

# Company Overview

# CAEN Group

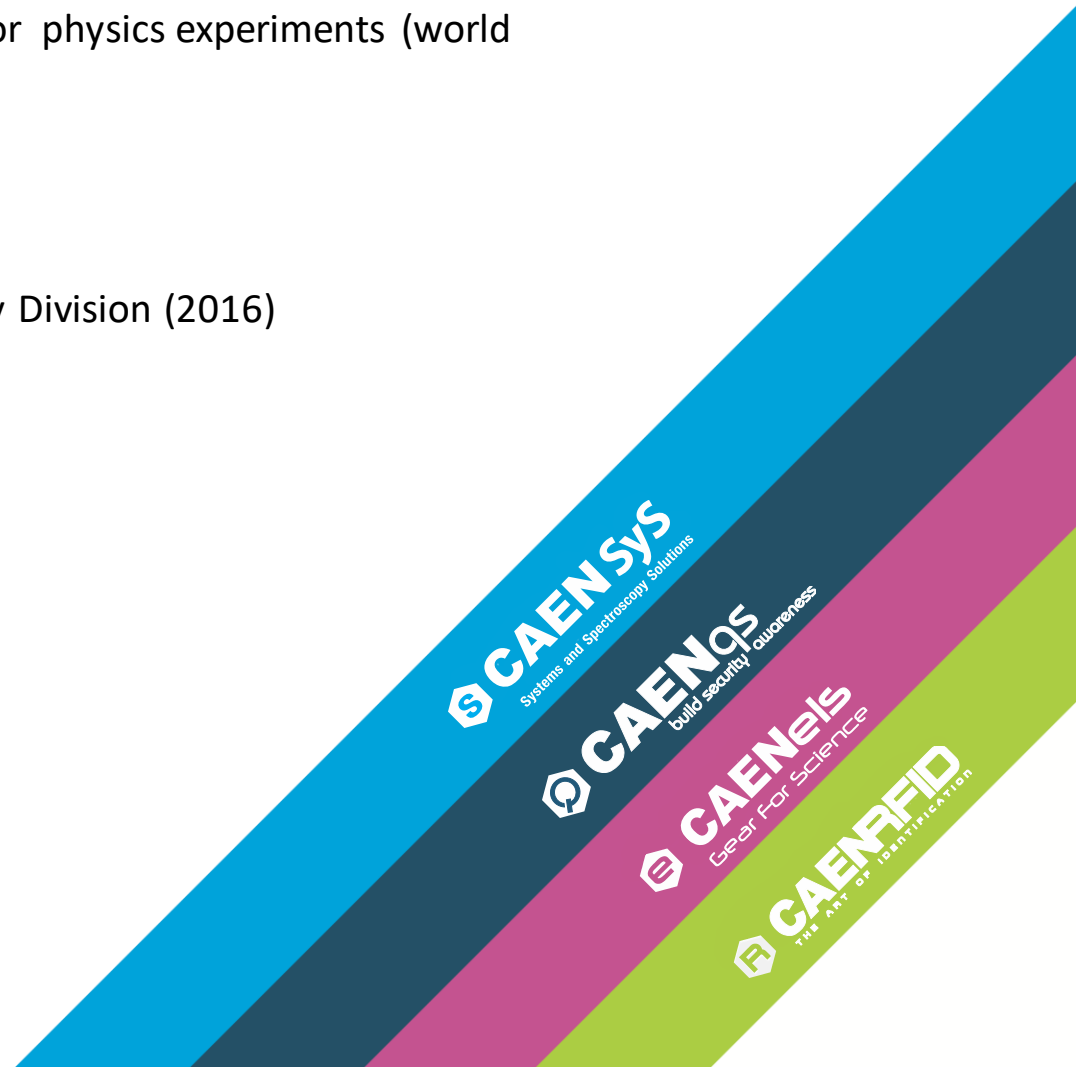
Founded in 1979, **CAEN s.p.a.** (Costruzioni Apparecchiature Elettroniche Nucleari) is an important industrial spin-off of the INFN.

**Core business:** Electronic Instrumentation for physics experiments (world leader)

## Spin-off activities:

- > **CAEN s.p.a.**
  - > **CAEN** SyS – CAEN Spectroscopy Division (2016)
  - > **CAEN** RFID s.r.l. (2003)
  - > **CAEN**els s.r.l. (2010)
  - > **CAEN**qS s.r.l. (2012)

**Total Employees: 160**



# Quality Certification



**IQNet**  
THE INTERNATIONAL CERTIFICATION NETWORK

**CERTIFICATE**

*CISQ/IMQ has issued an IQNet recognized certificate that the organization:*

**C.A.E.N. SPA**  
VIA VETRAIA 11 - 55049 VIAREGGIO (LU)  
VIA MONTECRISTO 7 - 57037 PORTOFERRAIO (LI)

*has implemented and maintains a Quality Management System for the following scope: \**

**Design, manufacturing and test of electronic equipment**  
Further clarifications regarding the applicability of ISO 9001:2015 requirements may be obtained by consulting the organization which fulfills the requirements of the following standard:

**ISO 9001:2015**  
Issued on: **2021 - 06 - 15**  
Expires on: **2024 - 06 - 20**

This attestation is directly linked to the IQNet Partner's original certificate<sup>1)</sup> and shall not be used as a stand-alone document

Registration Number: IT - 1066






<sup>1)</sup> IQNet Partners:  
AENOR Spain AFNOR Certification France AKPCER Portugal CCC Cyprus CISQ Italy  
CQC China COM China COS Czech Republic CQC Cert Croatia DQS Holding GmbH Germany EAGLE Certification Group USA  
FCV Brazil FONDONORMA Venezuela ICONTEC Colombia Inspecta Sertintest Oy Finland INTECO Costa Rica  
IRAM Argentina ICA Japan KPC Korea MERTEC Greece NSCF Hungary Nemko AS Norway NSAI Ireland  
NYCE-SIGE Mexico PCBQ Poland Quality Austria Austria RR, Russia SII Israel SIQ Slovenia  
SIRM QAS International Malaysia SQS Switzerland SRAC Romania TEST St Petersburg Russia TSE Turkey YUQS Serbia

\* The list of IQNet partners is valid at the time of issue of this certificate. Updated information is available under [www.iqnet-certification.com](http://www.iqnet-certification.com)





CISQ is a member of



THE INTERNATIONAL CERTIFICATION NETWORK  
[www.iqnet-certification.com](http://www.iqnet-certification.com)

IQNet, the association of the world's first class certification bodies, is the original provider of Management System Certification in the world.  
Active in continental Europe, Asia, Africa and Oceania, over 150 subsidiaries all over the globe.

