

Detector Applications on MicroTCA.4 Platform at CAEN ELS

Jan Marjanovic, Simone Farina, Enrico Braidotti

CAEN ELS d.o.o.

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Summary

- Company Profile
- AMC-PICO-8 and HV-PANDA
- AMC-PICO-8 Front-end Customization
- Software

CAEN ELS d.o.o.

- Spin-off company of CAEN SpA, founded in 2009 in Slovenia
- Oriented and dedicated to particle accelerator facilities
- Know-how and hands-on large installations and maintenance
- Industrial capability
- Customization and dedicated support

Product Lines

- MicroTCA and FMC instrumentation
- Power Supply Systems
- Beamline Electronic Instrumentation
- Precision Current Transducers

AMC-PICO-8 and HV-PANDA

TetrAMM Picoammeter with integrated HV source

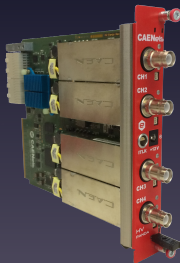


AMC-PICO-8 and HV-PANDA

TetrAMM Picoammeter with integrated HV source



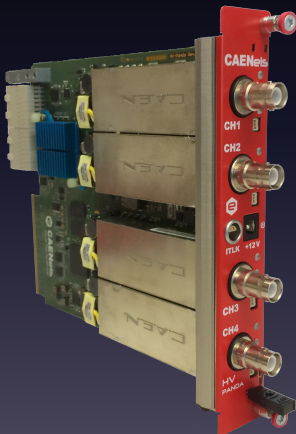
High-Voltage source



Picoammeter



HV-PANDA



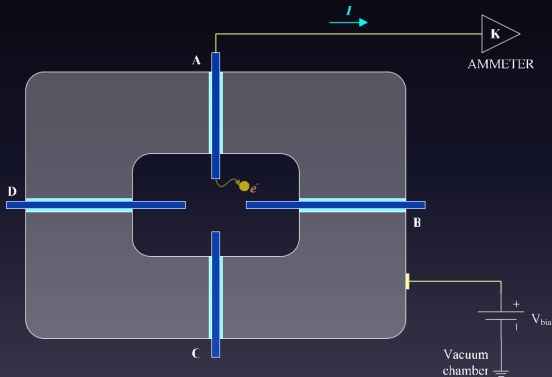
- 4 channels
- Various channel configurations
 - 500 V @ 1.5 W
 - 4 kV @ 7 W
 - other values (ask)
- Factory selectable polarity
- Developed under HVF
- Possibility for enhancements
 - Rear Transition Module D1.1
 - DDR3 memory (512 MB)
 - PCIe with DMA (60 MB/s)
 - Gigabit Ethernet on backplane
 - JTAG on backplane

AMC-PICO-8



- 8 channel bipolar picoammeter
- Two selectable ranges (changeable on request)
 - 1 mA (10 kHz)
 - 1 μ A (10 kHz)
- Floating up to 300V
- Trigger inputs from various sources
- Based on DAMC-FMC25 from DESY
- BSP available

Application example: blade-gap monitor

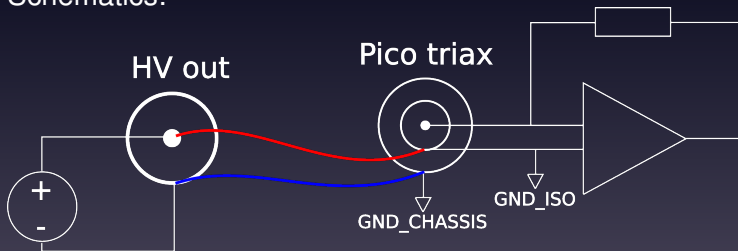


(from E. Braidotti: Design and Development of a Picoammeter for Global Orbit Feedback at Elettra)

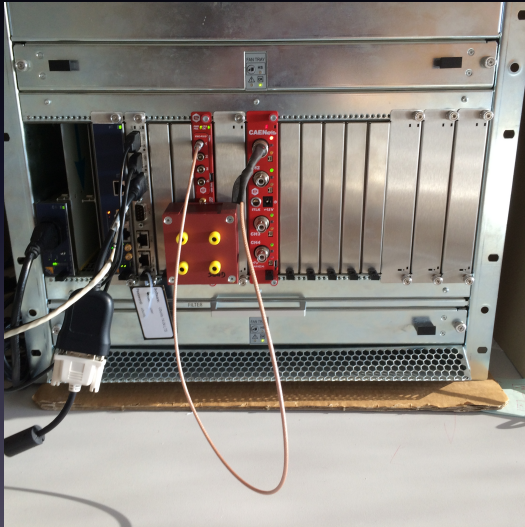
Test setup (schematics)

We wanted to see the performance of the combined system (in terms of noise)

