ADVANCED R&D AND TECHNOLOGIES

THE NAS OF UKRAINE

INFORMATION AND SENSOR SYSTEMS AND DEVICES

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SPECIAL ISSUES

ENVIRONMENT AND NATURE PROTECTION

FOOD INDUSTRY

FUEL, LUBRICANTS, AND TECHNOLOGIES

INDUSTRIAL AGRICULTURE
AND LANDSCAPE GARDENING

INFORMATION AND SENSOR SYSTEMS AND DEVICES

INFORMATION TECHNOLOGY

MACHINE-BUILDING AND
INSTRUMENT ENGINEERING

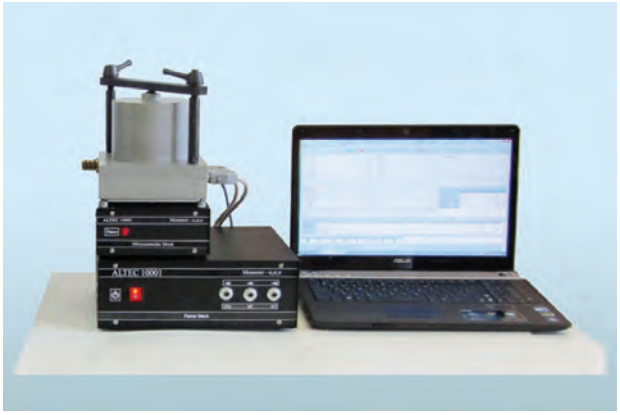
MEDICAL PRODUCTS
AND MEDICAL DEVICE ENGINEERING

POWER ENGINEERING AND ENERGY EFFICIENCY

TECHNOLOGIES AND EQUIPMENT
FOR EXPLORING, ESTIMATING,
AND EXTRACTING MINERAL RESOURCES

TECHNOLOGIES FOR CONSTRUCTION
AND FUNCTIONAL MATERIALS

ALTEC 10001 AUTOMATED EQUIPMENT FOR MEASURING THERMOELECTRIC PROPERTIES OF MATERIALS



Areas of Application

The device is to be used for automatic integrated measurements of electric conductivity, thermopower, and thermal conductivity, as well as for determination of Q-factor of thermoelectric material samples in the temperature range from 30 to 500 °C. It can be used both for research and for industrial manufacture of thermoelectric materials

Specification

Temperature measurement range, °C	30—500
Duration of measurement of sample σ, α, κ, Z at one temperature point, min	45—60
Electric conductivity measurement range, $Ohm^{-1} \cdot cm^{-1}$	10—10000
Thermal conductivity measurement range, $W \cdot m^{-1} \cdot K^{-1}$	0.1—20
Seebeck coefficient measurement range, $\mu V \cdot K^{-1}$	±(10—500)
Sample dimensions, mm	
length	8—13
diameter (for round-section sample)	6—9
width/thickness (for square-section sample)	5—7
Error in determination of the sample thermoelectric properties (at 500 °C), at most, %:	
electric conductivity	<1
seebeck coefficient	<1
thermal conductivity	<3
Alternating current supply voltage 50 Hz, V	220
Electric power consumption, at most, W	500
Overall dimensions, mm:	
measurement unit	200 × 170 × 210
measurement control unit	300 × 110 × 245

Stage of Development. Suggestions for Commercialization

IRL6, TRL6
Manufacture, supply, warranty service, and staff training, upon request

IPR Protection

IPR3

Advantages

As compared with the world analogs, the designed device for integrated measurements of thermoelectric materials properties gives a 3—5 higher accuracy of thermoelectric Q-factor measurements

Contact Information

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ANTISLEEP

Areas of Application

The device is designed to prevent drivers of motor vehicles and operators engaged in monotonous critical works from falling asleep that can lead to emergency and catastrophic situations

Advantages

Cyclic action of heat and cold on the active points of driver's forehead

Specification

The device is formed as a cap.

Electric voltage, V	12
Electric power, W	8
Work time	Unlimited

IPR Protection

IPR3

Stage of Development. Suggestions for Commercialization

IRL7, TRL6
Manufactured and supplied, upon request

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AUTOMATED EQUIPMENT FOR MEASURING σ, α, κ, AND Z ON A SINGLE SAMPLE BY THE ABSOLUTE METHOD IN THE TEMPERATURE RANGE FROM 30 TO 900 °C

Areas of Application

The device is to be used for automatic integrated measurements of electric conductivity, thermopower, and thermal conductivity, as well as for determination of Q-factor of thermoelectric material samples in the temperature range from 30 to 900 °C. The design of measuring thermostat has been optimized for its use at a high temperature

Advantages

As compared with the world analogs this device enables simultaneous integrated measurements of thermopower, electric conductivity, thermal conductivity, and thermoelectric Q-factor on a single sample and gives a 3—5 higher accuracy of thermoelectric Q-factor measurements

Stage of Development. Suggestions for Commercialization

IRL6, TRL6
Manufactured and supplied, upon request

IPR Protection

IPR3

Specification

Temperature measurement range, °C	30—900
Duration of measurement of sample σ, α, κ, Z at one temperature point, min	45—75
Electric conductivity measurement range, $Ohm^{-1} \cdot cm^{-1}$	10—10 000
Thermal conductivity measurement range, $W \cdot m^{-1} \cdot K^{-1}$	0.1—20
Seebeck coefficient measurement range, $\mu V \cdot K^{-1}$	±(10—500)
Sample dimensions, mm:	
length	8—13
diameter (for round-section sample)	6—9
width/thickness (for square-section sample)	5—7
Error in determination of the sample thermoelectric properties (at 900 °C), at most, %:	
electric conductivity	1.5
seebeck coefficient	1.5
thermal conductivity	5
Alternating current supply voltage 50 Hz, V	220
Electric power consumption, at most, W	500
Overall dimensions, mm:	
measurement unit	240 × 270 × 200
measurement control unit	300 × 110 × 245

Contact Information

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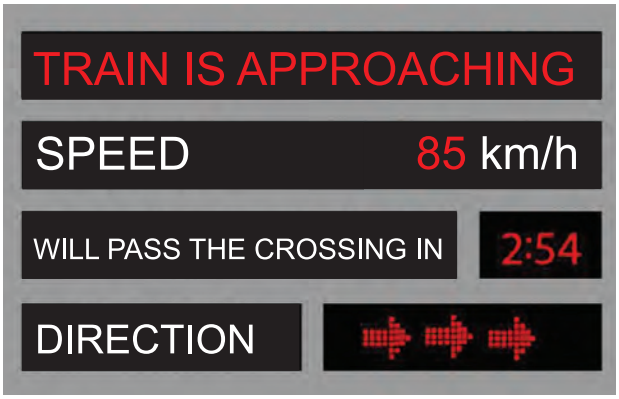
BLAGOVIST CONTROL AND INFORMATION SYSTEM FOR RAILWAY CROSSINGS

Information board at a railway crossing



Information board

Areas of Application

The system is designed to timely provide drivers of vehicles and pedestrians at railway crossings with information about the upcoming trains: speed, direction, time of train passage through the railway crossing; and other relevant information in the form of information line

Advantages

The system has no world or Ukrainian analogs. It is autonomous and is suitable for all types of crossings, provides complete information to drivers and pedestrians about the approaching trains. The system counting points are solar powered, communication is realized by radio data and does not require laying out electric and communication cables

IPR Protection

IPR2

Specification

The system consists of 2 information boards, 2 counting points connected by a radio channel with 1 central point, 4 radio antennas, 4 track sensors, and 2 solar panels to supply power to the counting points.

Controlled speed of the train passing through the counting points, km/h	≤250
Train detection range, km	≤2.5
Operating frequency of data transmission channel, GHz	2.4
Energy consumption of the central point, W	225
Energy consumption of the counting point, W	2

Stage of Development. Suggestions for Commercialization

IRL7, TRL8
Manufacture, delivery, and after-sales service, upon request

Contact Information

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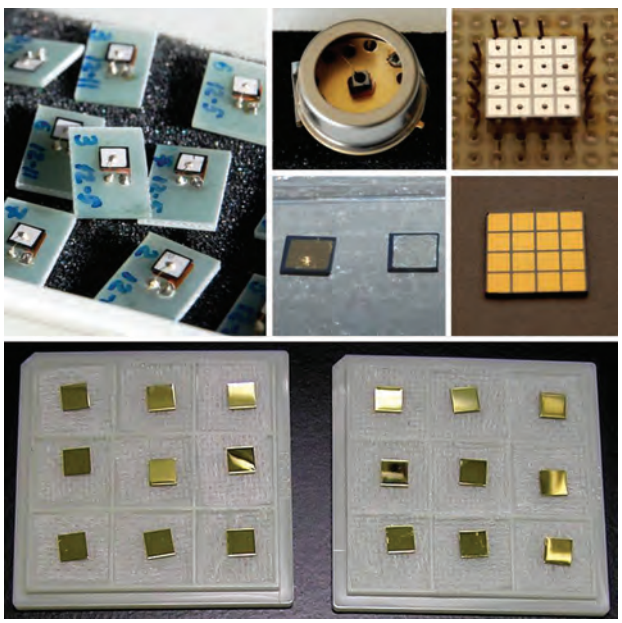
CdTe-BASED M-*p-n* SENSOR DIODE STRUCTURES WITH HIGH RESOLUTION

Areas of Application

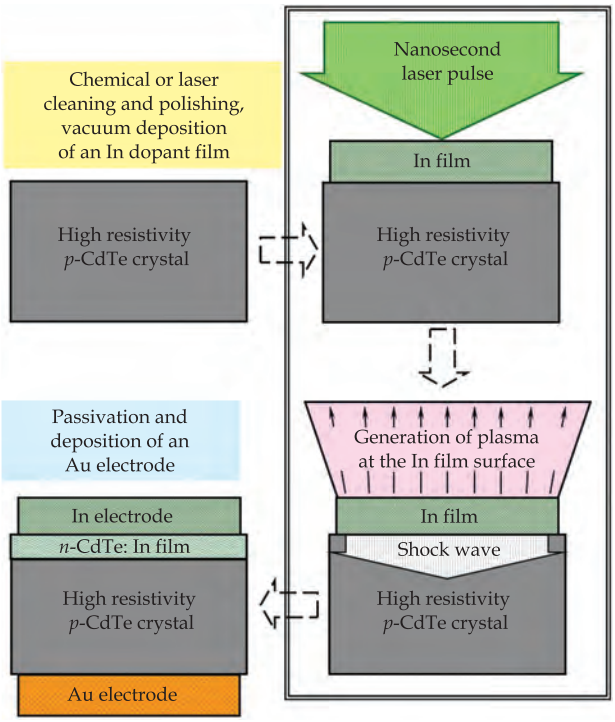
The In/CdTe/Au M-*p-n* sensor structures with a high energy resolution are to be used in X/γ-ray radiation detectors for localization and identification of radioactive sources and for visualization of objects in nuclear energetics, ecology, industry, medicine, etc.

Specification

Thicknesses of *p*-CdTe crystal, mm,	0.5—1
n-CdTe:In doped layer, nm	40
and In and Au electrodes in In/CdTe/Au M-*p-n* structure, μm	300—500
Electrons concentration, cm^3	~10^{19}
Mobility in *n*-CdTe:In layer, $cm^2/V \cdot s$	~140
Resistivity of *p*-CdTe crystal, Ω · cm,	10^9
and *n*-CdTe:In layer, Ω · cm	10^{-3}
Source current density, nA/cm^2	<10 (at 200 V)
Energy resolution, % (T = 300 K)	0.7—1.0 (FMHW at 662 keV)



Samples of In/CdTe/Au M-*p-n* sensor diode structures



Procedures and mechanisms of M-*p-n* diode structures formation using laser-induced doping

Advantages

There are no analogs in Ukraine.
The In/CdTe/Au M-*p-n* diode structures with a low source current have a high energy resolution of 0.7—1.0% (FMHW at 662 keV), versus 2—5% of the foreign commercial analogs

Stage of Development. Suggestions for Commercialization

IRL4, TRL5
Manufactured upon request

IPR Protection

IPR2, IPR3

Contact Information

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COMBINED GEOPHYSICAL DEVICE BASED ON DIGITAL LASER INTERFEROMETRY

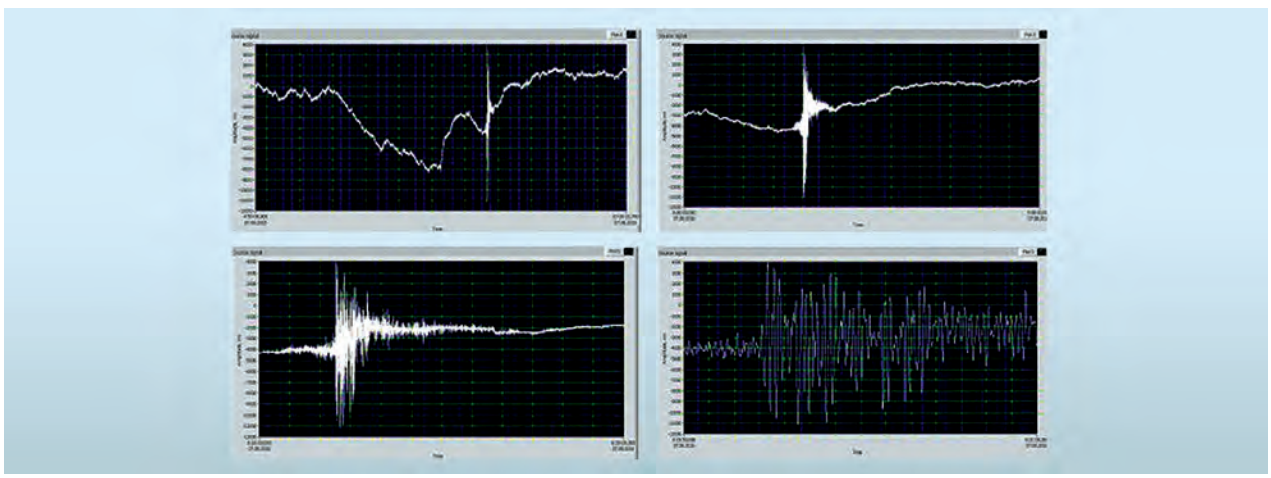
The vertical seismometer with digital laser interferometer

Areas of Application

The device is to be used for recording the Earth surface vibrations of natural and manmade origin, inclinations of structures, mining quarries, bridges, and dams, as well as changes in gravity

Specification

3D measurements and record of the surface vibrations with a resolution of, at least, 1 nanometer, within the frequency range from 0.01 to 50 Hz and the slopes with horizontal plane with a resolution of, at least, 0.0001 angular seconds



Earthquake in Mariupol, August 7, 2016 (GMT). Registered in Kyiv Oblast. The vertical axis in nanometers. The earthquake was preceded by changes in gravity

Advantages

The device has no counterparts in the world. It enables measuring and recording the very shifts instead of their rate or acceleration, this makes it possible to do measurements at very low frequencies starting with 0 Hz; also, the device enables using the vertical seismometer as relative gravimeter and the horizontal one as supersensitive inclinometer

Stage of Development. Suggestions for Commercialization

IRL3, TRL4
Manufactured upon request. Seeking partners for manufacturing and getting international IPR protection

IPR Protection

IPR3

Contact Information

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DEVICE FOR MEASURING TEMPERATURE AND LEVEL OF CRYOGENIC LIQUIDS

Measuring probe

Areas of Application

The device is designed to measure the level and temperature of cryogenic liquids in tanks for storage and transportation and in cryogenic equipment for various purposes

Display of cryogenic level detector data

Specification

Range of liquid level detection, m	≥0.2
Accuracy of liquid level detection, m	≥0.01
Temperature of cryogenic liquid, K	4—80
Temperature measurement accuracy, K	0.2

Advantages

There are no analogs in Ukraine and in the world. The device has a wide operating temperature range (4÷80 K) and a wide range of liquid level detection; enables simultaneous temperature measurements of in various places of liquid

Stage of Development. Suggestions for Commercialization

IRL6, TRL5
Manufactured upon request

IPR Protection

IPR2

Contact Information

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DEVICES FOR INSPECTING THE CONDITION OF RUST PROTECTION OF UNDERGROUND PIPELINES

Areas of Application

The equipment is to be used for ongoing control and diagnostics of the condition of insulation and electrochemical protection, detection of corrosion sites without earthworks, survey of in hard-to-reach places, and identification of places, direction, and depth of underground facilities by the contactless method

Specification

The equipment consists of the following devices: a pipeline finder for indicating the AC magnetic field direction; a depth meter for measuring distance to axis of underground pipelines; a voltmeter for measuring voltage drop and for monitoring the condition of electrochemical protection; and contactless current meters for determining current distribution among coils and sections of gas pipelines and for detecting damaged insulation

Advantages

The devices that complement each other enable to combine and to adjust them depending on specific facilities to be inspected and operating conditions

Stage of Development. Suggestions for Commercialization

IRL7, TRL8
Manufacture, delivery, warranty service of equipment, and staff training, upon request

IPR Protection

IPR2, IPR3

Contact Information

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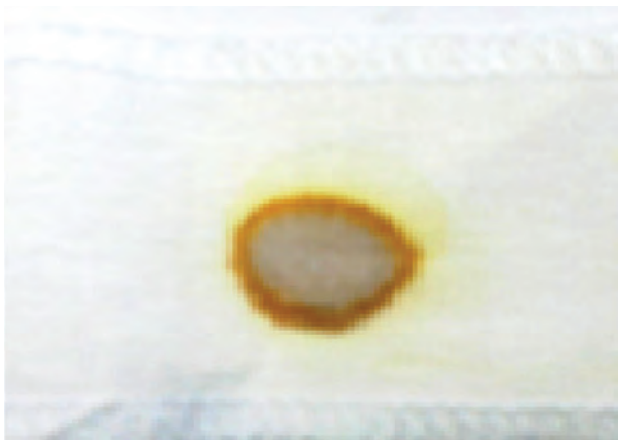
DINITROGEN TETROXIDE LEAK INDICATOR

