

Status of beamlines at MAX IV

September 2020



Status of MAX IV

MAX IV accelerators are performing well, and all three deliver X-ray light to beamlines. Fourteen beamlines are currently taking light, four of which are in commissioning and ten in general user operation.

The Covid-19 pandemic has had a dramatic impact on research activities globally. Despite this challenging environment, MAX IV accelerators and beamlines continue to operate according to schedule. The principal impact of the pandemic on research at MAX IV is that most users have not been able to come to MAX IV for their scheduled beamtime. MAX IV users have cancelled about 30 user projects since the last report.¹ Nevertheless, all beamlines are working together with their users to find solutions to serve them under these unprecedented circumstances. Several beamlines, e.g. BioMAX, Balder, MAXPEEM, and NanoMAX, are serving users remotely with mail-in samples. In order to support science towards understanding the SARS-CoV-2 virus-related disease, and to bring us closer to an effective vaccine, diagnostics or treatment, MAX IV offers its instrumentation and beamtime through a rapid access mode to facilitate these efforts. Two user groups have utilised rapid access mode so far. The first results have been analysed and are about to be submitted for publication.

MAX IV will reschedule users who could not use beamtime scheduled during the spring 2020 cycle due to the pandemic for beamtime in the upcoming autumn 2020 cycle. In addition, MAX IV will extend this cycle to allocate beamtime to highly ranked proposals in the spring call. We have cancelled the standard autumn proposal call for the ten beamlines currently operating to accommodate these adjustments and to give users who have already submitted proposals the best opportunity for beamtime soon under the present circumstances. However, proposal calls will be announced in autumn 2020 to open four new beamlines to general users, COSAXS in Q4 2020, FemtoMAX and DanMAX in Q1 2021, and SoftiMAX in Q2 2021. MAX IV closely follows Lund University's and Swedish authorities' regulations and guidelines concerning the pandemic. Users are encouraged to utilise remote or mail-in access when possible and are limited to five people per user group per visit. Until the pandemic situation improves, MAX IV does not allow study visits, collaboration visits, training activities or other external meetings or workshops on its premises.

The MAX IV Central Project Office (CPO) is working closely with resource teams to monitor potential project delays, including pandemic-related delays. CPO has developed various scenarios depending on the impact and timeframe of the pandemic to mitigate the risks and to redirect resources if needed. Projects that rely on international resources or equipment are at greater risk of delays. No significant activities are stopped due to the pandemic. The MAX IV project portfolio is currently executed with only minor delays. A manufacturing error by the undulator vendor will delay the start of commissioning of ForMAX by three months, and an optics procurement issue will delay the start of commissioning of MicroMAX by three months. However, we currently do not expect these delays to impact the start of user operations on these beamlines.

Extensive accelerator and beamline installation and maintenance activities were performed during the regular 2020 summer shutdown, which lasted five weeks. In addition to infrastructure maintenance, preparatory work for the installation of the ForMAX and MicroMAX beamlines was carried out, including front-end installation, personnel safety system updates and blue lining and support fixation for the future installation of the corresponding insertion devices. Also on the accelerator side, the photo gun cathode was replaced, a new gun laser system was installed and successfully tested, and an achromat was modified in the 3 GeV ring in order to accommodate a

¹ Submitted to VR on 6 June 2020.

future spare bunch lengthening system. The intervention was done using the now well established neon-venting procedure, which allows much faster recovery of the vacuum conditions in the ring compared to a conventional procedure requiring full re-activation of the NEG coating. Last but not least, an upgrade of the radiation shielding in both the 1.5 GeV and 3 GeV ring was completed, in preparation for 10 Hz operation of the linear accelerator.

Appendix 1 lists the current status of individual beamlines with techniques currently available to users on beamlines in operation and estimated dates to deliver baseline capabilities for beamlines in commissioning or under construction. This list is based on updated status information from each beamline, the anticipated availability of resources for installation and commissioning of the beamlines, and prioritisation by MAX IV Management based on the above and expected user need. Appendix 2 lists 2020 publications from MAX IV and MAX-lab beamlines that have been registered to date in our Digital User Office system.

