Digital technology for healthcare: apply for funding

Up to £8 million is on offer for UK businesses to work on innovation projects that tackle the biggest healthcare challenges.

To support a growing, ageing population, Innovate UK is making up to £8 million available to UK businesses to develop new and novel digital healthcare solutions.

This competition is being run under the digital health technology catalyst, which is part of the Industrial Strategy Challenge Fund. The aim is to support the development of digital health products that meet NHS needs. It is a new £35 million funding programme over 4 years.

Find out more about the Industrial Strategy Challenge Fund.
Impacting delivery and patient outcomes
Digital health promises to have a profound impact on the approach, delivery and administration of healthcare, for the benefit of patients.

We are seeking feasibility or development projects that advance digital health or digitally-enabled medical technologies. These should:

• improve patient outcomes, such as through better clinical decision-making and supporting them to manage their own care
• offer new approaches to healthcare that transform its delivery
• reduce the demand on the health system, make it more efficient and create savings

Read about our work in the health and life sciences sector.

Competition information
• the competition opens on 31 July 2017, and the deadline for registrations is 4 October 2017
• feasibility studies can range from £50,000 to £75,000 and last up to one year
• industrial research and experimental development projects can range from 500,000 to £1 million and last up to 3 years
• you can work alone or in collaboration with other organisations, but projects must be led by a UK-based SME
• you could get up to 70% of your eligible project costs
• projects must start by 1 February 2018

Get information and apply for the competition.
Dark Matter Day is coming... but Don’t Be Afraid of the Dark

On 31 October 2017, the world will come together to celebrate one of the biggest mysteries of our Universe, dark matter, and you can play a part – don’t be left in the dark.

Dark Matter Day will tell tales of the unknown about this mysterious mass, at local Dark Matter Day events planned all over the globe by organisations and individuals.

In the UK events are already being arranged – here is a selection of the events taking place so far:

• Family event at STFC’s Rutherford Appleton Laboratory during the October half term
• Family event at STFC’s Daresbury Laboratory during the October half term
• Family event at STFC’s UK Astronomy Technology Centre in the week leading up to Dark Matter Day
• Live link up to STFC’s Boulby Mine for schools on Dark Matter Day 31 October
• An evening of talks and discussion at King’s College London on Dark Matter Day 31 October
• Café Scientifique at The Filmhouse Café, Edinburgh on Monday 30 October

For full details on Dark Matter Day, please view the full article on the STFC website, or visit the Dark Matter Day website.
World’s largest x-ray laser facility is now open to users

The global science community is celebrating the official inauguration of the world’s largest X-ray laser at the international research facility, the European XFEL. This event marks the start of user operation after eight years of construction.

European XFEL is located in Hamburg and Schleswig-Holstein in Germany, and is capable of generating extremely intense X-ray laser flashes that will offer new research opportunities for scientists across the world.

UK scientists at the Science and Technology Facilities Council (STFC) have played a significant role in the creation of XFEL, by designing and creating the Large Pixel Detector (LPD) – a cutting edge X-ray camera that can capture images of ultrafast processes such as chemical reactions.

In addition to the LPD, designed and built by STFC’s Technology Division, STFC’s Central Laser Facility is currently building a DiPOLE100 laser for the European XFEL (directly funded by STFC and EPSRC), where it will be used to recreate the conditions found within stars.

The UK will soon be extending its relationship with XFEL by signing a partnership agreement, allowing UK researchers access to the facility through an STFC-managed subscription. The formal procedures of accession for the UK to join XFEL are underway. In anticipation of this being completed in the coming months the UK has already contributed the majority of its commitment towards the construction costs of the facility.

