

Semiconductor Detectors & Nuclear Electronics for Radiation Measurements



Baltic Scientific Instruments, Ltd.

Baltic Scientific Instruments was established in 1994 on the basis of Riga Research and Development Institute for Radio-Isotope Apparatus (RNIIRP, est.1966), which belonged to Ministry for Atomic Energy.

In 2003 the company has entered the group of BRUKER companies and in 2007 has change the name to Bruker Baltic. In June, 2010 the company has bought out its shares from Bruker AXS and returned its name Baltic Scientific Instruments (BSI).

The company Baltic Scientific Instruments specializes in the development and serial production of the spectrometric devices based on silicon, high-pure germanium and cadmium-zinc-tellurium detectors. Our products are applied in nuclear energetic and ecology, geology and mineral resource industry, medicine and research activities, customs control and other spheres.

Our goal is to secure a position among the leading manufacturers of precision equipment in nuclear physics in the world to arrange for the development and production of high-quality equipment meeting modern requirements and to provide support in the operation of products manufactured by Baltic Scientific Instruments.

The Company Baltic Scientific Instruments was certified to ISO 9001:2008 by TUV Nord Baltik in September, 2007



Specification

Model	Efficiency, %	Energy resolution		Peak/Compton ratio	Peak Shape	
		122 keV, (eV)	1.33 MeV, (keV)		FW.1M FWHM	FW.02M FWHM
GCD - 10 175	10	825	1.75	41:1	1.9	2.65
GCD - 15 180	15	825	1.80	46:1	1.9	2.65
GCD - 20 180	20	850	1.80	51:1	1.9	2.65
GCD - 25 185	25	850	1.85	55:1	1.9	2.65
GCD - 30 185	30	875	1.85	58:1	1.9	2.65
GCD - 35 190	35	875	1.90	60:1	1.9	2.65
GCD - 40 190	40	895	1.90	62:1	1.9	2.65
GCD - 50 190	50	895	1.90	64:1	1.9	2.65
GCD - 60 200	60	1000	2.00	68:1	2.0	3.00
GCD - 70 200	70	1000	2.00	73:1	2.0	3.00
GCD - 80 210	80	1000	2.10	77:1	2.0	3.00
GCD - 100 220	100	1000	2.10	81:1	2.0	3.00
GCD - 120 220	120	1000	2.10	83:1	2.0	3.00
GCD - 140 220	140	1100	2.20	86:1	2.0	3.00
GCD - 160 220	160*	1150	2.20	88:1	2.0	3.00

* Detectors with higher efficiency are available



P-type HPGe Coaxial Detectors GCD (Liquid Nitrogen cooled)

Application

Detection of Gamma-rays in nuclear energetics and environmental control, in industry and scientific research, in medicine and other applications.

Complete set

- HPGe coaxial detector
- Preamplifier with cooled input stage
- Different cryostat modifications are available

Accessories

- Digital or Analog-Digital Multichannel Analyzer
- Analytical software for quantitative and qualitative analysis
- Liquid nitrogen storage and filling system

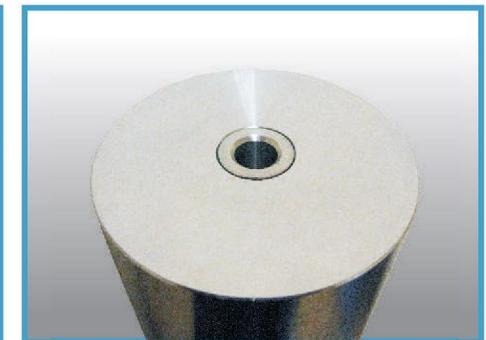
Features

- 10% - 160% efficient HPGe coaxial detectors are available
- Energy range from 40 keV to 10 MeV with P-type HP(Ge) Detector
- Well type detectors are available
- High energy rate up to 200000 MeV/s
- Excellent peak symmetry
- Aluminum, Beryllium or Carbon-fiber input window
- Detection of radiation in any spatial orientation depending on cryostat modification
- Manufacture in variable cryostat design is possible
- HV supply protection if detector is warm
- High count rate indicator

Baltic Scientific Instruments
Ganību Dambis 26
P.O. box 33, Rīga
LV - 1005, Latvia

Phone: (+371) 67383947
Fax: (+371) 67382620
Email: sales@bsi.lv
www.bsi.lv

Plenty of cryostat geometries available





Specification

Model	Efficiency, %	Energy resolution		Peak/Compton ratio	Peak Shape		Carbon window thickness, mm
		5.9 keV, (eV)	1.33 MeV, (keV)		FW.1M FWHM	FW.02M FWHM	
GCD - 10 180	10	625	1.80	41:1	1.9	2.65	0.70
GCD - 15 180	15	625	1.80	44:1	1.9	2.65	0.70
GCD - 20 185	20	650	1.85	48:1	1.9	2.65	0.70
GCD - 25 190	25	680	1.90	49:1	1.9	2.85	0.70
GCD - 30 190	30	715	1.90	52:1	1.9	2.85	0.70
GCD - 35 195	35	725	1.95	55:1	1.9	2.85	0.75
GCD - 40 200	40	750	2.00	59:1	2.0	2.95	0.75
GCD - 50 210	50	800	2.10	60:1	2.0	2.95	0.75
GCD - 60 220	60	1000	2.20	60:1	2.0	3.00	0.75
GCD - 70 225	70	1000	2.25	61:1	2.0	3.00	0.75
GCD - 80 230	80	1000	2.30	64:1	2.0	3.00	0.80
GCD - 100 240	100	1100	2.40	65:1	2.1	3.10	0.80
GCD - 120 250	120*	1200	2.50	66:1	2.1	3.10	0.80

* Detectors with higher efficiency are available

Plenty of cryostat geometries available



Accessories

- Digital or Analog-Digital Multichannel Analyzer
- Analytical software for quantitative and qualitative analysis
- Liquid nitrogen storage and filling system



N-type HPGe Coaxial Detectors GCD (Liquid Nitrogen cooled)

Application

Detection of Gamma-rays in nuclear energetics and environmental control, in industry and scientific research, in medicine and other applications in presence of neutron field.

