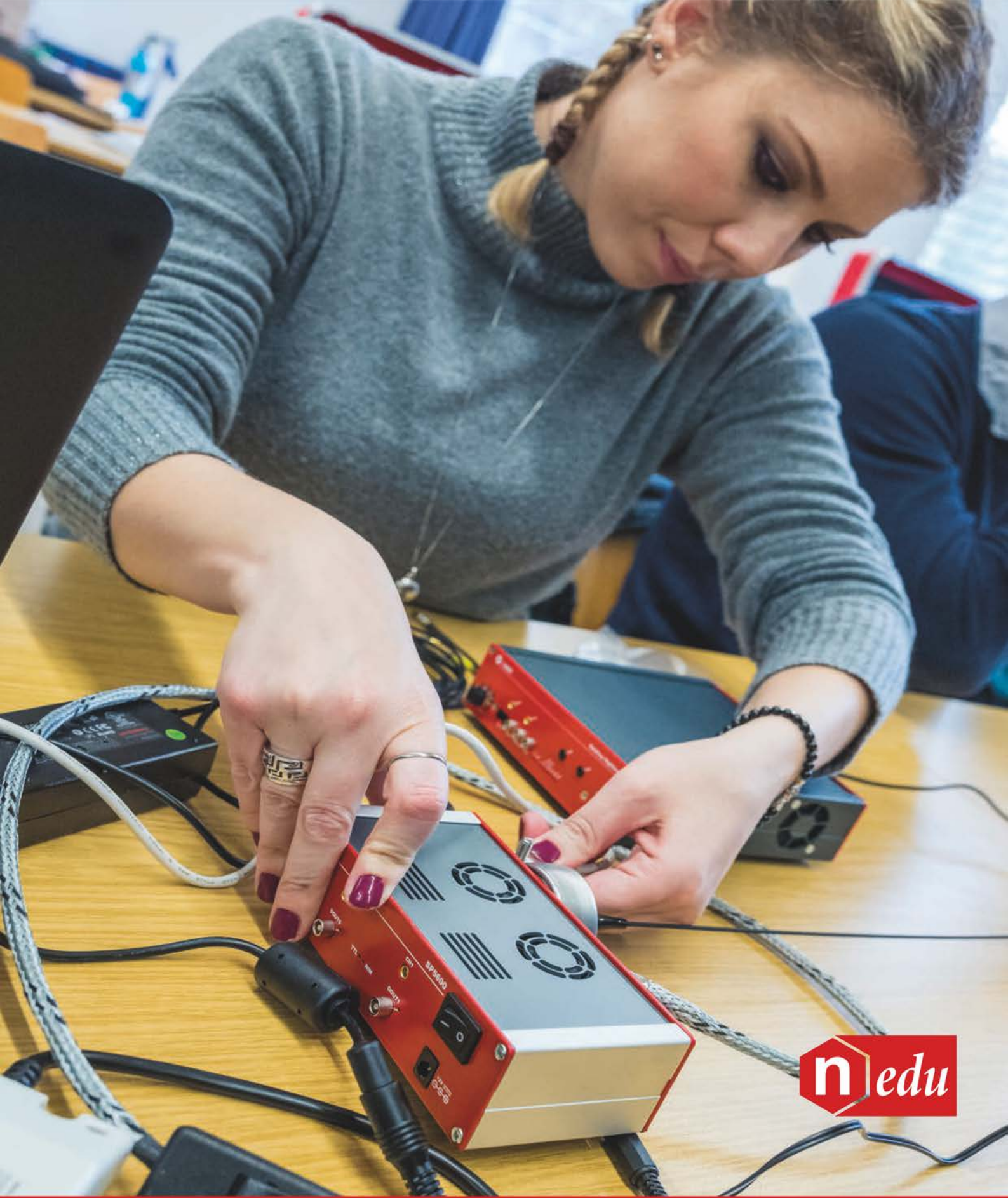


CAEN n edu Educational Tools 2022

www.caen.it/educational

SP5701
Easypet

2D image reconstruction in real-time to explore Nuclear Imaging World!

Ordering Option: see p. 46

EasyPET is a simple, user-friendly and portable didactic PET system developed for high-level education, to explore the physical and technological principles of the conventional human PET scanners, using the same basic detectors of state-of-the-art systems.

