



MTCA.4 Products and Solutions for Accelerators at CAEN ELS

Enrico Braidotti

Sales & Field Application Manager



- Company Profile
- Product Lines and Solutions
- FMC – FPGA Mezzanine Cards
- MTCA.4 Products
- Q&As



CAEN ELS d.o.o.



Spin-off company of CAEN Spa

Founded in 2009 in Sežana – Slovenia

Application fields

Oriented and dedicated to particle accelerator facilities
e.g. synchrotron light sources, LINACs and Free Electron Lasers

“Know-how” and “hands-on” large installations and maintenance

Industrial capability

Customization and dedicated support

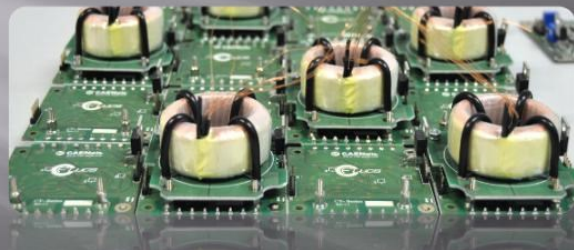




Digital Magnet Power Supplies
Bipolar + Monopolar
from $\pm 5A$ (small correctors) to 135A
Ethernet Interface



**MAGNET
POWER
SUPPLIES**



**PRECISION
CURRENT
TRANSDUCERS**



DC Current Transducers
Closed-loop Technology
DC + AC monitoring up to kA
Complete Digital T&M and Calibration Systems

Multi-channel Low Current Measurements
Dedicated Systems (Bipolar HV for Optics)
Beamline Local Feedback Integrated System - BEST



**BEAMLINE
ELECTRONIC
INSTRUMENTATION**



**MTCA.4
MicroTCA
For Physics**

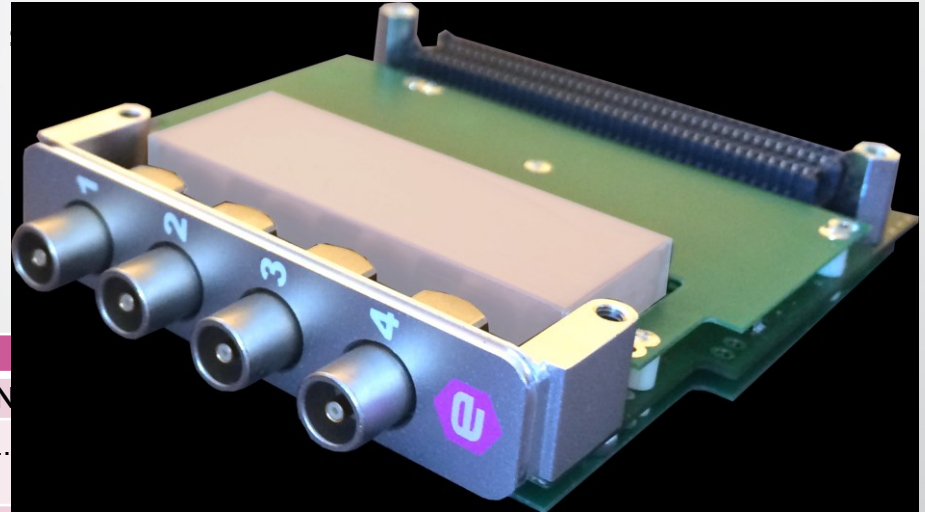


MicroTCA for Physics
FMC cards
Low-current Measurements and High-Voltage

Quad-Channel 16/20-bit 1MSPS Floating Ammeter Card

- Standard FMC - Vita 57.1
- Bipolar current-input stage
- Two measuring ranges (± 1 mA and
– *configurable upon request*)
- 16-bit and 20-bit versions
- Up to 1 MSPS
- Floating up to ± 300 V