Dr Brian Bowsher, Chief Executive of STFC, said: “The UK, through STFC, is already contributing a great deal to this project in terms of equipment and expertise, and we are looking forward to ratifying formally the UK’s involvement in XFEL. XFEL offers many exciting opportunities to the research community and STFC is delighted to support the UK’s involvement with this international facility. Being asked to design and build significant technological infrastructure for XFEL is recognition of the leading reputation STFC’s technology and engineering teams have on the world’s stage.”
ESA BIC Harwell’s 50th space tech start-up takes off to overhaul breast screening in the UK

From space cots to bed bugs, to bicycle bell satnavs and sustainable farm food - whatever the sector, the European Space Agency’s Business Incubation Centre in Harwell (ESA BIC Harwell) has supported them all. It is now celebrating as its 50th UK space tech start-up ‘graduates’ from the centre, ready to take off as a successful, viable business - as it sets out to overhaul breast screening in the UK.

The impressive survival rate is 93% for companies that have been incubated at the ESA BIC Harwell since it opened in 2011, all of which are using space and satellite technology to develop ‘the next big thing’. To date, 61 companies have joined the centre, with 50 graduating so far.

The 50th company to graduate from the ESA BIC Harwell is DEOS Consultancy, which is gearing up to overhaul mobile breast screening in the UK.

For the last 25 years, mobile breast screening vans have operated in isolation from hospitals, with digital images and confidential personal data physically transported from van to hospital by courier, taxi and even radiographers themselves. The target turnaround time between screening and the result is 14 days. DEOS Consultancy have been using satellite technology at the ESA BIC Harwell to develop their prototype for a completely integrated screening solution for smarter, faster and more cost-efficient mobile breast screening service. DEOS can transmit images directly from the van to hospital in three minutes, make appointments live on the van and synchronise with hospitals, giving realtime visibility of status.

Viv Barrett, CEO at DEOS Consultancy said: “By applying satellite connectivity to mobile medical units we have the real potential to radically overhaul mobile breast screening in the UK. We can achieve faster communication of results, along with more efficient staff deployment and logistical savings. Our focus has been on developing the prototype for our technology that could be implemented into all mobile breast screening vans. Being at the ESA BIC Harwell put us in the perfect position to access the specialist technology and expertise we needed to complete our prototype and network with the right audiences and markets. This has been a critical phase in the development of our business.”

Sue O’Hare, Operations Manager at the ESA BIC Harwell, said: “For any start-up, coming up with a great idea is just the first step in the innovation process. Turning an idea into a viable commercial offering is a huge challenge and the ESA BIC Harwell provides the environment and support to do this. I’m thrilled to be celebrating this major milestone with DEOS.”
Innovations Newsletter

Consultancy, whose technology could be life changing for so many. The ESA BIC Harwell is bringing space technology to Earth for new start-ups, maximising the potential of space to not only to improve our lives and wellbeing, but also for future economic growth, creating jobs and profitable businesses.”

Located within the well-established space cluster at the Harwell Campus, the ESA BIC Harwell sits alongside STFC’s RAL Space, the Satellite Applications Catapult and the brand new National Satellite Test Facility. It is also one of a wider European network of 16 successful ESA BICs, and part of ESA’s Technology Transfer Programme. It provides 10 companies a year with an impressive, carefully designed support package lasting between one and two years that enables them to harness space-related intellectual property, technologies and expertise through the provision of £41,500 grant funding, access to STFC’s world-class research facilities and skills, and dedicated business support.

The ESA BIC Harwell has strongly demonstrated that space technologies can be used to improve our lives and wellbeing. Here is just a handful of the companies currently being incubated at the ESA BIC Harwell, and what they are doing right now – the variety of companies on board is astounding:

- **AutoNaut** has developed a wave propelled Unmanned Surface Vessel (USV) that can be controlled by satellite from anywhere on the planet. It is enabling affordable oceanic data gathering to meet unique mission requirements in a changing world. It’s wave propelled, meaning no fuel is needed to cross the world’s oceans.

- **Entocycle** is developing a completely sustainable, natural solution to help feed the world. It has developed technology to convert food waste into 100% organic protein for farmed animals, achieving in six days a process that takes nature six months to achieve. Entocycle’s technology can simultaneously reduce land fill, recycle valuable nutrients and relieve stresses on food supply.

