UK Accelerator Institutes Seminar Series Winter 2022 (Session 3)

Report of Contributions

https://indico.cern.ch/e/1108852

Contribution ID: **1** Type: **not specified**

The Brightest Light in Canada

Thursday 20 January 2022 16:15 (1 hour)

The Canadian Light Source is a national user facility that delivers synchrotron radiation to thousands of Canadian and international scientific users. It has been operating since 2005, but it was built on the foundation of the Saskatchewan Accelerator Laboratory that was founded in 1962. The facility consists of an accelerator complex with a 250 MeV linear electron accelerator, a 2.9 GeV booster synchrotron and a 2.9 GeV storage ring with over 22 beamlines and endstations. This talk will give an overview of the facility, some of its history and some of the future developments.

Presenter: BOLAND, Mark James (University of Saskatchewan (CA))

Contribution ID: **2** Type: **not specified**

Present Performance and Future Opportunities at the ORNL Spallation Neutron Source

Thursday 27 January 2022 16:15 (1 hour)

The Spallation Neutron Source (SNS) at Oak Ridge National Laboratory, in operations since 2006, is the world's highest power spallation neutron source, enabled by the most powerful operating super-conducting hadron linac. I will overview the SNS scientific mission, the operational performance and the plans for the facility upgrade. I will also discuss the SNS potential strategic and scientific capabilities complementary to the present neutron scattering mission.

Presenters: PILAT, Fulvia (Jefferson Laboratory); PILAT, Fulvia (Department of Physics); PILAT, Fulvia (ORNL)

Contribution ID: **3** Type: **not specified**

Design and Operation of the MAX-IV Vacuum System based on NEG Coating

Thursday 3 February 2022 16:15 (1 hour)

The 3 GeV electron storage ring of the MAX IV laboratory is the first fourth generation light source to be built. The storage ring vacuum system has the inner surface of almost all the vacuum chambers along its circumference coated with non-evaporable getter (NEG) thin film. The coating provides a low dynamic outgassing rate and pumping of active gases. As the NEG coating was applied on an unprecedented scale, there were doubts concerning the storage ring performance. Fast conditioning of the vacuum system and over six years of reliable accelerator operation have demonstrated that the chosen design proved to be good and does not impose limits on the operation. The vacuum system performance is comparable with or better than that of other similar facilities around the world, where conventional designs were implemented. Observed pressure levels are low, and the electron beam lifetime is long and not limited by residual gas density. The design and operation status of the vacuum system will be presented.

Presenter: AL DMOUR, Eshraq (MAXIV)

Contribution ID: **4** Type: **not specified**

Developments in Medical Applications of Accelerators

Thursday 10 February 2022 16:15 (1 hour)

POSTPONED

This talk will be rescheduled for a later date.

Presenter: KIRKBY, Karen (University of Manchester)

Contribution ID: **5** Type: **not specified**

THz Accelerators and their Application to Ultrafast Electron Diffraction

Thursday 17 February 2022 16:15 (1 hour)

Accelerators ranging from midscale RF photoinjectors for femtosecond electron-diffraction experiments, to kilometer long free electron lasers that produce femtosecond x-ray pulses are utilized to resolve materials with atomic precision on femtosecond timescales. While the performance and recent results of these facilities are extraordinary, ensuring their continued vitality requires us to explore new accelerator physics and innovate the next generation of technology. One approach to achieving performance and accelerating gradients orders of magnitude above present capabilities is to dramatically increase the operational frequency into the Terahertz (THz) range. We are exploring accelerating structures designed to withstand high gradients and able to manipulate high-charge beams on femtosecond timescales; developing novel electronic and photonic THz sources; and laying the foundation for THz accelerator technology. Results from recent experiments on high gradient THz accelerators and their application to time stamping and electron bunch compression for ultrafast electron diffraction will be presented, along with a future outlook for the field.

Presenter: NANNI, Emilio Alessandro (SLAC National Accelerator Laboratory, Stanford University)

Contribution ID: **6** Type: **not specified**

EuPRAXIA - The Innovative and Compact Plasma Accelerator Facility for Europe

Thursday 24 February 2022 16:15 (1 hour)

The project on a "European Plasma Research Accelerator with eXcellence In Applications", EuPRAXIA, has been placed in 2021 on the government approved ESFRI Roadmap for future large European Research Infrastructures. ESFRI stands for the European Strategy Forum for Research Infrastructures. EuPRAXIA is the first ever plasma accelerator project that has been selected for and placed on this roadmap and is the first accelerator project included since the high-luminosity upgrade of the LHC. The seminar will show the consortium of 40 member institutes plus 10 observers from 15 countries that support EuPRAXIA. It will explain the concept of this new, highly innovative research infrastructure and its distributed implementation. The underlying principles to achieve high gradient acceleration, high beam quality and compact facility size are introduced. The various user applications in this facility will be explained. The path towards its full realisation will be presented and the role of this flagship project in the recently published European accelerator R&D roadmap for particle physics will be discussed.

