

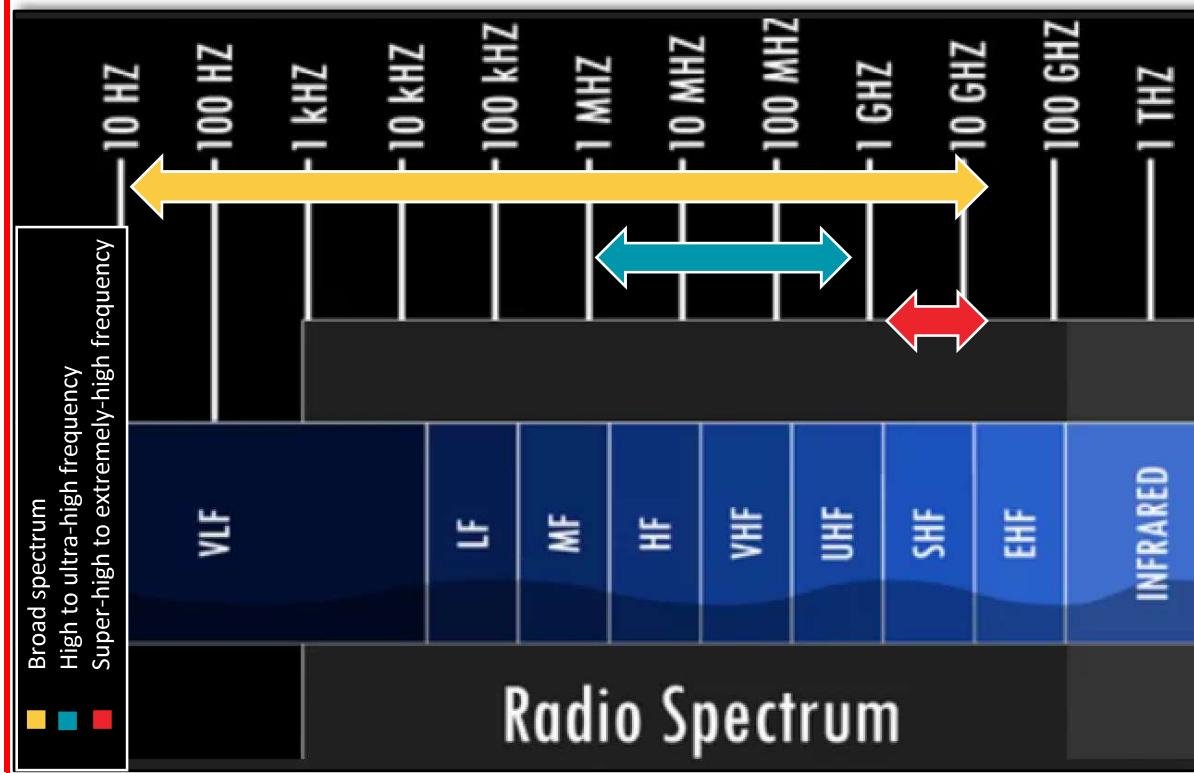
Russian Electronic Warfare Systems

Analytic Insight Report

7 June 2023

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ELECTRONIC WARFARE (EW) SYSTEMS ELECTROMAGNETIC SPECTRUM OVERVIEW



System name	Frequency	System name	Frequency
R-330 Mandat / R-330 K	1.5–100 MHz	15Ts56M Typhoon M	unknown
GT-01 Murmansk-BN	3–30 MHz	Moscow-1 / 1L267	unknown
RP-377UVM1 / UVM2 / UM2	20–1000 MHz	Moskva-1	unknown
Lesochek		RB-109A Bylina	unknown
R-330T / R-330B	30–100 MHz	Rosevnik-Aero	unknown
RB-531B Infrauna	300–1000 MHz	Samarkand	unknown
R-394B	100–400 MHz	Shipovnik-Aero	unknown
SPR-2M Rtut-BM	95–420 MHz	15Ts56M Typhoon M	unknown
1L262E Rtut-BM	95–420 and 80–900 MHz	Moscow-1 / 1L267	unknown
System name		System name	
MKTK-1A Judoist		0.0001–18 GHz	
RB-636 SVET-KU / LIGHT-KU		0.025–18 GHz	
Avtobaza-M		0.2–18 GHz	
RB-341V Leer-3		0.935–1.785 GHz	
Pelena-6BS-F		0.02–1 and 1.7–2 GHz	
R-340RP Field 21, Pole 21		1.176–1.602 GHz	
R-330 M1P Diabazol		0.1–2 GHz	
R-330Zh Zhitel		0.1–2 GHz	
85YA6 Tigr-M MKTK REI PP 'Leer-2'		0.02–2.7 GHz	
TORN		0.0015–3 GHz	
RB-310B Borisoglebsk-2		0.003–3 GHz	
1L269 Krasukha-2		2.3–3.7 GHz	
Pelena-1		2–4 GHz	
Repellent-1		0.2–6 GHz	
Tirada-2		3–14 GHz	
1RL237 SPN-30		8–12 GHz	
1RL257 Krasukha-4		8.5–10.7 and 13.4–17.7 GHz	
1RL238 SPN-40		13.333–17.544 GHz	
1RL248-2 SPN-2 / 1RL248-4 SPN-4		13.333–17.544 GHz	

Electromagnetic spectrum. Source: © 5 September 2018, NASA¹

15TS56M TYPHOON M



Name: 15TS56M Typhoon M

Name, Russian: 15Ц56М "Тайфун-М"

Other names: NATO Designation - BPDM "Typhoon-M"

Other names, Russian: (БПДМ) "Тайфун-М"

Purpose/use: Combat anti-sabotage vehicle designed to accompany mobile missile launchers on routes for combat use; used to detect enemy sabotage groups and destroy enemy manpower and light equipment¹; equipped with a radio and optoelectronic complex to provide reliable observations in all weather conditions and times of day²

Bandwidth/frequencies: Unknown

Range/antennae ranges: Can detect enemy armored vehicles within 10 km and people from up to 5 km away³

Variants: Unknown

Approximate date of adoption to Russian military: 2013 by Strategic Missile Forces

of the Teykovskaya Missile Division⁴

TTPs used to counter system(s): Unknown

Table Source: © 2 June 2023, Arsenal Info⁴

Performance Specifications	
Length [m]	7.65
Width [m]	3.6
Height [m]	4.42
Mass combat [tons]	14.5
Power reserve [km]	600
Turning radius minimum [m]	3.85
Crew [people]	3

15TS56M TYPHOON M, CONTINUED

ADDITIONAL INFORMATION, IMAGES, AND DIAGRAMS

- Includes a radar system, radio stations, satellite navigation, a thermal imager, means of counteracting radio-controlled explosive devices, and an echolocation system⁵
- Equipped with Eleron-3SV unmanned aerial vehicles equipped with optical-electronic surveillance equipment used to patrol territories in an expanded range⁶
- Capable of being in the air for two hours with a range of 25 km⁶
- Signal from the optoelectronic station displayed on liquid crystal screens; operator or commander can monitor the environment and attack the detected targets using the existing machine gun⁷



BPDM 15TS56M "Typhoon-M".

Source: © Date accessed: 2 June 2023, Wartime⁸

Remotely controlled combat module with a PKT machine gun.

Source: © Date accessed: 2 June 2023, Oruzhie.info⁶

1L262E RTUT-BM



Name: 1L262E Rtut-BM

Name, Russian: 1Л262Э Ртуть-БМ

Other names: SPR-2M, Mercury-BM^{9,10,11,12}

Other names, Russian: СПР-2М, Ртуть-БМ
Purpose/use: Protecting troops and equipment from artillery rockets and shells equipped with proximity fuses, which explode at 3 to 5 meters of altitude, in addition to neutralizing enemy radio frequencies⁹

Bandwidth/frequencies: 95–420 MHz operating, 80–900 MHz jamming

Range/antennae ranges: 500,000 m² or a semi-sphere of 400 m radius⁹

Variants: SPR-2/Rtut-B¹²

Approximate date of adoption to Russian military: 2013¹¹

TPPs used to counter system(s): Unknown

Additional information:

- SPR-2M/Rtut-BM is a modernization of the SPR-2/Rtut-B (GRAU Index -1L29), improving system reliability and adding the function of jamming radio lines on VHF frequencies¹²
- Rtut-BM affects proximity/radio-controlled fuses, causing targets to explode at higher altitude⁹

Russian Rtut-BM electronic warfare system.
Source: © 20 March 2022, Defence-ua.com¹⁰

Table Sources: © 5 June 2023, Deagel.com⁹
28 May 2021, Military.com.vn¹³
7 April 2022, Topwar.ru¹⁴

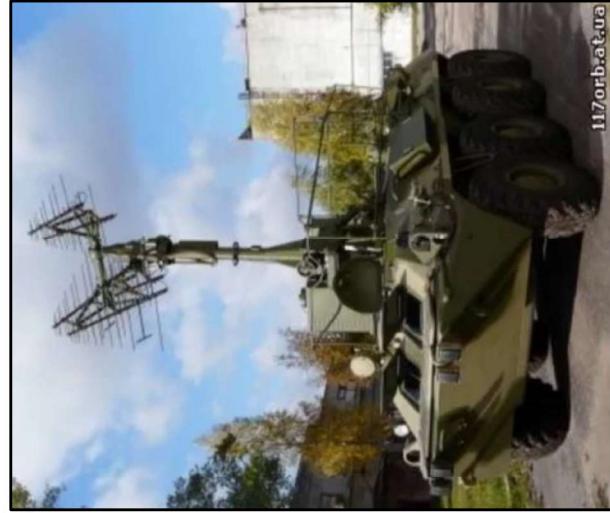
Performance Specifications	
Jamming frequency [MHz] ^{13,14}	80–900
Operating frequency range [MHz] ¹⁴	95–420
Coverage area [m ²] ^{9,13}	500,000
Ready time [min] ¹³	10
Continuous operation time [min] ^{9,13}	6
Coverage radius [m] ⁹	400
Crew [people] ¹³	2
Antenna rotation [deg] ⁹	150
Chassis ^{9,14}	MT-LBu
Total pulse power of the jamming signal [W] ¹³	180

1L262E RTUT-BM, CONTINUED

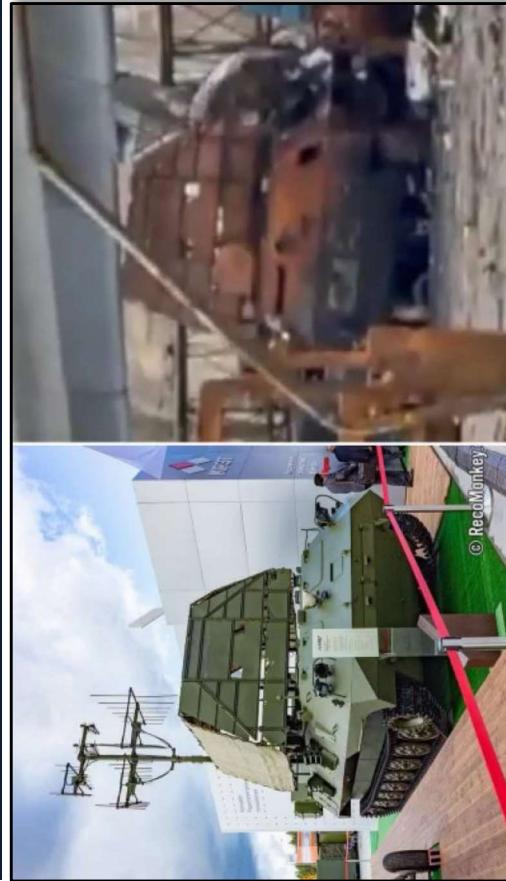
ADDITIONAL INFORMATION, IMAGES, AND DIAGRAMS



SPR-2M "Rtut-BM" at the Russian state corporation Rostec. Source: © 2 June 2023, Podarilove.ru¹⁷



Russian SPR-2, 1L29 "Mercury-B".
Source: © 30 March 2009, 117orb.at.ua¹⁸



Report of the first Russian 1L262E Rtut-BM EW system destroyed in Ukraine.
Source: © 2 April 2022, Twitter¹⁵



Electronic warfare complex 1L262E "Mercury-BM".
Source: © 22 May 2019, vpk.name¹⁶

1L269 KRASUKHA-2



Name: 1L269 Krasukha-2

Name, Russian: 1П/1257 Красуха-2

Other names: Unknown

Other names, Russian: Unknown

Purpose/use: Ground-based EW system intended to neutralize airborne warning and control systems (AWACS) by jamming its radar at ranges of up to 250 kilometers¹⁹

- Provides protection to ground forces by jamming any airborne radar, radar-guided weapon system or radar-guided missile¹⁹
- System used to protect the Iskander tactical ballistic missile units¹⁹

Bandwidth/frequencies: Used to jam S-band, 2.3 GHz–3.7 GHz²⁰

Range/antennae ranges: 250 kilometers¹⁹

Variants: Krasukha-2O, 1L269, 1RL269, and RB-261A²¹

Approximate date of adoption to Russian military: 2011²²

TTPs used to counter system(s): Unknown

Additional information:

- KRET corporation produces this EW system integrated onto a tactical truck system¹⁹
- System designed to counter enemies who possess high-tech weapons²³
- Missiles jammed by the 1L269 are provided with a false target¹⁹

1L269 Krasukha-2. Source: © 13 August 2014, VitalyKuzmin²²

Table Sources: © 19 March 2022, Global Defence Technology²⁰
23 March 2023, Military Factory²⁴

Performance Specifications	
Operating frequency range [GHz] ^{20,24}	2.3–3.7
Speed [km/h] ²⁴	115
Range [km] ²⁴	850
Weight [kg] ²⁴	35,000
Length [m] ²⁴	11.3
Width [m] ²⁴	9.0
Height [m] ²⁴	5.5
Crew [people] ²⁴	4

1L269 KRASUKHA-2, CONTINUED

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ADDITIONAL INFORMATION, IMAGES, AND DIAGRAMS

- Mounted on a BAZ-6910-022 automobile chassis, wheel arrangement 8x8²⁵
- Cab equipped with protection against microwave radiation and an independent air heater OH-32D-24 and an electric Webasto CC4E air conditioner²⁵
- 1L269 Krasukha-2 and 1RL257 Krasukha-4 are high-tech solutions used for defense of troops and stationary objects from enemy high-precision weapons, target designation and detection systems²⁵

1L269 Krasukha-2 advanced electronic jammer.
Source: © 24 September 2013, Defense-studies²⁵



Krasukha complex. Source: © 26 April 2013, Topwar.ru²⁷
1L269 Krasukha-2 and 1RL257 Krasukha-4 systems deployed with the army's independent EW brigades to jam airborne radars.
Source: © 26 May 2022, ADBR²⁶

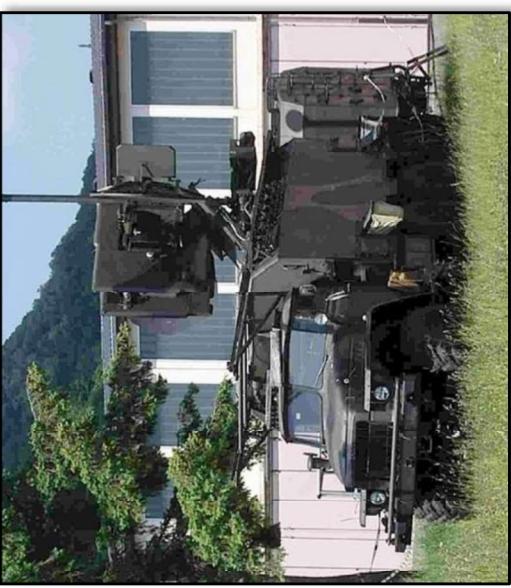


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1RL237 SPN-30



Name: 1RL237 SPN-30

Name, Russian: СПН-30

Other names: NATO Designation - "Paint Box"^{28,29}

Other names, Russian: Коробка с краской

Purpose/use: Denial of enemy reconnaissance and observation of area and small-size ground objects by airborne side-looking radars (SLAR/SAR), air-to-surface fire control radars, as well as navigation and low-altitude terrain-following radars²⁸