Appendix 1

Current status of individual beamlines

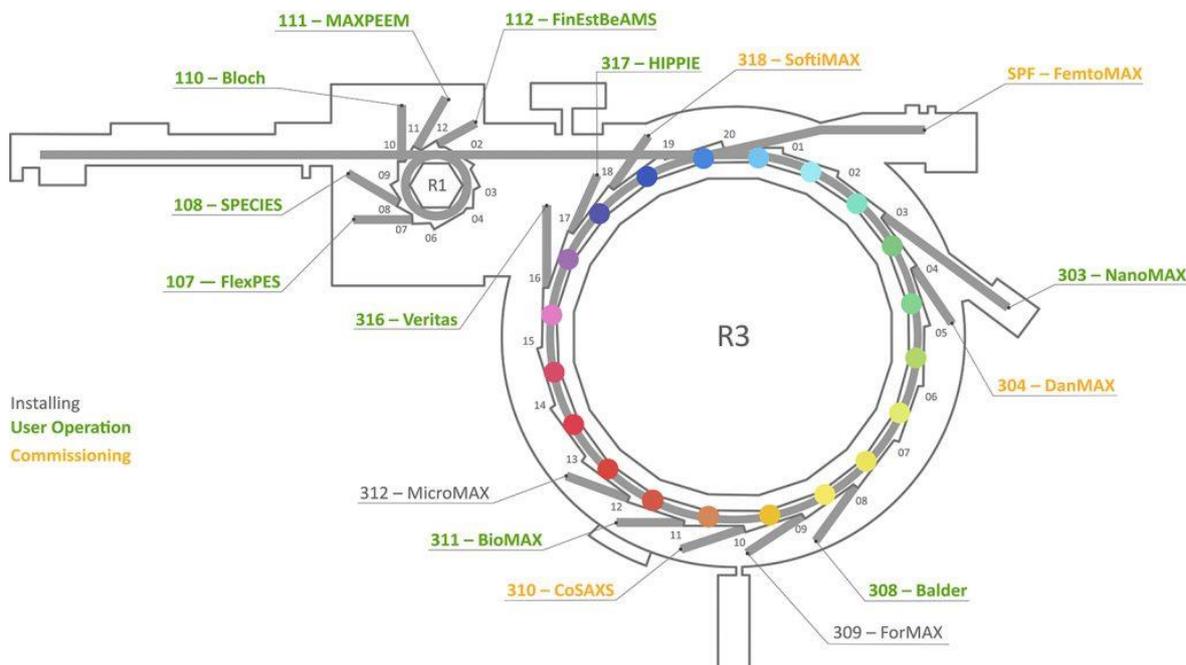
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Current status of individual beamlines



Balder

Balder is in general user operation.

Techniques available to general users

X-ray Absorption Spectroscopy (XANES and EXAFS) in transmission, continuous scanning down to 30 sec/EXAFS

X-ray Absorption Spectroscopy (XANES and EXAFS) in fluorescence with 7 element SDD, continuous scanning down to 30 sec/EXAFS

Techniques available to commissioning experts

X-ray Emission Spectroscopy (XES), expert mode with limited angular range (\sim Cu $K\alpha$)

BioMAX

BioMAX is in general user operation.

Techniques available to general users

Data collection at fixed energy between 6 and 19.5 keV, detector distance between 126 and 900 mm, beam focus of 20x5 microns or 50x50 microns and defining aperture of 5, 10, 20 or 50 microns

Automated sample mounting and dismounting from UniPucks, 29 puck positions in dewar

Sample temperature 100 K; room temperature with or without humidity control available for manual mounting only

SAD and MAD experiments

Automated data integration, scaling and merging. Offline remote access for manual data processing.

SX experiments using HVE-injector (High viscosity extrusion injector), fixed target scan using the MD3

| |
|---|
| Element identification by X-ray Fluorescence |
| Remote data collection. Under development. Please contact beamline manager |
| Fragment-based drug screening. Under development. Please contact beamline manager |

Bloch

Bloch is in general user operation.

| Techniques available to general users |
|--|
| High-resolution angle resolved photoelectron spectroscopy (ARPES), using deflection based analyzer or 6-axis manipulator |
| Linear vertical or horizontal polarised light from EPU, with energy range 10-1000eV (peak flux and resolution 15-200eV) |
| Online Scanning tunneling microscopy (STM), 50K - 300K |

CoSAXS

Commissioning is ongoing.

