Application of MTCA at photon science experiments at PETRA

Martin Tolkiehn

Deutsches Elektronen-Synchrotron
Ein Forschungszentrum der Helmholtz-Gemeinschaft

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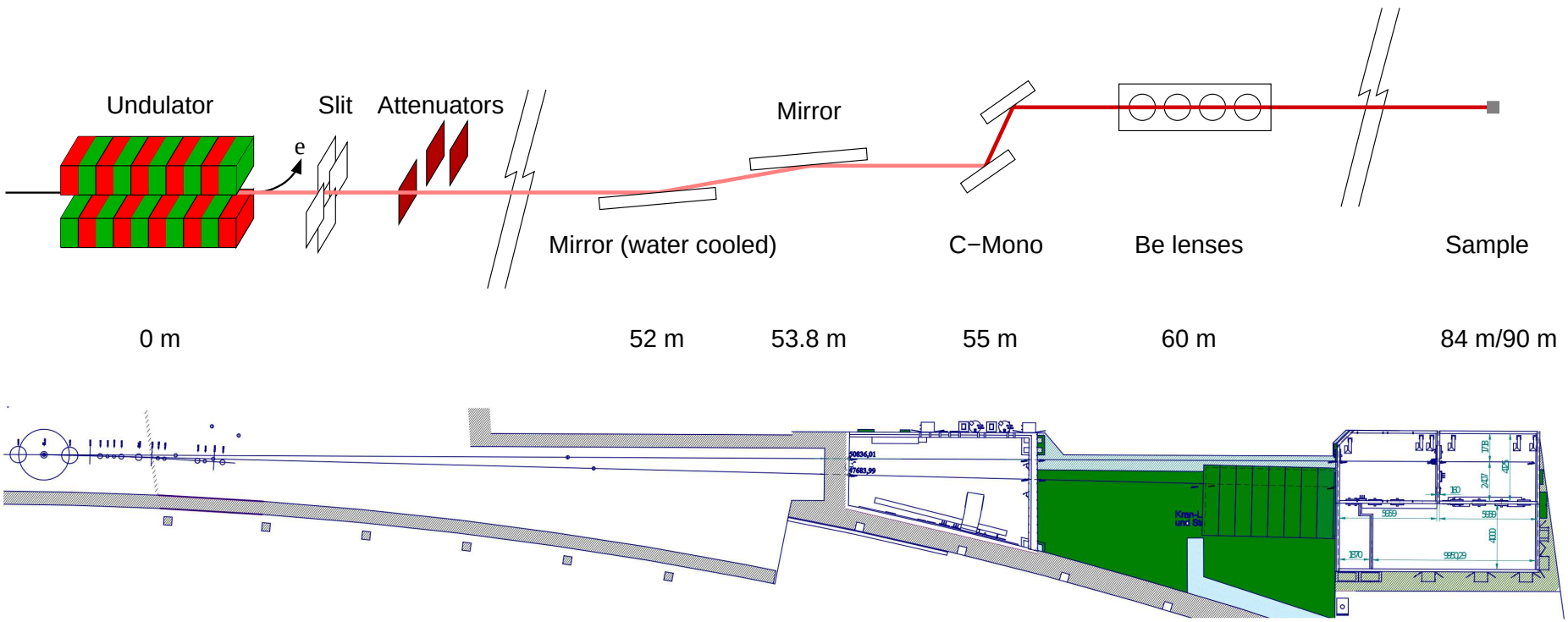
Outline

- Introduction
- Beam position monitoring
- Data acquisition for point detectors
- Motor controller

