UK Nuclear Activity

February 2017 Issue 44

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

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

Nuclear Physics Outreach Poster – order hardcopies from STFC free of charge here

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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.

Nature Astronomy, 1, 2, p. 0027 (2017) http://www.nature.com/articles/s41550-016-0027
Origin of meteoritic stardust unveiled by a revised proton-capture rate of ^{17}O
M. Lugaro, A. I. Karakas, C. G. Bruno, M. Aliotta, L. R. Nittler, D. Bemmerer, A. Best, A. Boeltzig, C. Broggini, A. Caciolli, T. Davinson et al.,
*Published 30 January 2017

Phys. Rev. C 95, 024301 (2017) http://journals.aps.org/prc/abstract/10.1103/PhysRevC.95.024301
First identification of excited states in ^{117}Ba using the recoil-β-delayed proton tagging technique
B. Ding[1], Z. Liu[1,*], D. Seweryniak[2,†], P. J. Woods[3], H. L. Wang[4], J. Yang[4], H. L. Liu[5], C. N. Davids[2], M. P. Carpenter[2], T. Davinson[3], R. V. F. Janssens[2], R. D. Page[6], A. P. Robinson[2], J. Shergur[7], S. Sinha[2], S. Zhu[2], X. D. Tang[1], J. G. Wang[1], T. H. Huang[1], W. Q. Zhang[1], M. D. Sun[1,8,9], X. Y. Liu[1,8], and H. Y. Lu[1,8]
Published 1 February 2017

Phys. Rev. C 95, 024602 (2017) http://journals.aps.org/prc/abstract/10.1103/PhysRevC.95.024602
Influence of single-neutron stripping on near-barrier ^{6}He+^{208}Pb and ^{8}He+^{208}Pb elastic scattering
G. Marquínez-Durán[1], N. Keeley[2,*], K. W. Kemper[3], R. S. Mackintosh[4], I. Martel[1], K. Rusek[5], and A. M. Sánchez-Benítez[1]
Published 2 February 2017

Phys. Rev. C 95, 024603 (2017) http://journals.aps.org/prc/abstract/10.1103/PhysRevC.95.024603
Nonlocal nucleon-nucleus interactions in (d,p) reactions: Role of the deuteron D state
G. W. Bailey, N. K. Timofeyuk, and J. A. Tostevin
Published 2 February 2017

*Also including missed publications from previous months.

Edited by Elizabeth Cunningham, STFC Particle and Nuclear Physics Outreach Officer.
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Phys. Rev. C 95, 021301(R) (2017) http://journals.aps.org/prc/abstract/10.1103/PhysRevC.95.021301
Identification of the crossing point at N=21 between normal and intruder configurations
R. Lică[1,2], F. Rotaru[2], M. J. G. Borge[1,3], S. Grévy[4,5], F. Negoiță[2], A. Poves[6,7], O. Sorlin[4], A. N. Andreyev[8], R. Borcea[2], C. Costache[2], H. De Witte[9], L. M. Fraile[10], P. T. Greenlees[11,12], M. Huyse[9], A. Ionescu[2], S. Kisyov[2,13], J. Konki[11,12], I. Lazarus[14], M. Madurga[1], N. Mărginean[2], R. Mărginean[2], C. Mihai[2], R. E. Mihai[2], A. Negret[2], R. D. Page[15], J. Pakarinen[11,12], S. Pascu[2], V. Pucknell[14], P. Rahkila[11,12], E. Rapisarda[1], A. Şerban[2], C. O. Sotty[2], L. Stan[2], M. Stănoiu[2], O. Tengblad[3], A. Turturică[2], P. Van Duppen[9], R. Wadsworth[8], and N. Warr[16] (IDS Collaboration)
Published 9 February 2017

