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LHC Matlab Tools and 1-turn Feedback commissioning

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Following the PEP-II experience, Matlab based tools have been used at the LHC for multiple configuration, machine development, and diagnostic purposes. These include the remote setting and optimization of the cavity controller, monitoring of beam, RF, and LLRF parameters, as well as synchronous excitations and acquisitions of system parameters. A synopsis of these applications is presented, with an emphasis on the 1-turn feedback implementation.

The 1-turn feedback is an FPGA based feedback system part of the LHC cavity controller, which produces gain only around the revolution frequency harmonics. As such, it helps reduce the transient beam loading and effective cavity impedance. Consequently, it increases the stability margin for Longitudinal Coupled Bunch Instabilities driven by the cavity impedance at the fundamental and allows reliable operation at higher beam currents. The 1-turn feedback commissioning tools and the resulting performance improvements are presented.

Primary author: Dr MASTORIDIS, Themistoklis (CERN)

Co-authors: RIVETTA, Claudio (SLAC); MOLENDIJK, John (CERN); BAUDRENGHIEN, Philippe (CERN)

Presenter: Dr MASTORIDIS, Themistoklis (CERN)

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