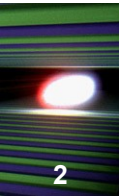


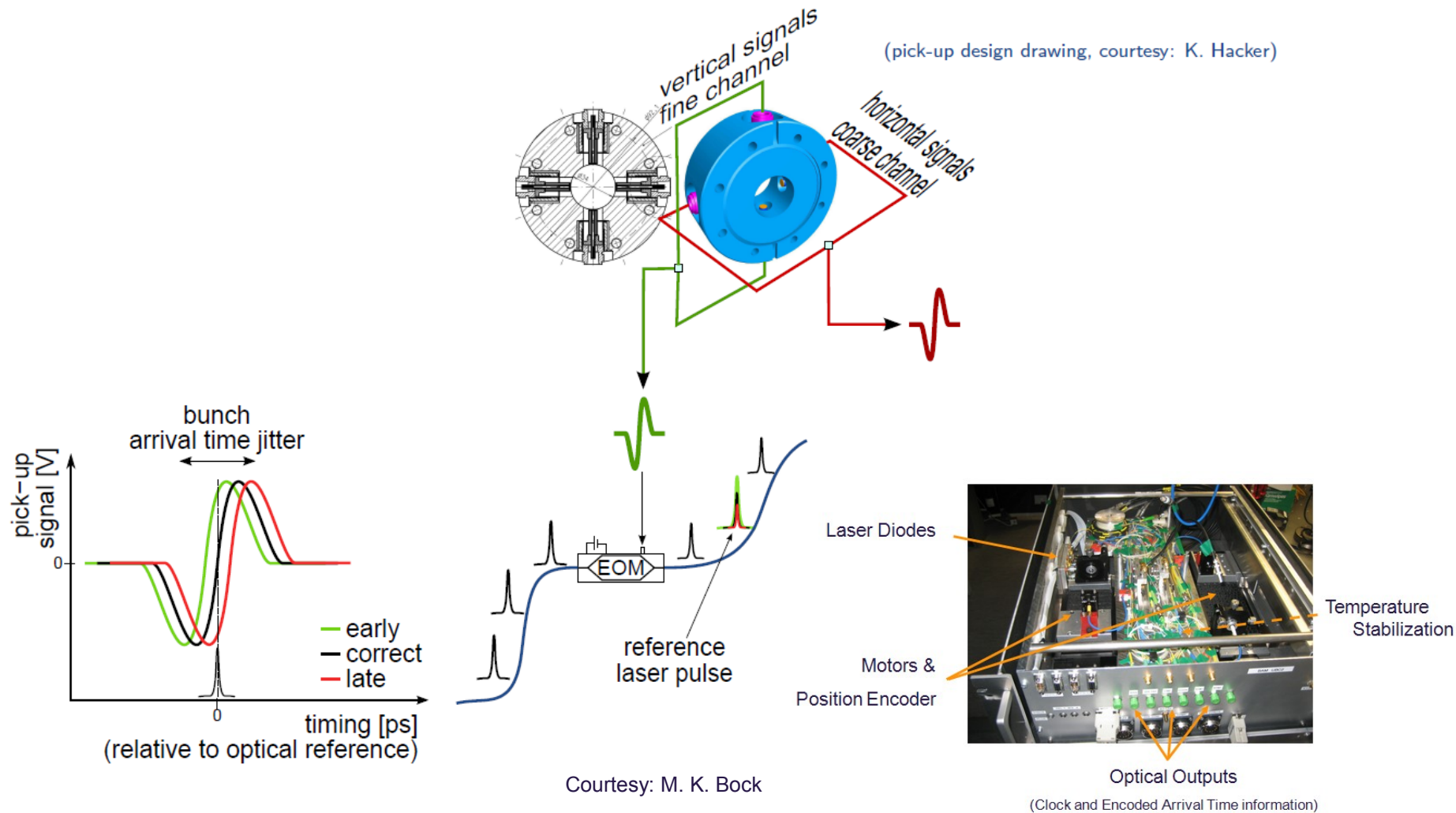
Bunch Arrival-Time Monitor Electronics & Software Developments

