UK Nuclear Activity

April 2015 Issue 22

In this issue,

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

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 April*

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. C 91, 034330 (2015) http://journals.aps.org/prc/abstract/10.1103/PhysRevC.91.034330
Observation of γ vibrations and alignments built on non-ground-state configurations in ^{156}Dy
S. N. T. Majola[1,2,*], D. J. Hartley[3], L. L. Riedinger[4], J. F. Sharpey-Schafer[5], J. M. Allmond[6,17], C. Beausang[6], M. P. Carpenter[7], C. J. Chiara[8], N. Cooper[9], D. Curien[10], B. J. P. Gall[10], P. E. Garrett[11], R. V. F. Janssens[7], F. G. Kondev[8], W. D. Kulp[12], T. Lauritsen[7], E. A. McCutchan[7,13], D. Miller[4], J. Piot[10], N. Redon[14], M. A. Riley[15], J. Simpson[16], I. Stefanescu[7], V. Werner[9], X. Wang[15], J. L. Wood[12], C.-H. Yu[17], and S. Zhu[7]
Published 26 March 2015*

Phys. Rev. C 91, 031301(R) (2015) http://journals.aps.org/prc/abstract/10.1103/PhysRevC.91.031301
Increased isomeric lifetime of hydrogen-like ^{192m}Os
A. Akber[1], M. W. Reed[1], P. M. Walker[2], Yu. A. Litvinov[3,4], G. J. Lane[1], T. Kibédi[1], K. Blaum[3], F. Bosch[4], C. Brandau[5,6], J. J. Carroll[7], D. M. Cullen[8], I. J. Cullen[2], A. Y. Deo[2], B. Detwiler[9], C. Dimopoulou[4], G. D. Dracoulis[1,*], F. Farinon[4], H. Geissel[4,10], E. Haettner[10], M. Heil[4], R. S. Kempley[2], R. Knöbel[4], C. Kozhuharov[4], J. Kurcewicz[4], N. Kuzminchuk[4], S. Litvinov[4], Z. Liu[11], R. Mao[12], C. Nociforo[4], F. Nolden[4], W. R. Plaß[4,10], Zs. Podolyák[2], A. Prochazka[4], C. Scheidenberger[4,10], D. Shubina[3], M. Steck[4], Th. Stöhlker[4,13], B. Sun[14], T. P. D. Swan[2], G. Trees[9], H. Weick[4], N. Winckler[3,4], M. Winkler[4], P. J. Woods[11], and T. Yamaguchi[15]
Published 27 March 2015*

*Also including missed publications from previous months.

Phys. Rev. C 91, 044307 (2015) http://journals.aps.org/prc/abstract/10.1103/PhysRevC.91.044307
Nuclear moments and charge radii of neutron-deficient francium isotopes and isomers
A. Voss[1,*], F. Buchinger[2], B. Cheal[3], J. E. Crawford[2], J. Dilling[4,5], M. Kortelainen[1,6], A. A. Kwiatkowski[4], A. Leary[2], C. D. P. Levy[4], F. Mooshammer[2], M. L. Ojeda[2], M. R. Pearson[4], T. J. Procter[4], and W. Al Tamimi[2]
Published 8 April 2015

Eur. Phys. J. C, 75, 146 (2015) http://link.springer.com/article/10.1140/epjc/s10052-015-3356-2
Inclusive photon production at forward rapidities in proton–proton collisions at √s = 0.9, 2.76 and 7 TeV
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 9 April 2015

Phys. Rev. C 91, 041302(R) (2015) http://journals.aps.org/prc/abstract/10.1103/PhysRevC.91.041302
Neutron single-particle strength in silicon isotopes: Constraining the driving forces of shell evolution
S. R. Stroberg[1,2,*], A. Gade[1,2], J. A. Tostevin[3], V. M. Bader[1,2], T. Baugher[1,2], D. Bazin[1,2], J. S. Berryman[1], B. A. Brown[1,2], C. M. Campbell[4], K. W. Kemper[5], C. Langer[1,6], E. Lunderberg[1,2], A. Lemasson[1], S. Noji[1], T. Otsuka[1,7,8], F. Recchia[1], C. Walz[1], D. Weisshaar[1], and S. Williams[1]
Published 15 April 2015