Areas of Application

The indicator is designed for visual detection of dinitrogen tetroxide (amyl) leak as a result of through defects in detachable pipe connections of rocket fuel systems by a local change in color

Specification

The product is made in the form of ribbon with geometric parameters chosen depending on the dimensions of pipeline connections. The original color of indicator's surface is white. While contacting the places of dinitrogen tetroxide leaks the indicator changes its color to brown shades. The minimum dinitrogen tetroxide leak reliably detectable by the indicator during 5-minute test is about 10^{-7} $m^3 \cdot Pa/s$. The product can be used in the temperature range from +5 to +50 °C at a relative humidity of 98%. The product meets TS of Ukraine 20.5-05417213-002:2016



Appearance of dinitrogen tetroxide leak indicator before (upper) and after (lower) contact with the mentioned substance

Advantages

As compared with the counterparts, the product is ten times more sensitive, reliably detects not only dinitrogen tetroxide, but also the products of its chemical transformations: nitrogen dioxide, nitric and nitrous acids. Suitable for the use in tropical conditions

IPR Protection

IPR3

Stage of Development. Suggestions for Commercialization

IRL8, TRL9
Manufacture, supply, and staff training, upon request

Contact Information

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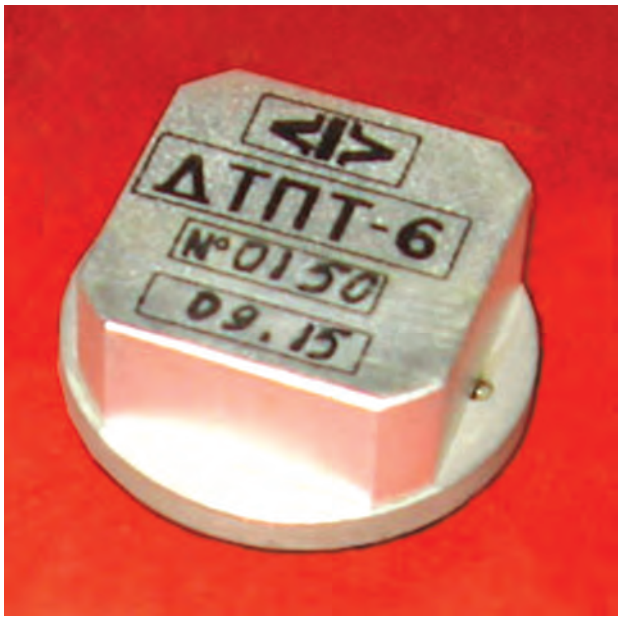
DTP-6 MEASURING THERMOELECTRIC CONVERTER



Areas of Application

The converter is to be used in high-precision AC instruments within the frequency range from 10 Hz to 100 MHz, in reference samples and standard AC instruments within a wide frequency range, and for the creation of calibration instruments

Advantages

Improved stability, overload capacity, identity of volt-ampere input characteristics, reduced response time, and extended frequency range

Specification

Heater resistance, Ohm	90—100
Nominal current, mA	7.5
Nominal thermopower, mV	≥20
Overload capacity, % of nominal current	300
Capacity between leads of heater and thermopile, at most, pF	2.5
Height (without leads), mm	15
Diameter, mm	32
Weight, g	70

Stage of Development. Suggestions for Commercialization

IRL7, TRL6
Manufactured and supplied, upon request

IPR Protection

IPR3

Contact Information

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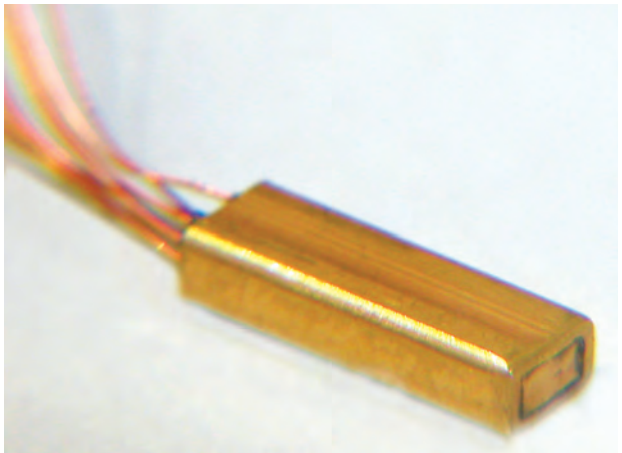
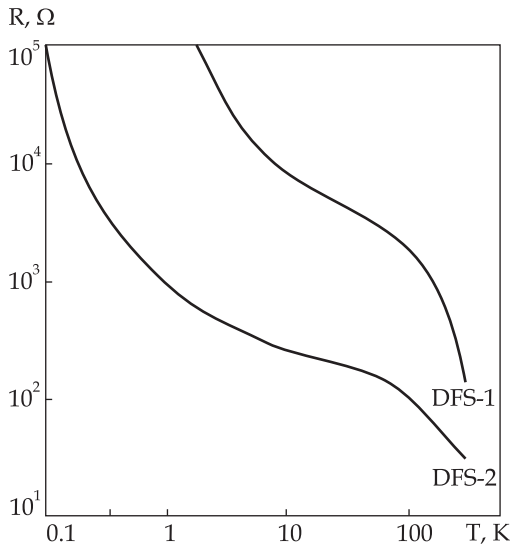
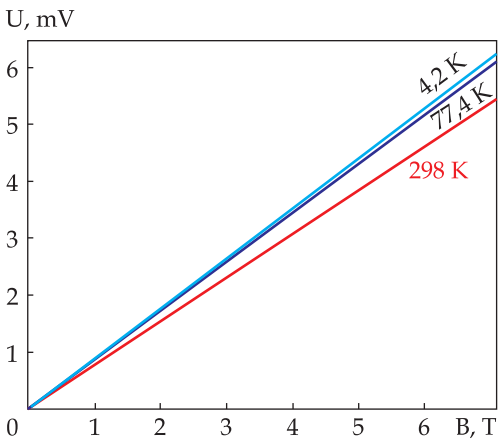
DUAL FUNCTION SENSORS (DFS)





Resistance vs temperature curves for DFS-1 and DFS-2 thermometers



Voltage vs magnetic field curves for DFS Hall-effect magnetic field sensor at a current of 0.5 mA

Areas of Application

The DFS can be used for local simultaneous measurements of temperature and magnetic field in superconducting magnet systems at research laboratories and universities. The DFS can improve the accuracy of temperature measurement in the presence of magnetic fields using the adjustment method (if magnetic field and thermometer sensitivity to it are known)

Specification

The DFS consists of resistance thermometer and Hall-effect magnetic field sensor. These sensors are incorporated in a 3.5 mm wide, 2.2 mm high, and 10.1 mm long sheath. The DFS has 8 copper contact leads: 4 leads for the resistance thermometer and 4 ones for the Hall-effect magnetic field sensor. The DFSs operate within the temperature range from 0.1 to 400 K and at magnetic fields of up to 15 T

Advantages

There are no analogs in Ukraine and in the world. The devices are notable for wide temperature and magnetic field operating range; monotonic response over a wide temperature and magnetic field range; high sensitivity; small temperature reading errors for operation in magnetic fields; and high radiation tolerance

Stage of Development. Suggestions for Commercialization

IRL6, TRL6
Manufactured upon request

IPR Protection

IPR1, IPR2

Contact Information

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EMA FAMILY ACOUSTIC EMISSION DIAGNOSTIC CONTROL SYSTEMS

Odesa Port Plant facilities to be continuously monitored by the systems

EMA-4 devices based on 4-channel and 16-channel modules

Areas of Application

The systems are to be used for periodic control or ongoing monitoring of technical condition of critical industrial facilities during operation

Specification

The system consists of AE transducers, AE signal preprocessors and amplifiers, PC with specialized software, means of communication, and support hardware. The system has individual configuration that depends on geometry and operating conditions, as well as on suggestions on their operating capacity. The systems recognize detect processes of fracture propagation based on AE data

Stage of Development. Suggestions for Commercialization

IRL7, TRL7
Manufacture, supply, warranty service, and staff training, upon request

IPR Protection

IPR1

Advantages

The EMA systems have no counterparts in the world. They assess the level of danger of the facilities condition, localize places of their possible fracture/destruction, estimate breaking strain under current operating conditions and residual service life of facilities. This enables to reduce costs of routine repair or remedial works

Contact Information

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EQUIPMENT FOR IONOSPHERE PLASMA DIAGNOSIS

Areas of Application

The equipment is to be used for monitoring and controlling the parameters of near-satellite environment

Specification

The equipment consists of neutral particles detector DN, charged particles detector DE, and research data accumulation unit.
The neutral particles detector DN: overall dimensions are 100 × 115 × 105 mm; weight is 1.2 kg; power consumption is 4 W; maximum current (output signal) is 100 mA.
The charged particles detector DE: the detector consists of two mutually orthogonal electric probes; diameter of the probe site is 5 mm; diameter of the measuring electrode is 1 mm; full length of the probe is 290 mm; weight is 40 g; power consumption is 0.25 mW; maximum current through the measuring electrode is 12 μA; time for current-voltage response measurement is 1 s

Advantages

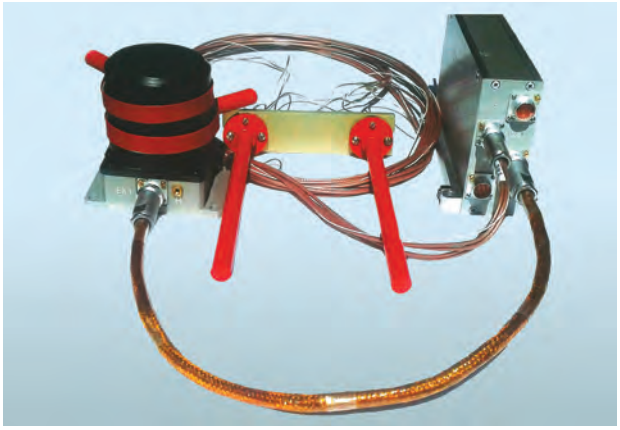
This equipment enables obtaining spatial and time distributions of parameters for neutral and charged particles of ionosphere plasma along the satellite orbit

Stage of Development. Suggestions for Commercialization

IRL6, TRL8
Manufactured and supplied, upon request

IPR Protection

IPR3



Neutral particles detector DN

Charged particles detector DE

Contact Information

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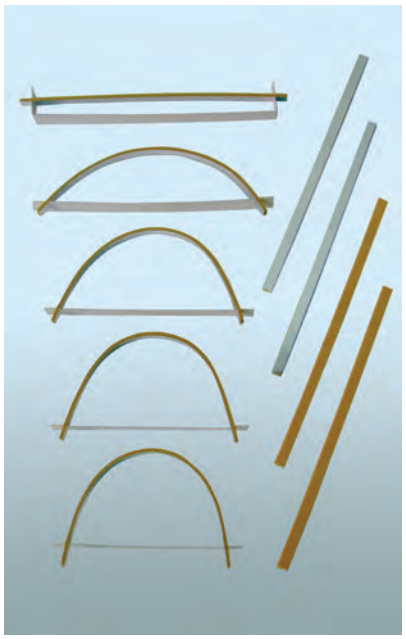
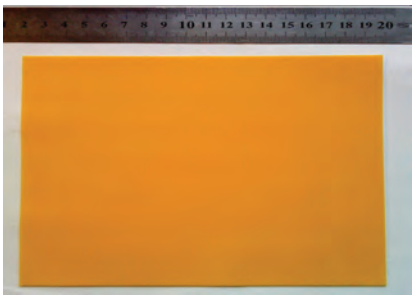
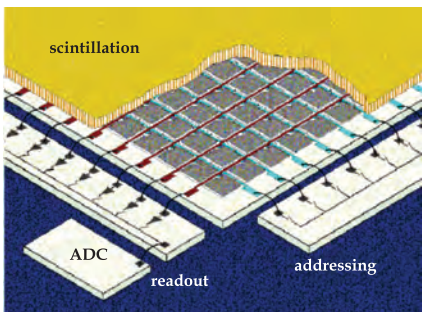
FLEXIBLE COMPOSITE SCINTILLATION PANELS FOR ADVANCED RADIOGRAPHIC AND TOMOGRAPHIC SURVEYS







Areas of Application

The device is to be used for recording X-ray radiation with a high spatial resolution, in detectors for nondestructive control systems, medical tomography and radiography, as well as in intensifying screens in medical and industrial radiography

Specification

The flexible composite scintillation panels and elements are based on fine-crystalline ZnSe. They can be used for realization of dual-energy X-ray detector that effectively operates in the range of from 20 to 100 keV X-ray radiation

Advantages

The cost of fine-crystalline scintillation panels is much less as compared with the single crystals possessing the same quality. They can be used in multi-energy X-ray scanners and medical computer tomography. The panels have a high spatial resolution (up to 7 line pairs per mm). Unlike the single crystals, these panels are not limited by size and can be shaped variously

Stage of Development. Suggestions for Commercialization

IRL8, TRL7
Small batches of scintillators are manufactured and X-ray detector systems are developed upon request

IPR Protection

IPR1, IPR3

Contact Information

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FLUOROTEST NANO PORTABLE LASER-BASED FLUOROMETER

Areas of Application

The device is designed to study biochemical reactions and to detect the presence and concentration of optically and biologically active substances for the purposes of environmental monitoring, design and manufacture of biosensors, rapid analysis of water and food in laboratory and field conditions

Specification

Excitation sources:	
lasers, nm	405, 532, 660
LEDs, nm	470, 515, 635
Limit of detection in solution (for rhodamine 6G), nmol/l	10
Maximum wavelength scan range, nm	320—900
Spectrometer exposure time	5 ms — 2 s
Overall dimensions, mm	200×250×100
Weight, kg	3
Compatibility	USB, Windows XP/ Vista/7/8/10

Stage of Development. Suggestions for Commercialization

IRL3, TRL4
Manufacture, delivery, warranty service, and staff training, upon request

IPR Protection

IPR1, IPR2, IPR3

Advantages

There are no analogs in Ukraine. The device enables implementing the technique for enhancement of fluorescence signal by gold and silver nanostructures both in fluorometric cuvettes using colloidal solutions and on substrates with nanostructured surface (nanochips). Rapid (10–15 min) and high-sensitivity fluorescent analysis in the real-time mode

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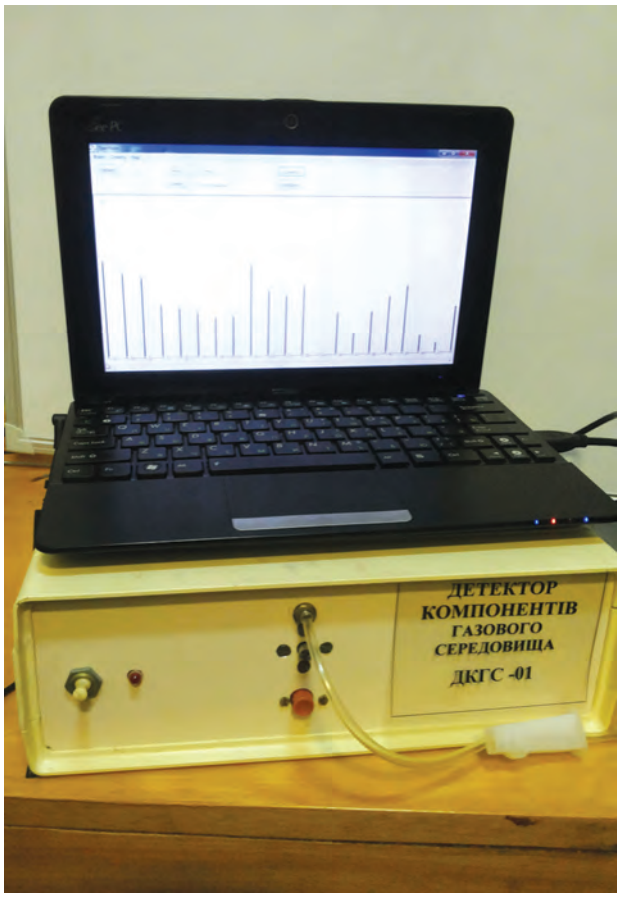
GAS COMPOSITION DETECTOR



Areas of Application

The device is to be used for detecting low concentrations of biomarker volatiles, toxic and explosive substances in multicomponent gas mixtures for ecological, medical, military, forensic, and security purposes

Specification

Sensitivity, ppm	≤0.1
Analysis time, s	15
Gas sample volume, ml	10
Resolution, substances in the spectrum per analysis mode	≤20
Drift gas (air) volume, ml	200

Advantages

Unlike the existing analogs, this portable device uses a nonradioactive ionization source and has an original configuration of gate

Stage of Development. Suggestions for Commercialization

IRL4, TRL4
Manufacture, delivery, warranty service, and staff training, upon request