Overview

The Positron Emission Tomography (PET) scanner is a state-of-the-art medical imaging system, capable of providing detailed functional information of physiological processes inside the human body.

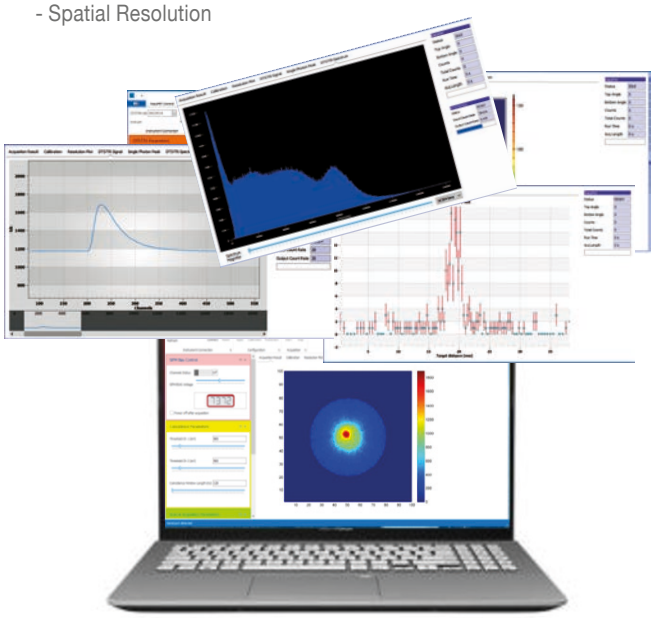
The EasyPET -- SP5700 concept, protected under a patent filed by Aveiro University, is based on a single pair of detector kept collinear during the whole data acquisition and a moving mechanism with two degrees of freedom to reproduce the functionalities of an entire PET ring. The main advantages are in terms of the reduction of the complexity and cost of the PET system. It opens the possibility of teaching by doing the basics behind PET imaging simplifying the set-up to make it accessible to Educational Laboratories.

The EasyPET is also available in a special Educational Kit, EasyPET Kit - SP5701, which includes a compact portable 16k Digital MCA - DT5770 too.

A Graphical User Interface allows the user to easily set the acquisition parameters, visualize the reconstructed image in real-time during acquisition, and perform several didactic experiments related to PET imaging, as well as offline image analysis.

Features

- **Two detector cells, each composed of a LYSO scintillator crystal optically coupled to a SiPM**
- **Software: data analysis and EasyPET and MCA management**
- **Main applications:**
  - Basic Measurements: γ Spectroscopy and System Linearity
  - Positron Annihilation Detection
  - Two-dimensional Reconstruction of Source
  - Spatial Resolution



Physics Experiments

Kit Model	Statistics	SiPM Characterization	Photons	Cosmic Rays	γ Spectroscopy	β Spectroscopy	Nuclear Imaging	Environmental Radioactivity Indoor	Environmental Radioactivity Outdoor	Pulse Processing
SPS5700 EasyPET	•	-	-	-	-	-	•	-	-	-
SPS5701 EasyPET Kit	•	-	-	-	•	-	•	-	-	-

CAEN
Tools for Discovery

SP5600EMU
Emulationl Kit

Create and Analyze a radioactive source!

Ordering Option: see p. 46

This kit allows the user to perform a series of lab experiments without using a radioactive source and a detector, by simulating the signals produced by the interaction of particles with the detecting unit.

Overview

The Emulation kit is based on the CAEN Digital Detector Emulator (DT4800) together with the Digital Multichannel Analyzer (DT5770).

The core of the system is the DT4800, the most compact and cost-effective model of the Detector Emulators family. The unit features one analog output and one digital input. As a Pulser it can generate exponential decay signals with programmable Rise Time and Fall Time up to a rate of 1 Mcps. The rate can be fixed or it can follow a Poissonian distribution. In Emulation mode the unit can reproduce signals from a real energy spectrum. A database of nuclides is provided to generate specific emission lines and Gaussian noise can be added.

The Software interface enables the Emulator to generate an analog output and apply different pulse processing via the MCA.

Features

- No need of radioactive source
- User Friendly Control SW
- γ and ß Spectroscopy
- System Linearity
- Real Energy spectrum emulation
- Noise emulation
- Time distribution Emulation (Poissonian)
- Continuous pre-amplifier emulation
- Pulse processing: Height Analysis and Charge Integration
- Statistic

SP5650
Open FPGA Kit

Programming with SCI-Compiler like setup an experiment!

