www.caenels.com

CAEN Network

Company Overview

Enrico Braidotti

e.braidotti@caenels.com

CAENels
Gear For Science
www.caenels.com

Overview

CAEN ELS – Gear For Science

- COMPANY PROFILE
- HISTORY
- FACILITIES
- PRODUCTS
- CUSTOM
- SALES NETWORK

Overview

CAEN - Company Network

CAEN Introduction

- Founded in 1979, for more than 35 years **CAEN** has been providing Scientists and Engineers with the most advanced electronic instrumentation designed for radiation & low light detectors
- Strong of an extremely close collaboration with the world major research laboratories CAEN is proud to produce the best tools for:
  - High Energy Physics
  - Nuclear Physics
  - Neutrino Physics
  - Astrophysics
  - Dark Matter Investigation
  - Educational
  - Medical Applications
  - Homeland Security
  - Industrial Applications
  - and more …

CAEN
Tools for Discovery

Global Coverage

Worldwide sales network

- CAEN HQ in Italy
- Company branches in Germany & USA
- Distributors in more than 30 countries

Customers include world leading research institutions:

- ✓ Europe: CERN, INFN, GSI, ESO, RAL, Ganil, PSI, …
- ✓ USA & Canada: FNAL, SLAC, LANL, BNL, JLab, TRIUMF, …
- ✓ Latin America: CBPF, CNEA, UTFSM, …
- ✓ Asia: J-Park, KEK, Riken, IHEP, TIFR, …
- ✓ Africa: iThemba Labs, SESAME, …
- ✓ Australia: CoEPP, ANSTO, …

and private companies:

- ✓ GE, Siemens, SAIC, L3, Raytheon, Lockheed, …

CAEN Key Strengths

More than 35 Years of activity in Physics Research allow CAEN the right way to approach and collaborate with the big projects thanks to our:

- ✓ R&D Division at the forefront of technology
  - Catalog Products
  - Customization of catalog models
  - Custom projects

- ✓ Production Division
- ✓ Test Division
- ✓ Maintenance Division

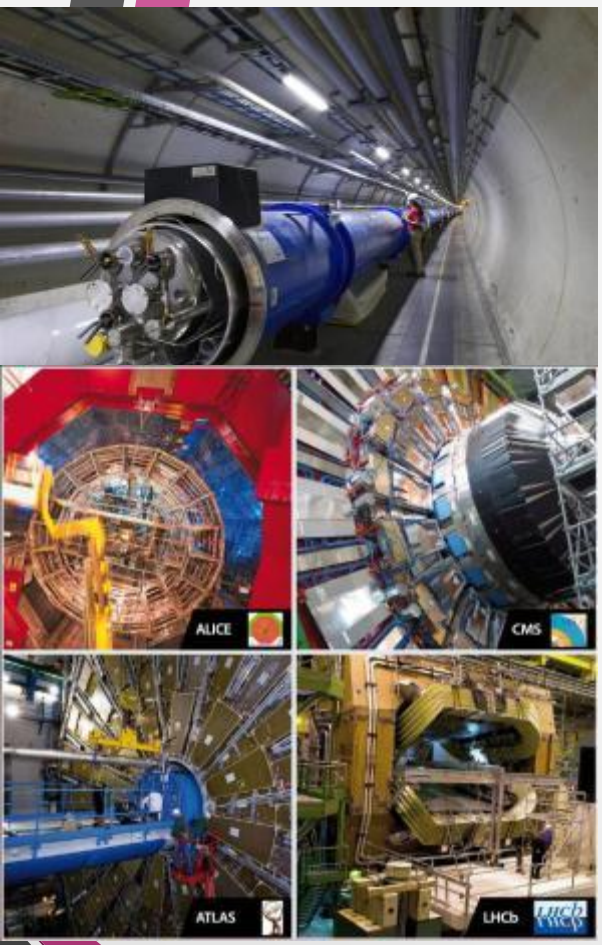
A typical customer approach

From custom requirements and tech specs up to delivery:

- ✓ Proactive Interaction with CAEN for Collaborative Info Sharing and Verification
- ✓ Procurement/General Contract
- ✓ Long Term Maintenance program
- ✓ Prototyping (Incoming acceptance tests)
- ✓ Fine tuning
- ✓ Pre-series (Test and Validation)
- ✓ Production
- ✓ Installation and Commissioning

CAEN is the ideal partner for big research facilities:

- ✓ Flexibility in R&D
- ✓ Reliability in mass production
- ✓ Responsiveness in Service & Support



1998 – 2008: ***SYNERGY for SUCCESS***

- 10 years of joint efforts to achieve top performances
- Collaboration started with information sharing and joint specifications assessment.
- 6.500 "Complex Electronics Units" delivered
  - **<u>190.000 sub-boards</u>**
- Designed for Hostile Environments
  - Magnetic Field resistant (up to 5000 Gauss)
  - Radiation tolerant with COTS components
- ***<u>Ad-hoc</u>*** **<u>on-site, long term maintenance contract</u>**

CAENels
Gear For Science
www.caenels.com

Company Profile

CAEN ELS d.o.o.

