UK Nuclear Activity

March 2020 Issue 81

In this issue,

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

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1. Nuclear Physics Publications for March (also includes missed publications from previous months)

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.

SciPost Phys. Proc. **3**, 047 (2020)
https://scipost.org/SciPostPhysProc.3.047
A time-dependent Hartree-Fock study of triple-alpha dynamics
Paul D. Stevenson, J. L. Willerton
Published 27 February 2020

SciPost Phys. Proc. **3**, 009 (2020)
https://scipost.org/SciPostPhysProc.3.009
Clustering in ^{18}O - absolute determination of branching ratios via high-resolution particle spectroscopy
S. Pirrie, C. Wheldon, Tz. Kokalova, J. Bishop, R. Hertenberger, H.-F. Wirth, S. Bailey, N. Curtis, D. Dell'Aquila, Th. Faestermann, D. Mengoni, R. Smith, D.Torresi, A. Turner
Published 24 February 2020

SciPost Phys. Proc. **3**, 010 (2020)
https://scipost.org/SciPostPhysProc.3.010
Short range nucleon correlations studied with electron and photon probes
I.J. Douglas MacGregor
Published 24 February 2020

SciPost Phys. Proc. **3**, 026 (2020)
https://scipost.org/SciPostPhysProc.3.026
Study of the hyperon-nucleon interaction via final-state interactions in exclusive reactions
Nicholas Zachariou, Daniel Watts, Yordanka Ilieva
Published 25 February 2020

SciPost Phys. Proc. **3**, 030 (2020)
https://scipost.org/SciPostPhysProc.3.030
The Hoyle Family: break-up measurements to probe α-condensation in light nuclei
Robin Smith, Jack Bishop, Joel Hirst, Tzany Kokalova, Carl Wheldon
Published 26 February 2020

Eur. Phys. J. A **56**, 36 (2020)
https://link.springer.com/article/10.1140/epja/s10050-020-00052-9
Study of the ^{25}Mg(d,p)^{26}Mg reaction to constrain the ^{25}Al(p,γ)^{26}Si resonant reaction rates in nova burning conditions
C. B. Hamill, P. J. Woods, D. Kahl, R. Longland, J. P. Greene, C. Marshall, F. Portillo & K. Setoodehnia
Published 5 February 2020

Eur. Phys. J. A **56**, 65 (2020)
https://link.springer.com/article/10.1140/epja/s10050-020-00071-6
Evidence for octupole collectivity in ^{172}Pt
A. Ertoprak, B. Cederwall, C. Qi, Ö. Aktas, M. Doncel, B. Hadinia, R. Liotta, M. Sandzelius, C. Scholey, K. Andgren, T. Bäck, H. Badran, T. Braunroth, T. Calverley, D. M. Cox, D. M. Cullen, Y. D. Fang, E. Ganioğlu, M. Giles, M. B. Gomez Hornillos, T. Grahn, P. T. Greenlees, J. Hilton, D. Hodge, E. Ideguchi, U. Jakobsson, A. Johnson, P. M. Jones, R. Julin, S. Juutinen, S. Ketelhut, A. Khaplanov, M. Kumar Raju, M. Leino, H. Li, H. Liu, S. Matta, V. Modamio, B. S. Nara Singh, M. Niikura, M. Nyman, I. Özgür, R. D. Page, J. Pakarinen, P. Papadakis, J. Partanen, E. S. Paul, C. M. Petrache, P. Peura, P. Rahkila, P. Ruotsalainen, J. Sarén, J. Sorri, S. Stolze, P. Subramaniam, M. J. Taylor, J. Uusitalo, J. J. Valiente-Dobón & R. Wyss
Published 20 February 2020

Nature Physics **16**, 409-412 (2020)
https://www.nature.com/articles/s41567-020-0799-7
Measurement of the mass difference and binding energy of the hypertriton and antihypertriton
The STAR Collaboration
Published 9 March 2020

