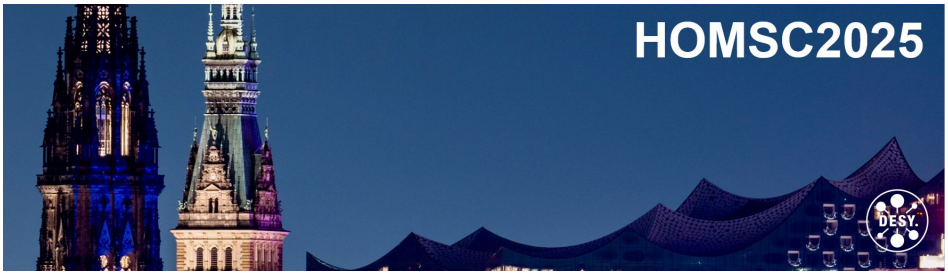

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The UK XFEL project: conceptual design

Wednesday 8 October 2025 10:30 (30 minutes)

The conceptual design of the UK XFEL facility responds directly to user community requirements for a next-generation X-ray facility. Surveys and consultations highlighted the need for higher repetition rates, near-transform-limited pulses, broader photon energy coverage, and the capacity to serve many experiments simultaneously. Current facilities typically offer only 1–3 source points, leading to limited access and high experiment costs. The proposed design addresses these needs by combining a high-repetition-rate (~1 MHz) superconducting linac with flexible distribution of electron bunches to 6–10 FELs, each capable of operating independently at ~100 kHz. Embedded within this structure are lower-repetition, higher-charge bunches that can be boosted to 12–15 GeV,enabling experiments requiring extreme photon energies and pulse energies. This irregular bunch structure offers unprecedented flexibility, supporting both high-throughput and flagship single-shot experiments. The modular design ensures adaptability to future upgrades, while dvanced synchronisation, AI-driven data management, and environmental sustainability measures positionthe UK XFEL as a facility uniquely tailored to user-defined scientific ambitions.

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