengthen our capability in technical support, partly through service agreements.

After the latest expansion of the Ångström Laboratory, including a new building moving the main entrance further away from the cleanroom, a new and more functional lab entrance has been established. This is located at the same level (ground floor) as the cleanroom and is also more spacious than the previous entrance (at the 1:st floor). A long-lasting project to install LED lighting in the cleanroom almost reached completion during 2023 (some switch installations still remain). Added tools and capabilities associated with the new 2-photon printer and 3D capabilities are not suitable for cleanroom installation and external lab premises have therefore been acquired to accommodate the extruder and the complementary 3D printer.

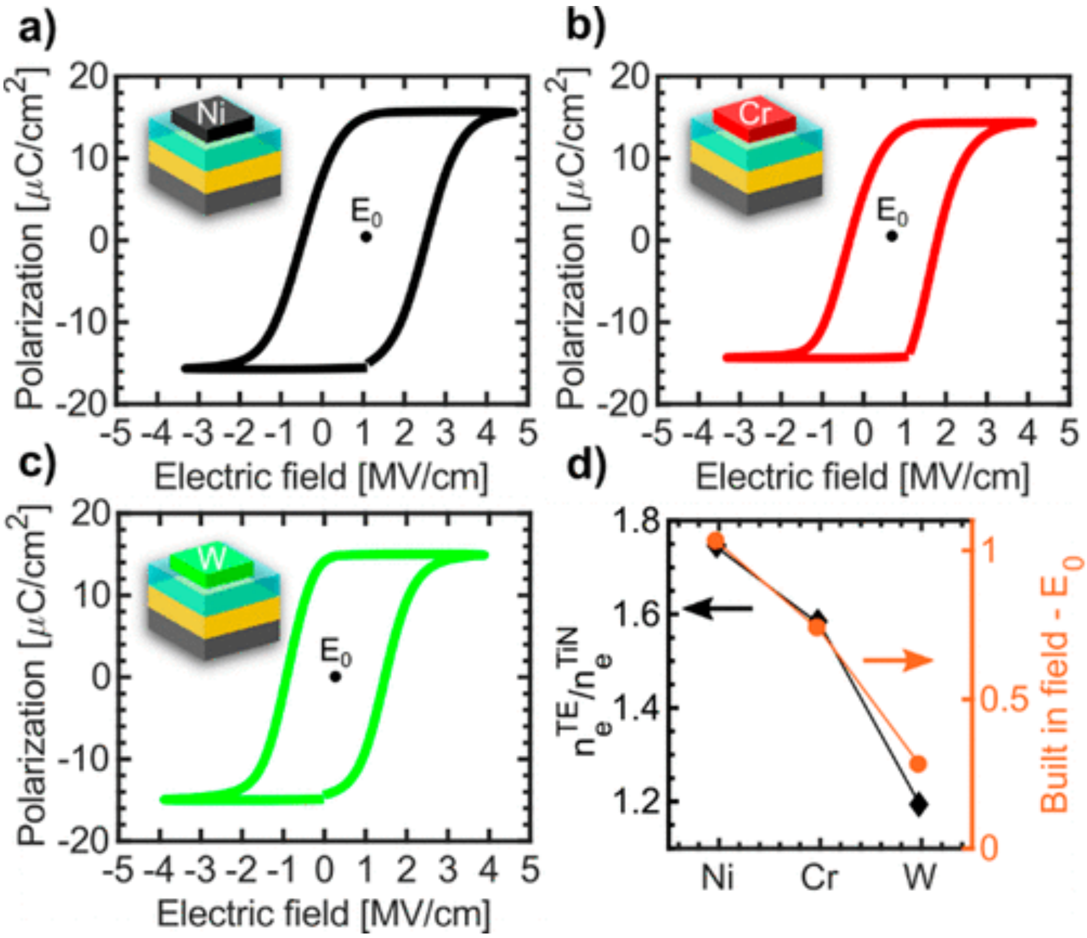
Our procurement activities proceed, and during 2022 we signed contracts for a UHV-PVD system and a TEM energy filter. In both cases added requirements and increased cost levels called for additional funding, which could be obtained by internal cofounding and an additional grant from OES (Olle Engkvists Stiftelse). These tools shall be delivered in September and April 2023 respectively, and will bring new capabilities in thin film deposition and materials analysis to Myfab. Award decisions have been made for an electron beam lithography (EBL) system and a complementary (to the 2-photon printer) 3D printer, but formal procedures remain before the contracts can be signed. Added funding from OES has also been granted for the EBL procurement. A versatile PVD cluster tool was acquired through a generous offer from the laser and photonics company Coherent.

SELECTED USER SUCCESS STORIES

Information and Communication Technologies

Electronics for neuromorphic computing

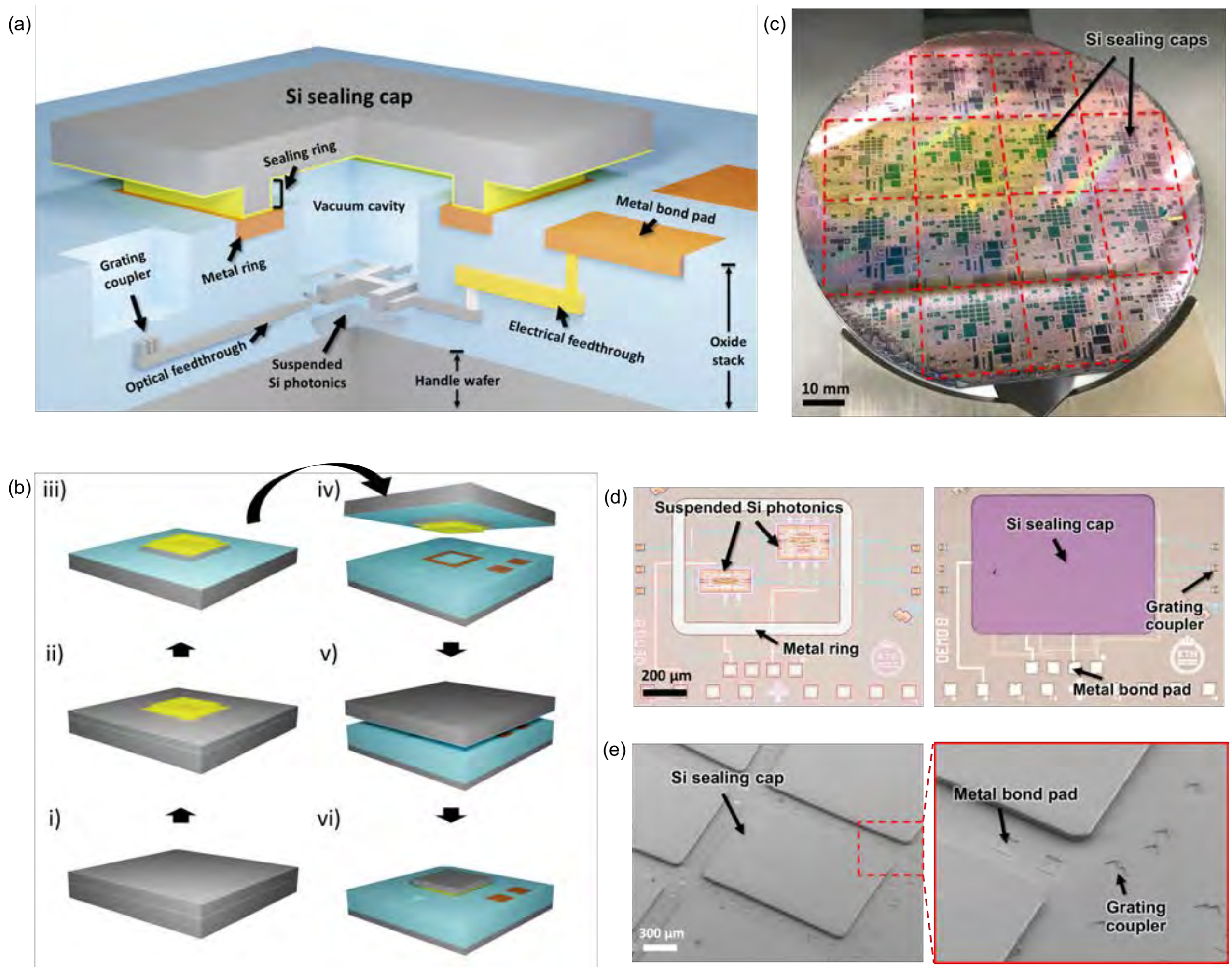
Neuromorphic computing in analogue hardware is being explored with the aim of reducing power consumption needed for machine learning using current hardware. Ferroelectric tunnel junction memristor technology developed at Myfab Lund with advanced materials characterization at MAX IV. In a joint project with Ericsson Borg's ferroelectric tunnel junction memristor technology is used in novel 3D-integrated analogue computing cores for energy-efficient machine learning in edge devices.



Athle et al. ACS Appl. Electron. Mater. 2022, 4, 3, 1002–1009.
Athle et al. IEEE Trans. Electron. Dev. 2023, 10.1109/TED.2023.3240399.
Athle et al. ACS Appl. Mater. Interfaces 2021, 13, 9, 11089–11095.

Wafer-level Hermetically Sealed Silicon Photonic MEMS

The emerging fields of silicon (Si) photonic micro-electromechanical systems (MEMS) and optomechanics enable a wide range of novel high-performance photonic devices with ultra-low power consumption. However, photonic MEMS are susceptible to environmental influences such as exposure to dust, gas composition, and humidity, and, therefore, require a robust packaging to ensure reliable operation over extended time periods. Hermetic sealing in inert gas or vacuum is crucial for their reliable performance and serves as a prerequisite for their commercialization. We have demonstrated wafer-level hermetic sealing of Si photonic MEMS inside cavities with electrical and optical feedthroughs. We validate the feasibility of our approach by sealing Si photonic MEMS devices on foundry wafers from the photonics platform of IMEC, Belgium.



Wafer-level hermetic packaging of Si photonic MEMS. (a) Cut-away 3D illustration of a hermetically sealed suspended photonic MEMS device. (b) Process flow of the hermetic packaging approach by transfer bonding of a Si sealing cap: Step i-ii) Patterning of sealing rings by deep reactive ion etching (DRIE) on the SOI cap wafer, followed by TiW/Au deposition and etching. iii) Etching of the sealing caps. iv-v) Wafer alignment of the SOI wafer containing the caps and the photonic device wafer, and bonding of the wafers inside a vacuum chamber at 250 . vi) Removal of the Si handle (substrate) layer of the SOI cap wafer by DRIE such that only the thin vacuum sealing caps remain on the photonic device wafer. (c) Photograph of a full wafer with sealed Si photonic MEMS. (d) Microscope images before sealing (left), and after sealing (right). (e) SEM images of the bond pads and grating couplers around the thin sealing caps.

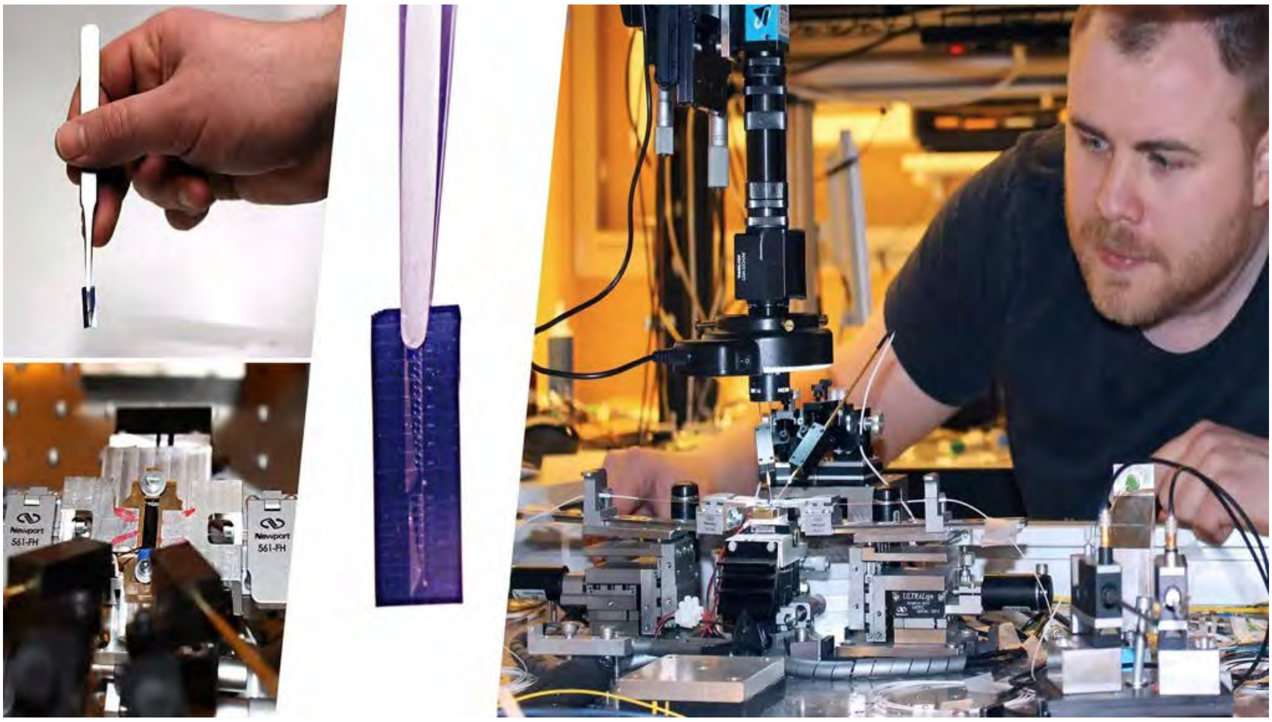
Our sealing approach uses low-temperature (250 ℃) thermo-compression wafer bonding that is fully compatible with the Si photonic foundry wafers. We have demonstrated a vacuum sealing yield of 90 %. The vacuum encapsulated photonic devices feature higher mechanical quality factors (Q) and increased mechanical cut-off frequency, due to the elimination of air damping.

Jo, Gaehun, Pierre Edinger, Simon J. Bleiker, Xiaojing Wang, Alain Yuji Takabayashi, Hamed Sattari, Niels Quack Frank Niklaus, et al. "Wafer-level hermetically sealed silicon photonic MEMS." Photonics Research 10, no. 2 (2022): A14-A21.

Bogaerts, Wim, Alain Yuji Takabayashi, Pierre Edinger, Gaehun Jo, Iman Zand, Peter Verheyen, Moises Jezzini, Frank Niklaus et al. "Programmable silicon photonic circuits powered by MEMS." In Smart Photonic and Optoelectronic Integrated Circuits 2022, vol. 12005, pp. 55-69. SPIE, 2022.

New microcomb could detect exoplanets and diseases.

Tiny photonic devices could be used to find new exoplanets, monitor our health, and make the internet more energy efficient. Researchers from Chalmers University of Technology, Sweden, now present a game changing microcomb that could bring advanced applications closer to reality. A microcomb is a photonic device capable of generating a myriad of optical frequencies – colours – on a tiny cavity known as microresonator. These colours are uniformly distributed so the microcomb behaves like a 'ruler made of light'. The device can be used to measure or generate frequencies with extreme precision. In a recent article in the journal Nature Photonics, eight Chalmers researchers describe a new kind of microcomb on a chip, based on two microresonators. The new microcomb is a coherent, tuneable and reproducible device with up to ten times higher net conversion efficiency than the current state of the art.



