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Design and Testing of a Universal Embedded Feedback Controller for RF Cavities

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The design of low-level feedback (LLRF) controllers used to stabilize amplitude and phase of the field inside the RF cavities are customized in nature depending upon the frequency and mode of operation. IUAC, India, operates accelerators with RF structures in the range from 12.125-97 MHz in normal and superconducting mode. Currently, all the LLRF controllers operational for many years, are structure specific and designed in analog domain. Component ageing, obsolescence and limited availability has made it difficult to maintain them amid frequent failures. To overcome this a universal digital controller has been developed whose design is based on using the same hardware for all the RF structures at IUAC. It is a compact, reconfigurable and standalone device with a microcontroller programmed Phase Locked Loop multiplier, a wideband analog front end and a System-on-Chip-FPGA based digital board with fast ADCs and DACs controlled using EPICS IOC. The controller is designed as a Sawtooth Waveform Generator for the Multi-Harmonic Buncher, and Generator Driven and Self-Excited Loop based LLRF for various RF cavities at IUAC. Design details and test results will be discussed in this paper.

Footnotes

Funding Agency

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Yes

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