



365

DAYS ON
(AND AROUND)
PLANET EARTH

2023 Year in Review

The UK's
leading science
and innovation
campus

4
CLUSTERS:

ENERGY, SPACE,
HEALTH AND
QUANTUM
COMPUTING

250+

PIONEERING
ORGANISATIONS

7000+

SCIENTISTS,
ENGINEERS AND
INNOVATORS



Moderna selects Harwell as UK home

Moderna, a biotechnology company pioneering messenger RNA (mRNA) therapeutics and vaccines, has selected Harwell as the home for a national health tech hub.

The Moderna Innovation and Technology Centre (MITC) – a base for pioneering research and the development of mRNA and nucleic acid therapeutics, will comprise two buildings:

- A research and development and manufacturing facility, providing the UK public with access to cutting-edge mRNA vaccines for a wide range of respiratory diseases, pending regulatory assessment and licensure
- A clinical biomarker laboratory

It's expected that the 145,000 sq ft site will create hundreds of jobs across Oxfordshire and the UK, as well as cement Harwell Campus's position as a national health tech hub – with over 70 life science organisations already on site.

1 Ground breaking celebration
 2 CGI of The Moderna Innovation and Technology Centre

Pioneer Campus 2040 – shaping the future of innovation campuses

100 guests, from 10 countries, representing eight campuses....

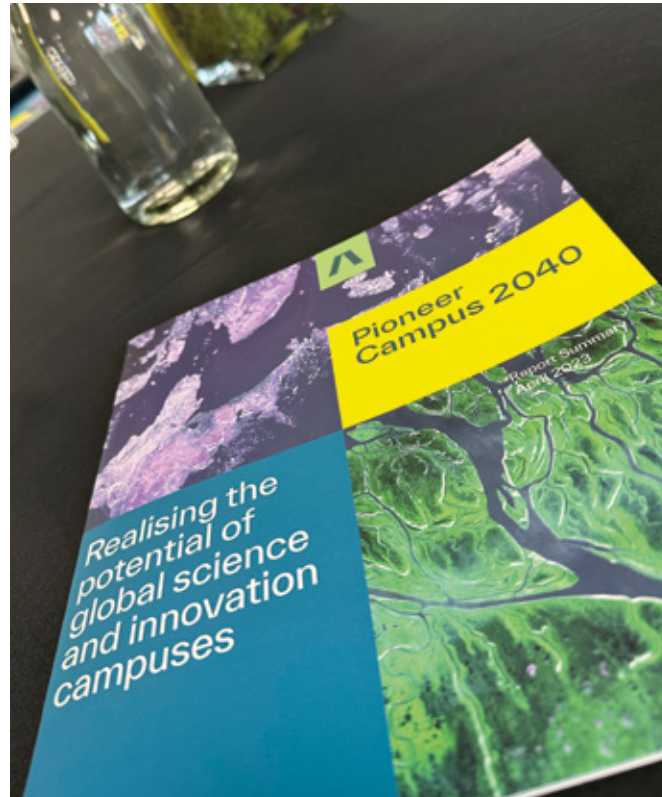
Our Pioneer Campus 2040 symposium attracted a hugely diverse audience – but revealed a striking amount of common thinking on how to make innovation campuses future-ready.

Campus leaders outlined what the next cycle has in store in terms of the building, management, leadership and investment of their locations. Attendees pooled intelligence, predicted, brainstormed, and collaborated on shaping the future of campuses.

The event took place amid a raft of extraordinary challenges such as climate change, which were outlined in a report launched by SQW in partnership with Harwell at the event.

Findings show that campuses which follow report recommendations will be best-placed to form the next generation of world-leaders.

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Welcome, Magali – A new ‘Out of this World’ conference centre at Harwell

The European Space Agency (ESA) opened a state-of-the-art conference centre to support the thriving UK space industry at Harwell Campus – the UK’s space gateway.

The centre is named Magali, after Magali Vaissiere, ESA’s former director of telecommunications activities, and head of ECSAT, who was instrumental in delivery.

The centre sits alongside ESA’s European satellite and space telecommunications centre (ECSAT) and provides cutting-edge, adaptable meeting facilities, a conference hall for 300 people, meeting rooms, breakout areas, exhibition space and dedicated rooms for interpreters.