- Jamming signal types include spectrally matched noise jamming²⁸
- Designed for deployment in prepared anti-fragmentation pits aligned with main combat direction, with connection to the command post AKUP-22 via R-403M radio and coupling device 5Z55M²⁹
- Used alongside other jamming stations like the SPN-40 and SPO-8M, all under the command of AKUP-22²⁹

Bandwidth/frequencies: X Band, 8000–12000 MHz²⁹

Range/antennae ranges: Detection between 250–400km, interference between 60–150km²⁹

Variants: None

Approximate date of adoption to Russian military: Unknown

TTPs used to counter system(s): Unknown

Table Source: © 1 May 2009, Air Power Australia³⁰

Performance Specifications	
Operating frequency range [GHz]	8–12
Power output rating [dBW]	narrow beam mode: 68, wide beam mode: 54
Receiver sensitivity [dBW]	< 100 [μs]: -123, > 100 [μs]: -140
Signal dynamic range [dB], no less than	60
Analyzed basic pulse signal parameters	duration [μs]: 0.1–5, at PRF [kHz]: 0.25–300
Complex linear FM chirped pulse modulation:	duration [μs]: 1–300, at PRF [kHz]: 0.5–10
Chirp rate [MHz/μs]	≥ 3
Receive/transmit polarization	oblique
Angular range [deg]	azimuth: 360, elevation: 1–70
Crew [people]	4

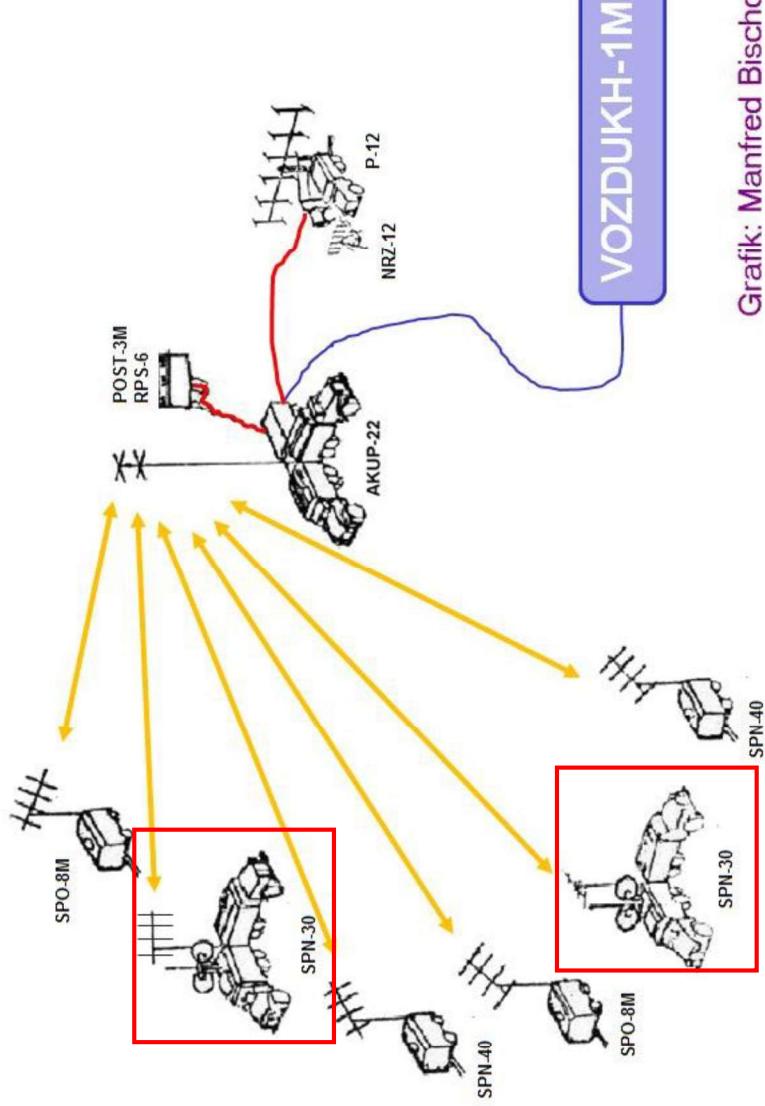
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3GIMBALS

ADDITIONAL INFORMATION, IMAGES, AND DIAGRAMS

JAMMER SET-UP



Two SPN-30 systems deployed as part of Vozdukh-1M jammer setup.
Source: © 25 May 2023, Manfred-Bischoff³¹



SPN-30 deployed in anti-fragmentation field setup.
Source: © 25 May 2023, Manfred-Bischoff³¹



SPN-30 system in the field.
Source: © 1 May 2009, Air Power Australia³²

1RL238 SPN-40



Name: 1RL238 SPN-40

Name, Russian: 1РЛ238 СПН-40

Other names: NATO Designation - "Dog Cart", Kvant SPN-40^{33,34,35}

Other names, Russian: КВАНТ СПН-40 / 1РЛ238³⁴

Purpose/use: Automatic interference with aviation navigation systems and radars to cover defended objects from bombing and use of air-to-ground missiles; specifically countering NATO fighter-bomber terrain-following radars (Tornado/F-111), but also other airborne emitters operating in the same Ku-band^{33,34}

Bandwidth/frequencies: 2–4cm wavelength (Ku Band), 13.333–17.544 GHz^{33,36}

Range/antennae ranges: Detection up to 250km, interference up to 150km³⁴

Variants: SPN-40/SPN-40M2 (M2 is an upgraded version of the SPN-40 with advanced detection

capabilities, modernized electronics, and Ku-band frequency range)^{33,36}

Approximate date of adoption to Russian military: Cold War era, date unknown³⁴

TTPs used to counter system(s): Unknown

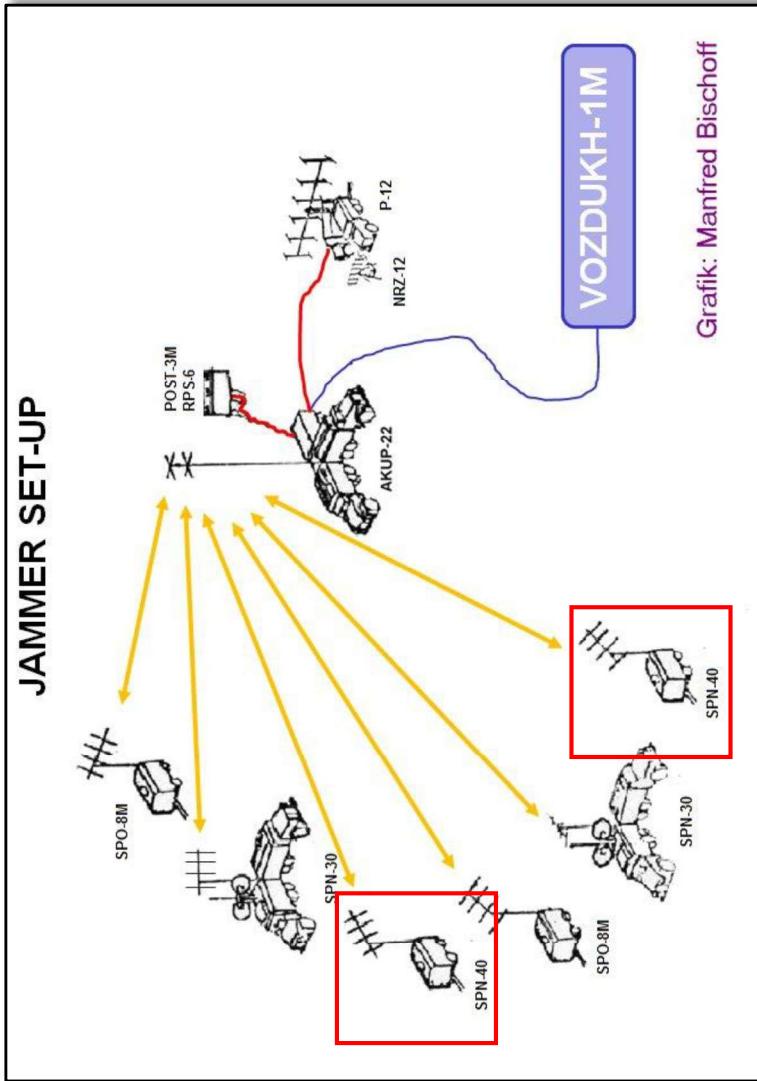
Additional information:

- System consists of a trailer (van body KUNG-P4M on the chassis of the trailer SMZ-810A (2-PN-4)) with equipment and a Ural-375 vehicle with a power unit³⁴
- Can interfere with up to 4 radars operating at different frequencies³⁴
- Spent time in service with Poland, where it was known as the Jadwiga-4³⁴

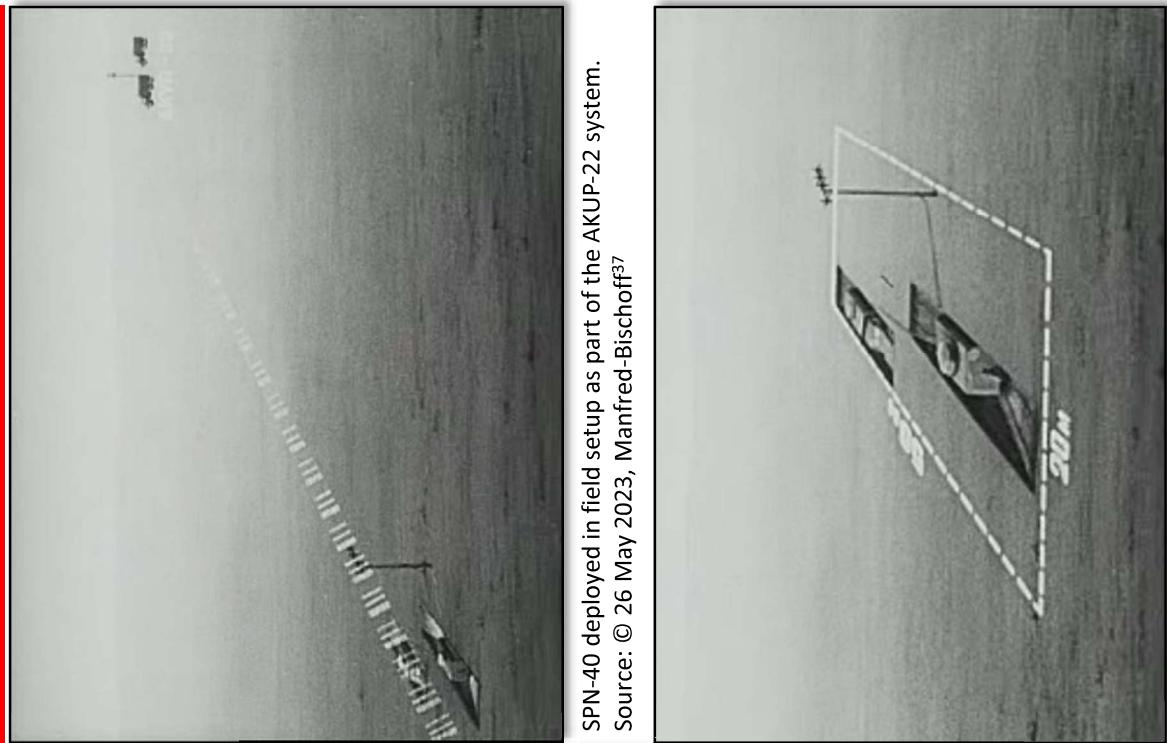
Table Source: © 24 May 2023, Armed conflicts³⁶

Performance Specifications (SPN-40M2)	
Operating frequency range [GHz]	13.33–17.54
Types of received signals	simple pulsed, quasi-continuous wave (CW), pulsed chirp, phase-code shift keyed with pseudo-random frequency tuning
Types of jamming signals	multiple-pulsed I (MP-I), MP-II, MP-I + noise, MP-II + noise, quasi-CW noise signals spot jamming in frequency range-detection signals
Receiver sensitivity [dBW]	-90
Frequency-accurate interference signal reproduction [MHz]	±0.5
Radiated power [W]	> 600
Power consumption [kW]	27

ADDITIONAL INFORMATION, IMAGES, AND DIAGRAMS



Two SPN-40 Systems deployed as part of Vozdukh-1M jammer setup.
Source: © 26 May 2023, Manfred-Bischoff³⁷



SPN-40 deployed in anti-fragmentation field setup alongside support vehicle. Source: © 26 May 2023, Manfred-Bischoff³⁷

1RL248-2 SPN-2 / 1RL248-4 SPN-4



Name: 1RL248-2 SPN-2 / 1RL248-4 SPN-4

Name, Russian: 1РЛ248-2 СПН-2 / 1РЛ248-4 СПН-4

Other names: NATO Designation - "Heart Ache", Kvant SPN-2 / Kvant SPN-4^{38,39}

Other names, Russian: Квант СПН-2 / Квант СПН-4

Purpose/use: Denial of enemy reconnaissance and observation of area and small-size ground objects by airborne side-looking radars, air-to-surface guided weapons control radars, as well as navigation and low-altitude flight control radars^{38,40}

Bandwidth/frequencies: 2–4cm wavelength (Ku Band), 13.333–17.544 GHz^{38,40}

Range/antennae ranges: Unknown

Air-launched weapon control radars: not less than 130–150km³⁸

Side-looking radars: at least 60km (one radar) or at least 40km (two radars)³⁸

Low-altitude flight control radars: at least 50km (one radar) or at least 30 (two radars)³⁸

Variants (vehicles, static, etc.): SPN-2/-3/-4 (variants are designed to deny surveillance using different radar systems in the 2-, 3-, or 4-centimeter wavelength bands, numbers indicate corresponding radar equipped, all wheeled mobile platforms³⁸

Approximate date of adoption to Russian military: Unknown

TTPs used to counter system(s): Unknown

Performance Specifications	
Operating frequency range [GHz]	13.33–17.54
Total power output [W]	1,100
Receiver sensitivity [dBW]	-90
Angular coverage limits [deg]	azimuth: 0–360, elevation: - 2.5–45 in azimuth: 45, in elevation: 10
Angular coordinates measurement accuracy [deg]	24
Number of beams in instant coverage sector	in azimuth: 7.5, in elevation: 2.5
Paraxial beam width [deg]	≤ 15
Repeater jamming signal delay [microsec]	24
Max continuous operation time [hrs]	5
Crew [people]	5

