

Femtosecond bunch arrival time monitoring with precision FMC-ADC modules

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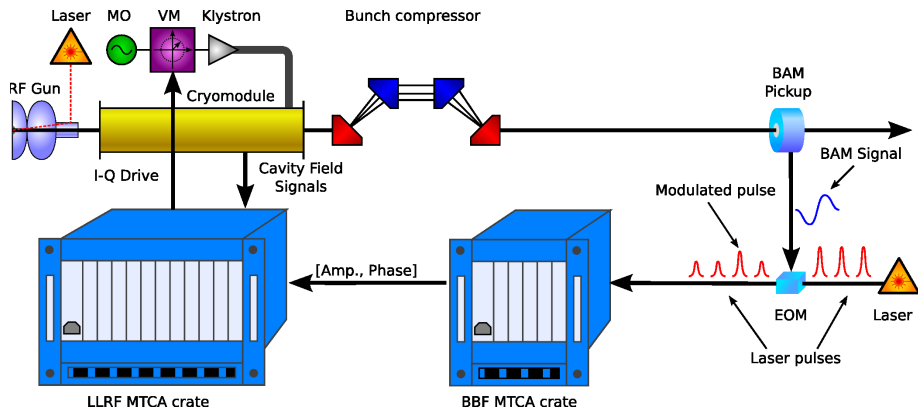


DESY, 12.12.2013

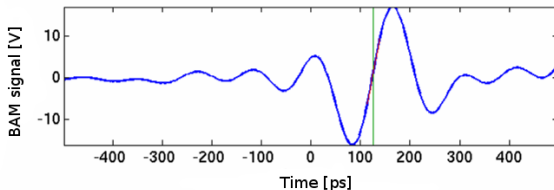
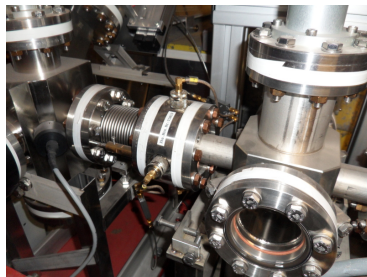
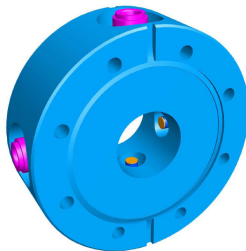
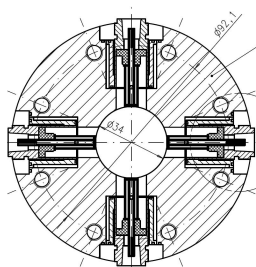
Agenda

