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High-Level Software Tools for LLRF System Dedicated to Elliptical Cavities Management of European Spallation Source Facility

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The elliptical cavities are important component of superconducting part of ESS (European Spallation Source) linear accelerator. Each of 120 cavities have to deliver the electric field at the proper phase and amplitude to accelerate protons. LLRF (Low Level Radio Frequency) system is responsible for controlling these parameters and distributing reference clock signal. Another task is compensation of the parasitic effects like Lorentz force detuning. These phenomena cause resonators frequency shift and its magnitude is dependent on mechanical properties of the cavity. This results in less effective accelerator performance.

The paper describes Piezo Driver application, used to control piezoelectric actuators actively compensating detuning effect. The Piezo Driver hardware was designed as an RTM (Rear Transition Module) in MTCA.4 (Micro Telecommunications Computing Architecture) based LLRF system. An LO (Local Oscillator) and a clock generation component are also a part of this setup. also implemented as RTM. Dedicated software module is destined to manage LO/CLK signal configuration and distribution for LLRF system. The Cavity Simulator software is responsible for configuration of the hardware cavity simulator. The device emulates behaviour of elliptical, resonant cavities. The IPMI (Intelligent Platform Management Interface) manager is an application to monitor the chassis state of MicroTCA.4 system, hardware standard chosen for LLRF infrastructure at ESS. All of presented tools uses EPICS (Experimental Physics and Industrial Control System) framework and E3 (ESS EPICS Environment) environment. The operator panels were designed in ESS Phoebus release.

The paper demonstrates the structure of the solutions and discusses results of conducted tests and measurements.

Minioral

Yes

IEEE Member

No

Are you a student?

Yes

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