

**Technical Means and
System Solution for
Spectrum Monitoring
of JSC “IRCOS”
(since 1992)**



ИРКОС

November, 2016

IRCOS Company areas of business

Engineering, manufacturing and supply of technical means for:

- Spectrum monitoring and direction finding (in urban, rural and industrial areas, airports, and areas where counter-terrorism operation is being conducted)
- Detection of information leakage via radio channels (inside one room, several rooms within a building, along the monitored site perimeter)
- Measuring of radio signal parameters and electromagnetic field strength, detection of interfering sources



IRCOS Customers

- Federal service for supervision of communications, information technology and mass communications of the Russian Federation
- Federal Security Service of the Russian Federation
- Federal Guard Service of the Russian Federation
- Ministry of Defense of the Russian Federation
- Ministry of Internal Affairs of the Russian Federation
- Federal Customs Service of the Russian Federation
- Federal Service for Supervision of Consumer Rights Protection and Human Well Fair (Health Inspection Services)
- Ministry of Transport and Communications of the Republic of Kazakhstan
- Ministry of Communications of the Republic of Tajikistan



Technical Means of Radio Monitoring and Direction Finding

Measuring radio receivers, which can be used as an integral part of fixed, mobile, transportable or manpack radio monitoring systems: **ARGAMAK-IS, ARGAMAK-RS, ARGAMAK-M**

FIXED TECHNICAL MEANS

Fixed measuring unattended stations of spectrum monitoring and direction finding: **ARCHA-IN, ARCHA-INM**

Fixed automatic direction finders: **ARTIKUL-S** and **ARTIKUL-SN**

MOBILE TECHNICAL MEANS

Mobile measuring stations of spectrum monitoring and direction finding: **ARGUMENT-I**

Mobile automatic direction finder: **ARTIKUL-M**

TRANSPORTABLE TECHNICAL MEANS

Transportable measuring stations of spectrum monitoring and direction finding: **ARCHA-IT**

Transportable automatic direction finders: **ARTIKUL-T, ARTIKUL-MT, ARTIKUL-P**

MANPACK TECHNICAL MEANS

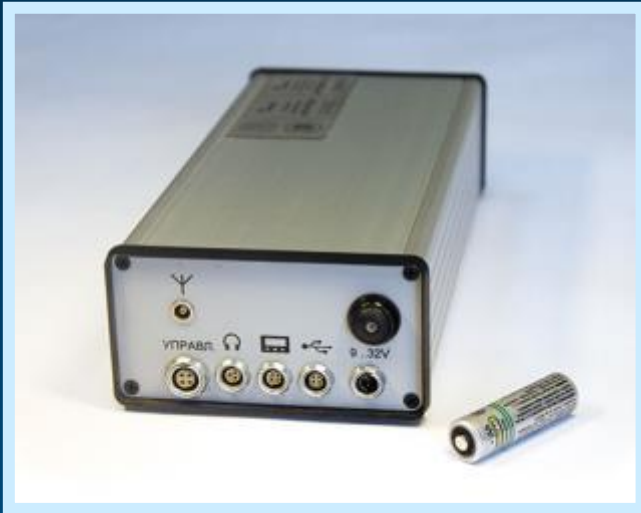
Manpack automatic direction finder: **ARTIKUL-H1**

