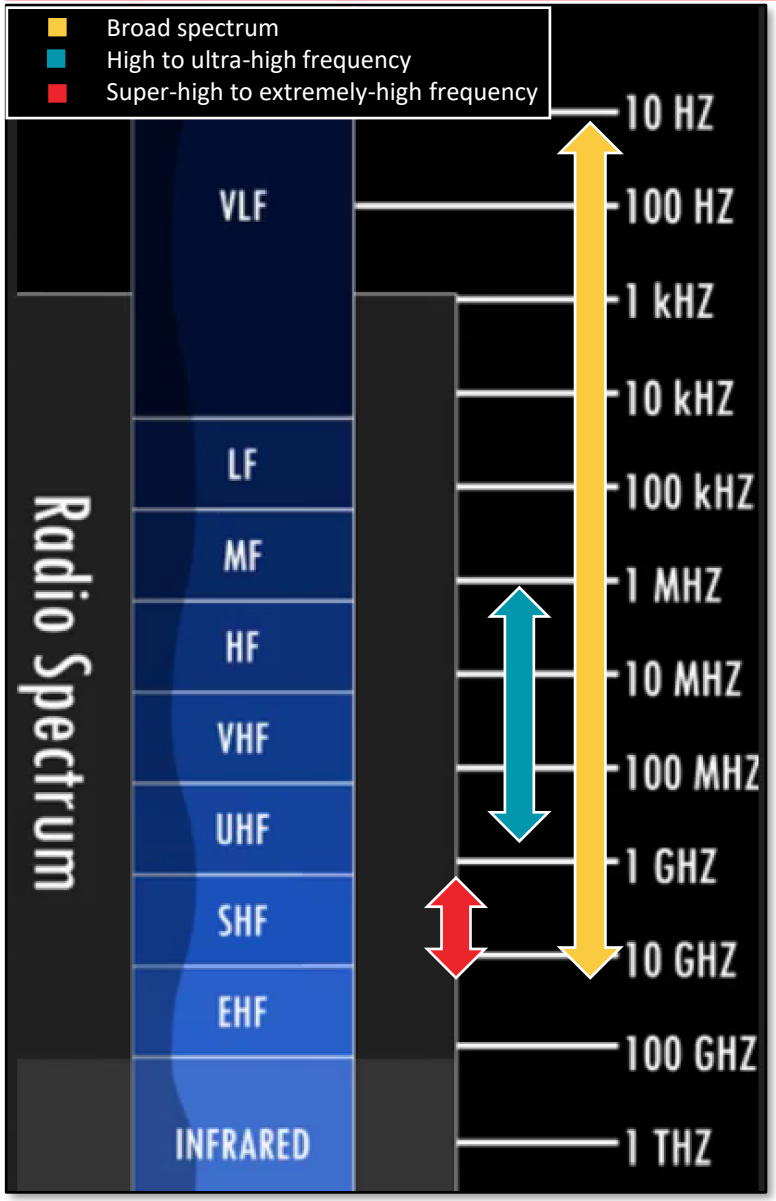
Russian Electronic Warfare Systems

Analytic Insight Report

7 June 2023

EW SYSTEMS: TABLE OF CONTENTS

ELECTRONIC WARFARE (EW) SYSTEMS ELECTROMAGNETIC SPECTRUM OVERVIEW



Electromagnetic spectrum. Source: © 5 September 2018, NASA[1]

System name	Frequency
R-330 Mandat / R-330 K	1.5–100 MHz
GT-01 Murmansk-BN	3-30 MHz
RP-377UVM1 / UVM2 / UM2 Lesochek	20–1000 MHz
R-330T / R-330B	30–100 MHz
RB-531B Infauna	30–300 and 300–1000 MHZ
R-394B	100–400 MHz
SPR-2M Rtut-BM	95–420 MHz
1L262E Rtut-BM	95–420 and 80–900 MHz

System name	Frequency
15Ts56M Typhoon M	unknown
Moscow-1 / 1L267 Moskva-1	unknown
RB-109A Bylina	unknown
Rosevnik-Aero	unknown
Samarkand	unknown
Shipovnik-Aero	unknown
15Ts56M Typhoon M	unknown
Moscow-1 / 1L267 Moskva-1	unknown

System name	Frequency
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

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 equipment[1;] equipped with a radio and optoelectronic complex to provide reliable observations in all weather conditions and times of day[2]
Bandwidth/frequencies: Unknown
Range/antennae ranges: Can detect enemy armored vehicles within 10 km and people from up to 5 km away[3]
Variants: Unknown
Approximate date of adoption to Russian military: 2013 by Strategic Missile Forces of the Teykovskaya Missile Division[4]
TTPs used to counter system(s): Unknown

BPDM 15Ts56M "Typhoon-M"
Source: © Date accessed: 2 June 2023, Arsenal Info[4]

Table Source: © 2 June 2023, Arsenal Info[4]

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 system[5]
- Equipped with Eleron-3SV unmanned aerial vehicles equipped with optical-electronic surveillance equipment used to patrol territories in an expanded range[6]
- Capable of being in the air for two hours with a range of 25 km[6]
- 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 gun[7]

Inside the BPDM "Typhoon-M". Source: © Date accessed: 2 June 2023, Oruzhie.info[6]

BPDM 15Ts56M "Typhoon-M".
Source: © Date accessed: 2 June 2023, Wartime[8]

Remotely controlled combat module with a PKT machine gun.
Source: © Date accessed: 2 June 2023, Oruzhie.info[6]

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 frequencies[9]
Bandwidth/frequencies: 95–420 MHz operating, 80–900 MHz jamming
Range/antennae ranges: 500,000 m^2 or a semi-sphere of 400 m radius[9]
Variants: SPR-2/Rtut-B[12]
Approximate date of adoption to Russian military: 2013[11]
TTPs 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 frequencies[12]
- Rtut-BM affects proximity/radio-controlled fuses, causing targets to explode at higher altitude[9]

Russian Rtut-BM electronic warfare system.
Source: © 20 March 2022, Defence-ua.com[10]

Table Sources: © 5 June 2023, Deagel.com[9]
28 May 2021, Military.com.vn[13]
7 April 2022, Topwar.ru[14]

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

Report of the first Russian 1L262E Rtut-BM EW system destroyed in Ukraine.
Source: © 2 April 2022, Twitter[15]

Electronic warfare complex 1L262E "Mercury-BM".
Source: © 22 May 2019, vpk.name[16]

SPR-2M “Rtut-BM” at the Russian state corporation Rostec. Source: © 2 June 2023, Podarilove.ru[17]

Russian SPR-2, 1L29 "Mercury-B".
Source: © 30 March 2009, 117orb.at.ua[18]

1L269 KRASUKHA-2

Name: 1L269 Krasukha-2
Name, Russian: 1РЛ257 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 kilometers[19]
- Provides protection to ground forces by jamming any airborne radar, radar-guided weapon system or radar-guided missile[19]
- System used to protect the Iskander tactical ballistic missile units[19]

Bandwidth/frequencies: Used to jam S-band, 2.3 GHz–3.7 GHz[20]
Range/antennae ranges: 250 kilometers [19]
Variants: Krasukha-2O, 1L269, 1RL269, and RB-261A[21]
Approximate date of adoption to Russian military: 2011[22]
TTPs used to counter system(s): Unknown
Additional information:
- KRET corporation produces this EW system integrated onto a tactical truck system[19]
- System designed to counter enemies who possess high-tech weapons[23]
- Missiles jammed by the 1L269 are provided with a false target[19]

