Dnr: STYR 2019/293

Annual Report of MAX IV Laboratory to the Swedish Research Council

2018

Contents

1 Introduction

The operation of MAX IV Laboratory 2018 was supported by the Swedish Research Council (VR) grant 827-2013-2235. As a condition for the grant, MAX IV Laboratory has been asked to submit an annual report with emphasis on the activities at the facility.

In 2018 three beamlines have been in regular user operation and three more have taken expert users. During the first half of the year, our main funders evaluated the status for completion of the beamline projects. The resulting reports were critical of MAX IV project management and how the status of the beamline projects was communicated to MAX IV's stakeholders. As a result of this, there have been changes in the Board and in MAX IV Management during the year. During autumn, in line with the requested action plan, the first changes to restore confidence in and strengthen project management have been initiated.

A final report for the MAX IV Phase I Project, the initial funding for accelerator and rings, was submitted to VR in March.

2018 is the last year of the funding period 2014 – 2018. For funding of the operation budget 2019 onwards several stakeholders, including VR, Vinnova, the Knut and Alice Wallenberg Foundation (KAW) and fourteen Swedish universities[1], will contribute to MAX IV operations cost. In addition, KAW has awarded MAX IV Laboratory funds for development of long-term data storage and services. This project will start in 2019.

This report covers the year 2018 and includes the following items as requested by VR:

- Organisational matters
- Status of accelerators and beamlines at MAX IV Laboratory
- User operation and statistics with scientific output
- Outreach
- Engagement with industry
- Collaborations
- Financial report

2 Organisational matters

At the end of 2018, MAX IV Laboratory had a total of 239 employees, see Figure 1. All parts of the organisation have been strengthened by new recruitments, although the vast majority have been of staff members for beamlines and to the Controls & IT group.

A thorough analysis to identify critical functions and key positions in the organisation has been made, followed by an action plan that includes new recruitments, to eliminate the vulnerability in these positions.

Ian McNulty started working full time as Physical Science Director at MAX IV in June 2018 after having worked part-time since March 2018. Ian McNulty, with expertise in materials science and coherent X-ray physics, previously was a senior scientist at the Center for Nanoscale Materials

[1] Chalmers University of Technology, Gothenburg University, Karlstad University, Karolinska Institutet, KTH Royal Institute of Technology in Stockholm, Linköping University, Linnæus University, Luleå University of Technology, Lund University, Malmö University, Stockholm University, Swedish University of Agricultural Sciences (SLU), Umeå University and Uppsala University

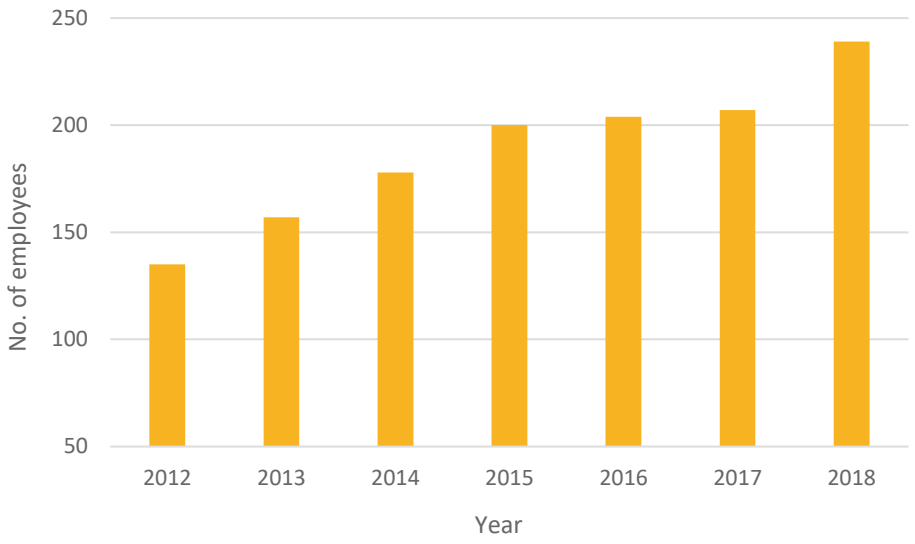

Figure 1. End of year numbers of MAX IV Laboratory employees for the years 2013-2017

at Argonne National Laboratory and led the CNM X-ray Microscopy Group. In July, Marjolein Thunnissen replaced Tomas Lundqvist as Life Science Director at MAX IV. Marjolein Thunnissen is an expert in structural biology using synchrotron radiation and has worked at Max-lab and MAX IV for many years. During the past two years, Marjolein Thunnissen led the MAX IV User Office reporting to Tomas Lundqvist.

As a consequence of the criticism in the reviews of the status, time plans and communication of MAX IV beamline projects, both the chair of the MAX IV board and the Director resigned. Vice-Chair Marianne Sommarin was appointed chair of the board until the end of this board's mandate at the end of 2019. Physical Science Director Ian McNulty agreed per request of the board to serve as interim director of MAX IV until a permanent director is in place.