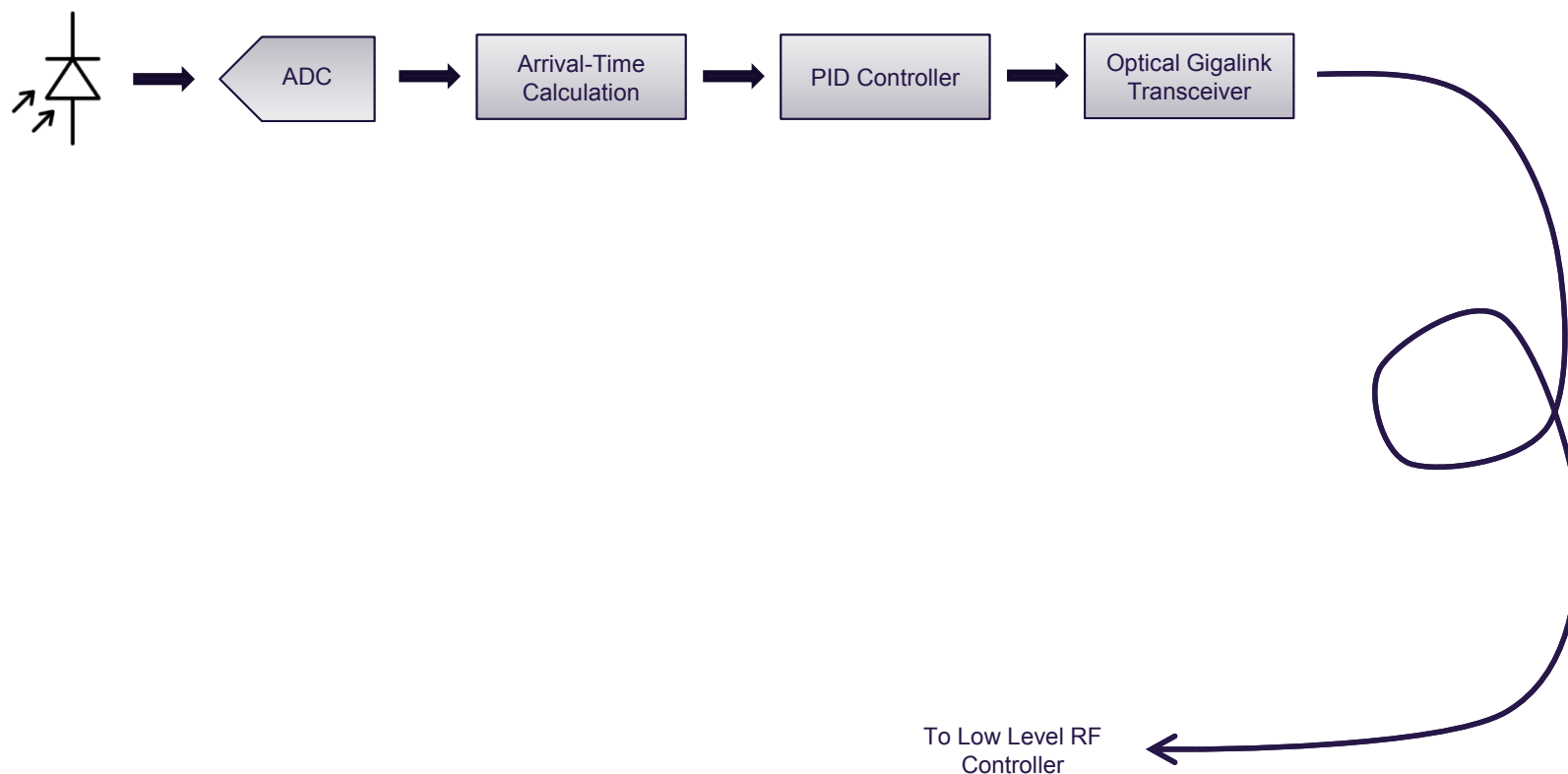
Patrick Gessler



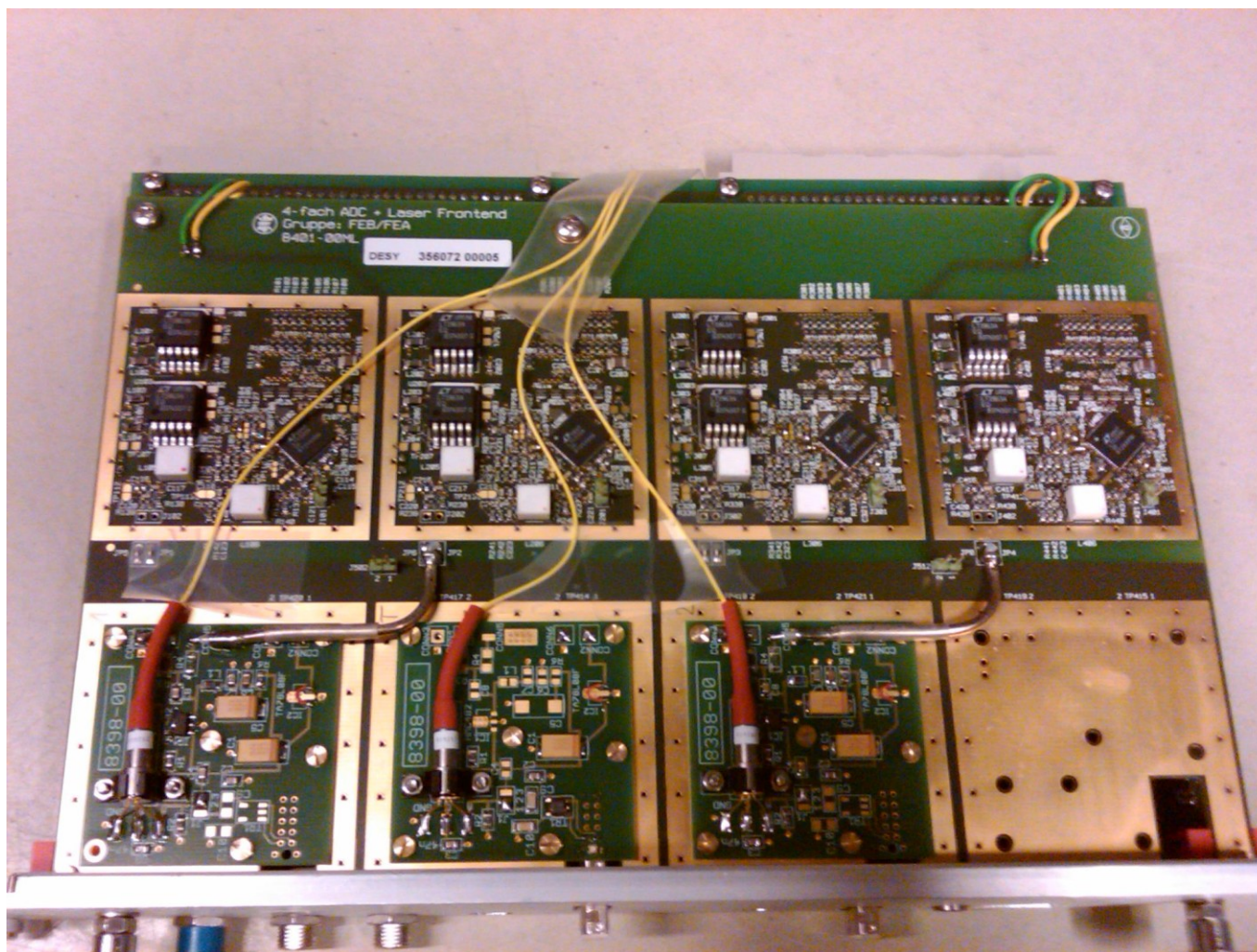
- From Bunch to Arrival-Time Feedback
- Current implementation
 - Hardware
 - Firmware
 - Software
- Functions to be added
- Next Generation developments

From Bunch to Arrival-Time Feedback (I)