1L269 Krasukha-2. Source: © 13 August 2014, VitalyKuzmin[22]

Table Sources: © 19 March 2022, Global Defence Technology[20]
23 March 2023, Military Factory[24]

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

Additional Information, Images, and Diagrams

- Mounted on a BAZ-6910-022 automobile chassis, wheel arrangement 8x8[25]
- Cab equipped with protection against microwave radiation and an independent air heater OH-32D-24 and an electric Webasto CC4E air conditioner[25]
- 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 systems[25]

1L269 Krasuha-2 advanced electronic jammer.
Source: © 24 September 2013, Defense-studies[25]

1L269 Krasukha-2 and 1RL257 Krasukha-4 systems deployed with the army's independent EW brigades to jam airborne radars.
Source: © 26 May 2022, ADBR[26]

Krasukha complex. Source: © 26 April 2013, Topwar.ru[27]

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 radars[28]

- Jamming signal types include spectrally matched noise jamming[28]
- 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 5Z55M[29]
- Used alongside other jamming stations like the SPN-40 and SPO-8M, all under the command of AKUP-22[29]

Bandwidth/frequencies: X Band, 8000–12000 MHz[29]
Range/antennae ranges: Detection between 250–400km, interference between 60–150km[29]
Variants: None
Approximate date of adoption to Russian military: Unknown
TTPs used to counter system(s): Unknown

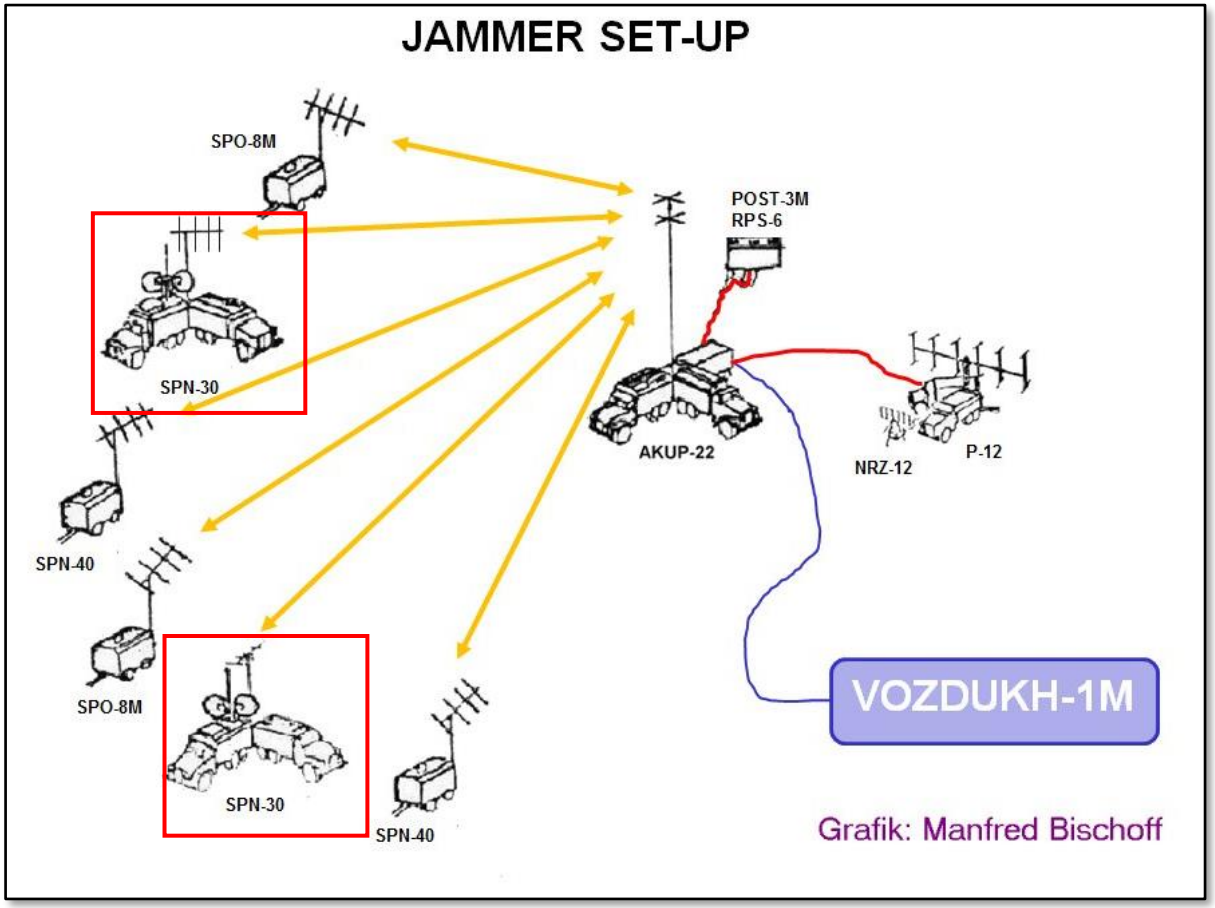
SPN-30 system in the field.
Source: © 1 May 2009, Air Power Australia[30]

Table Source: © 1 May 2009, Air Power Australia[30]

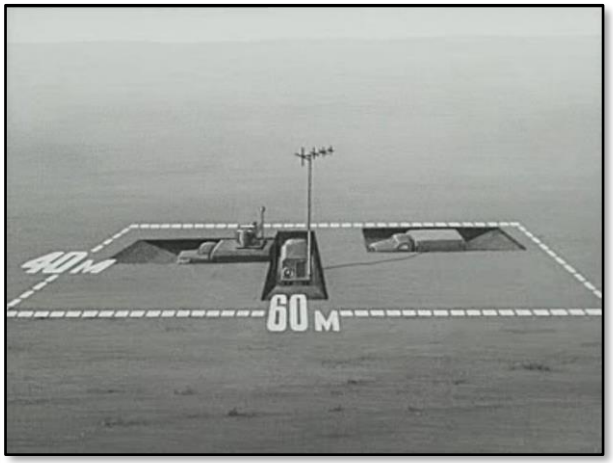
Performance Specifications	
Operating frequency range [GHz]	8–12
Power output rating [dBW]	narrow beam mode: 68, wide beam mode: 54
Receiver sensitivity [dBW]	< 100 [μs]: -123, > 100 [μs]: -140
Signal dynamic range [dB], no less than	60
Analyzed basic pulse signal parameters	duration [μs]: 0.1–5, at 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

1RL237 SPN-30, CONTINUED

Additional Information, Images, and Diagrams



Two SPN-30 systems deployed as part of Vozdukh-1M jammer setup.
Source: © 25 May 2023, Manfred-Bischoff[31]



SPN-30 deployed in anti-fragmentation field setup.
Source: © 25 May 2023, Manfred-Bischoff[31]

SPN-30 system in the field.
Source: © 1 May 2009, Air Power Australia[32]

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 / 1РЛ238[34]
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 150km[34]
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 unknown[34]
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 unit[34]
– Can interfere with up to 4 radars operating at different frequencies[34]
– Spent time in service with Poland, where it was known as the Jadwiga-4[34]