"The reason why the results are important is that they represent a unique combination of characteristics, in terms of efficiency, low-power operation, and control, that are unprecedented in the field," says Óskar Bjarki Helgason, a PhD student at the Department of Microtechnology and Nanoscience at Chalmers, and first author of the new article.

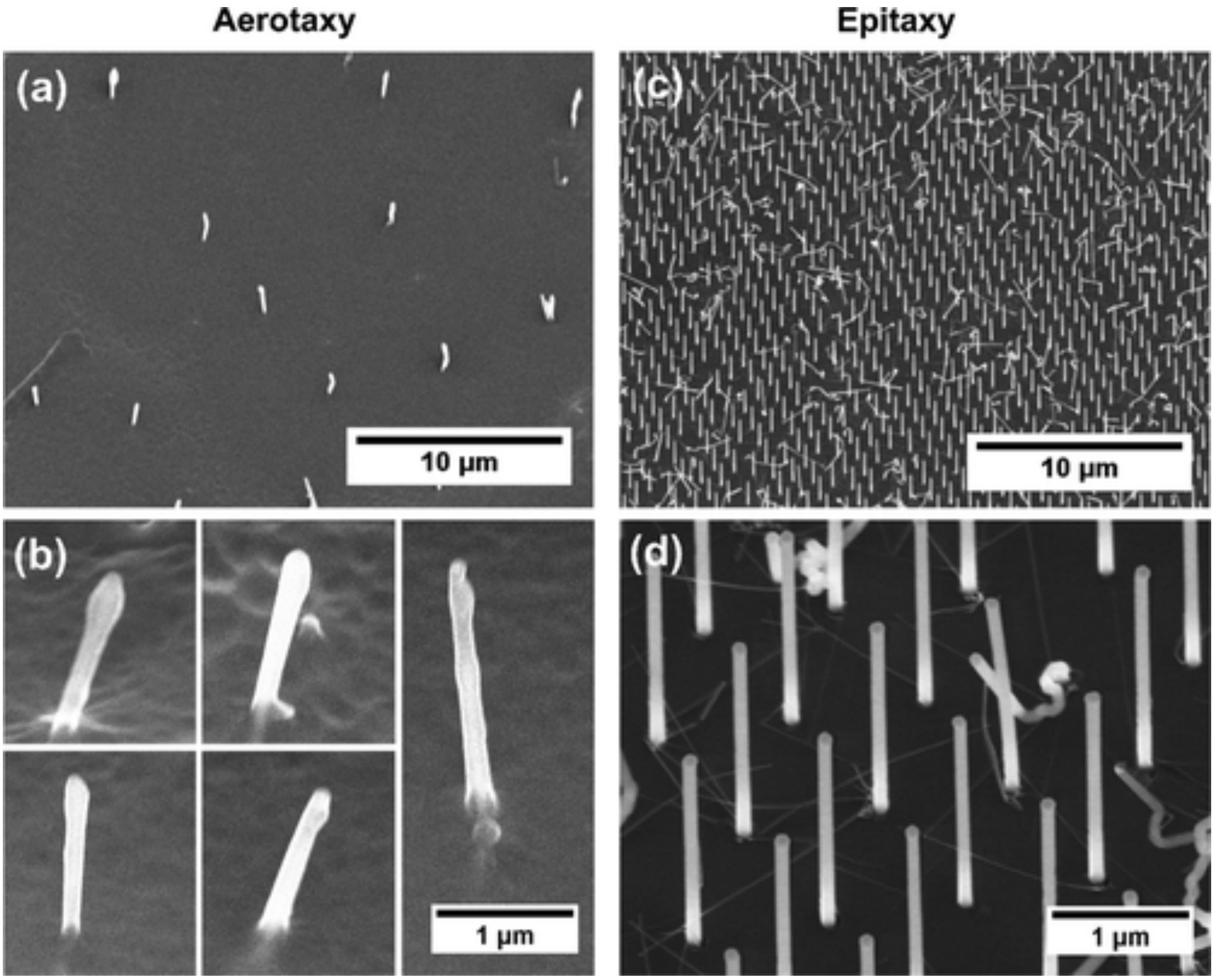
The Chalmers researchers are not the first to demonstrate a microcomb on a chip, but they have developed a method that overcomes several well-known limitations in the field. The key factor is the use of two optical cavities – microresonators – instead of one. This arrangement results in the unique physical characteristics. Placed on a chip, the newly developed microcomb is so small that it would fit on the end of a human hair. The gaps between the teeth of the comb are very wide, which opens great opportunities for both researchers and engineers.

Helgason, Ó.B., Arteaga-Sierra, F.R., Ye, Z. *et al*. Dissipative solitons in photonic molecules. *Nat. Photonics* **15**, 305–310 (2021).

Life Sciences

Light Guiding Nanowires

Semiconductor nanowires can be designed to enhance the fluorescence signal from surface-bound molecules, prospectively improving the limit of optical detection in diagnostic applications. However, currently used epitaxy techniques are relatively slow and costly. An alternative approach is aerotaxy, a high-throughput and substrate-free production technique for high-quality semiconductor nanowires.



Here, we show that custom-grown aerotaxy-produced Ga(As)P nanowires vertically aligned on a polymer substrate offer signal enhancement comparable to that from epitaxy nanowires. Aerotaxy nanowires thus offer a pathway to scalable, low-cost production of highly sensitive nanowire-based platforms for optical biosensing applications.

Enhanced Optical Biosensing by Aerotaxy Ga(As)P Nanowire Platforms Suitable for Scalable Production. Julia Valderas-Gutiérrez, Rubina Davtyan, Sudhakar Sivakumar, Nicklas Anttu, Yuyu Li, Patrick Flatt, Jae Yen Shin, Christelle N. Prinz, Fredrik Höök, Thoas Fioretos, Martin H. Magnusson, and Heiner Linke. ACS Appl. Nano Mater. 2022, 5, 7, 9063–9071. https://doi.org/10.1021/acsanm.2c01372

Nanochannels light the way towards new medicine

To develop new drugs and vaccines, detailed knowledge about nature's smallest biological building blocks – the biomolecules – is required. Researchers at Chalmers University of Technology, Sweden, are now presenting a groundbreaking microscopy technique that allows proteins, DNA and other tiny biological particles to be studied in their natural state in a completely new way.

Biomolecules are both small and elusive, but vital since they are the building blocks of everything living. In order to get them to reveal their secrets using optical microscopy, researchers currently need to either mark them with a fluorescent label or attach them to a surface. "With current methods you can never quite be sure that the labelling or the surface to which the molecule is attached does not affect the molecule's properties. With the aid of our technology, which does not require anything like that, it shows its completely natural silhouette, or optical signature, which means that we can analyse the molecule just as it is," says research leader Christoph Langhammer, professor at the Department of Physics at Chalmers. He has developed the new method together with researchers in both physics and biology at Chalmers and the University of Gothenburg.

Špačková, B., Klein Moberg, H., Fritzsche, J. *et al.* Label-free nanofluidic scattering microscopy of size and mass of single diffusing molecules and nanoparticles. *Nat Methods* **19**, 751–758 (2022).

Nanopore technology

The research objective of the UU team led by Shili Zhang is to develop novel nanopore devices based on standard silicon technology for comprehensive analysis of genome, proteome and transcriptome signatures, enabling AI assisted predictive diagnosis and preemptive therapy. By exploiting the well-established "local oxidation of silicon" process originally developed for device insulation in CMOS technology, the team has fabricated bowl-shape nanopores with the upper opening 60−120 nm in diameter and the bottom orifice down to sub-5 nm in size. Unprecedentedly large rectification of DNA translocation with larger amplitude, longer duration and higher frequencies for the downward movements from the upper opening than the upward ones from the orifice is achieved [1], a task our truncated-pyramidal nanopores (S. Zeng, et al., Nature Nanotechnol. 14, 1056–1062 (2019)) did not quite accomplish due to the high charge density of DNA. The research team has also developed deep learning algorithms for capturing and analyzing nanopore signals [1].

[1] D. Dematties, C. Wen, M. Perez, D. Zhou, S.-L. Zhang, "Deep learning of nanopore sensing signals using a bi-path network", ACS Nano 15, 14419-14429 (2021); D. Dematties, C. Wen, S.-L. Zhang, "A generalized transformer-based pulse detection algorithm", ACS Sensors 7, 1476-1483 (2022).

Microfluidic in vitro models

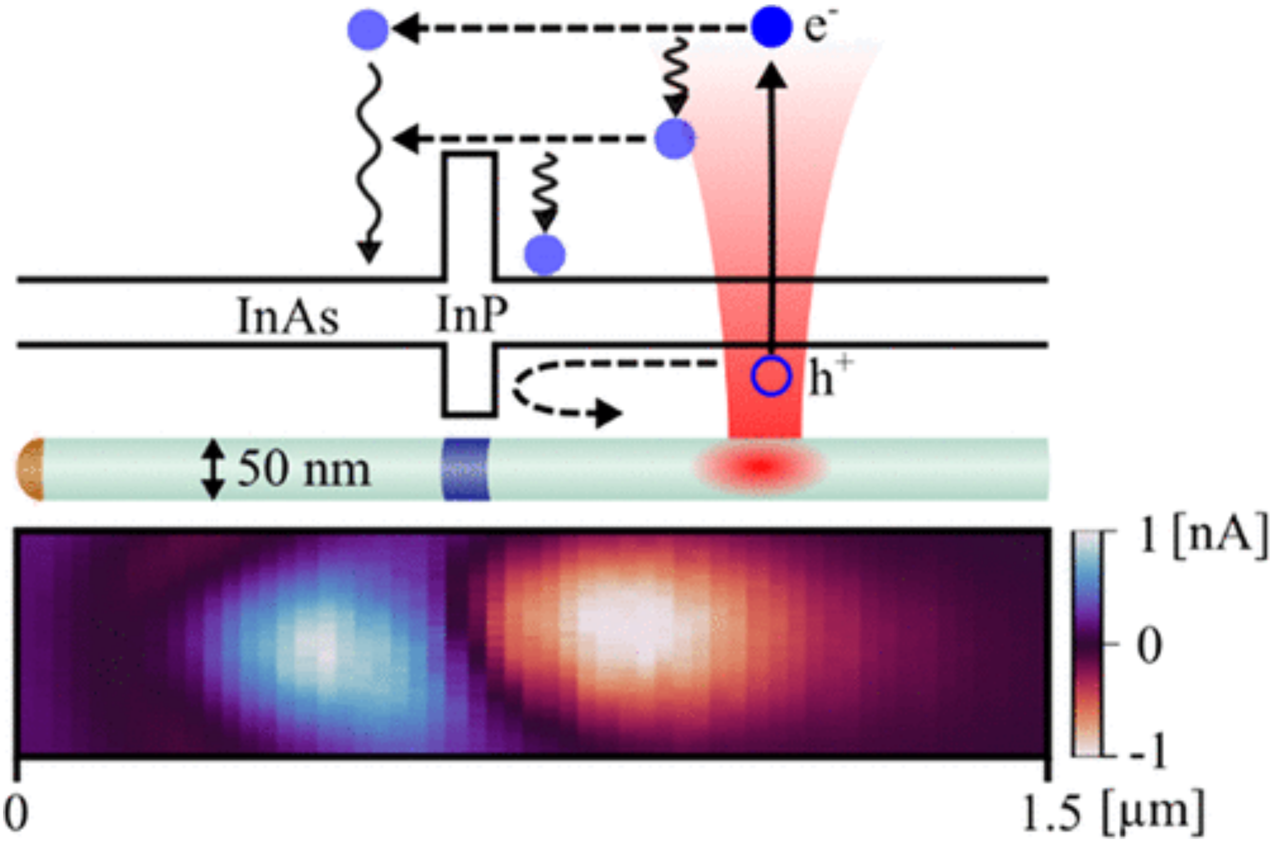
Wallenberg Academy Fellow and double ERC-grant awardee, Maria Tenje leads research focused on microfluidic technologies. The aim is to develop novel microfluidic based systems with applications in biology and medicine, such as in vitro models to evaluate biological interactions of new biomaterials. The research, with Dr. Gemma Mestres as co-lead, has demonstrated development of an array of different biomaterial-on-chip devices used to study growth and proliferation of bone cells in contact with commonly used implant biomaterials, such as Ti and the cement hydroxyapatite. We have shown that addition of flow is key to provide more stable test conditions, especially when studying bioactive materials. Microfluidic systems developed in the Tenje lab also have applications within the area of organs-on-chip aiming to replace animal testing, for example in drug delivery studies [1].

M. Wanselius, S. Searle, A. Rodler, M. Tenje, S. Abrahmsen-Alami, and P. Hansson, "Microfluidics platform for studies of peptide - polyelectrolyte interaction" International journal of pharmaceutics, 621 (2022) 121785, doi: 10.1016/j.ijpharm.2022.121785

Energy

Nanothermodynamics

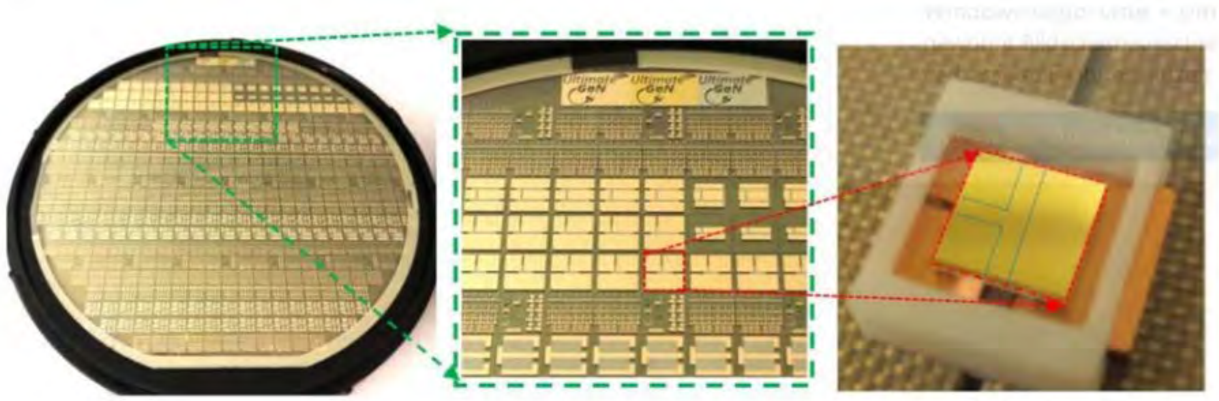
In this field the aim is to answer questions like: can we use the kinetic energy of electrons to do useful work? Can quantum phenomena make energy conversion more efficient? Experiment and theory are combined to explore the fundamentals of generating electricity from heat or light, and the use of information to generate work. In recent work, the optoelectric performance of semiconducting epitaxially grown nanowire devices with a InP barrier show promise as a platform for hot-carrier extraction. This work has direct relevance to future hot-carrier photovoltaics, on-chip coolers or energy harvesters for quantum technologies.



