UK Nuclear Activity

October 2014 Issue 16

In this issue,

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

Nuclear Physics Public Engagement Website: www.stfc.ac.uk/NuclearPhysicsForYou

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*1. Nuclear Physics Publications for October**

If you are publishing a paper that you think would be of media value please let Wendy Ellison wendy.ellison@stfc.ac.uk , STFC Press Officer, know. 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. Rev. Lett. 113, 132502 (2014) http://journals.aps.org/prl/abstract/10.1103/PhysRevLett.113.132502
Yrast 6^+ Seniority Isomers of ^{136,138}Sn
G. S. Simpson[1,2,3], G. Gey[3,4,5], A. Jungclaus[6], J. Taprogge[5,6,7], S. Nishimura[5], K. Sieja[8], P. Doornenbal[5], G. Lorusso[5], P.-A. Söderström[5], T. Sumikama[9], Z. Y. Xu[10], H. Baba[5], F. Browne[5,11], N. Fukuda[5], N. Inabe[5], T. Isobe[5], H. S. Jung[12,*], D. Kameda[5], G. D. Kim[13], Y.-K. Kim[13,14], I. Kojouharov[15], T. Kubo[5], N. Kurz[15], Y. K. Kwon[13], Z. Li[16], H. Sakurai[5,10], H. Schaffner[15], Y. Shimizu[5], H. Suzuki[5], H. Takeda[5], Z. Vajta[5,17], H. Watanabe[5], J. Wu[5,16], A. Yagi[18], K. Yoshinaga[19], S. Bönig[20], J.-M. Daugas[21], F. Drouet[3], R. Gernhäuser[22], S. Ilieva[20], T. Kröll[20], A. Montaner-Pizá[23], K. Moschner[24], D. Mücher[22], H. Naïdja[8,15,25], H. Nishibata[18], F. Nowacki[8], A. Odahara[18], R. Orlandi[26,†], K. Steiger[22], and A. Wendt[24]
*Published 26 September 2014

Phys. Rev. C 90, 034321 (2014) http://journals.aps.org/prc/abstract/10.1103/PhysRevC.90.034321
Shell structure of potassium isotopes deduced from their magnetic moments
J. Papuga[1,*], M. L. Bissell[1], K. Kreim[2], C. Barbieri[3], K. Blaum[2], M. De Rydt[1], T. Duguet[4,5], R. F. Garcia Ruiz[1], H. Heylen[1], M. Kowalska[6], R. Neugart[7], G. Neyens[1], W. Nörtershäuser[7,8], M. M. Rajabali[1], R. Sánchez[9,10], N. Smirnova[11], V. Somà[4], and D. T. Yordanov[2,12]
*Published 29 September 2014

*Also including missed publications from previous months.

Int. J. Mod. Phys. A 29, 1430044 (2014)
http://www.worldscientific.com/doi/abs/10.1142/S0217751X14300440
Performance of the ALICE experiment at the CERN LHC
The ALICE Collaboration, UK authors: D. Alexandre, L.S. Barnby, D. Evans, M. A. S. Figueredo, L.D. Hanratty, P.G. Jones, A. Jusko, M. Krivda, G.R. Lee, R.C. Lemmon, R. Lietava, R. Romita, P.A. Scott, O. Villalobos-Baillie
*Published 29 September 2014

NIM A 760, 28 (2014) http://www.sciencedirect.com/science/article/pii/S0168900214006202
An experimental characterisation of a Broad Energy Germanium detector
L.J. Harkness-Brennan[a,*], D.S. Judson[a], A.J. Boston[a], H.C. Boston[a], S.J. Colosimo[a], J.R. Cresswell[a], P.J. Nolan[a], A.S. Adekola[b], J. Colaresi[b], J.F.C. Cocks[b], W.F. Mueller[b]
Published 1 October 2014

Phys. Rev. C 90, 044601 (2014) http://journals.aps.org/prc/abstract/10.1103/PhysRevC.90.044601
Phonon coupling effects in proton scattering from ^{40}Ca
R. S. Mackintosh[*], N. Keeley[†]
Published 2 October 2014

Phys. Rev. C 90, 044602 (2014) http://journals.aps.org/prc/abstract/10.1103/PhysRevC.90.044602
Dynamic polarization potential and dynamical nonlocality in nuclear potentials: Nucleon-nucleus potential
N. Keeley[*], R. S. Mackintosh[†]
Published 2 October 2014