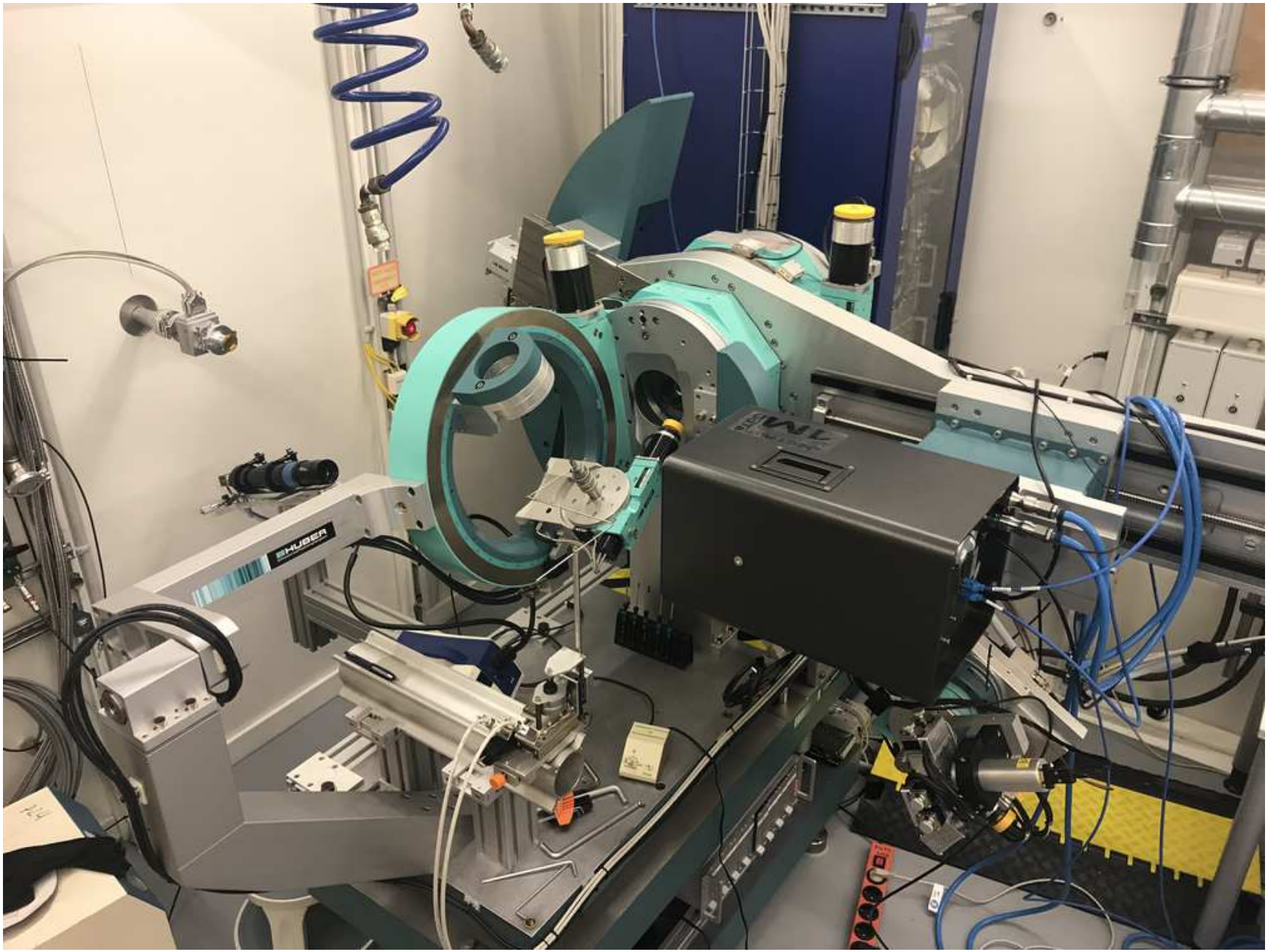
Beamline P24

- Chemical crystallography beamline, PETRA extension
- 2 Experimental stations at 84m and 90m
- Optical elements at 55 $\pm$ 5m

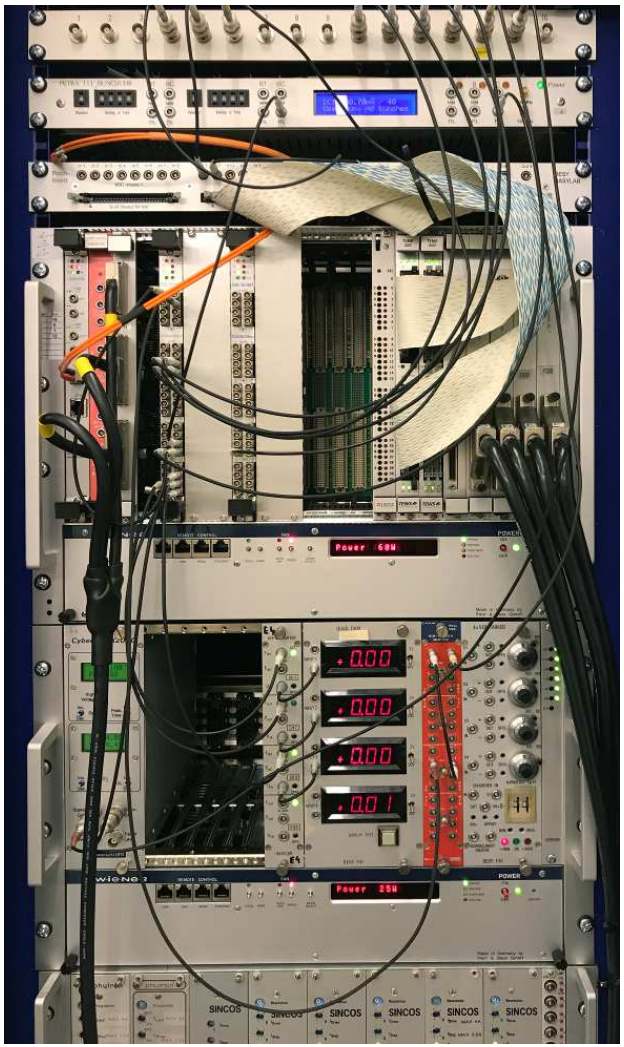


P24 under construction (in early 2017)

Four circle diffractometer in EH2



Control and data acquisition electronics



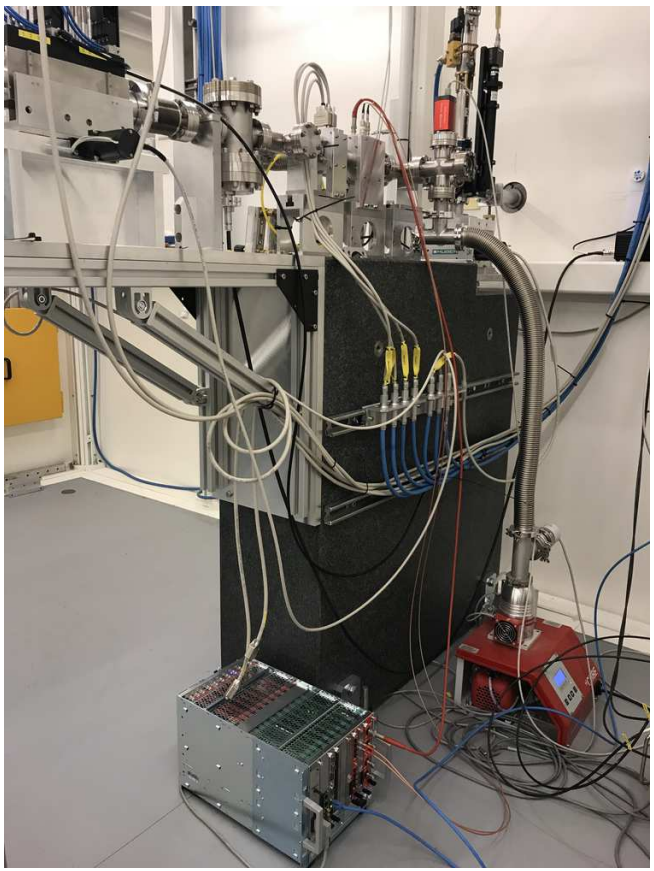
Mostly standard devices (VME or NIM):
Counter, Timer, GPIO, ADC, DAC,
HV supplies, filter amplifiers,
discriminators. . .
Lots of motor controllers!

Current amplifiers:

Most of this can be replaced by MTCA!