- 1 Introduction
- 2 Implementation
- 3 Results

Beam based feedback layout

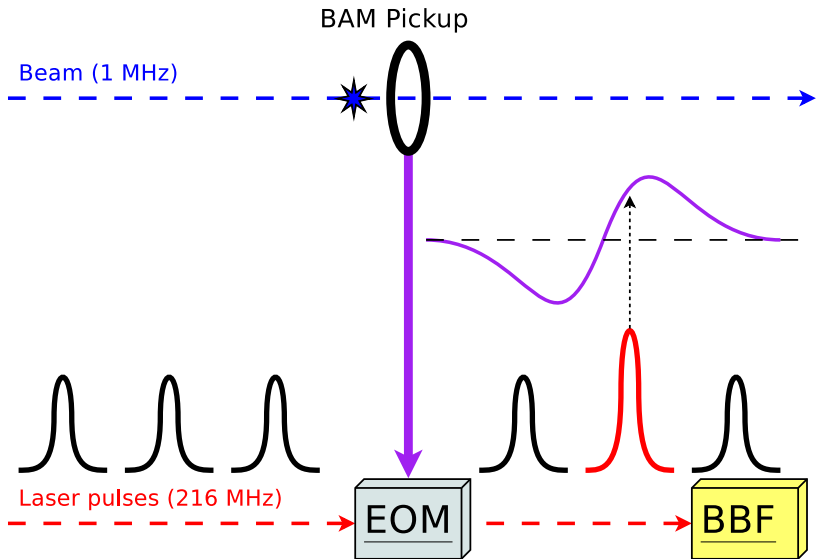


BAM - Bunch Arrival-time Monitor

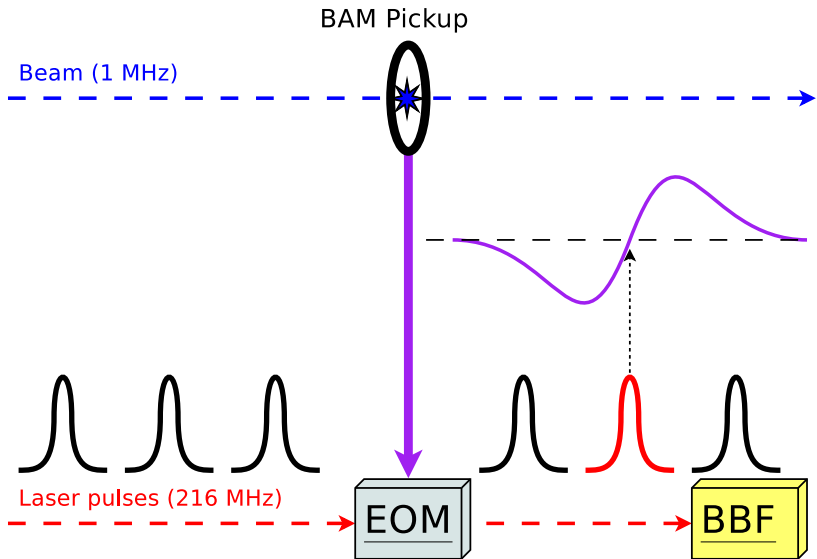


Signal from BAM pickup is used to modulate amplitudes of the laser pulses using the electro-optical modulator (EOM)

