UK Nuclear Activity

November 2017 Issue 53

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 November*

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. Scr. 92 114008 (2017) http://iopscience.iop.org/article/10.1088/1402-4896/aa8fdc/pdf
Shape coexistence and shape transition in self-conjugate nucleus ^{72}Kr and the tensor force
K Kaneko[1], Y Sun[2,3,4] and R Wadsworth[5]
*Published 24 October 2017

Radiat. Phys. Chem. 140, 57 (2017) http://www.sciencedirect.com/science/article/pii/S0969806X17301603
Progress towards the development of a rapid analytical approach for separation of ^{226}Ra using dibenzo-18-crown-6 ether functionalised silica (SiO2) disks
H.Mohamud[ab], E.M.van Es[ab], T.Sainsbury[b], P.Ivanov[b], B.Russell[b], P.H.Regan[bc], N.I.Ward[a]
Published November 2017

Radiat. Phys. Chem. 140, 122 (2017) http://www.sciencedirect.com/science/article/pii/S0969806X17302360
A review of the evaluation of TENORM levels at the produced water lagoon of the Minagish oil field using high-resolution gamma-ray spectrometry
H.M.Shams[abc], D.A.Bradley[ad], H.Alshammari[a], P.H.Regan[ac]
Published November 2017

Radiat. Phys. Chem. 140, 180 (2017) http://www.sciencedirect.com/science/article/pii/S0969806X17300683
Destructive and non-destructive measurements of NORM in monazite-rich sands of Brazil
C.Larijani[ab], P.Schwendner[c], C.Cockell[c], P.Ivanov[a], B.Russell[a], P.Aitken-Smith[a], A.K.Pearce[a], P.H.Regan[ab]
Published November 2017

*Also including missed publications from previous months.

Radiat. Phys. Chem. 140, 225 (2017) http://www.sciencedirect.com/science/article/pii/S0969806X17302402
The fate of radiation induced giant-nucleated cells of human skin fibroblasts
A.A.Almahwasi[ab], J.C.Jeynes[ac], D.A.Bradley[b], P.H.Regan[bd]
Published November 2017

Radiat. Phys. Chem. 140, 463 (2017) http://www.sciencedirect.com/science/article/pii/S0969806X17301779
Radionuclide metrology research for nuclear site decommissioning
S.M.Judge[ab]P.H.Regan[ab]
Published November 2017

Radiat. Phys. Chem. 140, 475 (2017) http://www.sciencedirect.com/science/article/pii/S0969806X17301305
Commissioning of the UK NAtional Nuclear Array
R.Shearman[ab], S.M.Collins[a], G.Lorusso[ab], M.Rudigier[b], S.M.Judge[ab], S.J.Bell[a], Zs.Podolyak[b], P.H.Regan[ab]
Published November 2017

Radiat. Phys. Chem. 140, 480 (2017) http://www.sciencedirect.com/science/article/pii/S0969806X17301354
Progress on the chemical separation of fission fragments from ^{236}Np produced by proton irradiation of natural uranium target
C.Larijani[ab], S.M.Jerome[a], G.Lorusso[a], P.Ivanov[a], B.Russell[a], A.K.Pearce[a], P.H.Regan[ab]
Published November 2017

Radiat. Phys. Chem. 140, 493 (2017) http://www.sciencedirect.com/science/article/pii/S0969806X16308131
Isomer spectroscopy of neutron-rich $^{168}Tb_{103}$
L.A.Gurgi[a], P.H.Regan[ab], P.A.Söderström[c], H.Watanabe[de], P.M.Walker[a], Zs.Podolyák[a], S.Nishimura[c], T.A.Berry[a], P.Doornenbal[c], G.Lorusso[abc], T.Isobe[c], H.Baba[c], Z.Y.Xu[fg], H.Sakurai[ch], T.Sumikama[ci], W.N.Catford[a], A.M.Bruce[j], F.Browne[j], J.J.Valiente-Dòbon[ab]
Published November 2017

Phys. Lett. B 772, 703 (2017) http://www.sciencedirect.com/science/article/pii/S0370269317305877
Spectroscopy at the two-proton drip line: Excited states in ^{158}W
D.T.Joss[a], R.D.Page[a], A.Herzán[a], L.Donosa[a], J.Uusitalo[b], R.J.Carroll[a], I.G.Darby[ac], K.Andgren[d], B.Cederwall[d], S.Eeckhaudt[b], T.Grahn[b], P.T.Greenlees[b], B.Hadinia[de], U.Jakobsson[bd], P.M.Jones[f], R.Julin[b], S.Juutinen[b], M.Leino[b]A.-P.Leppanen[b], M.Nyman[b], D.O'Donnell[a], J.Pakarinen[b], P.Rahkila[b], M.Sandzelius[b], J.Sarén[b], C.Scholey[b], D.Seweryniak[g], J.Simpson[h], J.Sorri[b]
Published November 2017

JINST 12, P11003 (2017) http://iopscience.iop.org/article/10.1088/1748-0221/12/11/P11003
EXILL—a high-efficiency, high-resolution setup for γ-spectroscopy at an intense cold neutron beam facility
EXILL-Core collaboration
Published 7 November 2017

