

NOV '16
ISSUE

PARTICLE POST

COLLIDER-ACCELERATOR DEPARTMENT

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October 2016

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NOTE FROM OUR CHAIR: Thomas Roser

Last week the C-AD Machine Advisory Committee was at BNL for its annual meeting. This year's focus was the development of superconducting RF and high intensity electron guns for both RHIC and eRHIC at the Department. All presenters gave excellent talks and, as always, preparing for the review was very useful. The committee was very impressed by the progress achieved at C-AD, in particular with the successful operation of the 56 MHz cavity, the first SRF cavity in operation at RHIC. But the committee also recommended that the SRF and electron gun efforts need to be significantly strengthened to support the ambitious program that C-AD is planning.

I am happy to report that Michiko Minty has been elected APS Fellow upon the recommendation of the APS Division of Physics of Beams. The citation is: "For achievements in beam instrumentation and operations leading to greatly enhanced performance of the Relativistic Heavy Ion Collider." Congratulations!

[VIEW UPCOMING CONFERENCE PROJECTIONS.](#)

PROJECTIONS DUE ASAP

DID YOU KNOW??

Check out who received an employee Service Award this year! Collider-Accelerator Dept. employees who received a [Service Award](#).

Check out who received an employee [Spotlight Award](#) this year!

Congratulations to Guillaume Robert-Demolaize who welcomed a new addition to the family!

Lilly Yvette, born on October 20th at 7 lbs., 1 oz. and 19 3/4 inches long

EVENTS/SEMINARS

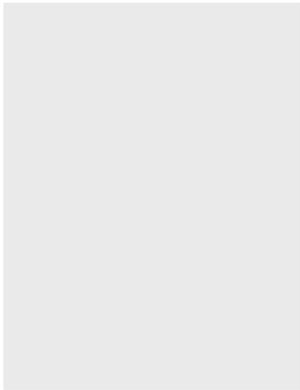
**November 21 - (Bldg. 815E | 11:00 am)
Environmental & Climate Sciences Department
Seminar "Stochastic ice nucleation and its effects
on the microphysical properties of mixed-phase
stratiform cloud"**

**November 23 - (Recreation Hall, Bldg. 317 | 10
am) Hospitality Coffee & Playgroup Event**

November 24 - Lab Holiday: Thanksgiving Day

**November 25 - Lab Holiday: Day After
Thanksgiving**

December 1 & 2 - (Large Seminar Room, Bldg.



510 | 8 am) PACCD Workshop (Precision Astronomy with Fully Depleted CCDs)

December 1 - (North Rm., Bldg. 30 | 9:30 am) Blood Drive

December 1 - (BNL Firehouse | 11 am - 1 pm) United Way Fundraiser: Car Wash

December 1 - (Lobby, Bldg. 400 | 11:30 am - 3:30 pm) United Way Holiday Shopping Fair

December 7 & 8 - (Lobby, Berkner Hall | 11 am - 2 pm) 2016 Holiday Boutique Jewelry/Accessory Sale & United Way Auction

December 8 - (Large Seminar Rm., Bldg. 510 | 4:30 pm) Brookhaven Women In Science Event: "Dream, Believe, Become"

December 9 - (2nd Floor Lobby, Interdisciplinary Science Bldg. 734 | 12 - 1 pm) Asian Food-Tasting United Way Fundraiser

December 16 - (Lobby, Bldg. 911A | 9 - 10:30 am) C-AD Holiday Breakfast

IN OTHER NEWS...

SNMMI's 63rd Annual Meeting Highlights History of FDG and Showcases New Research

More than 5,700 physicians, technologists, scientists and exhibitors gathered at the Society of Nuclear Medicine and Molecular Imaging's 2016 Annual Meeting, held June 11-15 in San Diego, CA. This year's meeting included a celebration of the 40th anniversary of FDG. [Read more.](#)

Local Scientists Take Home First Place Honors in BNL Science Fair

Budding young scientists filled the auditorium of the Suffolk County Legislature on Wednesday to educate Legislators on their outstanding projects that won first place accolades at the year's Brookhaven National Laboratory's Science Fair. [Read more.](#)