- FMC-Pico-1M4-16
- FMC-Pico-1M4-20



Equivalent Input Noise		
	RNGo: ± 1 mA	RNGo: ± 10 mA
$F_S = 2$ ksp/s	1 ppm/FS -120 dB	2 ppm/FS -110 dB
$F_S = 20$ ksp/s	2 ppm/FS -114 dB	7 ppm/FS -103 dB
$F_S = 200$ ksp/s	5 ppm/FS -107 dB	10 ppm/FS -100 dB
$F_S = 1$ Msp/s	8 ppm/FS -102 dB	15 ppm/FS -96 dB

- Extremely low unbalance between channels (by analog design)
- I²C EEPROM calibration

8-Channel MTCA.4 Floating Ammeter

- Based on the DAMC-FMC25 carrier designed by **DESY** and produced and supported by **CAEN ELS**
- 2 picoammeters FMC-Pico-1M4 supported
- Each FMC – i.e. 4-channel – is floating
 - Avoid ground loops if two different detectors are connected to the same DAMC-FMC25 - e.g. quadrature detectors

DAMC-FMC25

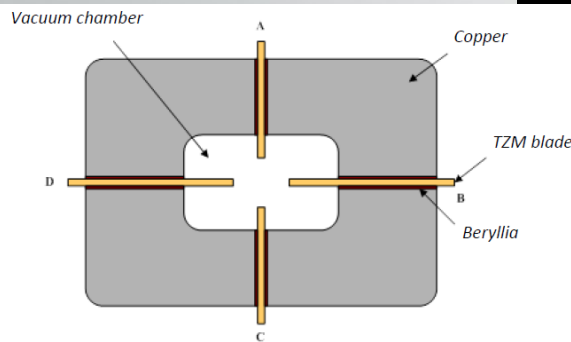
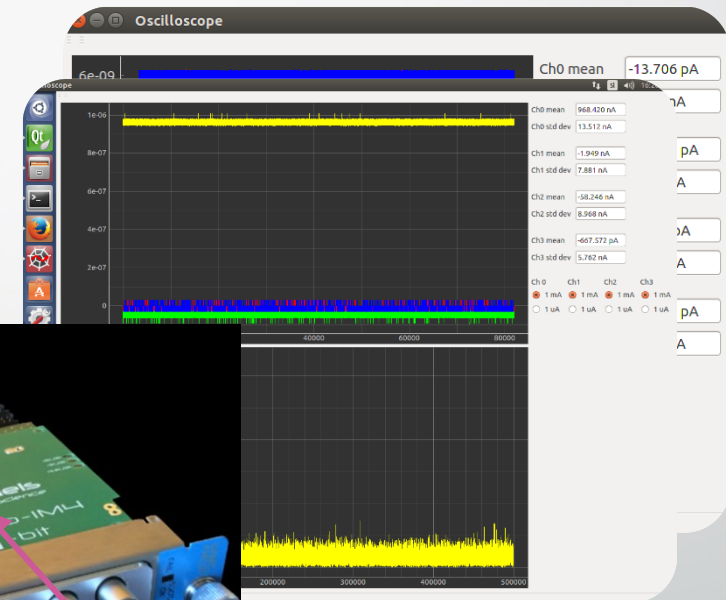
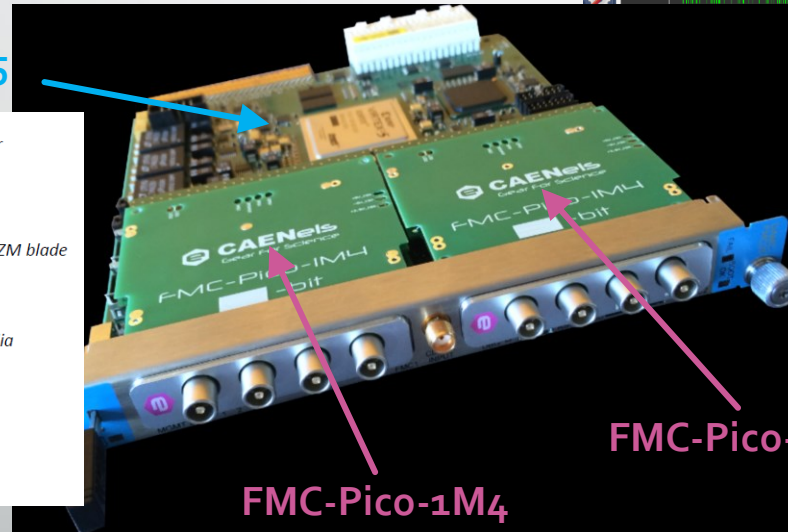
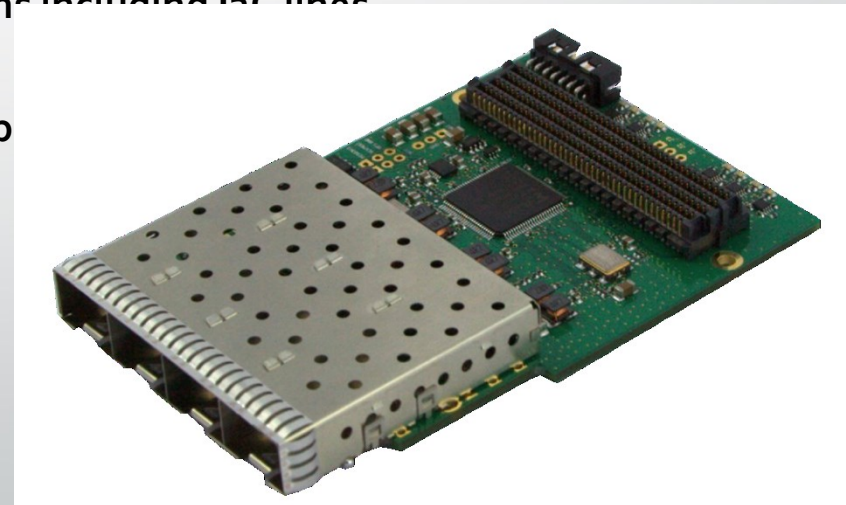