In September the board submitted an action plan to VR and Lund University that cited lack of professional project management, imperfections in the decision chain, and inadequate communication as the main reasons for the delays in delivery of MAX IV beamlines to users. As a response to the action plan, MAX IV Management decided to implement a central project office (CPO) at MAX IV and to hire a portfolio manager to manage the CPO. MAX IV Management initiated several activities in autumn of 2018 to address the points the action plan including procurement of a non-permanent (consultant) Portfolio Manager and budgeting for staff for the CPO including a permanent portfolio manager. Figure 2 shows the organisation of MAX IV Laboratory at the end of 2018.

3 Accelerators at MAX IV Laboratory

The year 2018 marked the start of round-the-clock accelerator operations for delivery of light to beamlines at MAX IV, establishing a critical milestone towards routine operation of the whole facility. The Accelerator operations team was enlarged, and a Head of Accelerator Operations was hired to coordinate 24/7 operations of the accelerators, significantly increasing the total

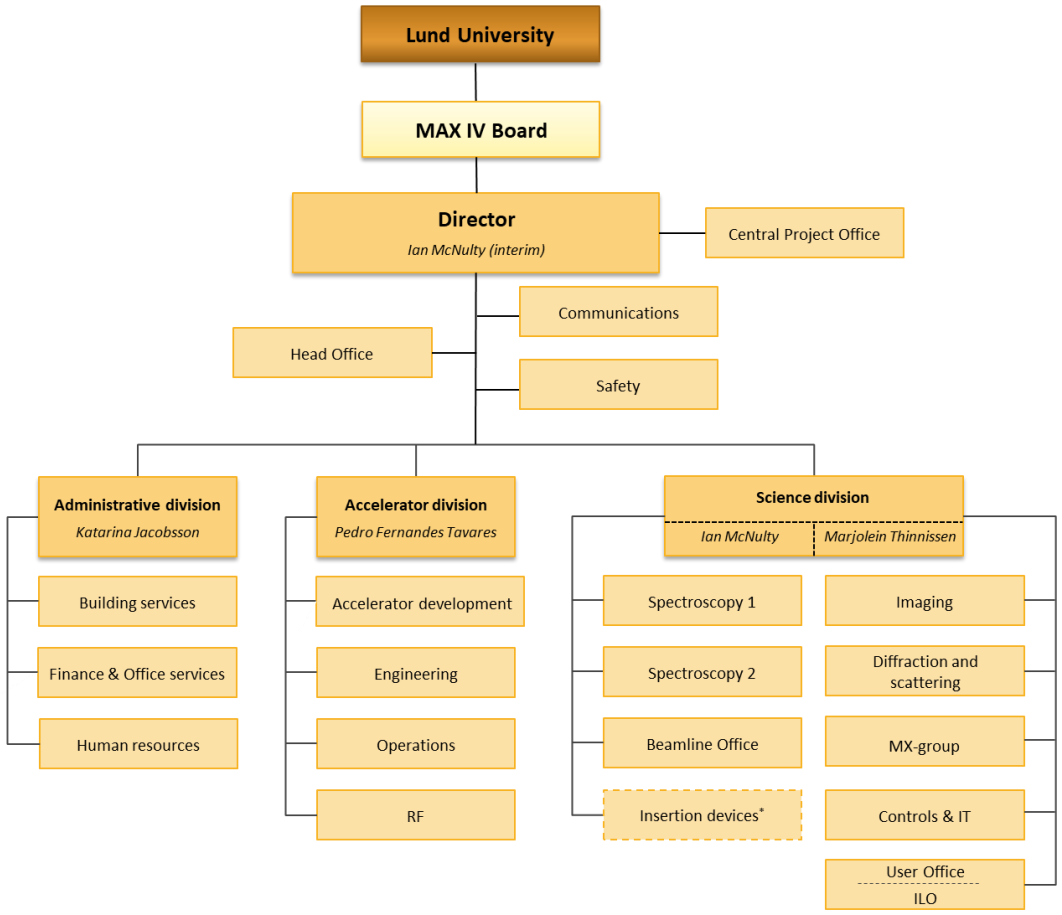

*Figure 2. MAX IV Laboratory organisation end 2018. * indicates team*

number of delivered hours in all MAX IV accelerators. Moreover, an on-call system for technical support by sub-system experts was negotiated with the unions and set in place in early spring.