Phys. Rev. Lett. **124**, 062501
https://journals.aps.org/prl/abstract/10.1103/PhysRevLett.124.062501
Isospin Properties of Nuclear Pair Correlations from the Level Structure of the Self-Conjugate Nucleus ^{88}Ru
B. Cederwall, X. Liu, Ö. Aktas, A. Ertoprak, W. Zhang, C. Qi, E. Clément, G. de France, D. Ralet, A. Gadea, A. Goasduff, G. Jaworski, I. Kuti, B. M. Nyakó, J. Nyberg, M. Palacz, R. Wadsworth, J. J. Valiente-Dobón, H. Al-Azri, A. Ataç Nyberg, T. Bäck, G. de Angelis, M. Doncel, J. Dudouet, A. Gottardo, M. Jurado, J. Ljungvall, D. Mengoni, D. R. Napoli, C. M. Petrache, D. Sohler, J. Timár, D. Barrientos, P. Bednarczyk, G. Benzoni, B. Birkenbach, A. J. Boston, H. C. Boston, I. Burrows, L. Charles, M. Ciemala, F. C. L. Crespi, D. M. Cullen, P. Désesquelles, C. Domingo-Pardo, J. Eberth, N. Erduran, S. Ertürk, V. González, J. Goupil, H. Hess, T. Huyuk, A. Jungclaus, W. Korten, A. Lemasson, S. Leoni, A. Maj, R. Menegazzo, B. Million, R. M. Perez-Vidal, Zs. Podolyak, A. Pullia, F. Recchia, P. Reiter, F. Saillant, M. D. Salsac, E. Sanchis, J. Simpson, O. Stezowski, Ch. Theisen, and M. Zielińska
Published 12 February 2020

Phys. Rev. Lett. **124**, 092301
https://journals.aps.org/prl/abstract/10.1103/PhysRevLett.124.092301
Scattering Studies with Low-Energy Kaon-Proton Femtoscopy in Proton-Proton Collisions at the LHC
S. Acharya et al. (A Large Ion Collider Experiment Collaboration)
Published 6 March 2020

Phys. Rev. C **101**, 034308
https://journals.aps.org/prc/abstract/10.1103/PhysRevC.101.034308
Hyperfine anomaly in gold and magnetic moments of $I^{\pi}=11/2^{-}$ gold isomers
A. E. Barzakh, D. Atanasov, A. N. Andreyev, M. Al Monthery, N. A. Althubiti, B. Andel, S. Antalic, K. Blaum, T. E. Cocolios, J. G. Cubiss, P. Van Duppen, T. Day Goodacre, A. de Roubin, Yu. A. Demidov, G. J. Farooq-Smith, D. V. Fedorov, V. N. Fedosseev, D. A. Fink, L. P. Gaffney, L. Ghys, R. D. Harding, D. T. Joss, F. Herfurth, M. Huyse, N. Imai, M. G. Kozlov, S. Kreim, D. Lunney, K. M. Lynch, V. Manea, B. A. Marsh, Y. Martinez Palenzuela, P. L. Molkanov, D. Neidherr, R. D. Page, M. Rosenbusch, R. E. Rossel, S. Rothe, L. Schweikhard, M. D. Seliverstov, S. Sels, C. Van Beveren, E. Verstraelen, A. Welker, F. Wienholtz, R. N. Wolf, and K. Zuber
Published 20 March 2020

Phys. Rev. C **101**, 031303(R)
https://journals.aps.org/prc/abstract/10.1103/PhysRevC.101.031303
Two-neutron knockout as a probe of the composition of states in ^{22}Mg, ^{23}Al, and ^{24}Si
B. Longfellow, A. Gade, J. A. Tostevin, E. C. Simpson, B. A. Brown, A. Magilligan, D. Bazin, P. C. Bender, M. Bowry, B. Elman, E. Lunderberg, D. Rhodes, M. Spieker, D. Weisshaar, and S. J. Williams
Published 12 March 2020

Phys. Rev. C **101**, 034309
https://journals.aps.org/prc/abstract/10.1103/PhysRevC.101.034309
Neutron-hole strength in N=81 nuclei
A. M. Howard, S. J. Freeman, D. K. Sharp, T. Bloxham, J. A. Clark, C. M. Deibel, B. P. Kay, P. D. Parker, J. P. Schiffer, and J. S. Thomas
Published 20 March 2020