IPR Protection

IPR3

Contact Information

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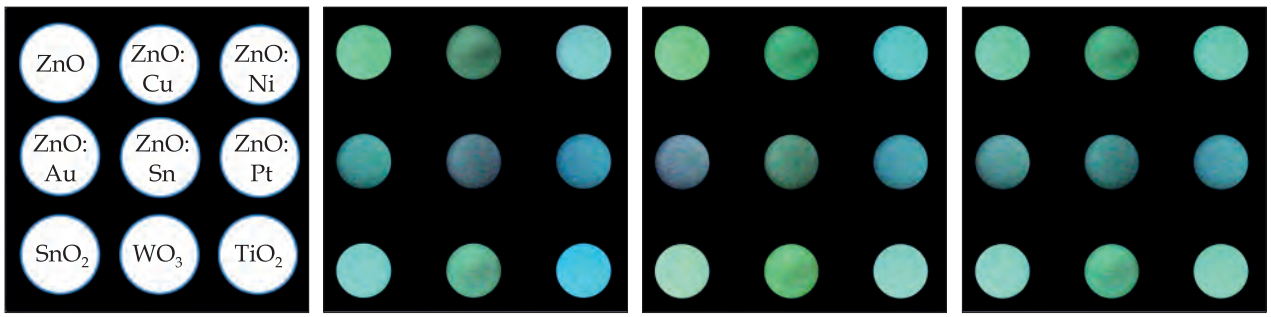
GAS SENSOR SYSTEM



a b c d

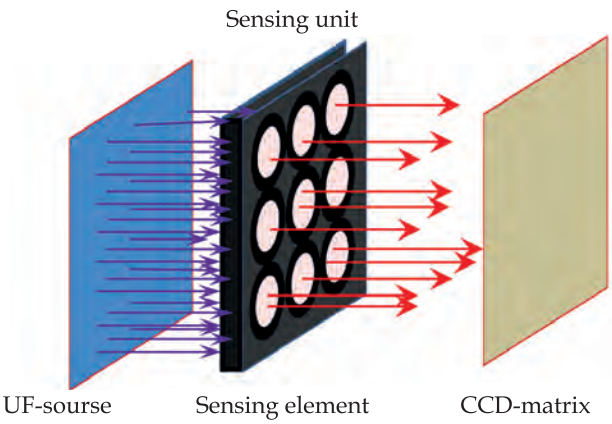
Photoluminescent emission of sensing matrix cells (a) in gas environment (b) air, (c) CO, (d) vacuum

Areas of Application

The system can be used in ecology, biology, medicine, and military industry

Specification

Gas detection is carried out by analyzing changes in luminescence color of nanopowder matrix cells in gas environment. In this case, for example, sensitivity to oxygen is ~3 ppb with a response time of ~100 ms while reaching a signal of ≥90%



Scheme of gas sensor system laboratory prototype

Advantages

The product has no analogs in Ukraine and in the world

IPR Protection

IPR1, IPR3

Stage of Development. Suggestions for Commercialization

IRL3, TRL2
The results of laboratory research are proposed to potential customers to confirm the design properties of the gas sensor system, its competitive ability in the market and to identify technological solutions for its manufacture and potential applications

Contact Information

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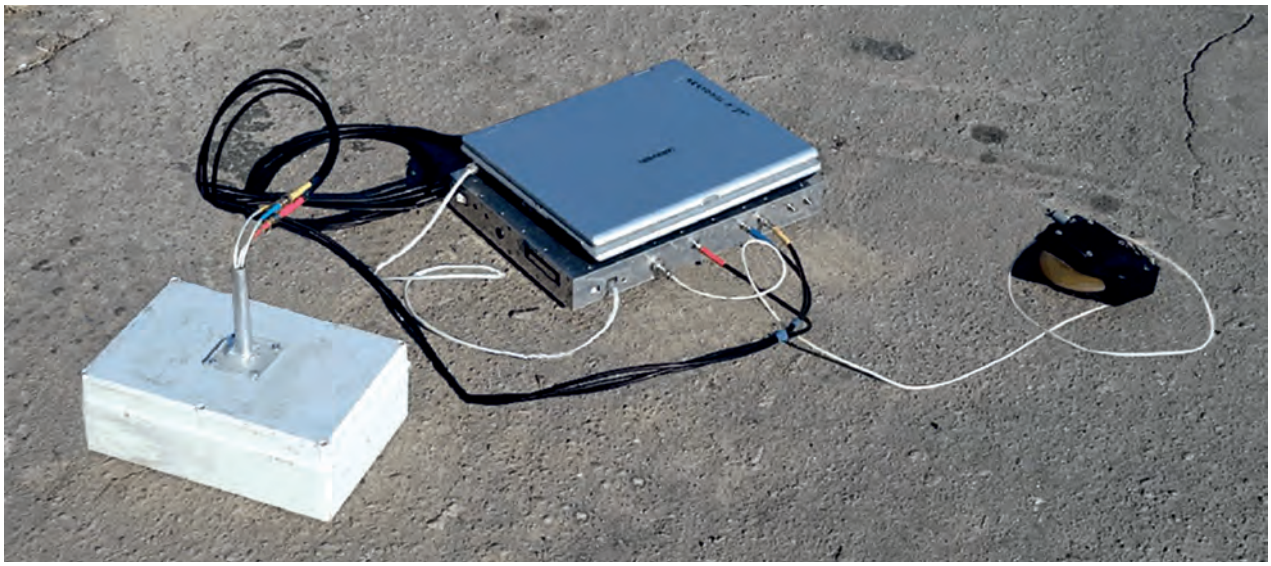
GROUND PENETRATING RADAR



Areas of Application

Monitoring of road pavement condition

Specification

The device collects data every 23 cm at a speed of up to 70 km/h.

Probing pulses:	
amplitude, V	≥75
front time, ns	≤0.4
Antenna:	
frequency band, GHz	0.8—1.6
Sampling receiver:	
noise level, mV	≤200
readout step, ps	10
increase in transient response, ns	≤0.2
synchronization readout error, ps	<3
Observation interval, μs	≤2

Advantages

Signals from the emitter are attenuated up to –65 dB at the receiver input, with amplitude of the useful signal increasing. Variable sensing time and possibility of its optimization improve the signal/noise ratio. High stability of synchronization enables accumulation of signals. Analog accumulation while receiving expands the operating bandwidth and increases the signal/noise ratio. Improved output performance increases probing depth, accuracy of localization of subsurface objects, and the ability to detect low-contrast objects

IPR Protection

IPR1, IPR3

Stage of Development. Suggestions for Commercialization

IRL6, TRL5
Manufacture, delivery, warranty service, and staff training, upon request

Contact Information

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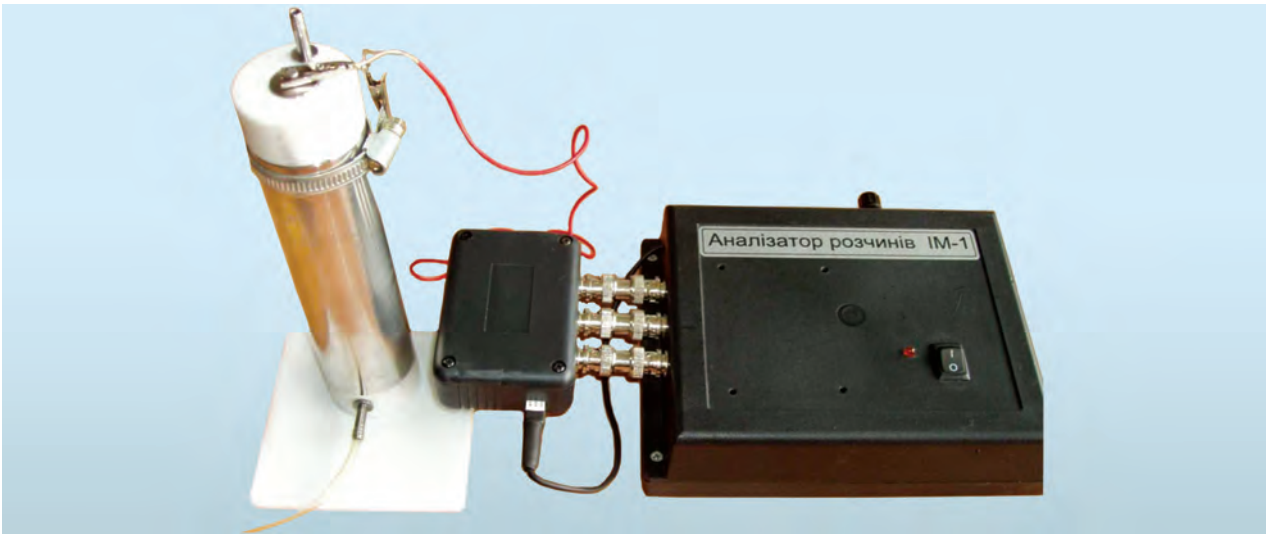
IM-2 PORTABLE IMPEDANCE ANALYZER OF SOLUTIONS



IM-2 portable impedance analyzer of solutions with a special electrolytic cell

Areas of Application

The device is to be used for studying electro-physical characteristics of weak-conductive liquid solutions with a specific resistance of up to 10^{12}–10^{13} Ohm · cm and materials with a low dielectric constant (gasoline, benzanol mixtures, oils, etc.) at liquor and spirits factories, motor gasoline plants, and in sanitary control services

Advantages

Portability, lower cost as compared with RCL-meters, and original techniques developed for rapid quantitative analysis of multicomponent liquid mixtures with the use of device

IPR Protection

IPR3

Specification

Maximally permissible error of active and reactive components of impedance is ±20% at minimum frequency and ±10% at maximum frequency; sample block connected via coaxial cables; connected to PC via RS232 or USB interface.

Range of operating frequencies	0.5 Hz—150 кHz with a pitch of 1 Hz
Maximally possible deviation from fundamental harmonic, %	±1
Power supply	±12 V / 0.5 A
Dimensions, mm	300×300×70
Weight, kg	≤0.5

Stage of Development. Suggestions for Commercialization

IRL6, TRL6
Manufacture, supply, and maintenance of device; measurement techniques provided, upon request

Contact Information

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INFRARED RADIATION SENSORS

Uncooled InAs photodiode prototypes

Optical cryostat with germanium window for cooled InAs and InSb photodiodes

Areas of Application

The sensors are to be used at R&D laboratories and metallurgical plants for registration of infrared radiation in the spectral range of 3–5 μm, and in optoelectronic devices for monitoring hazardous and explosive gases

Specification

Parameters	Values of technical parameters	
	InAs	InSb
Operating mode:	Photovoltage	
Operating temperature, K	77, 300	77
Spectral band, μm	1.5—3.1 (77 K) 1.5—3.7 (300 K)	1.5—5.3
Peak wavelength, μm	2.9—3.0 (77 K) 3.4—3.5 (300 K)	5.2
Current sensitivity, A/W	1.2 (77 K) 0.8 (300 K)	2.2
Specific detectivity at the peak wavelength, cm $Hz^{1/2}$ W^{-1}	$5 \cdot 10^{11}$ (77 K) $2 \cdot 10^{9}$ (300 K)	$4.8 \cdot 10^{10}$

Advantages

The sensors have no analogs in Ukraine and are import-substituting products. As compared with commercial photodiodes produced by leading manufacturers of similar products, they have a lower cost at comparable threshold parameters

Stage of Development. Suggestions for Commercialization

IRL5, TRL4
Manufactured and sold, upon request

IPR Protection

IPR1, IPR3

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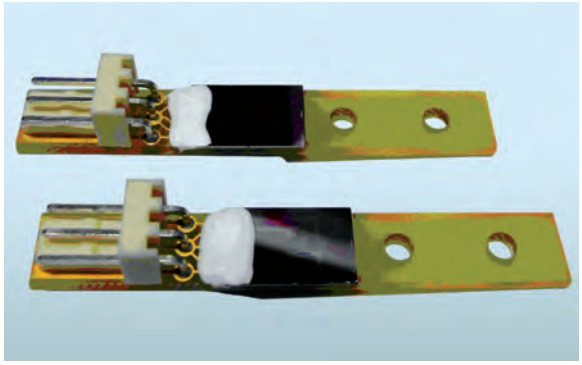
ISPT-3 PORTABLE BIOCHEMICAL ANALYZER

ISPT-3 Portable Biochemical Analyzer



Unified primary electrodes for the device

Areas of Application

The device is to be used for rapid analysis of biochemical composition of aqueous solutions and for identification of chemical substances, including the toxic ones, for the purposes of environmental monitoring, food products quality control, and medical diagnostics (quantification of glucose, urea, creatinine content in blood and urine, etc.)

Specification

Number of channels	2—16
Working capacity of cuvette, ml	0.5—5
Single measurement duration, s	0.1
Operating temperature range, °C	0—40
Time needed for biochemical analysis, min	≤15
Serial interface	RS 232
Software platform	Win 9X
Power supply	12 V/0.2 A

Advantages

There are no analogs in Ukraine. Modular configuration, easy conversion to a multi-sensor system, easy access to sensor cells, quickly replaceable sensitive membranes, lower cost as compared with international counterparts

Stage of Development. Suggestions for Commercialization

IRL7, TRL7
Manufacture, supply, and maintenance of small batches, upon request

IPR Protection

IPR3

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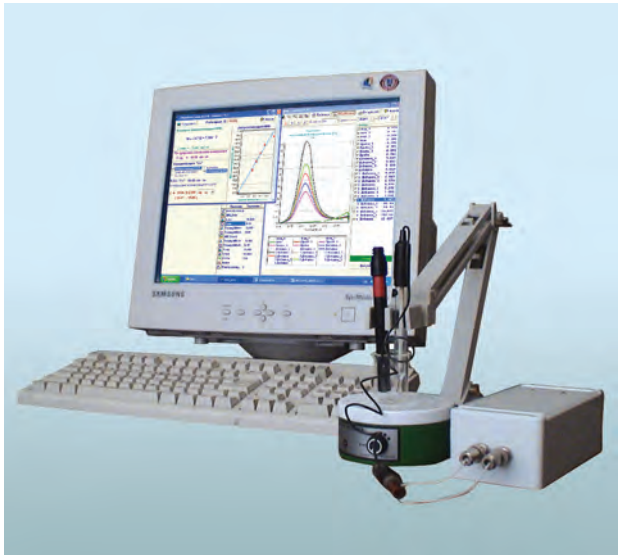
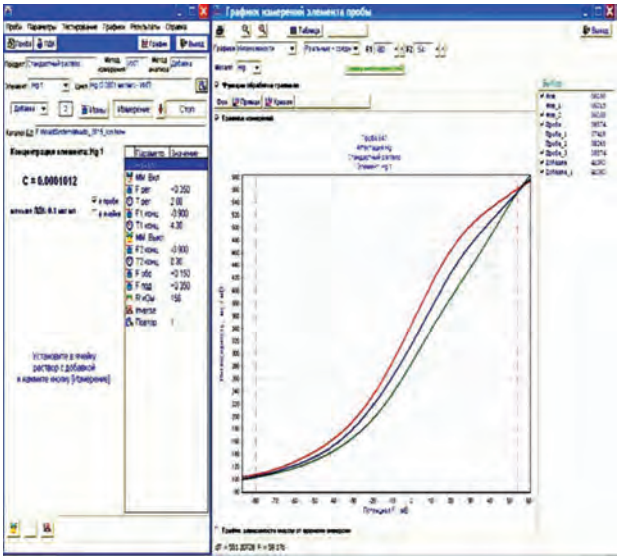
ICP ANALYZER FOR MEASURING CONCENTRATION OF TOXIC ELEMENTS IN ENVIRONMENT OBJECTS



ICP Analyzer device



Measurement of mercury concentration in water

Areas of Application

The device is to be used for quality control and certification of food, drinking water, soil, and feed at laboratories of corporations, educational establishments, and R&D institutions

Advantages

The device enables to measure concentration of toxic elements below the maximum permissible values. The methods for quantifying the content of these elements in drinking water, water reservoirs, and soils have been approved.
The content of toxic elements in food products is quantified using the device in accordance with government standards

IPR Protection

IPR1, IPR2

Specification

The lower limit for measuring concentration of toxic elements in the sample solution: Hg (mercury) — 0.1 μg/dm^3; Pb (lead), Cd (cadmium), Zn (zinc), Cu (copper), As (arsenic), Ni (nickel), and Co (cobalt) — 1.0 μg/dm^3; Sn (tin), Se (selenium), Mn (manganese), Cr (chromium), I (iodine), and Fe (iron) — 10 μg/dm^3. Concentration of K (potassium), Na (sodium), Ca (calcium), F (fluorine), NH_4 (ammonium), and NO_3 (nitrate) are measured using ion-selective electrodes

Stage of Development. Suggestions for Commercialization

IRL6, TRL5
Manufacture, certification, warranty service, installation, staff training, periodic verification, and replacement of electrodes are provided, upon request

Contact Information

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KD-3 OPTOELECTRONIC COLORIMETRIC GAS LEAK DETECTOR

KD-3 optoelectronic colorimetric gas leak detector with a portable sensor unit

Areas of Application

The device is to be used for detecting the presence of gas in the environment and the gas leaks in the pipelines, for assessing the pollution of hollow structures compartments with volatile gases (ammonia, amyl, heptyl etc.), and localizing the gas leaks at the structure joints

Specification

Image field, cm	≤2
Light sensitivity, lx	1—50
Color resolution	10^6 tones
Light source type/color temperature, K	USB LED/6500
Detection threshold, ppm	<1

Advantages

There are no analogs in Ukraine.
The device is notable for reproducibility of gas detection and a high sensitivity (about several tenth ppm) due to the use of highly sensitive colorimetric indicator

Stage of Development. Suggestions for Commercialization

IRL6, TRL6
Manufacture, supply, and maintenance, upon request

IPR Protection

IPR3

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LEMI-025 REFERENCE INTERMAGNET STANDARD FLUXGATE MAGNETOMETER

LEMI-025 reference fluxgate magnetometer with sensor, GPS antenna, and card reader

Areas of Application

A basic magnetometer for geomagnetic observatories that meets new 1-second INTERMAGNET standard; can be used for fundamental geophysical research of Earth's crust; a reference instrument for in-situ calibration of magnetometers without interruption of their operation

Specification

Measured range of Earth's magnetic field, nT	±70 000
Measured range of magnetic field variations, nT	±4 000
Resolution for each component, pT	1
Frequency band, Hz	0—3.5
Noise level within frequency band from 0.01 to 1 Hz	<10 $pT_{mean\ square}$
Temperature drift, nT/°C	<0.2
Components orthogonality error, min of arc	<30
Timing accuracy, ms	<10
Compact Flash card capacity, GB	<2
Operating temperature range, °C	–10…+50
Power supply, battery, V	12^{+6}_{-3}
Power consumption, W	<4
Weight:	
sensor with support, kg	3.3
electronic unit, kg	3.8

Advantages

The magnetometer has no counterparts in the world market. Its major advantages are a very precise GPS time synchronization of the acquired data and an effective cancellation of power mains interference

Stage of Development. Suggestions for Commercialization

IRL8, TRL8
Manufacture, delivery, warranty service, and staff training, upon request