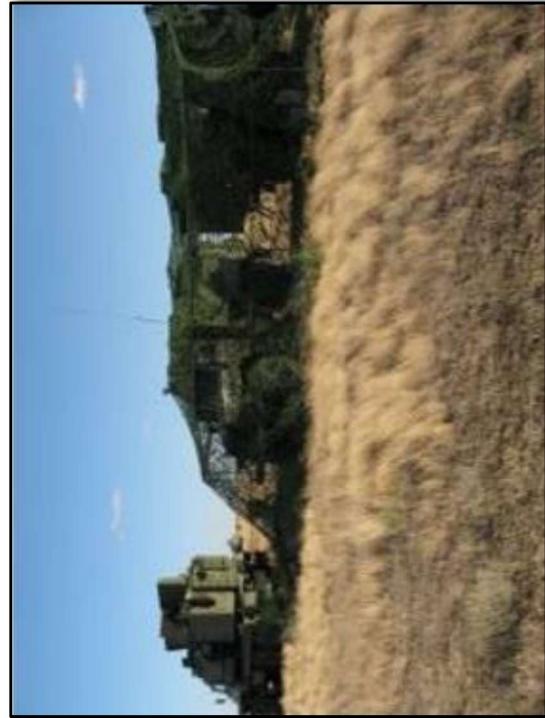
Table Source: © 1 May 2009, Air Power Australia³⁸

Frontal view of SPN-2. Source: © 1 May 2009, Air Power Australia³⁸

1RL248-2 SPN-2 / 1RL248-4 SPN-4, CONTINUED

ADDITIONAL INFORMATION, IMAGES, AND DIAGRAMS

- Quasi-continuous noise/masking jamming of either selective (6–19MHz) or barrage (260–270 MHz) type with repeater noise jamming if a hostile radar operates in the pulse-to-pulse frequency agility mode^{41,42}
- Intended to blind U.S. high-resolution ground-mapping ISR radars utilized in the E-8 JSTARS, U-2, RQ-4 Global Hawk, a variety of fighter aircraft, and smaller unmanned aerial systems⁴³
- Can suppress 2 side-looking radars, 2 low-altitude flight control radars, or up to 6 weapons control radars in two directions simultaneously. Suppression can be carried out depending on the antenna beam width: within a 10x45-deg sector (narrow beam mode) or a 45x45-deg sector (wide beam mode)⁴²
- Produced by OAO VNII Gradient (Russia, 344010, Rostov-on-Don, Prospect Sokolova, 96)⁴⁴
- Can be utilized as a stand-alone system or as part of a group of centrally controlled jammers, such as the Russian AKUP-1 automated jammer control system⁴¹
- Camouflaged concealment net sometimes used to disguise⁴⁴



Camouflaged netting used to disguise SPN-2 presence in the field. Source: © 13 December 2021, Borda.ru⁴⁴

1RL257 KRASUKHA-4 / K1 ELECTRONIC WARFARE JAMMER

Name: 1RL257 Krasukha-4 / K1 Electronic Warfare Jammer

Name, Russian: 1РЛ257 Красуха-4

Other names: Unknown

Other names, Russian: Unknown

Purpose/use: Neutralizes low-Earth orbit spy satellites, ground-based and airborne radars and is a means of protection against surveillance, unmanned aerial vehicles (UAVs), and small arms fire⁴⁵

Bandwidth/frequencies: Jamming X-band, 8.5–10.7GHz and Ku-band, 13.4–17.7GHz⁴⁶

Range/antennae ranges: 150–300 km⁴⁵

Variants: Krasukha-S4, 1L257, 1RL257, and RB-271A⁴⁷

Approximate date of adoption to Russian military: 2012⁴⁸

TTPs used to counter system(s): Unknown



1RL257 Krasukha-4 at Victory Day Parade in Ekaterinburg. Source: © 9 March 2021, Vitaly Kuzmin⁴⁹

Table Sources: © 19 March 2022, Global Defence Technology⁴⁶
23 March 2023, Military Factory⁵⁰

Performance Specifications	
Jamming frequency range, GHz ⁴⁶	X-band, 8.5–10.7; Ku-band, 13.4–17.7
Speed [km/h] ⁵⁰	115
Range [km] ⁵⁰	850
Weight [kg] ⁵⁰	35,000
Length [m] ⁵⁰	11.3
Width [m] ⁵⁰	9.0
Height [m] ⁵⁰	5.5
Crew [people] ⁵⁰	4

1RL257 Krasukha-4 / K1 ELECTRONIC WARFARE JAMMER, CONTINUED

ADDITIONAL INFORMATION, IMAGES, AND DIAGRAMS

- Complex is installed on the chassis of two KamAZ-6350 vehicles consisting:⁵¹
 - Radios R-168-5, R-168-100⁵¹
 - Antenna R-168ŠDAM⁵¹
 - Telescopic mast⁵¹
 - Satellite navigation BRIZ-KM (14C835/14Ц853)⁵¹
 - Secure computers Baget-23V and Baget-RSZBM⁵¹
 - Digital transmission system M-498⁵¹
 - Microwave equipment US522219⁵¹
 - Graphic information manipulator⁵¹
 - Generator ADS- 10 (2 pcs.), ADS-30 (1 pc.)^{51,52}
 - Has operational range of 186 miles⁵³



Container from 1RL257 Krasukha-4 in the Kiev region.

Source: © 23 March 2022 Militarnyi⁵⁴



1RL257 Krasukha-4 at complex in Russia. Source: © 23 March 2022 Militarnyi⁵⁴

85YA6 TIGR-M MKTK REI PP 'LEER 2'

Name: 85YA6 Tigr-M MKTK REI PP 'Leer 2'

Name, Russian: МКТК РЭИ ПП «Тигр-М»

Other names: NATO Designation - Leer-2, Tigr-M Leer-2

Other names, Russian: Тигр-М Leer-2

Purpose/use: Mobile technical control, assessment of electromagnetic environment (EMS), radio reconnaissance of radio emission sources (RES), radio-electronic interference and mobile communication systems jamming^{55,56,57}

Bandwidth/frequencies: Jamming 0.02-2.7 GHz⁵⁵

Range/antennae ranges: 6–40km⁵⁵

Variants: Unknown

Approximate date of adoption to Russian military: 2012^{55,58}

TPPs used to counter system(s): Unknown

Additional information:

- Quasi-simultaneous suppression of 12 sources of radio emission⁵⁵
- Continuous reconnaissance and suppression, even when mobile⁵⁵
- Mounted on Tigr-M armored vehicle platform⁵⁶



Table Source: © 23 May 2014, Airbase.ru⁵⁵

Performance Specifications	
Signal technical analysis range [GHz]	0.0001–18.0
Direction finding range of radio emission sources [GHz]	0.02–18.0
Radio reconnaissance and suppression range [GHz]	0.0–2.7, mast antennas: 0.02–2.7
Direction-finding accuracy [deg]	roof antennas: 3, mast antennas: 2
Navigation reference accuracy [m]	< 15
Maximum radio communication range [km]	for R.168 MRA (antenna AB): 6, for R-168-25U-2 (BShDA antenna): 40
Sweep rate by frequency during detection with direction finding [GHz]	> 2
Coagulation deployment time [min]	10
Autonomous battery operation time [hrs]	2
Crew [people]	3

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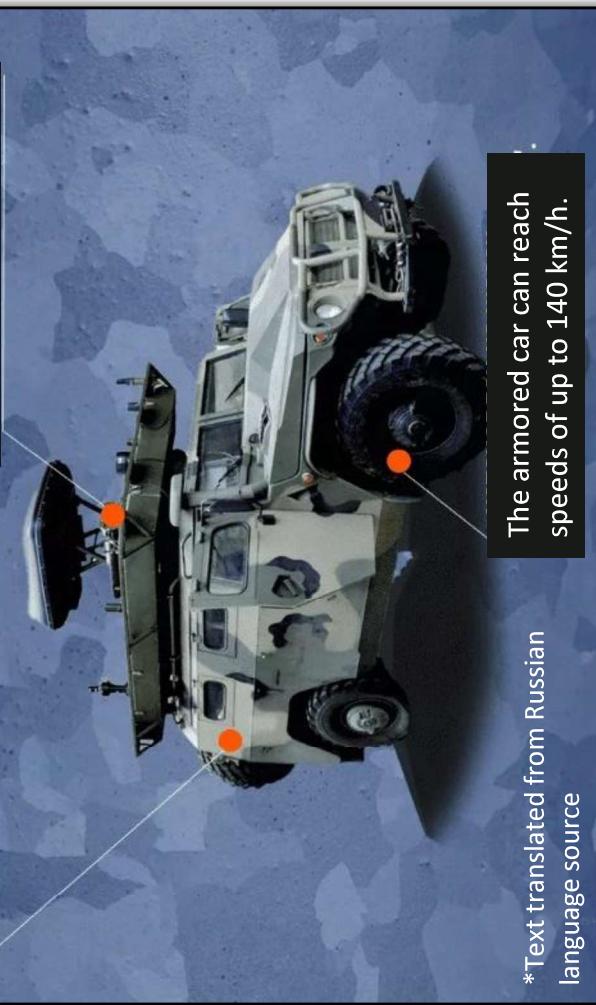
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ADDITIONAL INFORMATION, IMAGES, AND DIAGRAMS

Electronic warfare complex
“Leer-2”

Jamming and radio suppression of enemy electronic equipment is installed on the roof of the car.

The crew of the 8-ton armored car is made up of 2 people—the driver and the operator.



*Text translated from Russian language source

The armored car can reach speeds of up to 140 km/h.

85YA6 Tigr-M MKTK REI PP 'Leer 2' informational diagram. Source: © 11 March 2022, Ukraine Segodnya⁵⁹



Leer-2 side profile. Source: © 30 May 2023, Army Recognition⁶⁰

Interior of Leer-2. Source: © 30 May 2023, Arms.expo.ru⁶¹

AVTOBAZA-M

Name: Avtobaza-M

Name, Russian: Автобаза-М

Other names: Unknown

Other names, Russian: Unknown

Purpose/use: Ground-based passive electronic intelligence (ELINT) system designed for detection of pulse and continuous signals of air and sea-based radars, friend-or-foe identification signals, and tactical air navigation (TACAN) system signals; determination of parameters of signals and types of radars; trajectory tracking of air and airborne objects by their electronic signature, and for data support for higher air defense command and control posts⁶²

Bandwidth/frequencies: Operating frequency, 0.2–18 GHz⁶³

Range/antennae ranges: Up to 400 km⁶³

Variants: Unknown

Approximate date of adoption to Russian military: 2011, Russian Khmeimim airbase in Syria⁶⁴

TTPs used to counter system(s): Unknown

Additional information:

- Passive mode of operation increases the survivability of air defense and electronic warfare groups by 30 to 40 percent⁶⁵
- Stations of the passive complex can be used autonomously as radio intelligence stations and provide collection, accumulation and processing of reconnaissance information about emitting air targets⁶⁵



Ground-based ESM/ELINT system "Avtobaza-M"

Source: © 2023, Catalog Rosoboronexport⁶²

© 2019, Standfair Operations⁶³
2023, Redstar⁶⁵

Performance Specifications

Operating frequency bandwidth [GHz] ⁶³	0.2–18
Frequency bandwidth for TACAN systems [MHz] ⁶³	962–1213
Detection range [km] ⁶⁵	≤ 400
Position finding method ⁶³	Time-difference
Mean positioning error ⁶³	< 2% of range
Target image library capacity ⁶⁵	≤ 2,000 images and operation modes
Number of simultaneously tracked targets ⁶⁵	≤ 150
Emitter data update rate [s] ⁶⁵	< 2.5
Deployment/collapse time [min] ⁶⁵	≤ 45

GT-01 MURMANSK-BN

7 June 2023

Name: GT-01 Murmansk-BN

Name, Russian: ГТ-01 Мурманск-БН

Other names: Unknown

Other names, Russian: Unknown

Purpose/use: Designed to perform long-range communications jamming; operates as a network-centric capability; primary role to eliminate High Frequency broadcasts from NATO forces, particularly the HF Global Communications System of the United States; able to intercept communications between warships, aircraft, and satellites^{66,67}

Bandwidth/frequencies: Jamming frequency: 3-30 MHz⁶⁶
Range/antennae ranges: 5,000–8,000 km⁶⁶
Variants: None

Approximate date of adoption to Russian military: 2014 in Sevastopol, Crimea at the 475th Independent Electronic Warfare Centre of the Russian Navy^{66,68}

TTPs used to counter system(s): Unknown

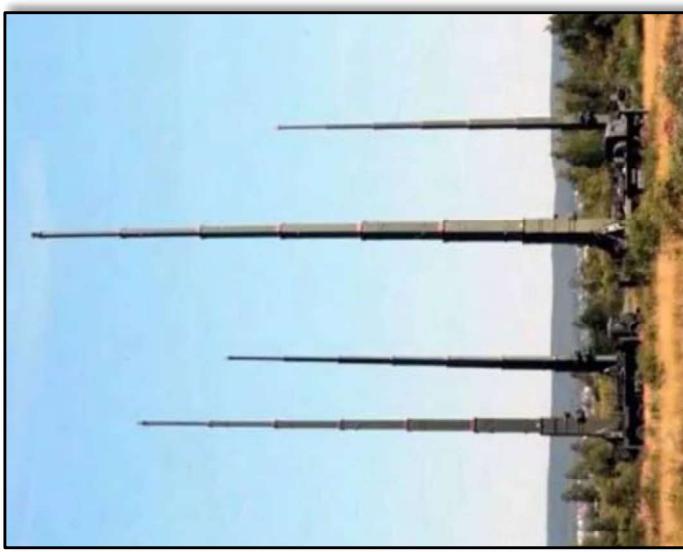
Additional information:

- Complex is fully mobile and has groups of up to four extendable antenna masts – two on a dedicated KamAZ or Ural truck, which tows another antenna on a trailer⁶⁶
- Full complex has four antenna groups for 16 antennas in total; masts extend to 32 meters in height⁶⁶
- Support vehicles include a KamAZ 6350 command vehicle, a heavy cargo truck that was developed in 1987 and was adopted by the Russian army in 2002, and a KamAZ 6350 generator vehicle per four antenna group⁶⁶
 - The layout of the KamAZ 6350 is conventional with a crew cab at the front and a cargo area at the rear, a weight of 11,400 kg and a payload capacity of 10,000 kg⁶⁶

 Table Source: © 18 April 2022, Army Recognition⁶⁶

 GT-01 Murmansk-BN.
 Source: © 18 April 2022, Army Recognition⁶⁶

Performance Specifications	
Jamming frequency [MHz]	3–30
Area of jamming [km ²]	640,000
Jamming range [km]	5,000–8,000
Deployment time [hours]	72
Truck vehicles	KamAZ 53501 and KamAZ 6350



ADDITIONAL INFORMATION, IMAGES, AND DIAGRAMS

- Vehicle carrying the extendable antenna masts is based on the KamAZ 53501 8x8 military truck chassis, fitted with a three-person crew cab; weighs 9,200 kg with a payload capacity of 6,000 kg; powered by a KamAZ-740.13.260 turbocharged diesel engine developing 260 horsepower⁶⁹
- Other vehicles include fuel bowlers and troop transport⁶⁹



Antenna mounted on a trailed.

