

Single bunch phase measurement

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Accurate knowledge of the longitudinal phase of individual bunches relative to a reference RF signal is essential for applications that demand tight synchronization, such as bunch-by-bunch transverse or longitudinal feedback systems. While many beam-phase diagnostics exist, they are not always optimal with sparse-filling or single-bunch operation.

Here we would like to discuss a method for measuring the phase of a single bunch directly from a BPM button signal, without using ultra fast ADC. The approach is based on IQ demodulation at the reference RF frequency, and moderately fast ADC. The system aims to be simple, low-cost, and readily integrable.

Applied to our booster synchrotron, it would generate a beam-synchronous reference signal that follows the rapidly varying beam phase throughout the acceleration cycle, enabling synchronous measurements even when only a single bunch is present.

Author: ROCHE, Benoit (ESRF)

Presenter: ROCHE, Benoit (ESRF)

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