Complete set

- HPGe N-type coaxial detector
- Preamplifier with cooled input stage
- Different cryostat modifications are available
- Dewar vessel

Features

- 10% - 120% efficient HPGe coaxial detectors are available
- Ultra-thin input contact on an end surface
- Energy range from 3 keV to 10 MeV with N-type HPGe Detector
- High energy rate up to 200000 MeV/s
- Excellent peak symmetry
- Aluminum, Beryllium or Carbon-fiber input window
- Detection of radiation in any spatial orientation depending on cryostat modification
- Manufacture in variable cryostat design is possible
- HV supply protection if detector is warm
- High count rate indicator
- Outstanding count rate
- Neutron damage resistance
- Carbon-fiber input window

Baltic Scientific Instruments
Ganību Dambis 26
P.O. box 33, Rīga
LV - 1005, Latvia

Phone: (+371) 67383947
Fax: (+371) 67382620
Email: sales@bsi.lv
www.bsi.lv

Specification

Model	Diameter, mm	Detector Sensitive Area		Energy resolution, eV	
		Area, mm ²	Thickness, mm	5.9 keV	122 keV
GPD - 05 145	5	20	6	145	465
GPD - 08 155	8	50	6	155	485
GPD - 12 165	12	100	7	165	490
GPD - 16 180	16	200	11	180	495
GPD - 25 300	25	500	13	300	545
GPD - 36 360	36	1000	13	360	585
GPD - 50 400	50	2000	15	400	600



HPGe Planar Detectors GPD

(Liquid Nitrogen cooled)

Application

Detection of Gamma and X-rays in nuclear energetics and environmental control, in industry and scientific research, in medicine and other applications.

Complete set

- HPGe Planar detector
- Preamplifier with cooled input stage
- Different cryostat modification are available
- Dewar vessel

Accessories

- Digital or Analog-Digital Multi Channel Analyzer
- Analytical software for quantitative and qualitative analysis
- Liquid nitrogen storage and filling device

Features

- Possibility of choosing preamplifier type with resistive or opto-electronic feedback
- Ability to increase energy rate up to 20000 MeV/s
- Energy range from 3 keV to 1500 keV
- Aluminum, Beryllium or Carbon-fiber input window
- Registration of radiation in any spatial orientation depending on cryostat modification
- Manufacture in variable cryostat design is possible

Baltic Scientific Instruments
Ganību Dambis 26
P.O. box 33, Rīga
LV - 1005, Latvia

Phone: (+371) 67383947
Fax: (+371) 67382620
Email: sales@bsi.lv
www.bsi.lv



Plenty of cryostat geometries available





Specification

Parameter	Value
Energy range, keV	40 - 3000
HPGe detector efficiency, %	30*
Energy resolution for 30% efficiency detector, keV at energy	
122 keV	0.875
1.33 MeV	1.85
Peak to Compton ration	58:1
Time of cooling after filling with liquid nitrogen, h	4
Time of continuous operation (depending on Dewar vessel volume), h	24, 48, 96
Weight of detector with Dewar vessel, kg	7
1.5l	11
3.0l	15
5.0l	

* HPGe Detectors are available with efficiency from 10% to 100%



Portable HPGe Gamma-ray Spectrometer (Liquid Nitrogen cooled)

Application

Detection, accumulation and processing of gamma spectra in field and industry conditions where small dimensions and weight of spectrometer are important.

Complete set

- Portable HPGe Coaxial or Planar detector, Preamplifier with cooled input stage
- Digital or Analog-Digital Multi Channel Analyzer (regular or miniature)
- Analytical software for quantitative and qualitative analysis
- Portable Dewar vessel (from 1l to 7l)
- Liquid nitrogen storage and filling device

Features

- Light weight aluminum construction
- Detection of radiation in any spatial orientation
- Compact low consuming electronics
- Available with HPGe Coaxial or Planar detector
- Transportation and storage without cooling
- Aluminum, Beryllium or Carbon-fiber input window
- Dewar vessels available with different volumes from 1l to 7l

Accessories

- Hand-cart for Multi Channel Analyzer, battery, transformer, etc.
- Additional batteries
- Recharger
- Collimators
- Transport case
- Tripod

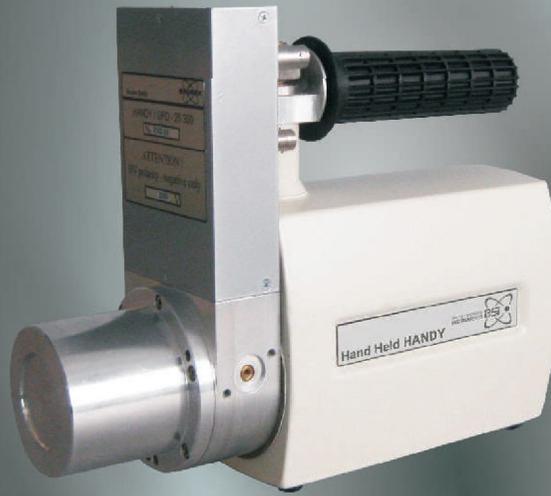
Baltic Scientific Instruments
Ganību Dambis 26
P.O. box 33, Rīga
LV - 1005, Latvia

Phone: (+371) 67383947
Fax: (+371) 67382620
Email: sales@bsi.lv
www.bsi.lv



Accessories





HPGe Hand Held Spectrometer HANDY

(Liquid Nitrogen cooled)

Application

Registration of Gamma and X-ray spectra in safeguard and homeland security, radiological control of environmental objects, materials and products of industry and farming, objects and plants of nuclear energetics, enterprises dealing with storage and processing of radioactive wastes

Complete set

- HPGe Planar or Coaxial detector
- Preamplifier with cooled input stage
- Multi Channel Analyzer
- Software package
- Cable set

Accessories

- Lead Shielding with collimators
- Hand-cart
- Hard-sided transport case
- Accessories: funnel for LN₂ filling, recharger, etc.

Features

- Minimal size and weight
- Can be placed in an ordinary case
- Opportunity of installation of planar or coaxial detectors
- Minimal time for reaching operating temperature (less than 1 hour)
- Minimal time for Dewar vessel emptying from remains of liquid nitrogen
- Convenience and simplicity of the device running and service
- Software features specially developed for:
 - Fuel rod enrichment level analysis
 - Plutonium content analysis in different fields of application

Baltic Scientific Instruments
Ganību Dambis 26
P.O. box 33, Rīga
LV - 1005, Latvia

Phone: (+371) 67383947
Fax: (+371) 67382620
Email: sales@bsi.lv
www.bsi.lv

Specification

Parameter	Value
Standard dimensions of planar detector	
Sensitive area, mm ²	500*
Thickness, mm	15
Energy resolution for 500 mm ² sensitive area detector at energy 122 keV, eV	560
Maximal efficiency of coaxial detector, %	8
Energy resolution for 8% efficient detector at energy 1.33 MeV, keV	1.8
Dewar vessel volume, l	0.6
Detector holding time, h	> 20
Time for reaching of operating temperature after liquid nitrogen filling, h	1
Maximum number of quantization levels of ADC	16k
Integral nonlinearity, %	0.05
Differential nonlinearity, %	< 1
Dimensions, mm	
Detection unit	270 x 190 x 195
Case	460 x 330 x 150
Weight, kg	
Detection unit	2.4
Case with spectrometer set (including detection unit)	6.5
Detector power supply	
Voltage, V	+/- 12
Current, mA (for each polarity)	35

* Planar Detectors are available with other sensitive area

The smallest ever





Specification

Parameter	Value
Detection limit for ¹³⁷ Cs radionuclide specific activity, measurement time 1 hour, Bq/kg	0.5
Absolute sensitivity to gamma flux for 30%* efficiency detector, pulse/quantum	4.5 x 10 ⁻³
Instrumental background intensity for energy range from 40 keV to 3 MeV, pulse/keV x s	< 5 x 10 ⁻⁴
¹³⁷ Cs radionuclide specific activity measurement error for 1 hour measurement time, %	< 20
Shield thickness	
Lead wall, mm	100
Copper wall, mm	10
AC power supply	
Voltage, V	230
Frequency, Hz	50
Detection Unit with Lead Shield dimensions, mm	1300 x 580 x 480
Detection Unit with Lead Shield weight, kg	800

* Detectors with higher efficiency are available



Laboratory HPGe Spectrometer with Lead Shield (Liquid Nitrogen cooled)

Application

Radionuclide monitoring of environmental objects (solid, powder, liquid), medicine and biological objects, materials and food.