- **Open Cosmos** is using patented ESA technology to develop nanosatellites that will enable simple and affordable access to space for SME’s and research institutions, at a fraction of the cost. It provides a one-stop shop service that covers all aspects of nanosatellite space missions, from spacecraft design, to simulation, testing, launch procurement, insurance and operations.

- **Sativa** is using satellite technology to make aviation smarter and safer. Environmental factors in the atmosphere, such as dust, ice, sulphur, and volcanic, accelerate wear of aircraft components, resulting in unscheduled maintenance that costs the industry billions of dollars each year. Satavia is developing a system that would enable aircraft companies to save millions in unscheduled maintenance every year.

- **Weedrbot Innovations** is using GPS satellite technology, combined with robotics, advanced image processing and visual navigation, to develop a unique crop management system that can radically reduce costs and improve cultural productivity. The company has plans to trial its system later this year.

Further information on all the start-ups at the ESA BIC Harwell can be found on the website.

ESA BIC Harwell’s 50th space tech start-up takes off to overhaul breast screening in the UK
UK ramps up its satellite testing capabilities with new vacuum chamber

The largest space test chamber in the UK is being installed at a premier satellite testing facility, helping to ensure the UK remains a world leader for space technology.

The £1million chamber, paid for by the Science and Technology Facilities Council, will add to the arsenal of equipment which makes the UK a global centre for testing satellites.

Once fully installed, the chamber will be used to test world-class satellites, including Sentinel 5.

Dr Brian Bowsher, Chief Executive of the Science and Technology Facilities Council, said: “This new test chamber puts the UK ahead of the game internationally when it comes to being able to test spacecraft and satellites. “We are looking forward to welcoming some of the world’s most exciting space technology to our test facilities, where they will be put into the hands of our incredibly skilled staff. This addition to our facilities, coupled with the expertise of our staff, illustrates what makes the UK a global leader in the space industry.”

This is the second 5m diameter by 6m long space test chamber to be installed at STFC’s RAL Space in Oxfordshire. Alongside its twin space test chamber, it is the biggest in the UK and one of the largest in Europe.

The new test chamber increases RAL Space’s capacity to meet growing demand from the space industry to test how instruments and small spacecraft work in space-like conditions. The new chamber will also help to ensure that the UK, through RAL Space, can meet demand from the country’s space sector, which is growing from strength to strength.

This capability will enable the UK space industry, which is worth more than £13billion, to win more national and international contracts for bigger and more technologically advanced satellites and reduce the need for UK companies to use test facilities located abroad.

The state-of-the-art chamber, when complete, will simulate the conditions and extreme temperatures spacecraft may have to operate in. It is capable of reaching temperatures ranging from -180 to +120 degrees Celsius while maintaining the vacuum of space. The vacuum is also situated within a specialised cleanroom environment, which is required for the preparation and installation of the items that will be tested within the facility.

The chamber embarked upon a seven-day and approximately 1000-mile journey from its manufacturers in northern Spain to RAL Space in Oxfordshire. A team of 15 people worked over four days to deliver and install the chamber.

The test chamber being delivered
Credit: RAL Space
UK ramps up its satellite testing capabilities with new vacuum chamber

Delivered via two lorries, each transporting a half vessel weighing roughly 24 tonnes, the two chamber halves were unwrapped, cleaned, and then rejoined. It was then installed in its final position late in the day on Thursday (July 27) and aligned with the 300-tonne seismic block – which will prevent the chamber from being affected by external vibrations. Spacecraft do not experience vibrations in space so any movement could affect the tests.

Electronics, control box and vacuum equipment were the last to be installed before the chamber began site acceptance tests on Monday (July 31). This process will conclude in May next year, ready for the first customer; the instrument for the ESA/EU Earth observation satellite Sentinel 5.

Dr Chris Mutlow, Director of STFC RAL Space said “This is another exciting step for STFC RAL Space as we expand our existing world-class test facilities to meet increasing demand from the space sector. We’re looking forward to getting the test chamber up and running so that our expert staff can start putting the next generation of spacecraft through their paces.”

