

SPECIAL NUCLEAR MATERIAL PORTABLE IDENTIFIER

SNIPER-GN

MAIN FEATURES

- **Neutron source identification** with discrimination between fissile material, alpha-n source, plutonium, thorium and uranium
- **Identification of gamma ray emitters and NORM sources**
- Parallel neutron and gamma **identification within a minute**
- In specific configurations, ability to **identify interposed moderator or lead shielding** between source and detector
- **Air Sampler measurement** (filters standard, cartridges optional) via dedicated side slot or additional shielded holder
- **Detection and localization** of radioactive materials such as **Special Nuclear Materials (SNM)** and Radiological Dispersal Devices (RDD)
- **Wi-Fi connection** to tablet or cell phone for data visualization
- **USB connection** alternatively to Wi-Fi
- **Autonomous Offline Identification** mode available
- **Software functionalities:** search, mapping, and identification
- Backpack or trolley portable system (<8 kg SNIPER-GN only)
- **Battery** powered with more than **8 hours** of autonomy

DESCRIPTION

SNIPER-GN is a new compact, lightweight and NATO coded backpack radiation device capable of **detecting and identifying 5.6g of Plutonium placed at a distance of 2.5 meters in less than 1-minute.**

Perfectly suited for quick deployment, detection, and identification.

The **SNIPER-GN** radiation detection system has been designed with the needs of nuclear security, homeland security and emergency response activities in mind. The compact design and light weight result in a very mobile detector which can easily be concealed in a backpack or trolley for use in multiple scenarios, ranging from public event monitoring to gateway and perimeter monitoring of critical locations.

SNIPER-GN can also be employed for radiation monitoring of harbors or-airport's cargo areas, for custom inspection at borders and for emergency response.



The **SNIPER-GN** users can perform undercover searching measurement of orphan sources in public crowded areas (airports, stadiums ...) without causing concern among the population.

SNIPER-GN performs real time neutron/gamma discrimination by using the same Pulse Shape Discrimination algorithm implemented by CAEN for the IAEA Fast Neutron Collar Monitor

SNIPER-GN runs automatic real-time counting of surrounding gamma and neutron emissions for detecting radiological threats. It can detect small deviation from the measured natural background thanks to the high efficiency detectors.



The background is continuously measured and updated as the user moves throughout an area of inspection. Gamma and neutron counting rates are shown separately in the web interface, and alarm thresholds are automatically calculated from the moving average of the background.

Alarms are triggered separately when the rate of gamma or neutrons is above the alarm threshold. The alarm thresholds are set to attain a detection probability of 95% with 95% confidence level.



PERFORMANCES

Alarming

- Alarm for neutron and gamma are calculated with 95% detection probability at 95% confidence level for a dose rate on the front face of the scintillator of at least 50 nSv/h
- neutron alarm detection has been tested also in high gamma ray fields up to 0.1 mSv/h
- 1 second for gamma alarm
- 2 second for neutron alarm
- < 1 minute for isotope identification (also for neutron emitters)
- Detector with the best discrimination between gamma and neutron on the market.

Neutron sources identification

- IEC 62327 requirements: neutron alarm triggered in 2 seconds for a Cf-252 source with 20.000 neutrons/s @ 25 cm
- 1 minute to identify the source

SNIPER-GN performances for 1 minute of identification

- 5.6g of Plutonium mix @ 2.5 m
- 5.6g of Plutonium mix @ 50 cm with 6cm of polyethylene and 5 cm of lead shielding the source
- A Cf-252 source of 0.57 MBq @ 2 m
- A Cs-137 source of 16.17 MBq encapsulated in 6 mm of lead at @ 10 m

WEB INTERFACE FUNCTIONALITIES

Web interface accessible via dedicated Wi-Fi tablet (default) or any other Wi-Fi enabled device. Data are shown in real time on the tablet

- HOME: identify, start mission and stabilize buttons. Real-time gamma/neutron rates with automatic plotting of trends and alarm thresholds.
- MAP: real-time position plot and route of the device on the map. The position where an alarm is triggered is also highlighted on the map
- REPORT: the report of any identification/mission measurement is reported: spectra, list of identified isotopes and their category and the confidence level

When an alarm pop-up appears, the operator initiates the identification measurement (user-configurable duration). The SNIPER-GN runs automatic isotope identification. The unique feature of SNIPER-GN, with respect to other commercially available radiation identification devices, is the neutron source identification algorithm. SNIPER-GN can detect and identify neutron sources automatically, discriminating between spontaneous fission material (e.g. ^{252}Cf), alpha-n sources (e.g. Am/Be and Am/Li), Plutonium, Thorium and Uranium. Additionally, standard gamma isotope identification through peak search is performed thanks to the high resolution CeBr_3 detector. The isotope library is based on the ANSI 42.48 Spectroscopic Personal Radiation Detectors for Homeland Security standard. Spectrum stabilization is obtained by the identification of naturally occurring radionuclides as the ^{40}K .



