UK Nuclear Activity

January 2018 Issue 55

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 January*

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. Rev. C 96, 064613 (2018) https://journals.aps.org/prc/abstract/10.1103/PhysRevC.96.064613
Kaon femtoscopy in Pb-Pb collisions at $\sqrt{s_{NN}}$ = 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 21 December 2017*

Phys. Rev. C 97, 015802 (2018) https://journals.aps.org/prc/abstract/10.1103/PhysRevC.97.015802
First measurement of ^{30}S+α resonant elastic scattering for the ^{30}S(α,p) reaction rate
D. Kahl[1,2,*], H. Yamaguchi (山口英斉)[1], S. Kubono (久保野茂)[1,3,4], A. A. Chen[5], A. Parikh[6], D. N. Binh[1,†], J. Chen (陈俊)[5,‡], S. Cherubini[7,8], N. N. Duy[9,10,§], T. Hashimoto (橋本尚志)[1,‖], S. Hayakawa (早川勢也)[1], N. Iwasa (岩佐直仁)[11], H. S. Jung (정효순)[12], S. Kato (加藤静吾)[13], Y. K. Kwon (권영관)[12,‖], S. Nishimura (西村俊二)[3], S. Ota (大田晋輔)[1], K. Setoodehnia[5,¶], T. Teranishi (寺西高)[14], H. Tokieda (時枝紘史)[1], T. Yamada (山田拓)[11,#], C. C. Yun (윤종철)[12,‖], and L. Y. Zhang (张立勇)[4,**]
Published 3 January 2018

Phys. Lett. B, 776, 91 (2018) http://www.sciencedirect.com/science/article/pii/S0370269317309000
J/ψ production as a function of charged-particle pseudorapidity density 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, M. Krivda, R. C. Lemmon, R. Lietava, J. Norman, O. Villalobos Baillie, N. Zardoshti
Published 10 January 2018

*Also including missed publications from previous months.

Phys. Rev. C 97, 012801(R) (2018) https://journals.aps.org/prc/abstract/10.1103/PhysRevC.97.012801
Reaction rate for carbon burning in massive stars
C. L. Jiang[1], D. Santiago-Gonzalez[1,2], S. Almaraz-Calderon[1,3], K. E. Rehm[1], B. B. Back[1], K. Auranen[1], M. L. Avila[1], A. D. Ayangeakaa[1], S. Bottoni[1], M. P. Carpenter[1], C. Dickerson[1], B. DiGiovine[1], J. P. Greene[1], C. R. Hoffman[1], R. V. F. Janssens[1], B. P. Kay[1], S. A. Kuvin[1,4], T. Lauritsen[1], R. C. Pardo[1], J. Sethi[1,5], D. Seweryniak[1], R. Talwar[1], C. Ugalde[1], S. Zhu[1], D. Bourgin[6], S. Courtin[6,7], F. Haas[6], M. Heine[6], G. Fruet[6], D. Montanari[6], D. G. Jenkins[8], L. Morris[8], A. Lefebvre-Schuhl[9], M. Alcorta[10], X. Fang[11], X. D. Tang[12], B. Bucher[13], C. M. Deibel[2], and S. T. Marley[2]
Published 10 January 2018

Phys. Rev. C 97, 014605 (2018) https://journals.aps.org/prc/abstract/10.1103/PhysRevC.97.014605
Reaction channel coupling effects for nucleons on ^{16}O: Induced undularity and proton-neutron potential differences
N. Keeley[*], R. S. Mackintosh[†]
Published 16 January 2018

J. Phys. G: Nucl. Part. Phys. 45, 025203 (2018) http://iopscience.iop.org/article/10.1088/1361-6471/aaa163
Improved background suppression for radiative capture reactions at LUNA with HPGe and BGO detectors
A Boeltzig[1,2,3], A Best[4,5], G Imbriani[4,5], M Junker[6], M Aliotta[7], D Bemmerer[8], C Broggini[9], C G Bruno[7], R Buompane[5,10], A Caciolli[9,11], F Cavanna[12], T Chillery[7], G F Ciani[1], P Corvisiero[12,13],L Csedreki[6], T Davinson[7], R J deBoer[2,3], R Depalo[9,11], A Di Leva[4,5], Z Elekes[14], F Ferraro[12,13],E M Fiore[15,16], A Formicola[6], Z Fülöp[14], G Gervino[17,18], A Guglielmetti[19,20], C Gustavino[21], G Gyürky[14],I Kochanek[6], R Menegazzo[9], V Mossa[15,16], F R Pantaleo[15,16], V Paticchio[16], R Perrino[16,25],D Piatti[9,11], P Prati[12,13], L Schiavulli[15,16], K Stöckel[8,22], O Straniero[23], F Strieder[24], T Szücs[14],M P Takács[8,22], D Trezzi[19,20], M Wiescher[2,3] and S Zavatarelli[13]
Published 18 January 2018