Complete set

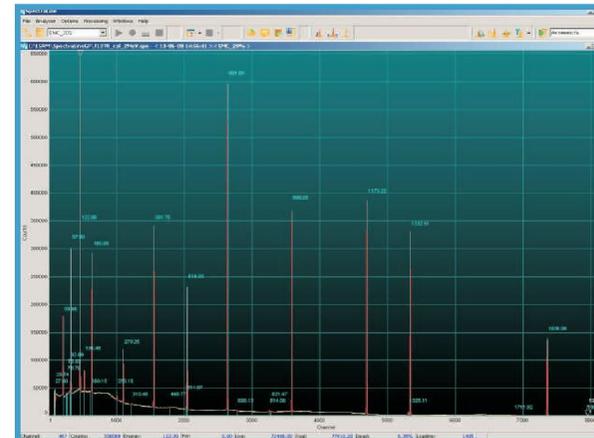
- HPGe Coaxial or Planar detector
- Well-type and N-type detectors are available
- Lead Shield for lower back signal with a support
- Liquid nitrogen sensor and level monitor LN₂ Monitor
- Digital or Analog-Digital Multi Channel Analyzer
- Analytical software for quantitative and qualitative analysis

Features

- Adopting precision gamma-spectrometry methods
- Radionuclide identification and determination of their specific activity
- Low level of instrumental background
- Low threshold for radionuclide detection
- Separate and simultaneous measurement of activity of 100 radionuclides
- Ultra-low background materials are available with U + Th content less than 1 Bq/kg
- Spectrometer can be equipped with automated liquid nitrogen filling system

Baltic Scientific Instruments
 Ganību Dambis 26
 P.O. box 33, Riga
 LV - 1005, Latvia

Phone: (+371) 67383947
 Fax: (+371) 67382620
 Email: sales@bsi.lv
 www.bsi.lv



Spectrum of source Lt978 in 1l Marinelli beaker, including:
 Americium-241
 Cadmium-109
 Cobalt-57
 Cerium-139
 Mercury-203
 Tin-113
 Strontium-85
 Cesium-137
 Yttrium-88
 Cobalt-60



Specification

Parameter	Value
Energy resolution, MeV	0.05 - 2.8
HPGe detector efficiency, %	10*
Detection limit for ¹³¹ I radionuclide specific activity, measurement time 600 s, Bq/l	1.5 x 10 ³
Absolute sensitivity to gamma flux for 30% efficiency detector, pulse/quantum	7.3 x 10 ⁵
Continuous autonomous operating time after filling with liquid nitrogen, days	18
Ambient temperature, °C	+5 to +40
Supply voltage, V/Frequency, Hz	220+10 / 50+60
Overall dimensions	
Lead shield, support and detector, mm	1300 x 580 x 480
Spectrometric device Multispectrum, mm	490 x 230 x 490
Lead shield, support and detector weight, kg	170

* Detectors with higher efficiency are available

Installations



HPGe Spectrometer with Shield for Radionuclide Analysis of Liquids and Gaseous Flows

Application

HPGe Spectrometer with shield is designed for defining the composition and activity of radionuclides in the flow of liquids and gases in automated technological processes such as those in nuclear energetics, environmental monitoring and industrial applications.

Complete set

- Detection Unit based on HPGe P-type coaxial detector
- Multi Channel Analyzer
- Shield-container with measuring unit
- Control unit with valves
- Sensors for liquid and gas flow
- Emulation and analysis software

Features

- Definition of composition and activity of radionuclides in real time mode
- Display of current values for specific activity of controlled radionuclides
- Indication of activity level increase of any chosen radionuclide
- High registration efficiency
- Wide range of measured activities
- Operation rates in fully-automatic mode: measurement, washing, purging, pre-starting
- Liquid nitrogen level indicator with alarm system

Baltic Scientific Instruments
Ganibu Dambis 26
P.O. box 33, Riga
LV - 1005, Latvia

Phone: (+371) 67383947
Fax: (+371) 67382620
Email: sales@bsi.lv
www.bsi.lv

Specification

Parameter	Value
Energy range, keV	40 - 3000
HPGe detector efficiency, %	30*
Energy resolution for 30% efficiency detector, keV at energy	
122 keV	0.8
1.33 MeV	1.8
Peak to Compton ration	58:1
Time of cooling after filling with liquid nitrogen, h	4
Time of continuous operation (depending on Dewar vessel volume), h	24, 48, 96
Weight of detector with Dewar vessel, kg	7
1.5l	11
3.0l	15
5.0l	

* HPGe Detectors are available with efficiency from 10% to 100%



HPGe Mobile Spectrometer for Field Application (Liquid Nitrogen cooled)

Application

Registration of Gamma and X-ray spectra for the radiological control of environmental objects, industrial and agricultural products, objects and plants of nuclear energetics and enterprises dealing with the storage and processing of radioactive wastes

Features

- Optimal size and weight for mobile application
- Placed on a hand trolley with lead shield set with collimators
- Minimal time to reach the proper temperature mode for the detector after filling with liquid nitrogen
- Simplicity of operating and servicing the device
- Laser measuring point indication
- 360° orientation
- Highest detector position is up to 1.3m

Complete set

- HPGe semiconductor detector for Gamma spectroscopy with planar or coaxial detector with preamplifier in portable cryostat
- Digital or Analog-digital spectrometric device
- Analytical software package
- Lead shielding with collimators
- Hand trolley and transport case
- Laser range indicator
- Accessories: funnel for liquid nitrogen filling, recharger, etc.
- Cable pack and documentation

Specially developed software package allows simulation of gamma spectra and spectrometer registration efficiency calculation for complex shape objects using Monte-Carlo method.

