



RayMon10[®]

**Detect, measure, identify
and analyse radionuclides
with the world's
highest resolution
CZT handheld detector**

Applications include:

- Health physics
- Nuclear installation monitoring
- Nuclear accident response
- Security screening by customs, police, fire and rescue services
- Military
- Site surveys
- Civil defense

Instrument Features:

- Accurate dose in US or SI units
- Dynamic search and alarm capability
- Automated radionuclide ID for ANSI N42.48
- RadBar® included for spectral dose visualisation
- Library of 94 radionuclides. User can add custom nuclides for their application
- Feature locking with PIN codes
- Data exports are fully compatible with Kromek's desktop spectroscopy software, MultiSpect Analysis®



Hardware:

- Rugged handheld platform
- 1280 x 800 pixel (WXGA) high-visibility backlit LCD for best-in-class sunlight view-ability
- Integrated GPS for location tagging (with 2-5m typical accuracy)
- Long-life rechargeable battery with 8-10 hours on one charge
- 8MP rear camera with LED illumination and 2MP front camera

RayMon10®

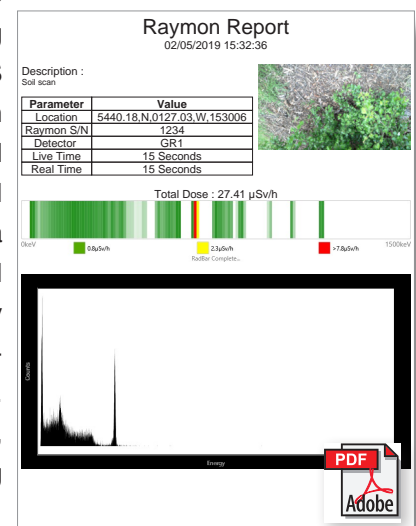
Detect, measure, identify and analyse radionuclides with the world's highest resolution CZT handheld detector



The RayMon10® is the highest resolution CZT handheld radiation monitor in the world. It can be used to detect, measure, identify and analyse gamma ray emitting radionuclides. The CZT detector produces high resolution gamma-ray spectra for clear and unambiguous interpretation. The RayMon10® algorithms provide spectral dose, radionuclide identification, line analysis and activity quantification.

RayMon10® is robust, lightweight and easy to use; its portability and usability are second-to-none.

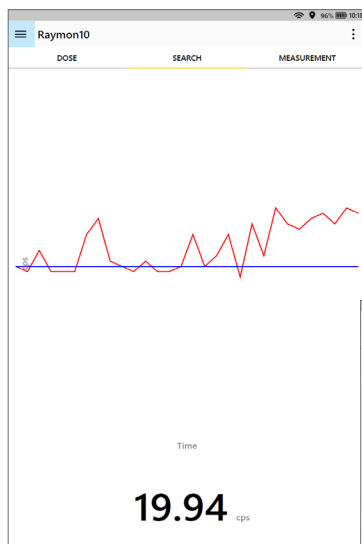
RayMon10 creates PDF reports including photograph, GPS position, radiation spectra and spectral analysis. Reports and measurement data can be transferred to a PC or laptop by sharing over a Wi-Fi connection (e.g. sending via email), and/or transferring onto a USB .



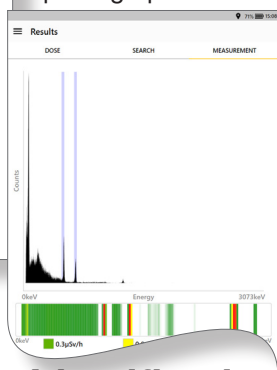
Searching and measuring

The search feature makes locating sources easy. As the detector is moved, clear visual graphs show when the count rate is increasing, guiding the user to the position of the source.

When exposed to radiation the operator can use the high resolution CZT detector to measure a detailed spectrum of the gamma rays present.