Accelerator availability was systematically followed up during the year, and improved systems have been set in place to identify and act on reliability bottlenecks. In particular, any downtime that exceeds 90 minutes is now documented in detailed reports to allow identification of the root causes and define mitigation measures. Important for achieving high reliability was the implementation of a fly-wheel system that not only keeps power to the whole MAX IV campus in case of short (few seconds) interruptions of the external electrical net but also continuously improves the stability of the electrical power delivered to all equipment at the facility. The result of all of these initiatives can be seen, for example, in a significant improvement of the availability of the 3 GeV ring, which achieved 92.6 % in 2017 and has increased to 96.2 % in 2018. The availability of the Short-Pulse Facility and the 1.5 GeV ring in 2018 achieved 95.4 % and 96.7 % respecitevly.

Work on a conceptual design for future soft-X ray laser beamline (SXL) that can use the 3 GeV MAX IV linear accelerator as a driver was initiated with a kick-off meeting in March and the first meeting with the science advisory committee for the SXL conceptual design report was held in August. Important conclusions from the early stage efforts on the design were the decision to fix the electron beam energy and not to consider the existing building as a hard constraint for the design efforts.

3.1 Technical highlights of the linear accelerator include:

1. Demonstration of electron bunches as short as 28 fs (FWHM)
2. Demonstration of double bunch operation with two electron bunches produced at the photo-gun and co-propagated along the accelerator.
3. Improvements in automation allow effective switching between delivery to 3 GeV ring, delivery to 1.5 GeV ring and delivery to the Short-Pulse Facility.
4. Improved redundancy as a result of further RF conditioning.

3.2 Technical highlights of the 3 GeV storage ring include:

1. Demonstration of the nominal 500 mA stored beam current in multi-bunch mode. Even though actual delivery at 500 mA with insertion device gaps closed depends on an expansion of the RF system, this result was a welcome confirmation that the work on removing to vacuum chamber hot spots was successful. Moreover, it confirms no unexpected issues have appeared on the way to 500 mA.
2. Routine delivery of up to 222 mA to users in top-up mode.
3. Further conditioning and trimming of harmonic cavities and implementation of a new "mode-zero damper system" allowed delivery of stable long bunches with a positive impact on increased beam lifetime, reduced wake-field induced heating of chambers (in particular Ti-coated kicker chambers) and narrow undulator spectral peaks.
4. Successful use of a new procedure for venting the 3 GeV ring chambers (for maintenance and changes to the system) using ultra-pure Neon gas. In this new scheme reactivation of the chamber´s NEG coating is no longer required, which means the total intervention time per achromat is reduced from a few weeks to a few days.
5. Improvement of the correction rate of the slow orbit feedback from 0.25 Hz up to 3-4 Hz, with the corresponding reduction of perturbations due to insertion devices.

3.3 Technical Highlights 1.5 GeV ring

1. 500 mA stored beam in multi-bunch mode with beam stability achieved by use of passive harmonic cavities.
2. Demonstration of >20 mA stored current in single-bunch mode
3. Routine delivery of up to 200 mA to users in top-up mode.
4. Implementation of a global tune-feedback system to compensate for optical perturbations generated by the insertion devices.

4 Beamline status

The first seven beamlines (Balder, BioMAX, Bloch, FemtoMAX, HIPPIE, NanoMAX and Veritas) were funded by the Knut and Alice Wallenberg Foundation (KAW) together with twelve Swedish Universities[2] in 2011. In 2012 Estonia and Finland funded the construction of the eighth beamline, FinEstBeAMS. These first eight beamlines constitute the Phase I beamlines. In 2013, KAW and VR funded the transfer of the SPECIES, MAXPEEM and FlexPES beamlines from MAX-lab to MAX IV. In addition, VR also funded two new beamlines, CoSAXS and SoftiMAX. These five

[2] Chalmers University of Technology, Gothenburg University, Karlstad University, Karolinska Institutet, KTH Royal Institute of Technology in Stockholm, Linköping University, Luleå University of Technology, Lund University, Stockholm University, Swedish University of Agricultural Sciences (SLU), Umeå University and Uppsala University

beamlines represent the Phase II beamlines. Funding for the DanMAX beamline was secured by the Technical University of Denmark, Aarhus University and the University of Copenhagen in 2016. In 2017 two beamlines received funding: KAW granted funding for the construction of the ForMAX beamline, and the Novo Nordisk Foundation (NNF) granted funding for the MicroMAX beamline. At the end of 2018, MAX IV had sixteen funded beamlines.

In 2018, three beamlines (BioMAX, NanoMAX and HIPPIE) have been in regular user operation. During autumn, beamtime at NanoMAX has however mainly been used to improve the focused beam intensity and stability, and the detector read-out reliability. FemtoMAX, FinEstBeAMS and Bloch have had expert users to help with the commissioning of these beamlines. The first call for regular users at FinEstBeAMS opened in November. Beamtime from this call will be allocated from April 2019.

In July the ForMAX and MicroMAX projects were officially started. Later in the year, the detailed design report (DDR) for the optics for ForMAX was reviewed, and an agreement with the research platform *Treesearch* settling the operation costs of ForMAX was finalised. Early autumn, the Swedish Radiation Safety Authority (SSM) approved a new method to make radiological simulations, developed by MAX IV staff, that are the foundation of the radiological risk analysis needed for the permit from SSM that beamlines need in order to take light.