- First expert users: Q2 2020
- First general users: Q4 2020

DanMAX

Commissioning of the powder X-ray diffraction(PXRD) station is ongoing.

The dates below apply for the PXRD station and assume that there are no delays in the tight schedule. The Imaging station will follow approximately six months behind.

- First expert users: Q3 2020
- First general users: Q1 2021

FemtoMAX

Commissioning activities and feasibility tests with expert users at 2 Hz repetition rate continue.

- Commissioning 2 Hz: on-going
- Start of commissioning 10 Hz: Q4 2020
- First general users: Q1 2021

FinEstBeAMS

FinEstBeAMS is in general user operation.

| Techniques available to general users |
|---|
| High-resolution photoelectron and Auger electron spectroscopy of gaseous samples. (GPES) |
| Ion time-of-flight mass spectrometry of gaseous samples. (GPES) |
| X-Ray Absorption of gaseous samples, measured in the Total Ion Yield mode. (GPES) |
| Photoluminescence spectroscopy of solid samples in the wavelength range 1.4um-200 nm. (PLES) |
| Measurement of Photoluminescence excitation functions at fixed emission wavelengths as well as reflection spectra from polished surfaces of solid samples. (PLES) |
| Temperature dependencies of luminescence properties of solid materials in the temperature range from 10 K up to 350 K. (PLES) |

Photoelectron-Photoion Coincidence (PEPICO) spectroscopy of gaseous samples. (GPES)

Techniques available to commissioning experts

X-ray photoelectron spectroscopy of surfaces and interfaces in the UHV. (SSES)

Angle-resolved photoelectron spectroscopy of 2D materials and condensed matter physics. (SSES)

FlexPES

FlexPES is in general user operation.

Techniques available to general users

Beamline: Linear horizontally polarized light from LPU, with energy range 40-1500 eV. Spot on sample both defocused (0.5-1.5 mm) and focused (from 50x15 um to 150x40 um in different end stations).

Surface- and Material Science (SMS) branch: High-resolution photoelectron spectroscopy (PES) on solid samples using SES-2002 analyzer and 4-axis manipulator; X-ray absorption spectroscopy (XAS or NEXAFS) using total and partial electron yield.

Low Density Matter (LDM) branch: High-resolution PES on LDM samples using R4000 analyzer with the following sample delivery systems (samples must be approved by chemical safety group):

- Liquid jet setup for e.g. aqueous solutions
- Molecular jet source (continuous beam) for experiments on cold beams of atomic and molecular gases
- Gas cell for PES experiments on atomic and molecular gases

ForMAX

Commissioning of ForMAX have been delayed from Q2 2021 to Q3 2021 due to a delay in the delivery of insertion device. We do not foresee that this delay will affect the time of arrival of first users.

- Start of commissioning: Q3 2021
- First expert users: Q3 2021
- First general users: Q4 2022

HIPPIE

HIPPIE is in general user operation.

Techniques available to general users

Catalysis Cell

Allows APXPS of a solid-gas interface up to 10 mbar. Used for catalysis and surface science experiments

PM-IRRAS

Allows APXPS and FTIR on the same spot up to 1 mbar. Used for catalysis and surface science experiments

Liquid/Electrochemistry Cell

Allows APXPS of a solid-liquid (dip-and-pull setup) and gas-liquid (liquid jet setup) interfaces up to 30 mbar for electrochemistry, energy, environmental, and atmospheric science experiments.

MAXPEEM

MAXPEEM is in general user operation.

Techniques available to general users

SPELEEM in the soft X-ray range

MicroMAX

The MicroMAX project timeline has shifted because of a delay in the procurement of essential optical components. If the administrative court (*förvaltningsrätten*) will rule in our favour we may manage to keep the first general user date and only one quarter delay for the commissioning start. The delay has however increased the risk for delaying the first general user date. The Novo Nordisk Foundation is informed about the situation.