Fast J., Liu Y.P., Chen Y., Samuelson L., Burke A.M., Linke H., Mikkelsen A., "Optical-beam-induced current in InAs/InP nanowires for hot-carrier photovoltaics", ACS Applied Energy Materials 5, 7728 (2022), https://doi.org/10.1021/acsaem.2c01208

High Performance and cost competitive Power HEMTs on Buffer-free GaN-on-SiC Wafers

GaN based HEMT devices have demonstrated outstanding potential for RF and power electronics applications. Superior GaN HEMT's (High Electron Mobility Transistors) characteristics are achieved on SiC and GaN substrates, Where the SiC has the advantage of higher thermal conductivity, which can more effectively remove the heat generated by GaN components during high-frequency and high-power operations to enhance reliability. A buffer-free GaN-on-SiC material known as QuanFINE has been developed by Swegan, one of partners within the UltimateGaN project - aimed to achieve significant improvement in digitizing the European industry by means of GaN electronic components and systems being used in applications, information highways and data centers in order to overcome the challenges of today’s society.



The figure shows the fabricated HEMTs using a 4’’ buffer free GaN-on-SiC substrate (left), the multiple fingers devices for power electronic application (middle) and a HEMT die flip-chip soldered onto its corresponding package produced using ceramic 3D printing at RISE (right)

RISE has designed and fabricated different types of lateral normally-on HEMTs to validate and benchmark the Quan-FINE structures grown on 4’’ SI-SiC substrates. The high performance of the HEMTs was demonstrated, including threshold voltage, good linearity with gate length and width, Ion/Ioff ratio of 1011 and output current up to 27 A with multiple fingers. A beyond state-of-the-art electric field strength was also achieved, so far at about 1.4MV/cm.

Saeed Akbari, Konstantin Kostov, Klas Brinkfeldt, Erik Adolfsson, Jang-Kwon Lim, Dag Andersson, Mietek Bakowski, Qin Wang, and Michael Salter, ‘Ceramic Additive Manufacturing Potential for Power Electronics Packaging’, IEEE transactions on components, packaging and manufacturing technology, vol. 12, no. 11, November 2022.

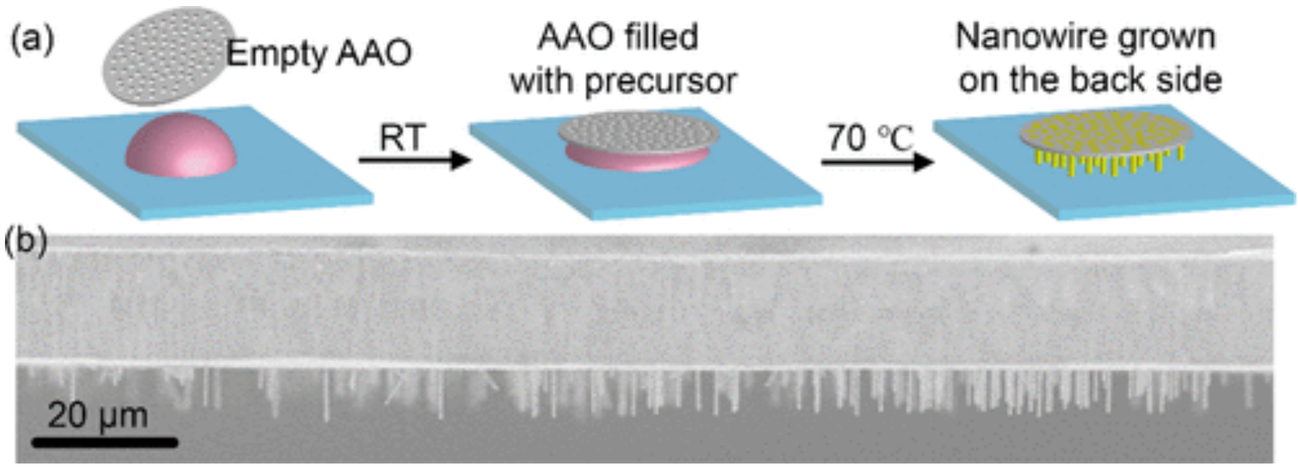
Ashutosh Kumar, Martin Berg, Qin Wang, Michael Salter, Peter Ramvall ‘P-GaN activation through oxygen-assisted annealing - What is the role of oxygen in activation of Mg-doping of GaN?’ conference presentation/paper in 2022 Compound Semiconductor Week, CSW 2022, June 1-3, 2022.

Peter Ramvall, Ashutosh Kumar, Martin Berg, Qin Wang, Michael Salter, presented in GaN Marathon, Venezia, 20-22 June 2022, 'Growth of p-type GaN – The role of oxygen in activation of Mg-doping', accepted by an open-access journal: Power Electronic Devices and Components.

Materials Science

Nanowire growth

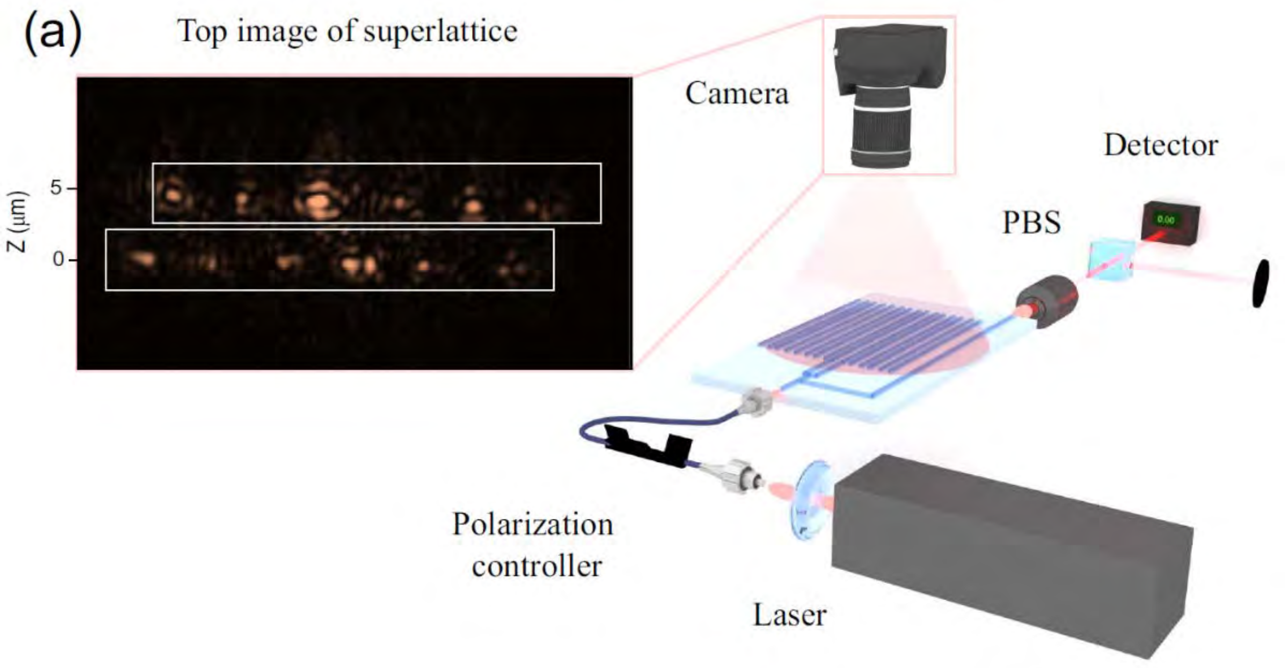
Growth of III-V semiconductor nanowires with very high precision and control has been one of the key achievements within Myfab for many years. The effort includes understanding of nanowire growth based on modelling, systematic growth and advanced characterization. New possibilities for optoelectronic applications may be enabled with the successful growth of high density vertically aligned nanowire arrays of metal halilde perovskites, which were grown successfully in a lithography-free approach at low temperatures from anodized aluminium oxide nanopore substrates in work led by Jesper Wallentin (new reference Zhang, below). This is not exactly the same approach as "ordinary" nanowire growth with high control, but a new complimentary approach.



Z. Zhang, N. Lamers, C. Sun, C. Hetherington, I. G. Scheblykin, and J. Wallentin, "Free-Standing Metal Halide Perovskite Nanowire Arrays with Blue-Green Heterostructures" Nano Lett. 22 (7), 2941 (2022) http://doi.org/10.1021/acs.nanolett.2c00137

Direct measurement of topological invariants in photonic superlattices

Topological phases have generated considerable attention across the physics community. The superlattices in particular offer a rich system with several degrees of freedom to explore a variety of topological characteristics and control the localization of states. Albeit their importance, characterizing topological invariants in superlattices consisting of a multi-band structure is challenging beyond the basic case of two-bands as in the Su–Schreifer–Heeger model.



Schematic of the experimental setup. A 795 nm CW laser is used to excite the chip via a lensed fiber, and the TE mode of the waveguide is selected with a polarization controller. To confirm the excited mode polarization in the superlattice, the chip's output is free-space-coupled to an optical power meter after a polarizing beam splitter. A microscope equipped with a CCD camera is used to top-image the light dispersed from the superlattice. To measure the light dynamics in the photonic lattice, nanoscattering structures are introduced. The inset shows the top image of the lattice, where the top and bottom rows sample the light propagating in the odd and even cells, respectively.

Ze-Sheng Xu, master student in the group of Val Zviller, has experimentally demonstrated the direct measurement of the topological character of chiral superlattices with broken inversion symmetry. Using a CMOS-compatible nanophotonic chip, state evolving in the system along the propagation direction using novel nanoscattering structures was probed. A two-waveguide bulk excitation scheme to the superlattice, enabled the identification of topological zero-energy modes through measuring the beam displacement. The results provide direct identification of the quantized topological numbers in superlattices using a single-shot approach, paving the way for direct measurements of topological invariants in complex photonic structures using tailored excitations with Wannier functions.

The master thesis by Ze-Sheng Xu resulted in two papers. The one where the student was the first author was selected as Editor Pick (Photonics Research IF 7.23) and highlighted by Chinese Laser Press.

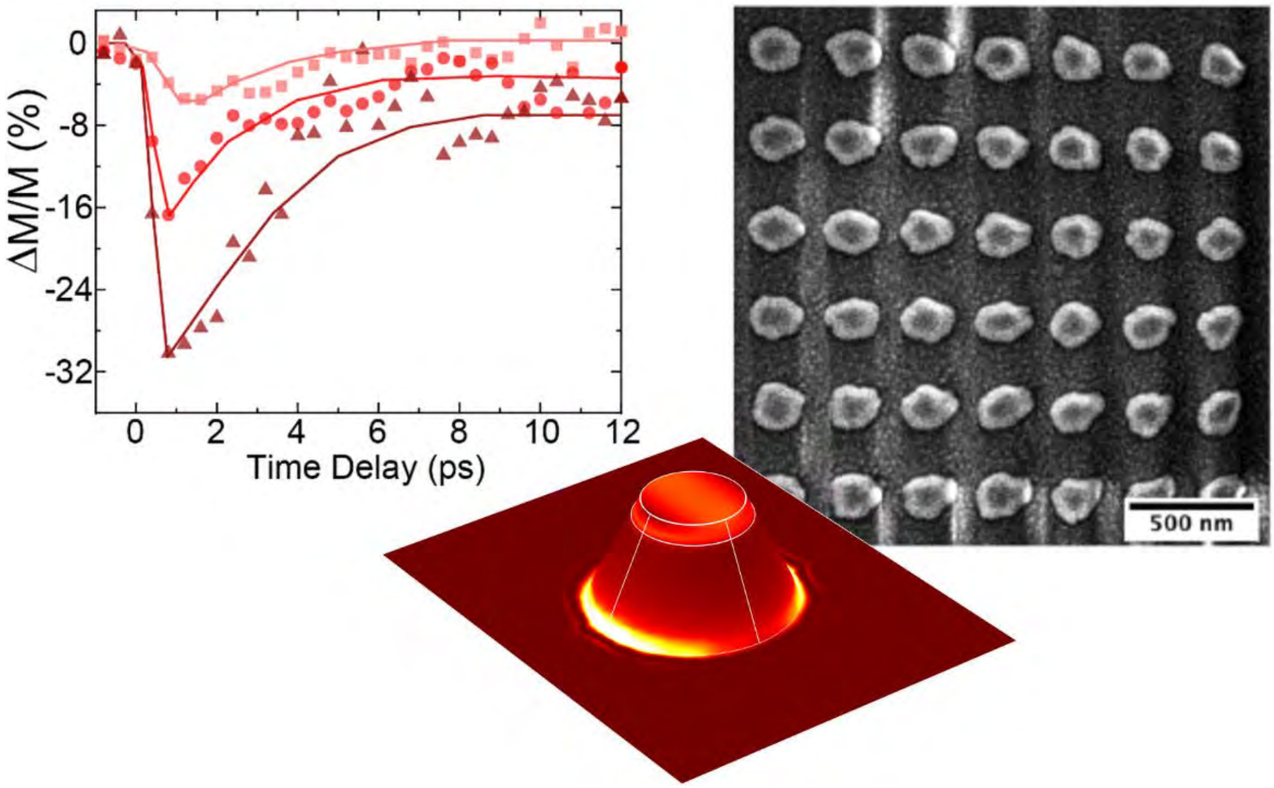
Xu, Ze-Sheng; Gao, Jun; Krishna, Govind; Steinhauer, Stephan; Zwiller, Val; Elshaari, Ali W. (2022). Direct measurement of topological invariants in photonic superlattices. PHOTONICS RESEARCH, 10, ISI: 000921354500008.

Gao, Jun; Xu, Ze-Sheng; Smirnova, Daria A.; Leykam, Daniel; Gyger, Samuel; Zhou, Wen-Hao; Steinhauer, Stephan; Zwiller, Val; Elshaari, Ali W. (2022). Observation of Anderson phase in a topological photonic circuit. Physical Review Research, 4, ISI: 000861109600008.