Phys. Rev. C 95, 024312 (2017) http://journals.aps.org/prc/abstract/10.1103/PhysRevC.95.024312
Measurement of lifetimes in ^{62,64}Fe, ^{61,63}Co, and ^{59}Mn
M. Klintefjord[1,*], J. Ljungvall[2], A. Görgen[1], S. M. Lenzi[3], F. L. Bello Garrote[1], A. Blazhev[4], E. Clément[5], G. de France[5], J.-P. Delaroche[6], P. Désesquelles[2], A. Dewald[4], D. T. Doherty[7], C. Fransen[4], A. Gengelbach[8], G. Georgiev[2], M. Girod[6], A. Goasduff[9], A. Gottardo[10], K. Hadyńska-Klęk[1], B. Jacquot[5], T. Konstantinopoulos[2], A. Korichi[2], A. Lemasson[5], J. Libert[10], A. Lopez-Martens[2], C. Michelagnoli[5], A. Navin[5], J. Nyberg[8], R. M. Pérez-Vidal[11], S. Roccia[2], E. Sahin[1], I. Stefan[10], A. E. Stuchbery[12], M. Zielińska[7], D. Barrientos[13], B. Birkenbach[4], A. Boston[14], L. Charles[15], M. Ciemala[16], J. Dudouet[17], J. Eberth[4], A. Gadea[11], V. González[18], L. Harkness-Brennan[14], H. Hess[4], A. Jungclaus[19], W. Korten[7], R. Menegazzo[20], D. Mengoni[20,3], B. Million[20], A. Pullia[21,22], D. Ralet[2,23,24], F. Recchia[20,3], P. Reiter[4], M. D. Salsac[7], E. Sanchis[18], O. Stezowski[17], Ch. Theisen[7], and J. J. Valiente Dobon[9]
Published 9 February 2017

A&A 598, A128 (2017) http://www.aanda.org/articles/aa/abs/2017/02/aa29624-16/aa29624-16.html
The impact of the revised ^{17}O(p, α)^{14}N reaction rate on ^{17}O stellar abundances and yields
O. Straniero[1,2], C. G. Bruno[5], M. Aliotta[5], A. Best[6], A. Boeltzig[3], D. Bemmerer[4], C. Broggini[7], A. Caciolli[7,8], F. Cavanna[9], G. F. Ciani[3], P. Corvisiero[9], S. Cristallo[1,16], T. Davinson[5], R. Depalo[7,8], A. Di Leva[6], Z. Elekes[10], F. Ferraro[9], A. Formicola[2], Zs. Fülöp[10], G. Gervino[11], A. Guglielmetti[12], C. Gustavino[13], G. Gyürky[10], G. Imbriani[6], M. Junker[2], R. Menegazzo[7], V. Mossa[14], F. R. Pantaleo[14], D. Piatti[7,8], L. Piersanti[1,16], P. Prati[9], E. Samorjai[10], F. Strieder[15], T. Szücs[4], M. P. Takács[4] and D. Trezzi[11]
Published 13 February 2017

Eur. Phys. J. A (2017) 53: 24 https://link.springer.com/article/10.1140/epja/i2017-12215-8
In-beam study of ^{253}No using the SAGE spectrometer
A. K. Mistry, R. -D. Herzberg, P. T. Greenlees, P. Papadakis, K. Auranen, P. A. Butler, D. M. Cox, A. B. Garnsworthy, T. Grahn, K. Hauschild, U. Jakobsson, D. T. Joss, R. Julin, S. Ketelhut, J. Konki, M. Leino, A. Lopez-Martens, R. D. Page, J. Pakarinen, P. Peura, P. Rahkila, M. Sandzelius, C. Scholey, J. Simpson, D. Seddon, J. Sorri, S. Stolze, J. Thornhill, J. Uusitalo, D. Wells
Published 14 February 2017

