UK Nuclear Activity

July 2015 Issue 25

In this issue,

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 July*

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. D 91, 112012 (2015) https://journals.aps.org/prd/abstract/10.1103/PhysRevD.91.112012
Charged jet cross sections and properties in proton-proton collisions at $\sqrt{s}$ = 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. Lietava, R.C. Lemmon, J. Norman, R. Romita, O. Villalobos Baillie
Published 22 June 2015*

JHEP, 06(2015) 190 http://link.springer.com/article/10.1007/JHEP06(2015)190
Elliptic flow of identified hadrons in Pb-Pb collisions at $\sqrt{s_{NN}}$ = 2.76 TeV
B. Abelev et al. (ALICE Collaboration), UK Authors: D. Alexandre, L.S. Barnby, D. Evans, M.A.S. Figueredo, L.D. Hanratty, P.G. Jones, A. Jusko, M. Krivda, G.R. Lee, R. Lietava, R.C. Lemmon, J. Norman, R. Romita, O. Villalobos Baillie
Published 29 June 2015*

JHEP, 07(2015) 051 http://link.springer.com/article/10.1007/JHEP07(2015)051
Inclusive, prompt and non-prompt J/ψ production at mid-rapidity in Pb-Pb collisions at $\sqrt{s_{NN}}$ = 2.76 TeV
J. Adam et al. (ALICE Collaboration), UK Authors: D. Alexandre, L.S. Barnby, M. Borri, M. Chartier, D. Evans, M.A.S. Figueredo, K.L. Graham, P.G. Jones, A. Jusko, M. Krivda, G.R. Lee, R. Lietava, R.C. Lemmon, J. Norman, R. Romita, O. Villalobos Baillie, N. Zardoshti
Published 10 July 2015

*Also including missed publications from previous months.

Edited by Elizabeth Cunningham, STFC Particle and Nuclear Physics Outreach Officer.
Elizabeth.Cunningham@stfc.ac.uk or E.Cunningham@surrey.ac.uk

Phys. Rev. C 92, 014306 (2015) http://journals.aps.org/prc/abstract/10.1103/PhysRevC.92.014306
Chiral three-nucleon forces and the evolution of correlations along the oxygen isotopic chain
A. Cipollone[1,2], C. Barbieri[1,*], and P. Navrátil[3]
Published 10 July 2015

Phys. Rev. C 92, 014310 (2015) http://journals.aps.org/prc/abstract/10.1103/PhysRevC.92.014310
First identification of rotational band structures in $^{166}_{75}Re_{91}$
H. J. Li[1,2,*], M. Doncel[1], M. Patial[1], B. Cederwall[1], T. Bäck[1], U. Jakobsson[1,3], K. Auranen[3], S. Bönig[4], M. Drummond[5], T. Grahn[3], P. Greenlees[3], A. Herzáň[3], D. T. Joss[5], R. Julin[3], S. Juutinen[3], J. Konki[3], T. Kröll[4], M. Leino[3], C. McPeake[5], D. O'Donnell[5], R. D. Page[5], J. Pakarinen[3], J. Partanen[3], P. Peura[3], P. Rahkila[3], P. Ruotsalainen[3,†], M. Sandzelius[3], J. Sarén[3], B. Saygı[5,‡], C. Scholey[3], J. Sorri[3], S. Stolze[3], M. J. Taylor[6], A. Thornthwaite[5], J. Uusitalo[3], and Z. G. Xiao[2]
Published 16 July 2015

Eur. Phys. J. A 51:87 (2015)
http://epja.epj.org/articles/epja/abs/2015/07/10050_2015_Article_268/10050_2015_Article_268.html
Branching ratios for the decay of d*(2380)
M. Bashkanov[1,2,3], H. Clement[2,3*] and T. Skorodko[4]
Published 20 July 2015

Phys. Rev. Lett. 115, 052701 (2015) http://journals.aps.org/prl/abstract/10.1103/PhysRevLett.115.052701
^{23}Na(α,p)^{26}Mg Reaction Rate at Astrophysically Relevant Energies
A. M. Howard[*], M. Munch, H. O. U. Fynbo, O. S. Kirsebom, K. L. Laursen, C. Aa. Diget and N. J. Hubbard
Published 29 July 2015

Phys. Rev. Lett. 115, 052702 (2015) http://journals.aps.org/prl/abstract/10.1103/PhysRevLett.115.052702
Measurement of ^{23}Na(α,p)^{26}Mg at Energies Relevant to ^{26}Al Production in Massive Stars
J. R. Tomlinson[1,*], J. Fallis[2], A. M. Laird[1], S. P. Fox[1], C. Akers[1,2,†], M. Alcorta[2], M. A. Bentley[1], G. Christian[2], B. Davids[2], T. Davinson[3], B. R. Fulton[1], N. Galinski[2], A. Rojas[2], C. Ruiz[2], N. de Séréville[4], M. Shen[2], and A. C. Shotter[3]
Published 29 July 2015

