SELEX Sistemi Integrati
A Finmeccanica Company

Predictable results
for unpredictable threats

THE LYRA RADAR FAMILY

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

- Homeland Protection (HP)
- Field applications as a Man Portable Radar (MPR)
- Vessel Traffic Service (VTS)

In such way that independently from the system architecture configuration, 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 Radar and a Surface Movement Radar (SMR) 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 suitable vehicle and Man Portable (High mobility version)
- LYRA 50 series for VTS applications and Coastline 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 50 SERIES – VTS APPLICATIONS

The radar LYRA 50 series is the most recent system completely designed and developed by Selex-SI for Vessel Traffic Service and Coastline 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

Moreover, it employs 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 transmitting 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 (WFM) is used

to minimise the electromagnetic compatibility impact and is helpful 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 accuratedesign 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 Perfomances

Typical Detection Range	48 km
Coverage	Full azimuth coverage or sectrorial transmission capability
Resolution	Range: 9 (nominal)

Azimuth: 0.45 degrees (nominal)

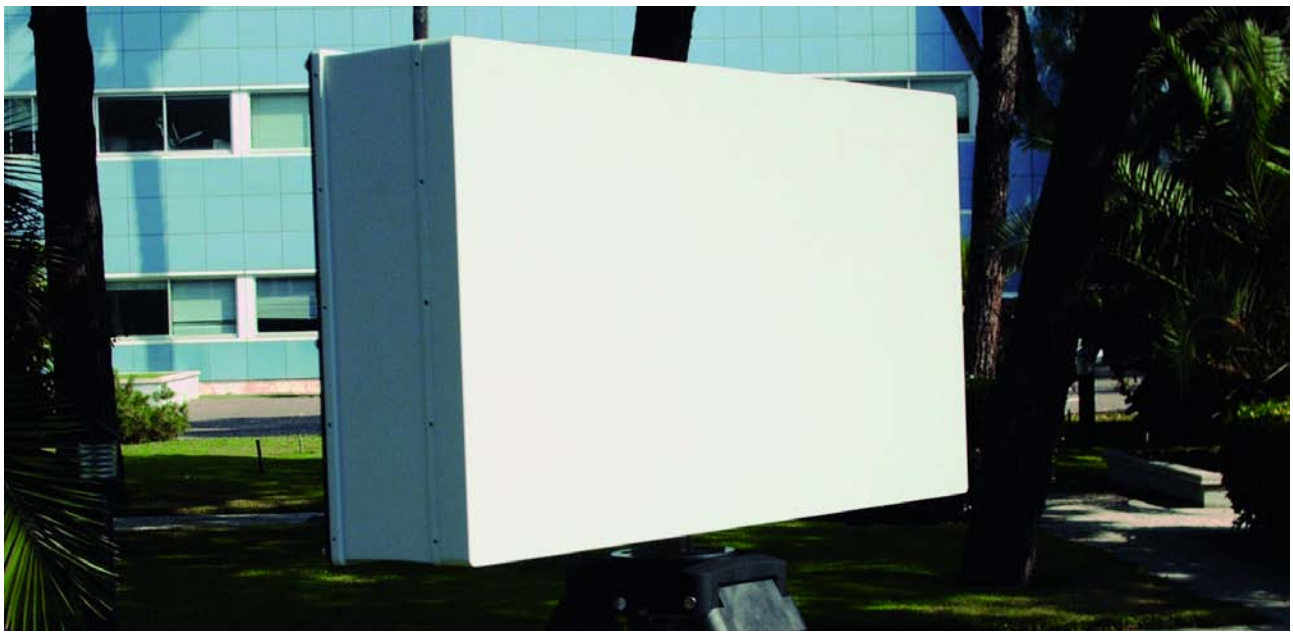
Technical characteristics

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 average value	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 according with CEI standards.



RADAR LYRA 10 SERIES - HP/MP APPLICATIONS

The radar LYRA 10 series is the most recent system completely designed and developed by Selex-SI specifically for Homeland Protection (HP) and Man Portable applications.

LYRA 10 can detect people, vehicles, boats and low altitude flying helicopter. It is a ground based radar providing outstanding range and azimuth measurements performances.
In addition, it performs automatically the targets 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
- It can be battery powered

LYRA 10 Series radar has 2 modes of operation, selectable by operator:

- Stand-by mode
- Surveillance and Classification mode

STAND-BY MODE

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: before starting surveillance, radar has to be aligned to Grid north; the procedure for North alignment will not take more than 5 minutes
- 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 (BIT capability) to detect automatically system failures.

SURVEILLANCE AND CLASSIFICATION MODE

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 +/- 6° and +/-180°.
  The sector setting can be performed locally or at remote site console unit
- Antenna speed selection capability: the system has the capability for two antenna speed selection
- 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 following free space detection ranges (with a probability of detection of 90%, probability of false alarms of 10-6, antenna scan speed of 6°/s).
The reduction of the detection range due to the 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 typical detection performances are as follows:

Target type	RCS (m²)	Detection Range (km)
personnel	0.5-1	10
wheeled vehicles	3	16
trucked vehicles	20	24
helicopters	5-10	18

The system is capable of to 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 Perfomances

Typical Detection Range	24 km
Coverage	Horizontal Azimuth Sector Scan +/-6°
	and +/-180° 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°/s-6°/s
Tilt	-+/-10°
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.

RADAR LYRA 80 SERIES COASTAL SURVEILLANCE APPLICATIONS

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

LYRA 80 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

Moreover, it employs 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 transmitting peak power
- low voltage supply
- high compactness
- high reliability
- capability of frequency diversity transmission on multiple frequencies

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