Ordering Option: see p. 46

The Open FPGA kit allows the user to perform a series of lab experiments without using radioactive source and detector, by simulating the signals and to create specific processing of pulses.

Overview

The Open FPGA kit is based on the CAEN Digital Detector Emulator (DT4800) together with a SCI-Compiler SMART starter pack. The kit allows performing a series of lab experiments without using a radioactive source and a detector, by simulating the signals produced by the interaction of particles within the detecting unit. The core of the system is the DT1260, 60 Ms/s, 12 bit General Purpose board with programmable FPGA. Besides DT4800, splitter, and several delay lines are also provided in the kit to reproduce some experimental situations that offer the possibility to configure the FPGA by using several types of pulse processing.

SCI(entific) Compiler is a Windows-based software designed to generate the firmware for signal processing in a simple way. It is an automatic code generator that, starting from a graphical block diagram, generates a VHDL piece of code that implements the required function.

Features

- Complex trigger logic
- Event Counters
- Single Channel (SCA) and Multi Channel Analyser (MCA)
- Time to Digital Converter
- Replacement for any old logic-based system
- Time tagging logic
- Particle real-time Time of Arrival distribution calculation
- Waveform recording digitizer
- Logic Analyzer

Physics Experiments

Kit Model	Statistics	SiPM Characterization	Photons	Cosmic Rays	γ Spectrospopy	ß Spectroscopy	Nuclear Imaging	Environmental Radioactivity Indoor	Environmental Radioactivity Outdoor	Pulse Processing
SP5600EMU Emulation kit	•	-	-	-	•	-	-	-	-	•
SP5650 Open FPGA Kit	•	-	-	-	•	-	-	-	-	•

SP5630EN
Environmental Kit

Discover the environment that surrounds us!

Ordering Option: see p. 46

To increase the familiarity with Environmental Radioactivity Field, CAEN designed a dedicated educational kit, based on a Silicon Photomultipliers (SiPM) matrix coupled to a CsI Scintillator.

Overview

CAEN developed a dedicated kit to discover the environmental radioactivity around us. The goal is to oppose the public imagination that often associates a negative feeling with this natural phenomenon.

The kit is composed of i-Spector- S2570B, a full-featured radiation detector system, and a kit of samples suitable for gamma environmental detection. Teaching and training experiences are performed starting from system calibration in terms of energy and by acquiring gamma spectra to study the emission and the radioactive elements contents of different samples.

Instrumentation Web Interface can be easily controlled through its dedicated web-based interface with no need to install software on your PC. The user can monitor the status of the module, configure the HV and connection parameters, visualize the energy spectrum in real-time, perform online analysis and download the data.

Features

- Indoor Radiation Measurements
- Energy Calibration
- Environmental background measurements
- Passive Radon measurements
- Samples and Photo-peaks identification
- Environmental Sample measurements
- SiPM based

SP5630ENP
Environmental Kit Plus

CAEN
Tools for Discovery

Experience the phenomena… Explore the Physics… Discover the essence!

Ordering Option: see p. 46

Radioactivity is around us and getting to know it experimentally is essential for physics students. Gamma spectroscopy is instrumental for understanding the mechanism of the interaction with matter, the fundamentals of detection, and the underlying nuclear physics.

Overview

CAEN designed a new dedicated Educational kit, the SP5630ENP – Environmental kit Plus, to guide the users towards the development of complementary measurement techniques based on counting and on the analysis of the spectrum.

The kit is composed by the i-Spector Digital (all-in-one detector, electronics and MCA), Shielding Kit (solution to perform several experiments about gamma spectroscopy and shielding materials), CsI and BGO crystals (to be coupled to the SiPM matrix), and a Sample Kit (suitable for gamma environmental detection).

The main goal is the study of the absorption of the gamma rays passing through matter thicknesses and the related observations about the different crossed materials. It is a user-friendly system for Advanced Labs based on the latest technologies and instrumentation.

