UK Nuclear Activity

February 2024 Issue 127

In this issue,

Newsletter archive: http://npg.dl.ac.uk/OutreachNewsletter/index.html

Nuclear Physics Public Engagement Website: NuclearPhysicsForYou

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1. Nuclear Physics Publications for February*

If you are publishing a paper that you think would be of media value, please contact Wendy Ellison, STFC Press Officer. She can help with press releases and publicity. If you get in touch with her before publication, she can also get material ready in advance for the day of publication.

Phys. Lett. B **849** 138476 (2024) (https://doi.org/10.1016/j.physletb.2024.138476)
Cluster effects on low-energy carbon burning
A. Diaz-Torres, L. R. Gasques, N. V. Antonenko
Published 25 January 2024

Phys. Rev. C 109 024907 (2024) (https://doi.org/10.1103/PhysRevC.109.024907)
Production of η and η′ mesons in pp and pPb collisions
R. Aaij *et al.* (LHCb Collaboration)
Published 13 February 2024

Phys. Rev. C 109 024914 (2024) (https://doi.org/10.1103/PhysRevC.109.024914)
Two-particle Bose-Einstein correlations and their Lévy parameters in PbPb collisions at $\sqrt{s_{NN}}$=5.02 TeV
A. Tumasyan *et al.* (CMS Collaboration)
Published 23 February 2024

Edited by Jack Henderson, IOP Nuclear Physics Group Committee
jack.henderson@surrey.ac.uk

Phys. Rev. C 109 024915 (2024) (https://doi.org/10.1103/PhysRevC.109.024915)
Femtoscopic correlations of identical charged pions and kaons in pp collisions at √s=13 TeV with event-shape selection
S. Acharya *et al.* (ALICE Collaboration)
Published 23 February 2024

Europhysics News **55** 26-28 (2024) (https://doi.org/10.1051/epn/2024108)
Pathways to new exotic nuclei
A. Diaz-Torres and S. Heinz
Published 21 February 2024

Symmetry **16** 231 (2024) (https://doi.org/10.3390/sym16020231)
Symmetries in Collisions as Explored through the Harmonic Oscillator
M. Freer and M. Davies
Published 14 February 2024

*Also includes missed publications from previous months

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2. News to Report

a. Reflections on Physics Powering the Green Economy Reception

David S Lee (Ordinary Member, IOP Nuclear Physics Group)

I was honoured to be part of the nuclear physics group that attended the reception of the "Physics Powering the Green Economy" event. This event, hosted by the Institute of Physics (IOP) Science and Innovation Committee, highlighted the amazing work of UK physics technology in contributing to COP28 in Dubai and the net zero goal of CO2 emission by 2050.

The reception was a fantastic opportunity to see how UK physics technology is leading the way in tackling the climate crisis and creating a better future for everyone. I was especially delighted to meet HRH Duke of Edinburgh, who showed his support and interest in our research.

HRH The Duke of Edinburgh attending the event

The event featured many UK companies that displayed their innovative technologies for a greener future, such as ground-based heat pumps, solar power from space, and heat pump-linked energy generation from aeroplane engines. However, the most impressive and realistic technologies came from the nuclear industry, which demonstrated how nuclear power can be safe, reliable, and sustainable.

One of the highlights of the event was the presentation by Rolls-Royce on their micro reactor design, which can fit inside a container and provide constant power to rural areas and industrial complexes without the need for massive infrastructure.

Poster illustrating the micro-reactor concept

This micro reactor is part of the UK government-backed consortium for Small Modular Reactors (SMR), which aims to deploy proven nuclear technology in a new and flexible way. The Rolls-Royce SMR will produce

470 MWe of electricity once it is built, enough to power 500,000 homes.

One of the exciting exhibits was the one by UKAEA, the United Kingdom Atomic Energy Authority. They showcased their ambitious plan to develop a new type of nuclear reactor that uses fusion instead of fission to produce clean and abundant energy: the Spherical Tokomak for Energy Production (STEP). It is a novel design that aims to create a compact and efficient fusion reactor that could be ready for testing by 2040.

Another exciting innovation was the Sizewell C nuclear plant project, which plans to produce hydrogen as a by-product of electricity generation by using an electrolyser. Sizewell C also shows other promising technologies such as synthetic fuel production using CO2 extraction through Direct Air Capture (DAC). Hydrogen is a clean and versatile fuel used for transport, heating, and industry. The successful demonstration in the Sizewell C project would help reduce the UK's dependence on fossil fuels.