In response to the reports on MAX IV project management published this summer, Lund University Vice-Chancellor requested a plan of action from the MAX IV Board. This action plan identified three main problem areas: i) lack of professional project management; ii) uncertainties in the chain of command and delegation of responsibility within the organisation, including the MAX IV Board; and iii) insufficient communication. During the months that have followed since the MAX IV Board and Management has worked to implement the changes requested in order to restore confidence and to strengthen project management at MAX IV, and to give users access to beamlines sooner. A clear set of development priorities of the beamline projects has been put in place by MAX IV Management and has been communicated to different stakeholders in different forums. MAX IV is working towards creating a refined, more detailed priority list for the beamline subprojects in order to accelerate beamlines going into user operation 2019 and forward.

As a result of the reviews of MAX IV beamline project timelines and actual status, VR request regular status updates on the progress of the beamline projects. More details of the status of MAX IV beamlines 2018 can thus be found in these reports (DNR: 2018/777).

Table 1. Number of user visits to beamlines and instruments at MAX IV Laboratory in 2018

Beamline	**User visits**
BioMAX	249
Bloch	6
FemtoMAX	9
FinEstBeAMS	29
HIPPIE	82
NanoMAX	108
Total	**483**

Instrument w/o synchrotron radiation	**User visits**
MAXPEEM	4
SPECIES-APXPS	14
STM Laboratory	5
Total	**23**

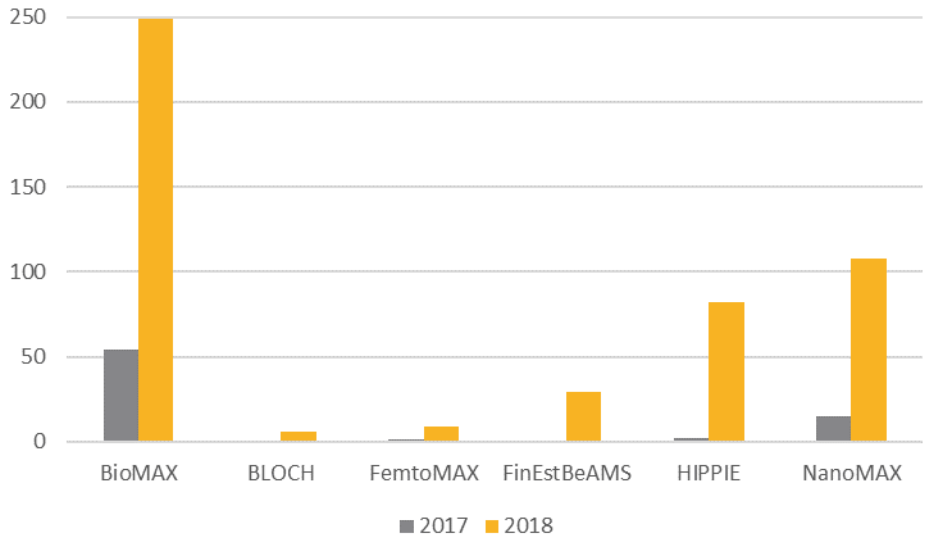

Figure 3. Number of user visits to beamlines in 2017 and 2018.

5 User operation

Beamlines BioMAX, NanoMAX and HIPPIE have been in operation and have received regular users in 2018. In addition, MAXPEEM, SPECIES-APXPS and the STM-laboratory have taken users to their instruments, which can partly operate independently of synchrotron radiation. There have not been any open calls for these experiments, but access is managed in dialogue with the respective instrument managers. The Bloch, FemtoMAX and FinEstBeAMS beamlines have taken expert users. In total, MAX IV Laboratory had 506 user visits by 366 individual users in 2018, see Table 1. The user gender distribution was 35% women and 65% men. Figure 3 shows the number of user visits to each beamline in 2017 and 2018.

The vast majority of users in 2018 came from the Nordic countries, Figure 4. In total, MAX IV had users from 18 different countries and 71 different institutions in 2018.

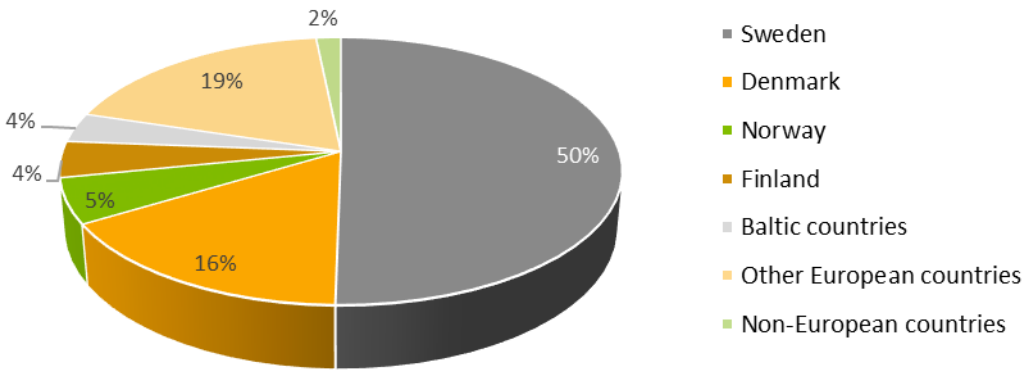

Figure 4. Distribution of users' home institution, 2018.