IPR Protection

IPR1

Contact Information

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LEMI-424 MAGNETOTELLURIC STATION

LEMI-424 MT station data logger with electrodes and complete set of field equipment

3-component fluxgate magnetometer of *LEMI*-424 MT station

Areas of Application

Exploration of ores and oil deposits.
Geophysical prospecting

Specification

Data Logger	
Frequency band, Hz	0—0.5
Electrometer measurement range, mV	±2450
Electrometer resolution, nV	2
Readout rate	1/s
SD card, GB	8
Digital output and control	USB
Power supply, V	5—20
Power consumption, W	<0.5
Weight, kg	2.0
3-component Fluxgate Magnetometer	
Magnetometer measurement range, nT	±65000
Magnetometer frequency band, Hz	0—10
Noise level at 1 Hz, pT/√Hz	≤10
Temperature drift, nT/°C	<0.3
Power consumption, W	<0.5
Weight of the sensor with 20 m cable, kg	~5

Advantages

There are no analogs manufactured in Ukraine. As compared with the foreign counterparts (for instance, MT station by METRONIX, Germany) *LEMI*-424 has a higher repeatablity and sensitivity and a significantly lower power consumption

Stage of Development. Suggestions for Commercialization

IRL8, TRL8
Manufacture, delivery, warranty service, and staff training, upon request

IPR Protection

IPR1

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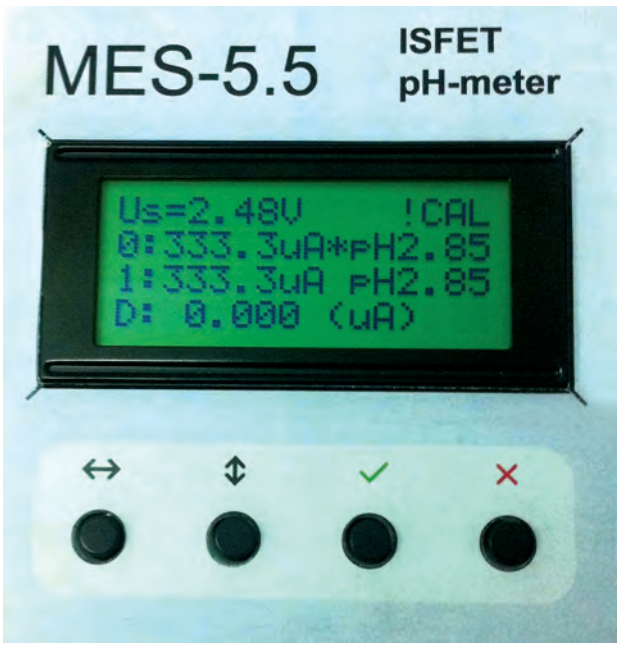
MES-5 DEVICE FOR BIOCHEMICAL ANALYSIS OF AQUEOUS AND PHYSIOLOGICAL SOLUTIONS

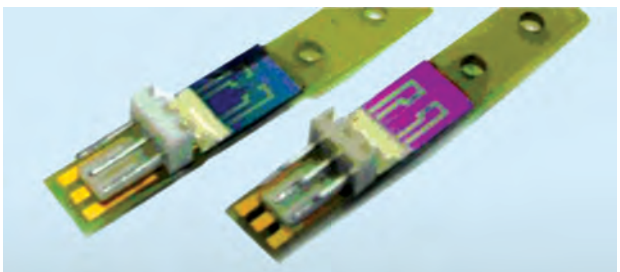


Areas of Application

The device is to be used for rapid analysis of biochemical composition of aqueous solutions and for identification of chemical substances, including the toxic ones, for the purposes of environmental monitoring, food products quality control, and medical diagnostics

Specification

Number of channels	2
Working capacity of cuvette, ml	0.5—5
Single measurement duration, s	0.1
Operating temperature range, °C	0—40
Time needed for biochemical analysis, min	≤15
Serial interface	RS 232
Software platform	Win 9X
Power supply	12 V / 0.2 A



Differential pH-sensitive unified electrodes for the device

Advantages

There are no analogs in Ukraine. The device contains self-diagnostics, control, and indication units; can operate independently as well as with a computer; has quickly replaceable sensitive membranes; can be used for studying the kinetics of biochemical reactions; has a lower cost as compared with international counterparts

Stage of Development. Suggestions for Commercialization

IRL6, TRL6
Manufacture, supply, and maintenance, upon request

IPR Protection

IPR3

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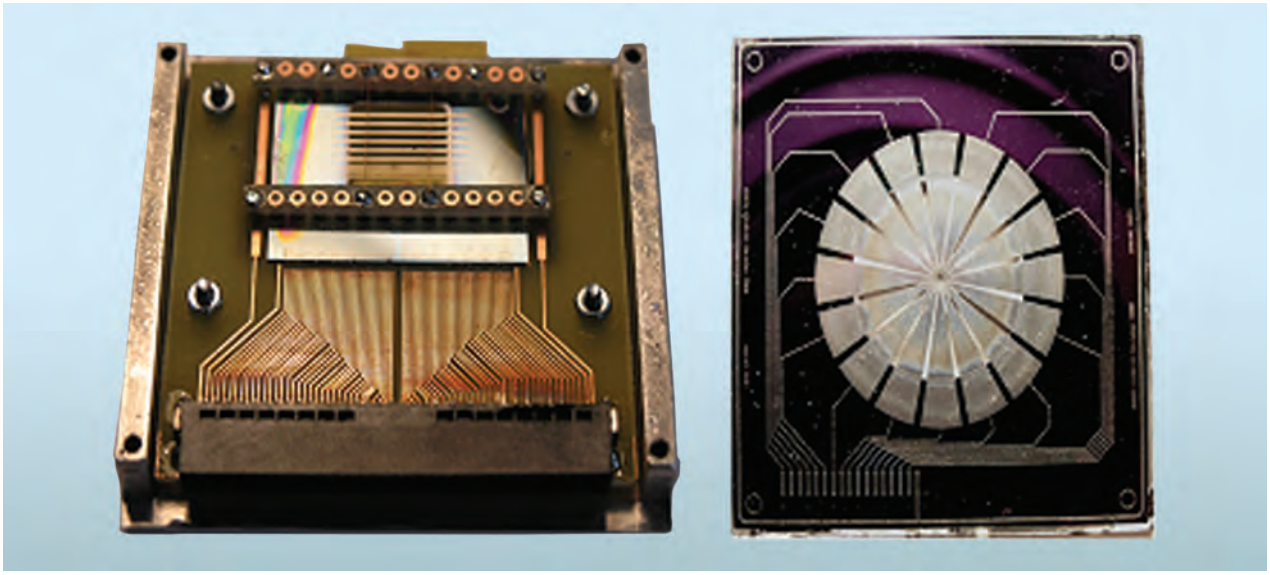
METALLIC MICROSTRIP RADIATION DETECTORS

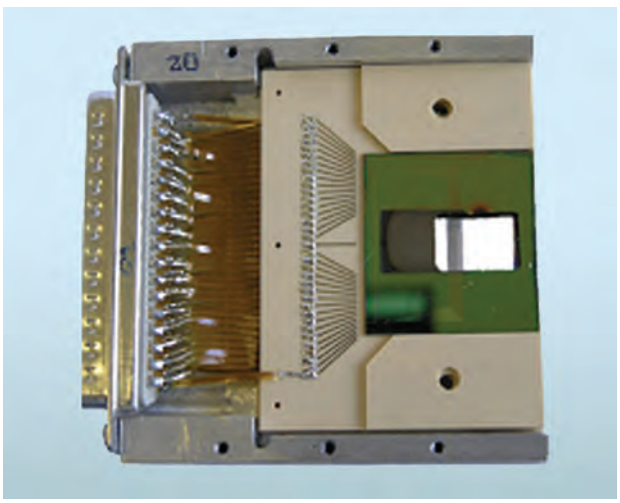


Areas of Application

It can be used in medicine (radiation therapy), research equipment based on accelerators and synchrotrons, mass spectrometry, X-ray diffraction, and so on

Specification

Radiation resistance is 100 GGy; spatial resolution is several microns; transparency: thickness is about 1 micron. A series of metallic microstrip detectors has been designed: 16-sector detectors, detectors with variable pitch (32 strips, 8 groups), detectors with 128, 256, and 1024 strips of different thickness and pitch, and other types



Advantages

There are no analogs. The detectors are transparent to radiation

Stage of Development. Suggestions for Commercialization

IRL6, TRL6
Manufactured and supplied, upon request

IPR Protection

IPR1

Contact Information

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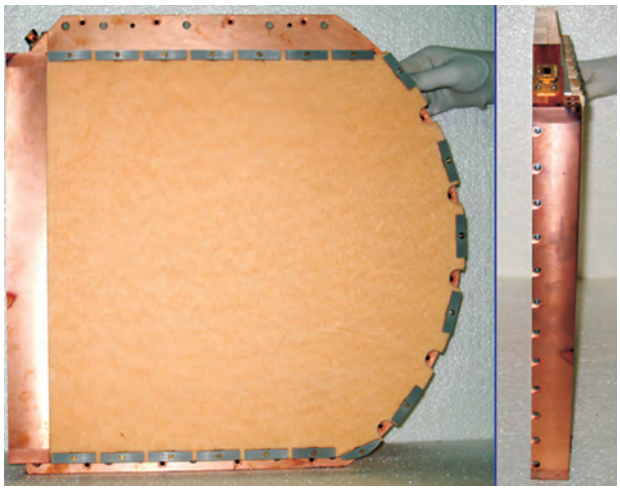
MM-WAVE DIFFRACTION ANTENNAS



W-band diffraction antenna for passive multi-beam imaging systems

Areas of Application

The antennas are to be used in radiometric systems for detecting various objects hidden behind opaque obstacles, in radar systems, and in mobile communication systems

Specification

Antenna gain factor is over 40dB, beam width in a given plane reaches several fractions of degree, the level of the broadside radiation is less than –20 dB, total losses are less than –3dB

Diffraction antenna for radar systems

Advantages

Unlike the existing analogs, antenna beam is scanned at a fixed position of the antenna. The antenna height does not exceed ten wavelengths. Weight is less than 4.0 g/cm^2 aperture. The multi-beam antenna version with frequency scanning has only one output. The antenna is easily adaptable to streamlined manufacture and has a low manufacturing cost

Diffraction omni-antenna for mobile communication systems

Stage of Development. Suggestions for Commercialization

IRL6, TRL5
Design and manufacture of product samples for launching commercial production. Trial products can be introduced to markets

IPR Protection

IPR3

Contact Information

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MULTI-ELEMENT DETECTORS OF SUB-THz RADIATION

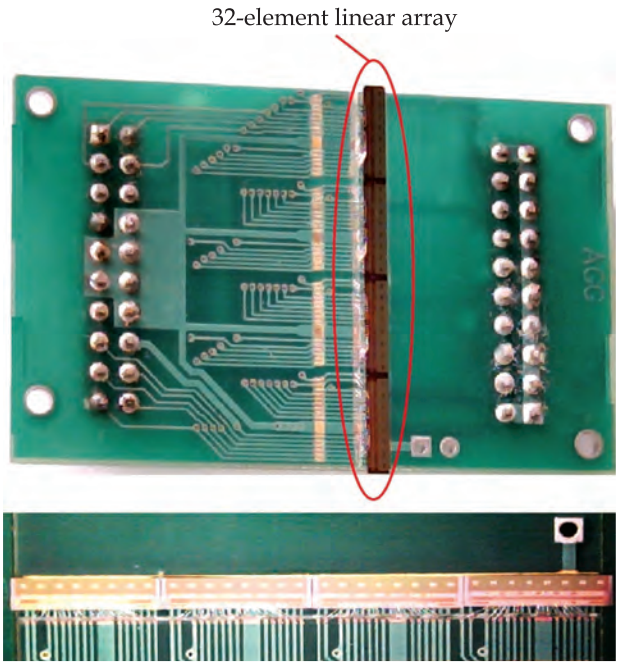
Areas of Application

The device is to be used in security systems of postal items, railway and subway stations, airport terminals for inspecting the content of packages/containers that are transparent in the sub-THz spectral region (paper, plastic, foamed plastic, gypsum plasterboard, dry wood, and footwear soles, etc.)

Specification

Format of detectors: linear array of 32 or 80 pixels; can be designed based on customer requirements (linear or matrix array).

External sub-THz radiation source needed, mW	~25
Radiation frequency region, GHz	35—300
Line scanning frequency, Hz	200
Dynamical range, dB	≥40



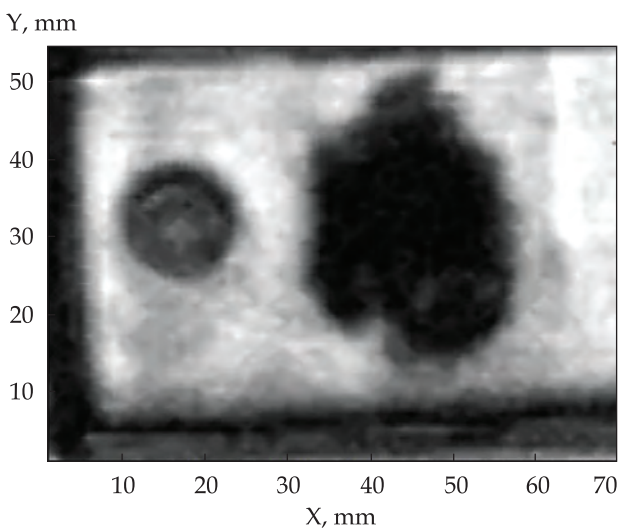


Image of items in plastic foam container at a radiation frequency ν = 140 GHz

Advantages

There are no analogs in Ukraine.
The devices are cheaper as compared with the foreign counterparts

Stage of Development. Suggestions for Commercialization

IRL4, TRL3
Sample manufacture, upon request

IPR Protection

IPR1, IPR2

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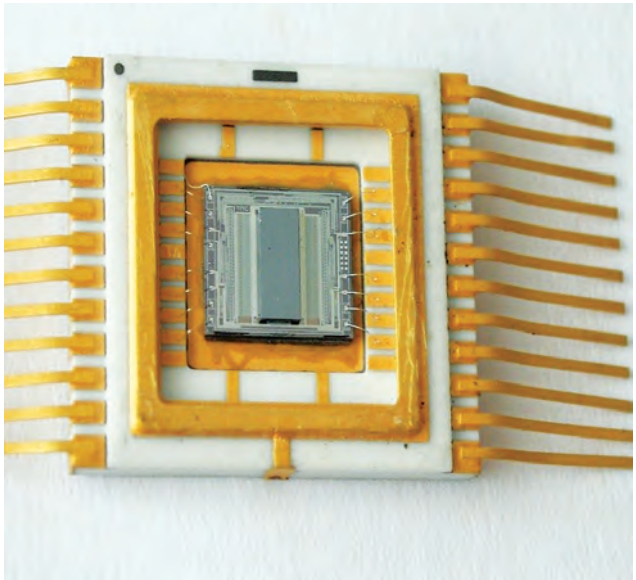
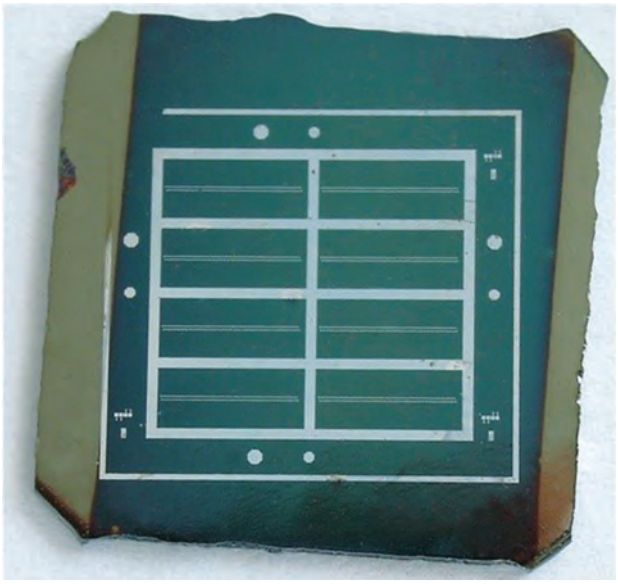
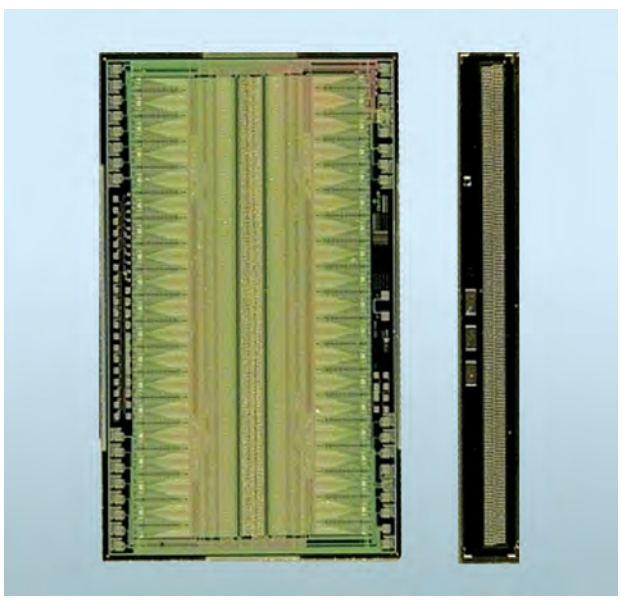
MULTI-ELEMENT INFRARED DETECTORS







Samples of multi-element infrared detectors for 3–5 μm and 8–12 μm spectral regions

Areas of Application

The IR detectors are to be used in systems for detection, tracking, and discrimination of objects, as well as in monitoring and security systems in metallurgy, power engineering, and defense industry

