Forthcoming PPRP meeting - 24 January 2018

The next meeting of the Projects Peer Review Panel (PPRP) will take place in CR12/13, Building 68, Rutherford Appleton Laboratory, Harwell Science and Innovation Campus, Didcot, OX11 0QX on the 24 January 2018. The Panel will be reviewing one project proposal.

Members of the science community should contact Tahmina Aziz (tel: 01793 442058) if they are likely to attend the open presentation.

The proposal being reviewed is as follows:

24 January 2018 12:00 – 13:15
The High-Luminosity Upgrade of the Compact Muon Solenoid (CMS) Detector

A programme of luminosity upgrades is planned at CERN, which will maintain the Large Hadron Collider (LHC) at the high energy frontier of particle physics into the late 2030s.

The international CMS detector will require upgrades in order to maintain performance and allow scientific return from the LHC to continue in the long term. This proposal is for the UK component of the upgrade programme for the CMS detector and proposes a five-year project that will deliver tracking, calorimetry and trigger capabilities for CMS.

The project will begin at the conclusion of the currently-funded R&D phase of the project, and will be followed by a two-year installation and commissioning period running through LHC Long Shutdown 3 (LS3), culminating in the start of High-Luminosity LHC physics running in April 2026.

The Panel goes into closed session for the rest of the day.
SYNERGI 2018

Europe has the best portfolio of Advanced Research Infrastructures (ARIs) worldwide, serving a wide and dynamic academic community of many tens of thousands of scientists every year. These large-scale and unique facilities enable remarkable insights into materials of all types, particularly in engineering materials science.

The research infrastructures are open not only for fundamental science, but are increasingly becoming a routine tool exploited for proprietary research by companies. When you cannot solve your problem with conventional technique available in your lab, Advanced Research Infrastructure might be able to help you.

4 good reasons to attend:

• Find out how neutrons and synchrotron light can be tailored to address your needs in the fields of industrial engineering, energy and metallurgy.
• Learn how neutron and synchrotron facilities are already working with a wide range of businesses.
• Discuss your challenges with scientific staff during a business-research matching session.
• Discuss the possibility to perform free feasibility tests via one of our programmes.

Download Flyer SYNERGI 2018 (262 KB)

SYNERGI2018 will demystify Analytical Research Infrastructures for industry, demonstrating how they already help companies with focus on the engineering and materials science sector, and will discuss a future vision and expectation on how they should be better integrated into regional and European-wide innovation processes.

In a research-to-business matchmaking session, we will bring together both industrial researchers and facility scientists to discuss living R&D problems and how they could eventually be solved using the special techniques provided at Europe’s ARIs.

The goal of SYNERGI2018 is to bring together industrial researchers and facility scientists to discuss present R&D problems. This is an unique opportunity to figure out how these issues could possibly be solved using the special techniques provided by large scale facilities (ARIs).

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SYNERGI2018 will take place on 8-9th March 2018 at the NEMO Science Museum, Amsterdam, Netherlands

To register please go here
Challenges in additive manufacturing industrial qualification: key solutions at large scale infrastructures

From process qualification until component certification, additive manufacturing presents big challenges as a new field of material processing with multiple new parameters. Therefore, new insights concerning characterization are envisaged for process and component standards and certification, as well as for experimental benchmark input for modellings.

European large installations ILL and ESRF offer a common frame for additive manufacturing industrial investigations, where unique static (scanning) and dynamic (in-situ) studies on stresses and imaging, from the nanometre until several centimetres range, are possible.

To foster industrial escalation of additive manufacturing, we aim at bringing together industry and applied sciences to address key manufacturing issues regarding final quality assessment of products.

With this aim the Challenges in Additive Manufacturing Industrial Qualification: key solutions at large scale infrastructures, event will be on the 9-10 April 2018 at the EPN Science Campus

For more information go here
Business Breakfast Networking Events at Sci-Tech Daresbury

As well as being host to world-class facilities and technology, Sci-Tech Daresbury is home to a wide range of scientists, researchers, engineers and entrepreneurs from both the public sector research community and from private industry. The campus’s Business Breakfast Networking (BBN) events offer an invaluable opportunity for these individuals to meet. With membership numbering around five thousand, the event connects some of the region’s most innovative entrepreneurs, academics and businesses into a single community.

Sharing expertise and inspiring collaboration
The BBN event offers a venue for individuals to share expertise, resources and technical know-how, as well as to identify where there may be opportunities for collaboration with other individuals and organisations.

