



Annual review

2025-26

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CEO welcome

After we initiated the transformation of Diamond in 2024/25, the past year has seen more significant changes in our organisational structure, driven by a coordinated programme of change.

Following internal engagement events and a workshop to better refine the operational model, we have developed a new Operations Division, formed from different groups with key supporting roles. Our search for a new director of this division was successful with the appointment of Dr Francesca Gliubich, who brings operational expertise in a research environment and in bringing teams together. We have also merged our Life and Physical Science Divisions into one single Science Division to provide a more unified approach to planning and strategy. Other changes include a more coordinated approach to planning science activities, and the formation of an operation and delivery group to push decision-making in order to make faster decisions.

We believe these structural changes will improve our efficiency and enhance internal collaborations between groups.

In addition, these changes will help Diamond to be more responsive to the needs of our user communities and actively support the UK Government priorities at a time where facilities need to demonstrate their impact for the nation.

In 2025 we also bid a fond farewell to two long-standing members of staff. Professor Sir David Stuart, Life Science Director and Dr Andy Dent, Deputy Physical Science Director, both retired after extensive careers at Diamond (17 and 23 years respectively). A symposium was held for Andy in September 2025, and we will be marking Dave's scientific contributions at an event in September 2026. Professor Keith Wilson, a member of our Board of Directors, also retired after nine years of service. We thank him for his valuable contributions and support.



We welcome Dr Petra Oyston OBE, as our newest Board member who joined in December 2025.

In 2025/26, we continued to offer a range of events to provide training, workshops and user events for our community. I am thankful to our advisory committees, Scientific Advisory Committee (SAC), Diamond User Committee (DUC) and Diamond Industrial Scientific Committee (DISCo) for their continued feedback on the delivery of the science.

Over the last year we have made significant progress on our Diamond-II upgrade programme with visible milestones achieved.

The Diamond Extension Building is now complete and is supporting the assembly of new machine components. As with any major project we continue to tightly monitor and evaluate our progress through a combination of external and internal assessment reviews.

I would like to take this opportunity to thank the entire Diamond team, for their diligent work and progress so far. I also thank the members of the Diamond-II Sponsor Group, Machine Advisory Committee (MAC) and the Scientific Software Advisory Committee (SSAC), for their valuable insights and commitment to promoting best practice across our facilities. All this work takes significant effort, especially as we continue to operate the facility while delivering full user operations. I continue to be impressed by the dedication and the engagement of our staff. As we see the enclosures of the new flagship beamlines nearing completion and the new building buzzing with activities, I remain convinced we will overcome daily challenges if we maintain our ambitions and continue to be focused on long-term objectives.

Prof Gianluigi Botton
CEO

Chair's report

As Chair of the Diamond Board, I am pleased to reflect on another year of scientific excellence and strategic progress. Diamond continues to play a vital role in world-leading research and innovation across a broad range of disciplines.

Diamond's status is due to the remarkable dedication of its staff, whose expertise supports the success of the facility and enables outstanding scientific outcomes for academic and industrial users. The collaborative spirit of Diamond's staff, users, partners and stakeholders is central to its success.

Over the past year, the facility has welcomed thousands of users from across the UK and around the world, enabling research that drives discovery and offers solutions to some of society's most pressing challenges.

In my role as Chair, I have witnessed a time of significant challenge but also opportunity. Like other UK facilities, Diamond continues to face risks around operational funding. Despite this, Diamond has continued to prepare for the future. While maintaining a strong focus on operational excellence and responsible stewardship of public resources, Diamond is well placed to deliver the Diamond-II upgrade project which will see a leap forward in scientific capabilities.

I was delighted to attend the official opening of the Diamond Extension Building in March, which marked a major milestone in the technical delivery of the upgrade. The Diamond-II project is essential to the future of UK synchrotron science, and we are committed to its delivery for the benefit of current and future generations of researchers.

As we look ahead, we need to ensure that Diamond remains focused on accomplishing our long-term vision. The scientific landscape continues to shift, creating new opportunities to exploit and challenges to contend with. I am convinced that the leadership at Diamond, as well as those who drive it forward every day, will see success through their unwavering commitment.

On behalf of the Board, I would like to thank our stakeholders, the research councils, the UK government and Wellcome for supporting the evolving needs of Diamond.

Prof Sir Leszek Borysiewicz
GBE DL FRS FMedSci FRCP FLSW
Chair of the Board



Management team



Prof Gianluigi Botton
CEO



Andrea Ward
CFO and Deputy CEO



Dr Richard Walker
Technical Director



Dr Adrian Mancuso
Director of Physical Sciences



Dr Martin Walsh
Interim Director of Life Sciences

Board of directors

Prof Sir Leszek Borysiewicz (Chair)

Prof Gianluigi Botton

Andrea Ward

Victoria Grant

Dr Roger Eccleston

Prof Michael Fitzpatrick

Dr Morag Foreman

Dr Petra Oyston

Company secretary

Dr Sean Hird

Advisory bodies

The Scientific Advisory Committee (SAC)

Prof Kristina Djinović-Carugo, EMBL (Chair)
Dr Paul Adams, Lawrence Berkeley National Laboratory
Dr Steve Aplin, European XFEL
Dr Elke Arenholz, NSLSII, Brookhaven National Laboratory
Prof Rohit Bhargava, University of Illinois Urbana-Champaign
Dr Dina Carbone, MAX-IV
Prof Peter Dowding, Infineum (DISCo Representative)
Prof Chris Hardacre, University of Manchester
Prof Phil King, University of St Andrews
Dr Silvia Ramos-Perez, University of Kent (DUC Chair)
Prof Matt Rosseinsky, University of Liverpool
Prof Andrea Russell, University of Southampton
Prof Christian Schroer, DESY
Prof Stephen Skinner, Imperial College London
Prof Xiaodong Zhang, Imperial College London
Prof Elizabeth Wright, University of Wisconsin-Madison

Diamond User Committee (DUC)

Dr Silvia Ramos-Perez, University of Kent (Chair)
Dr Simon Kondrat, Loughborough University
Prof Jose Artur Brito, ITQB NOVA
Dr Colin Levy, University of Manchester
Dr Daniel Toolan, University of Manchester
Dr Ellen Heely, Open University
Dr Hariom Jani, University of Oxford
Prof Yasmine Sassa, KTH Royal Institute of Technology
Dr Luke Daniels, University of Liverpool
Dr Gary Nicol, University of Edinburgh
Dr Rosa Arrigo, University of Salford
Prof Anna Regoutz, University College London
Dr James Everett, Keele University
Dr Alexander Lunt, University of Bath
Dr Richard Collins, University of Manchester
Dr Josie Ferreira, University College London
Oliver Thomas, University of Oxford
Dr Stephen Marshall, University of Oxford
Dr Sarah Gosling, Keele University

Audit, Finance and Risk Committee (AFRC)

Prof Michael Fitzpatrick (Chair)
Prof Sir Leszek Borysiewicz
Victoria Grant
Stella Neophytou
Jane Warren

Diamond Industrial Science Committee (DISCo)

Prof Dave Brown, Vertex (Chair)
Dr Andrew Barrow, Rolls-Royce
Dr Helen Blade, AstraZeneca
Dr Jonathan Booth, Johnson Matthey
Dr Cheryl Doherty, GSK
Dr Andrew Doré, Isomorphous Lab
Prof Peter Dowding, Infineum
Prof Jonathan Hyde, NNL
Dr Andrew Johnson
Dr Olga Kazakova, NPL
Dr Jenny Moore, Syngenta
Dr Ellen Norman, RSSL
Dr Pamela Williams, Astex Pharmaceuticals

Scientific Software Advisory Committee (SSAC)

Steve Aplin, European XFEL (Chair)
Yves-Marie Abiven, SOLEIL
Stuart Campbell, Brookhaven National Laboratory
Vincent Favre-Nicolins, ESRF
Andrew Richards, Imperial College London
Hannah Griffin, ISIS Neutron and Muon Source

Machine Advisory Committee (MAC)

Andreas Jankowiak, BESSY (Chair)
Eshraq Al Dmour, MAX-IV
Pedro Fernandes Tavares, MAX-IV
Gaël Le Bec, ESRF
Amor Nadji, SOLEIL
Montse Pont, CELLS
Vadim Sajaev, APS
Volker Schlott, SLS
Christoph Steier, ALS
Andy Wolski, University of Liverpool
Romain Ganter, SLS
Timo Korhonen, ESS
Roberto Visintini, Elettra

Diamond-II Sponsor Group

Gianluigi Botton (Chair)
Mary Barlow, EMBL-EBI
Roger Eccleston, STFC
Michael Fitzpatrick
Jean Susini, SOLEIL
Giles Robertson, DSIT
Andrea Ward

Key facts & figures 2025-26

USAGE



1,306

Proposals awarded



4,837

Research users



17,424

Shifts delivered



139,392

Hours of beamtime delivered*

OUTPUTS



85

PhD theses published**



1,011

Structures deposited in the Protein Databank**



1,185

Journal articles published**



10.4 PB

Data added to the archive**

MACHINE



77.9h

Mean time between failures



94.4%

Machine uptime



5,217

Scheduled hours of user operation



6,106

Scheduled hours of machine operation

ENGAGEMENT



755

Stakeholder and VIP visitors



2,830

Science and technical events attendees



2,985

School student and teacher visitors



6,820

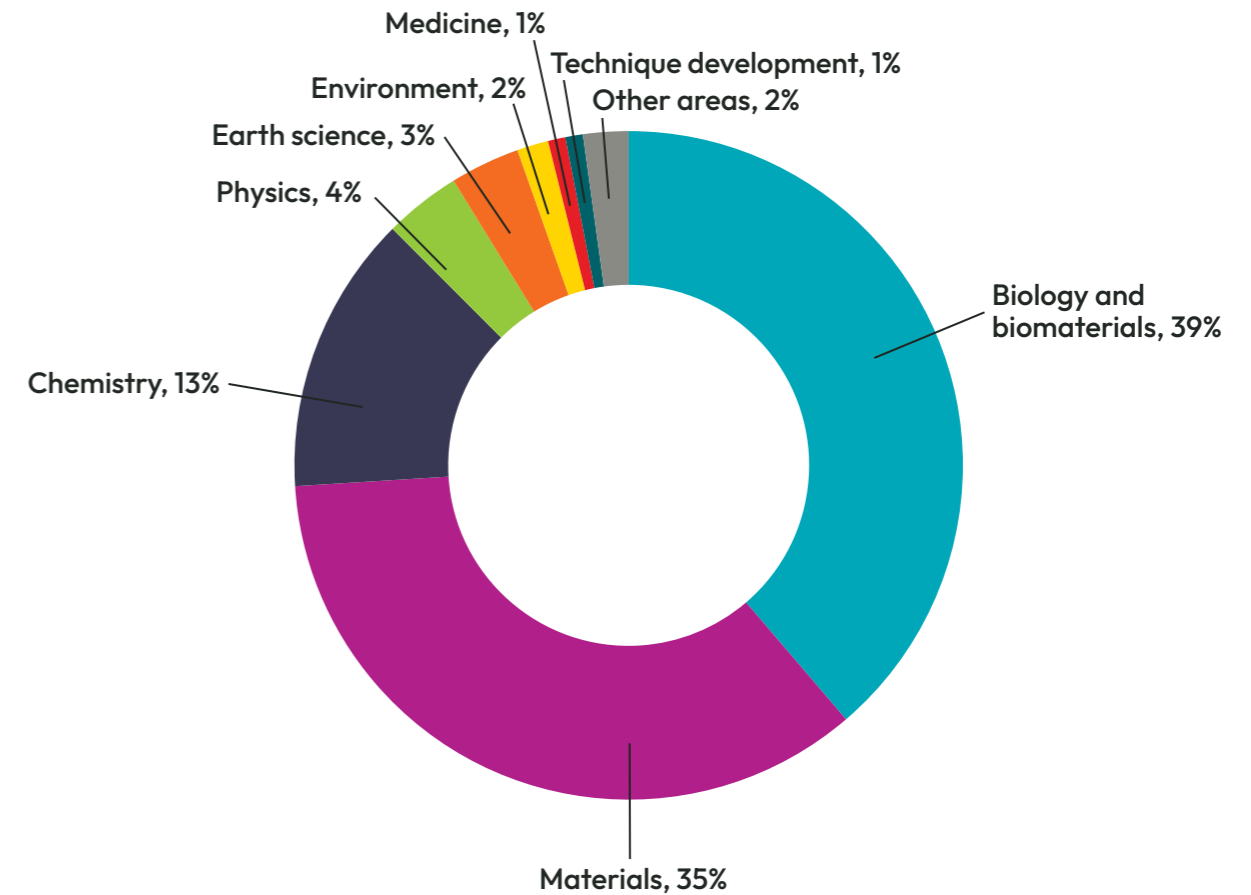
Significant interactions with the public***