Source: © 18 April 2022, Army Recognition⁶⁹



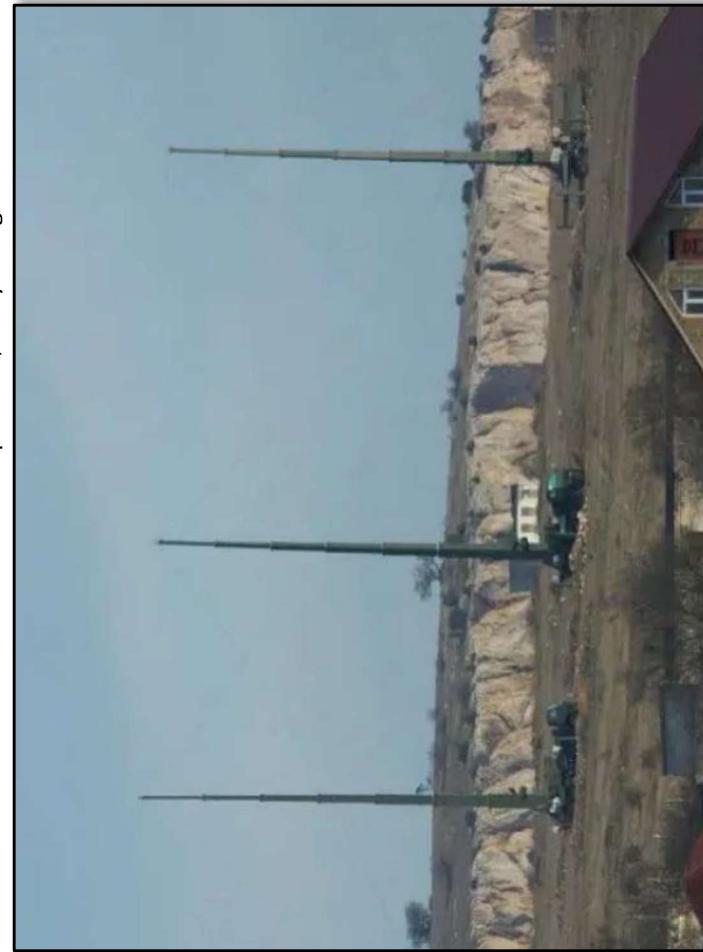
Command post and generator vehicle.

Source: © 18 April 2022, Army Recognition⁶⁹



KamAZ 53501 8x8 military truck with the extendable antenna mast.

Source: © 18 April 2022, Army Recognition⁶⁹



GT-01 Murmansk-BN. Source: © 18 April 2022, Army Recognition⁶⁹

MKTK-1A JUDOIST

Name: MKTK-1A Judoist

Name, Russian: МКТК-1А Дзюдоист

Other names: Dziudoist

Other names, Russian: Дзюдоист

Purpose/use: Intended for detection, measuring parameters and determining the location of radio emission sources, anti-missile defense (ABM), verification of compliance with the requirements for countering the technical means of reconnaissance of foreign states and blocking technical channels of information leakage^{70,71}

Bandwidth/frequencies: Radio and radio control frequency range is 0.0001–18 GHz⁷⁰

Range/antennae ranges: Unknown

Variants: Unknown

Approximate date of adoption to Russian military: 2012⁷²

TTPs used to counter system(s): Unknown

Additional information:

- Complex includes three automated workstations - for radio and radio control, technical analysis and special control⁷²

- Specialized software installed on workstations displays results of monitoring and analysis of the electromagnetic spectrum on a digital map of the area and identifies sources of radiation⁷²

Table Source: © 2 June 2023, Weapons of Russia⁷⁰, 2 June 2023, Вооружение.рф⁷²

Performance Specifications

Frequency range (radio and radio control) [GHz] ⁷²	0.0001–18
Frequency range of acoustic & vibroacoustic control [Hz] ⁷²	10–20000
Time of setup/breakdown [min] ⁷⁰	30
Power consumption [kW] ⁷²	3.5
Working temperature range [Celsius] ⁷⁰	-50 to +50
Power supply frequency [Hz] ⁷⁰	50
Communication range with portable radio station [km] ⁷⁰	< 20
Direction finding error [deg] ⁷⁰	Less than 2 to 3
Chassis ⁷²	KamAZ-4350
Navigation reference accuracy [m] ⁷²	< 50

ADDITIONAL INFORMATION, IMAGES, AND DIAGRAMS



Deployed MKTk-1A Judoist. Source: © 6 June 2023, Roe.ru⁷³



Operators of the MKTk-1A "Dzhudoist" EW system. Source: © 25 April 2023, Mil.in.ua⁷⁴



MKTk-1A Judoist. Source: © 6 June 2023, Roe.ru⁷³

MOSCOW-1 / 1L267 MOSKVA-1

Name: Moscow-1

Name, Russian: Москвa-1

Other names: Москвa-1, Москвa-1 1L265, 1L266, 1L267⁷⁵

Other names, Russian: Москвa-1, Москвa-1 1L265, 1L266, 1L267

Purpose/use: Intended for search, detection, direction finding, measurement of parameters and tracking of air sources of radiation operating in the radio frequency bands UHF, L, S, C, X, Ku. Designed to determine the coordinates, support of air sources of radiation by the triangulation method, and to carry out automated planning of combat tasks of the use of EW-C.⁷⁶ It operates on the principle of passive radar⁷⁷

Bandwidth/frequencies: Unknown

Range/antennae ranges: The range of the Moscow-1 is 400 kilometers⁷⁶

Variants: Unknown

Approximate date of adoption to Russian military: December 2013.⁷⁸ Russian Armed forces had an estimate of 10 Moscow-1 complexes in 2015⁷⁹

TTPs used to counter system(s): Unknown

Additional information:

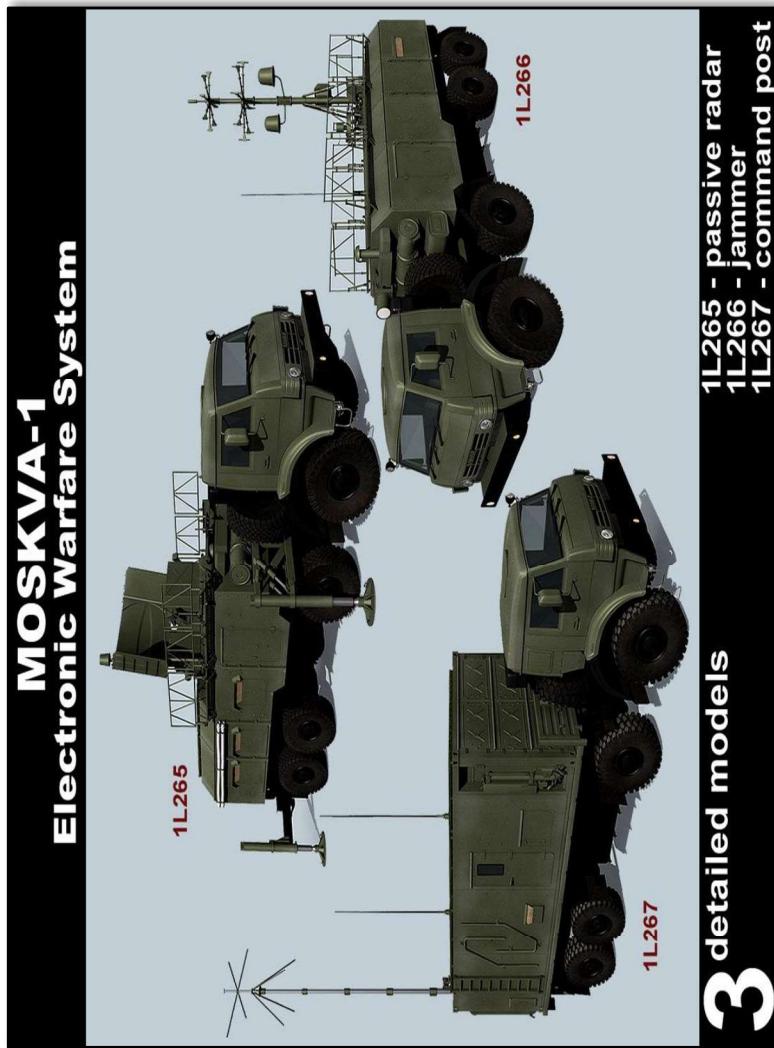
- Equipment of the complex is mounted on three KamAZ-6350-1335 vehicles⁷⁹
 - First machine has a module that performs tasks of searching and direction finding⁷⁸
 - Second machine performs the function of an automated command post⁷⁸
 - Third machine transports a control station for setting active radio interference, operating in the mode of electronic suppression (REP)⁷⁸
 - Complex may have other configurations with many stations and electronic warfare points if necessary⁷⁸



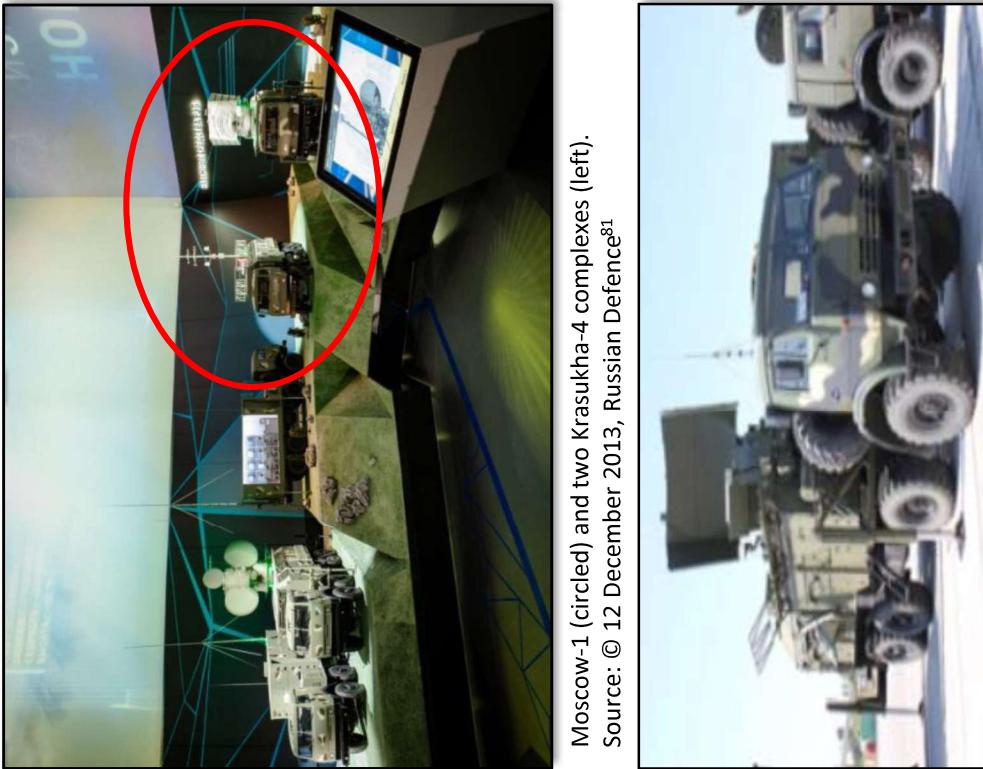
One of the vehicles of the complex RER and EW "Moscow-1". Source: © 11 December 2013, Military Russia⁷⁹

Performance Specifications	
Target detection range [km]	≤ 400
Sector of view [deg]	360
Deployment time [min]	45
Operating temperature [Celsius]	-40 to +50
Crew [people]	4

ADDITIONAL INFORMATION, IMAGES, AND DIAGRAMS



Moskva-1 Complex. Source: © 9 March 2020, Turbo Squid⁸⁰





Name: Palantin

Name, Russian: Палантин

Other names: Palantin-K, Stole⁸²

Other names, Russian: Палантин-К, Україл

Purpose/use: Automated jamming complex designed for suppression of satellite-guided weapons, cellular communication, radio communication, drones, and other forms of EW systems^{83,84,85}

Bandwidth/frequencies: 0.003–0.03 GHz (HF), 0.03–0.3 GHz (VHF)⁸⁴

Range/antennae ranges: Up to 20km⁸⁶

Variants: Unknown

Approximate date of adoption to Russian military: 2019⁸⁷

TTPs used to counter system(s): Unknown

Additional information:

- Complex combines the electronic warfare complexes "Moscow", "Zhitel" and "Judoist" into a single working network⁸⁷
- Complex can impede the use of precision-guided munitions by preventing the accurate location of potential targets and information dissemination once combined with existing EW systems⁸⁸

Table Sources: © 4 December 2022⁸⁴
22 September 2021, Jamestown Foundation⁸⁸
10 June 2022, TASS⁸⁹

Performance Specifications	
Range [km] ⁸⁹	20
Bands ⁸⁹	Shortwave (HF), ultrashortwave (VHF)
Antenna mast length [m] ⁸⁹	15
Radio communication suppression range [km] ⁸⁸	1,000
Frequency range [GHz] ⁸⁴	0.003–0.03 (HF), 0.03–0.3 (VHF)

PELENA-1

7 June 2023

Name: Pelena-1

Name, Russian: Пелена-1

Other names: Unknown

Other names, Russian: Unknown

Purpose/use: Suppression/jamming of airborne early warning, AEW/ARU-1 radar of AWACS-type aircraft with automatic frequency guidance, protecting installations with radar cross-sections between 10-15 square meters⁹⁰

Bandwidth/frequencies: 2-4 GHz, S Band⁹⁰

Range/antennae ranges: 50-80 km installations protected, up to 250 km for radar jamming^{90,91}

Variants: No known variants

Approximate date of adoption to Russian military: 1980s, exact date unknown

– Produced by OAO VNII Gradient (Russia, 344010, Rostov-on-Don, Prospect Sokolova, 96)⁹²

TTPs used to counter system(s):

- Pelena-1 jamming covers only one direction, so any effect the jamming has on AWACS systems is likely very limited

- Jamming effect is reduced with multiple AWACS aircraft in the area; overlap between AWACS aircraft results in successful transfer of information⁹²

- Powerful noise jamming coming from the Pelena-1 will likely be detected by enemy radar reconnaissance and present a viable target for anti-radiation missiles⁹²

- Lack of mobility led to the development of the Krasukha EW system⁹²



Side view of Pelena-1. Source: © 1 May 2009, Air Power Australia⁹⁰

Table Source: © 25 May 2023, Rusarmy.com⁹¹

Performance Specifications	
Airborne early warning [AEW] radar suppression sector [deg]	±45
AEW radar suppression probability	≥ 0.8
Angular coverage limits [deg]	azimuth: 360, elevation: -1 to +25
Automatic azimuth scan sector [deg]	30, 60, 120
Power consumption [kW]	80
Crew [people]	7

PELENA-6BS-F

Name: Pelena-6BS-F

Name, Russian: ПЕЛЕНА-6БС-Ф

Other names: Unknown

Other names, Russian: Unknown

Purpose/use: Protection of military equipment from radio-controlled explosive devices (RVD) by blocking the radio frequencies on which the RVU is controlled; used when necessary to block high power signals in the radio frequency range used by common civil devices (alarm, walkie-talkie, etc)⁹³

Bandwidth/frequencies: Operating frequencies 0.02–1 and 1.7–2 GHz⁹⁴

Range/antennae ranges: 20–2000 MHz⁹⁵

Variants: Pelena-6BS-F Sfera⁹⁶

Approximate date of adoption to Russian military: Unknown

TTPs used to counter system(s): Unknown



Pelena-6BS-F on a BTR-80.

