GAMON Platform

Global Measurement Platform for Nuclear Safety and Security

CAEN SyS
Systems and Spectroscopy Solutions

Enhancing Nuclear Safety and Security

The Challenge

Increased sensitivity to nuclear safety and security issues has prompted public entities and private institutions to maximize their capability to rapidly asses risks and intervene in the case of an accident or incident. Quick intervention and response is achieved through nuclear measurements via airborne, land, and underwater systems that may be effortlessly deployed, remotely controlled, and easily maintained with a high level of operational reliability and integration.

Current systems are often comprised of detectors and monitoring devices which were never designed to work in concert with one another. As such, data arriving from incompatible devices and detectors must be integrated and analyzed. This process wastes valuable time, time which could otherwise be spent in response and mitigation.

A network of cohesive, well-integrated and easy deployable detection systems combined with real-time fusion and analysis of critical data is absolutely essential to facilitate and enhance the decision-making process during these most critical moments enhancing the quality of the management plan.

Dr. Massimo Morichi

International Qualified Radioprotection and Nuclear Measurements Expert

GAMON Platform

The Solution

The GAMON Platform is a uniquely innovative system, capable of empowering authorities and institutions with the ability to respond to a wide range of operational activities and complex radiological situations in a single, simple, reliable solution. The GAMON Platform is built upon a foundation of smart systems that are designed to be interconnected into a network of sensors. The GAMON Platform combines a cloud database application for visualization and analysis of data arriving from all GAMON systems, as well as multi-functional electronics for autonomous and real-time measurements.

The integrated nature of the GAMON Platform can dramatically reduce response time for a real prompt intervention. The GAMON Geo-Referenced web application allows operators and administrators to easily visualize network status and dataflow in real time. Additionally, by taking advantage of integrated data-fusion algorithms tailored for data analysis, operators can easily manage ongoing in-field procedures and reduce prompt intervention time.

The GAMON Platform relies upon intelligent, cutting-edge, digital MCA electronics to perform data analysis and execute source identification algorithms. System network and integration options include GPS, WiFi, Bluetooth, and Long-Range (LoRa) wireless communication protocols as well as wired communication via USB and Ethernet. All data are automatically stored to a secure database via web (TCP/IP) protocol. Data be read from this database via the GAMON web application included with the system.

GAMON Platform Benefits

The GAMON Platform may be tailored to the customer's specific needs, offering critical advantages and capabilities such as rapid deployment, the development of a multi-station network, and improved personnel safety and security in compliance with international standards. These advantages are realized thanks to easy, fast, secure, and reliable access to all real time measurements.

