



Nuclear Physics



Labs and Education



Environmental monitoring

KEY FEATURES

- ◆ All-in-one detector, electronics and MCA for **Gamma Spectroscopy**
- ◆ Based on a **SiPM** area up to nearly 1.5 inch²
- ◆ 20-80 V Integrated High Voltage for SiPM biasing
- ◆ OEM electronics or tube-like detector assembly
- ◆ Assembly with **CsI scintillator**:
 - 18x18x30 mm³
 - 24x24x30 mm³ (approx. 1x1x1.2 inch³)
 - 30x30x30 mm³ (approx. 1.2x1.2x1.2 inch³)
- ◆ Resolution @ 662 keV < 6 % with 18x18x30 mm³ CsI(Tl) crystal
- ◆ Other assembly option available on request: NaI, BGO, LYSO, LaBr₃ or any other compatible scintillator
- ◆ Demountable tube-like mechanics to easily change crystal
- ◆ Ethernet and optional LoRa connectivity
- ◆ **i-Spector LoRa** version available, with LoRa radioantenna for IoT and environmental applications
- ◆ Web-based interface with spectrum analysis tools
- ◆ Compact form factor
 - Ø 60 mm, h 90 mm (OEM)
 - Ø 60 mm, h 135 mm (ASSEMBLY)
- ◆ **Rad Cloud** software for multiple detector networking (FREE TRIAL)

DESCRIPTION

The i-Spector Digital is a fully-integrated, tube-like **Gamma Spectrometer** designed to operate as a complete radiation detection system, with integrated MCA and optional wireless connectivity. It is a solution dedicated to those users that need the versatility of a full compact single photodetection system for Gamma Spectroscopy applications. Its profile makes it ideal for many **portable applications** where size, weight and power consumption are important constraints.

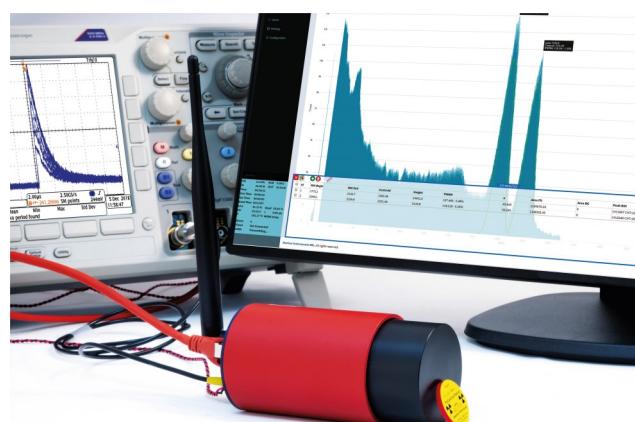


i-Spector Digital is based on a **SiPM** area (18x18, 24x24 or 30x30 mm²), eventually coupled to a suitable scintillation crystal, and it hosts a preamplifier stage, an integrated power supply for SiPM biasing with temperature feedback loop, a shaper and a MCA based on 80 MSps, 12-bit ADC and digital charge integration algorithm. The i-Spector Digital can be controlled through Ethernet and it provides as output an analog amplified signal and a 4k channels energy spectrum calculated onboard.

i-Spector LoRa integrates an additional **radiocommunication interface** which is ready to connect to LoRaWAN networks for IoT and environmental monitoring applications. A cloud server (**Rad Cloud**) allows to collect data from multiple i-Spector and display them on maps or interactive tables.

i-Spector Digital and i-Spector LoRa can be controlled through a **Web Interface**, to configure and monitor the device, with the possibility to access the spectrum, process it online, perform energy calibration and peaks gaussian fitting.

Multiple i-Spector can be connected and controlled from a single PC. The API interface allows to control multiple devices using very simple http requests and JSON vectors.



