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Initial Commission Result of LCLS II Precision Timing System

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In 2023, LINAC Coherent Light Source II achieved first light, spanning over 5 km. The goal of achieving 10fs relative jitter between the experiment laser and the x-ray led to the development of new systems. We will present the timing system design, architecture, and key commission results.

The challenge of reference distribution in the hostile environment of LCLS II was addressed by using a multi-drop coaxial cable for the superconducting LINAC and stabilized radio frequency over fiber systems for the experimental hall. An in-house laser locker locks the experiment laser to the reference signal, and an S-band beam phase cavity determines the electron beam's correlation with the reference.

Initial commission results show a laser-to-x-ray jitter of around 60 femtoseconds, aiming for significant improvement with optical detection. The precision timing system is vital for LCLS II's experiments, and additional diagnostic instruments are proposed to enhance synchronization performance.

Footnotes

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