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System-on-Chip based magnet control in a MicroTCA system

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This poster presents a master's thesis which outlines a concept for the migration of the DESY II magnet control from the VMEbus standard to the MicroTCA standard. A special focus is placed on meeting the real-time requirements, which were achieved in the VME system by using the real-time operating system VxWorks.
The central concept is the system-on-chip (SoC) approach, whereby the control loops of all six magnet circuits, which were executed on the central CPU in the VME system, are now outsourced to individual Zynq7000 SoCs. Thereby the workload for a single processor is significantly reduced. Real-time critical tasks are executed on the SoC, such as counting trigger and pulse signals from the current measurement on the Programmable Logic (PL) and calculations and control algorithms on the Processing System (PS). PL-PS interrupts and the AXI4-Lite protocol are used for data communication between these two components. The CPU module of the MicroTCA crate implements the control system server. For the communication between the CPU and the SoC-AMC modules, PCIe on the AMC backplane is used.
The SoC approach meets the real-time requirement of the old system. The results of this project provide a concept for using the MicroTCA standard in the DESY II magnet control.

Summary

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