“The new state-of-the art conference centre at ECSAT is a very welcome addition to the world-class science campus at Harwell”, offering an attractive base for collaboration and networking between people working in the space sector and beyond.”

Paul Bate, Chief Executive of the UK Space Agency, which provided funding

It’s designed to be a rallying point for the UK space community, and aid further collaboration between the campus’ space, life sciences, quantum, and energy clusters.

Harwell Campus is already a key enabler of the booming UK space industry, accommodating over 100 commercial, public and academic space enterprises.



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- 1 Launch night for Campus Symposium at Divinity School, Oxford
- 2 Pioneer Campus report summary
- 3 Shaun the Sheep visits Harwell
- 4 Official opening of the ESA conference centre

Multi-million-pound international manufacturer chooses Harwell as its centre for optical sensing activities

The WIKA group – an international company which manufactures pressure and temperature measuring equipment – has acquired Harwell-based firm Oxsensis – and earmarked the campus as home of its optical sensing activities.

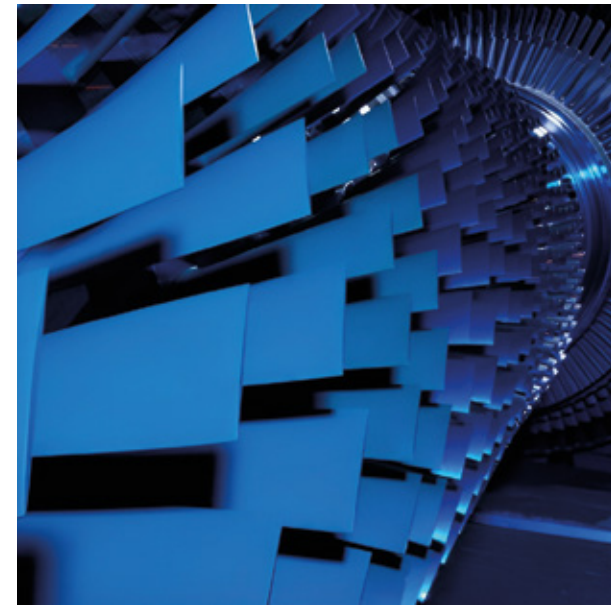
highly accurate and stable optical sensors. Customers worldwide use its products and solutions to monitor and control their critical systems.

Oxsensis realised its potential after working in partnership with a wide range of global brands including Rolls-Royce and GE, across multiple sectors.

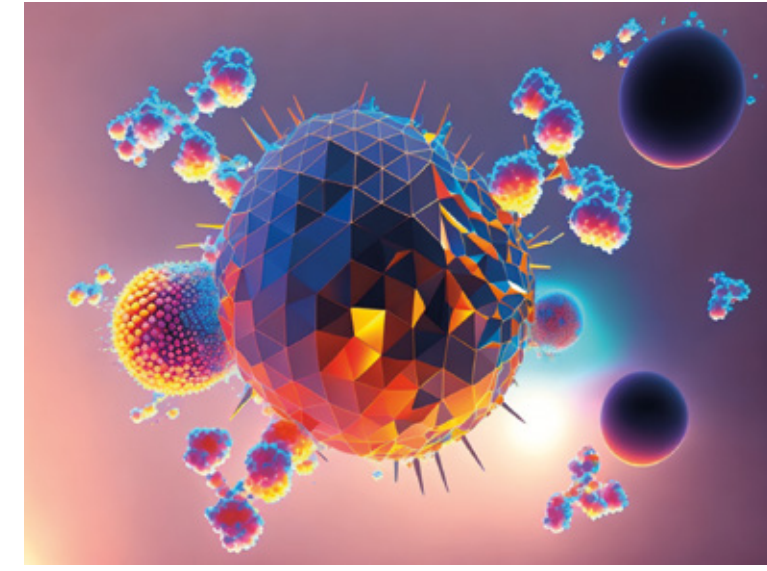
Oxsensis is a spin-out from the Science and Technology Facilities Council's (STFC) Rutherford Appleton Laboratory, based on Harwell Campus. The company pioneered a "new breed" of



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Etcembly: Training the body's cells to target cancer, using genetic engineering

Researchers at Harwell-based biotech company Etcembly have successfully used ChatGPT-inspired generative AI to design a pilot immunotherapy drug for cancer. It's the first time such technology has been used in this way.