Phys. Rev. C **101**, 034314
https://journals.aps.org/prc/abstract/10.1103/PhysRevC.101.034314
Shell structure of the neutron-rich isotopes ^{69,71,73}Co
T. Lokotko, S. Leblond, J. Lee, P. Doornenbal, A. Obertelli, A. Poves, F. Nowacki, K. Ogata, K. Yoshida, G. Authelet, H. Baba, D. Calvet, F. Château, S. Chen, A. Corsi, A. Delbart, J.-M. Gheller, A. Gillibert, T. Isobe, V. Lapoux, M. Matsushita, S. Momiyama, T. Motobayashi, M. Niikura, H. Otsu, C. Péron, A. Peyaud, E. C. Pollacco, J.-Y. Roussé, H. Sakurai, C. Santamaria, Z. Y. Xu, M. Sasano, Y. Shiga, S. Takeuchi, R. Taniuchi, T. Uesaka, H. Wang, V. Werner, F. Browne, L. X. Chung, Zs. Dombradi, S. Franchoo, F. Giacoppo, A. Gottardo, K. Hadynska-Klek, Z. Korkulu, S. Koyama, Y. Kubota, M. Lettmann, C. Louchart, R. Lozeva, K. Matsui, T. Miyazaki, S. Nishimura, L. Olivier, S. Ota, Z. Patel, E. Sahin, C. Shand, P.-A. Söderström, I. Stefan, D. Steppenbeck, T. Sumikama, D. Suzuki, Zs. Vajta, and J. Wu
Published 30 March 2020

Phys. Rev. C **101**, 034911
https://journals.aps.org/prc/abstract/10.1103/PhysRevC.101.034911
Measurements of inclusive jet spectra in pp and central Pb-Pb collisions at $\sqrt{s_{NN}}$=5.02TeV
S. Acharya et al. (ALICE Collaboration)
Published 16 March 2020

Phys. Rev. C **101**, 035207
https://journals.aps.org/prc/abstract/10.1103/PhysRevC.101.035207
Near-threshold π− photoproduction on the deuteron
B. Strandberg et al. (PIONS@MAX-lab Collaboration)
Published 16 March 2020

Phys. Rev. C **101**, 035804
https://journals.aps.org/prc/abstract/10.1103/PhysRevC.101.035804
Impact of statistical uncertainties on the composition of the outer crust of a neutron star
A. Pastore, D. Neill, H. Powell, K. Medler, and C. Barton
Published 16 March 2020

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2. News to Report

a. Results of d* hexaquark study published

New research led by the University of York at the Crystal Ball at MAMI facility has revealed strong signatures for the existence of a new form of matter - the d* hexaquark. The d* hexaquark is composed of six light quarks – the same quarks that usually combine in trios to make up protons and neutrons. The experiment searched for the d* hexaquarks by impinging an intense gamma ray beam on a liquid deuterium target and measuring the final state proton and neutron from the photodisintegration of the deuterium nuclei. Signatures of the d* were observed in the degree of spin polarisation of the outgoing proton and neutron, showing for the first time that both are almost completely polarised at photon energies corresponding to the mass of the d*, and in a way that cannot be explained by current conventional theories without the hexaquark. The results provide important new information for the emerging field of multiquark states and potentially for astrophysics, where the new d* degree of freedom has recently been indicated to play an important role in neutron stars and even in new candidates for dark matter. A novel large acceptance neutron spin polarimeter was developed for the measurement, which has potential application for a wide range of facilities.

Phys. Rev. Lett. **124**, 132001 (2020)
https://journals.aps.org/prl/abstract/10.1103/PhysRevLett.124.132001

b. New IOP Nuclear Physics Group officers appointed

The IOP Nuclear Physics Group has appointed a new Chair and Secretary.
David Sharp, an experimental nuclear physicist at the University of Manchester, is the new Chair, and James Benstead, a theoretical nuclear physicist from AWE, is the new Secretary.

David has over 12 years' experience, having started his PhD in 2008. In October 2020 he will be starting as an STFC Ernest Rutherford Fellow. His research focuses on studying the structure of short-lived radioactive nuclei at international accelerator facilities such as CERN. He is also interested in how processes such as nuclear fission proceed in these short-lived systems and developing new techniques to study this. He has also spent time working as a Physicist in industry focusing on detector development. Directly after completion of his studies he worked for Smiths Detection Ltd, before returning to academia to pursue that career path. He is passionate about supporting and developing early career researchers and promoting a culture of equality, diversity and inclusivity within Physics.