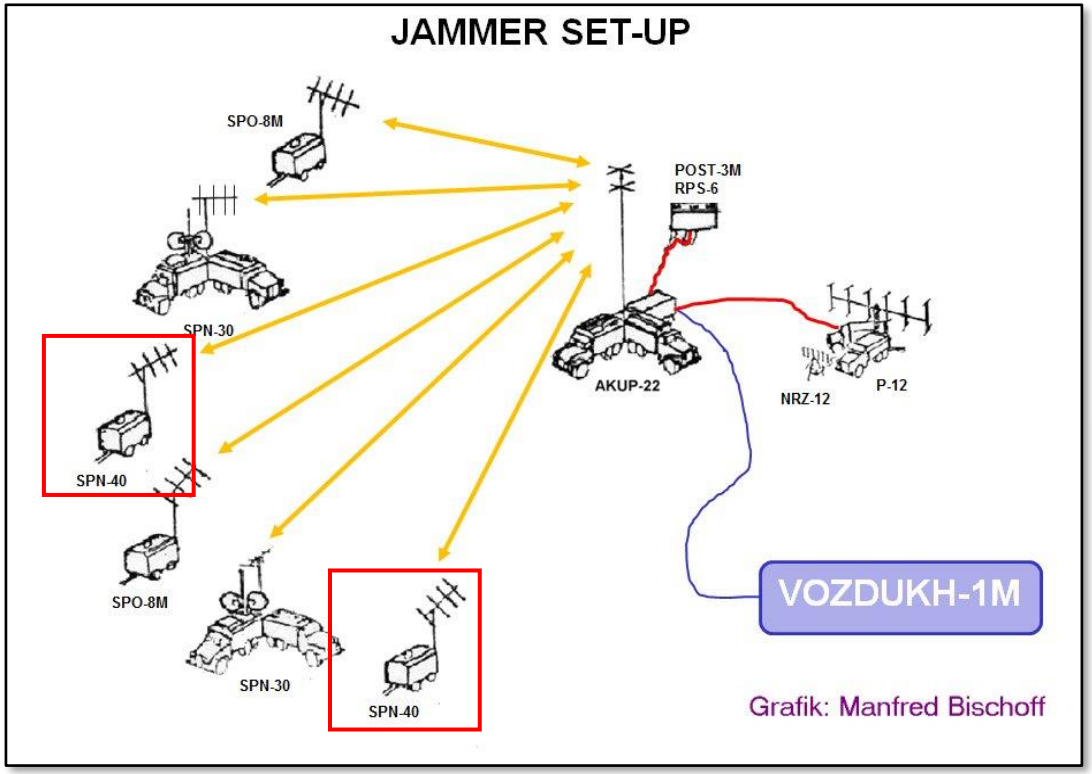
Side view of SPN-40.
Source: © 24 May 2023, Rvsn.ruzhany[34]

Table Source: © 24 May 2023, Armed conflicts[36]

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

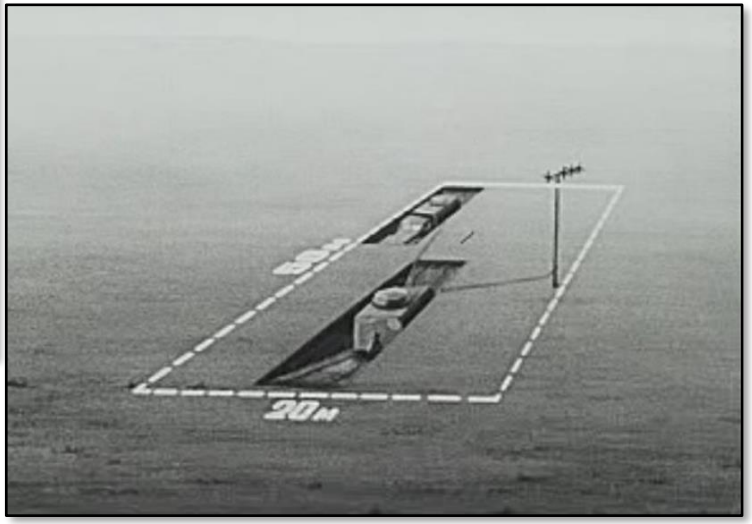
1RL238 SPN-40, CONTINUED

Additional Information, Images, and Diagrams



Two SPN-40 systems deployed as part of Vozdukh-1M jammer setup .
Source: © 26 May 2023, Manfred-Bischoff[37]

SPN-40 deployed in field setup as part of the AKUP-22 system.
Source: © 26 May 2023, Manfred-Bischoff[37]



SPN-40 deployed in anti-fragmentation field setup alongside support vehicle. Source: © 26 May 2023, Manfred-Bischoff[37]

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 130–150km[38]
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 platforms[38]
Approximate date of adoption to Russian military: Unknown
TTPs used to counter system(s): Unknown

Frontal view of SPN-2. Source: © 1 May 2009, Air Power Australia[38]

Table Source: © 1 May 2009, Air Power Australia[38]

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
Angular coordinates measurement accuracy [deg]	in azimuth: 45, in elevation: 10
Number of beams in instant coverage sector	24
Paraxial beam width [deg]	in azimuth: 7.5, in elevation: 2.5
Repeater jamming signal delay [microsec]	≤ 15
Max continuous operation time [hrs]	24
Crew [people]	5

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 systems[43]
- 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 system[41]
- Camouflaged concealment net sometimes used to disguise[44]

SPN-2 system deployed in the field.
Source: © 13 December 2021, Borda.ru[44]

Camouflaged netting used to disguise SPN-2 presence in the field. Source: © 13 December 2021, Borda.ru[44]

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 fire[45]
Bandwidth/frequencies: Jamming X-band, 8.5–10.7GHz and Ku-band, 13.4–17.7GHz[46]
Range/antennae ranges: 150–300 km[45]
Variants: Krasukha-S4, 1L257, 1RL257, and RB-271A[47]
Approximate date of adoption to Russian military: 2012[48]
TTPs used to counter system(s): Unknown

1RL257 Krasukha-4 at Victory Day Parade in Ekaterinburg. Source: © 9 March 2021, Vitaly Kuzmin[49]

Table Sources: © 19 March 2022, Global Defence Technology[46]
23 March 2023, Military Factory[50]

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-168-100[51]
  – Antenna R-168ŠDAM[51]
  – Telescopic mast[51]
  – Satellite navigation BRIZ-KM (14C835/14Ц853)[51]
  – Secure computers Baget-23V and Baget-RSZBM[51]
  – Digital transmission system M-498[51]
  – Microwave equipment US52219[51]
  – Graphic information manipulator[51]
  – Generator ADS- 10 (2 pcs.), ADS-30 (1 pc.)[51,52]
  – Has operational range of 186 miles[53]

Container from 1RL257 Krasukha-4 in the Kiev region.
Source: © 23 March 2022 Militarnyi[54]

1RL257 Krasukha-4 at complex in Russia. Source: © 23 March 2022 Militarnyi[54]

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 Леер-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 GHz[55]
Range/antennae ranges: 6–40km[55]
Variants: Unknown
Approximate date of adoption to Russian military: 2012[55,58]
TTPs used to counter system(s): Unknown
Additional information:
– Quasi-simultaneous suppression of 12 sources of radio emission[55]
– Continuous reconnaissance and suppression, even when mobile[55]
– Mounted on Tigr-M armored vehicle platform[56]

85YA6 Tigr-M MKTK REI PP 'Leer 2' system deployed in the field. Source: © 1 May 2012, Topwar.ru[56]

Table Source: © 23 May 2014, Airbase.ru[55]

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]	roof antennas: 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

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

Additional Information, Images, and Diagrams

85YA6 Tigr-M MKTK REI PP 'Leer 2' informational diagram. Source: © 11 March 2022, Ukraine Segodnya[59]

Leer-2 side profile. Source: © 30 May 2023, Army Recognition[60]