Features

- Detecting γ-Radiation
- System Calibration: Linearity and Resolution
- γ-Radiation Absorption
- Comparison of different Shielding Materials
- Photonuclear cross-section/Compton Scattering cross-section
- Passive Radon measurements
- Environmental Sample identification & measurements

Physics Experiments

Kit Model	Statistics	SiPM Characterization	Photons	Cosmic Rays	γ Spectrospopy	β Spectroscopy	Nuclear Imaging	Environmental Radioactivity Indoor	Environmental Radioactivity Outdoor	Pulse Processing
SP5630EN Environmental Kit	•	-	-	-	-	-	-	•	-	-
SP5630ENP Environmental Kit Plus	•	-	-	-	•	-	-	•	-	-

CAEN
Tools for Discovery

SP5620CH
Cosmic Hunter

When CAEN technology meets young talents!

Ordering Option: see p. 46

SiPM Modular

Cosmic Hunter is a simple and portable device from a lab desk to a hot-air balloon! It was indeed employed at the 42nd International Balloon Festival in Château-d'Oex to commemorate cosmic-ray pioneers.

Overview

Cosmic Hunter is a new educational tool developed to inspire young students and guide them towards the analysis and comprehension of cosmic rays. Cosmic Hunter, Silicon Photomultipliers (SiPM) based, is composed of one detection coincidence unit together with up to three plastic scintillating tiles.

Muons detection, flux estimation, shower detection and more can be performed thanks to a flexible system geometry.

The Cosmic Hunter needs no Software. All the controls are available on the module and the data can be downloaded via SD card.

CAEN is developing a new dedicated Software for the full control of the system. Through a simple graphical interface, the user can set all the parameters, manage the acquisition, and download the data.

Features

- **Based on SiPM detectors and plastic scintillating tiles**
- **Up to 3 scintillating tiles management**
- **Flexible system geometry**
- **No needs SW interface**
- **Main experiments:**
  - Muons Detection
  - Triple coincidence
  - Muons Vertical Flux on Horizontal Detector
  - Zenith Dependence of Muons Flux
  - Cosmic Shower Detection

SP5600D
Educational Beta Kit

From detector characterization to cosmic rays detection!

Ordering Option: see p. 46

SiPM Modular HERA

The Educational Beta kit is high-level instrumentation.

The kit addresses experiments on cosmic rays, from simple muons detection to flux estimation and angular distribution, using advanced tools for statistical analysis.

Overview

The Educational Beta kit is based on Silicon Photomultipliers (SiPM). The key element is the SP5608 – Scintillating tile. The SP5608 is an assembly with an embedded plastic scintillating tile, directly coupled to a SiPM. The tile is the ideal tool for tests with beta-emitting isotopes and cosmic rays. Thanks to the practical case assembly, SP5608 can be used as a stand-alone detector or in a cosmic telescope with two tile modules, together with the SP5609 - Telescope Mechanics.

HERA (Handy Educational Radiation Application) is a new dedicated control software for the full control of the system and the data analysis. Its "Experiment" area includes also a special section dedicated to Cosmic Rays and Beta Spectroscopy.

Features

- **Based on SiPM detectors and plastic scintillating tiles**
- **Up to 2 scintillating tiles management**
- **HERA software: remote control of the system and data analysis**
- **Main experiments:**
  - Cosmic Rays
  - Beta spectroscopy
  - Radiation-Matter Interaction
  - Absorption coefficient measurements

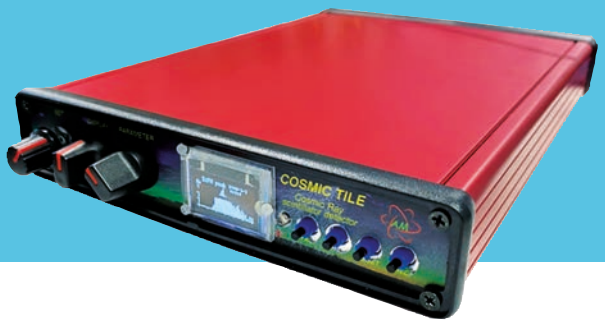
Physics Experiments

Kit Model	Statistics	SiPM Characterization	Photons	Cosmic Rays	γ Spectrospopy	ß Spectroscopy	Nuclear Imaging	Environmental Radioactivity Indoor	Environmental Radioactivity Outdoor	Pulse Processing
SP5620CH Cosmic Hunter	•	-	-	•	-	-	-	-	-	-
SP5600D Beta Kit	•	-	-	•	-	•	-	-	-	-

SP5622B

Detection System Plus

CAEN
Tools for Discovery



Portable scintillating tile for cosmic rays detection!