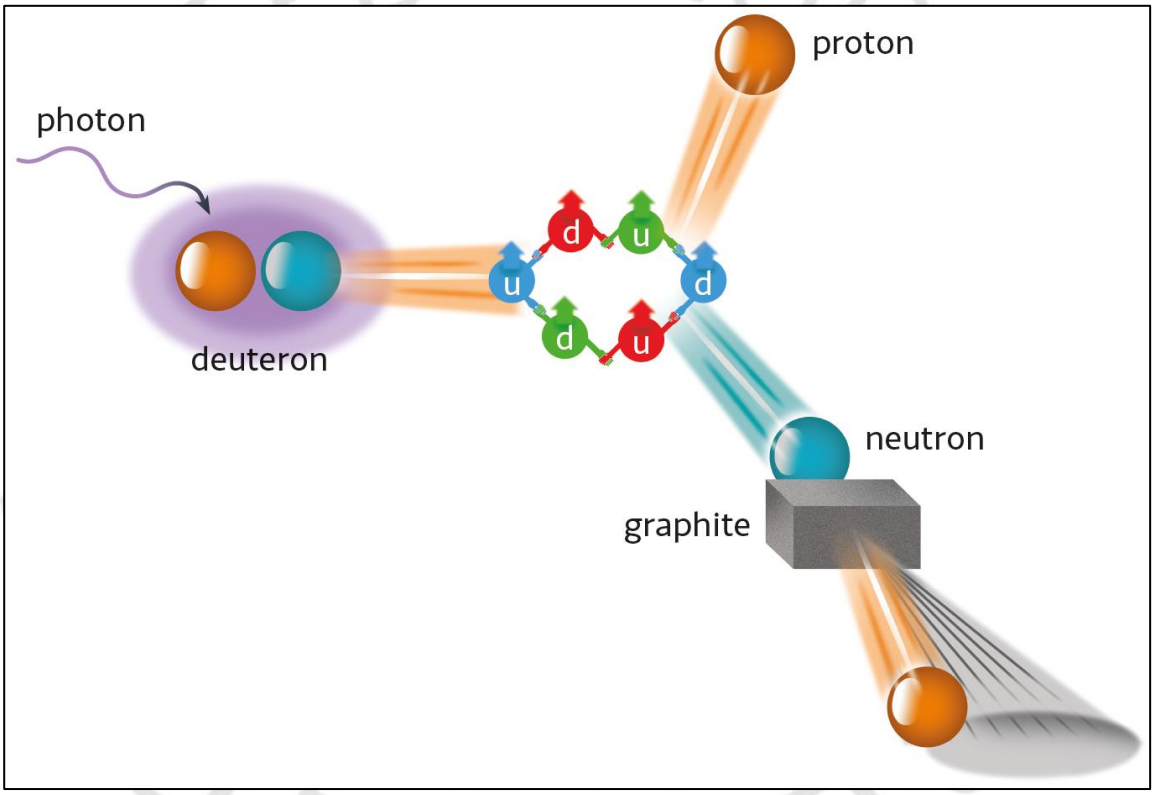
James has been at AWE since 2006. During that period he has completed a collaborative PhD at the University of Surrey and spent three years on secondment at a US national lab. He is keen to use his term as Secretary to encourage further links between academia and industry in the nuclear physics field.

David Sharp, new Chair of the IOP Nuclear Physics Group

The outgoing Chair Tzany Kokalova-Wheldon and Secretary Paul Davies are thanked for their excellent work within the group over the past few years.

c. Joint IOP NPG/APP/HEPP conference cancelled

Unfortunately, due to the ongoing Covid-19 outbreak the joint conference of the IOP's Nuclear Physics, Astroparticle Physics, and High Energy Particle Physics groups which was due to have been held 6-9 April in Edinburgh was cancelled.



Outline of the experimental process used to probe for the d*hexaquark state in the York-led study

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3. Outreach Activity

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4. Media Interactions

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