Interior of Leer-2. Source: © 30 May 2023, Arms.expo.ru[61]

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 seaborne objects by their electronic signature, and for data support for higher air defense command and control posts[62]
Bandwidth/frequencies: Operating frequency, 0.2–18 GHz[63]
Range/antennae ranges: Up to 400 km[63]
Variants: Unknown
Approximate date of adoption to Russian military: 2011, Russian Khmeimim airbase in Syria[64]
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 percent[65]
– 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 targets[65]

Ground-based ESM/ELINT system "Avtobaza-M" Source: © 2023, Catalog Rosoboronexport[62]

Table Sources: © 2019, Standfair Operations[63] 2023, Redstar[65]

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

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 MHz[66]
Range/antennae ranges: 5,000–8,000 km[66]
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 trailer[66]
- Full complex has four antenna groups for 16 antennas in total; masts extend to 32 meters in height[66]
- 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 group[66]
  - 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 kg[66]

GT-01 Murmansk-BN.
Source: © 18 April 2022, Army Recognition[66]

Table Source: © 18 April 2022, Army Recognition[66]

Performance Specifications	
Jamming frequency [MHz]	3–30
Area of jamming [km2]	640,000
Jamming range [km]	5,000–8,000
Deployment time [hours]	72
Truck vehicles	KamAZ 53501 and KamAZ 6350

GT-01 MURMANSK-BN, CONTINUED

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 horsepower[69]
  – Other vehicles include fuel bowsers and troop transport[69]

Antenna mounted on a trailed.
Source: © 18 April 2022, Army Recognition[69]

Command post and generator vehicle.
Source: © 18 April 2022, Army Recognition[69]

KamAZ 530501 8x8 military truck with the extendable antenna mast.
Source: © 18 April 2022, Army Recognition[69]

GT-01 Murmansk-BN. Source: © 18 April 2022, Army Recognition[69]

MKTK-1A JUDOIST

Name: MKTK-1A Judoist
Name, Russian: МКТК-1А Дзюдоист
Other names: Dzjudoist
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 GHz[70]
Range/antennae ranges: Unknown
Variants: Unknown
Approximate date of adoption to Russian military: 2012[72]
TTPs used to counter system(s): Unknown
Additional information:

- Complex includes three automated workstations - for radio and radio control, technical analysis and special control[72]
- 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 radiation[72]

Mobile automated complex of electronic warfare (EW) MKTK-1A "Judoist" Source: © Date accessed: 6 June 2023, ВПК[71]

Table Source: © 2 June 2023, Weapons of Russia[70], 2 June 2023, Вооружение.рф[72]

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

MKTK-1A JUDOIST, CONTINUED

Additional Information, Images, and Diagrams

MKTK-1A Judoist. Source: © 6 June 2023, Roe.ru[73]

Deployed MKTK-1A Judoist. Source: © 6 June 2023, Roe.ru[73]

Operators of the MKTK-1A “Dzhudoist” EW system. Source: © 25 April 2023, Mil.in.ua[74]

MOSCOW-1 / 1L267 MOSKVA-1

Name: Moscow-1
Name, Russian: Москва-1
Other names: Moskva-1, Moskva-1 1L265, 1L266, 1L267[75]
Other names, Russian: Москва-1, Москва-1 1Л265, 1Л266, 1Л267
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 radar[77]
Bandwidth/frequencies: Unknown
Range/antennae ranges: The range of the Moscow-1 is 400 kilometers[76]
Variants: Unknown
Approximate date of adoption to Russian military: December 2013.[78] Russian Armed forces had an estimate of 10 Moscow-1 complexes in 2015[79]
TTPs used to counter system(s): Unknown
Additional information:

- Equipment of the complex is mounted on three KamAZ-6350-1335 vehicles[79]
  - First machine has a module that performs tasks of searching and direction finding[78]
  - Second machine performs the function of an automated command post[78]
  - 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 necessary[78]

One of the vehicles of the complex RER and EW "Moscow-1".Source: © 11 December 2013, Military Russia[79]

Table Source: © 11 December 2013, Military Russia[79]

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

MOSCOW-1 / 1L267 MOSKVA-1, CONTINUED

ADDITIONAL INFORMATION, IMAGES, AND DIAGRAMS

Moskva-1 Complex. Source: © 9 March 2020, Turbo Squid[80]

Moscow-1 (circled) and two Krasukha-4 complexes (left).
Source: © 12 December 2013, Russian Defence[81]

Moscow-1. Source: © 12 December 2013, Russia Defence[81]

PALANTIN

Name: Palantin
Name, Russian: Палантин
Other names: Palantin-K, Stole[82]
Other names, Russian: Палантин-К, Украл
Purpose/use: Automated jamming complex designed for suppression of satellite-guided weaponry, 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 20km[86]
Variants: Unknown
Approximate date of adoption to Russian military: 2019[87]
TTPs used to counter system(s): Unknown
Additional information:

- Complex combines the electronic warfare complexes "Moscow", "Zhitel" and "Judoist" into a single working network[87]
- 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 systems[88]

Palantin automated jamming complex.
Source: © 10 June 2022, TASS[89]

Table Sources: © 4 December 2022[84]
22 September 2021, Jamestown Foundation[88]
10 June 2022, TASS[89]

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

Name: Pelena-1
Name, Russian: Пелена-1
Other names: Unknown
Other names, Russian: Unknown
Purpose/use: Suppression/jamming of airborne early warning, AM/ARU-1 radar of AWACS-type aircraft with automatic frequency guidance, protecting installations with radar cross-sections between 10-15 square meters[90]
Bandwidth/frequencies: 2–4 GHz, S Band[90]
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[92]
– Jamming effect is reduced with multiple AWACS aircraft in the area; overlap between AWACS aircraft results in successful transfer of information[92]
– Powerful noise jamming coming from the Pelena-1 will likely be detected by enemy radar reconnaissance and present a viable target for anti-radiation missiles[92]
– Lack of mobility led to the development of the Krasukha EW system[92]

Side view of Pelena-1. Source: © 1 May 2009, Air Power Australia[90]

Table Source: © 25 May 2023, Rusarmy.com[91]

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 GHz[94]
Range/antennae ranges: 20–2000 MHz[95]
Variants: Pelena-6BS-F Sfera[96]
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, Twitter[97]

Table Source: © 5 June 2023, СпецТехКонсалтинг[98]

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 transmitter[98]
- Radius of the protective zone, on average, is at least 70 meters[99]
- Power supplied from an external power supply with a nominal voltage of 12 V or 24 V[98]

Blocker of radio-controlled explosive devices PELENA-6BS-F.
Source: © 23 January 2016, Twitter[100]

PELENA-6BS-F. Source: © 32 January 2016, Twitter[100]

R-330 MANDAT / R-330K

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 60km[101]
Variants: R-330T, R-330U, R-330B, Borisoglebsk-2[101]
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 mode[103]
  - Used in PU-T-VG mode, system controls individual automated jamming station assets and processes information for command needs[103]

R-330K control point module, functioning as part of the R-330 Mandat EW complex.
Source: © 31 May 2023, Armed Conflicts[103]

Table Sources: © 31 May 2023, Academic.ru[101]
31 May 2023, Start.bg[102]

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

R-330 MANDAT, CONTINUED

Additional Information, Images, and Diagrams

R-330BM - modernized version of R-330B used in R-330 Mandat complex.
Source: © 2 November 2017, Topwar.ru[104]

R-325U high frequency jammer under camouflage netting - part of the R-330 Mandat complex). Source: © 15 July 2011, ruqrz.com[105]