Nanoscience and Nanotechnology

Controllable ultrafast demagnetisation using light

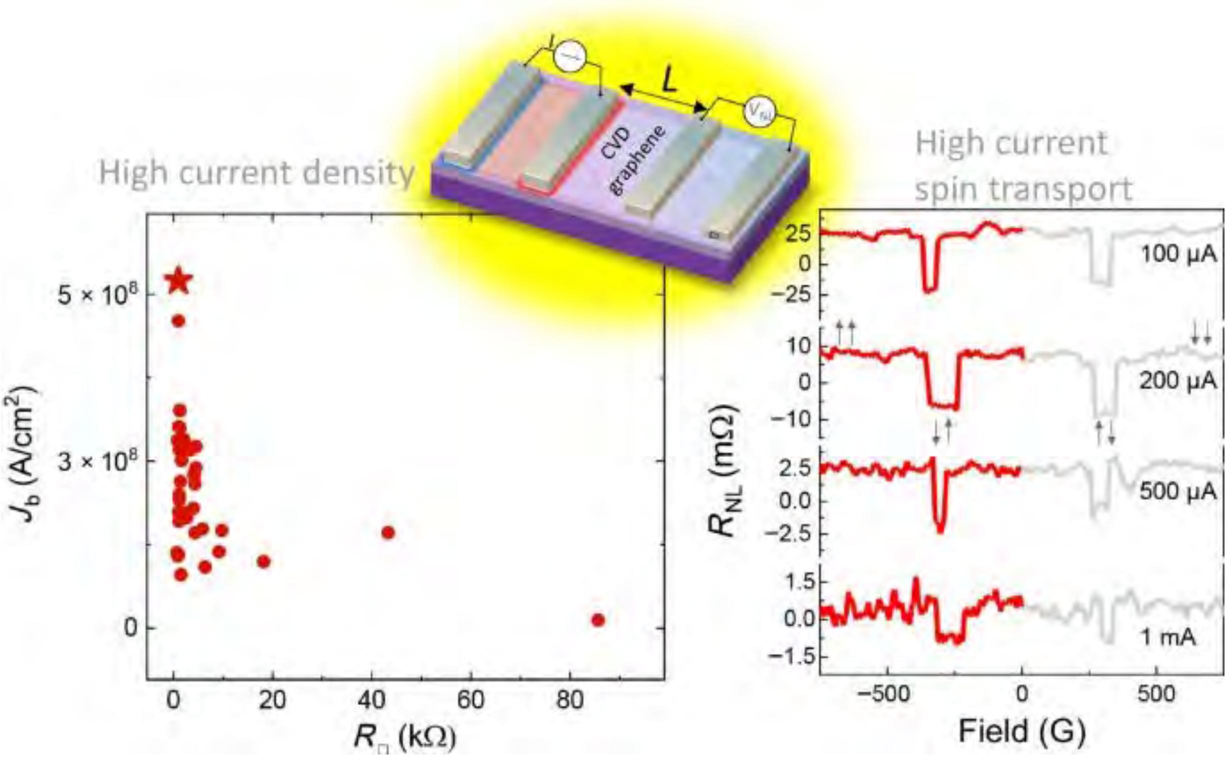
New types of magnetic metamaterial structures can be developed for future energy-efficient memories and processors, utilising advanced nanolithography processes. Vassilios Kapaklis and his research group at the Ångström Laboratory have created regular geometric lattices of hybrid magneto-plasmonic nanoparticles, where the magnetization of each particle can be controlled with short and power-intensive laser pulses in the visible or infrared range. The use of picosecond laser pulses for magnetisation switching can be more energy-efficient than the more conventional methods, based on external magnetic fields, that are used in e.g., hard drives. The shape of the lattice and the particles makes it possible to concentrate the laser light and control the magnitude of the demagnetization effect. This could be the first step towards a new generation of fast and energy-efficient processors that use light and magnetism instead of electric charges.



Kshiti Mishra, Richard M. Rowan-Robinson, Agne Ciuciulkaite, Carl S. Davies, Alexandre Dmitriev, Vassilios Kapaklis, Alexey V. Kimel, and Andrei Kirilyuk, "Ultrafast Demagnetization Control in Magnetophotonic Surface Crystals", Nano Letters 22, 9773–9780 (2022), DOI: [10.1021/acs.nanolett.2c00769](https://doi.org/10.1021/acs.nanolett.2c00769)

Graphene Spintronics

Understanding the stability and current-carrying capacity of graphene spintronic devices is key to their applications in graphene channel-based spin current sensors, spin-torque oscillators, and potential spin-integrated circuits. However, despite the demonstrated high current densities in exfoliated graphene, the current-carrying capacity of large-scale chemical vapor deposited (CVD) graphene is not established. Particularly, the grainy nature of chemical vapor deposited graphene and the presence of a tunnel barrier in CVD graphene spin devices pose questions about the stability of high current electrical spin injection.



The group of ERC consolidator grant holder Venkata Kamalakar Mutta recently reported that, despite structural imperfections, CVD graphene sustains remarkably highest currents of 5.2×10^8 A/cm^2, up to two orders higher than previously reported values in multilayer CVD graphene, with the capacity primarily dependent upon the sheet resistance of graphene. Furthermore, they noticed a reversible regime, up to which CVD graphene can be operated without degradation with operating currents as high as 10^8 A/cm^2, significantly high and durable over long time of operation with spin valve signals observed up to such high current densities. At the same time, the tunnel barrier resistance can be modified by the application of high currents. The results demonstrate the robustness of large-scale CVD graphene and bring fresh insights for engineering and harnessing pure spin currents for innovative device applications.

Belotcerkovtceva, D., Panda, J., Ramu, M., Sarkar, T., Noumbe, U., Venkata Kamalakar, M., High current limits in chemical vapor deposited graphene spintronic devices. *Nano Res.* (2022). https://doi.org/10.1007/s12274-022-5174-9

ECONOMY

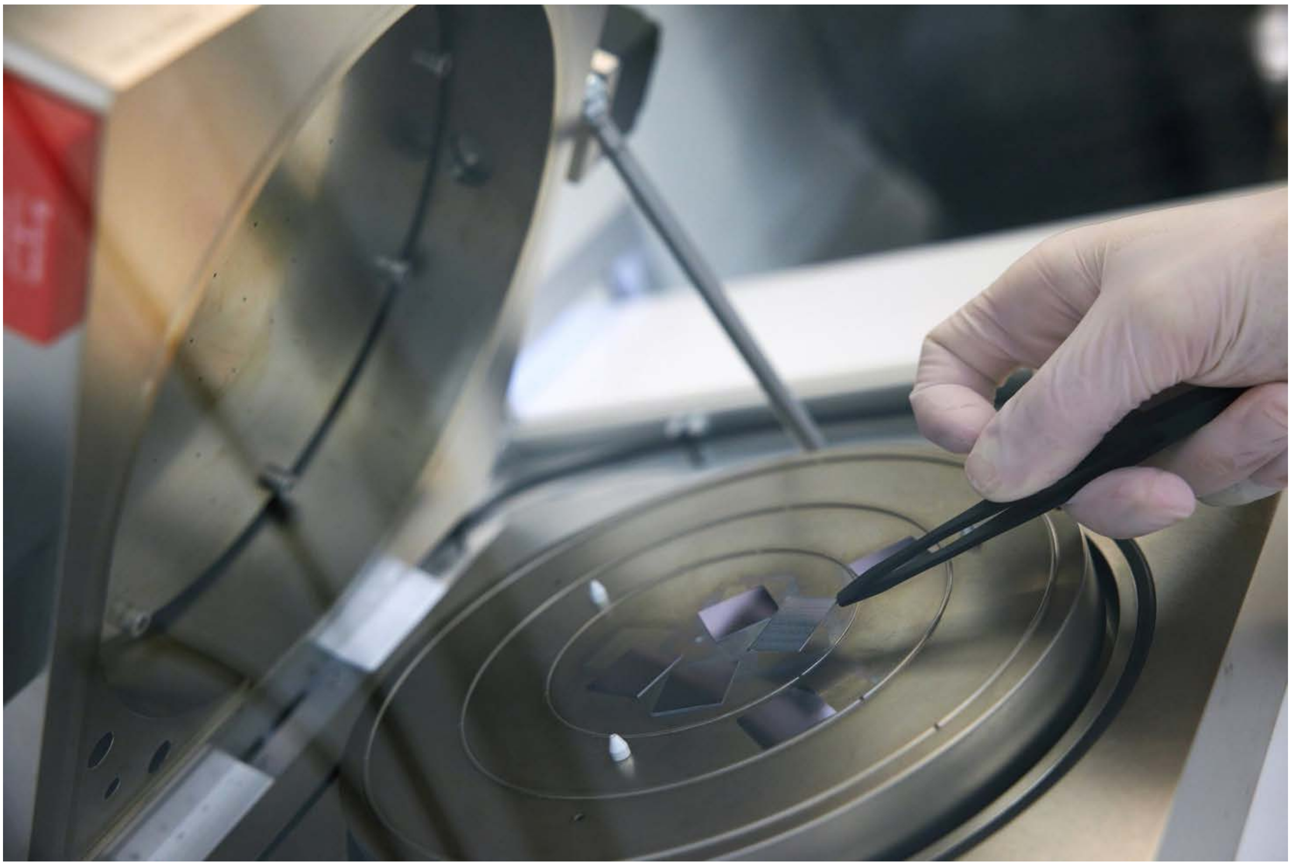
Myfab's financial report for 1 January – 31 December 2022 is undersigned by Chalmers financial controller and submitted separately to the Swedish Research Council. The report presents how the Myfab operations grant has been distributed, in accordance with the decisions taken by Myfab's steering group.

The table below present the total economy of the Myfab laboratories and sets the Myfab operation grant in perspective to each laboratory's total economy. The Myfab grant in this table represents the full-year 2022.

Income [kSEK]	Myfab Chalmers	Myfab KTH	Myfab Lund	Myfab Uppsala	Myfab all labs
Faculty grants	32 920	16 207	23 305	10 367	72 432
Fees, academic	18 148	13 856	6 127	8 053	38 131
Fees companies incl. RISE	17 753	25 093	2 548	4 474	45 394
Myfab SRC grant	3 027	3 027	3 028	3 028	12 110
Financed depr.	5 603	5 073	905	3 706	11 581
Projects SSF, EU		3 631			3 631
Services		4 208	1 191		5 399
Income Total	**77 451**	**71 095**	**37 104**	**29 626**	**185 650**
Costs [kSEK]					
Personnel	15 698	16 814	12 188	7 763	44 700
Rent premises	18 356	16 346	9 550	10 797	44 252
Operation	18 463	19 571	8 940	6 850	46 974
Overhead	4 754	8 072	7 010	1 696	19 836
Financed depr.	5 603	5 073	905	3 706	11 581
Depreciations	5 386	4 768	8 072	583	18 809
Costs Total	**68 260**	**70 645**	**46 665**	**31 395**	**185 570**
Result	**9 191**	**450**	**-9 561**	**-1 769**	**80**

MYFAB STANDARD REPORT 2022 – KEY NUMBERS FROM MYFAB LIMS

	Myfab Chalmers	Myfab KTH	Myfab Lund	Myfab Uppsala	2022 Myfab	2021 Myfab	2020 Myfab
Active users	202	209	135	289	**835**	811	782
-new users	39	33	44	103	**219**	-	-
Female active users	44	53	31	113	**241**	228	202
Gender balance, active users	22%	25%	23%	39%	**29%**	28%	26%
University active users	166	147	112	234	**659**	660	646
Institutes active users	1	8	3	2	**14**	16	17
Commercial active users	35	54	20	53	**162**	135	119
Companies w. own personnel	13	21	6	32	**72**	65	58
Number of booked hours	54 929	37 762	35 920	31 930	**160 542**	170 579	164 830
-from universities	49 014	27 217	31 613	29 158	**137 002**	147 833	141417
-from institutes	30	3 372	676	30	**4 108**	3 038	3 198
-from commercial users	5 886	7 174	3 630	2 742	**19 432**	19 708	20 215



ANNEXES

ANNEX A - MYFAB KEY NUMBERS 2022

Key numbers as specified in Appendix 1 (Bilaga 1) to Myfab's contract (Dnr: 2019-00207)

1	Anställda vid infrastrukturen	
1.1	*Enskilda individer*	
	Totalt	76
	Ledning (labchefer ingår)	5
	Vid Myfab Chalmers	20
	Vid Myfab KTH	22
	Vid Myfab Lund	15
	Vid Myfab Uppsala	14
1.2	*FTE*	
	Totalt	61,8
	Ledning	1,8
	Vid Myfab Chalmers	18
	Vid Myfab KTH	16
	Vid Myfab Lund	12
	Vid Myfab Uppsala	14

Infrastrukturens namn: Myfab 5

Diarienummer: 2019-00207

Respondent (namn): Thomas Swahn

Respondent (epost): thomas.swahn@chalmers.se

Respondent (telefon): 0730-744676

Avser år: 2022

Katergorier av nyckeltal

1 Anställda (enskilda individer (eller FTE))
2 Projekt (fakturerade)
3 Användare (enskilda individer)
4 Kvantitet av användning [timmar]
5 Output

		a. Alla projekt			b. Typ av hemvist för alla projekt						c. Typ av akademisk hemvist för projekt (endast akademiska hemvister)			
					Akademisk			Kommersiell	Offentlig	Övriga				
2	Projekt	Totalt	Män	Kvinnor	Totalt	Män	Kvinnor	Totalt	Totalt	Totalt	Värdorganisation	Inom konsortiet, ej värd	Annat svenskt lärosäte	Internationell
2.2	*Genomförda projekt*													
	Totalt													
	Vid Myfab Chalmers	158	141	17	132	114	17	26			124	1	6	1
	Vid Myfab KTH	166	158	8	92	88	4	50	24		85	4	3	
	Vid Myfab Lund	93	78	15	77	63	14	16			71		4	2
	Vid Myfab Uppsala	123	75	48	84	51	33	37	2		75	5	4	

		d. Alla användare			e. Typ av hemvist för alla användare						f. Typ av akademisk hemvist för användare (endast akademiska hemvister)			
					Akademisk			Kommersiell	Offentlig	Övriga				
3	Användare	Totalt	Män	Kvinnor	Totalt	Män	Kvinnor	Totalt	Totalt	Totalt	Värdorganisation	Inom konsortiet, ej värd	Annat svenskt lärosäte	Internationell
3.2	*Genomförda projekt*													
	Totalt	835	594	241	*659*	*468*	*191*	176						
	Vid Myfab Chalmers	202	158	44	166	129	37	36			153	1	11	1
	Vid Myfab KTH	209	156	53	147	110	37	62			129	9	9	
	Vid Myfab Lund	135	104	31	112	86	26	23			106	1	4	1
	Vid Myfab Uppsala	289	176	113	234	143	91	55			225	8	1	

		g. Total kvantitet per typ av tillgång till		h. Kvantitet av tillgång för akademiska projekt		
		Alla användare		Fysisk tillgång till infrastruktur		
4	Typ och kvantitet av tillgång	Fysisk [antal anv.]	timmar	Totalt (timmar)	Män (andel, %)	Kvinnor (andel, %)
4.1	*Användning under året*					
	Totalt	835	160541	137002		
	Vid Myfab Chalmers	202	54929	49014	78%	22%
	Vid Myfab KTH	209	37762	27217	75%	25%
	Vid Myfab Lund	135	35920	31613	77%	23%
	Vid Myfab Uppsala	289	31930	29158	61%	39%

5	Output		
5.1	Publikationer	Bifoga lista enl specifikation	
5.2	Antal examinerade doktorer	Som haft en väsentlig verksamhet i Myfab	

ANNEX B – ORGANISATION 2022

General Assembly members (Stämma)

Chair:
Lars Börjesson, Senior Advisor to the President, Chalmers
Annika Stensson Trigell, Vice-President KTH
Johan Tysk, Vice-Rector Uppsala University
Victor Öwall, Pro Vice-Chancellor Lund University

International Advisory Board (AB)

Chair:
Anna Rissanen Director OtaNano, Aalto University
Jörg Hübner Director DTU Nanolab
Maria Huffman Director UW Washington Nanofabrication Facility
Max Lemme Professor RWTH Aachen University

Steering Group members

Chair:
Mikael Östling, Deputy President KTH
Marcus Aldén, Professor, Lund University
Anne Borg, Rector NTNU Trondheim
Mikael Jonsson, Professor, Uppsala University
Ellen Moons, Professor, Karlstad University
Anna Stenstam, CEO CR Competence, Lund
Henrik Thunman, Professor Chalmers

Operational management

Director:
Thomas Swahn, Docent
Laboratory Managers:
Myfab Chalmers: Peter Modh, Ph.D.
Myfab KTH: Nils Nordell, PhD.
Myfab Lund: Luke Hankin, PhD.
Myfab Uppsala: Stefan Nygren, PhD.

ANNEX C – MYFAB ACCOUNTING OF PROCUREMEN 2022

Accounting of procurements during 2022.