Specification

Spectral range, μm	3—5, 8—12
Detector's format	6
Operating temperature, K	≤80
Detectability D^*_λ:	
3—5 μm	$\geq 5 \cdot 10^{10}$ cm · $Hz^{1/2} \cdot W^{-1}$
8—12 μm	$\geq 3 \cdot 10^{10}$ cm · $Hz^{1/2} \cdot W^{-1}$

Advantages

There are no analogs in Ukraine

Stage of Development. Suggestions for Commercialization

IRL3, TRL3
Sample manufacture, upon request

IPR Protection

IPR1, IPR2

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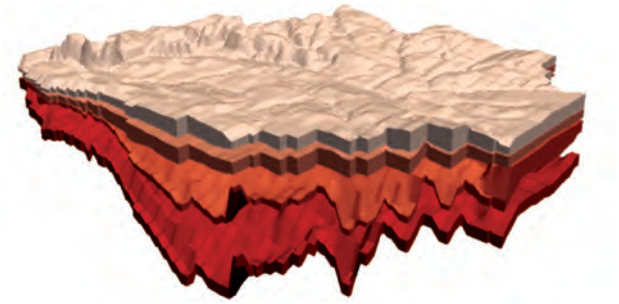
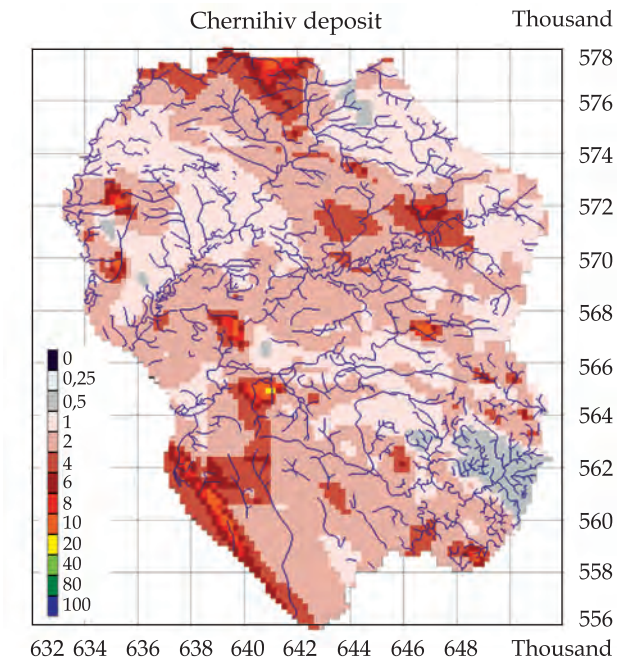
NADRA-3D SOFTWARE PACKAGE

Areas of Application

The software package is to be used in civil engineering, geotechnical, and geological surveys to forecast dynamic processes in hydraulic and industrial structures, embankment slopes, and soil bodies under the impact of intensive construction activities, underground and mining operations, fluid motion, and heat conduction phenomena





Nadra-3D grid computational domain

Specification

The software is based on algorithms using high-performance graphic processors that support CUDA technology; the number of computational grid nodes reaches 10^7; operates both on personal computers and multiprocessor supercomputers; runtime environment is Windows or Linux operating system

Stage of Development. Suggestions for Commercialization

IRL4, TRL4
Creation of commercial versions and development of customized *Nadra-3D* subsystems, upon request

IPR Protection

IPR2

Advantages

Original mathematical models with discontinuous solutions to reflect the influence of cracks and thin inclusions having significantly different physical properties. Depending on hardware parameters and configuration, the software enables to accelerate computations up to 10 times as compared with competitors

Contact Information

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NANOPLASMON PORTABLE SPECTROMETER

Areas of Application

The device is to be used for implementation of real-time bio- and chemosensing techniques in laboratory conditions; spectral investigation of nanosized objects; study of organic and inorganic thin films; and for measurement of refractive index

Advantages

There are no analogs in Ukraine. The device uses localized surface plasmon resonance phenomenon; enables studying nanostructures and molecules of different types using both photometric cuvettes and substrates of variable geometry; enables light polarization control; has a semi-automatic loading of liquid samples; can use both built-in and external spectrometer

Specification

Refractive index measurement range	>1.0
Refractive index sensitivity	0.0005
Wavelength maximum detection accuracy, nm	0.02
Maximum wavelength scan range, nm	400—900
Number of optical channels	1
Overall dimensions, mm	200×250×100
Weight, kg	3
Compatibility	USB, Windows XP/ Vista/7/8/10

Stage of Development. Suggestions for Commercialization

IRL3, TRL4
Manufacture, delivery, warranty service, and staff training, upon request

IPR Protection

IPR1, IPR2

Contact Information

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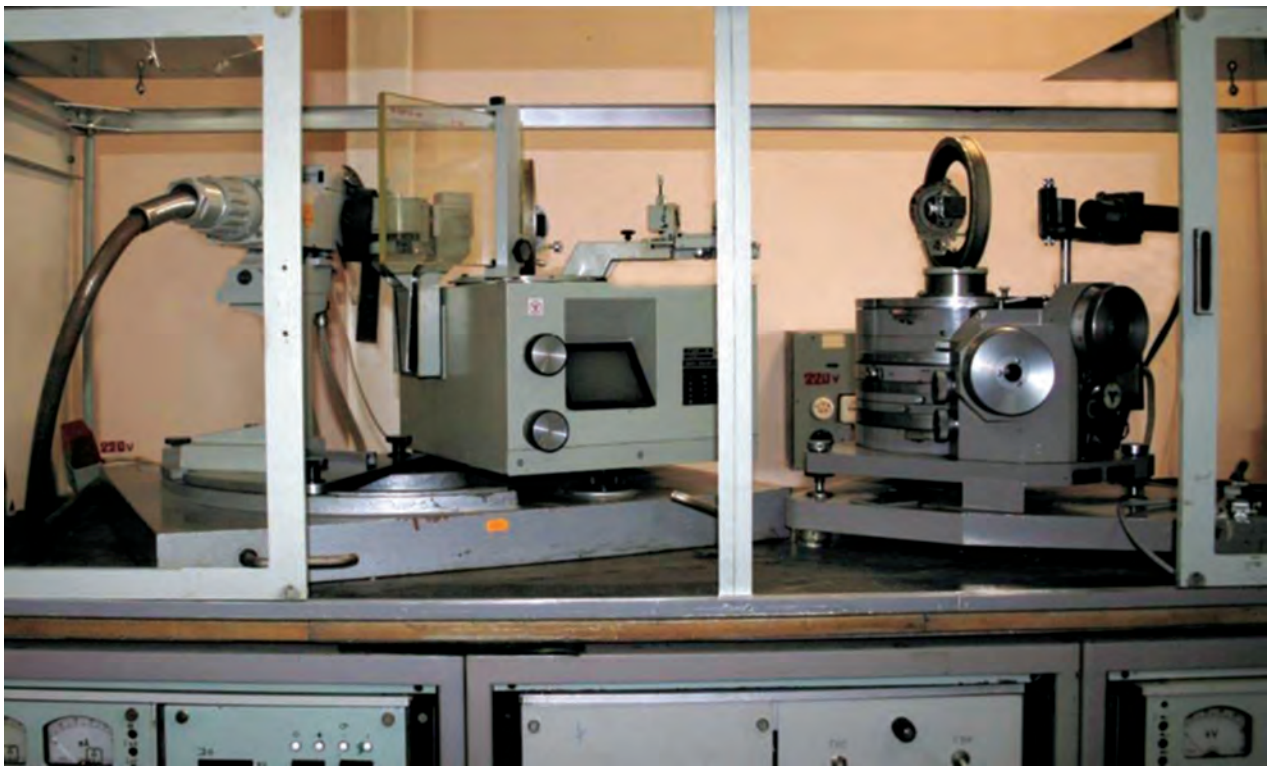
NONDESTRUCTIVE METHOD FOR SELECTIVE IN-DEPTH LAYER DIAGNOSIS OF DEFECTS



Device for nondestructive diagnosis of several types of single crystal defects

Areas of Application

Research equipment engineering, nanoindustry, and microelectronics

Specification

Sensitivity to defects (by concentration or volume share) is 10^{-8}—10^{-6}

Advantages

The method enables diagnosis without damaging the research object; an increase in sensitivity to the structural defects by 4—6 orders of magnitude; simultaneous determination of many structural parameters; layer-by-layer determination of structure with a nanosize pitch; identification of structural changes as a result of rapid-going processes; use of simplified techniques

Stage of Development. Suggestions for Commercialization

IRL3, TRL3
Vending of patent under license agreement

IPR Protection

IPR2

Contact Information

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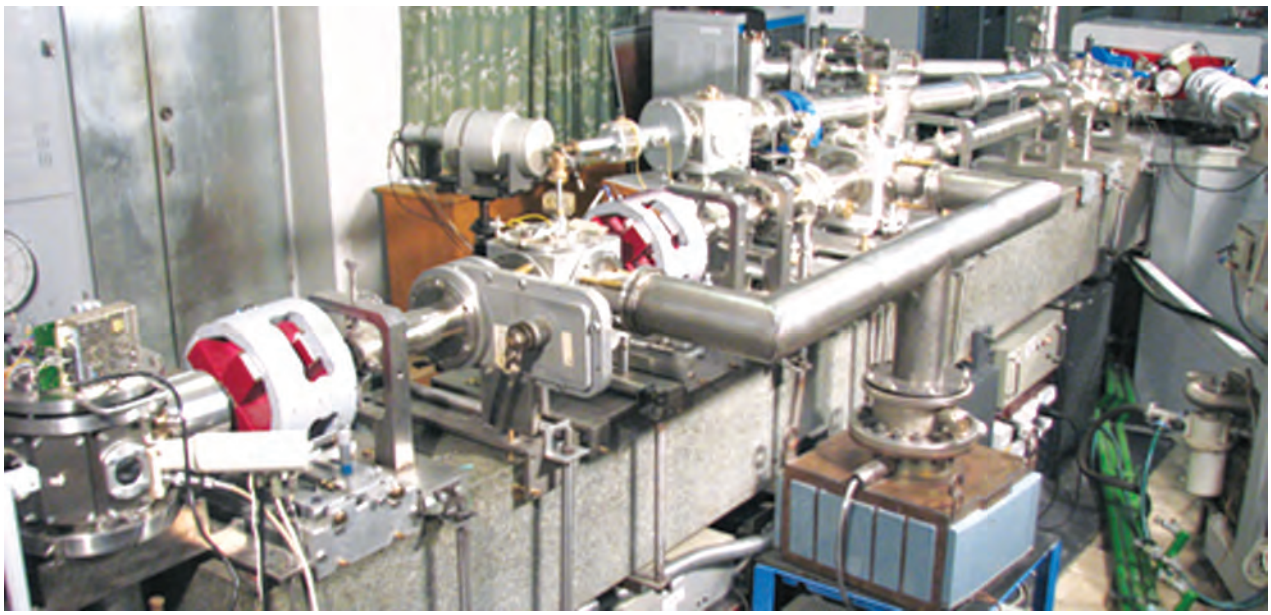
NUCLEAR SCANNING MICROPROBE



Areas of Application

The nuclear scanning microprobe is a high-precision microanalyzer for elemental analysis of materials ranging from hydrogen to uranium with a detection threshold of 1…100 ppm (depending on element and technique).
The use of scanning mode enables to map element distribution in the near-surface layers at a depth of 10–20 μm with a resolution of 2 μm. The analytical technique for element analysis is qualitative and absolute, does not require any reference samples

Specification

Spatial resolution in microanalytical mode, μm	0.6—2
Sort of beam ions	H^+, He^+
Beam energy, MeV	0.2—1.7
Scanning raster, μm	500
Analytical techniques applied:	
characteristic X-ray radiation, detection threshold, ppm:	1—10
Rutherford backscattering	
detection threshold, ppm	100
depth resolution, nm	10

Advantages

The nuclear scanning microprobe employs the distributed probe-forming system based on precision magnet quadrupole lenses using a distributed "Russian quadruplet" where the lenses are coupled in integrated doublets made of single piece of soft magnetic material. These doublets are unique and have no counterparts in the world; the probe has a higher resolution as compared with commercial samples

Stage of Development. Suggestions for Commercialization

IRL6, TRL4
Sample manufacture, adjustment, and maintenance, upon request

IPR Protection

IPR3

Contact Information

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OPTICAL DEVICE FOR ACTIVE REMOTE SENSING OF HAZARDOUS CHEMICAL AND BIOLOGICAL AGENTS

Areas of Application

This device can be installed on unmanned aerial vehicle (UAV) for detection and identification of biological and chemical agents, various toxins and viruses; for gaging of soil contamination and air pollution. Measurement results can be used for detection of hazardous situations and for risk assessment

Specification

Grid-type hyperspectrometer;
sensor (detectors): CMOS or CCD camera;
sources of radiation: laser diode.

Spectral range, μm	0.45—1.1
Wavelength resolution, nm	1—2
ADC bit capacity, bits	14

Advantages

Similar systems have been developed in US for NATO. There are no analogs in Ukraine. The device uses optical and laser radiation reflected from vegetation to improve identification of dangerous biological and chemical agents. The use of a group of interacting UAVs enhances the identification of hazardous components

Stage of Development. Suggestions for Commercialization

IRL3, TRL3
Manufacture, delivery, warranty service, and staff training, upon request

IPR Protection

IPR3

Contact Information

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PHOTON-3 PORTABLE DEVICE FOR MEASURING THE SOLAR CELL AND PHOTOVOLTAIC MODULE PARAMETERS

Areas of Application

The device is designed to measure the parameters of solar cells and photovoltaic modules with a power up to 200 W in standard spectral conditions (AM0, AM1.5) using solar or artificial illumination

Advantages

There are no analogs in Ukraine. In comparison with the existing world counterparts the device can display measurement and calculation results on the built-in LCD screen; is able to operate both independently and with external computer connected via USB

Specification

Voltage measurement ranges, V	0—10, 0—20, 0—50
Current measurement ranges, A	0—0.25, 0—1, 0—8
Measurement duration, s	≤4
Dimensions, mm	250×160×90
Relative errors of measurement results, %:	
current	<±1.5
voltage	<±0.3
maximum electric power	<±2.0
efficiency	<5.0

Stage of Development. Suggestions for Commercialization

IRL6, TRL5
Manufactured upon request

IPR Protection

IPR1

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PLASMON-POLARITON PHOTODETECTOR (PPP)

Areas of Application

The device is to be used for measuring light incidence angle, polarization or wavelength; for recording changes in the near-surface area of photodetector as a basis for design of highly sensitive detectors of plasmon-polariton type; in optical laboratories, medicine, biology, and environmental protection

Specification

Parameters	Specification of devices based on	
	GaAs	Si
Plasmon-active metal	Au	
Operating wavelength λ, nm	600–830	600–1000
Maximum polarization sensitivity (λ = 750 nm), $I_p/I_{s:}$	6:1	3:1
Angular half-width of resonance maximum, ΔΘ	4.5°	
Photosensitivity at resonance maximum, A/W	0.12	

Advantages

There are no analogs in Ukraine. Unlike the world counterparts, it has a flat interface between gold and semiconductor, which enhances resonance twice, reduces surface recombination and dark currents. The PPP has a simpler design, good resonance properties, and smaller dimensions as compared with the prism systems for excitation and registration of surface plasmon resonance (SPR). One element is used for SPR excitation and its registration

Stage of Development. Suggestions for Commercialization

IRL5, TRL4
Manufactured upon request

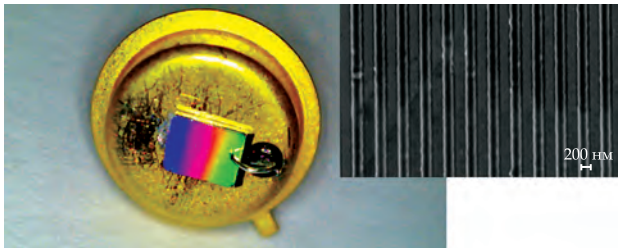
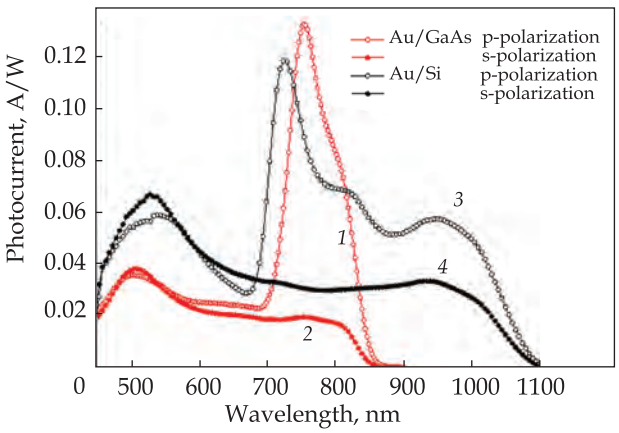
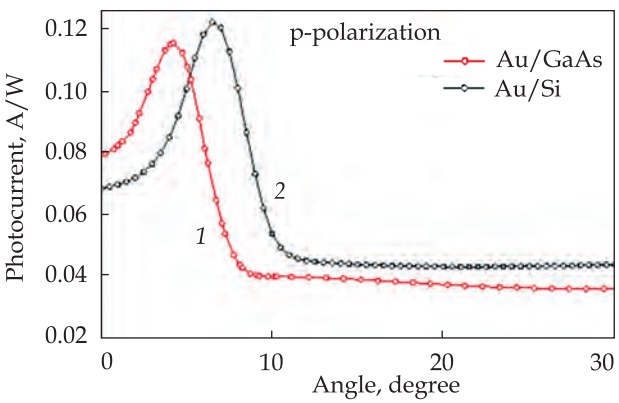


Photo and SEM image of the surface of Au/GaAs plasmon-polariton photodetector having a microrelief of diffraction grating with a period of 750 nm



Spectral characteristics of photocurrent of plasmon-polariton photodetectors based on Au/GaAs (1,2) and on Au/Si (3,4) for p-(1,3) and s-(2,4) polarized light



Angle dependence of photocurrent of plasmon-polariton photodetectors based on Au/GaAs (1) and Au/Si (2) for p-polarized light

IPR Protection

IPR1, IPR3

Contact Information

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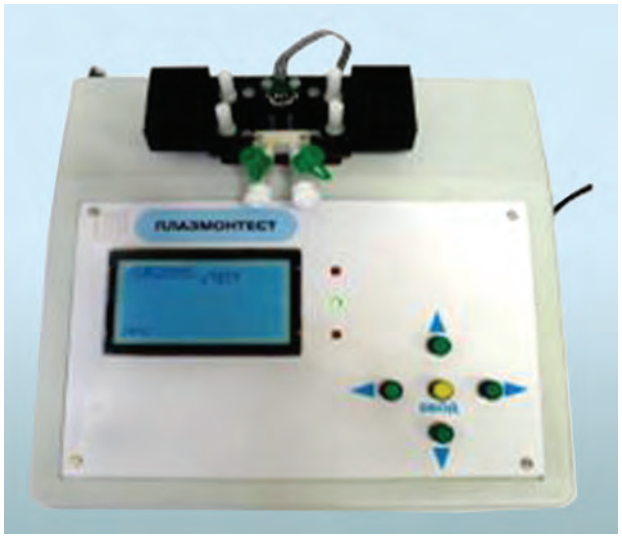
PLASMONTEST DEVICE



Areas of Application

The device is to be used in medical and veterinary institutions for rapid diagnostics, food quality control, environment monitoring, and analytical measurements (registration of specific interaction of analyte (sample) molecules with selective layer deposited on the surface of sensor substrate). The device can be used as SPR sensor with gold layer substrates and as waveguide sensor with various sensor substrates

Advantages

Unlike the domestic and foreign competitors, the Plasmontest device is portable, 1.5–2 times cheaper, can be used both in stationary and in field conditions. The double-channel modification with a reference channel increases accuracy and compensates temperature instability

Specification

There are single- and double-channel modifications.

