UK Nuclear Activity

March 2017 Issue 45

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 March*

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.

Astropart. Phys., 89, 57 (2017) http://www.sciencedirect.com/science/article/pii/S0927650517300294
Big Bang ^{6}Li nucleosynthesis studied deep underground (LUNA collaboration)
D. Trezzi[a], M. Anders[b, c, 1], M. Aliotta[d], A. Bellini[e], D. Bemmerer[b], A. Boeltzig[f, g], C. Broggini[h], C.G. Bruno[d], A. Caciolli[h, i], F. Cavanna[e], P. Corvisiero[e], H. Costantini[e, 2], T. Davinson[d], R. Depalo[h, i], Z. Elekes[b],M. Erhard[h], F. Ferraro[e], A. Formicola[f], Zs. Fülop[j], G. Gervino[k], A. Guglielmetti[a], C. Gustavino[l], Gy. Gyürky[j], M. Junker[f], A. Lemut[3, e], M. Marta[b, 4], C. Mazzocchi[a, 5], R. Menegazzo[h], V. Mossa[m], F. Pantaleo[m], P. Prati[e], C. Rossi Alvarez[h], D.A. Scott[d], E. Somorjai[j], O. Straniero[n, o], T. Szücs[j], M. Takacs[b]
Published March 2017

EPJ A, 53:50 (2017) https://link.springer.com/article/10.1140/epja/i2017-12224-7
Shell evolution of stable N = 50-56 Zr and Mo nuclei with respect to low-lying octupole excitations
E. T. Gregor, M. Scheck, R. Chapman, L. P. Gaffney, J. Keatings, K. R. Mashtakov, D. O'Donnell, J. F. Smith, P. Spagnoletti, M. Thürauf, V. Werner, C. Wiseman
Published March 2017

Phys. Rev. C 95, 031302(R) (2017) https://journals.aps.org/prc/abstract/10.1103/PhysRevC.95.031302
Characterization of the proposed 4−α cluster state candidate in ^{16}O
K. C. W. Li[1,2,*], R. Neveling[2], P. Adsley[1,2], P. Papka[1,2], F. D. Smit[2], J. W. Brümmer[1], C. Aa. Diget[3], M. Freer[4], M. N. Harakeh[5], Tz. Kokalova[4], F. Nemulodi[2], L. Pellegri[2,6], B. Rebeiro[7], J. A. Swartz[8,†], S. Triambak[7], J. J. van Zyl[1], and C. Wheldon[4]
Published 3 March 2017

NIM A 849, 112 (2017) http://www.sciencedirect.com/science/article/pii/S0168900216313171
Application of the Broad Energy Germanium detector: A technique for elucidating β-decay schemes which involve daughter nuclei with very low energy excited states

M. Venhart[a,*], J.L. Wood[b], A.J. Boston[a], T.E. Cocolios[c,d], L.J. Harkness-Brennan[e], R.-D. Herzberg[e], D.T. Joss[e], D.S. Judson[e], J. Kliman[a], V. Matoušek[a], Š. Motyčák[f], R.D. Page[e], A. Patel[e], K. Petrík[a], M. Sedlák[a], M. Veselský[a]
Published 21 March 2017

Phys. Lett. B, 766, 11 (2017) http://www.sciencedirect.com/science/article/pii/S0370269316307961
Experimental investigation of a linear-chain structure in the nucleus ^{14}C
H. Yamaguchi[a,*], D. Kahl[a,b], S. Hayakawa[a], Y. Sakaguchi[a], K. Abe[a], T. Nakao[a,c], T. Suhara[d], N. Iwasa[e], A. Kim[f,g], D.H. Kim[g], S.M. Cha[f], M.S. Kwag[f], J.H. Lee[f], E.J. Lee[f], K.Y. Chae[f], Y. Wakabayashi[h], N. Imai[a], N. Kitamura[a], P. Lee[i], J.Y. Moon[j,k], K.B. Lee[j], C. Akers[j], H.S. Jung[k], N.N. Duy[l,m], L.H. Khiem[l], C.S. Lee[i]
Published 10 March 2017

Phys. Lett. B, 766, 212 (2017) http://www.sciencedirect.com/science/article/pii/S0370269317300102
J/ψ suppression at forward rapidity in Pb–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 10 March 2017

Phys. Rev. C 95, 034319 (2017) https://journals.aps.org/prc/abstract/10.1103/PhysRevC.95.034319
Ab initio calculation of the potential bubble nucleus ^{34}Si
T. Duguet[1,2,3,*], V. Somà[1,†], S. Lecluse[2,‡], C. Barbieri[4,§], and P. Navrátil[5,‖]
Published 23 March 2017