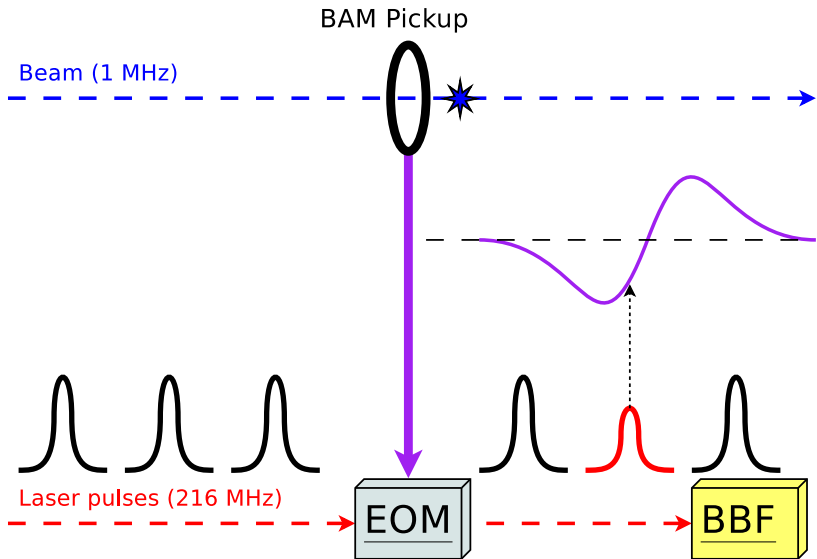
BAM operation principle



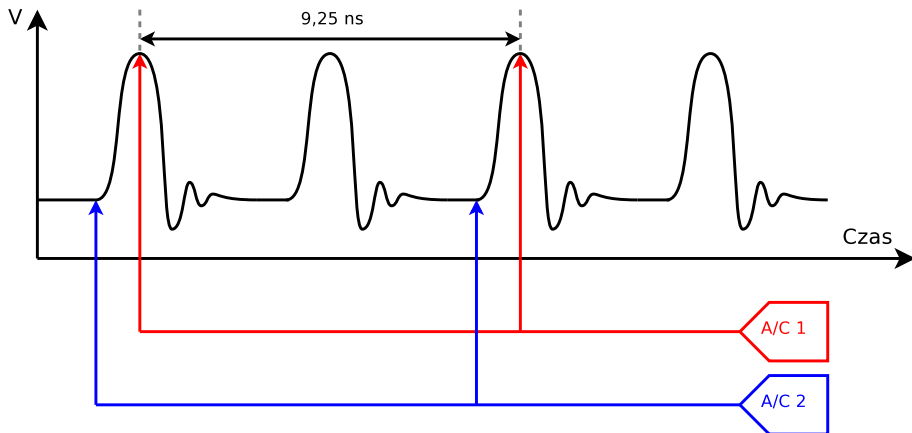
BAM operation principle



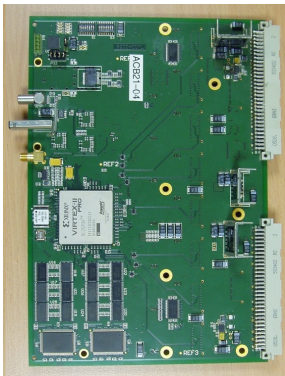
BAM operation principle



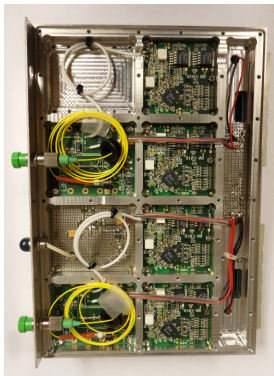
Relative pulse amplitude measurement



The old VME system



(a) ACB2.1 VME Carrier

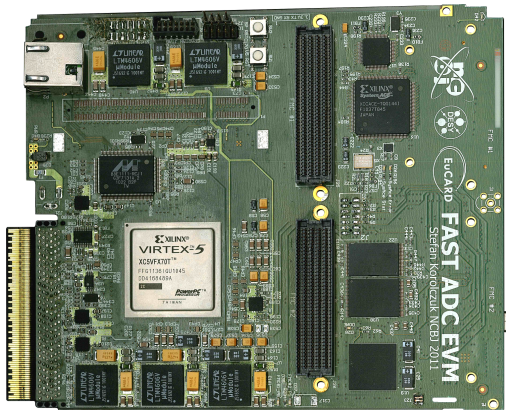


(b) Optical and analog input module

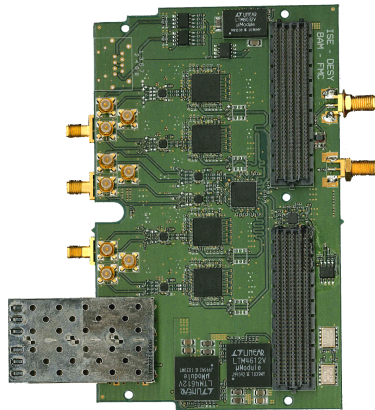


(c) Device in crate

The new prototype MTCA devices

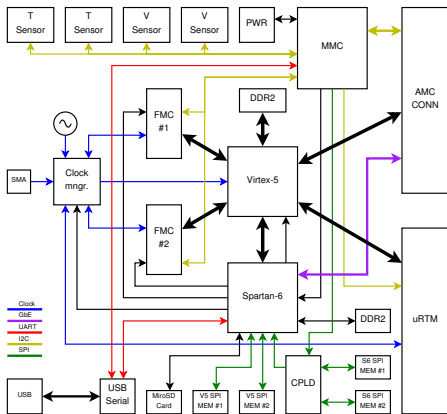


(d) Prototype FMC carrier

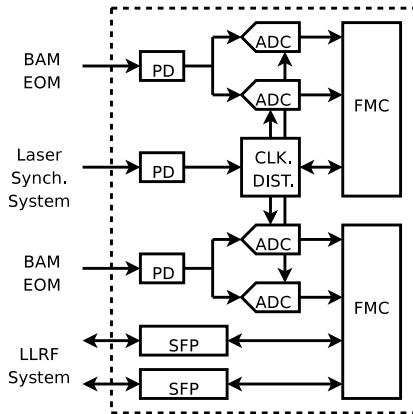


(e) Prototype FMC mezzanine with ADCs

Block diagrams



(f) FMC carrier block diagram

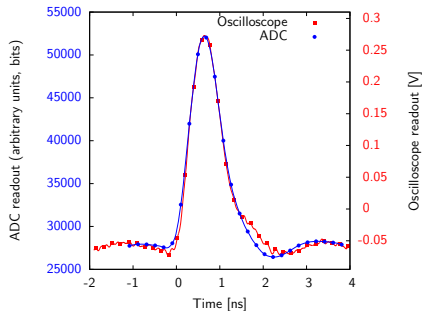


(g) BAM FMC mezzanine block diagram

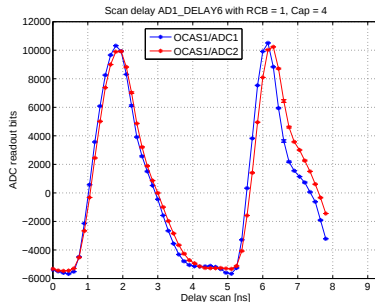
Carrier board features

- FPGA: Virtex-5 and Spartan-6
- MMC device: ATxmega128
- 2x HPC FMC mezzanine
- 1x uRTM D1.1
- 1x PCIe (x4) AMC ports 4-7
- 4x Low latency links AMC ports 12-15