New Graphene-Glass Combo Powers "Spontaneous"



Solar Cell

Brookhaven Does (Graphene) Windows. Apparently the Brookhaven solution to the graphene problem has been staring everybody in the face, ever since graphene was first discovered in 2004: ordinary glass window. [Read more.](#)

Research Teams Use DNA to Make 3-D Nanoparticle Structures with High Precision

DNA strands anchored to the surface of nanoparticles allow researchers to assemble the particles into three-dimensional crystalline lattices. Such control allows researchers to make new materials with desirable properties. [Read more.](#)

Farmingdale takes first in BNL High School Science Bowl

Farmingdale High School students have one contest down to a science. [Read more.](#)

New cathode material stops batteries turning crusty with age

Scientists at three US Department of Energy (DOE) national laboratories have discovered how to keep a promising new type of lithium ion battery cathode from developing a crusty coating that degrades its performance. [Read more.](#)



Steve Bellavia captured the 70-year Super Moon in this beautiful photograph. In his words, "A super moon occurs when the full moon coincides with the perigee of the month's orbit (i.e., its closest approach to earth). It is about 14% larger than at its more distant point, and brighter. It will not be this close again, while being full, for another 70 years."

RHIC Particle Smashups Find that Shape Matters
 Scientists colliding football and sphere-shaped ions discover evidence supporting a paradigm shift in the birth of the quark-gluon plasma. [Read more.](#)

Two American Physics Labs Are Vying for a Billion Dollar Particle Accelerator
 Two labs are vying for government funding to host a billion-dollar atom smasher, and the battle is getting political. [Read more.](#)

Neutrinos Change Their Flavor and Snag Another Nobel Prize
 Early this morning the world learned that the 2015 Nobel Prize in Physics has been awarded to Takaaki Kajita and Arthur B. McDonald for discovering that neutrinos can change from one type to another. [Read more.](#)

World's largest atom smashers create world's smallest droplets
 How long can a droplet shrink and remain a liquid? [Read more.](#)

'Inflatable Dark Matter' Could Explain Why We See Less Than Many Theories Predict
 Many wonderful theories that explain the evolution of the universe fail because they predict more dark matter than is actually out there. Now a new paper proposes one event in the early universe that would reduce the amount of dark matter in all the theories. [Read more.](#)

Ion collider produces droplets of primordial goo
 The Relativistic Heavy Ion Collider just spit out tiny droplets of a liquid researchers say resembles the



seeds of the cosmos, primordial goo created by the Big Bang, which existed on briefly before cooling the matter that helped birth stars, galaxies and planets. [Read more.](#)

Brookhaven National Laboratory projects are up for awards

Four projects developed at BNL have been nominated as finalists for awards to be presented this year by a national magazine. [Read more.](#)

Scientists Create Primordial 'Perfect Liquid' in Lab
The BNL's Relativistic Heavy Ion Collider smashed together large nuclei at nearly the speed of light to recreate the fundamental particles in the primordial soup present during the earliest days of the universe. [Read more.](#)



World's most powerful digital camera being built by US Department of Energy

The US Department of Energy is building a digital camera that puts your camera to shame. [Read more.](#)

United Way Fun Pasta Fundraiser!
Place your order before November 28 with Colleen Michael (cmichael@bnl.gov | x4919)

FUN PASTA FUNDRAISING

COLLEGIATE PASTA IS BACK
Top 20 Teams
(Includes zero fundraising!)

100% All Natural
pastably the best sauce ever
RED PASTA SAUCE

princess pasta

chicken noodle

Classic Angel Hair

2016-2017

HAVE FUN, EAT PASTA, RAISE MONEY!

Shapes for Everyone • Delicious Easy Meals • Great Gifts

WHAT'S GOING ON IN OUR NEIGHBORHOOD?

DAY AT THE VINEYARDS...