Baltic Scientific Instruments
 Ganību Dambis 26
 P.O. box 33, Rīga
 LV - 1005, Latvia

Phone: (+371) 67383947
 Fax: (+371) 67382620
 Email: sales@bsi.lv
 www.bsi.lv



Specification

Parameter	Value
Energy range, keV	40 - 3000
HPGe detector efficiency, %	30*
Energy resolution for 30% efficiency detector, keV at energy	
122 keV	0.9
1.33 MeV	1.9
Deterioration of energy resolution at 622 keV line as compared with resolution of detector cooled by liquid nitrogen, %	< 5
Overall dimensions	
Detector capsule, mm	Ø90 x 130
Detector capsule with cryocooler, mm	Ø114 x 350
Compressor, mm	445 x 357 x 281
Weight	
Detector with cryocooler, kg	2.9
Compressor, kg	31.8
Maximal distance between detector and compressor, m	15
Consumed power, W	570
Voltage, V	220
Frequency, Hz	50

* HPGe Detectors are available with efficiency from 10% to 100%

No LN₂ needed



Gamma-ray HPGe Spectrometer (Electrically cooled)

Application

Detection, accumulation and processing of gamma and x-ray spectra in conditions, when HPGe detector's cooling by liquid nitrogen is not possible

Features

- No liquid nitrogen necessary
- Detection of radiation possible in any spatial orientation
- Automatic restart after power supply switch-off
- Long-duration continuous operation
- Coaxial of Planar detector can be used

Complete set

- Detection Unit consisting of cryostat, HPGe detector crystal, temperature sensor and heat exchanger
- Gas compressor cooling system with built-in cryocontroller for the provision of automatic monitoring and control of operating modes for HPGe detector and cryosystem
- High pressure gas pipes for connecting the cryosystem to the Detection Unit heat exchanger
- Digital or Analog-digital Multi Channel Analyzer
- Emulation and analysis software

Baltic Scientific Instruments
Ganību Dambis 26
P.O. box 33, Rīga
LV - 1005, Latvia

Phone: (+371) 67383947
Fax: (+371) 67382620
Email: sales@bsi.lv
www.bsi.lv

Specification



Flowing HPGe Spectrometer (Liquid Nitrogen cooled)

Application

Highly efficient control of radionuclide materials with low activity in on-line mode (fresh fuel rods, liquid and gas flows)

Complete set

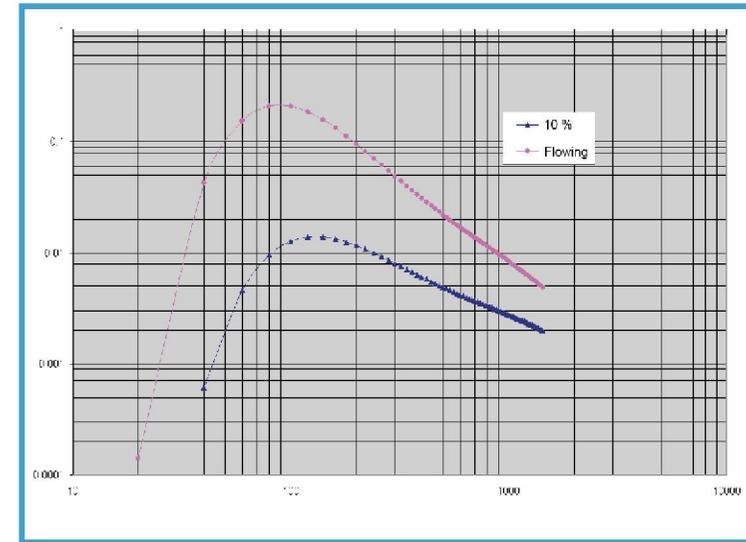
- Spectrometer based on HPGe flowing coaxial detector
- Digital or Analog-digital Spectrometric Device
- Software package

Features

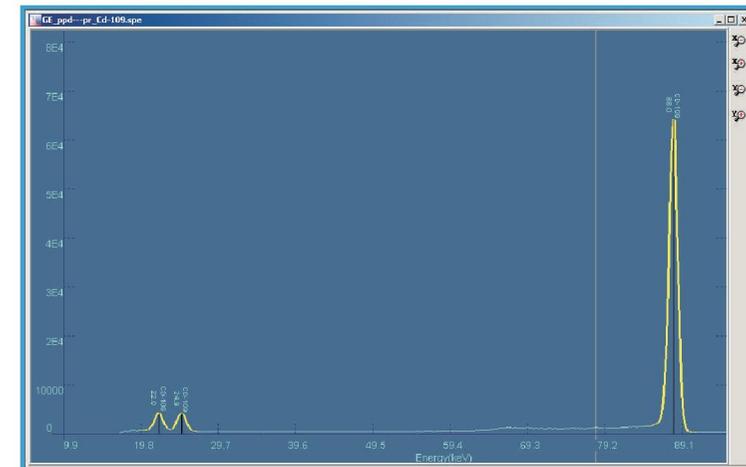
- Detection unit performs 4 π geometry measurements as measuring product is moving inside germanium detector
- Radionuclide efficiency registration is dozen times higher than efficiency registration of standard coaxial detection unit of the same dimensions
- HPGe detector flowing geometry can be developed based on the crystal with equivalent efficiency from 10% to 100%

Baltic Scientific Instruments
Ganibu Dambis 26
P.O. box 33, Riga
LV - 1005, Latvia

Phone: (+371) 67383947
Fax: (+371) 67382620
Email: sales@bsi.lv
www.bsi.lv



Absolute efficiency registration comparison curves during gamma-emitting sample positioning inside and outside detector



Spectrum of wire sample containing source ¹⁰⁹Cd of low activity

Specification

Parameter	Value
Energy range, keV	40 - 3000
HPGe detector efficiency, %	30*
Energy resolution for 30% efficiency detector, keV at energy	
122 keV	0.9
1.33 MeV	1.9
Detection limit for specific activity of radionuclides during 1 hour measurement time, Bq/l	
¹³⁷ Cs	0.259
⁶⁰ Co	0.222
⁵⁴ Mn	0.222
²³⁵ U	0.333
²⁴¹ Am	7.4 x 10 ⁻³
Number of spectra recorded during autonomous operation	100
Maximum diving depth, m	3000
Cryoaccumulator cooling time, h	8
Continuous operation time after cryoaccumulator cooling, h	50
Weight of spectrometer without protective housing, kg	30
Weight of equipment for cryoaccumulator cooling by liquid nitrogen, kg	56

Deep-water HPGe Gamma Spectrometer

Application

Deep-water gamma spectrometer is applicable to the registration of gamma-radiation from radionuclides in monitoring of the sea bed for objects from marine accidents, submarine storage of radioactive wastes, search of lost nuclear charges, inspection of radionuclide migration, etc.