* assuming 8-hour shifts

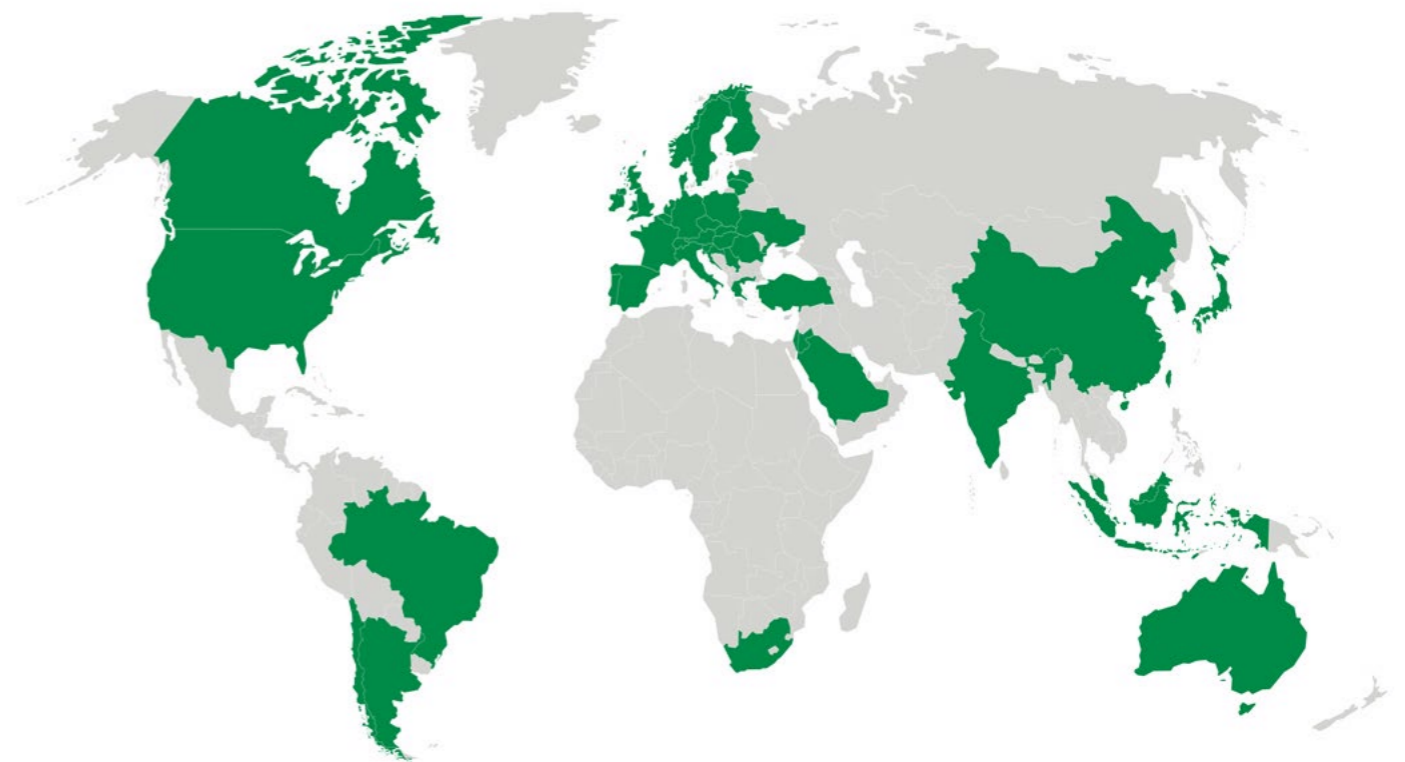
** calendar year 2025

*** includes general public, school and university visitors

Subject areas of articles



Our global user community



Biological Cryo-Imaging Group

The electron Bio-Imaging Centre (eBIC) is a CryoEM centre providing scientists with state-of-the-art experimental equipment and expertise in the field of cryo-electron microscopy, for single particle analysis, electron tomography and electron diffraction.

The location of eBIC enables scientists to combine their techniques with many of the other cutting-edge approaches that Diamond offers. Currently eBIC houses five Titan Krios microscopes, a Talos Arctica, two Glacios microscopes, Scios and Aquilos cryo-FIB/SEMs, and a Leica CryoCLEM.

Beamline B24 hosts a full field cryo-transmission X-ray microscope dedicated to biological X-ray imaging and has also established a cryo super resolution fluorescence microscopy facility, which was a joint venture between Diamond and the University of Oxford.

Breakthrough in next-generation polio vaccines

Researchers have taken an important step towards developing a safer and more affordable next-generation polio vaccine using virus-like particles (VLPs). Unlike traditional vaccines, these particles mimic the outer shell of the poliovirus but contain no genetic material, removing the risk of infection while still triggering an immune response.

The research team studied how different biological systems, including yeast, insect, mammalian and plant cells, could be used to produce VLPs. Their findings showed that VLPs made in yeast and insect cells performed as well as, or better than, current inactivated polio vaccines in laboratory testing.

Researchers used cryogenic electron microscopy (cryo-EM) at eBIC to visualise the vaccine particles at near-atomic resolution.

This helped scientists understand how the particles mimic the real virus and how they can be stabilised for vaccine development.

The work could help make polio vaccines cheaper and easier to manufacture globally, supporting ongoing efforts to eradicate the disease worldwide.

[DOI: 10.1038/s41467-025-56118-z](https://doi.org/10.1038/s41467-025-56118-z)

Visualising how HIV hijacks human cells

Scientists captured new images showing how HIV-1 enters the nucleus of human cells, a key step in how the virus infects the body.

Researchers used a technique called cell permeabilisation, which makes cell membranes porous without destroying the cells, allowing them to mimic HIV infection and capture nearly 1,500 viral cores entering the nucleus.

The research shows that HIV-1's ability to pass through the nuclear pore complex depends on the viral core's shape and flexibility, the adaptability of the nuclear pore, and a host protein called CPSF6. Previously, nuclear pores were thought to be relatively rigid gateways, but the study found they can expand and change shape to allow viral cores through.

Some viral cores do not enter the nucleus: fragile cores or those unable to interact with CPSF6 can become stuck or excluded. This suggests the nuclear pore actively influences infection, rather than simply acting as a doorway. The findings improve our understanding of HIV infection and may support future antiviral strategies.

[DOI: 10.1038/s41564-025-02054-z](https://doi.org/10.1038/s41564-025-02054-z)

Crystallography Group

The Crystallography Group comprises of the High-Resolution Powder Diffraction beamline (I11), the Extreme Conditions beamline (I15), the X-ray Pair Distribution Function (XPDF) beamline (I15-1), and the Small-Molecule Single-Crystal Diffraction beamline (I19).

Having these beamlines together in one science group allows us to fully exploit the technical and scientific expertise within the teams to provide the basis for future development and pioneering experiments. The group's beamlines use single crystal diffraction, powder diffraction and total scattering techniques to study structural properties of crystalline, amorphous, and liquid materials in different conditions. These facilities are used in a wide range of scientific disciplines, including condensed matter physics, chemistry, engineering, earth sciences and materials, and life sciences.

Under pressure: revealing the chemistry of Titan's atmosphere

Titan, Saturn's largest moon, has an atmosphere rich in methane and nitrogen. These molecules were previously thought to be largely unreactive when compressed, but the study shows that pressure alone can trigger unexpected chemical changes.

An international research team compressed methane-nitrogen mixtures using diamond anvil cells, which squeeze tiny samples between two diamonds to recreate conditions found deep inside planets and moons. At

the I15 beamline, they combined high-pressure X-ray diffraction with Raman spectroscopy and computer modelling to study the structures that formed.

The researchers found that above 7 gigapascals, new molecular compounds appeared, and at even higher pressure or temperature, nitrogen molecules began to break apart, allowing new covalent bonds between carbon, hydrogen and nitrogen atoms to form.

The findings suggest that planetary interiors may create complex organic chemistry through pressure, not just sunlight-driven reactions in atmospheres. This could help scientists better understand Titan, gas giants and exoplanets, and may support future missions such as NASA's Dragonfly mission to Titan.

[DOI: 10.1002/anie.202422710](https://doi.org/10.1002/anie.202422710)

Hybrid frameworks join forces to clean polluted water

A new hybrid material could help remove stubborn pollutants from water. The hybrid brings together two highly porous materials, metal-organic frameworks (MOFs) and covalent-organic frameworks (COFs). These act like molecular scaffolds, with internal spaces that can trap and react with pollutants.

The important finding is that the two parts are chemically joined, not just mixed together. Measurements showed bonds forming between the iron and zirconium-containing parts of the material.

These connections help electrons move more easily through the structure, which supports the reactions needed to break down BPA, a common pollutant found in some plastics and industrial wastewater.

Analysis on the I15-1 beamline showed subtle changes around the MOF clusters, confirming strong interaction between the two frameworks, while also showing that the overall structure stayed intact. The hybrid material broke down BPA effectively in both still-water and flowing-water tests and remained stable after repeated use, showing promise for future wastewater treatment.

[DOI: 10.1039/D5TA03279B](https://doi.org/10.1039/D5TA03279B)



Imaging and Microscopy Group

The Imaging and Microscopy Group brings together eight experimental facilities: I08, I08-1, DIAD, I12, I13-1, I13-2, I14 and the electron Physical Science Imaging Centre (ePSIC)

The facilities use electrons and X-rays to image samples under different experimental conditions across a diverse range of length scales and time scales. The ability to image material properties in minute detail lends itself to a wide range of scientific applications, from chemistry and catalysis to environmental science, materials science, biology, medicine, and cultural heritage.

The hidden superpower of roots

Understanding how roots function is more important than ever as the world faces escalating droughts and the problem of compacted soil. Research from the DIAD beamline revealed how plant roots push through hard soil.

X-ray imaging showed how the soil structure changed as a model root pushed through it, while X-ray diffraction measured the forces building up inside the soil.

This study, observing the soil's structure change and mapping the forces within it, was the first of its kind. They found that roots do not simply force soil out of the way. Instead, they create a compressed zone near the tip, then encourage the soil to yield and flow around them. In effect, the soil begins to behave more like modelling clay, leaving behind a stable tunnel called a biopore.

Understanding this process could help scientists breed crops with roots better suited to hard, dry soils, reducing the need for ploughing and supporting more sustainable farming. In conservation, plants with powerful roots could prepare degraded land for rewilding, creating water channels and breathing spaces for future ecosystems.

[DOI: 10.1038/s44341-025-00021-7](https://doi.org/10.1038/s44341-025-00021-7)

Fossil reveals silent swimmer of the Jurassic deep

Advanced imaging from the I12 beamline indicated that a giant marine reptile from the Early Jurassic period may have used stealth to hunt in dark waters.

The research focused on a rare, metre-long fossilised flipper from *Temnodontosaurus*, a large ichthyosaur that lived around 183 million years ago. Unusually, the fossil preserved soft tissue, giving scientists a much clearer view of the flipper's original shape and structure.

The flipper's wing-like shape, flexible outer tip and clearly serrated trailing edge suggest that the ichthyosaur had evolved features that helped to reduce noise as it swam. It may have moved through the water almost silently, much

like owls use the zigzag edges of their wing feathers to fly quietly while hunting at night. Such specialised adaptations for quiet movement have not been seen before in a marine animal.

For *Temnodontosaurus*, quiet swimming may have helped it approach prey in low-light environments without being detected. The discovery is significant because it gives rare evidence of behaviour from a fossil, not just anatomy. It also shows how studying ancient animals could inspire modern solutions, including ways to reduce human-made noise in the ocean.

[DOI: 10.1038/s41586-025-09271-w](https://doi.org/10.1038/s41586-025-09271-w)

Frozen iron: how Antarctic glaciers feed the Southern Ocean's hidden fertiliser

Iron is essential for phytoplankton, the tiny ocean plants that support marine food webs and help remove carbon dioxide from the atmosphere. In the Southern Ocean, iron is often in short supply, which can limit phytoplankton growth. Antarctic shelves release iron into the ocean but less is known about the form of iron coming directly from glacial meltwater.

Researchers examined particles from Antarctic meltwater, shelf sediments and nearby surface waters. They focused on a form of iron that is easier for living organisms to use, but which normally reacts quickly with oxygen and becomes less available.

Using X-ray microscopy at the I08 beamline, the team mapped where iron and organic carbon were located inside the particles.

They found that many glacier-derived particles were rich in usable iron and closely mixed with organic carbon. This carbon appears to protect the iron, slowing its reaction with oxygen and helping it survive longer in surface waters.

The findings suggest Antarctic glaciers are an underestimated source of bioavailable iron. As glacier melting increases, this process could affect phytoplankton growth, Southern Ocean ecosystems and the ocean's role in storing carbon.

[DOI: 10.1038/s41467-025-59981-y](https://doi.org/10.1038/s41467-025-59981-y)

Macromolecular Crystallography Group

Macromolecular crystallography (MX) exploits high flux X-rays to investigate the structure and function of biological macromolecules at atomistic resolution and up to millisecond timescales. This provides deep insight into the details of biological activity key to the understanding of the processes of life.

MX is a core activity at Diamond with seven beamlines (I03, I04, I04-1, I23, I24, VMXi and VMXm) dedicated to the technique alongside the XFEL Hub, Membrane Protein Laboratory, Crystallisation Facility and XChem fragment screening. The beamlines cover a broad range of capabilities from high throughput, micro- and nano-focus beams, extremely long wavelengths, room temperature in situ collection from crystallisation plates and (time-resolved) serial synchrotron crystallography (SSX).

One new future capability will be the exploitation of high energy electrons with the electron diffraction instrument HeXI currently in development following funding from the Wellcome Trust. Additionally, as part of the Diamond-II upgrade, XChem fragment screening will be transformed into a fully automated pipeline at the new K04 beamline, providing the capability to deliver larger campaigns while also investigating more challenging protein targets.

Fast fragment discovery with protein crystals

Using the high-throughput I04-1 beamline, researchers have developed a faster way to turn weak early drug-discovery “fragments” into more promising chemical leads.

Fragment-based drug discovery starts with very small molecules that bind weakly to a target protein. These fragments can be built up into stronger binders, but take repeated cycles of making, purifying and analysing each new compound. That process is slow and limits how much chemical space researchers can explore.

The new method, called Binding-Site Purification of Actives, or B-SPA, avoids purifying every reaction product. Instead, researchers make many crude reaction mixtures and soak them directly into protein crystals. X-ray crystallography is then used to see whether any molecule in the mixture binds to the protein.