Some of the procurements financed by the grant from the Swedish Research Council Dnr. 2019-00207 – Myfab 5 were finalized during 2022 and are reported using the template: "Mall för redovisning upphandling samt för slutredovisning av vetenskaplig utrustning.xlsx".

ANNEX C – INVESTMENT NUMBER 2: AUTOMATED SEM, MYFAB CHALMERS

Amount paid 2022: 3 272 484 SEK.

Actual amount is higher but cannot be presented here due to a non-disclosure agreement with the supplier.

ANNEX C – INVESTMENT NUMBER 5: HPVE REACTOR UPGRADE, MYFAB KTH

Amount paid 2022: 1 098 286 SEK and 1 639 580 SEK. Total: 2 737 866 SEK.

Bidragsfaktura / Rekvisition

Datum	Rekvisitionsnr
2022-11-17	VR-2019-00207 839

Kungliga Tekniska högskolan

Skolan för Elektroteknik o datavetenskap

CHALMERS TEKNISKA HÖGSKOLA AB

Ingrid Collin
FAKTURASERVICE

412 96 GÖTEBORG
Sverige

Ert momsregistreringsnr
SE5564795598

Er ref
Ingrid Collin

Vår ref
Nils Nordell
10004830

Kontraktsnr	Beskrivning	Belopp
VR-2019-00207	HPVE reactor uppgrade	2 737 866,00

Att betala senast:	2022-12-17	SEK	2 737 866,00

100 95 146

Agnitron Technology, Inc.
8360 Commerce Drive
Chanhassen MN 55317
United States

Invoice
#158037
4/6/2022

Bill To
Yanting Sun
Kungliga Tekniska hogskolan
Brinellvagen 8
100 44
Stockholm
Sweden

Ship To
Electrum Lab
KTH-Royal Institute of Technology
Electrum 229
154 40
Kista
Sweden

TOTAL (SEK)

1 098 285.60

Due Date: 5/6/2022

Terms	Due Date	PO #	Shipping Method
Net 30	5/6/2022	V-2021-0319 - NORDELL KTHEECS	UPS® Ground

QTY	Item	Description	Unit Price (SEK)	Amount (SEK)
0.4	**Control System**	Control System including software, control PC and cabling. Delivery DDP (VAT excluded) according to incoterms 2020 Installation and commission Training Functional test Warranty for 1 yearNonInvtPart	1 900 000.00	760 000.00
0.4	**Gas Control Option**	Gas control optionNonInvtPart	845 714.00	338 285.60

2022 -04- 19

Subtotal	1 098 285.60
Shipping	0.00
Discount	
Tax (%)	0.00
Total	1 098 285.60

Thank you for your business. We do expect payment within 30 days, so please process this invoice within that time.
There will be a **1.5%** interest charge per month on late invoices.

There will be an **additional 330 KTH** charge added for Wire Transfer Payments

Wire Instructions:
Beneficiary: Agnitron Technology Inc
Beneficiary Address: 8360 Commerce Dr. Chanhassen, MN 55317
Beneficiary Account Number: 104778957407
Beneficiary Routing/ ABA Number: 091000022
Swift Code: USBKUS44IMT
Bank: US Bank NA
Bank Address: 300 Prairie Center Drive Eden Prairie, MN 55344

158037

Verifikationsdetaljer

Verifikationsnummer: 80052636.000000 **Fakturanummer:** 158037 **Lev.nr:** 10095146 **Fakturadatum:** 06.04.2022

Konteringsinformation

Trans.typ	Valuta	Valutabelopp	Belopp	Konto	Dim 1	Dim 2	Dim 3	Dim 4	Dim 5	Dim 6	Dim 7	MK
AP	SEK	-1098285.60	-1098285.60	2585	JAX			E				0
GL	SEK	1098285.60	1098285.60	5000	JAX	9980		E			NORDELL	0

10095146

2022-07-28

agnitron
MOCVD SOLUTIONS AND SERVICES

Agnitron Technology, Inc.
8360 Commerce Drive
Chanhassen MN 55317
United States

Invoice

#158093
7/28/2022

Bill To
KTH
Kungliga Tekniska hogskolan
Fakturaservice
Ref: YASUN KTHSCI
104 50
Stockholm
Sweden

Ship To
Electrum Lab
KTH-Royal Institute of Technology
Electrum 229
154 40
Kista
Sweden

TOTAL (SEK)

1 639 580.40

Due Date: 7/28/2022

Terms	Due Date	PO #	Shipping Method
Immediate	7/28/2022	V-2021-0319 - NORDELL KTHEECS	UPS® Ground

QTY	Item	Description	Unit Price (SEK)	Amount (SEK)
0.6	**Control System**	Control System including software, control PC and cabling. Delivery DDP (VAT excluded) according to incoterms 2020 Installation and commission Training Functional test Warranty for 1 yearNonInvtPart	1 900 000.00	1 140 000.00
0.6	**Gas Control Option**	Gas control optionNonInvtPart	845 714.00	507 428.40
1	**Invoice Adjustment - Software**	UPS invoice - Dustin HomeNonInvtPart	(4 848.00)	(4 848.00)
1	**Invoice Adjustment - Software**	Electrician invoice - elitelNonInvtPart	(3 000.00)	(3 000.00)

Subtotal	1 639 580.40
Shipping	0.00
Discount	
Tax (%)	0.00
Total	1 639 580.40

158093

4013802

agnitron
MOCVD SOLUTIONS AND SERVICES

Agnitron Technology, Inc.
8360 Commerce Drive
Chanhassen MN 55317
United States

Invoice

#158093
7/28/2022

Thank you for your business. We do expect payment within 30 days, so please process this invoice within that time.
There will be a **1.5%** interest charge per month on late invoices.

There will be an **additional 330 KTH** charge added for Wire Transfer Payments

Wire Instructions:
Beneficiary: Agnitron Technology Inc
Beneficiary Address: 8360 Commerce Dr. Chanhassen, MN 55317
Beneficiary Account Number: 104778957407
Beneficiary Routing/ ABA Number: 091000022
Swift Code: USBKUS44IMT
Bank: US Bank NA
Bank Address: 300 Prairie Center Drive Eden Prairie, MN 55344

158093

Verifikationsdetaljer

Verifikationsnummer: 80056533.000000 **Fakturanummer:** 158093 **Lev.nr:** 10095146 **Fakturadatum:** 28.07.2022

Konteringsinformation

Trans.typ	Valuta	Valutabelopp	Belopp	Konto	Dim 1	Dim 2	Dim 3	Dim 4	Dim 5	Dim 6	Dim 7	MK
AP	SEK	-1639580.40	-1639580.40	2585	JAX			E				0
GL	SEK	1639580.40	1639580.40	5000	JCB	6854		E			NORDELL	0

ANNEX C – INVESTMENT NUMBER 6: AJA EVAPORATOR, MYFAB KTH

Amount paid 2022: 2 714 088 SEK. This amount represents 50% of the total investment, the remaining part will be paid at final acceptance of the tool.

Ver.nr	Ver.datum	Konto	Konto(T)	Belopp	Text	Anst/Anl	Anst/Anl(T)	Mp	Fin/Resnr	Resk.nr(T)
68004311	2021-12-20	1211	Maskiner & utrustning, årets anskaffning	2 594 064,00	AT Aktivering	SKJ21004	AJA evaporator			
		1211	**Maskiner & utrustning, årets anskaffning**	**2 594 064,00**						
68004320	2021-12-31	1218	Maskiner & utrustning, årets värdeminskning	-43 234,40	Avskrivning	SKJ21004	AJA evaporator			
		1218	**Maskiner & utrustning, årets värdeminskning**	**-43 234,40**						
80146948	2021-11-08	1298	AT Avräkningskonto	2 594 064,00	AJA evaporator, 50% against proof of tangible goods, V-2021-0401					AJA INTERNATIONAL, INC.
68004311	2021-12-20	1298	AT Avräkningskonto	-2 594 064,00	AT Aktivering					
		1298	**AT Avräkningskonto**	**0,00**						
122101442	2021-01-04	2091	Årets kapitalförändring enl resultaträkning	163 258,48	Periodisering BMÅN 202112					
		2091	**Årets kapitalförändring enl resultaträkning**	**163 258,48**						
622102576	2021-12-16	59521	Valutakursförlust fördelning	120 024,08	Valutakursdiff vernr 80146948,632100475					
		59521	**Valutakursförlust fördelning**	**120 024,08**						
68004320	2021-12-31	69133	Avskrivning maskiner & utrustning	43 234,40	Avskrivning	SKJ21004	AJA evaporator			
		69133	**Avskrivning maskiner & utrustning**	**43 234,40**						
122101442	2021-01-04	8991	Årets kapitalförändring	-163 258,48	Periodisering BMÅN 202112					
		8991	**Årets kapitalförändring**	**-163 258,48**						
		87751	**Myfab INFRA/Chalmers**	**2 714 088,08**						
				2 714 088,08						

Anskaffningsvärde SKJ21004 **2 714 088**

10096462

AJA International, Inc.
P.O. Box 246, 809 Country Way
N. Scituate, MA 02060
USA

Invoice

Date	S.O. No.	Invoice Number
11/8/2021	18236	7311

Customer /Contact:
KTH Royal Institute of Technology
Erik Holmgren
eholmgr@kth.se

Bill To:
KTH Royal Institute of Technology
Fakturaservice
Box 24075
104 50 Stockholm

OKÄND KTH SCI

Ship To:
KTH Royal Institute of Technology
AlbaNova University Center
Hannes Alfvens vag 11,
Alabanova Lab
114 19 STOCKHOLM, Sweden

Customer Order Number	Date Shipped	Shipped Via	F.O.B. Point	Order Date	Terms
V-2021-0401	10/5/2021		DDP VAT EXCL		See Below

Ordered	Code	Shipped	Description	Unit Price	TOTAL
1	CS		ATC-1800-HY: ATC Series UHV Multi-Technique Deposition System ($592,400.00)		
1	FR		Freight & Insurance ($6,000.00)		
			DELIVERY TERMS: 20-24 weeks - Build time starts after receipt of down payment.		
1	CS		PAYMENT TERMS: 50% due with order upon proof of bought-in components ($299,200.00)	299,200.00	299,200.00
			20% due after acceptance at factory and prior to shipment ($119,680.00) 20% due upon safe arrival at customer's facility ($119,680.00) 10% due Net 30 Days ($59,840.00)		
			NOTES: SHPPING TERMS: ~~DDP (VAT EXCLUDED)~~ KTH REF: EHOLMGR KTHSCI		
			PLEASE REMIT THE TOTAL AMOUNT OF THIS INVOICE TO THE ADDRESS ABOVE. LATE PAYMENTS ARE SUBJECT TO 1.5% / MONTH INTEREST ASSESSMENT.		

INKOM
Kungliga Tekniska högskolan
2021 -11- 17
Fakturaservice/Ekonomi

Foreign Incoming Wire Instructions (USD$ only):

Hingham Institution for Savings
55 Main Street
Hingham, MA 02043

SWIFT BIC Code: HIISUS52
Routing Number: 211370370
AJA International, Inc. Account Number 27018294

TOTAL (US Dollars) $299,200.00

Purchase Order

Bill To:

AJA INTERNATIONAL, Inc.

P.O.Box 246, N. Scituate, MA 02060

DATE : 11/5/2021

Vendor:	Ship To:	P.O. #
	AJA International, Inc. 809 Country Way, N. Scituate, MA 02066 Tel: 781-545-7365 Fax: 781-545-4105 topgun@ajaint.com	210923-2-TR File Copies: White-Job Yellow-Corr Pink-Rec Blue-F/U

Date Req'd!	FOB :	Ship Via	Vendor Reference Quote Number :	AJA Contact :	Terms :
SEE BELOW	Orig.	UPS GND	17-MA-2182 REV PRICE	Tim Ribbe	

JOB #	REC'D	QTY	Part Number	Item Description	U. Price	T. Price
						$0.00
		3	KDC40	KDC40 Kaufman Gridded Filament Ion Source Package		$0.00
				4cm Diameter Pattern		$0.00
				Beam Voltage 100 to 1200V Max.		$0.00
				Beam Current 120mA Max.		$0.00
				6.75"CF Mounting Flange		$0.00
						$0.00
		2		STD DUAL GRID OPTICS		$0.00
						$0.00
		1	GRID OPTION	3 GRID MOLY DISHED DEFOCUSED		$0.00
						$0.00
						$0.00
		3	KSC 1202	KSC 1202 Kaufman Ion Source Power Supply		$0.00
				Auto or Manual Beam Control		$0.00
				200mA at 1200V		$0.00
				Optic/Accel. 200mA, 600V		$0.00
				Electron Neut. 250mA emission		$0.00
				185/265V, Single Phase, 50/60Hz		$0.00
						$0.00
						$0.00
						$0.00
						$0.00
		3		Total Price:		$0.00
				please ship on dates below		$0.00
				FIRST DELIVERY ASAP (2GRID)		$0.00
				SECOND DELIVERY 01/28/2022 (2GRID)		$0.00
				THIRD DELIVERY 04/11/2022 (3GRID)		$0.00
PLS DESTROY ALL QUOTE PRINTS! MANUFACTURE TO ATTACHED DWGs & REVs! (APPLIES TO CUSTOM PARTS				SUBTOTAL :		$0.00
				DISCOUNT % :	0%	$0.00
AJA Tax Exempt Number: 04-3493550				TOTAL :		$0.00

SPECIAL INSTRUCTIONS :

!! VENDOR PLEASE FAX/E-MAIL ACKNOWLEDGEMENT WITHIN 2 DAYS OF ORDER RECEIPT !!

EXPECTED DEL'Y DATE : __________ VENDOR AUTHORIZED SIGNATURE: ______________________

AJA Authorized Signature for Orders Over $10,000. ______________________

NOTE: All AJA Int'l., Inc. orders over $10,000. must be faxed with authorized signature to be considered valid.

Purchase Order

Bill To:

AJA INTERNATIONAL, Inc.

P.O.Box 246, N. Scituate, MA 02060

DATE : 11/5/2021

Vendor:	Ship To:	P.O. #
	AJA International, Inc. 809 Country Way, N. Scituate, MA 02066 Tel: 781-545-7365 Fax: 781-545-4105 topgun@ajaint.com	210923-3-tr
		File Copies:
		White-Job Yellow-Corr Pink-Rec Blue-F/U

Date Req'd!		FOB :	Ship Via	Vendor Reference Quote Number :	AJA Contact :	Terms :
01/30/2022		Orig.	UPS GND	20-MA-5077	Tim Ribbe	
JOB #	**REC'D**	**QTY**	**Part Number**	**Item Description**	**U. Price**	**T. Price**
		1	KDC 75	KDC 75 GRIDDED ION SOURCE 14CM DIA X 18.5CM L		
				MOUNTED ON A 8" CF FLANGE BUILD TO		$0.00
				ATTACHED PRINT		$0.00
		1	KSC1212	ION SOURCE POWER SUPPLY		$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
				please ship for date required.		$0.00
						$0.00
						$0.00

PLS DESTROY ALL QUOTE PRINTS! MANUFACTURE TO ATTACHED DWGs & REVs! (APPLIES TO CUSTOM PARTS ONLY)	SUBTOTAL :	$0.00
	DISCOUNT % :	$0.00
AJA Tax Exempt Number: 04-3493550	TOTAL :	$0.00

SPECIAL INSTRUCTIONS :

!! VENDOR PLEASE FAX/E-MAIL ACKNOWLEDGEMENT WITHIN 2 DAYS OF ORDER RECEIPT !!