**CERTIFICATO N. 9105.CAEN**  
**CERTIFICATE N. 9105.CAEN**

SI CERTIFICA CHE IL SISTEMA DI GESTIONE PER LA QUALITÀ DI  
WE HEREBY CERTIFY THAT THE QUALITY MANAGEMENT SYSTEM OPERATED BY

**C.A.E.N. SPA**  
VIA VETRAIA 11 - 55049 VIAREGGIO (LU)

UNITÀ OPERATIVE / OPERATIVE UNITS  
Vedere gli Allegati per le Unità Operative (n° 2 allegati)  
View the Annexes for the Operative Units (n° 2 annexes)

E' CONFORME ALLA NORMA / IS IN COMPLIANCE WITH THE STANDARD

**ISO 9001:2015**

PER LE SEGUENTI ATTIVITÀ / FOR THE FOLLOWING ACTIVITIES  
Progettazione, fabbricazione e collaudo di apparecchiature elettroniche  
Design, manufacturing and test of electronic equipment

Ulteriori informazioni riguardanti l'applicabilità dei requisiti ISO 9001:2015 possono essere ottenute consultando l'organizzazione.  
Further clarifications regarding the applicability of ISO 9001:2015 requirements may be obtained by consulting the organization.

IL PRESENTE CERTIFICATO È SOGGETTO AL RISPETTO DEL  
REQUIREMENT PER LA CERTIFICAZIONE DEL SISTEMA DI GESTIONE  
THE USE AND THE VALIDITY OF THE CERTIFICATE SHALL SATISFY THE  
REQUIREMENTS OF THE RULES FOR CERTIFICATION OF MANAGEMENT SYSTEMS

|       |  |                                      |                     |
|-------|--|--------------------------------------|---------------------|
| DATE: | PRIMA CERTIFICAZIONE<br>FIRST CERTIFICATION: | EMISSIONE CORRENTE<br>CURRENT ISSUE: | SCADENZA<br>EXPIRY: |
|       | 1998-02-16                                   | 2021-06-15                           | 2024-06-20          |

  
BHQ S.p.A. - VIA QUINTILIANO, 43 - 20138 MILANO ITALY  
Management Systems Division - Flavia Origo



IAF: 19




La presente certificazione è rilasciata a condizione che il sistema di gestione per la qualità sia sottoposto a verifiche esterne e a un'ispezione di rinnovo. Il sistema di gestione è tenuto a essere sottoposto a un'ispezione di rinnovo ogni tre anni. Il rinnovo deve essere richiesto almeno 90 giorni prima della scadenza della certificazione.

Organismo di Certificazione Federazione CISQ  
[www.cisq.com](http://www.cisq.com)

CISQ è la Federazione Italiana di Organismi di Certificazione del sistema di gestione sottoposte a verifiche esterne e a un'ispezione di rinnovo. CISQ is the Italian Federation of Management System Certification Bodies.

# Worldwide presence

**Worldwide sales network offices in Italy, Germany, USA,  
Distributors in more than 30 countries.**

**Portfolio: > 5000 customers**

**Customers Include all world leading research centres as:**

**Europe: CERN, INFN, CEA, CNRS; GSI, ESO, ISIS,  
Ganil, PSI, ...**

**USA: FNAL, SLAC, Los Alamos, BNL, Jlab, ...**

**Asia: J-Park, KEK, Riken, IHEP, TIFR, ...**

**Africa: iThemba Labs, ...**

**And private companies:**

**GE, Siemens, SAIC, L3, Raytheon, Lockheed...**



# CAEN Headquarters

**CAEN** boasts more than 40 authorized distributors worldwide and maintains four headquarters strategically located across the globe.



- **CAEN** S.p.A. (Italy)
- **CAEN**spa India Private Limited (India)
- **CAEN** GmbH (Germany)
- **CAEN** Technologies (U.S.A.)