R-378B tracked jammer - one part of the R-330 Mandat complex.
Source: © 10 August 2016, Informnapalm.org[106]

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 complex[108]
Bandwidth/frequencies: Operating frequency 0.1–2.0 GHz[107]
Range/antennae ranges: 30x30km[107]
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 work[107]
– CDMA standard equipment with wideband signal for intra-complex communication is susceptible to disruption[107]

R-330Zh jamming station - one part of the R-330M1P Diazabol jamming complex.
Source: © 1 June 2023, Recombats.ru[109]

Table Source: © 1 June 2023, Protek-vrn.ru[107]

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

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 messages[112]
Bandwidth/frequencies: Operating frequency 30–100 MHz[112]
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
TTPs used to counter system(s): Unknown
Additional information:
– Developed by TNIIR Efir (R-330B: 1999-2001)[111]
  – System powered either by a towed ED-30 (ED30-T400-1RPM1) diesel generator or mains grid power converter[110]

R-330T at the international forum "Technologies in mechanical engineering" (2010).
Source: © 1 May 2009, Air Power Australia[111]

Table Source: © 2003, Rosoboronexport[112]

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 1 with PFT
Detection-to-suppression time [ms]	≤ 5

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 set[113]
– Reporting indicates the system may utilize jamming frequency-hopping VHF radios, performing up to 300 hops per second[114]

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 Australia[115]

Deployed configuration of the MTLBu hosted R-330B tracked chassis.
Source: © 1 May 2009, Air Power Australia[115]

Deployed configuration of the KamAZ hosted R-330T. Source: © 1 May 2009, Air Power Australia[115]

New build R-330T hosted on the Ural 43203-31 / K2-4320 6 x 6 chassis, stowed with generator in tow, and deployed.
Source: © 1 May 2009, Air Power Australia[115]

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: 2008[116]
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 communications[118]
- 20 minutes of reported collection time before danger of adversarial detection gets too high[118]
- Lengthy deployment time for antenna installation in the field; all antenna installation is accomplished manually without mechanization[118]

R-330Zh Zhitel jamming station.
Source: © 26 July 2016, Topwar.ru[118]

Table Source: © 1 June 2023, Вооружение.рф[116]
1 June 2023, Protek-vrn.ru[117]

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
Beam width [deg][117]	in azimuth: 90-120, in elevation: ≤ 20
Quasi-simultaneously emitted interference signals[117]	< 12
Signal emission source jamming range [km][117]	ground-based: 20–25, installed on aircraft: ≥ 50
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.ru[119]

R-330Zh Zhitel antenna reconnaissance and suppression module in field deployment. Source: © 26 July 2016, Topwar.ru[120]

R-330Zh Zhitel interior. Source: © 1 November 2017, Topwar.ru[119]

R-330Zh Zhitel station (red) alongside Tirada-2 jammer. Source: © 3 April 2019, UNIAN[121]

R-340RP FIELD 21, POLE 21

Name: R-340RP Field 21, Pole 21
Name, Russian: Р-340РП Полюс 21, Поле 21
Other names: Pole-21
Other names, Russian: Поле-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 GHz[123]
- GPS: 1.57542, 1.2276, 1.17645 GHz[123]
- GLONASS: 1.602, 1.246, 1.202 GHz[123]
- Galileo: 1.19179 GHz[123]
- BeiDou: 1.561042, 1.20714 GHz[123]

Range/antennae ranges: 25–75 km[123]
Variants: None
Approximate date of adoption to Russian military: 2016[124]
TTPs used to counter system(s): Unknown
Additional information:
- Modular and scalable[124]
- One complex with 100 antenna posts can jam area of 150x150 km[124]
- 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.ua[123]

Table Sources: © 1 June 2023, Вооружение.рф[122]
23 March 2023, Focus.ua[123]

Performance Specifications	
Signal technical analysis range [GHz][123]	1.176–1.602
Signal emission source jamming range [km][123]	25–75
Power consumption [W][122]	600
Azimuth operational limits [deg][122]	125
Elevation operational limits [deg][122]	25

R-340RP FIELD 21, POLE 21, CONTINUED

Additional Information, Images, and Diagrams

Pole-21 wheeled mobile unit. Source: © 28 May 2015, Twitter[125]

R-340RP Field 21, Pole 21 unit deployed in the field.
Source: © 17 April 2021, aif.ru[126]

Pole-21 stationary unit attached to cell tower.
Source: © 28 March 2023, Focus.ua[127]

R-934B

Name: R-934B
Name, Russia: Р-934Б
Other names: R-934B Sinitsa[128]
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
TTPs 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 independently[131]

A stowed R-934B system.
Source: © 1 May 2009, Air Power Australia[130]

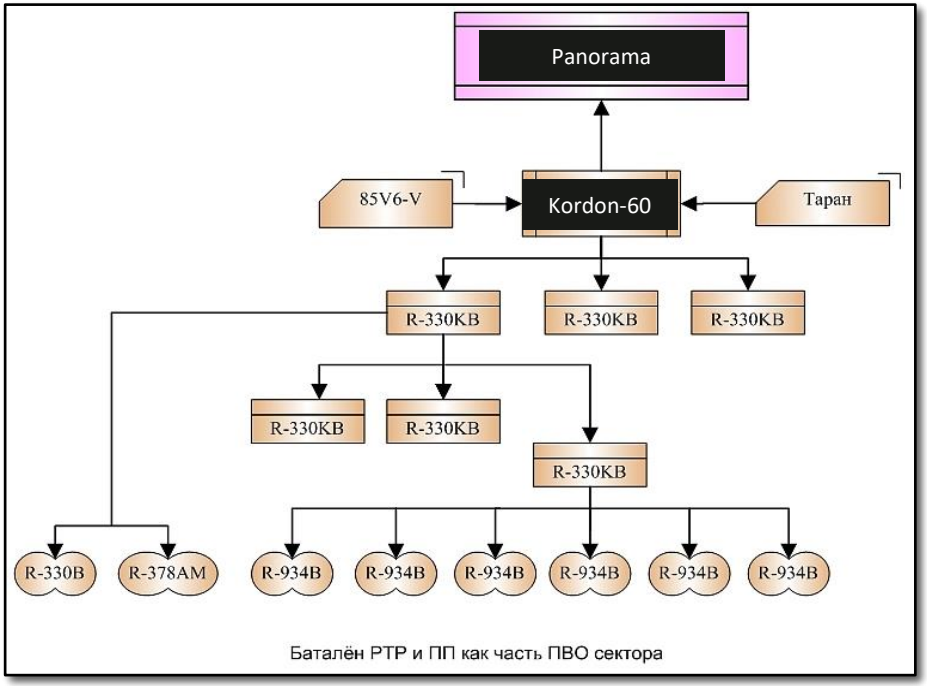
Table Sources: © 2003, Rosoboronexport[129]
27 June 2022, Jamestown Foundation[131]

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]	• 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