Service life, years	10
Range of refraction index	1.33 – 1.38
Divergence angle range, degree	±3...±10
Absolute measurement error, degree	$1 \cdot 10^{-3}$
Minimum time between measurements, s	0.5
Stabilization of measuring cell temperature, °C	±0.1

Stage of Development. Suggestions for Commercialization

IRL5, TRL5
Manufacture of small batches, delivery, warranty maintenance, and staff training upon request

IPR Protection

IPR3

Contact Information

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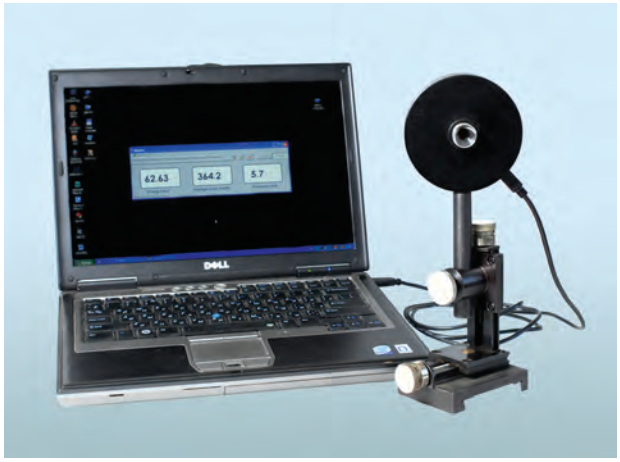
PYROELECTRIC USB METER OF LASER PULSE ENERGY

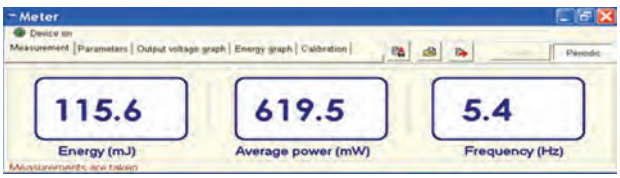
Areas of Application

The device is to be used for measuring energy and time parameters of laser radiation in R&D centers, industry, and medicine



Specification

Two types of laser energy meters are proposed: the energy meter with a thin sensitive element of absorptive type (VEP-1) and the energy meter with a transparent sensitive element for high energies measurements (VEP-9P); the measurements are made without interruption of process operations



Data display on a PC monitor

Основні параметри вимірювачів

	VEP-1	VEP-9P
Wavelength range, μm	0.2—12.0	0.35—4.5
Energy range, J	$1 \cdot 10^{-6}$—$2.5 \cdot 10^{-3}$	$2.5 \cdot 10^{-3}$—$5 \cdot 10^{-1}$
Energy resolution, J	10^{-7}	10^{-4}
Max energy density, J/cm^2	$1.5 \cdot 10^{-2}$	2.5
Max pulse duration, ns	0.1—100	

Advantages

The compact pyroelectric meter of laser pulse energy and average power does not yield to the world leading counterparts. Its software enables data registration on PC via USB interface, without adapters

Stage of Development. Suggestions for Commercialization

IRL3, TRL4
Manufacture and warranty service, upon request; investors and corporations for commercial production are invited

IPR Protection

IPR3, IPR4

Contact Information

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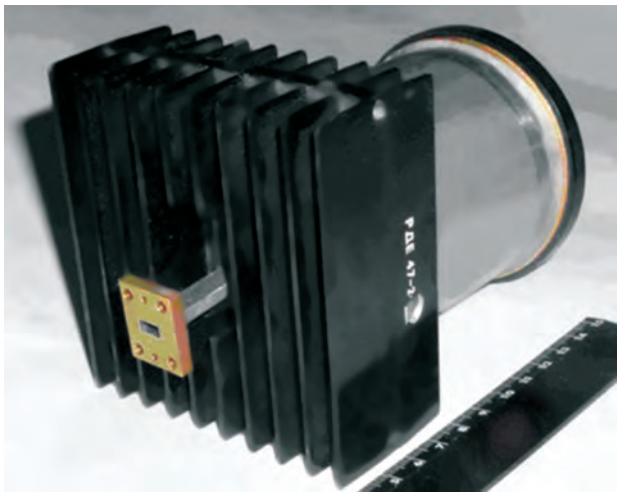
QUASI-OPTICAL SOLID GENERATORS (QSGs)



Appearance of 8-mm QSG

Advantages

Unlike the waveguide analogs, the QSGs have an open spherical oscillatory system. The QSGs are designed for fixed frequencies. The frequency is mechanically adjustable to 0.5 GHz. The generators do not require forced cooling. The QSG frequency instability for 1 s does not exceed 10^{-8}, which is, at least, several ten times better than that of waveguide generators. This improved long-term frequency stability is achieved due to the use of high Q-factor quasi-optical resonators and sealed temperature-stabilized chambers filled with inert gas

Areas of Application

Research, spectroscopy, microwave technology, low-noise heterodynes and generators for pumps of parametric amplifiers in radars and radio navigation

Specification

Device type	Diode type	Frequency, GHz	Power, mW
GKG-8	Gunn diode (GD) AsGa	30—40	110
GKG-3	GD InP	80—86	10
GKL-8	Impact avalanche and transit-time diode (IMPATT diode)	33—42	180
GKL-5	IMPATT diode	53—62	60
GKG-8E	GD AsGa	37.5	110
GKL-3	IMPATT diode	93—96	15
GKL-3A	IMPATT diode	115	15
GKL-1	IMPATT diode (second harmonic)	~300	~2

Stage of Development. Suggestions for Commercialization

IRL3, TRL5
The devices are ready for manufacture

IPR Protection

IPR3

Contact Information

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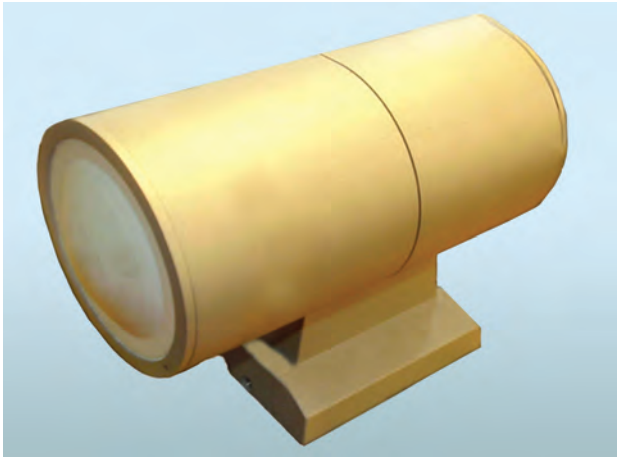
RADAR SENSOR FOR REMOTE CONTROL OF TRACK OCCUPANCY AND MEASUREMENT OF RAILWAY CAR SPEED

Areas of Application

The sensor is used for remote control of track occupancy and railway car speed on hump yards in complicated weather conditions and for protection of railway crossings to reduce the risk of accidents



Specification

The sensors are equipped with systems for remote control and transmission of radar data and service information to the control point.

Operating frequency, GHz	36.5
Max. range in the distance control mode, m	30
Max. range in the Doppler radar mode, m	50
Distance resolution, m	1
Speed detection range, km/h	0.5—35
Weight, kg	0.7
Dimensions (diameter/length), mm	92/170
Power consumption	12V/0.5A

Advantages

As compared with the counterparts, these sensors can perform various control functions. The sensors are able to operate in unfavorable meteorological conditions (snow, rain, and fog) and insusceptible to frosting

IPR Protection

IPR1, IPR2

Stage of Development. Suggestions for Commercialization

IRL6, TRL6
Manufacture, delivery, warranty service, and staff training, upon request

Contact Information

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RADIOTELEMETERING SYSTEM FOR ACOUSTIC EMISSION MONITORING

Areas of Application

The system is to be used for monitoring and diagnosis of long-term operating equipment and high-risk site facilities, identification of their technical condition and detection of damages location by sampling, recording, and processing acoustic emission signals and signal data on working parameters of studied object

Advantages

The portable system is operable in field conditions and hard-to-reach places;
its friendly software interface and helpdesk enable to quickly master operation skills;
independent power supply makes it possible to operate it in the places where there are no power grids

Specification

Gain, dB	35
Maximum gain of logarithmic amplifier, dB	92
AE signal sampling frequency, MHz	0.5
Number of bits of AE channel	8
Error of measurement of time of AE signal arrival, μs	4
ASPP data package size, bytes	1024
Time of 4 ASPP data package transfer, s	2
Time interval of AE information sampling from ASPP, s	≤2
Time of ASPP uninterrupted operation, hours	12

Stage of Development. Suggestions for Commercialization

IRL7, TRL8
Manufacture, delivery, warranty service, and staff training, upon request

IPR Protection

IPR2, IPR3

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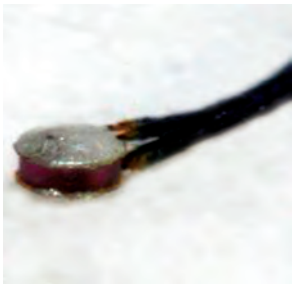
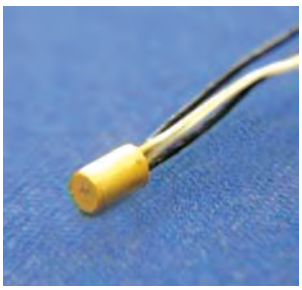
RESISTANCE THERMOMETERS AND DIODE TEMPERATURE SENSORS

Areas of Application

The resistance thermometers and diode sensors are to be used in static and dynamic temperature measurements in cryogenic liquefiers and storage tanks, in devices for magnetic resonance imaging and diagnostics of superconducting magnet systems, in space and rocket industry, cryogenic medicine, research laboratories, and universities



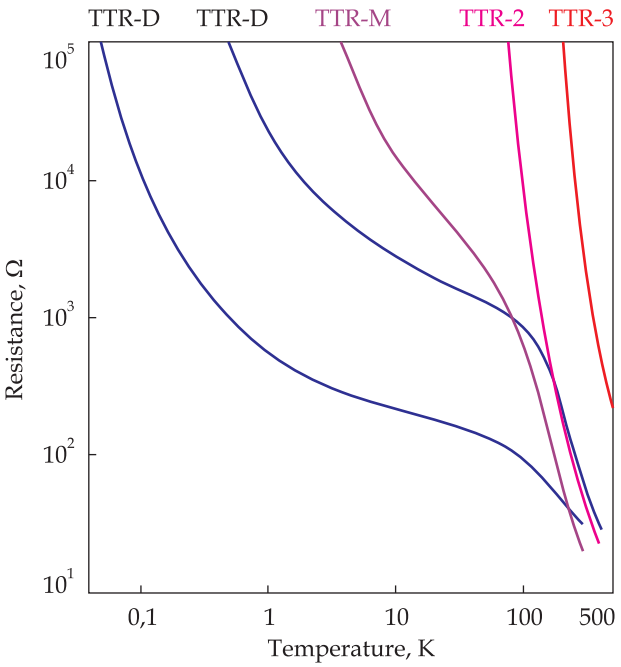
Micropackage (MP version)



Cylindrical package (CP version)

Specification

Operating temperature range: 0.03—500 K (resistance thermometers) and 1.5—450 K (diode sensors). Types of sensor packages: cylindrical package (3 mm in diameter and 5.0 mm long), CP package; micropackage (1.2 mm in diameter and 1.0 mm long), MP package; micropackage on plate, MPP package. Thermal response time: <1 ms at 4.2 K (MP package)



Typical resistance temperature dependences of various thermometers

Advantages

There are no analogs in Ukraine.
As compared with the world counterparts: the smallest cryogenic temperature sensor in the world (MP package); wider operating temperature range; higher sensitivity; excellent interchangeability for diode sensors.
The devices comply with the standard calibration curve with a high accuracy; the resistance thermometers have small temperature reading errors in magnetic fields; notable for a high radiation tolerance and a fast response to temperature changes

IPR Protection

IPR1, IPR2, IPR3

Stage of Development. Suggestions for Commercialization

IRL7, TRL7
Manufactured upon request

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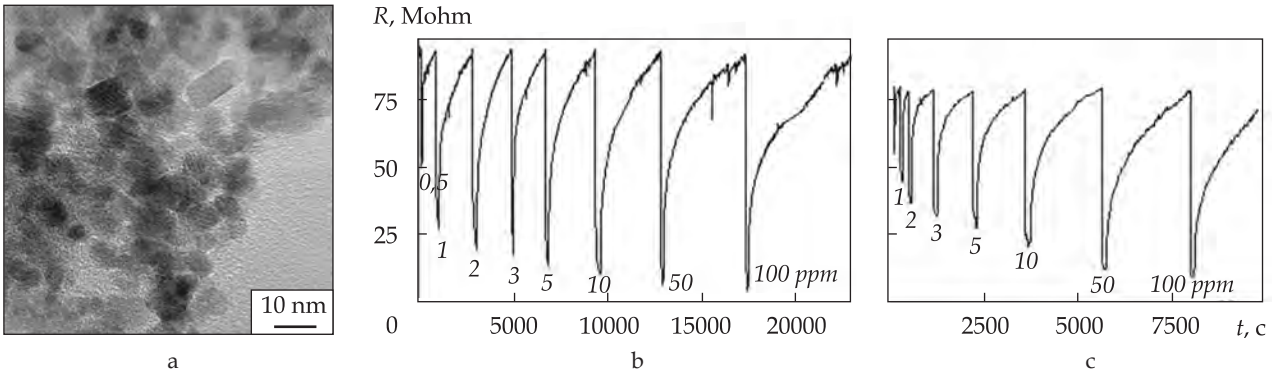
SENSOR MATERIAL RESPONSIVE TO ETHANOL AND ACETONE VAPORS



a b c

TEM image of SnO_2/Pd, Pt powder (a) and dynamic response of its film to ethanol (b) and acetone (c) vapors. Vapor concentration is given in ppm

Areas of Application

The material is to be used in gas sensitive elements of chemical sensors for measuring concentration of organic compound vapors in the air

Specification

The material consists of doped SnO_2 crystalline powder with a particle size of 10÷30 nm. The sensor elements are made using the thick films technology.