Phys. Rev. C 90, 044307 (2014) http://journals.aps.org/prc/abstract/10.1103/PhysRevC.90.044307
Evolution of nuclear ground-state properties of neutron-deficient isotopes around Z=82 from precision mass measurements
Ch. Böhm[1,*], Ch. Borgmann[1,†], G. Audi[2], D. Beck[3], K. Blaum[1], M. Breitenfeldt[4], R. B. Cakirli[1,‡], T. E. Cocolios[5,6], S. Eliseev[1], S. George[7,§], F. Herfurth[3], A. Herlert[6,‖], M. Kowalska[6], S. Kreim[1,6], D. Lunney[2], V. Manea[2], E. Minaya Ramirez[3,8,§], S. Naimi[2,¶], D. Neidherr[1,**], M. Rosenbusch[9], L. Schweikhard[9], J. Stanja[10,††], M. Wang[2], R. N. Wolf[9,§], and K. Zuber[10]
Published 7 October 2014

Phys. Rev. C 90, 041301(R) (2014) http://journals.aps.org/prc/abstract/10.1103/PhysRevC.90.041301
Evolution of fission-fragment mass distributions in the neutron-deficient lead region
L. Ghys[1,2,*], A. N. Andreyev[3,4,5], M. Huyse[1], P. Van Duppen[1], S. Sels[1], B. Andel[6], S. Antalic[6], A. Barzakh[7], L. Capponi[5], T. E. Cocolios[8,9], X. Derkx[5,10], H. De Witte[1], J. Elseviers[1], D. V. Fedorov[7], V. N. Fedosseev[11], F. P. Hessberger[12,13], Z. Kalaninová[6], U. Köster[14], J. F. W. Lane[5], V. Liberati[5], K. M. Lynch[8,9], B. A. Marsh[11], S. Mitsuoka[4], P. Möller[15], Y. Nagame[4], K. Nishio[4], S. Ota[4], D. Pauwels[2], R. D. Page[16], L. Popescu[2], D. Radulov[1], M. M. Rajabali[1], J. Randrup[17], E. Rapisarda[8], S. Rothe[11,18], K. Sandhu[5], M. D. Seliverstov[1,3,5,7], A. M. Sjödin[11], V. L. Truesdale[3], C. Van Beveren[1], P. Van den Bergh[1], Y. Wakabayashi[4,19], and M. Warda[20]
Published 15 October 2014

Eur. Phys. J. C 74:3077 (2014) http://link.springer.com/article/10.1140/epjc/s10052-014-3077-y
Event-by-event mean p_T fluctuations in pp and Pb–Pb collisions at the LHC
B. Abelev et al. ALICE Collaboration, UK Authors: D. Alexandre, L.S. Barnby, M. Borri, D. Evans, M. A. S. Figueredo, L.D. Hanratty, P.G. Jones, A. Jusko, M. Krivda, G.R. Lee, R.C. Lemmon, R. Lietava, J. Norman, R. Romita, O. Villalobos-Baillie
Published online 15 October 2014

Phys. Rev. C 90, 044312 (2014) http://journals.aps.org/prc/abstract/10.1103/PhysRevC.90.044312
α decay of ^{176}Au
A. N. Andreyev[1,2], S. Antalic[3], D. Ackermann[4], T. E. Cocolios[5], J. Elseviers[6], S. Franchoo[7], S. Heinz[4], F. P. Heßberger[4,8], S. Hofmann[4,9], M. Huyse[6], J. Khuyagbaatar[4], B. Kindler[4], B. Lommel[4], R. Mann[4], R. D. Page[10], P. Van Duppen[6], and M. Venhart[6]
Published 16 October 2014

Eur. Phys. J. C 74:3108 (2014) http://link.springer.com/article/10.1140/epjc/s10052-014-3108-8
Neutral pion production at midrapidity in pp and Pb–Pb collisions at $\sqrt{s_{NN}}$ = 2.76 TeV
B. Abelev et al. ALICE Collaboration, UK Authors: D. Alexandre, L.S. Barnby, D. Evans, M. A. S. Figueredo,

L.D. Hanratty, P.G. Jones, A. Jusko, M. Krivda, G.R. Lee, R.C. Lemmon, R. Lietava, J. Norman, R. Romita, O. Villalobos-Baillie
Published online 16 October 2014

