Belarusian State University
of Informatics and Radioelectronics

R&D Department

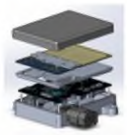
Announcement
BSUIR at the China International Import Expo
"China International Import Expo"

November 5 – 10, 2024
China, Shanghai

China International Import Expo (CIIE, https://www.ciie.org/zbh/en/) is a popular trade exhibition that has been held annually since 2018. In 2024, CIIE will be held from 5 to 10 November at the National Convention and Exhibition Center in Shanghai.

The BSUIR exposition will be presented within the framework of the National Exposition of the Republic of Belarus and will include the following high-tech developments, scientific and technical services:

All-weather long-range vehicle radar for collision prevention of large vehicles (e.g. buses, dump trucks).



Advantages:

1. Unique manufacturing technology and tuning method for a digital radar antenna array.

2. The design of the radar was developed taking into account the features of integration into various types of large-sized vehicles.

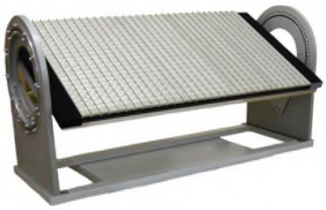
3. Open software and hardware level.

Technical specifications:

Operating frequency range	76-77 GHz
Detection range of a passenger car	no less than ±250 m
Range resolution	1.5 m
Relative velocity of an object	±200 km/h
Azimuth viewing angle	±9 degrees
Azimuth resolution	3 degrees
Supply voltage	24 V

The car radar was developed within the framework of subprogram 2 "Development of new and high technologies in production" of the State Program of the Republic of Belarus "High-tech and technology" for 2021–2025.

Basic panel (fragment) of the AESA of the experimental space-based X-band synthetic aperture radar.



Developed during the implementation of a scientific project financed by the Union State Program "Monitoring of the Union State".

Purpose: round-the-clock all-weather remote sensing of the earth's surface.

Advantages:
– polarization: vertical, horizontal;
– self-diagnosis;
– possibility of remote software updates;
– control and compensation of the influence of temperature on the parameters of the microwave path;
– compact dimensions and ease of installation.

Technical specifications:

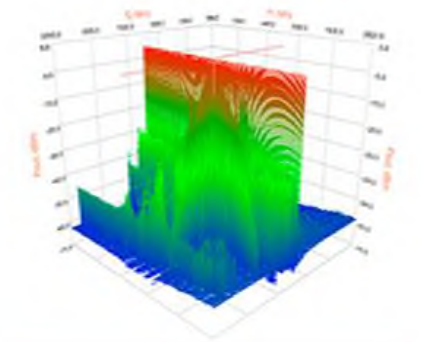
Panel size	400x800 mm
Number of transceiver modules in one panel	32
Working hours	pulse
Panel peak radiated power	160 W
Polarization modes	vertical, horizontal
Central frequency	9.65 GHz
Operating mode bandwidth	200 MHz
Azimuth scanning angle	±0.75 degrees
Scanning angle by elevation angle	±0.75 degrees

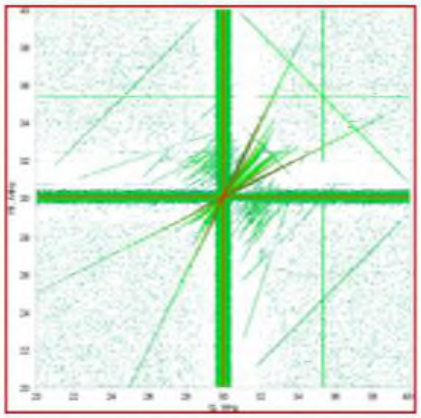
EMC – technique to evaluate EMC ecology and EMC safety of the population in the conditions of mass usage of mobile phones.

The EM C technique **is used** to analyze the level of electromagnetic ecology of densely populated area and electromagnetic safety of population in conditions of mass usage of mobile and stationary radio communication devices, such as mobile and fixed radio communication, TV and radio broadcasting, radar systems, etc.

The technique enables to evaluate the intensity level of electromagnetic background created by radio communication devices.

ADFTS – automated dual-frequency test system for measuring and modeling of electromagnetic compatibility (EMC) of radio receivers.





ADFTS system is used to detect, identify and measure characteristics of all possible interference channels and effects on the radio receiver.

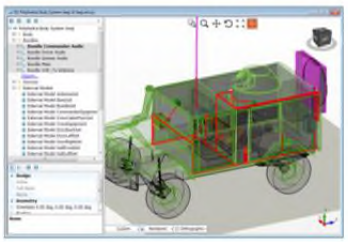
Technical concept:

– radio receiver sounding is based on the radio location 'content' approach via the antenna input and on summing of two signals of the oscillation frequency;
– innovative method to present the results of testing and analysis in the form of 3D dual-frequency characteristics and a number of 2D or 2D and dual-frequency diagrams on the PC screen.

Distinguishing features and advantages:

– it is the informative, comfortable and effective technology of EMC-testing and measurement of characteristics of radio receivers;
– it can be used when designing radio receivers and systems of HF, VHF, UHF, SHF and EHF ranges as well as radio frequency system components for various services (radar, stationary and mobile network, radio navigation), for civil and military aviation, satellite, marine and radio location systems.