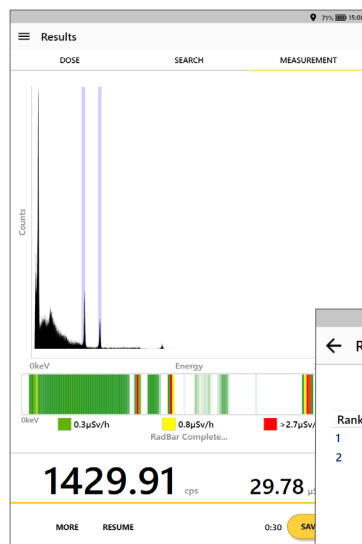
This spectrum is used for detailed analysis and can be saved for future reference, along with the location of the measurement and a photograph.



Automatic Isotope Identification

After recording a spectrum, fully automated radionuclide identification, designed to meet ANSI N42.48, can be performed for a library of 18 commonly encountered radionuclides*.

“Unknown Radionuclide” is displayed if there is a radiation source present that cannot be identified. Results are clearly ranked for the user with the largest contributor at the top of the results table.



Identification can be performed on spectra from a single radionuclide, mixtures, and shielded radionuclides.

Identification Result

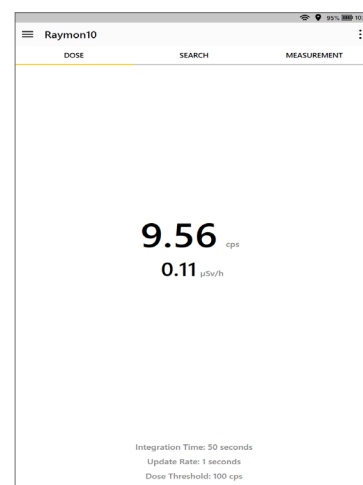
Rank	Source	Category
1	CS-137	Industrial
2	NA-22	Industrial

* For the list of radionuclides included, see the table on the following page

Dose

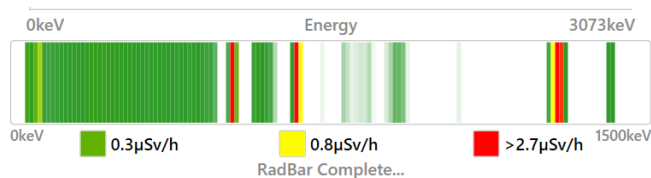
RayMon10[®] provides accurate dose measurements to the user from both a simple front screen and as part of a gamma ray spectrum measurement. The user can choose between SI and US standard units.

The spectral data is analysed by a Kromek developed algorithm across all energies to give an accurate dose value without the operator having to change any calibration factors.



RadBar[®] Technology

For the first time high resolution CZT technology allows the user to see the dose spectrum clearly in a RadBar[®] graphic. When viewed in conjunction with the emission energies of identified radionuclides the major dose contributors can be identified.

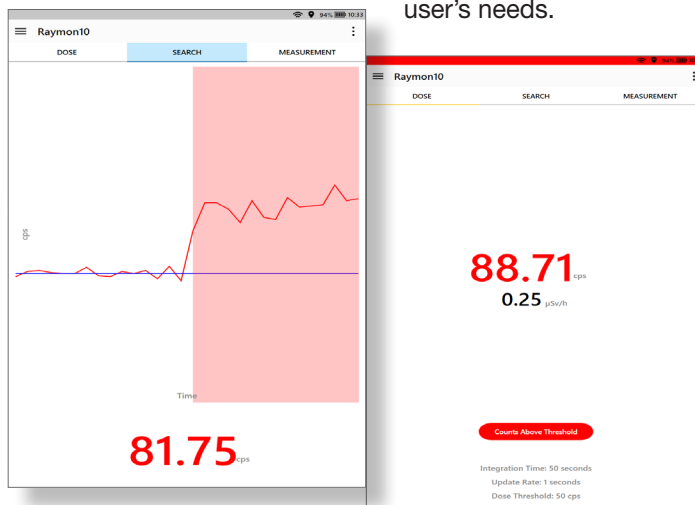


Colour scaling can be configured by the user depending on the application. Note that the RadBar only covers the energy range 0-1500keV, while the graphical spectrum covers the energy range 0-3000keV.

