



Electronic Instrumentation & Integrated Systems

Stefano Petrucci

s.petrucci@caen.it



SUMMARY

- CAEN Company Profile
- Products Line
- Taylored Successful Projects
- Collaborative R&D Projects





CAEN Network's Companies



CAEN SpA



- Founded in 1979, CAEN SpA (Costruzioni Apparecchiature Elettroniche Nucleare) is an important industrial spin-off of the INFN
- 115 people (assembly not included)
- Core business: Electronic Instrumentation for physics experiments (world leader)
- Spin-off activities: RFID (2003), CAENels (2010)



Quality Certification





www.itq.it

CISQ is a member of



www.cisq-certifications.com

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

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

C.A.E.N. SPA

VIA VETRAIA 11 - 55049 VIAREGGIO (LU)
UNITÀ OPERATIVE
OPERATIVE UNITS
VIA VETRAIA 11 - 55049 VIAREGGIO (LU)
È CONFORME ALLA NORMA
IS IN COMPLIANCE WITH THE STANDARD

ISO 9001:2008

PER LE SEGUENTI ATTIVITÀ
FOR THE FOLLOWING ACTIVITIES

Progettazione, fabbricazione, collaudo e commercializzazione di
apparecchiature elettroniche
Design, manufacturing, test and marketing of electronic equipment

Riferirsi al manuale della qualità per specificità dei requisiti delle norme ISO 9001:2008
Refer to quality manual for details of applications to ISO 9001:2008 requirements

IL PRESENTE CERTIFICATO È SOGGETTO AL RISPETTO DEL REGOLAMENTO
PER LA CERTIFICAZIONE DEI SISTEMI DI QUALITÀ E DI GESTIONE DELLE AZIENDE
THE USE AND THE VALIDITY OF THE CERTIFICATE SHALL SATISFY THE REQUIREMENTS
OF THE RULES FOR THE CERTIFICATION OF COMPANY QUALITY AND MANAGEMENT SYSTEM

PRIMA EMISSIONE FIRST ISSUE	EMISSIONE CORRENTE CURRENT ISSUE	DATA SCADENZA EXPIRY DATE
1998-02-16	2009-07-07	2012-07-14



IMQ S.p.A. - VIA QUINTILIANO, 43 - 20138 MILANO ITALY

SINCERT EA: 19

SINCERT è un marchio registrato di IMQ S.p.A. - Via Quintiliano, 43 - 20138 Milano - Italia

La presente certificazione è valida solo per il sistema di gestione della qualità
The validity of the certificate is valid only for the quality management system

CISQ è la Federazione Italiana di Organismi di Certificazione di Sistemi di Gestione Aziendali
CISQ is the Italian Federation of Management System Certification Bodies



Global coverage

- Worldwide sales network
 - CAEN offices in Italy, Germany, USA,
 - Distributors in more than 30 countries
- Portfolio: 1000 customers
- Includes world leading research centres
 - Europe: CERN, INFN, 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

Market

- **For 30 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**

Key Strengths

- **R&D** concentrated on physics research
- **TEST**
- **MAINTENANCE** After Sales support
- **Software**

R&D

- **R&D Division at the forefront of technology (40 aro. designers)**
- **Ongoing collaborations with important institutes (Elettra, IN2P3, LAL, IRES., PSI, INFN..)**



TEST

- **Assembly Outsourced**
- **In-House Calibration and Test with a Staff of 30 people**



Maintenance

- **Excellent pre- and after-sales support: Maintenance division**
- **Staff: 12 specialized senior technicians**





CAEN's Expertise

- HV and LV Power Supplies
- Low Light Sensors
- Multichannel CAEN Systems
- Multichannel NIM and VME Modules
- Signal Conditioning & Read-out Electronics
- Preamplifiers
- NIM, CAMAC, PCIe, USB2.0 and VME
- Front-End/Data Acquisition Modules
- Powered Crates and Chassis
- Low Ripple Linear NIM powered Crates
- New Hi-End VME64/VME64x Crates
- Custom Developments
- Software User Interface
- Educational



HV and LV Power Supplies

- Multichannel CAEN Systems
- Multichannel NIM and VME Modules



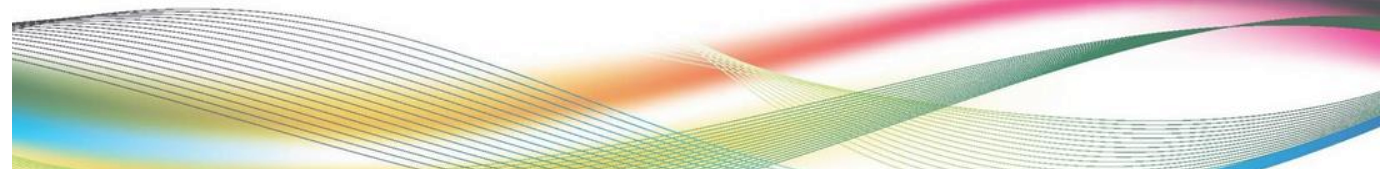
A complete family of HV and LV board is available for the new System