This drug binds to PRAME with a million-fold greater affinity than a natural TCR – but does not bind to any cells in healthy tissue, suggesting that it should be highly potent with few side effects.

The drug is based on naturally-occurring molecules known as T cell receptors (TCRs) which bring the body's immune T cells into contact with cancer cells to destroy them.

As a next step, Etcembly hopes to deliver further testing, clinical trials, and development to target other hard-to-treat cancers and autoimmune diseases.

Until now, the challenge has been that the body's T cells can't always differentiate between good and harmful cells in the body -so can also deplete healthy cells.

Harnessing the power of machine learning
Underpinning their research is EMLy™ – a sophisticated supercomputer that uses cutting-edge machine learning algorithms to scans through huge datasets to learn the 'language' of TCRs and find the best receptor for a given target.

A global race is on to use molecular engineering to make TCRs seek out only selected harmful cells in the body, so they can then be used as drugs.

A generative large language model (LLM) similar to ChatGPT is then used to 'rewrite' the genetic code for the TCR in order to make it as effective as possible. Finally, this code is validated experimentally in the lab where it is used to make real life TCR-based drugs for testing.

Etcembly is playing a key role. It has developed a new therapy, ETC-101, which is designed to target PRAME – a molecule that is present in many cancers which have poor survival rates.



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£300 million investment at Harwell, via public-private partnership

We're excited to have secured £300m of financing to deliver 440,000sq ft of new buildings at the campus - including laboratories, advanced manufacturing facilities, and office space.

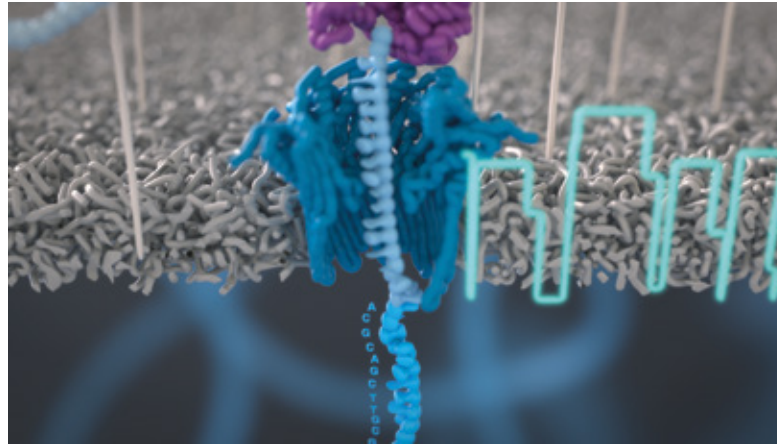
New facilities will include Tech Foundry - comprising 220,000 sq ft of Advanced Manufacturing space - and the Linear Accelerator Building, LAB - a landmark laboratory building for starting and scaling science organisations.

The finance facility was secured by the campus public-private partnership - a joint venture between Brookfield, the Science

and Technology Facilities Council (STFC) and the United Kingdom Atomic Energy Authority (UKAEA). The investment facility was provided by a consortium comprising Deutsche Bank, BNP Paribas and Axa.

“Harwell is a great example of a highly successful public-private partnership, and we look forward to continuing to build this very special place.”

Tim Bestwick, Chair of the Harwell Campus Joint Venture and Chief Technology Officer at UKAEA



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Collaboration is key in new method aimed at improving testing for diseases

Harwell-based Nanopore Technology has played a key role in developing a technology-led process which could make it quicker, easier and more accurate to diagnose diseases.

The company worked in a research collaboration with scientists at Imperial College London to develop a new method, which allows them to review dozens of disease biomarkers at the same time - from less than one milligram of blood.

The test works by mixing the blood sample with DNA 'barcodes'. The resulting solution is injected into a low-cost handheld device developed by Oxford Nanopore - the MinION.

The device holds a flow cell, containing an array of nanopores - very small holes - that are able to read the electrical signature from each DNA

barcode that passes through them. The complex electrical signal the device produces is interpreted by a machine-learning algorithm to identify the type and concentration of each biomarker present in the sample.