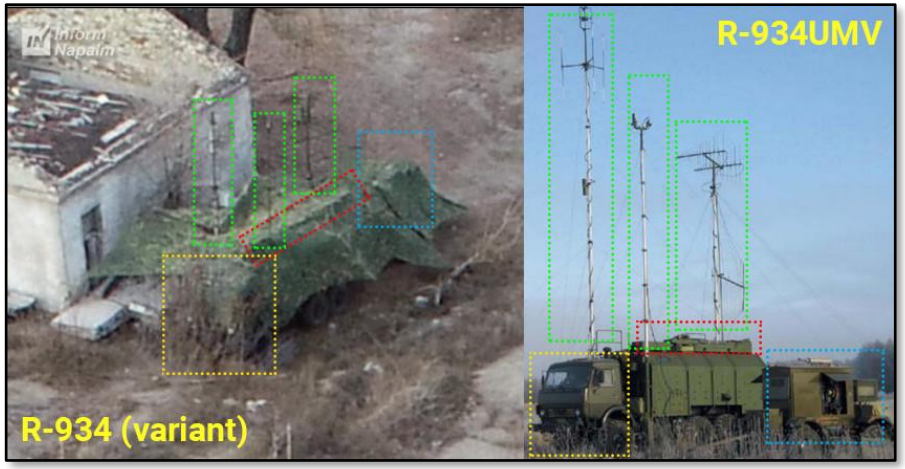
– Russian doctrine for the operation of EW assets in air defense applications employs a centrally controlled model. A Panorama sector command post (CP) controls one or more Kordon-60 CPs, each of which is tied to an 85V6 Orion/Vega emitter locating system, and a group of jammers[134]



Air defense sector ELINT and EW battalion structure.
Source: © 1 May 2009, Air Power Australia[134]

R-934B on Ural 4320 in desert camouflage.
Source: © 1 May 2009, Air Power Australia[134]

R-934B jammer carried on the MT-LBU tracked chassis.
Source: © 1 May 2009, Air Power Australia[134]



Probable R-934 variant hidden under camouflage net.
Source: © 1 May 2009, Air Power Australia[134]

RB-109A BYLINA

Name: RB-109A Bylina[1]
Name, Russian: РБ-109А Былина[1]
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: 2017-2018[138]
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 situation[136]
- 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 missiles[141]
- Russia plans on deploying the RB-109A to all electronic warfare brigades by 2025[140]

RB-109A Bylina.
Source: © 9 November 2018, novynarnia.com[138]

RB-109A Bylina.
Source: © 12 August 2018, twitter.com[142]

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 30km[147]
Variants: Unknown
Approximate date of adoption to Russian military: 2010[148]
TTPs used to counter system:
- Drones have achieved great success against RB-310B Borisoglebsk-2 complexes in the Russia-Ukraine war[149]
- Russia has less than 100 remaining Borisoglebsk-2 complexes in combat inventory and has lost approximately 12 in its war against Ukraine[149]

Additional information:
- Complete RB-310B Borisoglebsk-2 complex consists of 9 vehicles, most based on the tracked MT-LB platform[150]

Element of RB-310B Borisoglebsk-2 complex.
Source: © 31 May 2023, Armament.rf[151]

Table Sources: © September 2017, International Centre for Defense and Security[143]
31 May 2023, Armament.rf[151]
14 September 2022, Gagadget[145]
6 October 2022, Pulse.mail.ru[147]
14 March 2016, Topwar.ru[148]

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

RB-310B BORISOGLEBSK-2, CONTINUED

Additional Information, Images, and Diagrams

R-330KMV - modernized version of R-330K used in R-330 Mandat complex. Source: © 28 May 2015, Twitter[152]

R-934BMV jamming station - one part of the RB-310B Borisoglebsk-2 complex. Source: © 14 September 2022, Gagadget[153]

R-330BMV jamming station - one part of the RB-310B Borisoglebsk-2 complex. Source: © 14 June 2019, Janes[154]

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 6km[157]
Variants: Unknown
Approximate date of adoption to Russian military: 2015, upgrades increasing 3G/4G compatibility came later[155]
TTPs used to counter system(s): Unknown
Additional information:

- Uses Orlan-10 drones to suppress cellular networks within its operational radius[156]
- Can deploy psychological warfare measures using SMS to disrupt adversary communications and blast messages to cellular subscribers within radius[156]
- Combination of jammers and Orlan-10 drones disable and spoof cellular communications towers[155]
- Was used in Syria to message rebel groups concerning an armistice[155]

RB-341V 'Leer 3' with Orlan-10 integrated.
Source: © 4 April 2017, UAS Vision[155]

Table Source: © 21 February 2018, Topwar.ru[156]

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 blocked 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

RB-341V 'LEER 3', CONTINUED

Additional Information, Images, and Diagrams

Crew preparing Leer-3 system for field operation. Source: © 21 February 2018, Topwar.ru[158]

Orlan-10 drone loaded onto launch catapult as part of Leer-3 system.
Source: © 21 February 2018, Topwar.ru[158]

Interior of Leer-3 control vehicle.
Source: © 21 February 2018, Topwar.ru[158]

RB-531B INFAUNA

Name: RB-531B Infauna
Name, Russian: РБ-531Б Инфауна
Other names: Infauna K1SH1 UNSH-12[159]
Other names, Russian: Инфауна 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 2011[162]
TTPs used to counter system(s): Unknown
Additional information:

- Mounted on unified K1Sh1 chassis based on the BTR-80 armored personnel carrier[163]
- Capable of escorting columns of armored vehicles and performing operations in close proximity to ground forces[164]
- Antenna mounted inside of domed shell on the roof, can be deployed through a telescopic mast[160]
- Ability to work alongside sappers for anti-radio-controlled minesweeping[163]

RB531B Infauna system. Source: © 5 May 2013, Military Russia[165]

Table Source: © 30 May 2023, Armament[164]

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

RB-531B INFAUNA, CONTINUED

Additional Information, Images, and Diagrams

RB31B Infauna informational diagram. Source: © 11 March 2022, Ukraine Segodnya[166]

Roof-mounted dome antenna housing on the RB-531B Infauna.
Source: © 15 October 2015, Topwar.ru[167]

Auxiliary antenna, optoelectronic sensor, and grenade launcher on starboard side of RB-531 Infauna.
Source: © 15 October 2015, Topwar.ru[167]

RB-636 SVET-KU/SVET-VSG

Name: RB-636 Svet-KU/Svet-VSG[168]
Name, Russian: РБ-636 Свет-КУ/Свет-ВСГ
Other names: RB-636AM2 Svet-KU[169]
Other names, Russian: РБ-636АМ2 Свет-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 signals[170]
Bandwidth/frequencies: 0.025–18 GHz[170,171]
Range/antennae ranges: Unknown
Variants: RB-636AM2 Svet-KU complex, based on the Ford Transit van[169]
Approximate date of adoption to Russian military: Svet-VSG 2010, Svet-KU 2012[168,170]
TTPs 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 communication[168]
- Can interact with the automated complex technical control point (APU CPC)[168]

RB-636AM2 Svet-KU mounted on KamAZ-4350 two-axle chassis. Source: © 25 October 2017, Defense Express[171]

Table Sources: © 5 May 2017, Defence24.com[170]
2023, Вооружение.рф[172]
25 October 2017, Defense Express[171]

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

RB-636 SVET-KU/SVET-VSG, CONTINUED

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 degrees[173]

– 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]

Deployed RB-636AM2 Svet-KU complex - Newer variant based on the Ford Transit chassis.
Source: © 19 October 2015, Topwar.ru[174]

Mobile radio monitoring complex "Svet-KU« on KamAZ brand chassis.
Source: © 04 May 2014, militaryrussia.ru[175]

Can interact with the APU CPC "Less".
Source: © 04 May 2014, militaryrussia.ru[175]

Stationary antenna post and control point of the "Svet-VSG" complex.
Source: © 04 May 2014, militaryrussia.ru[175]

Antenna-feeder device.
Source: © 19 October 2015, Topwar.ru[174]