EMC-Analyzer – specialized expert system for analysis of EMC of on-board and ground radio electronic systems.



EMC-Analyzer system is used to analyze and solve EMC problems in on-board and ground radio electronic systems, as well as to design specifications of such systems in accordance with EMC requirements and to simulate radio-receiving process in severe electromagnetic environment.

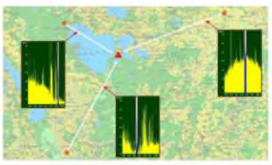
Distinguishing features and advantages:

– EMC-Analyzer significantly surpasses analogues in conducting detailed non-linear dynamic modeling of radio receivers operating in an extremely complex electromagnetic environment;
– it can simultaneously analyze a vast number of spurious electromagnetic couplings of various nature within the frequency band 0.1 MHz to 40 GHz and dynamic range up to 300 dB;
– EMC analysis is conducted at the system level taking into consideration the interference effects of spurious electromagnetic couplings of various nature inside the on-board radio electronic system.

EMC VTA – technology, software and hardware complex for EMC analysis in complex groupings of various radio systems.

EMC VTA is used to analyze EMC of radio systems of various purposes, as well as to place these radio systems within the given territory effectively.

It is developed as a virtual polygon using the augmented reality technology and semi-natural modeling technique.

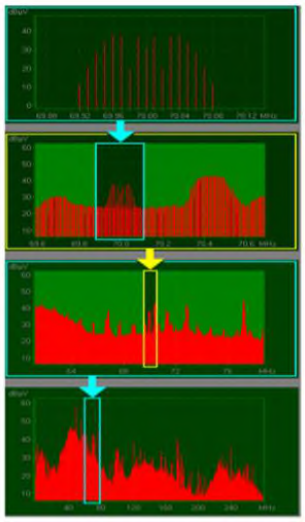


Distinguishing features and advantages:

– high efficiency and low cast of EMC analysis in complex radio systems would allow to avoid expensive polygon testing;

– highly objective modeling of electromagnetic environment is based on modern geographic information systems and radio wave propagation models recommended by the International Telecommunication Union.

DNA-EMC – technology and software for discreet non-linear behavior simulation of radio-receivers in severe electromagnetic environment.



DNA-EMC has extremely high modeling productivity, which does not depend on the complexity of the electromagnetic environment. This technology takes into account the main types of nonlinear effects (intermodulation, blocking, cross modulation, conversion of local oscillator noise, amplitude-phase conversion, side channels of reception).

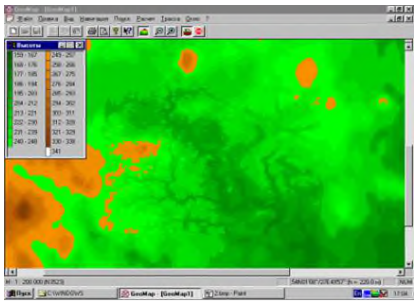
Distinguishing features and advantages:

– it supports wide bandwidth and high dynamic range simulations;

– it can automatically identify the sources of nonlinear interference (for example, intermodulation sources).

GIS-RF – specialized geoinformation technology and software for design and frequency-territorial planning of radio networks.

GIS-RF technology is used to design and plan the use of radio frequencies.



Distinguishing features and advantages:

– it is a time-tested set of technologies and tools for designing and frequency planning of radio networks, as well as for EMC analyzing and modeling of radio systems;

– it is based on widely popular geo-informational tools and platforms, eg MapInfo, Panorama, ArcGIS, etc.;

– it is the basis of the augmented reality technology, so called EMC Virtual Polygon or EMC VTA, which is designed to solve intersystem EMC problems in complex territorial groupings of radio systems of various services (fixed and mobile communications, radar, radio navigation, etc.) using semi-natural modeling methods;

– it can be used to solve EMC problems of complex electromagnetic environment using PCs on Windows OS.

Services for testing equipment for resistance to powerful ultra-wideband electromagnetic pulses.

We analyze the effectiveness of protecting technical equipment, buildings and structures from hybrid attacks and threats of electromagnetic terrorism.

The stability of technical equipment is tested by emitting powerful ultra-wideband and electromagnetic pulses of horizontal and vertical polarization in laboratory and field conditions.

We provide methodological support of the testing process:

– develop a plan of testing activities;

– prepare testing equipment taking into account the type and characteristics of the devices to be tested;

– scientific and methodological support of the testing activities (calculations, development of mathematical models of the processes under study, etc.).

PRIBOY – a device for protecting speech information.

Designed to protect speech information from leakage via acoustic and vibration channels from the premises outside the security zone. Used to ensure confidentiality of negotiations and protection from wiretapping from outside the premises.

Distinctive features:

– the device creates three types of masking signals: “white noise”, “speech-like signals”, “white noise” + “speech-like signals”;

– “speech-like signals" are generated by a microprocessor according to a random law, meet all the formal properties of speech and can be adapted to a specific person;

– there is a version of the program adapted for Chinese speech.

In 2023, the product was modified to use the element base produced in the Republic of Belarus and friendly countries.

More about the developments