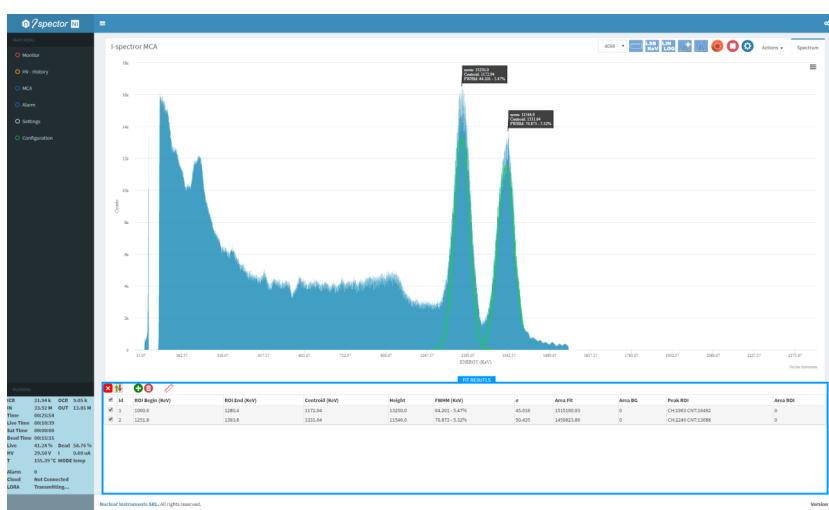
i-Spector Digital in assembly version is used as a complete readout system to acquire a ⁶⁰Co spectrum

Web Interface

i-Spector Digital can be easily controlled through its dedicated web graphical user interface, with no needs to install a dedicated software. The user can **configure the module and visualize the acquired spectrum**.

The web interface displays the spectrum on an interactive plot with **analysis tools**: cursors and ROI can be added to the spectrum to perform real-time fitting and linear background estimation. For each fitted peak, the centroid, the FWHM, counts and other statistics are automatically calculated. It is also possible to perform energy calibration of the bin axis using linear and higher-order fit models.

Thanks to the internal circular memory buffer, i-Spector module is able to store up to 1 hour of output data consisting in voltage, current and sensor temperature samples. The last 1-hour recording can then be downloaded by the web interface.



SDK

i-Spector Digital can be integrated in a custom user application using the available SDK. All needed features are supported by the SDK in order to fully **automatize and control the system**. The SDK is based on JSON data exchanged using standard HTTP POST, supported by every modern programming language and operating systems (Win/MacOs/Linux/Android/iOS).

TECHNICAL SPECIFICATIONS

Supply Voltage	8-13V (12 V typ.)
Power consumption	3W max.
Preamplifier bandwidth	>1GHz
Preamplifier gain	x 5
Shaping time	180 ns
Output signal	- 4 ... +4 V, 170 mA
SiPM area	up to 30x30 mm ² (nearly 1.5
SiPM Manufacturer	Hamamatsu
SiPM Model	S14160-60520HS
HV Power supply	20-80 V (10mA)
HV accuracy	1 mV
Thermal feedback accuracy	0.01°C - 1mV
MCA nr. of channels	4096
Connectivity	Ethernet/LoRA (optional)
Working Temperature	-20 ... +50°C
OEM Size	Ø 60 mm (2.40 in.) h 90 mm (3.55 in.)
Assembly Size	Ø 60 mm (2.40 in.) h 135 mm (5.32 in.)
Weight	OEM: 150g (5.3 oz.) ASSEMBLY: 500g (17.6 oz.) with 18x18x30 mm ³ CsI crystal

Performances with CsI(Tl) crystal

Energy Range	30 keV to 3 MeV
Energy Resolution (FWHM)	<6 % @ 662 keV (=5.5% with T < 28°C)
	< 4.5 % @ 1332 keV
Max input rate	100 kpcs without resolution degradation
MCA res. @ 100 kpcs	<0.2%
Non-linearity	<0.1%

Ordering Option

Ordering code	Description
WS2570DXOAAA	S2570D i-Spector Digital 18x18 mm ² - OEM
WS2570EXOAAA	S2570E i-Spector Digital 1" (24x24 mm ²) - OEM
WS2570FXOAAA	S2570F i-Spector Digital 30x30 mm ² - OEM
WS2570DXAAAA	S2570D i-Spector Digital 18x18 mm ² - CsI ASSEMBLY
WS2570EXAAAA	S2570E i-Spector Digital 1" (24x24 mm ²) - CsI ASSEMBLY
WS2570FXAAAA	S2570F i-Spector Digital 30x30 mm ² - CsI ASSEMBLY

i-Spector LoRa: a cloud-based facility for radiation monitoring

Collect data from multiple units using Long Range (up to 20 km) wireless communication



