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Detector Control System for CBM-TOF

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For charged hadron identification, a high-performance time-of-flight (TOF) RPC wall is being built for the Compressed Baryonic Matter (CBM) experiment at FAIR. The Detector Control System(DCS) for CBM-TOF is designed based on the Experimental Physics and Industrial Control System(EPICS).

Instruments including high voltage power supply, low voltage power supply distributor and gas control system are controlled and monitored in the mini-CBM at GSI. For monitoring environmental parameters such as pressure and temperature, a demonstration application was also implemented in EPICS.

Among the environmental parameters, especially the temperature in the detector is a very important reference to judge whether the detector is behaving properly. Considering the radiation environment, a sensor in the detector is controlled by GBT-SCA, which is a radiation tolerant ASIC for detector control and monitoring applications developed by CERN. Slow control information is being transferred to a FPGA, and a IPbus slave for GBT-SCA in the FPGA firmware will communicate with the EPICS I/O Controller(IOC). GPIOs interface of GBT-SCA is used for switching the clock between GBTx recovered clock and an external 160MHz clock (copper distributed clock) and for monitoring low voltage power of the Front-End Electronics(FEE).

In addition, an archive system for slow control data analysis and an alarm system is built. There is an exception handling system addressing the problem when some fatal errors happen, for example, the sudden loss of gas or low voltage.

During the beam time in mCBM, March 2019, GSI, this control system has proved to be usable and stable. Part of the DCS for CBM-TOF, the low voltage distributor and the GBT-SCA controlling will be adopted in the eTOF of the STAR experiment at RHIC/BNL during the beam energy scan campaign planned for 2019/2020.

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