- Established in 2009 as a spin-off company of CAEN SpA
- Focused on particle accelerator facilities
- HQ in Sežana - Slovenia

From July 1st

CAEN ELS s.r.l.

- HQ in Basovizza (TS) - Italy
- On the same campus of Italian largest accelerator facility
- New products, facilities, engineers
- "know-how" and "hands-on" large installations and maintenance
- Customization and dedicated support

CAENels
Gear For Science
www.caenels.com

Company Profile

History

Where we started from…

- started oriented to physics accelerator facilities

(e.g. CERN, DESY)

- "know-how" and "hands-on" large installations and maintenance
- CAEN Industrial capability
- Customization and dedicated support

History

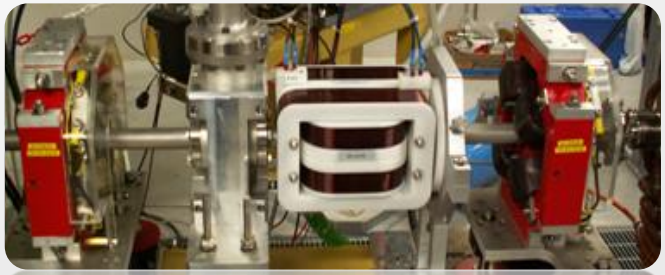
FERMI@Elettra

- linear accelerator – FEL (400-meter long)
- about 400 magnets requiring 5A to 750A
- 24 hours/day – 365 days/year
- Reliability and efficiency

FERMI installed base

X-FEL power supplies requirements:

- 180 PS rated ±20A @ ±20V (A2620BS)
- 210 PS rated ±5A @ ±10V (A2605BS)
- correctors and quadrupole magnets



History

Where we are going…

- HIGH-END INDUSTRIAL APPLICATIONS
- NUCLEAR
- AUTOMOTIVE
- PRIVATE RESEARCH
- MEDICAL FACILITIES

CAENels
Gear For Science
www.caenels.com

Facilities

Sežana - Slovenia

- R & D
- DESIGN
- SUPPORT
- MARKETING

- PRODUCTION
- TESTING

Viareggio - Italy

CAENels
Gear For Science
www.caenels.com

Capabilities

SOLUTIONS

- State-of-the-art catalogue products
- Customization of catalogue products
- Engineering of full-custom products

MAIN CUSTOMERS

- Research / Facilities

(KEK, DESY, KIT, Fraunhofer, BNL, APS, etc.)

- High-end Industry

(TESLA Motors, Bosch, GE, etc.)

ALL IN-HOUSE

- **Hardware** (Power, RF, low-signals, HS)
- **Firmware** (FPGA, DSP, SoC)
- **Software** (Phyton, EPICS, LabView)

CAENels
Gear For Science
www.caenels.com

Product Lines

Power Supply Systems

Precision Current Measurements

Beamline Electronic Instrumentation

FMC and MicroTCA

CAENels
Gear For Science
www.caenels.com

Power Supply Systems

FAST-PS

High Performance Bipolar Power Supply

- 19" – 1U stand-alone crate
- Different current and voltage ratings
- 10/100/1000 Ethernet
- 2x Fast SFP interface (10 kHz update)
- Current or Voltage regulation
- High analog bandwidth
- Analog control and Trigger Input - *optional*
- Low noise
- Configurable Digital control loop
- Internal protections and auxiliary readbacks
- Local display and control

EPICS

EPICS IOC Embedded

Regulation Type	Current- or Voltage- Control
Output current range	± 5 A, ± 10 A, ± 20 A, ± 30 A
Output voltage range	± 20 V, ± 40 V, ± 80 V
Maximum output power	up to 600 W
Setting resolution	18 bit
Output readbacks	20 bit
Output current ripple*	30 ppm / FS
Output current stability	< 50 ppm / FS
Output voltage stability	< 50 ppm / FS
Switching Frequency	100 kHz
Max Current/Voltage update rate	10 kHz
Accuracy	0.05%
External Interlocks/States	2 Inputs: user-configurable "dry" contacts 1 Outputs: relay (2 magnetic contacts)
Internal Interlocks	DC Link Under-Voltage MOSFETs Over-Temperature Over-Current and Over-Voltage Earth Fault Current Regulation Fault and Excessive Current Ripple
Hardware protections	Input Fuses Earth Fuse Over-Voltage
Auxiliary ADC Read-Backs	DC Link Voltage Ground Leakage Current Temperature
Cooling	On-Module Self-Regulated Fans
Control System Drivers	EPICS
Connection	1 x Ethernet 10/100/100 2 x SFP ports
Extra-Features	Point-by-Point Current Waveform Loading User-definable interlock thresholds, active levels and timings Firmware Remote Updates
Input Voltage	90/260 V(AC) (47-63 Hz)
Efficiency	up to 84 %
Power Factor	> 0.95