Beam position monitor

Old Keithley electronics and NIM HV supply has been replaced by CAENels PICO-8 and HV-Panda:

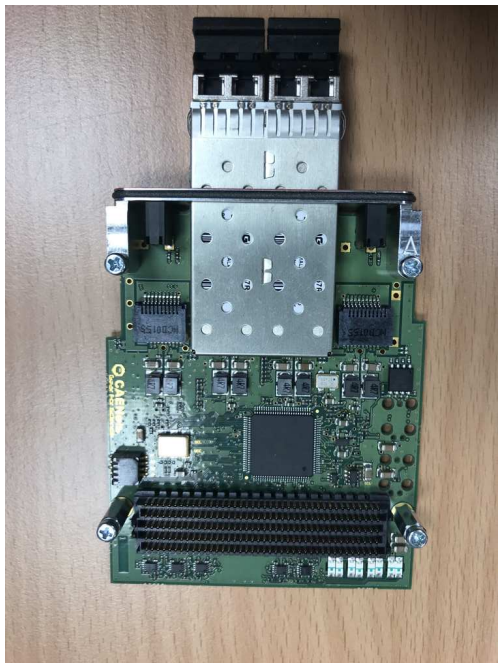


Advantage: HV supply and current amplifier in the same crate

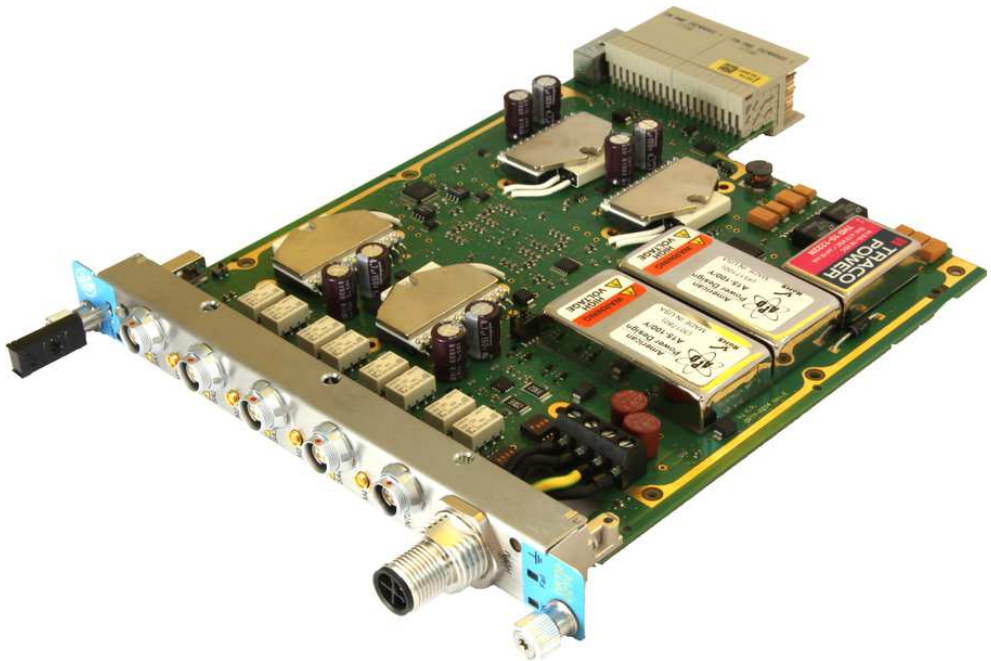
Outlook: One Pico-1M4 FMC can be replaced by a SFP/SFP+ FMC

Piezo control for monochromator stabilisation

Beam position will be send from PICO-8 to piezo controller via optical fiber:



CAENels FMC-2SFP+

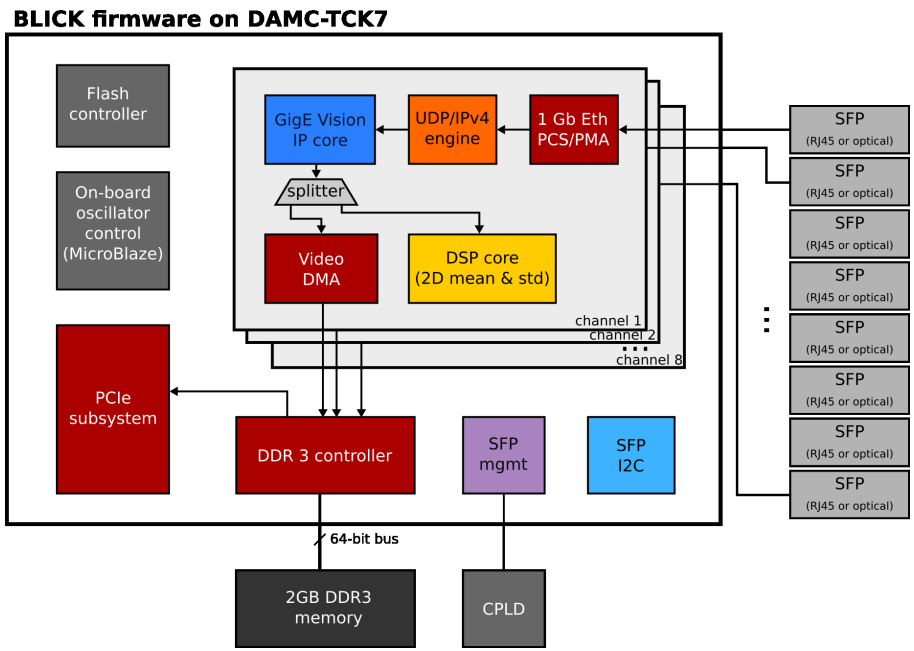


DRTM-PZT4

Position correction will be done by fine tuning the monochromator angle with a piezo.