Results of using the new test in this way with the blood of healthy participants, for a proof-of-concept study, have been published in Nature.

“The ability to monitor different types of molecules at the same time, in the same sample, offers a distinct advantage over traditional analysis methods.”

Co-first author Ben Reilly-O'Donnell, from the National Heart and Lung Institute at Imperial



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08-09 | 1 CGI of Tech Foundry
2 DNA strand being fed through a nanopore and corresponding signal
3 Nanopore scientist in the lab



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Imagine that: Harwell 'lights up' children's interest in space at Piccadilly Circus

Most children only ever get to see their artwork displayed on their family's fridge door. But thanks to Harwell, a lucky few saw their work 'in lights' at Piccadilly Circus - unveiled by astronauts and celebrities as part of a Space-themed campaign.

candidate Meganne Christian; and former NASA astronauts Susan Kilrain and Nicole Stott.

Harwell Campus hosted around 300 children during a series of events to mark World Space Week. The programme included Rise Together: Solutions Summit - aimed at fostering inclusivity, and highlighting career opportunities in the space sector. As part of this, we were thrilled to be joined by influential women from the space sector, including ESA UK astronaut

Rise Together encouraged children to use their imagination to create artworks expressing what space means to them. The event was inspired by a longitudinal study by NASA, which showed that children's imagination goes into freefall from as early as age five.

To launch the programme, Tim Peake and science communicator Brian Cox joined the female astronauts at Piccadilly Circus, to reveal a giant, illuminated art mosaic comprising all of the children's artworks.



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- 1 Children's artwork in lights at Piccadilly Circus
- 2 Schools day for Rise Together at Harwell Campus
- 3 Rise Together Solutions Summit
- 4 Giant artwork created by 270 school children

What do you get if you cross pioneering imaging technology with 2,500-year-old lizards?

A group of ancient, mummified lizards – who once held ‘God-like’ status – are continuing to inspire people 2,500 years after their deaths – after a team used pioneering imaging techniques developed at Harwell to inspect them without contact in their coffins.

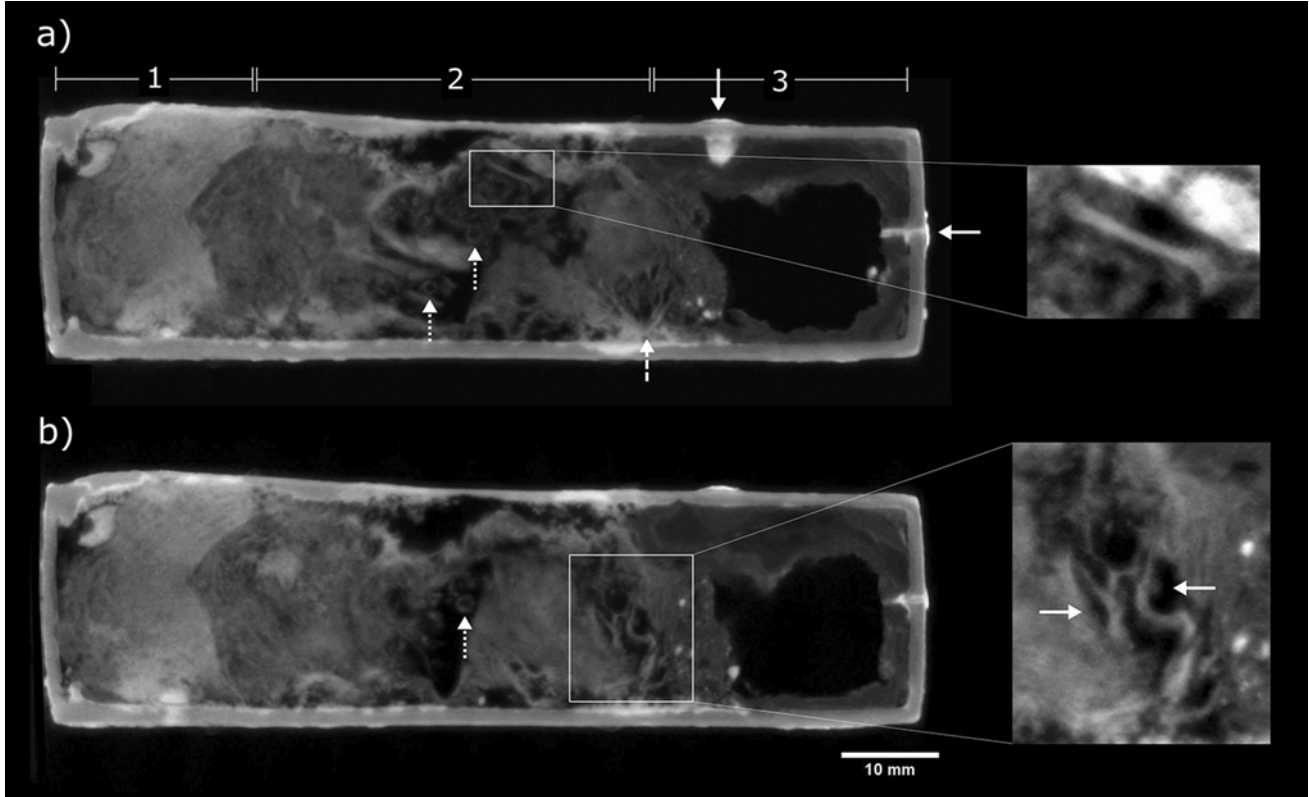
Experts from the British Museum used technology from the ISIS Neutron and Muon Source research facility at Harwell to scan (better than with X-ray) through the metal of six coffins, from ancient Egyptian sites.

