# UK Nuclear Activity

May 2025 Issue 142

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 May****

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.

*Also includes missed publications from previous months

Nature Communications **16** 4985 (2025) (https://doi.org/10.1038/s41467-025-60259-6)
New proton emitter $^{188}$At implies an interaction unprecedented in heavy nuclei
H. Kokkonen *et al.*
Published 29 May 2025

Nature Communications **16** 5003 (2025) (https://doi.org/10.1038/s41467-025-60047-2)
Discovery of the α-emitting isotope $^{210}$Pa
M. M. Zhang *et al.*
Published 29 May 2025

Phys. Rev. Lett. **134** 212501 (2025) (https://doi.org/10.1103/PhysRevLett.134.212501)
Experimental Test of the Ratio Method for Nuclear-Reaction Analysis
S. Ota *et al.*
Published 28 May 2025

Edited by Jack Henderson, IOP Nuclear Physics Group Committee
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Phys. Rev. Lett. **134** 182501 (2025) (https://doi.org/10.1103/PhysRevLett.134.182501)
Charge Radii of Neutron-Rich Scandium Isotopes and the Seniority Symmetry in the $0f_{7/2}$ Shell
S. W. Bai *et al.*
Published 7 May 2025

Phys. Rev. Lett. **134** 172701 (2025) (https://doi.org/10.1103/PhysRevLett.134.172701)
Impact of Newly Measured $\beta$-Delayed Neutron Emitters around $^{78}$Ni on Light Element Nucleosynthesis in the Neutrino Wind Following a Neutron Star Merger
A. Tolosa-Delgado *et al.*
Published 1 May 2025

Phys. Lett. B **867** 139601 (2025) (https://doi.org/10.1016/j.physletb.2025.139601)
Competing structures in the beyond neutron N=104 midshell nucleus $^{184}$Pb
J. Ojala *et al.*
Published 26 May 2025

Phys. Lett. B **867** 139600 (2025) (https://doi.org/10.1016/j.physletb.2025.139600)
Unbound neutron $\nu 0d_{3/2}$ strength in $^{17}$C and the N=16 shell gap
J. Lois-Fuentes *et al.*
Published 29 May 2025

Phys. Lett. B **866** 139551 (2025) (https://doi.org/10.1016/j.physletb.2025.139551)
The $^{76}$Cu conundrum remains unsolved
B. Olaizola *et al.*
Published 15 May 2025

Phys. Lett. B **866** 139562 (2025) (https://doi.org/10.1016/j.physletb.2025.139562)
Measurement of f1(1285) production in pp collisions at $\sqrt{s}$ = 13 TeV
S. Acharya *et al.* (ALICE Collaboration)
Published 19 May 2025

Phys. Rev. C **111** 054304 (2025) (https://doi.org/10.1103/PhysRevC.111.054304)
Triaxiality and confirmation of low-spin tilted precession in $^{135}$Nd
B. F. Lv *et al.*
Published 5 May 2025

Phys. Rev. C **111** 054317 (2025) (https://doi.org/10.1103/PhysRevC.111.054317)
First $\beta$-delayed $\gamma$-ray spectroscopy of $^{109}$Nb: Single-quasiparticle states with prolate shape in $^{109}$Mo
S. Bae *et al.*
Published 21 May 2025

Phys. Rev. C **111** 054906 (2025) (https://doi.org/10.1103/PhysRevC.111.054906)
Proton emission in ultraperipheral Pb-Pb collisions at $\sqrt{s_{NN}}$=5.02 TeV
S. Acharya *et al.* (ALICE Collaboration)
Published 7 May 2025

Phys. Rev. C **111** 054913 (2025) (https://doi.org/10.1103/PhysRevC.111.054913)
Bayesian inference analysis of jet quenching using inclusive jet and hadron suppression measurements
R. Ehlers *et al.*
Published 15 May 2025

Rev. Mod. Phys. **97** 025003 (2025) (https://doi.org/10.1103/RevModPhys.97.025003)
Quantum physics of stars
M. Wiescher *et al.*
Published 27 May 2025

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Eur. Phys. J. A **61** 99 (2025) (https://doi.org/10.1140/epja/s10050-025-01572-y)
The $^{22}$Ne(α,n)$^{25}$Mg reaction - state of the art, astrophysics, and perspectives
A. Best *et al.*
Published 10 May 2025

Eur. Phys. J. A **61** 105 (2025) (https://doi.org/10.1140/epja/s10050-025-01563-z)
Neutron capture measurements for s-process nucleosynthesis
C. Domingo-Pardo *et al.*
Published 19 May 2025

Eur. Phys. J. A **61** 98 (2025) (https://doi.org/10.1140/epja/s10050-025-01560-2)
Overview of stellar nucleosynthesis in explosive environments and recent experimental highlights
H. Jayatissa *et al.*
Published 8 May 2025

Eur. Phys. J. C **85** 553 (2025) (https://doi.org/10.1140/epjc/s10052-025-13971-y)
Measurement of the inclusive isolated-photon production cross section in pp and Pb–Pb collisions at $\sqrt{s_{NN}}$ = 5.02 TeV
S. Acharya *et al.* (ALICE Collaboration)
Published 19 May 2025

Nucl. Phys. A **1060** 123120 (2025) (https://doi.org/10.1016/j.nuclphysa.2025.123120)
First experimental test of the ratio method
S.Ota *et al.*
Published 29 April 2025

Front. Phys. **13** (2025) (https://doi.org/10.3389/fphy.2025.1530428)
Some aspects of the quenching of single-particle strength in atomic nuclei
A. O. Macchiavelli, S. Paschalis, M. Petri
Published 19 March 2025