Handheld direction finder: **ARC-RP3M**



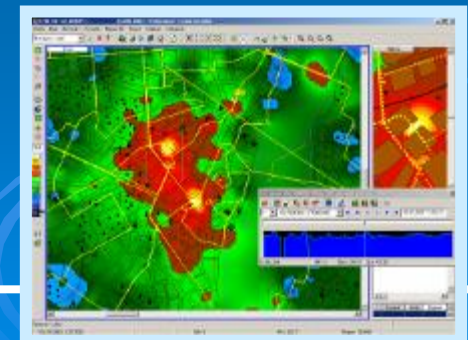
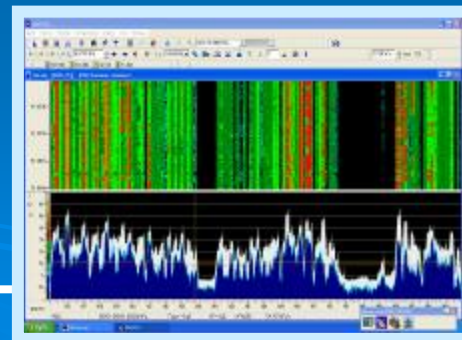
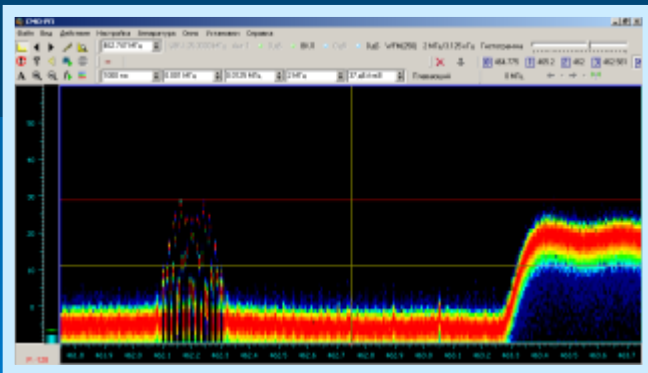
Radio Monitoring Equipment

ARGAMAK-M Panoramic Measuring Receiver



Features:

- Compact, light, low power consumption. Can be a base for portable / handheld radio monitoring equipment
- Built-in accumulator for 2 hours of uninterrupted operation
- Operating frequency in max. configuration is 9 kHz to 18 GHz
- The software enables remote control via wire or wireless channels



Radio Monitoring Equipment

ARGAMAK-RS Measuring Radio Receiver (Protected Design)

Operation modes:



ARGAMAK-RSS Fixed System

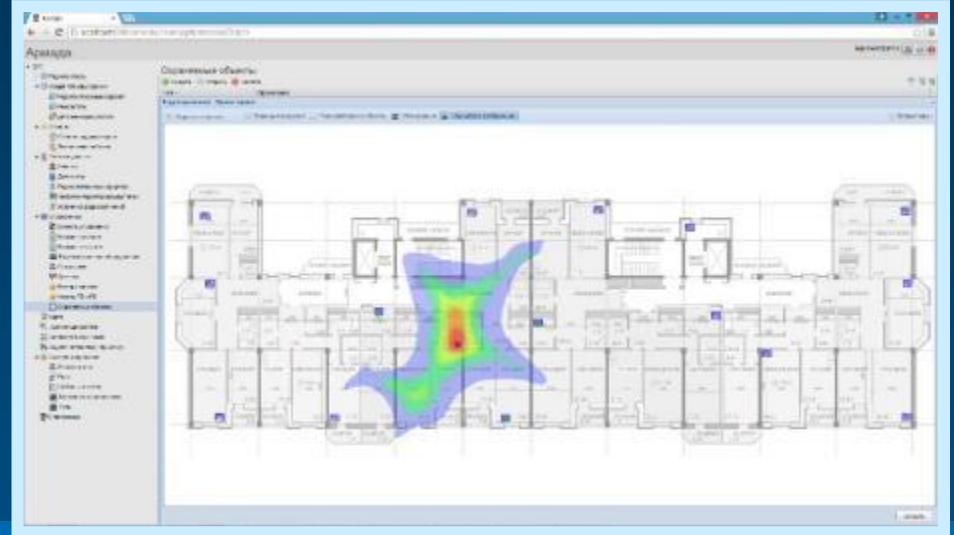
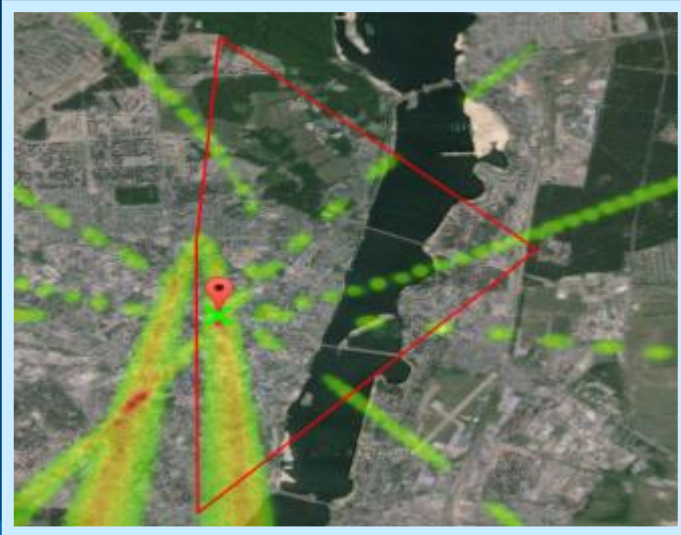