Phys. Rev. A 95, 032506 (2017) https://journals.aps.org/pra/abstract/10.1103/PhysRevA.95.032506
High-resolution laser spectroscopy of long-lived plutonium isotopes
A. Voss[1,*], V. Sonnenschein[1,†], P. Campbell[2], B. Cheal[3], T. Kron[4], I. D. Moore[1,‡], I. Pohjalainen[1], S. Raeder[5,§], N. Trautmann[6], and K. Wendt[4]
Published 24 March 2017

Phys. Rev. C 95, 034320 (2017) https://journals.aps.org/prc/abstract/10.1103/PhysRevC.95.034320
Lifetime measurement of neutron-rich even-even molybdenum isotopes
D. Ralet *et al.* (for the PreSPEC , PreSPEC and AGATA Collaborations)
Published 27 March 2017

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2. News to Report

a. Ultra-low Background Gamma Spectrometry at Boulby

Ultra-low background gamma spectrometry enables researchers to measure and identify trace levels of radioactivity in samples.
The technique of gamma spectrometry using high sensitivity germanium detectors enables researchers to measure and identify trace levels of radioactivity in samples - an important and useful capability in a variety of studies from material selection in 'rare-event physics' to numerous studies of the environment.
Boulby Underground Laboratory currently operates a 2kg ultra-low background germanium detector for gamma spectrometry. Operating such a system deep underground, free of interference from cosmic rays, enables improved sensitivities of orders of magnitude compared to that achieved in surface facilities allowing the very lowest levels of radioactivity to be measured.
Current participating institutions:
- STFC Rutherford Appleton Laboratory
- Sheffield University
- Edinburgh University
- Glasgow University
- The Scottish University Environmental Research Centre (SUERC)

If you are interested in conducting experiments at this facility please contact Sean Paling: sean.paling@stfc.ac.uk.
Contribution from https://www.boulby.stfc.ac.uk/Pages/Ultra-low-Background-Gamma-Spectrometry.aspx

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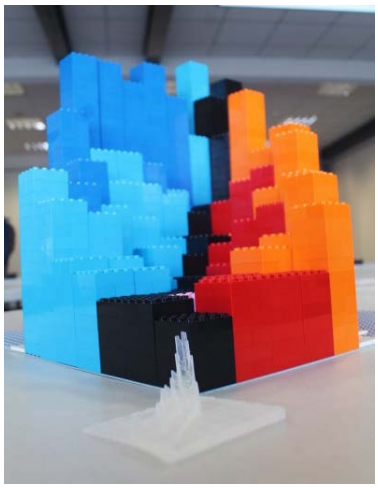
3. Outreach Activity

Upcoming Binding Blocks events and further news items.

As part of a Year 12 visit to the University of York, Binding Blocks delivered an hour long

workshop revolving around decay path ways and the Neon chart.
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.
The workshop began with an introduction to Binding Blocks and the nuclear chart, followed by a brief talk on nuclear research by a member of the team. Each of the 20 students then picked nuclei out of a hat, which they were then tasked to contribute towards building the Neon chart shown. The students then completed a decay path activity that particular nuclei on the Neon chart would follow through successive decays. This was then concluded with a discussion about mass excess/tower heights and nuclear fusion. The students were very engaged with the activity, probing the ambassadors about the physics of the chart.



The Binding Blocks team are in the process of writing a paper which will detail a range of activities 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. This paper follows our recently published paper in the IOP Journal of Physics Education's Special Issue: Focus on Nuclear and Particle Physics (viewable here: http://iopscience.iop.org/journal/0031-9120/page/Focus-on-Nuclear-and-Particle-Physics), entitled "Binding blocks: building the Universe one nucleus at a time".
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.
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)

STFC Spark Awards - 2017A
The Science and Technology Facilities Council (STFC) has launched the new Spark Awards scheme aimed at supporting high quality programmes of novel public engagement that inspire and involve audiences with stories of STFC science and technology. Grants of up to £15k are available.
The scheme replaces the STFC's Small Awards Scheme.
Proposed engagement programmes must focus around the remit of the STFC science programme (comprising astronomy, solar and planetary science, particle physics, particle astrophysics, cosmology, nuclear physics and accelerator science). Applicants should make clear how their application relates to the aims of the STFC Public Engagement Strategy.
Applicants may choose which audiences to engage with and the methods of engagement. However, we encourage applications that propose engagement with audiences considered to have a low 'science capital'. In addition, applications that highlight the social,

ethical, and economic benefits of research are welcomed.
The 2017A call for STFC Public Engagement Spark Awards is now open for applications.

The call for proposals closes at **16:00** on **27 April 2017.**
Before submitting your application you are encouraged to contact the Public Engagement Team to discuss your ideas.

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4. Media Interactions