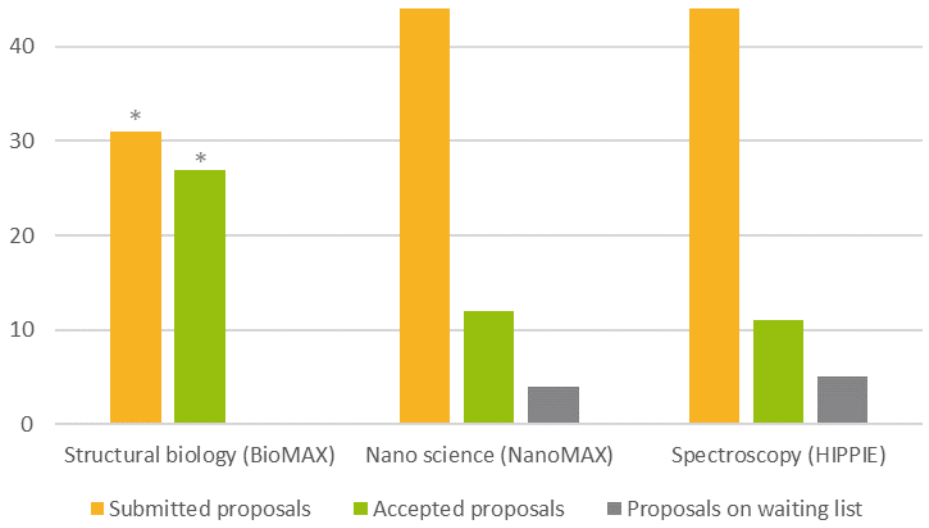

*Figure 5. Number of proposals for beamtime per scientific areas to MAX IV Laboratory in the call for proposals 2018. * Proposals for BioMAX include BAG-proposals.*

There has been one regular user call in 2018 (closing 27 April) for beamtime at BioMAX, HIPPIE and NanoMAX between October 2018 to July 2019. As shown in Figure 5 and Figure 6, there were far more requests for beamtime than the beamlines currently can provide for. Due to the considerable amount of commissioning time still needed at especially HIPPIE and NanoMAX, there are currently limitations for how many proposals that can be accepted. The highest ranked proposals were allocated beamtime, and some proposals were put on a waiting list in case more beamtime will become available.

In 2018 MAX IV opened for block allocation group (BAG) proposals at BioMAX. In these types of proposals, researchers in large well-established groups can combine their beamtime requests into a single, common proposal in order to permit greater flexibility in beamtime allocation and

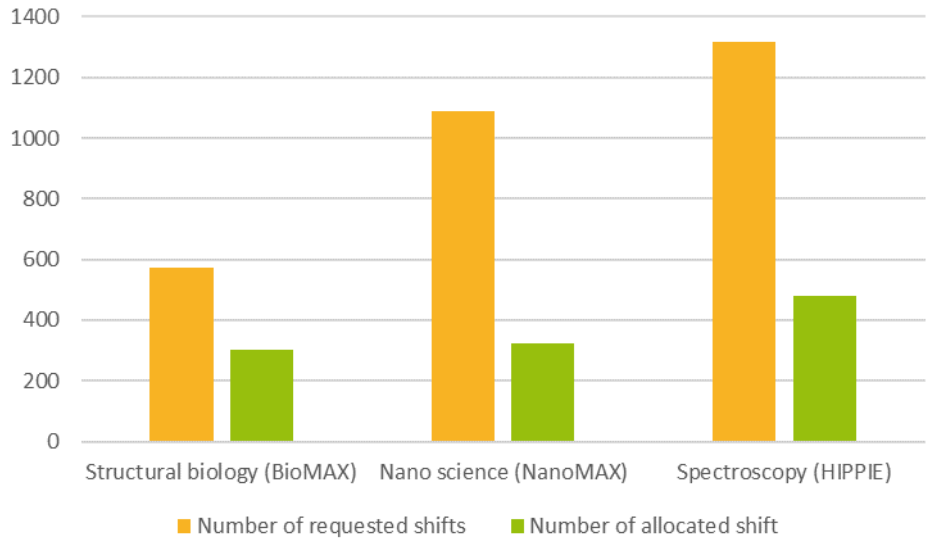

Figure 6. Number of requested and allocated shifts (four hours each) for beamtime at MAX IV Laboratory in the call for proposals 2018.

scheduling. Out of the 31 submitted proposals to BioMAX in the 2018 call, thirteen were BAG-proposals. All BAG-proposals were allocated beamtime. This explains why the number of both submitted and allocated proposals at BioMAX are seemingly smaller than at previous calls.