Phys. Rev. C 95, 021302(R) http://journals.aps.org/prc/abstract/10.1103/PhysRevC.95.021302
Half-life of the $15/2^+$ state of ^{135}I: A test of E2 seniority relations
P. Spagnoletti[1,2], G. S. Simpson[1,2,3,*], R. Carroll[4], J.-M. Régis[5], A. Blanc[6], M. Jentschel[6], U. Köster[6], P. Mutti[6], T. Soldner[6], G. de France[7], C. A. Ur[8], W. Urban[9], A. M. Bruce[10], F. Drouet[3], L. M. Fraile[11], L. P. Gaffney[1,2], D. G. Ghiță[12], S. Ilieva[13], J. Jolie[5], W. Korten[14], T. Kröll[13], C. Larijani[4,15], S. Lalkovski[16], R. Lică[12], H. Mach[11,17], N. Mărginean[12], V. Paziy[11], Zs. Podolyák[4], P. H. Regan[4,15], M. Scheck[1,2], N. Saed-Samii[5], G. Thiamova[3], C. Townsley[4], A. Vancraeyenest[3], V. Vedia[11], A. Gargano[18], and P. Van Isacker[7,†]
Published 15 February 2017

J. High Energy Phys. (2017) 2017: 77 http://link.springer.com/article/10.1007/JHEP02%282017%29077
W and Z boson production in p-Pb collisions at $\sqrt{s_{NN}}$ = 5.02 TeV
ALICE Collaboration, UK Authors: D. Alexandre, H.A. Andrews, L. S. Barnby, M. Borri, M. Chartier, D. Evans, K. L. Graham, P. G. Jones, A. Jusko, K. Krivda, R. Lemmon, R. Lietava, J. Norman, O. Villalobos Baillie, N. Zardoshti
Published 15 February 2017

Phys. Rev. C 95, 024316 (2017) http://journals.aps.org/prc/abstract/10.1103/PhysRevC.95.024316
Isomers and high-spin structures in the N=81 isotones ^{135}Xe and ^{137}Ba
A. Vogt[1,*], B. Birkenbach[1], P. Reiter[1], A. Blazhev[1], M. Siciliano[2,3], K. Hadyńska-Klęk[3], J. J. Valiente-Dobón[3], C. Wheldon[4], E. Teruya[5], N. Yoshinaga[5], K. Arnswald[1], D. Bazzacco[6], M. Bowry[7], A. Bracco[8], B. Bruyneel[9], R. S. Chakrawarthy[10], R. Chapman[11], D. Cline[12], L. Corradi[3], F. C. L Crespi[8], M. Cromaz[13], G. de Angelis[3], J. Eberth[1], P. Fallon[13], E. Farnea[6,†], E. Fioretto[3], S. J. Freeman[10], B. Fu[1], A. Gadea[14], K. Geibel[1], W. Gelletly[7], A. Gengelbach[15], A. Giaz[8], A. Görgen[16,17,13], A. Gottardo[3], A. B. Hayes[12], H. Hess[1], R. Hirsch[1], H. Hua[12], P. R. John[2,6], J. Jolie[1], A.

Jungclaus[18], L. Kaya[1], W. Korten[17], I. Y. Lee[13], S. Leoni[8], L. Lewandowski[1], X. Liang[11], S. Lunardi[2,6], A. O. Macchiavelli[13], R. Menegazzo[6], D. Mengoni[19,2,6], C. Michelagnoli[2,6,‡], T. Mijatović[20], G. Montagnoli[2,6], D. Montanari[2,6,§], C. Müller-Gatermann[1], D. Napoli[3], C. J. Pearson[7,‖], L. Pellegri[8], Zs. Podolyák[7], G. Pollarolo[21], A. Pullia[8], M. Queiser[1], F. Radeck[1], F. Recchia[2,6], P. H. Regan[7,22], D. Rosiak[1], N. Saed-Samii[1], E. Şahin[3,¶], F. Scarlassara[2,6], D. Schneiders[1], M. Seidlitz[1], B. Siebeck[1], G. Sletten[23], J. F. Smith[11], P.-A. Söderström[15,#], A. M. Stefanini[3], T. Steinbach[1], O. Stezowski[24], S. Szilner[20], B. Szpak[25], R. Teng[12], C. Ur[6], V. Vandone[8], D. D. Warner[26,†], A. Wiens[1], C. Y. Wu[12,**], and K. O. Zell[1]
Published 15 February 2017