EXPECTED DEL'Y DATE : __________ VENDOR AUTHORIZED SIGNATURE: ______________________________

AJA Authorized Signature for Orders Over $10,000. ______________________________

NOTE: All AJA Int'l., Inc. orders over $10,000. must be faxed with authorized signature to be considered valid.

Purchase Order

Bill To: ***AJA INTERNATIONAL, Inc.***
P.O.Box 246, N. Scituate, MA 02060
Email invoices to ajaap@ajaint.com

DATE : 11/5/2021
Page 1 of 1

Vendor:	Ship To:	P.O. #
	AJA International, Inc. Warehouse Loading Dock H, 155 Webster Street Hanover, MA 02339 Tel: 781-545-7365 Fax: 781-545-4105	211011-1-TR File Copies: White-Job Yellow-Corr Pink-Rec Blue-F/U

Date Req'd!		FOB :	Ship Via	Vendor Reference Quote Number :	AJA Contact :	Terms :
See Below		Orig.	BEST WAY	Q-145497-R5F1-1	Tim Ribbe	
JOB #	*	QTY	Part Number	Item Description	U. Price	T. Price
						$0.00
	01/10/2022	3	11136-UE01-0001	4.5" CF MANUAL VALVE		$0.00
	01/10/2022					$0.00
	01/10/2022					$0.00
						$0.00
	01/10/2022	1	11136-PE01-0001	ISO 63 MANUAL VALVE		$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
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						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00

PLS DESTROY ALL QUOTE PRINTS! MANUFACTURE TO ATTACHED DWGs & REVs! (APPLIES TO CUSTOM PARTS ONLY)	SUBTOTAL :		$0.00
	DISCOUNT % :	0%	$0.00
AJA Tax Exempt Number: 04-3493550	TOTAL :		$0.00

SPECIAL INSTRUCTIONS :

FOR PAYMENT EMAIL ALL INVOICES TO AJAAP@AJAINT.COM

!! VENDOR PLEASE FAX/E-MAIL ACKNOWLEDGEMENT WITHIN 2 DAYS OF ORDER RECEIPT !!

EXPECTED DEL'Y DATE : __________ VENDOR AUTHORIZED SIGNATURE: ______________________________

AJA Authorized Signature for Orders Over $10,000. ______________________________

NOTE: All AJA Int'l., Inc. orders over $10,000. must be faxed with authorized signature to be considered valid.

Purchase Order

Bill To: ***AJA INTERNATIONAL, Inc.***
P.O.Box 246, N. Scituate, MA 02060
Email invoices to ajaap@ajaint.com

DATE : 11/5/2021

Vendor:	Ship To:	P.O. #
	AJA International, Inc. Warehouse Loading Dock H 155 Webster Street Hanover, MA 02339 Tel: 781-545-7365 Fax: 781-545-4105	211014-1-tr File Copies: White-Job Yellow-Corr Pink-Rec Blue-F/U

Date Req'd!	FOB :	Ship Via	Vendor Reference Quote Number :	AJA Contact :	Terms :
see below	Orig.	UPS Ground - PPA		Tim Ribbe	

JOB #	REC'D	QTY	Part Number	Item Description	U. Price	T. Price
						$0.00
			HI PACE 1200 PKG	Consists of:		$0.00
		3	PM P03 912 B	HiPace 1200, 10"CF inlet flange, NW40 outlet		
		3	PM 061 348-AT	DCU 002 Display Control Unit, w/ 3M. Cable		
		3	PM Z01 113	Vent Valve, NO, 24VDC		
		3	PM 061 843-T	Cable, Vent valve, M12		
						$0.00
				1pc due 01/20/2022		$0.00
				1pc due 02/20/2022		$0.00
				1pc due 03/20/2022		$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00

PLS DESTROY ALL QUOTE PRINTS! MANUFACTURE TO ATTACHED DWGs & REVs! (APPLIES TO CUSTOM PARTS ONLY)	SUBTOTAL :		$0.00
	DISCOUNT % :	0%	$0.00
AJA Tax Exempt Number: 04-3493550			
	TOTAL :		$0.00

SPECIAL INSTRUCTIONS :

FOR PAYMENT EMAIL ALL INVOICES TO AJAAP@AJAINT.COM

!! VENDOR PLEASE FAX/E-MAIL ACKNOWLEDGEMENT WITHIN 2 DAYS OF ORDER RECEIPT !!

EXPECTED DEL'Y DATE : __________ VENDOR AUTHORIZED SIGNATURE: ______________________

AJA Authorized Signature for Orders Over $10,000. ______________________

NOTE: All AJA Int'l., Inc. orders over $10,000. must be faxed with authorized signature to be considered valid.

Purchase Order

Bill To: ***AJA INTERNATIONAL, Inc.***
P.O.Box 246, N. Scituate, MA 02060
Email invoices to ajaap@ajaint.com

DATE : 11/5/2021
Page 1 of 1

Vendor:	Ship To:	P.O. #
	AJA International, Inc. Warehouse Loading Dock H 155 Webster Street Hanover, MA 02339 Tel: 781-545-7365 Fax: 781-545-4105	211014-3-tr **File Copies:** White-Job Yellow-Corr Pink-Rec Blue-F/U

Date Req'd	FOB :	Ship Via	Vendor Reference Quote Number :	AJA Contact :	Terms :
SEE BELOW	Orig.			Tim Ribbe	

JOB #	REC'D	QTY	Part Number	Item Description	U. Price	T. Price
						$0.00
			HiPace 80 PKG	Consists of:		$0.00
		10	PM P03 940 A	HiPace 80 turbo, ISO63		
		10	PM C01 820 A	DCU 110 power/display unit		
		10	PM 061-351-T	TC 110 to TPS/DCU110/180 cable, 3m		
		10	PM Z01 113	Vent valve, NO, 24VDC		
		10	PM 061 687-T	Cable, Vent valve, M12		
		10	PM 016-623-T	Water cooling system		
		10	PM 016 207 AU	ISO63 Ctr ring, splinter screen		
						$0.00
						$0.00
				4pcs due 02/20/2022		$0.00
						$0.00
				2pcs due 03/30/2022		$0.00
						$0.00
				4pcs due 04/20/2022		$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00

PLS DESTROY ALL QUOTE PRINTS! MANUFACTURE TO ATTACHED DWGs & REVs! (APPLIES TO CUSTOM PARTS ONLY)	SUBTOTAL :		$0.00
	DISCOUNT % :	[illegible]	$0.00
AJA Tax Exempt Number: 04-3493550			
	TOTAL :		$0.00

SPECIAL INSTRUCTIONS :

FOR PAYMENT EMAIL ALL INVOICES TO AJAAP@AJAINT.COM

!! VENDOR PLEASE FAX/E-MAIL ACKNOWLEDGEMENT WITHIN 2 DAYS OF ORDER RECEIPT !!

EXPECTED DEL'Y DATE : __________ VENDOR AUTHORIZED SIGNATURE: ______________________________

AJA Authorized Signature for Orders Over $10,000. ______________________________

NOTE: All AJA Int'l., Inc. orders over $10,000. must be faxed with authorized signature to be considered valid.

Purchase Order

Bill To: ***AJA INTERNATIONAL, Inc.***
P.O.Box 246, N. Scituate, MA 02060
Email invoices to ajaap@ajaint.com

DATE : 11/5/2021
Page 1 of 1

Vendor:	Ship To:	P.O. #
	AJA International, Inc. Warehouse Loading Dock H, 155 Webster Street Hanover, MA 02339 Tel: 781-545-7365 Fax: 781-545-4105	211014-6-tr
		File Copies: White-Job Yellow-Corr Pink-Rec Blue-F/U

Date Req'd!		FOB :	Ship Via	Vendor Reference Quote Number :	AJA Contact :	Terms :
see below		Orig.	AJA FEDEX° no insurance		Tim Ribbe	

JOB #	QTY	DATE DUE	TOTAL QT	Part Number	Item Description	U. Price	T. Price
							$0.00
							$0.00
	2	01/20/2022	10	NeoDry15E-2	Air Cooled Multi Roots Pump 250 L/min		$0.00
	2	02/20/2022			220 VAC Single Phase		$0.00
	2	03/20/2022			N2 Ballast, no power cord		$0.00
	2	04/20/2022					$0.00
	2	05/20/2022					$0.00
							$0.00
					PLEASE SHIP BALAST IN PUMP BOX		$0.00
							$0.00
							$0.00
							$0.00
							$0.00
							$0.00
							$0.00
							$0.00
							$0.00
							$0.00
							$0.00
							$0.00
							$0.00
							$0.00

PLS DESTROY ALL QUOTE PRINTS! MANUFACTURE TO ATTACHED DWGs & REVs! (APPLIES TO CUSTOM PARTS ONLY)	SUBTOTAL :		$0.00
	DISCOUNT % :	0%	$0.00
AJA Tax Exempt Number: 04-3493550	TOTAL :		$0.00

SPECIAL INSTRUCTIONS :

FOR PAYMENT EMAIL ALL INVOICES TO AJAAP@AJAINT.COM

!! VENDOR PLEASE FAX/E-MAIL ACKNOWLEDGEMENT WITHIN 2 DAYS OF ORDER RECEIPT !!

EXPECTED DEL'Y DATE : ________ VENDOR AUTHORIZED SIGNATURE: ____________________

AJA Authorized Signature for Orders Over $10,000. ____________________

NOTE: All AJA Int'l., Inc. orders over $10,000. must be faxed with authorized signature to be considered valid.

Purchase Order

Bill To: ***AJA INTERNATIONAL, Inc.***
P.O.Box 246, N. Scituate, MA 02060
Email invoices to ajaap@ajaint.com

DATE : 11/5/2021
Page 1 of 1

Vendor:	Ship To:	P.O. #
	AJA International, Inc. Warehouse Loading Dock H, 155 Webster Street Hanover, MA 02339 Tel: 781-545-7365 Fax: 781-545-4105	211014-7-tr File Copies: White-Job Yellow-Corr Pink-Rec Blue-F/U

Date Req'dl		FOB :	Ship Via	Vendor Reference Quote Number :	AJA Contact :	Terms :
see below		Orig.	AJA FEDEX*		Tim Ribbe	

JOB #	QTY	DATE DUE	TOTAL QT	Part Number	Item Description	U. Price	T. Price
							$0.00
	2	01/20/2022	6	NeoDry30E-2	Air Cooled Multi Roots Pump 500 L/min		
	2	02/20/2022			220 VAC Single Phase		$0.00
	2	03/20/2022			N2 Ballast, Casters , no cord		$0.00
							$0.00
							$0.00
							$0.00
							$0.00
							$0.00
							$0.00
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							$0.00
							$0.00
							$0.00

PLS DESTROY ALL QUOTE PRINTS! MANUFACTURE TO ATTACHED DWGs & REVs! (APPLIES TO CUSTOM PARTS ONLY)	SUBTOTAL :		$0.00
	DISCOUNT % :	0%	$0.00
AJA Tax Exempt Number: 04-3493550	TOTAL :		$0.00

SPECIAL INSTRUCTIONS :

FOR PAYMENT EMAIL ALL INVOICES TO AJAAP@AJAINT.COM

!! VENDOR PLEASE FAX/E-MAIL ACKNOWLEDGEMENT WITHIN 2 DAYS OF ORDER RECEIPT !!

EXPECTED DEL'Y DATE : __________ VENDOR AUTHORIZED SIGNATURE: ______________________

AJA Authorized Signature for Orders Over $10,000. ______________________

NOTE: All AJA Int'l., Inc. orders over $10,000. must be faxed with authorized signature to be considered valid.

Purchase Order

Bill To:

AJA INTERNATIONAL, Inc.

P.O.Box 246, N. Scituate, MA 02060

DATE : 10/29/2021

Vendor:	Ship To:	P.O. #
	AJA International, Inc. Warehouse Loading Dock H, 155 Webster Street Hanover, MA 02339 Tel: 781-545-7365 Fax: 781-545-4105 topgun@ajaint.com	211029-1-X File Copies: White-Job Yellow-Corr Pink-Rec Blue-F/U

Date Req'd!	FOB :	Ship Via	Vendor Reference Quote Number :	AJA Contact :	Terms :
SEE BELOW	Orig.	UPS GND	email	CRYSTAL ROBINSON	

JOB #	REC'D	QTY	Part Number	Item Description	U. Price	T. Price
		7	ATC1800-HY-1140-XXXX / RXX	ATC1800-HY CHAMBER		
				ROLL-UP: 18.38" OD X 35" LG		
				FLANGE RING: 20.5" OD X 18" ID X 0.95" THK		
				BASE PLATE: 18.38" OD X 1.12" THK		
		#1				
		#2				
		#3				
		#4				
		#5				
		#6				
		#7				
		7	ATC1800-HY-4130-XXXX / RXX	ATC1800-HY		
				DISH: R20" X 5.87" ID		
				FLANGE RING: 20.5" OD X 18" ID X 1.12" THK		
				(OR) FLAT PLATE: 20.5" OD X 1.12" THK		
		#1				
		#2				
		#3				
		#4				
		#5				
		#6				
		#7				

PLS DESTROY ALL QUOTE PRINTS!
MANUFACTURE TO ATTACHED DWGs & REVs!
(APPLIES TO CUSTOM PARTS ONLY)

SUBTOTAL :

DISCOUNT % :

AJA Tax Exempt Number: 04-3493550

TOTAL :

SPECIAL INSTRUCTIONS : 1ST CHAMBER TO BE DELIVERED IN 12 WEEKS (DRAWINGS WITHIN 2 WEEKS OF ORDER), REMAINDER TO FOLLOW AS REQUESTED BY AJA.

!! VENDOR PLEASE FAX/E-MAIL ACKNOWLEDGEMENT WITHIN 2 DAYS OF ORDER RECEIPT !!

EXPECTED DEL'Y DATE : __________ VENDOR AUTHORIZED SIGNATURE: ______________________________

AJA Authorized Signature for Orders Over $10,000. ______________________________

NOTE: All AJA Int'l., Inc. orders over $10,000. must be faxed with authorized signature to be considered valid.

Purchase Order

Bill To:

AJA INTERNATIONAL, Inc.

P.O.Box 246, N. Scituate, MA 02060

DATE : 11/8/2021

Vendor:	Ship To:	P.O. #
	AJA International, Inc. Warehouse Loading Dock H, 155 Webster Street Hanover, MA 02339 Tel: 781-545-7365 Fax: 781-545-4105	211105-1-tr File Copies: White-Job Yellow-Corr Pink-Rec Blue-F/U

	FOB :	Ship Via	Vendor Reference Quote Number :	AJA Contact :	Terms :
02/25/2022		EXW COLLECT UPS GROUND 63694X NO INS	2210301	Tim Ribbe	

JOB #	RE	QTY	Part Number	Item Description	U. Price	T. Price
						$0.00
18236S		1	FS-1G3	Film Sense FS-1 Gen 3 Multi-Wavelength Ellipsometer System includes 4-wavelength (450, 525, 595, 660 nm) LED light source unit, no moving parts ellipsometric detector unit, reference sample, tilt base, wall plug power supply, cables, and documentation.		$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
18236S		1	FS-IS-275	2.75" INSITU MOUNTING BRACKETS		$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00

PLS DESTROY ALL QUOTE PRINTS! MANUFACTURE TO ATTACHED DWGs & REVs! (APPLIES TO CUSTOM PARTS ONLY)	SUBTOTAL :		$0.00
	DISCOUNT % :		
AJA Tax Exempt Number: 04-3493550	TOTAL :		

SPECIAL INSTRUCTIONS :

!! VENDOR PLEASE FAX/E-MAIL ACKNOWLEDGEMENT WITHIN 2 DAYS OF ORDER RECEIPT !!