NIM A 762, 42 (2014) http://www.sciencedirect.com/science/article/pii/S0168900214006664
Monte-Carlo optimisation of a Compton suppression system for use with a broad-energy HPGe detector
R. Britton[a,b,*], J.L. Burnett[b], A.V. Davies[b], P.H. Regan[a]
Published 21 October 2014

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2. News to Report

a. AGATA celebrated on an Italian Stamp. The Italian Ministry of Economic Development has approved the issue of four stamps dedicated to the national laboratories of the Italian National Institute for Nuclear Physics, one of which features AGATA. Professor John Simpson, Head of STFC's Nuclear Physics Group and the previous International AGATA Spokesperson, said: "It's a really exciting to see AGATA, which was developed by STFC's Nuclear Physics Group and UK Universities, to be featured on an Italian postage stamp. AGATA is a fantastic example of a truly collaborative project that will answer some of the most fundamental questions about our universe."
For further information see https://www.researchitaly.it/en/understanding/press-media/news/italian-nuclear-physics-in-four-postage-stamps/

Contribution by Rolf-Dietmar Herzberg R.Herzberg@Liverpool.ac.uk (Liverpool) and John Simpson John.Simpson@stfc.ac.uk (Daresbury)

b. Report on NuPECC meeting - Edinburgh Oct 2014. An open meeting was held in the morning consisting of presentations on the UK Nuclear Physics programme (for the agenda see www.nupecc.org). The presentations showed the high quality of the UK activity in the fields where the programme is focussed.
The closed NuPECC meeting discussed a number of topics.
Facilities: There was a series of presentations concerning developments at facilities in Europe. These featured ISOL facilities that are under development including SPIRAL2, HIE ISOLDE and SPES. The idea of a EURISOL Distributed Facility (DF) was discussed. This would be a proposal for the ESFRI list to get a coordinated development of ISOL facilities (EURISOL DF) accepted. In future the ESFRI roadmap will be shorter and based on different criteria. The new roadmap is due in January 2016.
There were additional presentations on ELI-NP, EPS Nuclear Physics Board, Horizon 2020 applications including ENSAR2 and HPH, ECOS proposal based in Spain and an EDM project in Julich.
In future ELI-NP will introduce a training programme across its activities and would welcome help.
There was a report on nuclear physics activities in Canada including their preparations for a long range plan. Canada (population 33 million) has two major national nuclear physics laboratories, ~200 academic/faculty nuclear physics staff and good capital and recurrent budgets.
NuPECC activities: The status of ECT*was presented. A new Director will take over in 2015, a contract is being negotiated.
The NuPECC budget was discussed. It is clear that support from ESF will not be available for the costs incurred in relation to the next long range plan. Thought will have to be given as to how this will be financed. In addition to the full brochure on Nuclear Physics in Medicine a short brochure will be printed for the launch event in Brussels in Nov 2014. Copies will be available for wide distribution.
NuPECC is considering a brochure on nuclear physics on the topic "Light to reveal the heart of matter" for publication during the

International year of light in 2015. This is being done by NuPECC board members.
Report from NuPECC chair: IUPAP working group 9 discussed the proposal that countries that are not FAIR members will be charged for access to carry out experiments. They have set up a working group to consider this. There is concern from many facilities worldwide about future implications.
With ESF evolving to become Science Europe, a residual group will remain from ESF as a service based organisation. This will be distinct from the policy work of Science Europe. NuPECC has expressed the view, along with 5 of the 6 current ESF expert boards, that it wished to continue its active role. Science Europe will maintain a dialogue with these expert boards and will seek their advice. Once a final decision is taken then the mechanism for paying the NuPECC fee (currently administered by ESF) will become clear.
Other business: Following the decision to give FAIR membership of NuPECC an application has been received from the JINR laboratory at Dubna that it should also be a member. Following discussion NuPECC agreed to JINR Dubna becoming a NuPECC member.
Contribution by Paul Nolan pjn@ns.ph.liv.ac.uk *(Liverpool) and Alex Murphy* a.s.murphy@ed.ac.uk (Edinburgh)

c. 2014 IOP Rutherford Medal and Prize. On Wednesday 15th October Professor Paul Nolan, University of Liverpool, was awarded the Rutherford Medal for his outstanding contributions to nuclear structure at extremes of angular momentum and his leading role in the development of segmented germanium detector technology.
The team enjoyed celebrating with Professor Nolan at the awards dinner in London.

