

AT117M Radiation Monitor

**Dosimetry of γ -, x - and n -radiation
in wide dose rate and energy range**

**Radiometry of α -, β -, γ -
and n -radiation**



Portable combined multi-purpose instrument, which can be equipped with different external detection units for various applications as applicable.

Depending on available set of detection units the radiation monitor can be used for measurement of:

- Ambient dose equivalent and ambient dose equivalent rate of X-ray, gamma and neutron radiation
- Air kerma and air kerma rate of X-ray and gamma radiation
- Directional dose equivalent and directional dose equivalent rate of X-ray and gamma radiation
- Flux density and fluence of alpha and beta particles from contaminated surfaces
- Flux density and fluence of neutrons with known energy distribution
- Surface activity and disintegrations of ^{239}Pu and $^{90}\text{Sr} + ^{90}\text{Y}$
- On-line search for sources of ionizing radiation and radioactive materials.

Processing unit (PU/PU2/PU4) or desktop computer can be used for operation and indication.

1) PU/PU2

Detection unit sends data over dedicated communication cable to processing unit, where the data is displayed on LCD screen.

PU and PU2 has recording and memory option for up to 999 measurement results, which can further be uploaded to a PC via dedicated application software. Sound and visual alarms activate in case user-adjustable threshold levels are exceeded.

Operation algorithm provides measurement continuity and real-time statistical processing of measurement results. PU and PU2 units feature integrated detection modules, allowing in situ dose and dose rate measurement of gamma radiation.



2) PU4 is a hand-held PC (HPC) with integrated detection module, providing in situ measurement of gamma radiation dose and dose rate. Operation algorithm provides measurement continuity and real time statistical processing of measurement results.

Data from detection unit into PU4 can transferred in two ways:

- Bluetooth interface by BT-DU4 adapter
- Direct cable connection to PU4

PU4 has the following functions:

- Processing and display of measurement data
- GPS referencing of measurement results
- Automatic recording and storing over 10,000 measurements with GPS referencing
- Sound and visual alarm when threshold level are exceeded
- Indication of battery charge level in PU4 and BT-DU4 adapter
- Loading data to PC for further analysis and processing in professional "GARM" software (Option)
- Automatic data transfer to a remote server by "ARMS" software [over FTP server; integrated 3G modem or connection to a Wi-Fi network shall be available] (Option).

3) Personal computer. "Atexch" software with dedicated kit for connection (Option) provides the following:

- Indication of dose and radiation measurement values, as well as writing into file and reading previously stored data
- Response when measured value thresholds are exceeded
- Error indication by instrument, message analysis and display in case of error conditions
- Multiple instances of program can be run in case more than one instrument is connected to different PC ports.

Application

- Radiation protective measures in case of nuclear disasters
- Radiation monitoring during decontamination operations
- Radioecology
- Sanitary and epidemiological inspection
- Nuclear industry
- Emergency rescue service
- Civil protection
- Research activities
- Customs control
- Search X-ray apparatus

Features

- Multiple functions
- High sensitivity and wide measurement range
- Quick accommodation to changes in radiation level
- Search for X-ray, gamma, alpha, beta and neutron radiation sources
- Search for X-ray, gamma, alpha, beta and neutron radiation sources
- Compensation of intrinsic Geiger-Muller counter tubes background
- Wide choice of accessories: Telescopic bars, tripods, alarm units, sealed containers, etc.






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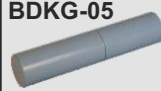







INSTRUMENTS AND TECHNOLOGIES FOR NUCLEAR
MEASUREMENTS AND RADIATION MONITORING

AT1117M Radiation Monitor

Processing units

Illustration	Detector	Ambient radiation dose rate equivalent measurement range	Ambient radiation dose equivalent measurement range	Energy range	Energy dependence relative to 662 keV (¹³⁷ Cs)	Sensitivity to ¹³⁷ Cs gamma radiation cps/(μ Sv·h ⁻¹)	Response time for dose rate change	Overall dimensions, mm weight, kg
	Geiger-Mueller counter tube	1 μ Sv/h – 10 mSv/h	1 μ Sv – 1 Sv	60 keV – 3 MeV	-25% to +35%	≥ 1	≤ 2 s (for dose rate change from 10 to 100 μ Sv/h)	177x85x124 1.2
	Geiger-Mueller counter tube	1 μ Sv/h – 10 mSv/h	1 μ Sv – 1 Sv	60 keV – 3 MeV	-25% to +35%	≥ 1	≤ 2 s (for dose rate change from 10 to 100 μ Sv/h)	210x88x36 0.6
	Geiger-Mueller counter tube	0.3 μ Sv/h – 100 mSv/h	0.15 μ Sv – 100 Sv	60 keV – 3 MeV	-25% to +35%	≥ 0.33	≤ 7 s (for dose rate change from 10 to 100 μ Sv/h)	265x90x40 0.6