Ordering Option: see p. 46

SiPM

The Detection System Plus, SP5622B, is a user-friendly system for cosmic-ray detection. It can be used as a didactic instrument or as an external trigger system for another experimental setup. The simple design makes it suitable for not only university-level physics labs, but also for high school level physics programs.

Overview

The Detection System Plus, SP5622B, is a useful tool for introducing people into the world of modern physics, particle physics, special relativity, etc.

It represents a small didactic and complete device for the explanation of the scientific method to the students by performing cosmic rays experiments.

The SP5622B is based on a plastic scintillating tile coupled to a solid-state Silicon Photomultiplier (SiPM), together with all the frontend electronics needed.

This avoids having high voltages, generator, cables, connectors, and offers an additional safety margin for students.

The module management is easily allowed via the selectors and buttons on the front panel. It is equipped with a front display that shows information related to the settings of main parameters and four histograms: charge distribution of the signal, timing distribution of the cosmic rays, cosmic flux rate vs time, and flux distribution per minute.

The data can be recorded on a microSD card.

Features

- Standalone
- Fully compatible with SP5620CH Cosmic Hunter
- Based on SiPM detectors and plastic scintillating tile
- External trigger system for several laboratory setups
- Analog and digital outputs
- No need of SW interface
- SD card to download data

Physics Experiments

Kit Model	Statistics	SiPM Characterization	Photons	Cosmic Rays	γ Spectrospopy	ß Spectroscopy	Nuclear Imaging	Environmental Radioactivity Indoor	Environmental Radioactivity Outdoor	Pulse Processing
SP5622B Detection System Plus	•	-	-	•	-	-	-	-	-	-

SP5600C - SP5600D - SP5600E – SP5600AN

Educational kits

Advanced and compact solutions for Nuclear & Particle Physics experiments!

SiPM Modular

The CAEN Educational kits are modern, digital, and flexible platforms developed by CAEN for teaching the fundamentals of Statistics & Nuclear, and Modern Physics.

The set-ups are all based on Silicon Photomultipliers (SiPM) state-of-the-art sensors of light with single-photon sensitivity and unprecedented photon counting capability.

Overview

CAEN designed several modular Educational Kits:

SP5600C - Educational Gamma Kit, SP5600D - Educational Beta kit, SP5600E - Educational Photon kit, and a Premium version, SP5600AN, which includes all the components of the three kits.

The kits are composed of detectors and electronics modules which can be configured to perform several experiments, covering different Physics fields. What is being proposed has to do with light quanta, radioactive decays (β and γ rays) and cosmic rays.

HERA (Handy Educational Radiation Application) is a user-friendly software allowing the user to manage all mentioned CAEN kits.

The software represents a modern and flexible platform for teaching the fundamentals of Statistics, Particles Detection, and Nuclear Imaging thanks to the simple graphical interfaces and the embedded documentation and analysis tools. The user can easily manage all the parameters of the Power Supply, the Amplification Unit, and the Digitizer. The digitized signals can be monitored for real-time fine-tuning of the setup.

Features

- **HERA software for control of the system and for data analysis**
- **Main experiments:**
  - Statistics
  - γ and ß Spectroscopy: from energy spectrum to radiation absorption end more
  - Cosmic rays: from cosmic rays detection to cosmic vertical flux measurement
  - Photon detection and light distribution
  - Radiation-Matter Interaction

Physics Experiments

Kit Model	Statistics	SiPM Characterization	Photons	Cosmic Rays	γ Spectroscopy	β Spectroscopy	Nuclear Imaging	Environmental Radioactivity Indoor	Environmental Radioactivity Outdoor	Pulse Processing
SP5600C - Gamma Kit	•	-	-	-	•	-	-	•	-	-
SP5600D - Beta Kit	•	-	-	•	-	•	-	•	-	-
SP5600E - Photon Kit	•	•	•	-	-	-	-	-	-	-
SP5600AN - Premium Kit	•	•	•	•	•	•	-	-	-	-

