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# Proposed Transition to CW Mode at the Eu-XFEL: Implications for Beam Diagnostics

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The European X-ray Free-Electron Laser (Eu-XFEL) currently operates in a pulsed mode, delivering ultra-short, high-intensity X-ray pulses for a wide range of scientific applications. However, transitioning to a continuous-wave (CW) operation mode could significantly enhance its capabilities by enabling higher average brightness, improved temporal coherence, and novel experimental opportunities. This contribution addresses the critical modifications required in the electron beam diagnostics system to accommodate the transition from pulsed to CW operation.

Key challenges include the need for real-time, high-resolution monitoring of beam parameters under continuous conditions, such as beam position, energy spread, emittance, and charge stability. Existing diagnostic tools, optimized for pulsed operation, may face limitations in bandwidth and sensitivity. We propose adaptations such as the integration of high-speed, low-noise detectors and advanced signal processing techniques.

This work outlines a roadmap for upgrading the Eu-XFEL's electron beam diagnostics infrastructure, ensuring compatibility with CW operation while preserving the facility's cutting-edge performance for next-generation X-ray science.

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