Figure 1: Gap BPM detector structure



Dual- and Quad-channel SFP/SFP+ FMC Adapter

- Designed by **DESY** and produced and supported by **CAEN ELS**
- Dual-channel and Quad-channel versions
 - **FMC-4SFP+2**
 - **FMC-4SFP+4** (*w/out FMC bezel*)
- Wide I/O operating range: V_{ADJ} can vary from 1.5V to 3.3V
- True level conversion of all SFP+ module pins including I²C lines
- I²C-controlled Oscillator (10-280 MHz)
- Compatible with the DAMC-FMC25 carrier board



License Agreement LV78 between DESY and CAEN ELS

Reproduction, transfer, distribution of part or all of the contents in this document in any form without prior written permission of CAEN ELS d.o.o. is prohibited

Idea: bring the widespread and well-known CAEN VME and NIM HV-modules to the MTCA platform

Thousands of channels sold since 2010



Cooperation with DESY in the Helmholtz Validierungsfond project
«MTCA.4 for Industry» (HVF-0016)

Reproduction, transfer, distribution of part or all of the contents in this document in any form
without prior written permission of CAEN ELS d.o.o. is prohibited

HV Positive And Negative Double-width AMC

Voltage / Current rating	VME counterpart	Typical application example
6 kV / 1 mA	V6534	Micro-channel Plates, Drift Chambers
4 kV / 3 mA	V6533	Photomultipliers, Drift Chambers, Silicon & Germanium Detectors
500 V / 3 mA	V6519	Semiconductor devices, Diamond Detectors