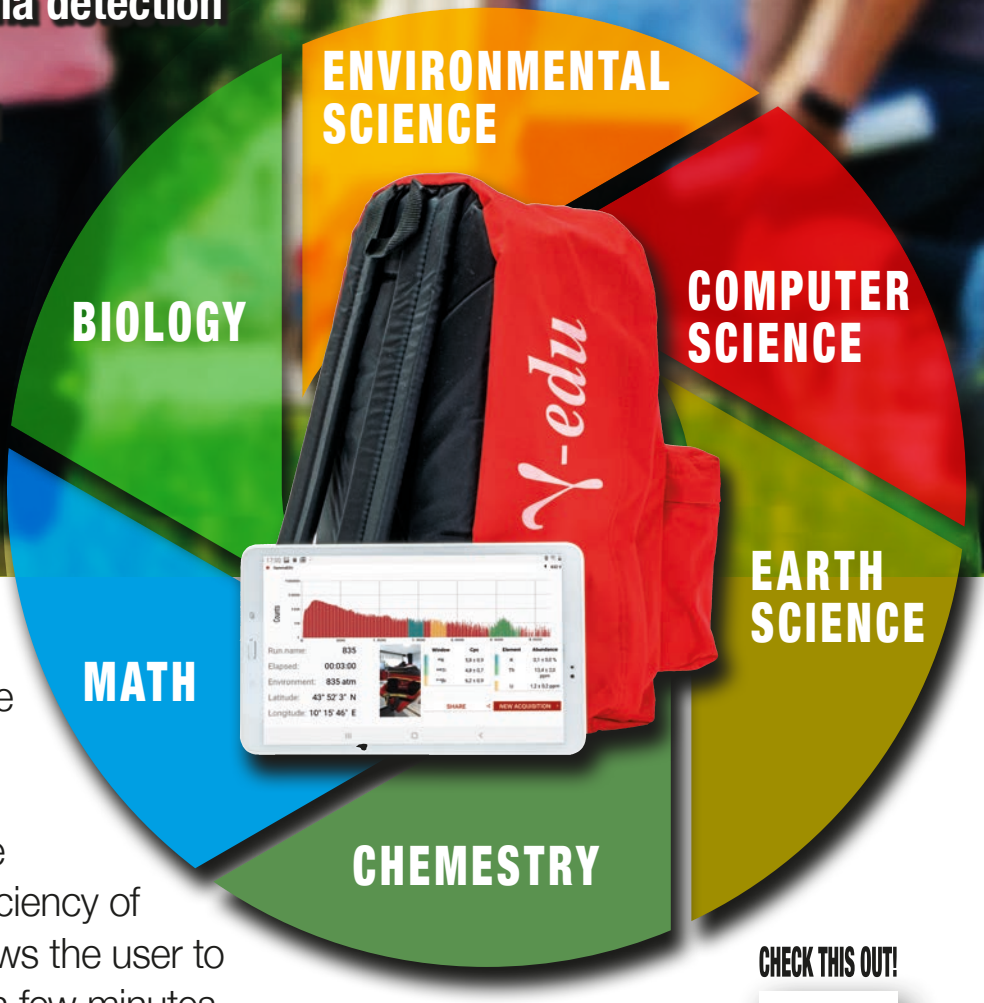
Ordering Option - Educational Kit (all Models)

Code	Description	Code	Description	Code	Description
WK5600XANAAA	SP5600AN - Educational Kit - Premium Version	WK5620CHAAAA	SP5620CH - Cosmic Hunter	WK5650XAAAAA	SP5650 - Open FPGA Kit
WK5600XCAAAA	SP5600C - Educational Gamma Kit	WSP5622BXAAA	SP5622B - Detection System Plus	WSP5700XAAAA	SP5700 - Easy Pet
WK5600XDAAAA	SP5600D - Educational Beta Kit	WK5630ENAAAA	SP5630EN - Environmental Kit	WK5701XAAAAA	SP5701 EasyPET Kit
WK5600XEAAAA	SP5600E - Educational Photon Kit	WK5630XENAAA	SP5630ENP – Environmental kit Plus		
WK5600XEMUAA	SP5600EMU - Emulation Kit	WK5640XAAAAA	SP5640 - GammaEDU		

SP5640 GammaEDU

Just one tablet click to perform radioactive measurements outdoor!