X and gamma radiation detection units





Illustration	Detector	Ambient radiation dose rate equivalent measurement range	Ambient radiation dose equivalent measurement range	Energy range	Energy dependence relative to 662 keV (¹³⁷ Cs)	Sensitivity to ¹³⁷ Cs gamma radiation cps/(μ Sv·h ⁻¹)	Response time for dose rate change	Overall dimensions, mm weight, kg
	Geiger-Mueller counter tube	0.1 μ Sv/h – 10 Sv/h	0.1 μ Sv – 10 Sv	60 keV – 3 MeV	-25% to +35%	≥ 4	≤ 3 s (for dose rate change from 1 to 10 μ Sv/h)	$\varnothing 54 \times 256$ 0.5
	Scintillation NaI(Tl), $\varnothing 25 \times 40$ mm	0.03 – 300 μ Sv/h	0.03 μ Sv – 1 Sv	50 keV – 3 MeV	$\pm 20\%$	≥ 350	≤ 2 s (for dose rate change from 0.1 to 1 μ Sv/h)	$\varnothing 60 \times 299$ 0.6
	Scintillation plastic, $\varnothing 30 \times 15$ mm	0.05 μ Sv/h – 10 Sv/h	0.7 nSv – 100 Sv	15 keV – 10 MeV	$\pm 25\%$ (15 keV - 3 MeV) $\pm 40\%$ (3 - 10 MeV)	≥ 70	≤ 2 s (for dose rate change from 0.1 to 1 μ Sv/h)	$\varnothing 60 \times 200$, 0.46
	Scintillation NaI(Tl), $\varnothing 40 \times 40$ mm	0.03 – 300 μ Sv/h	0.03 μ Sv – 0.3 Sv	50 keV – 3 MeV	$\pm 20\%$	≥ 760	≤ 2 s (for dose rate change from 0.1 to 1 μ Sv/h)	$\varnothing 60 \times 290$ 1.2
	Scintillation NaI(Tl), $\varnothing 63 \times 63$ mm	0.01 – 100 μ Sv/h	0.01 μ Sv – 10 mSv	50 keV – 3 MeV	$\pm 20\%$	≥ 2200	≤ 2 s (for dose rate change from 0.1 to 1 μ Sv/h)	$\varnothing 76 \times 320$ 1.9
	Geiger-Mueller counter tube	1 mSv/h – 100 Sv/h	1 mSv – 100 Sv	60 keV – 3 MeV	-25% to +35%	≥ 0.005		$\varnothing 54 \times 167$ 0.28
	Scintillation plastic, $\varnothing 50 \times 40$ mm	20 nSv/h – 1 Sv/h	0.1 nSv – 100 Sv	25 keV – 10 MeV	$\pm 25\%$ (25 keV - 3 MeV) $\pm 40\%$ (3 - 10 MeV)	≥ 530	≤ 2 s (for dose rate change from 0.1 to 1 μ Sv/h)	$\varnothing 60 \times 205$ 0.5
	Scintillation plastic, $\varnothing 50 \times 40$ mm	20 nGy/h – 1 Gy/h (Measurement range of air kerma rate)	0.1 nGy – 100 Gy (Measurement range of air kerma)	50 keV – 10 MeV	$\pm 25\%$ (50 keV - 3 MeV) $\pm 40\%$ (3 - 10 MeV)	≥ 600 cps/(μ Gy·h ⁻¹)	≤ 2 s (for dose rate change from 0.1 to 1 μ Gy/h)	$\varnothing 60 \times 207$ 0.6
	Scintillation plastic, $\varnothing 70 \times 80$ mm	20 nSv/h – 0.5 Sv/h	0.1 nSv – 100 Sv	40 keV – 10 MeV	$\pm 25\%$ (40 keV - 3 MeV) $\pm 40\%$ (3 - 10 MeV)	≥ 1660	≤ 2 s (for dose rate change from 0.1 to 1 μ Sv/h)	$\varnothing 80 \times 245$ 0.78
	Scintillation NaI(Tl), $\varnothing 9 \times 2$ mm	0.05 – 100 μ Sv/h (Measurement range of directional dose equivalent rate)	0.05 μ Sv – 5 mSv (Measurement range of directional dose equivalent)	5 keV – 160 keV	Energy dependence relative to 59.5 keV $\pm 35\%$ (5 - 60 keV) $\pm 30\%$ (60 - 160 keV)	≥ 400 (to ²⁴¹ Am gamma radiation)	≤ 2 s (for dose rate change from 1 to 10 μ Sv/h)	$\varnothing 60 \times 261$ 0.55
	Geiger-Mueller counter tube	0.1 μ Sv/h – 30 mSv/h	0.1 μ Sv – 1 Sv	20 keV – 3 MeV	$\pm 30\%$	≥ 6.6	≤ 3 s (for dose rate change from 1 to 10 μ Sv/h)	138x86x60 0.33