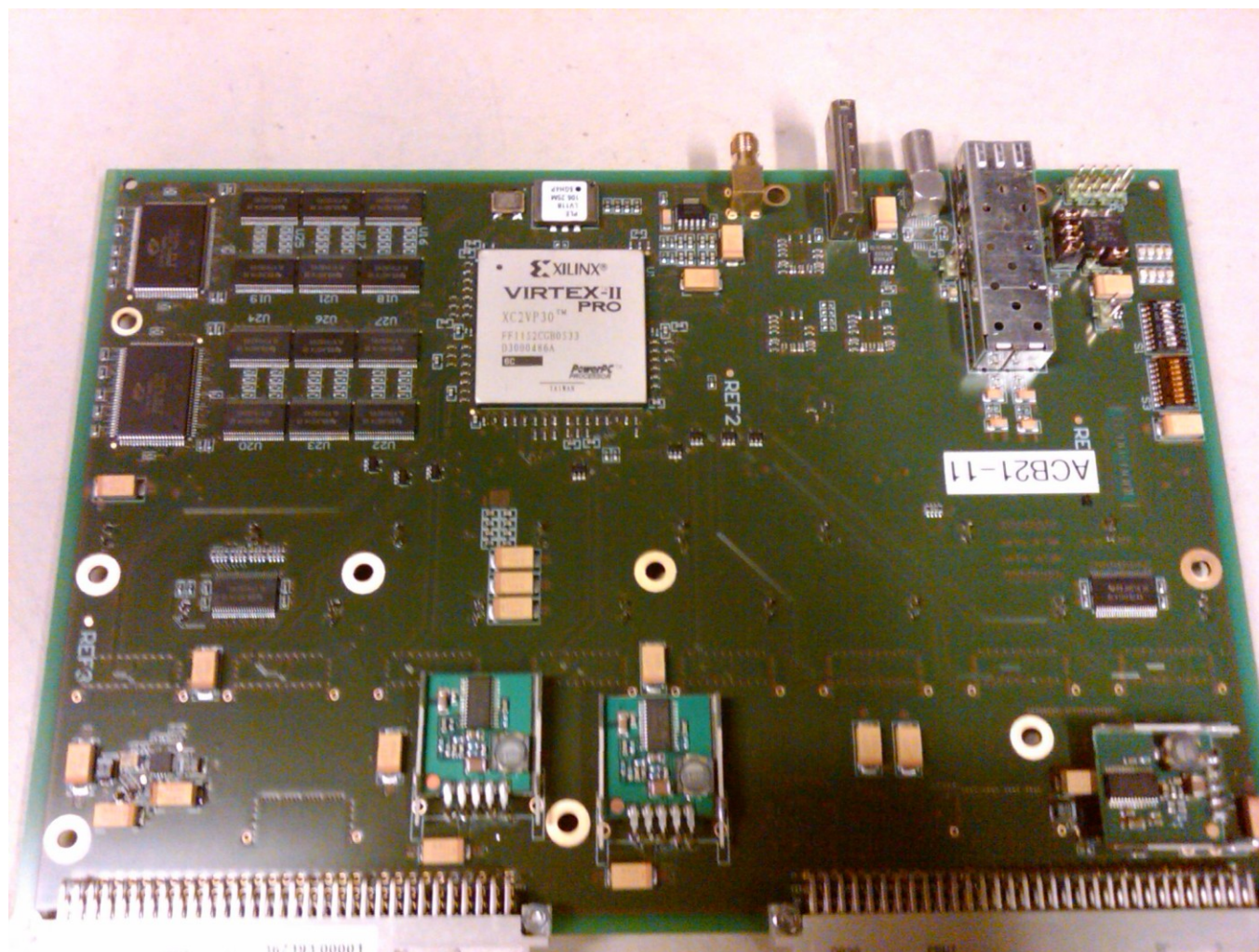
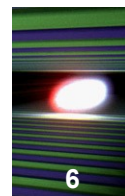