Source: © 23 January 2016, Twitter⁹⁷

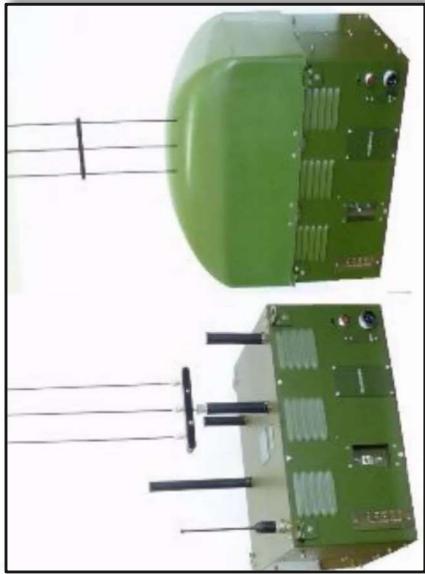
Table Source: © 5 June 2023, СпецТехКонсалтинг⁹⁸

Performance Specifications	
Operating modes	During movement or parked, with idling engine
Operating frequency ranges [GHz]	0.02–1 and 1.7–2
Total output power [W]	≥ 70
Working mode	Continuous, fed from onboard power source for 8 hours
Supply voltage [V]	13.8 (+1.2); 24 (+6 -4)
Power consumption [W]	≤ 550
Ambient temperature [Celsius]	-40 to +55
Atmosphere pressure [mm Hg]	650–800
Transmitter Dimensions [m]	.45x.38x.53

PELENA-6BS-F, CONTINUED

ADDITIONAL INFORMATION, IMAGES, AND DIAGRAMS

- Blocker is made in the form of a transmitter in a metal casing, complete with external antennas and a remote control connected to the transmitter, with a 6 m cable. To protect the product in combat conditions, a radio-transparent protective lamp for antennas is provided, additional armor for the remote-control cable, as well as regular body armor for the transmitter⁹⁸
- Radius of the protective zone, on average, is at least 70 meters⁹⁹
- Power supplied from an external power supply with a nominal voltage of 12 V or 24 V⁹⁹



Blocker of radio-controlled explosive devices
PELENA-6BS-F.

Source: © 23 January 2016, Twitter¹⁰⁰



PELENA-6BS-F. Source: © 32 January 2016, Twitter¹⁰⁰

R-330 MANDAT / R-330K

7 June 2023



Name: R-330 Mandat

Name, Russian: Р-330 Мандат

Other names: Unknown

Other names, Russian: Unknown

Purpose/use: Radio reconnaissance and suppression complex designed to counter adversarial tactical communication^{101,102}

Bandwidth/frequencies: Operating frequency 1.5–100 MHz^{101,102}

Range/antennae ranges: up to 60km¹⁰¹

Variants: R-330T, R-330U, R-330B, Borisoglebsk-2¹⁰¹

Approximate date of adoption to Russian military: Unknown

TTPs used to counter system(s): Unknown

Additional information:

- Complex is composed of the R-330K control point/points management module and automated jamming stations R-325U, R-378A/R-378B, and R-330B^{101,102}
- Capable of operation in three modes including PU-SK (control point-by means of the complex), PU-T (control point-tactical), or PU-T-VG (control point-tactical-independent)^{101,102,103}
- Used in PU-SK mode, system controls the combat operation of individual automated jamming station assets and the transmission of relevant information to higher levels of command^{102,103}
- Used in PU-T mode, system processes information from individual R-330K units operating in systems control mode¹⁰³
- Used in PU-T-VG mode, system controls individual automated jamming station assets and processes information for command needs¹⁰³

Table Sources: © 31 May 2023, Academic.ru¹⁰¹
31 May 2023, Start.bg¹⁰²

Performance Specifications	
Signal technical analysis range [MHz] ^{101,102}	1.5–100
Radio emission source (RES) detection range [km] ¹⁰²	60x60
Remote control of jamming stations range [km] ¹⁰²	Whip antenna: up to 12, directional antenna: up to 30
Communication directions per R-330 Mandat control point ¹⁰²	≤ 6
Computing speed [operations per second] ¹⁰²	750,000

ADDITIONAL INFORMATION, IMAGES, AND DIAGRAMS



R-325U high frequency jammer under camouflage netting - part of the R-330 Mandat complex. Source: © 15 July 2011, ruqrz.com¹⁰⁵



R-378B tracked jammer - one part of the R-330 Mandat complex.
Source: © 10 August 2016, Informnapalm.org¹⁰⁶



R-330BM - modernized version of R-330B used in R-330 Mandat complex.
Source: © 2 November 2017, Topwar.ru¹⁰⁴

R-330M1P DIABAZOL

Name: R-330M1P Diabazol

Name, Russian: Р-330М1П Диабазол

Other names: Diabazol

Other names, Russian: Диабазол

Purpose/use: Automated jamming complex designed for suppression and jamming of VHF radio communication, GSM cellular communication, INMARSAT and IRIDIUM satellite communication systems, and NAVSTAR satellite radio navigation system (GPS) in addition to geospatial identification of radio emission sources.¹⁰⁷ The R-330M1P Diabazol complex utilizes R-934UM and R-330Zh Zhitel jamming stations and is a heavy modernization of the R-330 Mandat automated jamming complex¹⁰⁸

Bandwidth/frequencies: Operating frequency 0.1–2.0 GHz¹⁰⁷

Range/antennae ranges: 30x30km¹⁰⁷

Variants: Unknown

Approximate date of adoption to Russian military: Unknown

TTPs used to counter system(s): Unknown

Additional information:

- Operates through tele-code information exchange with a higher command post to receive and submit tasks for combat work¹⁰⁷
- CDMA standard equipment with wideband signal for intra-complex communication is susceptible to disruption¹⁰⁷



R-330Zh jamming station - one part of the R-330M1P Diabazol jamming complex.
Source: © 1 June 2023, Recombats.ru¹⁰⁹

Performance Specifications	
Signal technical analysis range [GHz]	0.1–2.0
Signal emission source jamming range [km]	30x30
Max continuous operation time [hrs]	24
Telecode information exchange range [km]	20

Table Source: © 1 June 2023, Protek-vrn.ru¹⁰⁷

R-330T / R-330B



Name: R-330T/R-330B "Mandat-B"^{110,111}

Name, Russian: Р-330Т/Р-330Б «Мандат-Б»¹¹¹

Other names: Unknown

Other names, Russian: Unknown

Purpose/use: VHF jamming system designed for detection, direction finding, and jamming of VHF communication and tactical C2 links at fixed frequencies with conventional waveforms, in programmable and automatic frequency tuning modes, as well as for transmitting short encoded messages¹¹²

Bandwidth/frequencies: Operating frequency 30–100 MHz^{110,111}

Range/antennae ranges: Unknown

Variants: R-330T can be mounted on a KamAZ or Ural 43203-31 chassis^{110,111}

Approximate date of adoption to Russian military: Unknown

TPPs used to counter system(s): Unknown

Additional information:

- Developed by TNIIIR Efir (R-330B: 1999-2001)¹¹¹

- System powered either by a towed ED-30 (ED30-T400-1RPM1) diesel generator or mains grid power converter¹¹⁰

Table Source: © 2003, Rosoboronexport¹¹²

Performance Specifications

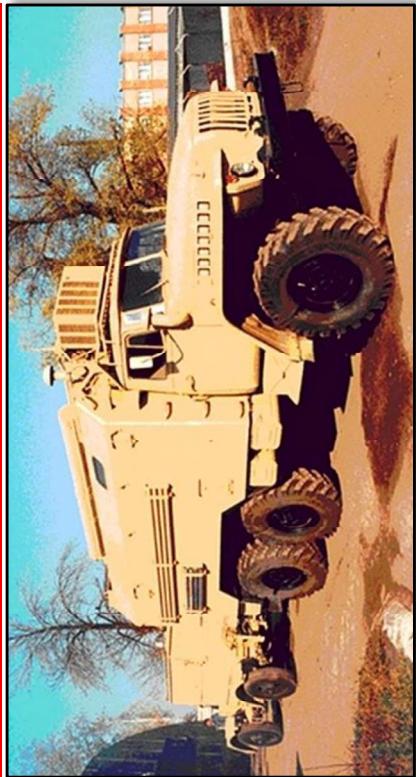
Operational frequency range [MHz]	30–100
Azimuth search coverage [deg]	360
Frequency panoramic scan rate [MHz/s]	up to 7,000
RMS direction-finding error [deg]	≤ 2.5
Transmitter output power [kW]	1.0
Types of received signals	AM, FM, CW, SSB, ISB, FSK, PSK, keying, PFT
Types of jamming signals	noise, meander type, with random encoding
Jamming spectrum width [kHz]	narrowband: 2, 10, 20, 100 barrage: 1,000
Number of simultaneously jammed RF links	≤ 3 at fixed frequencies
Detection-to-suppression time [ms]	1 with PFT ≤ 5

UNCLASSIFIED

R-330T / R-330B, CONTINUED

ADDITIONAL INFORMATION, IMAGES, AND DIAGRAMS

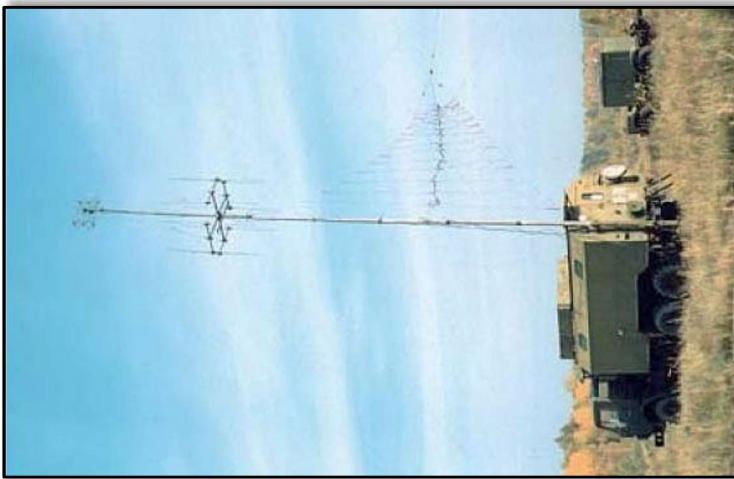
- Consists of an equipment vehicle on a wheeled (R-330T) or tracked (R-330B) chassis; a diesel electric power station mounted on a two-axle trailer (R-330T) or MT-Lbu armored tracked chassis (R-330B); a set of operational documentation; and a single spare parts, tools, and accessories set¹¹³
- Reporting indicates the system may utilize jamming frequency-hopping VHF radios, performing up to 300 hops per second¹¹⁴



New build R-330T interior, COTS digital hardware displaces the hardwired analogue components of the legacy R-330U series (Efir images). Source: © 1 May 2009, Air Power Australia¹¹⁵



New build R-330T hosted on the Ural 43203-31 / K2-4320 6x6 chassis, stowed with generator in tow, and deployed. Source: © 1 May 2009, Air Power Australia¹¹⁵



Deployed configuration of the KamAZ hosted R-330T. Source: © 1 May 2009, Air Power Australia¹¹⁵



Deployed configuration of the MTLBu hosted R-330B tracked chassis. Source: © 1 May 2009, Air Power Australia¹¹⁵

R-330Zh ZHITEL

Name: R-330Zh Zhitel

Name, Russian: Р-330Ж Житель

Other names: R-330Zh Resident

Other names, Russian: Р-330Ж Резидент

Purpose/use: Detection, direction finding, and jamming of GSM 900/1800 and 1900 cellular communication systems, INMARSAT, Iridium, and NAVSTAR jamming and suppression.^{116,117}

Bandwidth/frequencies: Operating frequency 0.1–2.0 GHz^{116,117}

Range/antennae ranges: 20–25 km (ground-based consumer equipment); at least 50 km (consumer equipment installed on aircraft).¹¹⁶

Variants: Unknown

Approximate date of adoption to Russian military: 2008¹¹⁶

TTPs used to counter system(s): Unknown

Additional information:

- The R-330Zh Zhitel system can function as a standalone EW unit, alongside another R-330Zh Zhitel unit, or as part of the R-330M1P Diazabol automated jamming complex^{116,117}
- Affects and suppresses both friendly and adversarial communications¹¹⁸
- 20 minutes of reported collection time before danger of adversarial detection gets too high¹¹⁸
- Lengthy deployment time for antenna installation in the field; all antenna installation is accomplished manually without mechanization¹¹⁸



R-330Zh Zhitel jamming station.
Source: © 26 July 2016, Topwar.ru¹¹⁸

Table Source: © 1 June 2023, Вооружение.рф¹¹⁶
1 June 2023, Protek-vrn.ru¹¹⁷

Performance Specifications	
Signal technical analysis range [GHz] ^{116,117}	0.1–2.0
Signal emission source jamming frequencies and ranges [GHz] ^{116,117}	0.8–0.96, 1.227, 1.575, 1.5–1.7, 1.7–1.9
Measurement error of sources of radio emission [deg] ¹¹⁷	≤ 2
Frequency range scanning speed [GHz/s] ¹¹⁷	detection mode: at least 0.8, direction finding mode: not less than 0.4 in azimuth: 90–120, in elevation: ≤ 20
Beam width [deg] ¹¹⁷	< 12
Quasi-simultaneously emitted interference signals ¹¹⁷	ground-based: 20–25, installed on aircraft: ≥ 50
Signal emission source jamming range [km] ¹¹⁷	Deployment time [min] ¹¹⁷
	40

R-330Zh Zhitel, CONTINUED

ADDITIONAL INFORMATION, IMAGES, AND DIAGRAMS



3-cylinder Italian Lombardini generator, the power source for the Zhitel antenna module.
Source: © 1 November 2017, Topwar.ru¹¹⁹



R-330Zh Zhitel antenna reconnaissance and suppression module in field deployment. Source: © 26 July 2016, Topwar.ru¹²⁰



R-330Zh Zhitel station (red) alongside Tirada-2 jammer.
Source: © 3 April 2019, UNIAN¹²¹



R-330Zh Zhitel interior. Source: © 1 November 2017, Topwar.ru¹¹⁹

R-340RP FIELD 21, POLE 21

Name: R-340RP Field 21, Pole 21

Name, Russian: Р-340РП Полюс 21, Поль 21

Other names: Pole-21

Other names, Russian: Поль-21

Purpose/use: Suppression of GPS, GLONASS, Galileo, and BeiDou navigation satellites, drones, and high-precision weapons targeting systems^{122,123}

Bandwidth/frequencies: Operating frequencies 1.176-1.602 GHz¹²³

- GPS: 1.57542, 1.2276, 1.17645 GHz¹²³

- GLONASS: 1.602, 1.246, 1.202 GHz¹²³

- Galileo: 1.19179 GHz¹²³

- BeiDou: 1.561042, 1.20714 GHz¹²³

Range/antennae ranges: 25–75 km¹²³

Variants: None

Approximate date of adoption to Russian military: 2016¹²⁴
TTPs used to counter system(s): Unknown
Additional information:

- Modular and scalable¹²⁴

- One complex with 100 antenna posts can jam area of 150x150 km¹²⁴

- R-340RP mobile stations and stationary Pole-21 units attached to buildings and towers^{123,124}



Pole-21 unit installed in stationary ground mount.

