



LYRA RADAR FAMILY

The Lyra radar family is conceived to address a number of different applications as an integral part of major systems for:

- Homeland Protection
- Field applications as a Man Portable Radar
- Vessel Traffic Service

Independently from system architecture, HW and SW components and the associated industrial processes are conceived in a modular and synergetic way, already envisaging the evolution to other possible applications such as a Maritime Surveillance and a Surface Movement for airport applications.

The Lyra radar family is composed of the following members:

- LYRA 10 series for Homeland Protection available for fixed installations on a tower, on a vehicle and Man Portable (High mobility version)
- LYRA 50 series for VTS applications and Coastal Surveillance
- LYRA 80 series for Maritime Surveillance applications

The LYRA family incorporates the best of the COTS hardware technology and proprietary state of art processing algorithms.



RADAR LYRA 10 SERIES

Homeland Protection/High Mobility applications



Lyra 10 High Mobility wheeled version

LYRA 10 is a system completely designed and developed by SELEX-SI specifically for Homeland Protection and Man Portable applications.

LYRA 10 can detect people, vehicles, boats and low altitude flying helicopter. It is a radar providing outstanding range and azimuth data.

In addition, it automatically performs target classification.

LYRA 10 has the following capabilities:

- Automatic sector surveillance
- Automatic audio/video alarm for detection
- Automatic target tracking
- Automatic classification of a selected target

Moreover, it incorporates the following characteristic:

- Very low electromagnetic emission
- Short re-deployment and maintenance time
- Ease of operation
- Remote control and command control data link facilities
- Power supply through batteries or mains

When the system is powered up, it automatically goes in stand-by mode.

In stand-by mode all system functions are active, but there is no antenna scanning and no radar emissions.

The following functions are also available:

- North alignment capability
- System set-up capability: during set-up it is possible to adapt the default system settings or the settings used in the previous session
- BIT capability: the system contains Built-in Test to automatically detect system failures

In Surveillance mode the system detects moving targets; the main functionalities are:

- Sector surveillance capability: the system has the ability for sector surveillance. It is possible to set one sector between $\pm 6^\circ$ and $\pm 180^\circ$
- The sector setting can be performed locally or at remote site console unit
- Antenna speed selection capability; between two antenna speeds selectable by the operator
- Target detection performance

For moving targets with radial velocities up to 90 km/h (unambiguous) with accuracy of 0.8 km/h, the power budget is in conformance with the free space detection ranges below (with a probability of detection of 90%, probability of false alarms of 10^{-6} , antenna scan speed of $6^\circ/\text{s}$).

The reduction of the detection range due to rain attenuation is less than 10% at a rainfall rate of 2 mm/h, and 25% at a rainfall rate of 4 mm/hr.

The system is capable of providing automatic target classification.

Automatic classification is based on the range Doppler analysis of target backscatter.

The classification result is indicated by a symbol on the display at the measured position.

SYSTEM SPECIFICATIONS

Main Performances

Typical Detection Range	24 km
Coverage	Horizontal Azimuth Sector Scan $\pm 6^\circ$ and $\pm 180^\circ$ azimuth
Resolution Range:	9 m (nominal)
Azimuth:	3 deg (nominal)

Technical characteristics

Technology	pulsed – coherent
Antenna type	Patch
Dimension	70 cm x 40 cm x 25 cm
Antenna gain	29 dB
Azimuth beam width	3 degrees
Elevation beam width	4 degrees
Scan Rate	$12^\circ/\text{s}$ - $6^\circ/\text{s}$
Tilt	$\pm 10^\circ$
Tx	solid state
Rx	Double conversion coherent chain
Coherent integration	256 sweeps
Frequency	X band
IF Band	22 MHz
CFAR	Yes
STAGGER	Yes
Digital conversion	12 bit / 100 Msps
Transmitted Power	average value 1 W
Radar Input Power (range)	24V DC (20V to 33V)

Antenna group Weight	< 25 kg
Data/Control Interface	Ethernet, WiFi
Operational Availability	> 99%

ENVIRONMENTAL CHARACTERISTICS

Altitude of operation	0-4500 m
Temperature Ranges (operation)	-30 °C to +50 °C
Temperature Ranges (storage)	-40 °C to +60 °C

The Electromagnetic Compatibility tests (EMC) performed on the whole system are in according with CEI standards.

