RADIATION SOLUTIONS INC.

RS-500
ADVANCED DIGITAL GAMMA-RAY SPECTROMETER for
Airborne Geophysical Exploration and Geological Mapping

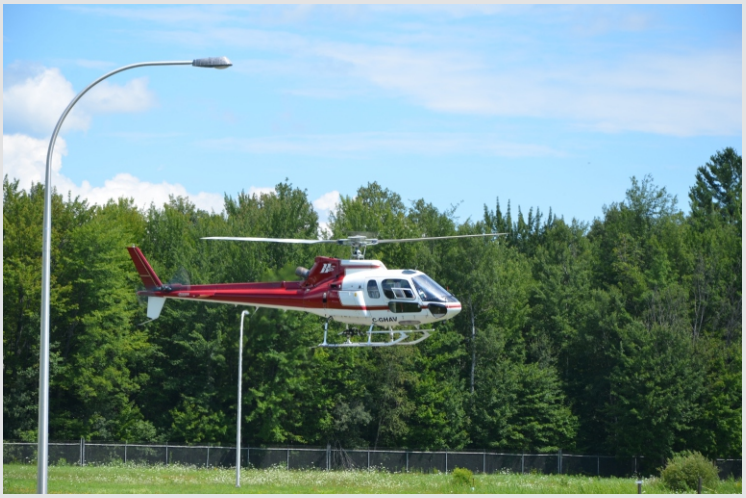
RS-500 Series Gamma-Ray Spectrometer - The "Gold Standard"

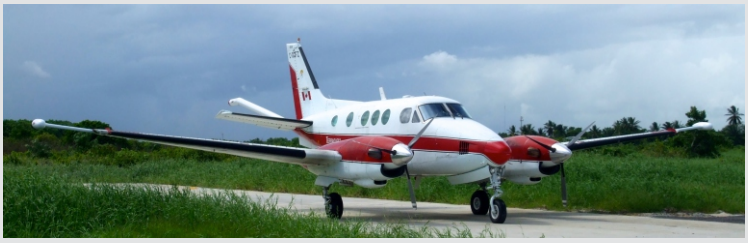
The RS-500 Series gamma-ray spectrometer is the "Gold Standard" in airborne instrumentation for the detection and measurement of low level radiation from both naturally occurring and man-made sources.

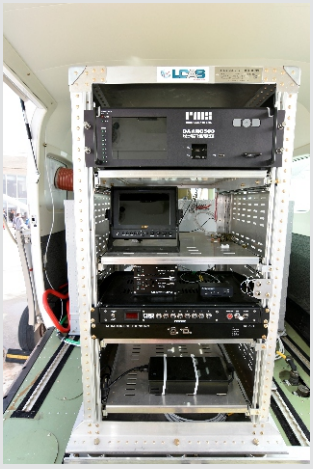
Whether flying in remote areas, during extreme weather conditions or on a limited flight budget, it is important to know you have reliable technology to collect high quality radiometric survey data, accurately the first time. Advanced technology and software techniques provide laboratory levels of spectral data performance that were previously unachievable on airborne platforms, providing a more stable operation with less drift and better data.

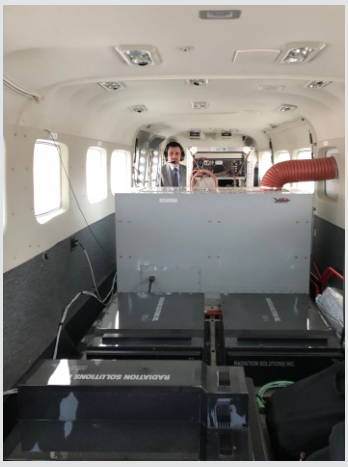
Key, unique features

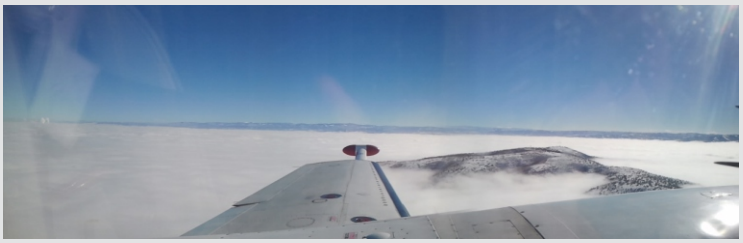
- **Accurate "the first time" technology** The advanced digital design using Field Programmable Gate Array (FPGA) and Digital Signal Processing (DSP) technology provides a more stable operation, with less drift, producing pure spectra that result in better data
- **Effectively no Dead-Time** Each crystal has a dedicated Advanced Digital Spectrometer (ADS) ensuring fully linearized output while permitting multi-crystal summing without degradation or distortion
- **1024 channel resolution** for any number of crystals (up to 5 times per second)
- **Effectively no signal degradation** when summing up to 20 crystals
- **No radioactive test sources** required for system setup or for system performance validation
- **Extremely wide dynamic range** of up to 250,000 cps for each crystal
- **High level of self diagnostics** with sophisticated error correction & reporting requiring less operator interaction
- **Multi-peak automatic gain stabilization** on natural isotopes faster than other manufacturers
- **Easy system integration** into existing data systems
- **Carbon fiber case** allows greater sensitivities to all energies