EXPECTED DEL'Y DATE : __________ VENDOR AUTHORIZED SIGNATURE: ______________________________

AJA Authorized Signature for Orders Over $10,000. ______________________________

NOTE: All AJA Int'l., Inc. orders over $10,000. must be faxed with authorized signature to be considered valid.

Purchase Order	Bill To: ***AJA INTERNATIONAL, Inc.*** P.O.Box 246, N. Scituate, MA 02060	**DATE : 11/5/2021** **Page 1 of 1**

Vendor:	Ship To:	P.O. #
	AJA International, Inc. Warehouse Loading Dock H, 155 Webster Street Hanover, MA 02339 Tel: 781-545-7365 Fax: 781-545-4105	211105-1-tr **File Copies:** White-Job Yellow-Corr Pink-Rec Blue-F/U

	FOB :	Ship Via	Vendor Reference Quote Number :	AJA Contact :	Terms :
02/25/2022			2210301	Tim Ri[illegible]	

JOB #	RE	QTY	Part Number	Item Description	U. Price	T. Price
						$0.00
		1	FS-1EX	FS-1EX Multi-Wavelength Ellipsometer System, includes 6-wavelength (spectral range 405-950 nm) LED light source unit, no moving parts ellipsometric detector unit, frame for mounting sample with manual height adjustment, reference sample, wall plug power supply, cables, and documentation.Tilt base included.		$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
		1	FS-1S1	2.75" INSITU MOUNTING BRACKETS		$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00

PLS DESTROY ALL QUOTE PRINTS! MANUFACTURE TO ATTACHED DWGs & REVs! (APPLIES TO CUSTOM PARTS ONLY)	SUBTOTAL :		$0.00
	DISCOUNT % :		
AJA Tax Exempt Number: 04-3493550	TOTAL :		

SPECIAL INSTRUCTIONS :

!! VENDOR PLEASE FAX/E-MAIL ACKNOWLEDGEMENT WITHIN 2 DAYS OF ORDER RECEIPT !!

EXPECTED DEL'Y DATE : __________ VENDOR AUTHORIZED SIGNATURE: ______________________________

AJA Authorized Signature for Orders Over $10,000. ______________________________

NOTE: All AJA Int'l., Inc. orders over $10,000. must be faxed with authorized signature to be considered valid.

Purchase Order

Bill To:

AJA INTERNATIONAL, Inc.

P.O.Box 246, N. Scituate, MA 02060

DATE : 11/5/2021

Page 1 of 1

Vendor:	Ship To:	P.O. #
	AJA International, Inc. Warehouse Loading Dock H, 155 Webster Street Hanover, MA 02339 Tel: 781-545-7365 Fax: 781-545-4105	211105-4-tr File Copies: White-Job Yellow-Corr Pink-Rec Blue-F/U

Date Req'd	FOB :	Ship Via	Vendor Reference Quote Number :	AJA Contact :	Terms :
2/22/2022	Orig.	FedEx Economy freight		Tim Ribbe	

JOB #	REC'D	QTY	Part Number	Item Description	U. Price	T. Price
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
18236S	1	1	107 9964-8	ST-6 400 vac; single output cable. With programable		$0.00
				sweep 1.5AMP		$0.00
						$0.00
				Please ship for delivery of requested date.		$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00
						$0.00

PLS DESTROY ALL QUOTE PRINTS! MANUFACTURE TO ATTACHED DWGs & REVs! (APPLIES TO CUSTOM PARTS ONLY)	SUBTOTAL :		$0.00
	DISCOUNT % :		$0.00
AJA Tax Exempt Number: 04-3493550	TOTAL :		$0.00

SPECIAL INSTRUCTIONS :

!! VENDOR PLEASE FAX/E-MAIL ACKNOWLEDGEMENT WITHIN 2 DAYS OF ORDER RECEIPT !!

EXPECTED DEL'Y DATE : __________ VENDOR AUTHORIZED SIGNATURE: ______________________________

AJA Authorized Signature for Orders Over $10,000. ______________________________

NOTE: All AJA Int'l., Inc. orders over $10,000. must be faxed with authorized signature to be considered valid.

---------- Original Message ----------
From: Karin Edoff <kedoff@kth.se>
To: "fakturaservice@kth.se" <fakturaservice@kth.se>
CC: Erik Holmgren <eholmgr@kth.se>
Subject:
Date: Wed, 17 Nov 2021 06:43:53 +0000

Hej,

Vidarebefordrar här en faktura med tillhörande underlag, kopplad till upphandling och avtal V-2021-0401.
Beställare är Erik Holmgren vid Albanova Nanolab, SCI-skolan (cc).

Hälsningar
Karin

[cid:image001.png@01D7DB28.01024620]

Karin Edoff, PhD
Upphandlare

KTH
Gemensamt verksamhetsstöd
Ekonomi, Upphandlingsgruppen
Drottning Kristinas väg 6, 114 28 Stockholm
Tfn: 08-790 88 78
kedoff@kth.se<mailto:kedoff@kth.se>, www.kth.se<http://www.kth.se/>

Verifikationsnummer: 80146948.000000 **Fakturanummer:** 7311 **Lev.nr:** 10096462 **Fakturadatum:** 08.11.2021

Konteringsinformation

Trans.typ	Valuta	Valutabelopp	Belopp	Konto	Dim 1	Dim 2	Dim 3	Dim 4	Dim 5	Dim 6	Dim 7	MK
	USD	299200.00	2594064.00	1298	SKJ	87751		E			3	0
	USD	-299200.00	-2594064.00	2583	SAX			E				0

ANNEX C – INVESTMENT NUMBER 10: CD OVERLAY DEFECT INSPECTION, KTH

Amount paid 2022: 1 733 916 SEK.

Bidragsfaktura / Rekvisition

Datum	Rekvisitionsnr
2022-11-30	VR-2019-00207 861

Kungliga Tekniska högskolan

Skolan för Elektroteknik o datavetenskap

CHALMERS TEKNISKA HÖGSKOLA AB

Ingrid Collin
FAKTURASERVICE

412 96 GÖTEBORG
Sverige

Ert momsregistreringsnr
SE5564795598

Vår ref
Nils Nordell
10004830

Er ref
Ingrid Collin

Kontraktsnr	Beskrivning	Belopp
VR-2019-00207	CD overlay defect inspection	1 733 916,00

Att betala senast:	2022-12-20	SEK	1 733 916,00

Adress	Telefonnr/E-post	Org.nr/F-skatt	Bankgiro: 895-9223
Skolan för Elektroteknik o datavetenskap	08-790 60 00	202100-3054	
100 44 STOCKHOLM	invoice@eecs.kth.se	VAT reg no SE202100305401	

FAKTURA

Fakturadatum
2022-11-16

Fakturanummer
2312253

Valuta
SEK

Konteringsreferens
Per-Erik Hellström
Beställarereferens
PEREH KTH-EECS

Kundens ordernummer
642822

Leverantör
BergmanLabora AB
Karlsrovägen 2 D
18217 Danderyd
SE
EndpointID 5560951401
Partsidentitet 5560951401
Organisationsnummer 5560951401
Säte BergmanLabora AB
Momsregnr. SE556095140101Godkänd för F-skatt

Leverantörens kontaktinformation
Lotta Mattsson
Telefon 46086251850
E-mail
lotta.mattsson@bergmanlabora.se

Kund
Kungliga Teknsika Högskolan
Fakturaservice Box 24075
10450 Stockholm
SE
EndpointID 2021003054
Partsidentitet 2021003054
Organisationsnummer 2021003054
Säte Kungliga Teknsika Högskolan

Kundens kontaktinformation
Per-Erik Hellström

Leveransmottagare
Electrumlaboratoriet
Isafjordsgatan 22-24
Kungliga Teknsika Högskolan
16440 Kista
SE

Fakturameddelande
Informationstext: I enlighet med vår branschorganisation Swedish Labtech tillämpar vi "Allmänna leveransbestämmelser IML 2009" om inget annat avtalats. Frakt- och leveransomkostnader på 595,- SEK per order tillkommer. Efter förfallodatum debiteras dröjsmålsränta med referensränta plus 8%. Anmärkningar mot denna faktura skall ske inom 10 dagar. Varan förblir vår egendom till dess att full likvid erhålles.

Avtalsreferens
PEREH KTH-EECS
Dokumentreferenser
2312253 (Dokumenttypkod 130)

Rad	Produktnummer	Info	Kvantitet	Enhet	Enhetspris	Momsdetaljer	Rabatt/Avgift(Rad)	Radsumma
1000	670-MBA60320	L200ND Eclipse basmikroskop s/n 522137	1.00	EA	112 128.00 SEK	25.00%		112 128.00 SEK
1001	670-MBF11300	Power Cord BE	1.00	EA	48.00 SEK	25.00%		48.00 SEK
1002	670-MBB60020	Tiltbar trinokulär ergotub L2-TTA	1.00	EA	27 720.00 SEK	25.00%		27 720.00 SEK
1003	670-MAK10110	Okular CFI 10X, 22 mm	2.00	EA	1 502.00 SEK	25.00%		3 004.00 SEK
1004	670-MBV60050	Breath Shield Plate for L300/L200	1.00	EA	1 636.00 SEK	25.00%		1 636.00 SEK
1005	670-MBN60740	ND16 Filter 25 EPI/DIA	1.00	EA	582.00 SEK	25.00%		582.00 SEK
1006	670-MUE42050	Objektiv CFI TU Plan Fl. 5X BD	1.00	EA	6 991.00 SEK	25.00%		6 991.00 SEK
1007	670-MUE42200	Objektiv CFI TU Plan Fl 20X BD	1.00	EA	10 274.00 SEK	25.00%		10 274.00 SEK
1008	670-MUC41500	Objektiv CFI TU	1.00	EA	34 178.00	25.00%		34 178.00

		Plan Apo BD 50X		SEK		SEK
1009	670-MUC41900	CFI TU Plan APO BD ELWD 100x	1.00 EA	40 126.00 SEK	25.00%	40 126.00 SEK
1010	670-MUC41150	CFI TU Plan Apo BD 150X	1.00 EA	42 937.00 SEK	25.00%	42 937.00 SEK
1011	670-MBN67940	L2-PPO Rot.Polarizer L300/L200	1.00 EA	7 790.00 SEK	25.00%	7 790.00 SEK
1012	670-MBN60921	L2-AN ANALYZER FOR L200	1.00 EA	6 494.00 SEK	25.00%	6 494.00 SEK
1013	670-MBP60160	L-DIHC DIC Prism HC	1.00 EA	36 286.00 SEK	25.00%	36 286.00 SEK
1014	670-MBE65700	LV-LL LED Lamphouse	2.00 EA	11 970.00 SEK	25.00%	23 940.00 SEK
1015	672-HE16/2-8	Large format ProScan® stage, Encoded for larger upright micr	1.00 EA	127 415.00 SEK	25.00%	127 415.00 SEK
1016	672-V31XYZE	ProScan III controller for stage and focus control s/n 1238971	1.00 EA	42 567.00 SEK	25.00%	42 567.00 SEK
1017	672-CS200XY	XY Joystick s/n 1239085	1.00 EA	4 865.00 SEK	25.00%	4 865.00 SEK
1018	672-CS200Z	Z Digipot s/n 1238870	1.00 EA	4 864.00 SEK	25.00%	4 864.00 SEK
1019	672-X10376	Customized Wafer chuck rotatable for vacuum for 75, 100, 150 and 200 mm wafers	1.00 EA	40 708.00 SEK	25.00%	40 708.00 SEK
1020	672-NRE	Customization of wafer chuck for 150 and 200mm wafers	1.00 EA	0.0 SEK	0.0%	0.00 SEK
1021	672-H2100	Adapter plate for L200	1.00 EA	3 664.00 SEK	25.00%	3 664.00 SEK
1022	670-MQS41100	NIS-D STAGE	1.00 EA	14 114.00 SEK	25.00%	14 114.00 SEK
1023	672-PS3H122R	Generic Focus drive and adaptor with rotating cable sytem s/n 1238344	1.00 EA	11 357.00 SEK	25.00%	11 357.00 SEK
1024	672-H3909	Nikon LV Focus Sleeve	1.00 EA	1 072.00 SEK	25.00%	1 072.00 SEK
1025	672-PF850M	Pure Focus 850 nm Line Mode	1.00 EA	140 984.00 SEK	25.00%	140 984.00 SEK

1026 672-LF320	Flange Set	1.00 EA	8 779.00 SEK	25.00%	8 779.00 SEK
1027 672-PF209	PureFocus Setup Sample Slide	1.00 EA	1 357.00 SEK	25.00%	1 357.00 SEK
1028 672-PF300	PureFocus Setup Camera Jig	1.00 EA	2 632.00 SEK	25.00%	2 632.00 SEK
1029 672-PF201	PureFocus Setup Camera kit Type 2	1.00 EA	2 144.00 SEK	25.00%	2 144.00 SEK
1030 670-MQS41320	NIS-D PLUG-IN EXTERN Z FOCUSER	1.00 EA	6 300.00 SEK	25.00%	6 300.00 SEK
1031 670-MQA20000	Digital Sight 10 Microscope Camera	1.00 EA	89 823.00 SEK	25.00%	89 823.00 SEK
1032 670-MQF52057	4-AC AC Nätadapter	1.00 EA	1 345.00 SEK	25.00%	1 345.00 SEK
1033 682-MBF41300	NÄTKABEL 1,8M	1.00 EA	48.00 SEK	25.00%	48.00 SEK
1034 670-MXA22214	S-DS-2 USB Cable USB3.2 Gen2 Cable, Type C-C, 2m 10Gbps Bandwidth	1.00 EA	3 174.00 SEK	25.00%	3 174.00 SEK
1035 670-MQD43000	DS-F-F mount Adapter DS series	1.00 EA	1 151.00 SEK	25.00%	1 151.00 SEK
1036 670-201955	Installation	1.00 EA	8 790.00 SEK	25.00%	8 790.00 SEK
1037 670-MQS31201	NIS-AR DUO	1.00 EA	73 698.00 SEK	25.00%	73 698.00 SEK
1038 670-MQS42560	NIS-A 6D Modul	1.00 EA	10 964.00 SEK	25.00%	10 964.00 SEK
1039 670-MQS42100	NIS-A EDF tillägs modul 3D	1.00 EA	9 498.00 SEK	25.00%	9 498.00 SEK
1040 670-MQS43200	NIS-A AI	1.00 EA	46 087.00 SEK	25.00%	46 087.00 SEK
1041 670-MQS43020A	NIS-A Bundle JOBS 2.0	2.00 EA	53 950.00 SEK	25.00%	107 900.00 SEK
1042 670-MPX12005	HP Z4 Arbetsstation High-End+ för avanserad WF och Konfocal	1.00 EA	76 408.00 SEK	25.00%	76 408.00 SEK
1043 670-MPX12010	HP Z4 Arbetsstation High Data Throughput med NIS.ai	1.00 EA	96 923.00 SEK	25.00%	96 923.00 SEK
1044 670-MPX00246	HP Z27q G3 QHD Display	2.00 EA	5 735.00 SEK	25.00%	11 470.00 SEK

