UK Nuclear Activity

May 2017 Issue 47

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 May*

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 95, 044321 (2017) https://journals.aps.org/prc/abstract/10.1103/PhysRevC.95.044321
Lifetime measurements of excited states in ^{162}W and ^{164}W and the evolution of collectivity in rare-earth nuclei
M. Doncel[1,2], B. Cederwall[1], C. Qi[1], H. Li[1,3], U. Jakobsson[1,4], K. Auranen[5,6], S. Bönig[7], M. C. Drummond[2], T. Grahn[5], P. T. Greenlees[5], A. Herzan[2,5], D. T. Joss[2], R. Julin[5], S. Juutinen[5], J. Konki[5], T. Kröll[7], M. Leino[5], C. McPeake[2], D. O'Donnell[2], R. D. Page[2], J. Pakarinen[5], J. Partanen[5], P. Peura[5,8], P. Rahkila[5], P. Ruotsalainen[5], M. Sandzelius[5], J. Sarén[5], B. Saygı[2,9], C. Scholey[5], J. Sorri[5], S. Stolze[5], M. J. Taylor[10], A. Thornthwaite[2], and J. Uusitalo[5]
*Published 24 April 2017

Phys. Rev. C 95, 041302(R) (2017) https://journals.aps.org/prc/abstract/10.1103/PhysRevC.95.041302
Low-lying structure and shape evolution in neutron-rich Se isotopes
S. Chen[1,2,*], P. Doornenbal[2], A. Obertelli[2,3], T. R. Rodríguez[4], G. Authelet[3], H. Baba[2], D. Calvet[3], F. Château[3], A. Corsi[3], A. Delbart[3], J.-M. Gheller[3], A. Giganon[3], A. Gillibert[3], V. Lapoux[3], T. Motobayashi[2], M. Niikura[5], N. Paul[3], J.-Y. Roussé[3], H. Sakurai[2,5], C. Santamaria[3], D. Steppenbeck[2], R. Taniuchi[2,5], T. Uesaka[2], T. Ando[2,5], T. Arici[6], A. Blazhev[7], F. Browne[8], A. M. Bruce[8], R. Caroll[9], L. X. Chung[10], M. L. Cortés[6,11], M. Dewald[7], B. Ding[12], F. Flavigny[13], S. Franchoo[13], M. Górska[6], A. Gottardo[13], A. Jungclaus[14], J. Lee[15], M. Lettmann[11], B. D. Linh[10], J. Liu[15], Z. Liu[12], C. Lizarazo[6,11], S. Momiyama[2,5], K. Moschner[7], S. Nagamine[2,5], N. Nakatsuka[2,16], C. R. Nita[17], C. Nobs[8], L. Olivier[13], R. Orlandi[18], Z. Patel[9], Zs. Podolyak[9], M. Rudigier[9], T. Saito[2,5], C. Shand[9], P.-A. Söderström[2], I. Stefan[13], V. Vaquero[14], V. Werner[11], K. Wimmer[5], and Z. Xu[15]
*Published 27 April 2017

Phys. Rev. Lett. 118, 172501 (2017) https://journals.aps.org/prl/abstract/10.1103/PhysRevLett.118.172501
Observation of the Isovector Giant Monopole Resonance via the ^{28}Si(^{10}Be,^{10}B* [1.74 MeV]) Reaction at 100 AMeV
M. Scott[1,2,3], R. G. T. Zegers[1,2,3,*], R. Almus[4], Sam M. Austin[1,2,3], D. Bazin[1], B. A. Brown[1,2,3], C. Campbell[5], A. Gade[1,3],

*Also including missed publications from previous months.

M. Bowry[1], S. Galès[6,7], U. Garg[8], M. N. Harakeh[9], E. Kwan[1], C. Langer[1,2], C. Loelius[1,2,3], S. Lipschutz[1,2,3], E. Litvinova[10,1,2], E. Lunderberg[1,3], C. Morse[1,3], S. Noji[1,2], G. Perdikakis[4,1,2], T. Redpath[4], C. Robin[10,2], H. Sakai[11], Y. Sasamoto[12,11], M. Sasano[11], C. Sullivan[1,2,3], J. A. Tostevin[13,1], T. Uesaka[11], and D. Weisshaar
*Published 28 April 2017

