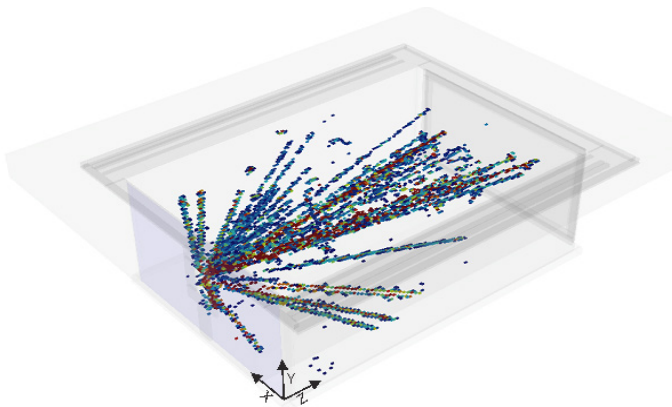


VIEWING NUCLEAR REACTIONS

Contributed by: Bill Lynch

Scientists reconstruct nuclear reactions by detecting fragments emitted in the collisions of two heavy nuclei. The process could be likened to recreating a car accident by collecting and noting the positions, sizes and types of the debris at the crash site. Unlike a car crash, however, a nuclear collision can be more precisely reconstructed because experimentalists have a better idea of what to expect and can design an appropriate detector. An ideal detector would capture all the particles emitted in the collisions. One such detector is a Time Projection Chamber (TPC), which is a gas detector that has an amplification region that can sense ionization electrons. These electrons drift to a X,Z pad plane (like pixels in a TV) where they are multiplied and make signals. The drift time of the electrons from the ionization point in the gas to the pad plane provides the third, Y, dimension.



The figure shows the ionization in the TPC for event. The beam initially travels in the Z direction and strikes a target located approximately 1 cm upstream of the TPC.

The π RIT (SAMURAI pion Reconstruction Ion Tracker) TPC was funded by the Department of Energy, Office of Nuclear Physics and constructed at NSCL as part of an international effort to constrain the symmetry-energy term in the nuclear Equation of State (EoS). It will be used in conjunction with the SAMURAI dipole magnet at the Radioactive Isotope Beam Factory (RIBF) at RIKEN to measure yield ratios for pions and other light fragments. For example, protons, deuterons, Helium-3 and Helium-4 (alpha) particles are produced in central collisions of neutron-rich heavy ions, such as such as Tin-132 (which has

32 neutrons more than protons) on Tin-124 (which has 24 neutrons more than protons). Signals from the 12096 pads near the multi-wire anode avalanche region, are read out with the recently developed Generic Electronics for TPCs.

The first commissioning run with the π RIT TPC was recently completed successfully at RIKEN using a 200 MeV/u secondary ^{79}Se beam. For this run, there was no magnetic field, so the tracks are straight, and not curved as they will be during the real experiment when the TPC resides inside the SAMURAI dipole magnet. Non-interacting beam also traverses the active volume of the TPC in both the test and the real experiment, so a gating grid is employed to keep the TPC from accepting an event if a projectile passes through the target without making a nuclear reaction. The commissioning run shows that the gating grid designed by NSCL student Suwat Tangwancharoen works very well, allowing one to select events in which violent nuclear reactions occur. The functionality of the scintillator trigger arrays and the data acquisition system were also successfully tested in the commissioning run. Online software allows experimenters to merge the data from the 12096 pads of the TPC and view events like the one shown here in real time, which led to a lot of “wows” and “woos!” by the experimentalists and by interested onlookers during the test run.

COMMUNICATING FRIB & NSCL SCIENCE HIGHLIGHTS

In an effort to disseminate science highlights and honors/awards of laboratory members broadly, you are encouraged to send material - high caliber and broader interest science highlights (e.g., upcoming Science/Nature/PRL papers, Editor's Choices, groundbreaking work featured by public media) as well as awards/honors that may be newsworthy - to [Alexandra Gade](#) or [Witek Nazarewicz](#), who will help with publicizing through appropriate channels.

