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A versatile low level RF controller design for FRIB and extended projects

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The digital LLRF controller for the Facility for Rare Isotope (FRIB) project was designed to accommodate various cavity types with six distinct frequencies ranging from 40.25 to 322 MHz. The cavities also adopt different types of tuners, e.g. stepper motor, pneumatic, water flow, etc. A common hardware platform with design choices such as direct sampling of RF, compatible footprint for RF components (e.g. filters), same form factor PCBs, spare channels (RF, analog and digital) made it a reality. The design later turned out to be very adaptive to unforeseen new requirements as the project moved on. Those include adding an interface to enable and monitor the bias tee high voltage power supply, adding a serial interface to communicate with the tuner servo controller and monitoring a cold cathode gauge for faster interlock response. Most recently FRIB LLRF controller use case is expanded to support the testing of e-gun for the SLAC LCLS-II project which runs at a different RF frequency and uses a piezo tuner. Furthermore we are exploring a solution with this versatile platform to support the upgrade of the K500 cyclotron RF control with a continuous frequency range from 10 to 27 MHz.

Footnotes

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