Source: © 28 March 2023, Focus.ua¹²³

Table Sources: © 1 June 2023, Вооружение.рф¹²²
23 March 2023, Focus.ua¹²³

Performance Specifications
Signal technical analysis range [GHz] ¹²³
Signal emission source jamming range [km] ¹²³
Power consumption [W] ¹²²
Azimuth operational limits [deg] ¹²²
Elevation operational limits [deg] ¹²²

R-340RP FIELD 21, POLE 21, CONTINUED

ADDITIONAL INFORMATION, IMAGES, AND DIAGRAMS



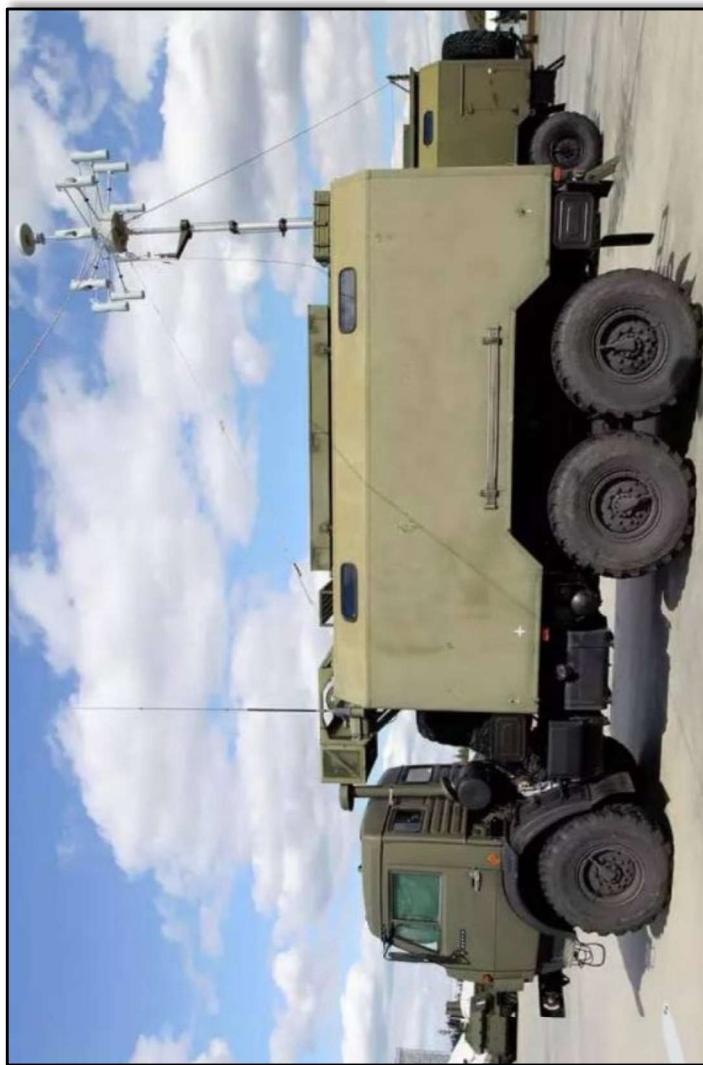
R-340RP Field 21, Pole 21 unit deployed in the field.

Source: © 17 April 2021, aif.ru¹²⁶



Pole-21 stationary unit attached to cell tower.

Source: © 28 March 2023, Focus.ua¹²⁷



Pole-21 wheeled mobile unit. Source: © 28 May 2015, Twitter¹²⁵

R-934B

Name: R-934B

Name, Russia: P-934Б

Other names: R-934B Sinitsa¹²⁸**Other names, Russian:** Р-934Б Синица**Purpose/use:** Detect and monitor radio emissions, suppress airborne VHF/UHF communications and tactical aircraft guidance systems^{129,130}**Bandwidth/frequencies:** Tactical aircraft guidance systems 100–150 MHz and 220–400 MHz; terrestrial radio communications and mobile radios 100–400 MHz^{129,131}**Range/antennae ranges:** Unknown**Variants:** R-934UM^{132,133}**Approximate date of adoption to Russian military:** Unknown**TPPs used to counter system:** Unknown**Additional information:** Two options for mounting system:

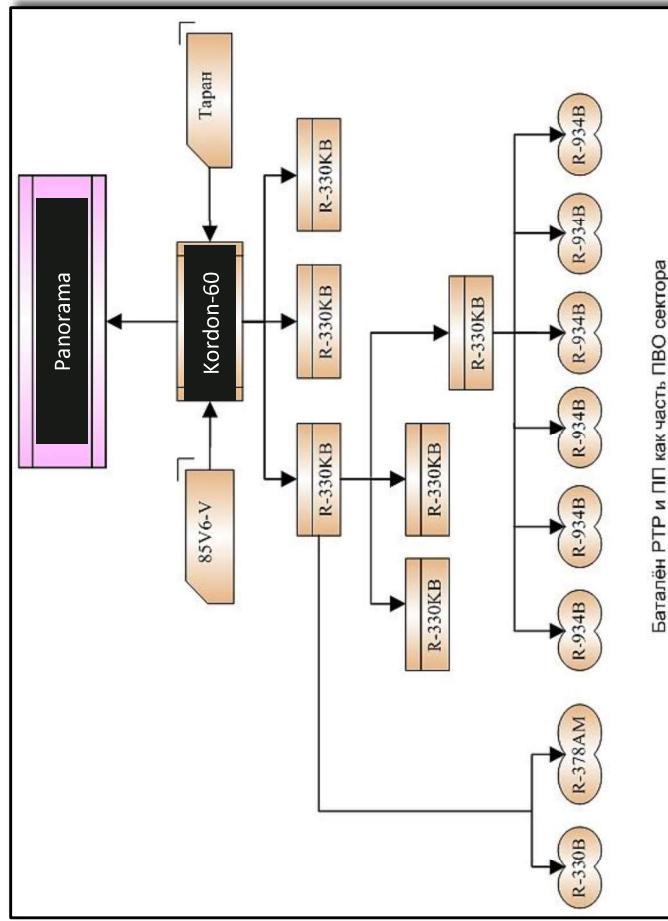
- MT-LBU armored tracked vehicle^{129,130}
- Equipment vehicle on the Ural-4320-31 truck chassis in the K1-4320-body and a 16-kW power plant on a trailer^{129,130}
- The R-934B can operate under a command post or independently¹³¹

Performance Specifications	
Operating frequency band [MHz] ^{129,131}	aircraft 100–150 and 220–400; terrestrial 100–400
Azimuth search coverage [deg] ¹²⁹	360
Automatic frequency measurement accuracy [kHz] ¹²⁹	±4
Transmitter output power [W] ¹²⁹	500
Types of jamming signals: ¹²⁹	<ul style="list-style-type: none"> • HF oscillation frequency-modulated by noise voltage with 800/6,000-Hz deviation • HF oscillation with frequency-shift keying at 5/10/20/40-kHz increment and 150/800-microsec signal element duration • HF oscillation with phase-shift (0–180 deg) keying at 800-microsec signal element duration
Number of targets jammed quasi-simultaneously ¹²⁹	1 with PFT ≤ 4 at fixed frequencies
Detection-to-suppression time (from 20-frequencies list) [ms] ¹²⁹	5
Into-action time [min] ¹²⁹	20

R-934B, CONTINUED

ADDITIONAL INFORMATION, IMAGES, AND DIAGRAMS

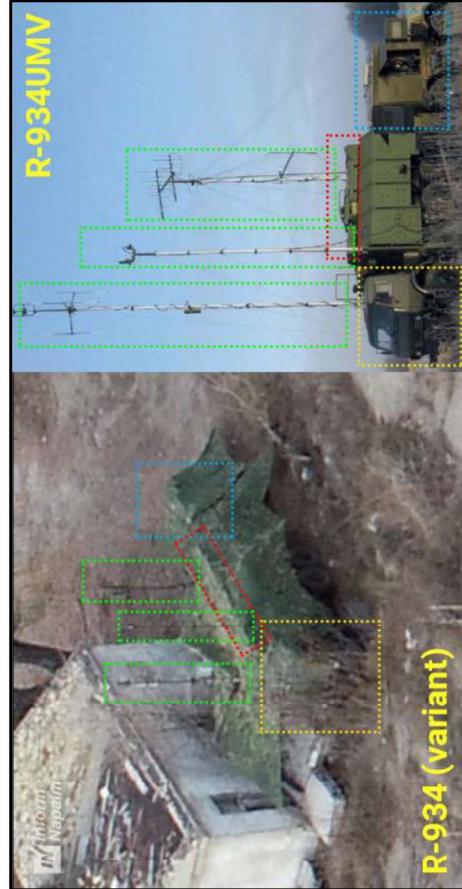
- Russian doctrine for the operation of EW assets in air defense applications employs a centrally controlled model. A Panorama sector command post (CP) controls one or more Kordon-60 CPs, each of which is tied to an 85V6 Orion/Vega emitter locating system, and a group of jammers¹³⁴



R-934B jammer carried on the MT-LBU tracked chassis.
Source: © 1 May 2009, Air Power Australia¹³⁴



R-934B on Ural 4320 in desert camouflage.
Source: © 1 May 2009, Air Power Australia¹³⁴



Probable R-934 variant hidden under camouflage net.
Source: © 1 May 2009, Air Power Australia¹³⁴

RB-109A BYLINA



Name: RB-109A Bylina¹

Name, Russian: РБ-109А Былина¹

Other names, NATO Designation: Unknown

Other names, Russian: Unknown

Purpose/use: Uses artificial intelligence to detect enemy radars, communication systems, aircraft, satellites, and radio stations. Automatically puts interference on the frequencies of their operation and controls the effectiveness of interference. Able to independently analyze the combat situation, and then apply various methods of suppressing enemy radars, satellites and communications. At the same time, "jammers" do not affect the equipment of their own troops^{136,137}

Bandwidth/frequencies: Unknown

Range/antennae ranges: Unknown

Variants: Name Bylina also refers to at least two other EW systems operating in different parts of the radio frequency spectrum ("Bylina-KV" and "Bylina-MM")^{136,137}

Approximate date of adoption to Russian military: 2017-2018¹³⁸

TTPs used to counter system(s): Has artificial intelligence capability aiding its automated C2^{139,140}

Additional information:

- The RB-109A Bylina electronic warfare complex consists of five KamAZ mounted trucks and a life support system. Complex can operate completely autonomously^{136,139}
- The exchange of information between nodes is carried out in real time. Operators only need to "monitor" the received data and control the situation¹³⁶
- The system has been tested in Syria and is expected to take out a variety of airborne threats ranging from aircraft and drones to cruise missiles¹⁴¹
- Russia plans on deploying the RB-109A to all electronic warfare brigades by 2025¹⁴⁰



RB-109A Bylina.

Source: © 12 August 2018, novnarnia.com¹⁴²

Performance Specifications

No information available

RB-310B BORISOGLEBSK-2

Name: RB-310B Borisoglebsk-2

Name, Russia: РБ-310Б Борисоглебск-2

Other names: Unknown

Other names, Russian: Unknown

Purpose/use: Automated jamming complex capable of detection, direction finding, analysis and suppression of HF/VHF radio communications. The Borisoglebsk-2 is a modernized version of the R-330 Mandat EW complex and includes 1 R-330KMV control point and 8 jamming stations (2x R-378BMV, 2x R-330BMV, 2x R-934BMV, 2x R-325UMV)^{143,144,145,146}

Bandwidth/frequencies: High frequency (HF) 0.003–0.03 GHz, Very high frequency (VHF) 0.03–0.3 GHz, and Ultra high frequency (UHF) 0.3–3 GHz bands^{143,144,145}

Range/antennae ranges: at least 30km¹⁴⁷

Variants: Unknown

Approximate date of adoption to Russian military: 2010¹⁴⁸

TTPs used to counter system:

- Drones have achieved great success against RB-310B Borisoglebsk-2 complexes in the Russia-Ukraine war¹⁴⁹
 - Russia has less than 100 remaining Borisoglebsk-2 complexes in combat inventory and has lost approximately 12 in its war against Ukraine¹⁴⁹
- Additional information:**
- Complete RB-310B Borisoglebsk-2 complex consists of 9 vehicles, most based on the tracked MT-LB platform¹⁵⁰



Element of RB-310B Borisoglebsk-2 complex.
Source: © 31 May 2023, Armament.rf¹⁵¹

Table Sources: © September 2017, International Centre for Defense and Security¹⁴³
31 May 2023, Armament.rf¹⁵¹
14 September 2022, Gagadget¹⁴⁵
6 October 2022, Pulse.mail.ru¹⁴⁷
14 March 2016, Topwar.ru¹⁴⁸

Performance Specifications	
Signal technical analysis range [GHz] ^{143,145}	0.003–3.0
Radio emission source (RES) detection range [km] ¹⁴⁷	≥ 30
Communication directions per R-330KMV control point ¹⁴⁸	< 8
Deployment time [min] ¹⁵¹	15

ADDITIONAL INFORMATION, IMAGES, AND DIAGRAMS



R-934BMV jamming station - one part of the RB-310B Borisoglebsk-2 complex. Source: © 14 September 2022, Gagadget¹⁵³



R-330BMV jamming station - one part of the RB-310B Borisoglebsk-2 complex. Source: © 14 June 2019, Janes¹⁵⁴



R-330KMV - modernized version of R-330K used in R-330 Mandat complex. Source: © 28 May 2015, Twitter¹⁵²

RB-341V 'LEER 3'



Name: RB-341V 'Leer 3'

Name, Russia: РБ-341В «Леер-3»

Other names: Unknown

Other names, Russian: Unknown

Purpose/use: Suppression of cellular communication in GSM, 3G, and 4G; detection of cellular devices, and SMS messaging capability within a 30km radius; detection of subscriber points, mapping subscriber points, transfer of subscriber data to artillery^{155,156}

Bandwidth/frequencies: GSM 900, 1800, 2000, 2500 bands (0.9–2.5 GHz)¹⁵⁶

Range/antennae ranges: SMS messaging capability and suppression radius within 6km¹⁵⁷

Variants: Unknown

Approximate date of adoption to Russian military: 2015, upgrades increasing 3G/4G compatibility came later¹⁵⁵

TTPs used to counter system(s): Unknown

Additional information:

- Uses Orlan-10 drones to suppress cellular networks within its operational radius¹⁵⁶
- Can deploy psychological warfare measures using SMS to disrupt adversary communications and blast messages to cellular subscribers within radius¹⁵⁶
- Combination of jammers and Orlan-10 drones disable and spoof cellular communications towers¹⁵⁵
- Was used in Syria to message rebel groups concerning an armistice¹⁵⁵

Table Source: © 21 February 2018, Topwar.ru¹⁵⁶

Performance Specifications	
Operating frequency range [GHz]	0.935–1.785
Control channel frequency range [GHz]	0.902–0.922
Number of simultaneously blocked cellular subscribers	2000
Number of simultaneously controlled mobile operators	3
Number of simultaneously controlled UAVs	2
Complex linear FM chirped pulse modulation: duration [μs]: 1–300, at PRF [kHz]: 0.5–10	
Crew [people]	5

ADDITIONAL INFORMATION, IMAGES, AND DIAGRAMS



Orlan-10 drone loaded onto launch catapult as part of Leer-3 system.

Source: © 21 February 2018, Topwar.ru¹⁵⁸



Interior of Leer-3 control vehicle.

Source: © 21 February 2018, Topwar.ru¹⁵⁸



Crew preparing Leer-3 system for field operation. Source: © 21 February 2018, Topwar.ru¹⁵⁸

RB-531B INFRAUNA



Name: RB-531B Infrauna

Name, Russian: РБ-531Б Инфрауна

Other names: Infrauna K1SH1 UNSH-12¹⁵⁹

Other names, Russian: Инфрауна К1Ш1 УНШ-12

Purpose/use: Mobile radio communication jammer (VHF and UHF radios); protection of combat vehicles and personnel against radio-controlled explosive devices, optical jammer, and GSM communication jammer with aerosol protection against precision small arms^{159,160,161,162}

Bandwidth/frequencies: 30-300 MHz, VHF and 300-1000 MHz, UHF^{159,160}

Range/antennae ranges: Unknown

Variants: Unknown

Approximate date of adoption to Russian military: 2009, first units delivered 2011¹⁶²

TPPs used to counter system(s): Unknown

Additional information:

- Mounted on unified K1Sh1 chassis based on the BTR-80 armored personnel carrier¹⁶³
- Capable of escorting columns of armored vehicles and performing operations in close proximity to ground forces¹⁶⁴
- Antenna mounted inside of domed shell on the roof, can be deployed through a telescopic mast¹⁶⁰
- Ability to work alongside sappers for anti-radio-controlled minesweeping¹⁶³

RB531B Infrauna system. Source: © 5

May 2013, Military Russia¹⁶⁵

Table Source: © 30 May 2023, Armament¹⁶⁴

Performance Specifications	
Chassis	K1Sh1 based on BTR-80
Gross Weight [tons]	approximately 12
Highway speed [km/h]	80
Swimming speed [km/h]	9
Highway range [km]	600
Length [mm]	7650
Width [mm]	2900
Height [mm]	2630
Crew [people]	3

UNCLASSIFIED**RB-531B INFANTRY, CONTINUED****ADDITIONAL INFORMATION, IMAGES, AND DIAGRAMS****Obstacle Complex RB-531B "Infauna"**

The “Infauna” has a mode that allows you to accompany mine-clearing sappers.

