

AUTONOMOUS MONOPULSE SECONDARY RADAR “LIRA-VME”

MSSR “LIRA-VME” is designed to serve as a source of radar information at terminal and air-route radar sites of ATC centers.

MSSR ensures:

- » detection and determination of coordinates of aircraft equipped with RBS/S transponders located within MSSR coverage zone;
- » receipt and processing of supplementary information from aircraft equipped with RBS/S transponders;
- » receipt of extended squitters from aircraft equipped with on-board ADS-B 1090 ES equipment;
- » identification of aircraft equipped with MK-XII transponders (optionally);
- » matching of radar information received in secondary radar surveillance and MK-XII modes;
- » output of information on aircraft received in RBS/S and ADS-B 1090 ES modes, and information on technical status of MSSR equipment to ATC systems;



- » display of radar information and technical status, as well as control over MSSR equipment using a remote terminal.

MAIN FEATURES OF MSSR “LIRA-VME”

MSSR ensures all existing types of surveillance and data transmission lines provided by ICAO, Annex 10, Volume IV recommendations and STANAG 4193 standard requirements:

- in RBS/MK-XII modes: 3/A, C, 1, 2;
 - in S mode discrete-address interrogation: ELS, EHS;
 - in ADS-B (ADS-B 1090 ES) mode.
- » MSSR ensures operation in terminal and air-route modes with reconfiguration of such parameters as rotation speed of the antenna system, instrumented coverage range (interrogation frequency) and interrogation sequence. Radiation sectors are adjustable to decrease output radiated power level and other parameters of the receiving-transmitting lines;
- » MSSR uses monopulse method for aircraft azimuth evaluation, which provides high-accuracy evaluation and reduction in number of radiated interrogation signals. Continuous calibration of monopulse response parameters and automatic reconfiguration of these parameters are carried out in the course of MSSR operation;
- » MSSR antenna system is driven in azimuth plane by a rotation drive with frequency control, which ensures high reliability (due to the absence of mechanical rotary

parts) and low noise level. The rotation drive is virtually maintenance-free;

- » Solid-state transmitting devices of MSSR ensure operative adjustment of output pulse power level in accordance with external control commands, continuous functional monitoring over parameters (levels of output and reflected power, power supply source status, case temperature, presence of control signals, etc.);
- » MSSR uses three-channel receiving devices of direct amplification with low noise ratio and wide dynamic range. Analog-to-digital conversion of reply signals is carried out at a radio frequency. Primary and secondary (air-route) information processing are implemented in MSSR;
- » Output of data to ATC AS is implemented via ASTERIX standard. Type and configuration of data transmission equipment are provided as required by the data consumer;
- » MSSR comprises an interrupted power supply source, which ensures continuous operation of MSSR for 25 minutes in case of a failure of the primary power supply source;
- » MSSR has 100% redundancy of equipment, except for the antennas, rotary joint, redundancy equipment and ADS-B receiver. Automatic switch-over from the main set of equipment to the stand-by one takes 1 s at most;

» Monitoring over MSSR parameters is provided by the use of a test responder (included in the composition of MSSR delivery set). The test responder ensures shaping of reply signals in all interrogation modes and ADS-B messages, as well as it is capable to changes its parameters (aircraft number, altitude, range of shaped reply signal, etc.) by the commands received from MSSR as part of a specially compiled S mode message without using a cable communication line;

» MSSR operation does not require constant presence of service personnel. Readiness time of MSSR for operation if the hardware module is powered up does not exceed 2-3 minutes;
 » MSSR equipment is installed in the hardware module. The antennas are mounted atop of a tower. The features of the radar site define height of the tower. The hardware module can be installed both at the base of the tower and on the tower under the antenna level. The antenna system can be used with or without a radome.

SPECIFICATIONS

Parameter	Parameter value depending on operation mode		
	Mode S	RBS	ADS-B 1090ES
Coverage (at 10 s / 5 s rotation speed):	from 0 to 360		
» in azimuth, deg.	from 0 to 360		
» maximal range, km, at least	465 / 400		465
» minimal range, km, at most	1		0.5
» maximal elevation angle, deg., at least	45		90
» minimal elevation angle, deg., at most		0.3	
» maximal altitude, km, at least		20	
Number of simultaneously tracked aircraft	more than 1000		
Coordinate determination accuracy (RMSE), not lower than:			7.5 (NIC=11)
» in range, m	15		
» in azimuth, min	3.6		
Resolution, not lower than:			
» in range, m	Absolute	90	Absolute
» in azimuth, min	Absolute	0.6	Absolute
Rotation speed (terminal / air-route mode), s	5 / 10		–
Aircraft detection probability	0.99	0.98	–
Information accuracy, at least	0.98		–
Reliability:			
» mean time between failures, h, at least		40000	
» servicelife, years		15	
» operation life, h		120000	
» mean time to recovery, min, at most		30	
Power consumption of MSSR equipment via three-phase industrial network ~ 50 Hz, 380 V, kW, at most		10	