Overall, I was impressed by the progress of nuclear technology and its potential to address the climate crisis during the event. The attendees and the IOP delegates both stated that they do not think the UK can reach net zero by 2050 with the current stages of research and development. While some innovative technologies are still at a low feasibility level, nuclear energy production is advancing rapidly to tackle the climate challenges. Hence, I believe that nuclear technology has a promising role in creating a better future for the climate change issue.

Contributed by David S Lee (Ordinary Member, IOP Nuclear Physics Group)

A report, summarising the conclusions of the impact project that this event was intended to highlight can be found here: https://downloads.iop.org/IOP-Physics-Powering-the-Green-Economy.pdf

b. DESNZ Consultation: Alternative Routes to Market for New Nuclear Projects Consultation

The Alternative Routes to Market for New Nuclear Projects consultation was published on 11th January 2024, alongside the Civil Nuclear Roadmap and a consultation on a new approach to siting new nuclear power generation beyond 2025. The consultation aims to explore what steps the government can take to enable different routes to market for Advanced Nuclear Technologies (ANTs), the potential wider roles of nuclear energy beyond electricity generation and understand how the government can support the private sector to bring forward new nuclear projects. Responses to the consultation will help shape future policy and enable the government to put the right policies in place to ensure nuclear energy plays a key role in our net zero future.

This consultation closes at 11:59pm on 12 April 2024.

More details can be found here: https://www.gov.uk/government/consultations/alternative-routes-to-market-for-new-nuclear-projects

c. Dr Hasan Maridi visit to HIL Warsaw

Dr. Hasan Maridi, based at the University of Manchester, undertook a two-week visit to the Heavy Ion Laboratory of the University of Warsaw. The visit was funded by the British Academy within the British Academy/Cara/Leverhulme Researchers at Risk Research Support Grants Programme under grant number LTRSF/100141. The purpose of the visit was to learn more about transfer reactions using Fresco code and to establish a new collaboration, investigating the breakup of light exotic nuclei.

The research work and training was with Professor Krzysztof Rusek [Heavy Ion Laboratory, University of Warsaw, Warsaw, Poland] and Professor Nicholas Keeley [National Centre for Nuclear Research, Otwock, Poland].

Contributed by Hasan Maridi, University of Manchester

d. Early Careers: One-to-one meetings

Previously, we posted an article about the importance of having a mentor in your early career. This month we will focus on the importance of having regular 1-2-1 meetings with your line manager/ supervisor. 1-2-1

meetings are a less formal setting for you to open up to your manager about your struggles or concerns, but you can also highlight parts of your work that you have really been enjoying! These meetings can take place in person or online and can be flexible to your needs.

In order to get the most out of this interaction, take some time before the meeting to prepare points of discussion. If there is something you have wanted to bring up during the week but have not found the right time to do so, now is the time. This is especially relevant if your manager is a very busy person - you can use this space to talk privately where all of the focus is on you and your development with no distractions, so make the most of it!

You can take charge of the conversation, after all, it's about your personal development. Prepare a list of topics you want to discuss to help you guide the conversation and ensure you don't miss anything out. If you bring up any challenges you have been facing, you and your manager can work together to set actionable goals to help you overcome these challenges.

These meetings can help you to build a strong working relationship with your manager, and if you are open about what your career aspirations are, could lead to more opportunities in the future

Contributed by Hannah Gill, Babcock International, IoP Nuclear Physics Group Committee

e. UK EIC Meeting held at the University of York

Researchers from across the UK involved with the upcoming Electron Ion Collider (EIC) facility at Brookhaven National Lab gathered in York on March 1st to share ideas and discuss UK strategy and direction for research at this high-priority next generation facility. An exciting range of talks spanned UK contributions to ongoing studies for physics analysis, relevant theoretical developments, accelerator science and detector development, and was the first such in-person meeting since the COVID pandemic, building on a previous in-person meeting in 2016 and a virtual one in 2020. In addition to the in-person contingent, online participants were able to join and contribute to the discussions.

UK-based early career researchers were well-represented, and had an opportunity to gain a bigger picture view of the EIC project and the related work in the UK. We look forward to the next UK EIC meeting in the near future and hope to build on the success of this event by deepening the connections within the UK EIC community and showcasing the potential of the EIC to new collaborators.

Contributed by Stuart Fegan, University of York

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3. Outreach Activity

a. Understanding the Atomic Nucleus: Into the Quantum Realm

Dr. Jack Bishop gave a public lecture at the University of Birmingham entitled "*Understanding the Atomic Nucleus: Into the Quantum Realm*". This lecture, on the 6th of February, gave an overview of how physicists have learnt ever more about the core of every atom - the nucleus - and the techniques scientists use to study it and how these methods link to our everyday lives. Additional details can be found here.

Contributed by Jack Bishop, University of Birmingham

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4. Media Interactions

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