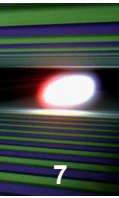


Current Hardware: ADC Board with Front-end



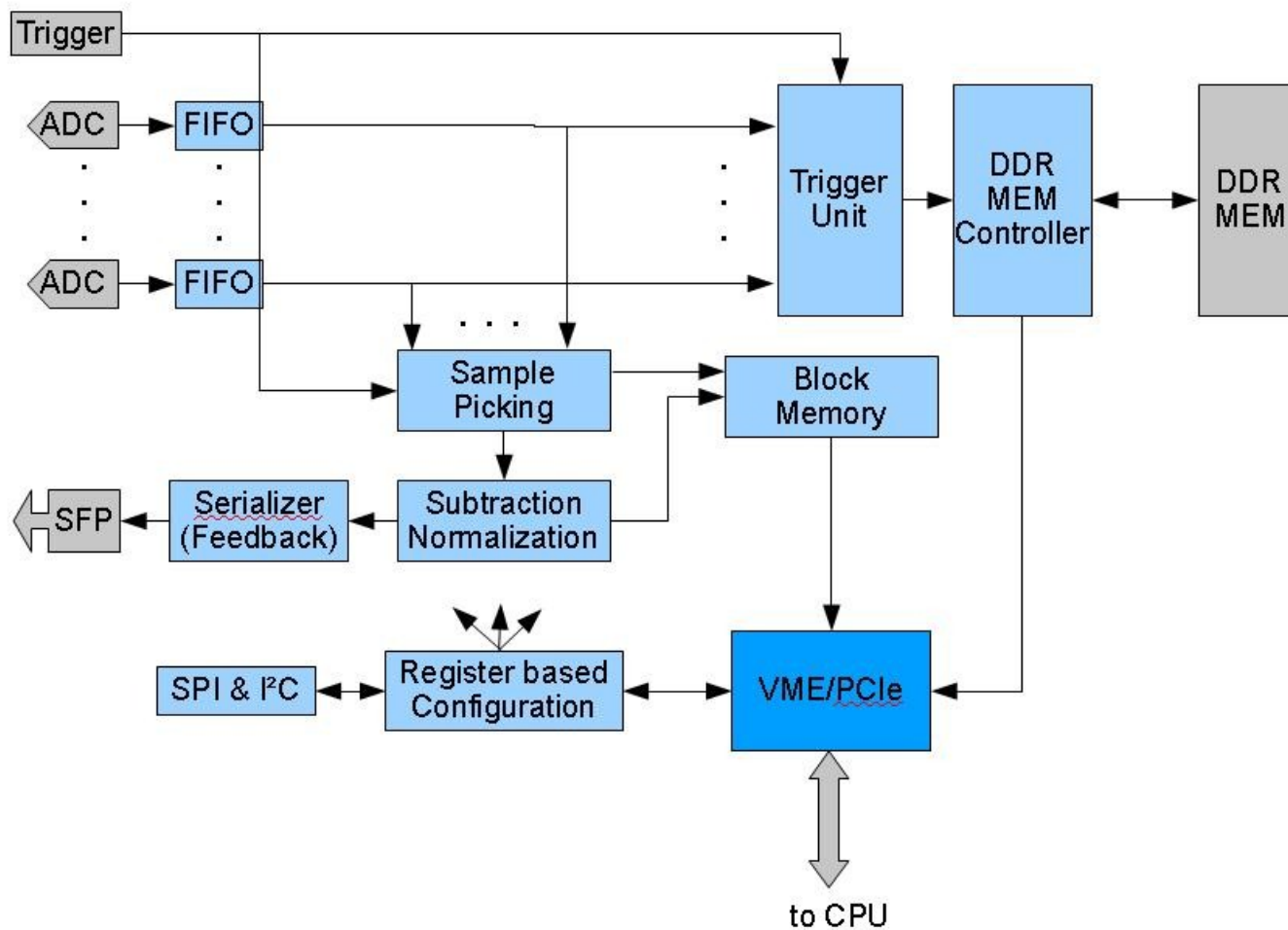
Digital VME Advanced Carrier Board (ACB2.1)