Contribution by John Simpson *John.Simpson@stfc.ac.uk (Daresbury)*

d. Applications of Novel Scintillators for Research and Industry. The ANSRI 2015 workshop will take place in the O'Brien Centre for Science at University College Dublin, Ireland from the 12th to the 14th of January 2015.
The primary goal of this workshop is to address the shortfalls in current scintillator performance in various application areas and to explore possible solutions to these problems. The latest developments in single crystal and glass ceramic scintillator technologies will be discussed. The workshop will host a mixture of invited and contributed talks, as well as a poster session.
A secondary goal of the workshop is to identify new pathways for future developments by bringing together experts from diverse backgrounds. Furthermore the exchange of knowledge between research and industry experts will lead to the formation of new networks in this rapidly changing field.
An Institute of Physics (IoP) Ireland sponsored public talk will also take place from 6-7pm on the evening of the 12th of January, in the Moore Auditorium, UCD. Invited speaker Prof. Luigi Piro from IAPS/INAF, Roma, will give an engaging talk on Europe's next generation X-ray observatory, Athena, and its future prospects for X-ray astronomy.
The abstract submission and early registration deadlines are the 21st November and 5th December respectively. More details about the workshop can be found at ssmr.ucd.ie/ansri2015/.
Contribution by Oliver Roberts *oliver.roberts@ucd.ie (Uni. College Dublin)*

e. MEDICIS Day. The CERN-MEDICIS project stands for MEDical Isotopes Collected from ISolde, the radioactive ion beam facility at CERN. It makes use of the CERN PS Booster proton beam after it travels through the ISOLDE main target volume and irradiates a second target at the position of the beam dump. After irradiation, this target can be removed along a rail system and transported to a series of class A laboratories where radioisotopes can be extracted, benefitting from 50 years of experience in radioactive ion beam production and purification at ISOLDE. Those radioisotopes are then meant to supply research institutes in Switzerland, and soon the UK, for pre-clinical studies of new medical radioisotopes.

On 15 October, a meeting was organised by Dr Thierry Stora, head of the CERN-MEDICIS project, at the Globe in CERN. It was the opportunity for the different partners to meet, whether from the nuclear physics side, or from the radiopharmaceutical and medical sides. The University of Manchester was featured amongst the prime partners of the MEDICS project, as Prof Novozelov is involved through a Marie Curie Initial Training Network, and also for the active role the Nuclear Physics Group is taking in supporting the laser system for CERN-MEDICIS.
ISOLDE can already provide radioisotope samples occasionally for initial studies. From 2016 onwards, CERN-MEDICIS should be able to provide one sample per week over 30 weeks of operation per year. The large array of isotopes available from CERN-MEDICIS will give the medical community the tools they need to experiment with an array isotopes not currently available on the market, and identify the cures of tomorrow.
Contribution by Thomas Elias Cocolios
thomas.elias.cocolios@cern.ch (Manchester)

f. Yrast 6^+ Seniority Isomers of ^{136,138}Sn. The decay of 6^+ isomeric states in the very neutron-rich nuclei ^{136,138}Sn have been measured as part of the EURICA campaign at RIKEN. The observation of gamma decays of these nuclei extends the limit of the last Sn nucleus with known excited states by four neutrons. Data on these semi-magic nuclei is essential for testing and tuning shell-model interactions in the N=82-126 valence space. The energies and transition rates of the transitions in $^{134-138}$Sn have been compared to several existing state-of-the-art shell-model calculations, performed using realistic effective interactions. Although the states in these decay cascades are predicted to be mostly made up of neutron f7/2 orbits, and their energies correctly calculated, none of the interactions correctly reproduced the B(E2; $6^+ \rightarrow 4^+$) of the mid-shell nucleus ^{136}Sn. Reducing the diagonal f7/2 matrix elements allowed all the transition rates be successfully calculated. The reduction of these matrix elements is equivalent to reducing the pairing force. The retarded B(E2; $6^+ \rightarrow 4^+$) of ^{136}Sn is due to the mixed seniority of the 4+_1 state, which has almost equal seniority 2 and 4 contributions. A similar situation is present in the isotopes ^{72,74}Ni and highlights a general problem in calculating the pairing force in modern realistic effective interactions.
For further details see the paper.
Contribution by Gary Simpson
Gary.Simpson@uws.ac.uk (Uni. West of Scotland)