Environmental monitoring



Healthcare



Industrial

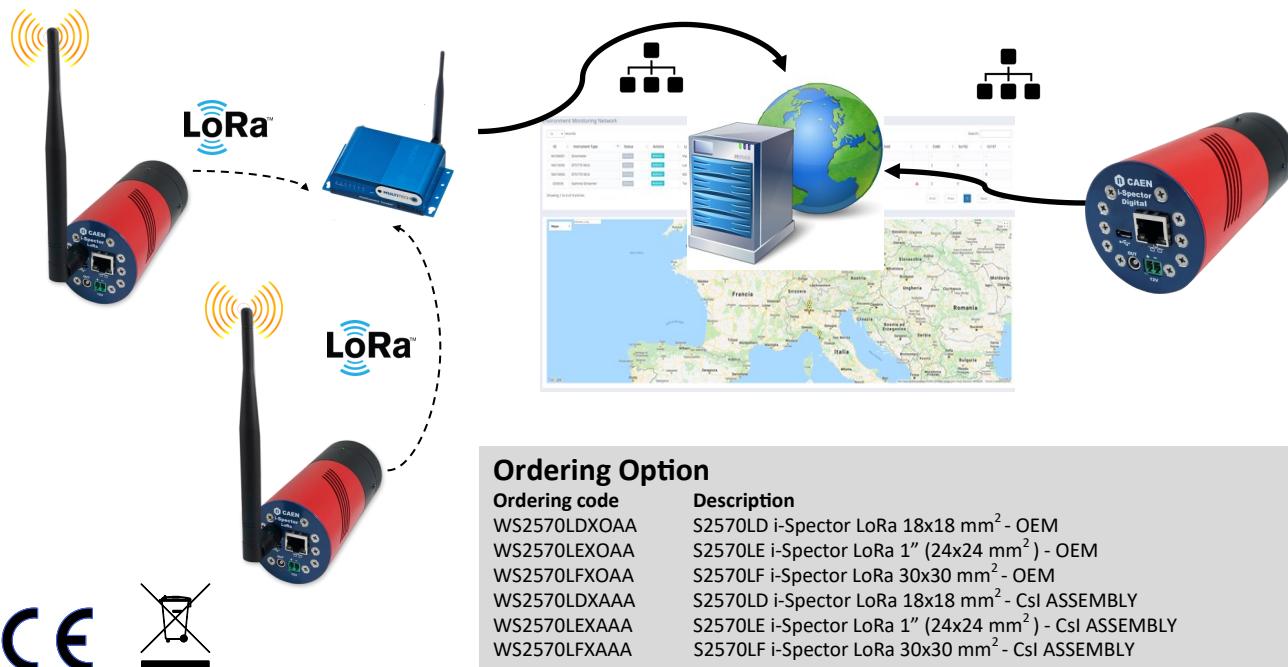
The i-Spector Digital LoRa is a cloud-based device, designed to monitor wide area in both indoor and outdoor installations. Multiple devices can be used to build a distributed network of sensors to monitor environmental radiation or operate inside nuclear power plant, scientific laboratories, accelerators, medical facilities, etc. It can be easily integrated in radioactivity portals, by coupling it with long scintillator bars to implement vehicle/personnel check point.

The i-Spector Digital LoRa offer both wireless and Ethernet connectivity. The wireless communication protocol is LoRaWAN certified and the module can be used with standard LoRa gateway. It also supports data cryptography with secured access to the network.

Depending on environmental condition and installed antenna, LoRa communication ranges in open field goes from 10 up to 20 km or more. Both LoRa standard at 868MHz (EU/Asia) and 915MHz (US) are available.

i-Spector Digital LoRa has the same performances of a standard i-Spector Digital, but the user can additionally set ROIs and alarms on the CPS for each ROI. Alarm status can then be collected, via LAN or LoRA, on a cloud server (**Rad Cloud**) to monitor the network of sensors.

The **Rad Cloud** (FREE TRIAL) can be provided as a web-based user application or as a server running on customer's site. Self-hosted cloud server is provided as a virtual machine that can run on a Linux server. The graphical interface shows, in a dynamic table, all the i-Spector units registered. It automatically displays alarms, stores statistics for each ROIs, and shows all devices on a geographical map or building map.





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