Alarms

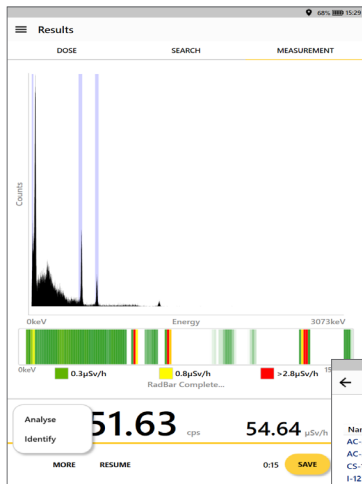
Counts per second alarms are configurable at user chosen levels and clearly visible on the front of the device.

The dynamic search alarms, which utilise statistical significance algorithms, can also be configured to the user's needs.



Spectrum analysis for advanced users

For advanced users RayMon10® contains a detailed library of the emission lines from 94 radionuclides. Libraries can be configured by the user for the radionuclides of most interest.



After a spectrum has been measured emission lines that pass a statistical critical limit test are highlighted to the user allowing the user to interpret the peaks in the spectrum.

Name	Energy	Intensity	Gross	Net	Lower	Upper
AC-225	187.96	1.79%	1036	268.38	156.76	379.99
AC-227	37.9	1.7%	1358	242.38	127.26	357.49
CS-137	661.657	91.63%	1660	1484.5	1387.5	1581.5
I-123	31.1044	7.24%	1502	734	633.03	834.97
I-123	31.7623	1.57%	1622	881	776.81	985.19
I-125	31.0589	13.22%	1502	734	633.03	834.97
I-125	31.7623	2.85%	1622	881	776.81	985.19
I-125	35.4922	4.16%	1603	710.5	600.24	820.76
XE-133	30.6254	14.92%	1552	776.88	672.95	880.8
XE-133	30.9731	27.54%	1502	734	633.03	834.97
XE-133	35.053	8.05%	1603	710.5	600.24	820.76
XE-133	35.9003	1.96%	1519	553	441.96	664.04

Isotopes over the critical limit: 12 of 12

27.41 µSv/h

Emission peak parameters are calculated and returned to the user. Detailed .csv reports allow the user to access all measured peak parameter values from the spectrum analysis.

Total Dose Rate	5.86455
FWnMn	0.1
Critical limit confidence level	99.9
Confidence limit confidence level	95

Source	Energy	Relative Intensity	Analysis	Peak Detected	Gross count	Net count	Centroid	FWHM	FWnM	FW ratio	Critical limit
CS-134	31.8174	0.0011	Included	Yes	710	240	34.8702	5.4298	6.30338	0.861412	115.3
CS-134	32.1939	0.0019	Included	Yes	784	330	34.1691	5.89801	7.25725	0.812706	113.4
CS-134	475.34	0.0067	Included	No	554	112	0	0	0	0	172.4
CS-134	563.23	0.0374	Included	No	518	23	0	0	0	0	181.36
CS-134	569.32	0.0687	Included	No	547	98	0	0	0	0	175.6
CS-134	604.69	0.4361	Included	Yes	811	402	605.979	7.34466	20.6735	0.35527	166.4
CS-134	795.84	0.382	Included	Yes	321	202	796.409	4.18142	19.9084	0.210033	103.6
CS-134	801.93	0.0389	Included	Yes	300	213	796.181	4.29306	20.2723	0.211769	91.17
CS-134	1038.555	0.0044	Included	No	12	5	0	0	0	0	47.1
CS-134	1167.92	0.008	Included	No	8	0	0	0	0	0	53.00
CS-134	1365.16	0.0135	Included	No	4	0	0	0	0	0	51.187
CS-137	31.8174	0.021	Included	Yes	710	240	34.8702	5.4298	6.30338	0.861412	115.3
CS-137	32.1939	0.0387	Included	Yes	784	330	34.1691	5.89801	7.25725	0.812706	113.4

Exporting Data and Sharing Reports

All reports and data files can either be exported onto a USB or shared via email. The shared report has all the data files attached to the document. The spectraldata.spe file can be opened into Kromek's desktop PC software, MultiSpect Analysis

The analysis of spectra can then continue with the convenience of a desktop and the extensive radionuclide library available in MultiSpect Analysis®.

Both RayMon10® and MultiSpect Analysis® allow reports to be generated in pdf format of the measurement, including spectrum, peak analysis, radionuclide identification results, and photographs.



