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EPICS-based X-ray beam intensity monitoring for the CBXFEL project at SLAC LCLS

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The Cavity-Based X-ray Free-Electron Laser (CBXFEL) project, to be deployed in the Linac Coherent Light Source (LCLS) Hard X-ray (HXR) undulator line, aims to produce a highly coherent X-ray beam by recirculating X-ray pulses within a cavity. Precise alignment of the diamond crystal mirrors in this cavity is critical to achieving optimal CBXFEL performance. To support this, we deploy a system of five silicon-based X-ray Beam Intensity Monitors (XBIMs) and one diamond XBIM. Each XBIM generates a signal that may be amplified and is then digitized using high-speed digitizers. These digitized values are integrated into the EPICS control system, enabling synchronized data acquisition, feedback, and monitoring alongside other experimental sub-systems. This paper outlines the requirements for CBXFEL beam diagnostics, details the digitizer selection and configuration, and describes the implementation of the control architecture.

Footnotes

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