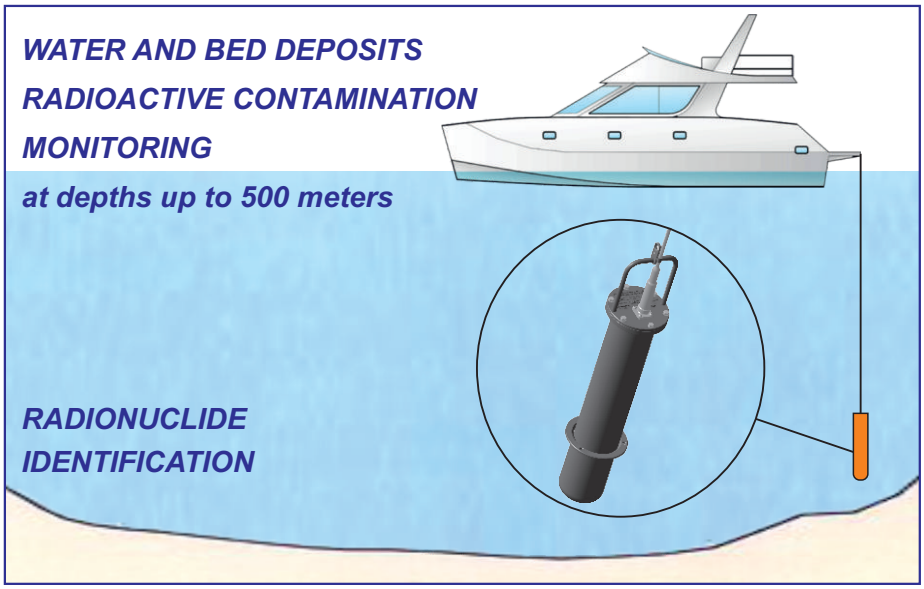
# AT6104DM, AT6104DM1 Spectrometers




Multifunction immersion spectrometers to monitor radiation levels in fresh and sea water, as well as in bottom sediments. Measurement at depths up to 500 m without prior sampling and sample preparation.

## Operating principle

Detection device in a shock-resistant and watertight stainless steel container registers gamma radiation of controlled radionuclides.

Detection device sends spectrometric data to tablet PC (hand-held PC) for displaying on screen.


Instrumental spectra processing algorithms in dedicated software are used for displaying radioisotope composition data and certain radionuclide volume activity.

Ambient gamma radiation dose equivalent rate value in inspection point is determined by instrument spectrum analysis with “spectrum-dose” operational function.

## Applications

- Monitoring radioactive contamination of water and bed deposits at depths up to 500 meters with data GPS-mapping
- Radioecological monitoring of water bodies near NPPs and RAW repositories
- Radiation control of underground RAW repositories and other objects in case of flooding
- Operational monitoring of radioactive hazardous objects hoisting

## Features

- Measurement results can be viewed as index maps of monitored radionuclide concentration allocation or gamma radiation dose rate
- Instant detection of near background dose rate level increase
- Built-in gyro transmitter
- Automatic LED stabilisation and measurement path temperature compensation
- Setting up procedure and parameter check using check sample that contains KCl salt with naturally occurring radionuclide $^{40}K$
- Expert mode for in-depth instrument spectrum analysis with auto-identification of radionuclide composition of object under control
- Records and stores in non-volatile memory up to 140,000 measured instrument spectra with subsequent reading option
- Measurement data can be transmitted to PC for further detailed processing in dedicated software “GARM”

## Spectrometer parts

- Detection device
- Cable spool with slip ring
- Dedicated deep-sea cable
- Tablet PC (Hand-held PC)
- Software
- Acoustic sounder, etc.