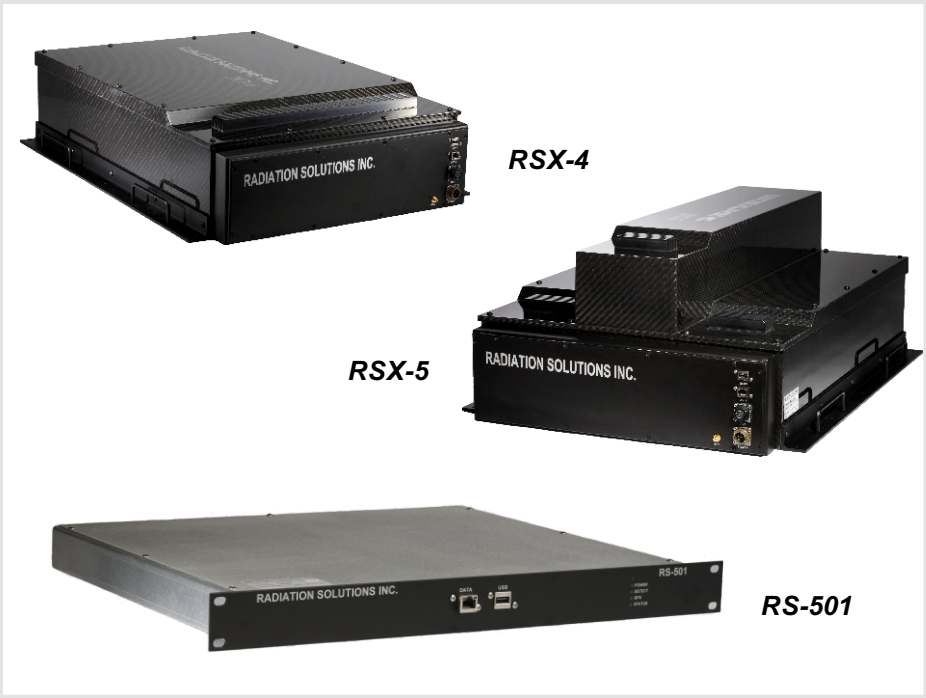












Ease of use, operator friendly

The system is designed for trouble-free operation and minimal operator interaction. A high level of self diagnostic and performance verification routines are implemented with automatic notification of any error conditions. However, the user may also monitor the data and system performance with their data acquisition system or with the RadAssist software. With multiple data verification methods available, rest assured that the resulting data, maps and other products are of high quality and accuracy.

Advanced Digital Spectrometer

The “heart” of the RS-500 system is the proprietary Advanced Digital Spectrometer (ADS) module. Each individual NaI crystal detector has its own high speed analog-to-digital (60 MHz) converter and a DSP / FPGA processor assembly. This module converts the analog signal from the detector to a digital spectrum with a 1,000,000 channel resolution. The spectrum is linearized to 1024 channels.

With high speed, the adaptive DSP allows the shape of each pulse to be verified, eliminating distortion and pile-up, even at high count rates. The combination of zero dead time, improved pulse pile-up rejection, individual crystal linearization and accurate detector summation results in exceptionally clean spectra.

Multi-detector pack systems

In applications where multiple detector packs are implemented, RSI offers an optional low profile (1U), RS-501 interface unit.

The RS-501 (4 system inputs) controller is an interface between the RS-500 systems and other ancillary devices (GPS, PPT, Wi-Fi router, etc.) that are connected to the RS-501. The controller determines how the data from various detectors and devices is collected and exported from the controller. When more than one system is connected to the RS-501, the system provides not only the sum of the systems but also the individual spectral data from each system and from each individual detector within each system.

Communications

Each detector pack is fully self-sufficient and communicates via Ethernet with up to 20 detectors. This provides for optimum operational performance with no technical limitations on data accuracy.

The Detector Processing Unit (DPU) continuously monitors the state of health of the individual crystals and the system as a whole. Each crystal is individually gain stabilized using a sophisticated multi-peak approach effectively eliminating the need for any pre-stabilization with external sources.