The team explored chemical changes around a fragment that binds to the second bromodomain of PHIP, a protein linked to epigenetic regulation and cancer.

They carried out 1,876 reactions, with 1,108 producing the intended product, and solved 22 protein-compound structures directly from crude mixtures.

The approach acts like a structural filter, identifying useful binders even when they are minor components. It could reduce purification work, speed up hit-to-lead development and help drug-discovery teams make better decisions earlier.

[DOI: 10.1002/anie.202424373](https://doi.org/10.1002/anie.202424373)

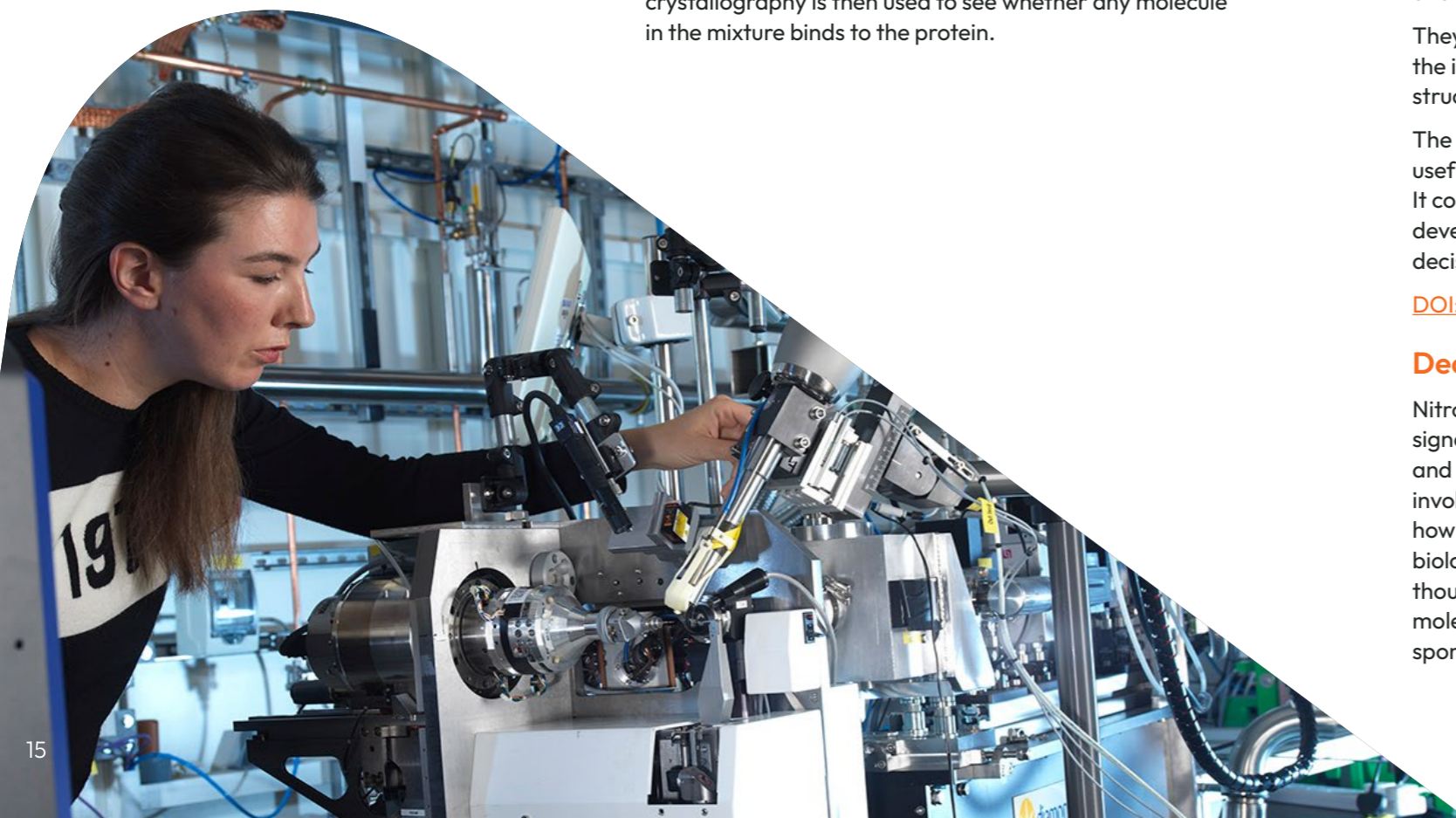
Decoding how enzymes process healing fats

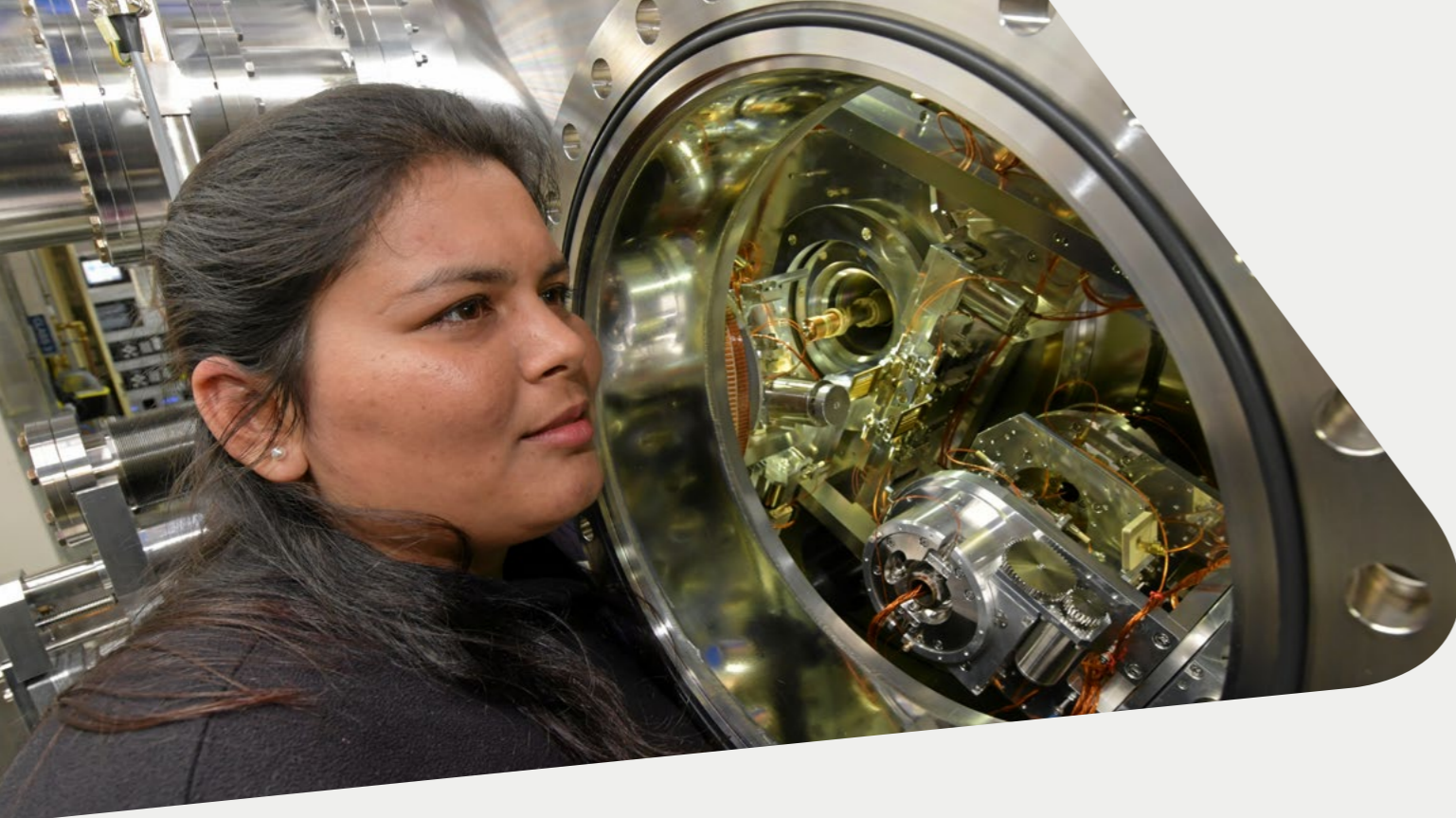
Nitroalkene fatty acids are naturally occurring lipid signalling molecules. They help regulate inflammation and cellular stress responses by modifying key proteins involved in protective signalling pathways. Understanding how they are metabolised is crucial to both fundamental biology and drug development. Until recently, it was thought that their reaction with glutathione, a small molecule essential for cellular detoxification, happened spontaneously, without help from enzymes.

Researchers learned that members of the human glutathione transferase (GST) enzyme family can catalyse this reaction with remarkable efficiency. Using ambient temperature macromolecular crystallography at the VMXi beamline, the team solved the crystal structure of one of these enzymes bound to the reaction product, providing unprecedented insight into the molecular details of this transformation.

The findings show that detox enzymes may help control how long these anti-inflammatory fatty acids remain active in cells. This could improve understanding of lipid metabolism and support the design of future therapies based on these protective molecules.

[DOI: 10.1016/j.jbc.2025.108362](https://doi.org/10.1016/j.jbc.2025.108362)





Magnetic Materials Group

Diamond's Magnetic Materials Group (MMG) concentrates on emergent phenomena in quantum materials using the capabilities of beamlines I06, I10, I16 and I21.

The research encompasses a variety of challenges and opportunities in condensed matter physics and materials science, ranging from topological states of matter, superconductivity, spintronics, two-dimensional systems, skyrmions and multiferroics. The MMG also runs the Materials Characterisation Laboratory (MCL). The Diamond-II flagship I17 beamline will be a unique facility for performing polarised X-ray imaging from quantum and functional materials.

A new window into the brain: laser powered electron microscopy accelerates connectome mapping

Connectome mapping is the study of how neurons connect to form the brain's networks. Mapping the brain's wiring is one of neuroscience's biggest challenges. Current electron microscopy methods are powerful, but slow and costly at whole-brain scale. Mapping a cubic millimetre of brain tissue can take months or years. The advanced laser-PEEM facility, part of the I06 beamline,

was used to image brain tissue at synaptic resolution, hundreds of times faster than conventional techniques.

Using ultra-thin mouse brain sections stained with osmium and mounted on gold-coated silicon wafers, the researchers achieved 20-nanometre resolution, enough to resolve individual synapses. With ultraviolet laser illumination, they reached gigavoxel-per-second imaging speeds.

The advanced laser-PEEM showed that these high imaging rates could be achieved without damaging delicate brain samples.

This approach could enable faster, high-resolution brain mapping and may also benefit pathology, materials science and nanotechnology.

[DOI: 10.1073/pnas.2521349122](https://doi.org/10.1073/pnas.2521349122)

Magnetic conversations at gigahertz speed

A study carried out on the I10 BLADE beamline focused on how one magnetic material can wirelessly control another at gigahertz speeds.

A helimagnet has a spiral magnetic structure. When microwaves make this spiral vibrate, it creates magnetic waves. These waves produce a changing magnetic field that can pass through a thin platinum layer and make a nearby magnet move in step with it.

Using a three-layer stack made from a helimagnet, platinum and a nickel-iron ferromagnet and time-resolved resonant elastic X-ray scattering, researchers tracked the spin motion in both magnetic layers with picosecond resolution. Measurements at copper and iron resonances allowed them to compare how each layer moved during an oscillation cycle. They found that the nickel-iron layer became phase-locked to selected helimagnon modes in the helimagnet. Choosing different modes changed the phase relationship, while preserving the handedness of the spiral magnetic structure.

The work points towards low-power spin-wave communication, where information could be encoded in frequency, phase and chirality rather than electric charge. It could help develop compact magnetic devices that communicate across thin layers without direct wiring.

[DOI: 10.1038/s41567-025-03148-5](https://doi.org/10.1038/s41567-025-03148-5)

Chiral magnons leave a measurable X-ray fingerprint in altermagnets

Research from the I21 beamline demonstrated how the chirality, or handedness, of magnons can be measured in an altermagnet.

Magnons are quantised spin-wave excitations: collective oscillations of magnetic moments within an ordered magnetic material. In certain systems, these excitations can be chiral, meaning their spin motion has a preferred rotational sense, either right-handed or left-handed.

The material studied was chromium antimonide, a metallic altermagnet that retains magnetic order at room temperature. Altermagnets are of interest because they combine features of ferromagnets and antiferromagnets, while also allowing spin-dependent electronic behaviour without producing a large external magnetic field.

To probe the magnon chirality, researchers used RIXS and compared the response to right- and left-circularly polarised X-rays, observing circular dichroism at the magnon energy.

The dichroic signal reversed with crystal momentum, crystal orientation and magnetic domain handedness. This shows that chiral magnons leave a measurable X-ray fingerprint, providing a powerful way to identify altermagnetic behaviour and study chiral spin dynamics, even when individual magnon branches cannot be resolved directly.

[DOI: 10.1103/PhysRevLett.132.176701](https://doi.org/10.1103/PhysRevLett.132.176701)



Soft Condensed Matter Group

The Soft Condensed Matter Group provides the infrared (IR) and ultraviolet Circular Dichroism (UV-CD) spectroscopy, and both Small and Wide Angle X-ray Scattering (SAXS and WAXS) imaging capabilities of Diamond.

The Soft Condensed Matter Group comprises four beamlines B21, B22, I22 and B23 and the Offline SAXS Instrument, labSAXS. This unique portfolio of beamlines can analyse a range of samples that include two-dimensional thin films (photovoltaics), living mammalian cells, three-dimensional matrices (metal-organic frameworks) and nanoparticles in non-crystalline states.