# Milestones: 1979 - 2022

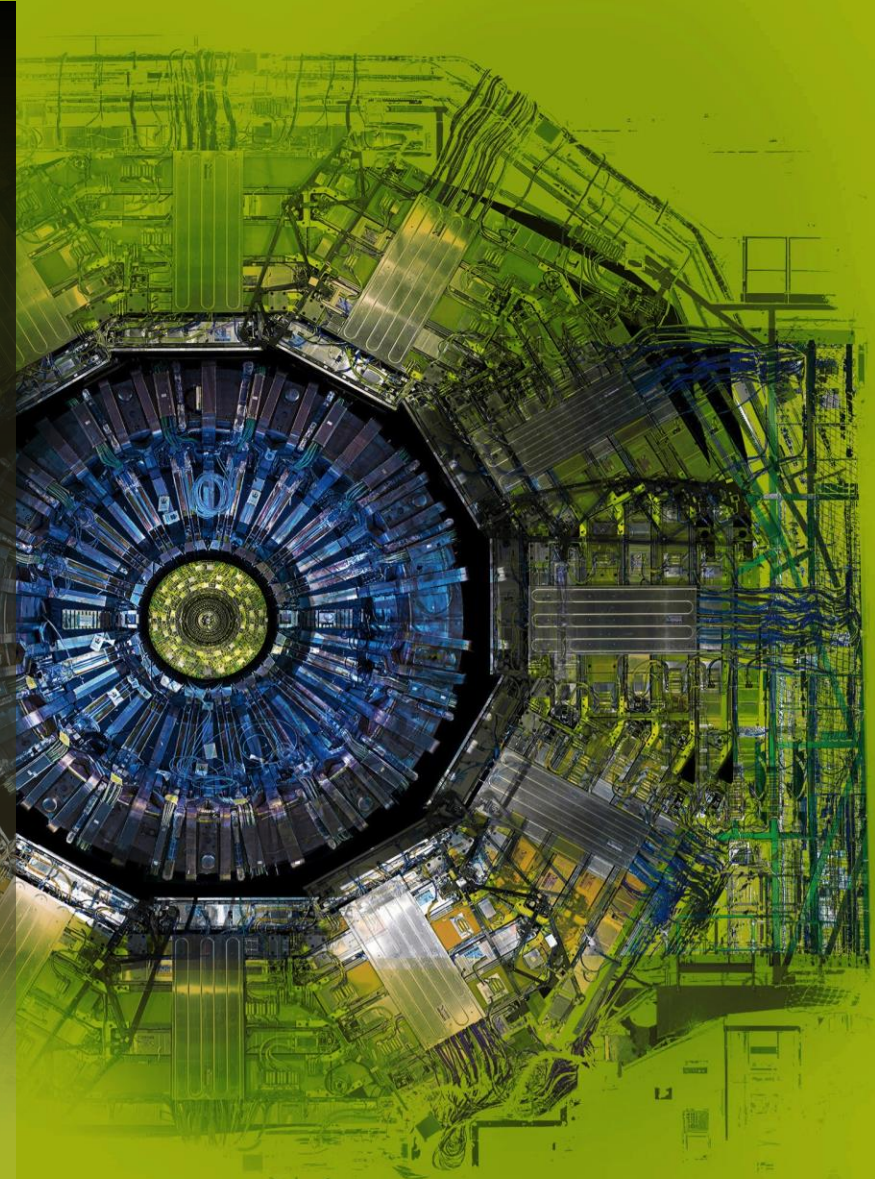
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- > **1979:** established in Viareggio by a group of senior engineers from INFN
  - > **1986:** first High Voltage Power Supply System (400.000 HV channels delivered worldwide in 30 years)
  - > **1991:** CAEN started VME design for nuclear market (1991-2016: 600.000 FE & DAQ channels delivered worldwide)
  - > **1994:** CAEN Microelectronics spin-off
  - > **1996:** CAEN Aerospace spin-off
  - > **1997:** UNI EN ISO 9001 quality certification
  - > **1998:** Started electronic design for LHC/CERN experiments (1998-2016: 8.500 electronic devices 250.000 boards/sub-boards)
  - > **2001:** UNI EN ISO 9001: **Vision 2000**
  - > **2003:** CAEN RFID spin-off (Radiofrequency Automatic Identification)
  - > **2005:** CAEN Technologies Inc., a CAEN branch company in the US
  - > **2006:** CAEN GmbH, A CAEN branch company in Germany
  - > **2010:** CAEN els spin-off (Accelerator Electronic Instrumentation)
  - > **2012:** CAEN qS spin-off (Cyber Security)
  - > **2016:** CAEN SyS started (Systems and Spectroscopy Division)
  - > **2022:** CAEN India Private Limited, a CAEN branch company in India

# Market

For more than 40 years CAEN has been providing Scientists and Engineers with the most advanced electronic instrumentation for any particle or radiation 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
- > Astrophysics
- > Neutrino Physics
- > Dark Matter Investigation
- > Nuclear Physics
- > Material Science
- > Medical Applications
- > Homeland Security
- > Industrial Applications
- > Spectroscopy Applications



# Key strengths



## > Product Development

- R&D
- System Integration
- Custom Design

## > Test and Calibration

## > After sales Services

- Maintenance
- Support



# Product Development

- > The R&D division is strong of 50 high level Physicists and Engineers who adopt forefront technologies to design innovative products
- > Ongoing collaborations with important institutes such as: Elettra, CEA, CNRS (LAL, IRES...), PSI, INFN...



# Test



- > All assembling activities are outsourced
- > Experienced group of 30 engineers dedicated to in-house Test and Calibration of the entire production
- > Capability: 500 complex modules/month
- > All procedures are ISO certified providing the complete traceability of the products

# Maintenance and Support services

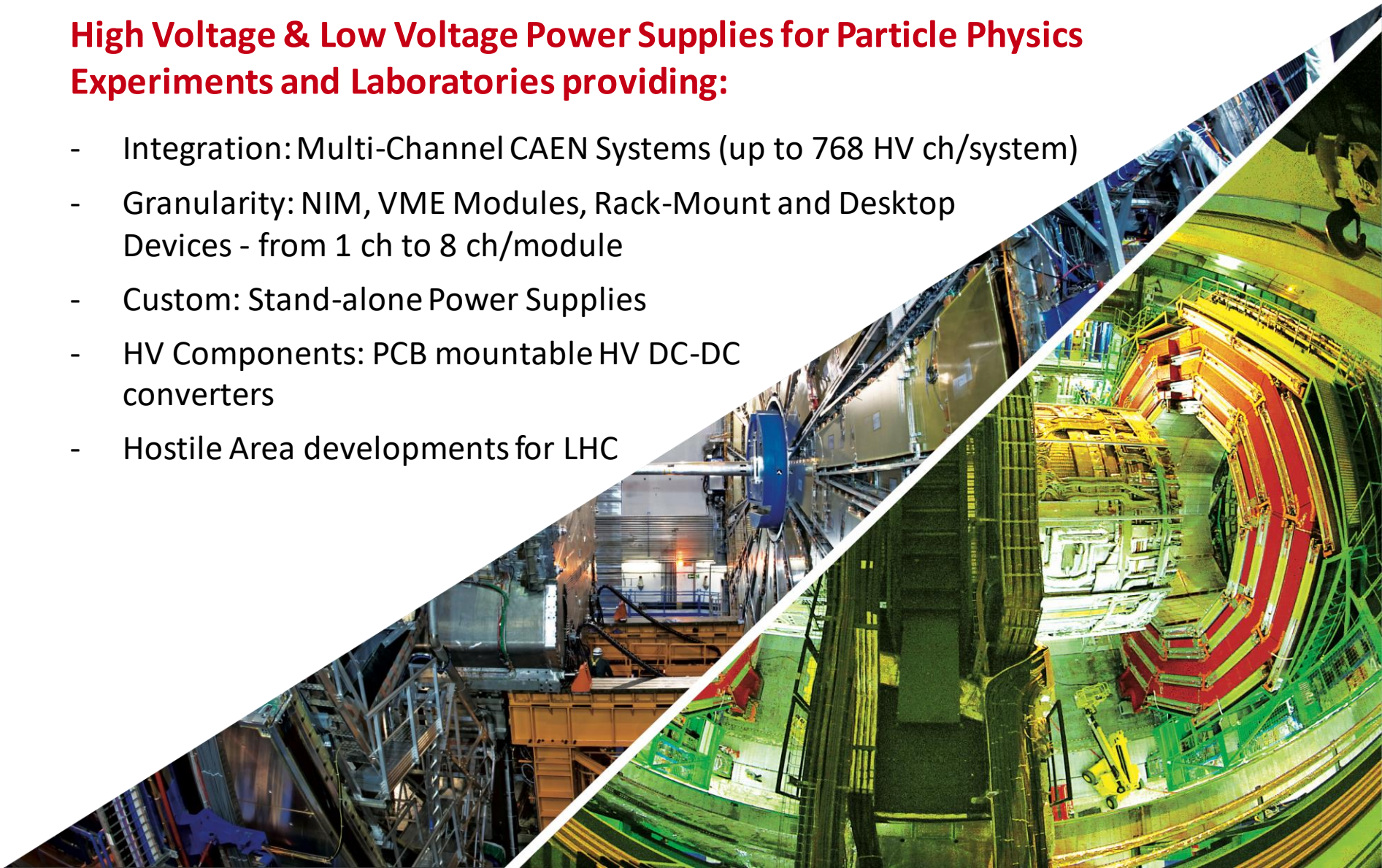
- > Excellent pre - and after - sales support
- > Strong maintenance division (25 engineers)
- > Long Term Maintenance Contract (CERN 10 years and more)
- > On line support service
- > Short intervention time (on request, on-site within one day only in Europe)
- > Short delivery (on request worldwide)