Phys. Rev. Lett. 118, 072701 (2017) http://journals.aps.org/prl/abstract/10.1103/PhysRevLett.118.072701
94 β-Decay Half-Lives of Neutron-Rich 55Cs to 67Ho: Experimental Feedback and Evaluation of the r-Process Rare-Earth Peak Formation
J. Wu[1,2,*], S. Nishimura[2], G. Lorusso[2,3,4], P. Möller[5], E. Ideguchi[6], P.-H. Regan[3,4], G. S. Simpson[7,8,9], P.-A. Söderström[2], P. M. Walker[4], H. Watanabe[10,2], Z. Y. Xu[11,12], H. Baba[2], F. Browne[13,2], R. Daido[14], P. Doornenbal[2], Y. F. Fang[14], G. Gey[7,15,2], T. Isobe[2], P. S. Lee[16], J. J. Liu[11], Z. Li[1], Z. Korkulu[17], Z. Patel[4,2], V. Phong[18,2], S. Rice[4,2], H. Sakurai[2,12], L. Sinclair[19,2], T. Sumikama[2], M. Tanaka[6], A. Yagi[14], Y. L. Ye[1], R. Yokoyama[20], G. X. Zhang[10], T. Alharbi[21], N. Aoi[6], F. L. Bello Garrote[22], G. Benzoni[23], A. M. Bruce[13], R. J. Carroll[4], K. Y. Chae[24], Z. Dombradi[17], A. Estrade[25], A. Gottardo[26,27], C. J. Griffin[25], H. Kanaoka[14], I. Kojouharov[28], F. G. Kondev[29], S. Kubono[2], N. Kurz[28], I. Kuti[17], S. Lalkovski[4], G. J. Lane[30], E. J. Lee[24], T. Lokotko[11], G. Lotay[4], C.-B. Moon[31], H. Nishibata[14], I. Nishizuka[32], C. R. Nita[13,33], A. Odahara[14], Zs. Podolyák[4], O. J. Roberts[34], H. Schaffner[28], C. Shand[4], J. Taprogge[35,36], S. Terashima[10], Z. Vajta[17], and S. Yoshida[14]
Published 16 February 2017

Phys. Rev. C 95, 024320 (2017) http://journals.aps.org/prc/abstract/10.1103/PhysRevC.95.024320
Total absorption γ-ray spectroscopy of the β-delayed neutron emitters ^{87}Br, ^{88}Br, and ^{94}Rb
E. Valencia, J. L. Tain[*], A. Algora[†], J. Agramunt, E. Estevez, M. D. Jordan, and B. Rubio. S. Rice, P. Regan, W. Gelletly, Z. Podolyák, M. Bowry, P. Mason, and G. F. Farrelly. A. Zakari-Issoufou, M. Fallot, A. Porta, and V. M. Bui. J. Rissanen, T. Eronen, I. Moore, H. Penttilä, J. Äystö, V.-V. Elomaa, J. Hakala, A. Jokinen, V. S. Kolhinen, M. Reponen, and V. Sonnenschein. D. Cano-Ott, A. R. Garcia, T. Martínez, and E. Mendoza. R. Caballero-Folch, B. Gomez-Hornillos, and V. Gorlichev. F. G. Kondev. A. A. Sonzogni. L. Batist
Published 21 February 2017

Phys. Rev. C 95, 024321 (2017) http://journals.aps.org/prc/abstract/10.1103/PhysRevC.95.024321
Penning-trap-assisted study of excitations in 88Br populated in β decay of 88Se
M. Czerwiński[1], K. Sieja[2,3], T. Rząca-Urban[1], W. Urban[1], A. Płochocki[1], J. Kurpeta[1], J. Wiśniewski[1], H. Penttilä[4], A. Jokinen[4], S. Rinta-Antila[4], L. Canete[4], T. Eronen[4], J. Hakala[4], A. Kankainen[4], V. S. Kolhinen[4], J. Koponen[4], I. D. Moore[4], I. Pohjalainen[4], J. Reinikainen[4], V. Simutkin[4], A. Voss[4], I. Murray[5], and C. Nobs[6]
Published 22 February 2017