Sensitive to ethanol and acetone in the air at concentration, ppm	0.5—100
Temperature range, °C	≥200
Response time of sensor model signal (depending on gas concentration), s	10—20
Time of return to the original settings after measurement, min	5—10

IPR Protection

IPR3

Advantages

The stability of material properties is explained by its unique physical and chemical composition that is a result of using the patented synthesis method in which SnO_2 nanoparticles are formed and crystallize rapidly and simultaneously at a low temperature. For comparison, commercial SnO_2 is obtained in the amorphous state, using a long-term heat treatment at 600÷700 °C, which impairs the sensory properties of the material

Stage of Development. Suggestions for Commercialization

IRL3, TRL3
Upon request, sensor material samples are produced, information on particle size, element and phase composition, crystal structure, and technical parameters measured by model sensors of organic compound vapors in the air are provided

Contact Information

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SENSORY DEVICE BASED ON SURFACE PLASMON RESONANCE PHENOMENON

Areas of Application

The device is to be used for carrying out real-time biokinetic, immunosensing, and biosensing measurements; studying nanoobjects like nanoparticles or nanotubes; studying adsorption, corrosion, and electrochemical reactions; measuring refractive index of organic and inorganic films; detecting gas and liquid composition; realizing chemosensor applications; and controlling motor oil quality and wear of meeting parts

Specification

Number of channels	2
Refractive index measurement range	1.0—1.45
Refractive index sensitivity	0.00005
Maximum time resolution of kinetics measurements, s	
Tracing measurement mode	2
Slope measurement mode	0.2
Angle-of-incidence precision, angular s	5
GaAs semiconductor laser as light source	650 nm, 2—3 mW
Overall dimensions of the measurement unit, mm	215×130×100
Weight, kg	2.5

Advantages

The device has no counterparts in Ukraine. It requires low doses of substances to be tested (in ml), is compact and cheaper than foreign analogs

Stage of Development. Suggestions for Commercialization

IRL3, TRL4
Manufacture, delivery, warranty service, and staff training, upon request

IPR Protection

IPR3

Contact Information

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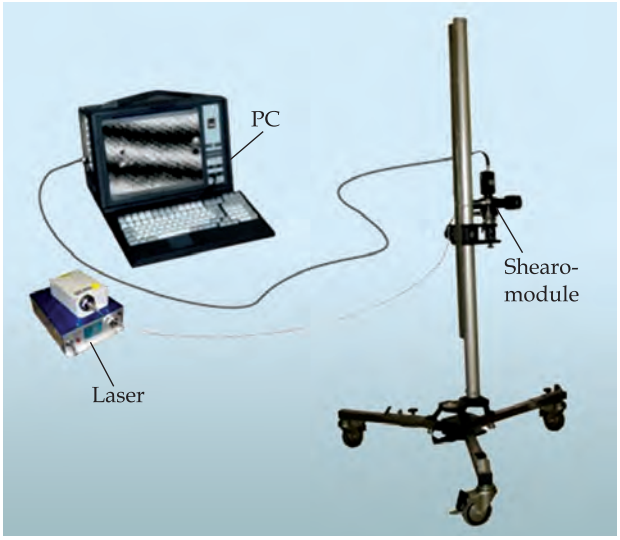
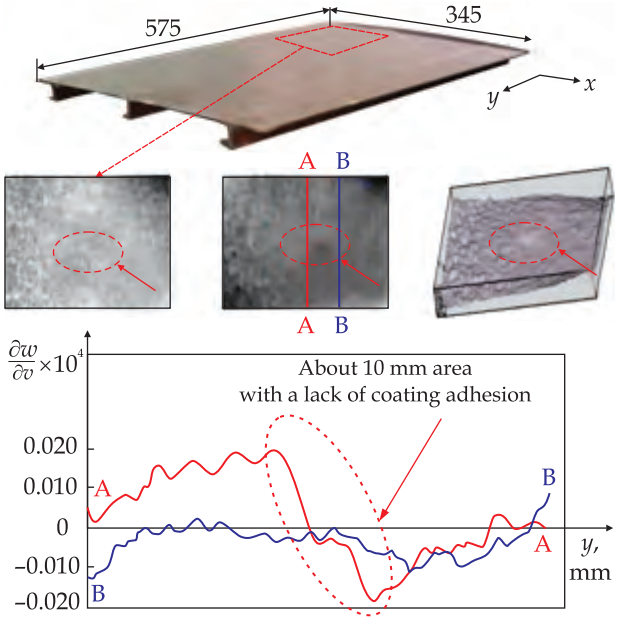
SHEAROGRAPHIC TECHNOLOGY FOR DETECTING DEFECTS IN PROTECTIVE COATINGS





Quality control of full-scale composite rib-stiffened panel coated with protective paint and lacquer

Areas of Application

The technology enables to detect defects in flat samples, elements of full-scale structures, and sophisticatedly configured nodes in a nondestructive way; to control quality of structures with ceramic and metallic coatings; to optimize technologies for application of coatings; and to improve operability and reliability of coated structure elements

Specification

Wavelength, nm	635
Field of view, height × width, mm	250×350
Control time, s	10

Advantages

The technology is nondestructive and contactless, does not require any vibration insulation; enables real-time control; ensures highly effective control of objects and rapid tests; adjustable sensitivity of equipment by varying shear value; identification of stress concentrations; direct quality assessment of the object state in industrial conditions; uninterrupted recording of research results

Stage of Development. Suggestions for Commercialization

IRL4, TRL4
Manufacture and delivery of equipment; customization of technology; staff training, upon request

IPR Protection

IPR1

Contact Information

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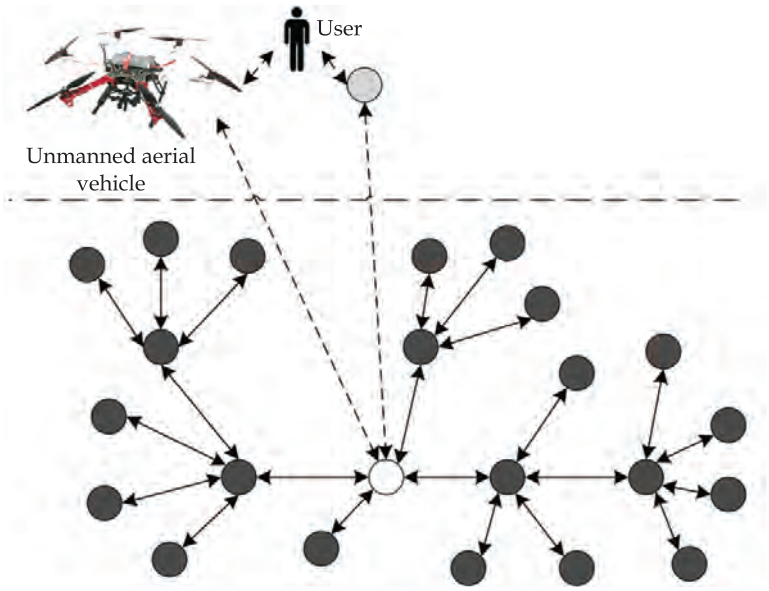
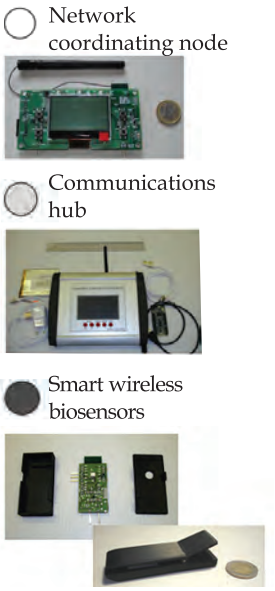
SMART WIRELESS SENSOR NETWORKS FOR AGRICULTURE, MEDICINE, AND ENVIRONMENT MONITORING



Wireless sensor network structure



Areas of Application

The sensor networks are designed to acquire data on the state of biological objects (plants, animals, and humans) from sets of sensors with wireless transmitters, which form a wireless network that can cover a large territory.
It enables to quickly provide emergency medical aid to people injured in accident or ecological catastrophe who bear smart wireless sensors embedded in their clothes; also this can be used in smart agriculture to timely take measures for saving crops or protecting plants from influence of stress factors of natural or anthropogenic origin

Specification

The number of nodes ranges from several to several hundreds; distance between the nodes is about 150 meters in conditions of obstacles; the network enables to connect variable sets of sensors; the sensors are resistant to climate influence

Stage of Development. Suggestions for Commercialization

IRL6, TRL6
Manufacture, delivery, warranty maintenance, and staff training, upon request

Advantages

Availability of smart sensor sets for various applications, comparatively low cost

IPR Protection

IPR3

Contact Information

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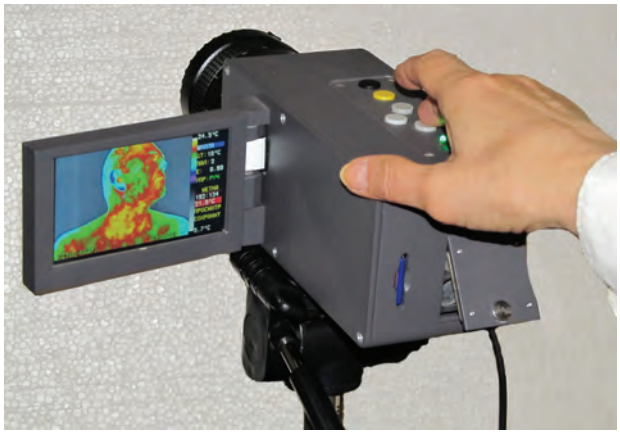
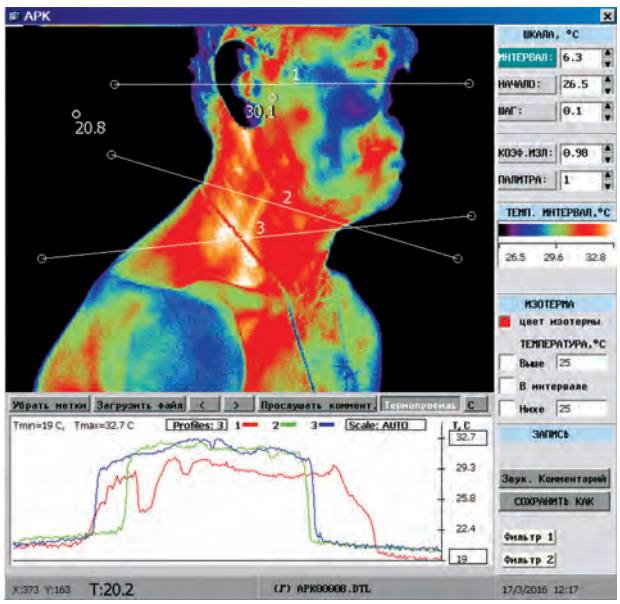
THERMAL FIELD ANALYZER (INFRARED IMAGER)



The analyzer external view



User interface

Areas of Application

The analyzer is designed to receive, to record, and to quantitatively analyze the infrared images of various objects in power engineering, construction, industry, medicine, defense industry, science, agriculture, ecology, etc.

Specification

Detector	Microbolometer FPA
Number of elements*	384 × 288
Spectral range, μm	8—14
Operating temperature, K	300
Spatial resolution*, mrad.	1.0
Temperature sensitivity* at 30 °C, °C	0.07
Frame rate*, Hz	25
Field of view*, deg	18 H × 22 V
Measured temperature range*, °C	–20…+300

* The parameters can vary depending on the task

Advantages

There are no Ukrainian analogs. The analyzer advantages over the foreign analogues (commercial imagers with similar technical specifications) are its low cost and original modular design, and software that enables adjusting the device parameters and functions depending on specific purpose of thermal analysis and creating a common interface with other equipment, etc.

Stage of Development. Suggestions for Commercialization

IRL7, TRL6
Manufacture, supply, warranty service, and staff training upon request

IPR Protection

IPR1, IPR2

Contact Information

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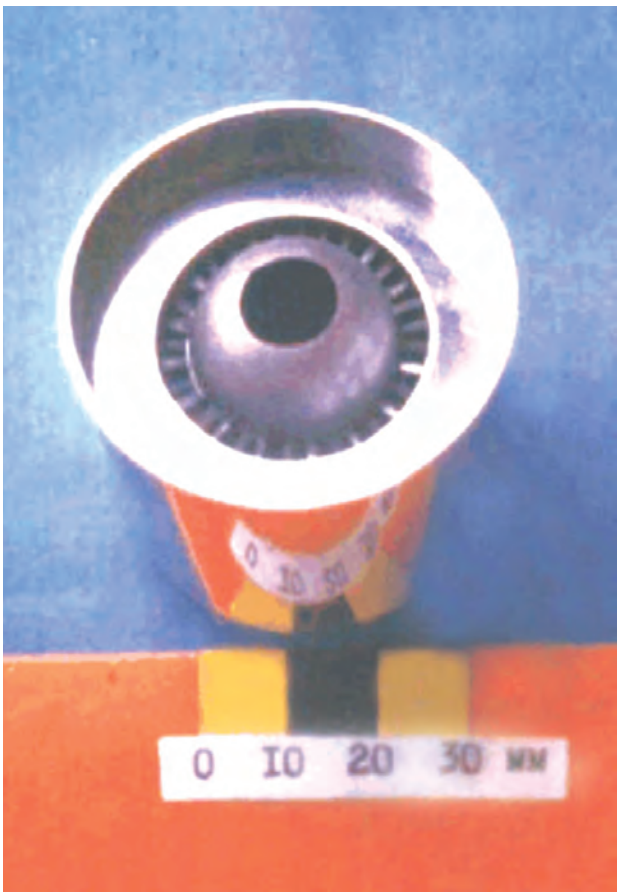
THERMOELECTRIC PYRHELIOMETER

Areas of Application

Designed to measure direct solar irradiance with the highest accuracy using the absolute method. It can be used for measuring the solar constant both ground based and in space conditions (as part of meteorological satellites or space stations) and as a metrological means for ensuring the accuracy of measurements of short- and long-wave parts of the solar spectrum, scattered solar radiation, etc.



Specification

Basic error of measurement within the range of 80–2500 W/m², %	±0.1
Reproducibility of measurement results at the level of solar constant, %	±0.04
Time constant, s	1
Time for reading the measurement result with an accuracy of up to 0.05% amplitude, s	–10
External dimensions of pyrheliometer (without mounting spots):	
diameter, mm	120
height (without aperture pipe), mm	110
height (with aperture pipe), mm	300
Total weight, kg	2.8

Advantages

Higher accuracy of measurements as compared with known counterparts

IPR Protection

IPR3

Stage of Development. Suggestions for Commercialization

IRL6, TRL6
Manufactured and supplied, upon request

Contact Information

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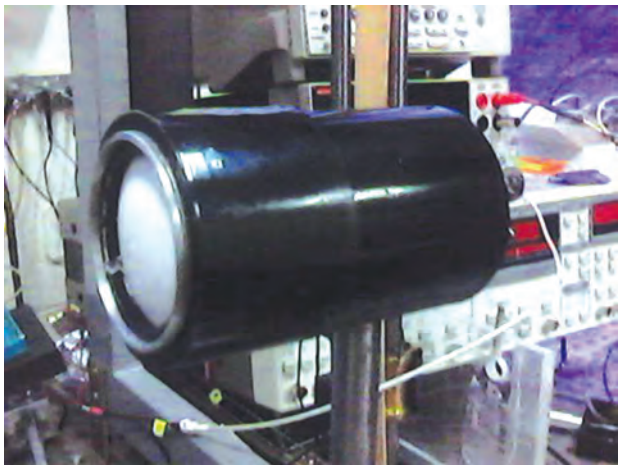
THz/SubTHz RADIATION DETECTOR



Areas of Application

The detector is to be used for registration and analysis of THz / sub-THz radiation in security systems to carry out nondestructive tests and to detect hidden objects

Advantages

The device is cheaper than the foreign counterparts

Specification

Spectral range *ν*, GHz	≈30 – 300
Operating temperature T, K	300
Noise equivalent power NEP$_{140\ ГГц}$, W/Hz$^{1/2}$	≈(3 – 5) · 10^{-10}
Sensitive area S:	
without antenna, μm^2	≈40 × 40
with antenna, mm^2	≈2 × 2
Response time τ, s	≈10^{-7}
Signal at detector output, V	≈2.5
Dimensions, mm	50×90
Diameter of focused spot (DAiry(140 GHz)) ∅, mm	≈5

Stage of Development. Suggestions for Commercialization

IRL7, TRL8
Manufacture, delivery, warranty service, and staff training, upon request

IPR Protection

IPR1, IPR3

Contact Information

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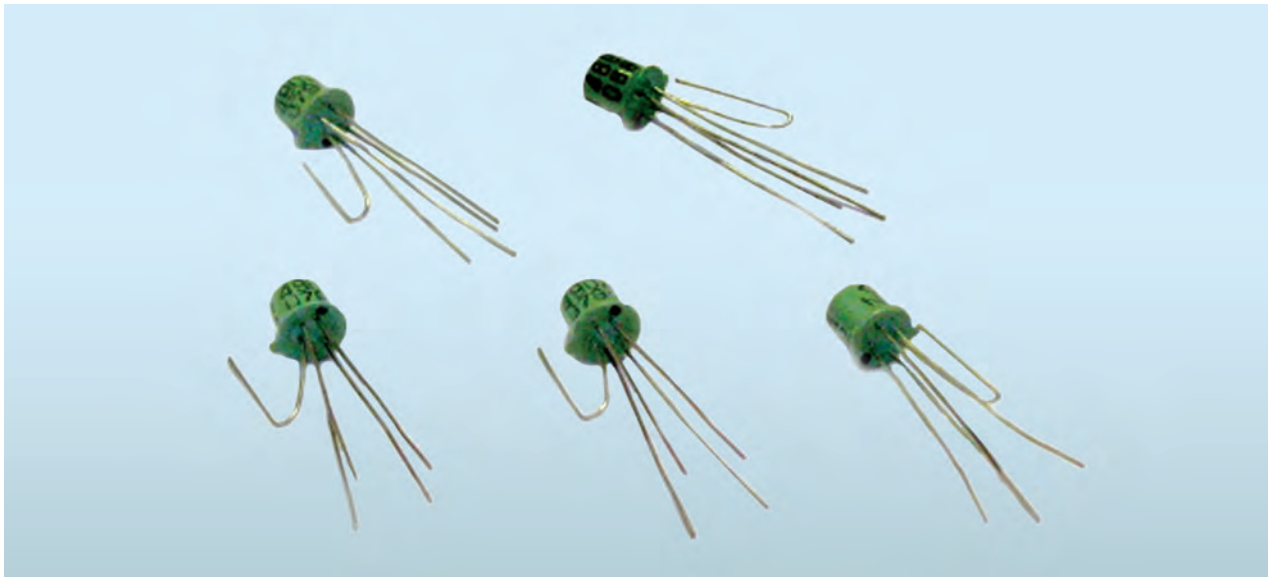
TI THERMOELECTRIC INTEGRATED CONVERTER



Areas of Application

The converter is designed to determine energy of single and infrequent electric pulses with a duration of 10^{-7}—10^{-1} s and energy value of $1 \cdot 10^{-6}$—$4 \cdot 10^{-3}$ J

Advantages

High sensitivity, small dimensions, and improved reliability

Specification

Parameters	Converter type												
	TI0101	TI0104	TI0108	TI0110	TI0114	TI0115	TI0116	TI0119	TI0120	TI0207	TI0211	TI0213	TI0219
R_H, ohm	0.5	1	2	3	5	7	9	16	20	2	4	6	18
S, V/J	10	10	10	10	15	15	15	15	15	30	40	40	50
Q_{max}, μJ	4	1	0.7	0.7	0.5	0.5	0.4	0.3	0.3	0.63	0.63	0.32	0.32
Q_{min}, μJ	5	5	5	5	3	3	3	3	3	2	2	1	1
T, s	10^{-6}—10^{-3}								10^{-7}—10^{-1}				