NAT-AMC-TCK7

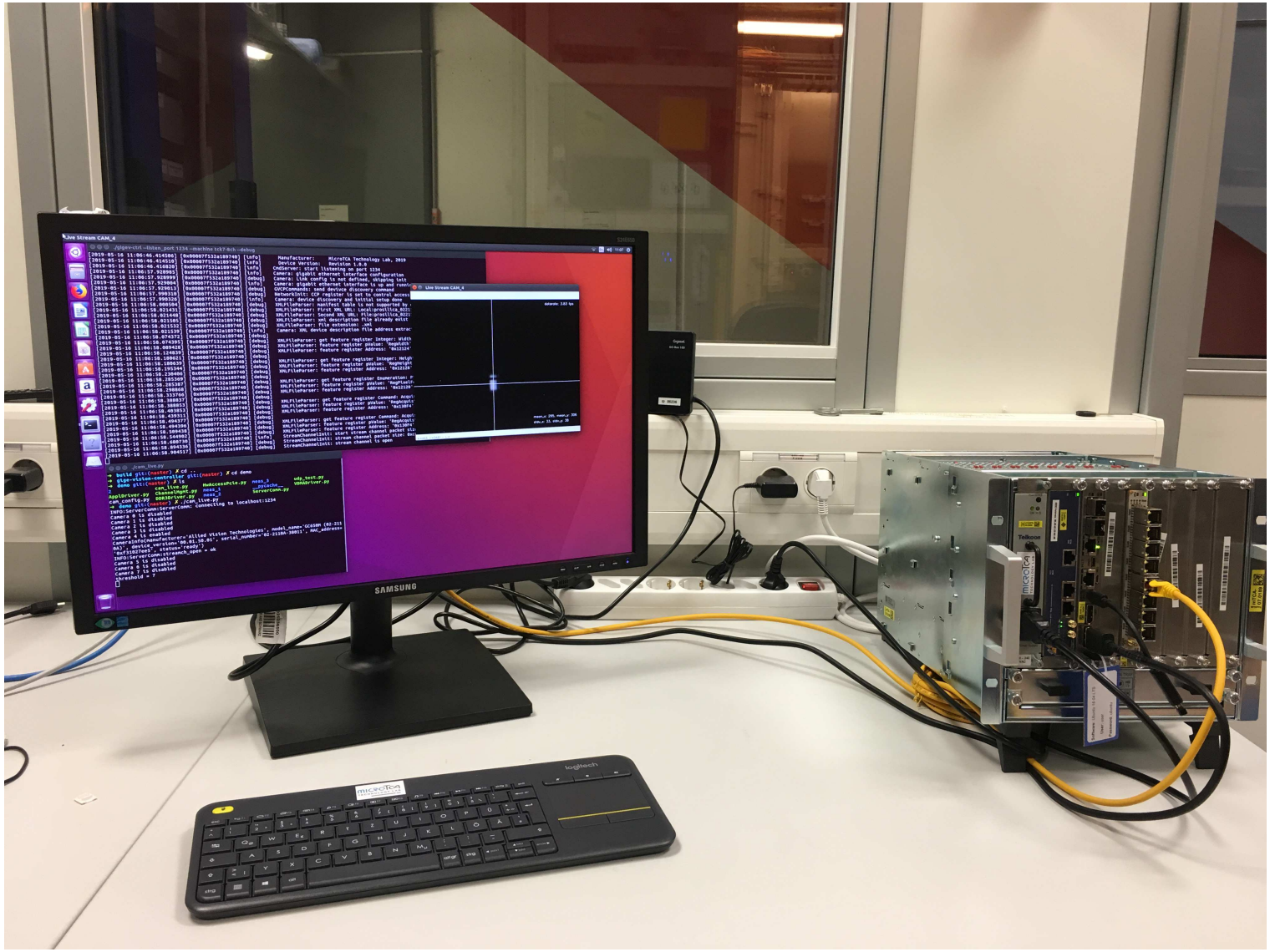
Data processing AMC with 8 SFP+ interfaces, Kintex 7 FPGA
Possible application: Camera readout + image processing



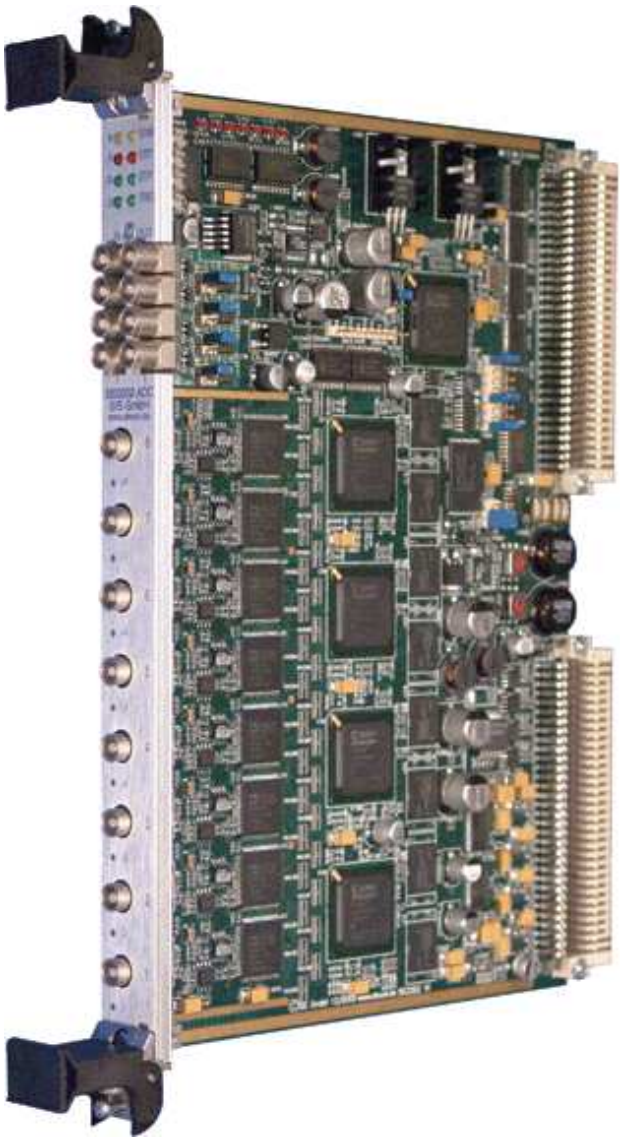
Developed by DESY MicroTCA Technology Lab, J. Marjanovic et al.