CAENels
Gear For Science
www.caenels.com

Precision Current Measurements

CURRENT TRANSDUCER - BOX

- First compact, stand-alone digital current measurement and calibration system
- High accuracy and high precision AC and DC current measurement
- Reading available directly in digital format
- Ethernet, USB and serial communication interfaces
- Temperature stabilized burden resistor and A/D conversion
- Analog monitor, external interlock and alarms

FLUCS DCCT SERIES

CAENels
Gear For Science
www.caenels.com

Beamline Electronics

TetrAMM

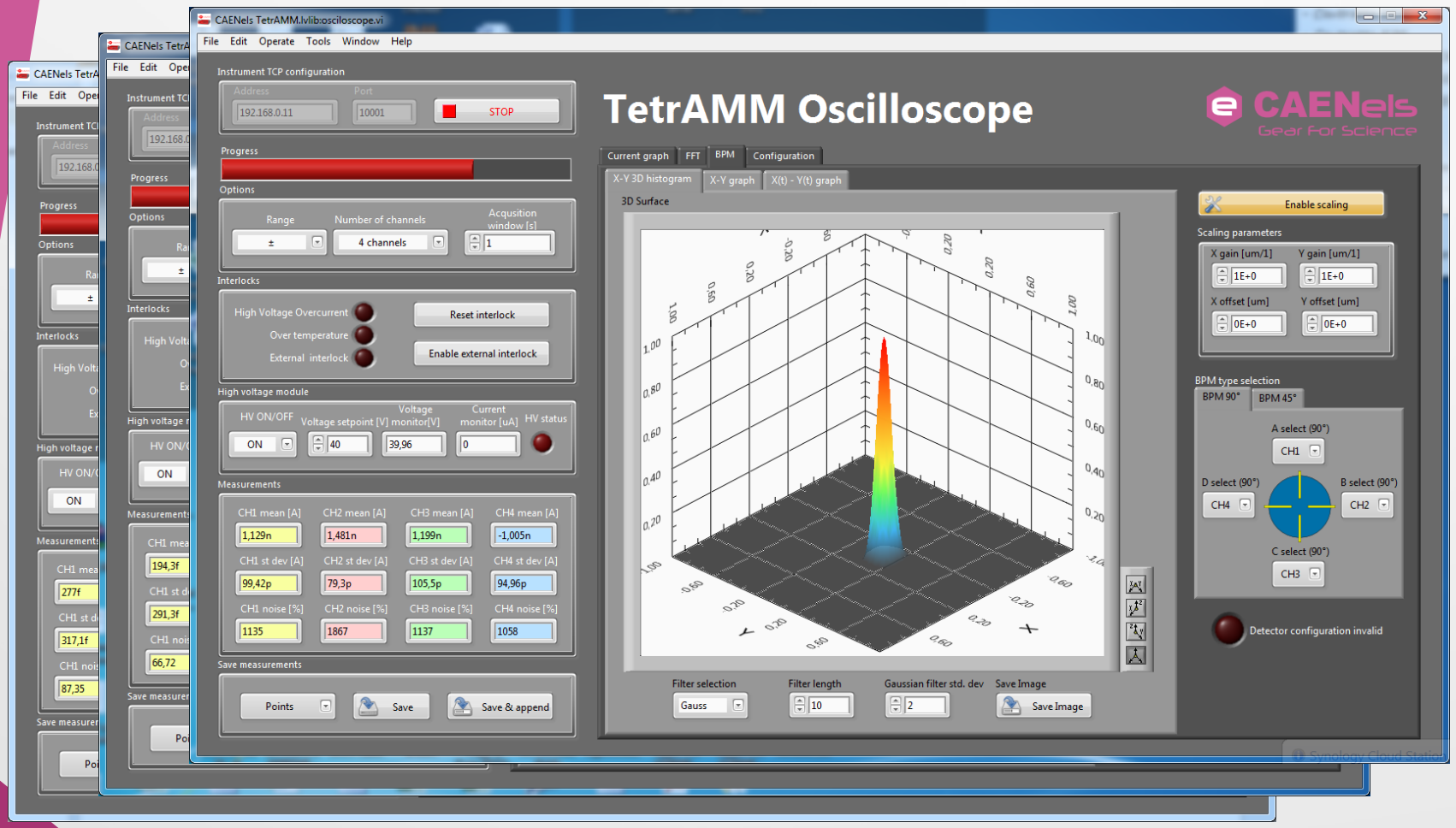
4-channel Fast-Interface Bipolar Picoammeter with Integrated HV