# Power Supplies Expertise

## High Voltage & Low Voltage Power Supplies for Particle Physics Experiments and Laboratories providing:

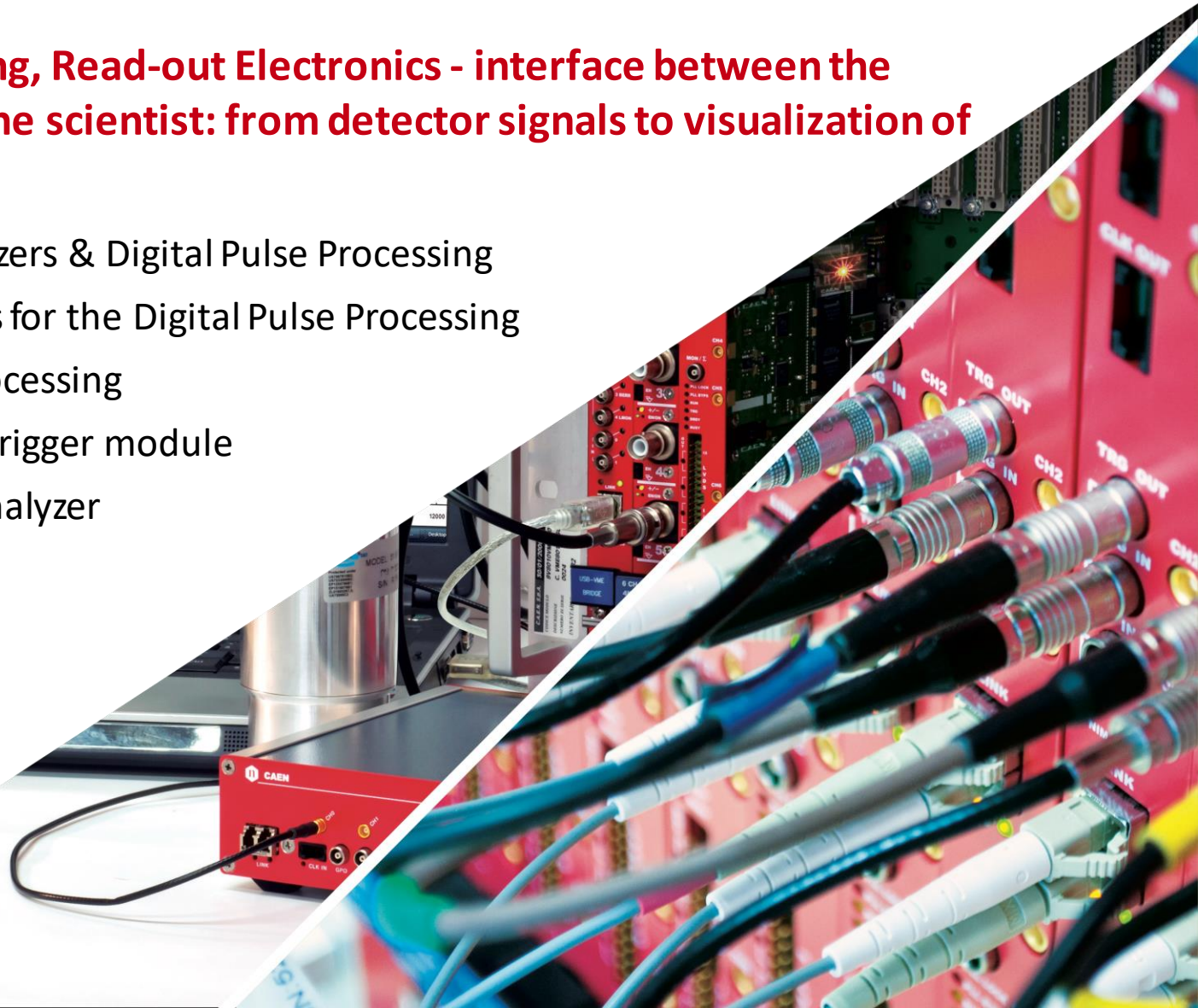
- Integration: Multi-Channel CAEN Systems (up to 768 HV ch/system)
- Granularity: NIM, VME Modules, Rack-Mount and Desktop Devices - from 1 ch to 8 ch/module
- Custom: Stand-alone Power Supplies
- HV Components: PCB mountable HV DC-DC converters
- Hostile Area developments for LHC



# Pulse Processing Expertise

**Signal Conditioning, Read-out Electronics - interface between the experiment and the scientist: from detector signals to visualization of data!**

- Waveform Digitizers & Digital Pulse Processing
- FPGA algorithms for the Digital Pulse Processing
- Analog Pulse Processing
- Programmable Trigger module
- Multichannel Analyzer
- Preamplifiers
- Custom project