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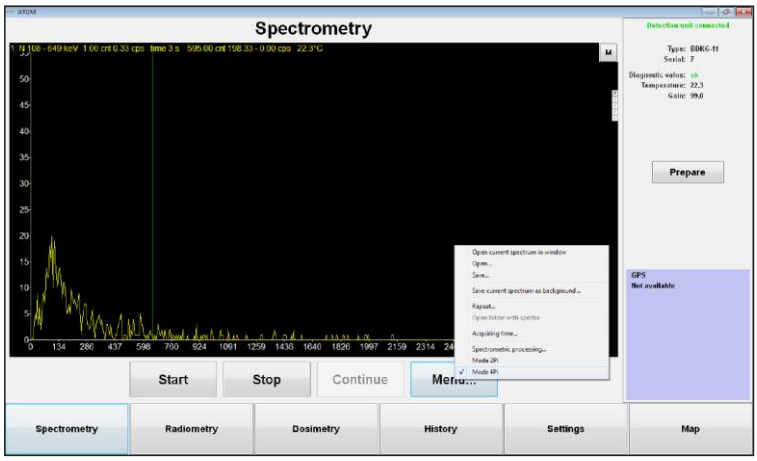
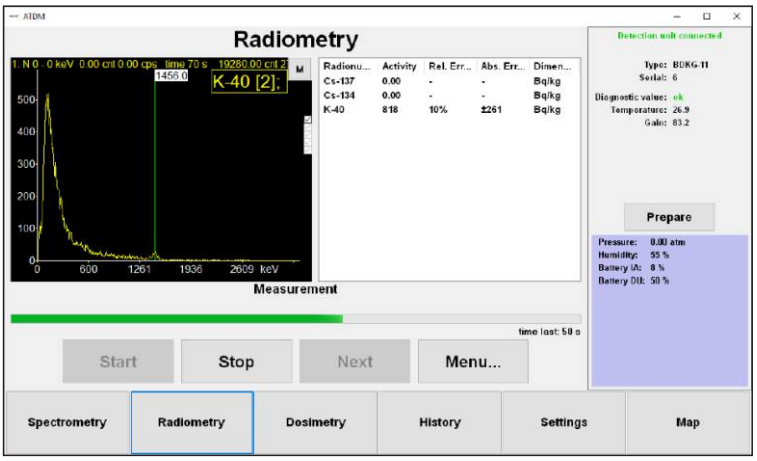
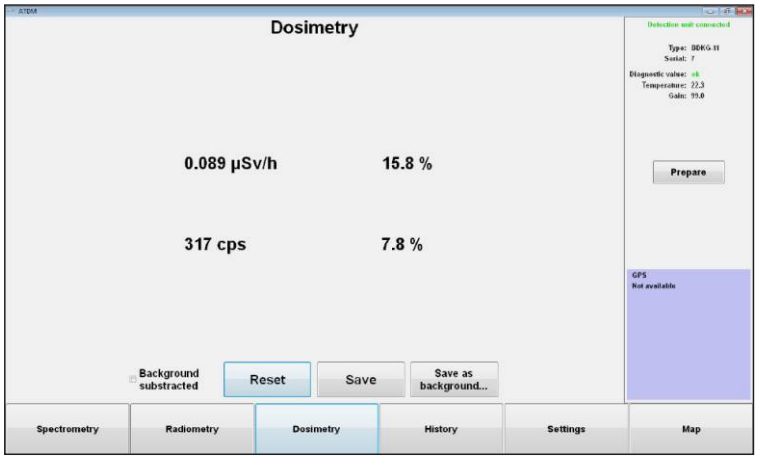
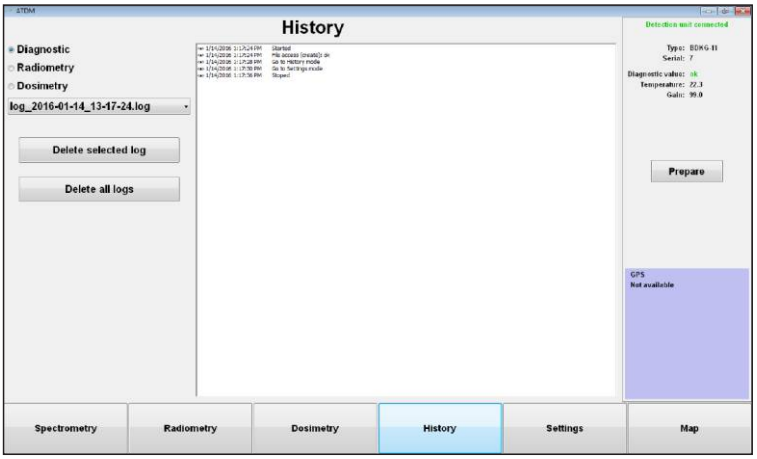
## "ATDM" Software *Main operation modes* (Tablet PC)

