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Compact multi-purpose imager for the Matter in Extreme Conditions end-station at LCLS

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This paper presents the mechanical design of a new imaging system developed at the Matter in Extreme Conditions (MEC) instrument at the Linac Coherent Light Source (LCLS) to improve setup efficiency while maintaining high-quality imaging performances. We designed an in-vacuum setup for imaging both the focal spot of a laser and the targets themselves. The system integrates high-resolution optics, remote positioning relative to the interaction point and control system. It supports spot sizes from 2 to 600 µm and spatial resolutions down to 1 µm. Using kinematic mounting features, we ensured repeatability of internal components positioning and user-friendly way when modifications are needed. The system is versatile as it accommodates different laser wavelengths, it can function as a confocal imager for precise target positioning and its compactness allows it to fit in various experimental geometries. Additionally, the system includes vacuum-compatible, adjustable wavelength filtering and attenuation that maintain optical alignment. Finally, a shutter protects the high-resolution optics from target debris while the whole imager is fully retractable to further clear the target area.

Footnotes

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