# Custom Developments: Case History

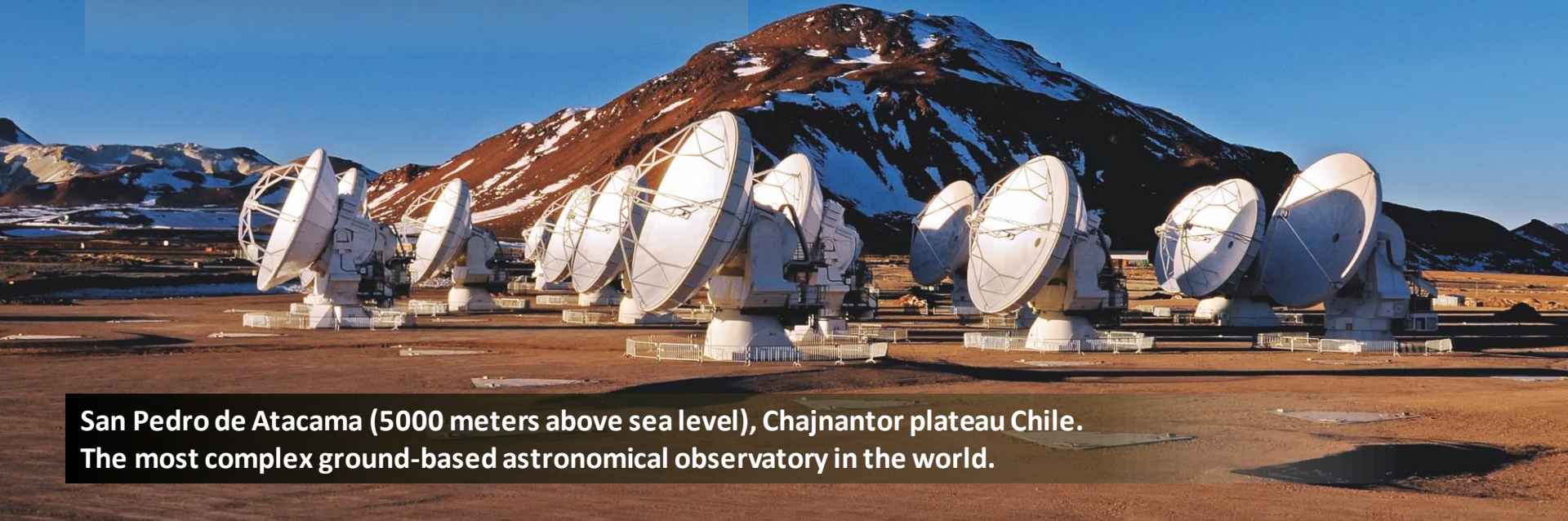
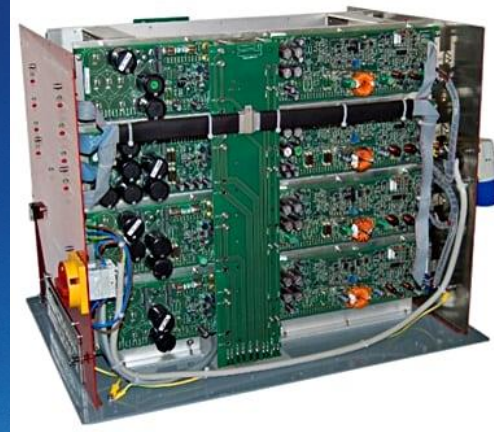
**Strong capability to manage complex custom solutions**

- High Voltage
- Digital and Analog Pulse Processing



# LV Power Supply for ALMA (ESO)

- > Design of custom LV Power Supply System for ALMA
- > **86 Complex LV Systems delivered (688 power channels)**
- > **Harsh environmental condition (desert at 5,000 m altitude)**
- > **Designed to operate for at least 30 years; 24/7 (24 hours a day, seven days a week)**



San Pedro de Atacama (5000 meters above sea level), Chajnantor plateau Chile.  
The most complex ground-based astronomical observatory in the world.

# NA62@CERN

CAEN was contract-awarded to design and manufacture the Calorimeter REAdout Module (CREAM) for the NA62@CERN Liquid Krypton Calorimeter (LKr)

- > VME 6U form factor
  - 32 channel
  - 14 bit 50 MS/s ADC
  - 2 Vpp input dynamics (differential)
  - 14-bit programmable DC offset adjustment ( $\pm 1V$ )
  - Memory buffer:
    - 26 MB circular buffer
    - 5.2 GB event buffer
  - Gbit Ethernet port for data readout
  - VME64X compliant interface