ARGAMAK-RSM
Mobile System

Radio Monitoring Equipment

ARGAMAK-RS Measuring Radio Receiver (Protected Design)

Localization of radio emission sources with amplitude, TDOA , and hybrid methods



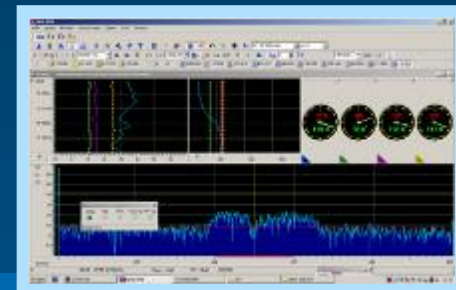
Contribution to ITU, including:

Report ITU-R SM.2211-1 "Comparison of time-difference-of arrival and angle-of-arrival methods of signal geolocation", Annex 1 "Factors affecting RF detection range and geolocation coverage area for monitoring stations", sections 2 and 6.

Direction Finding Equipment

List of items:

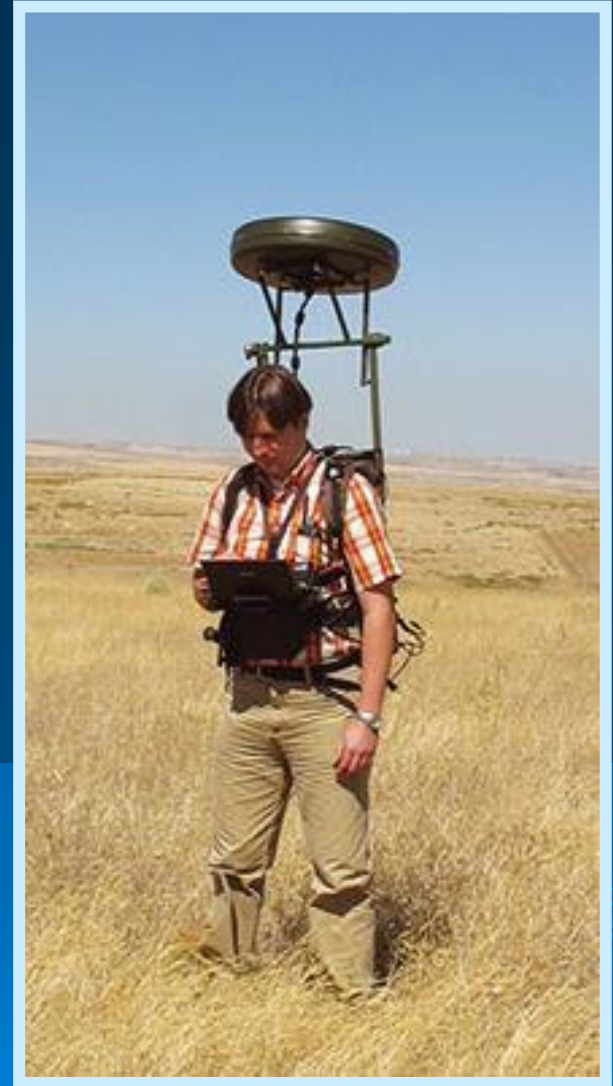
- ARTIKUL-S and ARTIKUL-SN Fixed Automatic Direction Finders
- ARTIKUL-T Transportable Automatic Direction Finder
- ARTIKUL-MT Transportable Automatic Direction Finder
- ARTIKUL-M Mobile Automatic Direction Finder
- ARTIKUL-P Portable Automatic Direction Finder
- ARTIKUL-H1 Manpack Automatic Direction Finder
- ARC-RP3M Handheld Direction Finder



