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D230A UAV Gamma-Ray Spectrometer

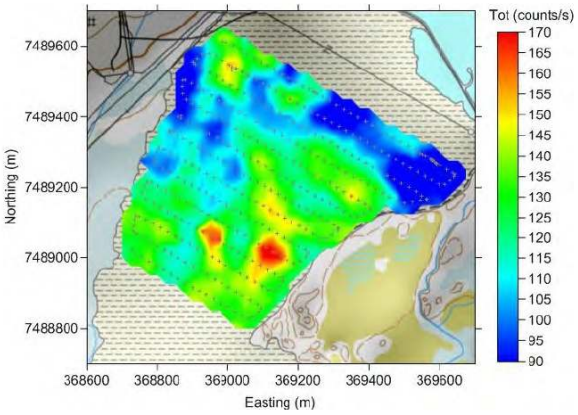
The D230A is a modular gamma-ray spectrometer designed specifically for UAVs. The system allows operators to simultaneously measure the dose rate, total intensity of gamma radiation, and intensity of the energy windows corresponding to potassium, uranium, thorium, plus a wide range of man-made radionuclides.

The standard D230A system utilizes two fully independent 1024 channel gamma-ray spectrometers, each with its own detector, and a lightweight data acquisition and control unit. Spectra of both detectors are accumulated and saved separately, with a sampling rate of one second. Both detectors contribute an integrated spectrum during monitoring activities, including dose rate.

D230A UAV Spectrometer in Flight

Benefits

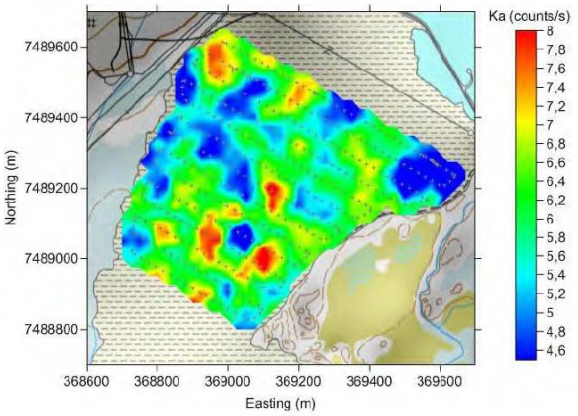
- Allows operators to complete surveys more efficiently than comparable ground instruments without the increased cost of large airborne systems.
- Systems available with one to four BGO or NaI/Tl detectors to accommodate a variety of applications and UAV payloads.
- Ability to directly identify naturally occurring and man-made radionuclides with the Nuclide Identification feature.
- Optional telemetric module for real-time wireless transmission of data.
- No radioactive sources required for operation.
- Easily mounted to commercially available drones with adequate lift power.



Contour Map of Total Intensity at 5m [1]

Applications

- **Mineral Exploration –** Radiometrics can be used to detect and delineate mineral deposits directly (uranium) or indirectly by association (rare earth elements, gold, copper, etc.) via thorium or potassium alterations.
- **Oil and Gas Exploration –** Radiation anomalies exist above most oil and gas reservoirs in the form of radiation "halos" surrounding salt domes. These anomalies can be detected through radiometric surveys for oil and gas exploration.
- **Environmental –** Radiometrics can be used in environmental investigations to identify the presence of radioactive material, measure radiation levels (including dose rate), and make assessments of its impact. Examples include the monitoring of uranium tailing ponds, decommissioning of nuclear facilities and uranium mines, and health physics.
- **Industrial –** Manufacturers use radioisotopes as tracers to monitor and inspect the integrity of industrial processes, from leak detection to the corrosion of process equipment. Small concentrations of short-lived isotopes can be detected with the use of radiometrics.



Contour Map of Intensity in Potassium Window at 5m [1]

[1] *Contour Maps Courtesy of Radai Oy*

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Operating Details

Detector Options

The number of detectors included in the D230A system can be reduced to one to minimize the system's weight or increased to three or four to improve its sensitivity. Each detector is 2" x 2" (51 x 51 mm) with a volume of 6.3 in^3 (104 cm^3) and is available in either Bismuth Germanate Oxide (BGO) or Sodium Iodide (NaI/Tl) configurations.

BGO detectors offer 3x greater sensitivity and are ideal for mineral exploration. NaI/Tl detectors are more lightweight and offer improved spectral resolution.

Each detector uses its own fully independent 1024 channel gamma-ray spectrometer. Spectra are accumulated and saved separately on a per detector basis and contribute towards an integrated spectrum.

Automatic Gain Stabilization

The D230A uses an advanced method of automatic gain stabilization using natural background radiation. This unique stabilization method eliminates the need for an additional radioactive check source.