Radiation monitor meets requirements of the following safety standards: IEC 61010-1:2001





Electromagnetic compatibility requirements of: EN 55011:2009, IEC 61000-4-2:2008, IEC 61000-4-3:2008, IEC 61000-4-4:2004+A1:2010, IEC 61000-4-6:2008

Radiation monitor has been added to state registries of approved measurement instruments of Republic of Belarus, Russian Federation, Ukraine, Kazakhstan, Uzbekistan, Azerbaijan and Turkmenistan.




**Alpha radiation detection units**

Illustration	Detector	Alpha particles flux density measurement range	²³⁹ Pu surface activity measurement range	Energy range	Sensitivity to ²³⁹ Pu source, cps/(particle·min ⁻¹ ·cm ⁻²)		Overall dimensions, mm weight, kg
	Scintillation ZnS(Ag), 30 cm ²	0.1 – 10 ⁵ particle·min ⁻¹ ·cm ⁻²	3.4·10 ⁻³ – 3.4·10 ³ Bq·cm ⁻²	4 – 7 MeV	≥0.15		Ø85x205 0.5
	Scintillation ZnS(Ag), 100 cm ²	0.05 – 5·10 ⁴ particle·min ⁻¹ ·cm ⁻²	1.7·10 ⁻³ – 1.7·10 ³ Bq·cm ⁻²	4 – 7 MeV	≥0.7		Ø137x230 0.7
	Scintillation ZnS(Ag), 300 cm ²	0.05 – 2·10 ⁴ particle·min ⁻¹ ·cm ⁻²	1.7·10 ⁻³ – 0.68·10 ³ Bq·cm ⁻²	4 – 7 MeV	≥2.5		Ø222x277 1.4
	Geiger-Mueller counter tube	2.4 – 30 particle·min ⁻¹ ·cm ⁻² (Limits of intrinsic relative measurement error ±30%) 30 – 10 ⁶ particle·min ⁻¹ ·cm ⁻² (Limits of intrinsic relative measurement error ±20%)	–	4 – 7 MeV	≥0.045		138x86x60 0.33

Beta radiation detection units

Illustration	Detector	Beta particles flux density measurement range	⁹⁰ Sr + ⁹⁰ Y surface activity measurement range	Energy range	Sensitivity to ⁹⁰ Sr + ⁹⁰ Y source, cps/(particle·min ⁻¹ ·cm ⁻²)		Overall dimensions, mm weight, kg
	Scintillation plastic, 30 cm ²	1 – 5·10 ⁵ particle·min ⁻¹ ·cm ⁻²	4.4·10 ⁻² – 2.2·10 ⁴ Bq·cm ⁻²	155 keV – 3.5 MeV	≥0.3		Ø85x205 0.55
	Scintillation plastic, 100 cm ²	0.5 – 1.5·10 ⁵ particle·min ⁻¹ ·cm ⁻²	2.2·10 ⁻² – 0.66·10 ⁴ Bq·cm ⁻²	155 keV – 3.5 MeV	≥0.9		Ø137x235 0.87
	Scintillation plastic, 300 cm ²	0.5 – 0.5·10 ⁵ particle·min ⁻¹ ·cm ⁻²	2.2·10 ⁻² – 0.22·10 ⁴ Bq·cm ⁻²	155 keV – 3.5 MeV	≥2.4		Ø222x281 1.8
	Geiger-Mueller counter tube	6 – 10 ⁶ particle·min ⁻¹ ·cm ⁻²	–	155 keV – 3.5 MeV	≥0.12		138x86x60 0.33