- 2x RocketIO channels to each FMC and to RTM
- 256MB DDR2 memory for Virtex-5
- 128MB DDR2 memory for Spartan-6
- MicroSD card slot
- Double SPI memories for both FPGAs
- Clocks, triggers and interlocks according to MTCA.4 specification
- Two 4x4 LVDS cross-switch for clock signal distribution
- External clock input on the front panel
- Debug interface USB-Serial to MMC and to FPGA

Measurement results



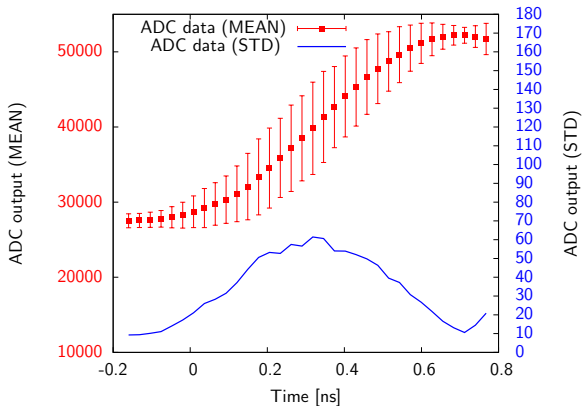
(h) MTCA system



(i) VME system

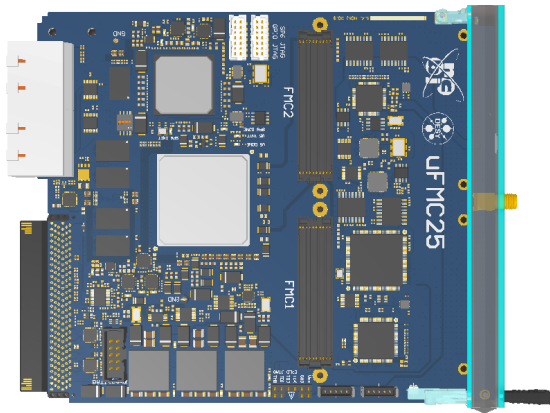
Laser pulse measured with the new MTCA BAM prototype devices and 8 GHz bandwidth oscilloscope 1(h) and with old VME system 1(i).

Measurement results

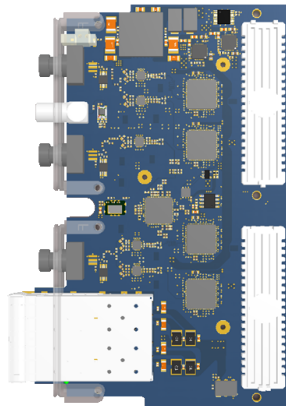


Single measurement of the rising edge of the laser pulse. Error bars around the mean values (red color) has been intentionally magnified, the numerical values of the STD are show on the sub-plot (blue color) on right vertical scale.

The final MTCA devices



(j) FMC carrier



(k) FMC mezzanine

Thank You