

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/PU5) 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 99 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) PU5 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 PU5 can be transferred in two ways:

- Bluetooth interface by BT-DU4 adapter
- Direct cable connection to PU5

PU5 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 PU5 and BT-DU4 adapter
- Automatic data transfer to a remote server by "Cloud9" software [via FTP server over 4G connection or if Wi-Fi network is available]
- Loading data to PC for further analysis and processing in professional "GARM" software (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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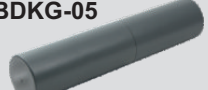
INSTRUMENTS AND TECHNOLOGIES FOR NUCLEAR
MEASUREMENTS AND RADIATION MONITORING



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)	Typical sensitivity to ¹³⁷ Cs gamma radiation cps/(μ Sv·h ⁻¹)	Response time for dose rate change	Overall dimensions, mm weight, kg
PU1 	Geiger-Mueller counter tube	1 μ Sv/h – 100 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
PU2 	Geiger-Mueller counter tube	1 μ Sv/h – 100 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
PU5 	Geiger-Mueller counter tube	1 μ Sv/h – 100 mSv/h	1 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)	227x94x26 0.5

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)	Typical sensitivity to ¹³⁷ Cs gamma radiation cps/(μ Sv·h ⁻¹)	Response time for dose rate change	Overall dimensions, mm weight, kg
BDKG-01 	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)	Ø54x256 0.5
BDKG-03 	Scintillation NaI(Tl), Ø25x40 mm	0.03 – 300 μ Sv/h	0.03 μ Sv – 1 Sv	50 keV – 3 MeV	±20%	350	≤2 s (for dose rate change from 0.1 to 1 μ Sv/h)	Ø60x299 0.6
BDKG-04 	Scintillation plastic, Ø30x15 mm	0.05 μ Sv/h – 10 Sv/h	0.7 nSv – 100 Sv	15 keV – 10 MeV	±25% (15 keV – 3 MeV) ±40% (3 – 10 MeV)	70	≤2 s (for dose rate change from 0.1 to 1 μ Sv/h)	Ø60x200, 0.46
BDKG-05 	Scintillation NaI(Tl), Ø40x40 mm	0.03 – 300 μ Sv/h	0.03 μ Sv – 0.3 Sv	50 keV – 3 MeV	±20%	760	≤2 s (for dose rate change from 0.1 to 1 μ Sv/h)	Ø60x290 1.2
BDKG-11 	Scintillation NaI(Tl), Ø63x63 mm	0.03 – 100 μ Sv/h	0.01 μ Sv – 10 mSv	50 keV – 3 MeV	±20%	2200	≤2 s (for dose rate change from 0.1 to 1 μ Sv/h)	Ø76x320 1.9
BDKG-17 	Geiger-Mueller counter tube	1 mSv/h – 100 Sv/h	1 mSv – 100 Sv	60 keV – 3 MeV	-25% to +35%	0.005		Ø54x167 0.28
BDKG-24 	Scintillation plastic, Ø50x40 mm	30 nSv/h – 1 Sv/h	0.1 nSv – 100 Sv	25 keV – 10 MeV	±25% (25 keV – 3 MeV) ±40% (3 – 10 MeV)	530	≤2 s (for dose rate change from 0.1 to 1 μ Sv/h)	Ø60x205 0.5
BDKG-30 	Scintillation plastic, Ø50x40 mm	30 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	±25% (50 keV – 3 MeV) ±40% (3 – 10 MeV)	600 cps/(μ Gy·h ⁻¹)	≤2 s (for dose rate change from 0.1 to 1 μ Gy/h)	Ø60x207 0.6
BDKG-32 	Scintillation plastic, Ø70x80 mm	30 nSv/h – 0.5 Sv/h	0.1 nSv – 100 Sv	40 keV – 10 MeV	±25% (40 keV – 3 MeV) ±40% (3 – 10 MeV)	1660	≤2 s (for dose rate change from 0.1 to 1 μ Sv/h)	Ø80x245 0.78