Phys Lett B 747, 88 (2015) http://www.sciencedirect.com/science/article/pii/S0370269315003093
Core excitations across the neutron shell gap in ^{207}Tl
E. Wilson[a,1], Zs. Podolyák[a], H. Grawe[b], B.A. Brown[c], C.J. Chiara[d,e,2], S. Zhu[e], B. Fornal[f], R.V.F. Janssens[e], C.M. Shand[a], M. Bowry[a,3], M. Bunce[a], M.P. Carpenter[e], N. Cieplicka-Oryńczak[f,4], A.Y. Deo[g,5], G.D. Dracoulis[h], C.R. Hoffman[e], R.S. Kempley[a], F.G. Kondev[i], G.J. Lane[h], T. Lauritsen[e], G. Lotay[a,j], M.W. Reed[a,6], P.H. Regan[a,j], C. Rodríguez Triguero[k], D. Seweryniak[e], B. Szpak[f], P.M. Walker[a]
Published 30 July 2015

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2. News to Report

a. Re-writing Nuclear Physics textbooks: 30 years of radioactive ion beam physics. This meeting was held in Pisa at the INFN and Department of Physics, from 20 to 24 July 2015 http://exotic2015.df.unipi.it/. The goal of this event was twofold…
…First to celebrate 30 years since the first genuine work on radioactive ion beams (RIBs) used to study properties of atomic nuclei – In this time Low Energy Nuclear Physics research fed by experiments at various facilities all over the world has experienced a great revival supported by widespread theoretical efforts which have changed deeply our understanding of nuclei and their interactions.
...Second to attract and educate the best possible students introducing them to the wonders of Physics with RIBs. To try to convey to such students a view of the rich variety of on-going activities in the field, both experimental and theoretical such that the progresses we have made in the last 30 years can be developed further in the future.
The UK was represented on the International Coordination Committee by Andrei Andreyev (York) who also gave a presentation at the event on ' Low-energy NP activities in the UK and prospects of doing a Master/PhD thesis in the UK'.
Contribution by Andrei Andreyev andrei.andreyev@york.ac.uk (York)

b. York scientists unlock the secrets of stars through aluminium. Physicists, including Dr Alison Laird and Dr Christian Diget, at the University of York have revealed a new

understanding of nucleosynthesis in stars, providing insight into the role massive stars play in the evolution of the Milky Way and the origins of the Solar System.
Radioactive aluminium (aluminium-26, or Al26) is an element that emits gamma radiation through its decay enabling astronomers to image its location in our galaxy. Studying how Al26 is created in massive stars, scientists have distinguished between previously conflicting assumptions about its rate of production by nuclear fusion.

Measuring the fusion of helium and sodium at two separate particle accelerators in Canada and Denmark, the rate of production of Al26 was determined to within a factor of two. An improvement on previous experiments where there was disagreement of around a factor of 100 between measurements, this outcome removes dispute about the effect of sodium fusion on the rate of aluminium production. For the full story, please click here.
Contribution by Christian Aaen Diget christian.diget@york.ac.uk (York)

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3. Outreach Activity

Daresbury Laboratory Masterclass
On Wednesday 24th June Daresbury Laboratory hosted a Nuclear Physics Masterclass for 80 AS Level students from local schools. The day included two lectures and four interactive workshops that embraced the fun that comes from working in Nuclear Physics.
Students got to grips with radiation detection with activities and materials provided by Paul Nolan, Andy Boston and Dan Judson from the University of Liverpool; simulated radiation interaction with matter using computers run by Marc Labiche, assisted by Marcello Borri; explored the history of the nucleus using Lego with Elizabeth Cunningham; and discovered how the use of SPECT scanners in forensic archaeology is unearthing the secrets from the past with Alan Brown.


Elizabeth Cunningham takes students on a journey 'Inside the Atom' with an interactive activity to understand Rutherford Scattering.

Laura Harkness Brennan (Liverpool University) and John Simpson set the scene for the day with an introduction to nuclear physics and Daresbury Laboratory whilst John Roberts from the University of Manchester rounded the day off with an engaging discussion about Nuclear energy that separated the facts from the fuss!


A-Level students identify unknown sources of gamma radiation with equipment and a workshop supplied and run by Prof Paul Nolan and his team from the Physics Department at the University of Liverpool.