The installation on this test chamber is the latest in a series of ongoing developments at the facility.

The UK Government also recently invested £99million into a National Satellite Test Facility (NSTF) which will continue to expand RAL Space’s capabilities. NSTF will provide a comprehensive world-class set of co-located facilities for the assembly, integration and testing of space payloads and satellites.
Upside Energy: balancing peak supply and demand for electricity

Innovate UK-funded firm supports National Grid by harnessing everyday devices in homes and businesses through the Internet of Things.

Upside Energy has created smart-grid technology that eases peak-time pressure on National Grid by connecting a range of common devices that store energy, from backup batteries to electric hot water tanks.

The development of renewable energy such as wind and sun means power comes intermittently and from multiple sources, making it harder for power stations to generate electricity consistently.

Volatile energy prices

This causes inefficiencies in the National Grid and leads to volatile energy prices for customers, as well as higher greenhouse gas emissions. The company’s founder and Chief Scientist, Graham Oakes, explained: “Every time you hit a switch, somewhere a power station must work a little bit harder. Power stations across the country are constantly ramping up and down as people keep turning switches on and off, and that’s really inefficient because power stations are just like cars; they like to get to a constant speed and just sit there.”

As the first customer of Upside Energy’s innovative ‘flexibility services’, National Grid can better balance electricity supply and demand as more energy comes from sun and wind and other less predictable renewable sources.

Business mentoring

Innovate UK has supported the company from startup, with an initial grant allowing the company to employ its first member of staff. Graham added: “From there, we’ve grown to 17. A year ago we raised our first equity round but, without the Innovate UK funding before that, we would never have got to the point of getting investors.

Innovate UK also provided access to business mentoring and connected us into customers, potential targets in the energy system and international targets.”

Upside Energy developed a pilot of their core service and communication protocols through an Innovate UK-funded collaborative project that received a £470,000 grant. Partners included Sharp Laboratories of Europe, Select Innovations (enLight), Tempus Energy and the University of Manchester.

Discover how other businesses have benefited from Innovate UK’s support

Homes and businesses as suppliers

The company is now embarking on a major investment round among private investors and venture capitalists and plans to expand to a workforce of 50 within 18 months. They are also developing business partnerships in Europe, with R&D for Germany already under way.

Upside Energy’s CEO, Devrim Celal, said: “National Grid in the UK is our first customer and we are starting to work with utilities as well. In essence, homes and businesses are our suppliers, so they give us their assets to use at the right times and we pay them money.”

A report to the Committee on Climate Change predicts that 20% of the value of the UK energy system will be supplied by flexibility services by 2030.

Find out how to apply for innovation funding
New synthetic Polio vaccine candidate visualised at the atomic scale at STFC’s Diamond Light Source

Plants have been used to produce a new vaccine against poliovirus in what is hoped to be a major step towards global eradication of the disease.

A collaborative team of researchers, including the University of Leeds, BBSRC’s John Innes Centre, the University of Oxford, STFC’s Diamond Light Source and The National Institute for Biological Standards and Control has developed a novel synthetic vaccine with a method grown in plants that uses virus-like particles (VLPs) – empty shells that trick immune system into a protective reaction. Genes that carry information to produce VLPs are infiltrated into the plant tissues. The host plant then reproduces large quantities of them using its own protein expression mechanisms.

The team turned to cryo-electron microscopy at Diamond’s Electron Bio-Imaging Centre (eBIC) to obtain a clear look at the structure of the empty shells. They confirmed the structure and showed that the external features of the new synthetic vaccine were identical to those of the poliovirus albeit it had not viral materials within to trigger actual infection. This means that they achieve a protective reaction by stimulating the immune system to respond without causing an infection of poliomyelitis as they do not contain the infectious material that allows viruses to replicate.

The breakthrough was made by employing technology that Diamond had previously used in the design of a new synthetic vaccine to combat the foot and mouth disease virus (FMDV) to target the virus that causes polio.