Data Access

Local database with historical data stored on device non-volatile memory

Georeferenced System

Georeferenced information for dose rate heat map

Fast deployment

Easy configuration of the network for security purposes

Smart communication

Redundant interfaces and failover configuration capability

Harsh weather tollerant

Extended operational temperature range and enhanced spectrum stabilization

Multi-system network

Data fusion of heterogeneous systems in the network

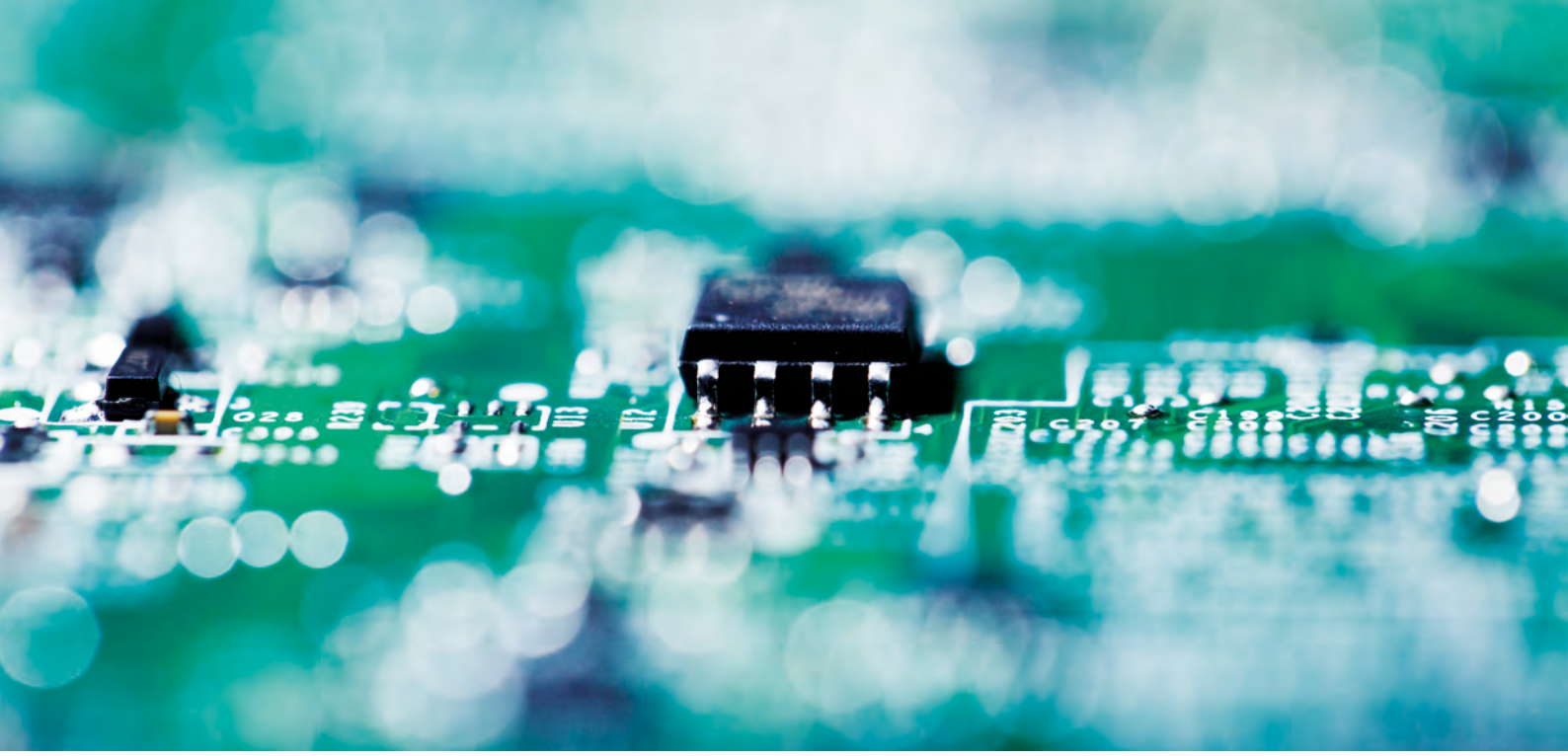
TOTAL BENEFITS

Multisystem integration

Enhanced ALARA

Prompt deployment and connection

Cost saving



All the systems of the GAMON Platform are composed by common building blocks enabling a 100% compatibility between the systems in the network:

Autonomous for unattended operation

The core of each GAMON system is a microprocessor. Each detector is connected to the microprocessor which acquires and processes the data through the Local GAMON software server. Extended non-volatile memory card allows a long time data storage.

Dosimetry

A Geiger-Muller tube is always featured in every GAMON System. The energy range of the GM is from 40 keV to 1.3 MeV while many dosimetric range are available. The most extended range goes from 10 nSv/h to 10 Sv/h

Spectrometry

Different spectrometers can be embedded in the GAMON systems. Different technologies of detector can be chosen between organic or inorganic scintillators. Large volume scintillators as NaI(Tl) are the best solution for high efficiency applications. On the opposite side, for high resolution purpose, CeBr3 or LaBr3 could be the best choice for specific needs.

Redundant Communication Interface

Each GAMON device is equipped with two communication interfaces at least. This allows redundancy in the data transmission and fail-over capability.

Rugged Case

All the GAMON systems are enclosed in a rugged case tailored for their use case scenario.

The rugged case IP level range from IP68 to IP69k and it is designed for outdoor operation in extreme weather condition.

Every GAMON system has been tested from -40 to +60 °C.