Schematics:



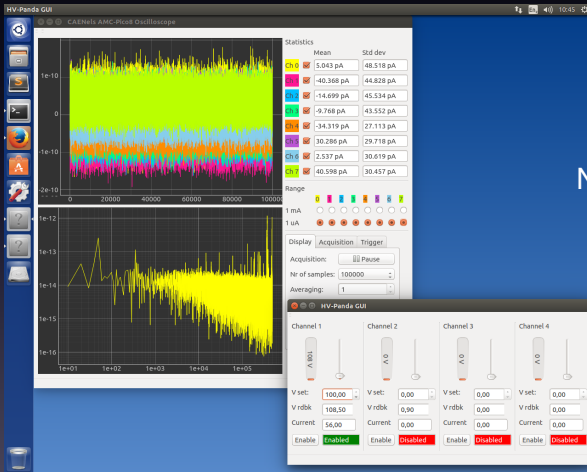
Test setup



Test setup (closer look)



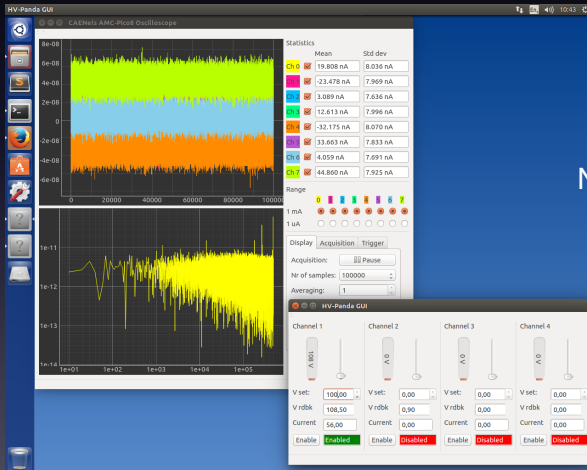
Results (1 uA range)



Noise

- shielded = 30.5 nA
(SNR = -90.3 dB)
- biased = 48.5 nA
(SNR = -86.3 dB)

Results (1mA range)



Noise

- shielded = 8.1 nA
(SNR = -101.8 dB)
- biased = 8.1 nA
(SNR = -101.8 dB)

AMC-PICO-8 Front-end Customization

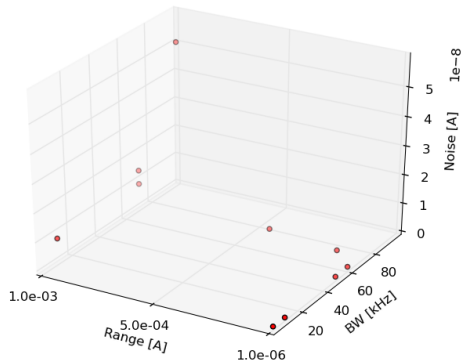
- The front-end can be customized to fit the user's needs
- Default configuration:
 - 1 mA (10 kHz)
 - 1 μ A (10 kHz)
- Always a trade-off between FS range, bandwidth and noise
- Calibration data is stored on EEPROM on FMC boards

Various combinations

This are the results (measured noise) from all the combinations of the front-end parameters we have tried

FS Range[A]	Bandwidth[kHz]	Noise RMS [A]
1 μ A	10.0	30 pA
1 μ A	1.0	120 pA
0.39 μ A	50.0	440 pA
1 μ A	60.0	570 pA
100 μ A	70.0	1.2 nA
400 μ A	70.0	3.2 nA
1 mA	10.0	8 nA
1 mA	70.0	8.5 nA
1 mA	70.0	13 nA
1 mA	100.0	50 nA

Various combinations



Software for HV-PANDA

- User-space driver (just three files)



panda.map

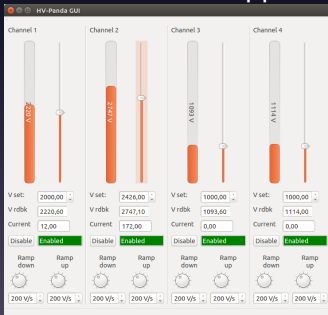


panda_gui.py



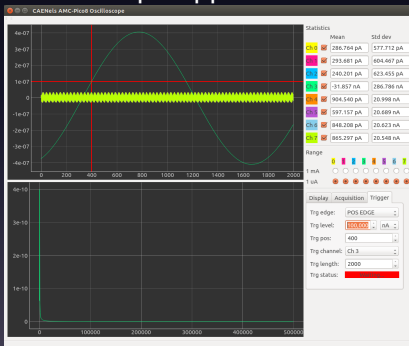
panda_gui.ui

- GUI and console application



Software for AMC-PICO-8

- Linux driver with support for DMA
- Oscilloscope application



- Smaller utility to dump data into CSV

Thank you