The pilot event was the result of a large amount of work and collaboration between the Nuclear Physics department, University of Liverpool, University of Manchester and the Public Engagement teams at Swindon and Daresbury and resulted in nearly 80% of participants reporting that they felt more motivated to find out more about nuclear physics and 50% reporting that they now liked nuclear physics more than they had before.
Contribution by Phill Day phill.day@stfc.ac.uk (STFC)

Teach the Teachers Workshops.
On 25th June 2015 a nuclear physics continuing professional development (CPD) teacher event was held at Manchester Metropolitan University organised by John Roberts (Manchester) in collaboration with Science Learning Centre North West . The aim of these events is to give secondary school teachers a greater understanding of curriculum linked topics in nuclear physics, astrophysics, energy and medicine and to increase their confidence when teaching these subjects in the classroom. The one day workshop consists of a combination of

lectures by UK nuclear physicists, laboratory demonstrations and hands on activities. Speakers included Rodi Herzberg (Liverpool) 'Alchemy in the 21st Century: the Quest for Super Heavy Elements', David Jenkins (York) 'Nuclear Physics at CERN', Elizabeth Cunningham (STFC/Surrey) 'The Evolution of a Star' and John Roberts (Manchester) 'Nuclear Energy – The Facts Behind the Fuss'. In total 30 teachers attended the event and comments on the day were very positive.
Contribution by Elizabeth Cunningham *elizabeth.cunningham@stfc.ac.uk* *(STFC/Surrey)*

York Physics Day (SIESTA-FIESTA)
Thirteen York PhD students presented their SIESTA talks at the York Physics Day, a Teacher's Conference held at the National Science Learning Centre on 26 & 27 June. The sessions were a mixture of seminars and hands-on workshops, covering a wide range of contemporary research topics, concepts and applications, which were both insightful and enjoyable for the participants. On Friday, the workshop went to the skies with the Rosetta Mission; Asteroids and Accelerators; Skydiving; and Climate research. On Saturday, the teachers were introduced to: The Nature of Science; "Einstein, stop telling God what to do!"; Experiments in the Kitchen; Cold plasmas in biomedical applications; Plasma Chemistry and green energy; Prince Rupert's Drops; Nuclear reactions in massive stars; Data storage; and finally the most physical "talk" on: Wrestling with Physics. A clip of this talk can be viewed here.

The conference was attended by 15 A-level physics teachers, who were very impressed with the quality of the talks and found the demonstrations to be extremely useful. One teacher for example expressed her surprise that for many of the speakers this was actually their first presentation of the material outside the physics department. Following the workshop, the teachers plan to incorporate the teaching material supplied by the PhD students directly into their teaching. Special thanks therefore go to the presenters: Jos Riley, Matt Williams, Jon Bean, Alasdair Whynn, Jarrod Leddy, Carlos Arango, James Cubiss, Sandra Schröter, Alex Foote, Graham Triggs, Nic Hubbard, John Sinclair, and Laura Sinclair who all did a great job at communicating physics research and concepts to the teachers.
The event is an annual event organised jointly between Christian Diget at the Department of Physics and the National Science Learning Centre. Based on the success of the event and the corresponding event last year, a much wider advertisement of the event is planned for next year to broaden the impact, particularly regionally. Following their talks, the PhD students were asked to contribute to other events at the NSLC, which will further strengthen the existing links between the Physics Department and the NSLC.
Contribution by Christian Aaen Diget *christian.diget@york.ac.uk* *(York)*

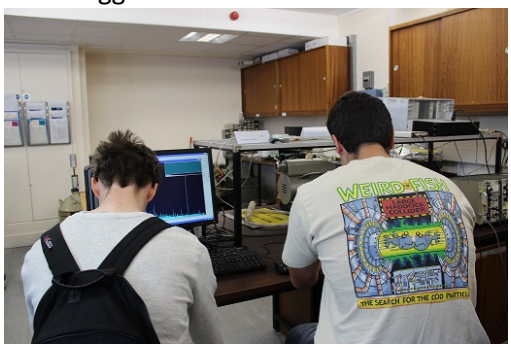
Hands-on Science at the Big Bang Fair South East
On 30th June over 7000 students and teachers attended the Big Bang Fair in Crawley. Hundreds of exhibitors provided a huge range of hands-on activities across STEM subjects. Amongst them Chantal Nobs provided physics activities through her outreach organisation "PHYSICS FUNdamentals". The activities included Bouncing Bubbles, Makey Makey, Cartesian Divers and a particle accelerator in a salad bowl. The official press release for the event can be found here.

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

Surrey Nuclear Physics Masterclass.

A nuclear physics masterclass was held at the University of Surrey on the 9th July. A total of 20 A Level students from five local schools attended. This is the second time this event has been held at Surrey and is run as a collaboration between STFC and the South East Physics Network (SEPnet) and was coordinated by the STFC outreach officer who was helped significantly by Chantal Nobs (Brighton).