GAMON Platform

SOFTWARE

GAMON Platform Software

Web application monitoring the GAMON Network of systems

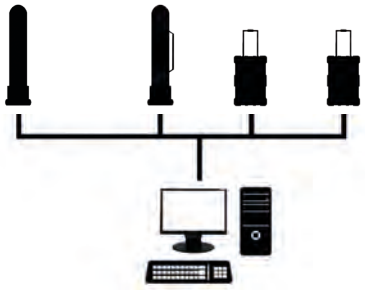
The GAMON Platform Software is an intuitive and easy handling tool for the operator to supervise all GAMON systems deployed in the field by a user-friendly web interface. The intuitive graphics allows the full control of the situation guaranteeing fast and reliable decision making for prompt emergency response.

The GAMON Platform Software visualize all GAMON network of systems on a map showing the status of all deployed systems and the radiological situation, alerting the operator in case of alarm. The dosimetric heat map is obtained using data fusion algorithms using real time measurements for all georeferenced systems.

The GAMON Platform software is the perfect tool for wide area coverage applications or the monitoring of sensitive locations or events to have a safer and clearer monitoring overview.

Highlights

- GIS overview of the entire network with visual alarms
- Automatic establishment and control of the GAMON Network of deployed systems
- Real-time monitor of the GAMON network measurements
- Web application connected to a cloud database for an easy data management
- Full access to data repository of acquired measurements and data export



GAMON Control Software

Web interface based software integrated in the GAMON system

The systems of the GAMON platform are provided with a web server application running in the internal central unit processor. The radiological information is stored in an internal database and in the wide non-volatile memory, allowing autonomous data taking even in case of sudden connection lost. Spectra, acquisition reports, data history can be displayed and downloaded through a common web browser. Users can monitor the data or modify the acquisition settings depending on the level of access credentials: user, technician or administrator.

Spectral analysis and statistical data treatment is performed according to ISO-11929 and extended isotope library is used for identification routines to address the robust spectrum stabilization algorithms are implemented.

Highlights

- User-friendly web interface with access to data reports and historical data
- Automatic and real time diagnostic of the systems working conditions
- Configuration of the isotope-based alarms
- Prompt alarms signaling based on the spectrum acquisition and Geiger-Muller counting
- Secured data and system configuration with password-controlled access and different levels of privileges
- Full control of the data acquisition and calibration for system optimization

GAMON Software Functionalities

Measurement

Gamma spectroscopy functionalities enhanced by advanced isotope identification algorithm.

H*(10) dose per identified isotope is automatically calculated.

Robust spectra stabilization routine has been tested from -40° to +60°.

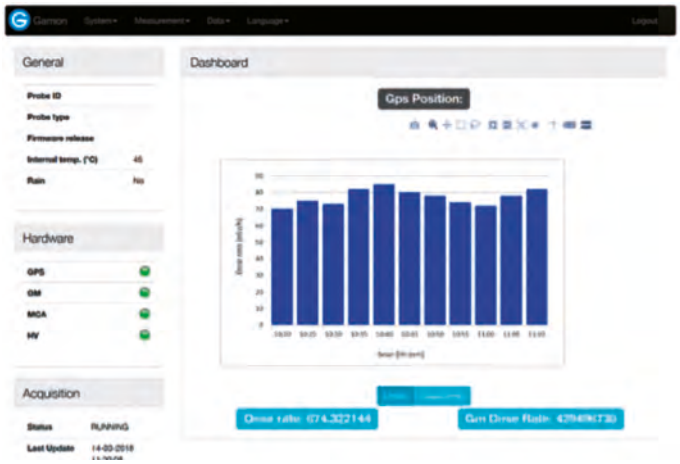
Optional gamma and neutron detector for special nuclear material detection and identification.

Mapping

H*(10) dose heat map obtained from data-fusion of each GAMON System.

Every georeferenced measurement report is plotted on the map.

GPS for tracking and mapping of devices and users.



Search

Count rate trend for every GAMON System for research of hot spots and orphan source.

Dosimetric trend is ideally suited for environmental radiation monitoring.

Spectra dose rate and Geiger-Mueller dose rate alarm can be triggered separately.

