

# Handheld direction finder of HF radio emission sources “Filin-K”

## PURPOSE

Radio direction finder “Filin-K” is designed for detection, reception and automatic determination of direction to radio emission source (RES) with vertical polarization within frequency band from 1.5 MHz to 30 MHz at preset frequency channel, or while scanning over channels, and also provides audio control of received signals.

Radio direction finder “Filin-K” is a portable compact radio direction finder with manual bearing sampling, designed for outdoor operation in the field.

## COMPOSITION

Handheld direction finder “Filin-K” consists of:

- 1) **Loop HF antenna with monopole** (provides signal reception with cardioid and figure-of-eight DF patterns shapes), with turn-on button of manual direction finding mode and needle indicator of signal level;
- 2) **Receiving and measuring device** on the base of HF receiver “**Filin-VU/DF**” with direct frequency transform i.e. with digitization of prefiltered radio-frequency signal in 16-bit ADC, designed for RES signal reception and their manual direction finding within frequency band 1.5 – 30 MHz and listening to them.
- 3) **Visualization unit** – smartphone HTC (or similar), provides informational interaction with receiver via Bluetooth V4.0, and displays operator’s graphic interface with indication of signal level and map and RES azimuth binding to smartphone compass;
- 4) **Headphones** for listening to the signal (audio control);
- 5) **Charging unit** for two accumulators of “Panasonic” type, (from AC 220 V, 50 Hz or automobile lighter DC 12 V);
- 6) **Backup accumulator set;**
- 7) **Power unit** from network AC 220 V, 50 Hz;
- 8) **Complete set of connecting cables;**
- 9) **Case** for carrying receiver on the belt;
- 10) **Case** for equipment transportation;
- 11) **Operational and maintenance documentation.**

## PECULIARITIES OF OPERATION

Involving functional capabilities of HF receiver and smartphone handheld direction finder “Philin-K” allows defining of direction to the source by signal level change during operator’s movement in azimuth plane of HF antenna module orienting by signal level needle indicator built into handle.

HF antenna module has a plane of antenna counterweight and provides two modes of operation: “cardioid” and “figure-of-eight”. In the mode “cardioid” side of the source location is defined, in the mode “figure-of-eight” - bearing to the source, in the near zone error of destination defining by “figure-of-eight” minimum comprises less than 5°.

For increasing sensitivity and accuracy of bearing taking the effect of **sound “sharpening”** of received signal occurring during angle rotation of antenna is realized in receiving and measuring device of direction finder. Listening to the signal is provided by headphones.

Presence of input HF-attenuator in receiver provides successful operation of direction finder “Filin-K” in near zone when searching for powerful radio emission sources.

Receiver and smartphone are placed on the belt of operator.

Tuning frequency, received signal level and position of operator on Google Maps are displayed on the screen of smartphone.

There is a possibility of remote control of the product via GSM 3G.

Power supply of the product is provided by internal accumulators of HF receiver and smartphone.

## MAIN TECHNICAL PARAMETERS

- Operating frequency band:
  - HF-antenna **1.5 - 30 MHz**
  - Receiving and measuring device **1.5 - 30 MHz**
- Instrumental bearing taking error: **not more than 10°**
- Sensitivity (depends on frequency) **20 – 100 μV/m**
- Time of continuous operation from accumulators **6 hours**
- Remote control **3G GSM**
- The product is designed for outdoor operation in field conditions within operating temperature range **–10° C...+50° C**

**Main technical parameters of HF receiver  
«Filin-VU/DF»**

<b>General</b>	
Operating frequency band	<b>1.5 – 30 MHz</b>
Antenna input (SMA connector)	<b>Z<sub>in</sub> = 50 Ohm</b>
VSWR of antenna input	not more than <b>2.5</b>
Tuning resolution of receiver	<b>10 Hz</b>
Time of receiver detuning	not more than <b>0.5 ms</b>
Relative frequency instability of receiver tuning frequency instability within operating temperature range	not more than $\pm 2.5 \cdot 10^{-6}$
Modulation types	<b>CW, SSB, AM, FM</b>
Bands of digital filters	<b>0.6 / 1.2 / 2.8 / 4 / 6.8 / 8 kHz</b>
Sensitivity in CW mode (BW = 0.6 kHz, SNR = 10 dB):	not more than <b>0.3 μV</b>
Sensitivity in SSB mode (modulation frequency 1kHz, BW = 2.8 kHz, SNR = 10 dB):	not more than <b>0.6 μV</b>
Sensitivity in AM mode with modulation depth 60% (BW = 6.8 kHz, SNR = 10 dB)	not more than <b>1 μV</b>
Noise factor	not more than <b>12 dB</b>
Attenuation of image channels	not less than <b>85 dB</b>
Dynamic range by third order intermodulation	not less than <b>70 dB</b>
Feedthrough level of heterodyne to antenna output	not less than <b>minus 105 dBmW</b>
Attenuation adjustment of HF attenuators	<b>0...20 dB, step 10 dB</b>
AGC adjustment range depending on sensitivity level	<b>120 dB</b>
Time constant of AGC “discharge“	<b>0.1/0.5/1/5/10 s</b>
LF signal volume control	<b>0...30 dB</b>
LF output level for connecting headphones	<b>32 Ohm, 0.4 V</b>
Remote control	<b>Bluetooth V4.0</b>
Powering from built-in accumulators	<b>2 accumulators Li-ion (3.7 V)</b>
Consumed power from accumulators	not more than <b>4 W</b>
Time of continuous operation from one accumulators set	not less than <b>5 h</b>
Weight of receiver (with accumulators)	not more than <b>1.06 kg</b>
Overall dimensions of receiver	not more than <b>86 × 50 × 220 mm</b>
Operating temperature range	<b>-10°C ...+50°C</b>

Loop antenna with monopole

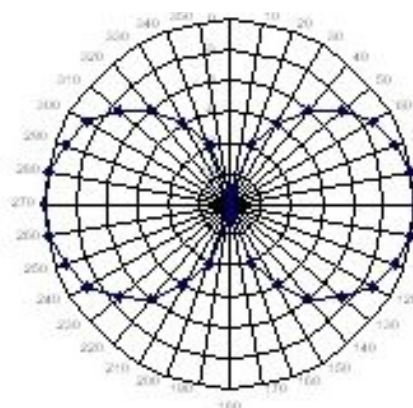


Receiving and measuring device on the base HF receiver  
“Filin-VU/DF”

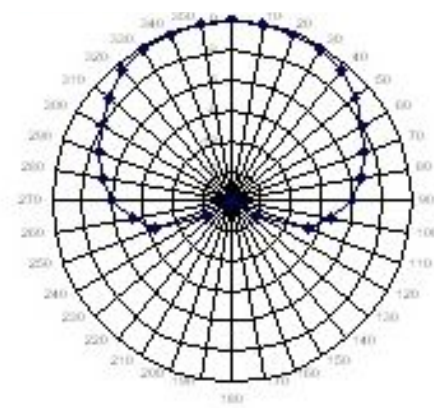


Directivity pattern of HF-antenna of direction finder  
“Filin-K” in the modes “figure-of-eight” and “cardioid”

“FIGURE-OF-EIGHT”



“CARDIOID”



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