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2. News to Report

a. Experiments start for AGATA at Ganil. The first experiment of the science campaign for AGATA at Ganil has been successfully completed. This was the result of a great deal of hard word by the collaboration over the last year. During the experiment 24 detectors, corresponding to 888 channels, operated perfectly.
The experiment, led by J. Ljungvall, used AGATA with a plunger to measure lifetimes in ^{62}Fe. The team were able to generate a lifetime decay curve during the online analysis- a superb achievement.
A series of experiments are now planned and the collaboration is looking forward to new exciting results.
AGATA will remain at GANIL until 2019 and will be coupled to several detector systems including VAMOS, FATIMA, PARIS, NEDA and DIAMANT.
Contribution by John Simpson john.simpson@stfc.ac.uk (Daresbury) and Andy Boston ajb@ns.ph.liv.ac.uk (Liverpool)

b. Manchester's IOP Nuclear Group Meeting 2015. On 30 March - 2 April, The University of Manchester hosted the 2015 IOP Nuclear Physics Group Meeting, together with the IOP Astro-Particle and IOP Particle Groups. The meeting was very successful, with over 350 attendees from institutions across the UK. A very exciting programme was presented and all participants were very enthusiastic, both in the lecture theatres and during the coffee breaks. The poster session was also a highlight, and congratulations are due in particular to Ruchi Garg from The University of York who won a prize for her poster on *Carbon-12 production in stellar evolution*. The STFC Town Meeting was attended by many participants and issues or concerns of common interest to all three groups were raised in a single voice, emphasising the similarities in the experience across the different communities.
The local organising committee extends their thanks to the Manchester students and members of staff who played a big role in the background, the exhibitors for their support, as well as to the Lord Mayor and Manchester City Council for their invitation to the City Hall for the welcoming reception. We now pass on the flame to the next committee and look forward to the 2016 edition.
Contribution by Thomas Cocolios thomas.cocolios@manchester.ac.uk (Manchester) on behalf of the Local Organising Committee.

c. Poster prize at the IoP conference. Ruchi Garg, from the University of York, won as the highest ranked Nuclear Physics poster (the third prize at the poster competition) at the joint *IoP Particle, Astroparticle, and Nuclear*

Physics groups Conference, held at the University of Manchester in March, 2015. The presented project is a Nuclear Astrophysics project, probing the triple-alpha continuum in the Carbon-12 nucleus in search of the second excited 2+ state. This state appears in the cluster model calculations as the first rotational excitation of the famous Hoyle state. Knowledge of this state is required to understand the debated structure of the Carbon-12 nucleus in the Hoyle state. Also, at higher temperatures in stars, the reaction rate of the triple-alpha process has a large dependency on the energy level of this second excited 2+ state.

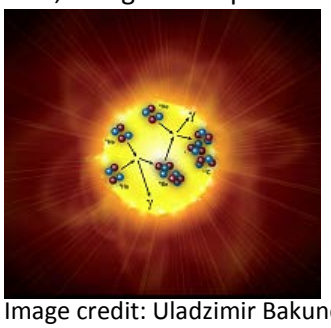

Image credit: Uladzimir Bakunovich, fotolia.com

Contribution by Christian Aaen Diget christian.diget@york.ac.uk (York)

d. Workshop on Compact Accelerators for Isotope Production. On 26-27 March 2015, The Cockcroft Institute in Daresbury hosted a workshop on Compact Accelerators for Isotope Production in the framework of the EUCARD2 FP7 project, especially WP2 (Catalysing Innovation) and WP4 (Accelerator Applications). The meeting gathered a wide variety of scientists, including accelerator physicists, nuclear physicists, radio pharmacists and medical doctors, with a large contingent from CERN and from the UK. The potential for a shortage in the world production 99mTc in the coming years is very real, and many facilities around the world are trying to find alternatives to this problem, either by developing new means of producing this isotope without relying on nuclear reactors, by researching alternative radioisotopes that could be used in medical imaging, or even trying to search for new imaging techniques. The progress from different exploratory programmes was presented, including projects like MEDICIS at CERN.

The concerns around 99mTc are very real and the timeline very tight, with more than 50% of the world's production planned to stop by 2016. New discoveries will require extensive validation before being available as a medical product and the deadlines will most likely run beyond that date. The research must therefore intensify in order to guarantee that the 99mTc crisis will be as short as possible. A round panel discussion concluded the workshop in order to identify how to proceed forward with this research avenue and maximise the impact of each participant. Ideas for a follow-up proposal within Horizon2020 are currently being explored.