Beta Test of BLICK

First test of the ’BeamLine Instrumentation Camera Kit’ at P24

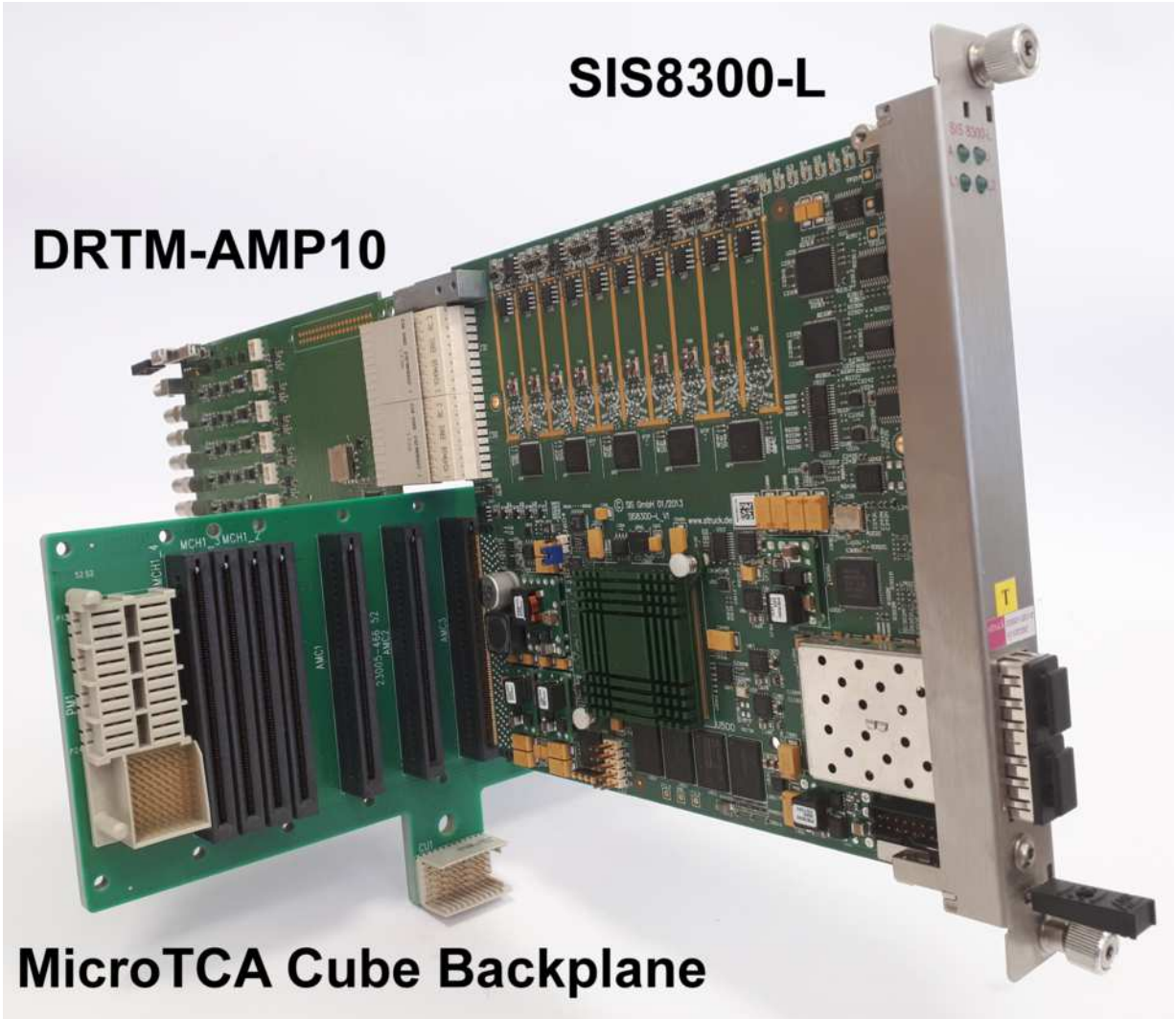


Struck SIS3302

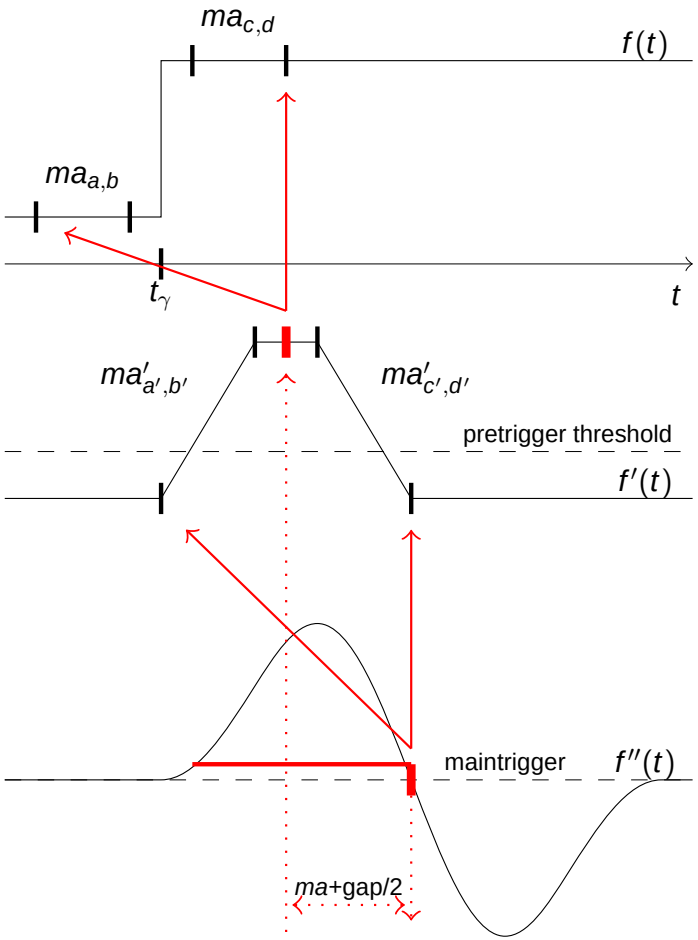


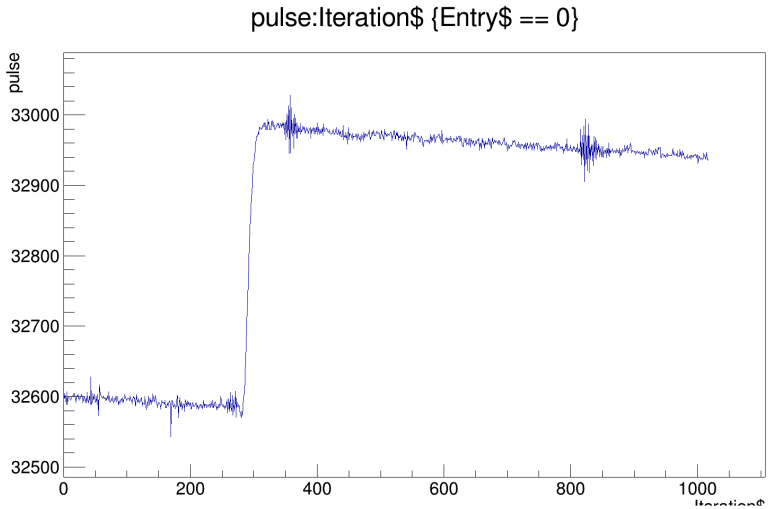
- VME module
- 4 or 8 channels, 16 bit 100MSPS
- General purpose ADC
- Spectroscopy firmware