In December a limited call for regular users requesting beamtime at FinEstBeAMS from April to July 2019 closed. 20 proposals were submitted, asking for 636 shifts. The submitted proposals will be evaluated at the beginning of 2019.

MAX IV has dedicated 2 % of the beamtime for education and training initiatives. Four courses with a total of 80 students have had beamtime for educational purposes in 2018.

To our knowledge, MAX IV users and staff together published at least 55 papers in 2018 on beamline and accelerator accomplishments. Six of these publications arose from work carried out at MAX IV, whereas the remainder derive from prior work carried out at MAX-lab before its shutdown in 2015. We have not yet fully accounted for all papers published by the MAX IV user community in 2018.

6 Outreach

MAX IV Laboratory operates an extensive outreach program and is active on popular social media platforms. The interest for study visits from schools, companies, universities and the general public from Sweden, as well as from abroad, has increased considerably over the years and still does. To be able to accommodate these requests, students from the natural science programs at Lund University are being hired on an hourly basis to work as tour guides. During 2018, the visitor's centre MAXESS welcomed around 1 000 visitors from schools, various associations and organisations who were given presentations of MAX IV (and ESS). A group of 20 student employees regularly give talks and tours at MAXESS, as well as in the experiment hall of MAX IV. It is the third year with student employees and every year a number of them also move on to other jobs within MAX IV. Helping with guided tours is a great workplace experience and an introduction to working at MAX IV.

At the facility itself, approximately 8 000 visitors were received during 2018. Most of these had some link to either funding or use of the facility, but visits from the general public are also included.

The open day 2018 attracted 920 visitors of all ages during *Kulturnaten Lund* in September. In several stations, MAX IV staff, as well as external exhibitors, showcased different aspects of the facility and the growing Brunnshög area. Polhemskolan, a local high school, hosted their own science show with experiments developed in collaboration with MAX IV.

Our web site www.maxiv.se is the main channel for seeking information and news about MAX IV Laboratory, its development, technical details on beamlines and examples of the research conducted. As a complement, and lead visitors to the web site, a newsletter has been sent out to users and stakeholders during 2018, and the intention is to have a bi-monthly newsletter going forward.

Table 2. Visits to www.maxiv.se

Visits			Unique visitors			Page views		
2018	*2017*	*2016**	*2018*	*2017*	*2016**	*2018*	*2017*	*2016**
136 000	100 000	56 000	55 000	41 000	28 000	482 000	422 000	203 000

**The web page was launched May 2016 so numbers should be read with that in mind.*

The different MAX IV social media channels are targeting different groups and interests, and the content posted and language used in the respective channels reflects this – Twitter (English) for the scientific community, Facebook (Swedish) for the regional geographically close community, LinkedIn (English) mainly for job postings and Instagram (English) for photos and weekly scientific and technical updates. During 2018, the content produced has had a focus on write-ups and videos with short interviews with scientists and users. This has turned out very well, as shown by the statistics in Table 2 and Table 3, and is also appreciated in-house due to the short production time combined with high impact.

In July MAX IV participated in Euroscience Open Forum, ESOF, in Toulouse. ESOF is the largest interdisciplinary science meeting in Europe. The meeting brought together researchers, journalists and policy makers from all over the world including a significant delegation from Sweden. It provided an important opportunity for MAX IV to be part of the Europe-wide debates that will shape the future of research funding and policy. The meeting also provided an opportunity to showcase our science communication projects across the city of Toulouse and together with our colleagues at ESS, we delivered a booth to explain the science behind X-ray and neutron scattering.

An important event to bring users and MAX IV Laboratory staff together is the annual User Meeting. The 2018 meeting, arranged 23–25 September in Lund, combined sessions discussing the status and prospects of different aspects of MAX IV Laboratory with parallel sessions covering the science that will be supported at MAX IV Laboratory, poster session and site visit. The meeting attracted more than 300 users and other stakeholders from Sweden and abroad. A number of satellite meetings were held in connection to the user meeting. One of the days, a special session was held with popular science talks for around 400 students from high schools in Southern Sweden.

For a list of meetings, arranged or co-arranged by MAX IV during 2018, see Appendix 1.

Table 3. MAX IV Laboratory on social media channels

	Followers			Impressions		Time spent (minutes)	
	2018	*2017*	*2016*	*2018*	*2017*	*2018*	*2017*
Twitter	2 870	2 400	1 850	473 000	321 000	2 100	
Facebook	2 574	2 400	2 200	188 000		5 431	5 100
LinkedIn	3 441	2 700	2 350	164 000	229 000	727	
Instagram	839	625	50				

Development over time. Empty cells indicate that statistics are not available or applicable.

