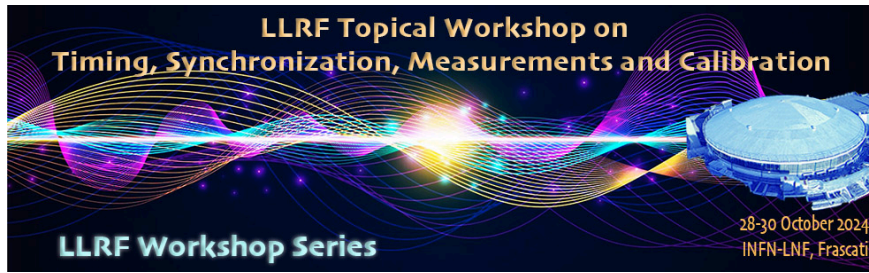


## LLRF Topical Workshop - Timing, Synchronization, Measurements and Calibration



Contribution ID: 13

Type: Oral

# Beam-based Stability Evaluation in the LINAC of European XFEL

*Tuesday, 29 October 2024 12:30 (25 minutes)*

The linear accelerator of European XFEL exhibits an outstanding phase and amplitude stability using state-of-the-art low-Level RF (LLRF) controls in combination with an optical synchronisation system. The achieved RF field regulation precision is well within design criteria, chosen to reach an electron bunch arrival time stability on the 10fs rms level. However, the high complexity of the vector sum RF field regulation and involved sub-systems requires a careful monitoring and optimisation of regulation parameters to keep an optimal operation point. To reach ultra-low arrival time stability to the level better than 5fs rms, beam-based error signals are integrated into the LLRF control loops for a beam-based RF field control with >10kHz regulation bandwidth, acting mainly on the amplitude.

We present latest record timing stability values and discuss which external and in-loop disturbances deteriorate this performance, in order to identify further means of improvement.

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