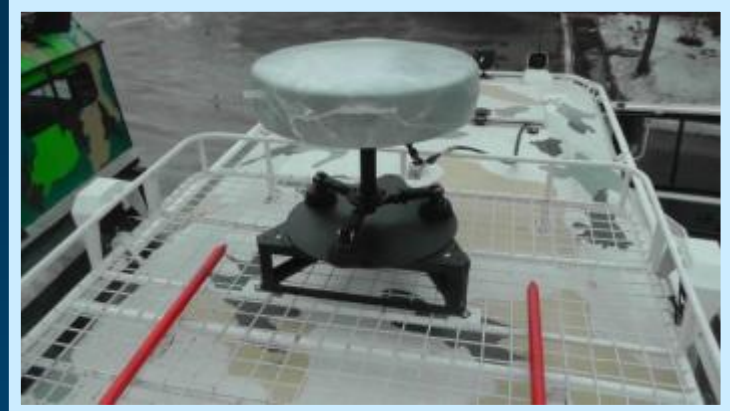
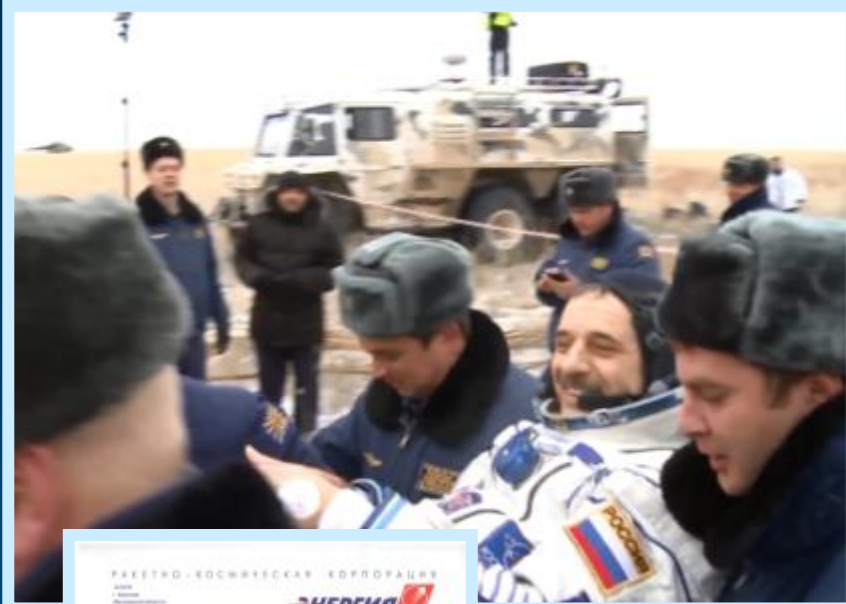
ARTIKUL-H1 Manpack Automatic Direction Finder

Features:

- Operator-portable (wearable) direction finder. Can be operated while Operator is on the move
- Complete with one or several antenna systems providing the required operating frequency
- Max. operation frequency range can be from 1.5 to 8,000 MHz
- Direction finder's antenna system can be mounted on the carrying frame, tripod mast or on a vehicle
- Weight of operated package is not more than 15 kg
- Direction finder has internal accumulator batteries for not less than 4 hours of operation
- Besides manpack mode, can be mounted on a vehicle's roof or a portable mast (tri-pod)



