

**UK Accelerator Institutes
Seminar Series Spring 2023
(Session 7)**

Report of Contributions

Contribution ID: 1

Type: **not specified**

Applications of Superconducting Undulator Technology for Hard X-ray Production at the European XFEL

Thursday 27 April 2023 16:15 (1 hour)

X-rays have important applications in medicine, industry and science.

In the scientific field, XFELs opened the possibility to study matter at atomic-level spatial scales and femtosecond time scales for the first time. The energy of the photons produced by XFELs is presently limited to about 25 keV.

The development of Superconducting Undulators (SCU) recently became part of the strategic programme foreseen at the European XFEL. On the one hand superconducting magnet technology would allow the production of photons with energies in the range 30-100 keV, while on the other hand the state of the art SCU technology offers a solution to cover the present range of photons in all beamlines using a fixed electron energy, thus simplifying consistently the machine set-up.

In this talk we will give an overview of some of the activities regarding the development of the SCU technology which are ongoing in the European XFEL facility, highlighting the potential of such technology for general application in Free Electron Lasers.

Presenter: Dr MARCHETTI, Barbara (European XFEL)

Contribution ID: 2

Type: **not specified**

Frontiers in Ultrafast Electron Diffraction Instrumentation

Thursday 4 May 2023 16:15 (1 hour)

Electron scattering instrumentation has evolved into a powerful tool for revealing the atomic structure enabling the visualization of the dynamic evolution of matter in real time, providing crucial information on phase transition and chemical reaction dynamics, among other phenomena. Ultrafast electron pulses have facilitated this scientific endeavor, thanks to rapid advances in both ultrafast laser and particle accelerator technologies. In this talk I will discuss the physics of high brightness electron sources for ultrafast electron diffraction (UED) and review the recent technical developments which have tremendously improved the spatial and temporal resolution in the experiments. I will also include a discussion of the opportunities to further push the state-of-the-art in the technique and continue to improve its performances.

Presenter: Prof. MUSUMECI, Pietro (UCLA)

Contribution ID: 3

Type: **not specified**

Particle Accelerators for Security Applications

Thursday 18 May 2023 16:15 (1 hour)

Particle accelerators provide a key tool in ensuring safety and security around the globe. This talk will cover the main uses of particle accelerators in the security field, the current accelerator technology used and potential areas where new research could result in a step change in the performance of particle accelerators for security applications.

The primary use of particle accelerators in security is in inspection systems. These use a variety of particle beams (x-ray, THz, neutron, etc.) to image everything from people to freight trains. Due to the requirements of end users and the environments these inspection systems are installed in, the technology used for the accelerator has not changed significantly in decades. The challenges to developing the accelerator technology and how they can be overcome will be reviewed. Areas where accelerator research can make a significant impact on the next generation of particle accelerators for security will be highlighted.

(This talk will be broadcast from the Merrison Lecture Theatre at Daresbury Laboratory.)

Unfortunately, due to technical problems, this seminar was not recorded.

Presenter: Dr JENKINS, Mike (Rapiscan Systems)

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**

Plasma Wakefield Accelerators as an Option at the HEP Energy Frontier

Thursday 8 June 2023 16:15 (1 hour)

Plasma wakefield accelerators are capable of particle acceleration with very high accelerating gradients. However, how well are they suited as an option for an energy frontier collider? What advantages may they have with respect to other options? At the University of Oslo we study these topics by targeting specific questions related to plasma linac performance through numerical simulations. I will discuss the methodology we use, and go through the status of the studies.

Presenter: Dr ADLI, Erik (University of Oslo)

Contribution ID: 8

Type: **not specified**

Seminar to be confirmed

Contribution ID: 9

Type: **not specified**

SESAME and Advances in Human Bioarchaeology: Synchrotron-radiation-enabled Ancient Human Stories from the Cradle of Civilisation

Thursday 15 June 2023 16:15 (1 hour)

SESAME, the first synchrotron located in the cradle of civilisation, opened its doors with its first official beam time focusing on ancient human remains. This talk introduces key aspects of SESAME, in its Eastern Mediterranean and Middle Eastern (EMME region) context, and takes the audience on a journey of discovery as regards the ancient people –real individuals –who inhabited the EMME region in the distant past, and contributed significantly to how we live today. In so doing we also focus on the advances, challenges and potential of synchrotron-radiation-enabled approaches to Human Bioarchaeology.

Presenter: Dr LORENTZ, Kirsi (Cyprus Institute)

Contribution ID: **10**

Type: **not specified**

TBC

Contribution ID: 11

Type: **not specified**

The ARES Linac as a Precision Tool for Accelerator Science, Technology and Application Developments

Thursday 25 May 2023 16:15 (1 hour)

The generation and acceleration of ultra-short, high quality electron beams have attracted more and more interest in accelerator science. Electron bunches with these properties are necessary to operate and test novel high-resolution diagnostics and advanced high gradient accelerating schemes.

The dedicated R&D linac ARES at DESY (Deutsches Elektronen-Synchrotron) is now fully operational and able to produce and diagnose these electron beams at the nominal energy of 155 MeV and to deliver them to users. First measurements have shown an outstanding energy stability and reproducibility with a relative energy stability of $1E-5$.

ARES is also used for medical experiments in the frame of Very High Electron Energy (VHEE) treatment with in-vivo experiments. First results will be presented.

This talk gives an overview of the linac, describes the beam commissioning lessons and summarizes the beam parameter measurements. The scientific program at ARES including accelerator R&D, medical studies and industrial applications will be presented.

Presenter: Dr BURKART, Florian (DESY)

Contribution ID: 12

Type: **not specified**

MeV Ultrafast Electron Diffraction for Scientific Exploration

Thursday 1 June 2023 16:15 (1 hour)

Recently, MeV ultrafast electron diffraction (UED) has emerged as a powerful and productive research tool for studying non-equilibrium processes on atomic-level spatial and temporal scales. Electron probes provide unique information about structure dynamics that is complementary to X-rays and optical lasers. High impact science outcomes using MeV UED are enabled by the performance of the entire instrument as well as appropriate choices of the scientific problems. In this talk, I will share some of my thoughts on how to optimize and operate an MeV UED apparatus and carry out experiments with a team composed of accelerator people and science users. I will also briefly introduce recent efforts at Tsinghua University that are relevant to high brightness electron sources and beams that can potentially benefit future UED applications.

Presenter: Dr LI, Renkai (Tsinghua University)