

CERN plans to evaluate MicroTCA for the SPS LLRF upgrade

Wednesday 6 December 2017 10:15 (15 minutes)

The LLRF of the CERN SPS will go through a complete renovation during the Long Shutdown 2019-2020. The upgrade is driven by the required performances as injector for the LHC:

For protons, the bunch intensity must be doubled (2.2×10^{11} p/bunch at transfer to LHC), requiring major modifications to the accelerating system. On the LLRF side, the active compensation of transient beam loading must be improved (Feedforward, One Turn Delay feedback, Longitudinal damper).

For LHC ions, the required 50 ns bunch spacing calls for new LLRF gymnastics, namely slip stacking in the SPS, before transfer to the LHC.

The new LLRF will be based on the distribution of a fixed frequency reference clock, plus data (such as the instantaneous Frequency Tuning Word and Phase) using the deterministic White-Rabbit link. Studies are ongoing to minimize the phase noise resulting from the reconstruction of the reference clock from the serial-data stream, to be used as sampling clock (ADC).

A cavity-controller (RF feedback) prototype is being designed based on MicroTCA, for evaluation as VME alternative. CERN considers the MicroTCA as a candidate for the replacement of the current VME systems in operation.

Plans for the upgrade include the SPS beam-control (beam based loops) in MicroTCA.

The new philosophy will make new features possible, such as the coupled-feedback on cavities of different lengths. Use of synchronized deterministic links is also very attractive for future machines with RF stations at distant locations, such as for the CERN future collider FCC-ee under study.

Primary author: Mr HAGMANN, Gregoire (CERN)

Co-authors: Mr BUTTERWORTH, Andy (CERN); Mr SPIERER, Arthur (CERN); Mr KOTZIAN, Gerd (CERN); Mr GALINDO, Javier (CERN, UPC); Mr SERRANO, Javier (CERN); Mr SCHMID, Lorenz (CERN); VANDEN EYNDEN, Marc (CERN); RIZZI, Mattia (CERN); Mr BAUDRENGHIEN, Philippe (CERN); Mr WLOSTOWSKI, Tomasz (CERN); Mr HOFLE, Wolfgang (CERN)

Presenter: Mr HAGMANN, Gregoire (CERN)

Session Classification: Session 1

Track Classification: Application in research facilities and industry