  (energy dispersive detectors)
- Raw data histogramming
  (VFC replacement)
- Synchronization with other devices

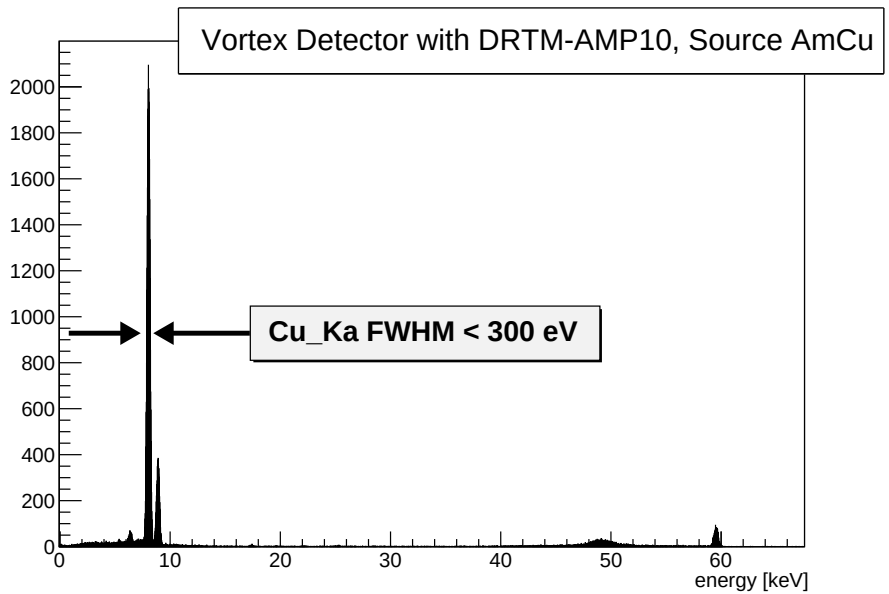
Struck SIS8300-L



Struck SIS8300 Gamma Firmware







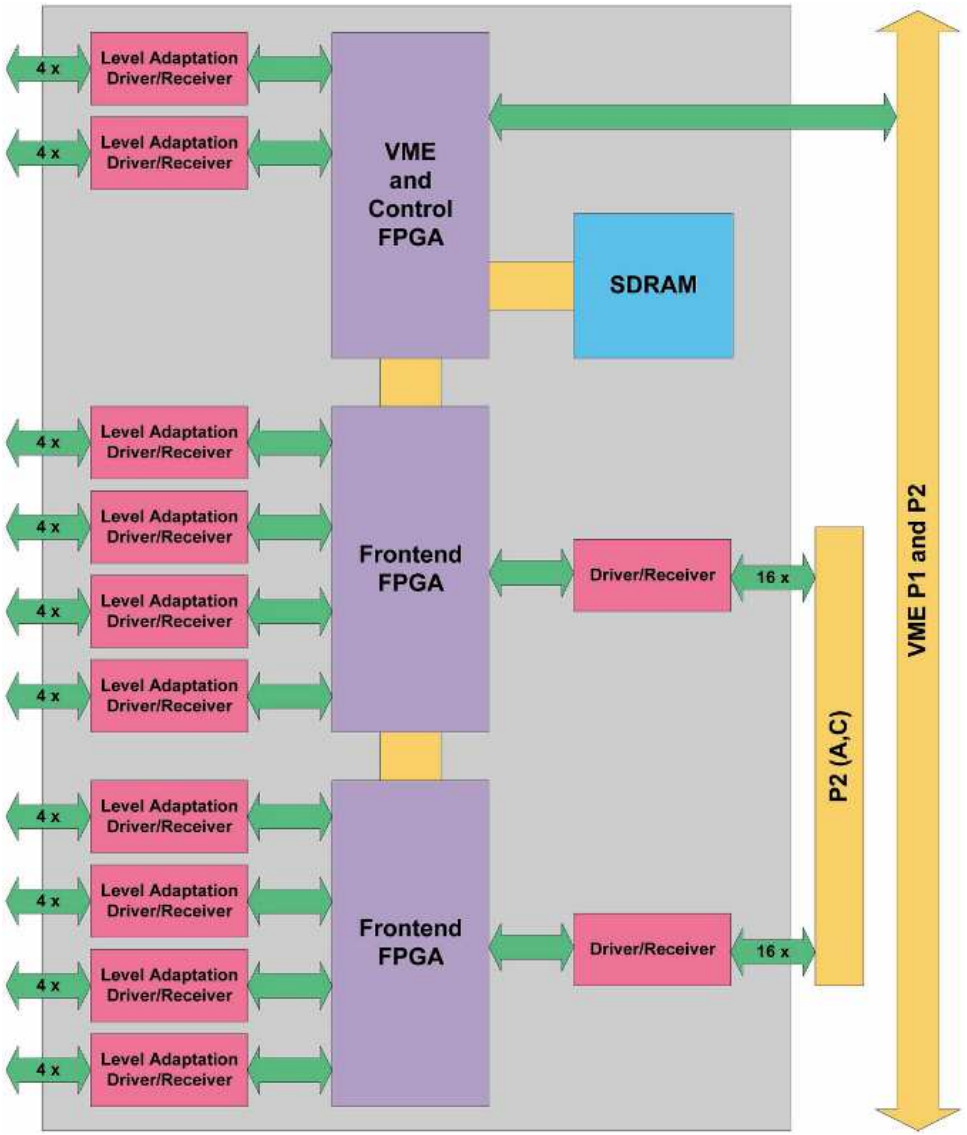
Developed in collaboration with DESY-MSK, J. Timm