Category	Nuclides Included
Industrial	Co-57 [†] , Co-60 [†] , Ba-133 [†] , Cs-137 [†] , Ir-192 [†] , Tl-204, Ra-226, Am-241 [†] , Cs-134, Cs-134 (M), Eu-152 [†] , Na-22 [†]
Medical	Ga-67 [†] , Cr-51, Se-75, Sr-89, Mo-99, Tc-99m [†] , In-111, I-123 [†] , I-125, I-131 [†] , Sm-153, Tl-201 [†] , Xe-133
NORM	K-40 [†] , Ra-224, Ra-226 [†] , Ac-228, Th-234, Th-228, Th-230, Th-232 [†] , Th-232 ⁰ , Rn-220, Po-216, Pb-212, Pa-234, Pa-234m, U-234, U-238, U-238 ⁰ , Rn-218, Rn-222, Bi-210, Bi-212, Bi-214, Po-214, Tl-206, Tl-208, Tl-210, Pb-210, Pb-214, Po-210, Po-218, Hg-206
Special	U-233, U-235 [†] , Np-237, Pu-239 [†] , Pu-240, O-19, Ar-41, Kr-87, Kr-88, Ac-225, Ac-227, At-215, At-217, Bi-211, Bi-213, Bi-215, Fr-221, Fr-223, Pa-231, Pa-233, Pb-211, Po-211, Po-213, Po-215, Ra-223, Rn-219, Th-227, Th-229, Th-231, Tl-207, Tl-209, Xe-133M, Xe-135M, Xe-138, I-134
Other	Mn-54, Zn-65, U-232

D in equilibrium with daughter products [†] included in automatic radionuclide identification

TECHNICAL DATA

DETECTOR PROBE

Detector: CZT detector 10 x 10 x 10 mm³

High energy resolution: 2.0-2.5% FWHM @ 662 keV

Display: 1280 x 800 pixel (WXGA) high-visibility backlit LCD for best-in-class sunlight view-ability

Indicator: On screen display confirming detector connected.

Dose rate display: µSv / hr

Connection: USB

Detector Testing: Tested by National Physical Laboratory in accordance with the conditions in;

ANSI N42.31 (2003) "Measurement procedures for resolution and efficiency of wide-bandgap semiconductor detectors of ionizing radiation"

NPL Good Practice Guide No. 14 "The examination, testing and calibration of portable radiation protection instruments"

Automated Radionuclide ID developed for:

ANSI N42.48 (2008) Section 6.10 "Requirements for Spectroscopic Personal Radiation Detectors (SPRDs) for Homeland Security"

PERFORMANCE

Energy range (Gamma): 30 keV to 3.0 MeV

Maximum throughput: 30,000 cps High level indicator warning on screen

Number of channels: 4096

Battery: 43.2Whr Li-ion rechargeable battery operating for 8-10 hours on one charge

Library: 94 radionuclides

Dose rate: Demonstrated up to 1mSv/h@ 662 keV

Dose accuracy: Better than +/- 20%

Stability: Peak drift +/- 1 channel (4096) over 8 hours continuous measurement

Analysis Software: RayMon10™ Analysis software

Tablet platform: Windows 10

PHYSICAL

Max. Dimensions: 21.6 x 20.5 x 4.5 cm

Weight: 1.08 kg

POWER ADAPTOR

Input: AC100-240V 50-60Hz 0.5A, 32-46VA

Output: DC12V 1.67A (Centre Positive)

International mains socket adaptors included as standard.

ENVIRONMENTAL

Tablet Unit

Performance is specified at an ambient temperature of 25°C. Operation at extreme temperatures (above 40°C or below 0°C) is not recommended.

