GSU

GAMMA SPECTROMETRY UNIT WITH NaI(Tl)

High sensitivity, short measurement time

Isotopic identification software with customisable libraries

Background subtraction to lower MDC

- High-sensitivity NaI(Tl) spectrometer
- Calculation of specific activity (e.g. Bq/g)
- Possibility to customise type and geometry of the measured sample
- NORM-dedicated version available
- Dedicated experimental and Monte Carlo characterisation

The **GSU** gamma spectrometry units employ a 3"x3" NaI(Tl) crystal coupled to a photosensitive detector (either PMT or SiPM) and an MCA. The detector is installed in a 5 cm thick lead shielding well, with additional inner layers of tin and copper for enhanced background reduction.

GSU is designed to perform gamma spectrometry analyses of small samples, such as foundry casting samples, air particulate filters, environmental samples (rocks, soil, biological samples), positioned in sample holders which can be tailored to meet specific measurement requirements, or Marinelli beakers.

The User can manage the system through the proprietary ELSE NUCLEAR **GSU** system software, calculating the specific activity and the Minimum Detectable Concentration (MDC) of the sample expressed in Bq/kg, Bq/l, Bq/m^3, etc. The built-in background subtraction subroutine improves the MDC without increasing the measurement time. The software includes fully-customisable isotope libraries as well as User-settable isotope-specific activity alarm thresholds, available through password-protected functions.

The **GSU-NORM** is a special version of system specifically conceived to perform Naturally Occurring Radioactive Material (NORM) analysis of environmental samples, such as rocks, sediments or soils. Through its MCA and its dedicated software, the **GSU-NORM** system allows determining the specific activity of NORM isotopes, i.e. K-40, Th-232 and U-238, expressed in Bq/g, %K, ppm eU and ppm eTh.

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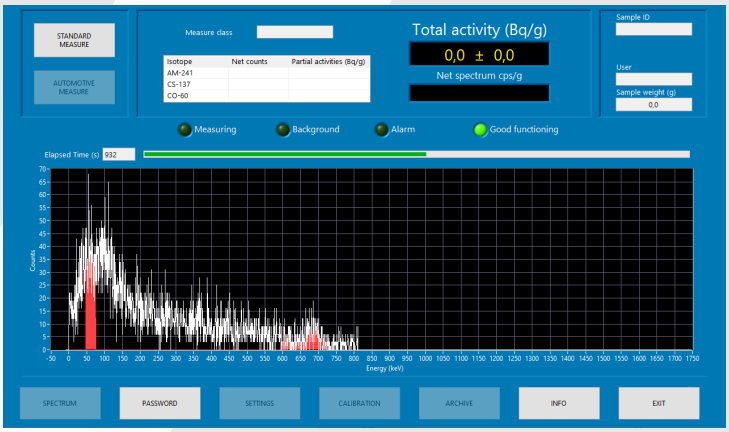
The sample holders are custom-made supports that fit directly on the detector's head, used to hold casting samples, test sources or other similar objects.
The Marinelli beakers are used to contain geological samples or other similar materials. Several volumes are available, from 250 ml up to 1 l, with different geometrical features.
Each GSU system includes efficiency curves and coefficients implemented in the analysis software, calculated through Monte Carlo simulations for each specific configuration, acquisition chain and measurement geometry. The simulations are always validated through experimental tests performed with reference radioactive sources.

TECHNICAL SPECIFICATIONS

General characteristics

- NaI(Tl) dimensions: 3"x3"
- Resolution at 662 keV: <7.5%
- Lead shielding: 5 cm thick, with 1 mm tin + 1 mm copper layers
- Total weight: 240 kg (including support)
- MCA channels: up to 2048
- Energy range: 30 keV ÷ 3 MeV



GSU software interface

Specific characteristics – GSU

- Typical MDC
  - Casting samples: 0.02 Bq/g for 300 s meas. (Cs-137)
  - Environmental analyses: see table

Specific characteristics – GSU-NORM

- Typical MDC
  - 0.002 Bq/g (40-K), 0.001 Bq/g (238-U), 0.003 Bq/g (232-Th) for 6 h meas.
  - 0.005 %K, 0.1 ppm eU, 0.7 ppm eTh for 6 h meas. (assuming secular equilibrium)

	Measurement time, minutes		
Isotope	**5**	**10**	**30**
^{60}Co	9.2	6.4	3.7
^{106}Ru	122.8 [38.7]$^{511\ keV}$	86.3 [27.2]$^{511\ keV}$	49.4 [15.6]$^{511\ keV}$
^{131}I	6.2	4.4	2.5
^{134}Cs	12.6	8.0	4.6
^{137}Cs	10.2	7.2	4.1
^{144}Ce	34.0	23.9	13.7
^{192}Ir	8.33	5.9	3.4

GSU MDC in Bq/kg of soil (1 l Marinelli, typical 100 nSv/h background H(10) rate, no background subtraction)*

OPTIONS

- NORM version
- 10 cm thick lead well to further lower MDC
- Different dimensions or type of detector

ACCESSORIES AVAILABLE UPON REQUEST

- Calibration source:
  - Contaminated steel samples (isotopes and activity to be defined)
  - Gel matrix in Marinelli beaker (isotopes and activity to be defined)
  - Certified soil matrix containing NORM in Marinelli beaker
  - Natural potassium salt for periodically quality controls
  - Cs-137 point source, < 10 kBq, for periodical quality controls
- Warranty extension from 12 months to 24 months

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