- Environmental Gamma detection and spectroscopy
- Mapping of potential radon-prone areas
- Environmental monitoring in land field
- Geochemical and mineral exploration
- Statistics

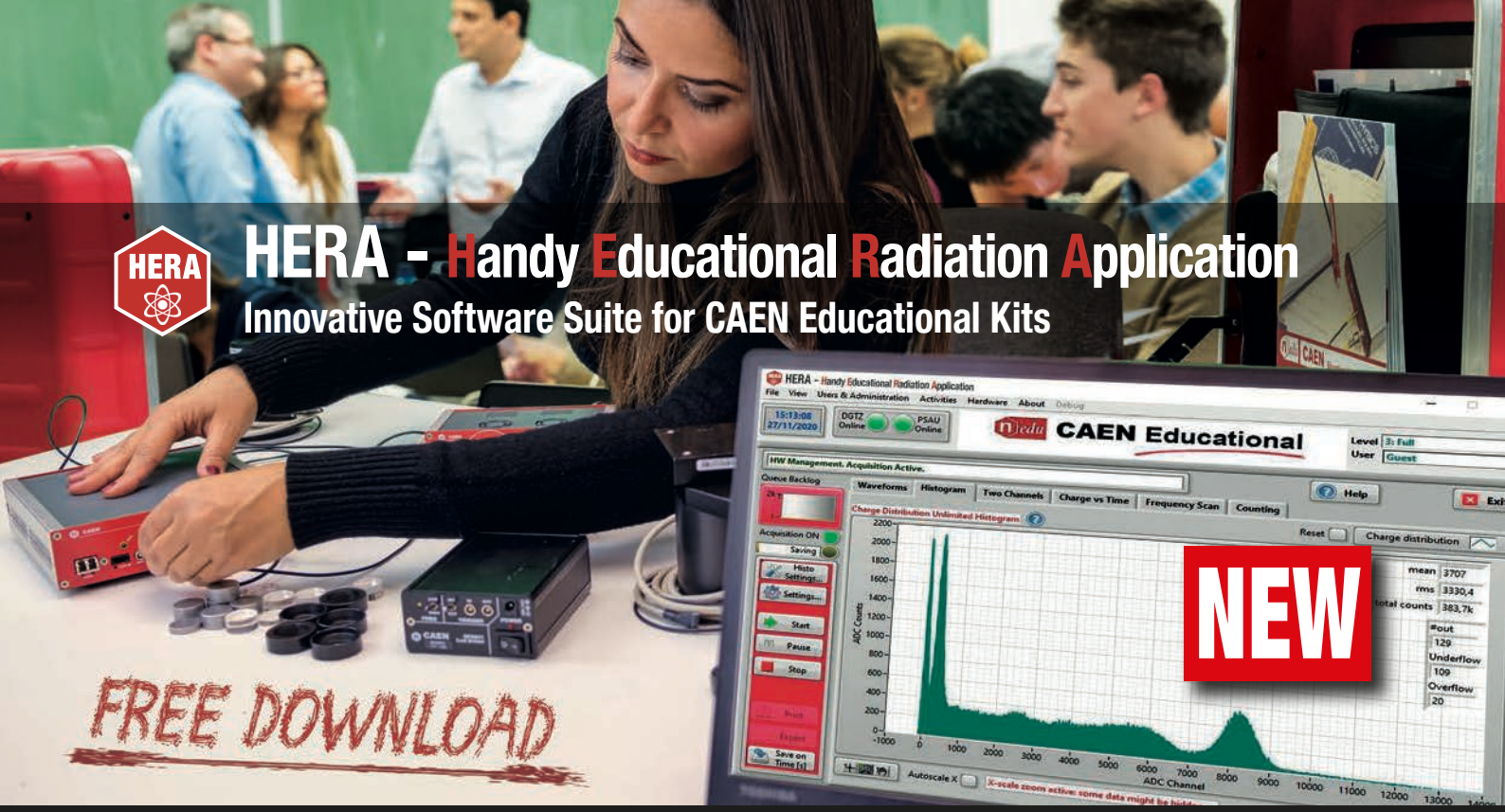


GammaEDU is a portable detection backpack for revealing the presence of radioactive materials in the environment. The high efficiency of the scintillation crystal allows the user to perform a measurement in few minutes.

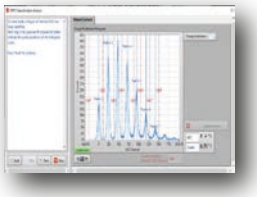
The students can acquire and analyze in real-time a γ-ray spectrum to get the K, U, and Th abundances, keep track of the surrounding environment, take the GPS coordinates, and shoot a picture of the on-going measurements.

