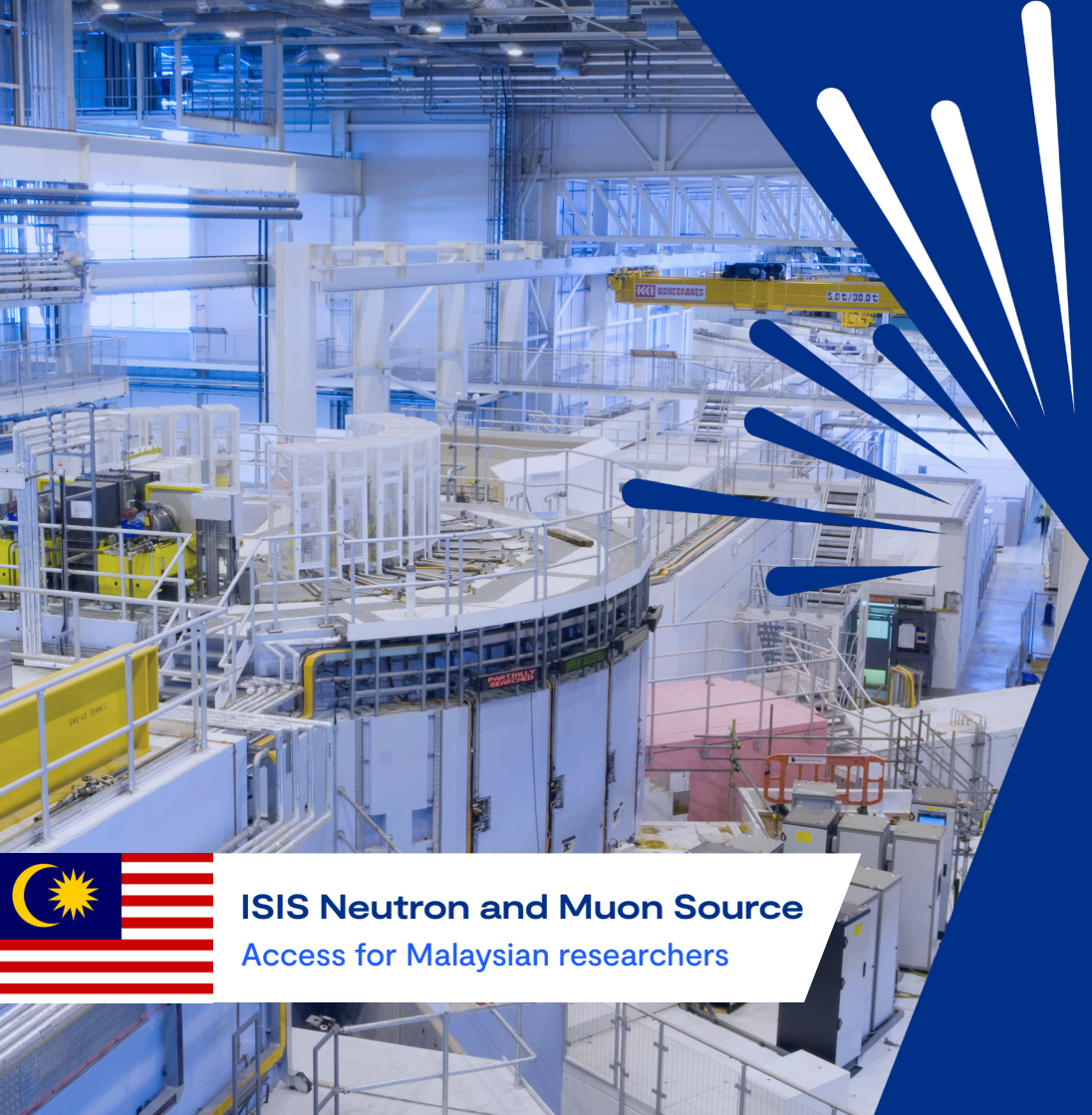


ISIS Neutron and Muon Source

Access for Malaysian researchers

UKRI Science and Technology Facilities Council

ISIS Neutron and Muon Source

Introduction to ISIS Neutron and Muon Source

The ISIS Neutron and Muon Source is based at the STFC Rutherford Appleton Laboratory in Oxfordshire, UK, and is a world-renowned centre for research in the physical and life sciences.

At ISIS, scientists use beams of neutrons and muons to study materials at the atomic level. The facility operates a suite of 35 experiment stations, each optimised to study different atomic and molecular properties of materials.

The neutron and muon beams at ISIS can be used to study a broad range of science areas, from fundamental physics, including magnetism and superconductivity, chemistry and catalysis, polymers, biosciences, engineering, geology, and a wide range of advanced and applied materials.

Neutrons provide complementary information to that given by X-rays and other methods. Muons are a more unusual probe of materials, but give complementary information to neutrons, particularly in studies of magnetism, superconductivity and ionic conductivity.

Scan the QR code to view recent science highlights from ISIS.[1]

Why use neutrons?