[HTTP://WWW.YACHTFIONA.COM](http://www.yachtfiona.com)

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NOTE FROM BUSINESS OPERATIONS: Sue Pankowski



Our DOE-funded budgets are on a continuing resolution (CR), meaning we are currently being funded at the same levels as last fiscal year. This CR runs through December 9, 2016. A "lame duck" Congress is now back in session through mid-December, and must determine what happens next with Federal budgets. Options include passing appropriations legislation to fund the government through the end of the fiscal year, or extending the current CR which, in essence, hands the job of finalizing fiscal year 2017 spending off to the new Congress to be sworn in on January 3, 2017. Stay tuned and we'll see where this leads.

In the meantime, and at the risk of sounding like a broken record (Is there an update for that idiom? A corrupted MP3 or faulty sound card, perhaps?), please continue to use appropriate discretion for all costing under your control. With the budget unknown, every dollar must be spent wisely in order to help us meet our programmatic goals.

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NOTE FROM OUR ACCELERATOR DIVISION: Wolfram Fischer



The NSRL Run-15C is now under way and will end on 20 December 2016. Installation of the LEReC DC gun from Cornell and short commissioning beam line is now in full swing. We are also refurbishing the 706 MHz SRF cavity for CeC PoP, and installing a new 9 MHz warm cavity in each of the RHIC rings for the next run.

Upcoming events:

11/16 - 11/17/16 DOE Project Review of LEReC, Germantown

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NOTE FROM OUR EXPERIMENTAL SUPPORT & FACILITIES DIVISION: Bill Christie



Work on the RHIC experiments has continued over the past month.

For PHENIX the Repurposing and Recycling (R&R) effort continues. The primary effort through the summer and into the Fall has been concentrated on the disassembly of the East Carriage. The expectation had been that this East carriage effort would be complete by the end of October. They are close to done with this East carriage effort, and it looks like it will be done by sometime the week of November 14th. Next up for PHENIX will be the R&R of the South Muon Magnet. The expectation had been that this effort will take six to eight weeks. Due to some effort already on this task, there is an expectation that the six to eight week duration may get shortened. The final large piece for PHENIX prior to the run is to move the Central magnet from the interaction region into the assembly building, and then construct the shield wall.

For STAR, the efforts in the past month have included:

- the check out of some of the detector systems after the move back into the IR,
- the installation of a prototype Time of Flight (TOF) detector, designed for a future Facility and experiment in Germany on one of the magnet poletips,
- the installation of some additional Muon detectors and scintillation counters outside the magnet for trigger studies during Run 17, relevant for running after 2020,
- the installation of the mounting structure for a new Post Shower detector to be installed prior to Run 17 behind the Forward Meson Spectrometer (FMS),
- the installation of cabling for the RHICf detector, a Japanese led effort which is planned to take data for one week during Run 17,
- the installation of bakeout equipment and the start of the beam pipe bakeout for the STAR IR.

Once the bakeout is finished, we'll move on to the annual re-certification of the STAR Global interlock system. There are two new detector systems still in the fabrication stages for STAR, the FMS Post Shower detector, and an Ultra Violet LED System to anneal the FMS pb-glass detector to counteract the expected radiation damage during Run 17. We had a delay in the procurement of some of the material for the Post Shower detector, but it is now on site and we expect to get started on the fabrication within the next week. We expect parts of the UV curing system to arrive at BNL soon, and have orders out for pieces needed to install a water cooling system for this device. At this point both of these efforts are expected to be completed and commissioned prior to the start of Run 17.

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NOTE FROM OUR ERHIC R&D PROGRAM: Ferdinand Willeke



No comment at the time of this publication.

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NOTE FROM OPERATIONS: Paul Sampson



RHIC shutdown will continue throughout November. Effort continues to be focused in the 2 o'clock region of RHIC on construction and installation of LEReC and CeC PoP. Initial conditioning of RF components will commence mid-month and continue throughout the shutdown. In the 4 o'clock area, installation of the new 9 MHz cavity, and AC Dipoles continues. Preparation and initial testing for the upcoming run is also ongoing. Work at STAR and PHENIX continues on or close to schedule.

AGS checkout will occur this month and startup with beam will occur in early December. The Booster and NSRL will run until November 11th and will resume November 30th. During this period, annual PSEG maintenance on the Booster 69kV feed may occur.