Modern Physics Letters A **40** 255073 (2025) (https://doi.org/10.1142/S0217732325500737)
Mass and charge transfers before contact in $^{40}$Ca + $^{208}$Pb collisions
R. Bhukya and A. Diaz-Torres
Published 9 May 2025

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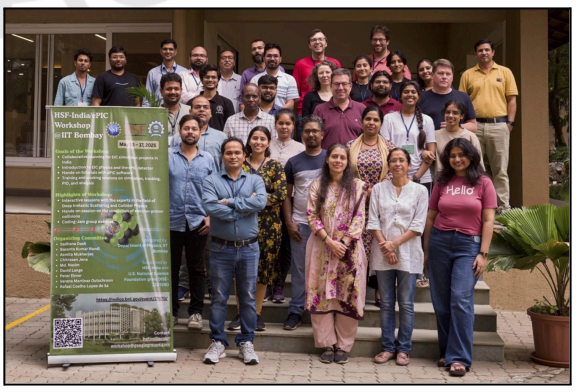
***2. News to Report***

***a. HSF-India/ePIC Workshop***

Stephen Kay from the University of York joined Electron-Ion Collider (EIC) researchers Charlotte Van Hulse (Alcala) and Chandradoy Chatterjee (INFN Trieste) to deliver a training workshop at IIT Bombay in Mumbai, India from the 13th to 17th of May. The workshop combined introductory lectures on the science and technology of the upcoming EIC with a series of long format tutorials. These tutorials introduced attendees to the software environment developed by the ePIC collaboration. Tutorials included: working with the output of ePIC simulations, details of particle identification with ePIC and how to construct a physics analysis code for the EIC.



The ePIC collaboration is responsible for designing, building and operating the first experiment at the EIC. Numerous UK universities and laboratories are already heavily involved in the development of detectors and software for the ePIC experiment.

The event was organised and funded as part of the US NSF award OISE-2201990: "AccelNet-Implementation: HSF-India - Research Software Networks in Physics". The HSF-India project aims to join networks in India to networks in the U.S. and Europe in order to build international research software collaborations required to reach the science goals of experimental particle, nuclear and astroparticle research.

Overall, the workshop was very well received, as attested to by feedback from an anonymous post workshop survey. Plans for follow-up EIC software workshops in India are already under discussion. This is an exciting opportunity to build and strengthen global research collaborations for the EIC ahead of this major new facility coming online.

*Contribution from Stephen Kay, University of York*

***b. HYPATIA Workshop – Science Opportunities***

In March 2025, the HYPATIA Collaboration organised the first physics workshop, HYPATIA Workshop – Science Opportunities, held at the Institute of Physics in London on 20–21 March 2025. The workshop brought together the international nuclear physics community to explore the opportunities enabled by HYPATIA, share innovative experimental ideas, and strengthen collaborations. We warmly welcomed new ideas for experiments, including those not involving in-beam γ-ray spectroscopy, as we continue to expand the scientific opportunities with HYPATIA. The workshop also served as a platform for expanding the scientific user base of HYPATIA and fostering a diverse and dynamic research program aligned with the upgraded capabilities of RIBF.

The workshop featured overview talks on the RIBF facility and its upgrade plans, an introduction to the HYPATIA project, and discussions on the physics opportunities across different spectrometers at RIBF. Updates on detector development, including progress on $CeBr_3$ and GAGG scintillators, data acquisition systems, and simulation studies, were presented. Further sessions focused on experimental techniques such as lifetime measurements and total absorption spectroscopy. More than 60 participants from institutions in 13 countries and regions across Europe, Asia, and North and South America attended the workshop (in person and online).

The meeting provided a valuable platform for fostering new collaborations and planning future experimental campaigns. Discussions concluded with a round-table session addressing key open questions in nuclear structure, especially around nuclei near $^{78}$Ni, $^{100}$Sn, and $^{132}$Sn. The workshop was co-organised by Professor Marina Petri (University of York) and Dr Pieter Doornenbal (RIKEN Nishina Centre, Japan), with support from the Institute of Physics and the STFC. Further details can be found here: https://iop.eventsair.com/hypatia2025/

*Contribution from Marina Petri, University of York*

***c. New Nature paper reports discovery of asymmetric fission driven by light-fragment shell effects***

A recent experiment performed with the R3B setup at GSI Helmholtzzentrum für Schwerionenforschung, as part of the FAIR Phase-0 programme, has revealed a new region of asymmetric nuclear fission among neutron-deficient nuclei. The work, published in Nature, reports charge distributions for 100 exotic fissioning systems, including 75 measured for the first time, and establishes a new "island" of asymmetric fission in the sub-lead region.

In contrast to the well-known asymmetric fission of actinides, which is driven by shell effects in the heavy fragment, this newly identified island appears to be governed by a deformed proton shell at Z = 36 in the light fragment. The findings challenge existing theoretical models and provide key input for refining predictions of fission distributions in short-lived nuclei, with implications for both

r-process nucleosynthesis and nuclear reactor modelling.

The work involved significant contributions from the Nuclear Physics Group of the University of York.

The paper is available here: https://doi.org/10.1038/s41586-025-08882-7

*Contribution from Marina Petri, University of York*

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***3. Outreach Activity***

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***4. Media Interactions***

***a. ALICE results reported in media - turning lead into gold***

Recent results from the ALICE collaboration arising from a publication in Physical Review C [Phys. Rev. C **111** 054906 (2025)] were reported on in the media, including an article in The Independent:
Scientists mimicking the Big Bang accidentally turn lead into gold

In this work, multiple proton emission was observed in ultraperipheral lead-lead collisions at the LHC, with 1-, 2- and 3-proton emission resulting in the creation of Tl, Hg and Au, respectively.

*Adapted from a contribution by Lee Barnby, University of Derby*