

Development of an Open-Source Synchronous Multi-Axis Motion Controller Solution for Large-Scale Experimental Physics Projects

Thursday 7 December 2023 11:00 (15 minutes)

Synchronous multi-axis motion control systems that can be integrated with diagnostic and data acquisition subsystems are integral parts of large experimental physics projects. To meet these specific requirements, DESY has developed an open-source solution based on the DAMC-MOTCTRL board. This solution is tailored for use in projects such as PETRA IV and offers the possibility to synchronously control up to 48 stepper motors with a single AMC board. Users can interact with this system through established control systems such as DOOCS, EPICS, and TANGO, or through a direct ASCII interface.

The central role of the multi-axis motion controller of driving and monitoring the stepper motors and responding to time-critical events is performed by the FPGA firmware. It is developed within the open-source framework FWK and validated using the Universal VHDL Verification Methodology (UVVM).

Building on this firmware, a C++ application, utilizing the ChimeraTK framework, takes on the task of orchestrating the motion and serving as the interface to external control systems. Leveraging ChimeraTK provides the flexibility to later on either run this application on the ARM cores within the MPSoC or externally on the AMC board via PCIe links.

This presentation will give a general overview of the hardware, firmware, and software components that make up this solution and provide information on the current status of the alpha phase for the PETRA IV beam lines.

Primary author: RANDALL, Michael (MSK (Strahlkontrollen))

Co-authors: GUERMES, Cagil (MSK (Strahlkontrollen)); FENNER, Michael (MSK (Strahlkontrollen)); KILLENBERG, Martin (MSK (Strahlkontrollen)); GEORG, Jens (MSK (Strahlkontrollen)); HUESMANN, Patrick (MSK (Strahlkontrollen)); CHYSTIAKOV, Stanislav (MSK (Strahlkontrollen)); KRACHT, Thorsten (FS-EC (Experimente Control)); TOLKIEHN, Martin (FS-PETRA-D (FS-PET-D Fachgruppe P24 (Chem.Cryst.)))

Presenter: RANDALL, Michael (MSK (Strahlkontrollen))

Session Classification: Session VIII