ARTIKUL-H1 Manpack Automatic Direction Finder



ARTIKUL-MT Transportable Automatic Direction Finder



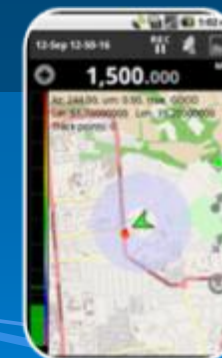
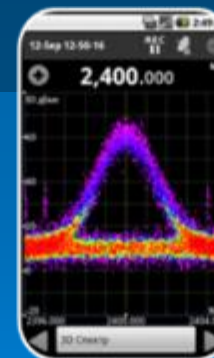
Features:

- Equipment of the direction finder is compact. It can be installed both on a mast and on a vehicle roof
- Direction finder can be operated at stops and while moving.
- Operating frequency range in complete configuration is from 1.5 to 8000 MHz (replaceable antenna systems)
- When installed at mast, the direction finder antenna system is fixed at mast together with the radio receiver. It allows using an antenna cable up to 80 m long without decrement of sensitiveness, dynamic range and antenna effect

ARC-RP3M Handheld Direction Finder

Features:

- The “last mile” handheld direction finder
- Direction finder is based on a small-scale panoramic receiver that performs all main radio monitoring activities, including spectrum and technical analysis
- Direction finder provides “selective” direction finding of Wi-Fi, DECT and GSM signals with selected parameters
- Direction finder's antenna system includes a handle and a set of directional antenna elements for manual direction finding
- Operating frequency range up to 18,000 MHz
- Receiver weight is not more 1.5 kg
- The weight of the handle equipped with an antenna element is 700 gramms
- Direction finder is controlled with an Android-based mobile device



Radio monitoring and direction finding stations

List of items:

- **ARCHA-IN** Fixed Unattended Measuring Radio Monitoring and Direction Finding Station
- **ARCHA-INM** Fixed Unattended Measuring Station of Radio Monitoring and Direction Finding
- **ARGUMENT-I** Mobile Measuring Radio Monitoring and Direction Finding Station



ARGUMENT-I Mobile Measuring Station



Features:

- Separate measuring and direction finding workstations
- Simultaneous direction finding, measuring and technical analysis