REPELLENT-1

Name: Repellent-1
Name, Russian: Репеллент-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 Ukraine[176]
Bandwidth/frequencies: Suppression bandwidth frequency is 0.2–6 GHz[177]
Range/antennae ranges: Incapacitates drones at a distance up to 30–35km[178]
Variants: Unknown
Approximate date of adoption to Russian military: 2016 presented at a defense exhibition[179]
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 and mobile units[180]
- Cabin is protected against small arms fire and NBC (Nuclear, Bacteriological and Chemical) agents[180]

Repellent-1. Source: © 21 July 2022, Gagagdet News[178]

Table Source: © 30 May 2023, Rosoboronexport[177]

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

Name: Rosevnik-Aero
Name, Russian: Росевник-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 minutes[181]
Bandwidth/frequencies: Unknown
Range/antennae ranges: Unknown
Variants: Unknown
Approximate date of adoption to Russian military: 2022, military bases and key areas in Syria[182]
TTPs used to counter system(s): Unknown
Additional information: The technical characteristics are unknown, as are its locations in Syria, if it is present there[181]

no photo available

Performance Specifications
No information available

RP-377L / LA LORANDIT-M

Name: RP-377L/LA Lorandit-M
Name, Russian: РП-377ЛА «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 GHz[186]
Range/antennae ranges: Unknown
Variants: Unknown
Approximate date of adoption to Russian military: 2019, serial production of latest system began in 2021[184]
TTPs used to counter system(s): Unknown

RP-377L/LA Lorandit-M on UAZ chassis.
Source: © 3 12 April 2014, Live Journal[187]

Table Source: © 24 May 2014, Air Base Forums[186]

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 terrain[188]
– Can be placed on a cross-country vehicle for use in field[188]

RP-377L complex. Source: © 24 May 2014, Air Base Forums[188]

RP-377L/LA Lorandit-M.
Source: © 28 April 2017, Khabara News[190]

Mounted RP-377LA complex.
Source: © 24May 2014, Air Base Forums[190]

RP-377UVM1 / UVM2 / UM2 LESOCHEK

Name: RP-377UVM1 / UVM2 / UM2 Lesochek
Name, Russian: РП-377УВМ1
Other names: Vehicle Mounted RP377 UVM2 Radio IED Jammer Lorandit[191]
Other names, Russian: Установленный на автомобиле RP377 UVM2 Устройство подавления радиосигналов СВУ 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 devices[192]
Bandwidth/frequencies: Interference frequency range 20–1,000 MHz[192]
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 case[192]
- Previous mounted vehicles include Typhoon-K - "Тайфуна-К ", Lynx - "Рысь", Tiger - "Тигр" and BTR variants[195]

RP-377VM1 Radio Fuze Jammer module
Source: © 7 May 2021, CRIB[195]

Table Source: © 2019, БПСЗ[192]

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

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 km[197]
Variants: Samarkand-U, Samarkand SU-Pred-K2, and Samarkand PU-Pred-D[198]
Approximate date of adoption to Russian military: 2017, Northern Fleet of the Russian Navy[198]
TTPs used to counter system(s): Unknown
Additional information:

- Domed electronic warfare system that provides blocking of any radio-electronic signals within the coverage area[197]
- 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.pro[197]

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

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 Donestsk[201]
TTPs used to counter system(s): Complexes of the "Rosehip - 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 UAVs[202]
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]

Shipovnik-AERO mounted on a vehicle.
Source: © 3 December 2012, Topwar[201]

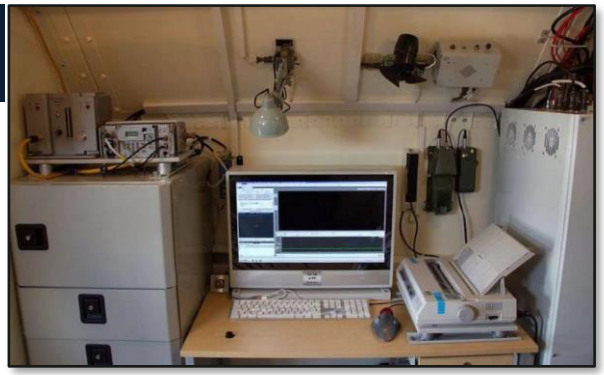
Table Source: © 3 December 2012, Topwar[201]

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

SHIPOVNIK-AERO, CONTNIUED

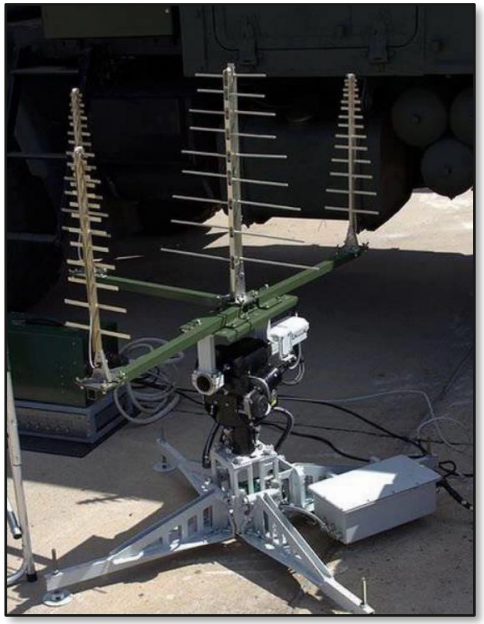
Additional Information, Images, and Diagrams

– Structure includes basic hardware complex, control equipment, communication equipment, a power supply system, a life supporting system, and a set of equipment external deployment[204]
– 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 complex[204]



Shipovnik-AERO internal equipment.
Source: © 3 December 2012, Topwar[204]

Shipovnik-AERO external deployment equipment.
Source: © 3 December 2012, Topwar[204]



Shipovnik-AERO external deployment equipment.
Source: © 3 December 2012, Topwar[204]

Shipovnik-AERO internal equipment.
Source: © 3 December 2012, Topwar[204]

SPR-2M RTUT-BM

Name: SPR-2M Rtut-BM
Name, Russian: СПР- 2М « Ртуть- ВМ »
Other names: Mercury BM
Other names, Russian: Меркурий БМ
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 MHz[206]
Range/antennae ranges: Unknown
Variants: SPR-2M "Rtut-BM“, a modernization of the SPR-2 ammunition radio fuse jamming station using new equipment[206]
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 value[207]

SPR-2M Rtut-BM (Mercury-BM).
Source: © September 2023, 3dmdb[209]

Table Source: © 5 June 2023, вооружение.рф[206]

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/W]	95–110
Potential of electronic countermeasures [W]	250

TIRADA-2

Name: Tirada-2
Name Russian: Тирада-2
Other names: Tirada-2S
Other names, Russian: Тирада-2С
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 interference[210]
- Capable of disrupting the satellite communications of reconnaissance UAVs[210]

Bandwidth/frequencies: 3–14 GHz, centimeter band[212]
Range/antennae ranges: unspecified, several tens of kilometers[214]
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-1D[212]
- 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 variations[212]

The Tirada complex includes a mobile command center, a hardware machine with means of detecting communications and jamming – mounted on a KamAZ chassis , and an electric generator. Source: © 9 October 2022, For-ua.info[211]

Table Sources: © 26 October 2020, The Space Review[212]
25 October 2022, Don24.ru[219]