Dave Stuart, Director of Life Sciences at Diamond and Professor of Structural Biology at University of Oxford explains, “We were inspired by the successful synthetic vaccine for foot-and-mouth disease, also investigated at Diamond as part of UK research collaboration. By using Diamond’s visualisation capabilities we were able to visualise something a billion times smaller than a pinhead and further enhance the design atom by atom of the empty shells. Through information gained at Diamond, we also verified that these have essentially the same structure as the native virus to ensure an appropriate immune response.”
Innovations Newsletter

UK engineers have developed a new type of energy-saving magnet for the next generation of particle accelerator that will not only save substantially on energy costs but also offers savings in the scale of such instruments.

Particle accelerators are machines that use electromagnetic fields to propel charged particles to nearly light speed whilst keeping them focused in well-defined beams and have been responsible for achieving some of the greatest scientific breakthroughs in human history - CERN’s Large Hadron Collider (LHC) in Switzerland enabled scientists to discover the Higgs boson. And while the LHC will continue to deliver ground-breaking science at CERN for years to come, physicists are already considering and planning for their next large scale research facility.

The Compact Linear Collider (CLIC) is one of those considerations – a 50km long accelerator being proposed for CERN; it will reach record-breaking energies and be the most powerful electron accelerator ever built.

However, one of the key challenges faced when designing and building a next generation particle accelerator is energy consumption and the associated financial and environmental cost. A large portion of the energy requirements are in the flexible, tuneable electromagnets that are used to bend and focus the beam, and which require a considerable amount of energy to operate, unlike permanent, fixed magnets that do not need a power supply. There is also the cost of powering the necessary water cooling systems with chillers and pumps associated with tuneable magnets.

Permanent magnets that are tuneable have not been developed with large scale production in mind until now but, commissioned by CERN, scientists and engineers at STFC’s Daresbury Laboratory in Cheshire have successfully designed, built and patented the ZEPTO (Zero Power Tuneable Optics) focussing magnets. The ZEPTO magnet is a brand new type of permanent but tuneable energy saving quadrupole magnet that could power particle accelerators at a fraction of the energy cost, making it a viable consideration for CERN’s next large scale facility. Should CLIC be cleared for construction, CERN will require more than 40,000 ZEPTO magnets.
Professor Jim Clarke, Head of Science Division at STFC’s Accelerator Science and Technology Centre at Daresbury, said: “Designing and building the ZEPTO magnets for CERN is a fantastic achievement for STFC, and confirms STFC’s ability to design, develop and test the brand new technologies required to build the world’s next generations of research facilities. CERN needed a new type of magnet that was permanent, adjustable, environmentally-friendly and almost free to run. It also needed to be easily up-scalable considering how many they’d need, and we’re thrilled to have met their challenge.”

The technology behind this brand new magnet designed by Professor Clarke and his team was patented through STFC’s Business and Innovations Division, which is responsible for the commercial exploitation of technology and intellectual property developed at STFC. As a result the technology has been licensed to Danfysik A/S, a world leading provider of components for particle accelerators worldwide.

Henning Bach Christensen, Vice President of Sales and Marketing at Danfysik, said: “Danfysik is looking forward to bringing STFC’s permanent based ‘Green’ magnet technology to the market. As a leading provider of permanent based magnet technologies for replacing traditional electromagnets, under the name ‘Green Magnet Technology’, the ZEPTO magnet concept is a perfect match to our product portfolio. The future accelerator systems will benefit from zero energy consumption and inexpensive infrastructure – no power and no cooling.”

Working alongside Danfysik this breakthrough from the STFC team has the potential to offer real benefits in the construction of accelerators for healthcare applications such as particle therapy systems.
The grand finale - Cassini’s last dive

On 15 September scientists across the UK said a fond farewell to the landmark Cassini Space Mission, which was launched almost 20 years ago.

The probe ended its journey with a dramatic dive into Saturn’s atmosphere, where it was crushed and vaporised.

The original Cassini-Huygens mission launched in October 1997, with the involvement of teams of scientists from across the globe.