Vadatech AMC 520

Similar specs as the Struck board

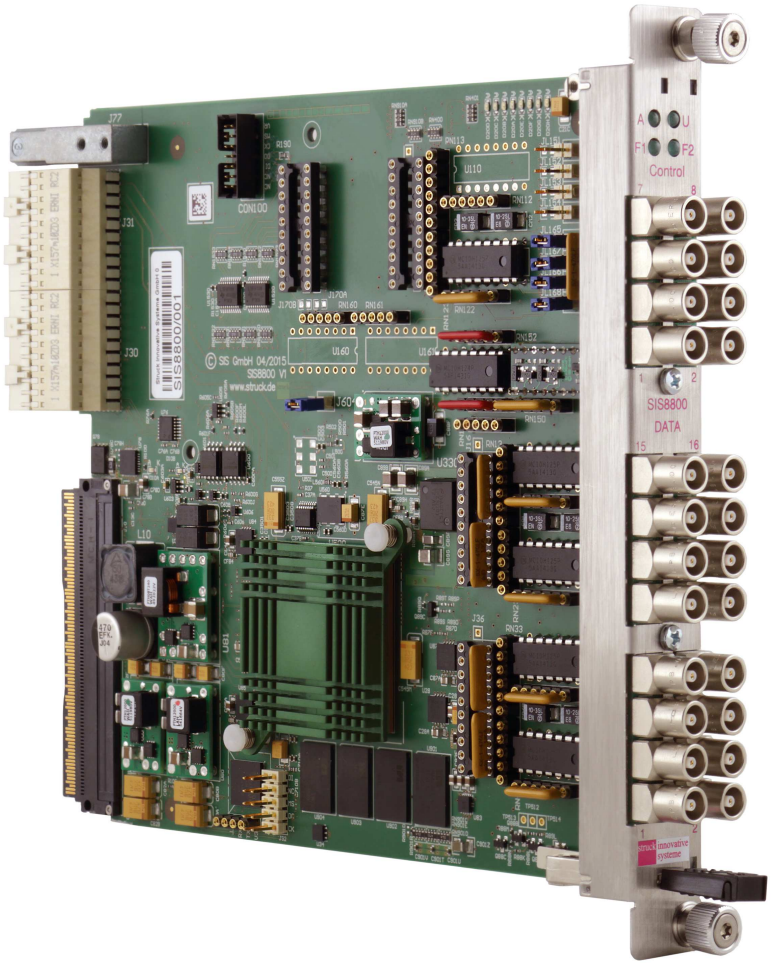
Counter: Struck SIS3820

- 32 channel, 32 bit counter
- Synchronization with motor controller:
  - Step signal
  - Quadrature encoder
- Sync. output for ADC
- Fast shutter control
- Continuous scans



Replacement: Struck SIS8800

- Similar features as SIS3820, but MTCA.4
- 16 channels on front panel
- 16 channels via RTM
- Synchronization with other devices via backplane?



Multi axis motor controller

OMS MAXv

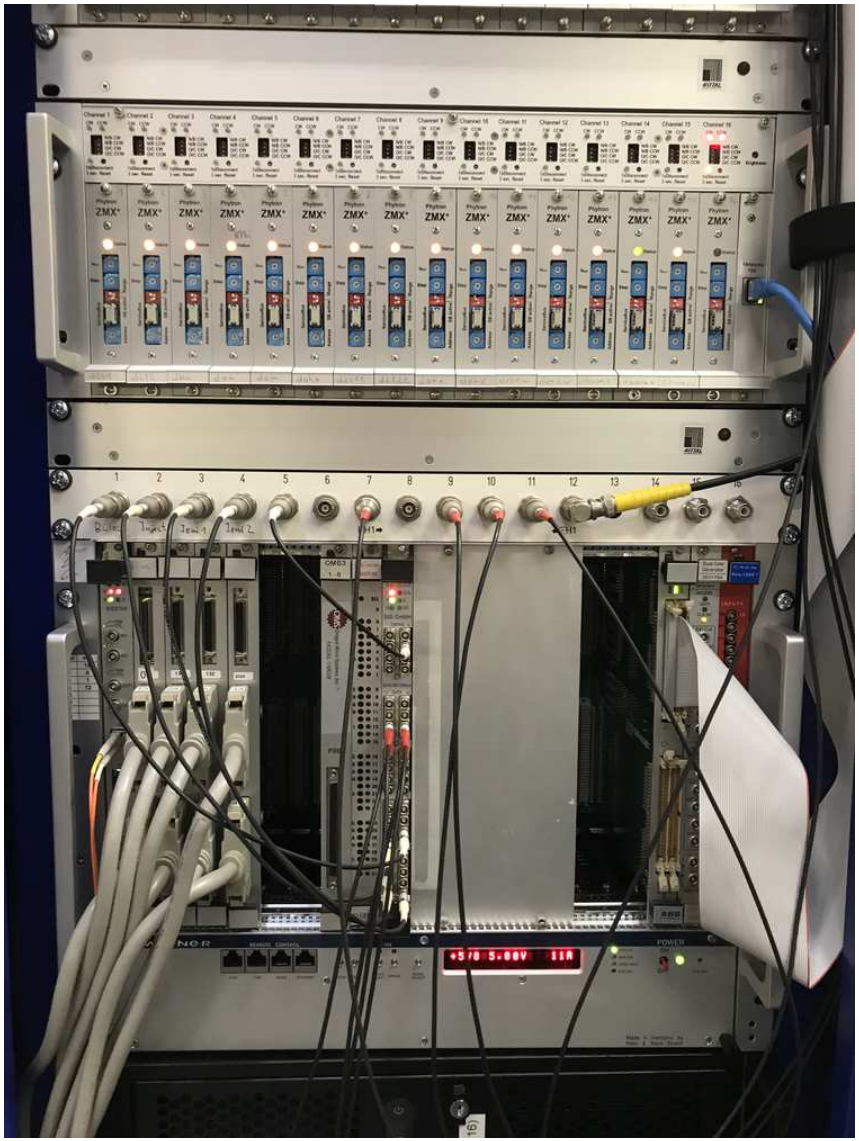
- 8 axis controller
- Stepper or servo motors
- Step/Direction output or analog output
- 10 encoder inputs,
- Limit and home switch inputs
- GPIO

