

LLRF Topical Workshop - Timing, Synchronization, Measurements and Calibration



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LINAC Locking Commissioning and Operation for the Phase Reference Line Synchronization between LCLS-I and LCLS-II at SLAC*

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Abstract

Since June 2024, LCLS-II has been providing users with an X-ray laser that features a higher repetition rate and more intensity compared to LCLS-I. This advancement offers users a broader range of X-ray free electron laser (FEL) options and significantly reduces data collection time. Existing photon instruments and beam diagnostic systems for LCLS-I must be able to detect the X-rays or electron beams from both LCLS-I and LCLS-II LINAC, which has different reference systems. Synchronization of the phase reference systems between the two machines is essential to achieve this goal. The LINAC Locking System at SLAC has replaced the LCLS-I stand-alone 476 MHz master oscillator with an ultra-low noise frequency synthesis system derived from the LCLS-II 1300 MHz phase reference signal. Phase initiation is achieved by aligning the timing of the LCLS-I LINAC event generator (EVG) with the LCLS-II timing pattern generator (TPG) using a common subharmonic frequency. The new low-noise 476 MHz phase reference is distributed to FACET and the LCLS-I LINAC via the existing Main Drive Line (MDL). This paper presents the system design architecture and operational experience of the LINAC Locking System.

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