Eur. Phys. J. Plus (2017) 132: 99 http://link.springer.com/article/10.1140/epjp/i2017-11279-1
Determination of the event collision time with the ALICE detector at the LHC
ALICE Collaboration, UK Authors: D. Alexandre, H.A. Andrews, L. S. Barnby, M. Borri, M. Chartier, D. Evans, K. L. Graham, P. G. Jones, A. Jusko, K. Krivda, R. Lemmon, R. Lietava, J. Norman, O. Villalobos Baillie, N. Zardoshti
Published 24 February 2017

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2. News to Report

a. Workshop on: Information and statistics in nuclear experiment and theory ISNET-5
Mark your diary: Monday, 6 November, 2017 to Thursday, 9 November, 2017
Come to: King's Manor, York, University of York, UK.
Nuclei communicate with us through a great variety of observables. Some are easy to measure; some take a considerable effort and experimental ingenuity. But not every observable has the potential to impact theoretical developments; some are more important than the others. Nuclear theory is developing tools to deliver uncertainty quantification and error analysis for theoretical studies as well as for the assessment of new experimental data. Statistical tools can also be used to assess the information content of an observable with respect to current theoretical models, evaluate the degree of correlation between different observables, and quantify theoretical approaches. Such technologies are essential for providing predictive capability, estimate uncertainties, and assess model-based extrapolations - as theoretical models

are often applied to entirely new nuclear systems and conditions that are not accessible to experiment.
Data are expensive to get, and come with uncertainty. So what is the best way to use experimental results in the formulation of theoretical models that attempt to explain the results? The aim of this series of workshops - involving the broad nuclear physics community, together with applied mathematics, statistics and computer science - is to discuss the use of applied mathematics, information theory and statistics in the analysis of experiments, and within the context of theoretical models that are dealing with current and future experimental data. Previous ISNET meetings have been held in Krakow, Poland (2012); Glasgow, UK (2013), ECT* (2015) and INT (2016).
Organisers:
Jacek Dobaczewski (University of York/Jyvaskyla)
David Ireland (University of Glasgow)
Witek Nazarewicz (FRIB/NSCL - Michigan State University)
Contribution by Jacek Dobaczewski *Jacek.Dobaczewski@fuw.edu.pl* *(York)*

b. Interview with Jacek Dobaczewski, Editor-in-Chief of Journal of Physics G
Earlier this month, Journal of Physics G proudly announced the appointment of Professor Jacek Dobaczewski from the University of York as its new Editor-in-Chief. In this interview, Prof Dobaczewski gives some insights into his work and his plans for JPhysG: https://jphysplus.iop.org/2017/01/31/interview-with-jacek-dobaczewski-editor-in-chief-of-journal-of-physics-g/
Contribution by Adam Day from Journal of Physics G submitted by Jacek Dobaczewski *Jacek.Dobaczewski@fuw.edu.pl* *(York)*

c. ISOL-SRS solenoidal magnet successfully recommissioned
The ISOL-SRS project achieved a crucial milestone in February with the recommissioning of the magnet for its "external spectrometer", the ISOL Solenoidal Spectrometer (ISS). This 4T ex-MRI magnet (see figure 1) was purchased with capital grant funding from STFC, matched by funding from the University of Liverpool, and started its journey from Brisbane a year ago. Since arriving in CERN it has undergone an extensive programme of preparatory work before the cooling procedure got underway in January, supported by CERN's cryogenics experts. The magnet was allowed to settle at liquid helium temperatures for a few days before it was "energised" by the team led by Paul Morrall and Ian Lazarus from Daresbury. The magnetic field was ramped up to the target field of 2.75T and held at this value for an hour before being ramped down again. This field is more than sufficient for approved experiments led by David Sharp (Manchester) and Ben Kay (Argonne), as well as a third proposal submitted to the INTC in January by Gavin Lotay (Surrey). These experiments constitute an early implementation phase prior to the completion of the advanced ISS detection system and will use the original silicon detector array from HELIOS at Argonne inside the ISS magnet.
The magnet will be moved into the ISOLDE Hall in early March to allow the construction of the third HIE-ISOLDE beam line to be completed. The ISOL-SRS project team is also making excellent progress on the mechanical infrastructure, the detectors and the readout system. It recently took delivery of the first batch of silicon detectors and these are undergoing acceptance tests in Liverpool at the time of writing. The ISOL-SRS project ends in 2019 and the completed ISS should be available for physics exploitation after the second long shutdown at CERN (LS2). A physics workshop open to anyone interested in using the ISS is being planned and an announcement will be circulated shortly.
http://npg.dl.ac.uk/isol-srs/index.html