LINAC maintenance and shutdown work is nearing completion. Installation of the new low level RF system and modification of Mod 5 for increased pulse width continues on schedule. RF testing will commence this month and startup with beam late this month in anticipation of providing polarized protons for setup early in December and high intensity for BLIP in early January.

EBIS and Tandem are providing beams for Booster and NSRL as necessary.

The "[RHIC Broadcast](#)" link displays the latest schedules for testing, power disruptions, outages and daily schedules.

To view a list of approved work for the Shutdown or to review past results, go to the [Job Request System](#) and select the appropriate date. This link is behind the firewall and requires privileges to view.

For weekly schedule updates see: [This Week](#), which can be viewed by all.

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Link to: [ATF Newsletter](#)

NOTE FROM OUR ACCELERATOR TEST FACILITY: Mark Palmer



The last several weeks have been very busy ones for the Accelerator Test Facility (ATF) team. We hosted our annual Users' Meeting, held a review of the ATF-II Cost and Schedule, began the detailed setup for experiments at the Ultrafast Electron Diffraction (UED) Facility, and continued a busy experimental schedule at the ATF in Building 820.

At the Users' Meeting we heard 20 updates from approved and ongoing experiments, 11 new proposals, and 2 presentations for future work that are at the pre-proposal stage. For the first time, proposals were accepted for experiments to run at the Ultrafast Electron Diffraction (UED) Facility, the first element of our ATF-II portfolio to come on line at Building 912. Needless to say, our ATF Program Advisory Committee had a very busy two days going through this amount of material. We also used the meeting to update our user community on plans for continued facility operations and improvements at Building 820 and the path forward for the ATF-II upgrade.

The last two months have required an intense focus on preparing for our ATF-II Cost and Schedule Review, which was held November 8-10. This internal review, requested through BNL's Project Oversight Board, was chaired by Ferdinand Willeke. I want to commend the project team for their efforts to assemble the complete cost estimate and an updated schedule for the project. I also want to thank the review committee, which included Erik Johnson, Cathleen Lavelle, Maria Chamizo Llatas, Ronald Prwivo and Triveni Rao, for their willingness to take two and one-half days out of their very busy schedules to evaluate the quality and consistency of our upgrade plan. I am happy to say that the review went very well. While we, not surprisingly, have some things to clean up in the plan, it is safe to say that the project team has established the foundation required to move forward.

On the operations front, our new x-band deflector cavity was successfully integrated into the ATF beam line and the first experiment is now setting up to take advantage of this new diagnostic tool. Since the beginning of October, four experimental teams have been active in Building 820: two exploring laser-based ion acceleration, one focused on laser wakefield acceleration of electrons, and one targeted at bunch-shaping utilizing dielectric wakefield structures. At the UED Facility, we are looking forward to making the first detailed measurements as soon as experimental setup is complete.

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NOTE FROM OUR MEDICAL ISOTOPE RESEARCH & PRODUCTION PROGRAM: Cathy Cutler



Capturing isotopes in the Brookhaven Lab Isotope Producer (BLIP) cooling water.

In addition to the isotopes that are produced by proton bombardment at the BLIP, there are isotopes that the MIRP distributes that are produced elsewhere and shipped to us for processing and shipment such as Fe-55 or Sn-117m. Additionally there are isotopes present in the BLIP water which we can harvest, cleanup and supply to researchers. There are other arenas in which isotope harvesting is of interest and we've been developing methods for isotope harvesting utilizing the unique BLIP cooling water. In these efforts we have examined capturing Be-7, Sr-82 and V-48 from the BLIP cooling water using modified solid supports. Be-7 is produced during BLIP irradiations from the following nuclear reaction $O-16(p,x)Be-7$ on water. Be-7 has a 54 day half-life and is used in environmental studies. V-48 is produced by a $Cr-52(p,x)V-48$ nuclear reaction on the target bodies, and the isotope has a 14 day half-life and can be used by researchers in stockpile stewardship. Sr-82 is used in CARDIOGEN generators and is the major cGMP product produced by the MIRP group and accumulation in the BLIP water can result due to a RbCl target failure.

