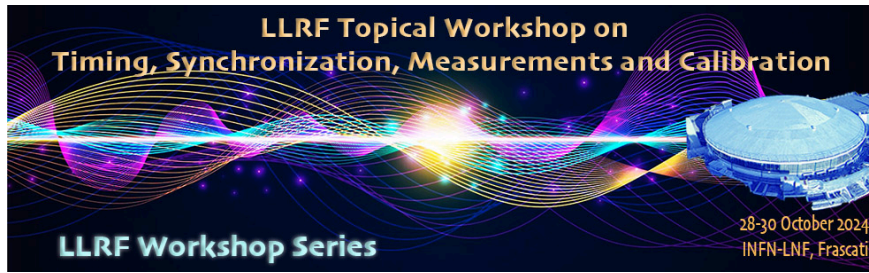


LLRF Topical Workshop - Timing, Synchronization, Measurements and Calibration



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All-fiber optical-microwave phase detector for laser-RF synchronization

Wednesday, 30 October 2024 09:50 (25 minutes)

To explore the implementation of laser-RF synchronization with femtosecond-level precision and stability, we proposed and demonstrated a Sagnac loop-based all-fiber optical-microwave phase detector (AFOM-PD). The repetition rate of the reference laser is 29.134 MHz, and its RIN has been suppressed by 40 dB at 1 Hz offset frequency. A 1.311010 GHz (2.855132 GHz) RF signal was synchronized with integrated RMS timing jitter from 1 Hz to 1 MHz of 18.6 fs (6.0 fs) and long-term timing drift of 15.8 fs (12.5 fs) over 6 h. The experiments were conducted in a standard laboratory environment with temperatures ranging from 23°C to 28°C and humidity varying between 28% and 33%, demonstrating the feasibility and stability of this laser-RF synchronization system under non-ideal conditions.

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