GAMON Systems

A VIEW INSIDE

GAMON S

Gamma Radiation Spectroscopy System For Real-Time Radiation Monitor

Description

The GAMON S gamma radiation spectroscopy system is designed for early environmental warning and emergency response. It runs automatic real-time analysis of surrounding gamma emitting isotopes for detecting radiological threats.

On-field installation allows GAMON S to easily monitor wide surrounding area, detect small deviation from natural background thanks to the high detector efficiency, to provide detailed reports on the radioisotopes found.

The GAMON S has redundant alarm types, extended radiation dose rate range and configurable isotope-based alarm levels allowing the security personnel to adapt the system for the specific needs.

Highlights

- Onboard web interface for easy configuration of isotope-based alarms
- Advanced and robust spectrum stabilization
- Robust case designed to guarantee IP68
- Designed for operating outdoor in extreme weather conditions from -40 to +60 °C
- Wired and Wireless communication interfaces: USB 2.0, Ethernet, WiFi and 3G/4G LTE
- Implementing long range, low power wireless platform LoRa™
- Scintillator detectors NaI(Tl), $CeBr_3$, $LaBr_3$(Ce) or NaIL™ for gamma and neutron detection

Operative Scenarios

- Ring monitor systems around nuclear facilities as nuclear power plants, nuclear fuel processing and spent fuel storage facilities
- Nationwide environmental monitoring networks
- Area monitor system in nuclear research laboratories
- Portable, mobile measurement stations for the characterization of radioactive material

Gamma Dose Rate Monitoring System For Real-Time Radiation Monitor

Description

The GAMON D is a versatile gamma dose rate monitoring system designed for early environmental warning and emergency response.

GAMON D integrates a low power consumption CPU, to guarantee autonomous operations, including the activation of backup communication interfaces for data transfer in any environmental condition.

The GAMON D is intended for a wide range of applications thanks to its high detection efficiency and its extended measurement range.

Operative Scenarios

- Ring monitor systems around nuclear facilities as nuclear power plants, nuclear fuel processing and spent fuel storage facilities
- Nationwide environmental monitoring networks
- Area monitor system in nuclear research laboratories
- Mobile stations for operator radioprotection

Highlights

- Wide measurement range from 10 nSv/h to 10 Sv/h with subtraction of intrinsic background
- Automatic transition between Geiger Muller tubes with advanced data processing
- Robust case designed to guarantee IP68
- Designed for operating outdoor in extreme weather conditions from -40 to +60 °C
- Wired and Wireless communication interfaces: USB 2.0, Ethernet, WiFi and 3G/4G LTE
- Implementing long range, low power wireless platform LoRa™
- Scintillator detectors NaI(Tl), $CeBr_3$, $LaBr_3$(Ce) or NaIL™ for gamma and neutron detection

GAMON Security

Spectroscopic Mobile and Networkable Station

Description

GAMON Security is a fast and easy deployable gamma and neutron detection system with the capability to be networked wirelessly with other systems.

GAMON Security allows response personnel to quickly and safely address radiation threats. It can be positioned in sensitive locations to monitor the situation in real time and in parallel, by both infield personnel and operators at remote command centers.

It provides remote monitoring and turnkey data reach back telemetry capabilities, thereby greatly reducing exposure risk to personnel in compromised environments and allows a discrete monitoring of sensitive locations and events.

Highlights

- Dosimetry probe based on Geiger Muller detection systems
- Spectroscopic crystals for an early identification of detected threads
- Neutron detection system available based on semiconductor technology
- Internal database and web application for an easy configuration of the system in expert mode
- Real time and georeferenced measurement information
- Mobile system equipped with rechargeable battery pack
- Wireless and long-range communication protocols
- Scintillator detectors NaI(Tl), $CeBr_3$, $LaBr_3$(Ce) or NaIL™ for gamma and neutron detection

Operative Scenarios

- Nuclear power fast-response teams, CBRN and nuclear emergency response personnel
- Discrete monitoring of public events or sensitive locations
- Environmental monitoring of large areas in network configuration like systems across a city
- Temporary screening of access points during events, conventions, Olympic games etc.