The UK had its part to play in the mission, as various universities and the Science and Technology Facilities Council (STFC) contributed hardware and expertise.
Cassini has made some significant discoveries, as it found three of Saturn’s 62 moons – and gathered evidence of water on one of these.

In 2005, Cassini released the European Space Agency’s (ESA) Huygens probe and it became the first probe to land successfully in the outer solar system. It gave scientists their first look at the surface of Titan, the largest moon of Saturn. STFC’s RAL Space played a role in developing and building Cassini-Huygens, a huge collaboration between NASA, ESA and ASI, the Italian Space Agency.

RAL Space Project Manager Dr Jane Hurley, who was previously part of the Oxford University team and helps to analyse the infrared data which comes from Cassini’s CIRS instrument, said: “Cassini has provided the international science community with decades of irreplaceable insight into Saturn and its moons, and inspiration to generations of scientists and engineers. As part of both the CIRS instrument science team and operations team, I have been very lucky to be part of such a successful mission - not least because of the collaborations and working relationships that become lifelong friendships. I shall be raising a glass with the Oxford University team to toast to the Cassini/CIRS operations team in the UK, Europe, at NASA/Goddard and NASA/JPL for the years of hard work behind the scenes that have given us the mission we’re celebrating.”

RAL Space worked with the Open University on the Huygens Surface Science Package (SSP), which analysed Huygen’s descent from Cassini through Titan’s atmosphere and Titan’s rocky surface.

RAL Space also collaborated on the Cassini Plasma Spectrometer (CAPS) and the Cosmic Dust Analyser (CDA.) For CAPS, we built a high voltage power supply board and for the CDA we built the Chemical Analyser electronics which measured the time-of-flight of ions, telling us the chemical composition of interplanetary dust grains.

Scientists from Oxford University were involved in the construction of one of the mission’s main instruments, the Composite Infrared Spectrometer (CIRS). CIRS measures the heat emitted by a planet’s atmosphere or surface, and reveals the individual elements present in the minerals and gasses, revealing their chemical make-up.

Oxford University team leader Professor Patrick Irwin said: “Speaking personally, the Cassini mission is as old as my marriage, which took place two months before the launch, and I and my wife were lucky enough to witness the launch in 1997. Together with losing a key, unique stream of data I will miss the camaraderie of the international Cassini/CIRS team and will miss being able to look up at Saturn and think ‘I helped build something in orbit about that!’ Our design, construction and testing of the CIRS cooler was a job well done and it still amazes me what we achieved with relatively little resource.”

As Cassini took its final dive, the instruments on board continued to send back data about Saturn’s atmosphere until it lost contact with Earth at around 11:30am.
UK supporting Arctic project to build the most advanced space weather radar in the world

The most advanced space weather radar in the world is to be built in the Arctic by an international partnership including the UK, thanks to new investment from NERC, with scientific collaboration from STFC.

The EISCAT_3D radar will provide UK scientists with a cutting-edge tool to probe the upper atmosphere and near-Earth space, helping them understand the effects of space weather storms on technology, society and the environment.

The UK government has placed space weather on the National Risk Register, in recognition of the potential damage it can do to satellites, communications and power grids. Solar storms drive space weather, but one of the biggest challenges in space weather science is improving our understanding of how the Earth’s magnetic field and atmosphere responds to this. EISCAT_3D will give scientists the means to understand these connections.

Dr. Ian McCrea, from STFC RAL Space and the NERC Centre for Atmospheric Science, said: “This announcement represents the culmination of 15 years effort to secure UK involvement in a facility which will be the most sophisticated of its kind in the world. With advanced capabilities based on state-of-the-art radar technology, this new radar will significantly expand the opportunities for our scientists to study the outermost regions of the Earth’s atmosphere and their interaction with the space environment. EISCAT_3D will provide us with a new way of spatially imaging the structure and dynamics of this important region, enabling us to contribute more effectively to growing international efforts to observe and forecast the effects of space weather, monitor the risks posed by space debris and probe the complex structure of the aurora.”