It is easy for professionals to become siloed in their own area – however innovation often comes about when disciplines meet and cross-fertilise ideas. Indeed, many dramatic advances have been driven by individuals borrowing technologies and techniques from other domains in order to disrupt the status quo. That said, networking can also allow individuals tackling similar challenges to meet and to pool their experience for their mutual benefit.

Ahead of each BBN event a delegate list is available to download, meaning that attendees can identify individuals in advance who it would be particularly useful to connect with. You can also contact attendees ahead of the event through the Network Hub portal, in order to pro-actively arrange meetings at the event.

Convenience and impact
Based in the heart of the Sci-Tech Daresbury campus, in The Innovation Centre, the BBN event aims to maximise convenience and impact. Whereas evening events can stretch on, and details get lost amidst drinks, the breakfast BBN event has a clear start and finish, and can act as an invigorating start to the working day, providing new ideas and connections.

High-intensity networking
The BBN event takes place monthly on a Friday, and sees around 100-150 members in attendance. The organisers have opted to avoid long presentations or speeches in preference of focusing on informal but high-intensity networking, to ensure that attendees get the maximum benefit possible.

The event runs for 90 minutes, but many attendees stay for longer to continue discussions – and, as the event is so popular, booking places in advance is essential.

Access to funding and professional services
The campus’s Business Support Manager, Dr Paul Treloar, also actively works to link companies to angel, institutional, seed and VC funding, and can make recommendations for marketing, legal and financial services when members need them. What’s more, the BBN event provides a perfect opportunity for attendees to make initial introductions, whatever they need.

The next BBN event will be on Friday 17th November 2017, running from 8:00 am to 9:30 am at The Innovation Centre at Sci-Tech Daresbury. Booking ahead is essential – and becoming a member of Sci-Tech Daresbury’s NetworkHub will ensure that you are notified of upcoming events in advance.
UK scientists and engineers are celebrating following the confirmation that their instrument has performed very well during the cryogenic testing for the James Webb Space Telescope (JWST) at NASA Johnson Space Flight Center in Houston, Texas. This is where the Mid Infrared Instrument (MIRI) has been put through its paces under the watchful eye of the consortium team drawn from the European and US institutes who have been taking care of MIRI 24 hours a day over the last four months.

The tests have taken place in the world renowned Chamber A, famously used in the Apollo moon missions. For these tests the environment of the chamber simulates the extreme space environment in which the telescope will eventually operate.

One of the first tests that MIRI underwent was the cold function tests. The instrument was cooled down to its operational temperature of 6 Kelvin (-267 C). These tests were aimed at verifying that MIRI was still in good working order and that everything was operating as it should following the trip from NASA Goddard Space Flight Center (near Washington) to Johnson earlier in the year. Results confirmed that there have been no changes since the last cold function tests the previous year, which is good news for the team.

A major and significant part of the campaign for MIRI has been the ‘end-to-end’ tests so called because it includes both the flight instruments and the telescope optics. The primary aim of these tests was to trial the technique that will be used to align the chain of mirrors which make up the telescope once in orbit and checking the focus and alignment of MIRI.

MIRI Instrument Scientist Alistair Glasse from STFC’s UK Astronomy Technology Centre (UK ATC) explains more about these tests “We have data that has been taken using MIRI’s medium resolution spectrometer (or MRS). We can see from the data that it shows an example of the spectral cubes which will allow MIRI MRS to simultaneously measure the spectra of astronomical sources at all points in an image with unprecedented sensitivity. The artificial targets shown in the image are approximately the same angular size as Neptune, with a single exposure sampling the image at 2000 wavelength points across the planetary disk all at the same time. Following the test campaign we know that MIRI is working well, which is the news that we wanted to hear.”

Professor Gillian Wright, MIRI European Principal Investigator said “The MIRI team have worked tirelessly throughout the test campaign and we are extremely pleased by the indications that MIRI is performing as it should, we look forward to seeing JWST again once the chamber is opened in the next few weeks. We should not forget that this test campaign has taken place in extremely difficult conditions because of the devastation that Hurricane Harvey inflicted on the area over the summer. Due to the fact that there was a good hurricane contingency plan put in place before the cryogenic tests started, the tests were able to continue with minor disruption. This was due to the dedication of those working at the facility and at other institutes around the World. Indeed, we had team members working around the clock in the UK simultaneously to help ensure that the testing remained on track. We were very mindful that people in the area local to Johnson had lost their homes and livelihood as a result of the hurricane and our thoughts were with them.”
MIRI on the right tracks at NASA Johnson

Chris Castelli, Director for Programmes at the UK Space Agency, said “The UK Space Agency has been funding the work to integrate and test MIRI since the instrument was delivered to NASA in 2012. This has been a team effort across Europe, led by the UK, and we’re delighted to see it performing so well in these tests, which have put some of the greatest spacecraft in history through their paces.”