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)	Typical sensitivity to ¹³⁷ Cs gamma radiation, cps/(μSv·h ⁻¹)	Response time for dose rate change	Overall dimensions, mm weight, kg
	Scintillation NaI(Tl), Ø9x2 mm	0.05 – 100 μSv/h (Measurement range of directional dose equivalent rate)	0.05 μSv – 5 mSv (Measurement range of directional dose equivalent)	5 keV – 160 keV	Energy dependence relative to 59.5 keV ±35% (5–60 keV) ±30% (60–160 keV)	400 (to ²⁴¹ Am gamma radiation)	≤2 s (for dose rate change from 1 to 10 μSv/h)	Ø60x261 0.55
	Geiger-Mueller counter tube	0.1 μSv/h – 30 mSv/h	0.1 μSv – 1 Sv	20 keV – 3 MeV	±30%	6.6	≤3 s (for dose rate change from 1 to 10 μSv/h)	138x86x60 0.33

Alpha radiation detection units

Illustration	Detector	Alpha particles flux density measurement range	²³⁹ Pu surface activity measurement range	Energy range	Typical 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	Ø85x200 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	Typical 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	Typical 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 $\mu\text{Sv/h}$ – 10 mSv/h (Limits of intrinsic relative measurement error $\pm 35\%$)*	0.1 μSv – 10 Sv (Limits of intrinsic relative measurement error $\pm 35\%$)*	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/($\mu\text{Sv}·\text{h}^{-1}$)	Ø90x260 2.0
	He-3 counter in a polyethylene moderator	0.1 $\mu\text{Sv/h}$ – 10 mSv/h	0.1 μSv – 10 Sv	0.1 – 10^4 neutron·s ⁻¹ ·cm ⁻² (Limits of intrinsic relative measurement error $\pm 30\%$)*	0.025 eV – 14 MeV	0.5 cps/(neutron·s ⁻¹ ·cm ⁻²)	0.355 cps/($\mu\text{Sv}·\text{h}^{-1}$)	314x220x264 8
	Two He-3 counters in polyethylene moderator	–	–	0.1 – $2 \cdot 10^3$ neutron·s ⁻¹ ·cm ⁻²	0.025 eV – 14 MeV	10 cps/(neutron·s ⁻¹ ·cm ⁻²)	–	105x115x380 3.5
	He-3 counter in a polyethylene moderator	0.1 $\mu\text{Sv/h}$ – 30 mSv/h	0.1 μSv – 10 Sv	–	0.025 eV – 16 MeV	1 cps/(neutron·s ⁻¹ ·cm ⁻²)	0.7 cps/($\mu\text{Sv}·\text{h}^{-1}$)	(w/o tripod) 550x254x254 10

* for Pu-Be sources

AT117M Radiation monitor: General parameters

Limits of tolerable intrinsic relative error		±20%
Power supply	- Detection unit (DU)	By PU/PU2/PU5/BT-DU4/PC
	- PU/PU2/PU5/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
Continuous operation time		≥24 h
		≥8 h - PU5 power supply
Interface	- DU to PU/PU2	RS232
	- DU to PC	USB
	- DU to PU5	RS232 , Bluetooth (via adapter BT-DU4)
Protection class		IP64
Operation temperature range		-40°C to +50°C
		-20°C to +50°C (PU5)
		-50°C to +50°C (BDKG-04/-24/-30/-32)
		0 to +40°C (BDKR-01)
Relative air humidity		≤95% (with air temperature ≤35°C without condensation)

The radiation monitor complies with: GOST 27451-87, Safety requirements of IEC 61010-1:2010, EMC requirements of EN 55011:2009, IEC 61000-4-2:2008, IEC 61000-4-3:2008

Design and specifications are subject to change without notice

AT1117M 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 / PU5
- Telescopic bar (1.7 m/3.2 m/4.0 m/4.5 m/5.0 m)
- Holder (For attaching detection unit to telescopic bar)
- Holder (For attaching PU2/PU5 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, BDKN-05, BDKN-06)
- PU2
- Handle (For attaching PU2 to smart probe)
- Cable

Transportable dosimetric monitoring stations



Components:

- Detection unit (except BDKN-03, BDKN-05)
- PU2 / PU5 with BT-DU4 adapter
- Cable
- Tripod
- Mounting bracket (For mounting detection unit and PU2/PU4 on the bar)

Measurements with GPS-mapping

Components:

- PU5
- Detection unit (any)
- BT-DU4 Adapter
- Handle
- Cable



Alarm units operation

Components:

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



Neutron dosimeter

Components:

- BDKN-03
- PU2 / PU5 with BT-DU4 adapter
- Cable
- Holder (For attaching PU2 to BDKN-03)



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
- Wire cable
- Cable (Up to 30 m)
- Cable spool