A key capability of the radar will be to measure an entire 3D volume of the upper atmosphere in unprecedented detail. This is necessary to understand how energetic particles and electrical currents from space affect both the upper and the lower atmosphere. Scientists will be able to take measurements across scales from hundreds of metres to hundreds of kilometres, providing exceptional detail and vast quantities of data, and opening the scope of research that can be carried out.

STFC’s RAL Space Director, Dr Chris Mutlow said: “I’m delighted that we’re able to bring our heritage in studying space weather to this fantastic new radar with our international partners. The level of detail it will provide represents a significant leap in our ability to understand the effects of space weather on our atmosphere and monitor space debris. This is critical to our national infrastructure as well as scientific advancement.”

The northern hemisphere already hosts several EISCAT radars, situated in the so-called auroral oval – where you can see the northern lights or aurora borealis. They take measurements in a region of the Earth’s upper atmosphere called the ionosphere – from about 70 to 1000 km altitude. They sample the electron concentration and temperature, and the ion...
temperature and velocity at a range of altitudes along the radar beam direction. But the current EISCAT radars provide a single pencil beam, so researchers can only look at one small portion of the sky at a given time.

Dr Andrew Kavanagh, UK EISCAT Science Support, based at the British Antarctic Survey, said: “The new EISCAT_3D radar will measure the ionosphere in lots of different directions simultaneously. It will be like having hundreds of radar dishes all operating together. This means we can easily see changes in the ionosphere and not miss important data: when our measurements change we will be able to say whether something had just appeared or faded or if something was moving through the beams. This is really important as it gives us information about how space weather effects evolve.”

Costing a total of £63m, the facility will be distributed across three sites in northern Scandinavia – in Skibotn, Norway, near Kiruna in Sweden, and near Kaaresuvanto in Finland. The project will start in September 2017 with site preparations beginning in summer 2018. The radar is expected to be operational in 2021.

The site in Skibotn, Norway will have a transmitter and receiver array, while the two other sites will have receiver arrays. These will generate beams that will ‘look into’ the transmitted beam and give researchers many intersection heights.

EISCAT Director, Dr Craig Heinselman, said: “Building on over three and a half decades of scientific observations with the legacy EISCAT radars, this new multi-site phased-array radar will allow our international user community to investigate important questions about the physics of the near-Earth space environment. The radar will make measurements at least ten times faster and with ten times finer resolution than current systems.”
UK signs £65m science partnership agreement with US

The UK is investing £65 million in a flagship global science project based in the United States that could change our understanding of the universe, securing the UK’s position as the international research partner of choice.

UK Universities and Science Minister Jo Johnson signed the agreement with the US Energy Department to invest the sum in the Long-Baseline Neutrino Facility (LBNF) and the Deep Underground Neutrino Experiment (DUNE). DUNE will study the properties of mysterious particles called neutrinos, which could help explain more about how the universe works and why matter exists at all.

This latest investment is part of a long history of UK research collaboration with the US, and is the first major project of the wider UK-US Science and Technology agreement.

On signing the agreement in Washington DC, UK Science Minister, Jo Johnson said: “Our continued collaboration with the US on science and innovation is beneficial to both of our nations and through this agreement we are sharing expertise to enhance our understanding of many important topics that have the potential to be world changing. The UK is known as a nation of science and technical progress, with research and development being at the core of our industrial strategy. By working with our key allies, we are maintaining our position as a global leader in research for years to come.”

This investment is a significant step which will secure future access for UK scientists to the international DUNE experiment. Investing in the next generation of detectors, like DUNE, helps the UK to maintain its world-leading position in science research and continue to develop skills in new cutting-edge technologies. 

Graphic of the LBNF/DUNE facility Credit: Fermilab
The UK’s Science and Technology Facilities Council (STFC) will manage the UK’s investment in the international facility, giving UK scientists and engineers the chance to take a leading role in the management and development of the DUNE far detector and the LBNF beam line and associated PIP-II accelerator development.