Phys. Rev. Lett. 120, 052501 (2018) https://journals.aps.org/prl/abstract/10.1103/PhysRevLett.120.052501
Quasifree (p, 2p) Reactions on Oxygen Isotopes: Observation of Isospin Independence of the Reduced Single-Particle Strength
L. Atar *et al.* (R3B Collaboration)
Published 29 January 2018

Phys. Lett. B 777, 281 (2018) https://www.sciencedirect.com/science/article/pii/S0370269317310134
Coherent gamma photon generation in a Bose–Einstein condensate of ^{135m}Cs
Luca Marmugi[a], Philip M. Walker[b], Ferruccio Renzoni[a]
10 February 2018

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2. News to Report

a. Nuclear Physics Division of the European Physical Society 2018 call for prizes

The board of the Nuclear Physics Division of the European Physical Society (EPS) calls for nominations for the 2018 "Lise Meitner Prize". The award will be given to one or several individuals for outstanding work in the fields of experimental, theoretical or applied nuclear science. The board welcomes proposals which represent the breadth and strength of European Nuclear Science.

The board of the European Physical Society (EPS) Nuclear Physics Division also calls for nominations for the 2015-2017 European Nuclear Physics Thesis Award. Nominations are open to any person who has received a PhD degree in experimental, theoretical or applied nuclear physics in a country which is member of the EPS and where the degree has been awarded within the three-year period 1st January 2015 – 31st December 2017. The award recognises the excellence of a recent PhD in Nuclear Physics.

Deadline for submission of nomination for both prizes is **Wed 28th February 2018**.
Contribution by Rodi Herzberg R.Herzberg@liverpool.ac.uk (Liverpool)

b. Coherent gamma-ray emission

One of the challenges with atomic nuclei is to learn how to produce coherent gamma-ray emission. It seems an almost impossible task, but could lead to many applications, such as gamma-ray lasers. Now a UCL/Surrey University collaboration has combined their atomic and nuclear physics expertise to come up with a testable proposal.

Published this month in Physics Letters B [1], the idea is to make a Bose-Einstein Condensate (BEC) of caesium atoms. The trick is to have the caesium nuclei in an isomeric state – such a condensate of isomers has never been studied before. Calculations show that the macroscopic BEC quantum state will be able to de-excite its isomers collectively, producing a burst of coherent gamma radiation.

This is not just theory. UCL physicist Ferruccio Renzoni and his collaborators are busy setting up an experiment in the middle of Finland, at the University of Jyväskylä nuclear physics facility. A cyclotron is being used to produce ^{135}Cs isomers, with a natural half-life of 53 minutes. These will be trapped and cooled to 100 nano-kelvin, forming an atomic BEC. The spontaneous emission of well-known 846 keV gamma radiation will trigger the BEC collapse. The tell-tale sign for collective decay will initially come from absorption imaging of the atomic cloud in order to identify its collective recoil, which goes along with the coherent gamma-ray emission. The experimental apparatus is even now being commissioned. Watch this space!

[1] Coherent gamma photon generation in a Bose-Einstein condensate of ^{135m}Cs,
L. Marmugi, P.M. Walker and F. Renzoni,
Phys. Lett. B 777 (2018) 281;
https://doi.org/10.1016/j.physletb.2017.12.036

Contribution by Phil Walker
p.walker@surrey.ac.uk (Surrey)

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3. Outreach Activity

U3A Science Series Lecture

On the 17th January Chantal delivered the first lecture of the 2018 U3A (University of the Third Age) Science Series in Lewes. The U3A is a UK-wide movement which brings together people in their "third age", those who have finished working full-time or are raising a family and have time to pursue new interests. Chantal's talk, titled "Fusion Energy: Harnessing the Power of a Man-Made Sun" followed the journey of fusion research in the UK from early fusion devices, like ZETA, through to ITER which is currently under construction.

Contribution by Chantal Nobs
chantal.nobs@ukaea.uk (Culham Centre for Fusion Energy)

A lesson in fusion at Worthing College

Chantal visited Worthing College on the 26th January to talk to A-level physics students during their physics lessons. Chantal discussed her journey from A-levels to fusion researcher to encourage the students to consider a future career in physics. The talk introduced the basics of nuclear physics, the importance of her PhD research and why she decided to pursue a career in nuclear fusion. Chantal's introduction to fusion research at Culham came just in time for the College's trip to see JET in February.

Contribution by Chantal Nobs
chantal.nobs@ukaea.uk (Culham Centre for Fusion Energy)

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4. Media Interactions

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