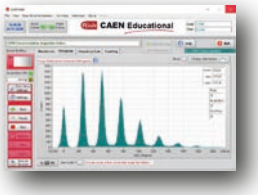
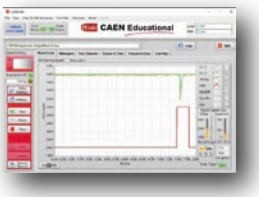
CHECK THIS OUT!

n edu **www.caen.it/educational**



HERA is a user-friendly platform to drive the digital revolution in Educational Labs


Beginner Users

- Experiments: From the radioactive decays (β and γ) to the cosmic rays, from the light quanta to the advanced statistics
- Frame and Presetting for Each Experiment
- Data Saving & Analysis Tools (Offline Analysis)
- Embedded Step-by-Step Guides

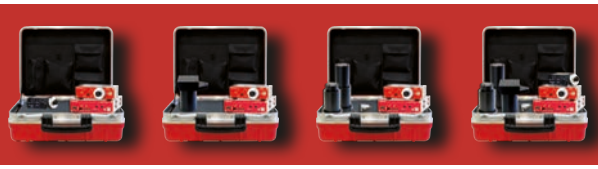
Intermediate Users

- Full access to hardware management
- Access to Experiments Frame covering Nuclear and Particle Physics fields
- Presetting for Each Experiment
- Data Saving and Embedded Help

Expert Users

- Full control of the Power Supply & Amplification Unit
- Full control of the Digitizer settings
- 6 plot tabs available: Waveform, Histogram, Counting, etc.
- Data Saving in two formats: ASCII, Binary
- Embedded Help

HANDBOOK EDUCATIONAL



RELATED PRODUCTS:

SP5600D – Educational Beta kit / **SP5600C** – Educational Gamma kit
SP5600E – Educational Photon Kit / **SP5600AN** – Educational Kit Premium Version

Cosmic Hunter

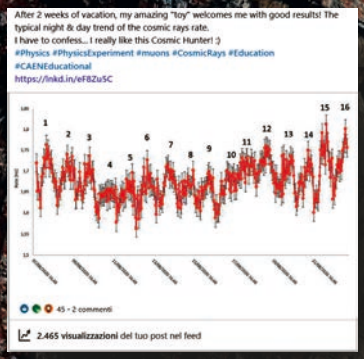
SP5620CH

NEW

Experiments

- Statistics
- Muons Detection
- Muons Vertical Flux on Horizontal Detector
- Random Coincidence
- Detection Efficiency
- Cosmic Flux as a function of the altitude
- Zenith Dependence of Muons Flux
- Cosmic Shower Detection
- Environmental and Cosmic Radiation
- Absorption Measurements
- Solar Activity Monitoring

Science Passion Creativity



Cosmic Hunter is a new STEM educational tool through which CAEN wants to inspire young students and guide them towards the analysis and comprehension of cosmic rays.

Environmental KIT - Gamma Radiation Measurements

EDUCATIONAL HANDBOOK
FREE DOWNLOAD

Be part of the project: develop your own experience and send an email to ***educational@caen.it***

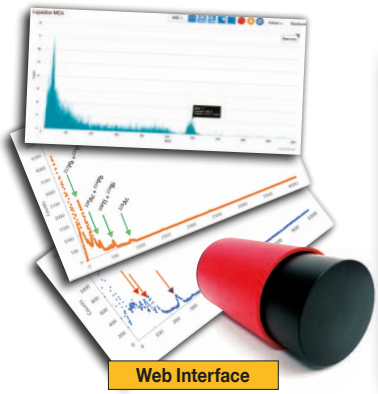
Environmental radioactivity is all around us. The public imagination often associates a negative feeling to this natural phenomenon.

To increase the familiarity with this field CAEN designed a **dedicated educational kit,** based on Silicon Photomultipliers (SiPM) matrix coupled to a CsI Scintillator.

Teaching and training experiences are performed starting from system calibration in terms of energy and by acquiring gamma spectra to study the emission and the composition of different samples.

Experiments

- Energy Calibration
- Environmental background measurements
- Passive Radon measurements
- Samples and Photopeaks identification
- Environmental Sample measurements


Web Interface


Empty Beaker & Test Sample


Fertilizer and Rock Samples


Canisters of Activated Carbon


Calibration Crystal (Lu1.8Y.2SiO5:Ce)