- 2 different full-scale ranges: ±120 μA and ±120 nA (*configurable*)
- internal sampling: 100 kHz@24 bit
- Configurable Sampling Frequency
- Gigabit Ethernet connectivity
- Factory calibration
- User-friendly software for photon BPM applications
- different trigger/gate and configuration → external events

- Firmware Remote Update
- Automatic independent ranging
- 500V standard HV bias (up to 4 kV)
- FPGA and soft-processor computations

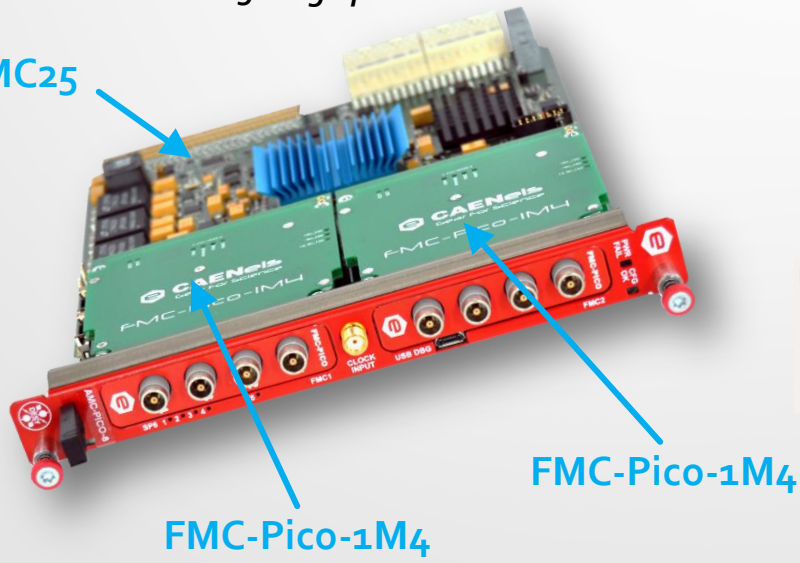
CAENels
Gear For Science
www.caenels.com

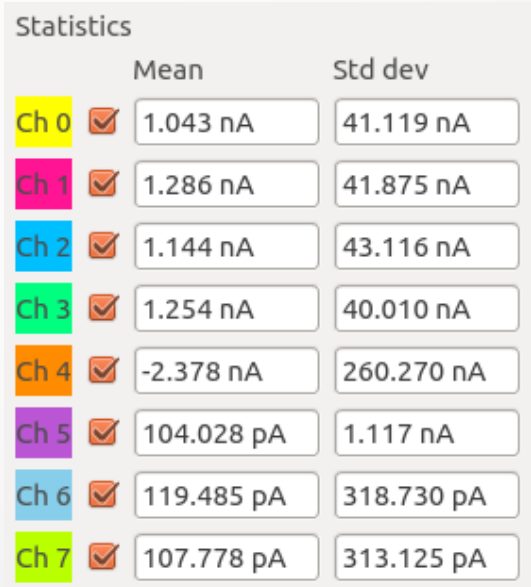
Beamline Electronics

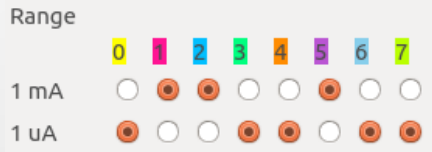


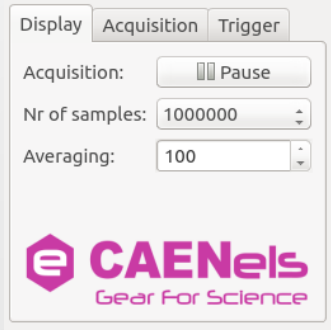
AMC-PICO-8 – 8-Channel MTCA.4 Floating Ammeter

- Based on the DAMC-FMC25 carrier designed by DESY and produced and supported by CAEN ELS
- 2 picoammeter 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*









Custom Design - Example

KEK - Japan

- Custom designed Bipolar Linear Power Converters
- Design started in December, delivery and installation in March
- On-the-field performance better than requested specs
- Approximately 170 units and other 100 units installed later on

CAENels
Gear For Science
www.caenels.com

Thank you for your attention!

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