

LLRF Topical Workshop - Timing, Synchronization, Measurements and Calibration



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An Overview: Reference Distribution and Synchronization Systems, from Sub-picoseconds to Sub-femtoseconds Stability

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Distribution systems are used to provide reference frequencies from a common source to all phase-critical clients at an accelerator. To precisely synchronize remote RF and optical oscillators to the common clock, a combination of phase-stabilized links and phase-locked loops with optimized bandwidth and locking parameters are implemented. A pre-requisite to reach the required phase-stability, is the availability of drift-free phase-detectors with sufficient resolution.

When selecting for a type of reference distribution and synchronization systems, various aspects need to be considered; among those the ultimately required time stability, the scale of the facility and the predominant sources of disturbances. Phase-critical sub-systems at an accelerator are susceptible for noise occurring in various frequency bands from megahertz to millihertz, from sources such as intrinsic noise of electronics and materials, vibrations and environmental conditions.

We present an overview of selected developments for RF and optical synchronization systems, suited for stability requirements in the several 10 fs to sub-fs regime.

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