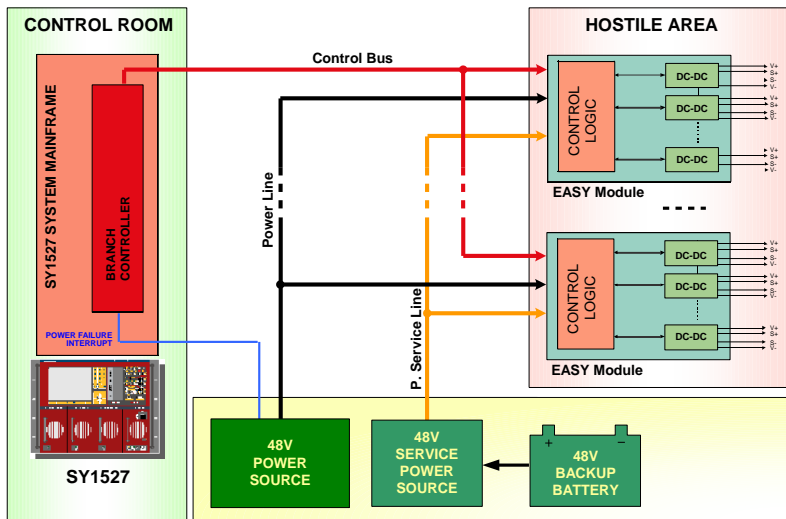
High Voltage boards with completely independent channels: from 6 to 32 channels, from 100 V to 15 kV (A15xx family).

High Voltage Distributor boards up to 48 channels with Independent Current Monitor (A2932/A2935).

Low Voltage boards from 4.5 V to 15 V with Remote Sensing Lines to compensate for the voltage drop over the connection cables.



Electronics in Hostile Environments

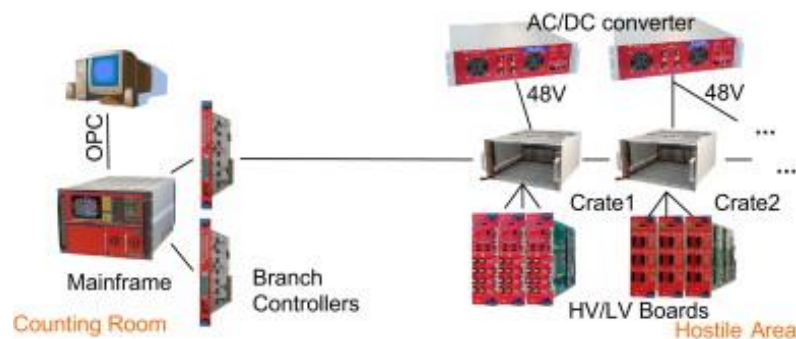


“EASY” System - CERN/LHC

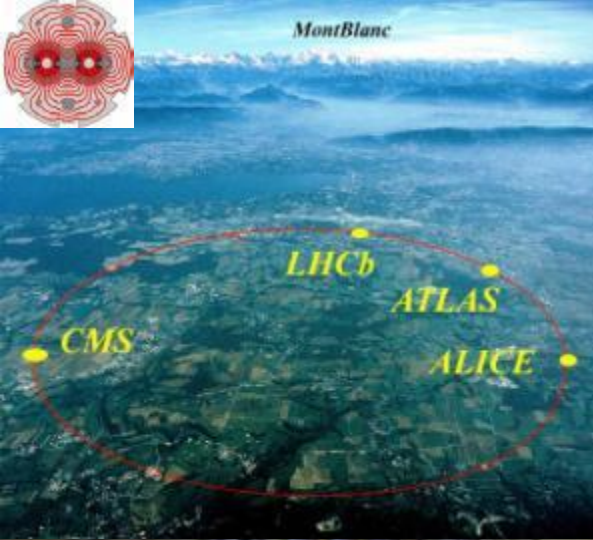
Embedded Assembly System

for “hostile” areas with COTS components

- 7 kGauss magnetic field
- $1 \cdot 10^{11}$ p/cm² TD - 15 kRad TID
- $2 \cdot 10^{12}$ n/cm² TD