- Start of commissioning: Q1 2022
- First expert users: Q1 2022
- First general users: Q4 2022

NanoMAX

The NanoMAX KB-station is in general user operation.

| Techniques available to general users |
|---|
| Scanning X-ray diffraction and coherent imaging in the Bragg geometry |
| Forward ptychography and CDI |
| X-Ray Fluorescence mapping in 2D |
| Forward ptycho-tomography (under development, not all samples are suitable, please contact beamline team to discuss feasibility before proposal submission) |

The development work of the NanoMAX FZP-end station is on-going, with tests of a prototype sample scanner and finalization of the design for coarse and fine scan stages planned for summer.

- Start of commissioning: Q3 2021
- First expert users: Q3 2021
- First general users: Q4 2022

SoftiMAX

Commissioning of SoftiMAX is ongoing and first successful experiments have been made.

- First expert users: Q3 2020
- First general users: Q2 2021

SPECIES

SPECIES is in general user operation.

| Techniques available to general users |
|---|
| APXPS using the standard cell Available for APXPS experiments up to 20 mbar. Used for catalysis, oxidation studies, and surface science experiments. |
| APXPS using the ALD cell Available for in-situ ALD experiments for pressures up to 20 mbar. |
| RIXS using the GRACE spectrometer (emission energy range 50-650 eV, only linear polarization horizontally and vertically). Solid samples only. LN ₂ -sample cooling available, 4-axis manipulator. |

VERITAS

Veritas B branch line (the open port branch) is in general user operation. The Veritas A branch line is in commissioning.

Techniques available to general users

User roll-up at the open port branch. Only approved equipment (contact beamline)

Appendix 2

2020 publications

Status of beamlines at MAX IV

September 2020

| BEAMLINE(S) | AUTHORLIST | TITLE | JOURNAL | DOI |
|---------------------|---|--|----------------------------------|---|
| Balder | Persson Ingmar, Lundberg Daniel, Bajnoczi Eva G., Klementiev Konstantin, Just Justus, Clauss Kajsa G. V. Sigfridsson | EXAFS Study on the Coordination Chemistry of the Solvated Copper(II) Ion in a Series of Oxygen Donor Solvents | INORGANIC CHEMISTRY | 10.1021/acs.inorgchem.0c00403 |
| Balder | Simonarson Gunnar, Calcagno Giulio, Lotsari Antiope, Palmqvist Anders E. C. | Electrochemical and structural characterization of lithiation in spray deposited ordered mesoporous titania as an anode for Li ion batteries | RSC ADVANCES | 10.1039/d0ra02687e |
