



Purpose

AT6103 Mobile Radiation Scanning System is intended for radiation survey for the purpose of radiation mapping, search for lost sources of ionizing radiation, reveal the facts of illegal traffic of radioactive and nuclear materials, detect nuclear terrorist threats and can be used by government departments and agencies, including customs, border control and other services.

System functions

- Detect gamma and neutron radiation sources
- Measure gamma radiation energy distribution
- Measure gamma radiation dose rate
- Measure neutron count rate
- Consolidate measurement information from multiple measurement units
- Identify radionuclides
- Log all measurement results and processing in application software
- Contour isolines by selected parameter
- Display all data on a terrain map.



GARM Software

The expert GARM software is specially designed for multi-dimensional analysis of all scanning results stored to the hard drive in the process of system operation. The software presents the results as a set of diagrams, spectra as well as "waterfall" diagram, map with scanning waypoints, isolines and gradient fill of the area.

The GARM software displays and analyses tens of thousands of pedestrian, vehicle and aerial radiation survey results, estimating the gamma radiation dose rate at a height of 1 meter and the surface contamination with Cs-137 radionuclide.

Field tests

Large-scale tests of AT6103 Mobile Radiation Scanning System in the contaminated area adjacent to the Chernobyl NPP were conducted. Large data sets of dosimetric and spectral distribution of local radioactive contamination at two sites were obtained. Measurements of gamma radiation dose rate at the first site were performed on foot at a level of 1 m above the ground.

Measurements of gamma radiation dose rate at the level of 50, 100, 150 and 200 m above the ground on a board of helicopter were made at the second site, which includes the first one.

