NSCL

THE GREENSHEET

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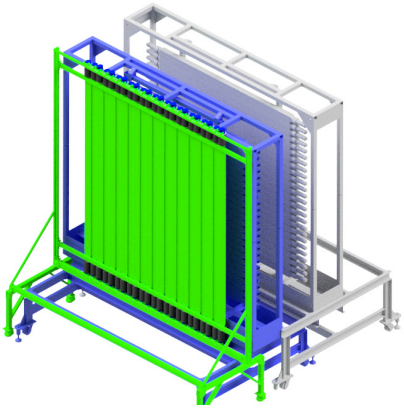
A CHARGED PARTICLE VETO WALL

Contributed by Betty Tsang

To understand the properties of neutron stars, which are very rich in neutrons, relative to the number of protons, it is important to study the symmetry energy. Symmetry energy is the additional energy that stems from having an unequal number of neutrons and protons in a nuclear system. Comparisons of neutrons and protons emitted in heavy-ion collisions have been used to study the symmetry energy. In general, neutrons are difficult to measure and specialized neutron detectors are required. In addition to neutron detectors MONA-LISA, LENDA, and HABANERO, NSCL also owns the Large Area Neutron Array (LANA), which is located in the S2 vault.

LANA consists of two neutron walls, each of which is about 2x2 m^2. Behind the thin Aluminum protective cover of each wall, 25 Pyrex tubes filled with liquid scintillator NE213 are mounted. Since neutrons and photons generate different pulse shapes in NE213, one can differentiate between them by carefully analyzing the signals. Unfortunately, the same technique cannot be applied to differentiate between neutrons and protons that hit the wall. Protons can be combined with neutrons and creates background in the data.



The 3D rendering of the arrangement of the veto wall (under construction) with the two neutron walls stacked behind. The horizontal Pyrex tubes containing the liquid scintillator NE213 are normally enclosed in an Aluminum casing for protection.

To ensure near 100% rejection of protons and other charged particles from the target, the HiRA group is collaborating with Zbigniew Chajecki at Western Michigan University to build a Charged Particle Veto wall (VW). The VW consists of 23 plastic scintillator mounted vertically. In an upcoming experiment planned in December, the two LANA neutron walls will be configured as shown in the figure and the veto wall will be placed in between the target and the neutron wall. All protons and charged particles from the target will interact with the VW but only a small fraction (~1%) of the neutrons will interact with the 1 cm thick VW. By rejecting particles that have signals in the VW, nearly 100% of charged particles will be rejected while keeping most of the neutrons. Work to reconfigure the neutron walls in the S2 vault will start in June with the VW to be installed later.

SEPARATOR FOR CAPTURE REACTIONS

Contributed by Hendrik Schatz

The SECAR project (Separator for Capture Reactions) aims at enabling direct laboratory measurements of nuclear reactions that otherwise only occur in extreme astrophysical environments with temperatures of between 100 million and 1 billion degrees Fahrenheit.

Such temperatures occur for example in explosions of a thin layer of hydrogen on the surface of a white dwarf star that leads to a dramatic brightening and the appearance of a new star that disappears after a few months. Other such astrophysical sites include explosions on neutron stars, supernova explosions, and the interiors of stars that are 100 or 1000 times more massive than the sun.

Data from SECAR will be incorporated into computer models that can then be used to understand how nuclear reactions in these extreme sites create new elements that one day may form new planets. In fact, some chemical elements found on earth or in observations of stars may have originated from these astrophysical explosions already.

SECAR uses the existing JENSA gas jet target to collide a radioactive beam of ions with a stream of hydrogen or helium gas. The radioactive ion beam is produced by the NSCL Coupled Cyclotron facility, stopped, and then reaccelerated with the ReA3 accelerator to the same energy that the ions have inside stars. SECAR consists of a set of magnets and electrostatic deflectors that separate the reaction products from the radioactive beams so they can be detected. SECAR will be extremely sensitive and pick out a single reaction product out of trillions of unreacted beam particles. Out of 27 magnets, 21 have now been delivered from the manufacturer.

Over the next months these magnets will be tested and installed in the ReA3 Hall, including power supplies, cable trays, cooling water. Tests with 4 quadrupole magnets have already been completed and it was shown that the magnets meet specifications. The 30 ton Wien filters will arrive later this year. They contain a dipole magnet and a strong electric field created by two 300,000 V high voltage power supplies. The cranes needed to assemble and maintain the Wien filters have already been installed in the ReA3 hall last month. SECAR is a collaboration of 9 Universities and National Laboratories. The project is supported by DOE Office of Science, Office of Nuclear Physics and the National Science Foundation and is managed to an early completion in 2020.

A SECAR dipole magnet arrived at MSU and was shown to visitors during "take your child to work day."

FORGING CONNECTIONS – FROM NUCLEI TO THE COSMIC WEB

The JINA-CEE workshop "Forging Connections – from Nuclei to the Cosmic Web" will be held June 26 – 29, 2017 at the Kellogg Hotel and Conference Center. Registration is open until May 19. To register and for more information, see the meeting website.

CCF UPDATE

This week, the cyclotrons are continuing their three-week-long run of calcium-48. Since Wednesday night of last week, a phosophorus-43 secondary beam has been produced for a GRETINA experiment in the S3 vault.

WORKPLACE FALLS AWARENESS

Following highway crashes, falls are the second leading cause of workplace fatalities. While construction workers are most at risk, falls can happen in any workplace that involves working from heights. In Michigan, Gov. Rick Snyder has declared the month of May as Workplace Falls Awareness Month urging workers to use caution and take safety measures when performing elevated work. Nearly half of the 43 fatalities the Michigan Occupational Safety and Health Administration (MIOSHA) investigated in 2016 were fall-related, occurring largely in the construction and tree-trimming industries.

At the Laboratory, employees have many tools available to prevent fall-related injuries:

- Use the Work Control Plan, AHD and JSA to identify task-specific fall hazards;
- Use appropriate controls and equipment to eliminate or mitigate fall hazards;
- Take training on the proper use of equipment and safeguards.

The Safety office can assist you with assessing and mitigating fall hazards at the Laboratory. Line Managers are responsible for ensuring employees have the appropriate training and equipment to perform work safely. MIOSHA has launched a comprehensive fall prevention public service campaign and website. For more information, go to www.michigan.gov/stopfalls. The website includes, fact sheets, standards, public service announcements, videos, and other informational resources.

SEMINARS

- THURSDAY, MAY 18 AT 11:00 AM
  NSCL Lecture Hall 1200
  Doerte Blume, Washington State University
  'The Many Facets of Small Liquid Helium-4 Clusters'

PEOPLE AT THE LAB

- Dena Mujtaba, Michael Bergeron, Savannah Jenuwine, Erik Dams, and Aryka Thomason joined the Lab as student employees.
- Mehgzhi Chen is a new Graduate Student in Witek Nazarewicz's research group.

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