Phys. Rev. C 95, 054308 (2017) https://journals.aps.org/prc/abstract/10.1103/PhysRevC.95.054308
Three-quasiparticle isomer in ^{173}Ta and the excitation energy dependence of K-forbidden transition rates
R. T. Wood[1], P. M. Walker[1,*], G. J. Lane[2], R. J. Carroll[1], D. M. Cullen[3], G. D. Dracoulis[2], S. S. Hota[2], T. Kibédi[2], N. Palalani[2,†], Zs. Podolyák[1], M. W. Reed[2], K. Schiffl[2], and A. M. Wright[2]
Published 11 May 2017

NIMA, 854, 134 (2017) http://www.sciencedirect.com/science/article/pii/S0168900217302310
Characterization of a cylindrical plastic β-detector with Monte Carlo simulations of optical photons
V. Guadilla[a,*], A. Algora[a,b], J.L. Tain[a], J. Agramunt[a], J. Äystö[c], J.A. Briz[d], A. Cucoanes[d], T. Eronen[c], M. Estienne[d], M. Fallot[d], L.M. Fraile[f], E. Ganioğlu[g], W. Gelletly[a,h], D. Gorelov[c], J. Hakala[c], A. Jokinen[c], D. Jordan[a], A. Kankainen[c], V. Kolhinen[c], J. Koponen[c], M. Lebois[i], T. Martinez[e], M. Monserrate[a], A. Montaner-Pizá[a], I. Moore[c], E. Nácher[j], S.E.A. Orrigo[a], H. Penttilä[c], I. Pohjalainen[c], A. Porta[d], J. Reinikainen[c], M. Reponen[c], S. Rinta-Antila[c], B. Rubio[a], K. Rytkönen[c], T. Shiba[d], V. Sonnenschein[c], E. Valencia[a], V. Vedia[f], A. Voss[c], J.N. Wilson[i], A.-A. Zakari-Issoufou[d]
Published 11 May 2017

Phys. Rev. Lett. 118, 202502 (2017) https://journals.aps.org/prl/abstract/10.1103/PhysRevLett.118.202502
Gamma Decay of Unbound Neutron-Hole States in ^{133}Sn
V. Vaquero[1], A. Jungclaus[1,*], P. Doornenbal[2], K. Wimmer[3], A. Gargano[4], J. A. Tostevin[5], S. Chen[2,6], E. Nácher[1], E. Sahin[7], Y. Shiga[8], D. Steppenbeck[2], R. Taniuchi[2,3], Z. Y. Xu[9], T. Ando[3], H. Baba[2], F. L. Bello Garrote[7], S. Franchoo[10], K. Hadynska-Klek[7], A. Kusoglu[11,12], J. Liu[9], T. Lokotko[9], S. Momiyama[3], T. Motobayashi[2], S. Nagamine[3], N. Nakatsuka[13], M. Niikura[3], R. Orlandi[14], T. Saito[3], H. Sakurai[2,3], P. A. Söderström[2], G. M. Tveten[7], Zs. Vajta[15], and M. Yalcinkaya[11]
Published 17 May 2017

