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MTCA.4 Applications for Accelerators: Machine Protection System and Photon Beam Stabilization Exploiting DAMC-FMC25

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This contribution aims to show how MTCA.4 is used for the development of accelerator systems for diagnostics and photon beam stabilization exploiting the DAMC-FMC25 AMC carrier board features.

We present the system architecture, the final application and some preliminary results regarding a Machine Protection System (MPS) and an Electron Beam Stabilization System (PBSS) in research facilities.

The MPS is composed by a third-party control board that communicates with multiple AMC-PICO-8 8-channel picoammeters developed by CAEN ELS. The AMC-PICO-8 stores acquired data buffer up to 1 Msps, generates a MPS signal upon specific over-threshold conditions and stops the acquisition after a post-mortem signal.

The PBSS elaborates the information received from a position detector via the FMC-PICO-1M4 picoammeter front-end, performs the feedback controller computations (IIR filter) and sends the correction signals directly to the FAST-PS power supplies equipped with fast low-latency SFP interfaces.

The communications with backplane (PCIe) and FMC modules (SPI) and all the high demanding computations are handled by the FPGA available on the DAMC-FMC25.

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