Features

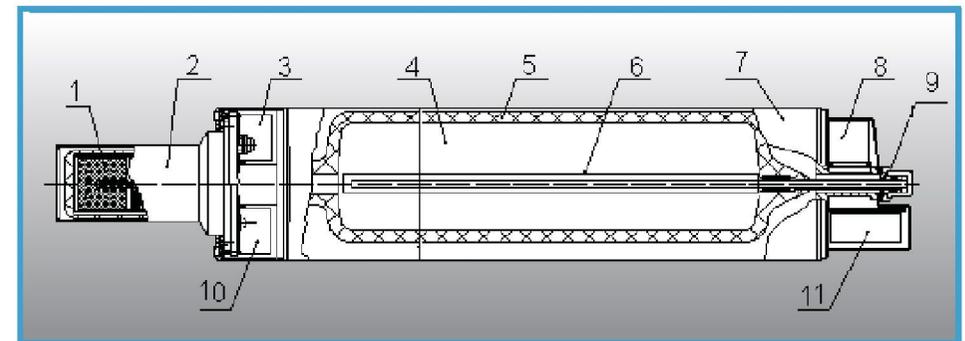
- Long-lasting independent functioning at great depths
- Programmable control with inbuilt microprocessor device
- Independent detection and accumulation of gamma spectra for a predetermined time
- Recording and storage of gamma spectra for an unlimited time period
- Possibility of reading and processing data using computers after retrieving the spectrometer

Complete set

- HPGe coaxial detector
- Cryostat combined with cryoaccumulator for detector cooling
- Spectrometric device with microprocessor and data transfer devices
- Durable waterproof housing with power supply for the spectrometer, allowing spectrometer to dive to depths of up to 100, 500, 100 or 3000 meters depending on requirements
- External equipment for cryoaccumulator cooling and refilling with liquid nitrogen
- Work station equipped with software for spectra visualization and radionuclide identification

Baltic Scientific Instruments
Ganību Dambis 26
P.O. box 33, Rīga
LV - 1005, Latvia

Phone: (+371) 67383947
Fax: (+371) 67382620
Email: sales@bsi.lv
www.bsi.lv



1. HPGe semiconductor detector;
2. cover of titan alloy;
3. compartment for preamplifier;
4. cryoaccumulator;
5. vacuum insulation;
7. stainless steel coating;
8. HV power supply;
9. filling nozzle;
10. HV filter;
11. shaping amplifier.



Waste Assay Monitor WAM-201

(Liquid Nitrogen cooled)

Application

WAM-201 is intended for the measurement and determination of activities, activity concentration, total activities and total activity concentrations of selected radionuclides which emit gamma radiation in a range from 100 to 1500 keV. Solids and subjects are measured with average density up to 2055kg/m³ located in standard drums with volume of about 0.2m³.

Features

Waste Assay Monitor is a complex measuring system which is intended for monitoring of radioactive waste in standard 200-litre drums. WAM includes following systems:

- Monitor - a fixed segmented gamma-spectrometric monitor for determination of activities of selected radionuclides in individual drum segments with vertical motion and collimator. Transfer system is used for moving measuring part from/to the drum measured,
- MDG-125 dose rate monitor, direction-dependent, measures dose rate of the segment in defined distance from the drum,
- MDG-02 dose rate monitor measures the background dose rate,
- Rotary table,
- RS01 and Rs02 control and power supply switchboards.

Baltic Scientific Instruments
Ganību Dambis 26
P.O. box 33, Rīga
LV - 1005, Latvia

Phone: (+371) 67383947
Fax: (+371) 67382620
Email: sales@bsi.lv
www.bsi.lv

Specification

Parameter	Value
Energy range, keV	100 to 1500 keV
Radionuclides measured	Cs-134, Cs-137, Co-60, Mn-54, Fe-59, Nb-95, Zn-65, Zr-95, Co-58, Cr-51, Ce-144, Hf-181, Ru-103*
Measuring range	from minimum detectable activity of 3.7 kBq (for background of 300 nSv/h, for ⁶⁰ Co in 0.2 m ³ drum with an average material density of 300 kg/m ³ and measuring time of 30 min.) up to 1GBq
Measurement precision	+/-20% (for the uniform activity distribution and the density in the volume measured) maximum 50% for the material density of 1000 kg/m ³ in the drum
Material density	up to 2500 kg/m ³
Material volume	up to 0.2 m ³
Material weight	up to 700 kg (maximum drum weight)
Drum measured	Type I – average of 600 mm, height of 860 mm, wall thickness from 1.4 to 1.5 mm Type II - average of 600 mm, height of 800 mm, all thickness of 4 mm
Detector	HPGe, efficiency of 30%** , resolution < 2 keV at 1.33 MeV
Dimensions	2500 x 700 x 2200 mm
Weight	1700 kg
Communication interface	X2X, CAN, RS-485
Protection from external influence	IP 54
Power supply	220 V +22/+33 V, 50 Hz, 2 kW, maximum power interruption up to 20 ms. TN-S power supply system

* Nuclide list can be changed accordingly

** Can be used with other efficiency





Borehole Gamma Spectrometer

(Several cooling options)

Application

Borehole Gamma Spectrometer is used for:

- Determination of underground orientation of transuranium ores in their natural beddings (headings, mines, boreholes);
- High precision gamma-spectrometry of radionuclides at inspection of sea bed, water sealed mines, water filled boreholes, radionuclide migration in groundwater;
- Gamma-spectrometry at neutron-activation method of substance analysis.

Baltic Scientific Instruments
Ganibu Dambis 26
P.O. box 33, Riga
LV - 1005, Latvia

Phone: (+371) 67383947
Fax: (+371) 67382620
Email: sales@bsi.lv
www.bsi.lv

Specification

Parameter	Value		
	Cryoaccumulator	Stirling cryocooler	Liquid nitrogen
Relative efficiency (with respect to 3" x 3" NaI detector and Co-60 source mounted 25 cm above the detector) at 1.33 MeV g-photon*, %		10	
Resolution at 122 KeV at 10^3 s^{-1} , keV	< 1.0	< 1.5	< 1.0
Resolution at 1.33 MeV, keV	< 1.9	< 3.2	< 2.0
Energy range of detector operation, keV		100 - 3500	
Diameter of protective housing, mm	65	80	70
Length of Borehole Probe, mm	1450	1250	1550
Cooling time, h	10	12	8
Autonomous operation time, h	8	15000	10

* Borehole detection unit can be equipped with HPGe detector with efficiency up to 40%

Complete set

Borehole Gamma Spectrometer consists of:

- Spectrometric Probe
- Ground workstation

Spectrometric probe consists of:

- Spectrometric gamma-radiation detection unit based on high-purity germanium detector with built-in preamplifier of signals.
- Alternatives for Cooling System:
 - Cryoaccumulator,
 - Stirling cryocooler;
 - Liquid nitrogen,
- Spectrometric device;
- Protective housing;
- Well-logging borehole connection cable;

Ground workstation consists of

- Data processing and analysis software SpectraLineGP;
- Personal computer;
- Borehole cable and connectors set.