1045 673-ST98X66	Active Pneumatic Vibration Isolation Complete system, including Quiet Air Compressor, Casters and Optical Hole Pattern (M6 holes in 25 x 25 mm pattern) on the whole surface of the top plate	1.00 EA	58 025.00 SEK	25.00%	58 025.00 SEK
1046 LOMK	Leveransomkostnad	1.00 EA	6 914.00 SEK	25.00%	6 914.00 SEK
1047 670-201960	Applikationssupport; Användarutbildning (handhavande) av hårdvara och/eller applikationssupport (programvara) och/eller utveckling av kundanpassad analys enligt kravspecifikation	1.00 EA	8 709.00 SEK	25.00%	8 709.00 SEK
1048 20600-NIKAVTAL	Nikon Förebyggande Underhållsavtal	1.00 EA	9 250.00 SEK	25.00%	9 250.00 SEK
1049 670-MXF60001	USB 2.0 Cable, A-B - 5meter	1.00 EA	0.0 SEK	0.0%	0.00 SEK
1050 670-MQD43000	DS-F-F mount Adapter DS series	-1.00 EA	1 151.00 SEK	25.00%	-1 151.00 SEK
1051 670-MQD43020	DS-F2,5 F Mount ADAPTER 2,5x	1.00 EA	1 151.00 SEK	25.00%	1 151.00 SEK

Skatteinformation (Moms på fakturan)

Skattekategori	Undantagsorsak	Skattepliktigt belopp	Momsbelopp
VAT : S 25.00%		1 387 133.00 SEK	346 783.25 SEK
VAT : E 0%	Exempt from VAT	0.00 SEK	0.00 SEK

Totalbelopp

Beloppsutjämning -0.25 SEK

Summa radbelopp	Belopp exkl. moms	Totalt momsbelopp	Belopp inkl. moms	Belopp
1 387 133.00 SEK	1 387 133.00 SEK	346 783.25 SEK	1 733 916.25 SEK	**1 733 916.00 SEK**

Betalningsvillkor 30 dagar | Dröjsmålsränta 0.75%

Betalsätt

Betalkod	Betalvägskod	Kontonummer	Institution	Betalningsreferens/OCR	Förfallodatum
30		9249772	SE:BANKGIRO (F.I. branch ID)	2312253	2022-12-16

Verifikationsdetaljer

Verifikationsnummer: 80060419.000000 **Fakturanummer:** 2312253 **Lev.nr:** 99140150 **Fakturadatum:** 16.11.2022

Konteringsinformation

Trans.typ	Valuta	Valutabelopp	Belopp	Konto	Dim 1	Dim 2	Dim 3	Dim 4	Dim 5	Dim 6	Dim 7	MK
TX	SEK	346783.25	346783.25	1542	JAX			E				11
AP	SEK	-1733916.00	-1733916.00	2581	JAX			E				11
GL	SEK	1387132.75	1387132.75	5000	JAX	9980		E			PEREH	0

FAKTURA

Fakturadatum
2022-11-16

Fakturanummer
2312253

Valuta
SEK

Konteringsreferens
Per-Erik Hellström
Beställarereferens
PEREH KTH-EECS

Kundens ordernummer
642822

Leverantör
BergmanLabora AB
Karlsrovägen 2 D
18217 Danderyd
SE
EndpointID 5560951401
Partsidentitet 5560951401
Organisationsnummer 5560951401
Säte BergmanLabora AB
Momsregnr. SE556095140101Godkänd för F-skatt

Leverantörens kontaktinformation
Lotta Mattsson
Telefon 46086251850
E-mail
lotta.mattsson@bergmanlabora.se

Kund
Kungliga Teknsika Högskolan
Fakturaservice Box 24075
10450 Stockholm
SE
EndpointID 2021003054
Partsidentitet 2021003054
Organisationsnummer 2021003054
Säte Kungliga Teknsika Högskolan

Kundens kontaktinformation
Per-Erik Hellström

Leveransmottagare
Electrumlaboratoriet
Isafjordsgatan 22-24
Kungliga Teknsika Högskolan
16440 Kista
SE

Fakturameddelande
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Avtalsreferens
PEREH KTH-EECS
Dokumentreferenser
2312253 (Dokumenttypkod 130)

Rad	Produktnummer	Info	Kvantitet	Enhet	Enhetspris	Momsdetaljer	Rabatt/Avgift(Rad)	Radsumma
1000	670-MBA60320	L200ND Eclipse basmikroskop s/n 522137	1.00	EA	112 128.00 SEK	25.00%		112 128.00 SEK
1001	670-MBF11300	Power Cord BE	1.00	EA	48.00 SEK	25.00%		48.00 SEK
1002	670-MBB60020	Tiltbar trinokulär ergotub L2-TTA	1.00	EA	27 720.00 SEK	25.00%		27 720.00 SEK
1003	670-MAK10110	Okular CFI 10X, 22 mm	2.00	EA	1 502.00 SEK	25.00%		3 004.00 SEK
1004	670-MBV60050	Breath Shield Plate for L300/L200	1.00	EA	1 636.00 SEK	25.00%		1 636.00 SEK
1005	670-MBN60740	ND16 Filter 25 EPI/DIA	1.00	EA	582.00 SEK	25.00%		582.00 SEK
1006	670-MUE42050	Objektiv CFI TU Plan Fl. 5X BD	1.00	EA	6 991.00 SEK	25.00%		6 991.00 SEK
1007	670-MUE42200	Objektiv CFI TU Plan Fl 20X BD	1.00	EA	10 274.00 SEK	25.00%		10 274.00 SEK
1008	670-MUC41500	Objektiv CFI TU	1.00	EA	34 178.00	25.00%		34 178.00

		Plan Apo BD 50X		SEK		SEK
1009	670-MUC41900	CFI TU Plan APO BD ELWD 100x	1.00 EA	40 126.00 SEK	25.00%	40 126.00 SEK
1010	670-MUC41150	CFI TU Plan Apo BD 150X	1.00 EA	42 937.00 SEK	25.00%	42 937.00 SEK
1011	670-MBN67940	L2-PPO Rot.Polarizer L300/L200	1.00 EA	7 790.00 SEK	25.00%	7 790.00 SEK
1012	670-MBN60921	L2-AN ANALYZER FOR L200	1.00 EA	6 494.00 SEK	25.00%	6 494.00 SEK
1013	670-MBP60160	L-DIHC DIC Prism HC	1.00 EA	36 286.00 SEK	25.00%	36 286.00 SEK
1014	670-MBE65700	LV-LL LED Lamphouse	2.00 EA	11 970.00 SEK	25.00%	23 940.00 SEK
1015	672-HE16/2-8	Large format ProScan® stage, Encoded for larger upright micr	1.00 EA	127 415.00 SEK	25.00%	127 415.00 SEK
1016	672-V31XYZE	ProScan III controller for stage and focus control s/n 1238971	1.00 EA	42 567.00 SEK	25.00%	42 567.00 SEK
1017	672-CS200XY	XY Joystick s/n 1239085	1.00 EA	4 865.00 SEK	25.00%	4 865.00 SEK
1018	672-CS200Z	Z Digipot s/n 1238870	1.00 EA	4 864.00 SEK	25.00%	4 864.00 SEK
1019	672-X10376	Customized Wafer chuck rotatable for vacuum for 75, 100, 150 and 200 mm wafers	1.00 EA	40 708.00 SEK	25.00%	40 708.00 SEK
1020	672-NRE	Customization of wafer chuck for 150 and 200mm wafers	1.00 EA	0.0 SEK	0.0%	0.00 SEK
1021	672-H2100	Adapter plate for L200	1.00 EA	3 664.00 SEK	25.00%	3 664.00 SEK
1022	670-MQS41100	NIS-D STAGE	1.00 EA	14 114.00 SEK	25.00%	14 114.00 SEK
1023	672-PS3H122R	Generic Focus drive and adaptor with rotating cable sytem s/n 1238344	1.00 EA	11 357.00 SEK	25.00%	11 357.00 SEK
1024	672-H3909	Nikon LV Focus Sleeve	1.00 EA	1 072.00 SEK	25.00%	1 072.00 SEK
1025	672-PF850M	Pure Focus 850 nm Line Mode	1.00 EA	140 984.00 SEK	25.00%	140 984.00 SEK

1026	672-LF320	Flange Set	1.00 EA	8 779.00 SEK	25.00%	8 779.00 SEK
1027	672-PF209	PureFocus Setup Sample Slide	1.00 EA	1 357.00 SEK	25.00%	1 357.00 SEK
1028	672-PF300	PureFocus Setup Camera Jig	1.00 EA	2 632.00 SEK	25.00%	2 632.00 SEK
1029	672-PF201	PureFocus Setup Camera kit Type 2	1.00 EA	2 144.00 SEK	25.00%	2 144.00 SEK
1030	670-MQS41320	NIS-D PLUG-IN EXTERN Z FOCUSER	1.00 EA	6 300.00 SEK	25.00%	6 300.00 SEK
1031	670-MQA20000	Digital Sight 10 Microscope Camera	1.00 EA	89 823.00 SEK	25.00%	89 823.00 SEK
1032	670-MQF52057	4-AC AC Nätadapter	1.00 EA	1 345.00 SEK	25.00%	1 345.00 SEK
1033	682-MBF41300	NÄTKABEL 1,8M	1.00 EA	48.00 SEK	25.00%	48.00 SEK
1034	670-MXA22214	S-DS-2 USB Cable USB3.2 Gen2 Cable, Type C-C, 2m 10Gbps Bandwidth	1.00 EA	3 174.00 SEK	25.00%	3 174.00 SEK
1035	670-MQD43000	DS-F-F mount Adapter DS series	1.00 EA	1 151.00 SEK	25.00%	1 151.00 SEK
1036	670-201955	Installation	1.00 EA	8 790.00 SEK	25.00%	8 790.00 SEK
1037	670-MQS31201	NIS-AR DUO	1.00 EA	73 698.00 SEK	25.00%	73 698.00 SEK
1038	670-MQS42560	NIS-A 6D Modul	1.00 EA	10 964.00 SEK	25.00%	10 964.00 SEK
1039	670-MQS42100	NIS-A EDF tillägs modul 3D	1.00 EA	9 498.00 SEK	25.00%	9 498.00 SEK
1040	670-MQS43200	NIS-A AI	1.00 EA	46 087.00 SEK	25.00%	46 087.00 SEK
1041	670-MQS43020A	NIS-A Bundle JOBS 2.0	2.00 EA	53 950.00 SEK	25.00%	107 900.00 SEK
1042	670-MPX12005	HP Z4 Arbetsstation High-End+ för avanserad WF och Konfocal	1.00 EA	76 408.00 SEK	25.00%	76 408.00 SEK
1043	670-MPX12010	HP Z4 Arbetsstation High Data Throughput med NIS.ai	1.00 EA	96 923.00 SEK	25.00%	96 923.00 SEK
1044	670-MPX00246	HP Z27q G3 QHD Display	2.00 EA	5 735.00 SEK	25.00%	11 470.00 SEK

1045 673-ST98X66	Active Pneumatic Vibration Isolation Complete system, including Quiet Air Compressor, Casters and Optical Hole Pattern (M6 holes in 25 x 25 mm pattern) on the whole surface of the top plate	1.00 EA	58 025.00 SEK	25.00%	58 025.00 SEK
1046 LOMK	Leveransomkostnad	1.00 EA	6 914.00 SEK	25.00%	6 914.00 SEK
1047 670-201960	Applikationssupport; Användarutbildning (handhavande) av hårdvara och/eller applikationssupport (programvara) och/eller utveckling av kundanpassad analys enligt kravspecifikation	1.00 EA	8 709.00 SEK	25.00%	8 709.00 SEK
1048 20600-NIKAVTAL	Nikon Förebyggande Underhållsavtal	1.00 EA	9 250.00 SEK	25.00%	9 250.00 SEK
1049 670-MXF60001	USB 2.0 Cable, A-B - 5meter	1.00 EA	0.0 SEK	0.0%	0.00 SEK
1050 670-MQD43000	DS-F-F mount Adapter DS series	-1.00 EA	1 151.00 SEK	25.00%	-1 151.00 SEK
1051 670-MQD43020	DS-F2,5 F Mount ADAPTER 2,5x	1.00 EA	1 151.00 SEK	25.00%	1 151.00 SEK

Skatteinformation (Moms på fakturan)

Skattekategori	Undantagsorsak	Skattepliktigt belopp	Momsbelopp
VAT : S 25.00%		1 387 133.00 SEK	346 783.25 SEK
VAT : E 0%	Exempt from VAT	0.00 SEK	0.00 SEK

Totalbelopp

Beloppsutjämning -0.25 SEK

Summa radbelopp	Belopp exkl. moms	Totalt momsbelopp	Belopp inkl. moms	Belopp
1 387 133.00 SEK	1 387 133.00 SEK	346 783.25 SEK	1 733 916.25 SEK	**1 733 916.00 SEK**

Betalningsvillkor 30 dagar | Dröjsmålsränta 0.75%

Betalsätt

Betalkod	Betalvägskod	Kontonummer	Institution	Betalningsreferens/OCR	Förfallodatum
30		9249772	SE:BANKGIRO (F.I. branch ID)	2312253	2022-12-16

Verifikationsdetaljer

Verifikationsnummer: 80060419.000000 **Fakturanummer:** 2312253 **Lev.nr:** 99140150 **Fakturadatum:** 16.11.2022

Konteringsinformation

Trans.typ	Valuta	Valutabelopp	Belopp	Konto	Dim 1	Dim 2	Dim 3	Dim 4	Dim 5	Dim 6	Dim 7	MK
TX	SEK	346783.25	346783.25	1542	JAX			E				11
AP	SEK	-1733916.00	-1733916.00	2581	JAX			E				11
GL	SEK	1387132.75	1387132.75	5000	JAX	9980		E			PEREH	0

ANNEX D – MYFAB PUBLICATIONS AND DOCTORAL THESES 2022

Peer-reviewed publication lists Doctoral Theses from

Myfab Chalmers:	198 publications, 11 doctoral theses
Myfab KTH:	146 publications, 7 doctoral theses
Myfab Lund:	181 publications, 12 doctoral theses
Myfab Uppsala:	311 publications, 17 doctoral theses

In total 836 peer-reviewed publications and 47 doctoral theses during 2022.

Myfab Chalmers Peer Reviewed Journal and Conference Papers

1. Andersson, John, Oudin, Anna, Nordin, Steven, Forsberg, Bertil & Nordin, Maria, 'PM2.5 exposure and olfactory functions', International Journal of Environmental Health Research., 32:11, s. 2484-2495, 2022
2. Andersson, John, Svirelis, Justas, Medin, Jesper, Järlebark, Julia, Hailes, Rebekah & Dahlin, Andreas, 'Pore performance: artificial nanoscale constructs that mimic the biomolecular transport of the nuclear pore complex', NANOSCALE ADVANCES., In Press, 2022
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12. Kücüköz, Betül, Munkhbat, Battulga & Shegai, Timur, 'Boosting Second-Harmonic Generation in Monolayer Rhenium Disulfide by Reversible Laser Patterning', ACS Photonics., 9:2, s. 518-526, 2022
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