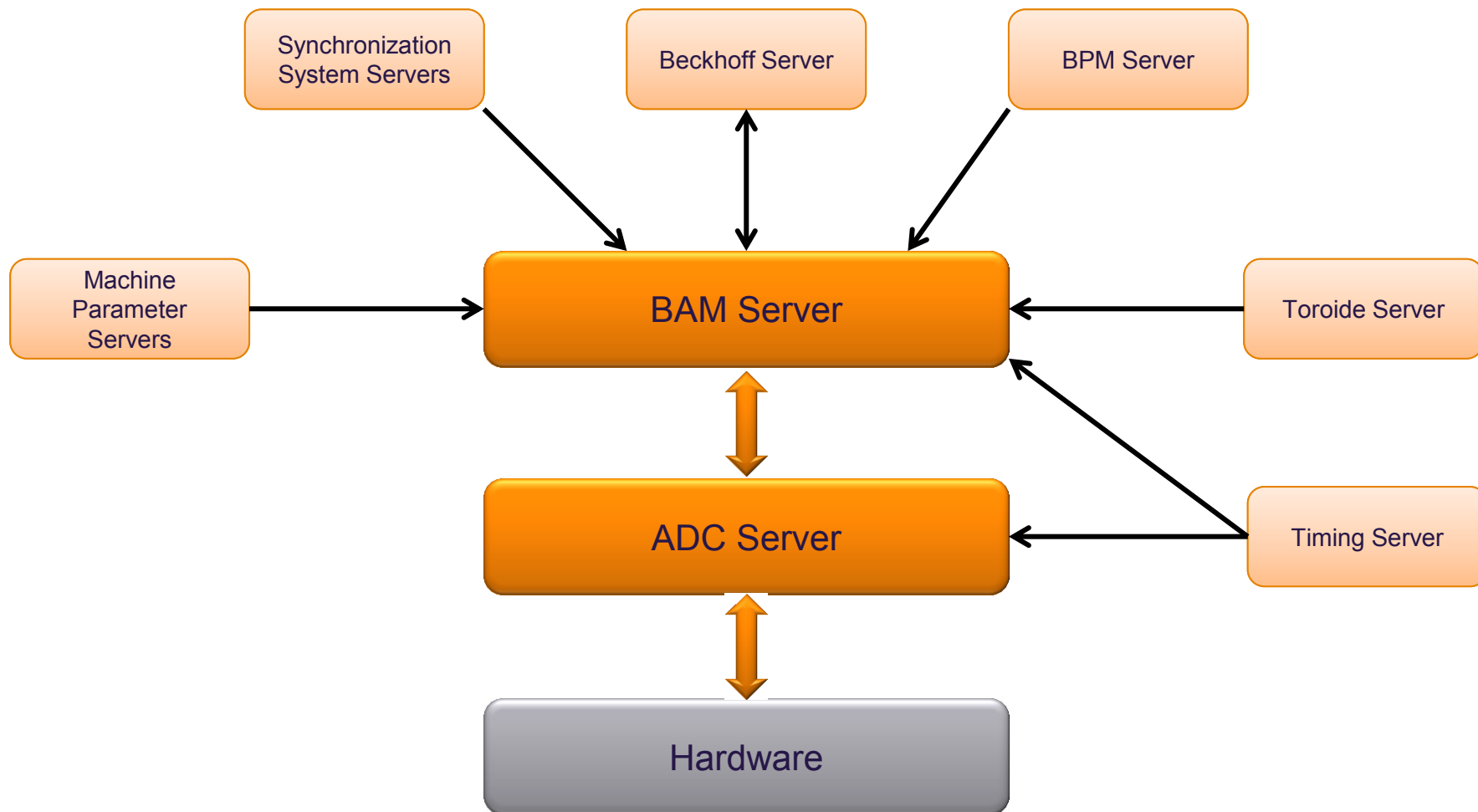


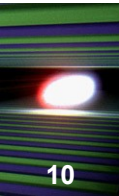


- Convert optical pulses to electrical ones
- „Generate“ a stable clock
- Sample the signals
- Calculate bunch arrival-times (at least values proportional to them)
- Implement PID controller and high-speed serial link for Fast Feedback
- Offers high speed/ DMA Transfer to CPU