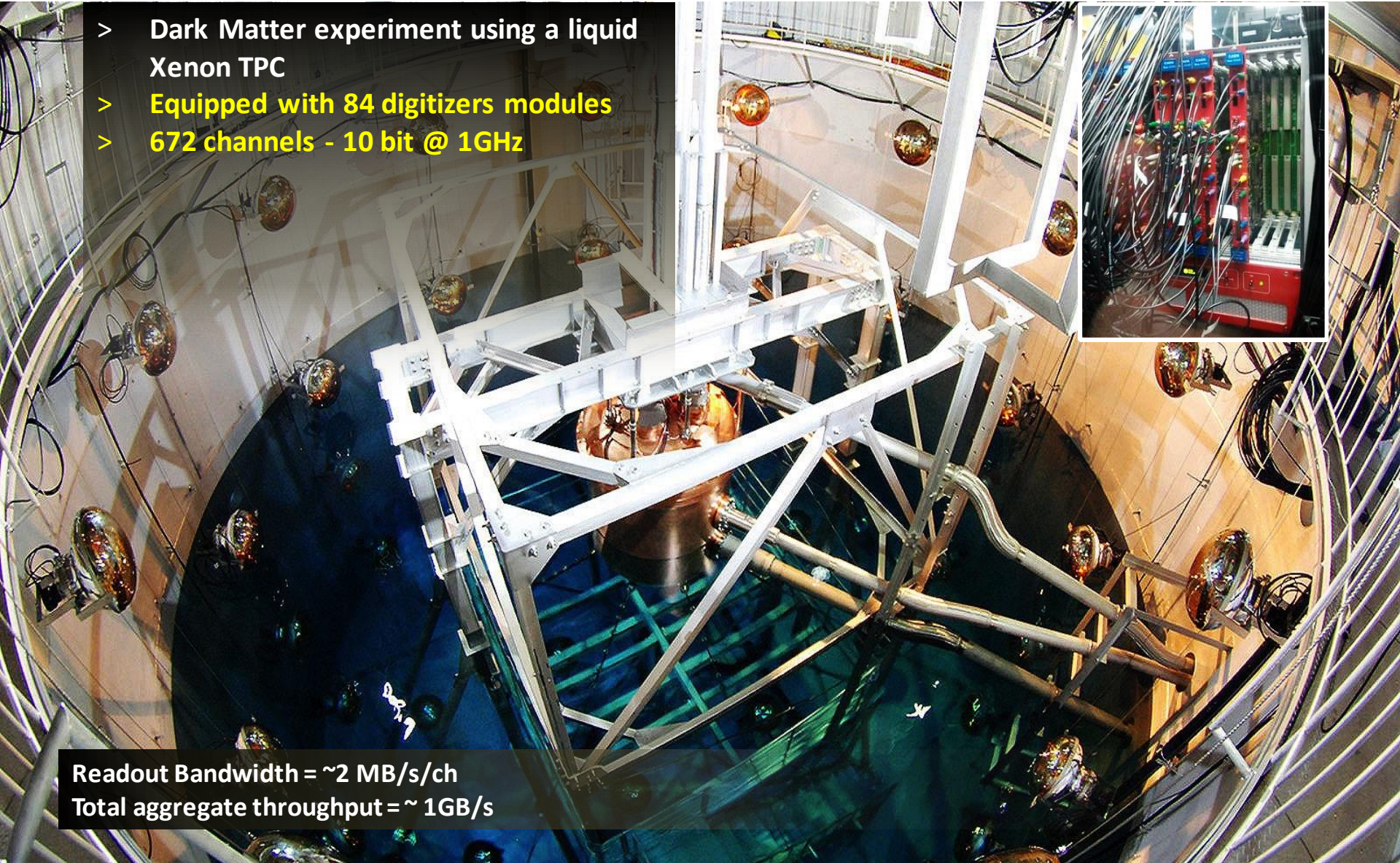


**455 modules - 13,249 read-out channels**



# XMass @ Kamioka, Japan

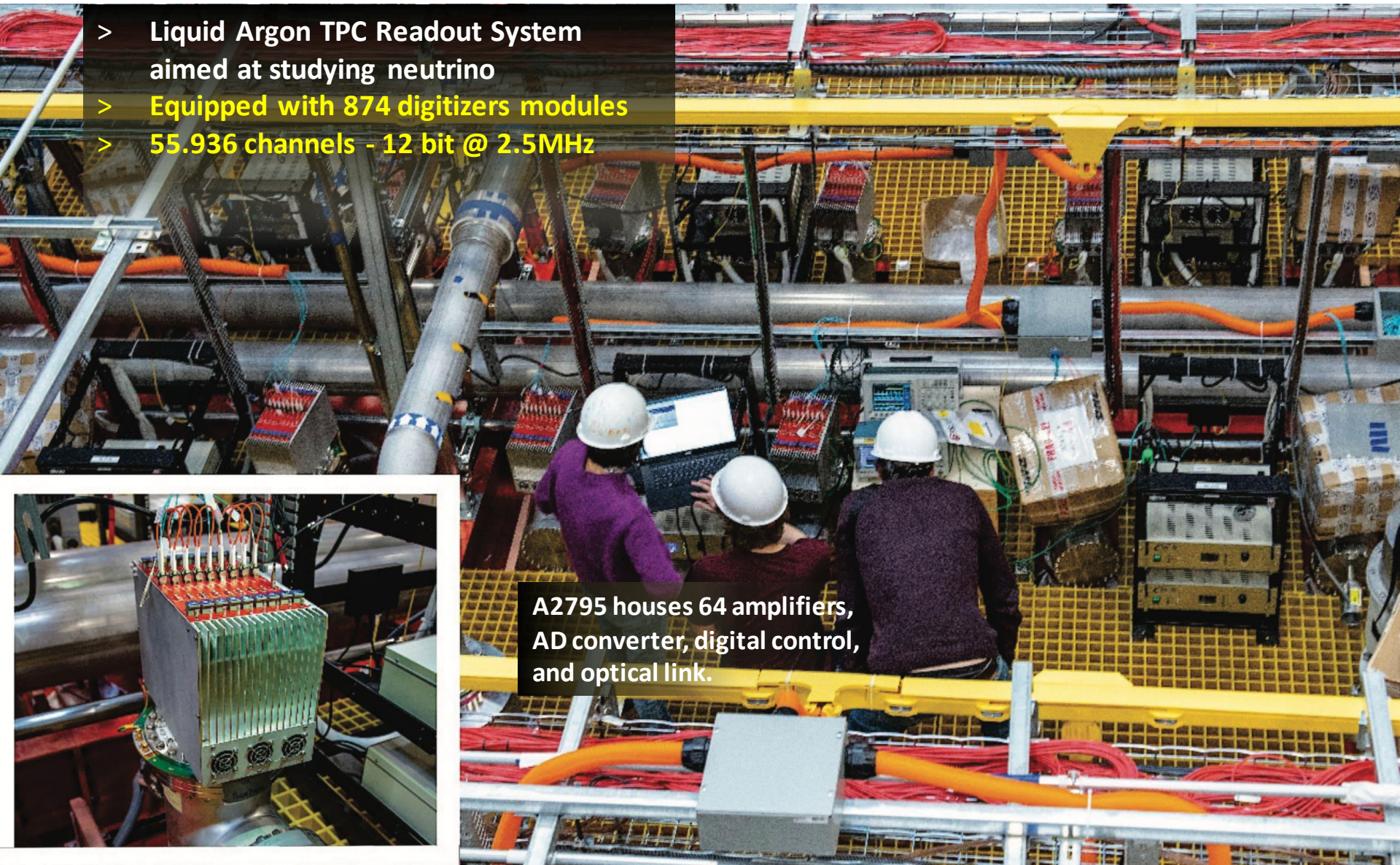
- > Dark Matter experiment using a liquid Xenon TPC
- > Equipped with 84 digitizers modules
- > 672 channels - 10 bit @ 1GHz



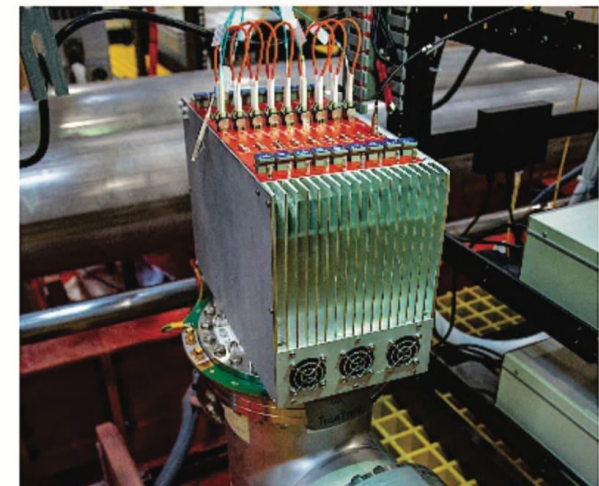
Readout Bandwidth =  $\sim 2$  MB/s/ch  
Total aggregate throughput =  $\sim 1$  GB/s

# ICARUS @ Fermilab, USA

- > Liquid Argon TPC Readout System aimed at studying neutrino
- > Equipped with 874 digitizers modules
- > 55.936 channels - 12 bit @ 2.5MHz



A2795 houses 64 amplifiers, AD converter, digital control, and optical link.