TECHNICAL SPECIFICATION – RS-500 Gamma-Ray Spectrometer

Spectrometer

Channels	1024
Differential non-linearity	<0.19% over top 99.5%
Integral non-linearity	<0.01% over top 99.5%
Zero dead time[1]	✓
Baseline restoration	Digital (IPBR)[2]
Pulse Shaping	Digital (AOPS)[3]
Pile-up rejection	Digital (<40nS)
Pile-up contamination	<1% @ 250kcps
Sample rate	0.1- 5 sec^{-1}
Timing trigger	GPS sync (internal / external)
Gain stabilization	Automatic multi-peak using the natural occurring isotopes of U, K, and Th. < 0.5% peak drift.

Outputs

Composite spectrum	✓ with improved detectors summing.
Individual spectra	✓
State of health	✓
Output formats	256, 512, 1024 (3keV / channel)
MCA	1,000,000 channel
Communication	TCP IP (Ethernet), RS-232, USB Diagnostic tool, remote maintenance over internet is possible.
USB diagnostics	System log, stabilization log, GPS stamped data, every detector and every sample

Inputs

Detector configuration	✓
Operational parameters	✓
Trigger signal	✓
Calibration data	✓
GPS	Built-in, or external GPS support, NMEA, TSIP

Detectors

Type	NaI (Tl)
Signal processing	3.5" PMT, Divider Chain and Digital MCA housed in low noise Mu Metal housing
Energy resolution	<8.5%[4]
Energy range	12 keV - 3 MeV
RSX-4	4 x 4L NaI(Tl)
RSX-5	4 + 1 x 4L NaI(Tl)

Power

Input	9-40 VDC

Weight

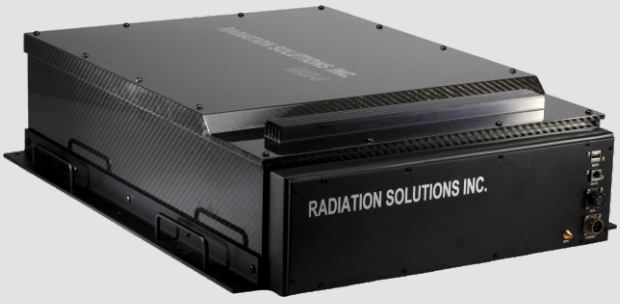
RSX-4	200 lbs. (91 kg)
RSX-5	250 lbs. (114 kg)

Size

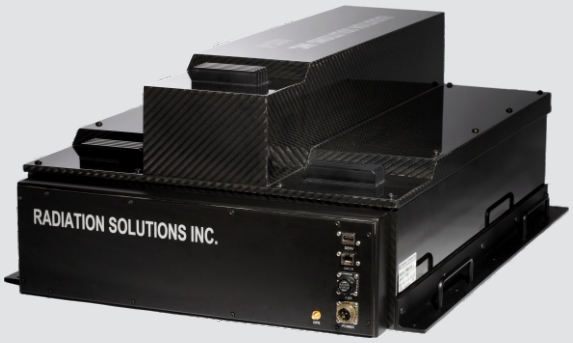
RSX-4	28.8" x 22.56" x 6.97" (690mm x 573mm x 177mm)[5]
RSX-5	28.8" x 22.56" x 11.32" (690mm x 573mm x 288mm)[5]

Environmental

Enclosure material	Low attenuation carbon fiber allows greater sensitivities to all energies
Operating Temp.	-20°C to +50°C
Temp. variation	Insulated from rapid temperature change
Protection	Incorporated thermal shock and vibration absorbing material
Protection rating	IP66 - Direct floor mount in aircraft
Connectors	Mil-spec



RSX-4 (16L of downward-looking detector)



RSX-5 (16L with 4L upward-looking detector)

RADIATION SOLUTIONS INC

Corporate Head Office

5875 Whittle Road

Mississauga, ON, CANADA,

L4Z 2H4

GeoRESULTS Pty Ltd

Sales, Support and Customisation

www.GeoResults.com.au

Ph: 0428 147 973

NOTES

(1) The RS-500 has no dead time in a traditional sense. A live time clock will be adjusted for loss of system measured pile-up rejections to give an apparent dead time to ensure the net count rate is correct.

(2) IPBR - Individual Pulse Baseline Restoration. The baseline is established for each individual pulse for maximum pulse height accuracy.

(3) AOPS - Automatic Optimized Pulse Shaping. Pulses are continuously analyzed and the signal pulse shaping adjusted for optimum performance.

(4) Stated energy resolution is for new systems. Refurbished system performance depends on the quality of the crystals supplied.

(5) Dimensions include removable mounting rails.

* Photos courtesy of AGT Systems and ATS, Terraquest Ltd. and Xcalibur Multiphysics.