Hand-held direction finder of VHF-UHF radio emission sources “PHILIN-A”

PURPOSE

Radio direction finder “Philin-A” is designed for detection, receiving and automatic direction designation to the source of emission with vertical polarization in the frequency band from 25 MHz to 3000 MHz in preset frequency channel, or while receiver scanning over the channels and also provides audio control of received signals.

Radio direction finder “Philin-A” is a portable compact radio direction finder with antennas set and automatic bearing sampling.

Product “Philin-A” was designed in order to replace similar product with low-quality receiver ICom R20, PDA (already phased out), obsolescent DF-processor and is purposed for outdoor operation in field conditions.

COMPOSITION

1) Antennas set:

AFS-1D (25-200 MHz) – 4-element array on ferrite antennas;

AFS-2D (200-800 MHz) – 8-element array on dipole antennas;

AFS-3D (800-3000 MHz) – 8-element array on slot antennas;

2) **Receiving and measuring device** based on VHF-UHF receiver of super heterodyne type with triple frequency conversion with IF signal digitizing by 16-bit ADC is designed for receiving signals of radio sources, manual or automatic direction finding in the frequency band 25-3000 MHz (including GSM-phones) with interception;

3) **Visualization unit – Smartphone HTC,** provides informational interaction with receiver via Bluetooth V4.0 interface and also displays visual interface of operator, bearing indication on the map with bearing binding to compass readings, in addition it provides triangulation with coordinates display when operating in the composition of direction finding network consisting of similar stations (via Wi-Fi or 3G);

4) **Remote control board** (RCB) is a device with micro switchers set for secret selection of product parameters in manual mode (without smartphone);

5) **Headphones set** for audio control;

6) **Charging unit** for 4 accumulators of AA type operating from AC network 220 V, 50 Hz or from cigarette lighter DC 12 V;

7) **Reserved accumulator set**;

8) **Power supply unit** from AC 220 V, 50 Hz network.

9) **Connecting cables set**;

10) **Cover** for carrying receiver on the belt;

11) **Case** for equipment transportation;

12) **Operation and maintenance documentation**.

MAIN FUNCTIONS

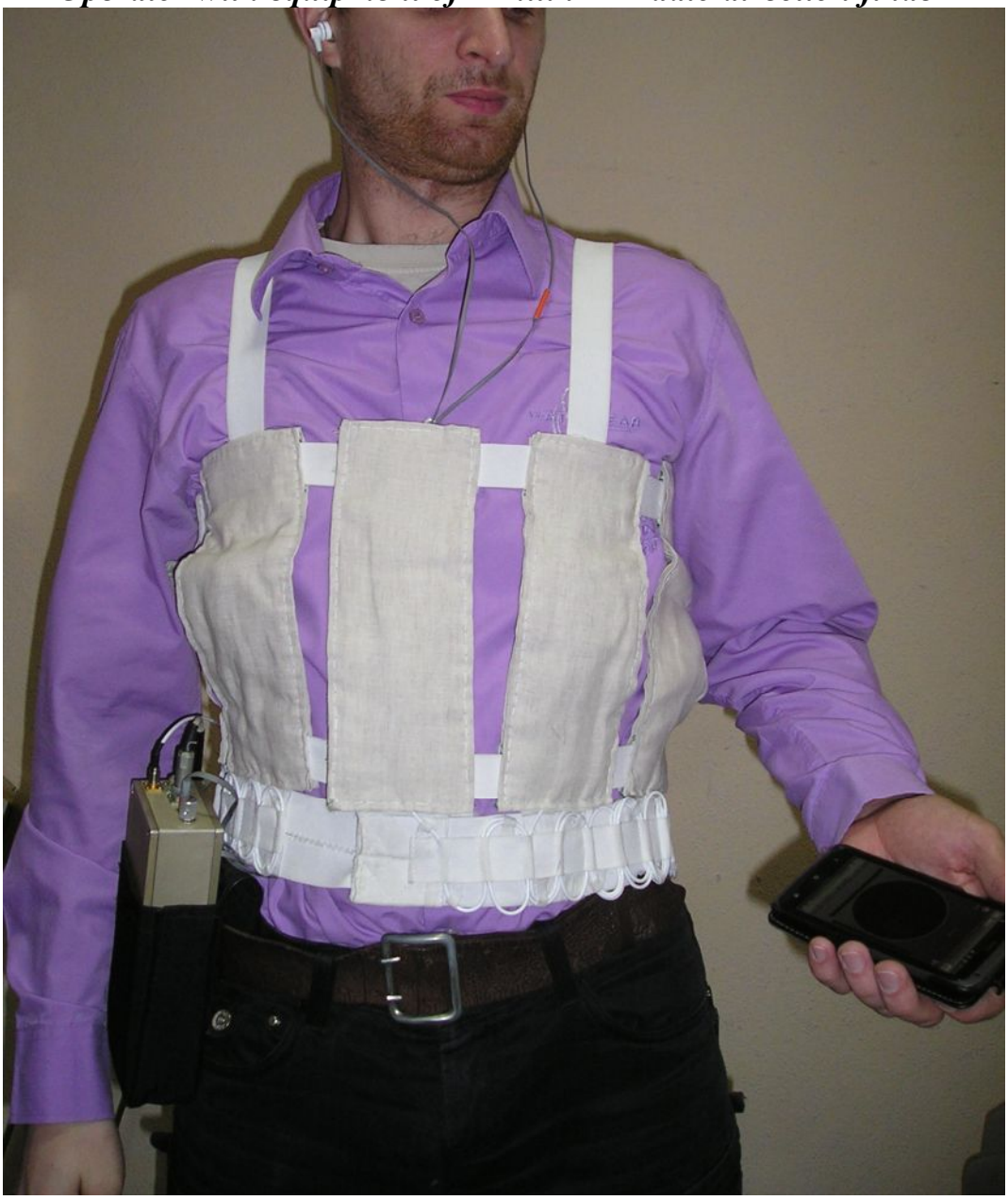
- in **manual mode** – direction finding of signal source by body rotation with direction designation to the source of received signal by tone change of colorization (error of bearing 10º…20º);
- in **auto mode** – automatic radial direction finding implementing diagram method (error method 20º…25º) with indication lines of bearings and audio listening of voice bearing samples and signal level;
- **listening to received signal** during direction finding process;
- **direction finding of GSM 900/1800 mobile phone signals** under control of external "catcher".

