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UK XFEL Overview & Science Case

Friday, 22 November 2024 09:30 (30 minutes)

Note: Following discussions with Lawrence Norris we would like to submit for two talks. One discussing the UK XFEL Project and Facility Design, and a second discussing the UK XFEL Science Case and notable recent XFEL highlights. However we can deliver this as one talk if the schedule is limited at this stage.

UK XFEL: Overview and Facility Design.
A conceptual design and options analysis (CDOA) is currently being carried out by the UK into the possibility to deliver a next generation XFEL (X-ray Free-Electron Laser). XFELs generate ultra-bright, short pulses of X-rays, allowing for the study of matter at the atomic and molecular level with unprecedented detail. This talk will explore the options and facility design of a potential UK XFEL along with our options for collaborating with existing facilities international, and international partners without XFEL access. We will discuss the conceptual design process, from translating science requirements into specific technical solutions and ultimately into compelling facility proposals. We will present a preliminary design for a UK XFEL– a multi-billion Pound science facility - highlighting key next-generation features and examine top-level design choices. These include multiplexing to enable up to 10 FELs, achieving high peak and average brightness, generating near-transform-limited pulses, reaching high pulse energy and photon energy, incorporating two-colour synchronous sources, enabling high data rates and AI integration, as well as ensuring sustainability throughout. The expected timelines for the project, highlighting the current status of the Conceptual Design and Options Analysis phase, which is expected to be completed by October 2025, will also be discussed along with the plans for subsequent phases of the project.

UK XFEL: Science Case highlights and refresh.
As part of this project we will also review the Science Case for UK XFEL, here we will explore recent scientific advances from XFELs worldwide, highlighting results which strengthen the case for a next-generation UK XFEL facility. We will discuss transformative breakthroughs in several scientific fields, showcasing the power of XFELs to address fundamental questions across the physical, chemical, and life sciences. We will discuss highlights and XFEL applications in our main science areas: Matter in Extreme Conditions, Nano/Quantum Materials, Engineering and Material Applications, Life Sciences, Chemical Sciences and Physical Sciences. And how we have approached engaging with these communities through a series of workshops and townhall discussions over the last 18 months.

Primary authors: Dr ADEN, Paul (STFC); Prof. MARANGOS, Jon (Imperial College); Dr DUNNING, David (STFC)

Presenters: Dr ADEN, Paul (STFC); Prof. MARANGOS, Jon (Imperial College); Dr DUNNING, David (STFC)

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