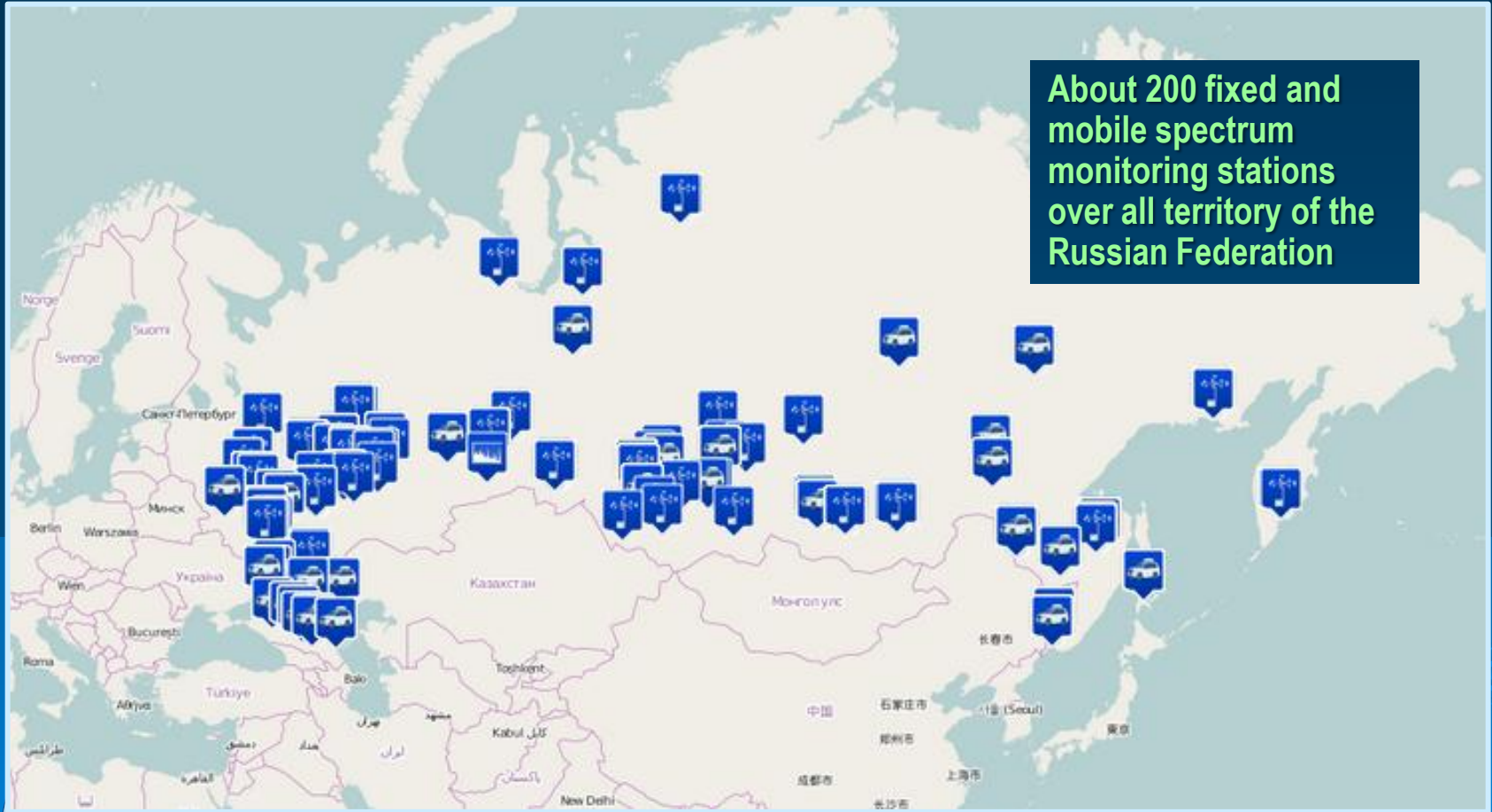


Mobile Stations Based on Different Vehicles



Radio Monitoring and Direction Finding Stations Supplied to Radio Frequency Service of the Russian Federation

About 200 fixed and mobile spectrum monitoring stations over all territory of the Russian Federation



Means for Technical Surveillance Counter-Measures

List of items:

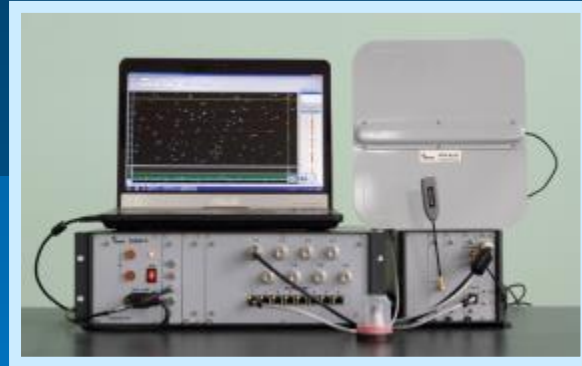
- **ARK-D11** Two-channel Panoramic Radio Receiver
- **ARK-D13R** Indoor Remote Radio Monitoring System
- **SMO-SECTOR** Software Package for External Monitoring of Extended Objects

Fundamental principles implemented in the equipment:

- Time discrimination of radio-frequency sources
- Space discrimination of radio-frequency sources
- Harmonic test
- Correlative acoustic test