The enormous chamber door will open sometime in the next few weeks and JWST will be visible again. Keep track of this by watching the live Webb telescope web cam.

The UK contribution to MIRI is funded by The UK Space Agency and the European Space Agency (ESA).
UK team probe the nature of the neutrino one mile underneath a mountain

A mile beneath the French Alps scientists are hoping to unlock the mysteries of anti-matter and the neutrino particle.

Deep underground a cutting-edge experiment is being launched to explore the imbalance of matter and anti-matter in the universe which has long left physicists puzzled.

It has been partly funded, designed and built by a UK team and today, researchers from all over the world have gathered at the Modane Underground Laboratory in the south of France to celebrate the official opening of SuperNEMO – the Super Neutrino Ettore Majorana Observatory.

The experiment is partly funded by over £7 million investment from the UK’s Science and Technology Facilities Council (STFC), with collaboration from Manchester University, University College London (UCL), Warwick University and Imperial College London. The aim is to use SuperNEMO in the search for neutrino-less double-beta decay, a rare nuclear decay which – if observed – could answer some of the biggest fundamental questions in physics and cosmology.

UK Science Minister, Jo Johnson, said: “SuperNEMO is an example of international collaboration at its best, and the UK’s valuable contribution to increasing our understanding of the universe. With Science and innovation at the core of our Industrial Strategy and our additional funding of £4.7 billion for R&D, we are ensuring UK expertise continues to drive international projects such as this, further reinforcing our position as being a world leader in research and innovation and reaping the economic benefits of that.”

Neutrinos are fundamental particles which, despite being the most common matter particles in the Universe, are amongst the least understood. If a neutrino-less double-beta decay is observed by SuperNEMO, it would mean the neutrino is different to all the other matter particles in that it would be its own antiparticle. This discovery would revolutionise our understanding of the relationship between matter and antimatter, potentially giving new insights into how mass is generated.

The tracking cells installed into the complete tracking-detector module for SuperNEMO Credit: UCL
Innovations Newsletter

The UK has made a major construction contribution to SuperNEMO by delivering the gaseous tracking detector. A team at Manchester University built the individual tracking cells, while UCL were responsible for assembling those cells into a complete tracker and transporting it in modules to France. In addition physicists from Warwick University and Imperial College took important leadership roles in developing the experiment’s simulation and analysis software frameworks at a time when cutting edge software tools are more important than ever when it comes to ensuring the success of modern experiments.

Dr Justin Evans from Manchester University is the UK’s Principal Investigator for SuperNEMO. “The UK-built tracker makes SuperNEMO stand out amongst double-beta decay experiments,” he said. “It enables us to build a real picture of the radioactive decays in the detector. Not only does that give us a powerful tool for investigating the physics, but it is also critical in enabling us to reject background sources of radiation. The task of building this tracker was immense: every component, from the biggest structural component, right down to the smallest of nuts and bolts, had to be produced from carefully selected, pure materials, to be as clear of natural radioactivity as possible. To add to the technical challenge, the whole detector had to be assembled in a strict cleanroom environment, then packed up and relocated to a cavern deep under the Alps. Seeing this project come to fruition is hugely exciting, and is a testament to the skills and dedication of the entire UK team.”

The Modane Underground Laboratory is the deepest in Europe, 1,700m below the peak of the Frejus mountain. By going deep underground, the SuperNEMO experiment is shielded from the cosmic rays that continually reach the Earth’s surface, making it possible for scientists to spot the incredibly rare double-beta decay events they are interested in.

The UK-built tracking detector shows the paths of electrons given off by the double-beta decays, and this is a feature that other double-beta experiments around the world do not possess. This gives SuperNEMO an advantage, in that it provides certainty that what has been seen is really a double-beta decay, rather than other backgrounds such as alpha, gamma, or single-beta decay.

Furthermore, it enables the scientists to investigate the mechanism behind the decays they see - double-beta decay could be mediated by supersymmetric particles, or other new heavy particles.

