2Q 2018 Newsletter

An Official Publication of the Health Physics Society's Accelerator Section

"From the President"

Vashek Vylet, vylet@jlab.org
Jefferson Lab

NON-US AND NON-HPS COLLEAGUES – PLEASE READ: I know you may usually skip this section, but I have a message/request for you. While this newsletter, IARPE, originated within the newborn Accelerator Section of HPS almost thirty years ago, its ambition was to connect a wider audience – all accelerator radiation safety professionals from around the world. In past years we were getting contributions from multiple sites around the world, but international contributions have dwindled lately. I am hereby appealing to all colleagues from ALL accelerator facilities to periodically publish updates on what is happening in their areas. Our field is narrowly specialized and it does not make sense to confine it further within national boundaries.

Regarding the section business, the Nominating Committee was unable to secure nominations for all required positions in time to announce the roster of candidates before the HPS Annual Meeting. We will have to catch up, as we did last year, by hopefully getting nominations and attracting candidates at the meeting in Cleveland. The good news is that we have a strong technical program in the Special Accelerator Session on Tuesday AM, July 17 – I am looking forward to meeting many of you there. Since this is my last contribution to IARPE as Accelerator Section President, I would like to thank both the outgoing and current section officers for their service and the section members for their confidence in me. Finally, I wish all the luck and success to Marcia Torres, the new HPS Accelerator Section President for the coming year.

HPS 63rd Annual Meeting

Cleveland, Ohio
July 15-19, 2018

Accelerator Section Session
Tuesday July 17

Link to webpage for more information.

"Exploring the Nature of Matter
2018 Open House Recap"

Provided by Bob May, may@jlab.org
Jefferson Lab

Even the threat of severe weather couldn't keep away the almost 6,000 community members who attended Jefferson Lab's biennial open house event on Saturday, May 19, 2018. Assisted by more than 350 volunteers, visitors from as far away as Arizona and Pennsylvania explored nearly all of the major facilities that were opened for one day every two years to the public.

Hundreds of visitors young and old were entertained during the event's special cryogenics shows in CEBAF Center. Additional interactive, kid-friendly and hands-on STEM-focused activities were showcased throughout the lab.

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"It was great to see the outpouring of interest in what Jefferson Lab is doing, especially considering the rainy weather we had that day," said Stuart Henderson, Jefferson Lab Director. "We are always really glad to see the interest in the laboratory from our neighbors here in Hampton Roads and beyond."

Many attendees of the event ventured down into the south linac section of the Continuous Electron Beam Accelerator Facility (CEBAF) tunnel to witness some of the cryomodules in person and learn how they work. They also visited the CEBAF Machine Control

Center from which one crew chief and two operators can run the one kilometer around racetrack-shaped accelerator, and the accelerator's Central Helium Liquefier facility that is responsible for cooling the accelerator down to colder than outer space, or 2 Kelvin.

Three of the lab's four experimental halls – Halls B, C and D – were open to guests displaying their new and existing equipment and featuring interactive displays, with some even participating in a virtual reality demonstration that showed how particles fly through an experimental hall's detectors during experiments. In the Hall A tent, pieces of demonstration equipment and hands-on activities captured the excitement of ongoing Hall A experiments, as well as demonstrations and exhibits from several local universities whose scientists conduct research at Jefferson Lab.

Still others journeyed through a veritable maze of exhibits featuring the lab's accelerator research, development, fabrication and testing facilities. Groups worked together to fire a particle into a target on a model accelerator, observed the superconductivity demo and marveled at the huge accelerating components currently being built in the facility.

One new and unique exhibit this year was an outdoor torsional Wave Machine created by two lab scientists to mimic the wave energy which drives our superconducting accelerator. The device uses dual catenary lines, under 500 pounds of tension to support 78 matched ribs, to resonantly transfer energy from one end of the 78-foot-long device to the other. Visitors were encouraged to launch their own waves and try to match the resonant frequencies of the structure.

There was also no lack of hands-on demonstrations for kids, who observed and interacted with unique robots built by local student groups, tried out a mini supercomputer that illustrated the concept of parallel computing, and programmed a tiny robot using basic visual cues while touring the lab's Data Center.

At each tour stop, scientists, engineers, technical staff and other volunteers were on hand to describe how the highly specialized equipment runs and how it is used to help researchers conduct experiments designed to help them better understand the tiniest bits of matter, and how these particles come together to form our visible universe.

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"Our staff and the scientists who conduct research here really love explaining what they do to the public. We live with this every day, and it's through events like this that we are reminded of how important our work is to keeping our Nation at the forefront scientifically and economically," Henderson noted.

The federal funding agency for Jefferson Lab – the U.S. Department of Energy's Office of Science – also participated in the open house, and agency representatives shared information about the wide range of basic and applied research conducted by its 10 national laboratories.

In addition to Jefferson Lab, the event featured staffed exhibits and displays from several regional university physics departments and many of the lab's technology partners, including Branscome Concrete, BNNT, Southside Safety, Dilon Diagnostics, Linde and Tech Center at Oyster Point.