The day consisted of two lectures from Surrey nuclear physicists; the first was an introduction to nuclear physics, including a closer look at some particularly interesting isotopes, by Paul Stevenson; the second talk, given by Jim Al-Khalili, was about halo nuclei. The students had an opportunity to use Surrey's undergraduate radiation teaching laboratory in the morning to investigate neutron activated copper samples and learn more about the astrophysical s-process from Phil Walker, helped by Simon Barnes, John-William Brown, Callum Shand, Chantal Nobs, Matt Taggart and Sarah Lonsdale.



In the afternoon three PhD students from the Surrey group: Callum Shand, Ralitsa Ilieva, Louise Dummott and a PhD student from the Brighton group, Chantal Nobs, spoke to the students about their careers and research and Daniel West from the Atomic Weapons Establishment (AWE) also gave an industry career talk. The day finished with a 'making ice cream from liquid nitrogen' activity, and while it was not directly related to nuclear physics, it was very well received.

The overall feedback from the students was very positive, 100% of those who attended said they found the masterclass useful, 80% said they enjoyed the event and 75% said they had been motivated to find out more about nuclear physics. All the teachers said they would bring students back next year.

Contribution by Elizabeth Cunningham
elizabeth.cunningham@stfc.ac.uk
(STFC/Surrey)

Hands-on physics session at the STEM Summer School

On 10th July about 30 local students attended the STEM Summer School at the University of Brighton. They spent three days participating in a variety of hands-on sessions covering many different STEM subjects. On Friday morning Chantal Nobs provided a physics session, teaching the students about the electromagnetic spectrum. The activities included finding clues and answering questions using different sources of electromagnetic radiation, including infrared and ultraviolet torches.

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

Headstart Nuclear Physics course

For the second year running, the Nuclear Physics Group at The University of Manchester organized a 'Nuclear Physics at Manchester' Headstart course which was held from July 13th-16th. Forty enthusiastic students attended from various sixth form colleges across the UK. The course serves as an introduction for interested students to nuclear physics.

Students attended a number of lectures, given by experts in their relevant fields, covering topics such as nuclear energy, nuclear interactions, a history of particle detectors and how to apply nuclear physics in industry. Special thanks go to Dr Thomas Cocolios, who gave a talk on the ISOLDE facility over Skype during his holidays in Belgium. Tours were organised of two local laboratories; Jodrell bank and Daresbury. After this, students had the opportunity to experience laboratory work themselves as sessions were run by Dr David Sharp guiding them through the experiments undergraduates perform at the University. Finally, Dr Mike Taylor guided the students through the setup of a Geant4 simulation, demonstrating the use of Monte Carlo simulation in Nuclear Medicine.

The Headstart courses provide a great opportunity for young students to learn more about topics of interest to them, their applications, possible career paths and ultimately help to decide what subject they would like to study at university.

Contribution by Tobias Wright
tobias.wright@manchester.ac.uk
(Manchester)

Nuclear Science Summer School
13-15th July and 18th July at the University of Liverpool.
Over 30 pupils from local schools participated in activities for the first Nuclear Science Summer School at the Central Teaching Laboratories at the University of Liverpool. Students participated in a range of talks about nuclear research and undertook hands on activities including identifying materials from the gamma ray spectra recorded on research grade equipment. Students also learned about the role that accelerators play in nuclear research and spent time learning about the detectors at CERN and building the LHC from Lego. Students who engaged in the three day programme also did their own research topic and produced a poster. An open morning on 18th July allowed participants to be rewarded and try out some more family friendly activities. This activity was supported through a grant from STFC.
Contribution by Helen Vaughan
H.L.Vaughan@liverpool.ac.uk (Liverpool)

Media and Communication Training
The Science and Technology Facilities Council offers free Media Skills training and Writing about your Research courses for researchers, as part of its Public Engagement programme. The Media Skills training develops skills in working with television, radio, newspapers and other media. The next course date is 7 October 2015, in London.
The Writing about your Research course trains researchers to write about their research for non-specialist readers in a variety of contexts. The next course date is 2 September 2015, in London.
A two-day residential combination of the courses is also available. These are held at the Kavli Royal Society International Centre in Buckinghamshire. The next dates are 2/3 November 2015.
STFC offers bursaries to pay the course fees and T&S costs for eligible researchers. The courses are run for us by the Royal Society. To book a place visit the Royal Society website. Once you have a confirmed place, go to the STFC website to apply for an STFC bursary. The STFC contact for more information is Jane.Butt@stfc.ac.uk, tel: 01793 442030.

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4. Media Interactions

HG and the H-Bomb
This BBC Radio 3 Sunday feature unearths the extraordinary role of HG Wells in the creation of the nuclear bomb 70 years ago - and how a simple, devastating idea led to the world we know today. Features Elizabeth Cunningham talking about chain reactions and the positive applications of nuclear physics on society.
Contribution by Elizabeth Cunningham
elizabeth.cunningham@stfc.ac.uk
(STFC/Surrey)