CAEN SyS

CAEN Spectroscopy Division

GAMON-Mobile

APPLICATIONS AND SCENARIOS

The **GAMON-Mobile** is a high efficiency detection system designed to perform gamma radionuclide identification from a moving vehicle and neutron counting. It runs automatic real-time analysis of surrounding gamma emitting isotopes for detecting radiological threats.

GAMON-Mobile can be installed on cars, helicopters or boats to monitor wide areas, detect small deviation from natural background thanks to the high detector efficiency, to provide detailed reports on the radioisotopes found.

The **GAMON-Mobile** can be deployed in multiple scenarios ranging from the public event to a routine perimetric survey of sensitive areas.

The **GAMON-Mobile** has extended radiation dose rate measurement range and configurable isotope-based alarm levels.

- Radiological threat search
- Emergency and first-response application for an easy control of the area
- Large area survey and control for public events
- Georeferenced measurements for radioactive mapping

DESCRIPTION

GAMON-Mobile is a high efficiency detection system designed to perform radionuclide identification from a moving vehicle as e.g. a car, helicopter or boat. The system is very well suited to be operated on-field to assess rapid threats and to monitor large areas via mobile mounting/deployment.

It can identify gamma radionuclides and differentiate between them according to category, e.g. NORM, Medical, Industrial. Moreover, it can be equipped with a second detector to perform neutron measurements.

GAMON-Mobile is ideally suited to scan sensitive areas, points of entrance and strategic areas such as embassies, EXPO events, critical infrastructure, airports, train stations.

GAMON-Mobile is composed of gamma spectrometric and dosimetric units and optionally with a neutron counting unit.

The **GAMON-Mobile** spectrometer runs automatic isotope identification and isotope related dose rate evaluation. The real-time data processing and the defined isotope-based alarm allow **GAMON-Mobile** to detect the presence of artificial nuclides in a short time window and more effectively compared to traditional dose rate meters.

The system can be deployed in multiple scenarios for gamma radionuclide identification in case of accident mitigation, for access point security or environmental monitoring.

The user can select the isotopes to be identified from the library and adjust the thresholds of the isotope related alarms. The spectrum stabilization is obtained with the identification of natural occurring radionuclides as the ^{40}K.

MAIN FEATURES

The GAMON Mobile is a transportable gamma radiation spectroscopy system designed to detect for radiological threats or searching orphan sources.

- High detection efficiency for detecting minimal variation in background radioactivity during survey

- Rugged housing for outdoor monitoring in public areas

- Optional neutron detector

- Web page for an easy system configuration and visualization of the measurements

- Georeferenced and real time data visualized by the operator

- Embedded dosimeter and spectrometer

- Internal database for an easy handling of the acquired data

- Count rate alarm and alarm reporting to the operator directly on the notebook

- Embedded Gain stabilization of the detector

- Wifi, Ethernet, USB communication

- Embedded Rechargeable battery

- Programmable ROI alarm

The gamma detector is composed by an inorganic scintillation crystal which can be either NaI(Tl) (preferable solution), CeBr$_3$ or LaBr$_3$(Ce) (both only ON REQUEST). NaI(Tl) is preferable its high light yield and moderate cost, LaBr$_3$(Ce) for its excellent energy resolution and CeBr$_3$ for its good energy resolution and low internal radioactivity. Signals from scintillation detector is pre-amplified and the pulse is digitized by a 12 bit 62.5 MHz fADC. Digital signal shaping and pulse height analysis is performed by a digital MCA with 2048 channels (ON REQUEST: it can be configured to have up to 8192 channels).

The spectroscopy detector is configured to collect gamma interactions in the energy range from 50 keV to 3 MeV. It provides statistically accurate dose rate

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- Mobile system for radiological search and monitoring purposes
- Large area survey and control for public events
- Emergency and first-response application for an easy control of the area
- Georeferenced measurements for radioactive mapping
- Access point monitoring

measurements in the range from 1 nSv/h to 500 µSv/h. An additional Geiger-Mueller counter extends the dose rate measurement up to a level of 1 Sv/h in the energy range from 50 keV to 1.3 MeV.