Stage of Development. Suggestions for Commercialization

IRL7, TRL6
Manufactured and supplied, upon request

IPR Protection

IPR3

Contact Information

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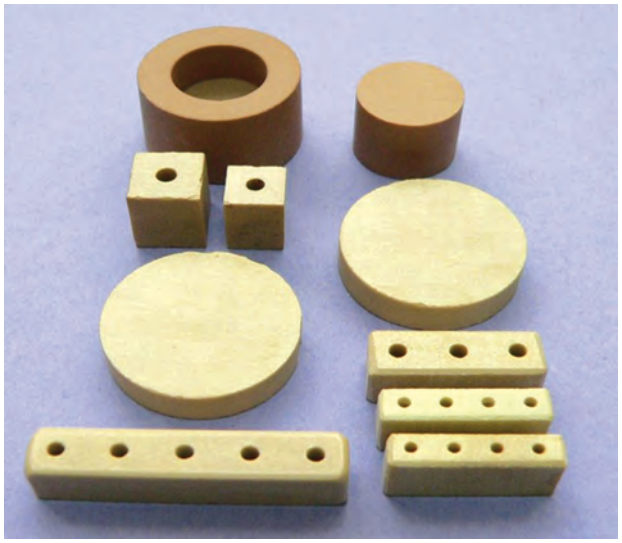
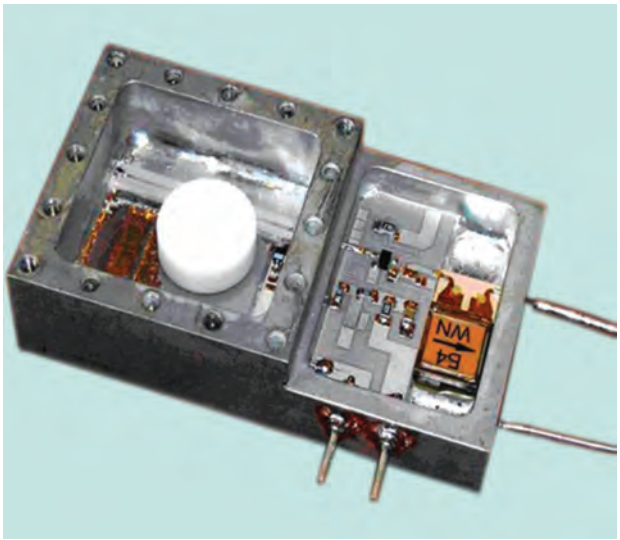
UHF DIELECTRIC RESONATORS FOR ADVANCED COMMUNICATION SYSTEMS



Dielectric resonators



Low-noise UHF oscillator

Areas of Application

The dielectric resonators are to be used in radio filters, diplexers, solid MW generators of advanced communication systems of centimeter and millimeter frequency ranges

Specification

Dielectric permittivity	$\varepsilon_1 = 20-25$, $\varepsilon_2 = 30-35$
Q-factor	$Q \times f = 100\,000$ (ε_1), $Q \times f = 80\,000$ (ε_2)
Resonant frequency coefficients (cam be given with an accuracy of 1 ppm/K)	$\tau_f = -5...+5$ ppm/K

Advantages

The dielectric resonators do not contain any expensive components (tantalum or rare-earth metals), which significantly reduces their price. They have a high quality factor and enable changing the resonant frequency coefficient as may be required, which ensures a sustainable operation of communication systems in a wide temperature range

Stage of Development. Suggestions for Commercialization

IRL7, TRL7
Manufactured, tested, and delivered, upon request

IPR Protection

IPR1, IPR3

Contact Information

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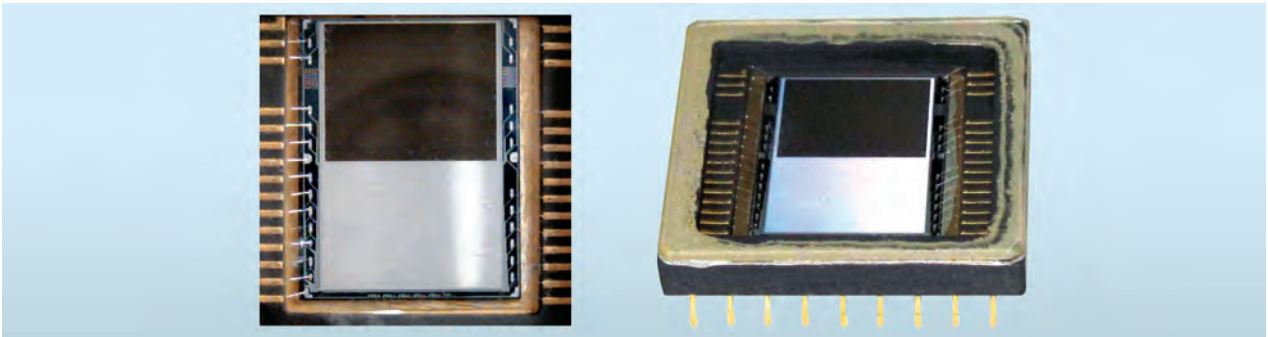
ULTRASENSITIVE PHOTOMATRIX OF VISIBLE RANGE



EMCCD photomatrix (top view and side view)

Areas of Application

Identification of dynamic and static objects in low brightness conditions; security systems; supervision systems; driving vehicles in low light conditions

Specification

Spectral range, nm	400—1060
Matrix format	640 × 512, 640 × 780, 1024 × 1024
Frame rate, Hz	≥25
Pixel size, μm²	16 × 16, 13 × 13, 10 × 10
Luminosity dynamic range, lx	10^{-4}—10^{1}
Type of base element	EMCCD (electron multiplication charge coupled devices)

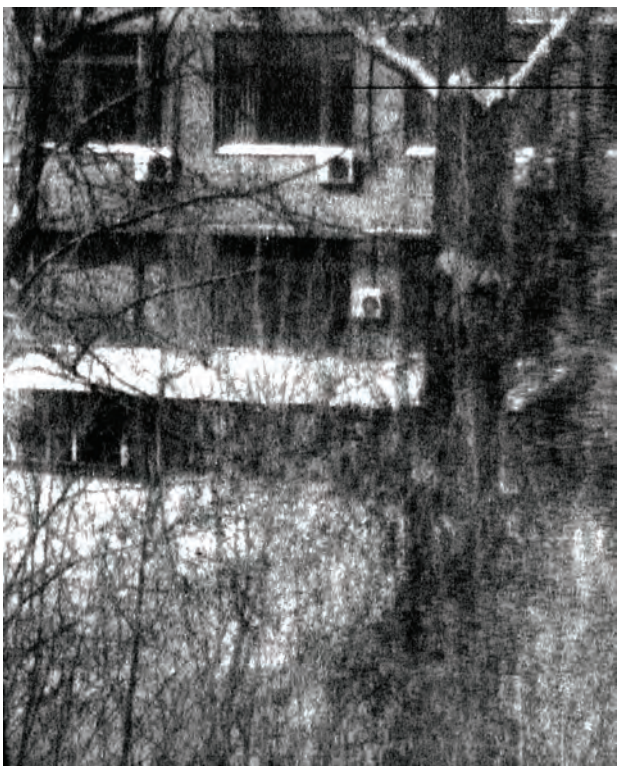


Image of a building in night conditions (at a luminosity ~5×10^{-4} lx) obtained with the use of EMCCD matrix

Stage of Development. Suggestions for Commercialization

IRL4, TRL3
Design of configuration and process technology for manufacture of ultrasensitive EMCCD photo matrix. Devices can be manufactured upon request

IPR Protection

IPR1, IPR2

Advantages

There are no analogs in Ukraine. The foreign analogs are subject to restrictions on sale abroad. The devices are cheaper as compared with foreign products

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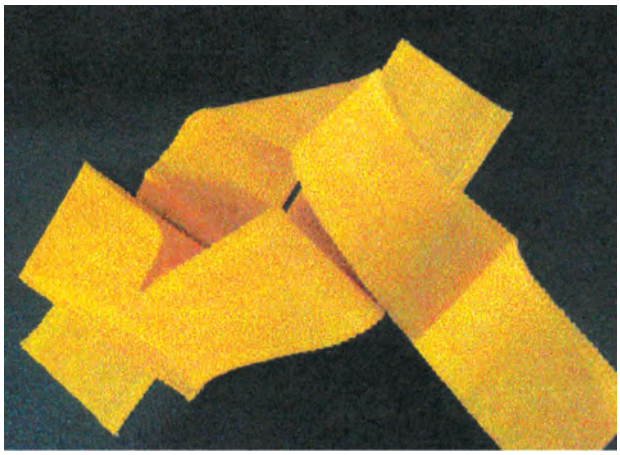
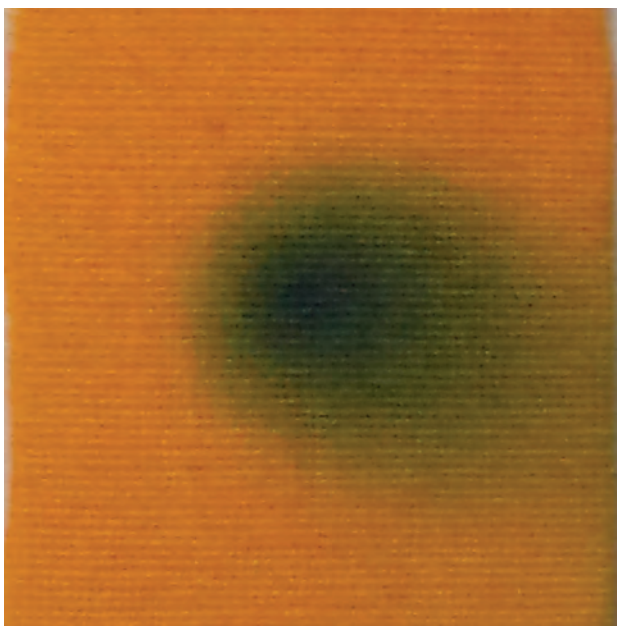
UNSYMMETRICAL DIMETHYLHYDRAZINE LEAK INDICATOR





Appearance of unsymmetrical dimethylhydrazine leak indicator before (upper) and after (lower) contact with the mentioned substance

Areas of Application

The indicator is designed for visual detection of unsymmetrical dimethylhydrazine (heptyl) leak as a result of through defects in detachable pipe connections of rocket fuel systems by a local change in color

Specification

The product is made in the form of ribbon with geometric parameters chosen depending on the dimensions of pipeline connections. The original color of indicator's surface is orange. While contacting the places of unsymmetrical dimethylhydrazine leaks the indicator changes its color to green or blue. The minimum unsymmetrical dimethylhydrazine leak reliably detectable by the indicator during 5-minute test is about 10^{-7} $m^3 \cdot Pa/s$. The product can be used in the temperature range from +5 to +50 °C at a relative humidity of 98%

Advantages

As compared with analogs, the product is more sensitive and suitable for the use in tropical conditions

IPR Protection

IPR3

Stage of Development. Suggestions for Commercialization

IRL8, TRL9
Manufacture, supply, and staff training, upon request

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VECTOR VIBRATION DIAGNOSTIC SYSTEM

Areas of Application

The *VECTOR* mobile vibration diagnostic system is designed for measuring and processing vibration signals generated by revolving mechanisms to detect and to prevent failure of turbine generators, oil pumping terminals, etc., to diagnose axially symmetric bodies, electric engines, and so on

Specification

Number of input channels	8
Maximum sampling frequency, kHz	400
Input signal frequency, kHz	25
Maximum USB throughput, kWords/s	500
Range of input signal, V	±10, ±2.5, ±0.625, ±0.156
Co-phased signal voltage, V	±10
Conversion time, μs	2.5
Input resistance at in the case one-channel input, Mohm	≤1
Power supply	
battery, V	12
AC voltage, V	220

Advantages

The system enables to synchronously make 3D measurements of vibrations at many points; to work remotely; to detect defects of revolving mechanisms at early stages; to define depth of modulations in signals, and to estimate the residual life of continuously operating mechanisms

Stage of Development. Suggestions for Commercialization

IRL7, TRL8
Manufacture, delivery, warranty service of equipment, and staff training, upon request

IPR Protection

IPR2, IPR3

Contact Information

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TECHNOLOGY READINESS LEVEL (TRL) SCALE

Stage	TRL	Interpretation	Definition and Description
Invention	TRL1	Basic principles observed	Basic scholarly research is translated into potential new basic principles that can be used in new technologies
	TRL2	Technology concept formulated	Potential areas of application of basic (technological) principles, including the technological concept are identified. Basic manufacturing principles are elaborated and potential sales markets are identified. A small research team is established to assess the project feasibility
Concept validation	TRL3	First assessment of concept and technology effectiveness	Based on preliminary study, actual research is conducted to assess technical and market feasibility of the concept. This includes active R&D works at the lab and first negotiations with potential customers. The research team expands. Market feasibility is assessed
	TRL4	Prototype validation at lab	Basic technological components are integrated to assess early feasibility by testing in laboratory environment. Manufacture options are studied with basic manufacturing principles identified. Key markets are researched to study demand. The organization is ready to scale up, possible services are analyzed. Comprehensive marketing analysis is made
Prototyping and incubation	TRL5	Prototype testing in user environment	The system is tested in user environment with broader technological infrastructure involved. The actual use is tested and validated. Production-support works and pre-production tests are done in lab environment. Trial batches of prototypes enter the key markets. The organization starts activities to further distribute the prototypes and to enter the sales markets
Pilot production and demonstration	TRL6	Pre-production, including tests in user environment	The product and manufacturing technologies are completely ready for launch of a pilot line/pilot plant (low-scale manufacture). The product and manufacturing technologies are assessed and finalized. This may include additional R&D works. The early products and manufacturing technologies are tested in the key markets with simultaneous organization of manufacture (marketing research, logistics, production facilities, etc.)
	TRL7	Low-scale pilot production demonstrated	The product manufacture is fully operational at low rate. Actual commercial products are manufactured. The final products are verified in the key markets. The organizational component is completed (comprehensive marketing strategy, all components of manufacturing activities). The products are formally launched in test markets
Initial market introduction	TRL8	Manufacture fully tested, validated, and certified	The manufacturing flow charts, product final version, production organization, and marketing tools are completed. The full-scale manufacture has been launched. The final product is sold in majority of domestic and international markets
Market expansion	TRL9	Manufacture and products fully operational and competitive	The full-scale manufacture is sustainable, with the product gaining new markets. Minor modifications and improvements create new versions. The technology and product output are optimized through implementing innovative concepts on manufacturing process. The product is fully customized to the key markets

INNOVATION READINESS LEVEL (IRL) SCALE

IRL	Innovation Readiness Level	Definition
IRL1	Inventor or team with a dream	The lowest level of readiness where the intention transforms into an idea of space system application or the space technology transforms into a business venture
IRL2	Paper studies produced	Once the basic ideas have been formulated, they are put down on paper in studies and analyses of business opportunities
IRL3	Experimental evidence of business opportunity	Active research and development are initiated, including analytical / laboratory studies to validate predictions regarding the market, the competition, and the technology
IRL4	Capability to implement limited-scope programs with project teams	Basic technological and business components have been developed to establish that they will work together; an initial business plan is available
IRL5	Capability to support project engineering development and design (no product, no revenues)	The basic technological and business components have been integrated with reasonably realistic supporting elements. The business plan is credible, but still needs to be validated against the final product characteristics
IRL6	Capability to support development and design with a market-driven business team (product, no revenues)	The representative prototype system has been tested in a relevant environment. The business team is still incomplete and the venture is not yet ready for commercialization. A full business plan including the market, the operational, the technological, and the financial aspects is available
IRL7	Capability to support limited production; full business team in place (product and limited revenues)	The business can run on a limited scale. The full team is in place
IRL8	Capability to advance to full production and distribution (product and revenues)	The technology has been proven to work and the venture structure has proven to be able to support growing market shares
IRL9	Fully articulated business with appropriate infrastructure and staffing (growing market share)	The offering incorporating the new technology has been used in operational conditions and the business is running with a growing market share

Intellectual Property Rights Protection[1] Levels

IPR codes	Protection Level
IPR1	Technical solutions are know-how[2]
IPR2	Applications for copyright protection of IPR objects are expected to be or have been submitted
IPR3	The copyright protection of IPR objects as established by the applicable law of Ukraine has been obtained and is kept in force
IPR4	International industrial patent application(s) (according to the PCT system, etc.) has (have) been submitted. Application(s) for industrial patents has (have) been submitted in foreign country(ies) under national procedure
IPR5	The industrial patent(s) in foreign country(ies) has (have) been obtained and is/are kept in force

[1] The IPR protection measures are implemented by R&D institutions in accordance with the applicable legislation of Ukraine and the requirements of paragraphs 5, 8, and 9 of the Regulations for the use of intellectual property objects at the NAS of Ukraine as approved by Resolution of the Presidium of the NAS of Ukraine No.15 of January 16, 2008, on the Structural Units Responsible for Technology Transfer, Innovation Activities, and Intellectual Property (as revised)

[2] Know-how is technical, organizational, or commercial data obtained with the use of experience and upon trials of technology and its components, which are: closely held (not a part of general knowledge or available for public) on the date of license agreement; essential, i.e. important and useful for manufacture of products, manufacturing process, and/or provision of services; and elaborate i.e. detailed and complicated enough to verify their compliance with the criteria of being never-before-known and essential (Clause 1 of the Law of Ukraine on the State Regulation of Technology Transfer Activities)

Reference Book

THE NATIONAL ACADEMY OF THE SCIENCE OF UKRAINE

ADVANCED R&D AND TECHNOLOGIES

IN 11 SPESIAL ISSUES

THE NAS OF UKRAINE

Issue
INFORMATION AND SENSOR SYSTEMS AND DEVICES

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Illustrative materials prepared
by N.M. Kovalenko

Signed to print 18.05.2018
Format 60 × 84/8. Font: Book Antiqua.
Conventional printed sheets 6.74. Published sheets 5.34.
Circulation: 100 copies. Order No.5266