

Project Note

Reliable firmware for Swiss Light Source SLS

The firmware for receiving data for an electron-beam positioning system was unstable. Zühlke analysed the problem and developed an FPGA architecture, which was modularly implemented and then tested on the hardware platform.

Task

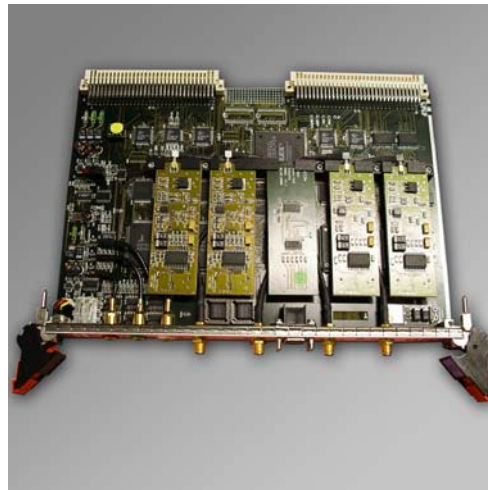
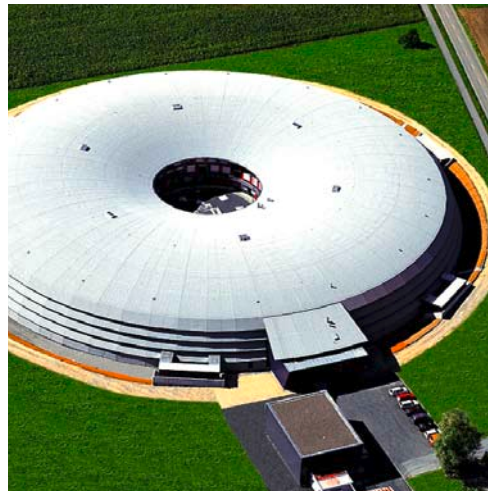
The quad digital receiver (QDR) is a key component in the digital monitoring system for beam positioning in Swiss Light Source. The available data and control structures were unreliable. As a result, system faults and hardware failures were not adequately identified. The revised firmware was supposed to improve the robustness and the reliability of the entire system.

Implementation

Analysis: The weaknesses of the firmware were detected in simulations of the AHDL design for the quad digital receiver. Based on this analysis, the Zühlke engineers drew up a detailed product specification for reorganising the firmware implementation.

Architecture: Zühlke applied the findings of the analysis to develop a completely new firmware architecture. The individual units were modularly structured, ensuring the decoupling of the time-critical interfaces. The system satisfied the critical internal and external timing requirements. Two Altera FPGAs formed the interface between the RF front-end and the DSP module. In this system, the control FPGA configured and monitored the main units of the quad digital receiver such as the digital down converter, FIFO buffers and VME controller. It handled system configuration while also controlling defined data flows and monitoring system status. The link FPGA served as the interface to the SHARC-DSP.

Implementation and testing: Zühlke implemented the new firmware in modules and checked the simulation results at every stage. A smooth start-up on the Swiss Light Source hardware platform was guaranteed.



Technical Data

Altera FPGA

VHDL Designflow

Quartus II
Development Kit

Customer benefits

- The impartial and objective review quickly revealed the problems in the legacy FPGA implementation.
- The customer profited from proceeding in accordance with the Zühlke product development process. It obtained clear-cut system specifications and robust, platform-portable firmware that was easy to maintain.
- Using the specified simulation environment, Zühlke was able to validate the new firmware fully and then implement it efficiently and successfully.

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