Phys. Rev. C 96, 054305 (2017) https://journals.aps.org/prc/abstract/10.1103/PhysRevC.96.054305
Effective proton-neutron interaction near the drip line from unbound states in ^{25,26}F
M. Vandebrouck et al. (R3B collaboration)
Published 8 November 2017

Phys. Lett. B 774, 599 (2017) http://www.sciencedirect.com/science/article/pii/S0370269317308274
Isoscalar single-pion production in the region of Roper and $d^*(2380)$ resonances
The WASA-at-COSY Collaboration
Published 10 November 2017

Phys. Lett. B 774 64 (2017) http://www.sciencedirect.com/science/article/pii/S0370269317307074
Measuring K^0_S $K^{\pm}$ interactions using Pb–Pb collisions at √sNN = 2.76 TeV
ALICE Collaboration, UK Authors: H. A. Andrews, L. S. Barnby, M. Borri, M. Chartier, D. Evans, K. L. Graham, C. Hills, P. G. Jones, A. Jusko, M. Krivda, R. C. Lemmon, R. Lietava, S. W. Lindsay, J. Norman, O. Villalobos Baillie, E. Willsher, N. Zardoshti
Published 10 November 2017

Phys. Rev. Lett. 119, 192503 (2017) https://journals.aps.org/prl/abstract/10.1103/PhysRevLett.119.192503
Discovery of ^{72}Rb: A Nuclear Sandbank Beyond the Proton Drip Line
H. Suzuki[1], L. Sinclair[1,2], P.-A. Söderström[1,3,4,*], G. Lorusso[1,5,6], P. Davies[2,†], L. S. Ferreira[7], E. Maglione[8], R. Wadsworth[2], J. Wu[1,9,‡], Z. Y. Xu[10,§], S. Nishimura[1], P. Doornenbal[1], D. S. Ahn[1], F. Browne[1,11], N. Fukuda[1], N. Inabe[1], T. Kubo[1,‖], D. Lubos[1,12], Z. Patel[1,6], S. Rice[1,6], Y. Shimizu[1], H. Takeda[1], H. Baba[1], A. Estrade[13,¶], Y. Fang[14,**], J. Henderson[2,††], T. Isobe[1], D. Jenkins[2], S. Kubono[1], Z. Li[9], I. Nishizuka[15,‡‡], H. Sakurai[1,10], P. Schury[1,16,§§], T. Sumikama[15], H. Watanabe[17,18], and V. Werner[19,3]
Published 6 November 2017

Phys. Rev. C 96, 051304(R) (2017) https://journals.aps.org/prc/abstract/10.1103/PhysRevC.96.051304
Spin-dependent evolution of collectivity in ^{112}Te
M. Doncel[1,2], T. Bäck[2], C. Qi[2], D. M. Cullen[3], D. Hodge[3], B. Cederwall[2], M. J. Taylor[3,4], M. Procter[3], M. Giles[3], K. Auranen[5,6], T. Grahn[5], P. T. Greenlees[5], U. Jakobsson[2,5], R. Julin[5], S. Juutinen[5], A. Herzáň[1,5], J. Konki[5], J. Pakarinen[5], J. Partanen[5], P. Peura[5], P. Rahkila[5], P. Ruotsalainen[5], M. Sandzelius[5], J. Sarén[5], C. Scholey[5], J. Sorri[5], S. Stolze[5], and J. Uusitalo[5]
Published 27 November 2017

Phys. Rev. C 96, 054323 (2017) https://journals.aps.org/prc/abstract/10.1103/PhysRevC.96.054323
Experimental study of the lifetime and phase transition in neutron-rich ^{98,100,102}Zr
S. Ansari[1,2,*], J.-M. Régis[1], J. Jolie[1], N. Saed-Samii[1], N. Warr[1], W. Korten[2], M. Zielińska[2], M.-D. Salsac[2], A. Blanc[3], M. Jentschel[3], U. Köster[3], P. Mutti[3], T. Soldner[3], G. S. Simpson[4], F. Drouet[4], A. Vancraeyenest[4], G. de France[5], E. Clément[5], O. Stezowski[6], C. A. Ur[7], W. Urban[8], P. H. Regan[9,10], Zs. Podolyák[9], C. Larijani[9,10], C. Townsley[9], R. Carroll[9], E. Wilson[9], H. Mach[11,†], L. M. Fraile[12], V. Paziy[12], B. Olaizola[12,13], V. Vedia[12], A. M. Bruce[14], O. J. Roberts[14], J. F. Smith[15], M. Scheck[15], T. Kröll[16], A.-L. Hartig[16], A. Ignatov[16], S. Ilieva[16], S. Lalkovski[17], N. Mărginean[18], T. Otsuka[19,20,21,22,23], N. Shimizu[20], T. Togashi[20], and Y. Tsunoda[20]
Published 27 November 2017