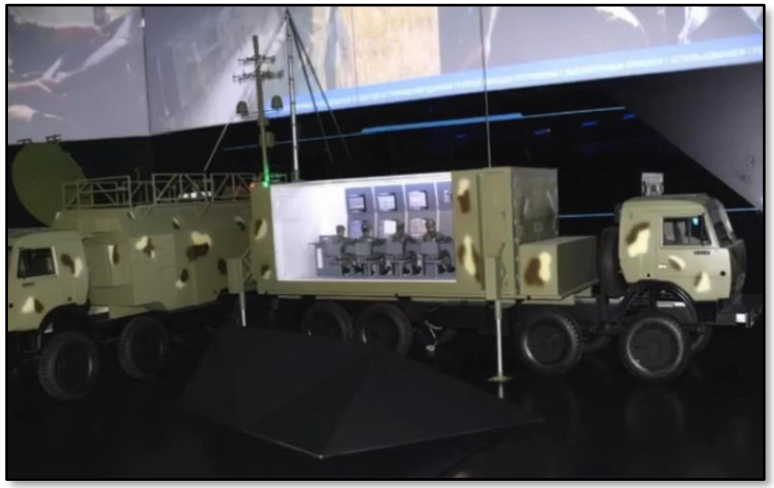
Performance Specifications	
Operating frequency range [GHz][3]	3–14
Crew [people][11]	5
Deployment time [min][3]	30

TIRADA-2, CONTINUED

Additional Information, Images, and Diagrams

Left: Tirada informational diagram. Source: © 11 March 2022, Ukraine Segodnya[220]

Right: Mobile Tirada-2 satellite jamming systems. Source: © April 2021, Center for Strategic and International Studies[221]



Model of the mobile Tirada-2 satellite jamming system at the 2013 MAKS air show. Source: © 25 September 2019, Dfnc.ru[222]

TORN

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 devices[223]
Bandwidth/frequencies: 0.0015–3.0 GHz[223]
Range/antennae ranges: up to 30km (VHF), up to 70km (HF)[224]
Variants: Unknown
Approximate date of adoption to Russian military: 2012[225]
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 communication[226]

Additional information:
- Uses 2 KamAZ-5350 trucks:
  - One with rigging and cables in support of antenna array[225]
  - One with systems antennas, processing equipment and workstations[225]
- Used with reconnaissance units in the Russian Armed Forces' motorized rifle and tank brigades and divisions, not with electronic warfare companies[225]
- 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 antennae[223]

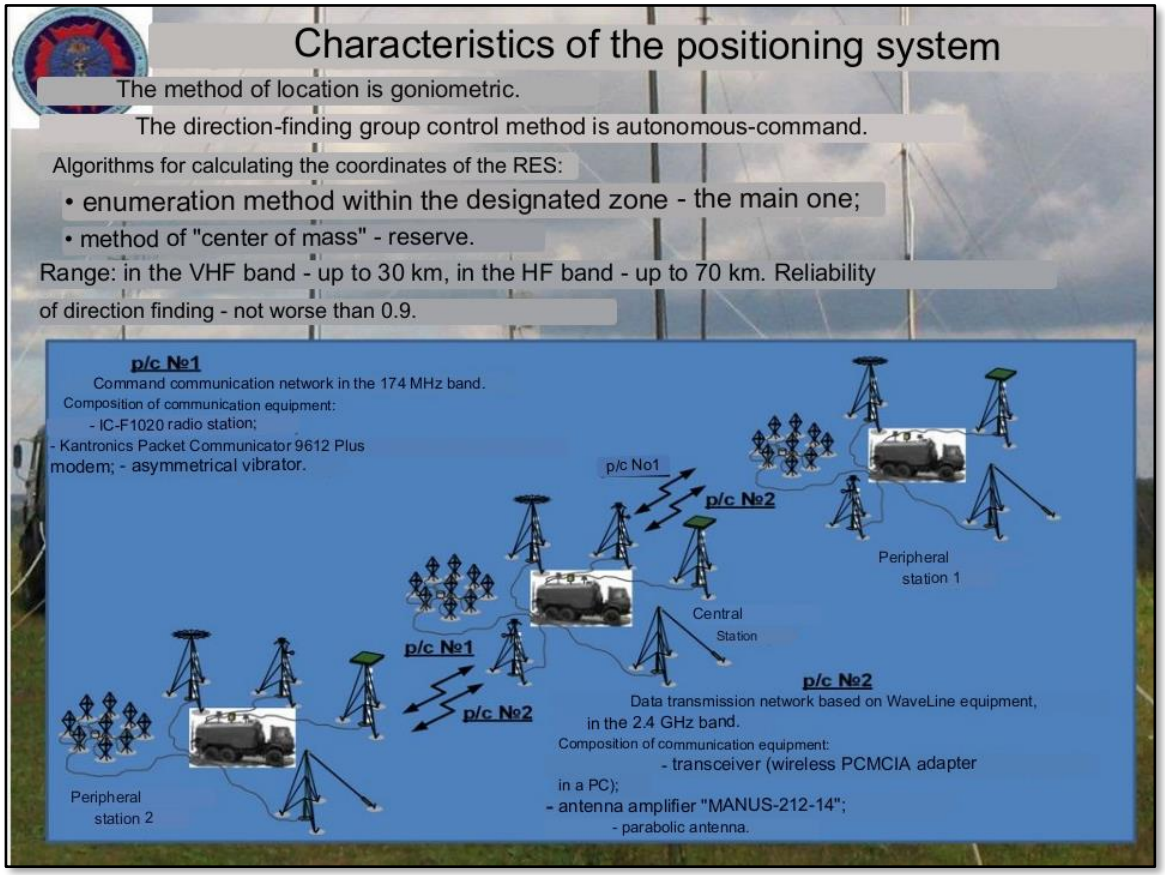
TORN automated jamming complex fully deployed with supporting antennae.
Source: © 12 June 2022, Defense Express[224]

Table Source: © 2 June 2023, Ppt-online.org[223]

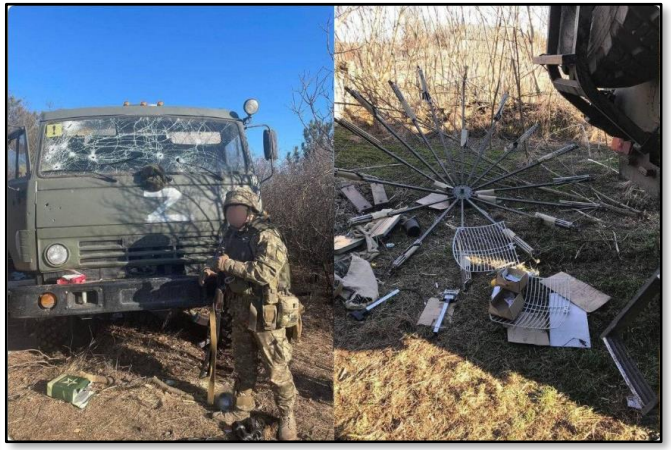
Performance Specifications	
Operating frequency range [GHz]	0.0015–3.0
Radio emission source (RES) detection range [km]	VHF: ≤ 30, HF: ≤ 70
Number of simultaneously-controlled cellular subscribers	1024
Minimum time of electromagnetic contact with radio emission [ms]	VHF: 0.5–2.0, HF: 5.0–10.0

TORN, CONTINUED

Additional Information, Images, and Diagrams



Communication characteristics of the TORN automated jamming complex.
Source: © 2 June 2023, ppt-online.org[227]



Captured TORN automated jamming Complex and accompanying TU-10M Roza antenna.
Source: © 11 June 2022, Armyinform.com.ua[228]

Parked TORN automated jamming system.
Source: © 11 June 2022, Armyinform.com.ua[228]

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