They could then view through the wrapping containing the animal, creating detailed images of them without needing to open or damage the coffins.

In neutron imaging, experts direct powerful beams of subatomic particles called neutrons at materials. Teams use scientific instruments to study the paths neutrons take through the material – then infer details about the contents.

The imaging confirmed that the coffins contained bones consistent with North African wall lizards which were wrapped in textile. The lizards placed in these coffins were mummified as part of religious practices and beliefs that particularly thrived in the first millennium BC.

Now there’s huge potential to use the same technology more widely, including within archaeology.



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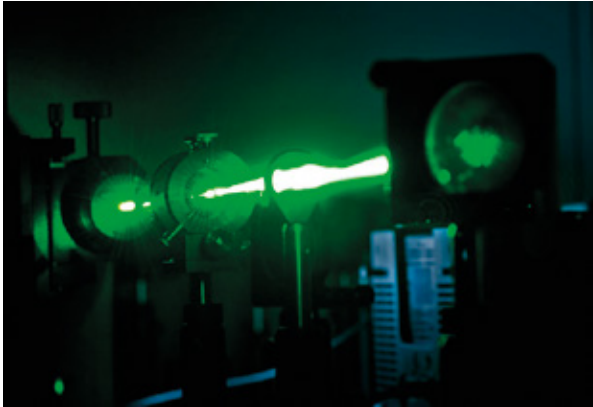
£85m laser could unlock near-limitless access to clean energy

Scientists at Harwell Campus are to build the world’s most powerful laser - an £85 million device which could accelerate efforts to harness nuclear fusion as a source of near-limitless clean energy.

The CLF, at Harwell Science Campus, expects that the new laser, Vulcan 20-20, will be a million, billion, billion times brighter than the Sahara Desert’s brightest sunlight.

The technology, which revolves around plasma -a new material state, could be applied in multiple research areas, including potential ion radiotherapy treatments to treat cancer.

The programme to create Vulcan 20-20 is expected to take six-years to complete and will create a range of new jobs for scientists, as well as designers, engineers, and technicians.



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It will help society to better understand various scientific areas, from astrophysical phenomena like supernovae and solar flares to the potential of laser fusion as a clean energy source.

12-13 1 Neutron image of lizard remains and skull
2 Laser scientist
3 Laser at CLF

2023: Another high-growth year for the Harwell Campus Community

Harwell Campus continues to cement its reputation as a hub for science and tech innovation – with 25 new companies joining as members, and nine organisations expanding their presence on site during 2023.

Please join us in welcoming these companies helping to change the world across multiple industries including health tech, space, agritech, aerospace and defence.

It's all part of rapid growth on the campus. Over the next two years Harwell will build an additional 500,000 sq ft of new laboratory and R&D buildings.