Professor Ruben Saakyan, outgoing SuperNEMO co-spokesperson from UCL, said: “If you ask any theorist today about the most pressing questions in modern particle physics a likely answer will be lepton number violation. This is because this question is intimately connected to the biggest puzzles of modern physics, such as the origin of matter and unification of fundamental forces. Searching for Lepton Number Violation through neutrinoless double-beta decay is precisely the main physics goal of SuperNEMO, and our search will be independent of the mechanism behind this phenomenon, whether it is due to neutrino mass or any other new physics. SuperNEMO is uniquely equipped for such an open-minded search due to its ability to reconstruct the tracks of individual electrons emitted in this process.”

UCL’s Professor David Waters, incoming SuperNEMO co-spokesperson said “We now face a huge but exciting challenge in extracting the maximum physics impact from our newly built instrument, as well as planning further developments in the field of neutrinoless double-beta decay.”

SuperNEMO builds on the very successful NEMO-3 experiment that ran in the same Modane Underground Laboratory until 2011. Through a very intensive R&D programme this technology has been significantly improved, pushing the boundaries in areas such as detection of traces of radioactive impurities and high-resolution calorimetry. This development has also found its applications outside of SuperNEMO, for instance in dark matter and proton cancer-therapy research.

The construction of the first SuperNEMO module has involved 19 laboratories from 7 countries. It has culminated in the Demonstrator module whose launch was celebrated on 9 November.

The first physics data will be recorded by the Demonstrator in early 2018.
UK astronomers have discovered a new type of fiery explosion in a distant galaxy.

This research, funded by STFC, shows the explosion seems to prefer active galaxies that house supermassive black holes consuming the gas and material around them.

Using telescopes on La Palma and Hawaii, lead author Dr Erkki Kankare, from the School of Mathematics and Physics at Queen’s University Belfast detected an explosion that was so energetic, it must have originated either as an extremely massive star – up to several hundred times more massive than our Sun – exploding as a supernova, or from a lower mass star that has been shredded by the ultra-strong gravitational forces close to the supermassive black hole.

Explaining the findings, which were published on 13 November in Nature Astronomy, Dr Kankare said: “If these explosions are tidal disruption events - where a star gets sufficiently close to a supermassive black hole’s event horizon and is shredded by the strong gravitational forces - then its properties are such that it would be a brand new type of tidal disruption event. If they are supernova explosions then their properties are more extreme than we have ever observed before, and are likely connected to the central environments of the host galaxies.”

The explosion which has been named PS1-10adi, was discovered 2010, but due to its slow evolution it could be monitored for several more years.

Dr Rubina Kotak, co-author of the study, commented: “Now that we know what we are looking for, we are particularly excited that we will find more transients such as PS1-10adi in larger datasets from upcoming facilities. This means that we are in a fantastic position to pin down their origin, and this will help to piece together more clues of how these events come about.”
UK astronomers contribute to the discovery of a new potential planetary system

Dust detected around the closest star to the solar system, Proxima Centauri, may indicate the presence of an elaborate planetary system.

An international team, that included astronomers from Queen Mary University London and the University of Manchester, used the ALMA Observatory in Chile to make these new observations.

Their findings revealed the glow coming from cold dust in a region that is between one to four times as far from Proxima Centauri as the Earth is from the Sun.

The data also hint at the presence of an even cooler outer dust belt and may indicate the presence of an elaborate planetary system. These structures are similar to the much larger belts in the Solar System and are also expected to be made from particles of rock and ice that failed to form planets.

Proxima Centauri is the closest star to the Sun. It is a faint red dwarf lying just four light-years away in the southern constellation of Centaurus (The Centaur). It is orbited by the Earth-sized temperate world Proxima b, discovered in 2016 and the closest planet to the Solar System. But there is more to this system than just a single planet. The new ALMA observations reveal emission from clouds of cold cosmic dust surrounding the star.

Co-author of the study Dr Guillem-Anglada-Escudé, from QMUL, said: “The cold dust detected by ALMA is really important because it shows the new level of detail that we can reach in understanding planetary systems when focusing on these very nearby stars with new generation observatories. These observations show that Proxima Centauri seems to hold a rich planetary system with an interesting dynamical history rather than just Proxima b, which we discovered last year.”

Dust belts are the remains of material that did not form into larger bodies such as planets. The particles of rock and ice in these belts vary in size from the tiniest dust grain, smaller than a millimetre across, up to asteroid-like bodies many kilometres in diameter.

Proxima Centauri’s planetary system is also particularly interesting because there are plans – the Starshot project – for future direct exploration of the system with microprobes attached to laser-driven sails. Knowledge of the dust environment around the star will be essential for planning such a mission.

Further information
You can learn more about the findings here.
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.

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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