CUSTOM PROJECT



CAEN & LHC Experiments

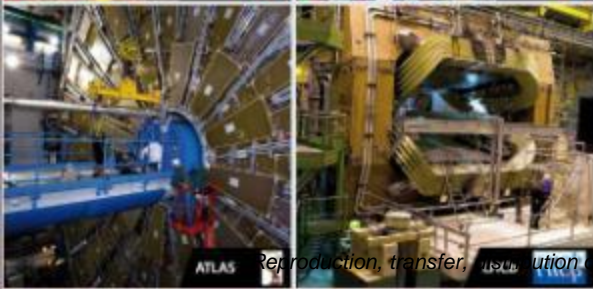
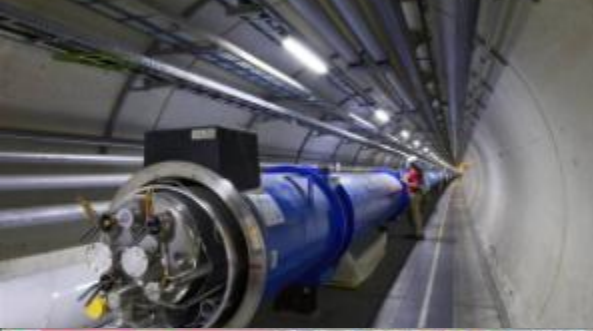


1998 – 2008

SYNERGY for SUCCESS

10 years of joint efforts to achieve top performances

- **6.500 electronic units delivered**
 - 190.000 sub-boards
- **Designed for Hostile Environments**
 - **Magnetic Field resistant (up to 5000 Gauss)**
 - **Radiation tolerant**



CAEN & LHC Experiments

1998 – 2008

SYNERGY for SUCCESS

CAEN has received the **"CMS Crystal Award of the year 2009"** for the development and production of the power system for the CMS Tracker.

- Detector subdivided into 1994 Power groups
- HV (0÷600V) for silicon strip detector
- LV (1.25V - 2.5V) for FE electronics
- $I_{tot} > 15$ kA
- 139 crates / 29 racks / 1200 Power Supply Units



CMS Crystal Award of the Year 2009 to
CAEN SpA
For the development and the production of the
power system for the LHC Tracker



CAEN CAEN and its Partners/Customers: Winning Synergies



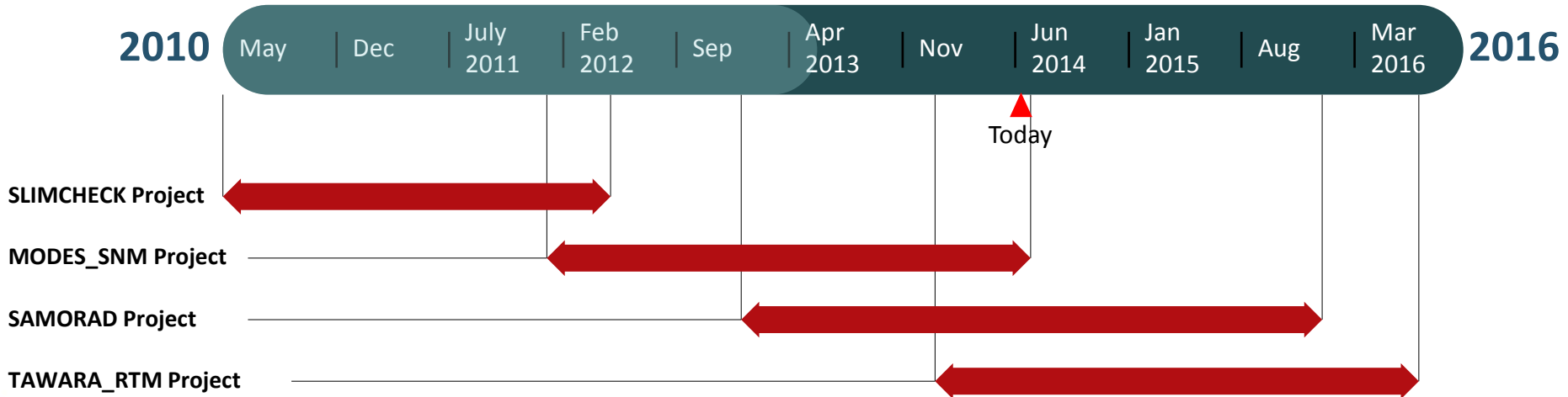
- **CAEN is always open to cooperate and talk about new projects and partnerships**



R&D COLLABORATIVE PROJECTS BACKGROUND & CASE HISTORY

CAEN is involved in several R&D collaborative projects, all of them with these common goals:

- to continuously grow up our expertise in high-level electronic design
- to extend its use to the most relevant applications for the benefit of the community



In particular, the most of them are in the fields of **SECURITY** (CBRNE protection, Illicit Trafficking countermeasures, Radiation monitoring of sensitive sites,...) and **ENVIRONMENT** (environmental radioactivity monitoring, recognition of contamination threats respect to the natural radioactivity,...)