NIMA, 855, 1 (2017) http://www.sciencedirect.com/science/article/pii/S0168900217302590
Conceptual design of the AGATA 1π array at GANIL
E. Clément[a,*], C. Michelagnoli[a], G. de France[a], H.J. Li[a], A. Lemasson[a], C. Barthe Dejean[a], M. Beuzard[a], P. Bougault[a], J. Cacitti[a], J.-L. Foucher[a], G. Fremont[a], P. Gangnant[a], J. Goupil[a], C. Houarner[a],M. Jean[a], A. Lefevre[a], L. Legeard[a], F. Legruel[a], C. Maugeais[a], L. Ménager[a], N. Ménard[a], H. Munoz[a], M. Ozille[a], B. Raine[a], J.A. Ropert[a], F. Saillant[a], C. Spitaels[a], M. Tripon[a], Ph. Vallerand[a], G. Voltolini[a], W. Korten[b], M.-D. Salsac[b], Ch. Theisen[b], M. Zielińska[b], T. Joannem[b], M. Karolak[b], M. Kebbiri[b], A. Lotode[b],R. Touzery[b], Ch. Walter[b], A. Korichi[c], J. Ljungvall[c], A. Lopez-Martens[c], D. Ralet[c], N. Dosme[c], X. Grave[c],N. Karkour[c], X. Lafay[c], E. Legay[c], I. Kojouharov[d], C. Domingo-Pardo[e], A. Gadea[e], R.M. Pérez-Vidal[e], J.V. Civera[e], B. Birkenbach[f], J. Eberth[f], H. Hess[f], L. Lewandowski[f], P. Reiter[f], A. Nannini[g], G. De Angelis[h], G. Jaworski[h], P. John[h], D.R. Napoli[h], J.J. Valiente-Dobón[h], D. Barrientos[h], D. Bortolato[h], G. Benzoni[i], A. Bracco[i], S. Brambilla[i], F. Camera[i], F.C.L. Crespi[i], S. Leoni[i], B. Million[i], A. Pullia[i], O. Wieland[i], D. Bazzacco[j], S.M. Lenzi[j], S. Lunardi[j], R. Menegazzo[j], D. Mengoni[j], F. Recchia[j], M. Bellato[j], R. Isocrate[j],F.J. Egea Canet[j], F. Didierjean[k], G. Duchêne[k], R. Baumann[k], M. Brucker[k], E. Dangelser[k], M. Filliger[k], H. Friedmann[k], G. Gaudiot[k], J.-N. Grapton[k], H. Kocher[k], C. Mathieu[k], M.-H. Sigward[k], D. Thomas[k], S. Veeramootoo[k], J. Dudouet[l], O. Stézowski[l], C. Aufranc[l], Y. Aubert[m], M. Labiche[n], J. Simpson[n], I. Burrows[n],P.J. Coleman-Smith[n], A. Grant[n], I.H. Lazarus[n], P.S. Morrall[n], V.F.E. Pucknell[n], A. Boston[o], D.S. Judson[o],N. Lalović[p,q], J. Nyberg[r], J. Collado[s], V. González[s], I. Kuti[t], B.M. Nyakó[t], A. Maj[u], M. Rudigier[v]
Published 21 May 2017

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2. News to Report

a. Recycling medical equipment at ISOLDE

Taken from Gizmodo article:

An old MRI machine took a several-week boat journey around the world last week. Scientists are going to gut it, replace the bed, and try to understand the secrets of the universe with it—because, why not?

There's actually a good reason. When some physicists at the CERN experiment ISOLDE realized they'd have to drop a million and a quarter just to build their own magnet, they started to look for alternatives. Luckily, an Australian hospital was scrapping their giant magnet, which the ISOLDE folks bought for a measly hundred sixty thousand bucks. Physicists hope to use the magnet to understand the nature of nuclei and even the

nuclear reactions happening inside supernovae.

"We want to study… shell structure," Liam Gaffney, a research fellow at CERN, told Gizmodo. He said that the nucleus is much more difficult to understand because the strong nuclear force is holding it together, while the repulsive electromagnetic force between positively-charged protons is trying to push it apart.

"There's no real true understanding of the strong force in nuclei," said Gaffney. "We can't find a theory like the Standard Model," the theory of individual particles. "We can't describe many isotopes we observe today," the flavours that different atoms of elements might come in, with isotopes differing only in the number of neutrons in their nuclei.

The new magnet, which was purchased by CERN's Isotope mass Separator On-Line facility, or ISOLDE, will help shed light on these atomic mysteries and on the rates of nuclear reactions during supernovae. ISOLDE is a smaller experiment that harnesses a beam of protons from a small nearby proton accelerator, the first in a slew of accelerators that eventually injects particles into the Large Hadron Collider. ISOLDE, in fact, takes 40 percent of the protons that CERN produces for its experiments.

Those protons slam into a (usually) uranium target, splitting uranium atoms into low-energy beams of different radioactive elements. The ISOLDE experiment then directs these elements into individual experimental halls that scientists can use to do whatever they might need to do with a strange beam of radioactive ions.

ISOLDE recently received an upgrade to accelerate some of the heavy ion beams called HIE-ISOLDE (High Intensity and Energy ISOLDE) produced from splitting the initial uranium source. These radioactive beams hit targets and interact, resulting in high-energy cannons of heavy radioactive elements. Those are sent down the next pipe aimed at a target made from much smaller deuterium atoms, which are just single protons mixed with single neutrons. "When you have a heavy ion coming in... it's like throwing a basketball at a ping pong ball," Gaffney said.