# Pierre Auger Observatory

- > Based on A7501 PCB mount HV DC-DC converter
- > Extended Temperature working range:  $-10^{\circ}\text{C} \div 70^{\circ}\text{C}$
- > Designed for long working life in harsh environment



- > A detection area of  $3.000 \text{ km}^2$  (the size of Luxembourg)
- > Mendoza Province (Argentina)



- > High efficiency
- > 2100 V/100  $\mu\text{A}$  output ranges
- > Available with positive or negative polarity
- > Stand alone architecture
- > Compact package: 34,5 x 62,9 x 119 mm<sup>3</sup>



A tailored solution for Large Area experiments in harsh environment: A7501PB

# International Atomic Energy Agency

- > 12 liquid scintillators
- > Digital DPP and Waveform readout
- > Sustained throughput: 340 MB/s

The Fast Neutron Collar (FNCL) is a liquid scintillator-based instrument developed as an efficient NDA (non destructive assay - test) tool for verification of modern NPP's Fresh Fuel Rods



Fast neutron counting System for safeguards and non proliferation activities (IAEA): SD7750

# GammaFly: Airborn Gamma Spectroscopy

Aerial monitoring system of environmental radioactivity with applications in:

- > Homeland security
- > Environmental protection
- > Geological and soil mapping
- > Uranium and mineral exploration
- > Mineral/gas and oil processing
- > Environmental radioactivity monitoring



**4x4 array of 1 liter NaI detectors**



# CERN/LHC Electronics in Hostile Environments

## “EASY” Multi Function System

- > 2 kGauss magnetic field
- >  $1 \cdot 10^{11}$  p/cm<sup>2</sup> TD - 15 kRad TID
- >  $2 \cdot 10^{12}$  n/cm<sup>2</sup> TD



Designed with COTS components to work in “hostile” areas

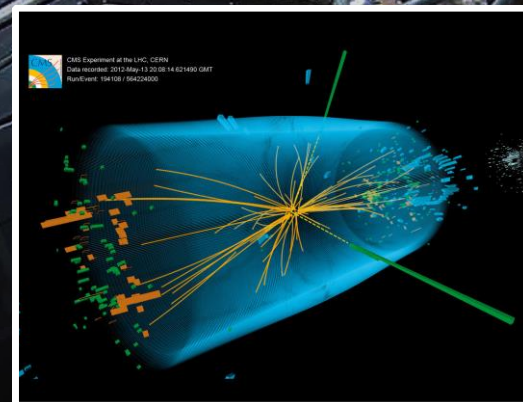
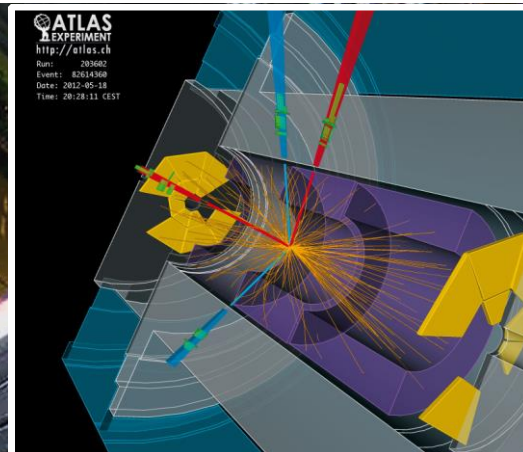
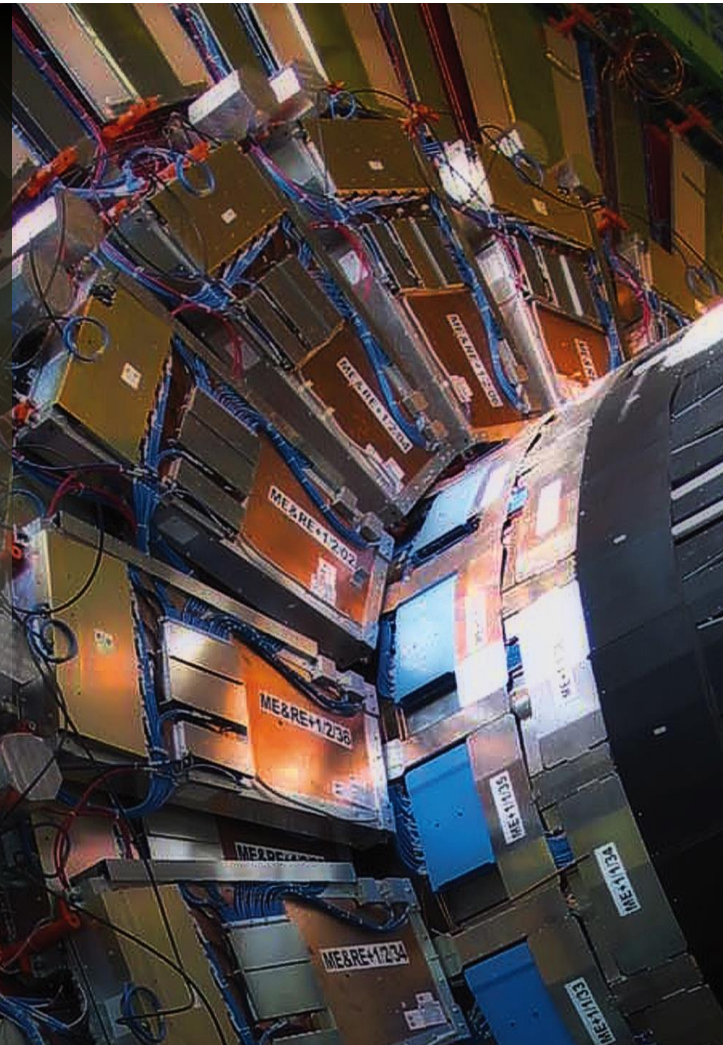
# CAEN & LHC Experiments

1998 – 2019

**SYNERGY for SUCCESS**

21 years of joint efforts to achieve top performances

- > 8.500 electronic devices
- > 250.000 boards/sub-boards



CAEN has received the "CMS Crystal Award" for the development and production of the power system for the CMS/LHC Tracker