SLIMCHECK

A SLIMPORT programme project

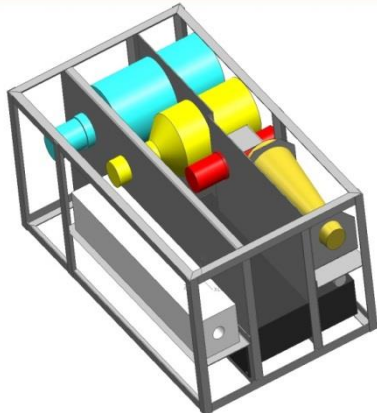
- Funded by: **Italian Ministry for Economic Development**
- Programme: **Industria 2015**
- Theme: **SUSTAINABLE MOBILITY**



Project Partners



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DI PADOVA



<http://www.caen.it/csite/DisplaySupportData.jsp?Type=News&Id=25>

SLIMCHECK

A SLIMPORT programme project

- In most harbors worldwide, inspection systems dedicated to the security of passengers and freight are based on fixed x-ray portals, radiation portal monitors and handheld radiometers.
- CAEN, in collaboration with University of Padova, has developed an integrated mobile system for port security as a part of the SLIMPORT project, funded by the Italian Ministry for the Economic Development (MISE) under the "Industria 2015" program. This system, called SMANDRA, aims to detect and identify different types of radioactive and nuclear materials hidden inside containers, and to identify dangerous and/or illegal materials inside volumes tagged as "suspect" by conventional surveys (as active NDA system).

The SMANDRA system consists in two different parts:

- 1) **A PASSIVE UNIT** featuring Gamma-ray detectors (NaI and LaBr) and neutron counters (Liq. Scintillator and ^3He proportional counter)
- 2) **AN ACTIVE UNIT** that contains a EADS-SODERN sealed neutron generator with the associated particle detector to perform active interrogations using the tagged neutron inspection technique

The SMANDRA system was tested in April 2011 at the JRC-Ispra laboratory, showing excellent results in the identification of different radioactive and special nuclear materials. A more detailed explanation of those results can be found [HERE](#). This Paper was presented at the [ANIMMA2011](#) conference, held in the beginning of June 2011 in Gent-Belgium, where CAEN showed the passive unit of the system.

MODES_SNM

MOdular DEtection System for Special Nuclear Materials

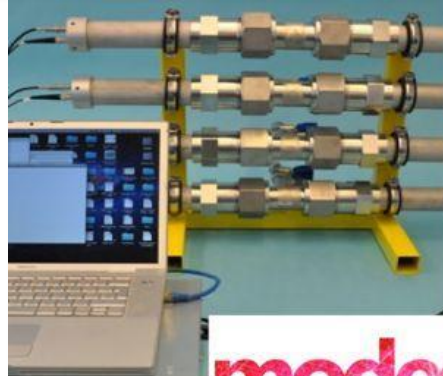
- Funded by: **EUROPEAN COMMISSION**
- Programme: **FP7 – Cooperation**
- Theme: **SECURITY**



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modes SNM



www.modes-snm.eu

MODES_SNM

MOdular DEtection System for Special Nuclear Materials

- The MODES_SNM project aims to carry out technical research in order to develop a prototype for a mobile, modular detection system for radioactive and Special Nuclear Materials (SNM). To maximize the detection capability for SNM the project will develop new detectors for fast and thermal neutrons, as well as gamma-rays, based on the technology of high pressure scintillation cells using noble gases (as ^4He and Xe) recently developed by ARKTIS. The proof-of-principle of the new detectors has already been recently demonstrated.
- The goal of the project is to deliver a tested prototype of a modular mobile system capable of passively detecting weak or shielded radioactive sources with accuracy higher than that of currently available systems. The identification of the gamma-ray emitter is also possible by using the spectroscopic analysis performed by high pressure Xe cells whereas the ratio between fast and thermal neutrons will bring information about the eventual shielding around the source.
- The R&D aims at improve the current detectors (i.e. at designing, constructing and testing robust, safe, and lightweight high pressure cells with an advanced read-out system) so that they can be used as basic components of the modular mobile system. A suitable Information System will be also developed to manage the detectors, integrate and analyze the data, and provide to the user simple information derived by a decision tree utilizing the data from the three types of detectors. The prototype detection system is the major deliverable of the project. The project also includes the qualification of this detection system in laboratory condition to quantify its detection performance and ultimate limits, as well as a demonstration phase in which the detection system will be field-tested by the end-user group established within the project.