GAMON Pack

Portable And Discrete Radionuclide Identifier

Description

GAMON Pack is a portable detection unit which allows to detect and identify radiation sources in crowded or sensitive areas or locations forbidden to vehicles.

It is designed to perform undercover measurements in strategic areas like airports or railway stations where the probability for a terroristic attack is higher. It can detect and identify orphan source or radiological dispersal device classifying them in NORM, medical or industrial.

The data are displayed on a visualization device (smartphone or tablet) that allows to remain anonymous in the crowd. In case of alarm an acoustic signal, a short vibration or a message can be configured as warning notification.

Operative Scenarios

- Radiological threat search across a large area or in a zone difficult to reach
- In emergency and first-response applications for an easy control of the zone
- For location survey and control before, during and after a public event

Highlights

- Rugged and discrete housing for outdoor monitoring in public areas
- Size and weight suited for being easily transported in back-packs or carry-on luggage
- Spectroscopic and dosimetry probes with the dentification of radionuclides gamma emitters
- Extended operation with rechargeable batteries
- Onboard web interface for easy configuration of the system and isotope-based alarms
- Georeferenced map of the measurements for a real time data visualization
- Scintillator detectors NaI(Tl), $CeBr_3$, $LaBr_3$(Ce) or NaIL™ for gamma and neutron detection

GAMON Mobile

Vehicle Mountable Gamma Spectrometric Mapping System

Description

GAMON Mobile is a modular and vehicle mountable spectroscopy system with radionuclide identification and mapping features. GAMON Mobile system is supplied in a rugged and IP66 container designed to resist to external stresses (e.g. shocks and vibrations) and easy to mount and fix on the vehicle chosen for the inspection (boat, helicopter or car).

It is designed to make radiometric measurement and identification of gamma emitters on wide areas providing a map of the radioactivity detected. The real time identification algorithm can recognize artificial gamma emitters beyond the natural background and mark the hot spot over the trajectory traveled by the moving vehicle. This feature allows the user to make a map of the radioactivity of the scanned area.

Highlights

- Rugged housing for outdoor monitoring in public areas
- High detection efficiency for detecting minimal variation in background radioactivity during surveys
- Spectroscopic and dosimetry probes with the dentification of radionuclides gamma emitters
- Extended operation with rechargeable batteries
- Onboard web interface for easy configuration of the system and isotope-based alarms
- Georeferenced map of the measurements for a real time data visualization
- Scintillator detectors NaI(Tl), $CeBr_3$, $LaBr_3$(Ce) or NaIL™ for gamma and neutron detection

Operative Scenarios

- Radiological threat search across a large area or in a zone difficult to reach
- In emergency and first-response applications for an easy control of the zone
- For location survey and control before, during and after a public event
- Georeferenced measurements for radioactivity mapping

GAMON Drone

Compact Radionuclides Identification Mobile Unit

Description

GAMON-Drone is a compact and independent system designed for radiological threat search. Weight and dimensions allow an easy installation on an UAV to conduct measurements over large areas to improve the operator safety or for access difficulties.

The GAMON-Drone is a two units system with independent spectrometric and dosimetry probes for gamma detection integrated in a rugged housing for outdoor environments. It communicates wireless directly to the ground control station where a GIS map visualizes trajectory and measurements without affecting the UGV connections and performances.

The GAMON-Drone system is designed to maximize portability without sacrificing performance into a single portable unit.

Operative Scenarios

- Radiological threat search across a large area or in a zone difficult to reach
- In emergency and first-response applications for an easy control of the zone
- During radiological accident to evaluate the situation and reduce the exposure rate of the personnel
- For location survey and control before, during and after a public event

Highlights

- Weight, dimensions and housing for outdoor and aerial applications
- Wireless communication protocols independent from UAV
- Spectroscopic and dosimetry probes with the dentification of radionuclides gamma emitters
- Extended operation with rechargeable batteries
- Onboard web interface for easy configuration of the system and isotope-based alarms
- Georeferenced map of the measurements for a real time data visualization
- Intelligence and storage onboard for data storage in case of wireless connection failure
- Scintillator detectors NaI(Tl), $CeBr_3$, $LaBr_3$(Ce) or NaIL™ for gamma and neutron detection

GAMON Airport

Portal Monitor Family

Description

The GAMON AirPort family has been designed for infield real time radiation control of elements passing through the portal for security controls in sensitive access points.