In automatic mode, it detects a shot from an anti-tank or hand grenade launcher and shoots aerosol ammunition.



The complex can travel up to 80 km/h.

*Text translated from Russian language source

RB31B Infauna informational diagram. Source: © 11 March 2022, Ukraine Segodnya¹⁶⁶



Roof-mounted dome antenna housing on the RB-531B Infauna.

Source: © 15 October 2015, Topwar.ru¹⁶⁷



Auxiliary antenna, optoelectronic sensor, and grenade launcher on starboard side of RB-531 Infauna.

Source: © 15 October 2015, Topwar.ru¹⁶⁷

UNCLASSIFIED

RB-636 SVET-KU/SVET-VSG

Name: RB-636 Svet-KU/Svet-VSG¹⁶⁸

Name, Russian: РБ-636 Свёт-КУ/Свёт-ВСГ

Other names: RB-636AM2 Svet-KU¹⁶⁹

Other names, Russian: РБ-636AM2 Свёт-КУ

Purpose/use: Carrying out SIGINT activities and jamming radio and radar signals within the frequency range from 25 MHz up to 18 GHz; tracks variety of emissions and calculates source coordinates. Capable of autonomously jamming the GSM, CDMA2000 and UMTS cellphone signals¹⁷⁰

Bandwidth/frequencies: 0.025–18 GHz^{170,171}

Range/antennae ranges: Unknown

Variants: RB-636AM2 Svet-KU complex, based on the Ford Transit van¹⁶⁹

Approximate date of adoption to Russian military: Svet-VSG 2010, Svet-KU 2012^{168,170}

TPPs used to counter system: Unknown

Additional information:

- Composed of the Svet-VSG stationary antenna post of electronic intelligence with a control point and the Svet-KU mobile complex of radio for radio control and protection of information from leakage through technical channels of wireless communication¹⁶⁸
- Can interact with the automated complex technical control point (APU CPC)¹⁶⁸

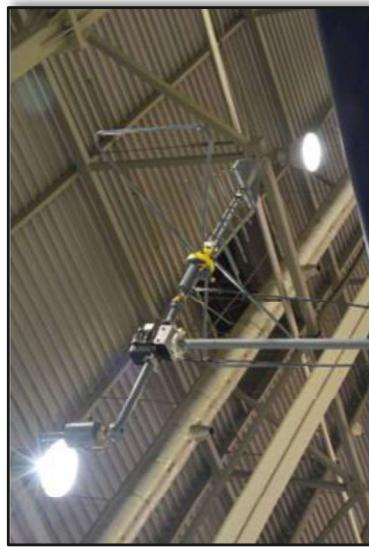
Table Sources: © 5 May 2017, Defence24.com¹⁷⁰
2023, Вооружение.рф¹⁷²
25 October 2017, Defense Express¹⁷¹

Performance Specifications

Frequency range [GHz] ^{170,171,172}	0.025–18
Simultaneous analysis and direction-finding bandwidth [MHz] ¹⁷²	≥ 20
Scanning speed when analyzing frequency band loading [MHz/s] ¹⁷²	≥ 500
canning speed for space-energy detection [MHz/s] ¹⁷²	100
Noise figure [dB] ¹⁷²	12
Suppression of side channels of reception [dB] ¹⁷²	≥ 80
Intermodulation dynamic range [dB] ¹⁷²	≥ 85
Mean time between failures, [h] ¹⁷²	3000
Power consumption [kW] ¹⁷²	≤ 3
Deployment time (calculation of 3 people) [min] ¹⁷²	10

ADDITIONAL INFORMATION, IMAGES, AND DIAGRAMS

- Extended antenna array may be rotated in a horizontal plane, making it possible to receive radio signals from any direction; accuracy depends on the emitted signal's frequency range. In case of the emitters operated within the range between 30 to 100 MHz, 5 degrees accuracy is achievable. For the ranges from 1 to 3 GHz, the accuracy is narrowed down to 2 degrees¹⁷³
- Newer variant, presented at a 2015 exhibition and based on the Ford Transit van, allows users to operate covertly. When the antenna array system is not extended, the vehicle does not differ from its civilian counterpart^{173,174}



Stationary antenna post and control point of the "Svet-VSG" complex.
Source: © 04 May 2014, militaryrussia.ru¹⁷⁵



Mobile radio monitoring complex "Svet-KU" on KamAZ brand chassis.
Source: © 04 May 2014, militaryrussia.ru¹⁷⁵



Deployed RB-636AM2 Svet-KU complex - Newer variant based on the Ford Transit chassis.
Source: © 19 October 2015, Topwar.ru¹⁷⁴

Can interact with the APU CPC "Less".
Source: © 04 May 2014, militaryrussia.ru¹⁷⁵

REPELLENT-1

Name: Repellent-1

Name, Russian: Пенелент-1

Other names: Unknown

Other names, Russian: Unknown

Purpose/use: Suppresses operation of unmanned aerial vehicles, mainly designed to repel massive drone attacks. Could theoretically neutralize commercial drones (UAVs), as well as limit the ability to monitor the OSCE SMM in Ukraine¹⁷⁶

Bandwidth/frequencies: Suppression bandwidth frequency is 0.2–6 GHz¹⁷⁷

Range/antennae ranges: Incapacitates drones at a distance up to 30–35km¹⁷⁸

Variants: Unknown

Approximate date of adoption to Russian military: 2016 presented at a defense exhibition¹⁷⁹

TTPs used to counter system(s): Unknown

Additional information:

- System utilizes a 20-ton MAZ-6317 6x6 truck to protect a wide range of military facilities

- Cabin is protected against small arms fire and NBC (Nuclear, Bacteriological and Chemical)

- agents¹⁸⁰

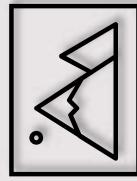
Repellent-1. Source: © 21 July 2022, Gagagdet News¹⁷⁸

Table Source: © 30 May 2023, Rosoboronexport¹⁷⁷

Performance Specifications	
Signal intelligence and suppression frequency bandwidth [GHz]	0.2–6
Signal intelligence range [km]	> 30
Electronic suppression range [km]	< 30
Azimuth operational limits [deg]	0–360
Maximum direction-finding error [deg]	3
Max operating temperature [Celsius]	50
Max weight [kg]	200,000
Minimum operating temperature [Celsius]	-45

ROSEVNIK-AERO

7 June 2023

Name: Rosevnik-Aero**Name, Russian:** Poceбник-Аэро**Other names:** Unknown**Other names, Russian:** Unknown**Purpose/use:** Designed to hack into a drone's onboard computer; can hack into both familiar and unknown systems and take them under its control in under a few minutes¹⁸¹**Bandwidth/frequencies:** Unknown**Range/antennae ranges:** Unknown**Variants:** Unknown**Approximate date of adoption to Russian military:** 2022, military bases and key areas in Syria¹⁸²**TTPs used to counter system(s):** Unknown**Additional information:** The technical characteristics are unknown, as are its locations in Syria, if it is present there¹⁸¹

no photo available

Performance Specifications

No information available

RP-377L / LA LORANDIT-M

Name: RP-377L/LA Lorandit-M

Name, Russian: РП-377Л/А «Лорандит»

Other names: Unknown

Other names, Russian: Unknown

Purpose/use: Provides operational search, location and radio suppression of radio-electronic means of VHF radio communications and sources of interference to control and communication systems. The complex is placed on a cross-country vehicle and can be used in the field and in medium-rough terrain. It can also be placed on high traffic vehicles^{183,184,185}

Bandwidth/frequencies: 0.02–2 GHz¹⁸⁶

Range/antennae ranges: Unknown

Variants: Unknown

Approximate date of adoption to Russian military: 2019, serial production of latest system began in 2021¹⁸⁴

TTPs used to counter system(s): Unknown



RP-377L/LA Lorandit-M on UAZ chassis.

Source: © 312 April 2014, Live Journal¹⁸⁷

Table Source: © 24 May 2014, Air Base Forums¹⁸⁶

Performance Specifications	
Operating frequency range [GHz]	0.02–2
Direction of error [deg]	≤ 3
Detection rate [MHz]	≥ 10
Jamming transmitter power [W]	40
Simultaneous bandwidth [kHz]	180
Reconnaissance signals	ChM, AM, OM, ChMn, FMn
Crew [people]	2–3

RP-377L / LA LORANDIT-M, CONTINUED

ADDITIONAL INFORMATION, IMAGES, AND DIAGRAMS

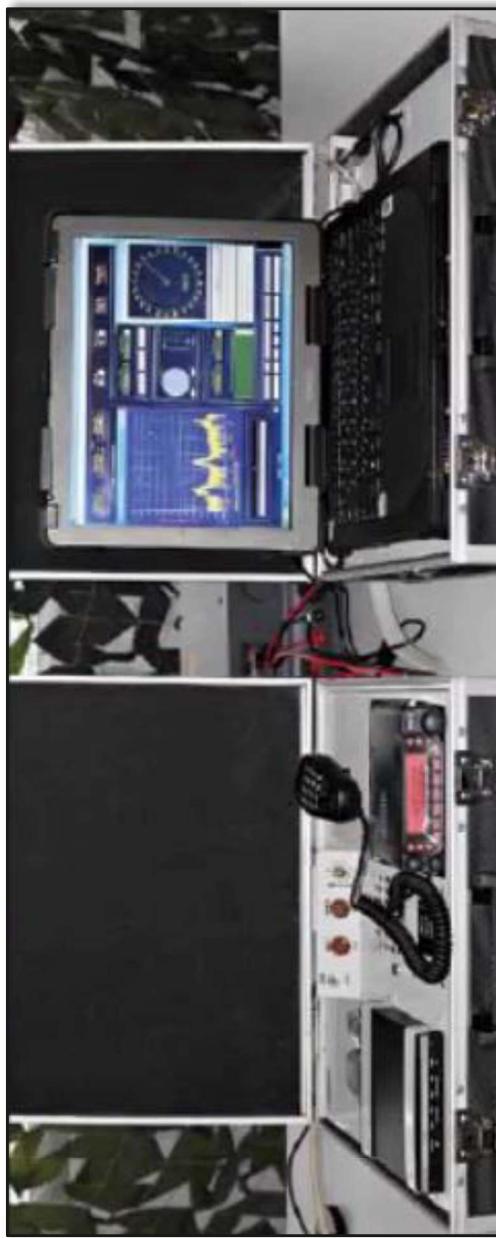
- Complex can be combined into a system of two or more complexes RP-377L or RP-377LA "Lorandit" at which point one performs the function of the system control point^{188,189}
- System consists of two cases and four canvas bags and transported by 2-3 people, enabling use in rugged terrain¹⁸⁸
- Can be placed on a cross-country vehicle for use in field¹⁸⁸



RP-377L/LA Lorandit-M.
Source: © 28 April 2017, Khabara News¹⁹⁰



Mounted RP-377L complex.
Source: © 24 May 2014, Air Base Forums¹⁹⁰



RP-377L complex. Source: © 24 May 2014, Air Base Forums¹⁸⁸

RP-377UVM1 / UVM2 / UM2 LESOCHEK

Name: RP-377UVM1 / UVM2 / UM2 Lesocheok

Name, Russian: РП-377УВМ1

Other names: Vehicle Mounted RP377 UVM2 Radio IED Jammer Lorandit¹⁹¹

Other names, Russian: Установленный на автомобиле RP377 UVM2 устройство подавления радиосигналов СБУ Lorandit

Purpose/use: Creates interference and blocks local radio communication and control lines both in stationary conditions and in motion; used for protection against radio-controlled explosive devices¹⁹²

Bandwidth/frequencies: Interference frequency range 20–1,000 MHz¹⁹²

Range/antennae ranges: Unknown

Variants: Unknown

Approximate date of adoption to Russian military: 2021 with motor rifle formations stationed in the Leningrad Region, used by the Russian military in Syria in 2022^{193,194}

TTPs used to counter system(s): Unknown

Additional information:

- Equipment can be placed on armored vehicles, a car, in a backpack, in a case¹⁹²
- Previous mounted vehicles include Typhoon-K - "Тайфун-К" , Lynx - "Рысь" , Tiger - "Тигр" and BTR variants¹⁹⁵



RP-377UVM1 Radio Fuze Jammer module

Source: © 7 May 2021, CRI¹⁹⁵

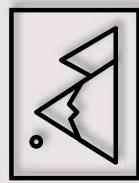
Performance Specifications	
Interference frequency range [MHz]	20–1000
Output power [W]	130
Supply voltage range [V]	23–29.7
Total consumption current [A]	A
Operating temperature range [Celsius]	-40 to 50
Dimensions [m]	.514x.255x.368
Weight (without battery) [kg]	50

SAMARKAND

7 June 2023

Name: Samarkand**Name, Russian:** Самарканд**Other names:** Unknown**Other names, Russian:** Unknown**Purpose/use:** Electronic suppression system used to hide objects from the enemy, jam communications system, target command and control, and spoof GPS coordinates^{196,197,198,199}**Bandwidth/frequencies:** Unknown**Range/antennae ranges:** estimated effective ground radius of 350 km, height 80 km¹⁹⁷**Variants:** Samarkand-U, Samarkand SU-Pred-K2, and Samarkand PU-Pred-D¹⁹⁸**Approximate date of adoption to Russian military:** 2017, Northern Fleet of the Russian Navy¹⁹⁸**TTPs used to counter system(s):** Unknown**Additional information:**

- Domed electronic warfare system that provides blocking of any radio-electronic signals within the coverage area¹⁹⁷
- At least 16 systems have been deployed in 13 units in Arkhangelsk, Kaliningrad, Moscow, Murmansk, and Nizhny Novgorod oblasts, Krasnodar and Primorsky Kray regions, and Belarus^{198,199,200}



no photo available

Table Source: © 31 October 2018, Avia.pro¹⁹⁷

Performance Specifications	
Estimated effective radius [km]	350
Estimated effective height [km]	80

3GIMBALS

UNCLASSIFIED

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SHIPOVNIK-AERO



Name: Shipovnik-Aero
Name, Russian: Шиповник-АЭРО
Other names: Rosehip-Aero

Other names, Russian: Шиповник-Аэро

Purpose/use: Suppresses drone control signal by hacking on-board systems; determines origin of control with an accuracy of several centimeters; can be used to suppress communication command posts, cellular network signals, Wi-Fi, WiMAX and DECT networks; complex can take control of UAVs and force to land^{201,202,203}

Bandwidth/frequencies: Unknown
Range/antennae ranges: Capable of detecting and identifying enemy drone control signals within a radius of approximately ten kilometers^{201,202}