The lab usually holds an open house event every other year. The next open house will likely be scheduled to take place in the spring of 2020.

Additional pictures from the event can be viewed on our flckr site.

14th workshop on Shielding aspects of Accelerators, Targets and Irradiation Facilities (SATIF-14)

HICO, Gyeongju, Korea
Oct 30 – Nov 2, 2018

Hosts:
KOrea Multi-purpose Accelerator Complex (KOMAC) and
Pohang Accelerator Laboratory (PAL)

Link to webpage for more information.

"News from PAL: Accelerator Radiation Protection in Korea"

Hee-Seock Lee, lee@postech.ac.kr
Pohang Accelerator Laboratory

The research circumstances of accelerator radiation protection in Korea have become warm in recent years. Three construction projects of high energy accelerator facilities, types of which have not been constructed before in Korea, were launched: PAL-XFEL (X-ray free electron laser, 11 GeV electron), RAON (Radioactive Ion beam, 400 keV/u – 400 kW Uranium) and KHIMA (particle therapy machine, 430 MeV/u Carbon). Those facilities will require all the technologies of accelerator radiation protection. Because of such environments, interest in accel-erator radiation protection has increased greatly. Many benchmarking calculations and comparisons were carried out using the well-known Monte Carlo codes, MCNPX, PHITS, FLUKA and MARS with the inventory codes, FISPACT, DChain-SP, CINDER, and even some experiments.

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The government authority on nuclear safety released a project to understand the status of analysis technologies on accelerator radiation and to improve the regulation system of Korean Nuclear Safety Law. The project has suggested to consider the decommissioning issue in the regulation and a graded approach of operation permit, which are not considered in the present Korean Nuclear Law. The decommissioning study of PET cyclotrons have also been underway.

One of those project facilities, PAL-XFEL, has already started a user service since Autumn in 2017. The others have been constructed now and completed in 2011 or 2022. During this year, Yensei University Hospital, which is one of major universities in Korea, announced the construction of Carbon therapy machine at its campus, and it will be operated in 2021.

In recent years, several medium or large size accelerator facilities started its operation or have been constructed in Korea. The practical improvements of technology and safety regulation related to accelerator facilities have been requested in several aspects. Eventually the accelerator radiation safety forum (ARSF) for large scale accelerators was suggested by PAL and formed in 2017; it includes a light source, a X-ray free electron laser, a high power proton linac, a radioactive ion beam facility, particle therapy machines and a superconducting fusion device (KSTAR).

In addition, the Korean Nuclear Society (KNS) is preparing the revised version of the technical tree of nuclear safety this summer. For the first time, accelerator radiation protection is included as one of major technology branches of nuclear safety.

All results of the above mentioned have been introduced through the international meetings on accelerator radiation protection including SATIF, ARIA, ICRS, and Radsynch.

"A Short Recap on Radiation Physics, Regulation, and Management at USPAS"

Taiee Liang, tliang6@slac.stanford.edu
SLAC National Accelerator Laboratory

The most recent session of United States Particle Accelerator School (USPAS) was held at Michigan State University and hosted its one-week course on Radiation Physics, Regulation, and Management, which was instructed by J. Donald Cossairt and Matthew Quinn of Fermilab.

Students tackled a wide spectrum of accelerator health physics topics such as calculation of radiation dose hazards from prompt radiation fields for electron and proton accelerators, estimation of induced radioactivity in the environment, shielding and maze design for accelerator facilities, and skyshine dose from accelerators.

They also learned the importance of unit conversion and discovered how frequently the name Swanson appears in health physics textbooks.

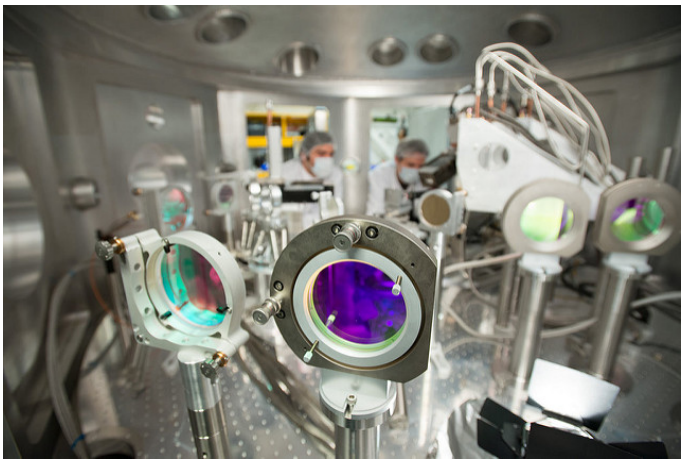
Your newsletter editor himself was in attendance and would highly recommend the course for the aspiring accelerator health physicist.

The image below is of the students and instructors for this session and is credited to Irina Novitski, USPAS.