That's where the MRI magnet comes in. Yes, it's literally a cylindrical MRI machine like the ones you see at the hospital, shipped on a boat all the way over from Australia, turned into a vacuum chamber with the particle beams replacing the bed.

Instead of a splash of difficult-to-decode particles, the magnetic field inside the MRI machine bends some of the protons and causes them to spiral. When these protons hit silicon detectors, the scientists can gather information about the structure of the atomic nuclei themselves.

This isn't the first time that a high energy physics experiment has used an MRI machine. The ISOLDE team got the idea from Argonne National Laboratory in the United States, which first used an MRI magnet in their own Helical Orbit Spectrometer, or HELIOS, that surrounds a source of stable, not radioactive beams. ISOLDE's focus is predominantly a radioactive beam.

The magnet arrived a few weeks ago and is currently sitting at liquid helium temperatures and being tested. The magnet works, at least. Experiments should be up and running next year, said Gaffney. "It's still wrapped up almost like a little baby."

Contribution by Liam Gaffney
liam.gaffney@cern.ch (CERN)

b. "INTERACT" Symposium

Are you interested in outreach, public engagement and science communication? If so then the "INTERACT" Symposium is for you…

The STFC, IOP and SEPnet are organising a one day conference in Birmingham that promises to be both useful and fun! We want to help you share your enthusiasm for science.

This lively one day event offers you the opportunity to be inspired by experienced outreach/public engagement champions, share your experience and good practice, take part in hands-on interactive workshops and parallel sessions. In addition there will be a marketplace showcasing engagement in practice that offers you a chance to see what resources are out there to help you.

Themes of the day are:

- Evaluation and impact: How to do effective evaluation and demonstrate impact, sharing

case studies, what worked for REF and what didn't. Looking forward to REF 2021

- Reaching traditionally hard-to-engage and underserved audiences: Working with the right partners, raising your skills and working with STEM influencers to reach low science capital audiences
- Schools outreach: How to work with young audiences and inspire them
- Sharing both good practice and a safe space for "what not to do": Understanding your audience, reflective practice and what constitutes high-quality public engagement.

The symposium is open to all Physical Science researchers including engineering and STFC facility users. Attending can also contribute to your continuing professional development.

This event is free to attend but you will need to register in advance. Please register at https://www.iopconferences.org/iop/1102/home by Friday 30 June. Registered delegates will be invited to submit ideas for running a session or workshop that address the key symposium themes and there will an opportunity to demonstrate your outreach activities. Registered delegates will also be asked to vote on the final conference programme.

We all look forward to seeing you there.

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

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3. Outreach Activity

Primary Nuclear Physics Outreach

On Monday 22nd May Elizabeth Cunningham piloted a KS2 nuclear physics workshop to 150 primary school students at the STFC Rutherford Appleton Laboratory – Science and engineering exploration day. During the activity the students learned what a nuclear physicist is, what atoms are made of and how we study the nucleus through scattering and collisions. Each pair of students was given a hidden shape or 'nucleus' under a piece of cardboard that they had to identify by scattering a bouncy ball or 'electron' off the edges.

The students engaged well with the workshop and during the Q&A one ten your old asked what quarks were (even though they had not been mentioned in the session) and another child told the group how her mum used radiation to treat cancer!

Contribution by Elizabeth Cunningham
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(STFC/Surrey)

Outreach Talks to Astronomical Societies

Alex Murphy gave a talk on Nuclear Astrophysics to about 40 members of the Highlands Astronomical Society, Inverness on the 2nd May.

Contribution by Alexander Murphy
a.s.murphy@ed.ac.uk (Edinburgh)

At the end of April Elizabeth Cunningham gave a talk titled: 'Radiation Protection How to survive a journey to Mars' to 55 members of the Vectis Astronomical Society on the Isle of Wight.

Contribution by Elizabeth Cunningham
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(STFC/Surrey)

Keynote speech at the year 9 STEM festival at Worthing College

On 28th April Chantal Nobs was invited as a keynote speaker to the year 9 STEM festival at Worthing College. Chantal discussed her route into physics, the research she was involved with during her MPhys and PhD degrees and the importance of scientific research to inspire the students to consider taking Physics at A-level and beyond.

Contribution by Chantal Nobs
chantal.nobs@ukaea.uk (CCFE)

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4. Media Interactions