PECULIARITIES OF OPERATION

- Antennas of the device are placed under operator's clothes;
- Receiver and Smartphone are placed on the belt of operator;
- Smartphone displays indicator of circular look of bearing in one of three modes (automatic, manual or in form of histogram), signal level and RMS of bearing, table of emission sources bearings DB;
- On the screen of Smartphone against the background of Google Maps operator's position and direction to the source are displayed;
- Headphones set provides audio control of radio emission sources and in manual mode by the tone change of colorization depending on operator's body rotation provides direction finding of signals;

View of radio direction finder "Philin-A"

Operator with equipment of "Philin-A" radio direction finder



- There also exists a possibility of remote control of the product via 3G GSM.

View of receiver of "Philin-A" receiver

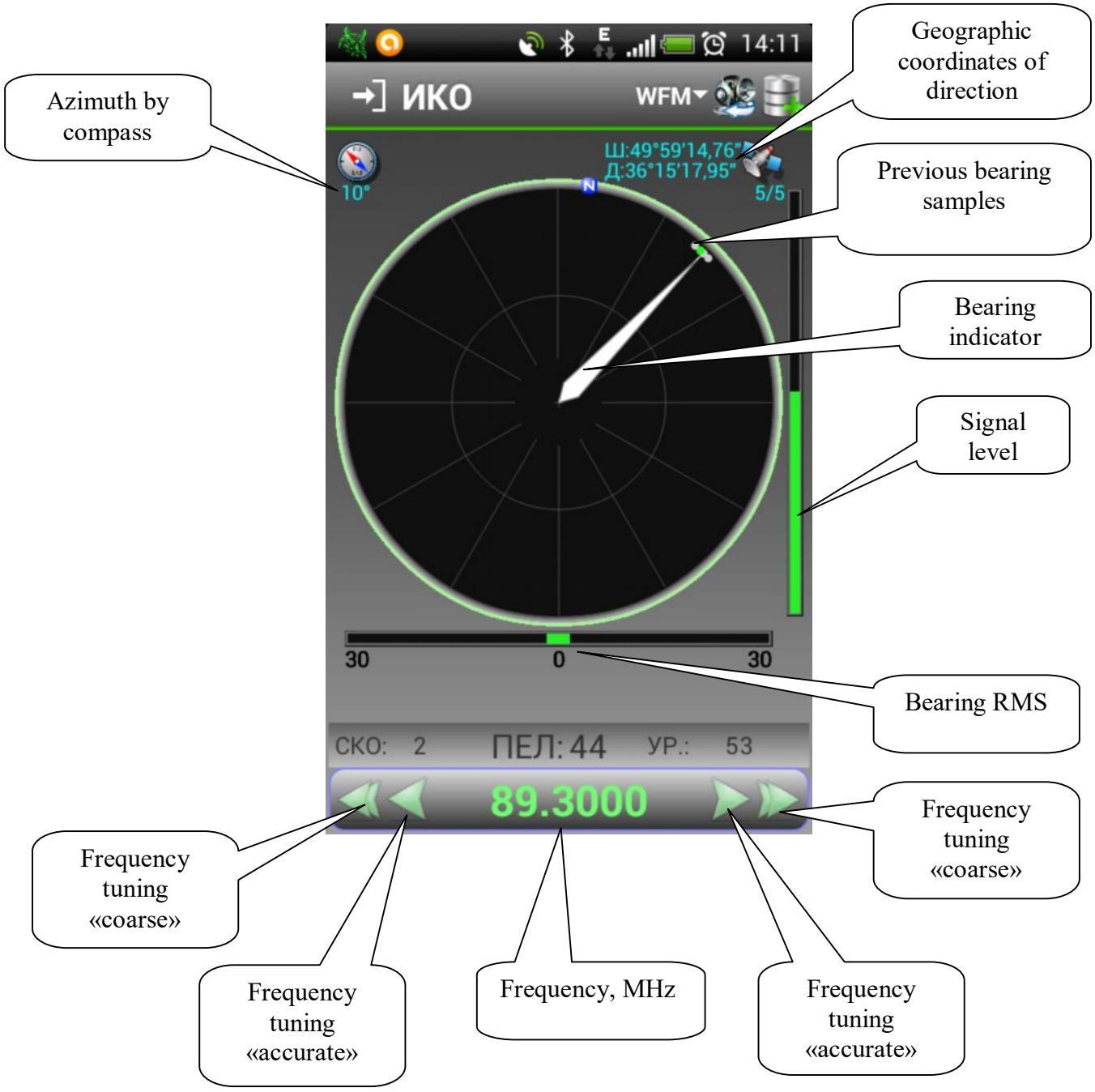
MAIN TECHNICAL PARAMETERS

- Operating frequency band:
  - Receiver **25 - 3000 MHz**
  - Antenna AFS-1D **25 - 200 MHz**
  - Antenna AFS-2D **200 - 800 MHz**
  - Antenna AFS-3D **800 – 3000MHz**
- Instrumental error of bearing taking (RMS):
  - in manual mode **10º…20º**
  - in auto mode **20º…25º**
  - in GSM mode **10º…15º**
- Sensitivity of the product by electromagnetic field is not more than:
  - in manual mode:
    - **70 - 300 µV/m** in the frequency subband 25 - 200 MHz;
    - **40 - 150 µV/m** in the frequency subband 200 - 800 MHz;
    - **150 - 1000 µV/m** in the frequency subband 800 - 3000 MHz;
  - in automatic mode:
    - **50 - 200 µV/m** in the frequency subband 25 - 200 MHz;
    - **50 - 150 µV/m** in the frequency subband 200 - 800 MHz;
    - **70 - 1000 µV/m** in the frequency subband 800 - 3000 MHz;
  - in the mode of bearing taking of GSM signals:
    - **150 - 300 µV/m** in frequency subbands 900 and 1800 MHz;
- Direction finding method **amplitude**
- Minimal duration of signals for their bearings to be taken:
  - in manual mode **100 msec**
  - in automatic mode **300 msec**
  - in GSM mode **500 µsec**
- Bearing output delay of GSM signals (accumulation time) **1-2 sec**
- Time of continuous product operation when powering from main (additional) accumulator **3 (6) hours**
- Remote control **Wi-Fi, 3G**
- The product is purposed for outdoor operation in field conditions within the temperature range **–10°C…+50° C**