| Balder, FinEstBeAMS | Kozlova Anna P., Kasimova Valentina M., Buzanov Oleg A., Chernenko Kirill, Klementiev Konstantin, Pankratov Vladimir | Luminescence and vacuum ultraviolet excitation spectroscopy of cerium doped Gd ₃ Ga ₃ Al ₂ O ₁₂ single crystalline scintillators under synchrotron radiation excitations | RESULTS IN PHYSICS | 10.1016/j.rinp.2020.103002 |
| BioMAX | Ernst HA, Mosbech C, Langkilde AE, Westh P, Meyer AS, Agger JW, Larsen S | The structural basis of fungal glucuronoyl esterase activity on natural substrates | NATURE COMMUNICATIONS | |
| BioMAX | Labourel Aurore, Frandsen Kristian E. H., Zhang Feng, Brouilly Nicolas, Grisel Sacha, Haon Mireille, Ciano Luisa, Ropartz David, Fanuel Mathieu, Martin Francis, Navarro David, Rosso Marie-Noelle, Tandrup Tobias, Bissaro Bastien, Johansen Katja S., Zerva Anastasia, Walton Paul H., Henrissat Bernard, Lo Leggio Leila, Berrin Jean-Guy | A fungal family of lytic polysaccharide monooxygenase-like copper proteins | NATURE CHEMICAL BIOLOGY | 10.1038/s41589-019-0438-8 |
| BioMAX | Lima GMA, Talibov VO, Jagudin E, Sele C, Nyblom M, Knecht W, Logan DT, Sjögren T, Mueller U | FragMAX: the fragment-screening platform at the MAX IV Laboratory | ACTA CRYSTALLOGRAPHICA SECTION D | 10.1107/S205979832000889X |
| BioMAX | Teze D, Shuoker , Chaberski K E, Kunstmann S, Fredslund F, Nielsen S T, Stender G P E, Peters H J G, Karlsson Nordberg E, Welner D H, Hachem Abou M | The Catalytic Acid-Base in GH109 Resides in a Conserved GGHGG Loop and Allows for Comparable alpha-Retaining and beta-Inverting Activity in an N-Acetylgalactosaminidase from Akkermansia muciniphila | ACS CATALYSIS | 10.1021/acscatal.9b04474 |
| BioMAX | Vilstrup Joachim, Simonsen Amanda, Birkefeldt Thea, Strandbygard Dorthe, Lyngso Jeppe, Pedersen Jan Skov, Thirup Soren | Crystal and solution structures of fragments of the human leucocyte common antigen-related protein | ACTA CRYSTALLOGRAPHICA SECTION D | 10.1107/S2059798320003885 |
| BioMAX | Ursby T, Åhnberg K, Appio R, Aurelius O, Barczyk A, Bartalesi A, Bjelčić M, Bolmsten F, Cerenius Y, B Doak R, Eguiraun M, Eriksson T, J Friel R, Gorgisyan I, Gross A, Haghighat V, Hennies F, Jagudin E, Norsk Jensen B, Jeppsson T, Kloos M, Lidon-Simon J, M A de Lima G, Lizatovic R, Lundin M, Milan-Otero A, Milas M, Nan J, Nardella A, Rosborg A, Shilova A, L Shoeman R, Siewert F, Sondhauss P, O Talibov V, Tarawneh H, Thånell J, Thunnissen M, Unge J, Ward C, Gonzalez A, Mueller U | BioMAX – the first macromolecular crystallography beamline at MAX IV Laboratory | J. SYNCHROTRON RADIATION | 10.1107/S1600577520008723 |

