

Low Level RF Workshop 2022



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FPGA implementation of a multi-harmonic cavity controller for the Proton Synchrotron Booster at CERN

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The LLRF system of the Proton Synchrotron Booster (PSB) was widely renovated during Long Shutdown 2 (LS2) as part of the LHC Injectors Upgrade (LIU) project. Wide-band Finemet cavities were installed and a new cavity controller implemented in Field Programmable Gate Arrays (FPGA) was put into operation. In the new system, a fixed frequency clock is used with individual demodulation/modulation of 16 revolution frequency harmonics. Feedback loops allow the amplitude and phase of the different harmonics to be controlled as well as enabling precise synchronization between different cavities in the ring. New features such as an embedded network analyzer and a new method for longitudinal blow-up control are also included. The system was commissioned in late 2020, allowing all operational beams to be produced with the required beam characteristics within the LIU project.

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