SNIPER-GN web interface is accessible via a dedicated Wi-Fi tablet (default), or any other Wi-Fi enabled device. Tablet and SNIPER-GN are connected via Wi-Fi, which provides connectivity from a distance greater than Bluetooth allows, or USB port when the previous option is not feasible. The Wi-Fi feature adheres to the ALARA concept, permitting remote measurement close to a possible source of contamination and avoiding contamination of the operator.

The web interface displays real-time counting of gamma and neutrons. Should the counts exceed the thresholds then an alarm is displayed. System position can be easily monitored in real time within the web interface thanks to an integrated GPS. Alarmed measurements are displayed on the map and a highlighted icon is noted on the user's track within the display. This track is also recorded and saved in a dedicated file. After each identification the web interface automatically displays a report. This report includes data, hour, GPS coordinates (lat/long and MGRS format), spectra accumulated by EJ309/ CeBr_3 detectors, identified radionuclides and their category (SNM, NORM, industrial or medical). Reports are saved locally on the SNIPER-GN and optionally on the connected tablet (user-configurable). SNIPER-GN is easily transportable and comes with a battery (8-hour runtime) housed in a shockproof case.

Two detectors are installed inside the device:

- a novel PSD detector which can distinguish between gamma and neutron and perform the neutron identification
- a CeBr_3 detector only for gamma spectroscopy measurement and gamma isotope identification

The patented analysis algorithm is based on Pulse Shape Discrimination (PSD) operated by the digitizer that allows the discrimination between neutrons and gamma rays. Tests were performed to check the neutron detection in high gamma ray field (up to $100 \mu\text{Sv/h}$) as required in the current specification for Homeland Security instrumentation. Neutron identification tests were

performed following the indication of ANSI N42.34-2016. Thanks to high efficiency of the neutron detector SNIPER-GN can identify the Cf-252 source:

- with emission of 20.000 neutrons/s at more than 4 times the standard distance (up to 200 cm)
- @25 cm a source with 1/16 of the emission rate (1.250 neutrons/s)

For other neutron sources like Pu-239, U-235 and Am/Be SNIPER-GN can detect at higher distances up to 25 times the standard one.

An additional feature of **SNIPER-GN** is radioactivity detection from contaminated air filters (standard) or cartridges (optional) using the dedicated side slot facing the CeBr₃ detector or the additional shielded holder (for cartridges).

TECHNICAL SPECIFICATIONS

Standard procedure

- 5 minutes warm up of the system at power up.
- 3 minutes background measurement.
- Typical scanning times:
 - 1 s for a gamma ray alarm
 - 2 s for a neutron alarm
 - 1 minute for identification of gamma or neutron emitters (user-configurable)
 - Programmable identification time for Filters/Cartridges measurements

Power supply

- Battery powered by LiFePO₄ rechargeable batteries
- Removable batteries
 - Nominal voltage: 14.4 V
 - Capacity: 98 Wh
 - Storage Temperature: Best 20±5C for long-time storage
 - To prevent discharge-related issue check the charge status every 4 months
 - Cycle life: >1000 cycles
- Total autonomy 8+ hours
- AC/DC power supply included

Mechanical

- Compact sizes: (L x W x D) = 435 x 295 x 147 mm³
- Easily transportable: weight < 8 kg
- Rugged and shockproof containing case

Tablet

- 10.1" display
- Wi-Fi and USB connection with the SNIPER-GN for data visualization
- Reports saved both on SNIPER-GN and locally on the tablet (user-configurable)
- *Optional: rugged tablet compliant with military standard

Neutron/Gamma PSD detector

- Dimension: 2" x 2"
- Neutron source identification allows discriminating U, Pu, Cf, Th, Am/Li or Am/Be sources
- Flash Point: 144 °C
- Energy range (fast neutron) 100 KeV - 10 MeV

CeBr₃

- Energy range 25 keV – 3 MeV
- Total efficiency to Cs-137 800 cps/μSv/h
- Peak efficiency to Cs-137 190 cps/μSv/h
- Spectroscopy with isotope identification
- Nuclide library compliant with the ANSI N42.34
- Energy Resolution FWHM at 662 keV < 4.2%

Environmental

- IP 67
- Operating temperature: -20 °C to 50 °C (-4 °F to 122 °F) according to ANSI N42.53



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