7 Engagement with industry

The MAX IV industrial relations office (IRO) has been strengthened thanks to funding for a two-year position from Vinnova. Selma Maric, who has a strong background in both synchrotron and neutron techniques with a scientific background within life science, started as Industrial Relations Officer at MAX IV in May.

Two strategic reports important for the MAX IV industrial strategy were published in 2018; the SWEbeams report, and the Swedish strategy for ESS and the surrounding knowledge environment. We are currently aligning the MAX IV industry strategy to these reports. A central part of our strategy is to engage the Swedish industry through strategic and thematic industry-focused initiatives.

The Vinnova funded project BIR2Gain connects the metal industry to MAX IV. This project focuses on workshops and strategies to broaden and strengthen the industrial network. Similar other initiatives include the linking of the MedTech industry to the facility through the MAXAMedTech project led by RISE, and the food industry, an initiative led by MAX IV. Extensive mapping of the food sector has been undertaken including networking, informing and engaging both industry and academia leading up to a gathering workshop in 2019.

The BioMAX beamline opened for proprietary access early 2018 and has served the pharmaceutical industry throughout the year with four Swedish and Danish companies buying beamtime on six occasions. MAX IV IRO has been key to these arrangements. The proprietary access of beamlines is an important access mode for companies that do not want to publish their results. However, the strongest industrial impact of MAX IV is believed to come from academic-industrial collaborations. In the open call for beamtime in spring 2018, MAX IV introduced a set of questions to the proposals to capture industrial involvement in academic projects better. During this open call, 28% of the proposals declared to have an industrial connection in some way. This result is well in line with what has been seen at other European synchrotrons, and it motivates us to continue strengthening industry-academic collaborations to create societal impact from MAX IV.

A general outreach program for the IRO has been the organisation of an industry-oriented session at MAX IV's annual user meeting (UM2018) focusing on making MAX IV available to the industry through academic-industrial partnerships, a key feature of the ongoing IRO strategy. As a continuous outreach activity during the entire year, IRO has been responsible for various guided tours and/or information sharing around the facilities while also actively participating in strategic external meetings, discussions, partnerships and applications.

8 Collaborations

MAX IV Laboratory is actively working to take advantage of the ever-increasing interest from other research facilities, research organisations, companies and scientists worldwide. MAX IV Laboratory participates actively in several projects, for example, LEAPS – League of European Accelerator-based Photon Sources, lightsources.org, The Bridge Forum, SWEBeams, PARI – workshop on Public Awareness of Research Infrastructures, EuroScience Open Forum (ESOF), Big Science Business Forum and the Association of European-level Research Infrastructure Facilities (ERF-AISBL). These projects all aim to raise awareness of synchrotron techniques through targeted outreach both to users and the general public and are crucial for the

development of beamlines and accelerators at MAX IV Laboratory. The management and staff of MAX IV Laboratory are active on the international scene of synchrotron radiation science as for example members of advisory committees for other facilities.

In August the three-year project ESS & MAX IV: Cross Border Science and Society came to an end. MAX IV Laboratory has been an active partner in this collaboration funded by the European Regional Development Fund Interreg Öresund-Kattegat-Skagerrak (ÖKS) with the aim of raising awareness and competence of using synchrotron lights and neutron-based methods through targeted training efforts. MAX IV researchers have been supervisors or co-supervisors in about a third of the very popular and successful MAX4ESSFUN-projects. At the end of the year, a new project enabling further development of this highly successful project was approved funding by ÖKS; The Hanseatic League of Science (HALOS) will build a unique collaboration between Hamburg and South-West Scandinavia, bringing together the four unique research facilities MAX IV, ESS, DESY and European XFEL, and create a centre for integrated, world-leading Life Science innovation and research and will include stakeholders from academia, regional development actors, research facilities and industry.

In the VR grant for accessibility to research infrastructure, in total five projects involving MAX IV was granted funds (out of a total of nine funded projects), one of which the main applicant is a MAX IV researcher. The FragMAX project, led by Uwe Müller, is a collaboration with two Swedish companies, Astra Zeneca and SAROMICS BioStructures and the Lund University Protein Production Platform (LP3). FragMAX aims to establish a fragment screening facility at MAX IV, an important tool for industrial drug discovery as well as probing the functional surfaces of proteins within a basic science approach.

MAX IV Laboratory researchers are involved in five of the approved research projects that were awarded grants within the Röntgen-Ångström Cluster 2018-2021.

The Foundation for Strategic Research, SSF, awarded grants to projects to promote the development of instruments, methods and technologies in the ITM-17 call. One of the granted projects is the “AdaptoCell for MAX IV laboratory users” with MAX IV scientist Kajsa Sigfridsson Clauss as the main applicant. The goal of this project is to develop a microfluidic flow-cell platform, the AdaptoCell, for MAX IV users.