Diamond helps uncover a lost branch of life

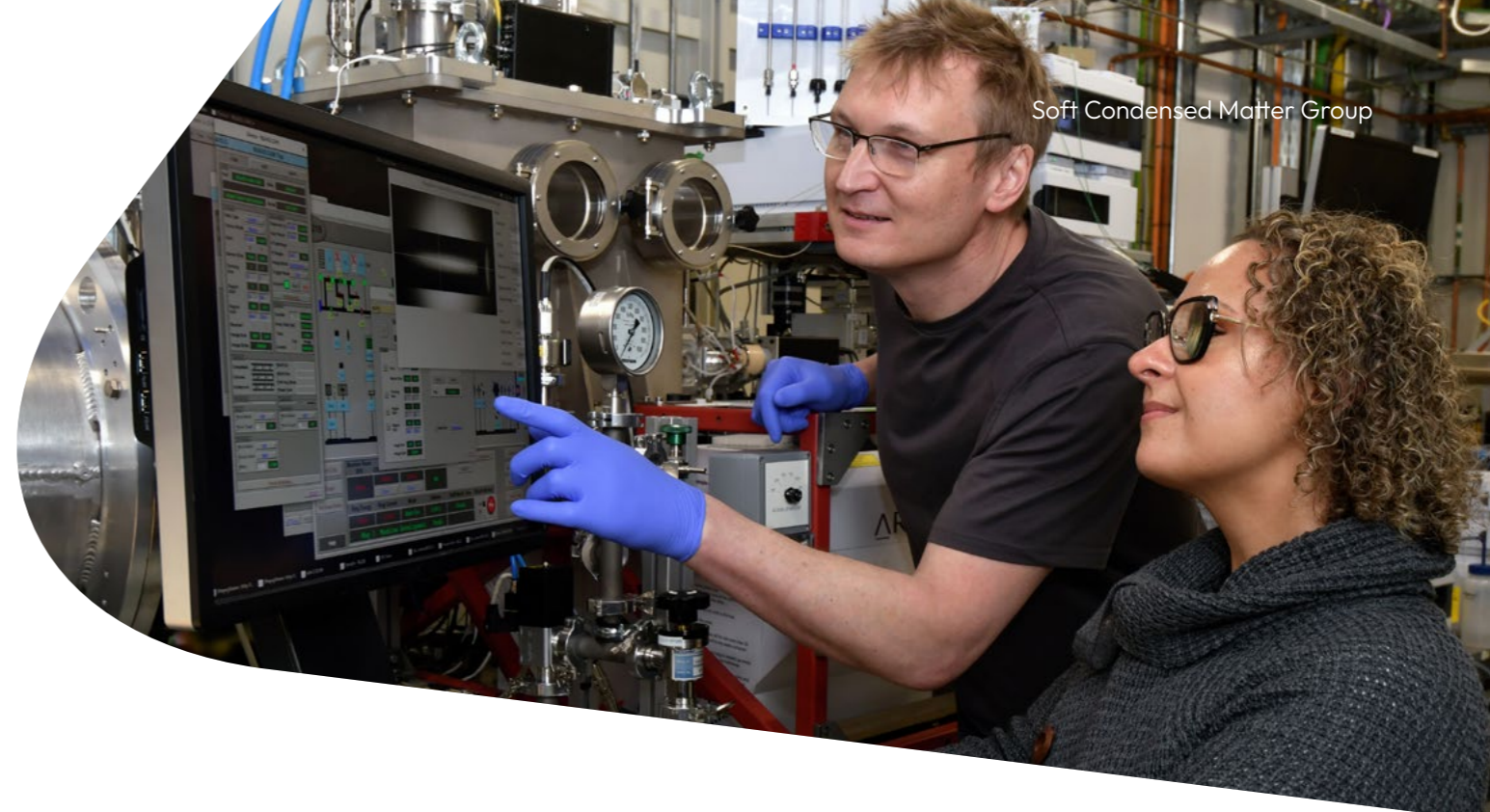
The B22 beamline helped to solve a 160-year-old fossil mystery. Researchers looked at Prototaxites, giant trunk-like fossils from the early Devonian period, more than 400 million years ago. These organisms could grow several metres tall and were among the largest known life forms on land before trees evolved.

For over 160 years, scientists debated what Prototaxites actually was. Because of its tube-like internal structure and lack of obvious plant features, it was often thought to be a giant fungus. However, new evidence suggests it was not a fungus, plant, or any other known type of organism.

B22's infrared microspectroscopy beamline was used to study the fossil's chemical fingerprints at very small scales. This helped identify chemical bonds and compare different structures within the fossil. The data supported the idea that the specimen was a single organism, rather than a mix of different organisms living together.

Combined with 3D imaging and machine-learning analysis, the results placed Prototaxites outside all known major groups. The study suggests it belonged to a completely extinct branch of complex life, changing how scientists understand Earth's earliest land ecosystems.

[DOI: 10.1126/sciadv.aec6277](https://doi.org/10.1126/sciadv.aec6277)



Speeding up G-Quadruplex drug discovery with synchrotron light

G-quadruplexes are unusual, folded structures that can form in DNA or RNA. They are found in chromosome ends, gene-control regions and some viral genomes, and are linked to cancer, infections and gene regulation. This makes them promising targets for anticancer and antiviral drug discovery.

The challenge is that screening small molecules that bind to G-quadruplexes can be slow, material-intensive or unable to detect subtle structural changes. Researchers used high-throughput synchrotron radiation circular dichroism at the B23 beamline to measure these interactions quickly in 96-well plates, using very small sample volumes.

The team tested three biologically relevant G-quadruplex sequences with a library of tetrazole-based molecules and a known G-quadruplex-binding peptide. The method detected changes in circular dichroism signals and spectral shape, showing not only whether binding occurred, but also whether the G-quadruplex structure changed.

Different molecules produced different spectral fingerprints depending on the G-quadruplex sequence and the surrounding ions. The work shows that B23's high-throughput approach could help researchers rapidly prioritise promising G-quadruplex ligands for future therapeutic development.

[DOI: 10.3390/molecules30163322](https://doi.org/10.3390/molecules30163322)

A greener glue for solid-state batteries

Solid-state batteries could offer safer, higher-energy storage as they use solid materials instead of flammable liquid electrolytes. Making them work well means combining several solid components, including cathode particles, solid electrolyte and conductive additives. These need a binder: a material that holds everything together while still allowing lithium ions to move through the battery.

Many current binders are fluorinated polymers, which can be environmentally problematic and may face future regulatory restrictions. Researchers investigated whether a safer, recyclable, non-fluorinated binder could deliver similar performance. They designed block copolymer binders made from polyester and polycarbonate segments. One part provides mechanical strength, while the other supports lithium-ion movement. By changing the arrangement and amount of each component, the team could tune the binder's balance of strength, flexibility and ion transport.

The researchers tested the polymers as thin films, then used them in composite cathodes and full solid-state battery cells. Small-angle X-ray scattering experiments at labSAXS helped study the binder structure. The new recyclable binders showed high-voltage stability, lithium-ion conductivity and battery performance rivaling fluorinated binders, offering a greener route towards practical solid-state batteries.

[DOI: 10.1039/D3SC05105F](https://doi.org/10.1039/D3SC05105F)



Spectroscopy Group

The Spectroscopy Group consists of three operational beamlines: the Microfocus Spectroscopy beamline (I18), the Core Extended X-ray Absorption Fine Structure beamline (B18), and the Versatile X-ray Absorption Spectroscopy beamline (I20- Scanning).

Diamond-II will see the addition of a new beamline, SWIFT (Spectroscopy Within Fast Timescales). SWIFT will be a wiggler-based, quick-scanning EXAFS beamline dedicated to operando studies, also at micrometric scale.

The three operational spectrometers are complementary in the energy ranges they cover, the size of their focused beam spots delivered to the sample, and the time resolutions they reach. This complementarity means that they can support research across many different scientific disciplines, from chemistry and catalysis through materials science, condensed matter physics, environmental and life science, energy materials and cultural heritage. The addition of SWIFT to the portfolio of beamlines will enhance the fast-scanning capabilities of the Spectroscopy Group, pushing the achievable time resolution towards the millisecond timescales.

Understanding Parkinson's Disease through gene silencing

Parkinson's disease is a progressive neurodegenerative disorder involving the loss of dopamine-producing neurons. One gene linked to a juvenile-onset form of the disease is ATP13A2, which helps cells transport ions. To investigate its role, researchers reduced ATP13A2 brain activity by using modified, neutralised viruses. This caused a 95% loss of ATP13A2 expression.

After five months, they compared injected and control brain tissue. They found a 30% loss of neuron cells in the most affected region.

To understand the cellular changes, they used X-ray fluorescence on the I18 Microfocus Spectroscopy beamline to map metals in thin sections of the substantia nigra, a brain region strongly affected in Parkinson's.

The results showed clear accumulation of iron and manganese in the treated brain samples, both linked to Parkinson's-related changes. This pilot study suggests that ATP13A2 suppression can trigger early Parkinson's-like molecular and cellular changes, although larger and longer studies are needed to confirm the findings.

[DOI: 10.1038/s41531-024-00757-4](https://doi.org/10.1038/s41531-024-00757-4)

Turning plastic waste into clean hydrogen

Researchers are exploring a way to turn plastic waste into clean hydrogen fuel using sunlight. A study looked at combining two processes. First, common plastics such as polyethylene terephthalate, polyamides and polyurethanes are broken down using acid-catalysed depolymerisation. This turns long, stable polymer chains into smaller, more reactive molecules. These molecules are then fed into a photocatalytic system, where a light-absorbing catalyst uses solar energy to drive hydrogen production.

Diamond's B18 beamline was used for X-ray absorption spectroscopy, allowing researchers to study the catalyst during the reaction.

The measurements showed that plastic-derived molecules donate electrons at the catalyst surface, while protons are reduced to form hydrogen gas. They also showed that the catalyst remained stable under reaction conditions. The work suggests a promising route to tackle two challenges at once: reducing plastic waste and producing lower-carbon hydrogen fuel.

[DOI: 10.1016/j.joule.2026.102347](https://doi.org/10.1016/j.joule.2026.102347)

How water unlocks hidden activity in iridium catalysts

Iridium oxide is one of the best catalyst materials for proton exchange membrane water electrolysis, a technology used to produce green hydrogen. It is especially valuable because it can survive the acidic conditions inside commercial electrolyzers. However, iridium is rare and expensive, so researchers need to understand how to make it work as efficiently as possible.

Research conducted on the I18 beamline showed how water can "switch on" hidden activity in iridium oxide catalysts. It combined X-ray absorption spectroscopy with electrochemical measurements and compared different forms of iridium oxide under realistic operating conditions.

Researchers found that water-rich, amorphous iridium oxide can be up to ten times more active than dry, crystalline forms. The water inside the material appears to help it adapt during the oxygen evolution reaction, creating highly active sites for oxygen production. The water-rich catalyst is more active but less stable, while crystalline iridium oxide is more durable but less active. Understanding this balance could help design better catalysts for large-scale green hydrogen production.

[DOI: 10.1021/acscatal.5c05765](https://doi.org/10.1021/acscatal.5c05765)

Structures and Surfaces Group

The Structures and Surfaces Group includes four beamlines, each consisting of multiple end-stations that are optimised for a specific type of experiment: I05 (Angle-Resolved Photoelectron Spectroscopy – ARPES), I07 (Surface and Interface X-ray Diffraction), B07 (Versatile Soft X-ray Scattering – VERSOX) and I09 (Surface and Interface Structural Analysis – SISA).

They offer a variety of techniques to examine the atomic scale structure, chemical nature and electronic state at buried interfaces or the surfaces of material

Preserving superconductivity in strong magnetic fields

Superconductors are materials that let electricity flow with no energy loss, making them important for future high-performance electronics. The challenge is that most superconductors stop working when exposed to strong magnetic fields because those fields break apart the electron pairs that enable superconductivity. Researchers used the I09 beamline to investigate a way to overcome that limitation by creating a very thin layered structure. They placed a sheet of gallium only three atoms thick between two other materials; graphene on top and silicon carbide underneath. This setup created special quantum effects at the boundaries between the layers.

As a result, the material was able to keep its superconducting properties even in magnetic fields much stronger than what would normally destroy them. This is unusual behaviour that had previously only been seen in materials made from heavy elements, whereas gallium is relatively light. The discovery shows that it is possible to design new types of superconductors using lightweight materials by carefully engineering how they are layered. It opens the door to creating new, high-performance superconductors from lighter, more common elements, which could be important for future electronics and quantum technologies.

[DOI: 10.1038/s41563-026-02573-y](https://doi.org/10.1038/s41563-026-02573-y)

Mapping nanoscale buckling in an ultra-thin magnetic semiconductor

Ultra-thin magnetic materials could be used to make new kinds of tiny electronic devices, such as better memory and spin-based electronics. A study focussed on one such material, called chromium germanium telluride, which is a magnetic semiconductor made of stacked atomic layers. Researchers used I05 to measure the electronic band structure of the semiconductor. They also used an

ePSIC advanced microscope to see individual atoms, successfully imaging to a single atomic layer for the first time. They created a new method that can measure very small bends and tilts in these ultra-thin crystals using only high-resolution images.

It was seen that a single layer is surprisingly wavy and, in some places, the layer tilts by as much as 20 degrees over just a few nanometres. This strong bending may happen because defects in the crystal structure are more common when the material is only one layer thick. The researchers linked these structural features to how the material's electrons behave, using a technique that measures electronic energy levels. Overall, the study provides new atomic-level understanding of this material and introduces a useful new way to map the shape of atom-thin crystals, which could help future research and device development using layered materials.