No alternative for MTCA, yet!

Multi axis motor controller

OMS MAXv with Phytron ZMX:

- 2 MAXv for 1 Phytron crate
- 16 stepper motors with step/direction per crate
- only 8 encoders usable
- Limit switches
- No GPIO or home switches

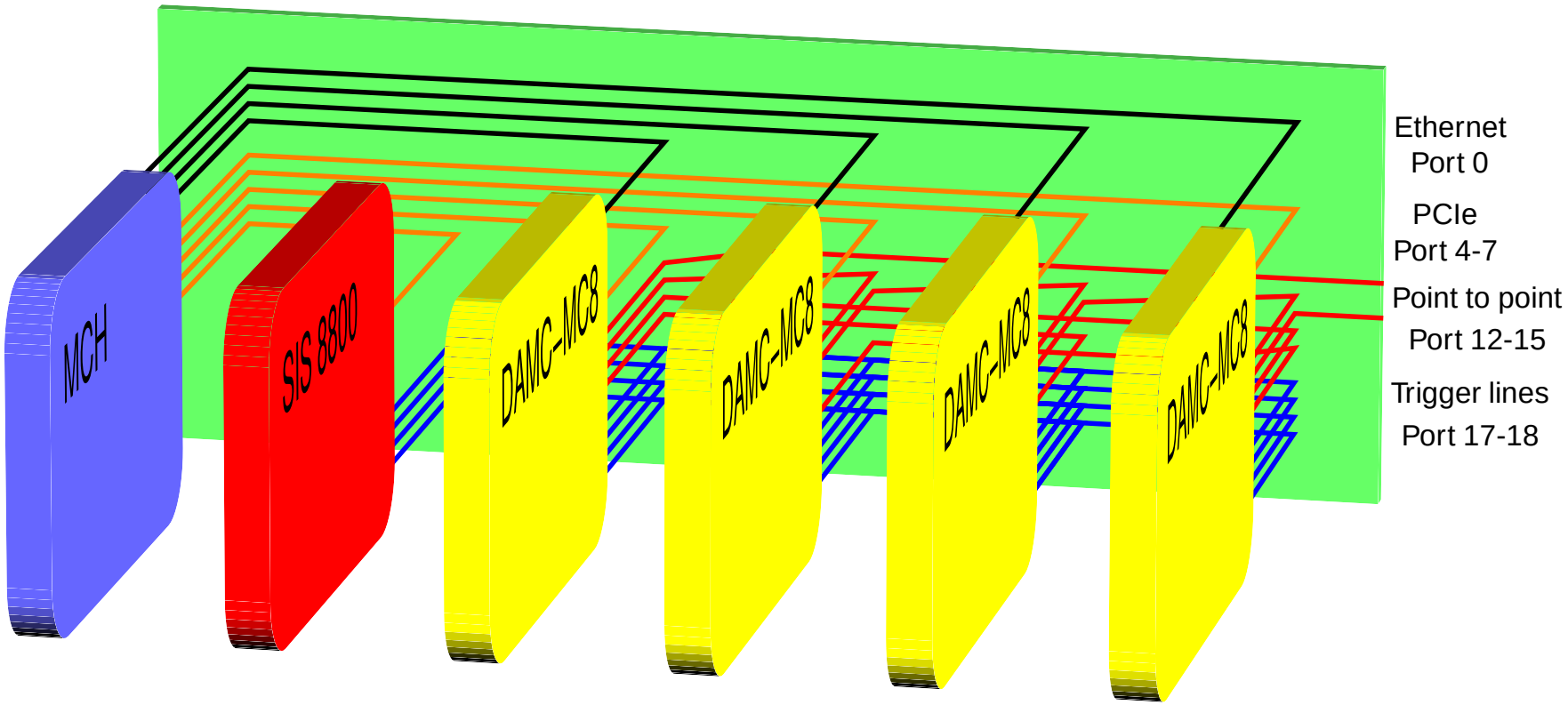


DAMC-MC8

Required features:

- Compatible with existing ZMX crates
- 8 step/direction outputs on front panel
- Limit switch and encoder inputs
- Synchronized moves
- Synchronization with data acquisition
- Continuous / on the fly scans

Synchronization



- Synchronization of many motor controllers will be possible
- Controllers can be in different crates (optical fiber)
- Continuous scans, synchronization with detectors

Encoder inputs

Encoder inputs could be on RTM

- Space for 8 encoder inputs
- Power supply for encoders
- Preprocessing of encoder signals
- Different RTMs are possible
- Incremental/absolute encoders
- Different interfaces
  (RS-422, BiSS C, . . .)

Encoder RTM for OMS MAXv

Conclusion

Old VME electronics can be replaced by MTCA:

- Different types of ADCs are available
- Photon counting
- Camera interface (new!)
- Motor controller is in development