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Development Activities of MicroTCA-based Systems at the SPring-8 Accelerator Complex

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We are planning to change the LLRF system of the SPring-8 storage ring from the current analog-circuit-based system into a modern digital one. We started the development of a MTCA.4-based system, as it is one of the best candidates for a new standard electronics platform at SPring-8. A prototype of the LLRF system was built, consisting of commercial MTCA.4 modules, such as AMCs (SIS8300L2, Struck), a down convertor and vector modulator RTM (DWC8VM1, Struck), and so on. A feedback control function was implemented onto an FPGA firmware on the AMC module and sequence control and data acquisition are running on the CPU module with the Message And Database Oriented Control Architecture (MADOCA) control framework used at SPring-8. The prototype was installed into the high power rf test stand at the SPring-8 storage ring and the basic performance has been evaluated. We are developing a new digitizer AMC having high-speed (370 MSPS and 700 MHz bandwidth) and high-precision (16 bits) ADCs for an under-sampling rf detection scheme and it is concurrent with the test of commercial digitizers and down-converters. After the performance test of the new digitizer, the new LLRF system with the under-sampling scheme will be installed to one of the four rf stations of the storage ring next year. In addition to the LLRF system, we are developing other MTCA.4-based systems, such as a beam position monitor system and the timing synchronization system between the SACLA linac and the SPring-8 storage ring.

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