Potential applications of MTCA at synchrotron beamlines

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Introduction

- Possible applications of MTCA
- A MTCA based motion controller
- Gamma spectroscopy with the SIS8300KU



P24 under construction (in early 2017)





Four circle diffractometer in EH2





Ionisation chamber readout



FMB Oxford AHQ1855

- Beam position monitor
- needs HV
- provides 2 current signals (nA range)



Keithley 427 (or similar)

- old, expensive
- needs additional hardware (HV supply, ADC)



Ionisation chamber readout



FMB Oxford AHQ1855

- Beam position monitor
- needs HV
- provides 2 current signals (nA range)





HV-PANDA

- 4 channel HV source
- easy to use, python based GUI

PICO-8 8 channel 1MSPS, 20bit

- MSK firmware framework
- Newer version with ZYNC UltraScale+ EPGA

Scintillation detector readout



e.g. CeBr₃ detector

- Single photon counting
- needs HV
- provides pulses



SIS8800 multi channel scaler

- 16 channels on front panel
- 16 channels via RTM (discriminator RTM)
- Synchronization with other devices via MLVDS
- BSP from Struck



New motion controller

MTCA.4 based motion controller for 16 axes:



DESY-ITT funded project in collaboration with MSK, open source firmware based on FWK (N. Radakovic, M. Fenner, M. Randall, C. Gümüs et al.)



Continuous scans



- Motor steps are used for synchronization
- Enable and Trigger signals are distributed via MLVDS
- Synchronization with other devices is possible (e.g. LAMBDA, ...)
- Will be supported by spec (flyscan)



New motion controller — test at P24







Motors can be moved from spec, first user experiment planned for 2024...



New motion controller — test at P24





Motors can be moved from spec, first user experiment planned for 2024...



The Struck SIS8300-KU digitizer



- MTCA.4 based
- 10 Channels 125MS/s
- 4x PCEe Gen3
- XCKU040-1FFVA1156C Kintex Ultrascale FPGA
- 2GByte DDR4 Memory



Energy dispersive X-ray detectors





Energy dispersive X-ray detectors



PhD thesis Sarmad Adeel



The Gamma firmware



Based on the DESY-MSK firmware framework.



Simple trapezoidal shaping





Simple trapezoidal shaping - Results





Other shaping methods

