

**UK Accelerator Institutes
Seminar Series Autumn 2023
(Session 8)**

Report of Contributions

Contribution ID: 1

Type: **not specified**

Medical Accelerator Research in Australia: Developing Advanced Accelerators for Future Needs

Thursday 12 October 2023 16:15 (1 hour)

In this seminar I will give an overview of some of the research projects underway in the Medical Accelerator Physics group at the University of Melbourne, with a focus on the future potential of novel accelerator technologies in Australia. In 2023, our group inaugurated the first southern hemisphere X-band accelerator facility, on-track to realise a compact electron accelerator R&D lab with the X-LAB 'X-band Laboratory for Accelerators and Beams'. I will also overview how a scaled experimental technology demonstrator –the TURBO 'Technology for Ultra Rapid Beam Operation' project –aims to speed up particle therapy.

Presenter: Dr SHEEHY, Suzie (University of Oxford and University of Melbourne)

Contribution ID: 2

Type: **not specified**

UK XFEL - Conceptual Design and Options Analysis Phase

Thursday 19 October 2023 16:15 (1 hour)

The UK XFEL project is now one year into its three-year Conceptual Design and Options Analysis (CDOA) phase. The purpose of this phase is to develop concepts to meet the required 'next-generation' XFEL capabilities identified in the project's comprehensive, peer-reviewed, Science Case, which was developed by UK academia. The envisaged next-generation features are a step-change in both the number of simultaneous experiments and in their capability –through multiple, combinable FEL sources delivering transform limited pulses across a wide range of photon energies and pulse durations, together with a comprehensive array of synchronised sources including high power lasers and particle beams. The project is assessing options to achieve this either via a new UK-based facility or by investment at existing XFELs, based on criteria including performance, cost, and environmental sustainability. The project is holding a series of Townhalls and other workshops around the UK (see <https://xfel.ac.uk>) and is building collaborations nationally and internationally. This talk will give an overview of progress to date and future plans.

Presenter: Dr DUNNING, David (ASTeC)

Contribution ID: 3

Type: **not specified**

The Sustainable HECAP+ Initiative

Thursday 2 November 2023 16:15 (1 hour)

The climate crisis and the degradation of the world's ecosystems require humanity to take immediate action. The international scientific community has a responsibility to limit the negative environmental impacts of basic research.

The HECAP+ communities (High Energy Physics, Cosmology, Astroparticle Physics, and Hadron and Nuclear Physics) make use of common and similar experimental infrastructure, such as accelerators and observatories, and rely similarly on the processing of big data. Our communities therefore face similar challenges to improving the sustainability of our research. This talk aims to reflect on the environmental impacts of our work practices and research infrastructure, to highlight best practice, to make recommendations for positive changes, and to identify the opportunities and challenges that such changes present for wider aspects of social responsibility based on a discussion document that was published earlier this year.

Presenter: Dr LOHWASSER, Kristin (University of Sheffield (GB))

Contribution ID: 4

Type: **not specified**

TBC

Contribution ID: 5

Type: **not specified**

Seminar to be confirmed

Contribution ID: 6

Type: **not specified**

Seminar to be confirmed

Contribution ID: 7

Type: **not specified**

The Long Baseline Neutrino Facility (LBNF)

Thursday 23 November 2023 16:15 (1 hour)

The LBNF, with a neutrino beamline at Fermilab, will provide neutrinos to the upcoming Deep Underground Neutrino Experiment (DUNE). The DUNE experiment, with its far detectors 1300 km away in South Dakota and physics goals to study neutrino oscillations with unprecedented precision, will require an intense and well understood neutrino beam. The LBNF will deliver the most intense high energy neutrino beam in the world. This talk will give an overview of the LBNF and the path to the neutrino beam that will enable groundbreaking discoveries with DUNE.

Presenter: PAVLOVIC, Zarko (FNAL)

Contribution ID: 8

Type: **not specified**

Seminar to be confirmed

Contribution ID: 9

Type: **not specified**

Return of the Asteroids: Exploring the Early Solar System Using Synchrotron Radiation - Analysis of the Ryugu Asteroid Fragments

Thursday 30 November 2023 16:15 (1 hour)

Asteroids are the building blocks of the Solar System, providing a record of the processes and events that shaped the planets. Dark C-type asteroids are thought to contain water and organic matter and were likely an important source of hydrogen, carbon, nitrogen, and prebiotic molecules to the early Earth. Fragments of C-type asteroids arrive naturally on Earth as carbonaceous meteorites or can be directly sampled by space missions. However, characterizing these extra-terrestrial materials in the laboratory is challenging and requires analytical techniques that offer both high spatial resolution and sensitivity. I'll talk about how synchrotron radiation is being applied to the study of asteroids and what we can learn about the earliest history of our solar system.

Presenter: Dr KING, Ashley (Natural History Museum London)

Contribution ID: **10**

Type: **not specified**

TBC

Contribution ID: **11**

Type: **not specified**

No seminar

Thursday 9 November 2023 16:15 (1 hour)

Contribution ID: 12

Type: **not specified**

Antimatter Gravitation Studies with Trapped Antihydrogen

Thursday 16 November 2023 16:15 (1 hour)

Precision atomic physics measurements with antimatter may help us understand the lingering Baryon asymmetry problem. The ALPHA Collaboration has recently published the first direct measurements of the gravitational effect on the trajectory of antiparticles in ALPHA-g, an apparatus dedicated to making measurements on antimatter gravitation [1]. This first-of-a-kind direct test of the free-fall Weak Equivalence Principle definitively measures the effect of gravitational acceleration on antimatter. With a best-fit value of the effective gravitational acceleration of antihydrogen of $(0.75 \pm 0.13 \text{ (stat. + syst.)} \pm 0.16 \text{ (simulation)})$, it finds consequent motion of antimatter consistent with that expected of matter. We present a brief background of this effort in the context of experiments conducted to date at ALPHA and explain the underlying principle of the magnetic bias technique used to probe the gravitational behavior of the anti-atoms in our trap. We explain the experimental techniques used to realize the measurement and present the experimental results and analysis in detail. Finally, we outline the future direction of gravitation measurements on ALPHA-g.”

[1] Anderson, E.K., et al. (ALPHA Collaboration) Observation of the effect of gravity on the motion of antimatter. *Nature* 621, 716–722 (2023). <https://doi.org/10.1038/s41586-023-06527-1>

Presenter: BERTSCHE, William Alan (University of Manchester (GB))

Contribution ID: 13

Type: **not specified**

Overview of Neutral Beam Injection Systems in Fusion Machines

Thursday 26 October 2023 16:15 (1 hour)

Neutral Beam Injection (NBI) systems are indispensable components in modern fusion machines, playing pivotal roles in plasma heating, diagnostics, and control. This seminar will provide a comprehensive overview of NBI systems, with a particular focus on their implementation and performance on Joint European Torus (JET) and MAST-U tokamaks. The presentation will delve into the core principles and critical components of NBI, including ion source design, accelerator technology, residual ion management, and neutralizer systems. The thermal considerations, advanced diagnostics, and the operational safety systems that are crucial for the secure operation of NBI systems will be discussed as well.

Presenters: Dr EL-HAROUN, Hana (UKAEA); Dr SHARMA, Ridhima (UKAEA)