g. SET for Britain: A poster competition at Westminster for early-career researchers.
SET for BRITAIN exists to raise the profile of Britain's early-stage researchers by providing them with an opportunity to engage with Members of both Houses of Parliament during a poster session. The aim is to expose the 100 or so Parliamentarians who attend during the day to current science, engineering and mathematics research being undertaken in the UK, especially by their local constituents and in their local University.
The competition is for anyone who falls into these disciplines:
Biological and Biomedical Sciences
Physical Sciences (Chemistry and Physics)
Engineering and Mathematics
For more information see:
http://www.setforbritain.org.uk/2015event
Deadline for competition entries: 5pm, 5 Dec 2014. The event itself will take place on Monday 9 March 2015.

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3. Outreach Activity

Nuclear physics goes north. The UK's second most northern nuclear physics group ventured even farther to the north. Dr Seitz of Glasgow University's nuclear physics group followed a short notice invitation to the Orkney international science festival to present the work of the group in nuclear physics and particularly the environmental aspects and analysis of natural occurring radiation to a wide audience from nearly all orca dian secondary schools. The enthusiasm engagement and hospitality on the islands have been outstanding and the group hopes for a return in future festivals.
Hot on the heels of the trip far north was a high profile commitment to the Glasgow Explorathon, embedded in a European night of science, presented at the Glasgow science centre, where members of the group gave presentations and demonstrations on nuclear physics and its medical imaging applications

to a sell-out crowd of over 2500 people from all age groups.
Contribution by Bjorn Seitz
Bjoern.Seitz@glasgow.ac.uk (Glasgow)

Ada Lovelace Day. To celebrate Ada Lovelace Day, York ScienceGrrl once again invaded the Yorkshire Museum, bringing scientists, gadgets and hands-on demos. There were a range of scientists involved: physicists, astronomers, chemists, biologists, computer scientists and an archaeologist.
There was lots of science to be seen. From nuclear physics, Dr Gemma Wilson took along a sample of Fergusonite (a radioactive rock dug up in the USA) and some different radiation detectors. A Geiger counter was used to measure the activity of the rock, while a scintillator detector was used to detect gamma rays from the sample (and also from the surroundings), and reveal their energies, helping to identify exactly what was decaying inside the rock.
Dr. Lianne Scruton also brought a piece of polycrystalline diamond, used inside detectors. This was used to show how diamond is a very good conductor of heat, and can be used to cut ice, using the heat from your hands.

The idea of Ada Lovelace Day is to celebrate both current and past women in science. A trail of 12 women was also set up around the museum, women that should be household names, from many different disciplines. Children were challenged with a quiz about the twelve female scientists, and two winners of the quiz, who were chosen out of the hat, won some ace books and ScienceGrrl goodies. For further details see http://theunstablenucleus.wordpress.com/2014/10/21/ada-lovelace-day/.
Contribution by Gemma Wilson
Gemma.Wilson@york.ac.uk (York)

Liverpool Physics Olympics 2014. The 23rd annual Liverpool Physics Olympics took place at the University of Liverpool on Saturday 18th October. Thirty four teams of 4 or 5 year 12 students took part in the many activities accompanied by their teachers. The events took place throughout the day and covered a wide range of Physics activities including a session led by Nuclear Physicists in the radiation laboratory involving gamma ray measurements. The students also completed a Fermi quiz during the day where they had to answer challenging physics questions to the nearest order of magnitude, several nuclear physics questions were included. The Nuclear physics group at Liverpool has played a leading role in this event for many years and has as a result established excellent relations with a number of schools.
Contribution by Paul Nolan
pjn@ns.ph.liv.ac.uk *(Liverpool)*

Public Lecture. On the 22nd October the nuclear structure group at University of the West of Scotland, held a lecture entitled "The origin of elements - a stars' life", to an audience of about 60 people, mostly members of the general public.
Contribution by Marcus Scheck
Marcus.Scheck@uws.ac.uk (Uni. West of Scotland)

Outreach Workshops. Following on from their outreach grant success in August, researchers from the University of York presented their research and nuclear physics outreach workshop at YorNight, the York part of the European researchers night on the 26th September. They used their CSI gamma-ray detector in Treasurers House, a historic stone building that provided some nice spectra. The same workshops were presented between the 13th and 15th October as part of the Scarborough Engineering fair.
Contribution by Thomas Henry
twh509@york.ac.uk (York).

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4. Media Interactions

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