Figure 1: Photograph of the ISOL Solenoidal Spectrometer (ISS) magnet during the energising procedure at CERN in February.

Contribution by Robert Page *rdp@ns.ph.liv.ac.uk* *(Liverpool)*

3. Outreach Activity

Institute of Physics Lecture at the University of Sussex

On the 21st February Chantal presented an evening lecture, titled "Nuclear Physics: Why study what we can't see?", at the University of Sussex. The talk covered a short introduction to nuclear physics, the many real-world applications of research in the field, and details of her PhD project. The audience was diverse in age and experience, approximately 60 people turned out for the talk including school children and retired local residents.

Contribution by Chantal Nobs
c.nobs@brighton.ac.uk (Brighton)

Upcoming Binding Blocks events and further news items.

From early June through until late July, Binding Blocks will be attending various events both within the York area and further afield, with a couple beforehand.

The purpose of the Binding Blocks chart is to explain nuclear phenomena to the general public and schools, for all age ranges and anyone with an enthusiasm for LEGO. On the chart, black blocks represent stable nuclei, yellow alpha decay, red beta+ decay, orange proton decay, light blue beta- decay and dark blue neutron decay. The height represents the available energy per kg material (in units of 25TJ/kg). This project revolves around building a full 8m, ~27000 brick chart of the nuclides, and two smaller portions can be built up to Yttrium (our Iron+ chart) and up to Neon (our Neon chart), depending on the event.

Binding Blocks will attend the IOP Nuclear Physics Conference happening from the 3rd - 6th April in Birmingham, where we hope to showcase our Iron+ chart. Further to this, the summer period of events will kick off with our iron+ chart attending the "Festival of Ideas: Science out of the Lab" event within York from 2nd – 3rd June, followed by a CERN Teachers Day and possible York Physics Day at the NSLC on the University of York Campus from 8th – 10th June with the full chart. On the 22nd June, a Nuclear Masterclass will be held in Surrey and we will also be attending the National Astronomy Meeting at the University of Hull from 2nd – 6th July, amongst many more planned and spontaneous events later in July.

Our Binding Blocks paper, viewable at https://arxiv.org/abs/1610.02296, has been formally accepted for publication within the IOP's Journal of Physics Education as a Special Issue Article: Focus on Nuclear and Particle Physics. The paper details everything about the project, from the chart itself and the physics behind it to building instructions, implementation, usage and much more. We are also producing another paper which will describe a series of activities we have been working on, aimed at A-Level students. These activities will utilise the Binding Blocks chart and include activities about radioactivity and decay pathways, medical isotopes, fusion and stellar physics.

Check out our website: http://www.york.ac.uk/physics/bindingblocks as well as our own YouTube channel: https://www.youtube.com/channel/UCvIXlFgJyGh4Jle_4_KE2aA, Twitter account: https://twitter.com/BindingBlocks and Facebook page: https://www.facebook.com/bindingblocks/

Contribution by Thomas Sanders
tjs529@york.ac.uk (York)

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4. Media Interactions

Quantum Mechanics: A Ladybird Expert Book by Jim Al-Khalili

This new book has more than a quantum of understanding!

Press Release
The Guardian
The Times