Phys. Rev. C 96, 054327 (2017) https://journals.aps.org/prc/abstract/10.1103/PhysRevC.96.054327
Detailed α-decay study of ^{180}Tl
B. Andel[1,*], A. N. Andreyev[2,3,4], S. Antalic[1], A. Barzakh[5], N. Bree[6], T. E. Cocolios[6,4], V. F. Comas[7], J. Diriken[6], J. Elseviers[6], D. V. Fedorov[5], V. N. Fedosseev[8], S. Franchoo[9], L. Ghys[6,10], J. A. Heredia[7], M. Huyse[6], O. Ivanov[6], U. Köster[11], V. Liberati[12], B. A. Marsh[8], K. Nishio[3], R. D. Page[13], N. Patronis[6,14], M. D. Seliverstov[6,4], I. Tsekhanovich[15,16], P. Van den Bergh[6], J. Van De Walle[4], P. Van Duppen[6], M. Venhart[17], S. Vermote[18], M. Veselský[17], and C. Wagemans[18]
Published 28 November 2017

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2. News to Report

a. US nuclear-physics facility completes $338m upgrade

The Jefferson National Accelerator Facility has completed a $338m upgrade to the lab's Continuous Electron Beam Accelerator Facility (CEBAF), making it the world's most powerful microscope for studying the nucleus of the atom. CEBAF will now be able to produce a continuous beam of elections with an energy of 12 GeV – more than double its previous incarnation – and with a much greater intensity. The Department of Energy, which operates the lab, approved the completion of the upgrade late last month.

CEBAF is a 1500 m-long oval-shaped track built 7.5 m underground. It accelerates electrons using superconducting radio-frequency modules and then smashes the beam into experimental targets. Huge detectors then collect the fragments. By then studying the momentum and direction of the scattered fragments, physicists can probe the inner structure of protons and neutrons to test the theory of quantum chromodynamics and the Standard Model of particle physics.

Exotic meson spectroscopy

As well as improvements to the accelerator, the upgrade also involves the construction of a new experimental hall, taking the number to four. Known as "Hall D", it will use the full 12 GeV to perform exotic meson spectroscopy enabling researchers to map the spectrum of exotic mesons that could provide clues about why quarks – the fundamental building blocks of matter – do not exist on their own. The three remaining halls, which will use 11 GeV beams, have also been upgraded and will let researchers explore the quark–gluon structure of hadrons.

"The team is thrilled to reach the successful conclusion of this complex project," says Allison Lung at the Jefferson Lab, who is chief

planning officer and director of the upgrade project. "This moment is a culmination of the dedication and the hard work of hundreds of Jefferson lab staff members, users and subcontractors."
David Ireland, head of nuclear physics at the University of Glasgow in the UK, who regularly uses the facility, says that CEBAF will be integral to determining where the proton gets its mass and spin from. "Previously we have only been able to touch on the properties of the proton and neutron," Ireland told Physics World. "The upgrade to 12 GeV will now allow us to look at scales smaller than the proton and in a lot further detail."
That view is backed up by nuclear physicist Daniel Watts from Edinburgh University in the UK, who is also a regular user of the facility. "The completion of the upgrade is a big milestone for the international nuclear-physics community," he says.
Planning for CEBAF's upgrade began in 2004 with a design completed in 2007. Construction started in 2008 with initial operations beginning in 2014.
Contribution by Dave Ireland
David.Ireland@glasgow.ac.uk (Glasgow)
Taken from Physics World article by Michael Banks

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3. Outreach Activity

IOP Festival of Physics
Two PhD students studying nuclear physics at the University of Edinburgh were honoured to be part of the Festival of Physics, which was organised by the Institute of Physics at George Watson's College in Edinburgh on the 4 & 5 November.
Thousands of visitors enjoyed hands-on activities, talks and exhibitions at the Festival. Sarah-Jane Lonsdale and Conor Hamill joined colleagues from across the School of Physics and Astronomy in sharing their research with children, teenagers and adults using hands-on, interactive activities. Physics enthusiasts of all ages enjoyed their explanation of radioactive decay using microwave popcorn, and were interested in hearing more about their experience at nuclear facilities around the world.

Contribution by Sarah Lonsdale
sarah.lonsdale@ed.ac.uk (Edinburgh)

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4. Media Interactions

Article in the EUROfusion Fusion in Europe magazine (Fusion Writers edition)
Chantal has been working at the Culham Centre for Fusion Energy since March 2017, developing and testing a novel neutron detector for use in future fusion power plants. To share her research Chantal published an article in the November issue of the Fusion Writers edition of the Fusion in Europe magazine titled "Neutrons: illusive, yet powerful particles". The article is primarily aimed at non-specialists and discusses the importance of neutrons in a fusion environment, and the challenges faced in measuring these particles. The article can be found online at https://www.euro-fusion.org/newsletter/powerful-particles/.
Contribution by Chantal Nobs
chantal.nobs@ukaea.uk (Culham Centre for Fusion Energy)

High Radioactivity levels above Russia
Paddy Regan commenting on the ^{106}Ru radiation 'cloud' above Russia and its measurement across Europe on 21st November:
Reuters
The Guardian
Daily Mail
Daily Record