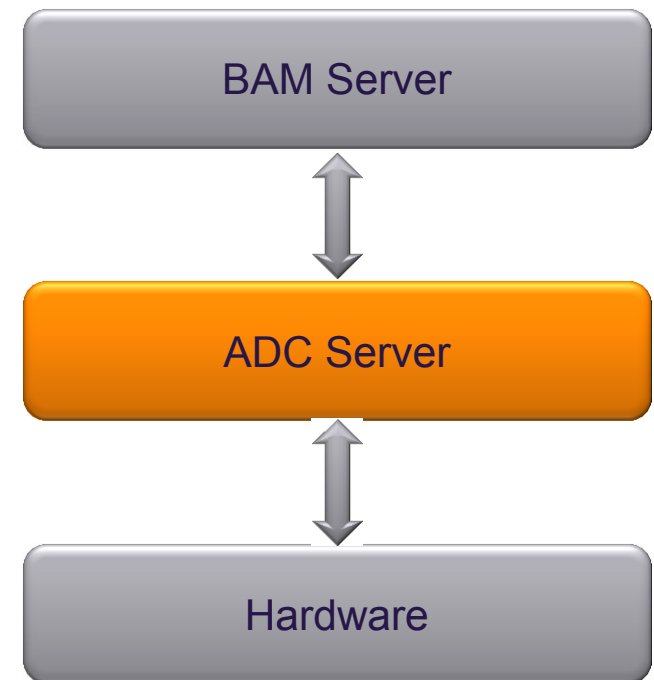
Simplified block diagram of Firmware



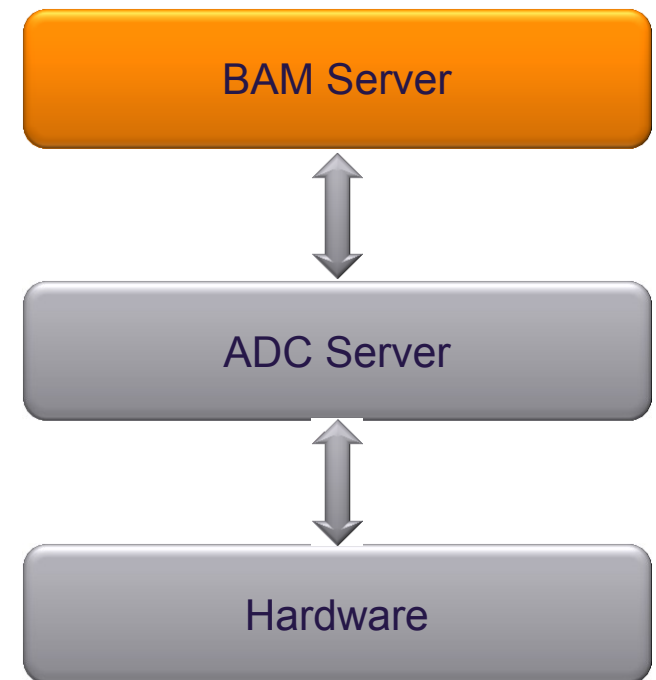


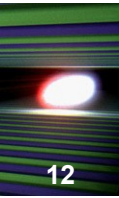


- Fast read out of data from hardware
- Synchronization of event number and data
- Configuration of hardware
- Sending data to DAQ

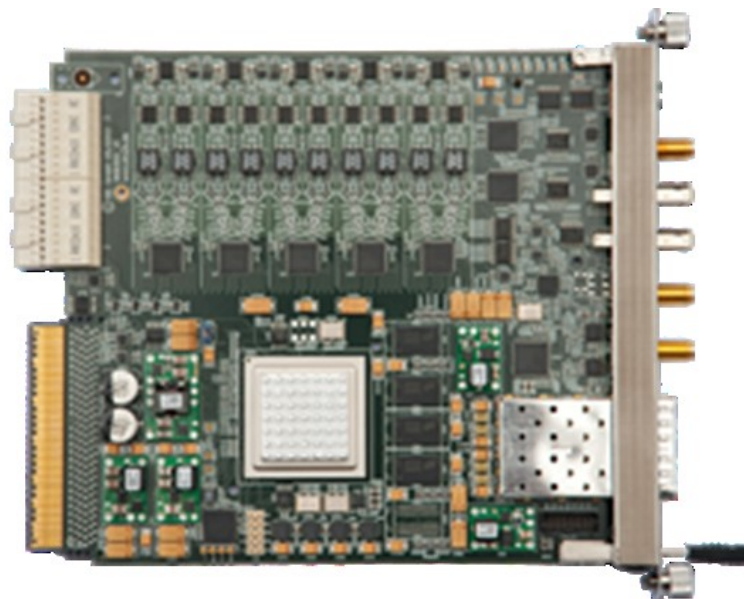
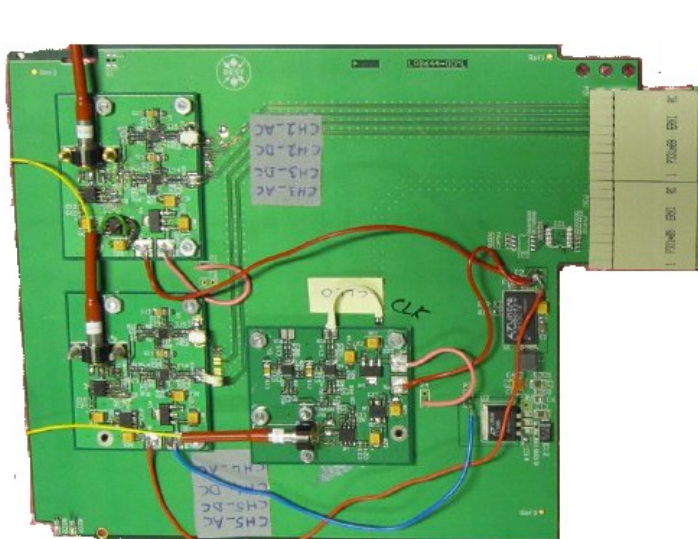


