

The Soviet/Russian Deep Space Network

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Radio systems

Frequencies used by the Soviet/Russian Deep-Space Network

Nowadays the ground stations in the Ukraine and Russia are planning to move to internationally agreed frequency bands, but the table below shows what their original frequency bands were.

L-band frequencies used (all right polarized)

Uplinks (MHz)	770	960	-
Downlinks (MHz)	926	928	930

C-band frequencies

Uplinks (GHz)-Polarization	5.008-R	-	-
Downlinks (GHz)-Polarization	5.84-L	5.86-L	5.884-L

Data reception rates

1-128 bits/sec without coding. 512-100000 bits/sec with (K=6. R=0.5) Viterbi coding.

Ranging

Ranging tone phase-modulated on the carrier. Ranging accuracy is 50 meters on 770 MHz, and 10-20 m on 5GHz. range rate accuracy is 2mm /s and 0.5 mm/s respectively. During Luna flights 3 kHz ranging tones have been observed.

Flight Control Centers

There are two flight control centers, one located at TsUP in Kaliningrad and the other at the Western Deep Space Communications Center in the Crimea.

Ballistic Centers

Two ballistic centers provide ballistic support for the missions. One belongs to the TsUP in Kaliningrad and the the other is located at the Keldysh Institute of Applied Mathematics.

Station Network

Station name	Location	Antenna	Mode	Frequency	Remarks
Ussuriisk	44°0330N 131°7550 E	A70 A32 A25	T/R R T	L/C L/C L/C	- - Tx Pwr: L=80 kW, C=8kW
Shcholkovo	55°9330N 37°9690E	A25	T/R	L	Two antennas. Tx Pwr=40 kW
Bear Lake	55°8657888 N 37°9546083 E	TNA-1500 (64 m diam)	R	L/C	Noise temperature 35- 85 K, depending on elevation.
Kalyasin	On the Volga, 180 km from Moscow, 57°194 N 37°945 E	TNA-1500 (64 m diam)	R	L/C	Noise temperature 35- 85 K, depending on elevation.
Yevpatoria	45°2166 N 33°3666 E	A70 A32 ADU-1000	T/R T R	L/C L/C ?	- Tx Pwr: L=80 kW, C=8kW Eight 16 m diam dishes.

Stations in the Far East

The Eastern Deep Space Communications Center is located at Ussuriisk (44°03'30"N 131°07'50"E). The center has an A70 (70 meter diameter) dish used for receiving telemetry from the Russian Interball and Granat satellites and for commanding these satellites. In addition there is an A32 reception antenna with 32 meter diameter. There is an A25 command transmission antenna with 25 meter diameter. It transmits 8 kW of power on 5 GHz and 80 kW on 770 MHz.

Stations near Moscow

At Shcholkovo (55°03'30"N, 37°09'00"E) there are two 25 meter (A25) antennas for reception and transmission in the 0.93 GHz and 0.77 GHz bands respectively. Higher frequencies are not supported. The transmitter power is 40 kW.

Reception Stations near Moscow

- Bear Lake site, 26 km from Moscow center at 55°08'57.888"N, 37°09'54.6083"E.
- Kalyasin, on the Volga, 180 km from Moscow.

These two sites are equipped with TNA-1500 radio telescopes with **64 meter** diameter. These can be used for the reception of space vehicles on 926 MHz, 928 MHz, 5.84 GHz and 5.86 GHz. The noise temperature at all these frequencies varies between 35 and 85 K, depending on elevation.

Stations in the Ukraine

The ground station that is normally called Yevpatoria (45°02'16.6"N, 33°03'36.6"E) is actually called the Western center for Deep Space Communications or Complex #160. There is another tracking station close by, at Simferopol, denoted Complex #10. In western Ukraine there is Complex #190 located at Dunevtsy. The Western Center was set up to support the Venera-1 mission in 1961.

The "Western Center" (#160) has two [ADU-1000 antennas](#) consisting of eight (8) **16 meter** dishes coupled together on a truss. The center also has an A70 (70 meter diameter) dish used for receiving telemetry from the Russian Interball and Granat satellites and for commanding these satellites. In addition there is an A32 command transmission antenna with 32 meter diameter. It transmits 8 kW of power on 5 GHz and 80 kW on 770 MHz. There are also two 25-meter dishes.

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