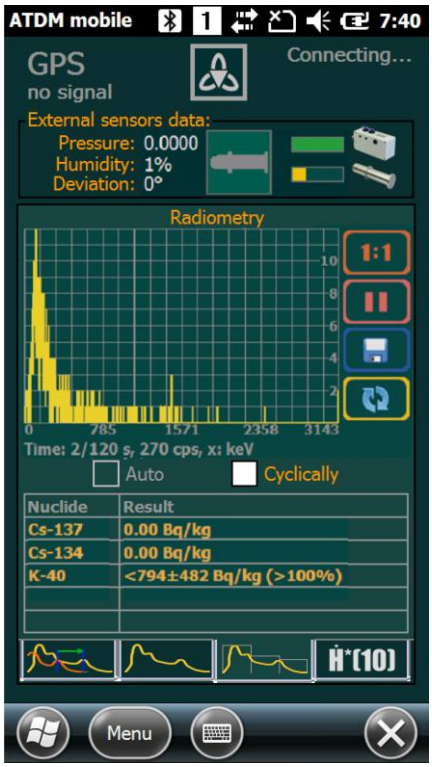


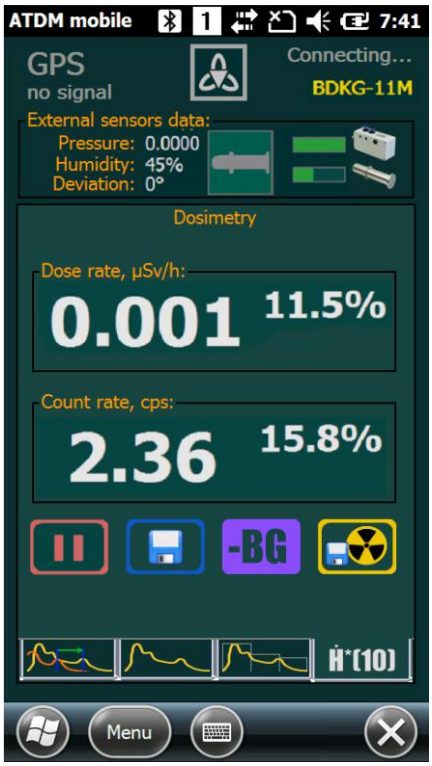




## "ATDM mobile" Software *Main operation modes* (HPC)



# AT6104DM, AT6104DM1 Spectrometers

| Specification | AT6104DM | AT6101DM1 |
|---|---|---|
| Scintillation detector | NaI(Tl) Ø63x63 mm | NaI(Tl) Ø63x160 mm |
| Energy range | 70 keV – 3 MeV | |
| Identified radionuclides | $^{137}$Cs, $^{134}$Cs, $^{131}$I, $^{40}$K, $^{226}$Ra, $^{232}$Th | |
| | *Extended library* (add $^{60}$Co, $^{24}$Na, $^{54}$Mn, etc.) *available on request* | |
| Measurement range of specific activity in water for 4$\pi$ measurement geometry | 3 – 1·10$^{6}$ Bq/kg [$^{134}$Cs, $^{137}$Cs, $^{131}$I]<br>250 – 2·10$^{4}$ Bq/kg [$^{40}$K] | 1 – 1·10$^{6}$ Bq/kg [$^{134}$Cs, $^{137}$Cs, $^{131}$I]<br>100 – 2·10$^{4}$ Bq/kg [$^{40}$K] |
| | *Extended library* (add $^{60}$Co, $^{54}$Mn, etc.) *available on request* | |
| Measurement range of bottom sediments specific activity for 2$\pi$ measurement geometry | 50 – 1·10$^{6}$ Bq/kg [$^{134}$Cs, $^{137}$Cs]<br>250 – 2·10$^{4}$ Bq/kg [$^{40}$K] | – |
| Error range of specific activity measurement (P=0.95) | ±(20 – 50)% | |
| Measurement range of ambient dose equivalent rate in air | 0.03 – 130 μSv/h | 0.03 – 50 μSv/h |
| Limits of tolerable intrinsic relative error of ambient dose equivalent rate measurement | ±20% | |
| Energy dependence relative to 662 keV ($^{137}$Cs) | ±20% | |
| Anisotropy in angular spacing ±120° relative to vertical axis | ±30% (100 keV – 3 MeV energy range) | |
| Typical sensitivity to gamma radiation | 2350 cps/(μSv·h$^{-1}$) [$^{137}$Cs]<br>1300 cps/(μSv·h$^{-1}$) [$^{60}$Co] | 5100 cps/(μSv·h$^{-1}$) [$^{137}$Cs]<br>2900 cps/(μSv·h$^{-1}$) [$^{60}$Co] |
| Response time for dose rate change from 0.1 to 1 μSv/h | <2 s (accuracy error ≤±10%) | |
| Typical resolution at 662 keV ($^{137}$Cs) | 7.5% | 8.5% |
| Maximum input statistical load | ≥10$^{5}$ s$^{-1}$ | |
| Integral nonlinearity | ≤1% | |
| Number of ADC channels | 1024 | |
| Operation mode setup time | 2 min | |
| Continuous run time in normal conditions | ≥9 h | |
| Measurement instability during continuous service | ≤5% | |
| Working temperature range | -20°C to +50°C | |
| Burn-up life | ≥100 Sv | |
| Protection class of the detection device | IP68 (Withstands static hydraulic pressure up to 5 Mpa for not less than 24 h) | |
| GPS | GPS receiver is integrated into PC. Positioning accuracy ≥3 m | |
| Connection to PC | RS485 / Bluetooth | |
| Overall dimensions and weight of the detection device | Ø130x510 mm, 4.5 kg | Ø130x633 mm, 6.5 kg |

The spectrometers comply 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, IEC 61000-4-4:2004, IEC 61000-4-5:2005, IEC 61000-4-6:2008, IEC 61000-4-11:2004

Design and specifications are subject to change without notice