# CAENels – Gear for Science



## Application fields:

- > Oriented and dedicated to particle accelerator facilities, e.g. synchrotron light sources and Free Electron Lasers
- > “Know-how” and “hands-on” large installations and maintenance
- > CAEN industrial capability
- > Customization and dedicated support



# Product Lines

**Digital Magnet Power Supplies**

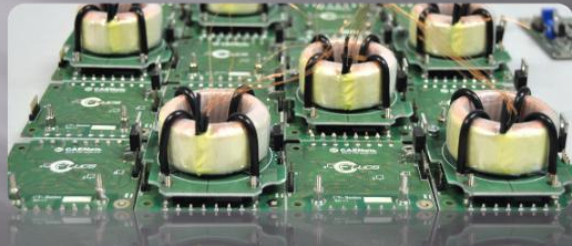
**Bipolar + Monopolar**

**from  $\pm 5A$  (small correctors) to 135A**

**Ethernet Interface**



MAGNET  
POWER  
SUPPLIES



PRECISION  
CURRENT  
TRANSDUCERS



**DC Current Transducers**

**Closed-loop Technology**

**DC + AC monitoring**

**Current monitoring up to kA**

**Multi-channel Low Current Measurements**

**Dedicated Systems (Bipolar HV for Optics)**

**Beamline Local Feedback Integrated System**



BEAMLINE  
ELECTRONIC  
INSTRUMENTATION



MTCA.4  
MicroTCA  
For Physics



**MicroTCA for Physics**

**High-Voltage Board**

**Collaboration with DESY**



# Facilities that rely on us

- APS – Advanced Photon Source, Argonne (Chicago, USA)
- ALS – Advanced Light Source, LBNL (Berkeley, USA)
- BNL – Brookhaven National Lab (Brookhaven, USA)
- CLS – Canadian Light Source (Canada)
- DESY – Deutsches Elektronen-Synchrotron (Germany)
- ELETTRA – Elettra Light Source (Italy)
- ESRF – European Synchrotron Radiation Facility (France)
- JLAB – Thomas Jefferson Lab (Newport News, USA)
- KEK – Photon Factory, cERL (Tsukuba, Japan)
- PAL – Pohang Accelerator Laboratory (South Korea)
- RRCAT – Raja Ramanna Centre for Advanced Technology (India)
- SLRI – Synchrotron Light Radiation Institute (Thailand)
- SPARC – INFN Frascati (Italy)

and companies:

KYMA Undulators, BRUKER ASC



# CAEN Sys - CAEN Spectroscopy Division



## What we do

Providing nuclear measurement solutions and technical expertise for a wide array of applications.

### SNIPER-GN - Special Nuclear material Portable identifier

- > Search and secure operations
- > Airport security checkpoints
- > Nuclear facilities and radiation-sensitive areas
- > Radiological Dispersal Device (RDD) detection and identification
- > First responder prompt intervention
- > Customs border inspections

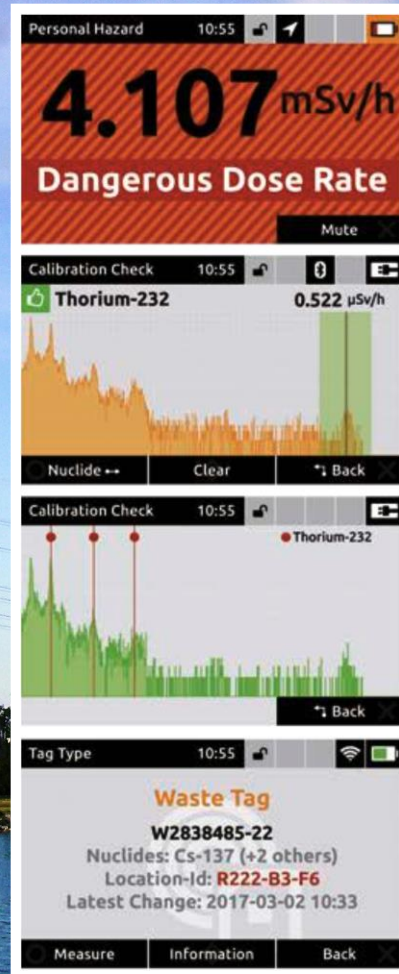


NATO Stock Numbers

# Nuclear Safety & Security

## DigiWaste - Digital Platform for Nuclear Waste Management

- > Decommissioning & Dismantling
- > Interim Storage of Nuclear Waste
- > Radioprotection
- > Legacy Waste



# Nuclear Safety & Security

**GAMON - Global Measurement Platform for Nuclear Safety and Security**

- > Ring monitor systems around nuclear facilities
- > Nationwide environmental monitoring networks
- > Area monitor system in nuclear research laboratories
- > Portable, mobile measurement stations for emergency response



Different models for applications





# CAEN RFID

- > The first Italian company providing UHF RFID products
- > Key player in the EU RFID scenario (EPCglobal, ETSI...)
- > Worldwide customers in manufacturing, logistics, transport, healthcare, fashion, retail...
- > Totally in-house HW, SW & support skills
- > Key partner in EU funded projects
- > An “added value manufacturer”





# CAEN RFID



UHF RFID is an enabling technology for several fields of applications:

- > Embedded
- > Fashion - Retail
- > Cold Chain - Pharma
- > Waste Management
- > Access Control
- > Industrial Manufacturing
- > Transportation - Logistics
- > FMCG - Supply Chain
- > Leisure
- > We are the Technology provider & design center for Datalogic Spa





## • Solutions

- Next Generation Security
- Threats and vulnerabilities Protection
- Mobility and endpoint Security
- Next Generation Network

## • Services

- Managed Security Services
- Technologies Consulting
- Risk & Vulnerability Assessment
- Compliance Consulting





# CAENqS Solutions

## Security Architecture

- IT security strategy definition, roadmap and approach
- Definition and design of security controls and solutions
- People, process, technology and data security assessment
- Security policies and processes
- Operations and monitoring
- Business impact analysis
- Security risk assessment

## Threats and Vulnerabilities

- Vulnerability assessment
- Penetration test
- Wireless security test

## Managed Security Support

- SOC Support Call
- Professional Assistance
- Service On-Site

# Winning Synergies

**CAEN** is always open to cooperate with its Partners and Customers to evaluate new projects and partnerships