Specification

Parameter	Value
Energy range, keV	50 - 3500
HPGe detector efficiency, %	38*
Energy resolution for 30% efficiency detector, keV at energy	
122 keV	1.0
1.33 MeV	1.9
Detection limit for ¹³⁷ Cs radionuclide specific activity, measurement time 1 hour, Bq/m ³	200
¹³⁷ Cs radionuclide specific activity measurement error for measurement time 1 hour, %	30
Integral nonlinearity, %	0.05
Instability of specific activity measurement from calibration source, %	10
Time of operation mode setting, h	0.5
Time of continuous operation, days	30

* HPGe Detectors are available with efficiency from 10% to 160%



Automated System for Water Activity Measurement

Application

Automatic monitoring of gamma-ray radionuclide specific activity directly in water reservoirs in the regions of nuclear weapons testing, near nuclear storage, nuclear power plants and other objects of nuclear energetics

Features

- High sensitivity of radionuclide activity detection
- Full autonomy of measurement station data transfer via radio channel or cable channel into the point of information receiving, processing and archiving
- Operation simplicity and system high reliability

Complete set

Floating monitoring station that is situated on the platform on pontoon and contains:

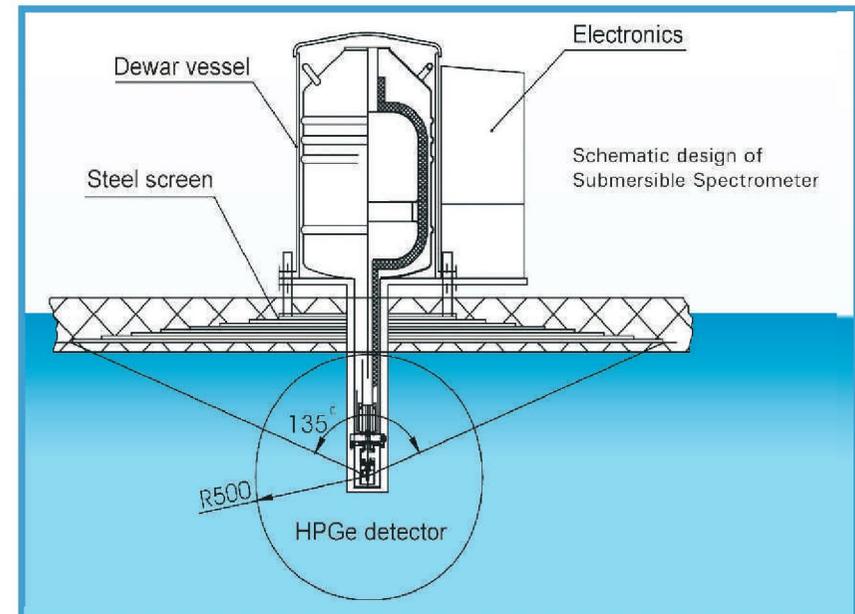
- Gamma-ray spectrometer based on submerged high purity germanium or scintillator detector;
- Transmitter receiver;
- Microprocessor device for interfaces necessary for automatic operation, self-diagnostic, calibration;
- Backup accumulators;
- Accessories for station control, calibration.

Station for receiving, processing and archiving information including:

- Radio station;
- Decoding modem connection device with personal computer;
- Software for spectra description, nuclides identification, calculation of their specific activity;
- Device for information CD ROM recording.
- Metrological assurance, set of accessories and necessary instruments.

Baltic Scientific Instruments
Ganibu Dambis 26
P.O. box 33, Riga
LV - 1005, Latvia

Phone: (+371) 67383947
Fax: (+371) 67382620
Email: sales@bsi.lv
www.bsi.lv





Multi Channel Analyzer MS Hybrid

Application

Amplification, optimal filtering, analog-digital conversion of signal from semiconductor detectors of ionizing radiation, the accumulation of spectra and transfer to a PC via an RS-232 or USB, the formation of the necessary voltages for detecting units (high voltage for semiconductor detector and power for preamplifier). Hybrid is designed to work with HPGc or SiLi detectors produced by Baltic Scientific Instruments or other manufacturers.

Complete set

- Analog processor - ADC;
- Microprocessor unit with memory and I/O port RS-232 or USB;
- Power supply for detector and preamplifier;
- Cable set;
- Emulation software.

Features

- High speed;
- Low self-noise;
- Analog signal processing of the spectrometric signal;
- Rejection of superimposed pulses and taking into account the dead time of the spectrometer;
- High linearity of the amplifier path;
- Simultaneous registration of signals in the eight energy ranges;
- Via PC or manual control of the spectrometer;
- Switch on and off collecting spectra for a preset time;
- Collecting spectrum by "live" or real-time;
- Setting the number of channels by software;
- The possibility of energy calibration;
- Definition of energy resolution, centroids of the peaks of total absorption and peak areas with and without taking into account the background under the peak;
- Works with I/O ports RS-232 or USB;
- Compatibility with spectra processing software LSRM, SpectraLine, ANGAMMA, AXILL.

Baltic Scientific Instruments
Ganību Dambis 26
P.O. box 33, Rīga
LV - 1005, Latvia

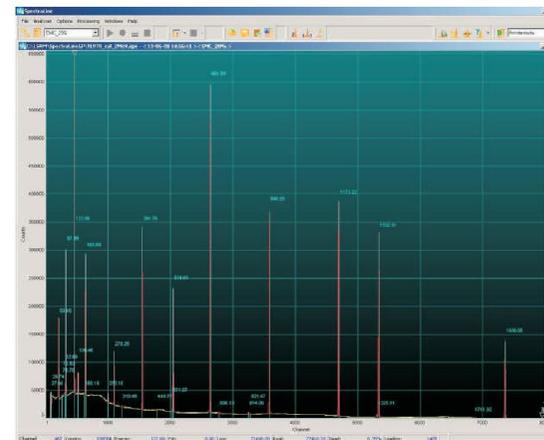
Phone: (+371) 67383947
Fax: (+371) 67382620
Email: sales@bsi.lv
www.bsi.lv

Specification

Parameter	Value
ADC conversion time, ms	7
Number of channels	1024, 2048, 4096, 8192, 16384
Channel capacity	$2^{32}-1$
Gain, adjustable (manual transmission)	
gradually	1-2,5
roughly*	X1, X2, X4, X8
Noise level (adducted to the entrance), mV	<5
Integral non-linearity, %	<0.04
Temperature instability, %/°C	<0.01
Shaping time constants (switchable)**, ms	1-16
Output load frequency control (for each of the outputs)	TTL
Power supply range, V	+/- 0-5000
Dimensions, mm	305 x 210 x 85
Weight, kg	2,8
Power consumption, W	<10
Supply voltage, V	220
Frequency, Hz	50

* 4 fixed settings are set by the manufacturer depending on the detection unit.

** 2 fixed settings are set by the manufacturer depending on the detection unit.



Software package

SpectraLineGP spectra processing includes calibration, peaks parameters determination, nuclides identification, activities calculation and using the true-coincident factors for the gamma-emission intensity correction. Non-parametric model for pattern of the full energy peak provides a correct model for a line in any energy range. Adjustment of the DigiSpectrum parameters.



Digital Multi Channel Analyzer DigiSpectrum

Application

The Digital Spectrometric Device is a high - precision, ultra-fast all - digital spectrometer, comprising a single processing channel, a preamplifier power supply and a detector bias supply in a compact package. The Digital Spectrometric Device can accept signals from practically any radiation detector. The Digital Spectrometric Device has built-in support for HPGe detectors with a Compton shield.