"Ionizing Radiation from Optical Laser Light: An Overview"

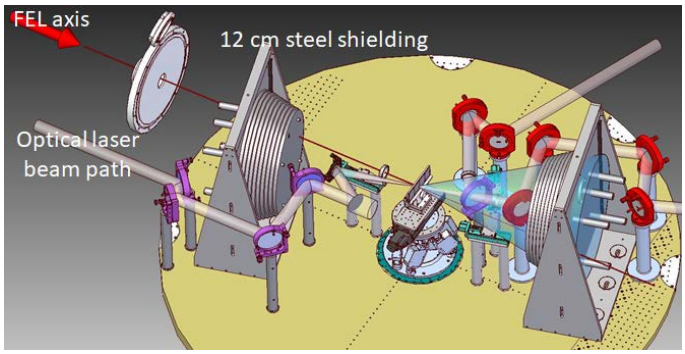
Taiee Liang, tliang6@slac.stanford.edu
SLAC National Accelerator Laboratory

The Matter in Extreme Conditions Instrument (or MEC) located at the end of the SLAC National Accelerator Laboratory's Linac Coherent Light Source (LCLS) recently finished its latest series of high-power laser experiments for Run 16. Instrument scientists at MEC can focus the high-power (25 TW, 1 J in 40 fs) short-pulse optical laser to micrometer spot sizes and achieve irradiances (or intensities) in excess of 10^{18} W cm^{-2}.



This high-intensity laser is focused onto targets (gas, liquid, and solid) and used to study warm and hot dense matter, high pressure science, and even the insides of giant gas planets like Jupiter. It can also be used as a driver for generating mono-energetic beams of proton (and other ion) beams and for accelerating electrons to hundreds and even thousands of MeV.

These high-intensity laser-matter experiments pose a unique challenge to a health physicist: ionizing radiation hazards generated from optical laser light. Furthermore, the type of ionizing radiation hazard is highly dependent on the laser's target type, which determines the type of science being explored. In the past few years, the Radiation Protection group at SLAC has committed to characterizing the ionizing radiation hazard generated from high-intensity experiments and has developed controls (depending on the experiment type) to mitigate the generated ionizing radiation hazard. These controls include radiation shielding, active monitoring with ionization chambers, and administrative controls (such as hutch search procedures).



Additional images and more information about the facility itself may be found at the MEC homepage.

SLAC will host its 6th High-Power Laser Workshop from September 25-26, which will be used to discuss the recent progress in the field of high-energy density physics and the numerous scientific opportunities possible at MEC. More information on this workshop is provided at the embedded link.

"Accelerator/Experimental Nuclear Physics at CEBAF"

Bob May, may@jlab.org
Jefferson Lab

The CEBAF Accelerator is currently in its Scheduled Accelerator Down period, which will continue into early August. Many staff members are engaged in a wide range of projects related to CEBAF maintenance and improvements. Some of these SAD projects include:

- Central Helium Liquefier and End Station Refrigerator maintenance.
- 5th-pass radiofrequency separator leak repair.
- Detailed analysis of optics data from spring 2018, to identify and correct model errors.
- Modify Hall C beamline to improve beam transport to the hall (mimic Hall A beamline design).
- Gradient maintenance tasks (includes helium processing, cryomodule swaps, and other items).
- Move Low Energy Recirculator Facility cryomodules to CEBAF.
- Power grid maintenance items.

"Science Centers"
(continued from previous issue)

Thomas Johnston, tjohnstn@gmail.com

Bulgaria. This country released a science center issue on 10 March 1981 to highlight the Joint Institute for Nuclear Research, JINR. The Institute is portrayed along with particle tracks. The JINR is located at Dubna, about 125 km north of Moscow in Russia.

Bulgaria, 1981, Joint Institute for Nuclear Research, JINR.

Hungary. Hungary issued on 23 May 1966 a stamp to mark the 10th anniversary of the Joint Institute for Nuclear Research foundation (JINR) at Dubna. The JINR was established in 1956 with the main objective to study fundamental properties of matter.

Bulgaria, 1981, Joint Institute for Nuclear Research, JINR.

Poland. On 10 March 1976, Poland issued a stamp to honor the 20th anniversary of the Joint Institute for Nuclear Research facility at Dubna, USSR.

Poland, 1976, Joint Institute of Nuclear Research, Dubna, USSR.

Belgium. The stamp from Belgium issued on 27 February 1982 illustrates an artist's interpretation of a cyclotron. The stamp depicts radioisotope production at the National Radio Elements Institute at Fleurus, Belgium.

Belgium, 1982, Radioisotope production at the National Radio Elements Institute, Fleurus.

China. China, 1 November 1989. Beijing Electron Positron Collider, BEPC. Macau, China particle detector. Souvenir sheet issued on 22 November 2002. The stamp from Macau celebrates the Standard Model. The souvenir sheet includes one stamp for 8 patacas. The sheet depicts the first electron-positron pair detected at the Large Electron–Positron Collider (LEP) in the DELPHI detector. On the left edge of the souvenir sheet in traditional Mandarin are the words: Science and Technology, standard model of particle physics.

China, 1966, Electron accelerator.

China, 1989, Beijing Electron Positron Collider, BEPC.

China, 2002. Macau, China particle detector.