The **GAMON-Mobile** spectrometer can be provided with wired connections, RJ45 Ethernet and USB 2.0 port, or embedding additional wireless interfaces as WiFi. The **GAMON-Mobile** spectrometer is provided with a tablet that allows the user to communicate with the spectrometer.
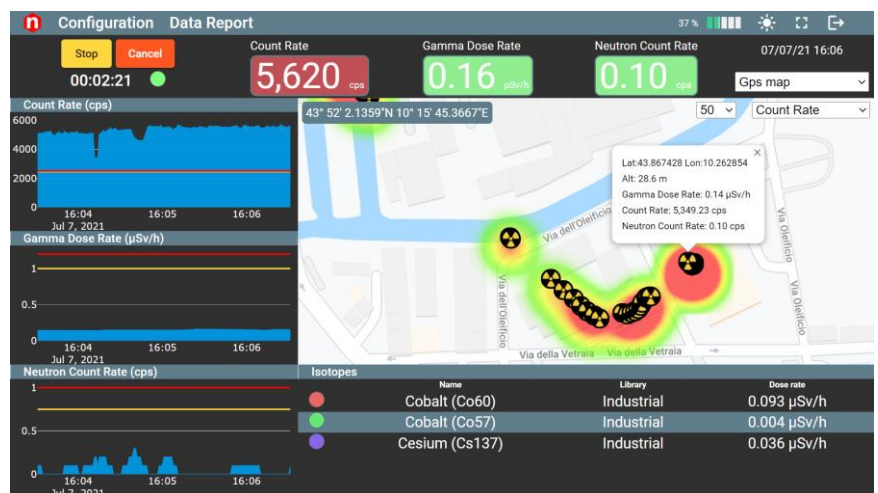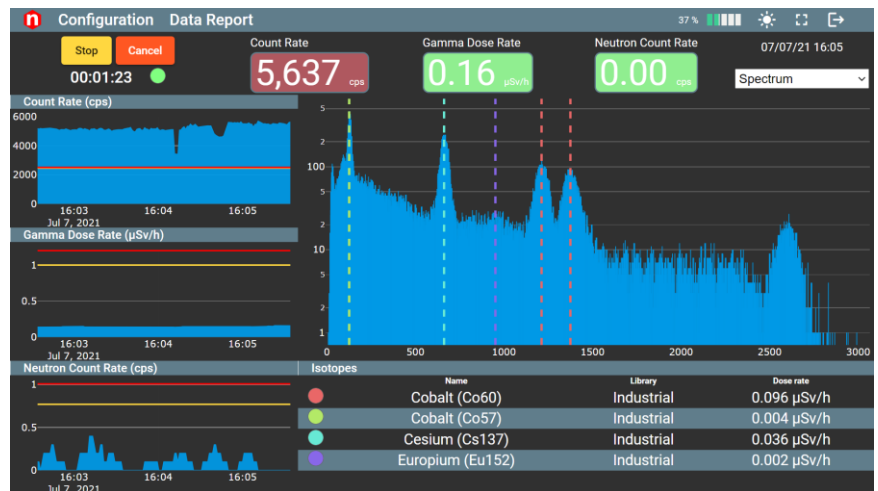
The tablet runs the software of the **GAMON-Mobile.** The GUI of the software is a web interface reachable by a common browser like Chrome, Firefox, Edge …ecc. No apps or software installation is needed.

Also rugged tablets compliant with military standards are available. The **GAMON-Mobile** embedded ARM based CPU stores the data in an internal non-volatile memory of 32 GB. The spectrometer CPU runs a web interface to allow the user to easily configure the data acquisition and the isotopic analysis. Security level of the web interface can be configured by the user to avoid unauthorized setting changes.

In the web interface the real time counting rate of the scintillator and the real time exposure rate measured by the dosimeter are shown.
Also the live spectrum measured by the scintillator is available on the dashboard.

Counting and dosimetry trend of the last ten minutes are displayed with a waterfall chart to help the user in the search of radiological dispersal device.

Through the web interface the user can set the library of the radionuclides, set the alarm thresholds for each radionuclide and modify the measurement settings.

The GIS function display the georeferenced counting and dosimetry values on a map using a heat scale to highlight the hot spot locations.

TECHNICAL SPECIFICATIONS

Scintillation Detector
- Standard Version 4"x4"x16" NaI(Tl) or NaIL (Lithium doped) crystal
- Energy range: 30 ÷ 3000 keV
- Energy resolution:
  FWHM @ 662 keV (137Cs): 7%
  Rate Accuracy: <10%

Neutron Detector
- Solid-state detection module for thermal neutrons
- Volume: 36.8 x 16.5 x 5.7 cm
  sensitivity: 40 $N/s/cm^2$

Geiger-Mueller
- Energy range: 50 keV ÷ 3 MeV
- Dose rate range: 40 µSv/h ÷ 1 Sv/h
- Optional extended range 100 nSv/h ÷ 10 Sv/h

Sensors
- Internal temperature sensor
- GPS

Wired Communication interfaces
- Ethernet RJ45
- USB 2.0 port
- Communication protocol TCP/IP
- Connector protection level IP68

Wireless communication interfaces
- LoRa™
- 3G/4G LTE
- WiFi
- Radio communication (military frequencies based on custom request)

Data acquisition
- MCA depth: 2048 channels (8192 on request)
- ADC depth: 12 bits
- ADC sampling frequency: 62.5 MHz
- Digital signal processing

Embedded PC
- Low power ARM based CPU
- Linux based operative system
- 32GB internal data storage

Software
- Integrated web interface
- Local database and data repository on 8 GB non volatile memory
- Hourly and daily automatically generated reports
- Spectrum standard ANSI 42.42 (XML-based)
- Nuclide analysis
- Adjustable integration time: 5, 10, 20, 30 min
- Spectrum stabilization with natural background
- Configurable isotope library
- Adjustable isotope related alarms
- Unattended operation for more than 1 year

Power supply
- Power consumption: < 5 W
- Voltage: 5 ÷ 12 VDC
- Internal chargeable battery with 4 hours autonomy

Physical dimensions and weight
Basic version
- LxHxW 100 x 43 x 15 cm
- Weight 28 kg

Extended dosimeter + neutron detector
- LxHxW 100 x 43 x 40 cm
- Weight 40 kg

Environmental
- Temperature range -40 ÷ 60 °C
- Humidity 0 ÷ 95 %

Protection grade
- IP65

Military Tablet specifications
- IP65
- Temperature range -15 ÷ 50 °C
- drop test resistance up to 1.2 m
- MIL-STD-810G compliant
- ATEX compliant
- Hot swap batteries

Data-sheet DS 7379 - GAMON-Mobile_datasheet High Efficiency Mobile Unit For Radionuclides Identification - rev. 5 - 07/07/2021

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