Features

- Pulse heights measured with up to 16 bits accuracy (i.e. 32K spectrum length).
- Programmable gain, input offset, and peaking times between 0.25 and 40 microseconds.
- Programmable pileup inspection criteria include trigger filter parameters, threshold, and rejection criteria.
- Peak stability with rate: 0.05% up to highest ICR.
- Integral Nonlinearity of Energy: = 0.1% of full scale.

Functionalities

- Automatic peaks search with the required sensitivity level,
- Energy, FWHM and peak pattern calibrations,
- Peaks parameters determination - position, FWHM, area; calculation results can be saved to a text file,
- Efficiency "curves" can be obtain with the efficiency calibration,
- Activity calculation by various methods,
- Use the true-coincident factors to correct the gamma-emission intensity,
- Measured spectra and processing results saving to database for the analysis of the specified criterions convergence of the repeated measurements,
- Simultaneous processing of any spectra number; the peak pattern calibration with several spectrum peaks in different energy ranges,
- Numeric and visual control of the calibrations results,
- Any measurement tracts number,
- Independent control of all channels - start, stop, etc.

Baltic Scientific Instruments
Ganibu Dambis 26
P.O. box 33, Riga
LV - 1005, Latvia

Phone: (+371) 67383947
Fax: (+371) 67382620
Email: sales@bsi.lv
www.bsi.lv

Specification

Signal Input (Analog) - Works with common reset or resistor feedback preamps of either polarity.

- Impedance: 50 Ohms, 90 Ohms, 250 Ohms, and 1k Ohms - jumper selectable.
- Attenuation: 1:21, 1:12, 1:5 and 1:1- jumper selectable.
- Voltage Range: +10.0 V to -10.0 V standard.

Inputs (Digital)

- Gate Input: Analog input for Compton suppression. Can alternatively be configured as digital I/O.
- HV Inhibit: TTL logic input. BNC connector, jumper set active HI or LO.

Interface:

- USB: Universal Serial Bus.

Digital Controls:

- Gain: 50X coarse gain (2% accuracy), fine gain controlled by 16 bit DAC.
- Shaping: Triangular/Trapezoidal. Peaking time and dwell set independently : 50ns - 45 microseconds in small steps. Adjustable dwell time may be used to eliminate ballistic deficit effects.
- Pileup: Set fast channel filter time, pulse detection threshold, and fast channel pileup inspection test limits to achieve best results in each situation.
- Spectrum: 1K-32K bins, 32 bits deep (4.3 billion counts per bin)

Collection:

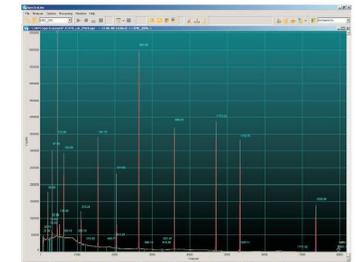
- Livetime; Realtime; input/output count rates; Compton coincidence rate.

Power Outputs:

- Detector Supply: High Voltage +/- 5kV, SHV connector, push-button on/off, front panel adjust, 60 sec. on/off ramp standard.
- Preamp Supply: standard preamp power voltages +/- 24V and +/- 12V, each to 100 mA.
- Power Requirements: 110 V at 0.2 A 50/60 Hz or 220 V at 0.1 A 50/60 Hz, specify at

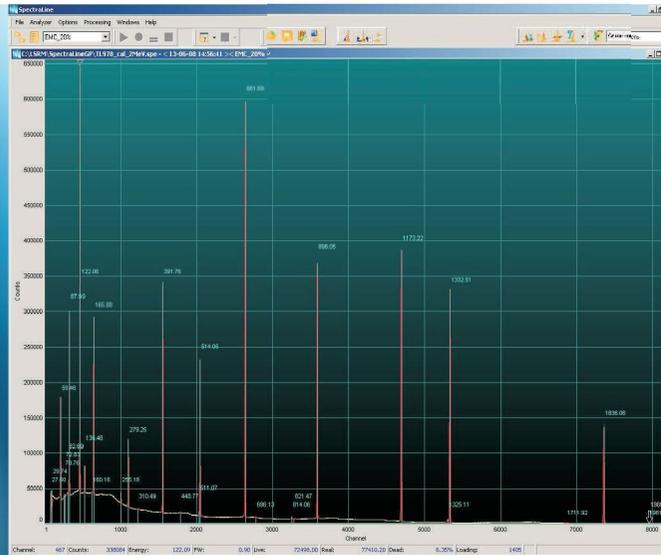
Software package

SpectraLineGP spectra processing includes calibration, peaks parameters determination, nuclides identification, activities calculation and using the true-coincident factors for the gamma-emission intensity correction. Non-parametric model for pattern of the full energy peak provides a correct model for a line in any energy range. Adjustment of the DigiSpectrum parameters.



Specification

- Automatic peak search with the required level of detection (peak search results are stored in files).
- Calibration by energy, half-width, and peak shape.
- Calculation of the peak parameters (position, half-width, area), with storing the results in a text file.
- Calibration by efficiency; construction of approximate efficiency curves.
- Activity calculation by different methods;
- Correction for true summation in view of the subsequent gamma-ray intensity correction.
- Storing the measured spectra and results of processing in the database in order to analyze the repeated measurements for convergence in the given criteria (the quality estimation).
- Simultaneous processing of an arbitrary (optional) number of spectra; the use of several spectra peaks from different energy ranges at calibration by shape.
- Quantitative and visual control over the calibration quality.
- Connection of an arbitrary (optional) number of measuring channels.
- Independent control, start, stop, spectra storage and visualization in all measuring channels.



SpectraLineGP software package

Application

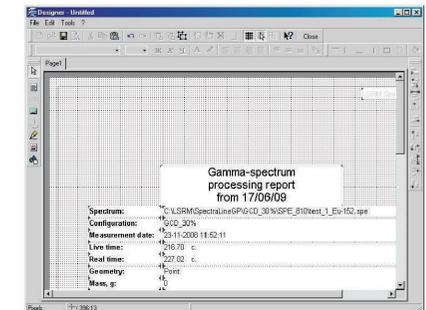
SpectraLine Gamma Precision (GP) software has been developed for a wide range of application tasks in spectrometry using gamma-ray semiconductor detectors.

The tasks are as follows:

- Examination and certification of food products and building materials.
- Radiation monitoring of environmental and other objects.
- Certification of radiation samples.
- Determination of the enrichment level for uranium, plutonium and other elements.
- Fuel analysis in scientific research, etc.

