

GAMMA DOSE RATE MONITORING SYSTEM FOR REAL-TIME RADIATION MONITOR

GAMON-D

APPLICATIONS AND SCENARIOS

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. Its design allows an easy integration in different systems ranging from on-field monitoring stations to mobile survey vehicles. The **GAMON-D** can be mounted on a tripod to be easily relocated for typical security or emergency response scenarios and the embedded GPS provides the current location.

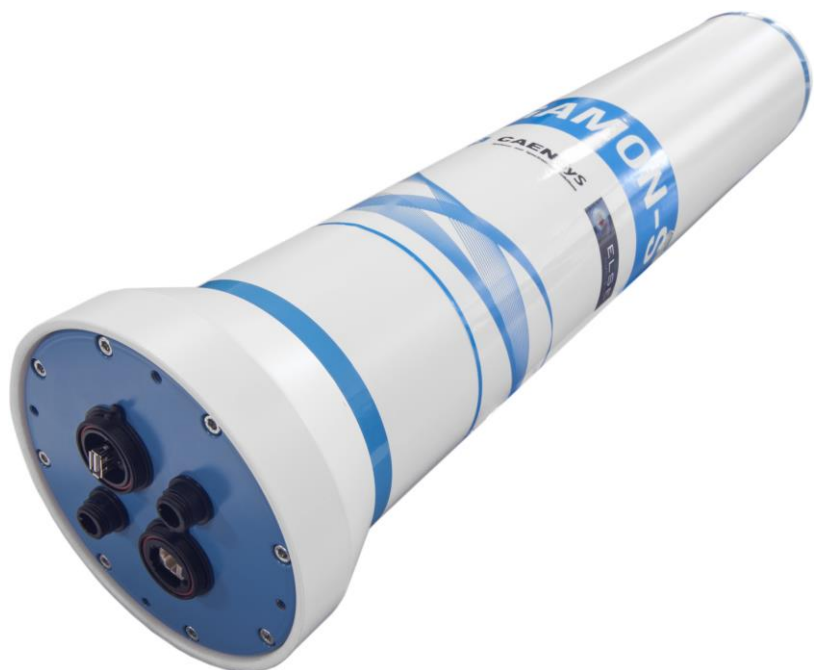
The **GAMON-D** can be deployed in

- 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 emergency response and public security purposes.

DESCRIPTION

The **GAMON-D** is a gamma dose rate monitoring system series, designed for outdoor and indoor online radiation monitoring, for early environmental warning and emergency response. The **GAMON-D** can be deployed in a wide range of scenarios, as in permanent ring monitoring as well as in moving monitoring stations. It can be mounted on a tripod to be easily relocated for typical security or emergency response scenarios and the GPS monitors the current location.

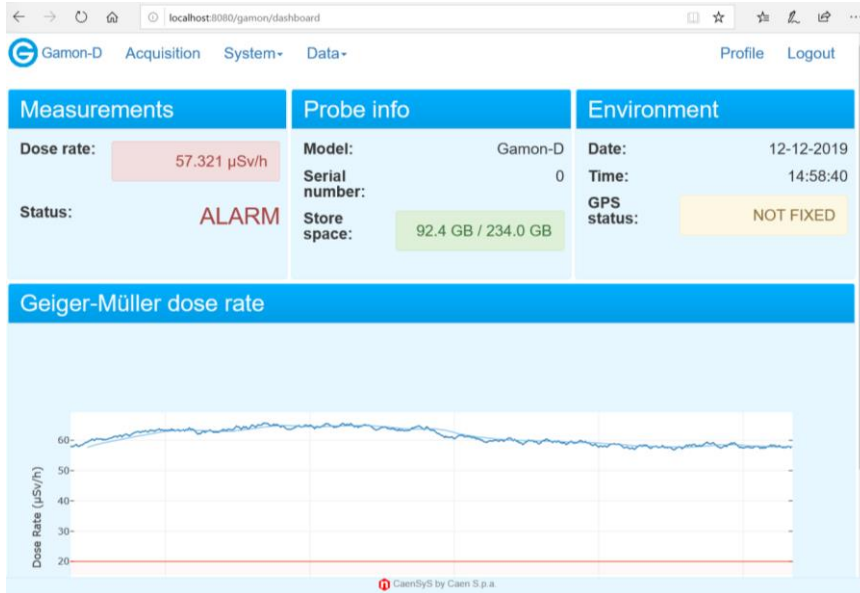
The **GAMON-D** embeds two energy compensated Geiger–Mueller (GM) detectors to provide a wide detection range for ambient equivalent dose rate $H^*(10)$. The high-volume GM is used for low dose rate measurement and can detect small changes of the natural background also in short acquisition cycles. The control of the two detectors is performed by internal electronics, which continuously monitors the count rate. Customized extended range dose rate can be provided on request, from 10 nSv/h to 10 Sv/h.



It can operate in a wide temperature range from -40 to 60 °C and in harsh weather conditions since protected from rain and moisture.

The **GAMON-D** dose rate monitor system has low power consumption and can be powered by common AC-DC converters, additional battery packages or external solar panels.

The **GAMON-D** is provided with wired connections, RJ45 Ethernet and USB 2.0 port, or can be provided with additional wireless interfaces as WiFi, GPRS/LTE and LoRa™. The operator can select the preferred communication interface and backup interfaces, which guarantee the communication thanks to its failover capability.



