NSCL

THE GREENSHEET

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PHYSICS OF ATOMIC NUCLEI (PAN)

Contributed by: Zach Constan

Today marks the end of two one-week Physics of Atomic Nuclei (PAN) programs. Sponsored by JINA and hosted by NSCL, PAN is in its 22nd year of serving science teachers and high school students. This year's PAN participants come from 16 states plus France and Spain. Participants are engaged in nuclear astrophysics through guest lectures on several topics and experiments that give them an idea of the research process. Students and teachers always rate their time with faculty/staff/students as the best part of their PAN experience, showing that they deeply value the interaction with JINA/NSCL personnel.

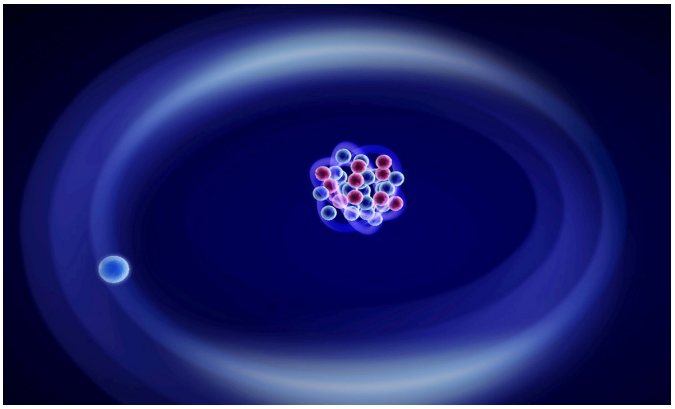
PAN students try out the new beta app of "Nucleon". It's a rare isotope production game that the NSCL Outreach Committee has been developing with the GEL lab.

Teachers who get their professional development through PAN work to incorporate nuclear astrophysics into their curriculum using new content knowledge, equipment, ideas and confidence. Students are basically "trying their hand" at research science for the week to see if it's a career that interests them. A recently-published journal article showed that PAN students are much more likely than their peers to pursue majors and careers in the STEM disciplines.

LIFETIME MEASUREMENT OF A HALO NUCLEUS

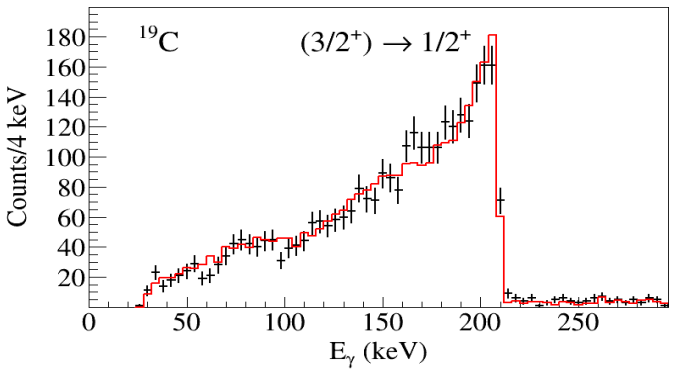
Contributed by: Kenneth Whitmore

As one moves away from stability, new features occur in nuclei with extreme proton-to-neutron ratios. One such example is the halo, in which a valence proton or neutron is spatially extended beyond the rest of the nucleus. Traditionally, halos have been characterized by their large radii and low angular momentum. Despite numerous investigations into such static properties, there are very little data available on their dynamic properties.



The illustration shows a neutron halo around neutron-rich magnesium nucleus. Image credit: Ken-ichiro Yoneda, RIKEN

Experiment e12015 was designed to make the first measurement of a magnetic transition between bound states in a halo system. The measurement is based on determination of the lifetime of excited states via the line-shape method. In the line-shape method, a fast rare-isotope beam is excited in a target and emits gamma rays as it travels down the beam line. For sufficiently long lifetimes, the gamma decays occur well behind the target, resulting in a much broadened peak. The excellent position and energy resolution of the gamma-ray tracking array GRETINA allowed for a precise determination of lifetimes based on the shape of the Doppler-shifted peaks.



Gamma spectrum obtained for ^{19}C. The data points are shown in black with the best-fit simulation in red. The broad peak is from a single transition at 209 keV.

The line-shape method has been used to quantify the decay strength of the first excited state in ^{19}C. The figure shows the gamma-ray spectrum measured in the experiment. The peak with a broad low-energy tail indicates a long lifetime, corresponding to one of the weakest known gamma transitions governed by the magnetic interaction. The result highlights halo as a system that is resistant against the magnetic response. This is the first such measurement in a halo nucleus and can serve as a benchmark for similar measurements on heavier systems. (Phys. Rev. C 91, 041303(R))

HAND TOOL HAZARDS

One of the key issues with hand tools is choosing and using the right tool for the task. Unfortunately, tools are used improperly, by people who improvise with what they have on hand. Hand tools are viewed as simple to use, so there is little concern for safety. In reality, a person using hand tools must always follow safety precautions. Nearly 10% of industrial incidents result from the improper use of hand tools. Injuries range from simple cuts, contusions and abrasions to amputations, fractures and punctures.

Pneumatic tools are powered by compressed air and require the use of eye protection and a secure attachment of the tool to the air hose.

Below are examples of improper use of hand tools:

- Pushing rather than pulling a wrench to loosen a tight fastener.
- Bending metal with undersized pliers, which can damage the pliers and the metal.
- Holding an item you're working on in one hand while attempting to remove a screw with a screwdriver in the other hand.
- Cutting toward your body with a cutting tool.
- Using dull cutting tools.
- Using sharpened tools near other employees or aisle areas
- Removing safety guards from power tools, such as those on circular saws
- Using tools outside their designed safety limits

Inspect tools before use and keep up with maintenance to ensure that equipment functions properly. Disconnect tools or machines when not in use, before servicing, and when changing accessories.

SHUTDOWN UPDATE

The K500 cap is down and vacuum has been recovered. The Radio Frequency (RF) is being tuned for our Argon test beam. With the RF and main magnet on, and the vacuum recovered, a final test of the Magnetic channel #8 extraction drive is being completed today.

The K1200 beam chamber final assembly is being completed today and the cap lowered. We will recover rough vacuum once the cap is down.

24/7 operator rotation starts this Sunday at 11pm. The remainder of next week, we will complete our quarterly radiation safety checks and then start testing all systems with beam. The first experiment is scheduled for August 12th.

PEOPLE AT THE LAB

- Katie Childers is a Graduate Student who joined the lab this week. Sean Liddick is her line manager.
- Ben Wilson joined IT Systems this week. He is an Information Technology Professional. Paul Mantica is his line manager.

THE ARCHIVE FOR PREVIOUS GREENSHEETS IS AVAILABLE HERE

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