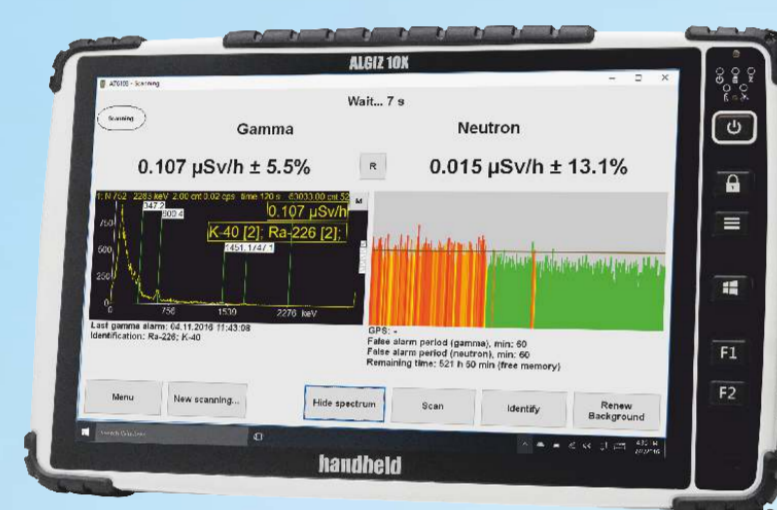
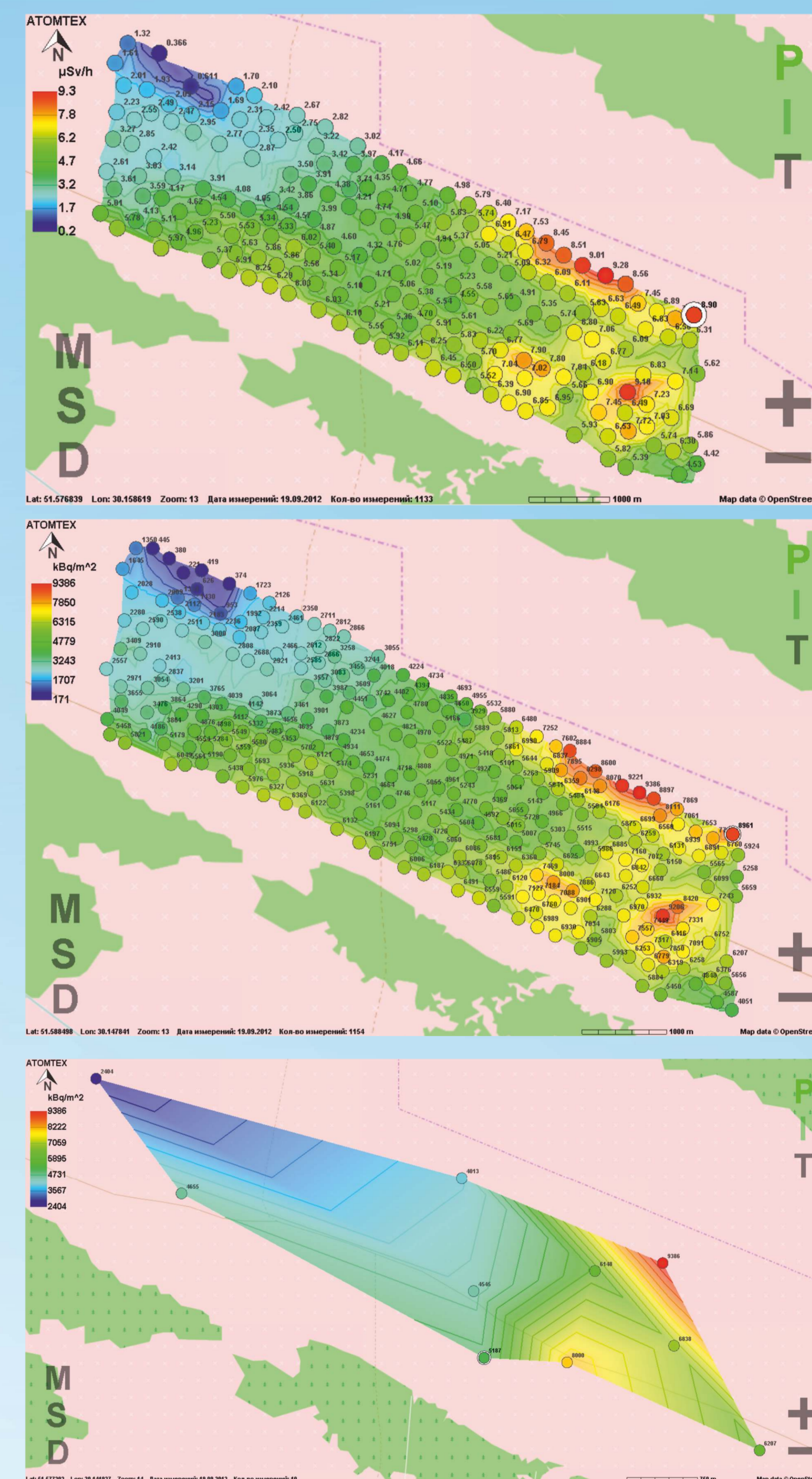
The result of the two-site data processing in GARM is an estimate of the gamma radiation dose rate at a height of 1 m above the ground. This estimate is based on the gamma radiation dose rate values measured at altitudes from 50 to 200 m. When assessing the dose rate at 1 m, the nature of contamination, temperature and pressure at the date of measurement, as well as the time elapsed since contamination are taken into account.

The high-altitude attenuation coefficients for gamma radiation dose rate were found using the developed mathematical model of areal contamination of surface with Cs-137 radionuclide. Comparison of the results of remote assessment and the measurements at 1-meter altitude established their coincidence within ±10%.

The obtained results were used for assessing surface contamination of area with Cs-137 radionuclide in kBq/m², provided that the average depth of Cs-137 in the soil throughout the area is 5 cm, and the average density of the soil is 1.26 g/cm³. It is known that the soil at the site was not restored after the accident.

The results of surface contamination assessment were compared with ten sampling results that fall in the site area, made by Polesye State Radiation-Ecological Reserve (PSRER) and the Institute of Radiology of Gomel in various years. Preliminary analysis of the data showed that the variation in determining surface contamination is within ±20%.