The **GAMON-D** embedded ARM based CPU stores the data in an internal non-volatile memory of 8 GB. The CPU runs a web interface to allow the user to easily configure the data acquisition. Security level of the web interface can be configured by the user to avoid unauthorized setting changes.

The web interface enables the access to multiple **GAMON-D** systems located in a multi-point measurement network and to visualize the status on a map. Network or sub-network status summary can be monitored from the graphical interface.



The full dose rate monitor is designed to guarantee IP68, including the power and the communication interface connectors. The case has been designed to ease wall or pole mounting, or the integration for permanent and mobile monitoring stations.

MAIN FEATURES

- Gamma dose rate monitoring system embedding two energy compensated Geiger–Mueller (GM) detectors
- Onboard web interface for easy configuration
- Wide measurement range from 10 nSv/h to 10 Sv/h with subtraction of intrinsic background
- Automatic switching between GM tubes based on the acquired count level
- Moving average algorithm for instantaneous dose rate measurement
- Big onboard data storage for long autonomous data taking
- Designed for operating outdoor in extreme weather conditions from -40 to +60 °C
- Robust case, designed to guarantee IP68, including the power and the communication connectors
- Design for easy wall and pole mounting
- Wired and Wireless communication interfaces: USB 2.0, Ethernet, WiFi and 3G/4G LTE
- Implementing long range, low power wireless platform LoRa™
- Configurable list of communication interfaces for selecting primary and backup interfaces
- Quick and easy to install and commission thanks to onboard web graphical interface
- Autonomous delivery of email and SMS on alarm to a configurable list of recipients

MODELS

The **GAMON-D** gamma dose rate monitoring system is provided with wired communication interfaces or can be provided with enhanced connectivity through the integration of LoRa™, WiFi and 3G/4G LTE wireless interfaces. The monitoring system has IP68 connectors for USB 2.0 and RJ45 Ethernet ports.

Standard Gamma Dose Rate System:

- USB, Ethernet interfaces;
- 12 VDC power plug.

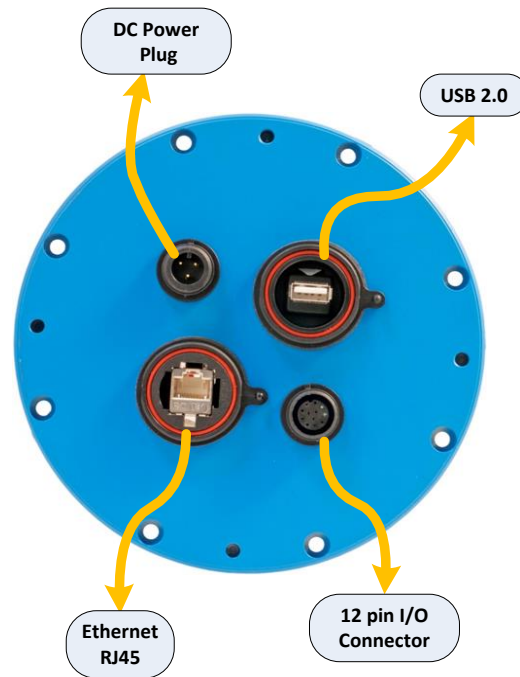
Wireless Gamma Dose Rate System:

- USB, Ethernet interfaces;
- 12 VDC power plug;
- Housing with LoRa™, 3G/4G LTE and WiFi, optional rain sensor, optional backup battery.

The **GAMON-D** can be also integrated in monitoring stations for tailored solution.

Gamma Dose Rate Monitoring Station:

- Pole or wall mounted with mains power supply;
- Backup battery;
- Optional solar panel power supply.



The **GAMON-D** dose rate monitor can interface an external rain sensor for correlating possible dose rate variations due isotopes deposited by the rain. It integrates an internal temperature sensor for compensating the background and the measured dose rate.



TECHNICAL SPECIFICATIONS

Geiger-Mueller

- Two energy compensated Geiger-Mueller tubes
- Energy range: 50 keV ÷ 2 MeV
- Dose rate range: 100 nSv/h ÷ 1 Sv/h
- Optional extended range: 10 nSv/h ÷ 10 Sv/h
- Energy response (¹³⁷Cs): -10 / +20 %, from 50 to 1300 keV
- Linearity: < 10% from 100 nSv/h to 1 Sv/h

Sensors

- Internal temperature sensor
- External rain sensor on request, with extension
- GPS

Wired Communication interfaces

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

Wireless communication interfaces

Available with **GAMON-D** extension

- LoRa™
- 3G/4G LTE
- WiFi

Data acquisition

- Dead time correction
- Moving average algorithm for instantaneous dose rate
- Subtraction of intrinsic background

Embedded PC

- Low power ARM based CPU
- Linux based operative system
- 8 GB internal data storage

Software

- Integrated web interface
- Hourly and daily automatically generated reports
- Unattended operation for more than 1 year

Power supply

- Power consumption: < 3.5 W
- Voltage: 5 ÷ 12 VDC
- Power connector protection IP68

Physical dimensions and weight

- Length: 60.3 cm
- Diameter: 10.0 ÷ 17.2 cm
- Weight: up to 4 kg

Environmental

- Temperature range -40 ÷ 60 °C
- Protection level IP68
- Relative humidity: 100% (water proof)



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