In the past to capture Be-7 from the BLIP water we removed 10-20 gallons of BLIP water and passed the solution through multiple ion exchange columns, however this can lead to high doses to staff, extensive hours of purification and risks contamination. One approach to simplify the process to capture Be-7 from BLIP is to add solid supports (12x5 mm) with metal capturing groups to the BLIP cooling water, let the pumps circulate the water and attempt to capture Be-7. This would eliminate the need to remove large volumes of water from BLIP and would be less labor intensive. Chris Cullen designed and using a 3D printer produced a flow through target box. The box was designed to fit in the target holder at BLIP, and can hold hundreds of solid supports allowing BLIP cooling water to flow through the box.

The first experiments in 2015 were to determine the best functional groups to capture Be-7, and five different functional groups were tested by incubating the solid supports in the BLIP cooling water for 1 week. One sulfonic acid solid support was able to capture ~2 mCi of Be-7 with ~93% radiopurity, and each of the other solid supports captured less than 0.1 mCi. We developed a purification method that produced Be-7 with a radiopurity of 99.5% and chemical recovery of 85%. In the second experiment we showed the solid supports had optimal uptake at 24 hours and scaled the process up to ~30 polymers enabling us to capture and purify ~65 mCi of Be-7.

In 2016 the process was scaled up again using ~138 solid supports which captured 1036 mCi of Sr-82, 740 mCi of Be-7, 730 mCi of Sr-85 and ~100 mCi of Rb-83 and Rb-84 in a 24 hour time period. Less than 20 mCi of radioactive isotopes of Co, Zn, and Mn were also captured. The presence of the Sr-82 and Rb radioisotopes in the BLIP water were a result of the RbCl target failure, and caused a complication to the purification process. Different methods were examined to purify the Be-7 from the BLIP water, and we were able to purify the isotope to ~99% radiopurity. Purification of Sr-82 was much simpler as a commercial resin selective for Sr-82 available. In subsequent BLIP studied eleven different solid supports, which were examined for their ability to capture V-48 from the BLIP water. Two of the solid supports had higher uptake of V-48, and final purification was performed with one of the inorganic resins we developed in-house that was selective for V-48.

The experiments proved the solid supports can be used to capture isotopes from large bodies of water and could be used in radioactive waste treatment or cleanup of metal contaminated pools. A proposal was submitted to DOE to develop the approach for isotope harvesting at FRIB.

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ARRIVALS: Welcome!

Nancy Johnson - Accelerator Division

Anton Kolmogorov - Preinjector Systems, Accelerator Division

DEPARTURES: Farewell, you will surely be missed..

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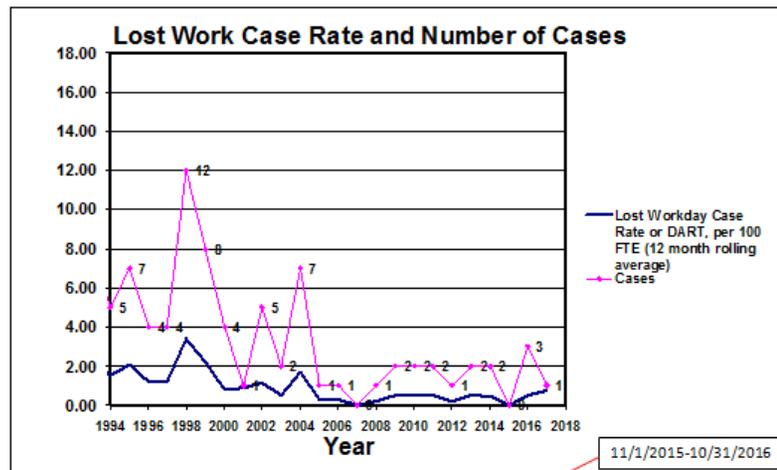
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SAFETY STATS: Peter Cirnigliaro



Rolling Average for 12 months

C-AD Occupational Injury Statistics

For Year 2016 For Year* 2017

First Aid Cases	4	0
Recordable Cases	2	1
Lost Work Cases	2	1

* Calendar Year through 09/30/2017