STUDY DYNAMICS

Neutron energies are comparable to the time scales of molecular diffusion, vibrations and rotations.

STUDY STRUCTURE

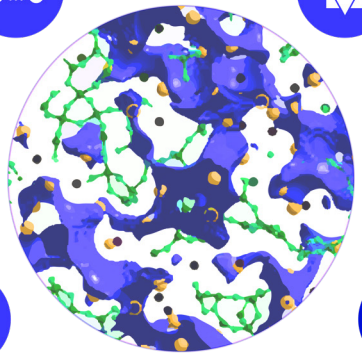
Neutron wavelengths are are comparable to the spacings of atoms and molecules.

PENETRATION POWER

Neutrons can penetrate deep into matter (including many different metals) enabling the study of large samples - even within complex sample environments.

STUDY MAGNETISM

The neutron's magnetic moment can be used to study the microscopic magnetic properties of materials.



NON-DESTRUCTIVE

Neutrons are suitable for the characterisation of delicate and precious samples.

VERSATILE SAMPLE ENVIRONMENTS

Sophisticated sample environments enable studies under operating conditions, including extreme temperatures and pressures.

SENSITIVITY TO LIGHT ELEMENTS

The neutron scattering power of nuclei varies in a quasi-random manner such that lighter atoms (e.g. H, Li) can be studied in the presence of heavier ones.

COMPLEMENTARITY

Neutron scattering is highly complementary to other techniques, such as X-ray scattering, electron microscopy, magnetic resonance and computational methods.

ISOTOPIC CONTRAST

Neutrons are sensitive to different isotopes of the same element, so isotopic substitution (e.g. H/D) can be used to highlight specific features.

1. www.isis.stfc.ac.uk/Pages/Science-Highlights.aspx

Case study: ISIS and Malaysia Developing longer-lasting electronics for electric vehicles

Associate Professor Dr Mohd Arif Anuar Mohd Salleh and his research team from the Universiti Malaysia Perlis used the IMAT instrument at the ISIS Neutron and Muon Source to investigate new soldering materials for use in electric vehicles.

Malaysia's Green Technology Master Plan aims to reduce greenhouse gas emissions, particularly in the transportation sector. Dr. Salleh's team is targeting a critical aspect of electric vehicle electronics: the solder joints.

Unlike conventional solder materials, which contain toxic lead, the group have developed a composite material that embeds a ceramic within the solder. The new material should enable longer solder lifetimes and reduce the energy and materials required to produce the electronics.

In collaboration with Professor Dr Mohd Mustafa Al Bakri Abdullah, the team used IMAT to investigate how fabrication methods affect the ceramic's structure.They also analysed the solder material with and without the ceramic embedded in it.

"This experiment is just the beginning! We hope to build on these tomography experiments and return to expand the research."

Dr Mohd Arif Anuar Mohd Salleh

Universiti Malaysia Perlis

Using the ISIS Neutron and Muon Source

Researchers can apply to use ISIS instruments by submitting proposals to the facility and, if successful, facility time is normally scheduled within six months.

Researchers attend ISIS for their experiments and usually stay in on-site accommodation at the Rutherford Appleton Laboratory. Experiments typically last between 1-6 days and are assigned an ISIS scientist who provides advice on sample preparation, the practicalities of running the experiment and data analysis.

ISIS scientists can also offer support with proposals and advise on the best-suited instrument for a particular investigation.

The Rutherford Appleton Laboratory (RAL), where ISIS is located, is about a 1.5-hour journey from London. Visitors often fly into London Heathrow Airport and use public transport to reach RAL.

Funding for Malaysian researchers

STFC (ISIS) has been awarded a grant from the UK's International Science Partnerships Fund[2] to support Malaysian use of ISIS until March 2026. The award will pay for the costs of beamtime at ISIS, and will support the cost of travel, food and accommodation of Malaysian researchers coming to ISIS for experiments.

The fund will also provide workshops and webinars for technical advice on muon and neutron science, and can support costs for researchers to disseminate their research at ISIS once back in Malaysia.

2. The International Science Partnerships Fund is a long-term approach to international research and collaboration for the UK, led by the Department for Science, Innovation and Technology.

Important dates and next steps

Scan the QR code to learn more about ISIS and this funded call to support your research.

22 January 2024	**Webinar:** Introduction to the ISIS Neutron & Muon Source
5 February 2024	**Webinar:** Science at the ISIS Neutron & Muon Source: 1
14 February 2024	**Webinar:** Science at the ISIS Neutron & Muon Source: 2
1 March 2024	ISIS proposal call opens
15 March 2024	**Webinar:** Proposal writing and submission for the ISIS Neutron and Muon Source
17 April 2024	ISIS proposal call closes
Early June 2024	ISIS proposal peer review panel meetings
1 September 2024	ISIS proposal call opens
16 October 2024	ISIS proposal call closes

www.isis.stfc.ac.uk/Pages/Malaysia-Indonesia.aspx

www.isis.stfc.ac.uk @isisneutronmuon uk.linkedin.com/showcase/isis-neutron-and-muon-source