The family is made by two main types of portals: the Pedestrian Portal Monitors (PPM) and the Radiation Portal Monitors (RPM) for the monitoring of vehicles in transit.

The GAMON AirPort systems detect both gamma and neutron emitters and can also identify the detected gamma radionuclides included in pre-selected libraries.

The GAMON Airport systems take advantage of a real-time data processing combined to automated background subtraction algorithms to alarm in presence of both artificial nuclides and SNM in a short time window. In case of RPM the algorithm takes into account also the vehicle shielding effect to do not overestimate the background and have a more reliable system answer.

Highlights

- Wired and wireless communication interfaces for system configuration and monitoring from the main control station
- Detection technology selection for bothe gamma and neutron probes based on application and requirements
- High efficiency gamma spectroscopic detector and energy spectrum stabilization
- Onboard web interface for an easy configuration and data storage for long autonomous data taking
- Scintillator detectors NaI(Tl), $CeBr_3$, $LaBr_3$(Ce) or NaIL™ for gamma and neutron detection

Operative Scenarios

- Access, exit and security inspection points for the monitoring of person and vehicle in transit
- Sensitive locations as public buildings or event locations
- Custom inspection points or border control
- First inspection points based on alarm systems for the detection of both gamma and neutrons
- Secondary inspection points based on spectrometric systems for the identification of the source

GAMON Diver

Compact Underwater System for Radionuclides Identification

Description

The GAMON Diver system is specifically designed for submerged radiometric measurement and radiological alerts. The system can be used as a quick response measurement device, or it can be installed as a permanent monitoring device for sensitive underwater locations or for oil&gas applications.

The submersible hermetic case and its weight allow an easy gamma spectroscopic measurement in real time from small boat or watercraft.

The GAMON Diver system was designed to offer the best combination of portability, low power consumption and performance.

Operative Scenarios

- Detection and monitoring of water reservoir, lakes, ports or sea
- Long term monitoring of the environmental conditions in rivers or after a nuclear power plant or before a water extraction point
- Control of the NORM content in the Oil&Gas waste like accumulated sludge from the extraction process

Highlights

- Underwater system up to 50 m depth (5 ATM) in both fresh or salted water for radiological search
- Hermetic housing for underwater and Oil&Gas waste operation and for an easy cleaning
- Rechargeable battery for daily measurements
- Integrated GPS used for an easy visualization of the measurements
- Wired communication during the measurement session and also wireless capability for the configuration of the system

Operative Scenarios

Access Point

GAMON D	GAMON S	GAMON SECURITY	GAMON PACK	GAMON MOBILE	GAMON DRONE	GAMON AIRPORT	GAMON UNDERWATER
		•		•		•	

Critical Infrastructure

GAMON D	GAMON S	GAMON SECURITY	GAMON PACK	GAMON MOBILE	GAMON DRONE	GAMON AIRPORT	GAMON UNDERWATER
	•				•		•

Event Protection

GAMON D	GAMON S	GAMON SECURITY	GAMON PACK	GAMON MOBILE	GAMON DRONE	GAMON AIRPORT	GAMON UNDERWATER
		•	•	•	•		

Operative Scenarious

Nuclear Industrial Facilities

GAMON D	GAMON S	GAMON SECURITY	GAMON PACK	GAMON MOBILE	GAMON DRONE	GAMON AIRPORT	GAMON UNDERWATER
•	•					•	•

Environmental Monitoring

GAMON D	GAMON S	GAMON SECURITY	GAMON PACK	GAMON MOBILE	GAMON DRONE	GAMON AIRPORT	GAMON UNDERWATER
•	•						

First Responder

GAMON D	GAMON S	GAMON SECURITY	GAMON PACK	GAMON MOBILE	GAMON DRONE	GAMON AIRPORT	GAMON UNDERWATER
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