Neutron radiation detection units

Illustration	Detector	Ambient radiation dose rate equivalent measurement range	Ambient radiation dose equivalent measurement range	Neutron flux density measurement range	Energy range	Sensitivity to Pu-Be source		Overall dimensions, mm weight, kg
						In flux density measurement mode	In dose rate measurement mode	
	He-3 counter in a polyethylene moderator	0.1 µSv/h – 10 mSv/h (Limits of intrinsic relative measurement error ±35%)*	0.1 µSv – 10 Sv (Limits of intrinsic relative measurement error ±35%)*	0.1 – 10 ⁴ neutron·s ⁻¹ ·cm ⁻²	0.025 eV – 14 MeV	≥0.5 cps/(neutron·s ⁻¹ ·cm ⁻²)	≥0.355 cps/(µSv·h ⁻¹)	Ø90x260 2.0
	He-3 counter in a polyethylene moderator	0.1 µSv/h – 10 mSv/h	0.1 µSv – 10 Sv	0.1 – 10 ⁴ neutron·s ⁻¹ ·cm ⁻² (Limits of intrinsic relative measurement error ±30%)*	0.025 eV – 14 MeV	≥0.5 cps/(neutron·s ⁻¹ ·cm ⁻²)	≥0.355 cps/(µSv·h ⁻¹)	314x220x264 8
	Two He-3 counters in polyethylene moderator	–	–	0.1 – 2·10 ³ neutron·s ⁻¹ ·cm ⁻²	0.025 eV – 14 MeV	≥10 cps/(neutron·s ⁻¹ ·cm ⁻²)	–	105x115x380 3,5

* for Pu-Be sources

AT117M Radiation monitor: General parameters

Limits of intrinsic relative measurement error	±20%	Power supply - Detection unit (DU) By PU/PU2/PU4/BT-DU4 - PU/PU2/PU4/BT-DU4 1) By integrated rechargeable battery pack 2) By external 12 VDC power source 3) By external +230 VAC 50 Hz power source 4) By external battery (PU/PU2/BT-DU4)
Protection class	IP64	
Working temperature range	-40°C...+50°C/-30°C...+50°C (PU4) -50°C...+50°C (BDKG-04/-24/-30/-32) 0...+40°C (BDKR-01)	Continuous run time ≥24 h (≥8 h - PU4 power supply)
Relative humidity	≤95% (with air temperature ≤35°C without condensation)	Interface - DU to PU/PU2 RS232 - DU to PC USB, RS232 - DU to PU4 Bluetooth, RS232

AT117M Radiation Monitor

TYPICAL SOLUTIONS

Remote measurements

Components:

- Detection unit (BDKG-01, BDKG-03, BDKG-04, BDKG-05, BDKG-17, BDKG-24, BDKG-30, BDKG-32, BDKR-01, BDPA-01, BDPA-02, BDPA-03, BDPB-01, BDPB-02, BDPB-03)
- PU / PU2 / PU4
- Telescopic bar (1.7 m/3.2 m)
- Holder (For attaching detection unit to telescopic bar)
- Holder (For attaching PU2/HPC to telescopic bar)
- Cable



Monitoring of hand and coat contamination by alpha/beta particles



Components:

- Detection unit (BDPA-02, BDPA-03, BDPB-02, BDPB-03)
- PU2
- Wall bracket
- Cable

Handle for ease of measurement



Components:

- Detection unit (except BDKN-03)
- PU2
- Handle (For attaching PU2 to smart probe)
- Cable

Transportable dosimetric monitoring stations



Components:

- Detection unit (except BDKN-03, BDKN-05)
- PU2 / PU4 with BT-DU4 adapter
- Cable
- Tripod
- Mounting bracket (For mounting detection unit and PU2/PU4 on the bar)



Measurements with GPS-mapping

Components:

- PU4
- Detection unit (any)
- BT-DU4 Adapter
- Handle
- Cable



Neutron dosimeter

Components:

- BDKN-03
- PU2 / PU4 with BT-DU4 adapter
- Cable
- Holder (For attaching PU2 to BDKN-03)



Alarm units operation

Components:

- PU/PU2
- Detection unit (any)
- Alarm unit (With horizontal or vertical mounting bracket)
- Cables



General control of pollution by radioactive materials in impulse count rate mode

Components:

- BDPS-02
- PU
- Cable



Measurements in water, wells, etc.



Components:

- Detection unit (BDKG-01, BDKG-03, BDKG-04, BDKG-05, BDKG-17, BDKG-24, BDKG-30)
- PU/PU2
- Cable (Up to 30 m)
- Wire cable
- Cable spool



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