Main technical characteristics of VHF-UHF receiver

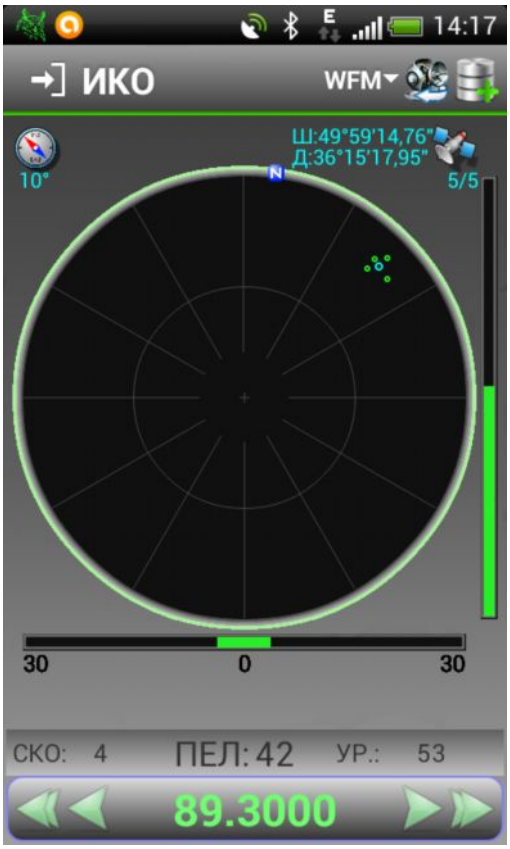
General parameters	
Operating frequency band	**25 MHz– 3000 MHz**
Antenna input (SMA connector)	**Z_{in} =50 Ohm**
VSWR of antenna input	not more than **2.5**
Receiver tuning resolution	**10 Hz**
Frequency tuning time of receiver	not more than **0.5 msec**
Relative instability of frequency tuning of receiver within the operating temperature range	not more than **$\pm 2.5 \cdot 10^{-6}$**
Modulation types	**AM, FM, WFM, CW**
Bands of digital filters	**4/6,8/8/10/15/25/50/100/150/250 kHz**
Band of frequency capture in AFC mode when receiving signals with FM	not less than **$½ \cdot \Delta F_{BW}$**
Sensitivity in AM mode with modulation rate 60% (bandwidth 6.8 kHz, SNR 10dB):	not more than **1 µV**
Sensitivity in FM mode with deviation 5kHz (modulation frequency 1kHz, bandwidth 4.0 kHz, SNR 12 dB):	not more than **0.6 µV**
Sensitivity in CW mode (bandwidth 4 kHz, SNR 10 dB):	not more than **0.4 µV**
Noise coefficient	not more than **13 dB**
Attenuation of intermediate frequencies	not less than **85 dB**
Attenuation of image channels	not less than **85 dB** (25-630 MHz) not less than **70 dB** (630-3000 MHz)
Dynamic range with respect to the third order intermodulation	not less than **70 dB**
Attenuation of spurious receiving channels	not less than **75 dB**
Level of heterodyne leak to antenna input	not less than **–105 dBmW**
Attenuation control of HF attenuators	**coarse 0...30 dB, step 10 dB** **accurate 0...31 dB, step 1 dB**
AGC control from sensitivity level	**106 dB**
Time constant of AGC discharge	**0.1/0.5/1/5/10 sec**
Volume control of LF signal	**0...30 dB**
Level of LF output for headphones connecting	**4 Ohm, 0.4 V**
Remote control	**Bluetooth V4.0**
Powering from built-in accumulator	**4 accumulators NiMH** **type size AA**
Power consumption from accumulator unit	not more than **3 W**
Time of continuous operation from one set of accumulators	not less than **3 hours**
Weight of receiver with accumulators	not more than **1.06 kg**
Overall dimensions	not more than **86 x 50 x 220 mm**
Operating temperature range	**-10°C …+50°C**

Indicator of circular look Smartphone, mode «AUTO»