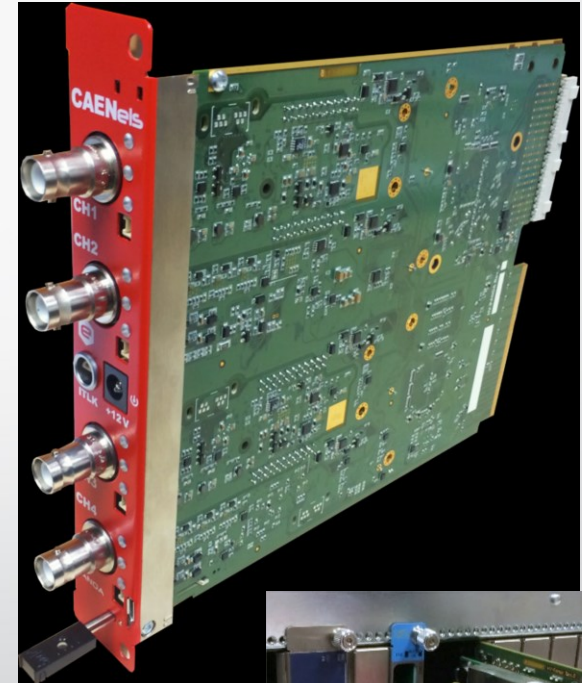


Cooperation with DESY in the Helmholtz Validierungsfond project
«MTCA.4 for Industry» (HVF-0016)

Reproduction, transfer, distribution of part or all of the contents in this document in any form without prior written permission of CAEN ELS d.o.o. is prohibited

HV Positive And Negative Double-width AMC

- Double-Width **AMC** Board – Full Size
- **MTCA.4** carrier
- Four High-Voltage channels
- Output ratings:
 - 500 V @ 1.5 W
 - 4 kV @ 7 W
 - 6 kV @ 6 W
- Polarity selectable
- Provides infrastructure for management of optional **Rear Transition Module (RTM)** boards – class D1.1
- DDR3 On-board Memory (up to 4 Gbit)
- Separate Interlock for each channel and global one
- Stand-by voltage, Ramping, Current Monitoring and Current Limit



Cooperation with DESY in the Helmholtz Validierungsfond project
«MTCA.4 for Industry» (HVF-0016)

Reproduction, transfer, distribution of part or all of the contents in this document in any form without prior written permission of CAEN ELS d.o.o. is prohibited

HV Positive And Negative Double-width AMC

- Floating ground per pair of channels
 - $\pm 20\text{V}$ standard for safety, up to $\pm 500\text{V}$
- Communication via PCI-e 1x standard
- Gigabit Ethernet Connection on backplane
- User selectable behavior when output current threshold is exceeded :
 - Switch-off
 - Current source mode
- Output voltage ripple :
 - $< 12\text{ mV}$ @ $\text{MAX } P_{\text{OUT}}$ (up to 4 kV)
 - $< 4\text{ ppm/FS}$ @ $\text{MAX } P_{\text{OUT}}$ (up to 6kV)



Cooperation with DESY in the Helmholtz Validierungsfond project
«MTCA.4 for Industry» (HVF-0016)

Reproduction, transfer, distribution of part or all of the contents in this document in any form
without prior written permission of CAEN ELS d.o.o. is prohibited

AMC Dual High-Pin Count FMC Carrier Board

- Double width AMC board – MTCA.4 carrier
- Two HPC FMC slots
- Data processing on Virtex-5 FPGA
- Board management on Spartan-6 FPGA
- RTM D1.1 connectivity
- DDR2 memories on both FPGAs
- External clock input on front panel SMA connector
- 4.25 Gbps ("-1") and 6.5 Gbps ("-2") transceiver board options



**Turnkey solution with dual 4-channel (8-channel) floating
picoammeter AVAILABLE!**

[License Agreement LV75 between DESY and CAEN ELS](#)

Reproduction, transfer, distribution of part or all of the contents in this document in any form
without prior written permission of CAEN ELS d.o.o. is prohibited

Thank You for Your Attention!

(Vielen Dank für Ihre Aufmerksamkeit 😊)

CAEN ELS d.o.o.
Kraška ulica, 2
6210 Sežana – Slovenia

Tel. +386 (0)5 7313 585
Fax +386 (0)5 7313 587

Mail: info@caenels.com

Web: www.caenels.com