Key features:

- Multi-functionality
- High performance
- Remote control capability
- Wide range of operation bands from 9 kHz to 8 GHz (optionally, to 18 GHz)



ARK-D11 Two-channel Panoramic Radio Receiver

Functions:

- Detection of data leakage technical channels indoors
- Wire networks monitoring
- Automatic direction finding and localization of active radio signal sources
- External radio monitoring of extended objects
- Radio signal recording and technical analysis

Features:

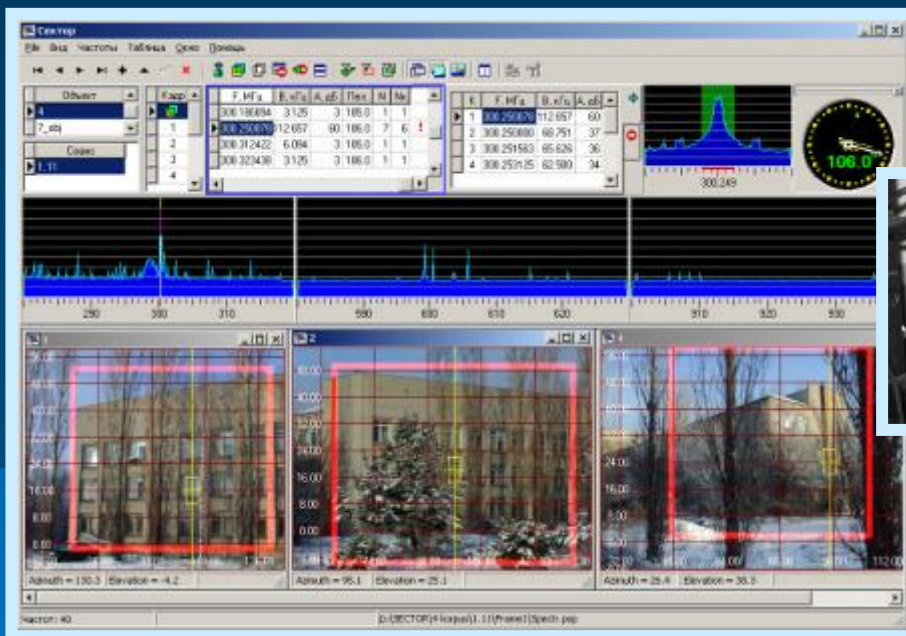
- Two physical reception channels enables usage of advanced search algorithms and connection of optional direction-finding system
- Antenna switch



Emission Monitoring along Perimeter of Protected Object

Technical support:

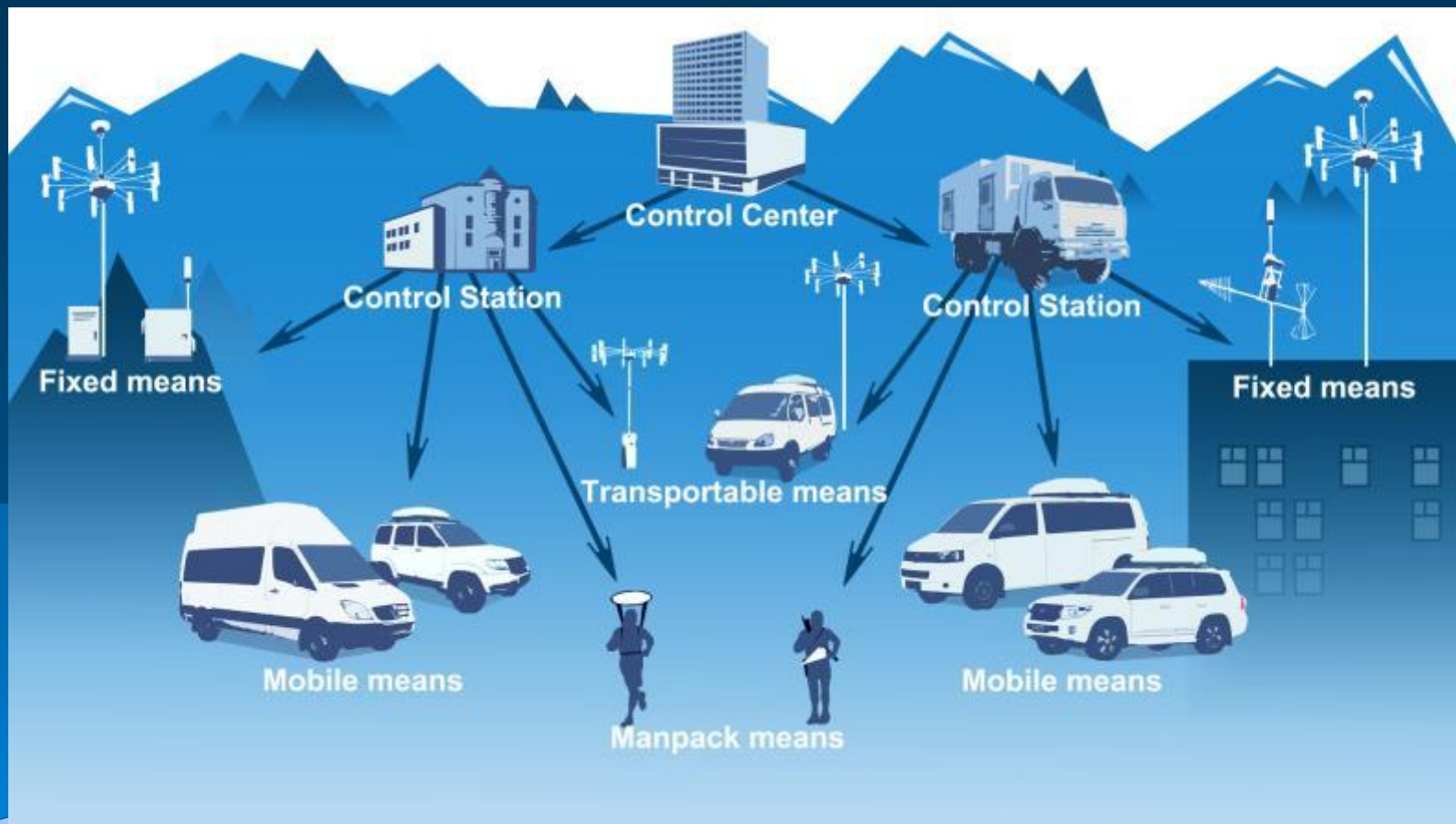
- Automatic mobile direction finder
- SMO-SECTOR Software package
- Videocamera



The method used in SMO-SECTOR Software Package is presented as an ITU contribution from Russian Federation and included in the reference book "Spectrum Management" – ITU, Geneva, 2011, section 3.6.2.2.6.

ARMADA Automated Spectrum Monitoring System

In 2009–2011 IRCOS have created a concept for developing geographically distributed automated spectrum monitoring system, intended for radio monitoring on national, regional, city, district and departmental levels.



UNIVERSIADE-2013

Concept of automated radio monitoring system developed by IRCOS has been successfully implemented for RFS ACS “UNIVERSIADE-2013” in Kazan. Based on the ARMADA Automated Spectrum Monitoring System, this system has united the following units under the management of Operating center:

- ✓ 11 object radio control units to control radio situation on the most important sport objects
- ✓ 12 mobile radio control stations
- ✓ 6 groups of manpack radio control and interference search equipment
- ✓ 9 marking and measuring laboratories
- ✓ 5 stations of stationary radio control for solving tasks on city level

The system has provided remote management for geographically spread stationary, mobile and manpack equipment for radio monitoring and marking of radioelectronic equipment, interaction with external informational structures, including requests for interference search and marking of radio electronic means.

Thank you for attention!
Any questions?