Telemetric Module and Data Storage

The optional telemetric module allows for the real-time transmission of data, including spectra, dose rate, elevation, atmospheric pressure, and GPS position. The D230A also records data onto an internal 32 GB SD card with a standard storage capacity of 40,000 full spectra samples. The memory size is upgradeable to record additional records.

Power and Operation

The D230A electronics are powered from a small Li-Ion battery. A fully charged battery holds for up to 4 hours of operation and can be quickly replaced. A single button is used to both turn the system on and off, as well as to start and stop the measurements. For ease of use, total counts, spectra, nuclide identification, and dose rate are automatically captured using the same measurement mode.

UAV Integration

The housing is made from thin aluminum, and includes four hoisting points on its upper side to couple the system to a UAV. The D230A is delivered with an external GPS module with precision of 2m.

Weight Distribution of D230A Configurations

	Detector Types	
Number of Detectors	*BGO*	*NaI/Tl*
1 x	2.5 kg	2.1 kg
2 x	3.5 kg	2.7 kg
3 x	5.3 kg	4.1 kg
4 x	7.0 kg	5.4 kg

D230A UAV Spectrometer with Drone

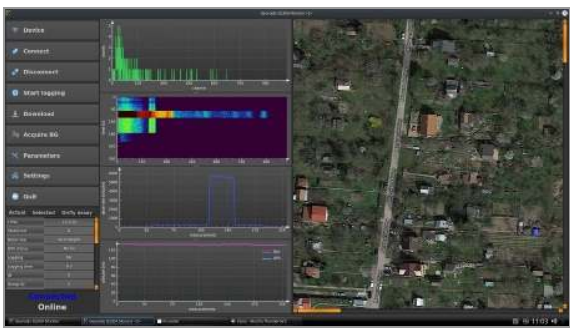
D230A with GPS Antenna & Telemetric Module

MapView Software

MapView is an easy-to-use data management software that facilitates online communication between a PC or laptop and the D230A UAV spectrometer.

It enables the setup of the system's operating parameters, data logging, and the export of data for use with the user's preferred visualization software.

When combined with the optional telemetric module, MapView also displays the real-time spectra, dose rate, elevation, atmospheric pressure, and GPS position recorded by the system.



MapView Software with Telemetric Data

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Specifications

Detector Size:	2" x 2" (51 x 51 mm) with volume of 6.3 in^3 (104 cm^3) per detector
BGO Detector(s):	Bi-alkali PMT Sensitivity 2 x 160 cps / MBq / m (Cs-137) Resolution max 11.5% FWHM (661 keV)
NaI/Tl Detector(s):	Bi-alkali PMT Resolution max 8% FWHM (661 keV)
Spectrometer(s):	1024 channels, 40 MHz DSP, Linear Energy corrected, Pile-up rejecter, 200 ns Resolution, Max throughput 250,000 cps per detector
Sampling Rate:	1 measurement per second Spectrometer data can be combined for a longer period during post-processing Each spectrum is recorded in a separate data file, as is total accumulated spectrum
Energy Range:	25 keV – 3,000 keV
Dose Rate:	Fully energy compensated (from 30 keV – 1,500 keV), linear up to 100 micro Sv/h, Complies with IEC 60486-1, Sensitivity 1 nSv/hr
Operating Time:	Up to 4 hours of continuous use at 20°C (flight time is limited by drone)
Display:	LCD black & white graphical display with resolution of 104 x 81 pixels
Control:	Single button operation
Data Storage:	32 GB, capable of storing 40,000 samples with full spectra, including GPS coordinates Stabilization spectra and system message logs are also recorded Memory size expandable
External GPS:	Navigate down to -162 dBm and -148 dBm coldstart, Precision of 2m
Communication:	Data transfer, remote control, and diagnostic by USB 2.0
Power:	Rechargeable Li-Ion 7.2V/2200 mAh
System Dimensions:	145 x 78 x 260 mm for 1-2 Detector Systems (excluding drone) Additional detectors are 78 x 78 x 260 mm each and are mounted to the console
Operating Temperature:	-10°C to 50°C
Rating:	IP40 (not dust and water resistant)
Weight:	Varies based on number and type of detectors (refer to chart)

Specifications are subject to change without notice (September 15, 2020)

D230A Contents

D230A Standard System Includes:
(1) D230A Console with:
- BGO **or** NaI/Tl detector(s)

(1) GPS Module
(2) Rechargeable Li-Ion Batteries with Charger
(1) USB Cable
(1) MapView Software for Data Management
(1) Operations Manual
(1) Rugged Transportation Case

Optional Telemetric Module Includes:
(1) Radio Modem with Removable Base
(2) Antennas with (1) 1m Antenna Extension Cable
(1) USB Cable

D230A Contents in Shipping Case
Shown with Telemetric Module

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