| BEAMLINE(S) | AUTHORLIST | TITLE | JOURNAL | DOI |
|--|---|---|---|---|
| BioMAX | Shilova A, Lebrette H, Aurelius O, Nan J, Welin M, Kovacic R, Ghosh S, Safari C, Friel RJ, Milas M, Matej Z, Hogbom M, Branden G, Kloos M, Shoeman RL, Doak B, Ursby T, Hakansson M, Logan DT, Mueller U | Current status and future opportunities for serial crystallography at MAX IV Laboratory | J. SYNCHROTRON RADIATION | 10.1107/S1600577520008735 |
| BioMAX | Lima GMA, Talibov VO, Jagudin E, Sele C, Nyblom M, Knecht W, Logan DT, Sjögren T, Mueller U | FragMAX: the fragment-screening platform at the MAX IV Laboratory | ACTA CRYSTALLOGRAPHICA SECTION D | 10.1107/S205979832000889X |
| BioMAX | Wollenhaupt Jan, Metz Alexander, Barthel Tatjana, Lima Gustavo M. A., Heine Andreas, Mueller Uwe, Klebe Gerhard, Weiss Manfred S. | F2X-Universal and F2X-Entry: Structurally Diverse Compound Libraries for Crystallographic Fragment Screening | STRUCTURE | 10.1016/j.str.2020.04.019 |
| Bloch | Shah J, Wang W, Sohail H, Uhrberg R | Experimental evidence of monolayer arsenene: an exotic 2D semiconducting material | 2D MATERIALS | 10.1088/2053-1583/ab64fb |
| Bloch | Yang X, Cochran TA, Chapai R, Tristant D, Yin JX, Belopolski I, Cheng Z, Multer D, Zhang SS, Shumiya N, Litskevich M, Jiang Y, Chang G, Zhang Q, Vekhter I, Shelton WA, Jin R, Xu SY, Hasan MZ | Observation of sixfold degenerate fermions in PdSb ₂ | PHYSICAL REVIEW B | 10.1103/PhysRevB.101.201105 |
| Bloch | Igor Marković, Matthew D. Watson, Oliver J. Clark, Federico Mazzola, Edgar Abarca Morales, Chris A. Hooley, Helge Rosner, Craig M. Polley, Thiagarajan Balasubramanian, Saumya Mukherjee, Naoki Kikugawa, Dmitry A. Sokolov, Andrew P. Mackenzie, and Phil D. C. King | Electronically driven spin-reorientation transition of the correlated polar metal Ca ₃ Ru ₂ O ₇ | PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES | 10.1073/pnas.2003671117 |
| Bloch | D. A. Chareev, P. Evstigneeva, D. Phuyal, G.J. Man, H. Rensmo, A.N. Vasiliev, M. Abdel-Hafiez | Growth of Transition Metal Dichalcogenides by Solvent Evaporation Technique | CRYST. GROWTH DES | 10.1021/acs.cgd.0c00980 |
| Bloch | Tian, S., Gao, S., Nie, S., Qian, Y., Gong, C., Fu, Y., Li, H., Fan, W., Zhang, P., Kondo, T., Shin, S., Adell, J., Fedderwitz, H., Ding, H., Wang, Z., Qian, T. & Lei, H. | Magnetic topological insulator MnBi ₆ Te ₁₀ with a zero-field ferromagnetic state and gapped Dirac surface states | PHYSICAL REVIEW B | 10.1103/PhysRevB.102.035144 |
| Bloch, FinEstBeAMS, HIPPIE, SPECIES, SoftiMAX, Veritas | Sjöblom P, Todorescu G, Urpelainen S | Understanding the mechanical limitations of the performance of soft X-ray monochromators at MAX IV laboratory | J SYNCHROTRON RADIATION | 10.1107/S1600577520000843 |
| FemtoMAX | Wang Xiaocui, Ekstrom J. C., Bengtsson A. U. J., Jarnac A., Jurgilaitis A., Van-Thai Pham, Kroon D., Enquist H., Larsson J. | Role of Thermal Equilibrium Dynamics in Atomic Motion during Nonthermal Laser-Induced Melting | PHYSICAL REVIEW LETTERS | 10.1103/PhysRevLett.124.105701 |