Element	Half-life	Abundance
Ag-110m	243.75 day	
ANNUL	1E+009 year	
12322	2.62015 year	
Sr-90	159.50	0.36
1274543	99.94	0.01
K-40	1.20E+009 y.	
Tl-44	63 year	
Mn-54	312.116 day	
Co-56	77.9 day	
Co-57	271.81 day	
Co-60	5.2714 year	
Zn-65	244.12 day	
Y-90	105.617 day	
Zr-95	64.02 day	
Ru-103	39.36 day	
Rh-106	367 day	
Cd-109	453 day	
Sr-113	115.09 day	
Sb-125	2.77 year	
Ba-133	10.536 year	
Cs-134	2.062 year	

It is possible to create libraries of arbitrary (optional) configuration depending on the task to be solved is involved in the program. Information is provided on the radionuclide designation, its half-life period, line energy, line intensity, and absolute error.



SpectraLineGP Software has a user-friendly interface and offers the following options:

- Color scheme adjustment of the window.
- Data copying into the spectrum windows.
- Addition/deletion of peaks and zones in a spectrum.
- Viewing the parameters of indicated zones or separate peaks.
- Zone integration or splitting into smaller zones;
- Viewing of calibration results, corrections, calculations, etc.

The program has a built-in editor, which allows making up the reports of various forms and connecting external programs.

Specification

Model	Detector Sensitive Area		Energy Resolution on 5.9 keV
	Diameter, mm	Area, mm ²	
SXRD - 04 140	4	12.5	140
SXRD - 05 150	5	20	150
SXRD - 06 155	6	30	155
SXRD - 08 160	8	50	160
SXRD - 12 175	12	100	175
SXRD - 16 195	16	200	195
SXRD - 25 300	25	500	300



SiLi X-ray Detectors SXRD (Liquid Nitrogen cooled)

Application

Detectors are applied for X-rays registration in X-ray fluorescence and X-ray diffraction analysis devices, in laboratory measurements etc.

Complete set

- Si(Li) semiconductor detector SXRD
- Preamplifier with cooling input stage
- Digital or Analog-Digital Multichannel Analyzer
- Analytical software for quantitative and qualitative analysis
- Different cryostat modifications are available
- Dewar vessel

Features

- Possibility of choosing a preamplifier type with resistive or opto-electronic feedback
- High energy resolution
- High count rate - 500 MeV/s and ability to increase it up to 1000 MeV/s
- Thin Be windows, possibility to install ultra-thin polyimide windows
- Detection of radiation in any spatial orientation depending on cryostat modification
- Manufacture in variable cryostat design is possible

Baltic Scientific Instruments
Ganību Dambis 26
P.O. box 33, Rīga
LV - 1005, Latvia

Phone: (+371) 67383947
Fax: (+371) 67382620
Email: sales@bsi.lv
www.bsi.lv



Plenty of cryostat geometries available



Specification

Parameter	Value
Energy range, keV	1 - 60
Detector sensitive area, mm ²	20*
Energy resolution at 5.9 keV, eV	
at shaping time constant 16 μ s	138
at shaping time constant 1 μ s	268
at count rate 10 ⁵ cps and shaping time constant 1 μ s	275
Peak to background ration	4000
Time of cooling after filling with liquid nitrogen, h	3
Ambient temperature, °C	+5 to +38
Operation mode	Continuous
Spatial orientation of detection unit	Any
Voltage, V / frequency, Hz	200 / 50-60
Power Supply, W	60
Overall dimensions	
Detection Unit, mm	80 x 135 x 150
Compressor, mm	140 x 160 x 300
Weight	
Detection Unit, kg	1.8
Compressor, kg	7.5



X-ray SiLi Detectors ELSiX (Electrically cooled)

Application

The X-ray SiLi detector with electric cooling is designed for X-ray fluorescence analyzers, X-ray diffractometers and X-ray spectrometers, where detector cooling by liquid nitrogen is undesirable or impractical.

Complete set

- SiLi detector
- Compressor unit
- Connecting gas lines

Accessories

- Digital or Analog-Digital Multi Channel Analyzer
- Software package

Features

- No liquid nitrogen
- High energy resolution
- Thin Be windows with rust-proofing
- Allows for any spatial orientation of detection unit

Baltic Scientific Instruments
Ganibu Dambis 26
P.O. box 33, Riga
LV - 1005, Latvia

Phone: (+371) 67383947
Fax: (+371) 67382620
Email: sales@bsi.lv
www.bsi.lv

Any spatial orientation



Specification

Parameter	Value
Energy range, keV	1 - 60
Detector sensitive area, mm ²	20*
Energy resolution for 20 mm ² sensitive area detector, eV at energy	
5.9 keV	180
59.6 keV	450
Integral nonlinearity, %	0.05
Peak to background ration	2500
Time instability during 8 hours of continuous work, %	0.05
Input count rate, pulse/s	1.5 x 10 ⁵
Dimensions of detection unit, mm	Ø90 x 210
Dimensions of Multi Channel Analyzer, mm	300 x 180 x 80
Weight of detection unit, kg	2
Weight of Multi Channel Analyzer, kg	2.8
Power consumption, W	100
Power Supply, V	220
Frequency, Hz	50

* Detectors with 20 - 100 mm² sensitive area are available



SiLi X-ray Spectrometers

(Peltier cooled)

Application

Detection, accumulation and processing of X-ray spectra when detector cooling by liquid nitrogen is inconvenient or impossible.

Complete set

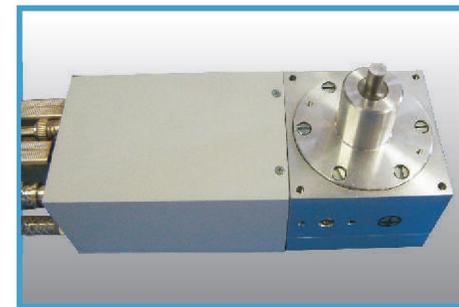
- Detection unit with SiLi detector and Peltier cooler
- Multi Channel Analyzer with power supplies
- Self-contained unit for water cooling the Peltier cooler hot seal
- PC with MCA emulation software package

Features

- Thermoelectric cooling of detector and input stage of preamplifier, thin Be window, possibility of installing ultra-thin polyamide windows
- Encapsulated hermetically sealed case for the detection unit
- Detection of radiation in any spatial orientation
- Closed-loop system of water cooling using Peltier cooler hot seal
- Mobile spectrometer with power supply from car accumulator is available

Baltic Scientific Instruments
Ganibu Dambis 26
P.O. box 33, Riga
LV - 1005, Latvia

Phone: (+371) 67383947
Fax: (+371) 67382620
Email: sales@bsi.lv
www.bsi.lv



Examples



Cryostat geometry modifications

Baltic Scientific Instruments develops and manufactures cryostats and vacuum chambers according to customer's requirements.

Current catalogue includes only examples of the most popular cryostat geometries.

Do you have specific requirements?

Tell us!

We will bring you a solution.

Baltic Scientific Instruments
 Ganību Dambis 26
 P.O. box 33, Rīga
 LV - 1005, Latvia

Phone: (+371) 67383947
 Fax: (+371) 67382620
 Email: sales@bsi.lv
 www.bsi.lv