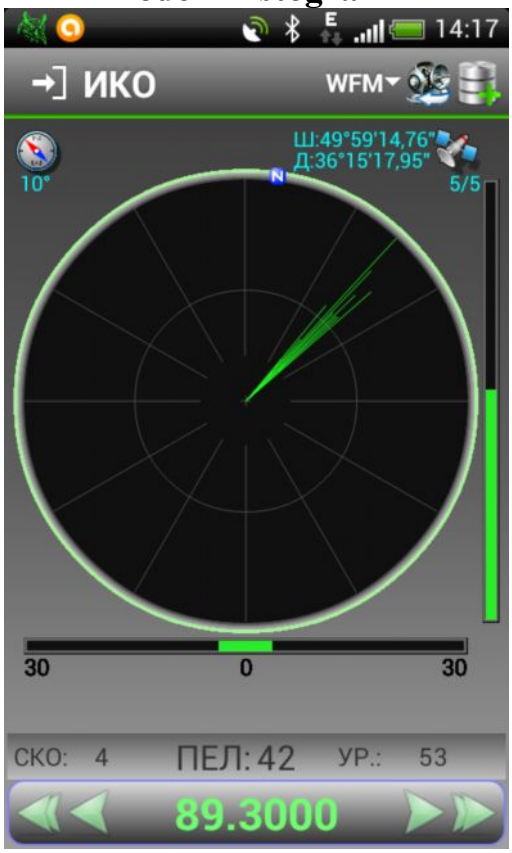


Indicator of circular look Smartphone

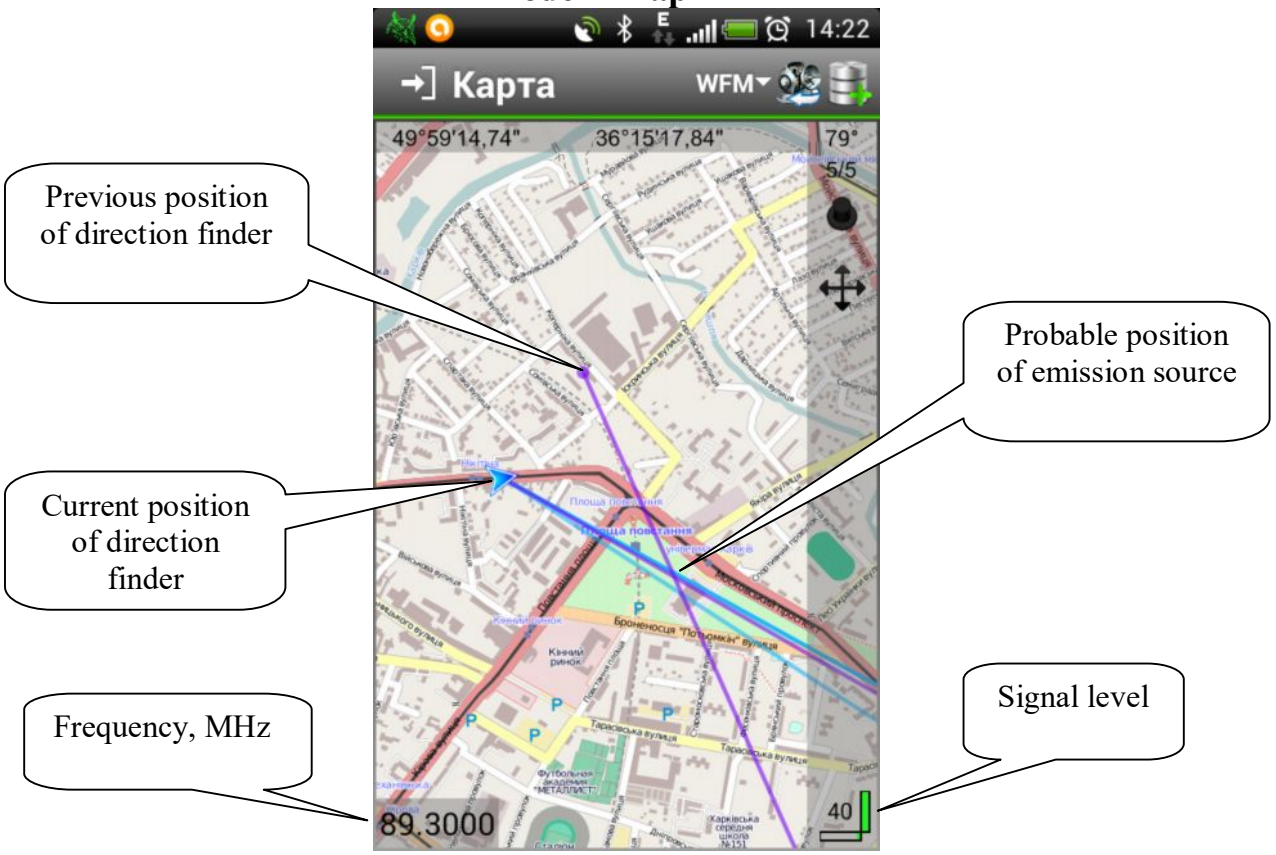
Mode «Manual»



Mode «Histogram»



Mode «Map»



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