Presenter: ASSMANN, Ralph Wolfgang (DESY & INFN)

Contribution ID: **7** Type: **not specified**

Space-Borne Accelerators

Thursday 3 March 2022 16:15 (1 hour)

Quinn Marksteiner (qrm@lanl.gov), Bruce E. Carlsten, Patrick Colestock, Gian Luca Delzanno, Seth Dorfman, Leanne D. Duffy, Michael A. Holloway, John W. Lewellen, Dinh C. Nguyen, Geoffrey D. Reeves, Vadim Roytershteyn, Nikolai Yampolsky, Haoran Xu

Los Alamos National Laboratory, Los Alamos, NM 87545 USA

Los Alamos is developing electron-accelerator technology for future space missions, including science missions and a possible future mission to protect low-earth orbit satellites from natural or man-made enhancements of the relativistic electron flux in the radiation belts. The target of the ongoing technology development is to be able to field, in space, an electron accelerator with 1 to 10 mA of average current. The key enabling technology for this accelerator is a new gallium nitride (GaN) high-electron mobility transistor (HEMT) which can produce about 500 W at a frequency of about 5 GHz (C-band). A chain of 50 HEMTs, each individually driving a C-band RF cavity, can accelerate an electron beam from a DC electron gun energy (about 14 keV) to about 1 MeV in about a meter.

The Beam-Plasma Interactions Experiment (Beam-PIE) is a recently selected NASA sounding rocket experiment designed to test new theoretical understandings of beam-based wave generation in the ionosphere. The main objectives of Beam-PIE are to test theories of how energetic electron beams couple to very-low frequency (VLF) waves in plasmas including whistler modes and X-type modes, and measure and quantify the resonant wave-particle scattering of ambient ionospheric electrons by X-type mode electromagnetic waves. Beam-PIE will be the first space experiment to employ the HEMT-driven accelerator technology. The proposed CONNection Explorer (CONNEX) NASA mission will also rely on this technology. In this proposed experiment, a relativistic electron beam will be generated in the transition region of the magnetosphere and aimed to travel down a field line to the Earth. The main CONNEX science objective will be to study the release of energy by magnetic field line reconnections and to understand the origin of auroras and to determine how accurately ionospheric and aurora observations can predict the state of the magnetosphere. Additionally, electron-beam-driven VLF waves in the ionosphere have also been proposed as a mechanism to drain enhanced flux in the radiation belts and to limit satellite damage by allowing trapped electrons to precipitate into the Earth's atmosphere through scattering the electrons off VLF waves.

This talk will provide an overview of the accelerator technology development and experiments to date, the ongoing NASA missions, and a possible future radiation-belt remediation mission.

Presenter: MARKSTEINER, Quinn (Los Alamos National Laboratory)

Contribution ID: **8** Type: **not specified**

Accelerator Physics at Fermilab's IOTA ring

Thursday 10 March 2022 16:15 (1 hour)

The Integrable Optics Test Accelerator (IOTA) at the Fermilab Accelerator Science and Technology (FAST) facility has been operating since 2018. The IOTA ring was first commissioned with 100-MeV electrons and, to date, performed three experimental runs. The IOTA research program aims at attaining maximum beam intensities and brightness in future ring accelerators while minimizing the accelerator scale and cost. Along this direction, the key research areas are i) suppression of coherent beam instabilities by Landau damping; ii) mitigation of space-charge effects, and iii) beam cooling. The flexibility of the IOTA ring allows it to cover a wide range of complementary studies, such as experiments with a single electron, studies of undulator radiation and to test IOTA with low emittance beams. The most-recent IOTA Run-3 physics program was focused on the world's first demonstration of Optical Stochastic Cooling. In the near future, a proton injector will be constructed and commissioned, which would complete a premier accelerator physics test facility with lasers, linacs, a ring, and with photons, electrons, and protons. This talk will describe the accelerator science program at IOTA and will highlight the emerging collaboration opportunities.

Presenter: NAGAITSEV, Sergei