[DOI: 10.1002/adfm.202526564](https://doi.org/10.1002/adfm.202526564)

Optics and Metrology

The Optics and Metrology group provide expert support to Diamond beamlines in the design, procurement, acceptance testing and optimisation of all beamline optics.

To extend Diamond's capability and achieve world leading performance, the group is also actively involved in research and development in the field of X-ray optics and specialised optical systems. B16, Diamond's Test beamline, is also part of the Optics and Metrology group.

Unlocking the secrets of 3D printed polymers

Polymer material extrusion is a common form of additive manufacturing because it is relatively affordable, versatile and simple. However, the final strength and function of printed parts depend strongly on how the polymer crystallises as it is deposited and cools. Until now, this fast, real-time process has not been well understood.

By developing a new X-ray diffraction setup at the B16 test beamline, a research team could observe crystallisation while the polymer was being extruded from a 3D printer nozzle and cooling on the printing platform. The X-ray data were combined with thermal modelling to link crystal formation to printing conditions.

The results showed that printing temperature was the main factor controlling crystallisation. Slightly lower processing temperatures could accelerate crystal

nucleation and growth, while slower deposition speeds encouraged higher crystallinity.

These insights could help optimise 3D-printing parameters to produce smaller, more uniform crystals, improving mechanical performance and material consistency. The work could support advanced polymer applications, including biomedical implants, tissue-engineering scaffolds and lightweight engineering components.

[DOI: 10.1016/j.matdes.2024.113255](https://doi.org/10.1016/j.matdes.2024.113255)

First demonstration of stripe-free multilayer monochromator imaging

For the first time, multilayer monochromators have matched the beam uniformity normally achieved with crystal monochromators, while keeping their advantage of much higher X-ray flux.

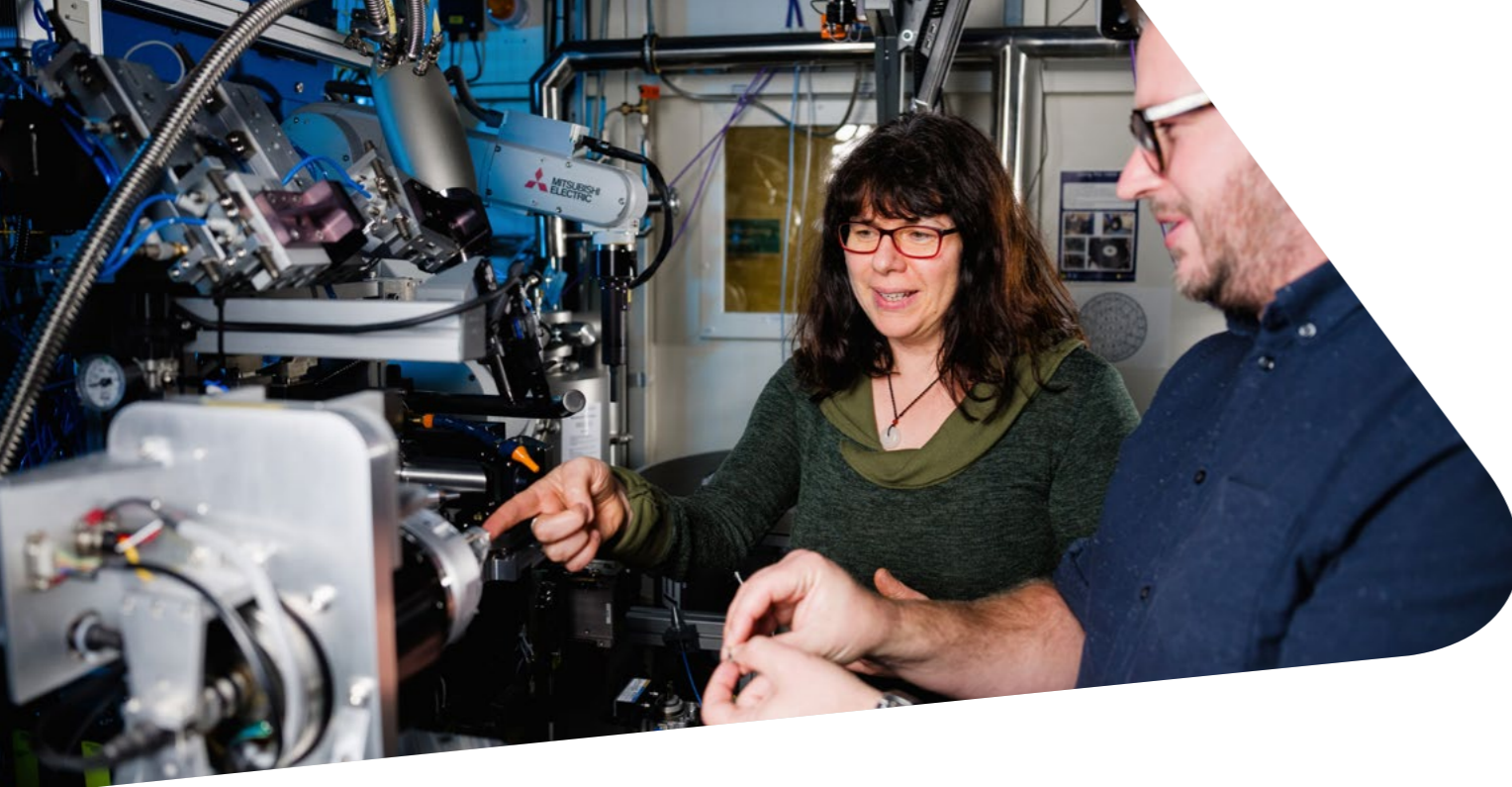
This breakthrough solves a long-standing problem in X-ray imaging. Multilayer monochromators are useful for high-speed imaging, diffraction and spectroscopy

because they deliver more photons than crystal monochromators. However, they can introduce faint stripe-like intensity variations into the X-ray beam. These reduce the image quality and make data analysis harder, especially in techniques such as tomography.

Diamond scientists addressed this by improving both the shape and coating quality of the optics. Using ion beam figuring in Diamond's optics fabrication facility, they produced substrates with extremely small slope errors. These were then coated with highly uniform multilayers using the multilayer deposition system.

The new monochromators were tested on the B16 test beamline using at-wavelength speckle-based metrology. The results confirmed excellent wavefront uniformity and flat-field images with no visible stripe artefacts. The advance could improve tomography, high-speed imaging, materials research and biomedical studies.

[DOI: 10.1002/adom.202501312](https://doi.org/10.1002/adom.202501312)



Industry and Innovation

Industrial engagement continues to be central to Diamond's role as a national research facility, helping companies of all sizes turn cutting edge science into real world impact. Over the past year, our Industrial Liaison activity has focused on streamlining how Diamond engages with industry, strengthening long term partnerships, and supporting ambitious programmes that operate at scale across the UK and Europe.

One of the most important developments during the year was the merger of the Industrial Liaison and Research Support teams to form an Industry and Innovation group. Bringing these functions together has transformed how industry engages with Diamond. Rather than having to navigate multiple interfaces, partners now benefit from a more joined up approach that covers funding, contracts, delivery and reporting in a single, coherent pathway. The merger has strengthened internal collaboration, sharpened our strategic focus, and ensured that industrial needs are embedded from the earliest stages of programme design.

This integrated model has been particularly valuable as Diamond has embarked on increasingly complex, multi partner initiatives. A standout example is OpenBind, a project funded by the UK Government's Sovereign AI fund, which has moved from its set-up phase into full delivery during the reporting period. OpenBind brings together academic researchers, industry partners and

public funders around shared challenges in structure enabled drug discovery, using open science principles alongside industrial best practice and AI-ready data. Diamond has played a central role in convening this diverse community and delivering a programme that balances ambition with practical execution.

OpenBind has also shown how Diamond can support new ways of working with industry: developing approaches to governance, contracting and risk management that are flexible enough for innovation while robust enough for large, funder backed programmes. The experience gained through OpenBind is already influencing wider research activity, strengthening Diamond's ability to act as a trusted delivery partner for similarly ambitious initiatives in the future.

As the programme moves into its next phase, it continues to demonstrate the value of Diamond's facilities, expertise and collaborative culture.

At the European level, the year also marked the successful conclusion of LEAPS INNOV, a major project under the League of European Accelerator based Photon Sources (LEAPS). Our group's involvement in LEAPS INNOV focused on improving industrial access to light sources across Europe, with a particular emphasis on engaging SMEs and aligning facilities more closely with industrial needs. Diamond led the industrial engagement reporting for the project, drawing directly on extensive conversations with industrial partners. This work provided a grounded, honest picture of what industry really needs from research infrastructures, helping to inform future strategy across the LEAPS network.

Crucially, LEAPS INNOV did not mark an end point. Building on its success, Diamond was awarded a leading role in the follow-on programme LEAPS TECH. This new project moves from insight to action, focusing on practical collaboration between facilities to improve technologies, methods and processes that support industrial users.

Diamond has been closely involved in shaping LEAPS TECH's industrial work, reinforcing its position as a European leader in industrial engagement and innovation within large-scale research infrastructures.

Taken together, the past year marks a clear transition point for Industrial Liaison at Diamond. The merger with Research Support has laid the foundations for a more agile, user focused model of engagement. OpenBind has shown what is possible when long term partnerships are built around shared ambition and trust. And the journey from LEAPS INNOV to LEAPS TECH reflects Diamond's growing role in shaping how industry engages with photon science across Europe.

Looking ahead, the group will build on this momentum to support the next generation of industrial challenge led programmes, aligned with Diamond's future strategic direction. The focus will be on earlier engagement, smarter access routes for companies, and deeper collaboration that spans facilities, disciplines and borders. As Diamond prepares for the future, Industrial Liaison will continue to ensure that industry is not just a user of the facility, but an active partner in shaping its impact – helping translate world class science into innovation, growth and societal benefit.





Scientific Software, Controls and Computation

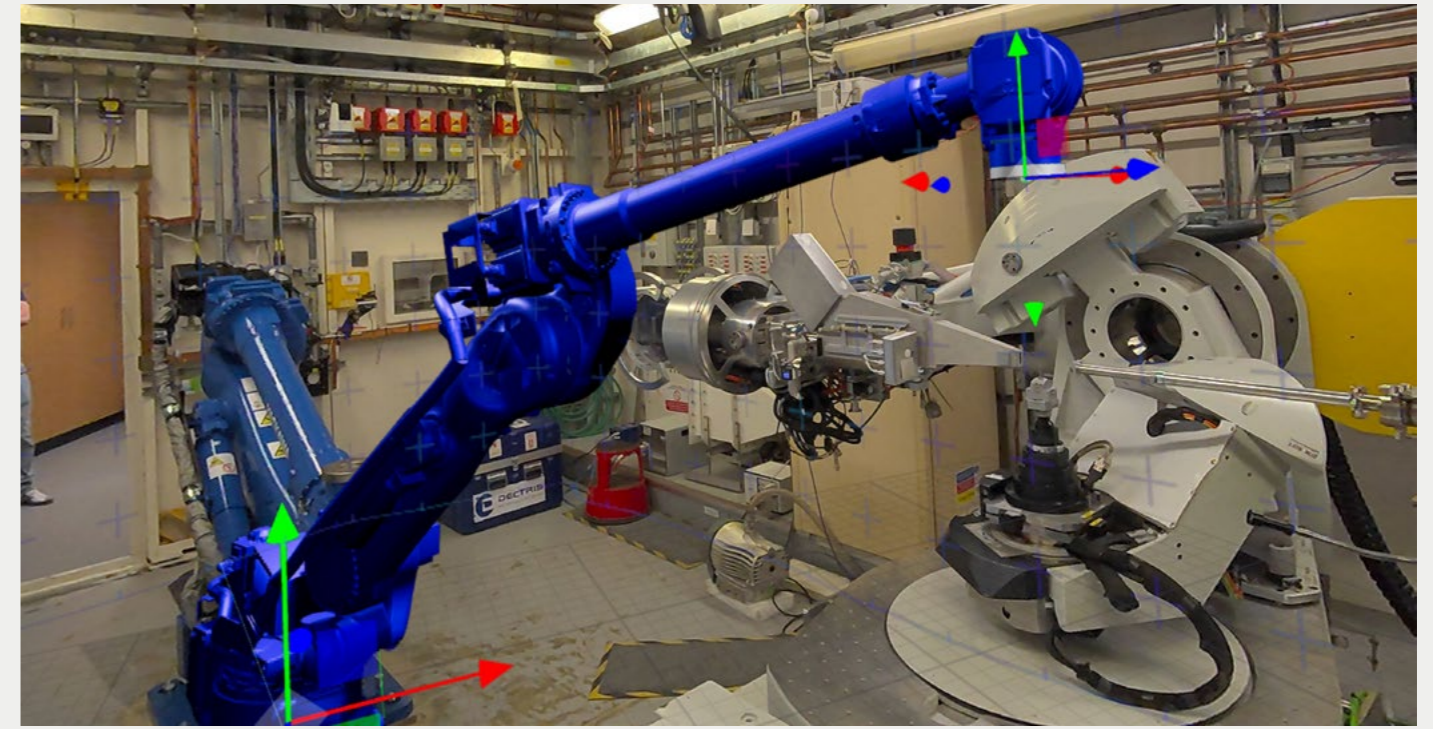
The Scientific Software, Controls and Computation (SSCC) department is responsible for overseeing all software, computing, and control systems that underpin and advance Diamond's scientific programme.