Variants: Unknown

Approximate date of adoption to Russian military: 2016 in Donetsk²⁰¹

TTPs used to counter system(s): Complexes of the "Rosship - AERO" class are only capable of fighting small drones that are guided by radio from ground stations, starting with the RQ-11 Raven, then the RQ-5 and RQ-7 and up to the Israeli Hermes-type UAVs²⁰²

Additional information:

- Complex can operate in a completely passive mode^{201,202,203}
- Suppression of control signal is less than a minute from detection of drone; if frequencies are known in advance, suppression takes less than a second^{201,202,203}

Table Source: © 3 December 2012, Topwar²⁰¹

Performance Specifications	
Time from drone detection to suppression [s]	25
Direction-finding accuracy [deg]	2–3
Time to deploy the station [min]	20–40
Crew [people]	3
Radio monitoring equipment range [MHz]	25–2500
Transmitting AFS operating frequency range [MHz]	400–500, 800–925, 2400–2485

ADDITIONAL INFORMATION, IMAGES, AND DIAGRAMS

- Structure includes basic hardware complex, control equipment, communication equipment, a power supply system, a life supporting system, and a set of equipment external deployment²⁰⁴
- External deployment equipment includes: a remote working automated place to ensure monitoring, radio monitoring equipment, a direction-finding receiver AFS antenna-feeder system, equipment of the radio-suppression radio control complex of aircraft in the 25–100, 400–500, 800–925, 2400–2485 MHz bands, AFS transmitting at 25–80, 400–500, 800–925, 2400–2485 MHz frequencies - with a given azimuth width and equipment for providing data reception and transmission between the basic and remote equipment complex²⁰⁴



Shipovnik-AERO internal equipment.
Source: © 3 December 2012, Topwar²⁰⁴



Shipovnik-AERO internal deployment equipment.
Source: © 3 December 2012, Topwar²⁰⁴



Shipovnik-AERO internal equipment.
Source: © 3 December 2012, Topwar²⁰⁴



Shipovnik-AERO external deployment equipment.
Source: © 3 December 2012, Topwar²⁰⁴

SPR-2M RTUT-BM

Name: SPR-2M Rtut-BM

Name, Russian: СПР- 2М « Ртуть- BM »

Other names: Mercury BM

Other names, Russian: Меркурий BM

Purpose/use: Protects ground forces and equipment from projectiles with electronic fuses using interference, initiating premature detonation at a safe height; station suppresses enemy signals and conducts reconnaissance in a passive mode^{205,206,207}

Bandwidth/frequencies: Operating frequency range 95–420 MHz²⁰⁶

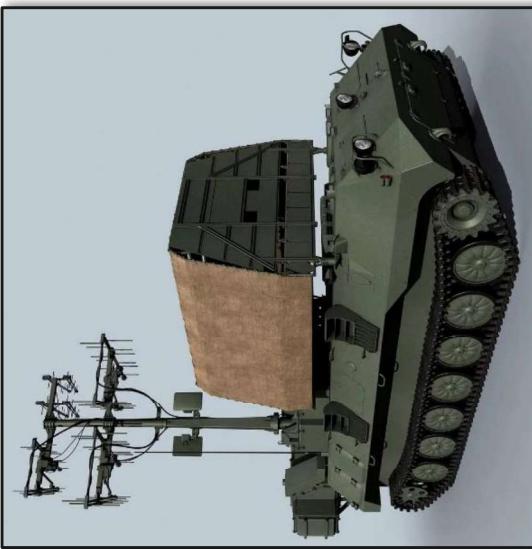
Range/antennae ranges: Unknown

Variants: SPR-2M "Rtut-BM", a modernization of the SPR-2 ammunition radio fuse jamming station using new equipment²⁰⁶

Approximate date of adoption to Russian military: 2013^{206,208}

TTPs used to counter system(s): Unknown

Additional information: Cannot affect shells without electronic devices which limits its combat value²⁰⁷



SPR-2M Rtut-BM (Mercury-BM).

Source: © September 2023, 3dmdbs²⁰⁹

Table Source: © 5 June 2023, Вооружение.рф²⁰⁶

Performance Specifications	
Time by detecting radiation from radio fuses/creating interference with [s]	1–2
Interference formation error [Hz]	200–300
Interference coverage area [ha]	20–50
Deployment (clotting) time [min]	≤ 10
Suppression probability	0,8
Number of suppressed VHF radio communication lines	3–6
Crew [people]	2
Operating frequency range [MHz]	95–420
Equipment sensitivity [dB/ μ W]	95–110
Potential of electronic countermeasures [W]	250

TIRADA-2

7 June 2023



Name: Tirada-2

Name Russian: Тирада-2

Other names: Tirada-2S

Other names, Russian: Тирада-2C

Purpose/use: Uplink jamming of communications satellites using a narrow beam to target the frequencies of certain satellite communication channels^{210,211,212,213}

- Disrupts the operation of satellite communications by determining the parameters of the satellite communications complex and creating interference²¹⁰
- Capable of disrupting the satellite communications of reconnaissance UAVs²¹⁰

Bandwidth/frequencies: 3–14 GHz, centimeter band²¹²

Range/antennae ranges: unspecified, several tens of kilometers²¹⁴

Variants: Tirada-1D, Tirada-2S, Tirada-2.2, Tirada-2.3 (also called RB-371A), and

Tirada-2.4^{212,215}

Approximate date of adoption to Russian military: 2019^{214,216}

TTPs used to counter system(s): Unknown

Additional information:

- Suspected of being used to disrupt SpaceX's Starlink communications satellites on the southern frontlines in Kherson and Zaporizhzhia oblasts, as well as Kharkiv, Donetsk, and Luhansk oblasts in the east^{217,218}
- Predecessor of Tirada-2 and other variants is the Soviet era Tirada-1D²¹²
- Different variations of Tirada-2 may be designed to cover different parts of the radio spectrum, however little information is known of the exact technical specifications of these variations²¹²

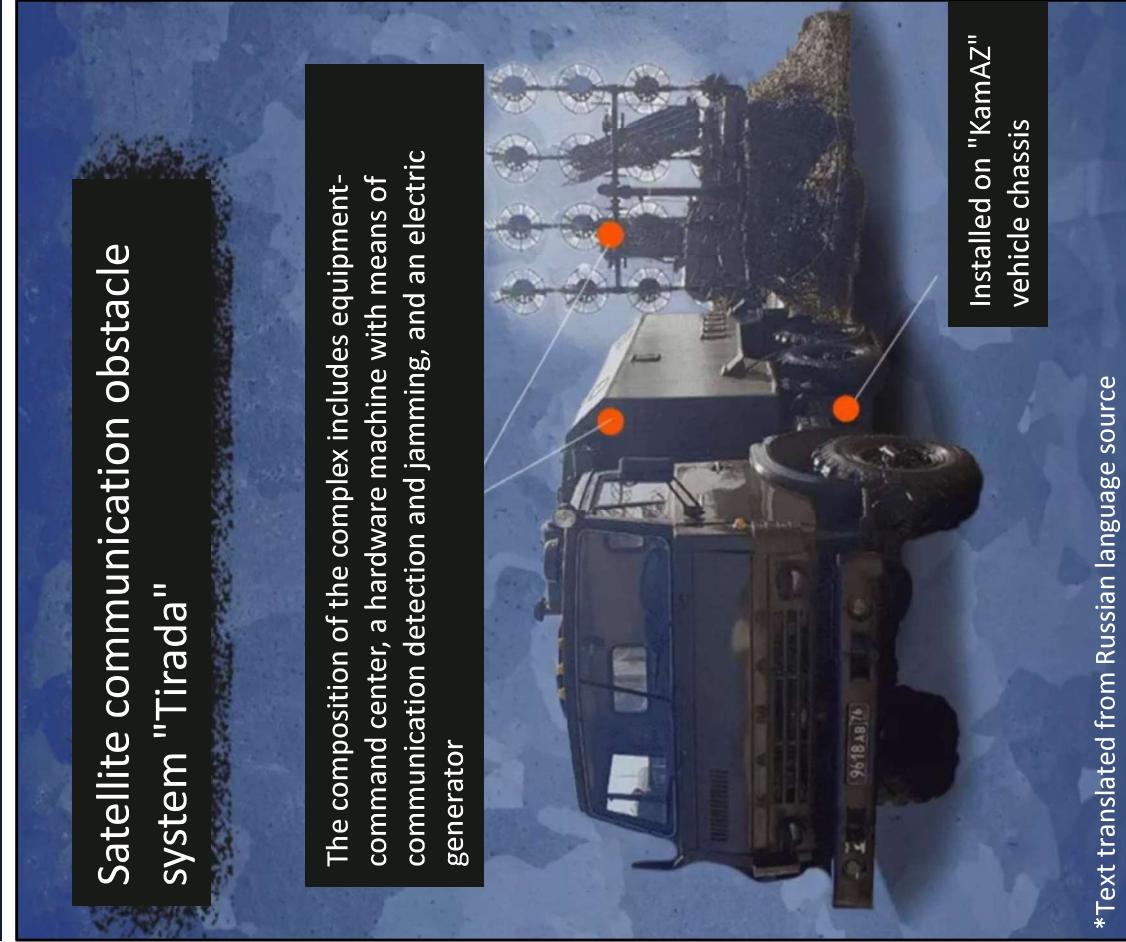
Table Sources: © 26 October 2020, The Space Review²¹²
© 25 October 2022, Don24.ru²¹⁹

Performance Specifications	
Operating frequency range [GHz] ³	3–14
Crew [people] ¹¹	5
Deployment time [min] ³	30

ADDITIONAL INFORMATION, IMAGES, AND DIAGRAMS

Satellite communication obstacle system "Tirada"

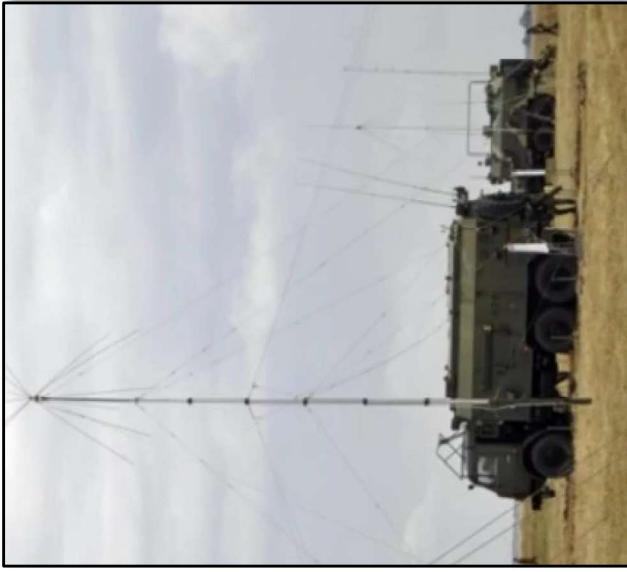
The composition of the complex includes equipment-command center, a hardware machine with means of communication detection and jamming, and an electric generator



*Text translated from Russian language source

Left: Tirada informational diagram. Source: © 11 March 2022, Ukraine Segodnya²²⁰

Right: Mobile Tirada-2 satellite jamming systems. Source: © April 2021, Center for Strategic and International Studies²²¹



Model of the mobile Tirada-2 satellite jamming system at the 2013 MAKS air show. Source: © 25 September 2019, Dfnc.ru²²²



Name: TORN

Name, Russian: ТОРН

Other names: NATO Designation - Torn-MDM

Other names, Russian: ТОРН-МДМ

Purpose/use: Automated jamming complex designed for identification, analysis, and interference with VHF/UHF radio signals and cellular devices²²³

Bandwidth/frequencies: 0.0015–3.0 GHz²²³

Range/antennae ranges: up to 30km (VHF), up to 70km (HF)²²⁴

Variants: Unknown

Approximate date of adoption to Russian military: 2012²²⁵

TTPs used to counter system(s):

- Time-synchronization packets broadcast to paralyze the network communication system of time-slotted channel hopping (TSCH) networks like the WaveLine 2.4GHz data transmission network used by the TORN for internal data communication²²⁶

Additional information:

- Uses 2 KamAZ-5350 trucks:
 - One with rigging and cables in support of antenna array²²⁵
 - One with systems antennas, processing equipment and workstations²²⁵
- Used with reconnaissance units in the Russian Armed Forces' motorized rifle and tank brigades and divisions, not with electronic warfare companies²²⁵
- Uses a data transmission network based on WaveLine equipment in the 2.4 GHz band and Windows XP as the primary operating system of its VHF/UHF radio reception antennae²²³

TORN automated jamming complex fully deployed with supporting antennae.
Source: © 12 June 2022, Defense Express²²⁴

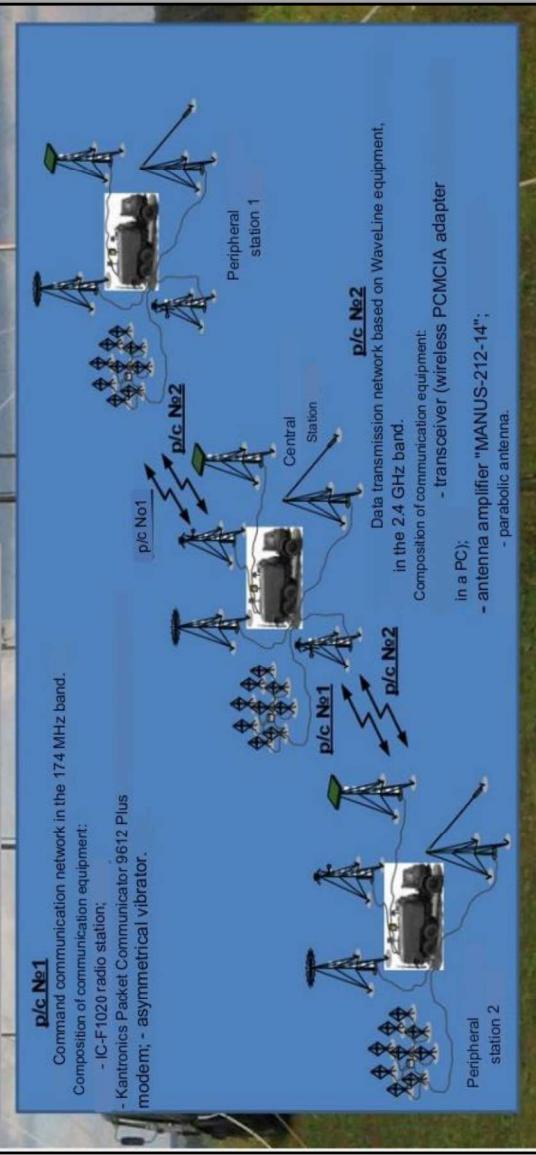
Table Source: © 2 June 2023, Ppt-online.org²²³

Performance Specifications	
Operating frequency range [GHz]	0.0015–3.0
Radio emission source (RES) detection range [km]	VHF: ≤ 30, HF: ≤ 70
Number of simultaneously-controlled cellular subscribers	1024
Minimum time of electromagnetic contact with radio emission [ms]	VHF: 0.5–2.0, HF: 5.0–10.0

ADDITIONAL INFORMATION, IMAGES, AND DIAGRAMS



Captured TORN automated jamming Complex and accompanying TU-10M Roza antenna.
Source: © 11 June 2022, Armyinform.com.ua²²⁸



Communication characteristics of the TORN automated jamming complex.
Source: © 2 June 2023, ppt-online.org²²⁷



Parked TORN automated jamming system.
Source: © 11 June 2022, Armyinform.com.ua²²⁸

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