

**UK Accelerator Institutes
Seminar Series Spring 2022
(Session 4)**

Report of Contributions

Contribution ID: 1

Type: **not specified**

ALS Upgrade Goals and Project Status

Thursday 5 May 2022 16:15 (1 hour)

The ALS-U project will upgrade the existing Advanced Light Source (ALS) at Berkeley Lab to deliver diffraction limited photon beam performance and aims to increase the beam brightness by two orders of magnitude for soft x-rays compared to the current ALS facility. The storage ring design utilizes a nine-bend achromat lattice with reverse bending magnets and on-axis swap-out injection from an accumulator ring. In order to achieve the new target brightness for the x-ray source, the storage ring lattice was optimized to reach a stored beam horizontal emittance of 70 pm rad, thereby requiring the addition of an accumulator ring to the accelerator complex.

Our talk will describe the optics design and highlight some of the challenging technical hardware developments. In addition, we will discuss installation progress of the accumulator ring as well as our extensive installation planning for the 12 months Dark Time where the ALS storage ring will be replaced with the new nine-bend achromat.

Presenters: STEIER, Christoph (Lawrence Berkeley National Laboratory); LEITNER, Daniela (LBNL)

Contribution ID: 2

Type: **not specified**

IsoDAR@YEMILAB and its next-generation proton cyclotron

Thursday 12 May 2022 16:15 (1 hour)

The IsoDAR cyclotron design, for a neutrino experiment at YEMILAB, Korea, produces 60 MeV protons with a beam current of 10 mA. This is an order of magnitude larger than that from conventional machines and will be a game changer for medical isotope production.

This is achieved through three innovations: use of H_2^+ as the accelerated particle, deploying an RFQ in place of the usual LEBT system, and harnessing the 'vortex motion' of the high current beam to reduce the transverse beam dimension. These will be explained, and the current status and prospects outlined.

Presenter: BARLOW, Roger (University of Huddersfield (GB))

Contribution ID: 3

Type: **not specified**

The H2020 CompactLight Design Study

Thursday 19 May 2022 16:15 (1 hour)

CompactLight (XLS) is an H2020 Design Study funded by the Horizon 2020 Research Program and carried out by an International Collaboration of 26 partners and 5 third parties, including CERN, INFN, Elettra, and UKRI. The project, which started in January 2018 with a duration of 48 months, aimed at designing an innovative, compact, and cost-effective hard X-ray FEL facility complemented by a soft X-ray source. In December 2021, the CompactLight Conceptual Design Report was completed. The result is an accelerator that can be operated up to 1 kHz repetition rate, beyond today's state of the art, using the latest concepts for high brightness electron photoinjectors, very high gradient accelerating structures in X-band, and novel short period undulators. This paper gives an overview of the project, focusing on the addressed technological challenges and the future applications.

Presenter: LATINA, Andrea (CERN)

Contribution ID: 4

Type: **not specified**

The Muon Collider

Thursday 26 May 2022 16:15 (1 hour)

Recently, the muon collider has been recognised as an important option to be considered for the future of particle physics. It is part of the European Accelerator R&D Roadmap developed in 2021 and approved by the CERN Council. Also, interest is increasing in the Americas and in Asia, demonstrated, for example, by the ongoing Snowmass process. The presentation will give an introduction to the muon collider concept and the identified challenges. It will also describe the R&D progress and plans.

Presenter: SCHULTE, Daniel (CERN)

Contribution ID: 5

Type: **not specified**

Distributed coupling Linear Accelerators and their applications

Tuesday 31 May 2022 16:15 (1 hour)

We introduce a new type of linear accelerator for which the cells are isolated, and the RF is fed from a set of manifold waveguides that runs in parallel with the structure. These structures were originally motivated by the desire to optimize the accelerator cavity shapes for high gradient operation, which led to mostly isolated cells. We discuss the efforts being pursued to apply these new structure topologies to future energy frontier linear colliders, medical linacs, and industrial linacs. The need to develop these linacs with high beam loading led us to create a new methodology for computing the beam loading, especially at very low energy. The beam dynamics and the RF loading need to be solved self-consistently. We will also discuss our efforts to invent new methods for economically manufacturing these structures.

Presenter: TANTAWI, Sami (SLAC)

Contribution ID: 6

Type: **not specified**

Lessons learnt in building a research capability for proton therapy; informing the design of a future Ion Therapy Research facility

Thursday 9 June 2022 16:15 (1 hour)

In April 2019 a meeting was held in Birmingham to discuss a future Ion Therapy Research Facility (ITRF). This meeting brought together a multidisciplinary audience including clinicians, clinical scientists, and academic scientists and engineers from across the life and physical sciences. Policy makers and funders also attended the meeting. The meeting agreed a consensus document and roadmap for the ITRF which was published in 2020 and this forms the basis of the ITRF which is being discussed with UKRI.

In Manchester we have practical experience of designing a research capability for ion therapy research. When the NHS clinical proton therapy centre was designed in Manchester the fourth gantry space was set aside so that research capability could be integrated alongside the three clinical treatment gantries. The Christie Charity raised over £5.4M to build and equip this proton therapy research room.

The research room was designed to investigate the key scientific and technological challenges that confront proton therapy and to provide a route for translating research innovations into the clinic for patient benefit. The research room was designed to emulate the clinical delivery of proton beams.

This talk follows the building and commissioning of the proton therapy research room and the challenges encountered during the Covid-19 pandemic. It then goes on to highlight some of our latest results (including experiments conducted under ultra-high dose rate (FLASH)). It also talks about the latest innovations in the research room and how these are being developed to give world leading capabilities. It also demonstrates how working in partnership with clinical colleagues, the research is contributing to new innovations and clinical trials.

Presenter: KIRKBY, Karen (University of Manchester)

Contribution ID: 7

Type: **not specified**

The CERN LHC Injector Complex

Thursday 16 June 2022 16:15 (1 hour)

The recently-upgraded CERN LHC Injector complex is not only a key ingredient for the production of high-brightness beams for the LHC and the future HL-LHC, but also provides various types of beams to a very rich and varied fixed-target programme. A pulse-to-pulse modulated settings scheme make the injector complex very versatile, allowing efficient beam-time sharing for the experiments. This seminar will give an overview of the injector complex and its functioning, focusing on the production and delivery of beams to the various experimental areas.

Presenter: STEERENBERG, Rende (CERN)

Contribution ID: 8

Type: **not specified**

Accelerator Physics at Fermilab's IOTA ring

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

Contribution ID: 9

Type: **not specified**

Ion Sources

Thursday 28 April 2022 16:15 (1 hour)

A quick journey through ion sources, from the plasma pioneers and hot filament ion sources, to microwave ion sources and Electron Cyclotron Resonance (ECR) ion sources. Even higher charge states can be reached with Electron Beam ion sources. Vacuum arc and laser plasma ion sources are used for 'hard to ionise' materials. There are several good uses for negative ions, but how do you make them? Caesium is key to high current negative ion production, however the volume process can also reliably and cleanly create negative ions. The Low Energy Beams Group at ISIS is currently developing two world leading negative ion sources: the 150 mA 2X Scaled Penning Surface Plasma Source and an un-caesiated maintenance-free Inductively Coupled Plasma (ICP) negative volume source for ISIS operations.

Presenter: FAIRCLOTH, Dan (STFC)