Water:

Immersed in 1.4m of water for 2hrs, IP68
Designed for MIL-STD-810G, Method 512.5

Sand & dust: Totally protected against sand and dust, IP68. Designed for MIL-STD-810G, Method 510.5

Drop:

Shockproof: multiple drops from 4' (1.2 –1.5 m) onto concrete

Ship box drop tests

Designed for MIL-STD-810G, Method 516.6

Vibration:

Helicopter and general x, y and z axis vibration tests
Designed for MIL-STD-810G, Method 514.6

Operating Temperature:

-4°F to 122°F (-20°C to 50°C)

Designed for MIL-STD-810G, Method 501.5 and Method 502.5I

Storage Temperature:

-22°F to 158°F (-30°C to 70°C)

Designed for MIL-STD-810G, Method 501.5 and Method 502.5

Temperature shock:

-4°F/140°F (-30°C/+60°C)

Designed for MIL-STD-810G, Method 503.5

Humidity:

95%RH temp cycle 86°F/140°F (30°C/60°C)

Designed for MIL-STD-810G, Method 507.5

Altitude:

Rapid decompression, 40,000 ft (12,192 m) to sea level in <15secs

Designed for MIL-STD-810G, Method 500.5

Detector Probe

IP65

EMC tested

Recommended service interval: Annual

Applications include:

- Health physics
- Nuclear installation monitoring
- Nuclear accident response
- Security screening undertaken by customs, police, fire and rescue services
- Military
- Site surveys
- Civil defense
- First responders

Quantitative Analysis with RayMon10[®]



The RayMon10 Quant eliminates the need for lab-based intrusive sampling and radiochemical analysis in order to determine the classification of the material

Applications include:

- Decommissioning
- Environmental Monitoring
- Waste Disposal

Quantitative activity analysis module provides the complete hardware and software package required for accurate measurements of specific radionuclides. The module is fully ruggedised for field use.

Accurate measurements of radionuclide activity can now be made in field with the RayMon10[®] using the Quant[®] module.

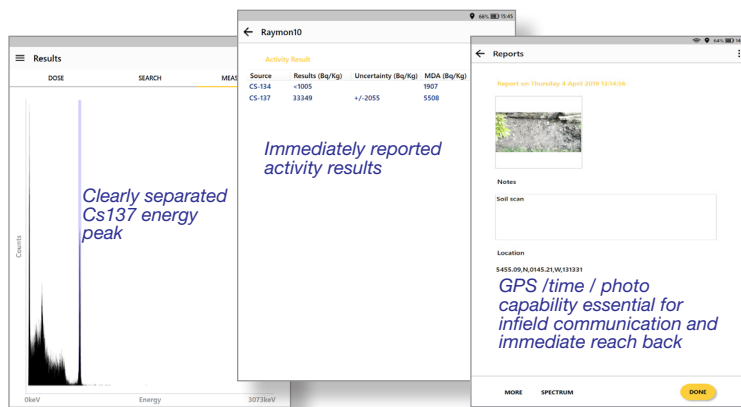
Raymon10[®] advanced high resolution detector allows quantitative analysis of isotopes which normally overlap in lower resolution instruments based on LaBr3 or NaI. This unique capability allows rapid in-field analysis and sample classification, avoiding costly delays associated with laboratory or radiochemical analysis.

Quant[®] is simple to use for distributed or point sources. The beaker and sample collection tools provided allow either sample type to be accurately presented to the detector in seconds. Measurement time is determined by the required MDA and can be executed in minutes.

Radionuclide	Minimum Detectable Activity
Cs134	0.1 Bq/g
Cs137	0.1 Bq/g

Features:

- Rugged and easy to operate both in field and laboratory use
- Provides activity analysis in complex spectra where normal detectors cannot be used
- Can be used with distributed (soil, building material sample, liquid waste) and point source (air sampling filters, calibration sources) samples
- Unique field reporting technology allows isotope analysis to be tagged to photographs, notes and GPS coordinates and reports to be transmitted directly from the field for immediate response
- PDF reporting facility
- Radionuclide library tailored to customer needs



Min Detectable Activity (Bq/g) for Cs137	Scan Time	Degree of confidence in typical background
4	<1min	95%
0.4	<10min	95%
0.1	<1hr	95%

Take RayMon10 anywhere

Every Kromek RayMon10® comes complete in its own heavy-duty weatherproofed and ruggedised Peli Case containing the following items as standard:

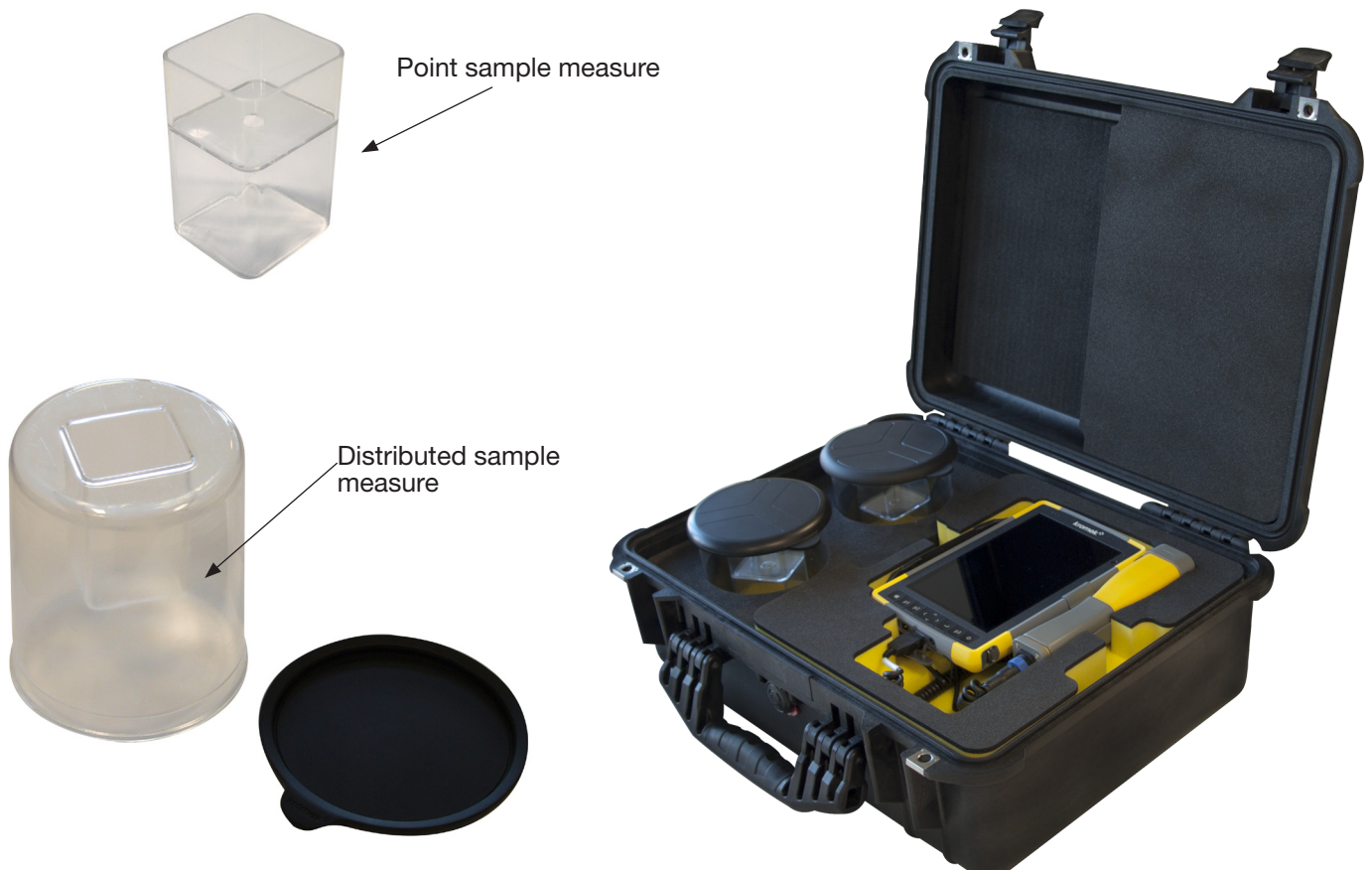
- Ruggedised handheld tablet
- RayMon10® detector probe
- Detachable coiled cable
- Wall charger with universal international plug adapters
- Accessory/storage pocket
- Operating manual
- Test certificates

Optional extras:

- RayMon05® probe with 5 x 5 x 5 mm³ CZT detector
- Extra battery pack
- Computer docking station
- Extra beakers (for Quant models only)



The Quant® analysis pack



Point sample measure

Distributed sample measure



**Nuclear
detection**

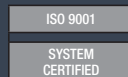


**Medical
imaging**



**Security
screening**

detect image identify



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