More information on the meeting, including the slides from the presentation, are available at the following link: https://indico.cern.ch/event/366464/. For more information on the follow-up to EUCARD2, please contact Dr Hywel Owen, hywel.owen@manchester.ac.uk; small statement of interest are expected by the end of June.

Contribution by Thomas Cocolios thomas.cocolios@manchester.ac.uk (Manchester)

e. Fundamental Nuclear Properties Measured with Laser Spectroscopy. The prime research theme of this project is the study of short-lived exotic nuclei with laser spectroscopy. Over the next 5 years a team lead by Kieran Flanagan, University of Manchester will study the role of three-nucleon forces and their associated influence on nuclear structure and the limits of nuclear existence. This work will investigate the interplay between tensor and central forces and the associated effect on quantum shells in exotic nuclear systems. Kieran's team will use innovative laser spectroscopy methods to achieve these goals. The project will be carried out at the ISOLDE facility, CERN, which is the premier radioactive beam facility at the precision frontier. The proposed research activity closely matches the NuPECC (Nuclear Physics European Collaboration Committee) 2010 Long Range Plan. The wider scientific impact of this research will influence modelling explosive stellar processes and nuclear synthesis, understanding the structure of astrophysical compact-objects such as neutron stars and predicting regions of enhanced stability in the super heavy

elements. The FNPMLS project will develop ultra-sensitive methodologies that set a new paradigm in laser spectroscopy. It builds on the cutting edge technology of collinear resonance ionization spectroscopy (CRIS) which was developed during Kieran's STFC Advanced Fellowship. The CRIS technique combines the high resolution nature of collinear laser spectroscopy with the high sensitivity of resonance ionization spectroscopy.

Contribution by Kieran Flanagan kieran.flanagan-2@manchester.ac.uk (Manchester)

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3. Outreach Activity

Outreach Talk

On 27th March Laura Harkness-Brennan gave her talk "Imaging the Invisible" at Daresbury Laboratory to ~140 people as part of the Daresbury Talking Science lecture series.

Contribution by Laura Harkness-Brennan Laura.Harkness@liverpool.ac.uk (Liverpool)

Outreach Poster

A new Nuclear Physics Outreach Poster – 'Inside the atom: Nuclear activity in the UK' is available to aid your outreach activities. The webform to order hardcopies from STFC free of charge can be found here. The nuclear physics poster is the third publication in the 'Popular Science and Schools and Education: Particle Physics & Nuclear Physics' section.

I'm a Scientist, Get me out of here

This is an outreach activity in which scientists talk to school students online at imascientist.org.uk.

Scientists answer students' questions, and engage directly with them in live text-based chats. Students vote for their favourite researcher to win £500 to spend on further public engagement.

For two weeks, **June 15th- 26th**, there will be an **Electromagnetic Zone** and an **Extreme Force Zon**e; and **we are recruiting STFC scientists** whose research is related to any of these themes to take part. You can find a full list of the zones we're running in June here.

You can read more and **apply to take part before Sunday May 3rd** at: imascientist.org.uk/scientists

Have a look at what Ollie Brown had to say after taking part – and winning! – in March: particlem15.imascientist.org.uk/2015/03/23/thank-you-from-your-winner-ollie-b/

If you have any questions, please contact angela@gallomanor.com 01225 326892.

Electromagnetic Zone

Team Wave or Team Particle? Warning: Students in this zone may force you to finally pick a side, as you help them understand the out-there qualities and uses of the electromagnetic spectrum. We need astronomers using infra-red waves to explore the universe, physicists shooting lasers at novel materials and chemists deducing molecular structure with X-Rays; essentially anyone enjoying a working relationship with photons. #TEAMPARTICLE

Extreme Force Zone

Not the latest vanity project for a bunch of fading action stars, something much more rewarding: five scientists unraveling the four fundamental forces of the universe! You might be nuclear or theoretical physicists, computer scientists, astrophysicists, all studying how these forces behave and interact… Whatever Hawking says, the easiest way to unite your fields is by taking part in this zone.

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4. Media Interactions

Postgraduate: 'I feel in love with science at an early age'

Independent article on a love of science and Lego.

The (half) life of Strontium

A BBC Radio 4 poetic meditation on the element which unites the atomic bomb dropped on Nagaski, a remote village in Argyll, to a mutant bounty hunter and features Liverpool's Laura Harkness-Brennan.

Contributions by Laura Harkness-Brennan Laura.Harkness@liverpool.ac.uk (Liverpool)