- Calculate
 - Bunch Arrival-Times
 - Jitter
 - Resoluion
- Calibration
- Adjustment of delay stages
- Requires data from
 - ADC/ACB Server
 - Toroids
 - BPM
 - Position encoder in frontend
 - Machine parameters



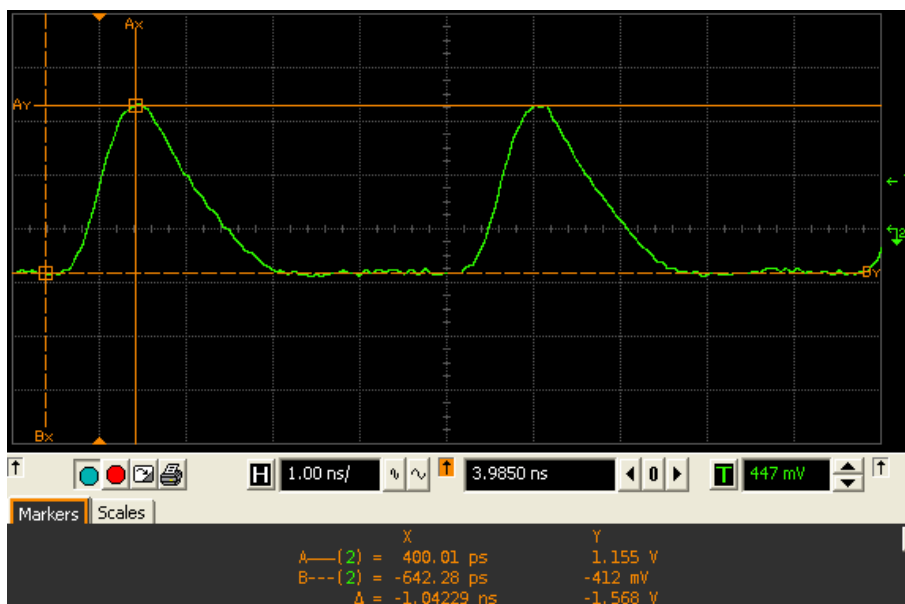
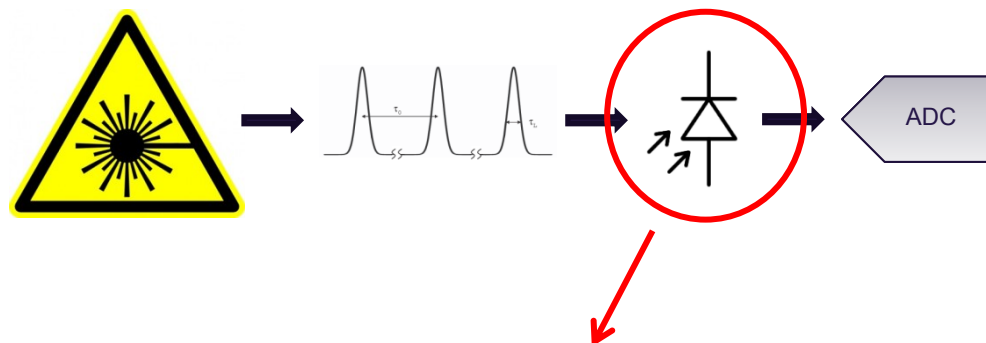


- Readout of motor position encoder in FPGA
 - Real time correction of motor movements
 - Calculation of absolute arrival-time in FPGA
- Control loop to optimize polarization → optical power
 - Optimize signal-to-noise ration at ADCs
- Remove reading / processing of duplicated data

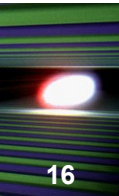


- Based on 10 CH, 125MSPS, 16Bit ADC Board from Struck (SIS8300)
- Includes powerful FPGA, high-speed serial ports
- Signal conversion, amplification and splitting on Rear Transition Module (RTM)

Critical aspect: Signal conversion and splitting



- 2 CH, 500MSPS ADCs
- > 1GHz analog input bandwidth
- Combined with signal conversion and clock generation on one PCB
- Implemented as
 - Double size FPGA Mezzanine Card (FMC)
 - or Rear Transition Module
- Connecting to a digital Advanced Mezzanine Card



- Implementation and tests of the “Functions to be added”
- Performance measurements of the 125MSPS board with RTM solution and further developments towards complete RTM
- Test at FLASH with beam based feedback