| BEAMLINE(S) | AUTHORLIST | TITLE | JOURNAL | DOI |
|-----------------------|--|---|--|------------------------------|
| FinEstBeAMS | Dendebera M., Chornodolskyy Ya, Gamerny R., Antonyak O., Pashuk I., Myagkota S., Gnilitzkiy I., Pankratov V., Vistovskyy V., Mykhaylyk V., Grinberg M., Voloshinovskii A. | Time resolved luminescence spectroscopy of CsPbBr ₃ single crystal | JOURNAL OF LUMINESCENCE | 10.1016/j.jlumin.2020.117346 |
| FinEstBeAMS | Pankratov Vladimir, Kotlov Aleksei | Luminescence spectroscopy under synchrotron radiation: From SUPERLUMI to FINESTLUMI | NUCLEAR INSTRUMENTS & METHODS IN PHYSICS RESEARCH SECTION B-BEAM INTERACTIONS WITH MATERIALS AND ATOMS | 10.1016/j.nimb.2020.04.015 |
| FemtoMAX, FinEstBeAMS | Kamenskikh I, Tishchenko E, Kirm M, Omelkov S, Belsky A, Vasil'ev A | Decay Kinetics of CeF ₃ under VUV and X-ray Synchrotron Radiation | SYMMETRY | 10.3390/sym12060914 |
| FinEstBeAMS | Kooser K, Kivimäki A, Turunen P, Pärna R, Reisberg L, Kirm M, Valden M, Huttula M, Kukk E | Gas-phase endstation of electron, ion and coincidence spectroscopies for diluted samples at the FinEstBeAMS beamline of the MAX IV 1.5 GeV storage ring | JOURNAL OF SYNCHROTRON RADIATION | 10.1107/S1600577520007146 |
| FinEstBeAMS | Shalaev A, Shendrik R, Rusakov A, Bogdanov A, Pankratov V, Chernenko K, Myasnikova A | Luminescence of divalent lanthanide doped BaBr ₂ single crystal under synchrotron radiation excitations | NUCLEAR INSTRUMENTS & METHODS IN PHYSICS RESEARCH SECTION B-BEAM INTERACTIONS WITH MATERIALS AND ATOMS | 10.1016/j.nimb.2020.01.023 |
| FinEstBeAMS | Spasskiy D, Kozlova N, Zabelina E, Kasimova V, Krutyak N, Ukhanova A, A Morozov V, V Morozov A, Buzanov O, Chernenko K, Omelkov S, Nagirnyi V | Influence of Sc cation substituent on structural properties and energy transfer processes in GAGG:Ce crystals | CRYSTENGCOMM | 10.1039/D0CE00122H |
| FinEstBeAMS | Spasskiy D, Voznyak-Levushkina V, Arapova A, Zadneprovski B, Chernenko K, Nagirnyi V | Enhancement of light output in ScxY1-xPO ₄ :Eu ³⁺ solid solutions | SYMMETRY | 10.3390/sym12060946 |
| FlexPES | Marcel J. S. Abb, Tim Weber, Daniel Langsdorf, Volkmar Koller, Sabrina M. Gericke, Sebastian Pfaff, Michael Busch, Johan Zetterberg, Alexei Preobrajenski, Henrik Grönbeck, Edvin Lundgren, and Herbert Over | Thermal Stability of Single-Crystalline IrO ₂ (110) Layers: Spectroscopic and Adsorption Studies | J. PHYS. CHEM. C | 10.1021/acs.jpcc.0c04373 |
| HIPPIE | Hohner Chantal, Kettner Miroslav, Stumm Corinna, Blaumeiser Dominik, Wittkaemper Haiko, Grabau Mathias, Schwarz Matthias, Schuschke Christian, Lykhach Yaroslava, Papp Christian, Steinrueck Hans-Peter, Libuda Jorg | Pt-Ga Model SCALMS on Modified HOPG: Thermal Behavior and Stability in UHV and under Near-Ambient Conditions | JOURNAL OF PHYSICAL CHEMISTRY C | 10.1021/acs.jpcc.9b10944 |
| HIPPIE | Weststrate CJ, Sharma D, Garcia Rodriguez D, Gleeson MA, Fredriksson HOA, Niemantsverdriet JW | Mechanistic insight into Carbon-Carbon bond formation on Cobalt under | NATURE COMMUNICATIONS | 10.1038/s41467-020-14613-5 |