The department is organised into five specialised groups: Scientific Computing, Data Analysis, Data Acquisition, Beamline Controls, and Scientific Information Management Systems. This structure is carefully designed to emphasise the critical role of each area in delivering and supporting robust software, computing, and control solutions, ensuring the highest standards of service for the facility. This reflects that software and computing services are an essential driver of the facility's operations and its scientific productivity.

Diamond-II core software

Diamond-II requires a step change in software, controls and computing to support future scientific delivery.

Over the past year, substantial progress has been made in building the core platforms and infrastructure to ensure the facility is ready. Software development has matured, with useful capabilities already emerging ahead of the dark period. Workshops and away days have helped science and software teams explore opportunities and challenges in adopting these new systems. Following deployment to the ViSR beamline, components are now being integrated into I15-1 to enhance and automate their mail-in programme. Imaging and macromolecular crystallography have also started to benefit from improved pipelines and web-based tools.



Visualising a robot model alongside the physical robot in a beamline experiment hutch

New ULIMS services

Universal LIMS (Laboratory Information Management System) is a new set of web services being developed as part of the Diamond-II upgrade. It will provide users and beamline scientists with tools to manage the logistics and scientific metadata for their experiments. Over the past year development of these services has continued, with minimum viable products of the Data Catalogue and Sample Information services now complete, and Experiment Definition and Container Logistics in progress. The Universal LIMS team has been closely involved in the I15-1 mail-in project to allow users to provide the information on how to run their samples on the beamline, and automatic data ingest has been set-up in the Data Catalogue for B18.

AI opportunities

AI offers immense opportunities from the orchestration of complex experiments to the efficient management of datasets, and sophisticated analysis of scientific results. Recognising the transformative potential of AI, Diamond is proactively developing new AI-powered capabilities. Over the past year, Diamond secured £2.5 million in funding to address future computational and storage requirements for AI, alongside £8 million dedicated to pioneering work in protein crystallography – actively showcasing our expertise and achievements in this field. In the coming year, we will deliver these advantages to the UK user community and beyond, through the provision of sovereign capabilities, open and curated datasets, and a concerted effort to enhance AI integration across Diamond as a whole.

Anti-collision modelling for beamlines

We have developed tools for modelling and visualising robotic systems with a focus on collision awareness and spatial constraints. The software is written in Python and Java Script to represent instrument geometry, using imported CAD derived STL models, alongside kinematic descriptions and visualisation tools. An interactive web-based environment with virtual and augmented reality is included. The software enables offline exploration of robot and instrument motion, workspace limits, and potential collision scenarios, supporting safer deployment and informed system design. By combining geometry, simulation, and visualisation in a lightweight framework, this approach provides a practical foundation for integrating anti-collision modelling into Diamond's control and acquisition system paving the way for physical AI and the automation of complex experiments.

Machine

Machine operation

2025/26 was our 19th year of operation and carried out in normal operating mode: running six days per week, from 09:00 Wednesday to 09:00 Tuesday, interspersed with machine development days.

A total of 217.4 days (5,217 hours) were scheduled for user mode operation, including five beamline start-up days. Most scheduled operation was in standard multibunch mode (900-bunch train) with total current of 300mA. However, 37 days were scheduled for hybrid mode, using a 686-bunch train, incorporating a high-charge 3nC bunch positioned in the centre of the dark gap.

The annual operating statistics are shown in Figure 1. The overall Mean Time Between Failures (MTBF)

was disappointing at 77.9 hours, but still above the target minimum of 72 hours. User uptime was more disappointing at 94.4%, representing a significant reduction compared with recent years. This decrease was primarily due to approximately one week of lost user time following a major water leak affecting a main Control and Instrumentation Area and causing significant damage. Excluding this single event the uptime would have been 97.1%, consistent with previous years.

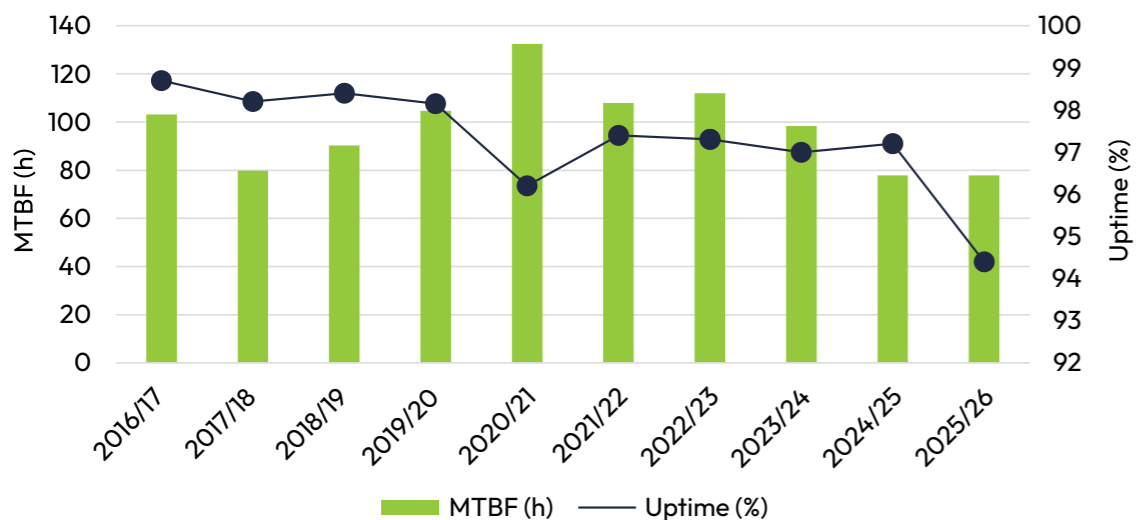


Figure 1: MTBF and uptime for the last 10 years

Radiofrequency developments

The new SLED system installed in the Linac has been in routine operation throughout the year, allowing operation with a single klystron rather than with two as before, at the same power level. This has proved to be a stable and robust mode of operation, providing greater efficiency and resilience.

Significant progress has also been made last year in preparing the RF systems for Diamond-II. Two new 120 kW solid-state amplifiers have been installed on a new RF platform and passed their Site Acceptance Tests. There will eventually be three similar platforms hosting six amplifiers, with two further amplifiers located elsewhere. Overall, for the Diamond-II storage ring there will be eight normal conducting cavities powered by eight amplifiers, to provide redundancy and removing the reliance on superconducting cavities and obsolete IOT amplifiers.

The kick-and-cancel injection scheme

One of the main goals of the Diamond-II upgrade is the ability to inject fresh electrons into the storage ring without affecting the user experiments. This is to be achieved by adopting a novel 'kick-and-cancel' injection scheme. In this, fast stripline kickers are used to deflect a single stored bunch in the filling pattern, causing it to oscillate at large amplitudes. This is followed by a second kick a few turns later, placing it back on axis. The arrival of the fresh electron bunch from the booster is timed to arrive with the second kick, reducing its oscillation amplitude and allowing it to be captured into the storage ring with good efficiency.



Two new 120 kW solid-state 500 MHz amplifiers installed on a new platform in readiness for Diamond-II.

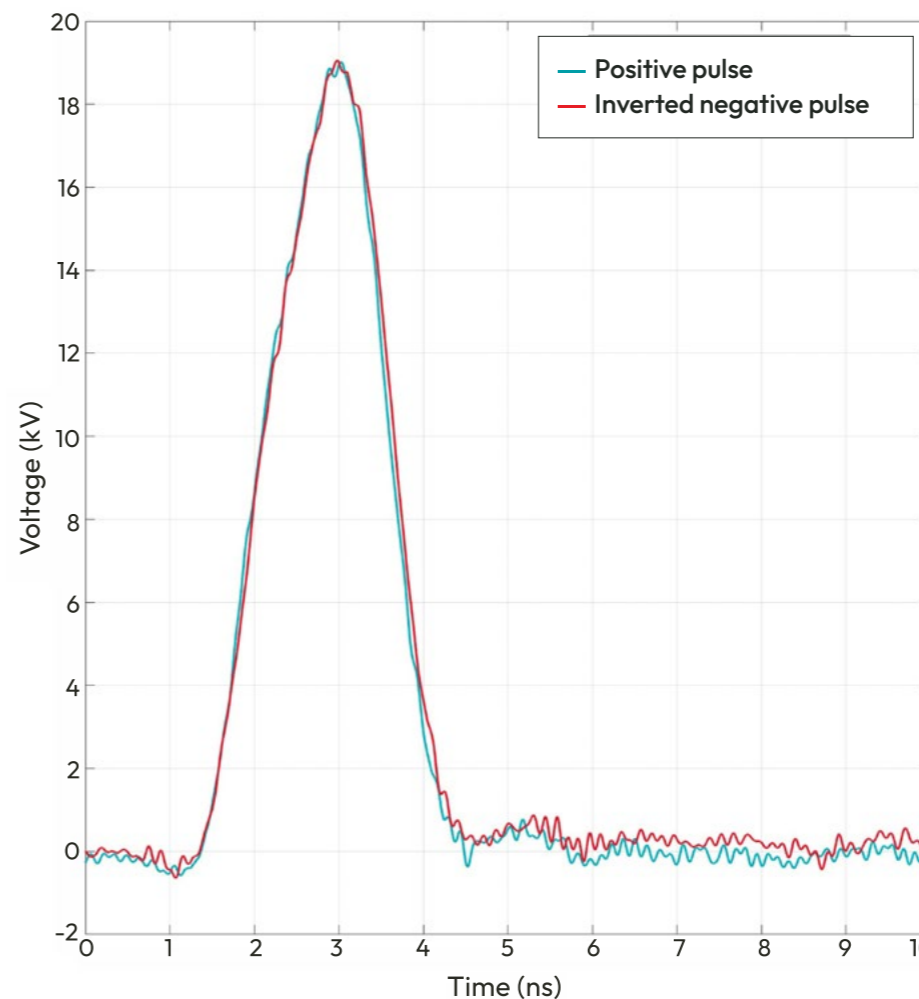


Figure 2: Estimated voltage pulse at the stripline kicker showing close to 3ns full width



Buildings and infrastructure

Buildings

The Diamond Extension Building (DEB) will provide assembly areas and storage space for the construction of Diamond-II equipment prior to installation, as well as some additional office accommodation.



The DEB was completed and handed over to Diamond in December 2025 and underwent office and laboratory fit outs, allowing staff to progress the Diamond-II programme. An official opening ceremony was held on March 2026, attended by various dignitaries.

Beamline cabin and services

The new flagship beamlines have progressed with the main structures of SWIFT and CSXID well underway with a scheduled completion date of August 2026. Services installation for K04 have also recently commenced on site.

SWIFT

To gain experience with this scheme, prototype components have been developed and tested in the existing storage ring. A vertical stripline kicker was installed in straight I19 in June 2025, initially without a power supply attached. This allowed the impedance to be checked by monitoring electron beam stability as a function of stored current along as well as recording the equilibrium temperatures of the stripline components. Once these tests were satisfactorily complete, the kicker could then be connected to a ± 20 kV, 3 ns pulser to investigate the impact of kicking the electron beam. Figure 2 shows the estimated pulse at the striplines, based on measurements made at the attenuators.

Various tests were carried out, including validation of the expected kick amplitudes, studies of pulse stability,

impact on trailing bunches and confirmation of kick-and-cancel double-pulse operation. This final test can be seen in Figure 3 below, in which the oscillation amplitude of the target bunch is plotted as a function of time for five consecutive shots superimposed, with and without the second kick. Another important result was that it has been verified that a 3nC single bunch charge (typically used for hybrid mode) can be maintained while firing the double kick, but the bunch becomes unstable and is lost when using only a single kick, showing the expected benefit of the kick-and-cancel scheme over the previously proposed aperture sharing injection scheme in suppressing wakefields. The lessons learnt from these tests are now being incorporated into the Diamond-II designs, and the selection of cables, feedthroughs and attenuators has now been made.

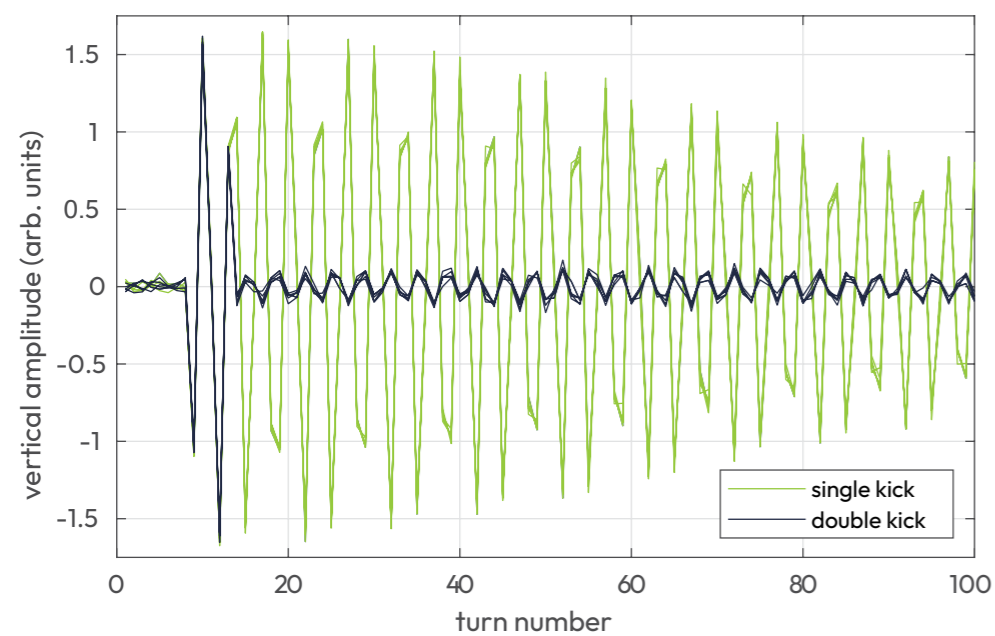


Figure 3: Proof-of-principle tests of the kick-and-cancel injection scheme. The plot shows the beam orbit for five consecutive kicks to the stored electron bunch, first with a just a single kick on turn eight (blue lines), then with the second kick five turns later (red lines).