¹ BioOrbit is developing hardware to crystallize drugs – which would mean patients no longer have to go through time-consuming and invasive infusions. The team hope to go truly 'out of this world' – aiming to develop a pharmaceuticals factory in space within the next 10 years. The company is already supported by the Harwell-based UK Space Agency Accelerator, ESA BIC, and ESA's Business in Space Growth Network.

- > ABSL
- > APCO Technologies
- > **BioOrbit Ltd¹**
- > BioSpire
- > Celesse Ltd
- > East London Electric Company
- > Extend Robotics Limited
- > Helix
- > Ionech
- > Knowledge Transfer Network
- > Kognitiv Spark
- > Lifelancer
- > Lodestar Space Ltd
- > MDA Space & Robotics
- > Moderna
- > OptimalSlope
- > Orbit Fab
- > Origin Enterprises
- > OxLEP
- > Radtest
- > Raytheon
- > Samudra Oceans Ltd
- > Second Star Ltd
- > Soil Benchmark Ltd
- > SpaceFlux Ltd
- > Stellar Solutions Aerospace
- > Terra Motus
- > Thales
- > Umbrella Space
- > Vaxbiosolutions
- > Yeet Aerospace Ltd

12,000+

Supporting over 12,000 high-skilled, high-paid jobs across the UK, fostering innovation and expertise in the rapidly growing space industry

£2bn

Projected to contribute £2bn sales for the UK Space Agency, accelerating economic growth and prosperity

56%

Locating an impressive 56% of expenditure outside the South East and London, boosting investment opportunities across the whole of the UK

£23

Delivering a £23 per £1 return on public investment, showcasing Astroscale's ability to maximise value for the UK economy

Astroscale's game changing year

Earlier this year Astroscale announced groundbreaking insights from an Economic Impact Report focusing on growth, job creation and regional development. The results demonstrated how their work is helping to propel the nation towards becoming one of the most innovative and attractive space economies in the world.

National Satellite Test Facility welcomes Airbus

Harwell's National Satellite Test Facility (NSTF), the UK's new £116m centre for testing large, next-generation satellites, will soon welcome Airbus Defence and Space UK as its first customer.

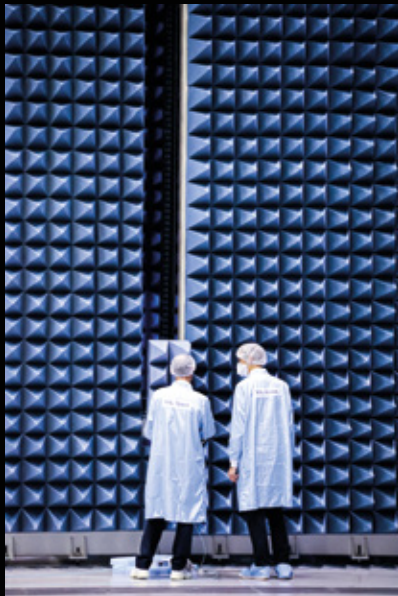
STFC RAL Space will operate the cathedral-sized facility which allows companies to test whether satellites will withstand the brutal conditions of space travel. It features the UK's largest vacuum test chamber, where satellites the size of a double decker bus will be exposed to extremes of hot and cold for months at a time, and a vibration facility that replicates the conditions of a rocket launch. The first satellite to be tested at the NSTF will be Skynet 6A, the latest payload in the UK Ministry of Defence's secure military communication programme.

Currently under construction at Airbus, the satellite is due to launch in 2025 aboard Space X's Falcon 9 rocket.

Plans for the NSTF began in 2015, when a Facilities Gap Study run by the UK Space Agency found that there was a critical need for a single, central large-scale testing site based in the UK that gave companies an alternative to similar facilities in the USA and Europe.

Built with funds from UKRI's Industrial Strategy Challenge Fund, the site includes an imposing electromagnetic chamber that features 44,000 inwardly pointing foam spikes, and an acoustic test facility capable of producing 146 decibels - far louder than the loudest rock concert.

The facilities were commissioned during the second half of 2023, with the target of being fully operational in 2024.



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Cover image: Close up of EMC chamber in the National Satellite Test Facility