| BEAMLINE(S) | AUTHORLIST | TITLE | JOURNAL | DOI |
|-------------|---|--|---|----------------------------|
| | | simulated Fischer-Tropsch Synthesis conditions | | |
| HIPPIE | C. J. Weststrate, Devyani Sharma, Daniel Garcia Rodriguez, Michael A. Gleeson, Hans O. A. Fredriksson & J. W. Niemantsverdrie | Reactivity of C ₃ H _x Adsorbates in Presence of Co-adsorbed CO and Hydrogen: Testing Fischer–Tropsch Chain Growth Mechanisms | TOPICS IN CATALYSIS | 10.1007/s11244-020-01306-y |
| HIPPIE | Joachim Schnadt, Jan Knudsen, and Niclas Johansson | Present and new frontiers in materials research by ambient pressure x-ray photoelectron spectroscopy | JOURNAL OF PHYSICS | 10.1088/1361-648X/ab9565 |
| MAXPEEM | Forti S, Link S, Stöhr A, Niu Y, Zakharov AA, Coletti C, Starke U | Semiconductor to metal transition in two dimensional gold and its van der Waals heterostack with graphene | NATURE COMMUNICATIONS | 10.1038/s41467-020-15683-1 |
| MAXPEEM | Kim Kyung Ho, He Hans, Rodner Marius, Yakimova Rositsa, Larsson Karin, Piantek Marten, Serrate David, Zakharov Alexei, Kubatkin Sergey, Eriksson Jens, Lara-Avila Samuel | Chemical Sensing with Atomically Thin Platinum Templated by a 2D Insulator | ADVANCED MATERIALS INTERFACES | 10.1002/admi.201902104 |
| MAXPEEM | Li Hao, Shi Yuchen, Shang Huan, Wang Weimin, Lu Jun, Zakharov Alexei A., Hultman Lars, Uhrberg Roger I. G., Syvaejaervi Mikael, Yakimova Rositsa, Zhang Lizhi, Sun Jianwu | Atomic-Scale Tuning of Graphene/Cubic SiC Schottky Junction for Stable Low-Bias Photoelectrochemical Solar-to-Fuel Conversion | ACS NANO | 10.1021/acsnano.0c00986 |
| MAXPEEM | Shi Yuchen, Zakharov Alexei A., Ivanov Ivan G., Vinogradov Nikolay A., Yazdi G. Reza, Syvajarvi Mikael, Yakimova Rositsa, Sun Jianwu | A patterning-free approach for growth of free-standing graphene nanoribbons using step-bunched facets of off-oriented 4H-SiC(0001) epilayers | JOURNAL OF PHYSICS D-APPLIED PHYSICS | 10.1088/1361-6463/ab6149 |
| MAXPEEM | Shi Yuchen, Zakharov Alexei A., Ivanov Ivan Gueorguiev, Yazdi Gholamreza, Syvajarvi Mikael, Yakimova Rositsa, Sun Jianwu | Epitaxial Graphene Growth on the Step-Structured Surface of Off-Axis C-Face 3C-SiC(1 over bar 1 over bar 1 over bar) | PHYSICA STATUS SOLIDI B-BASIC SOLID STATE PHYSICS | 10.1002/pssb.201900718 |
| NanoMAX | Akan Rabia, Frisk Thomas, Lundberg Fabian, Ohlin Hanna, Johansson Ulf, Li Kenan, Sakdinawat Anne, Vogt Ulrich | Metal-Assisted Chemical Etching and Electroless Deposition for Fabrication of Hard X-ray Pd/Si Zone Plates | MICROMACHINES | 10.3390/mi11030301 |
| NanoMAX | Björling A, Kalbfleisch S, Kahnt M, Sala S, Parfeniukas K, Vogt U, Carbone D, Johansson U | Ptychographic characterization of a coherent nanofocused X-ray beam | OPTICS EXPRESS | 10.1364/OE.386068 |
| NanoMAX | Hammarberg S, Dagytė V, Chayanun L, Hill MO, Wyke A, Bjorling A, Johansson U, Kalbfleisch S, Heurlin M, Lauhon LJ, Borgström MT, Wallentin J | High resolution strain mapping of a single axially heterostructured nanowire using scanning X-ray diffraction | NANO RESEARCH | 10.1007/s12274-020-2878-6 |
| NanoMAX | Ji Cheng, Li Bing, Liu Wenjun, Smith Jesse S., Bjorling Alexander, Majumdar Arnab, Luo Wei, Ahuja Rajeev, Shu Jinfu, Wang Junyue, Sinogeikin Stanislav, Meng Yue, Prakapenka Vitali B., Greenberg Eran, Xu Ruqing, Huang Xianrong, Ding Yang, Soldatov Alexander, Yang Wenge, Shen Guoyin, Mao Wendy L., Mao Ho-Kwang | Crystallography of low Z material at ultrahigh pressure: Case study on solid hydrogen | MATTER AND RADIATION AT EXTREMES | 10.1063/5.0003288 |

| BEAMLINE(S) | AUTHORLIST | TITLE | JOURNAL | DOI |
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| Veritas, HIPPIE, SoftiMAX, FinEstBeAMS, MAXPEEM, Bloch and FlexPES | Agaker, M., Mueller, F., Norsk Jensen, B., Ahnberg, K., Sjoblom, P., Deiwijs, J., Henniger, H., Parna, R., Knudsen, J., Thiagarajan, B. & Sathe, C. | A five-axis parallel kinematic mirror unit for soft X-ray beamlines at MAX IV | J SYNCHROTRON RADIATION | 10.1107/S160057751901693X |
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