Accompanying Jo Johnson on the visit to the US, Chief Executive Designate at UK Research and Innovation, Sir Mark Walport said: “Research and innovation are global endeavours. Agreements like the one signed today by the United Kingdom and the United States set the framework for the great discoveries of the future, whether that be furthering our understanding of neutrinos or improving the accessibility of museum collections. Agreements like this also send a clear signal that UK researchers are outward looking and ready to work with the best talent wherever that may be. UK Research and Innovation is looking forward to extending partnerships in science and innovation around the world.”

DUNE will be the first large-scale US-hosted experiment run as a truly international project at the inter-governmental level, with more than 1,000 scientists and engineers from 31 countries building and operating the facility, including many from the UK. The US is meeting the major civil construction costs for conventional facilities, but is seeking international partners to design and build major elements of the accelerator and detectors. The total international partner contributions to the entire project are expected to be about $500m.

The UK research community is already a major contributor to the DUNE collaboration, with 14 UK universities and two STFC laboratories providing essential expertise and components to the experiment and facility. This ranges from the high-power neutrino production target, the readout planes and data acquisition systems to the reconstruction software.

Dr Brian Bowsher, Chief Executive of STFC, said: “This investment is a significant and exciting step for the UK that builds on UK expertise. International partnerships are the key to building these world-leading experiments, and the UK’s continued collaboration with the US, through

STFC, demonstrates that we are the science partner of choice in such agreements. I am looking forward to seeing our scientists work with our colleagues in the US in developing this experiment and the exciting science which will happen as a result.”

Professor Mark Thomson, from the University of Cambridge and co-spokesperson of the DUNE collaboration said: “The international DUNE collaboration came together to realize a dream of a game-changing program of neutrino science; today’s announcement represents a major milestone in turning this dream into reality. This UK investment in fundamental science will enable us to deliver critical systems to the DUNE experiment and to provide new opportunities for the next generation of scientists to work at the forefront of science and technology.”

One aspect DUNE scientists will look for is the differences in behaviour between neutrinos and their antimatter counterparts, antineutrinos, which could give us clues as to why we live in a matter-dominated universe – in other words, why we are all here, instead of having been annihilated just after the Big Bang. DUNE will also watch for neutrinos produced when a star explodes, which could reveal the formation of neutron stars and black holes, and will investigate whether protons live forever or eventually decay, bringing us closer to fulfilling Einstein’s dream of a grand unified theory.

The DUNE experiment will attract students and young scientists from around the world, helping to foster the next generation of leaders in the field and to maintain the highly skilled scientific workforce worldwide.
External Innovations and Innovations Club

The External Innovations team manages the activities that aim to realise the impacts and benefits that flow from STFC's investments in science and technology towards commercialisation through one to one brokering, events and a range of funding schemes.

If you wish to contact the teams for more information please see the following contacts and email addresses.

Innovations club: innovationsclub@stfc.ac.uk

External Innovations – Global Challenges

Jason Green Head of External Innovations
Tel: + 44 (0)1793 442 014 Email: Jason.green@stfc.ac.uk

Ling Xu Knowledge Exchange Manager
Tel: + 44 (0)1793 442 104 Email: ling.xu@stfc.ac.uk

Katharine Hollinshead 21st Century Challenges Programme Manager
Tel: + 44 (0)1793 442 068 Email: katharine.hollinshead@stfc.ac.uk

Stephen Loader 21st Century Challenges Programme Manager
Tel: +44 (0)1793 442 111 Email: stephen.loader@stfc.ac.uk

Administration

Andi Kidd Office Manager
Tel: +44 (0)1793 442 059 Email: andi.kidd@stfc.ac.uk

Pauline Thompson Programme Support
Tel: +44(0)1793 442 650 Email: pauline.thompson@stfc.ac.uk

Richard Traini Grants Manager
Tel: +44(0)1793 442 162 Email: richard.traini@stfc.ac.uk

The Innovations Club newsletter contains a selection of articles drawn from our partner organisations that we think you will find interesting. We welcome your comments innovationsclub@stfc.ac.uk