Comparison results are listed in the table below which contains sampling data and data on assessing the surface contamination with Cs-137 radionuclide providing the average penetration of Cs-137 into the soil is 5 cm.



Rugged 10" tablet PC for control and indication



Highly sensitive gamma radiation monitor: BDKG-28 (1 unit)



Gamma radiation and neutron radiation monitor: BDKG-11M (1 unit), BDKG-04 (1 unit), BDKN-05 (1 unit)



Highly sensitive gamma radiation counting monitor: BDRM-05 (1 unit)

System configuration

The system consists of a set of measurement units, a protected tablet PC, accessories and software.

Each measurement unit is a single or multiple detection units located inside an operating case and are connected to BT-DU3 adapters by cables.

BT-DU3 adapters are connected to a PC via one of the interfaces: Bluetooth, USB or RS232.

Data from National Belarussian Registry												Surface contamination estimate on the nearest points of airborne gamma survey									
Point number	Square number	Area number	Sample code	Collected by	Weight	Sample volume, cm ³	Note	Dose rate at 1m, μsv/h	Specific activity of Cs-137, kBq/kg	Uncertainty, kBq/kg	Surface contamination on Cs-137, kBq/m ²	Uncertainty, kBq/m ²	Sample density, g/cm ³	Depth estimate of Cs-137, cm	Altitude of airborne gamma-survey, m	Dose rate at the survey altitude, μsv/h	Dose rate estimate at 1 m., μsv/h	Dose rate deviation from national registry data, %	Surface contamination estimate of Cs-137, kBq/m ²	Deviation from national registry data, %	Sample code
1	92	8	92/8	PSRER	1,466	1256,6	brushwood, birch forest, forest wood near swamp	2,52	12,414	2,483	2888,7	578	1,17	5	108,4	0,664	2,49	-1,2%	2404	-16,8%	92/8
2	93	9	93/9	PSRER	2,108	1256,6	mossy pinewood	4,85	13,195	2640	4415,09	883	1,68	5	98,6	1,37	4,74	-2,3%	4655	5,4%	93/9
3	93	12	93/12	PSRER	1,54	1256,6	field grass	4,44	17,579	3,516	4320	864	1,23	5	97,3	1,2	4,1	-7,7%	4013	-7,1%	93/12
4	93	16	93/16	PSRER	0,862	1256,6	former farmland, swamp	3,43	32,577	6,513	4457,36	891	0,69	5	92,3	1,42	4,63	35,0%	4545	2,0%	93/16
5	109	4	109/4	Radiology institute	1,49	1256,6	former farmlands, grass	5,4	21,826	4,365	5175,9	1035	1,19	5	96,8	1,55	5,27	-2,4%	5187	0,2%	109/4
6	94	13	94/13	Radiology institute	2,153	1256,6	former farmlands, swamped field	4,87	20,82	4,165	7115,15	1423	1,71	5	96,2	1,84	6,24	28,1%	6148	-13,6%	94/13
7	94	14	94/14	Radiology institute	1,751	1256,6	pine, birch	8,06	29,448	5,89	8184,67	1637	1,39	5	108,4	2,48	9,48	17,6%	9386	14,7%	94/14
8	110	2	110/2	Radiology institute	1,6	1256,6	former farmlands	9,4	30,686	6,137	7814,2	1563	1,27	5	107,5	1,83	6,93	-26,3%	6838	-12,5%	110/2
9	110	7	110/7	Radiology institute	0,95	1256,6	birch forest	7,8	45,211	9,042	6835,9	1367	0,76	5	92,8	1,92	6,3	-19,2%	6207	-9,2%	110/7
10	110	1	110/1	Radiology institute	1,96	1256,6	pine wood, forest edge	8,6	25,368	5,073	7913,5	1583	1,56	5	110,8	2,08	8,09	-5,9%	8000	1,1%	110/1