LYRA 50 SERIES VTS applications



Lyra 50 Vessel Traffic Surveillance

LYRA 50 is the most recent system completely designed and developed by SELEX-SI for Vessel Traffic Service and Coastal Surveillance applications.

LYRA 50 has the following capabilities:

- Detection of steady or moving vessels and boats
- High spatial resolution which provides rejection of unwanted background echoes and ensures the required system sensitivity

It uses fully solid state technology and very powerful digital processing boards using proprietary state of art algorithms which allow the following improvements with respect to existing radars:

- Low in transmission peak power
- Low voltage supply
- High compactness
- High reliability
- Capability of frequency diversity transmission on multiple frequencies

LYRA 50 is a coherent radar and can control and track the frequency and phase characteristics of the transmitted waveform. Wideband Frequency Modulation is used to minimise the electromagnetic compatibility impact and is effective in reducing interference from other radiating systems.

Frequency diversity is performed by using a Digital Frequency Synthesizer to generate waveforms. Pulse compression is performed digitally; this technique allows accurate characterization of the compressed pulse.

The joint use of frequency modulation and pulse compression allows to use low peak power long pulses. A proprietary side lobe suppression algorithm is used to reduce the pulse compression range side lobe; its time stability at different environmental conditions is also obtained by means of state of art calibration algorithms.

Finally frequency diversity improves the sensor coverage by reducing the fluctuation of the target echo and decreasing the range and time correlation of the clutter returns. The performance improvement is obtained by integrating multiple different frequency pulses.

SYSTEM SPECIFICATIONS

Main Performances

Typical Detection Range	48 km
Coverage	Full azimuth coverage or sectorial transmission capability
Resolution Range:	9 m (nominal)
Azimuth:	0.45 degrees (nominal)

Technical characteristics

Technology	pulsed with digital pulse compression
Antenna type	Slotted Wave Guide or reflector
Antenna gain	>35 dB
Azimuth beam width	0.45 degrees
Elevation beam width	20 degrees
Scan Rate	11/22 rpm
Tx	solid state
Rx	Double Conversion
Azimuth integration	Non coherent, frequency diversity or MTD
Range integration	Coherent
Frequency	X band
IF Band	22 MHz
CFAR	Yes
Maps	Fixed and adaptive range azimuth clutter maps
STAGGER	Frequency agility
Transmitted Power	5 W
Digital conversion	12 bit / 100 Msps
Data/Control Interface	Ethernet, WiFi
Operational Availability	> 99%

Environmental characteristics

Altitude of operation	0-4500 m
Temperature Ranges (operation)	-25 °C to +50 °C
Temperature Ranges (storage)	-40 °C to +60 °C

The Electromagnetic Compatibility tests (EMC) performed on the whole system are in accordance with CEI standards.

LYRA 80 SERIES

Coastal Surveillance applications



LYRA 80 is the High End version of the system for Vessel Traffic Service and Coastal Surveillance applications.

LYRA 80L has the following capabilities:

- Longer Range than the standard VTS version by using a more powerful Transmitter and a higher gain antenna
- Detection of steady or moving boats
- High spatial resolution which provides rejection of unwanted background echoes and ensures the required system sensitivity

It uses fully solid state technology and very powerful digital processing boards using proprietary state of art algorithms which guarantee the following improvements with respect to existing radars:

- Low in transmission peak power
- Low voltage supply
- High compactness
- High reliability
- Capability of frequency diversity transmission on multiple frequencies

SYSTEM SPECIFICATIONS

Main Performances

Typical Detection Range	48 Nmi
Coverage	Full azimuth coverage or sectorial transmission capability

Technical characteristics

Technology	pulsed coherent Doppler radar with digital pulse compression
Antenna type	reflector
Antenna gain	40-44 dB
Tx	solid state
Rx	Double Conversion
Azimuth integration	MTD, frequency diversity or non coherent
Range integration	Coherent
Frequency	X band
IF Band	22 MHz
CFAR	Yes
Maps	Fixed and adaptive range azimuth clutter maps
STAGGER	Frequency agility
Transmitted Power	average value 5-20 W
Digital conversion	12 bit / 100 Msps
Data/Control Interface	Ethernet, WiFi
Operational Availability	> 99%

ENVIRONMENTAL CHARACTERISTICS

Altitude of operation	0-4500 m
Temperature Ranges (operation)	-25 °C to +50 °C
Temperature Ranges (storage)	-40 °C to +60 °C



Lyra 10 High Mobility tracked version