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The HIPA radio frequency control system application

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For the upgrade of the High Intensity Proton Accelerator at PSI of injector cavities 2 and 4, a new digital radio frequency control system was developed using the IFC 1210 VME board. This system comprises three components: A single-board computer running the control system software and the real-time application, both running on a dual core P2020 PowerPC, as well as the FPGA Design utilizing a Virtex 6. The real-time application (RTAPP) covers three use cases: “Cavity Tuning”, “Startup FSM”, and “Calculate Statistics”. “Cavity Tuning” implements the controller for the cavity’s tuning system, which consists of two controllers. One controls the physical position of the two tuners within the cavity, and the other one provides the setpoint for the tuner controller and controls on the phase error between forward power and cavity pickup, ensuring minimum reflected power during operation. The “Startup FSM” governs the radio frequency control system during the startup procedure. Here, the cavity must overcome the multipactoring zone while minimizing reflected power and without overstressing the amplifiers. Finally, “Calculate Statistics” performs computations on measurement data from high resolution ADC RAW values, reducing the data load before forwarding them to the control system. The software design is split into four layers: Common, hardware, service and application layer. These layers cover 13 different components which are each assigned a dedicated thread. The update frequency of the components varies between 25 and 50Hz, real-time behavior is given if a deadline of 20ms or 40ms respectively can be guaranteed.

Minioral

Yes

IEEE Member

No

Are you a student?

No

Authors: STEF, Benoit; AMBROSCH, Karina; JURCEVIC, Mario

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