Uninterrupted supply supplies (UPS): various critical plant at Diamond is supported with UPS (battery backup) in times of mains power failures, ensuring that critical equipment does not have unwanted power interruptions. Many of Diamond's UPS units were approaching end-of-life or had become too small for the increasing electrical loads required. Diamond commissioned the installation of 23 new UPS units across the facility, supporting electrical power loading requirements for machine and beamline-critical equipment.

Adiabatic coolers: In 2021, Diamond installed adiabatic coolers on two of the four main synchrotron chillers to supplement the heat rejection capacity of the existing dry air coolers. This form of cooling provides a lower condensing temperature to the main chillers which stabilises them in times of very high ambient temperatures. Further funding was provided in 2025 to install adiabatic coolers on the remaining two main chillers and works are well underway with a planned completion by the end of this summer.



New and upgraded UPS units



Adiabatic coolers

1MW data centre

The construction of the data centre is well underway with a planned completion date of February 2027. The data centre is a key Diamond-II investment that will more than double current computing capacity and support rapidly growing scientific data needs. The purpose-built facility will use efficient liquid-cooling and free-cooling technologies to reduce environmental impact while enabling high-density HPC, storage and networking.



1MW Data Centre

Infrastructure

Demineralised 'A' pipework upgrades: construction within the Storage Ring tunnel has progressed, with 70% of the facet wall works now completed. The upgrade works will increase the capacity of the distribution pipework to service the increased flow requirements for Diamond-II girders.



Demineralised A pipework upgrades





Energy savings

Diamond continues with its energy saving programme, realising savings of £3,654,401 for 2025. This brings accumulated total savings to £18,592,374 since conception of the programme in 2009.

Figure 4 provides a graphical comparison of energy supplied from the grid (cyan), energy generated by Diamond's solar panel installations (yellow) and other energy savings measures such as LEDs, light sensors, variable speed drive installations (green).

This demonstrates that approximately 5.8% of Diamond's annual energy consumption is generated through solar power.

A further breakdown energy savings from solar power alongside other miscellaneous energy saving measures is depicted in Figure 5.

The above cost savings equate to an overall energy saving of 13.9MWh for 2025.

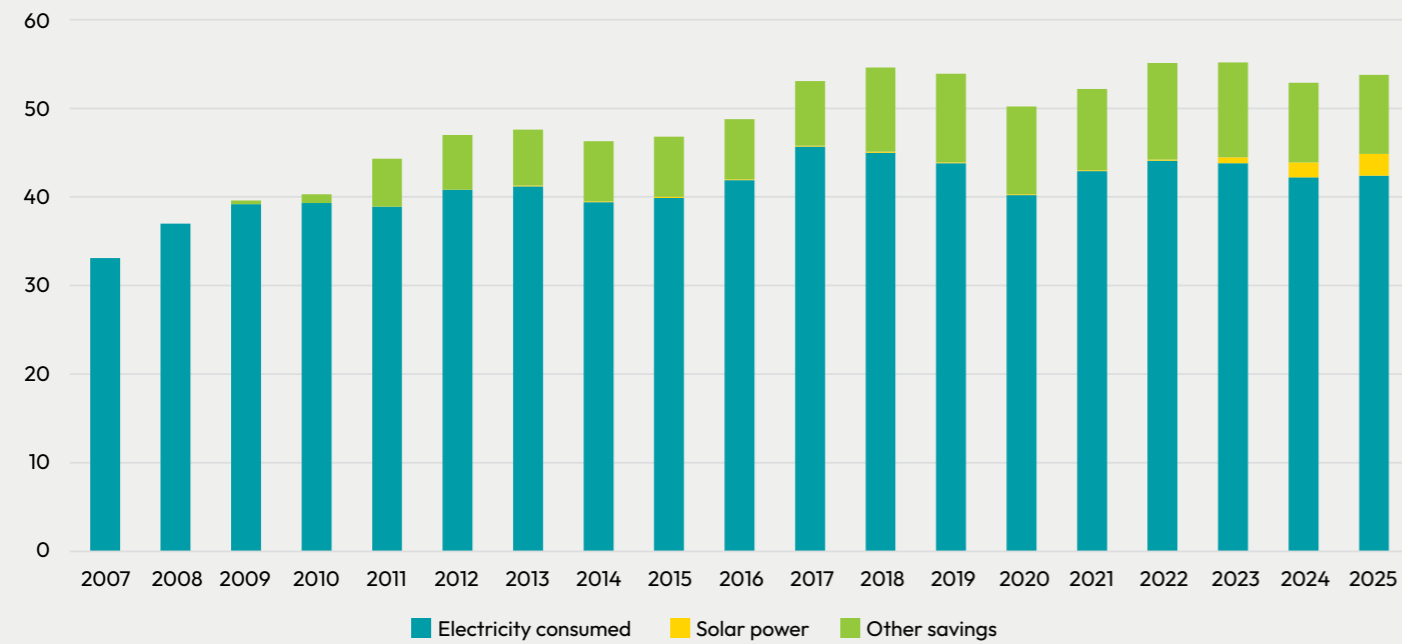


Figure 4: Grid usage vs solar power generation vs miscellaneous other energy saving measures

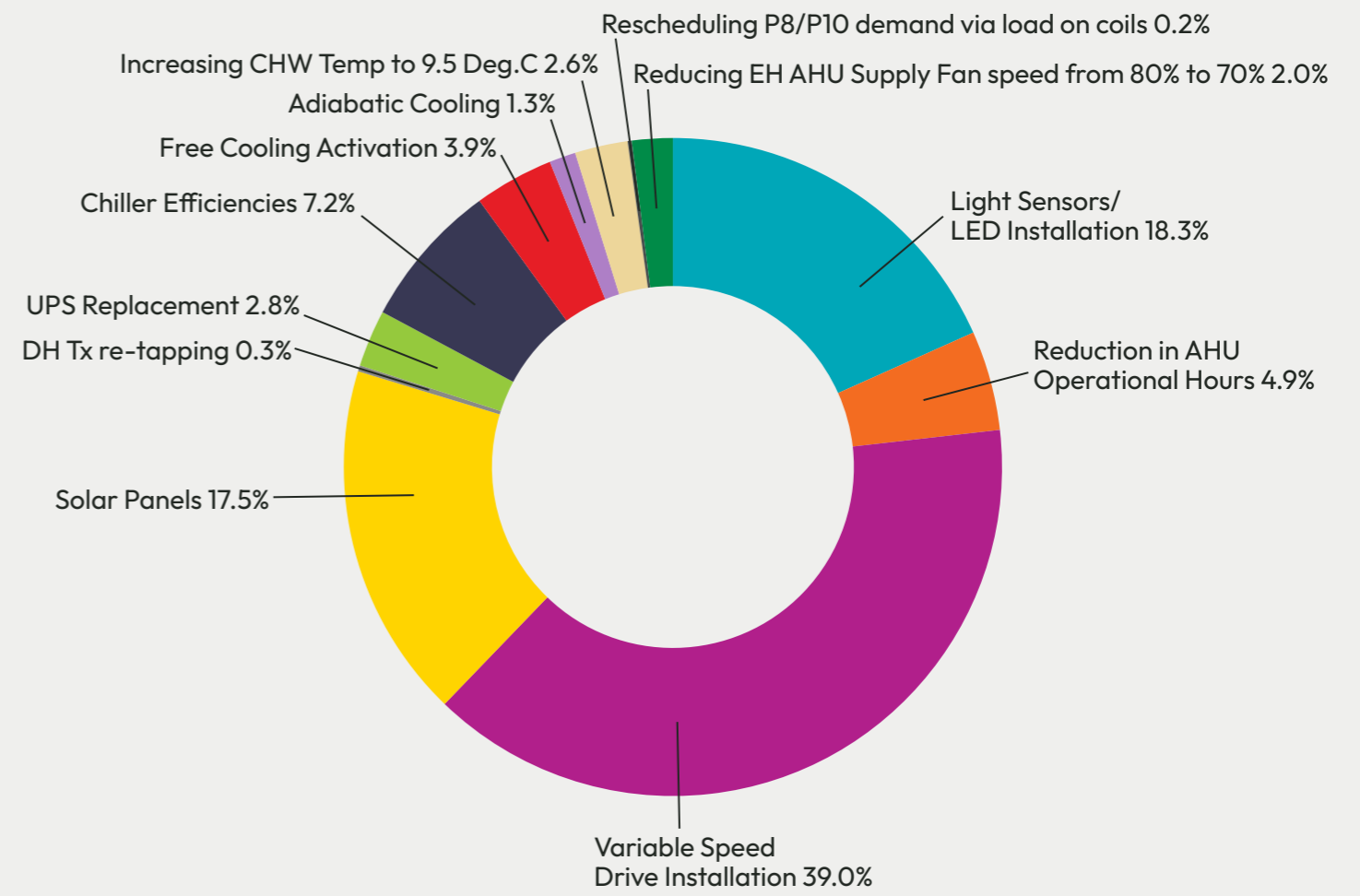


Figure 5: Energy saving measures per category for 2025





Diamond-II

There has been significant effort across almost all areas of Diamond to progress the Diamond-II upgrade project this year. This is intentionally reflected in this annual review, as details on the progress of the upgrade are captured in the various technical sections and not just in this dedicated section.

As of March 2026, the project is approximately a third through the time estimates and has either spent or committed 50% of the estimated cost to complete. We have taken occupation of the DEB and are putting it into operational use, and the construction of the 1MW data centre has started. Deliveries for technical equipment are starting to arrive in the facility and are being housed within the DEB or in a contracted storage facility a few miles away in Milton Park.

In September 2025 a Project Assessment Review was held, led by three UK government Gateway-trained project delivery experts over three days. They spent time interviewing key stakeholders within the project team, across Diamond, funders and advisory committees. The review team assessed that “the project is being managed well; however, some risks remain which should be carefully managed. Overall, these risks seem to be understood by the project with mitigations planned”. The review team therefore set the current project delivery confidence assessment as ‘amber/green’.

The review was very useful, pointing out areas to focus on to improve deliverability, beamline financial planning, and completion requirements clarity. It also recognised the concern of funding pressure within Diamond business as usual (BAU), which partially funds the project.

The review also identified areas of good practice, noting strong project leadership and robust project management practices, recognising the value of stakeholder expertise to support delivery, and the value of shared learning and peer review from similar worldwide operations.

In preparations for the dark period, Diamond recognises that minimising the time without user operations is key. We have set a series of readiness reviews every six months to take a critical look at progress, determining whether adherence to planned timeframes remains feasible.

The first of these reviews took place in December 2025, concluding that the current timelines are achievable with successful mitigation of key risk areas. At the next review in June 2026, we will take another in-depth critical look and update users and stakeholders.



Figure 6: Diamond-II readiness reviews timeline

A key review is planned for December 2026, as this will determine the details of last call to users for beamtime. Through this year, as project budgets have proved to be very robust, we have been able to release a further £13m of scope into the project within the available funding. However, as recognised in the Project Assessment Review, BAU funding is under pressure. Funding towards the project has been recognised and it is highly unlikely we will be able to release further scope without a change in funding or risk within the project. Due to this funding reduction, we are developing scenarios and options should risks realise and we need to take action. Diamond will monitor progress and risk over the coming years and attempt to maximise what can be delivered within the funding available.



CSXID





Imaging User Meeting, and international conferences including the HPC-CONEXS conference, Particle Accelerators and Beams Conference, and the International Technical Safety Forum. The Early Career Scientists Symposium was a particular highlight, which provided an opportunity for early career scientists to be inspired by high-profile speakers from a diverse range of career paths, including a Nobel Prize winner and a European Space Agency astronaut reserve.

“Our A-Level Physics class went on an amazing trip to Diamond Light Source and honestly, it was one of the best educational experiences I’ve had so far.” – Schools open day visitor

Stakeholder engagement and VIP visits

Throughout the year, Diamond hosted many stakeholder and VIP visits which solidified partnerships, enhanced international collaboration, and celebrated milestones of the Diamond-II project. In July 2025, Feryal Clark MP, the UK’s Parliamentary Under-Secretary of State for the Department of Science, Innovation and Technology, alongside Clara Chappaz, France’s Minister Delegate for AI and Digital Affairs, visited Diamond to learn about the exciting work of the OpenBind consortium. In December 2025, Diamond hosted a delegation from SESAME in Jordan, marking a renewed commitment to the existing scientific collaboration between the two facilities. In March 2026, Diamond marked the official opening of the Diamond Extension Building with an event attended by members of the Board, representatives from campus facilities, DEB contractors and staff members on our Diamond-II project board, to mark a significant step forward in the delivery of the Diamond-II project.

Engagement

It has been another impactful year of engagement at Diamond, underpinned by a blend of in-person and hybrid events for the scientific community, a varied programme of public engagement activities, and high-profile stakeholder visits.

The 2025/26 period saw increased numbers across the board in comparison to 2024 - 25, including for school student and teacher interactions, stakeholder and VIP visitors, and science and technical events attendees. Of particular note in the last year was the number of staff from across the organisation who supported engagement activities. Our staff are regularly praised by visitors as enthusiastic, friendly and great ambassadors for Diamond.