SAMORAD

An Airborne System for Environmental Radioactivity Monitoring

- Funded by: **REGIONE TOSCANA**
- Programme: **POR CReO – B.U. R&S 2012**
- Theme: **ENVIRONMENTAL MONITORING**



Project Partners



www.samorad.eu

SAMORAD

An Airborne System for Environmental Radioactivity Monitoring

- Monitoring the environmental radioactivity can provide useful information in many fields of social life: homeland security, construction industry, environmental protection, geology studies, mineral/gas and oil processing, etc...
- Measuring the environmental radioactivity through the gamma ray spectroscopy becomes very crucial for the man-made radioactivity control. Few examples are the radioactive waste from nuclear reactors, or the disasters of Chernobyl and Fukushima. This technique may help both in looking for illegal disposal of radioactive sources, and in a better management of the working conditions of nuclear factories and mine workers. Unfortunately this technique is not yet well exploited, since there are only few instruments in the world able to make these kind of measurements.
- We conceived the SAMORAD project to accomplish this study, in collaboration with the University of Siena, whose Geo Technology researchers have a strong know-how on this topic, Desys S.r.l and Hydea S.p.A.. The project aim is to develop a high precision instrument for the measurement of the environmental radioactivity.
- These measurements are intended to be made from a helicopter flying over the area under inspection (through the technique called AGRS - Airborne Gamma Ray Spectroscopy). The result of those measurements would be made available through radiometric maps of the areas of interest.

Applications:

- Geology
- Oil&Gas
- Monitor of Special Sites
- Security

TAWARA_RTM

Tap Water Radioactivity Real Time Monitor

- Funded by: **EUROPEAN COMMISSION**
- Programme: **FP7 – Cooperation**
- Theme: **SECURITY**



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CAEN
Tools for Discovery



Ente per le Nuove tecnologie, l'Energia e l'Ambiente



SCIONIX

Dedicated
Scintillation Detectors



**WAR WSP
DYN OLN
SKI+ ICY.**



UNIVERSITÀ DI PISA



[TAWARA website](#)

TAWARA_RT

Tap Water Radioactivity Real Time Monitor

The TAWARA_RT project aims at developing a complete platform to control the quality of the tap water with respect to the radioactivity content. The platform will provide a real time measurement of the activity in the water (measuring the gross alpha and beta activity) to verify whether the distributed water is well within the limits set by the EU legislation or if it's reaching the threshold that requires rapid actions. In the latter case, a message is sent to the water plant management to verify the need of stopping the water distribution. At the same time, a second part of the system is activated, to determine the nature of the contamination by gamma ray spectroscopy, defining the nature of the contamination and the corresponding counter-measures. The determination of the contaminants is also needed in order to establish the effects on the population and produce a full information report to the Civil Security Authorities.

The prototypes of a real time monitoring system and spectroscopy analyzer will be designed, built, tested under laboratory condition and finally installed at the North Waterworks Plant of Warsaw managed by the Warsaw Waterwork Company for the demonstration campaign. The site selected for the demonstration is particularly sensible for possible radioactivity contamination being in communication with the Chernobyl region through a network of rivers and canals, and due to its proximity with a Polish National Nuclear Waste storage site.

The TAWARA_RT system will be designed taking into account that the increase of the water radioactivity might derive from natural phenomena (as earthquakes) but also from a whole set of radioactive and nuclear emergencies. The TAWARA_RT project will include the development of the complete platform including the fast real-time monitor system (RTM), the spectroscopic system (SPEC) as well as the Information and Communication System that will be designed to include in the future also chemical and biological sensors.

Articles/Papers

- [AR2594 - The EURITRACK Project: Status of a Tagged Neutron Inspection System for Cargo Containers](#)
- [AR2548 - An integrated mobile system for port security.](#)
- [AR2610 - Special Nuclear Material Detection Studies With The SMANDRA Mobile System.](#)
- [AR2613 - Special nuclear material detection with a mobile multi-detector system](#)

CAEN S.p.A.

Via Vetraia, 11

55049 Viareggio - Italy

Tel. +39.0584.388.398

Fax +39.0584.388.959

info@caen.it

www.caen.it

