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Automating x-ray beam alignment processes with the split-and-delay graphical user interface at LCLS

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At SLAC National Accelerator Laboratory's Linac Coherent Light Source (LCLS), a series of optics and diodes in the X-ray Correlation Spectroscopy (XCS) beam line's split-and-delay chamber divide the beam into two equal intensity pulses. One pulse is intentionally delayed, facilitating X-ray Photon Correlation Spectroscopy techniques that operate at nanosecond time scales for experiments in biology, chemistry, and materials science. However, achieving precise beam alignment with this setup poses significant challenges because meticulous adjustments to each of the beam line optics are required in succession each time the split-and-delay chamber is used, and this process is very time and effort intensive. To address these challenges, the implementation of the split and delay graphical user interface (GUI) streamlines x-ray beam alignment by enabling remote control of the motorized optical components and displaying user-friendly, live-time monitoring of the beam diagnostics. Work is on-going to allow automatic optimization of beam alignment by stepping the motorized optical components through various positions, measuring the beam intensity, and moving optics on motorized stages to the preferred positions. This advancement will further streamline alignment of the beam through the split-and-delay chamber and thus increase time available for data collection at XCS.

Footnotes

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