Public engagement

Our core public engagement programme, including partner events with STFC, continued to thrive. Notable highlights from this period include our attendance at large offsite festivals, such as IF Oxford and the Festival of Tomorrow in Swindon, where we engaged hundreds of local families with the work of Diamond; our schools work experience week, which welcomed 54 students across 23 projects across our facility; and The Beam,

the most powerful display laser in the UK, which shone from the centre of Diamond on the first day of 2026 to mark eight decades of Harwell’s world-leading science and innovation, and attracted the attention of people across the region.

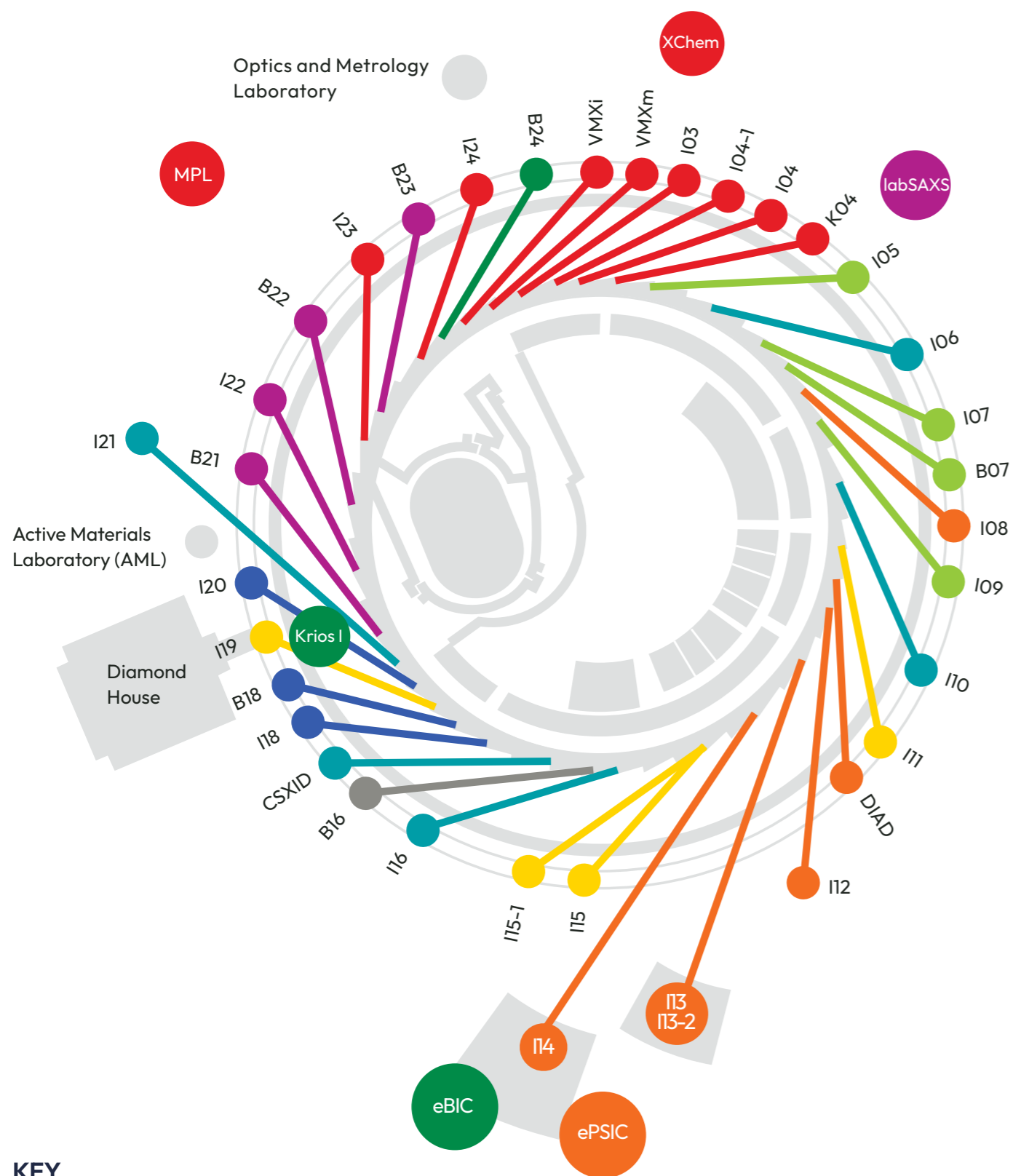
“I got stopped by three teenagers in the street who recognised me from one of the tours at Diamond. I asked if they enjoyed it, to which they said they were inspired to work at Diamond in the future.” – Staff volunteer

Scientific and technical events

Diamond continued to host a wide array of scientific and technical events, catering to the needs of our diverse staff and user communities. Highlights from this period include multiple successful user meetings including the Structures and Surfaces Group User Meeting and Biological Cryo-



Science groups around our facility



KEY

- Macromolecular Crystallography
- Biological Cryo-Imaging
- Imaging and Microscopy
- Crystallography
- Magnetic Materials
- Soft Condensed Matter
- Structures and Surfaces
- Spectroscopy
- Optics and Metrology

Beamlines

Beamline	Main Capabilities	Energy / Wavelength Range
Versatile MX micro (VMXm)	Micro- and nano-focus in vacuum cryo-macromolecular crystallography	7 - 28 keV
Versatile MX in situ (VMXi)	In situ microfocus, room temperature macromolecular crystallography, Serial Synchrotron Crystallography	10 - 25 keV
I03 - UDC MX	High Throughput (HT) Unattended Data Collection (UDC) Macromolecular Crystallography (MX), Multiwavelength Anomalous Diffraction (MAD)	5 - 25 keV
I04 - Microfocus MX	MX, MAD, variable and microfocus MX	6 - 2018 keV
I04-1 - Monochromatic MX	MX, XChem fragment screening	13.53 keV (fixed wavelength)
I05 - ARPES	Angle-Resolved PhotoEmission Spectroscopy (ARPES) and nano-ARPES	18 - 240 eV; 500 eV
I06 - Nanoscience	X-ray Absorption Spectroscopy (XAS), X-ray photoemission microscopy and X-ray magnetic circular and linear dichroism	80 eV - 2200 eV
I07 - Surface and Interface Diffraction	Surface X-ray diffraction (SXRD), Grazing Incidence X-ray Diffraction (GIXD), Grazing Incidence Small Angle X-ray Scattering (GISAXS), X-ray Reflectivity (XRR)	6 - 30 keV
B07 - VerSoX: Versatile Soft X-ray	Branch C: Ambient Pressure XPS and NEXAFS Branch B: NEXAFS and High-Throughput XPS	110 - 2800 eV 45 - 2200 eV
I08 - Scanning X-ray Microscopy	Scanning X-ray microscopy, NEXAFS/XANES, X-ray fluorescence (XRF)	I08 branch: 250 eV - 4.4 keV I08-1 - Soft and Tender X-ray Ptychography branch: 250 - 2000 eV
I09 - Atomic and Electronic Structure of Surfaces and Interfaces	XPS (including HAXPES), X-ray Standing Waves (XSW), Near Edge X-ray Absorption Fine Structure (NEXAFS), energy-scanned photoelectron diffraction	Hard X-rays: 2.1 - 18+20 keV
I10 - BLADE: Beamline for Advanced Dichroism Experiments	Soft X-ray resonant scattering, XAS and X-ray magnetic circular and linear dichroism	Circular: 400-1600 eV; Linear Horizontal: 250- 1600 eV; Linear Vertical: 480-1600 eV
I11 - High Resolution Powder Diffraction	X-ray powder diffraction	7 - 25 keV (1.7 - 0.5 - 2.1 Å)
DIAD: Dual Imaging and Diffraction	Correlated X-ray computed tomography (XCT) and microfocus X-ray powder diffraction (XRD)	Imaging: 7 - 38 keV Diffraction: 7 - 38keV
I12 - JEEP: Joint Engineering, Environmental and Processing	Time-resolved imaging and tomography (EH1 and EH2); phase contrast imaging (EH1); 2D detector for time-resolved monochromatic powder diffraction, single crystal diffraction and diffuse scattering; energy dispersive X-ray diffraction (EDXD);	53 keV - 150 keV monochromatic or continuous white beam
I13-1 - Coherence	Nano-tomography: Ptychography, X-ray fluorescence (XRF), X-ray diffraction (XRD). 3D Bragg mapping: Coherent diffraction imaging (CDI) and Ptychography	6 - 20 KeV
I13-2 X-ray imaging	Phase contrast imaging, Tomography, Ptychography, Bragg CDI, Full-field microscopy (TXM), grating interferometry, nano-tomography	8 - 30 keV
I14 - Hard X-ray Nanoprobe	Nanofocus X-ray fluorescence (XRF), X-ray Absorption Spectroscopy (XAS) and transmission diffraction (XRD) mapping and tomography. Differential phase contrast (DPC) imaging, ptychography and ptycho-tomography.	5 - 23 keV

Beamlines

Beamline	Main Capabilities	Energy / Wavelength Range
I15 - Extreme Conditions	Powder diffraction, single crystal diffraction	Monochromatic and focused 20 - 80 keV
I15-1 - XPDF	X-ray Pair Distribution Function (XPDF)	40, 65, and 76 keV
I16 - Materials and Magnetism	Resonant and magnetic single crystal diffraction, fundamental X-ray physics	2.57 - 15 keV
B16 - Test beamline	Diffraction, imaging and tomography, topography, reflectometry	4 - 20 keV monochromatic focused; 4 - 45 keV monochromatic unfocused White beam
I18 - Microfocus Spectroscopy	Microfocus X-ray Absorption Spectroscopy (XAS), X-ray fluorescence (XRF) and X-ray diffraction (XRD) mapping and tomography	2.05 - 20.5 keV
B18 - Core XAS	X-ray Absorption Spectroscopy (XAS)	2.05 - 35 keV
I19 - Small Molecule Single Crystal Diffraction	Small molecule single crystal diffraction	5 to 25 keV / 0.5 to 2.5 Å
I20 - LOLA: Versatile X-ray Spectroscopy	X-ray Absorption Spectroscopy (XAS), X-ray Emission Spectroscopy (XES)	Scanning branch: 4.5 - 20 keV
I21 - Inelastic X-ray Scattering	Resonant Inelastic X-ray Scattering (RIXS), X-ray Absorption Spectroscopy (XAS)	250 - 3000 eV
B21 - High Throughput SAXS	BioSAXS, solution state small angle X-ray scattering	6 - 23 keV (set to 13.1 keV by default)
I22 - Small Angle Scattering and Diffraction	Small angle X-ray scattering and diffraction: SAXS, WAXS, USAXS, GISAXS. Micro-focus SAXS Tensor Tomography. Micro-focus capability.	7 - 20 keV
P38 - labSAXS (Offline SAXS instrument)	SAXS/WAXS, GiSAXS/GiWAXS	9.2; 17.4 keV
B22 - MIRIAM: Multimode InfraRed Imaging And Microspectroscopy	FTIR microscopy & FPA imaging FTIR and THz spectroscopy FTIR nanospectroscopy s-SNOM and AFM IR	microFTIR: 5,000-500cm ⁻¹ (2-20µm) FTIR/THz:10,000-10cm ⁻¹ (1-1000µm) nanoFTIR: 5000-600cm ⁻¹ (2-17µm)
I23 - Long Wavelength MX	Long wavelength macromolecular crystallography	2.1 - 11 keV (1.1 - 5.9 Å)
B23 - Circular Dichroism	Circular Dichroism (CD)	Module A: 125-500nm for CD Imaging at 50 µm spatial resolution, and for 96-cell high throughput CD (HTCD). Module B: 180-700nm for MMP at 50 µm spatial resolution.
I24 - Microfocus and Serial MX	MX, MAD, Serial Crystallography, high energy MX	7 - 30.0 keV
B24 - Cryo Transmission X-ray Microscopy (TXM)	Cryo Structured Illumination microscope (CryoSIM) 3D cryo super resolution fluorescence microscopy /correlative microscopy	405, 488, 561, 647 nm

New beamlines in development for Diamond-II

Beamline	Main Capabilities	Energy / Wavelength Range
K04 - ultra-HT MX for XChem	Automated, integrated, ultra-high throughput crystal preparation and MX for accelerated chemical biology	10 - 27 keV
K14 - SWIFT	X-ray Absorption Spectroscopy (Quick-EXAFS), X-ray fluorescence (XRF) and X-ray diffraction (XRD) mapping and tomography	4-34 keV
I17 - CSXID	Ptychography, Tomography, Scanning Transmission X-ray Microscopy (STXM), X-ray Absorption Spectroscopy (XAS) and X-ray Magnetic Circular and Linear Dichroism (XMCD/XMLD)	250 eV - 2000 eV

Electron Microscopes

Microscope	Main Capabilities	Accelerating Voltages
Titan Krios I	Cryo-EM, Cryo-ET	80, 120, 200, 300 kV
Titan Krios II	Cryo-EM, Cryo-ET	80, 120, 200, 300 kV
Titan Krios III	Cryo-EM, Cryo-ET	80, 120, 200, 300 kV
Titan Krios IV	Cryo-EM, Cryo-ET	80, 120, 200, 300 kV
Titan Krios V	Cryo-EM, Cryo-ET	80, 120, 200, 300 kV
Glacios	Cryo-EM, Cryo-ET	200 kV
Aquilos	Cryo-SEM, Cryo-FIB	3 to 30 kV
JEOL ARM200F	Atomic scale STEM imaging, EELS, EDX, electron diffraction	80, 200 kV
JEOL ARM300F	Atomic scale TEM and STEM imaging, electron diffraction, 4D-STEM, EDX	30, 60, 80, 160, 200, 300 kV





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