SHUTDOWN UPDATE

The Z071 coil and magnet steel placement was completed on Wednesday November 25th. Operations engineers are now in the process of making the electronic, control and cryogenic connections to the magnet. The cap of

the KI200 was raised this week to remove and refurbish the stripper foil mechanism. There will be a complete power shutdown to the laboratory on Saturday December 5th to tie-in the new office building the power grid. The AC233 degrader pot was removed from the N4 vault to have the wedges upgraded.

ANNUAL HOLIDAY POT-LUCK & CONTEST RECEPTION

The Social Events Committee is pleased to announce the Annual Pot-Luck Holiday Dinner will be **Thursday, Dec. 17th**, starting at 11:30am in the Atrium. There will be ham, turkey, potatoes, punch and tea provided by the committee through generous donations of faculty and staff.

Pot-Luck Dishes needed! We hope to see many contributions of food, as a successful pot-luck depends on you, too! We expect to see over 200 people make their way through the buffet, and we need your help to make sure everyone gets enough to eat. If you do plan to attend, please register on Google Drive <http://tinyurl.com/gurrfzw> and please consider bringing a dish to pass. After you get a chance to eat and sample as much as possible, please vote for your favorite main dish and dessert to help award special prizes! Main dish and dessert winners will be announced at the 1pm reception



in the Lecture Hall.

Ugly Sweater Contest - Do you have a great Holiday Sweater that doesn't get to make enough public appearances? Show off that awesome garb by participating in this year's Ugly Sweater Contest! The rules are pretty simple, and you could win a sweet prize! Just snap a picture of yourself here at work wearing your atrocity, I mean, attire, in a conspicuous place. Then send it by Tuesday, December 15th so we can laugh at it and then judge it! Winners announced at the 1pm reception in the Lecture Hall. email Aditya wakhle@nscl.msu.edu subject: Ugly Sweater Contest.

The Holiday Decorating Contest- It's back again and the committee is looking for the most Holiday Spirit! Decorate your desk, office, cube, or particle accelerator

(personal area please) and snap a picture, then send it in for a chance to win a special prize! Deadline Dec 10th at 5pm email: wakhle@nscl.msu.edu subject: Decoration Contest. The winner will be announced at the 1pm reception in the lecture hall. Need not be present to win.

SEMINARS

- **MONDAY, DEC 07 AT 1:30 PM**
NSCL Lecture Hall
Yuchen Cao, NSCL
'Systematic Prediction of Schiff Moment in Atomic Nuclei'
- **TUESDAY, DEC 8 AT 10:15 AM**
NSCL Lecture Hall
Justin Estee, NSCL
'Studying the high density behavior of the Symmetry Energy using pions'
- **TUESDAY, DEC 08 AT 2:00 PM**
Research Discussion
NSCL Lecture Hall
Max Hughes, NSCL
'Precision Measurements of 20F Beta Decay'
- **WEDNESDAY, DEC 09 AT 2:00 PM**
Research Presentation
NSCL Lecture Hall
Tenzin Rabga, NSCL
'An Improved Measurement of the 225Ra Electric Dipole Moment'
- **THURSDAY, DEC 10 AT 12:30 PM**
NSCL Lecture Hall
Andrea Shindler, Institute of Nuclear Physics, Juelich, Germany
'Nuclear physics from QCD on supercomputers'

PEOPLE AT THE LAB

- Vincent Meller is student Professorial Assistant who joined Oscar Naviliat-Cuncic's research group.
- Dinesh Kapuganti is student Professorial Assistant who joined Oscar Naviliat-Cuncic's research group.
- Madeline Labelle is a Beam Diagnostics Student Research Assistant who joined the lab this week under the line management of Steve Lidia.
- Thomas Stine joined the lab as a Cryomodule Assembly Technician, under the line management of Brian Bird.
- Michael Mooney is a student employee who joined the lab this week, his line manager is Jennifer Gilbert.
- Gordie Frederick is a new Electrical Technician, under the line management of Stephen Stanley.

[THE ARCHIVE FOR PREVIOUS GREENSHEETS IS AVAILABLE HERE](#)

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