9 Financial report with comments

The result and budget for operations at MAX IV Laboratory 2018 can be found in Table 4.

Comments to the outcome

The total result differs from the budget with 20 MSEK, which implies an increase in agency capital. Since the MAX IV agency capital is relatively low, it was decided in favour of increasing the agency capital as opposed to increasing the VR operations grant subject to carry-over between 2018 and 2019.

The deviation in funding is coupled to various costs being below budget, hence the budgeted VR operations grant was not fully accounted for in the 2018 income and loss statement (9 MSEK, Table 4). In addition, the turn-over in externally funded projects within operations was approximately 3 MSEK lower than estimated (20.7 MSEK in the budget), and MAX IV used 5.5 MSEK to co-fund these projects.

Lund University has fulfilled its funding commitment, but part of the grant has been forwarded as a result of collaborations with LUNARC and Lund Protein Production Platform (LP3) within Lund University.

Table 4. Result and budget for 2018 (MSEK)

Funding	**Funding**	**Budget**
Lunds University	55,5	57,0
Research council & other funding	320,8	333,7
Operations contribution Finland	3,6	4,4
Total Funding	**379,9**	**395,1**

Director	**Cost**	**Budget**
Staff Cost	-155,2	-158,8
Lund University OH	-22,9	-22,9
DM Ex Contingency	-5,5	-2,5
NLF Phase 1 project deficit	-3,5	-3,5
Directors Groups	-7,0	-7,7
Total Director	**-194,1**	**-195,4**

Administration	**Cost**	**Budget**
Rent	-73,6	-78,4
Facility Cost	-33,8	-36,6
Deposition MAX IV decommissioning	-1,0	-1,0
LU Staff	-3,8	-3,5
Admin groups	-9,1	-10,2
Total Administration	**-121,3**	**-129,7**

Accelerator	**Cost**	**Budget**
AFSG	-21,2	-29,9
Accelerator Groups	-6,8	-6,4
Total Accelerator	**-28,0**	**-36,3**

Science	**Cost**	**Budget**
DanMAX co-funding	-2,2	-6,1
Beamline Office	-4,7	-5,3
IT & Controls	-11,7	-15,0
Beamline Groups	-15,1	-16,7
Total Science	**-33,8**	**-43,1**

Result		**Budget**
Total funding	379,9	395,1
Total cost	-377,1	-404,4
External projects (net)	6,9	-1,0
Total Result	**9,7**	**-10,3**

Comments to cost item deviations:

DIRECTOR:

- Staff: Recruitments slowed down during this year´s change in management.
- DM Ex Contingency: Cost for additional surveillance of the facility

ADMINISTRATIVE DIVISION:

- Rent: The outcome for rent is lower than anticipated since STIBOR was lower than budgeted and since we received government approval to sign a 22-year rental contract for the converter building (10 years in the budget). Electricity prices rocketed during the fourth quarter, but over the entire year, the outcome was 2 MSEK lower than the budgeted 17.7 MSEK.

ACCELERATOR DIVISION:

- AFSG (Accelerator Facility Steering Group): Reduced spending is a result of the need to postpone or slow down a number of tasks within the accelerator group given the strained human resource situation in 2018 and the need to focus on delivering beamlines. In particular, engineering human resources have not been available to the extent needed in order to move ahead with the following:
    1. Establishment of a spare parts pool for the accelerators
    2. License fees for maintenance management software
    3. Projects that have been run at a slower pace than expected due to the prioritisation of the use of human resources.

SCIENCE DIVISION:

- DanMAX co-funding: incorrectly budgeted 2018.
- IT & Controls: lower licence fees as well as consultants not being utilised to the extent planned.

RESULT:

The positive result for 2018 increased our agency capital to 46 MSEK. It is our ambition to consume the agency capital exceeding 20-28 MSEK as soon as possible and equate the agency capital with the rent reserve (funds to mitigate interest rate risk). For 2019 MAX IV has budgeted a deficit of 14.5 MSEK.

Appendix 1

Meetings arranged or co-arranged by MAX IV in 2018

Name	Date	Location	Nbr of participants
Scattering for Biological and Soft Matter and Computational workshop	January	Lund	70-80
ForMAX User Workshop	January	Lund	44
SXL Kick-off	February	Lund	27
NextBioForm workshop – Experimental techniques	April	Lund	28
PNS0158 - Protein crystallisation and X-ray data collection, postgraduate course	April	Lund	12
Summer School	May	Höör & Lund	61
TAILOR, Tailored surfaces in operando conditions A Marcus Wallenberg symposium	June	Ystad	86
Science@FELs	June	Stockholm	160
Forum on advanced FEL techniques	June	Stockholm	60
UM18 – Coherent Visions	September	Lund	300
BIR2GainII - workshop för metallindustrin	October	Lund	70